

Maintenance Manual

Table of Content

| | |
|---|------------|
| Chapter 1: Product Inspection and Model Numbers | 1-1 |
| 1.1 Product Inspection | 1-1 |
| 1.2 Model numbers | 1-2 |
| 1.2.1 Nameplate | 1-2 |
| 1.2.2 Structure of Model number | 1-2 |
| 1.3 Cross References of NC300 Controller Accompanying Servo Drive and Motor Models | 1-3 |
| 1.4 NC300 Controller Overview | 1-4 |
| 1.5 Operation Mode Overview | 1-5 |
| Chapter 2: Installation | 2-1 |
| 2.1 Cautions | 2-1 |
| 2.2 Storage Environment | 2-1 |
| 2.3 Installation Environment..... | 2-2 |
| 2.4 Installation Direction and Space..... | 2-3 |
| 2.5 Dimensions | 2-3 |
| Chapter 3: Wiring | 3-1 |
| 3.1 Wiring of system interface and main power circuit..... | 3-1 |
| 3.1.1 System interface wiring diagram | 3-1 |
| 3.1.2 Connectors and terminals of NC300A controller | 3-2 |
| 3.1.3 Wiring the power line..... | 3-5 |
| 3.1.4 DMC connection setup for NC300A and ASDA-A2-N | 3-7 |
| 3.1.5 Specifications for lead connectors to each NC300A port | 3-8 |
| 3.2 I/O Wiring | 3-9 |
| 3.3 Signal Wiring for AXIS 1~4 Input Terminal | 3-12 |
| 3.4 Wiring for spindle input terminal signal | 3-15 |

| | | |
|--|--|------------|
| 3.5 | Wiring for MPG input terminal signal..... | 3-19 |
| 3.6 | Wiring for Remote I/O Signal | 3-23 |
| 3.7 | Wiring for DMCNET Communication terminal signal | 3-25 |
| 3.8 | Wiring for Ethernet communication terminal signal..... | 3-26 |
| 3.9 | Wiring for RS-485 communication terminal signal | 3-27 |
| 3.10 | Optical Coupler terminal block module NC-TBM-T1616 | 3-28 |
| 3.11 | Relay Terminal block module NC-TBM-R1616..... | 3-29 |
| 3.12 | Optical coupler remote I/O block module NC-EIO-T3232 | 3-30 |
| 3.13 | Relay remote I/O block module NC-EIO-R3216 | 3-31 |
| 3.14 | Relay remote I/O block module NC-EIO-R3216 | 3-32 |
| 3.15 | Definitions of the secondary control panel I/O | 3-35 |
| Chapter 4: Summary of User Parameters | | 4-1 |
| 4.1 | Overview | 4-1 |
| 4.2 | Parameter Information | 4-1 |
| 4.2.1 | Operation parameters | 4-2 |
| 4.2.2 | Tool magazine parameters..... | 4-8 |
| 4.2.3 | Machining parameters..... | 4-10 |
| 4.2.4 | Spindle parameters | 4-13 |
| 4.2.5 | Mechanical parameters | 4-17 |
| 4.2.6 | Home point parameters..... | 4-19 |
| 4.2.7 | Compensation parameters | 4-22 |
| 4.2.8 | System parameters | 4-25 |
| 4.2.9 | MLC setup | 4-28 |
| 4.2.10 | Diagram parameters | 4-30 |
| 4.2.11 | Internet setting | 4-31 |
| 4.2.12 | Servo parameters | 4-33 |

| | |
|--|------------|
| 4.2.13 Channel setting..... | 4-36 |
| 4.2.14 Rio setting..... | 4-37 |
| 4.3 Note..... | 4-39 |
| 4.3.1 Setting method of absolute motor | 4-39 |
| 4.3.2 Setting method of synchronous function | 4-41 |
| 4.3.3 Setting method of command transfer | 4-43 |
| Chapter 5: MLC Special M&D Command | 5-1 |
| 5.1 Definition to MLC special M&D command..... | 5-1 |
| 5.2 MLC bit output from MLC to NC where M indicates bit output..... | 5-2 |
| 5.3 MLC bit input NC -> MLC special M bit input description..... | 5-8 |
| 5.4 MLC register output (MLC -> NC) the description of special D word output | 5-13 |
| 5.5 MLC register input (NC -> MLC) the description of special D word input | 5-15 |
| Chapter 6: Troubleshooting | 6-1 |
| 6.1 List of alarms of NC300 controller..... | 6-1 |
| 6.1.1 PLC system alarms (code range: 0x1200~0x1300) | 6-1 |
| 6.1.2 NC alarm code (range: 0x4200~0x4300) | 6-3 |
| 6.1.3 Channel alarm code (range: 0xA000~0xD000)..... | 6-5 |
| 6.1.4 Description of macro form configuration error message..... | 6-8 |
| 6.1.5 HMI system alarm (range: 0x3010~0x3FFFF) | 6-10 |

Chapter 1: Product Inspection and Model Numbers

1.1 Product Inspection

Please check the items listed below against what you have received to identify any damage and or missed item(s) caused during purchasing and delivery.

| Items | Description |
|------------------------|---|
| What you have received | Please check the Model number on NC300 nameplate. See Section 1.2 for descriptions on Model numbers. |
| Keys and buttons | Press each buttons and keys. Normal membrane keys can be pressed smoothly. If you feel any abnormality when pressing them, they may be damaged! |
| Improper appearances | Visual checking for any exterior damage and/or scratch. |
| Loose connector(s) | Visual checking for any loose or poorly fastened connector. |

Please contact the agent for any situation listed above.

Items included with the NC300 product:

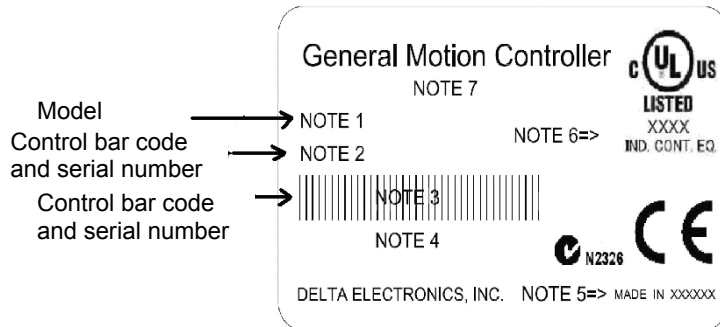
- (1) NC300 controller.
- (2) Two 6-pin connectors for connecting to MPG and Remote I/O (Delta P/N: 3051622646 *2 PCS).
- (3) One 2-pin connector for connecting to the secondary control panel IES (Delta P/N: 3051622246 *1 PCS).
- (4) One 3-pin connector for connecting to DC24V power supply (Delta P/N: 3050243446 *1 PCS).

1.2 Model numbers

1.2.1 Nameplate

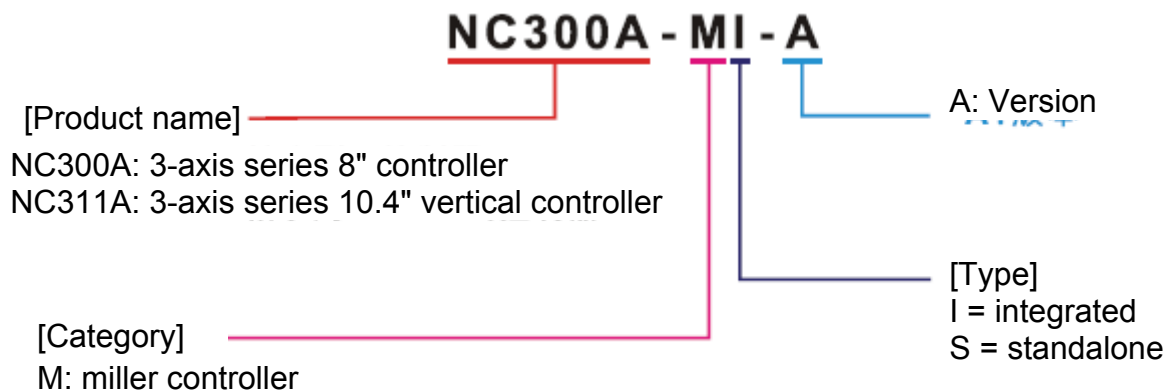
NC300 series controller

- Contents of the nameplate



1.2.2 Structure of Model number

NC300A series controller

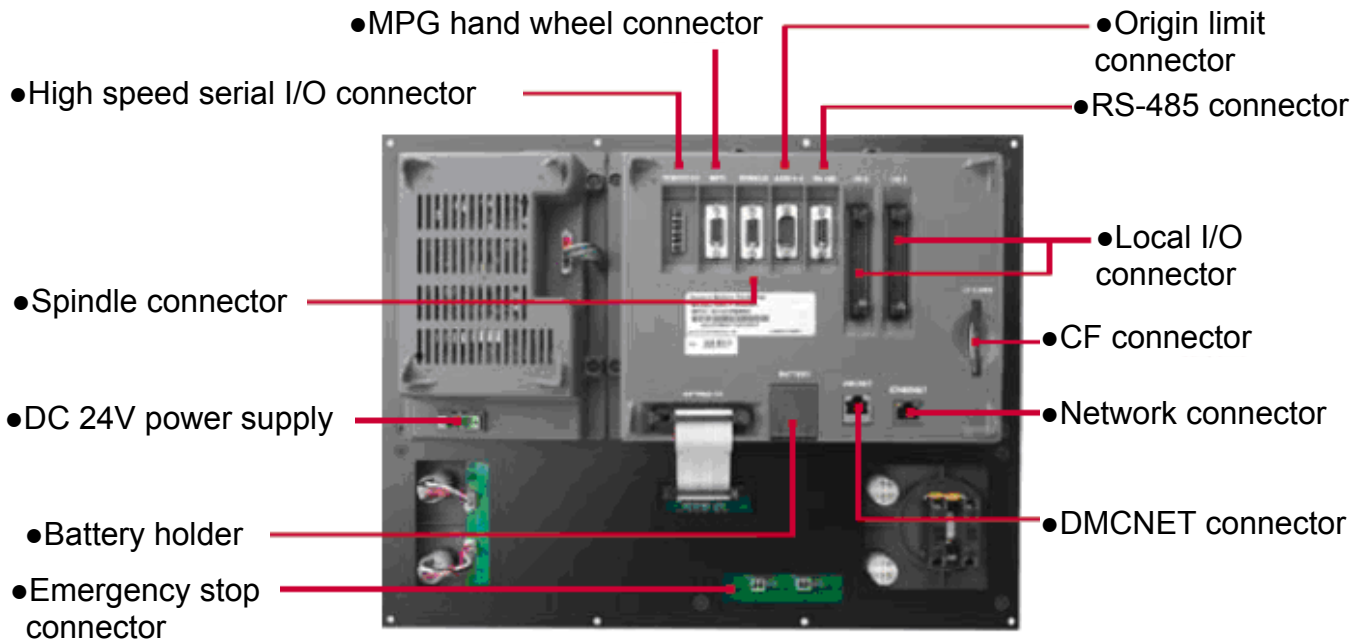


1.3 Cross References of NC300 Controller Accompanying Servo Drive and Motor Models

| Servo drive | | Accompanying servo motor |
|-------------|---------------|--|
| 200W | ASD-A2-0221-F | ECMA-C10602□S (S=14mm) |
| 400W | ASD-A2-0421-F | ECMA-C10604□S (S=14mm) ECMA-C10804□7 (7=14mm) ECMA-E11305□S (S=22mm) ECMA-G11303□S (S=22mm) |
| 750W | ASD-A2-0721-F | ECMA-C10807□S (S=19mm) ECMA-G11306□S (S=22mm) |
| 1000W | ASD-A2-1021-F | ECMA-C11010□S (S=22mm) ECMA-E11310□S (S=22mm) ECMA-G11309□S (S=22mm) |
| 1500W | ASD-A2-1521-F | ECMA-E11315□S (S=22mm) |
| 2000W | ASD-A2-2023-F | ECMA-C11020□S (S=22mm) ECMA-E11320□S (S=22mm) ECMA-E11820□S (S=35mm) |
| 3000W | ASD-A2-3023-F | ECMA-E11830□S (S=35mm) ECMA-F11830□S (S=35mm) |

Specifications of servo drives shown in the table above are designed with three times the rated current of the servo motor. Please contact distributors for custom servo drive with six times the rated current of the servo motor. See Chapter for detailed specifications on motors and drives.

1.4 NC300 Controller Overview



1.5 Operation Mode Overview

This controller offers multiple operation modes as described below:

| Name | Description |
|------|--|
| AUTO | <p>You are required to set the system in AUTO mode before a program can be executed. This enables you to validate machining program, cutting conditions, and coordinates of positions before execution as well as to avoid unexpected operation by incorrectly pressing keys in non-auto mode. The AUTO mode allows running program only. You cannot edit the program nor do manual axial offset among other operations.</p> |
| EDIT | <p>You can edit the program only in EDIT mode. In EDIT mode, you may fully access various program editing functions available in the PROGRAM group. Please note that you cannot execute the program and do manual axial offset either as only the file editing function is available in this mode.</p> |
| MDI | <p>You can input a single block program with screens available in PROGRAM group and run it in MDI mode.</p> <p>Memory capacity of the program is limited as most MDI programs are simple ones manually entered by users. MDI's PROGRAM group screens allow a single step program of up to 17 statements. General program editing and editing and manual axial operations are unavailable in MDI mode.</p> |
| MPG | <p>You can do manual axial offset for each axis with external hand wheel in MPG mode for fast and solid axial movements. Program editing, execution, and jog operations are prohibited in MPG mode.</p> |
| INC | <p>You can use the axial keys in the secondary control panel for manual incremental offset in INC mode. You can move the tool by one unit of a given distance by pressing relevant axial keys once. Pressing and holding the key have the same effect as pressing it once rather than moving the tool continuously. You cannot edit and execute the program in INC mode.</p> |
| JOG | <p>The JOG mode enables you to do axial jog offset by pressing relevant axial movement keys in the secondary control panel. The speed and distance of each jog movement is controlled by the jog adjustment key. There are two JOG types available: normal and fast.</p> <p>Both program execution and editing functions are banned from the JOG mode. You can only do manual axial offset with relevant axial movement keys in the secondary control panel.</p> |

| Name | Description |
|------|--|
| HOME | <p>The HOME mode simplifies the manual origin reset operation. You can reset each axis to its mechanical origin by pressing all axial movement keys in the secondary control panel in HOME mode.</p> <p>After re-starting the controller, users are required to reset each axis to its mechanical origin by running the HOME mode first. Otherwise, the controller stops the program execution function.</p> |
| DNC | <p>The DNC mode enables importing machining programs from external devices through communication connection. Select the DNC mode and then starts to import program files from external devices with the networking function of the PROGRAM group.</p> |

Chapter 2: Installation

2.1 Cautions

Please pay special attention to conditions, including voltage, current, and temperature, given in this document to prevent personal injury and/or equipment damage from occurring.

2.2 Storage Environment

Please keep this product in its original package before installation. Please ensure your product is stored in an environment as described below if it is to be not used for a while in order to meet warranty specifications and maintenance requirements:

Keep your product in a dust-free and dry place.

Keep the ambient temperature of the storage location in the range of $-20^{\circ}\text{C} \sim +60^{\circ}\text{C}$ ($-4^{\circ}\text{F} \sim 149^{\circ}\text{F}$).

Keep the relative humidity of the storage location in the range of 10% ~ 95% without condensation.

Keep your product away from an environment of corrosive gases and liquids.

Keep your product in a proper package and placed on a rack or flat surface.

Hardware specifications

| Model | NC300 |
|------------------------------------|--|
| Working environment | 10% ~ 95% RH ($0 \sim +55^{\circ}\text{C}$) |
| Storage environment | 10% ~ 95% RH ($-20 \sim +60^{\circ}\text{C}$) |
| Cooling | Natural cooling |
| Voltage | DC +24V ($-10\% \sim +15\%$) (embedded isolated circuit ⁰) |
| Insulation endurance | Between DC24 and FG terminals: AC500V, 1 minute |
| Power consumption | 24V 0.6A 15W |
| Backup battery for memory | 3V lithium battery CR2032 × 1 |
| Life span of backup battery | Varies with ambient temperature and working conditions; about three years in 25°C room temperature |
| Dimensions (W) x (H) x (D) mm | 400 x 309 x 129 |
| Opening dimensions (W) x (H) mm | 378 x 289 |
| Weight | Around 3700g |

2.3 Installation Environment

Operation temperature

NC300 series controller : 0°C ~ 55°C (32°F ~ 131°F)

Please keep the ambient temperature below 45°C for long-term operation to ensure the reliability of your product.

Please place your product in a place with good ventilation if the ambient temperature tops 45°C. For a product installed in a distribution box, please ensure that the size and ventilation status of the box can prevent overheating of electronic devices. Keep electronic devices within your product away from the effect of vibration of the machine.

Please install the product subject to the conditions described below to ensure the validity of NC300 controller's warranty and subsequent maintenance:

Please install the product in an environment where meets the requirements described below:

- free from strong heating devices,
- free from water, steam, dust and oil,
- free from corrosive and/or flammable gas and liquid,
- free from floating dust and metal particles,
- robust and vibration-free places without electromagnetic noise interference.

Make sure the installation site of NC300 controller is of a temperature and humidity in a given range.

Store NC300 controller in a place with vibration in a specified range.

2.4 Installation Direction and Space

NC300 series controller must be installed vertically on a dry and robust as well as NEMA standards-compliant surface. For good ventilation and cooling efficiency, sufficient clearance (50mm or roughly 2 inches) must be maintained between adjacent objects and partitions (walls) surrounding your product.

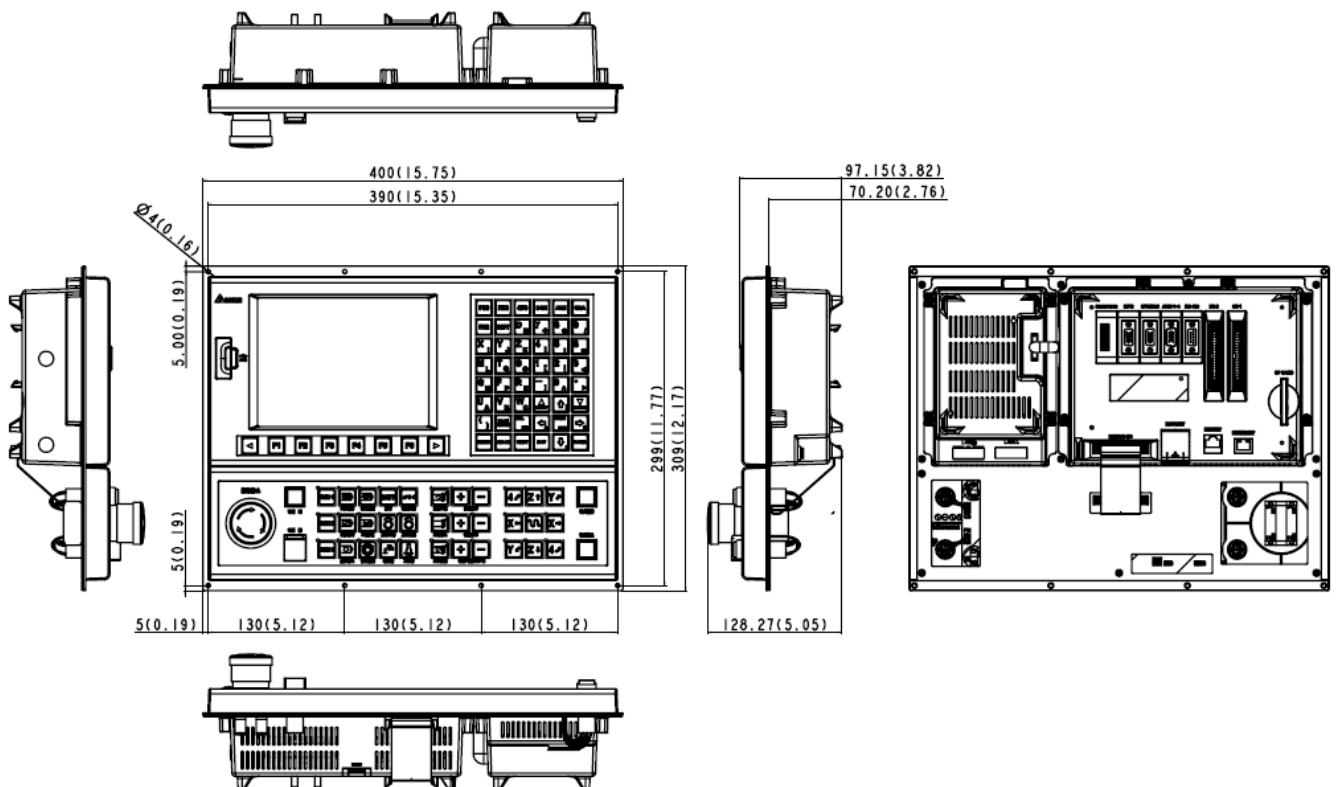
Note:

For good ventilation and cooling efficiency, sufficient clearance must be maintained between adjacent objects and partitions (walls) surrounding the product. Otherwise, product failure may result.

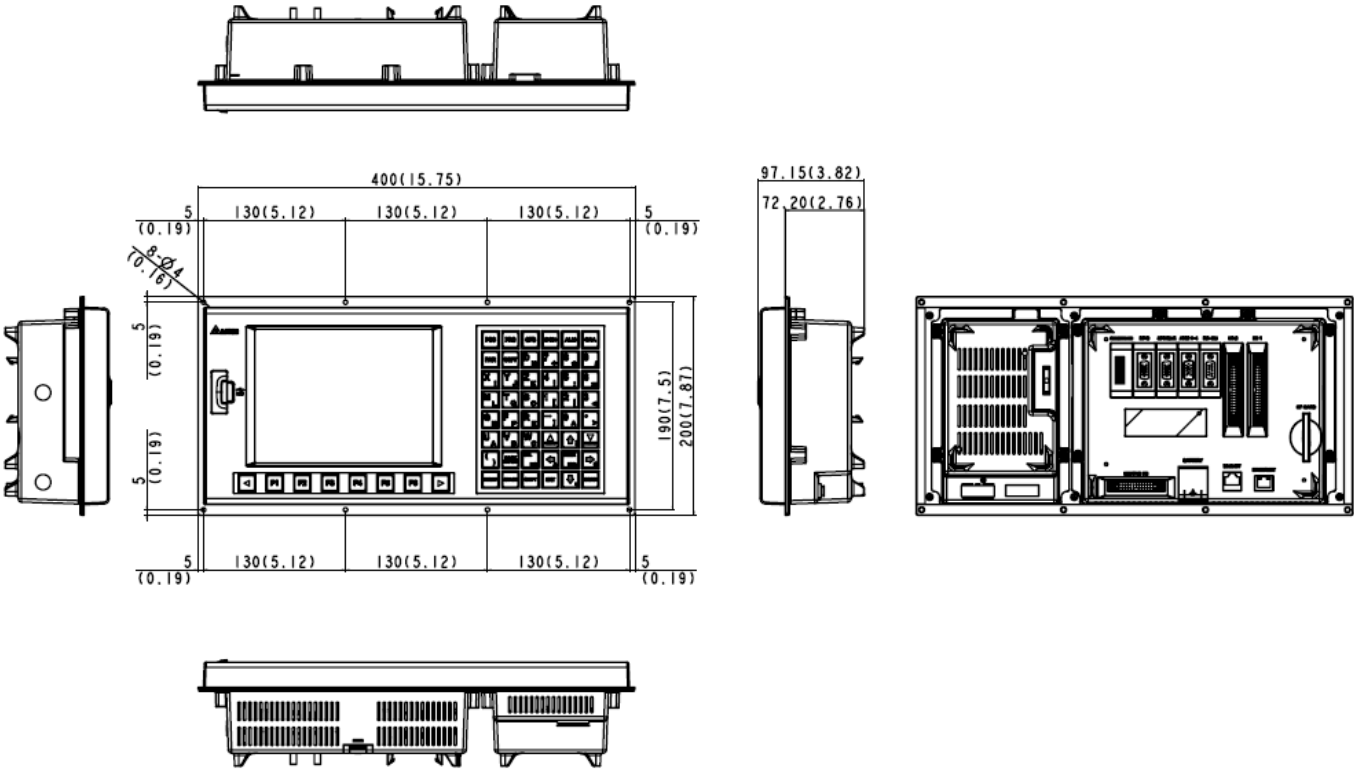
Do not block the ventilation slot of NC300 controller or product failure may result.

2.5 Dimensions

NC300A-MI-A



NC300A-MS-A

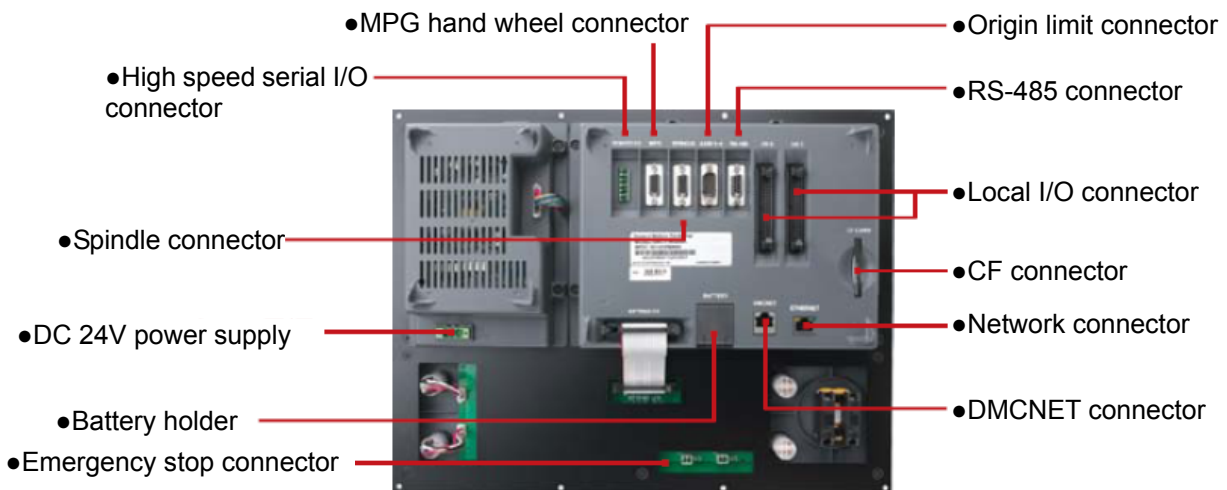


Chapter 3: Wiring

This chapter explains the wiring of the servo drive and the meaning of various signals along with the standard wiring diagrams for various modes.

3.1 Wiring of system interface and main power circuit

3.1.1 System interface wiring diagram



| Connector | Description |
|-----------------------|---|
| High speed serial I/O | Every module features 32 pairs of inputs and outputs |
| | Up to 20M between stations and up to 160M (20 x 8) total length |
| MPG hand wheel | External hand wheel function with internal DC 5V driving power and 6 inputs |
| Spindle | One spindle encoder signal input |
| | One analog signal output |
| | G31 high speed input |
| Origin limit | 4-axis limit and origin input |
| RS-485 | RS-485 communication |

| Connector | Description |
|------------------|---|
| Power socket | DC 24V power input |
| DMCNET | High speed communication network connector |
| Ethernet network | DNC control and system monitoring |
| CF card | G code program storage |
| Emergency stop | Triggers immediate system stop when opening circuit |
| I/O 1 and I/O 2 | I/O 1 for 16 pairs of I/O |
| | I/O 2 for 12 pairs of I/O |



NOTE

Notes on installation:

- 1) Ensure correct DC 24V power connection. Do not connect to AC 110V power.
- 2) On board and remote I/O require extra DC 24V power to drive X input and Y output.
- 3) Short circuit the EMG (emergency stop) switch of the product to ready the controller.
- 4) For abnormal or emergency stop, disconnect the servo drive power by breaking the electromagnetic contactor power with the Y output.

3.1.2 Connectors and terminals of NC300A controller

| Terminal mark | Name | Description | | |
|---------------|------------------------------------|--|---|--------------------------|
| 0V, +24V ⊕ | Controller power input | Connect the DC 24V power (15W at 0.6A) | | |
| | | Terminal ID | Wire color | Description |
| | | +24V | Red | Positive of DC 24V power |
| | | 0V | White | Negative of DC 24V power |
| | | ⊕ | Green | Power grounding |
| I/O 1 | On Board I/O 1 | DI/DO range (X0~X15, Y0~Y15), see Section 3.3 | | |
| | | PIN ID | Description | |
| | | P1~ P16 | Input X0~X15 terminal, up to 16 points (8~25mA) | |
| | | P19~P34 | Output Y0~Y15 terminal, up to 16 points (<120mA) | |
| | | P18 | Input COM2 port, for +24V or 24V GND | |
| | | P17 | Output OUT-COM port for VDD GND | |
| | | DO power specifications apply: voltage: <DC 24V; current <60mA | | |
| I/O 2 | On Board I/O 2 | DI/DO range: (X16~X27, Y16~Y27), see Section 3.3 | | |
| | | PIN ID | Description | |
| | | P1~ P12 | Input X16~X27 terminal, up to 12 points (8~25mA) | |
| | | P19~P30 | Output Y16~Y27 terminal, up to 12 points (<120mA) | |
| | | P18 | Input COM3 port, for +24V or 24V GND | |
| | | P17 | Output OUT-COM port for VDD GND | |
| | | DO power specifications apply: voltage: < DC 24V; current < 60mA | | |
| AXIS 1~4 | Limit to each axis and home sensor | 0~3 axis, the positive/negative limits and home sensor input terminal, up to 12 points (Operating current: 8~25mA) | | |
| | | PIN ID | Description | |
| | | P1~P3 | Positive limit, negative limit, home point input for axis 0 (Special M [M2144], [M2145], [M2146]) | |
| | | P4~P6 | Positive limit, negative limit, home point input for axis 1 (Special M [M2148], [M2149], [M2150]) | |
| | | P7~P9 | Positive limit, negative limit, home point input for axis 2 (Special M [M2152], [M2153], [M2154]) | |

| Terminal mark | Name | Description | |
|---------------|------|-------------|--|
| | | P10~P12 | Positive limit, negative limit, home point input for axis 3 (Special M [M2156], [M2157], [M2158]) |
| | | P13~P15 | Input COM1 port, for +24V or 24V GND |

| Terminal mark | Name | Description | |
|---------------|----------------------------|---|---|
| SPINDLE | Spindle specific connector | Including spindle revolution speed feedback, analog output and 2 high speed counter inputs (the HIS_1 is for G31 disconnection) | |
| | | PIN ID | Description |
| | | P1 | HIS_COM, for +24V or 24V GND |
| | | P2 | HIS_1 counter C78, Input [M2142] |
| | | P3 | HIS_2 counter C79, Input [M2143] |
| | | P4 | SP_OUT |
| | | P5 | SP_GND |
| | | P6 | EMG_STOP |
| | | P7 | No connection |
| | | P8 | SP_A+ |
| | | P9 | SP_A- |
| | | P10 | +5V_OUT |
| | | P11 | SP_B+ |
| | | P12 | SP_B+ |
| | | P13 | SP_Z+ |
| P14 | SP_Z+ | | |
| P15 | +5V_GND | | |
| MPG | Hand wheel pulse input | 6 DI input and along with one hand wheel input terminal, A, /A, B, /B | |
| | | PIN ID | Description |
| | | P1 | External 24V input |
| | | P2~P7 | DI (X28~X33) < 8~20mA, connect to +5V_GND May trigger DI |
| | | P8 | +5V_GND |
| | | P9 | +5V_GND |
| | | P10 | +5V power positive end + (<300mA) |
| | | P11 | XA+ |
| | | P12 | XA- |
| | | P13 | XB+ |
| | | P14 | XB- |
| P15 | +5V_GND | | |

| Terminal mark | Name | Description | |
|---------------|---------------------------------------|--|-----------------------|
| REMOTE I/O | Remote I/O serial connection terminal | Remote I/O communication terminal, with ranges X256~X511, Y256~Y511 Every remote I/O is X32/Y32 and may connect up to 8 modules | |
| | | PIN ID | Description |
| | | P1 | SHIELD |
| | | P2 | GND |
| | | P3 | RX+ |
| | | P4 | RX- |
| | | P5 | TX- |
| ETHERNET | Ethernet connector | Connect PC with RJ45 connector with normal network cable. See below for wire jumping. | |
| | | PIN ID/color at end A | PIN ID/color at end B |
| | | 1. Orange white | 1. Orange white |
| | | 2. Orange | 2. Orange |
| | | 3. Green white | 3. Green white |
| | | 4. Blue | 4. Blue |
| | | 5. Blue white | 5. Blue white |
| | | 6. Green | 6. Green |
| | | 7. Brown white | 7. Brown white |
| | | 8. Brown | 8. Brown |
| DMCNET | DMCNET communication connector | Connect to Delta's servo drive ASD-A2 model N with standard RJ45 connector. Wire in standard Ethernet manner. | |

| Terminal mark | Name | Description |
|---------------|----------------------------|--|
| EMG | Emergency stop switch | Press to open circuit |
| Power On | Key | A connector key with key light indicator (with DC 24V power) |
| Power Off | Key | B connector key with key light indicator (with DC 24V power) |
| IES | EMG emergency stop contact | Emergency stop contact. Activate EMG when breaking circuit. |

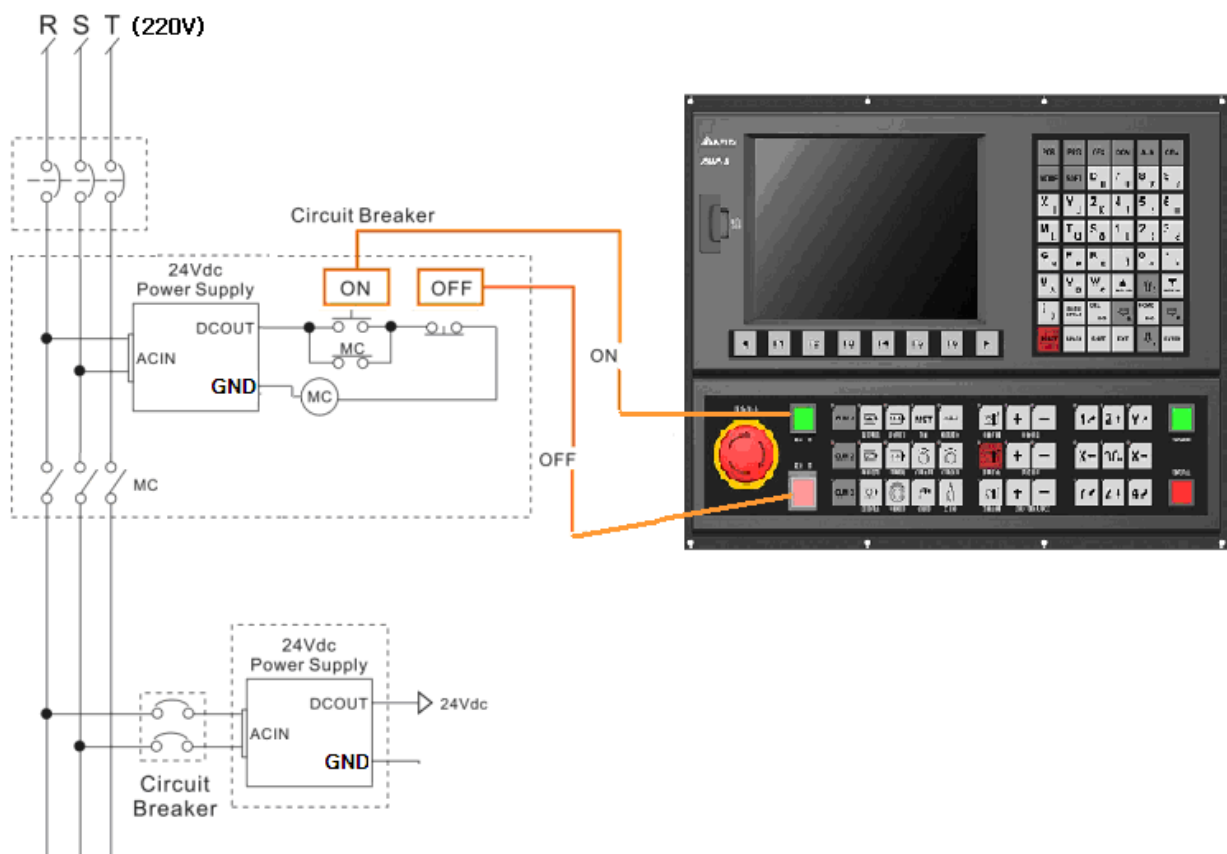
Notes on wiring:

- 1) The IES connector is for EMG emergency stop switch. Activate EMG when breaking circuit.
- 2) Power On / Power Off, with key light indicator (with DC 24V power)

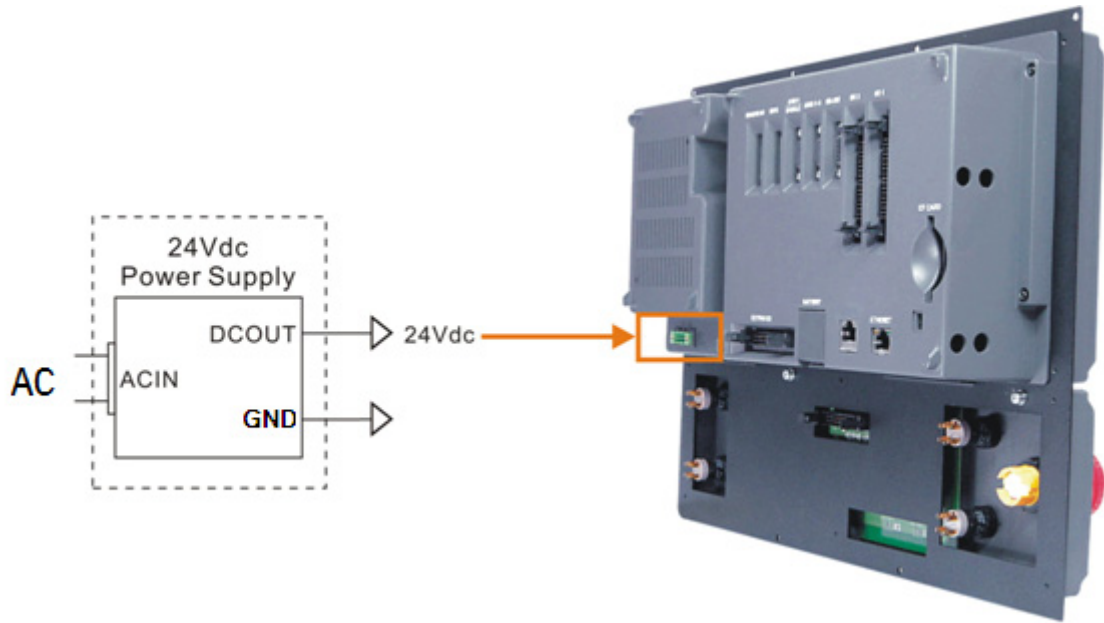
3.1.3 Wiring the power line

The GMC-A series controller can be powered by direct or machine power supply. As shown in figure below, connector "a" is for power ON and "b" for power OFF. The MC is for magnetic contactor coil and self-keep power as well as the main circuit power connector.

- Three-phase power wiring (powered by DC 24V transformed by machine AC power supply). Please note that the light indicator is in DC 24V power.



- Wiring for direct DC power supply (to power ON the controller)



3.1.4 DMC connection setup for NC300A and ASDA-A2-N



Simple DMC Connection

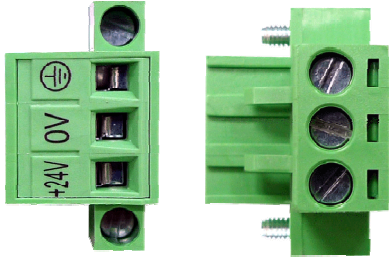
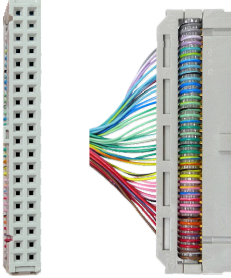
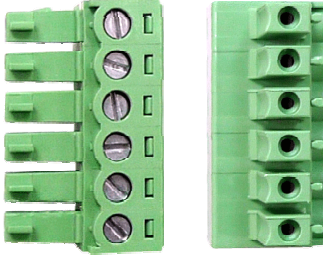
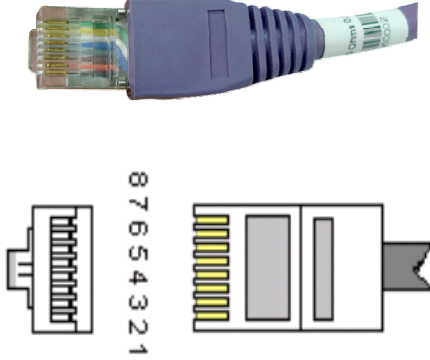
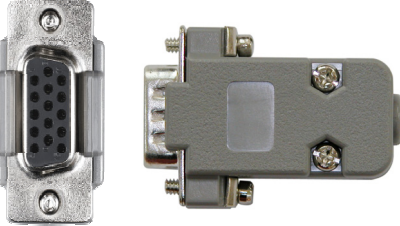
ASDA-A2-N and DMC connection setup

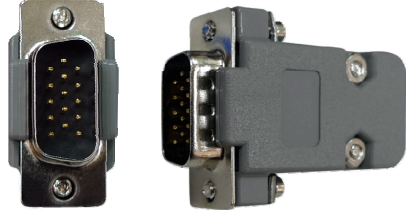
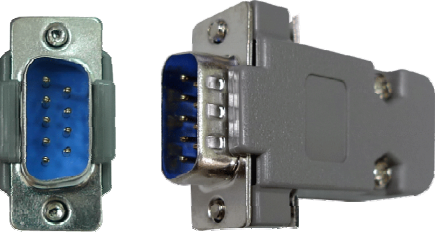

- Set P1-01 to b
- Set P1-01 (CW, CCW) to 010b
- Set P3-00 (station ID) to 1~12
- Set P3-01 (CNC connection) to 0203
- Set P3-10 (communication) to 1
- Set P2-15 (limit to the right) to 1XX
- Set P2-16 (limit to the left) to 1XX
- Set P2-17 (EMG) to 1XX



Delta Confidential

3.1.5 Specifications for lead connectors to each NC300A port

| Terminal name and mark | Connector | PINs |
|---|--|------|
| DC 24V power input |  | 3 |
| I/O 1 and I/O 2 |  | 34 |
| REMOTE I/O |  | 6 |
| DMCNET and ETHERNET (with standard RJ45 connector) |  | 8 |
| AXIS 1~4 |  | 15 |

| Terminal name and mark | Connector | PINs |
|------------------------|--|------|
| SPINDLE and MPG |  | 15 |
| RS-485 |  | 9 |
| IES |  | 2 |

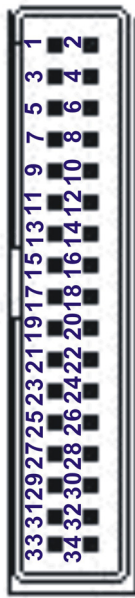
Please use AWG30, UL1007 compliant I/O wires shielded with metal mesh to prevent signal noise. The DMCNET terminal uses RJ45 connector and insulated network cable to connect with the server.

3.2 I/O Wiring

Layout of I/O 1 and I/O 2 terminal blocks

For more flexible I/O configuration, the controller features On Board I/O. There are 16 pairs of inputs and outputs in I/O 1 with the outputs entered with +V. Users may set input point signal to GND or +V depending upon whether the COM2 is connected to +V or GND.

In total, there are 28 input and 28 output points. See the table below for pins of the MLC (X0~27/Y0~27):



| | | | |
|--------------|-----|--------|-----|
| | | | |
| I/O 1 | | | |
| PIN 1 | X0 | PIN 2 | X1 |
| PIN 3 | X2 | PIN 4 | X3 |
| PIN 5 | X4 | PIN 6 | X5 |
| PIN 7 | X6 | PIN 8 | X7 |
| PIN 9 | X8 | PIN 10 | X9 |
| PIN 11 | X10 | PIN 12 | X11 |
| PIN 13 | X12 | PIN 14 | X13 |

| | | | |
|--------------|-----|--------|-----|
| | | | |
| I/O 2 | | | |
| PIN 1 | X16 | PIN 2 | X17 |
| PIN 3 | X18 | PIN 4 | X19 |
| PIN 5 | X20 | PIN 6 | X21 |
| PIN 7 | X22 | PIN 8 | X23 |
| PIN 9 | X24 | PIN 10 | X25 |
| PIN 11 | X26 | PIN 12 | X27 |
| PIN 13 | NC | PIN 14 | NC |

| | | | |
|--------------|--------|--------|------|
| | | | |
| I/O 1 | | | |
| PIN 15 | X14 | PIN 16 | X15 |
| PIN 17 | OUTCOM | PIN 18 | COM2 |
| PIN 19 | Y0 | PIN 20 | Y1 |

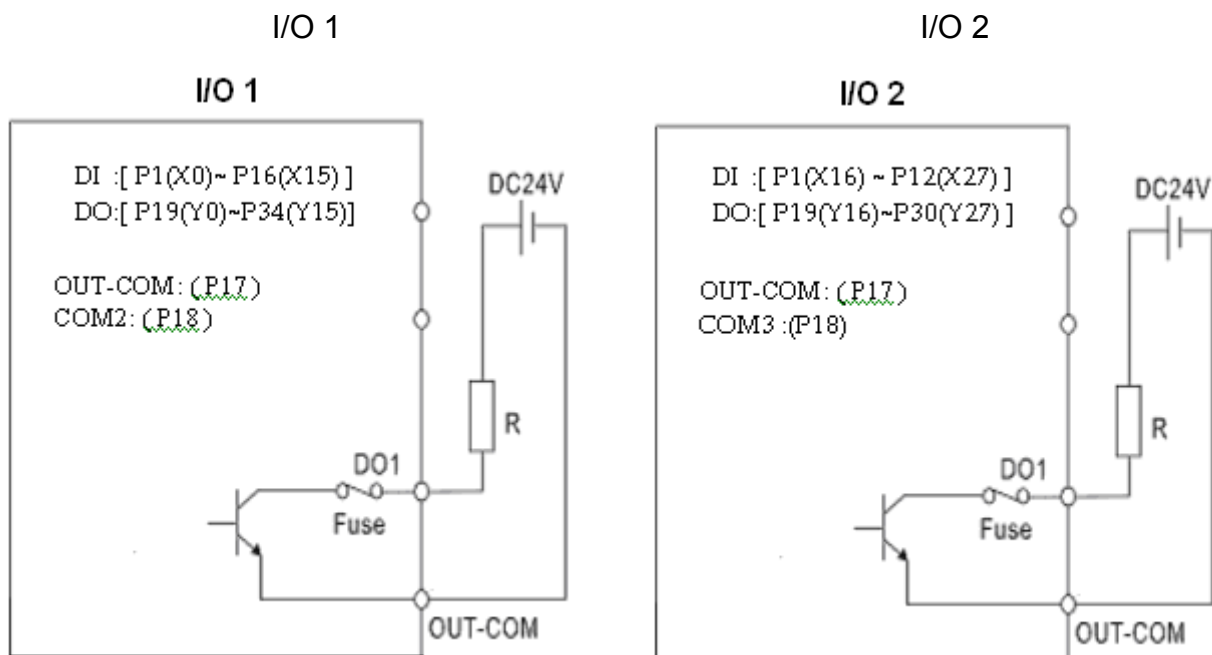
| | | | |
|--------------|--------|--------|------|
| | | | |
| I/O 2 | | | |
| PIN 15 | NC | PIN 16 | NC |
| PIN 17 | OUTCOM | PIN 18 | COM3 |
| PIN 19 | Y16 | PIN 20 | Y17 |

| | | | |
|--------|-----|--------|-----|
| PIN 21 | Y2 | PIN 22 | Y3 |
| PIN 23 | Y4 | PIN 24 | Y5 |
| PIN 25 | Y6 | PIN 26 | Y7 |
| PIN 27 | Y8 | PIN 28 | Y9 |
| PIN 29 | Y10 | PIN 30 | Y11 |
| PIN 31 | Y12 | PIN 32 | Y13 |
| PIN 33 | Y14 | PIN 34 | Y15 |

| | | | |
|--------|-----|--------|-----|
| PIN 21 | Y18 | PIN 22 | Y19 |
| PIN 23 | Y20 | PIN 24 | Y21 |
| PIN 25 | Y22 | PIN 26 | Y23 |
| PIN 27 | Y24 | PIN 28 | Y25 |
| PIN 29 | Y26 | PIN 30 | Y27 |
| PIN 31 | NC | PIN 32 | NC |
| PIN 33 | NC | PIN 34 | NC |

DO drive general load (with allowable current less than 140mA and surge current less than 200mA)

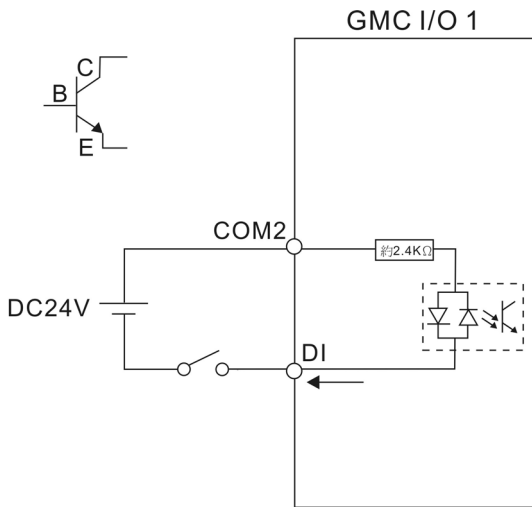
DO wiring: external power source and normal load



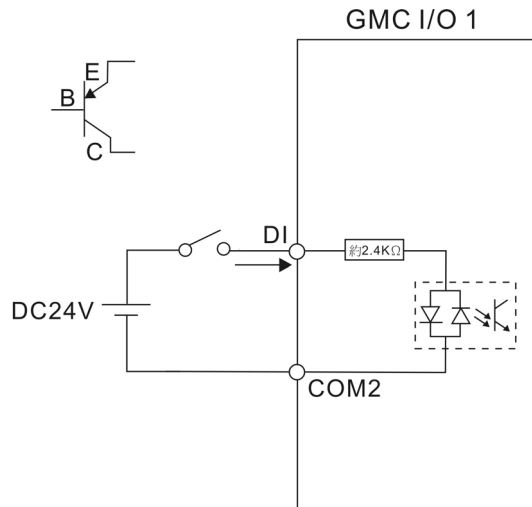
Take voltage as input signal (with allowable current between 8~25mA and surge current less than 50mA)

DI wiring: external power source

NPN transistor (SINK mode)



PNP transistor (SOURCE mode)

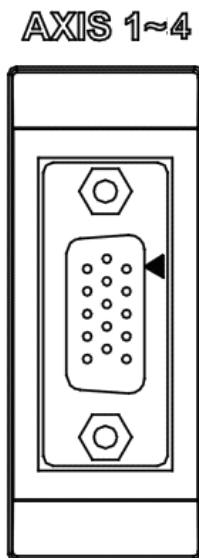


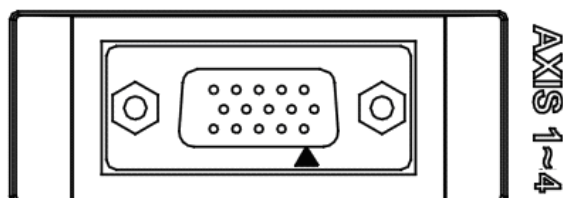
3.3 Signal Wiring for AXIS 1~4 Input Terminal

AXIS1~4 Connector terminal layout

The GMC-A series controller feature hardware positive and negative limits and home point for each of its 4 axes at the AXIS 1~4 terminal blocks respectively. There are 12 input points and users may set the input point signal to GND or +V depending upon whether COM1 is connected to +V or GND.

See figure for pin wiring:





AXISI 1~4

| Pin No. | Function | Pin No. | Function | Pin No. | Function |
|---------|-----------------------|---------|-----------------------|---------|-----------------------|
| PIN 1 | 0-axis positive limit | PIN 6 | 1-axis home | PIN 11 | 3-axis negative limit |
| | OT0+ | | DOG1 | | OT3- |
| PIN 2 | 0-axis negative limit | PIN 7 | 2-axis positive limit | PIN 12 | 3-axis home |
| | OT0- | | OT2+ | | DOG3 |
| PIN 3 | 0-axis home | PIN 8 | 2-axis negative limit | PIN 13 | COM |
| | DOG0 | | OT2- | | |
| PIN 4 | 1-axis positive limit | PIN 9 | 2-axis home | PIN 14 | COM |
| | OT1+ | | DOG2 | | |
| PIN 5 | 1-axis negative limit | PIN 10 | 3-axis positive limit | PIN 15 | COM |
| | OT1- | | OT3+ | | |

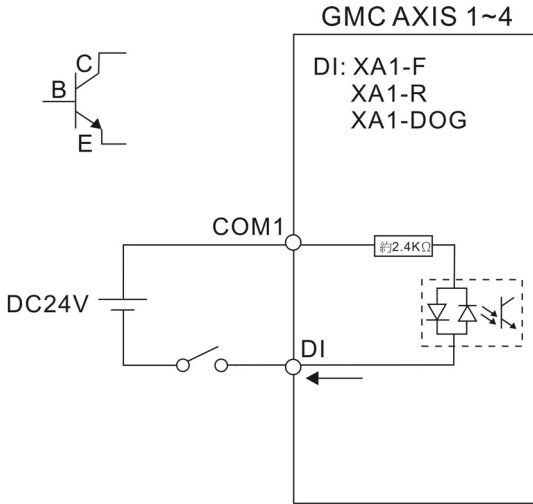
Special M description:

| | |
|-------------|---|
| Pin P1~P3 | Positive limit, negative limit, home point input of axis-0 (Special M [M2144], [M2145], [M2146]) |
| Pin P4~P6 | Positive limit, negative limit, home point input of axis-1 (Special M [M2148], [M2149], [M2150]) |
| Pin P7~P9 | Positive limit, negative limit, home point input of axis-2 (Special M [M2152], [M2153], [M2154]) |
| Pin P10~P12 | Positive limit, negative limit, home point input of axis-3 (Special M [M2156], [M2157], [M2158]) |

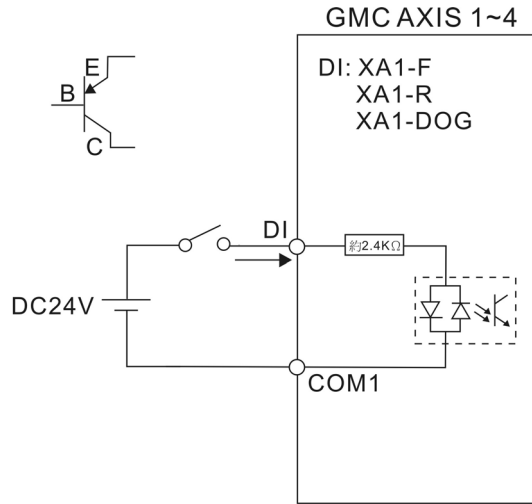
Take voltage as input signal (with allowable current between 8~25mA and surge current less than 50mA)

DI wiring: external power source

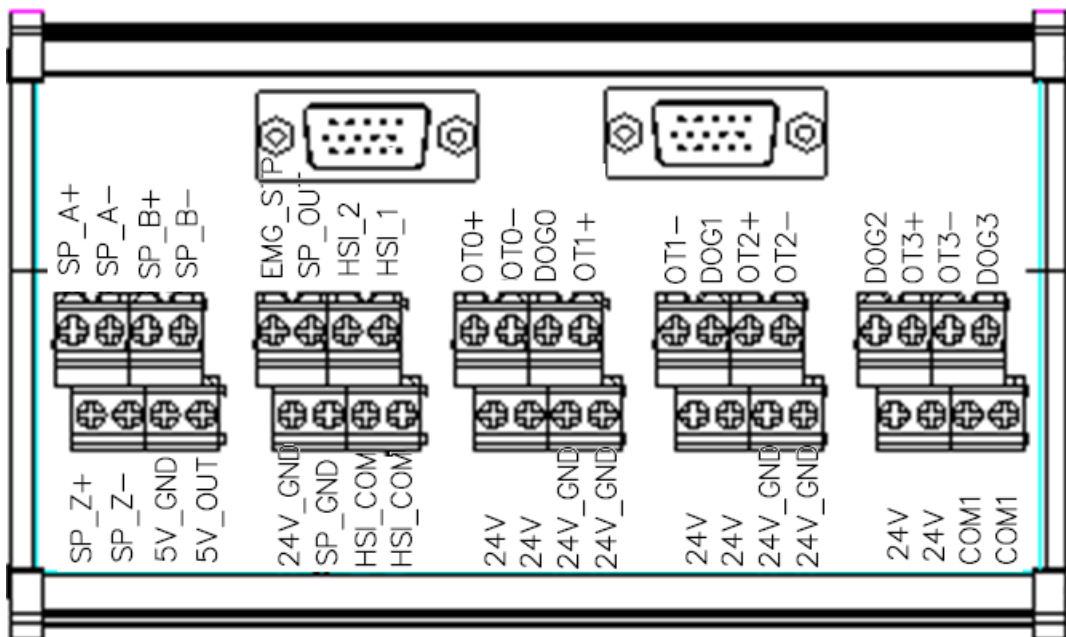
NPN transistor (SINK mode)

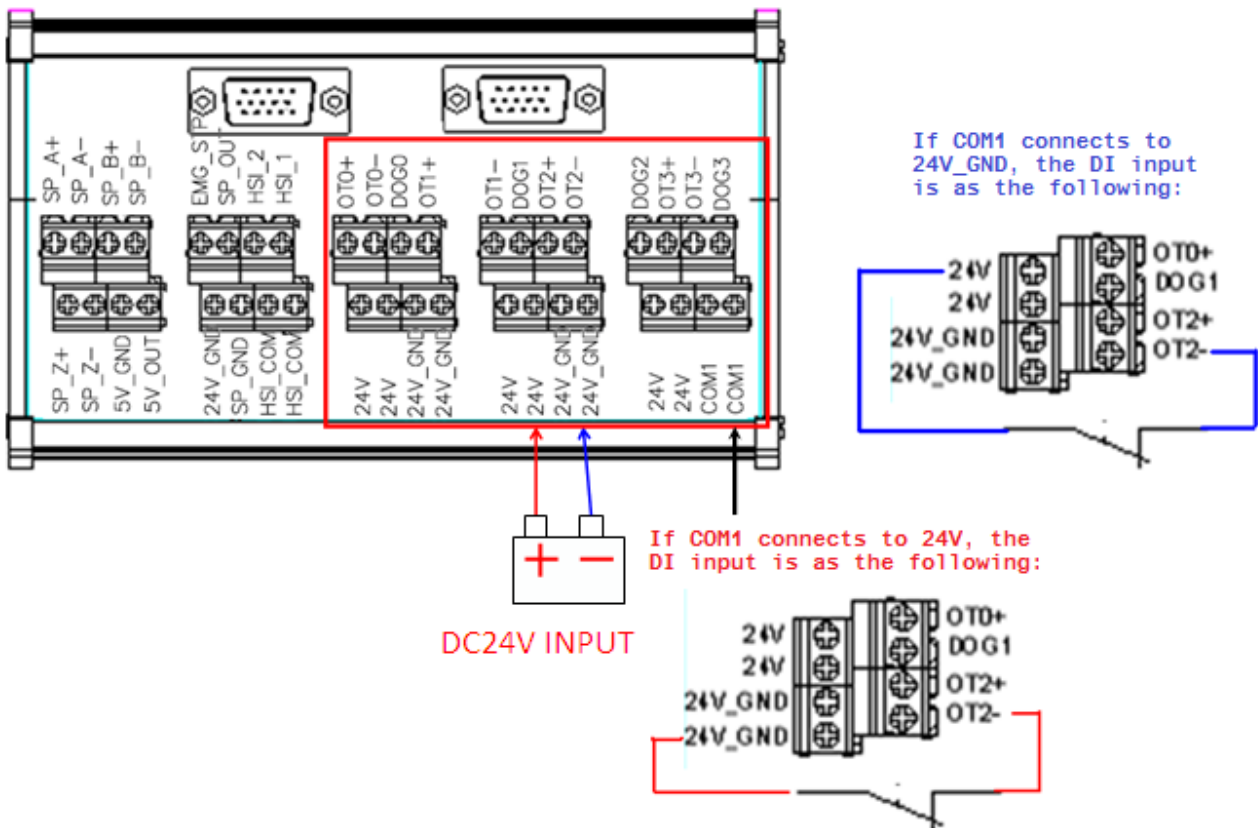


PNP transistor (SOURCE mode)



AXIS1~4 Connector Terminal NC-EXM-S01Wiring of Conversion Card



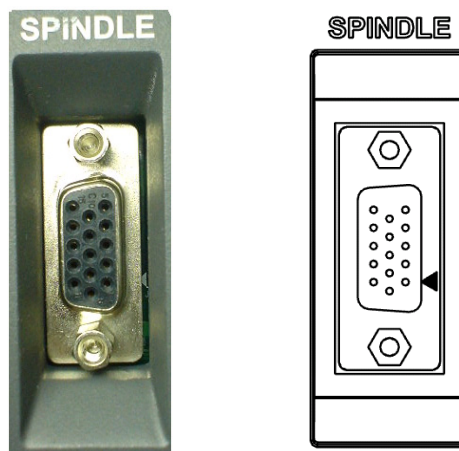


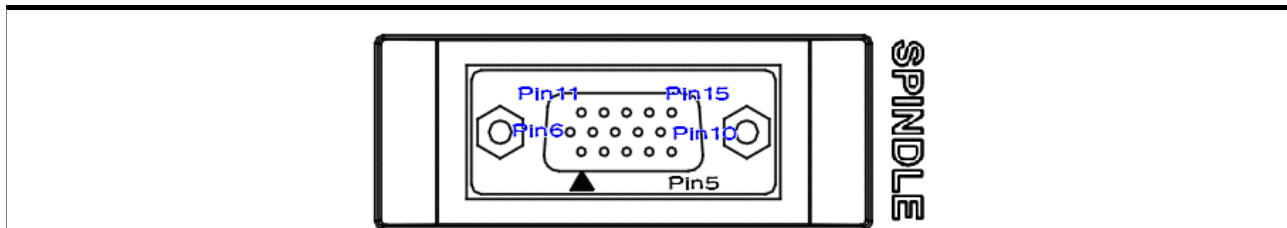
3.4 Wiring for spindle input terminal signal

SPINDLE connector terminal layout

The NC300-A series controller features one spindle feedback input and two hardware high speed counter inputs.

See the figure below for its wiring:



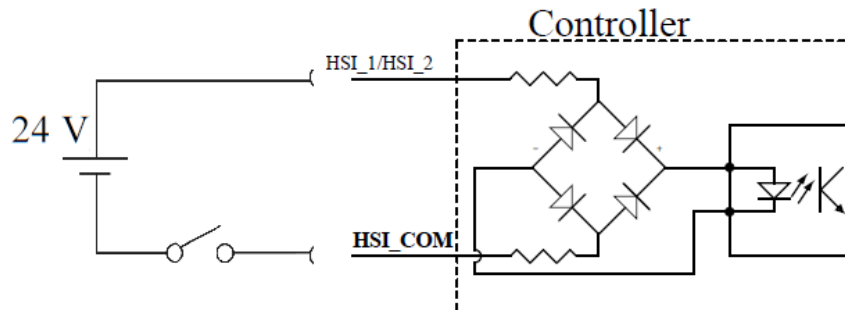


| SPINDLE | | |
|---------|----------|--|
| Pin No | Function | |
| PIN 1 | HSI_COM | High speed counter COM that may connect to +24V or 24V GND |
| PIN 2 | HSI_1 | High speed counter input 1 (24v 10mA) |
| PIN 3 | HSI_2 | High speed counter input 2 |
| PIN 4 | SP_OUT | Spindle analog output |
| PIN 5 | SP_GND | Spindle analog ground |
| PIN 6 | EMG_STOP | Emergency stop input |
| PIN 7 | NC | No connection |
| PIN 8 | SP_A+ | Spindle encoder A phase positive input |
| PIN 9 | SP_A- | Spindle encoder A phase negative input |
| PIN 10 | +5V_OUT | Spindle encoder power output |
| PIN 11 | SP_B+ | Spindle encoder B phase positive input |
| PIN 12 | SP_B- | Spindle encoder B phase negative input |
| PIN 13 | SP_Z+ | Spindle encoder Z phase positive input |
| PIN 14 | SP_Z- | Spindle encoder Z phase negative input |
| PIN 15 | +5V_GND | Spindle encoder power ground |

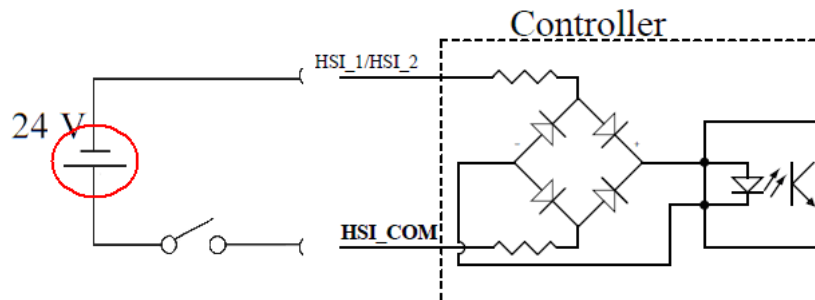
The high speed counter DI wiring supports a band up to 5MHz input and is suitable for G31 interruption input, external power (with voltage tops 24V and restrict current between 8~20mA and surge current less than 50m). Set high speed counter input 1 for G31 interruption with parameter 46Bit5=1; parameter 307Bit4=1; input limit parameter 25Bit0=1 and special M=M2142.

The high speed counter input 1 wiring (input bi-directional optical coupler) HIS_1 can be set for G31 interrupt input.

High Speed Counter Inputs



High Speed Counter Inputs



Analog spindle setup:

Parameter setup

| 參數功能(主軸參數) | 1 | N1 | SP1 |
|--------------|------|------|-------|
| 399 主軸應用設定 | | | 19 |
| • 主軸功能啟動 | | | 1 |
| • 閉迴路控制旗標 | | | 0 |
| • 主軸輸出模式 | | | 1 |
| • 速度控制模式 | | | 1 |
| 401 主軸輸入埠號 | | | 8 |
| 402 主軸編碼器脈波數 | | | 1280 |
| 主軸增益 | | | 50 |
| 404 主軸定位速度 | | | 1000 |
| 主軸定位距離 | | | 3000 |
| 405 主軸目標速度誤差 | | | 10 |
| 406 主軸定位誤差 | | | 100 |
| 407 主軸零速範圍 | | | 5 |
| 408 主軸最高轉速 | | | 12000 |
| 409 主軸加速時間常數 | | | 200 |
| 範圍: 0~1 | | | |
| 寸動 | 通道 0 | 1/2 | |
| 操作參數 | 刀庫參數 | 加工參數 | 主軸參數 |
| 機械參數 | 原點參數 | | |

399 Servo spindle: set to 1101

Analog spindle: set to 1020

| | | |
|----|---|-----|
| 0 | Spindle function started 0: spindle OFF / 1: spindle ON | 0~1 |
| 1 | Close loop control flag 0: close loop control OFF / 1: Close loop control ON (feedback encoder is required) | 0~1 |
| 2 | Spindle output mode 0: DMCNET (servo spindle) | 0~2 |
| ~3 | 2: EDAC (analog output) | |
| 4 | Speed control mode 0: rmp / 1: PPM | 0~1 |
| 5 | Bit5: feedback form 0: high resolution (x1000) / 1: normal resolution (x4) | 0~1 |

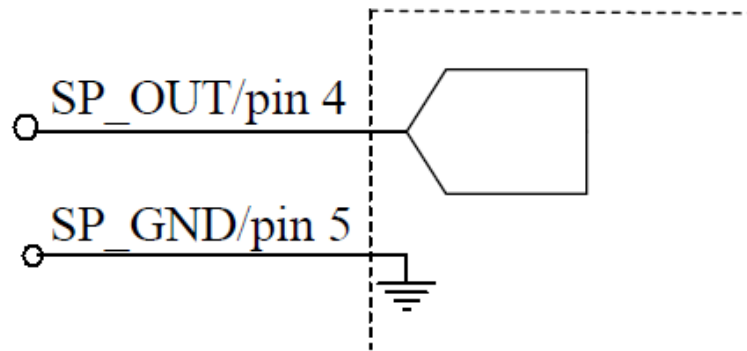
Please activate SP1 and set its port number to 10 in channel setup and match 0~10V DC to S0~S maximum turning speed (with -10V~+10V parsed to 14bit).

The analog spindle output, Pin4 and Pin5

SPINDLE ANALOG OUTPUT -10V~+10V



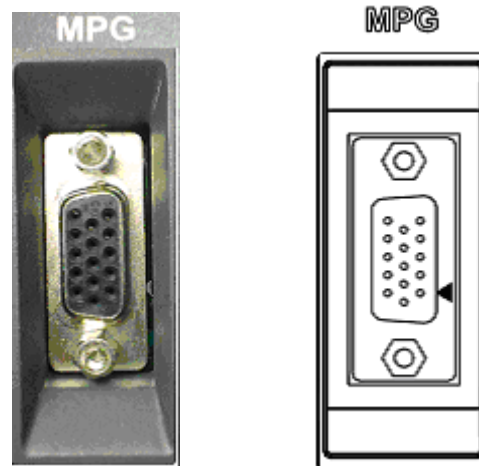
Delta inverter



3.5 Wiring for MPG input terminal signal

MPG terminal layout

The GMC-A series controller features one manual pulse input for machine's hand wheel operation. Its internal DC 5V working power can power the hand wheel device directly. See the figure below for its wiring:



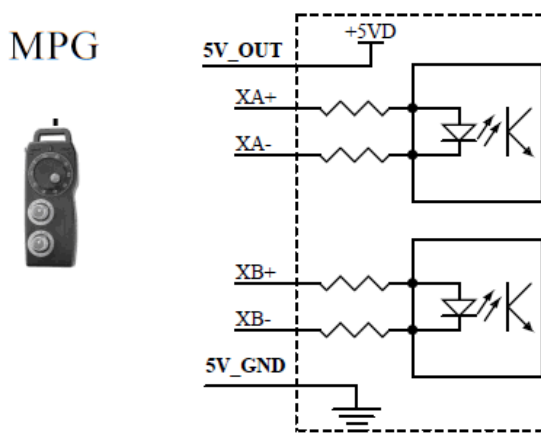
| MPG | |
|--------|-----------------------------------|
| Pin No | Function |
| PIN 1 | External 24V input bi-directional |
| PIN 2 | IN1 (X28) X-axis |
| PIN 3 | IN2 (X29) Y-axis |
| PIN 4 | IN3 (X30) Z-axis |
| PIN 5 | IN4 (X31) 4 axis |
| PIN 6 | IN5 (X32) magnification x10 |
| PIN 7 | IN6 (X33) magnification x100 |
| PIN 8 | +5V_GND |
| PIN 9 | +5V_GND |
| PIN 10 | +5V_OUT |
| PIN 11 | XA+ |
| PIN 12 | XA- |

| | |
|--------|---------|
| PIN 13 | XB+ |
| PIN 14 | XB- |
| PIN 15 | +5V_GND |

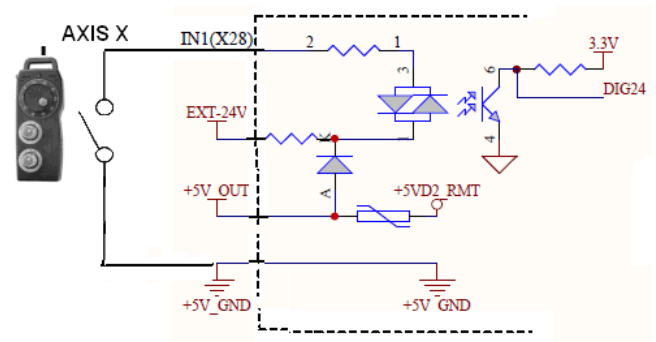
With servo connection in MPG mode, turning the hand wheel may lead to **VS0** value updating in the information console (axis selection and magnification setup are required)

MPG pulse input wiring with internal power DI pin wiring of 5V DC

MPG Input (3-9 v) Controller



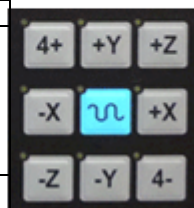
Digital Input Controller



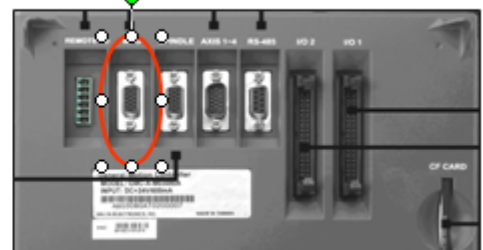
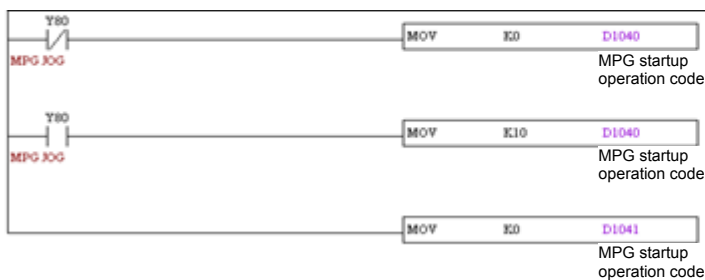
MPG Hand Wheel

For axis and triggering signal selection

| Function name | Special D code | Description |
|-------------------------------------|----------------|--|
| MPG startup operation | D1040 | Set operation code for MPG hand wheel startup with value "0" for using external hand wheel and "10" for secondary control panel incremental jogging. It triggers signal M1156 and M1157. |
| Select channel for MPG operation | D1041 | Set to select channel for MPG hand wheel operation. It is set to "0" now. |
| Status of MPG 0-axis selection knob | D1043 | Set the axis to be controlled by MPG0 hand wheel: 0 for X-axis; 1 for Y-axis; 2 for Z-axis. |



OR



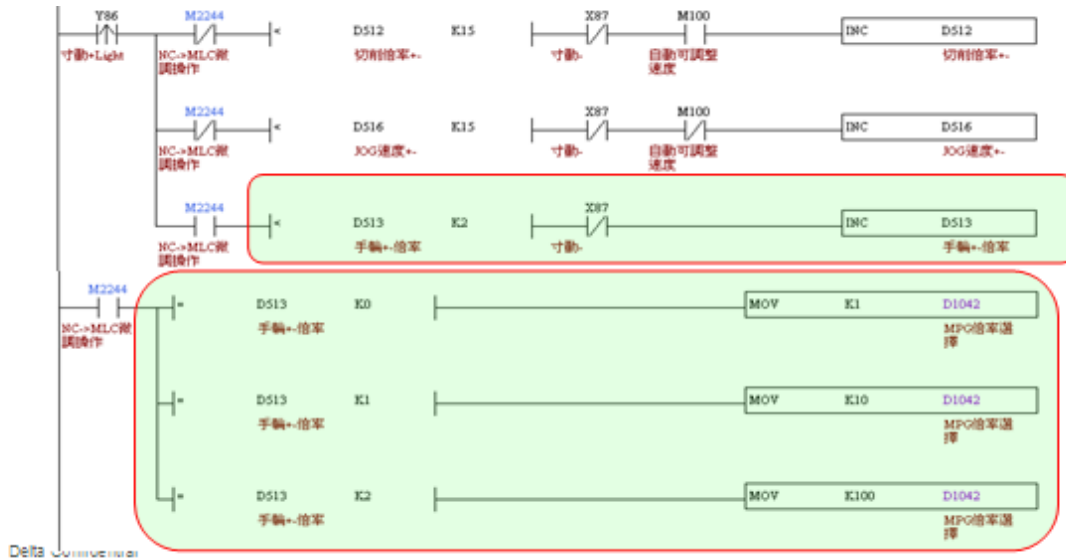
| | | |
|---------------|-------|--|
| Software MPG+ | M1118 | Secondary control panel incremental jogging, forward triggering signal, see D1040 |
| Software MPG- | M1119 | Secondary control panel incremental jogging, backward triggering signal, see D1040 |



Magnification Adjustment (MPG)

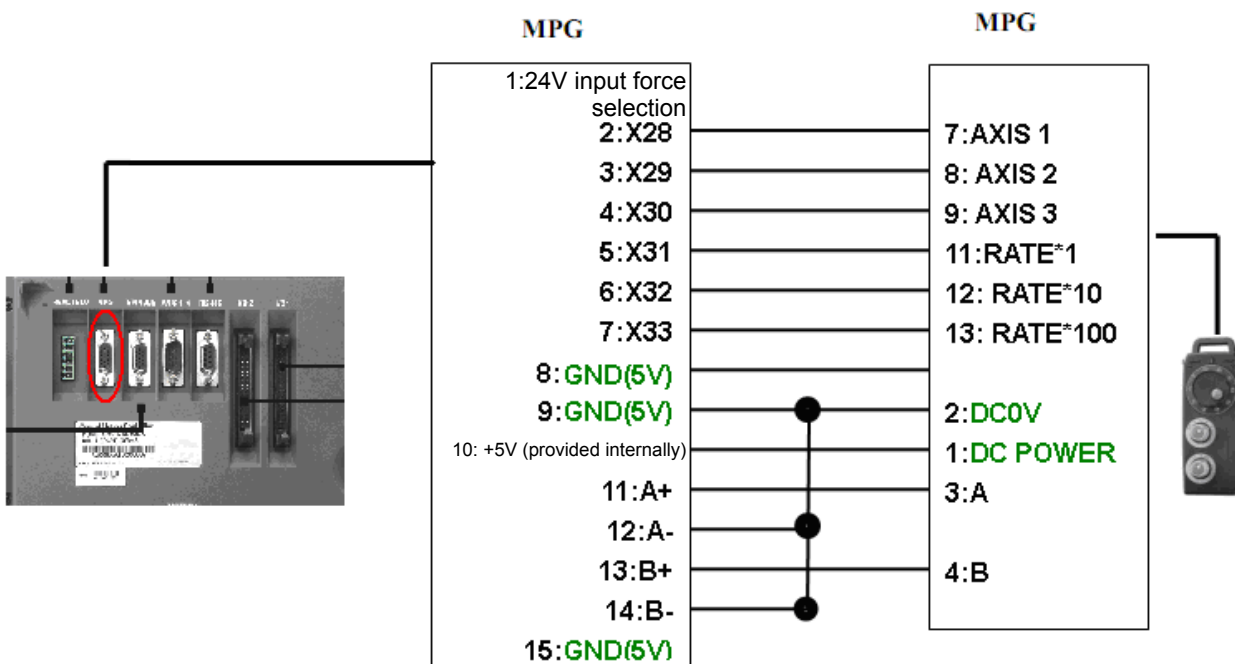
For selecting MPG magnification in 3 stages, each stage is magnified 10 folds within a range of 0~100

| Function name | Special D code | Description |
|--------------------------------|----------------|--|
| MPG0 magnification knob status | D1042 | MPG0 hand wheel pulse input magnification factors of 1, 10, and 100. These factors apply to the least movement unit 0.001mm, e.g. 1*0.001 = 0.001mm/cnt. |

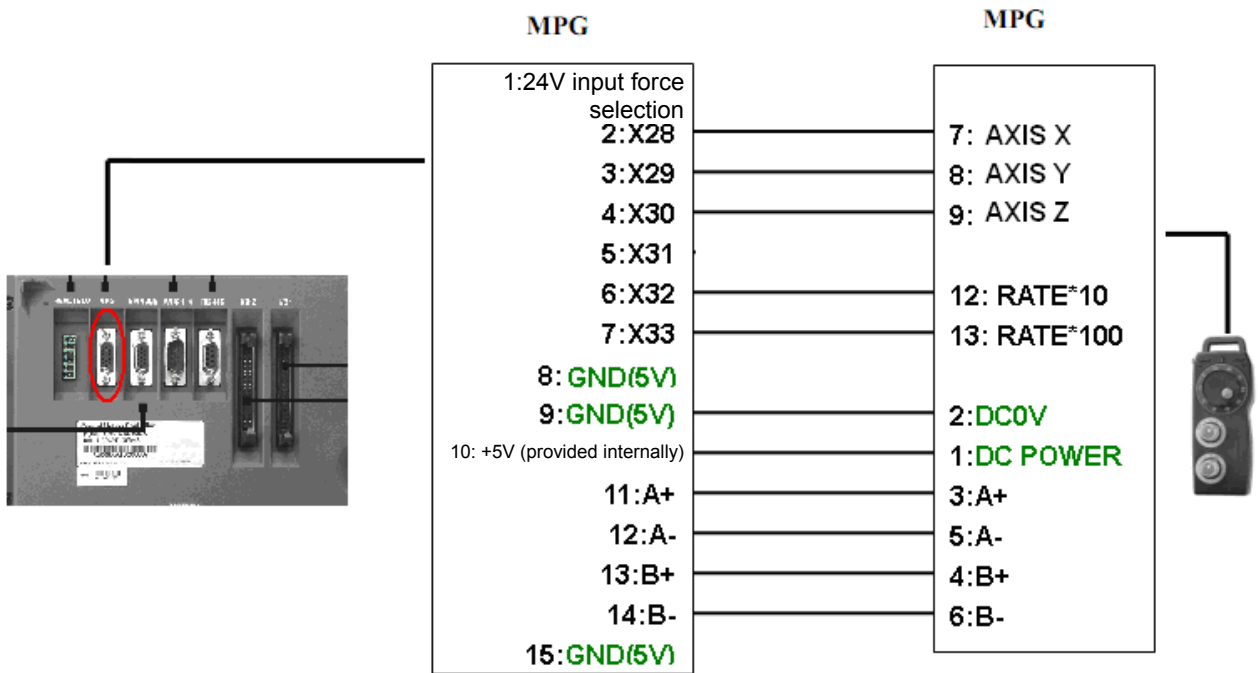


Varies with hand wheel wiring (100 PPR for every cycle): Single-ended EHDW-BA6SI and differential EHDWBE6SI.

Wiring for single-ended EHDW-BA6SI hand wheel



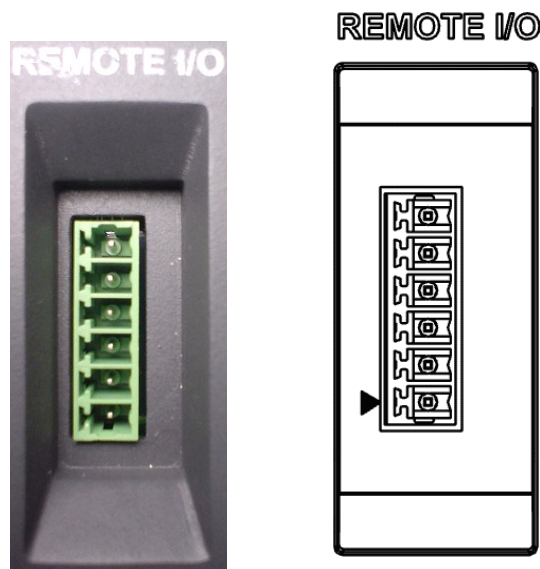
Wiring for EHDW-BE6SI hand wheel:



3.6 Wiring for Remote I/O Signal

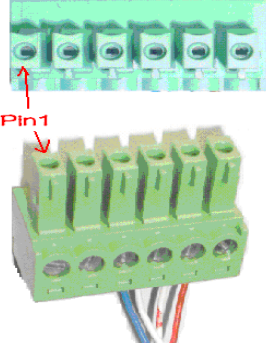
Remote I/O terminal layout

The NC300A series controller features a remote I/O communication port for the remote I/O module. There are station options on board: starting with the first station of (X256, Y256), every additional station adds another 32 points. You can cascade up to 8 modules for up to 256 points. See the figure below for the communication wiring pins:



| REMOTE I/O | |
|------------|----------|
| Pin No | Function |
| PIN 1 | SHIELD |
| PIN 2 | GND |
| PIN 3 | RX+ |
| PIN 4 | RX- |
| PIN 5 | TX- |
| PIN 6 | TX+ |

Wiring description

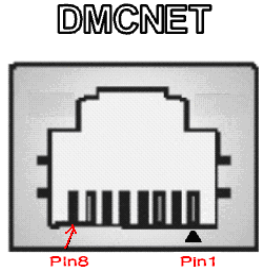
| 6-pin connector at GMC-A wiring end | REMOTE I/O module | Connector picture |
|-------------------------------------|-------------------|---|
| SHIELD (1) | (1) SHIELD |  <p data-bbox="1189 734 1316 772">Top view</p> |
| GND (2) | (2) GND | |
| RX+ (3) | (3) TX+ | |
| RX- (4) | (4) TX- | |
| TX- (5) | (5) RX- | |
| TX+ (6) | (6) RX+ | |

3.7 Wiring for DMCNET Communication Terminal Signal

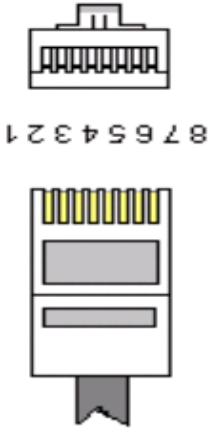
DMCNET connector terminal layout

The GMC-A series controller and servo system employ Delta's next generation high speed communication network DMCNET with instant and backup communication functionality.

See the table below for its connectors:

| Pin No | Signal name | Function description | Connector illustration |
|--------|-------------|-------------------------------|---|
| 1, | DMCNET_1A | DMCNET Channel 1 bus line (+) |  |
| 2, | DMCNET_1B | DMCNET Channel 1 bus line (-) | |
| 3, | DMCNET_2A | DMCNET Channel 2 bus line (+) | |
| 4, | - | Reserved | |
| 5, | - | Reserved | |
| 6, | DMCNET_2B | DMCNET Channel 2 bus line (-) | |
| 7, | - | Reserved | |
| 8, | - | Reserved | |

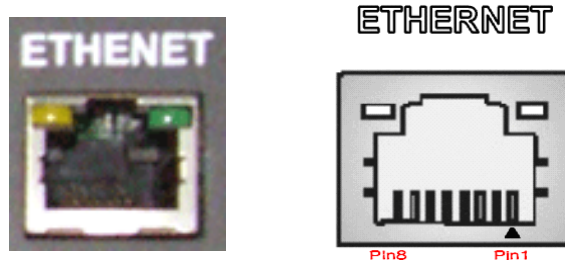
Wiring description

| GMC-A wiring end 8-pin DMCNET connector (RJ45) | Motor servo wiring end | Connector end illustration |
|---|------------------------|---|
| Orange white (1) | (1) Orange white |  <p>Top view</p> |
| Orange (2) | (2) Orange | |
| Green white (3) | (3) Green white | |
| Blue (4) | (4) Blue | |
| Blue white (5) | (5) Blue white | |
| Green (6) | (6) Green | |
| Brown white (7) | (7) Brown white | |
| Brown (8) | (8) Brown | |


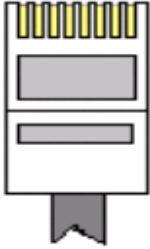
3.8 Wiring for Ethernet Communication Terminal Signal

Ethernet connector terminal layout

The GMC-A series controller reserves Ethernet channel for communication with PC or network. See the figure below for the wiring pins:



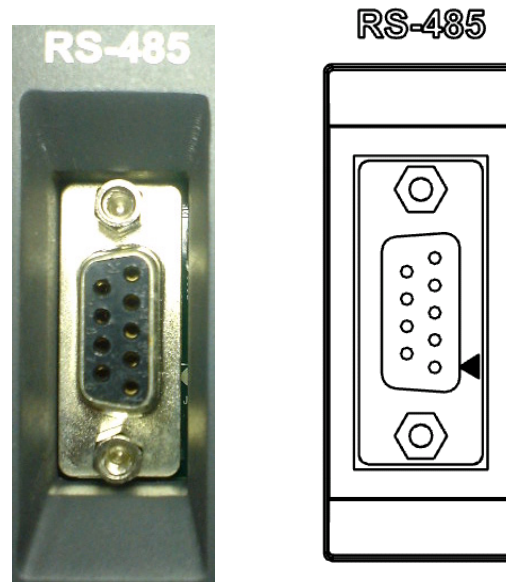
Wiring description

| 8-pin Ethernet connector (RJ45) at the GMC-A wiring end | Wiring end for hub | Connector illustration |
|---|--------------------|---|
| Orange white (1) | (1) Orange white |   Top view |
| Orange (2) | (2) Orange | |
| Green white (3) | (3) Green white | |
| Blue (4) | (4) Blue | |
| Blue white (5) | (5) Blue white | |
| Green (6) | (6) Green | |
| Brown white (7) | (7) Brown white | |
| Brown (8) | (8) Brown | |

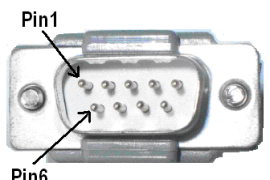
3.9 Wiring for RS-485 Communication Terminal Signal

RS-485 terminal layout

The GMC-A series controller features the RS-485 channel. See the picture below for its pins:



Wiring diagram

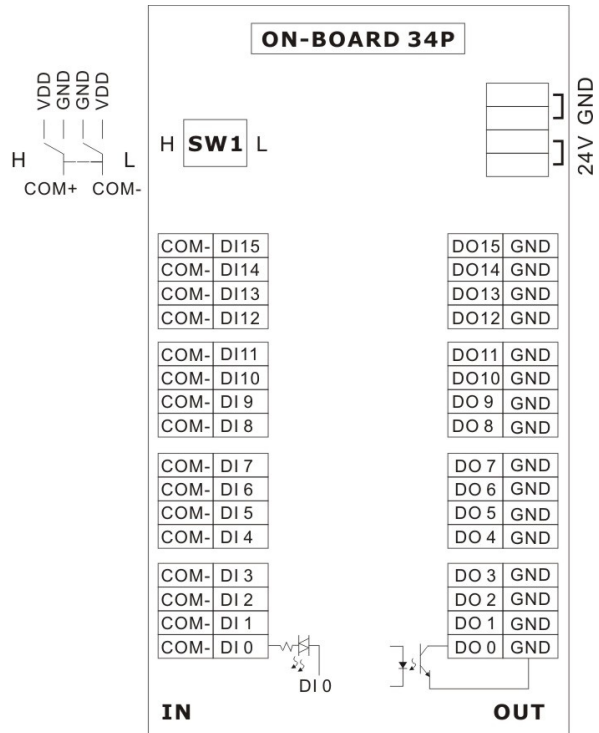
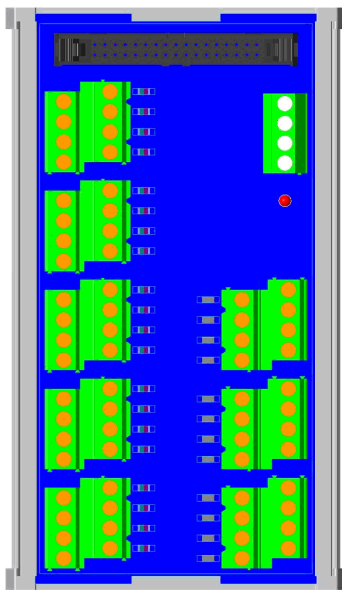
| 9-pin D-SUB male (RS-485) at the GMC wiring end | Wiring end of other devices | Controller wiring end illustration |
|--|-----------------------------|---|
| RS485_D+ (1) | RS485_D+ |  <p>Top view</p> |
| RS485_D- (6) | RS485_D- | |



3.10 Optical Coupler Terminal Block Module NC-TBM-T1616

NC-TBM-T1616 terminal layout

The optical coupler terminal block module (IO: 16/16) can be used at On Board I/O module 1 (16/16 DI/DO in range of X0~X15 and Y0~Y15) and On Board I/O module 2 (12/12 DI/DO in range of X16~X27, Y16~Y27). Module 2 of this version supports 12 pairs of I/O. See below for wiring pins:

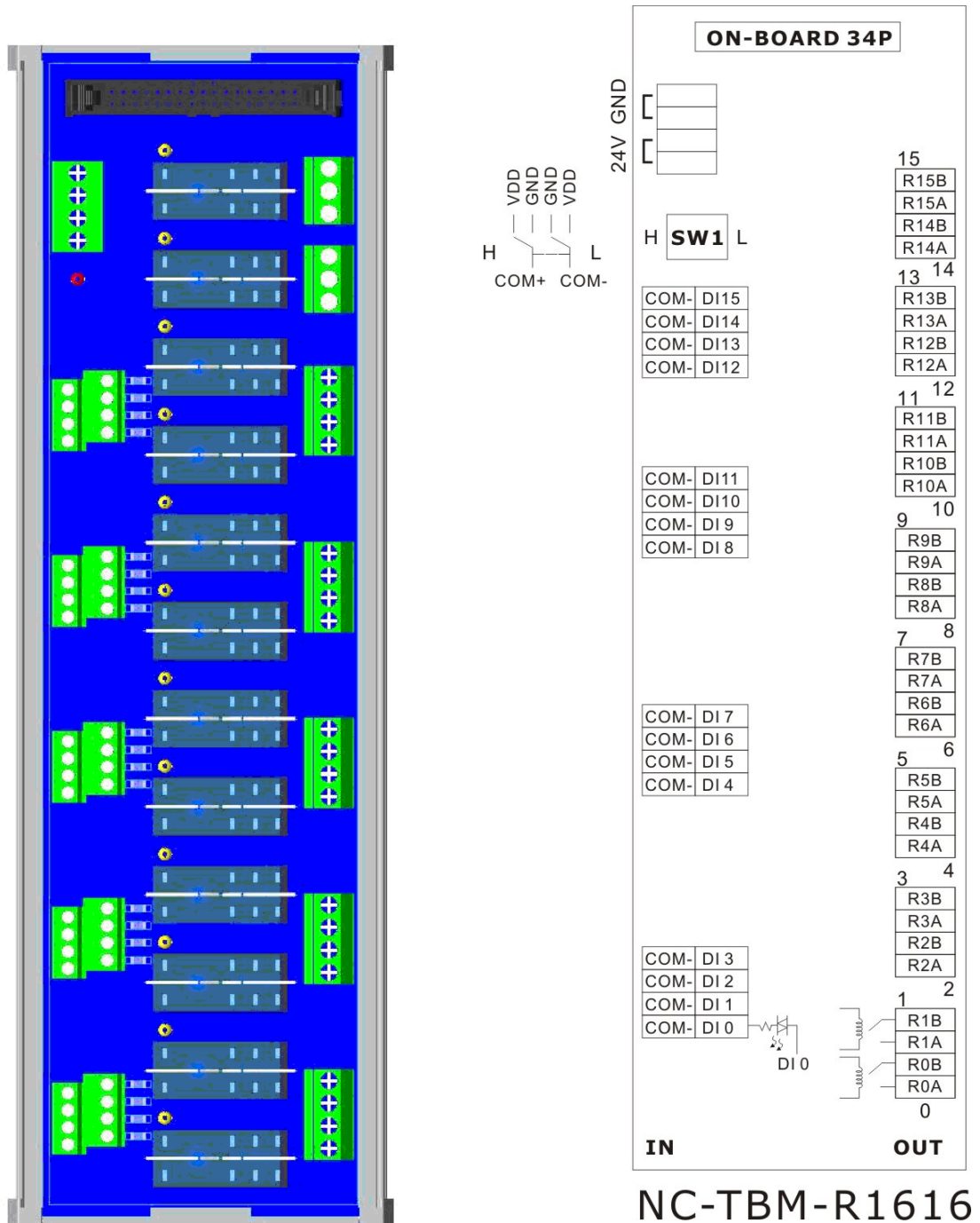


NC-TBM-T1616

3.11 Relay Terminal Block Module NC-TBM-R1616

NC-TBM-R1616 terminal layout

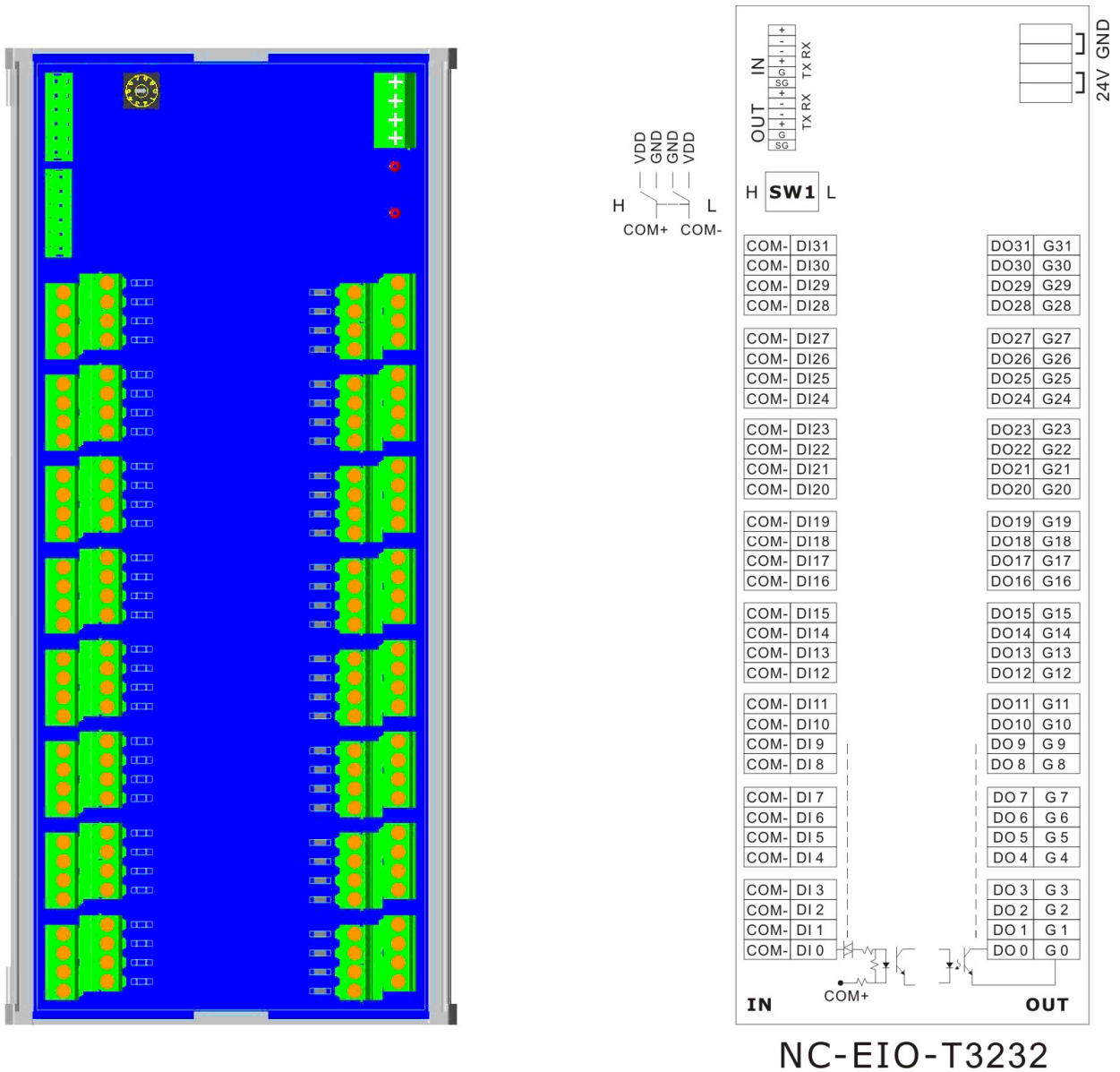
The relay terminal block module (IO: 16/16) can be used at On Board I/O module 1 (16/16 DI/DO in range of X0~X15 and Y0~Y15) and On Board I/O module 2 (12/12 DI/DO in range of X16~X27, Y16~Y27). Module 2 of this version supports 12 pairs of I/O. See below for the wiring pins:



3.12 Optical Coupler Remote I/O Block Module NC-EIO-T3232

NC-EIO-T3232 terminal layout

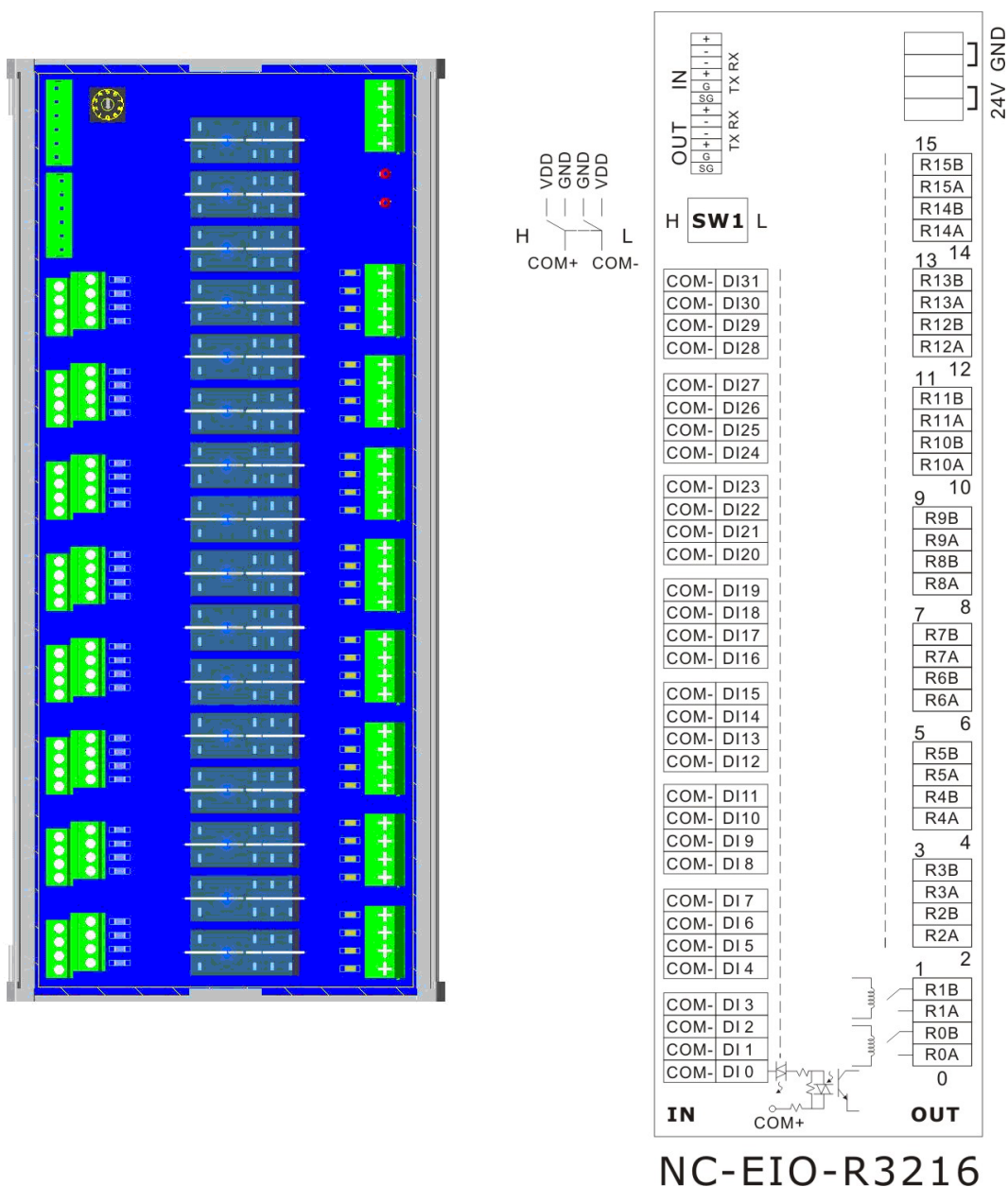
The optical coupler remote I/O block module provides NC300A with a remote I/O connection in RS422 communication protocol. There are station options on board: starting with the first station of (X256, Y256), every additional station adds another 32 points. Users can cascade up to 8 modules for up to 256 points for each I/O. See the figure below for communication wiring pins:



3.13 Relay Remote I/O Block Module NC-EIO-R3216

NC-EIO-R3216 terminal layout

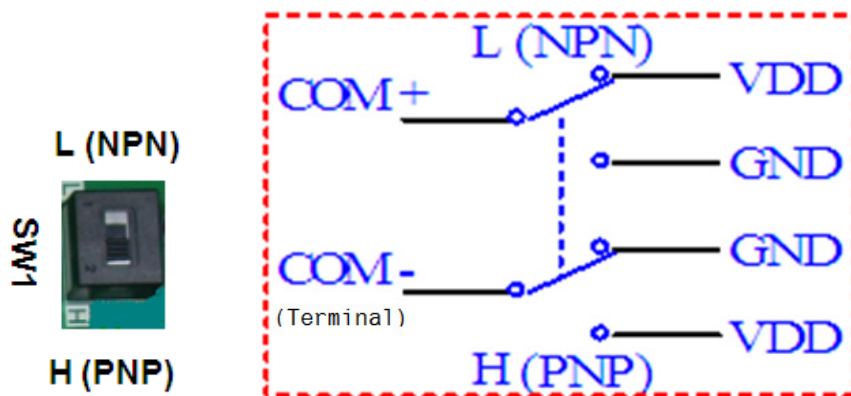
The relay remote I/O block module provides NC300A with a remote I/O connection in RS422 communication protocol. There are station options on board: starting with the first station of (X256, Y256), every additional station adds another 32 points. Module of this version supports 32 points for DI, 16 points for DO. The rest of 16 points is unable to use and every additional station adds another 32 points for Y. See the figure below for their communication wiring pins:



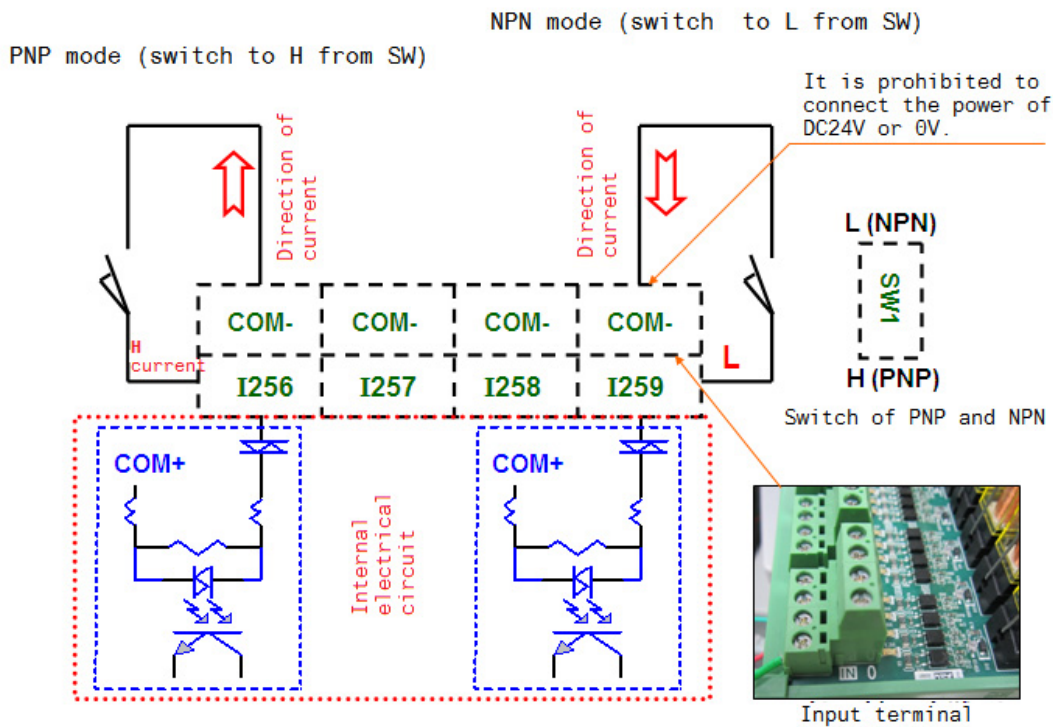
3.14 Input Description of I/O Panel

The terminal indication of COM+ and COM- in the diagram does not represent the actual direction and polarity of the current. COM- is the power output terminal, which supplies the power to the external switch. It is prohibited to connect the power of DC24V or 0V. It can select PNP or NPN as the external input signal through the switch H/L. However, both cannot be mixed with each other.

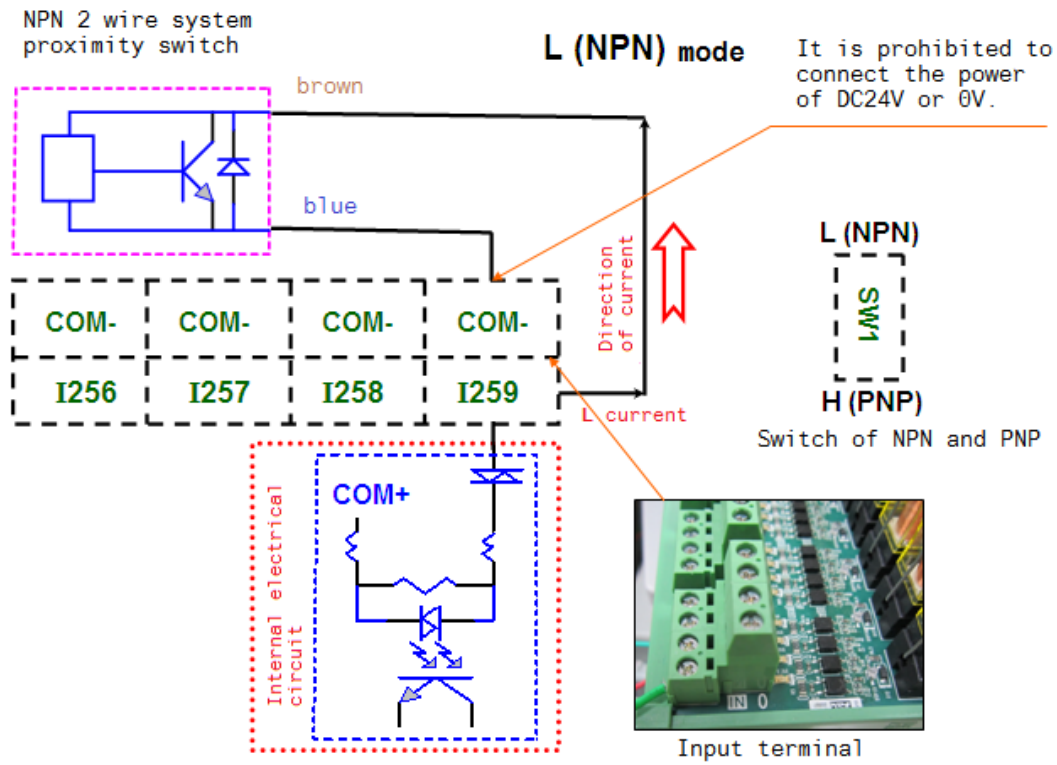
The switch description of NPN and PNP



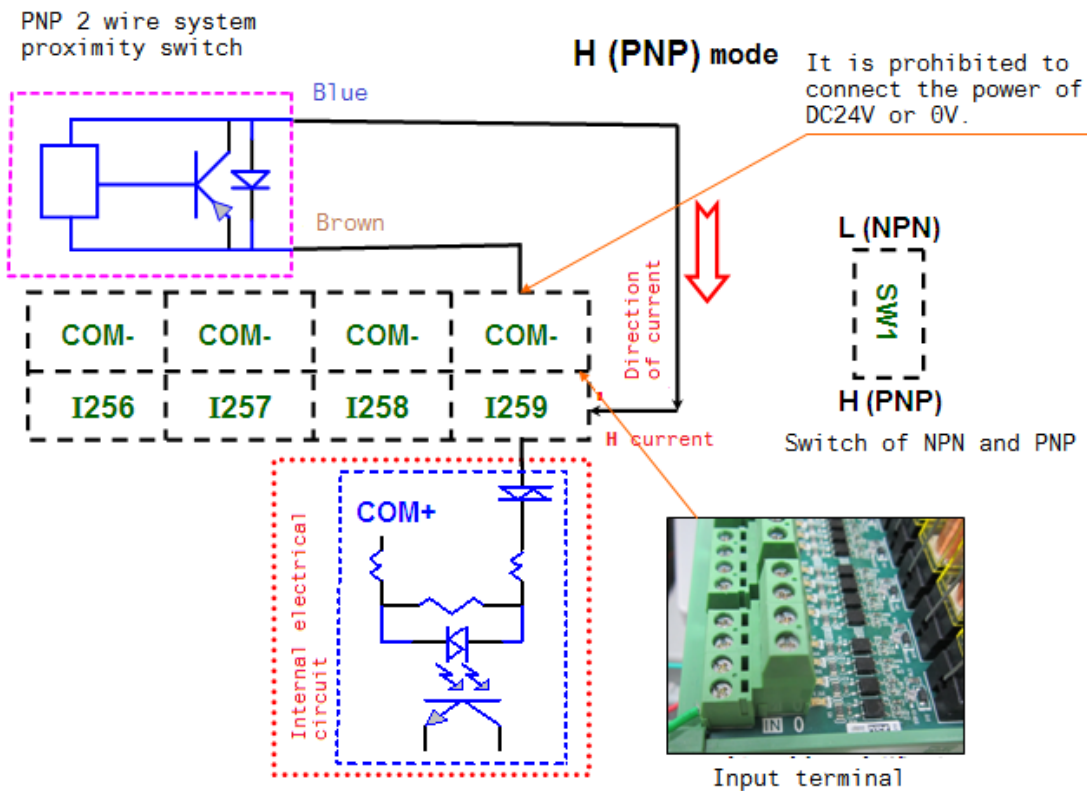
The wiring example of the bottom and mechanical switch



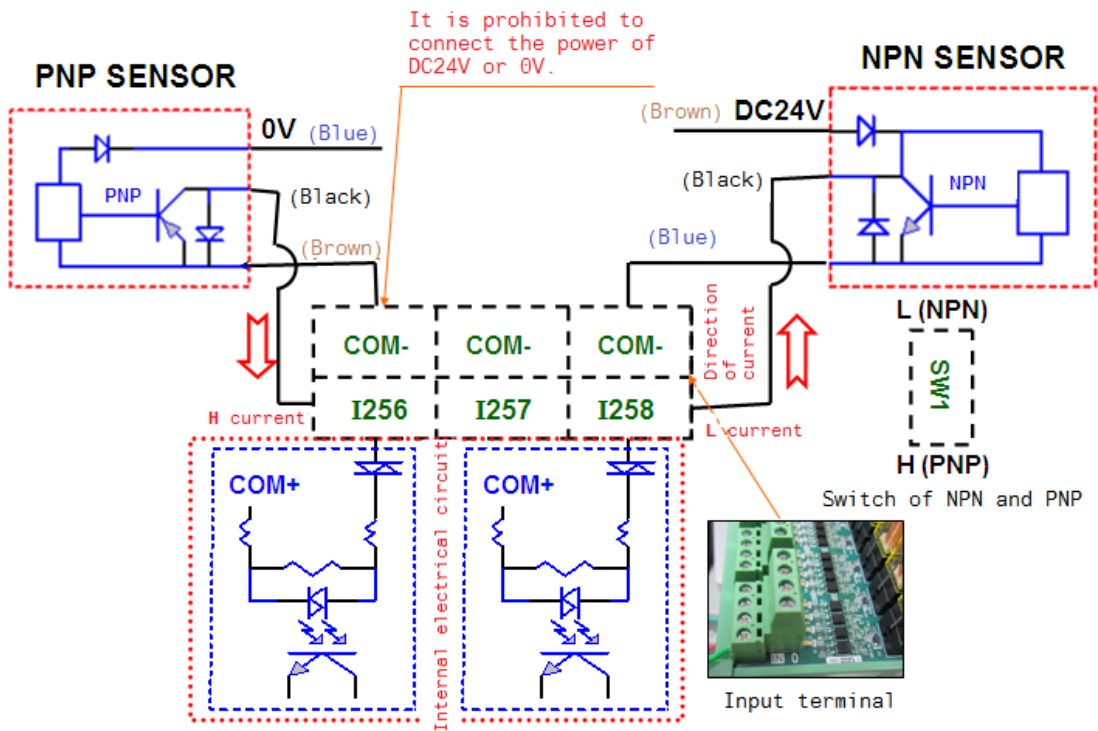
The proximity switch example of NPN 2 wire system



The proximity switch example of PNP 2 wire system

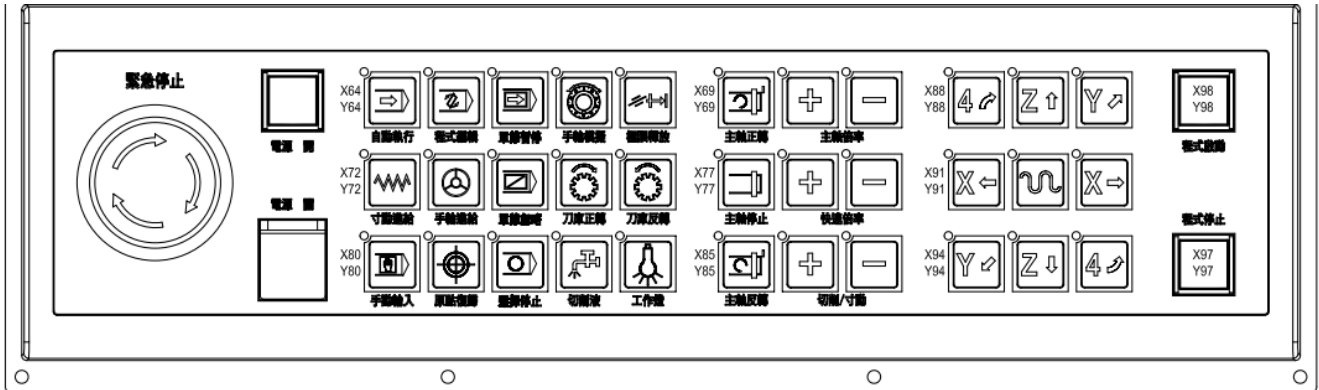


The proximity switch of NPN and PNP 3 wire system

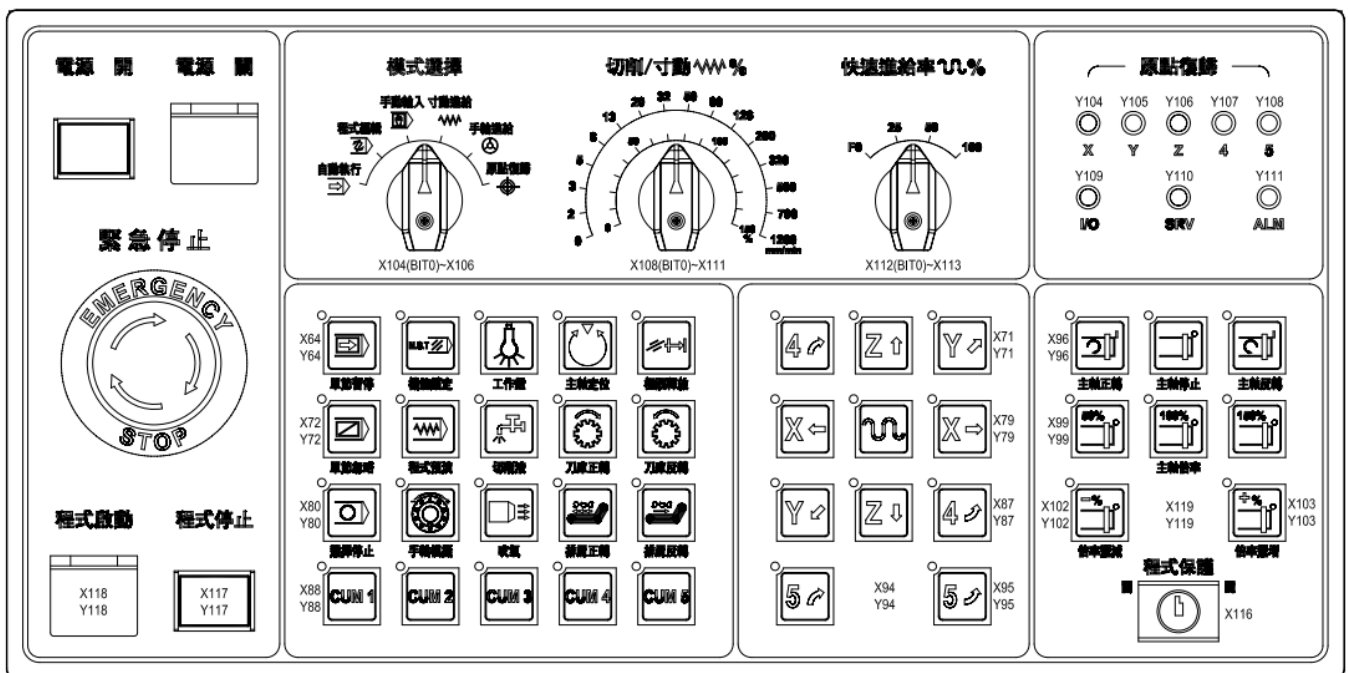


3.15 Definitions of the Secondary Control Panel I/O

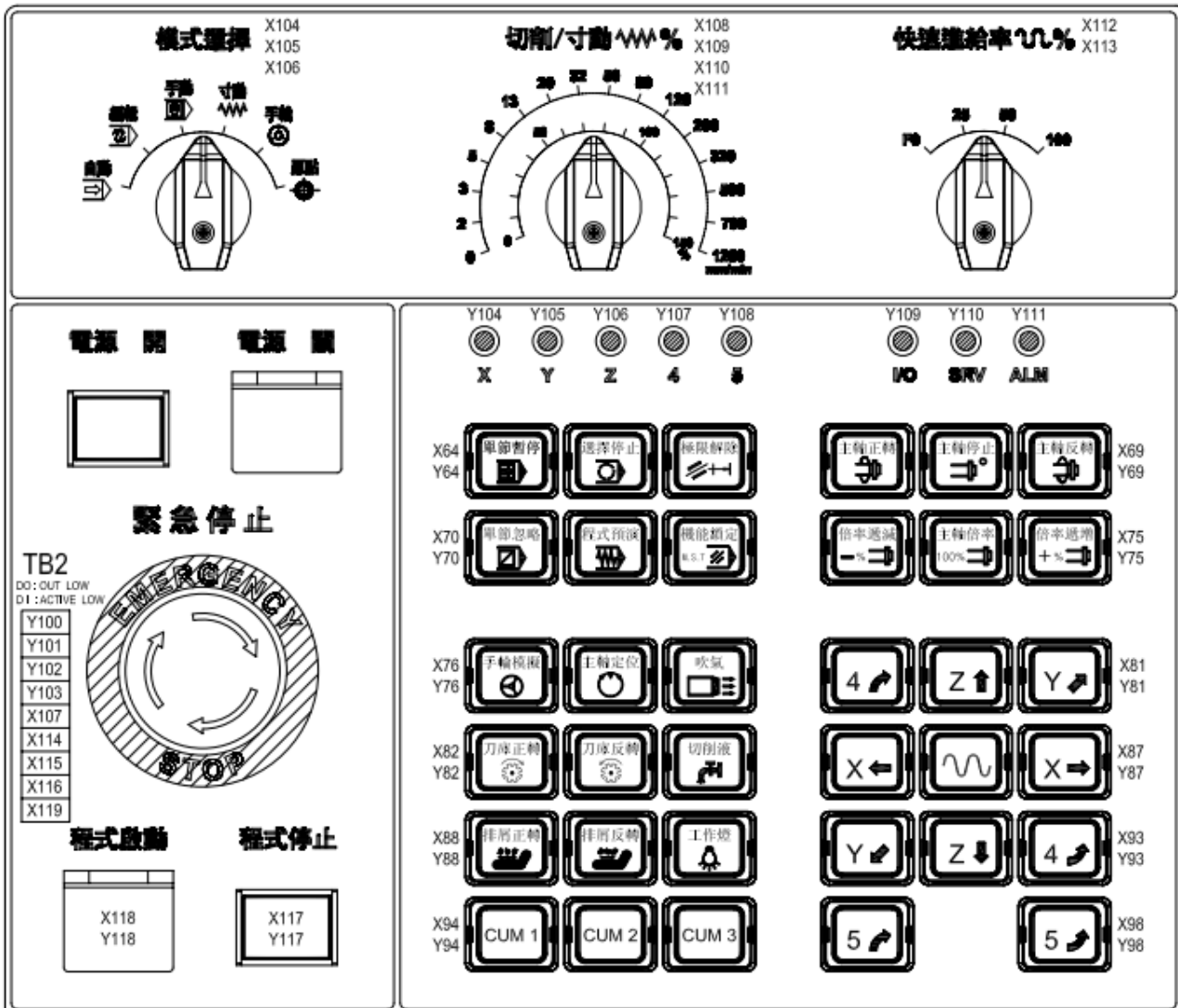
NC300A-MI-A (all-in-one model)



NC-PAN-300AM-F (P)



NC-PAN-311AM-F (P)

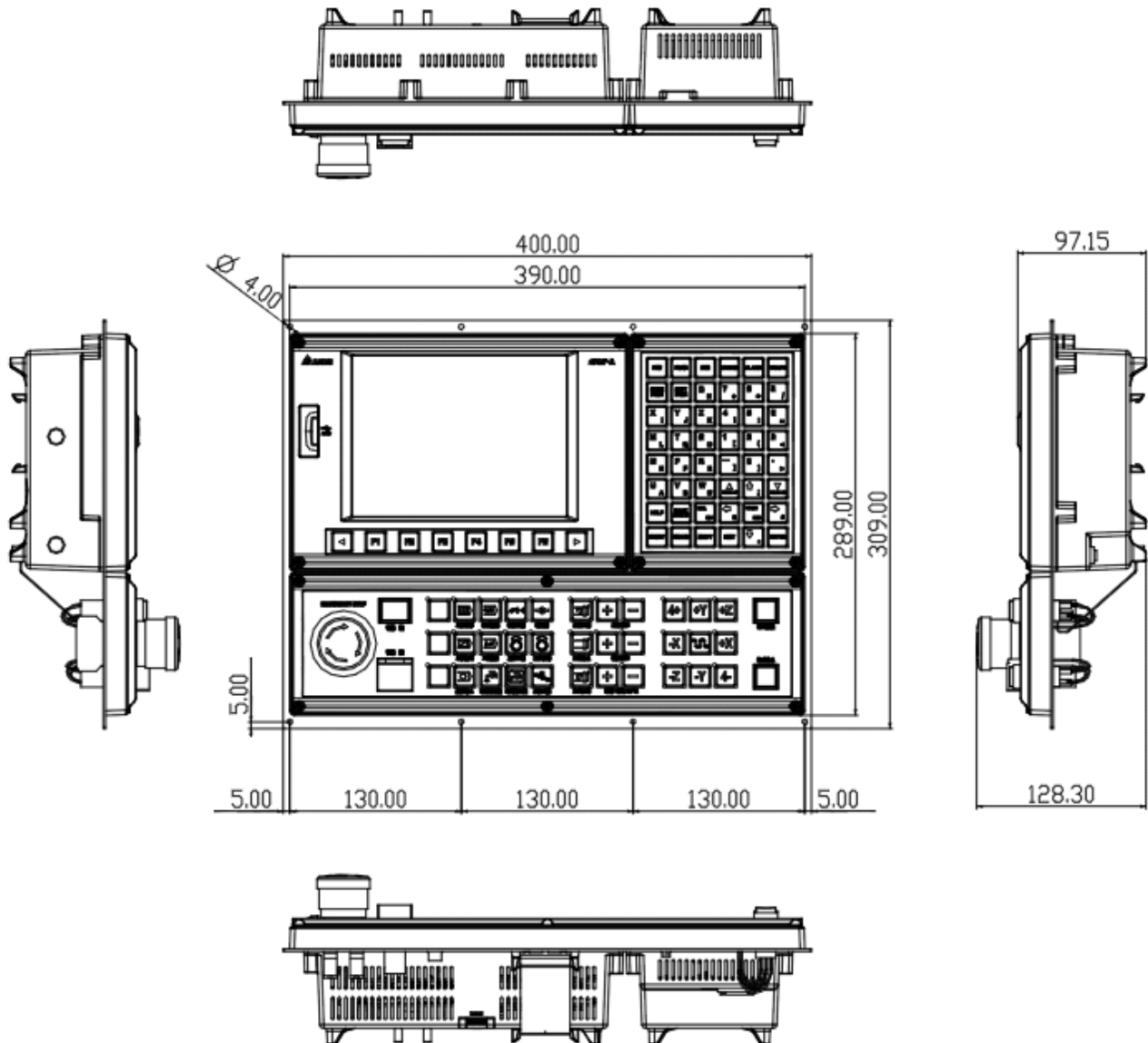


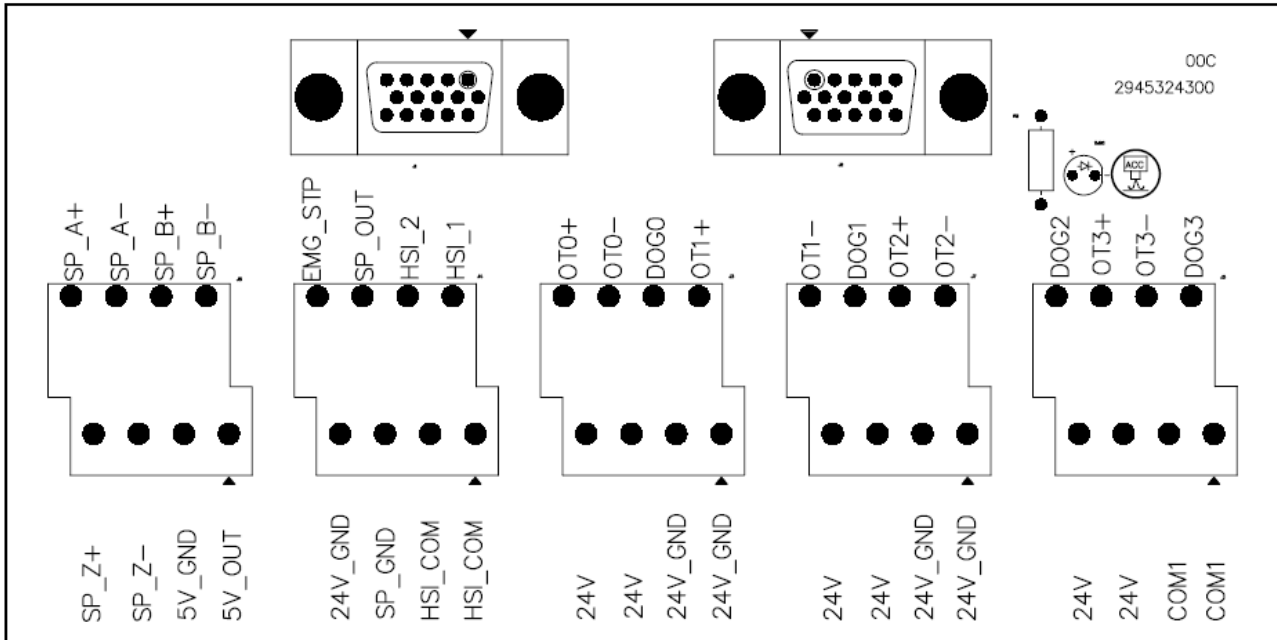
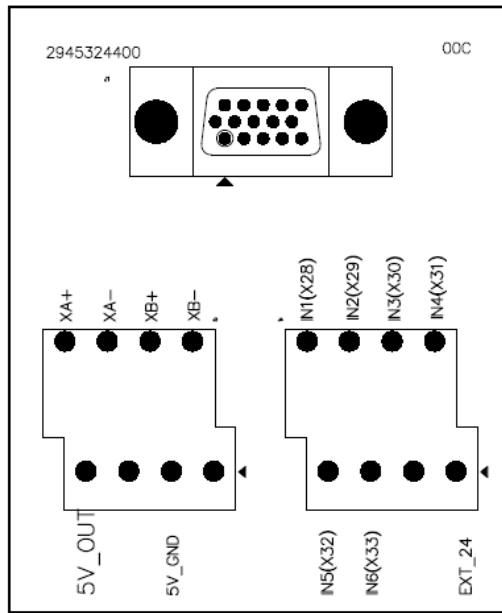
Electrical attributes:

| Model | NC300A |
|--|---|
| Working environment | 10% ~ 95% RH (0 ~ +55°C) |
| Storage environment | 10% ~ 95% RH (-20~ +60°C) |
| Cooling | Natural cooling |
| Safety Certification (Panel waterproof level) | IP65/NEMA4/CE, UL ^(Note 4) |
| Working voltage ^(Note 5) | DC +24V (-10% ~ +15%) (embedded isolated circuit ^(Note 3)) |
| Insulation endurance | Between DC24 and FG terminals: AC500V, 1 minute |
| Power consumption ^(Note 5) | 24V 0.6A 15W |
| Backup battery for memory | 3V lithium battery CR2032 × 1 |
| Life span of backup battery | Varies with ambient temperature and working conditions; about three years in 25°C room temperature |
| Vibration/collision resistance | IEC61131-2 specifications: Intermittent vibration: 5Hz-9Hz 3.5mm, 9Hz-150Hz 1G Continuous vibration: 5Hz-9Hz 1.75mm, 9Hz-150Hz 0.5G 10 times in direction X, Y, and Z respectively |
| Dimensions (W) x (H) x (D) mm | 400 x 309 x 129 |
| Opening dimensions (W) x (H) mm | 378 x 289 |
| Weight | Around 3700g |

| NC accessories | | | TBM | TBM | EIO | EIO | |
|---------------------------|--------------------------------------|--|---|--|---|---|--|
| | | | T16/16 | R1616 | T3232 | R3216 | |
| Input voltage | | | 24V DC | | | | |
| Voltage fluctuation range | | | DC: 21.6 ~ 26.4V | | | | |
| Cooling | | | Natural cooling | | | | |
| Digi- tal I/O | DI | Type | 16 points (photo coupler insulation) sink/source type | 16 points (photo coupler insulation) sink/source type | 32 points (photo coupler insulation) sink/source type | 32 points (photo coupler insulation) sink/source type | |
| | | Input signal voltage | 24V DC (+/-10%) | 24V DC (+/-10%) | 24V DC (+/-10%) | 24V DC (+/-10%) | |
| | DO | Type | 16 points (photo coupler insulation) | 16 points (Relay) | 32 points (photo coupler insulation) | 16 points (Relay) | |
| | | Working voltage | 24V DC | < 250VAC, 30VDC | 24V DC | < 250VAC, 30VDC | |
| | | Separation type | Photo coupler insulation | Electromagnet ic insulation | Photo coupler insulation | Electromagnet ic insulation | |
| | | current | < 40mA | < 16A | < 40mA | < 16A | |
| | Electrical transmission interface | | | CABLE | | RS-422 | |
| | Environment requirements | Installation location | | Indoor (away from direct sun light), without corrosive mist (free of fumes, flammable gas and dust) | | | |
| Elevation | | Below 1000M | | | | | |
| Atmospheric pressure | | 86kPa ~ 106kPa | | | | | |
| Ambient temperature | | 0°C ~ 55°C (Please add forced ventilation in case the ambient temperature exceeds given specifications) | | | | | |
| Storage temperature | | -20°C ~ 65°C | | | | | |
| Humidity | | 0 ~ 90% RH (without condensation) | | | | | |

Appearance and dimensions





Chapter 4: Summary of User Parameters

4.1 Overview

This document summarizes all information on parameters accessible to users including: parameter ID, Chinese and English name, description, default values, valid value range, and remarks. Later parameter pages of shall be made in accordance with this document.

- (★) Parameter values take effect only after machine is restarted
- (●) Cannot reset to default values. Changes can only be made manually
- (▲) Parameter values take effect only by pressing the Reset key

4.2 Parameter information

There are two kinds of user parameters: NC and system. The NC parameters are for CNC machining with types of operation, tool magazine, machining, spindle, mechanical, home and compensation. The system parameters are those referred by system interface or operations including: system parameters, MLC setup, and graphic parameters. See the sections below for information on each parameter category.

4.2.1 Operation Parameters

| PARAMETER(Operation) | | 117.NC | N1 | SFT |
|----------------------|----------------|--------|-------|-----|
| No. | Parameter Name | | Value | |
| 3 | GO9010 | | R | 0 |
| 4 | GO9011 | | R | 0 |
| 5 | GO9012 | | R | 0 |
| 6 | GO9013 | | R | 0 |
| 7 | GO9014 | | R | 0 |
| 8 | GO9015 | | R | 0 |
| 9 | GO9016 | | R | 0 |
| 10 | GO9017 | | R | 0 |
| 11 | GO9018 | | R | 0 |
| 12 | GO9019 | | R | 0 |
| 13 | MO9020 | | R | 6 |
| 14 | MO9021 | | R | 0 |
| 15 | MO9022 | | R | 0 |
| 16 | MO9023 | | R | 0 |
| 17 | MO9024 | | R | 0 |

Range: 0 ~ 1000

JOG Ch 0 1/6

◀ OPERATE MAGA PROCESS SPINDLE MACHINE HOME ▶

| Item | Name | Description | UOM | Default | Range | Length (word) | Remark |
|------|------------------------------------|---|-----|---------|--------|---------------|--------|
| 3 | GO9010 G code calls macro O9010 | Set G code calling macro O9010, e.g. if GO9010 is set to 1 then statement G01 in program calls to enter O9010. 0: disable the function of calling macros | | 0 | 0~1000 | 1 | |
| 4 | GO9011 G code calls macro O9011 | Set G code calling macro O9011. Its function is the same as GO9010. 0: disable the function of calling macros | | 0 | 0~1000 | 1 | |
| 5 | GO9012 G code calls macro O9012 | Set G code calling macro O9012. Its function is the same as GO9010. 0: disable the function of calling macros | | 0 | 0~1000 | 1 | |
| 6 | GO9013 G code calls macro O9013 | Set G code calling macro O9013. Its function is the same as GO9010. 0: disable the function of calling macros | | 0 | 0~1000 | 1 | |

| | | | | | | | |
|-----------|------------------------------------|---|--|---|--------|---|--|
| 7 | GO9014 G code calls macro O9014 | Set G code calling macro O9014. Its function is the same as GO9010. 0: disable the function of calling macros | | 0 | 0~1000 | 1 | |
| 8 | GO9015 G code calls macro O9015 | Set G code calling macro O9015. Its function is the same as GO9010. 0: disable the function of calling macros | | 0 | 0~1000 | 1 | |
| 9 | GO9016 G code calls macro O9016 | Set G code calling macro O9016. Its function is the same as GO9010. 0: disable the function of calling macros | | 0 | 0~1000 | 1 | |
| 10 | GO9017 G code calls macro O9017 | Set G code calling macro O9017. Its function is the same as GO9010. 0: disable the function of calling macros | | 0 | 0~1000 | 1 | |
| 11 | GO9018 G code calls macro O9018 | Set G code calling macro O9018. Its function is the same as GO9010. 0: disable the function of calling macros | | 0 | 0~1000 | 1 | |
| 12 | GO9019 G code calls macro O9019 | Set G code calling macro O9019. Its function is the same as GO9010. 0: disable the function of calling macros | | 0 | 0~1000 | 1 | |
| 13 | MO9020 M code calls macro O9020 | Set M code calling macro O9020, e.g. if MO9020 is set to 3 then statement M03 in program calls to enter O9020. 0: disable the function of calling macros | | 0 | 0~1000 | 1 | |
| 14 | MO9021 M code calls macro O9021 | Set M code calling macro O9021. Its function is the same as MO9020. 0: disable the function of calling macros | | 0 | 0~1000 | 1 | |
| 15 | MO9022 M code calls macro O9022 | Set M code calling macro O9022. Its function is the same as MO9020. 0: disable the function of calling macros | | 0 | 0~1000 | 1 | |
| 16 | MO9023 M code calls macro O9023 | Set M code calling macro O9023. Its function is the same as MO9020. 0: disable the function of calling macros | | 0 | 0~1000 | 1 | |
| 17 | MO9024 M code calls macro O9024 | Set M code calling macro O9024. Its function is the same as MO9020. 0: disable the function of calling macros | | 0 | 0~1000 | 1 | |
| 18 | MO9025 M code calls macro O9025 | Set M code calling macro O9025. Its function is the same as MO9020. 0: disable the function of calling macros | | 0 | 0~1000 | 1 | |

Chapter 4: Summary of User Parameters

| 19 | MO9026 M code calls macro O9026 | Set M code calling macro O9026. Its function is the same as MO9020. 0: disable the function of calling macros | | 0 | 0~1000 | 1 | |
|-----|---|---|-----|------|-----------|---|--|
| 20 | MO9027 M code calls macro O9027 | Set M code calling macro O9027. Its function is the same as MO9020. 0: disable the function of calling macros | | 0 | 0~1000 | 1 | |
| 21 | MO9028 M code calls macro O9028 | Set M code calling macro O9028. Its function is the same as MO9020. 0: disable the function of calling macros | | 0 | 0~1000 | 1 | |
| 22 | MO9029 M code calls macro O9029 | Set M code calling macro O9029. Its function is the same as MO9020. 0: disable the function of calling macros | | 0 | 0~1000 | 1 | |
| 23 | TO9000 Start up T code to call macro O9000 | Set T code calling macro O9000, e.g. if TO9000 is set to 1 then statement Txx in program calls to enter O9000 0: disable the function of calling macros 1: Any T code will call macro | | 0 | 0~1 | 1 | |
| 24 | RO9030 Start up breakpoint search to call O9030 | Breakpoint search: Calls entering O9030 after the desired statement is found. 0 (Off): Continue machining from statement after the breakpoint found 1 (On): Execute program O9030 after breakpoint is found and resume machining after the breakpoint | | 0 | 0~1 | 1 | |
| 25 | System DIO signal polarity settings | Set up system HIS 0/1 DI polarity | | 0 | 0 ~ 65535 | | |
| | | <table border="1"> <thead> <tr> <th>Bit</th> <th>Name</th> <th>Range</th> </tr> </thead> <tbody> <tr> <td>0~1</td> <td>HIS 0 (G31 interrupt) and HIS 1 settings Bit0: HIS 0b input Bit1: HIS 1 input 0: b contact open->H, close->L 1: a contact open->L, close->H</td> <td>0~3</td> </tr> </tbody> </table> | Bit | | | | |
| Bit | Name | Range | | | | | |
| 0~1 | HIS 0 (G31 interrupt) and HIS 1 settings Bit0: HIS 0b input Bit1: HIS 1 input 0: b contact open->H, close->L 1: a contact open->L, close->H | 0~3 | | | | | |
| 46 | System utility settings | Set up system utility procedures | | 1100 | 0~0xFFFF | 1 | |
| | | <table border="1"> <thead> <tr> <th>Bit</th> <th>Name</th> <th>Range</th> </tr> </thead> <tbody> <tr> <td>5</td> <td>High speed input point (G31)</td> <td>0~1</td> </tr> </tbody> </table> | Bit | | | | |
| Bit | Name | Range | | | | | |
| 5 | High speed input point (G31) | 0~1 | | | | | |

| | | | | | | | | | |
|------------|----------------------------|--|---|-------|--------|-----|---------|-----|-----|
| | | | 1: Open G31 input point 0: Close | | | | | | |
| | | 10 | Ignore movement command floating point 0: Do not ignore, i.e. 1 = 1µm 1: Ignore, 1 = 1mm | 0~1 | | | | | |
| | | 11 | (Switch function is unavailable) G00 operation mode 0: Fast path feed 1: Fast axial feed | 0~1 | | | | | |
| 47 | MPG hand wheel gain | MPG filter gains for hand wheel effect adjustment. The larger the value is, the faster the system reacts and the more it vibrates. | | | 0.0001 | 100 | 1~60000 | 1 | |
| 48 | MPG hand wheel filter | MPG filter settings: 0: None | | | | 0 | 0 ~ 6 | 1 | |
| | | Grade | 1 | 2 | 3 | 4 | 5 | 6 | |
| | | KhZ | 312 | 10 | 5 | 2.5 | 1.6 | 1.2 | |
| 49 | Servo axis output settings | Servo axis output connector setup 0: the fourth axis features limit and home signal 1: Set to ABC origin signal | | | | 0 | 0 ~ 1 | 1 | |
| 50 | Show macro file | Bit | Name | Range | | 0 | 0 ~ 3 | 1 | |
| | | 0 | Show macro file O | 0~1 | | | | | |
| | | 1 | Show G/M macro file | 0~1 | | | | | |
| 350 | Halt M code 1 | Halt M code 1 (0: no setting) | | | | 0 | 0~1000 | 1 | (★) |
| 351 | Halt M code 2 | Halt M code 2 (0: no setting) | | | | 0 | 0~1000 | 1 | (★) |
| 352 | Halt M code 3 | Halt M code 3 (0: no setting) | | | | 0 | 0~1000 | 1 | (★) |
| 353 | Halt M code 4 | Halt M code 4 (0: no setting) | | | | 0 | 0~1000 | 1 | (★) |
| 354 | Halt M code 5 | Halt M code 5 (0: no setting) | | | | 0 | 0~1000 | 1 | (★) |
| 355 | Halt M code 6 | Halt M code 6 (0: no setting) | | | | 0 | 0~1000 | 1 | (★) |
| 356 | Halt M code 7 | Halt M code 7 (0: no setting) | | | | 0 | 0~1000 | 1 | (★) |
| 357 | Halt M code 8 | Halt M code 8 (0: no setting) | | | | 0 | 0~1000 | 1 | (★) |
| 358 | Halt M code 9 | Halt M code 9 (0: no setting) | | | | 0 | 0~1000 | 1 | (★) |
| 359 | Halt M code | Halt M code 10 (0: no setting) | | | | 0 | 0~1000 | 1 | (★) |

Chapter 4: Summary of User Parameters

| | 10 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|-------------------------------|--|-------------------------|-------|--------|---|-------------------------|-----|---|-------------------------|-----|---|-------------------------|-----|---|-------------------------|-----|---|-------------------------|-----|---|-------------------------|-----|--|--|--|--|--|
| 360 | Synchronous control direction | Synchronous control direction Bit0~5: Synchronous control X~C 0: same direction 1: different direction | | 0 | 0~0x3F | 1 | (★) | | | | | | | | | | | | | | | | | | | | | |
| | | <table border="1"> <thead> <tr> <th>Bit</th> <th>Name</th> <th>Range</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Synchronous direction X</td> <td>0~1</td> </tr> <tr> <td>1</td> <td>Synchronous direction Y</td> <td>0~1</td> </tr> <tr> <td>2</td> <td>Synchronous direction Z</td> <td>0~1</td> </tr> <tr> <td>3</td> <td>Synchronous direction A</td> <td>0~1</td> </tr> <tr> <td>4</td> <td>Synchronous direction B</td> <td>0~1</td> </tr> <tr> <td>5</td> <td>Synchronous direction C</td> <td>0~1</td> </tr> </tbody> </table> | Bit | Name | Range | 0 | Synchronous direction X | 0~1 | 1 | Synchronous direction Y | 0~1 | 2 | Synchronous direction Z | 0~1 | 3 | Synchronous direction A | 0~1 | 4 | Synchronous direction B | 0~1 | 5 | Synchronous direction C | 0~1 | | | | | |
| | | Bit | Name | Range | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 0 | Synchronous direction X | 0~1 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 1 | Synchronous direction Y | 0~1 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 2 | Synchronous direction Z | 0~1 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 3 | Synchronous direction A | 0~1 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 4 | Synchronous direction B | 0~1 | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | Synchronous direction C | 0~1 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 361 | Synchronous control X | Slave axis X follows the master axis 0: close 1~6:X~C | | 0 | 0 ~ 6 | 1 | (★) | | | | | | | | | | | | | | | | | | | | | |
| 362 | Synchronous control Y | Slave axis Y follows the master axis 0: close 1~6:X~C | | 0 | 0 ~ 6 | 1 | (★) | | | | | | | | | | | | | | | | | | | | | |
| 363 | Synchronous control Z | Slave axis Z follows the master axis 0: close 1~6:X~C | | 0 | 0 ~ 6 | 1 | (★) | | | | | | | | | | | | | | | | | | | | | |
| 364 | Synchronous control A | Slave axis A follows the master axis 0: close 1~6:X~C | | 0 | 0 ~ 6 | 1 | (★) | | | | | | | | | | | | | | | | | | | | | |
| 365 | Synchronous control B | Slave axis B follows the master axis 0: close 1~6:X~C | | 0 | 0 ~ 6 | 1 | (★) | | | | | | | | | | | | | | | | | | | | | |
| 366 | Synchronous control C | Slave axis C follows the master axis 0: close 1~6:X~C | | 0 | 0 ~ 6 | 1 | (★) | | | | | | | | | | | | | | | | | | | | | |
| 371 | Transfer control X | Axis X transfers the command of master axis and the master axis does not move at the moment. 0: close 1~6:X~C | | 0 | 1~6 | | | | | | | | | | | | | | | | | | | | | | | |
| 372 | Transfer control Y | Axis Y transfers the command of master axis. 0: close 1~6:X~C | | 0 | 1~6 | | | | | | | | | | | | | | | | | | | | | | | |
| 373 | Transfer control Z | Axis Z transfers the command of master axis. 0: close 1~6:X~C | | 0 | 1~6 | | | | | | | | | | | | | | | | | | | | | | | |
| 374 | Transfer control A | Axis A transfers the command of master axis. 0: close 1~6:X~C | | 0 | 1~6 | | | | | | | | | | | | | | | | | | | | | | | |
| 375 | Transfer | Axis B transfers the command of | | 0 | 1~6 | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | |
|--|-----------------------------------|--|------------------------|--------------|----------------------|-------|-----------|---|-----|
| | control B | master axis. 0: close 1~6:X~C | | | | | | | |
| 376 | Transfer control C | Axis C transfers the command of master axis. 0: close 1~6:X~C | | | | 0 | 1~6 | | |
| 2010 | High speed input trigger settings | Bit | Name | Range | | 0 | 0 ~ 65535 | 1 | (★) |
| | | 0 | HSI 0 trigger settings | 0~1 | | | | | |
| | | 1 | HSI 1 trigger settings | 0~1 | | | | | |
| Set up upper edge (set to 0) counting for high speed input. Set up lower edge (set to 1) counting | | | | | | | | | |
| 621 | Maximum allowable speed | Set up maximum axial moving speed in unit of mm/min or inch/min | | | mm/min, inch/min rpm | 5000 | 0 ~ 60000 | 1 | (★) |
| 622 | ACC / DEC time constant | Set up acceleration time for manual and homing operation | | | 0.001 sec | 50 | 0~10000 | 1 | |
| 623 | S curve time constant | Set up S-curve time constant for manual and homing operation | | | 0.001 sec | 5 | 1~2000 | 1 | |
| 624 | EMG axial DEC time | Deceleration time constant for axial emergency stop | | | 0.001 sec | 100 | 1 ~ 2000 | 1 | ★ |
| 643 | Allowable following error | Beeps for any movement with follow-up error greater than this setting (CU: command unit) | | | CU | 30000 | 1~32767 | 1 | (☆) |

4.2.2 Tool Magazine Parameters


| PARAMETER(Magazine) | | 117.NC | N1 | |
|---------------------|--|--------|---------|------------------------|
| No. | Parameter Name | | | Value |
| 304 | Magazine selection | P | | 16384 |
| | • ATC enable flag | | | 1 |
| | • Set the magazine tool channel | | | 0 |
| | • ATC type | | | 0 |
| | • Set the search mode of the ATC tool change | | | 0 |
| 336 | Magazine control | P | | 0 |
| | • ATC type | | | 0 |
| 337 | Magazine selection | P | | 1 |
| | • Enable ATC 1 | | | 1 |
| | • Enable ATC 2 | | | 0 |
| 338 | ATC 1 station | P | | 24 |
| 339 | ATC 1 init number | P | | 1 |
| 340 | ATC 1 start number | P | | 1 |
| 341 | ATC 2 station | P | | 2 |
| | | | | Range: 0 ~ 1 |
| JOG | | Ch 0 | | 1/2 Ready |
| ◀ OPERATE | | MAGA | PROCESS | SPINDLE MACHINE HOME ▶ |


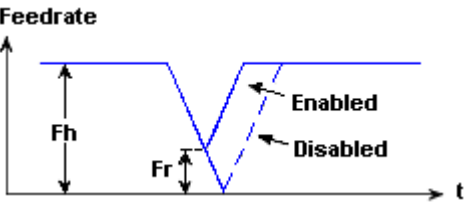
| Item | Name | Description | UOM | Default | Range | Length (word) | Remark |
|------|--------------------------------|---|---|---------|----------|---------------|--------|
| 304 | Tool magazine parameters setup | Tool magazine selection | | 0x4800 | 0~0xFFFF | 1 | |
| | | Bit | Name | Range | | | |
| | | 14 | Enable ATC (Automatic Tool Change) function | 0~1 | | | |
| | | | 0: OFF 1: ON | | | | |
| | | 9 | Set up ATC number 0: tool magazine 0 1: tool magazine 1 | 0~1 | | | |
| | 11 | ATC type 0: switching 1: non switching | 0~1 | | | | |
| | 12~13 | Set up ATC searching mode 0: shortest length path 1: CW | 0~2 | | | | |

| | | | | | | | | | |
|-----|--------------------------------|-----|--|-------|--------|---------|---|------------|--|
| | | | 2: CCW | | | | | | |
| | | 15 | Control type 0: MLC control 1: NC control | 0~1 | | | | | |
| 336 | Tool magazine database control | Bit | Name | Range | 0x0800 | 0~65535 | 1 | (★) (●) | |
| | | 11 | ATC type 0: Exchanger type (switching arm) 1: Non-exchanger type (tool tray) | 0~1 | | | | | |
| 337 | Tool magazine database control | Bit | Name | Range | 1 | 0~3 | 1 | | |
| | | 0 | Enable ATC 1 0: Disable 1: Enable | 0~1 | | | | | |
| | | 1 | Enable ATC 2 0: Disable 1: Enable | 0~1 | | | | | |
| 338 | ATC station | 1 | Set up number of stations of tool magazine 1 tool number | | 10 | 2 ~ 255 | 1 | (★) (●) | |
| 339 | ATC 1 init number | | Set up tool number after tool magazine 1 reset | | 1 | 1 ~ 100 | 1 | | |
| 340 | ATC 1 start number | | Set up starting number of tool magazine 1 | | 1 | 1 ~ 100 | 1 | | |
| 341 | ATC station | 2 | Set up number of stations of tool magazine 2 tool number | | 10 | 2 ~ 255 | 1 | (★) (●) | |
| 342 | ATC 2 init number | | Set up tool number after tool magazine 2 reset | | 1 | 1 ~ 100 | 1 | | |
| 343 | ATC 2 start number | | Set up starting number of tool magazine 2 | | 1 | 1 ~ 100 | 1 | | |

4.2.3 Machining Parameters

| PARAMETER(Process) | | 117.NC | N1 | SFT |
|--------------------|----------------------------------|--------------|---------|------------------------|
| No. | Parameter Name | | | Value |
| 307 | Channel utility | P | | 20 |
| | • Skip signal channel selection | | | 1 |
| | • Break point return | | | 0 |
| | • EMG stop mode | | | 0 |
| 309 | Nominal arc feed rate | R | | 1000 |
| 310 | Minimal arc feed rate | R | | 500 |
| 311 | Overlapped speed reduction ratio | R | | 100 |
| 315 | F0 Speed | P | | 100 |
| 316 | G00 Rapid speed | R | | 12000 |
| 317 | G00 Rapid ACC/DEC time | R | | 40 |
| 318 | Maximum moving speed | R | | 10000 |
| 319 | ACC/DEC time | R | | 150 |
| 320 | S curve time constant | R | | 25 |
| 321 | ACC/DEC time | R | | 20 |
| 322 | S curve time constant | R | | 5 |
| | | Range: 0 ~ 2 | | |
| JOG | | Ch 0 | | 1/3 Ready |
| ◀ OPERATE | | MAGA | PROCESS | SPINDLE MACHINE HOME ▶ |

| Item | Name | Description | UOM | Default | Range | Length (word) | Remark |
|------|---|-------------|---|---------|--------------|---------------|--------|
| 307 | Channel utility setup | | | 0xB4 | 0~0xFF FF | 1 | |
| | | Bit | Name | Range | | | |
| | | 4~5 | G31 input selection 0: input via PLC 1: HIS 0 (latch input 1) 2: HIS 1 (latch input 2) "Refer to uni_sysUtil" | 0~1 | | | |
| 6 | Continue the execution 0: During the execution of one single block: offset, move remaining coordinates, recover positions in next block when running the program again; see illustration  1: During the execution of one single block: offset, | 0~1 | | | | | |

| | | | | | | | |
|-----|---|---|---|---------------------|------|-------------|---|
| | | when running the program again, recover the offset and move remaining coordinates; see illustration  | | | | | |
| | | 8~9 | Emergency stop mode 0: emergency stop then servo OFF 1: emergency stop then servo OFF after some delay 2: emergency stop without servo OFF | 0~2 | | | |
| | | 10 | Enable macro O9xxx display 0: enabled and O90xx can turn on 1: disabled and O90xx cannot turn on | 0~1 | | | |
| 309 | Arc feed rate | Set up feed rate of arc with diameter 2mm | | mm/min | 1000 | 10~50000 | 1 |
| 310 | Minimum arc feed rate | Set up the minimum feed rate for executing G02 and G03 arcs | | mm/min | 500 | 10~50000 | 1 |
| 311 | Overlapped speed reduction ratio (corner speed limit) | Set the rapid speed reduction ratio to enable or disable overlap rapid traverse blocks (has no switching function yet) | | mm/min | 100 | 0~5000 0 | 1 |
| | |  | | | | | |
| 315 | F0 Speed | Set up speed of Rapid feed F0 | | mm/min, inch/min | 100 | 10~10000 | 1 |
| 316 | Rapid speed (G00 feed rate) | Set up Rapid speed | | mm/min, inch/min | 5000 | 1~6000 0 | 1 |
| 317 | Rapid ACC/DEC time G00 acceleration/ | Set up acceleration time of fast moving speed with the same S curve time of item 319. | | 0.001 sec | 200 | 1~2000 | 1 |

Chapter 4: Summary of User Parameters

| | | | | | | | |
|------------|--|--|------------------|------|-------------|---|-----|
| | deceleration time constant | | | | | | |
| 318 | Maximum moving speed | Set up the maximum cut moving speed | mm/min, inch/min | 5000 | 1~6000 0 | 1 | |
| 319 | ACC/DEC time Cutting speed of acceleration/deceleration time constant | Set up the acceleration time for cutting speed (before ACC/DEC interpolation) | 0.001 sec | 200 | 1~2000 | 1 | |
| 320 | S curve time constant | Set up S curve time (before ACC/DEC interpolation) | 0.001 sec | 20 | 1~2000 | 1 | |
| 321 | ACC/DEC time | Set up acceleration time post acceleration/deceleration (after ACC/DEC interpolation) The larger the value is the more significant the profiling error will be. | 0.001 sec | 50 | 1~500 | 1 | |
| 322 | S curve time constant | Set up S curve time post acceleration/deceleration (after ACC/DEC interpolation) | 0.001 sec | 10 | 1~100 | 1 | |
| 327 | EMG stop time constant | Set up the time required for a servo motor to decelerate to stop after the emergency button is pressed. | 0.001 sec | 50 | 5~500 | 1 | (☆) |
| 328 | EMG stop delay time | Set up flag enabled (M2224) delay time after emergency stop in servo OFF mode | 0.001 sec | 35 | 0~200 | 1 | (☆) |
| 418 | Feed forward gain ratio of master axis | Set the feed forward compensation proportion of the master axis | | 0 | 0 ~ 200 | 1 | |
| 635 | Feed forward gain ratio | Set the feed forward compensation proportion of each axis | | 0 | 0 ~ 200 | 1 | |

4.2.4 Spindle Parameters

| PARAMETER(Spindle) | | 117.NC | N1 | |
|--------------------|----------------------------|--------|---------|------------------------|
| No. | Parameter Name | | | Value |
| 399 | Spindle mode | P | | 9 |
| | • Spindle control flag | | | 1 |
| | • Closed loop control flag | | | 0 |
| | • Spindle control output | | | 2 |
| | • SP Type | | | 0 |
| | • Encoder type | | | 0 |
| 401 | Spindle import number | P | | 8 |
| 402 | 1st encoder pulse | P | | 1280 |
| 403 | 1st Gain | P | | 50 |
| 404 | 1st positioning speed | P | | 1500 |
| 405 | 1st Spindle offset | R | | 520 |
| 406 | 1st speed in range | P | | 10 |
| 407 | 1st position In range | P | | 100 |
| 408 | 1st zero speed | P | | 5 |
| 409 | 1st Spindle speed | P | | 12000 |
| | | | | Range: 0 ~ 1 |
| JOG | | Ch 0 | | 1/2 Ready |
| ◀ OPERATE | | MAGA | PROCESS | SPINDLE MACHINE HOME ▶ |

| Item | Name | Description | UOM | Default | Range | Length (word) | Remark |
|------|--------------|-------------|--|---------|----------|---------------|--------|
| 399 | Spindle mode | | | 0 | 0~0xFFFF | 1 | (●) |
| | | Bit | Name | Range | | | |
| | | 0 | Spindle function on/off 0: Spindle OFF 1: Spindle ON | 0~1 | | | |
| | | 1 | Close loop control flag 0: Close loop control OFF 1: Close loop control ON (requires feedback encoder) | 0~1 | | | |
| | | 2~3 | Spindle | 0~2 | | | |

Chapter 4: Summary of User Parameters

| | | | | | | | | |
|-----|---------------------------------|---|-------------|------|---------|---|------------|--|
| | | output mode 0: DMCNET (servo spindle) 2: EDAC (analog output) | | | | | | |
| | | 4 Speed control mode (has no switching function yet) 0: rmp 1: PPM | 0~1 | | | | | |
| | | 5 Spindle encoder type selection 0: high resolution (x1000) 1: normal resolution (x4) | | | | | | |
| 401 | Spindle input port number | Set up feedback channel for spindle port encoder (has no switching function yet) | | 8 | 0~8 | 1 | (★) (●) | |
| 402 | Pulse number of spindle encoder | Set up the pulse number of encoder | pulse/rev | 1280 | 2~10000 | 1 | (★) (●) | |
| 403 | Spindle gains | Set up speed regulator gains (the smaller the value is the faster the response will be). | 0.001 | 50 | 1~5000 | 1 | | |
| 404 | Spindle positioning speed | Set up positioning speed | rpm | 100 | 1~20000 | 1 | | |
| 405 | Spindle positioning offset | Set up servo spindle positioning offset | 0.01 degree | 0 | 0~36000 | 1 | | |
| 406 | Spindle target speed error | Set up tolerance between spindle's nominal and actual speeds | rpm | 10 | 0~100 | 1 | | |
| 407 | Spindle positioning error | Set up spindle positioning error | 0.01 degree | 100 | 0~36000 | 1 | | |

| | | | | | | | |
|-----|---|---|-----------|-------|----------|---|-----|
| 408 | Range of spindle zero speed | Turn on spindle zero speed signal when its speed is in given range (NC-> MLC M2257). | rpm | 5 | 0~1000 | 1 | |
| 409 | Spindle maximum speed | Set up spindle maximum speed | rpm | 20000 | 0~50000 | 1 | |
| 411 | Spindle acceleration/deceleration time constant | Set up spindle acceleration/deceleration time | 0.001 sec | 20 | 1~2000 | 1 | |
| 412 | Spindle S curve time constant | Set up spindle S curve time | 0.001 sec | 10 | 1~2000 | 1 | |
| 416 | Tapping acceleration/deceleration time constant | Set up spindle acceleration/deceleration time for tapping | 0.001 sec | 2000 | 1~20000 | 1 | (☆) |
| 417 | Tapping S curve time constant | Set up spindle S curve time for tapping | 0.001 sec | 100 | 1~2000 | 1 | (☆) |
| 420 | 1 st Spindle positioning low speed | Low speed positioning of the master axis [Unit: rpm] | rpm | 100 | 1~20000 | 1 | |
| 421 | 1 st spindle retrieve ratio | The 1 st spindle retrieve ratio. The setting speed is the maximum, e.g. tapping speed is S1000, if the parameter is set to 20, retrieve speed will be S2000. (Unit: 0.1) | 0.1 | 10 | 10~50000 | 1 | |
| 422 | Gear ratio numerator 1 | Set the numerator of the spindle gear ratio (speed at first gear) | | 1 | 0~60000 | 1 | ★ |
| 423 | Gear ratio denominator 1 | Set the denominator of the spindle gear ratio (speed at first gear) | | 1 | 0~60000 | 1 | ★ |
| 424 | Gear ratio numerator 2 | Set the numerator of the spindle gear ratio (speed at second gear) | | 1 | 0~60000 | 1 | ★ |
| 425 | Gear ratio denominator 2 | Set the denominator of the spindle gear ratio (speed at second gear) | | 1 | 0~60000 | 1 | ★ |
| 426 | Gear ratio numerator 3 | Set the numerator of the spindle gear ratio (speed at third gear) | | 1 | 0~60000 | 1 | ★ |
| 427 | Gear ratio denominator 3 | Set the denominator of the spindle gear ratio (speed at third gear) | | 1 | 0~60000 | 1 | ★ |
| 428 | Gear ratio numerator 4 | Set the numerator of the spindle gear ratio (speed at fourth gear) | | 1 | 0~60000 | 1 | ★ |
| 429 | Gear ratio denominator 4 | Set the denominator of the spindle gear ratio (speed at | | 1 | 0~60000 | 1 | ★ |

Chapter 4: Summary of User Parameters

| | | | | | | | |
|--|--|--------------|--|--|--|--|--|
| | | fourth gear) | | | | | |
|--|--|--------------|--|--|--|--|--|

4.2.5 Mechanical Parameters

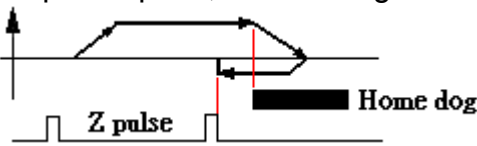
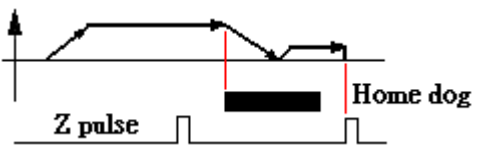
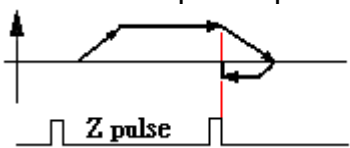
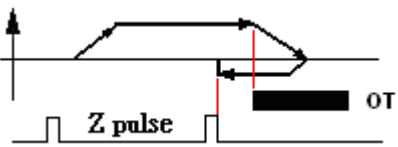
| PARAMETER(Machine) | | 117.NC | N1 | SFT |
|--------------------|----------------------|------------------------------|-------------|------------------------|
| No. | Parameter Name | X | Y | Z |
| 602 | 1st Upper soft limit | R 100000.000 | 100000.000 | 100000.000 |
| 603 | 1st Lower soft limit | R -100000.000 | -100000.000 | -100000.000 |
| 604 | 2ed Upper soft limit | R 100000.000 | 100000.000 | 100000.000 |
| 605 | 2ed Lower soft limit | R -100000.000 | -100000.000 | -100000.000 |
| 628 | Port polarity | P 3 | 3 | 3 |
| | • CWL polarity | 1 | 1 | 1 |
| | • CCWL polarity | 1 | 1 | 1 |
| | • Home dog polarity | 0 | 0 | 0 |
| 630 | Encoder pulse count | P 1280 | 1280 | 1280 |
| 631 | Shaft gear number | P 1 | 1 | 1 |
| 632 | Motor gear number | P 1 | 1 | 1 |
| 633 | Lead screw pitch | P 10 | 10 | 10 |
| 634 | Control utility | P 1 | 1 | 1 |
| | • Rotation mode | 0 | 0 | 0 |
| | | Range: -100000 ~ 100000 (mm) | | |
| JOG | | Ch 0 | | 1/1 Ready |
| ◀ OPERATE | | MAGA | PROCESS | SPINDLE MACHINE HOME ▶ |

| Item | Name | Description | UOM | Default | Range | Length (word) | Remark |
|------|----------------------------|---|-----|---------|---------------------|---------------|--------|
| 602 | First positive soft limit | Set up positive software limit. 0 = OFF 1. Over travel leads to positive software limit alarm 2. Can be controlled by special M (set M1250 to NO to relieve first software limit) | mm | 10^5 | -10^5 ~ +10^5 | 2 | |
| 603 | First negative soft limit | Set up negative software limit. 0 = OFF 1. Over travel leads to negative software limit alarm 2. Can be controlled by special M | mm | -10^5 | -10^5 ~ +10^5 | 2 | |
| 604 | Second positive soft limit | Set up positive software limit. 0 = OFF 1. Over travel leads to positive software limit alarm 2. Can be controlled by special M | mm | 10^5 | -10^5 ~ +10^5 | 2 | |

Chapter 4: Summary of User Parameters

| 605 | Second negative soft limit | Set up negative software limit. 0 = OFF 1. Over travel leads to negative software limit alarm 2. Can be controlled by special M | mm | -10 ⁵ | -10 ⁵ ~ +10 ⁵ | 2 | | | | | | | | | | | | | |
|-----|---|---|------|------------------|---|-----|---|-----|---|----------------|-----------|---|------|-----|--|--|--|--|--|
| 628 | Polarity of hard limit setting | Set up forward/backward hardware limit and home input polarity. Value 0 = input by Hi activity and on/off at A connector 0 = input by Lo activity and on/off at B connector | | 0 | 0~3F | 1 | | | | | | | | | | | | | |
| | | <table border="1"> <thead> <tr> <th>Bit</th> <th>Name</th> <th>Range</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>positive limit</td> <td>0~1</td> </tr> <tr> <td>1</td> <td>negative limit</td> <td>0~1</td> </tr> <tr> <td>2</td> <td>home</td> <td>0~1</td> </tr> </tbody> </table> | Bit | Name | Range | 0 | positive limit | 0~1 | 1 | negative limit | 0~1 | 2 | home | 0~1 | | | | | |
| Bit | Name | Range | | | | | | | | | | | | | | | | | |
| 0 | positive limit | 0~1 | | | | | | | | | | | | | | | | | |
| 1 | negative limit | 0~1 | | | | | | | | | | | | | | | | | |
| 2 | home | 0~1 | | | | | | | | | | | | | | | | | |
| 630 | Encoder pulse number | The pulse number in each revolution of the motor when ASD-A2 is employed (default) | 1000 | 1280 | 10~50000 | 1 | (★) (●) | | | | | | | | | | | | |
| 631 | Number of teeth of spindle | Set up teeth number at the transmission shaft end | | 1 | 1~65535 | 1 | (★) (●) | | | | | | | | | | | | |
| 632 | Number of teeth of motor | Set up teeth number at the motor end | | 1 | 1~65535 | 1 | (★) (●) | | | | | | | | | | | | |
| 633 | Lead screw pitch | Set up lead screw pitch of the drive shaft | mm | 10 | 2~100 | 1 | (★) (●) | | | | | | | | | | | | |
| 634 | Axis control variables | <table border="1"> <thead> <tr> <th>Bit</th> <th>Name</th> <th>Range</th> </tr> </thead> <tbody> <tr> <td>1~2</td> <td>Rotation mode Feed mode of the rotation axis is only suitable in axis A, B and C. Axis X, Y and Z is not applicable. 0: the rotation axis is not the shortest path 1: the rotation axis is the shortest path 2: straight line axis 3~4: reserved 5: linear axis</td> <td>0~5</td> </tr> </tbody> </table> | Bit | Name | Range | 1~2 | Rotation mode Feed mode of the rotation axis is only suitable in axis A, B and C. Axis X, Y and Z is not applicable. 0: the rotation axis is not the shortest path 1: the rotation axis is the shortest path 2: straight line axis 3~4: reserved 5: linear axis | 0~5 | | 5 | 0 ~ 65535 | 1 | ★ | | | | | | |
| Bit | Name | Range | | | | | | | | | | | | | | | | | |
| 1~2 | Rotation mode Feed mode of the rotation axis is only suitable in axis A, B and C. Axis X, Y and Z is not applicable. 0: the rotation axis is not the shortest path 1: the rotation axis is the shortest path 2: straight line axis 3~4: reserved 5: linear axis | 0~5 | | | | | | | | | | | | | | | | | |

Chapter 4: Summary of User Parameters

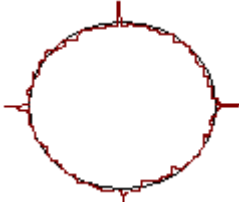
| | error settings | will be ON | | | | | | | | | | |
|-----|---|--|-----|------|-------|---|---|-----|---|------|---|--|
| 616 | Homing mode | <p>0: Back to origin is OFF 1: mode 1 Leave in reverse direction after the block is touched, search the first Z phase point, set it to origin</p>  <p>2: mode 2 Leave in the same direction after the block is touched, search the first Z phase point, set it to origin</p>  <p>3: mode 3 Move to Z phase point in slow speed</p>  <p>4: OT mode Set the hardware limit as the home sensor. Set the hardware limit as the home sensor in origin mode and the limit block in other modes.</p>  <p>5: Absolute motor mode</p> | 1 | 0~4 | 1 | | | | | | | |
| 617 | Searching the origin | <table border="1"> <thead> <tr> <th>Bit</th> <th>Name</th> <th>Range</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Direction searching mode for returning back to the origin 0: clockwise (forward) 1: counterclockwise (backward)</td> <td>0~1</td> </tr> </tbody> </table> | Bit | Name | Range | 0 | Direction searching mode for returning back to the origin 0: clockwise (forward) 1: counterclockwise (backward) | 0~1 | 1 | 0~7h | 1 | |
| Bit | Name | Range | | | | | | | | | | |
| 0 | Direction searching mode for returning back to the origin 0: clockwise (forward) 1: counterclockwise (backward) | 0~1 | | | | | | | | | | |

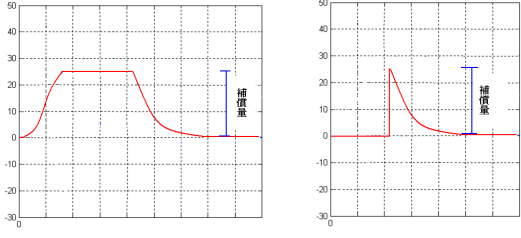
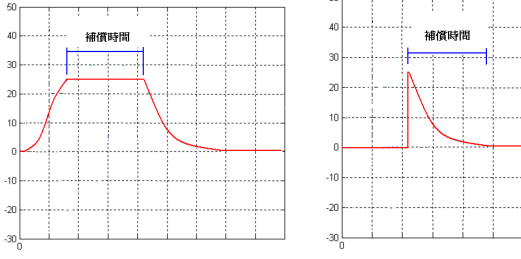
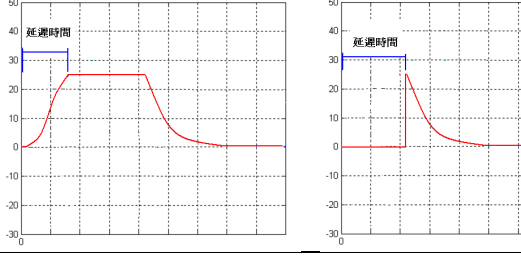
Chapter 4: Summary of User Parameters

| | | | | | | | |
|-----|--------------------------------|---|--------|------|---------|---|--|
| 618 | First stage speed of homing | Set up starting speed for origin sensor searching | mm/min | 2000 | 0~10000 | 1 | |
| 619 | Second stage speed of homing | Set up speed for Z phase point searching | mm/min | 200 | 0~2000 | 1 | |
| 620 | Reference point movement speed | Set up feed rate from first reference point to the origin | rpm | 10 | 0~20000 | 1 | |

4.2.7 Compensation Parameters

| PARAMETER(Compensation) | | 117.NC | N1 | | |
|--------------------------|-------------------------------|--------|---------|---------|---------|
| No. | Parameter Name | | X | Y | Z |
| 1000 | Backlash amount | R | 0.00000 | 0.00000 | 0.00000 |
| 1001 | Compensation time | R | 0 | 0 | 0 |
| 1002 | Compensation delay time | R | 0 | 0 | 0 |
| 1003 | Friction comp amount | R | 0.00000 | 0.00000 | 0.00000 |
| 1004 | Friction comp time | R | 0 | 0 | 0 |
| 1005 | Friction comp delay time | R | 0 | 0 | 0 |
| 1006 | Compensation utility | R | 0 | 0 | 0 |
| | • Absolute or Relative | | 0 | 0 | 0 |
| | • Friction positive direction | | 0 | 0 | 0 |
| | • Friction negative direction | | 0 | 0 | 0 |
| | • Friction compensation mode | | 0 | 0 | 0 |
| | • LSC direction | | 0 | 0 | 0 |
| 1007 | LSC point number | R | 0 | 0 | 0 |
| 1008 | LSC Space | R | 0.00000 | 0.00000 | 0.00000 |
| 1009 | LSC Offset | R | 0.00000 | 0.00000 | 0.00000 |
| Range: -2 ~ 2 (mm, inch) | | | | | |
| JOG | | Ch 0 | 1/10 | | |
| ▲ | OK | mm | mm+ | um | um+ ▶ |

| Item | Name | Description | UOM | Default | Range | Length (word) | Remark |
|------|----------------------------------|---|------------|---------|---------|---------------|--------|
| 1000 | Rear gap compensation value | Set up the backlash amount that is fixed in most screws of the mechanical system. There is no difference in G00 and G01 modes. Set positive value for forward backlash and negative for backward one. Compensation is turned off for zero parameter value.  <p style="text-align: center;">Arc contouring example</p> | mm, inch | 0 | 0~10.0 | 2 | |
| 1001 | Backlash compensation time | The movement direction of backlash compensation amount. The time constant for compensation ratio takes effect only when non-zero rear backlash compensation value is given. | 0.0001 sec | 0 | 0~10000 | 1 | |
| 1002 | Backlash compensation delay time | Set up time delay for startup compensation. | 0.0001 sec | 0 | 0~10000 | 1 | |

| 1003 | Friction compensation amount | <p>Friction compensation amount</p>  | mm | 0 | 0 ~ 1 (float) | 2 | | | | | | | | | | | | | | | | |
|------|---|--|---------------|------|------------------|---|---|-----|---|-----------------------------|-----|---|-----------------------------|-----|----|---|-----|--|---|--------------|---|--|
| 1004 | Friction compensation time | <p>Friction compensation time</p>  | 0.0001 sec | 0 | 0~10000 | 1 | | | | | | | | | | | | | | | | |
| 1005 | Friction compensation delay time | <p>Friction compensation delay time</p>  | 0.0001 sec | 0 | 0~10000 | 1 | | | | | | | | | | | | | | | | |
| 1006 | Pitch compensation application setup | <table border="1" data-bbox="339 1167 932 2047"> <thead> <tr> <th>Bit</th> <th>Name</th> <th>Range</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Absolute or incremental input 0: Absolute: difference against the first measuring point 1: difference between current and the last measuring points</td> <td>0~1</td> </tr> <tr> <td>2</td> <td>Friction positive direction</td> <td>0~1</td> </tr> <tr> <td>3</td> <td>Friction negative direction</td> <td>0~1</td> </tr> <tr> <td>15</td> <td>Measuring direction from starting point Mechanical coordinates direction 0: measuring toward forward direction 1: measuring toward</td> <td>0~1</td> </tr> </tbody> </table> | Bit | Name | Range | 0 | Absolute or incremental input 0: Absolute: difference against the first measuring point 1: difference between current and the last measuring points | 0~1 | 2 | Friction positive direction | 0~1 | 3 | Friction negative direction | 0~1 | 15 | Measuring direction from starting point Mechanical coordinates direction 0: measuring toward forward direction 1: measuring toward | 0~1 | | 0 | 0~0xFFF F | 1 | |
| Bit | Name | Range | | | | | | | | | | | | | | | | | | | | |
| 0 | Absolute or incremental input 0: Absolute: difference against the first measuring point 1: difference between current and the last measuring points | 0~1 | | | | | | | | | | | | | | | | | | | | |
| 2 | Friction positive direction | 0~1 | | | | | | | | | | | | | | | | | | | | |
| 3 | Friction negative direction | 0~1 | | | | | | | | | | | | | | | | | | | | |
| 15 | Measuring direction from starting point Mechanical coordinates direction 0: measuring toward forward direction 1: measuring toward | 0~1 | | | | | | | | | | | | | | | | | | | | |

Chapter 4: Summary of User Parameters

| | | | backward direction | | | | | |
|-------------------|---------------------|---|--------------------|--------|---|------------|---|--|
| 1007 | Measuring points | Set up screw compensation table correction value. If the value is set to zero, compensation is turned off. | | | 0 | 0~128 | 1 | |
| 1008 | Measuring intervals | Set up interval for screw compensation | | mm | 0 | 1~300 | 2 | |
| 1009 | Measuring offsets | Set measurement initial point at starting point Comply with direction of Bit 15 | | | 0 | -1000~1000 | 2 | |
| 1010 ~1137 | Data 1 ~ data 128 | 1 st ~128 th screw compensation value, the first point is set to the origin | | mm/deg | 0 | -20~20 | 2 | |

4.2.8 System Parameters

| PARAMETER(System) | | 117.NC | N1 | SFT |
|--------------------------|------------------------------------|------------|-----|-------|
| No. | Parameter Name | Value | | |
| 10000 | Date | 2013/03/26 | | |
| 10001 | Time | 11:16:13 | | |
| 10002 | Language | 0 | | |
| 10003 | Brightness | 80 | | |
| 10004 | User defined language | 0 | | |
| 10009 | Synchronous coordinate display | 0 | | |
| 10010 | Enable screen saver | 1 | | |
| 10011 | Screen saver time 1 | 10 | | |
| 10012 | Screen saver brightness 1 | 30 | | |
| 10013 | Screen saver time 2 | 30 | | |
| 10014 | Screen saver brightness 2 | 30 | | |
| 10016 | System utility | 0 | | |
| | • Reset system at EMG releasing | 0 | | |
| | • Display soft screen when startup | 0 | | |
| 10017 | G code edit setting | 1 | | |
| Format: Year /Month /Day | | | | |
| JOG | | Ch 0 | 1/2 | Ready |
| | DEFAULT | COLOR | | |

| Item | Name | Description | UOM | Default | Range | Length (word) | Remark |
|-------|--------------------------------|---|-----|---------|-----------------|---------------|--------|
| 10000 | System date | Set up system date Format: yyyy/mm/dd | | | | 0 | |
| 10001 | System time | Set up system time Format: hh:mm:ss | | | | 0 | |
| 10002 | System language | System multi-language 0: English 1: Chinese | | 1 | 0~SysTotalLang | 1 | |
| 10003 | Screen brightness | Set up screen brightness | | 50 | 1~60 | 1 | |
| 10004 | User defined language | User defined system language | | 0 | 0~UserTotalLang | 1 | |
| 10009 | Synchronous coordinate display | Method of showing the synchronous coordinate | | 0 | 0~2 | 1 | |
| 10010 | Screen saver ON | Activate screen save function 0: ON 1: OFF | | 1 | 0~1 | 1 | |


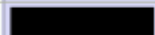


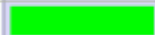
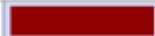
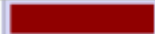
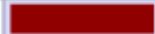
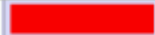



Chapter 4: Summary of User Parameters

| | | | | | | | |
|-------|---|--|-----|-----------|---------|---|--|
| 10011 | Time of first stage screen saver | When screen saver is ON, set up the time of first stage screen saver | min | 10 | 1~60 | 1 | |
| 10012 | Brightness of first stage screen saver | When screen saver is ON, set up the brightness of first stage screen saver | | 30 | 0~60 | 1 | |
| 10013 | Time of second stage screen saver | When screen saver is ON, set up the time of second stage screen saver | min | 30 | 1~60 | 1 | |
| 10014 | Brightness of second stage screen saver | When screen saver is ON, set up the brightness of second stage screen saver | | 10 | 0~60 | 1 | |
| 10015 | Reserved | Reserved | | 0 | 0~0 | 1 | |
| 10016 | Reset the system when releasing EMG | Auto generate a reset signal after releasing emergency stop 0: OFF 1: ON | | 0 | 0~1 | 1 | |
| 10017 | Open G code editor | G code editing 0: OFF 1: ON | | 1 | 0~1 | 1 | |
| 10018 | Background color | Background color | | LIGHTGRAY | 0~65535 | 1 | |
| 10019 | Title bar text color | Title bar text color | | BLACK | 0~65535 | 1 | |
| 10020 | Mode bar text color | Mode bar text color | | DARKBLUE | 0~65535 | 1 | |
| 10021 | Function bar text color | Function bar text color | | BLACK | 0~65535 | 1 | |
| 10022 | Label text font color | Label text font color | | BLACK | 0~65535 | 1 | |
| 10023 | Numeric text color | Numeric text color | | BLUE | 0~65535 | 1 | |
| 10024 | Grid line color | Grid line color | | BLACK | 0~65535 | 1 | |
| 10025 | System cursor color | System cursor color | | COLOR_S07 | 0~65535 | 1 | |
| 10026 | System highlight text color | System highlight text color | | WHITE | 0~65535 | 1 | |
| 10027 | Software panel cursor | Software panel cursor color | | YELLOW | 0~65535 | 1 | |

Chapter 4: Summary of User Parameters

| | | | | | | | |
|--------------|--------------------|--------------------|--|------|---------|---|--|
| | color | | | | | | |
| 10028 | System alarm color | System alarm color | | RED | 0~65535 | 1 | |
| 10029 | User alarm color | User alarm color | | BLUE | 0~65535 | 1 | |

4.2.9 MLC Setup

| PARAMETER(MLC) | | 117.NC | N1 | SFT |
|---|------------------------------|----------------|-----|---|
| No. | Parameter Name | Value | | |
| 12000 | Program title | ChangFeng GMC | | |
| 12001 | Company name | | | |
| 12002 | Designer name | | | |
| 12003 | Show comments | 0 | | |
| 12004 | Show symbol | 0 | | |
| 12005 | Ladder color | 0 | |  |
| 12006 | Ladder text color | 0 | |  |
| 12007 | Ladder symbol color | 0 | |  |
| 12008 | Ladder cursor color | 31 | |  |
| 12009 | Ladder monitor color | 2016 | |  |
| 12010 | Ladder device comment color | 36864 | |  |
| 12011 | Ladder segment comment color | 36864 | |  |
| 12012 | Ladder row comment color | 36864 | |  |
| 12013 | Ladder monitor value color | 63488 | |  |
| 12014 | NC special device color | 8799 | |  |
| | | Length: 0 ~ 20 | | |
| JOG | | Ch 0 | 1/2 | Ready |
|  | DEFAULT | COLOR | |  |

| Item | Name | Description | UOM | Default | Range | Length (word) | Remark |
|-------|-----------------------------|------------------------------------|-----|---------------|-------------|---------------|--------|
| 12000 | Program title | Program title | | | | 0 | |
| 12001 | Company name | Company name | | | | 0 | |
| 12002 | Designer's name | Name of designer | | | | 0 | |
| 12003 | Display remarks | Display remarks 0: OFF 1: ON | | 0 | 0~1 | 1 | |
| 12004 | Display symbols | Display symbols 0: OFF 1: ON | | 0 | 0~1 | 1 | |
| 12005 | Ladder diagram color | Ladder diagram color | | BLACK | 0~655 35 | 1 | |
| 12006 | Ladder diagram text color | Ladder diagram text color | | BLACK | 0~655 35 | 1 | |
| 12007 | Ladder diagram symbol color | Ladder diagram symbol color | | BLACK | 0~655 35 | 1 | |
| 12008 | Ladder diagram | Ladder diagram cursor color | | LIGHT BLUE | 0~655 35 | 1 | |

| | | | | | | | |
|-------|---------------------------------------|---|--|------------|---------|---|--|
| | cursor color | | | | | | |
| 12009 | Ladder diagram monitoring color | Ladder diagram monitoring color | | LIGHTGREEN | 0~65535 | 1 | |
| 12010 | Ladder diagram device remark color | Ladder diagram device remark color | | BROWN | 0~65535 | 1 | |
| 12011 | Ladder diagram section remark color | Ladder diagram section remark color | | BROWN | 0~65535 | 1 | |
| 12012 | Ladder diagram row remark color | Ladder diagram row remark color | | BROWN | 0~65535 | 1 | |
| 12013 | Ladder diagram monitoring value color | Ladder diagram monitoring value color | | LIGHTRED | 0~65535 | 1 | |
| 12014 | Color of special NC devices | Color of special NC devices | | COLOR_S2B | 0~65535 | 1 | |
| 12015 | Color of special MLC devices | Color of special MLC devices | | MAGENTA | 0~65535 | 1 | |
| 12016 | Enable MLC editing protection | MLC editing protection 0: protection OFF 1: protection ON | | 1 | 0~1 | 1 | |

4.2.10 Diagram Parameters

| PARAMETER(Graphic) | | 117.NC | N1 |
|--------------------|--------------------------|-------------------|-----------|
| No. | Parameter Name | Value | |
| 14000 | Graphic line color | 0 | BLACK |
| 14001 | Graphic background color | 1183 | SEA |
| 14002 | Graphic line width | 1 | |
| 14003 | Graphic stock width | 500 | |
| 14004 | Graphic stock height | 500 | |
| 14005 | Graphic stock length | 500 | |
| 14006 | Graphic stock X offset | 0 | |
| 14007 | Graphic stock Y offset | 0 | |
| 14008 | Graphic stock Z offset | 0 | |
| | | Range : 0 ~ 65535 | |
| JOG | | Ch 0 | 1/1 Ready |
| HOME | | DEFAULT | COLOR |

| Item | Name | Description | UOM | Default | Range | Length (word) | Remark |
|-------|--------------------|---|-----|---------|--------------|---------------|--------|
| 14000 | Line color | Diagram line color *Diagram for machining program movement | | BLACK | 0~65535 | 1 | |
| 14001 | Background color | Diagram background color | | SEA | 0~65535 | 1 | |
| 14002 | Line width | Diagram line width | | 1 | 0~4 | 1 | |
| 14003 | Workpiece width | Diagram workpiece width | mm | 200 | 0~10000 | 1 | |
| 14004 | Workpiece height | Diagram workpiece height | mm | 200 | 0~10000 | 1 | |
| 14005 | Workpiece length | Diagram workpiece length | mm | 200 | 0~10000 | 1 | |
| 14006 | Workpiece X offset | Diagram workpiece X offset | mm | 100 | -10000~10000 | 1 | |
| 14007 | Workpiece Y offset | Diagram workpiece Y offset | mm | 100 | -10000~10000 | 1 | |
| 14008 | Workpiece Z offset | Diagram workpiece Z offset | mm | 200 | -10000~10000 | 1 | |

4.2.11 Internet Setting

| PARAMETER(Ethernet) | | 117.NC | N1 | P | SFT |
|---------------------|----------------------------|---------|------------|------|---------------|
| No. | Parameter Name | Value | | | |
| 10030 | Host Name | P | CNC000 | | |
| 10031 | IP Address | P | 0. 0. 0. 0 | | |
| 10032 | Subnet Mask | P | 0. 0. 0. 0 | | |
| 10033 | Default Gateway | P | 0. 0. 0. 0 | | |
| 10034 | Ethernet Enable | P | 0 | | |
| 10035 | DHCP Enable | P | 0 | | |
| 10036 | PC1's IP Address | | 0. 0. 0. 0 | | |
| 10037 | PC2's IP Address | | 0. 0. 0. 0 | | |
| 10038 | PC3's IP Address | | 0. 0. 0. 0 | | |
| 10039 | PC4's IP Address | | 0. 0. 0. 0 | | |
| 10040 | PC5's IP Address | | 0. 0. 0. 0 | | |
| 10041 | Network Sharing IP Address | | 1 | | |
| | | | | | Length: 1 ~ 8 |
| JOG | | Ch 0 | 1/1 | STOP | |
| ↑ | | DEFAULT | | | ▶ |

| Item | Name | Description | UOM | Default | Range | Length (word) | Remark |
|-------|--------------------------|---|-----|---------|-------|---------------|--------|
| 10030 | Host name | Host name | | CNC000 | 1~8 | 4 | |
| 10031 | IP Address | System IP address | | 0.0.0.0 | 0~255 | 2 | |
| 10032 | Subnet mask | System subnet mask | | 0.0.0.0 | 0~255 | 2 | |
| 10033 | Default gateway | System default gateway | | 0.0.0.0 | 0~255 | 2 | |
| 10034 | Enable Ethernet function | Enable system network function 0: OFF 1: ON | | 0 | 0~1 | 1 | |
| 10035 | Enable DHCP function | Enable DHCP function 0: OFF 1: ON | | 0 | 0~1 | 1 | |
| 10036 | Remote PC IP Address 1 | IP address 1 | | 0 | 0~255 | 2 | |
| 10037 | Remote PC IP Address 2 | IP address 2 | | 0 | 0~255 | 2 | |
| 10038 | Remote PC | IP address 3 | | 0 | 0~255 | 2 | |

Chapter 4: Summary of User Parameters

| | | | | | | | |
|--------------|--|--|--|---|-------|---|--|
| | IP Address 3 | | | | | | |
| 10039 | Remote PC IP Address 4 | IP address 4 | | 0 | 0~255 | 2 | |
| 10040 | Remote PC IP Address 5 | IP address 5 | | 0 | 0~255 | 2 | |
| 10041 | IP address 1 for remote directory sharing | Edit IP address of computer defined by Network in directory 0: OFF | | 0 | 0~5 | 1 | |

4.2.12 Servo Parameters

| PARAMETER(Servo) | | | 117.NC | N1 | P |
|------------------|-----|---------------------------------|---------------|------|------|
| Group | No. | Parameter Name | X | Y | Z |
| P0 | 0 | Firmware Version | 1744 | 1744 | 1744 |
| P1 | 1 | Control Mode and Output Dirt | B | B | B |
| P1 | 8 | Smooth Constant of Position | 0 | 0 | 0 |
| P1 | 36 | Accel /Decel S-curve | 0 | 0 | 0 |
| P1 | 44 | Gear Ratio(Numerator N1) | 1 | 1 | 1 |
| P1 | 45 | Gear Ratio(Denominator M1) | 1 | 1 | 1 |
| P1 | 55 | Maximum Speed Limit | 3000 | 3000 | 3000 |
| P1 | 62 | Friction Compensation(%) | 0 | 0 | 0 |
| P1 | 63 | Friction Compensation(ms) | 1 | 1 | 1 |
| P1 | 68 | Position Command Moving Filter | 4 | 4 | 4 |
| P2 | 0 | Position Loop Gain(Kpp) | 78 | 78 | 78 |
| P2 | 1 | Kpp Gain Switching Rate | 100 | 100 | 100 |
| P2 | 2 | Position Feed Forward Gain(Kpf) | 0 | 0 | 0 |
| P2 | 3 | Smooth Constant of Kpf Gain | 5 | 5 | 5 |
| P2 | 4 | Speed Loop Gain(Kvp) | 314 | 314 | 314 |
| | | | Range : 0 ~ 0 | | |
| JOG | | Ch 0 | 1/3 | | STOP |
| READ | | | | | |

| Group | Item | Name | Description | UOM | Default | Range | Length (word) | Remark |
|-------|------|--|--|---------|---------|--------------------------|---------------|--------|
| P1 | 1 | Set up control mode and control command input source | Control settings for various modes | | b | 0x00 ~ 0x110F (HEX) | 1 | |
| P1 | 8 | Position command smoothing constant | Position command smoothing constant | 10 msec | 0 | 0 ~ 1000 | 1 | |
| P1 | 36 | Acceleration/deceleration smoothing constant for S curve | Acceleration/deceleration smoothing constant for S curve | msec | 0 | 0~65500 | 1 | |
| P1 | 44 | Electronic gear ratio numerator (N1) | Multi step electronic gear ratio numerator settings | pulse | 1 | 1 ~ (2 ²⁹ -1) | 2 | |
| P1 | 45 | Electronic gear ratio denominator (M1) | Electronic gear ratio denominator (M1) | pulse | 1 | 1 ~ (2 ³¹ -1) | 2 | |
| P1 | 62 | Friction compensation (%) | Friction compensation level | % | 0 | 0 ~ 100 | 1 | |
| P1 | 63 | Friction compensation (ms) | Friction compensation smoothing constant | ms | 0 | 0 ~ 1000 | 1 | |
| P1 | 68 | Position command moving filter | Position command Moving Filter | ms | 4 | 0 ~ 100 | 1 | |
| P2 | 0 | Proportional gain to position control (Kpp) | Proportional gain to position control | rad/s | 35 | 0 ~ 2047 | 1 | |
| P2 | 1 | Gain change rate to position control | Gain change rate to position control | % | 100 | 10 ~ 500 | 1 | |

Chapter 4: Summary of User Parameters

| | | | | | | | | |
|----|----|---|--|---------|------|-------------|---|--|
| P2 | 2 | Feed forward gain to position control (Kpf) | Feed forward gain to position control | % | 50 | 0 ~ 100 | 1 | |
| P2 | 3 | Feed forward gain smoothing constant to position control | Feed forward gain smoothing constant to position control | msec | 5 | 2 ~ 100 | 1 | |
| P2 | 4 | Speed control gain (Kvp) | Speed control gain | rad/s | 500 | 0 ~ 8191 | 1 | |
| P2 | 5 | Gain change rate to speed control | Gain change rate to speed control | % | 100 | 10 ~ 500 | 1 | |
| P2 | 6 | Speed integral compensation (Kvi) | Speed integral compensation | rad/s | 100 | 0 ~ 1023 | 1 | |
| P2 | 7 | Speed feed forward gain (Kvf) | Speed feed forward gain | % | 0 | 0 ~ 100 | 1 | |
| P2 | 9 | DI response filter time | DI response filter time | 2msec | 2 | 0 ~ 20 | 1 | |
| P2 | 23 | Resonance suppression filter frequency (Notch filter) (1) | Mechanical resonance frequency settings 1 | Hz | 1000 | 50 ~ 1000 | 1 | |
| P2 | 24 | Resonance suppression decay rate (1) | Resonance suppression decay rate settings 1. Set it to 0 to disable the function of Notch filter | dB | 0 | 0 ~ 32 | 1 | |
| P2 | 25 | Resonance suppression low-pass filter | Set up resonance suppression low-pass filter time constant. Set it to 0 to disable low-pass filter | 0.1msec | 2 | 0 ~ 1000 | 1 | |
| P2 | 26 | Anti-interference gain | Anti-interference gain | 0.001 | 0 | 0 ~ 1023 | 1 | |
| P2 | 27 | Gain switching conditions and method selection | Gain switching conditions and method selection | | 0 | 0 ~ 4 (HEX) | 1 | |
| P2 | 28 | Gain switching time constant | Gain switching time constant | 10msec | 10 | 0 ~ 1000 | 1 | |
| P2 | 43 | Resonance suppression filter frequency (Notch Filter)(2) | Mechanical resonance frequency settings 2 | Hz | 1000 | 50 ~ 2000 | 1 | |
| P2 | 44 | Resonance suppression decay rate (2) | Resonance suppression decay rate settings 2. Set it to 0 to disable the function of Notch filter. | dB | 0 | 0 ~ 32 | 1 | |
| P2 | 45 | Resonance suppression filter frequency (Notch filter) (3) | Mechanical resonance frequency settings 3 | Hz | 1000 | 50 ~ 2000 | 1 | |
| P2 | 46 | Resonance suppression decay rate (3) | Resonance suppression decay rate settings 3. Set it to 0 to disable the function of Notch filter. | dB | 0 | 0 ~ 32 | 1 | |
| P2 | 47 | Auto resonance suppression mode | 0: fixed 1: auto fix after | | 1 | 0 ~ 2 | 1 | |

| | | | | | | | | |
|-----------|-----------|--|--|-----|---|--------|---|--|
| | | | suppression 2: continuous auto suppression | | | | | |
| P2 | 49 | Speed detection filter and jitter suppression | Set up speed testing filter | sec | 0 | 0 ~ 1F | 1 | |
| P4 | 0 | Fault record (N) | Latest abnormality record | | 0 | | 2 | |
| P4 | 1 | Fault record (N-1) | The last second fault record | | 0 | | 2 | |
| P4 | 2 | Fault record (N-2) | The last third fault record | | 0 | | 2 | |
| P4 | 3 | Fault record (N-3) | The last fourth fault record | | 0 | | 2 | |
| P4 | 4 | Fault record (N-4) | The last fifth fault record | | 0 | | 2 | |
| P5 | 00 | Firmware sub-version | Firmware sub-version in the servo drive | | | | | |

4.2.13 Channel Setting

| PARAMETER(Ch/Axis Setting) | | | | | | 117.NC | N1 | P | SFT |
|----------------------------|-------------------------------------|-------------------------------------|-------------------------------------|--------------------------|------|--------------------------|-------------------------------------|-------|-----|
| Channel | Axis | Enable | NC | MLC | Port | Used port | | | |
| CH 0 | X | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | 1 | 1 | <input checked="" type="checkbox"/> | CH0 X | |
| | Y | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | 2 | 2 | <input checked="" type="checkbox"/> | CH0 Y | |
| | Z | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | 3 | 3 | <input checked="" type="checkbox"/> | CH0 Z | |
| | A | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | 4 | <input type="checkbox"/> | | |
| | B | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | 5 | <input type="checkbox"/> | | |
| | C | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | 6 | <input type="checkbox"/> | | |
| | U | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | 7 | <input type="checkbox"/> | | |
| | V | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | 8 | <input type="checkbox"/> | | |
| | W | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | 9 | <input type="checkbox"/> | | |
| SP1 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 10 | | <input type="checkbox"/> | | | |

JOG RPD 100% JOG 3000 S 100% STOP

⬆ OK ▶

Check the used axis the used port in order to correspond to the DMENT. Then, press OK to activate the setting.

4.2.14 RIO Setting

| PARAMETER(RIO Setting) | | 117.NC | N1 | SFT | |
|------------------------|----------------------------------|---------------|-------|--------------|-------------------------------------|
| RIO Status | Enable RIO type | Port polarity | Disc. | Home Limit | |
| 1 | <input checked="" type="radio"/> | V | 3 | 00000000 | <input type="checkbox"/> |
| 2 | <input type="radio"/> | | | | <input type="checkbox"/> |
| 3 | <input type="radio"/> | | | | <input type="checkbox"/> |
| 4 | <input type="radio"/> | | | | <input type="checkbox"/> |
| 5 | <input type="radio"/> | | | | <input type="checkbox"/> |
| 6 | <input type="radio"/> | | | | <input type="checkbox"/> |
| 7 | <input type="radio"/> | | | | <input type="checkbox"/> |
| 8 | <input type="radio"/> | | | | <input type="checkbox"/> |
| | | | | CH0 | <input checked="" type="checkbox"/> |
| | | | | X | <input checked="" type="checkbox"/> |
| | | | | Y | <input checked="" type="checkbox"/> |
| | | | | Z | <input type="checkbox"/> |
| | | | | A | <input checked="" type="checkbox"/> |
| | | | | B | <input checked="" type="checkbox"/> |
| | | | | C | <input type="checkbox"/> |
| | | | | U | <input type="checkbox"/> |
| | | | | V | <input type="checkbox"/> |
| | | | | W | <input type="checkbox"/> |
| | | | | Filter level | 2 |
| JOG | | RPD 100% | | JOG 3000 | S 100% |
| OK | | | | | |

RIO Setting: Press OK after the setting is completed.

| RIO Status | Enable RIO type | Port polarity | Disc. |
|--|---|---|--|
| 1 <input checked="" type="radio"/> | V | 3 | 00000000 |
| Use the RIO station number to show the connection status, M2832 is station number 0. | Check the station number. Set RIO type to 3 as DIO and the setting of the others is as the following. AD/DA(set 0) DA (set 1) AD (set 2) | The setting of DI port polarity, which only can be set as station number 0 and can set DI0~DI31 (32 points in total). | Check this for disconnection. It means, when disconnection, DO is remained in origin status. |

Chapter 4: Summary of User Parameters

Origin limit setting: Press OK after the setting is completed.

| | | | | | | | | | | | | | |
|---------------------------|-------------------------------------|--|--|--|---------------------------|---------------------------|--------------------------|---------------------------|---------------------------|--------------------------|---------------------------|---------------------------|--------------------------|
| Home Limit | | Set the positive DI, negative DI and origin DI via the DI of RIO. RIO station number 0 only | | | | | | | | | | | |
| CH0 | | Axis selection. If none of them is checked, it means the positive, negative and origin DI is input by AXIS1~4 of the controller. According to the checked axis number and name, starting from X256, each axis occupies three DI, positive, negative and origin respectively. | | | | | | | | | | | |
| X | <input checked="" type="checkbox"/> | <p>For example, if check axis Y and Z, then, The positive DI (X256), negative DI (X257) and origin (X258) of axis Y; The positive DI (X259), negative DI (X260) and origin (X261) of axis Z</p> <p>Special M remains</p> <table border="1"> <tr> <td>X positive limit M2144</td> <td>X negative limit M2145</td> <td>X origin signal M2146</td> </tr> <tr> <td>Y positive limit M2148</td> <td>Y negative limit M2149</td> <td>Y origin signal M2150</td> </tr> <tr> <td>Z positive limit M2152</td> <td>Z negative limit M2153</td> <td>Z origin signal M2154</td> </tr> </table> | | | X positive limit M2144 | X negative limit M2145 | X origin signal M2146 | Y positive limit M2148 | Y negative limit M2149 | Y origin signal M2150 | Z positive limit M2152 | Z negative limit M2153 | Z origin signal M2154 |
| X positive limit M2144 | X negative limit M2145 | | | | X origin signal M2146 | | | | | | | | |
| Y positive limit M2148 | Y negative limit M2149 | | | | Y origin signal M2150 | | | | | | | | |
| Z positive limit M2152 | Z negative limit M2153 | | | | Z origin signal M2154 | | | | | | | | |
| Y | <input checked="" type="checkbox"/> | | | | | | | | | | | | |
| Z | <input type="checkbox"/> | | | | | | | | | | | | |
| A | <input checked="" type="checkbox"/> | | | | | | | | | | | | |
| B | <input checked="" type="checkbox"/> | | | | | | | | | | | | |
| C | <input type="checkbox"/> | | | | | | | | | | | | |
| U | <input type="checkbox"/> | | | | | | | | | | | | |
| V | <input type="checkbox"/> | | | | | | | | | | | | |
| W | <input type="checkbox"/> | | | | | | | | | | | | |
| Filter level | | Set the DI filter level of RIO, each level is 40micro second(10^{-6} sec) There are 5 levels in total. All DI in RIO is applicable. | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | |

Chapter 4: Summary of User Parameters

2 After parameter setup, conduct absolute reset to the absolute encoder by following pages of **DGN -> System Monitoring -> Servo Monitoring** as shown in the figure below.

| DIAGNOSE(Servo Monitor) | | | | 117.NC | N1 | P | SFT | | |
|-------------------------|---------|------|--------------|--------|------|----------|------|-----|-----|
| Port | Channel | Axis | Servo Status | LOAD | Peak | MECH | Home | ABS | RST |
| 1 | 0 | X | ON | 0 % | 2 % | -147.695 | OK | | |
| 2 | 0 | Y | ON | 1 % | 4 % | -115.941 | OK | | 1 |
| 3 | 0 | Z | ON | 0 % | 9 % | 49.046 | OK | | |

| | | | | | | | | | |
|-----|----------|----------|----------|----------|--|--------|--|------|---|
| JOG | | RPD 100% | | JOG 3000 | | S 100% | | STOP | |
| ▲ | VAR MONI | I/O MONI | SRV MONI | | | | | | ▶ |

3 A system can run absolute reset only in **JOG** or **MPG** mode. Move the mechanical position of the axis with JOG or MPG operation to the proper location, press key [1] then press the **Enter** key to finish the absolute reset. The origin status indicator lights up, the mechanical coordinates reset to 0, and the axis returns to the origin.

Note: When setting in MPG mode, only when selecting axis MPG will be effective. If select axis X of MPG, enter [1] and press [Enter], the absolute reset is completed.

If the alarm occurs after the absolute reset, reset the absolute reset flag. See below for reset alarms:

| |
|---|
| AL 060: the position of homing is not set, so conduct absolute reset. |
| AL 061: low battery voltage, please replace battery. |
| AL 069: Invalid accompanying encoder. Please ensure an absolute encoded is connected. |

4.3.2 Setting Method of Synchronous Function

For example: Axis A (slave axis) has to follow axis Z (master axis) in the same direction. Assume M13 enables the synchronization and M14 disables it.

Set parameter 350 to 13
 Set parameter 351 to 14
 Set parameter 364 (synchronous control A) to 3

When issuing command M13, MLC triggers M1088 (Synchronous control to trigger flag) and M1092 (Slave axis A follows the master axis)

In program, when axis Z is moving, axis A will follow up. If G01A10. appears, the alarm will occur. Issue command M14 at the end to disconnect special **M**.

It is not only effective in auto mode or when MDI is executing the program, but also in JOG, MPG and HOME mode. The effectiveness remains until M14 disconnects special **M**. (except when tapping, axis A follows axis Z, but axis A does not synchronize with axis Z.)

Rules:

- A. After the master axis is set, the axis cannot be set as the slave axis.
- B. After the slave axis is set, the axis cannot be set as the master axis.
- C. More than one slave axis can follow one master axis at the same time.
- D. If returns to the origin when synchronization, it should mainly follow the master axis.
- E. Press Reset will not cancel the function of synchronization.

Program:

```
G54X0Y0Z0A0
G90G54G0X10.Y10.Z10.
Z50.
A0
M13
Z0.
Z111.
G4X2.
Z150.
M14
A100.
A51.
M30
```

| | | | | |
|------------|----------------|---------------------------------|------|--------|
| 350 | Halt M code 1 | Halt M code 1 (0: no setting) | 0 | 1~1000 |
| 351 | Halt M code 2 | Halt M code 2 | 0 | 1~1000 |
| 352 | Halt M code 3 | Halt M code 3 | 0 | 1~1000 |
| 353 | Halt M code 4 | Halt M code 4 | 0 | 1~1000 |
| 354 | Halt M code 5 | Halt M code 5 | 0 | 1~1000 |
| 355 | Halt M code 6 | Halt M code 6 | 0 | 1~1000 |
| 356 | Halt M code 7 | Halt M code 7 | 0 | 1~1000 |
| 357 | Halt M code 8 | Halt M code 8 | 0 | 1~1000 |
| 358 | Halt M code 9 | Halt M code 9 | 0 | 1~1000 |
| 359 | Halt M code 10 | Halt M code 10 | 0 | 1~1000 |
| 360 | Synchronous | Synchronous control direction : | 0x00 | 0~0x3F |

Chapter 4: Summary of User Parameters

| | | | | |
|------------|-----------------------|---|---|-----|
| | control direction | Bit0~5: Synchronous control X~C 0: same direction 1: different direction | | |
| 361 | Synchronous control X | Slave axis X follows the master axis 0: close 1~6: X~C cn : c:chanal n:axis (set 1~6) (1~6 , 11~16, 21~26, 31~36) | 0 | 1~6 |
| 362 | Synchronous control Y | Slave axis Y follows the master axis 0: close 1~6: X~C | 0 | 1~6 |
| 363 | Synchronous control Z | Slave axis Z follows the master axis 0: close 1~6: X~C | 0 | 1~6 |
| 364 | Synchronous control A | Slave axis A follows the master axis 0: close 1~6: X~C | 0 | 1~6 |
| 365 | Synchronous control B | Slave axis B follows the master axis 0: close 1~6: X~C | 0 | 1~6 |
| 366 | Synchronous control C | Slave axis C follows the master axis 0: close 1~6: X~C | 0 | 1~6 |

MLC NC

| | | | |
|---|----------|---|-------|
| 0 | Syn_ctrl | Synchronous control to trigger the flag | M1088 |
| 1 | Syn_X | Slave axis X follows the master axis | M1089 |
| 2 | Syn_Y | Slave axis Y follows the master axis | M1090 |
| 3 | Syn_Z | Slave axis Z follows the master axis | M1091 |
| 4 | Syn_A | Slave axis A follows the master axis | M1092 |
| 5 | Syn_B | Slave axis B follows the master axis | M1093 |
| 6 | Syn_C | Slave axis C follows the master axis | M1094 |

4.3.3 Setting Method of Command Transfer

For example: The command of axis Z (G01Z10.) has to transfer to axis a (transfer axis). Assume M20 enables the transfer function and M21 disables it.

Set parameter 350 to 20

Set parameter 351 to 21

Set parameter 374(Transfer control A) to 3

When issuing command M20, MLC triggers M1098 (command transfer control triggers the flag) and M1102 (Axis A receives the command from master axis).

If axis Z moves in program, axis A is the one that actually moves (axis Z stands still). If command G01A10. appears, the alarm will occur. At the end, M21 disconnect special M. This is function only can be enabled (M20) and disabled (M21) in auto and MDI mode. Please disable the function (M21) when the program is finished. It is unable to use in JOG, MPG and HOME mode.

Rules:

- A. After the transfer axis is set, the axis cannot be set as the master axis.
- B. After the master axis is set, the axis cannot be set as the transfer axis.
- C. It can have more than one transfer axis and follow one master axis.
- D. It is not applicable in homing mode.

Press Reset to cancel the function of command transfer

Program:

G54X0Y0Z0A0

G90G54G0X10.Y10.Z10.

Z50.

A0

M20 (The program reads M20 in advance and enable the function of command transfer control)

Z0. (It shows that axis Z moves in this area, but actually axis A is the one is moving.)

Z111.

G4X2.

Z150.

M21 (The program reads M21 in advance and disable the function of command transfer control)

A100.

A51.

M30

| | | | | |
|------------|---------------|-------------------------------|---|--------|
| 350 | Halt M code 1 | Halt M code 1 (0: no setting) | 0 | 1~1000 |
| 351 | Halt M code 2 | Halt M code 2 | 0 | 1~1000 |

Chapter 4: Summary of User Parameters

| | | | | |
|------------|----------------|----------------|---|--------|
| 352 | Halt M code 3 | Halt M code 3 | 0 | 1~1000 |
| 353 | Halt M code 4 | Halt M code 4 | 0 | 1~1000 |
| 354 | Halt M code 5 | Halt M code 5 | 0 | 1~1000 |
| 355 | Halt M code 6 | Halt M code 6 | 0 | 1~1000 |
| 356 | Halt M code 7 | Halt M code 7 | 0 | 1~1000 |
| 357 | Halt M code 8 | Halt M code 8 | 0 | 1~1000 |
| 358 | Halt M code 9 | Halt M code 9 | 0 | 1~1000 |
| 359 | Halt M code 10 | Halt M code 10 | 0 | 1~1000 |

| | | | | |
|------------|---------------------------|---|---|-----|
| 371 | Transfer control X | Axis X transfers the command of master axis. The master axis does not move at the moment. 0: close 1~6:X~C | 0 | 1~6 |
| 372 | Transfer control Y | Axis Y transfers the command of master axis. 0: close 1~6:X~C | 0 | 1~6 |
| 373 | Transfer control Z | Axis Z transfers the command of master axis. 0: close 1~6:X~C | 0 | 1~6 |
| 374 | Transfer control A | Axis A transfers the command of master axis. 0: close 1~6:X~C | 0 | 1~6 |
| 375 | Transfer control B | Axis B transfers the command of master axis. 0: close 1~6:X~C | 0 | 1~6 |
| 376 | Transfer control C | Axis C transfers the command of master axis. 0: close 1~6:X~C | 0 | 1~6 |

MLC→NC

| | | | |
|----|-----------|--|-------|
| 10 | Tran_ctrl | Transfer command control triggers the flag | M1098 |
| 11 | Tran_X | Axis X receives the command of master axis | M1099 |
| 12 | Tran_Y | Axis Y receives the command of master axis | M1100 |
| 13 | Tran_Z | Axis Z receives the command of master axis | M1101 |
| 14 | Tran_A | Axis A receives the command of master axis | M1102 |

| | | | |
|----|--------|--|-------|
| 15 | Tran_B | Axis B receives the command of master axis | M1103 |
| 16 | Tran_C | Axis C receives the command of master axis | M1104 |

NC→MLC

| | | | |
|----|---------------|-----------------------------|-------|
| 20 | Trans enabled | Executing transfer function | M2228 |
|----|---------------|-----------------------------|-------|

Chapter 4: Summary of User Parameters

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Chapter 5: MLC Special M&D Command

5.1 Definition to MLC special M & D command

The MLC (Motion Logic Control) and NC systems are two independent systems. The MLC system performs knobs and buttons controls, mechanical operations, and other electric on/off logic controls while the NC system manages system and servo axis related functions. The MLC special M&D acts as the I/O interface between these two systems for data exchanges and message transmissions. Signals sent to the NC system by the MLC special M&D are called output while signals send to MLC special M&D by the NC system are called input. Data exchanges are divided into four groups. The M letter prefixed commands are "bit" based with signal 0 (OFF) or 1 (ON) while the D prefixed ones are "word" based with values like 1000.

MLC special M&D codes are all expressed in the form of M- and D- suffixed with four digits.

Definitions of MLC special M&D:

- 1: MLC bit output from MLC to NC special M means Bit output
- 2: MLC bit input from NC to MLC special M means Bit input
- 3: MLC word output from MLC to NC special D means Word output
- 4: MLC word input from NC to MLC special D means Word input

5.2 MLC bit output from MLC to NC where M indicates bit output

System common: special M output description

You can use variable #1801~#1832 in the machining program to read the signal status in MLC's interface output points M1024~M1055. Variable #1801 pairs with output point M1024 and #1802 with M1025 and so forth for all the remaining pairs up to #1832 and M1055. For example, for an output ON by M1024 in an MLC program, the value of the variable number #1801 will be 1 and will be 0 for an output OFF by M1024.

Global Bit (MLC->NC)

| Function code | Special M code | Variable ID | Function code | Special M code | Variable ID |
|---------------------|----------------|-------------|---------------------|----------------|-------------|
| Interface output 1 | M1024 | #1801 | Interface output 17 | M1040 | #1817 |
| Interface output 2 | M1025 | #1802 | Interface output 18 | M1041 | #1818 |
| Interface output 3 | M1026 | #1803 | Interface output 19 | M1042 | #1819 |
| Interface output 4 | M1027 | #1804 | Interface output 20 | M1043 | #1820 |
| Interface output 5 | M1028 | #1805 | Interface output 21 | M1044 | #1821 |
| Interface output 6 | M1029 | #1806 | Interface output 22 | M1045 | #1822 |
| Interface output 7 | M1030 | #1807 | Interface output 23 | M1046 | #1823 |
| Interface output 8 | M1031 | #1808 | Interface output 24 | M1047 | #1824 |
| Interface output 9 | M1032 | #1809 | Interface output 25 | M1048 | #1825 |
| Interface output 10 | M1033 | #1810 | Interface output 26 | M1049 | #1826 |
| Interface output 11 | M1034 | #1811 | Interface output 27 | M1050 | #1827 |
| Interface output 12 | M1035 | #1812 | Interface output 28 | M1051 | #1828 |
| Interface output 13 | M1036 | #1813 | Interface output 29 | M1052 | #1829 |
| Interface output 14 | M1037 | #1814 | Interface output 30 | M1053 | #1830 |
| Interface output 15 | M1038 | #1815 | Interface output 31 | M1054 | #1831 |
| Interface output 16 | M1039 | #1816 | Interface output 32 | M1055 | #1832 |

NC system function: special M output

Send signal from MLC to NC system. The MLC program outputs M signal to NC system with mechanical keys or knobs to change NC modes or enable and disable NC functions. For example, users can output an ON signal by M1060 in MLC program to have NC system running a single block function.

| Function name | Special M code | Description |
|------------------------|----------------|--|
| Select machining mode: | M1056 | Users can select machining modes with command M1056~M1059. Use Bit 0~ 3 of digits 0~7 in binary format to represent each system mode. For example, to select Fine tune (MPG) |
| 0. AUTO | M1057 | |
| 1. EDIT | M1058 | |
| 2. Manual input (MDI) | M1059 | |

| | | |
|--|------------------|--|
| 3. Fine tune (MPG) 4. JOG 5. Fast feed (RAPID) 6. Homing (HOME) 7. DNC | | (represented by decimal number 3 and binary number 0011) M1056= BIT0 ON M1057= BIT1 ON M1058= BIT2 OFF M1059= BIT3 OFF |
| Single block execution | M1060 | In auto execution mode, stops the program after one block is executed |
| Auto loop execution | M1061 | Auto execution signal |
| NC pause | M1062 | NC controller pauses after the signal is triggered |
| System emergency stop | M1063 (reserved) | Triggers emergency stop and the system halts immediately |
| System reset | M1064 | Press Reset key to trigger the rising edge in an interval of 4 seconds (NC->MLC) |
| Dummy execution | M1065 | In auto execution mode, the movement speed F of G01 will be given by D1062 register after the signal is triggered. |
| M01 pause | M1066 | Select stop key. The control pauses when M01 is encountered in the program. |
| Single statement delete '/' | M1067 | Skip statement with symbol '/' after this function is ON. |
| Mechanical lock each axis | M1068 | Lock X, Y, and Z axes from movement. |
| Z-axis lock | M1069 | Lock Z-axis from movement |
| Relieve limit detection function | M1070 | Ignore limit signal of each axis when this function is active. |
| M, S, and T code lock | M1071 | Lock M, S, and T codes (i.e. they are ignored in the program) |
| Servo ON | M1072 | The servo is ON during DMC connection |
| Hand wheel simulation | M1080 | Control hand wheel speed |
| MST Code executed flag | M1152 | Trigger this signal to indicate to the NC system that M, S, and T codes have been executed. |
| Tool plate 1 move forward | M1168 | Tool plate 1 move forward |
| Tool plate 1 move backward | M1169 | Tool plate 1 move backward |

Chapter 5: MLC Special M&D Command

| | | |
|--------------------------------|-------|--|
| Tool 1 exchange | M1170 | Exchange data of tool 1 |
| Tool magazine 1 reset | M1171 | Trigger resetting tool magazine 1 (auto operation when working together with M code) |
| Tool plate 2 move forward | M1172 | Tool plate 2 move forward |
| Tool plate 2 move backward | M1173 | Tool plate 2 move backward |
| Tool 2 exchange | M1174 | Exchange data of tool 2 |
| Tool magazine 2 reset | M1175 | Trigger resetting tool magazine 2 (auto operation when working together with M code) |
| | | |
| | | |
| Software MPG+ | M1118 | Incremental jog by the secondary control panel, forward triggering signal, see D1040. |
| Software MPG- | M1119 | Incremental jog by the secondary control panel, backward triggering signal, see D1040. |
| Lock program from being edited | M2935 | Prevent program in controller from being edited. |

NC axis related special M output description

After special M triggering, instructs NC to move. Set M1216 to ON to jog the axis forward.

| Function name | Special M code | Function name | Special M code |
|-------------------------------|----------------|-----------------------------------|----------------|
| X-axis forward limit | M1088 | X-axis homing control | M1236 |
| Y-axis forward limit | M1089 | Y-axis homing control | M1237 |
| Z-axis forward limit | M1090 | Z-axis homing control | M1238 |
| A-axis forward limit | M1091 | A-axis homing control | M1239 |
| X-axis backward limit | M1097 | X-axis 1st software limit relieve | M1248 |
| Y-axis backward limit | M1098 | Y-axis 1st software limit relieve | M1249 |
| Z-axis backward limit | M1099 | Z-axis 1st software limit relieve | M1250 |
| A-axis backward limit | M1100 | A-axis 1st software limit relieve | M1251 |
| X-axis home signal (Homg dog) | M1106 | X-axis lock | M1257 |

| | | | |
|----------------------------------|-------|-------------|-------|
| Y-axis home signal (Homg dog) | M1107 | Y-axis lock | M1258 |
| Z-axis home signal (Homg dog) | M1108 | Z-axis lock | M1259 |
| A-axis home signal (Homg dog) | M1109 | A-axis lock | M1260 |
| X-axis forward jog control | M1216 | B-axis lock | M1261 |
| Y-axis forward jog control | M1217 | C-axis lock | M1262 |
| Z-axis forward jog control | M1218 | U-axis lock | M1263 |
| A-axis forward jog control | M1219 | V-axis lock | M1264 |
| X-axis backward jog control | M1226 | W-axis lock | M1265 |
| Y-axis backward jog control | M1227 | | |
| Z-axis backward jog control | M1228 | | |
| A-axis backward jog control | M1229 | | |

Spindle and MLC axis relevant special M output description

Spindle relevant outputs

| Function name | Special M code | Function name | Special M code |
|------------------------------------|----------------|------------------------------------|----------------|
| Spindle forward turning | M1120 | Spindle as the MLC control axis | M1193 |
| Spindle backward turning | M1121 | X-axis as the MLC control axis | M1184 |
| Select spindle gear ratio Bit 0 | M1122 | Y-axis as the MLC control axis | M1185 |
| Select spindle gear ratio Bit 1 | M1123 | Z-axis as the MLC control axis | M1186 |
| Spindle positioning control | M1124 | A-axis as the MLC control axis | M1187 |
| Spindle returns after tapping | M1125 | | |

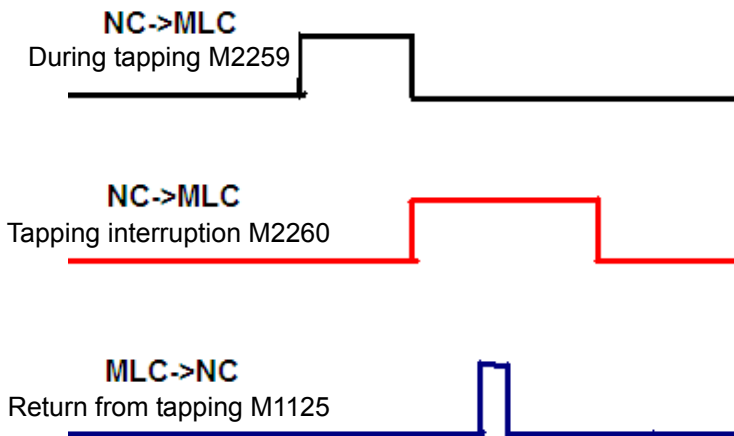
Return from tapping interruption

A tapping interruption flag (M2260) is triggered by pressing the **RESET** key or **EMG** during tapping. A return after tapping (M1125) triggered in auto mode will return point R automatically. This tapping interruption is relieved and ignored in the following situations:

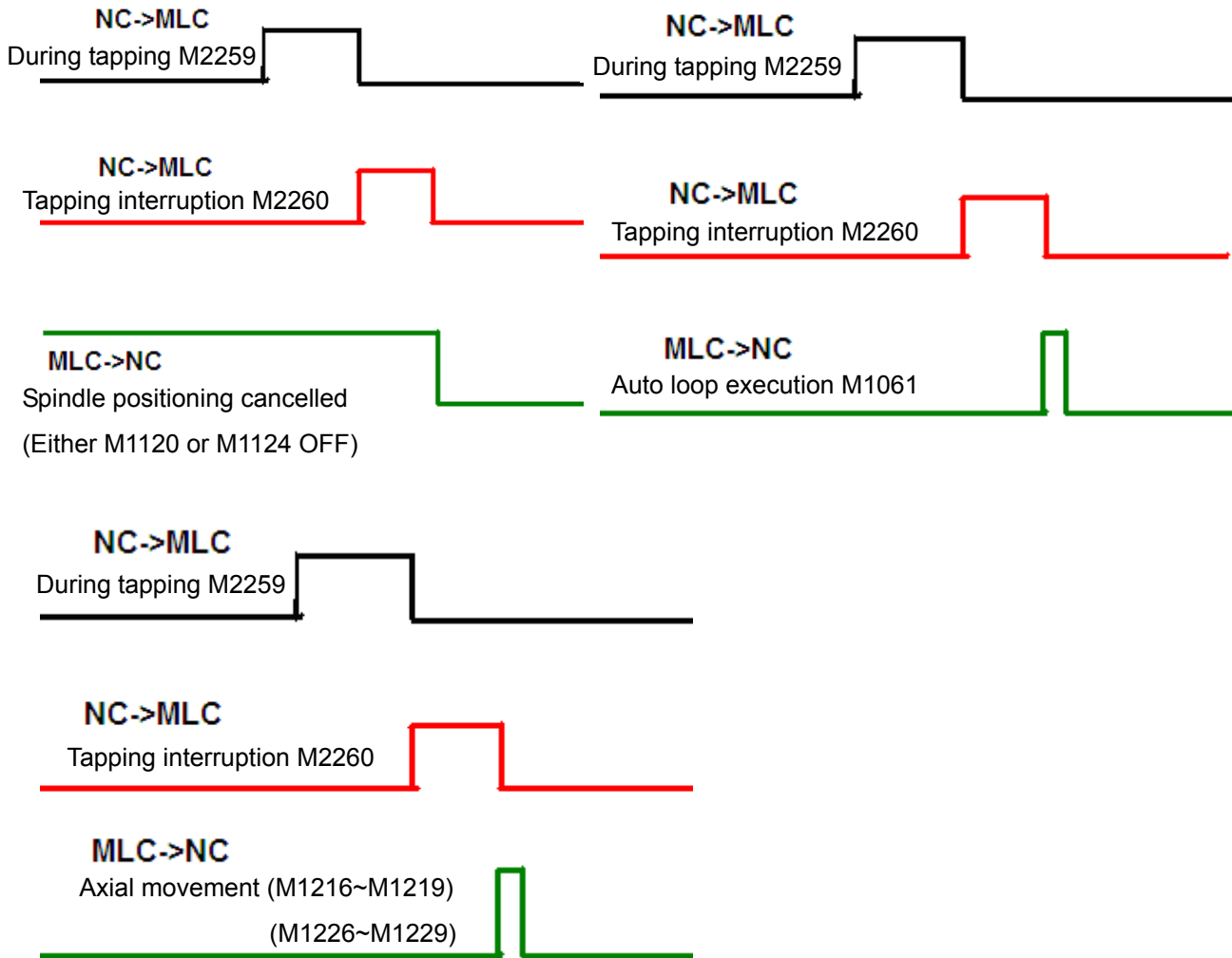
1. Spindle positioning cancelled
2. Program restarted
3. Any axial movement
4. System power on again
5. Set the emergency stop mode of parameter 307 to 0.

Note:

1. You cannot switch modes during tapping.
2. You cannot return from tapping when M1125 is ON during tapping.
3. You must remove tapping interruption (execute program again and any axial movement) together with positioning (set M1120 and M1124 to 0).
4. When tapping interruption flag (M2260) is ON, the spindle and Z-axis halt at the current position. The spindle is not positioned (the spindle positioned signal is indicated by M2258 = 0).
5. After the tapping interruption flag M2260 is ON, users cannot run MPG and homing.



Cancel tapping interruption



5.3 MLC bit input NC -> MLC special M Bit input description

System common - special M input description

You can use variable #1864~#1895 in the machining program to write in the signal status in MLC's interface input points M2080~M2111. Variable #1864 pairs with input point M2080 and #1865 with M2081 and so forth for all the remaining pairs up to #1895 and M2111. For example, for an output ON by M2080 in an MLC program, the value of the variable number #1864 will be 1 and will be 0 for an output OFF by M2080.

| Function name | Special M code | Variable ID | Function name | Special M code | Variable ID |
|--------------------------|----------------|-------------|--------------------------|----------------|-------------|
| Interface input point 1 | M2080 | #1864 | Interface input point 17 | M2096 | #1880 |
| Interface input point 2 | M2081 | #1865 | Interface input point 18 | M2097 | #1881 |
| Interface input point 3 | M2082 | #1866 | Interface input point 19 | M2098 | #1882 |
| Interface input point 4 | M2083 | #1867 | Interface input point 20 | M2099 | #1883 |
| Interface input point 5 | M2084 | #1868 | Interface input point 21 | M2100 | #1884 |
| Interface input point 6 | M2085 | #1869 | Interface input point 22 | M2101 | #1885 |
| Interface input point 7 | M2086 | #1870 | Interface input point 23 | M2102 | #1886 |
| Interface input point 8 | M2087 | #1871 | Interface input point 24 | M2103 | #1887 |
| Interface input point 9 | M2088 | #1872 | Interface input point 25 | M2104 | #1888 |
| Interface input point 10 | M2089 | #1873 | Interface input point 26 | M2105 | #1889 |
| Interface input point 11 | M2090 | #1874 | Interface input point 27 | M2106 | #1890 |
| Interface input point 12 | M2091 | #1875 | Interface input point 28 | M2107 | #1891 |
| Interface input point 13 | M2092 | #1876 | Interface input point 29 | M2108 | #1892 |
| Interface input point 14 | M2093 | #1877 | Interface input point 30 | M2109 | #1893 |
| Interface input point 15 | M2094 | #1878 | Interface input point 31 | M2110 | #1894 |

| | | | | | |
|-----------------------------|-------|-------|-----------------------------|-------|-------|
| Interface input point 16 | M2095 | #1879 | Interface input point 32 | M2111 | #1895 |
|-----------------------------|-------|-------|-----------------------------|-------|-------|

NC system function special M input description

Signals are sent from NC system to MLC special M to pass NC system actual status to MLC.

| Function name | Special M code | Description |
|-----------------------------|----------------|---|
| System started and is ready | M2112 | NC system is in ready status |
| System alarm | M2113 | NC system encounters abnormalities |
| System emergency stop | M2114 | System stops immediately after EMG key is pressed |
| Servo enabled | M2115 | Servo ON message |
| HSI1 | M2142 | Status of high speed input point 1 (G31 input) |
| HSI2 | M2143 | Status of high speed input point 2 |
| System emergency stop | M2224 | Emergency stop is enabled and then the flag signal is ON (valid for servo OFF mode) to prevent Z axis from falling down |
| Channel alarm message | M2240 | NC channel abnormality encountered |
| Auto execution (AUTO) | M2241 | NC system sends this signal when in AUTO mode |
| Edit (EDIT) | M2242 | NC system sends this signal when in EDIT mode |
| Manual input (MDI) | M2243 | NC system sends this signal when in MDI mode |
| Fine tuning (MPG) | M2244 | NC system sends this signal when in MPG mode |
| Jog (JOG) | M2245 | NC system sends this signal when in JOG mode |
| Rapid feed (RAPID) | M2246 | NC system sends this signal when in RAPID mode |
| Homing (HOME) | M2247 | NC system sends this signal when in HOME mode |
| DNC | M2248 | NC system sends this signal when in DNC mode |
| Single block stops | M2249 | NC system sends this signal when single |

| | | |
|------------------------------|-------|---|
| | | block stops |
| Loop enabled | M2250 | NC system sends this signal when loop operation started |
| Pause | M2251 | NC system sends this signal when the system is paused |
| M00 program stops | M2252 | NC system sends this signal when code M00 is read |
| M01 optional pause | M2253 | NC system sends this signal when code M01 is read |
| M02 program ends | M2254 | NC system sends this signal when code M02 is read |
| M30 program ends and returns | M2255 | NC system sends this signal when code M30 is read |
| Start program machining | M2270 | Set this to ON when program machining starts |
| End program machining | M2271 | Set this to ON when program machining ends |

M, S, and T code special M input description

When M, S, and T codes are encountered in a program, the NC system outputs relevant special M to MLC. For example, an M03 in the MLC program sets M2208 to ON.

| Function name | Special M code | Description |
|-----------------------|----------------|---|
| M Code execution flag | M2208 | A M code in the program sets this signal to ON and back to OFF only when another M , S , or T code triggers flag M1152. The following M codes are excluded: M00, M01, M02, M30, M98 and M99 or an M code macro. |
| S Code execution flag | M2209 | A S code in the program sets this signal to ON and back to OFF only when another M , S , or T code triggers a flag. When a S code macro is used, the trigger does not work. |
| T Code execution flag | M2210 | A T code (code of tool standby) in the program sets this signal to ON and back to OFF only when another M , S , or T code triggers a flag. When a T code macro is used, the trigger does not work. This flag varies with tool magazine station number setup. The flag is triggered only when the T code is within the tool ranges given by the station parameter. |
| B Code execution flag | M2211 | A B code in the program sets this signal to ON and back to OFF only when another M , S , or T code triggers a flag. When a B code macro is used, the trigger does not work. |

NC axis relevant special M input description

During input of X-, Y-, and Z-axes forward/backward and home hardware signal, the relevant special **M** is triggered with hardware position corresponding to AXIS1~4 ports at the back of the GMC-A controller. After each axis is home positioned, it changes to ON.

| Function name | Special M code | Function name | Special M code |
|--------------------------------|----------------|----------------------------------|----------------|
| X-axis positive hardware limit | M2144 | X-axis home positioned | M2272 |
| X-axis negative hardware limit | M2145 | Y-axis home positioned | M2273 |
| X-axis home signal | M2146 | Z-axis home positioned | M2274 |
| Y-axis positive hardware limit | M2148 | A-axis home positioned | M2275 |
| Y-axis negative hardware limit | M2149 | X-axis secondary home positioned | M2286 |
| Y-axis home signal | M2150 | Y-axis secondary home positioned | M2287 |
| Z-axis positive hardware limit | M2152 | Z-axis secondary home positioned | M2288 |
| Z-axis negative hardware limit | M2153 | | |
| Z-axis home signal | M2154 | X-axis is moving | M2320 |
| A-axis positive hardware limit | M2156 | Y-axis is moving | M2321 |
| A-axis negative hardware limit | M2157 | Z-axis is moving | M2322 |
| A-axis home signal | M2158 | A-axis is moving | M2323 |
| | | | |

Spindle and tool magazine MLC axis relevant special M input description

Spindle and MLC axis relevant

| Function name | Special M code | Function name | Special M code |
|---------------------------------------|----------------|-----------------------|----------------|
| Speed of axis 1 reaches target speed | M2256 | PLC X-axis positioned | M2304 |
| Speed of axis 1 reaches zero speed | M2257 | PLC Y-axis positioned | M2305 |
| Primary-axis 1 positioned signal | M2258 | PLC Z-axis positioned | M2306 |
| Primary-axis is in rigid tapping mode | M2259 | | |

Chapter 5: MLC Special M&D Command

| | | | |
|------------------------------|-----------------------|-----------------------------|--|
| Rigid tapping interruption | M2260 | | |
| Primary-axis home positioned | M2281 | | |
| Primary-axis is moving | | | |
| | | | |
| Function name | Special M code | Function description | |
| Tool magazine 1 reset | M2212 | | |
| Tool magazine 2 reset | M2213 | | |

5.4 MLC register output (MLC -> NC) The description of special D Word output

System common - Description of special D output

Users can use variables #1833~#1848 in the machining program to read the signal status in MLC's interface output registers D1024~D1039. Variable #1833 pairs with output point D1024 and #1834 with D1025 and so forth for all the remaining pairs up to #1848 and D1039. For example, for an output value 100 by D1024 in an MLC program, the value of the variable number #1833 will be 100. That is, variable #1833 varies with register D1024.

| Function name | Special D code | Variable ID | Function name | Special D code | Variable ID |
|-----------------------------|----------------|-------------|------------------------------|----------------|-------------|
| Interface output register 1 | D1024 | #1833 | Interface output register 9 | D1032 | #1841 |
| Interface output register 2 | D1025 | #1834 | Interface output register 10 | D1033 | #1842 |
| Interface output register 3 | D1026 | #1835 | Interface output register 11 | D1034 | #1843 |
| Interface output register 4 | D1027 | #1836 | Interface output register 12 | D1035 | #1844 |
| Interface output register 5 | D1028 | #1837 | Interface output register 13 | D1036 | #1845 |
| Interface output register 6 | D1029 | #1838 | Interface output register 14 | D1037 | #1846 |
| Interface output register 7 | D1030 | #1839 | Interface output register 15 | D1038 | #1847 |
| Interface output register 8 | D1031 | #1840 | Interface output register 16 | D1039 | #1848 |

NC system function - special D output description

Signals are sent by MLC to NC system. With mechanical keys and knobs, MLC program sends special D value to NC system to select MPG hand wheels and change its speed.

| Function name | Special D code | Description |
|-------------------------------------|----------------|--|
| Number of completed machining | D1022 | Set up in machining data or input from MLC |
| Number of target machining | D1023 | Set up in machining data or input from MLC |
| MPG startup operation ID | D1040 | Set up MPG hand wheel startup operation ID. Set to 0 to use external hand wheel and to 10 so that the secondary control panel incremental jogs with trigger signal M1118 and M1119 respectively. |
| Select channel during MPG operation | D1041 | For MPG hand wheel operation channel selection, default at 0 |

Chapter 5: MLC Special M&D Command

| | | |
|--|-------|--|
| MPG0 factor knob status | D1042 | MPG0 hand wheel factor settings (1, 10, 100 times of the least movement unit 0.001mm) e.g. $1 \times 0.001 = 0.001\text{mm/cnt}$ |
| MPG0 spindle direction selection knob status | D1043 | Select control axis set up by MPG0 hand wheel: X-axis = 0, Y-axis = 1 and Z-axis = 2. |
| MPG1 factor knob status | D1044 | MPG1 hand wheel factor settings (1, 10, 100, 1000 times of the least movement unit 0.001mm) |
| MPG1 spindle direction selection knob status | D1045 | Select control axis set up by MPG0 hand wheel: X-axis = 0, Y-axis = 1 and Z-axis = 2. |
| MPG2 factor knob status | D1046 | MPG2 hand wheel factor settings (1, 10, 100 times of the least movement unit 0.001mm) |
| MPG2 spindle direction selection knob status | D1047 | Select control axis set up by MPG0 hand wheel: X-axis = 0, Y-axis = 1 and Z-axis = 2. |

NC axis relevant special D output description

Signals are sent by MLC to NC system. With mechanical keys and knobs, MLC program sends special D value to NC system to change the speed of various NC modes.

| Function name | Special D code | Description |
|-------------------------------------|----------------|--|
| Feed rate adjustment | D1056 | This is the percentage of F value set in the program. For example, for F1000 given in the program and a D value of 50, an F500 mm/min will be derived ($500 = 1000 \times 50\%$) |
| Fast movement speed adjustment rate | D1058 | Set up a percentage against the maximum fast movement parameter G00. For example, for maximum fast movement 6000 and a D value of 50, the G00 and rapid jog speed would be 3000 mm/min ($3000 = 6000 \times 50\%$) |
| Spindle speed adjustment rate | D1060 | Set up percentage against the S value. For example, for S1000 given in the program and a D value of 30, then a S300 r/min will be derived ($300 = 1000 \times 30\%$) |
| Speed set for JOG and Dry run | D1062 | Set up movement speed F for dry run in JOG or AUTO mode. For example, Special D set at 50 represents F50 mm/min with a |

| | | |
|--|--|-------------------------|
| | | range of 0~65535mm/min. |
|--|--|-------------------------|

Spindle and MLC axis relevant special D input description

Spindle and MLC axis relevant

| Function name | Special D code/command unit | Function name | Special D code/command unit |
|---------------------------------------|-----------------------------|---------------------------------|-----------------------------|
| MLC X-axis positioning command | D1064 (mm/inch) | PLC X-axis command of feed rate | D1082 (mm, inch/min) |
| PLC Y-axis positioning command | D1066 (mm/inch) | PLC Y-axis command of feed rate | D1084 (mm, inch/min) |
| PLC Z-axis positioning command | D1068 (mm/inch) | PLC Z-axis command of feed rate | D1086 (mm, inch/min) |
| PLC A-axis positioning command | D1070 (mm/inch) | PLC A-axis command of feed rate | D1088 (rpm) |
| PLC B-axis positioning command | D1072 (mm/inch) | PLC B-axis command of feed rate | D1090 (rpm) |
| PLC C-axis positioning command | D1074 (mm/inch) | PLC C-axis command of feed rate | D1092 (rpm) |
| PLC U-axis positioning command | D1076 (mm/inch) | PLC U-axis command of feed rate | D1094 (mm, inch/min) |
| PLC V-axis positioning command | D1078 (mm/inch) | PLC V-axis command of feed rate | D1096 (mm, inch/min) |
| PLC W-axis positioning command | D1080 (mm/inch) | PLC W-axis command of feed rate | D1098 (mm, inch/min) |
| | | | |
| PLC spindle positioning/speed command | D1100 | | |

5.5 MLC register input (NC -> MLC) The description of special D word input

System common – Description of special D input

You can use variables #1896~#1911 in the machining program to read the signal status in MLC's interface input registers D1336~D1351. Variable #1896 pairs with output point D1336 and #1897 with D1337 and so forth for all the remaining pairs up to #1911 and D1351. For example, for an output value 101 by D1336 in MLC program, the value of the variable number #1896 will be 101. That is, variable #1896 varies with register D1336.

| Function name | Special D code | Variable ID | Function name | Special D code | Variable ID |
|----------------------------|----------------|-------------|-----------------------------|----------------|-------------|
| Interface input register 1 | D1336 | #1896 | Interface input register 9 | D1344 | #1904 |
| Interface input register 2 | D1337 | #1897 | Interface input register 10 | D1345 | #1905 |
| Interface input register 3 | D1338 | #1898 | Interface input register 11 | D1346 | #1906 |
| Interface input register 4 | D1339 | #1899 | Interface input register 12 | D1347 | #1907 |
| Interface input register 5 | D1340 | #1900 | Interface input register 13 | D1348 | #1908 |
| Interface input register 6 | D1341 | #1901 | Interface input register 14 | D1349 | #1909 |
| Interface input register 7 | D1342 | #1902 | Interface input register 15 | D1350 | #1910 |
| Interface input register 8 | D1343 | #1903 | Interface input register 16 | D1351 | #1911 |

NC axis relevant special D input description

MPG position signal

| Function name | Special D code | Description |
|------------------------------|----------------|--|
| MPG 0 current position value | D1352 | Incremental pulse value when MPG0 hand wheel is used |
| MPG 1 current position value | D1353 | Reserved |
| MPG 2 current position value | D1354 | Reserved |
| ADC analog value | D1355 | Reserved (channel 1) |
| ADC analog value | D1356 | Reserved (channel 2) |
| DAC analog value | D1357 | Reserved (channel 1) |
| DAC analog value | D1358 | Reserved (channel 2) |

M, S, and T code special D input description

When M, S, and T codes are encountered in a program, NC system outputs relevant special D to MLC. For example, M03 in program sets D1368 to 3.

| Function name | Special D code | Description |
|---------------|----------------|---|
| M code data | D1368 | The program sets M code data to special D register. The |

| | | |
|--|-------|--|
| | | following M codes are excluded: M00, M01, M02, M30, M98 and M99 and M code macro. |
| S code data | D1369 | The program sets S code data to special D register. When a S code macro is used, the trigger does not work (unit: RPM). |
| T code data (command) | D1370 | T code data in use is set to this special D register. When a T code macro is used, the trigger does not work. This flag varies with tool magazine station number setup. The flag triggers only when the T code is within the tool ranges given by the station parameter. |
| T code data (standby) tool magazine 1 | D1371 | Last T code data kept in the tool magazine 1 system is set to this special D register. |
| T code data (incremental movement station ID) tool magazine 1 | D1372 | The tool magazine 1 system determines the difference between tool plate forward and backward move for tool replacement code selection and setting to this special D register. |
| Tool pot (standby) tool magazine 1 | D1373 | Set current standby tool pot ID in the tool magazine 1 system and set to this special D register. |
| T code data (standby) tool magazine 2 | D1374 | Last T code data kept in the tool magazine 2 system is set to this special D register. |
| T code data (incremental movement station ID) tool magazine 2 | D1375 | The tool magazine 2 system determines the difference between tool plate forward and backward move for tool replacement code selection and setting to this special D register. |
| Tool pot (standby) tool magazine 2 | D1376 | Set current standby tool pot ID in the tool magazine 2 system and set to this special D register. |

NC axis relevant special D input description

Signals are sent from the NC to the MLC system and written to the mechanical system from the MLC.

| Function name | Special D code | Description |
|-------------------|----------------|--|
| X-axis mechanical | D1384 | X-axis mechanical coordinates (float Low word) |

Chapter 5: MLC Special M&D Command

| | | |
|-------------------------------------|-------|---|
| coordinates | | |
| X-axis mechanical coordinates | D1385 | X-axis mechanical coordinates (float High word) |
| Y-axis mechanical coordinates | D1386 | Y-axis mechanical coordinates (float Low word) |
| Y-axis mechanical coordinates | D1387 | Y-axis mechanical coordinates (float High word) |
| Z-axis mechanical coordinates | D1388 | Z-axis mechanical coordinates (float Low word) |
| Z-axis mechanical coordinates | D1389 | Z-axis mechanical coordinates (float High word) |
| | | |

Summary of settings of devices in MLC

| Device name | | General | | | | | Power outage maintain | Function | Total number of points |
|-------------------------------|-------------------------|---------------------------------|---|-------------------------------|---|--|---|---|------------------------|
| X-axis mechanical input (Bit) | On Board | MPG | N/A | Secondary control panel | Remote | | Corresponds to external input point | 296 | |
| | X0~X27 | X28~X33 | X34~X63 | X64~X255 | X256~X511 | None | | | |
| Y-axis mechanical input (Bit) | Y0~Y27 | | Y28~Y63 | Y64~Y255 | Y256~Y511 | None | Corresponds to external output point | 296 | |
| M auxiliary relay (Bit) | General | | Special M for system | | MLC special M | M512~M1023 | [General function] | 3072 | |
| | M0~M3071 | | | | | | | | |
| | M0~M511 | MLC->NC | | NC->MLC | MLC | | Contact point can turn on/off within program | | |
| | | M1024~M1215 | M1696~M1983 | M2816~M3071 | | | [Special M function] | | |
| | | | | | | For communication between system and MLC | | | |
| A Alarm (Bit) | A0~A511 | | | | | None | User-customized MLC alarm with NC screen display format: A0 + alarm description | 512 | |
| T | Timer (Bit) | T0~T199 (100ms unit) | | T200~T255 (10ms unit) | | None | The timer set by TMR command. When time is up the T contact with the same code turns ON | 256 | |
| | Timing (Word) | T0~T255 (16 bit, range 0~65535) | | | | | | | |
| C counter | (Bit) | C0~C79 | | | | | None | The counter set by CNT (DCNT) command. When time is up the C contact with the same code turns ON (C78 and C79 hardware counting) Enabled when special M paired with the lower 32 bit is opened, e.g. the lower bit of C64 pairs to M1200 and C65 pairs to M1201. | 80 |
| | Word or DWord | 16 bit (upper) | 32 bit (upper and lower) | | 32 bit high speed (upper and lower) | | None | | |
| | | Range | 0~65,536 | -2,147,483,648~+2,147,483,647 | | -2,147,483,648~+2,147,483,647 | | | |
| | | C0~C63 | C64~C77 | | C78 C79 | | | | |
| | | None | Open the lower number after M2832~M2845 | | Open the lower number with parameter MLC (#312) | | | | |
| D data register Word | General | | Special D for system | | MLC special D | D512~D1023 | The memory zone for data storage. C and T can be used as register too. | 1536 | |
| | D0~D511 (-32768~+32767) | MLC->NC | | NC->MLC | MLC 用 | | [Special D function] | | |
| | | D1024~D1118 | D1336~D1384 | D1456~D1535 | | | For communication between system and MLC. | | |
| V register Word | V0~V7 (-32768~+32768) | | | | | None | V and Z can be used for special indirect designation. | 8 | |
| Z register Word | Z0~Z7 (-32768~+32768) | | | | | None | | 8 | |
| Indicators | Function | | | Range | | | [Function] | | |
| N (circuit indicator) | For main circuit | | | N0~N7 | | None | Main circuit control point | 8 | |
| P (jumping indicator) | For CJ, CALL | | | P0~P255 | | None | Position flag of CJ, CALL | 256 | |
| I (interruption indicator) | interruptio | On Board hardware | | IX00~IX07 | | None | The main board has 8 external hardware interruptions | 34 | |
| | | Hardware counting | | IC00~IC01 | | | The 2 mainboard high speed counting interruptions | | |

Chapter 5: MLC Special M&D Command

| | | | | | | |
|------------------|----------------------|--|-----------|------|--|--|
| | | Remote computing | IR00~IR23 | | Each remote card has 3 external hardware interruptions | |
| K constant | Decimal | K-32,768~K+32,767 (16 bit computing) | | None | | |
| | | K-2,147,483,648~ K+2,147,483,647 (32 bit computing) | | None | | |
| F floating point | Up to one thousandth | -3.4+10³⁸ ~ 3.4+10³⁸ | | None | | |

Analog spindle gear switch setup description

MLC accompanied gear switch

Assumptions

| M Code expression | Output point | Input point | M1122=Bit0 M1123=Bit1 | Gear switch parameter for the corresponding spindle (shift gear ratio) |
|-----------------------------|------------------------------|------------------------------|--------------------------|--|
| M69 neutral point | Y256= neutral point | X256= neutral point | | |
| M70: switch to the 1st gear | Y257: switch to the 1st gear | X257: switch to the 1st gear | 00 | Gear 1 [422 numerator/423 denominator] |
| M71: switch to the 2nd gear | Y258: switch to the 2nd gear | X258: switch to the 2nd gear | 01 | Gear 2 [424 numerator/425 denominator] |
| M72: switch to the 3rd gear | Y259: switch to the 3rd gear | X259: switch to the 3rd gear | 10 | Gear 3 [426 numerator/427 denominator] |
| M73: switch to the 4th gear | Y260: switch to the 4th gear | X260: switch to the 4th gear | 11 | Gear 4 [428 numerator/429 denominator] |

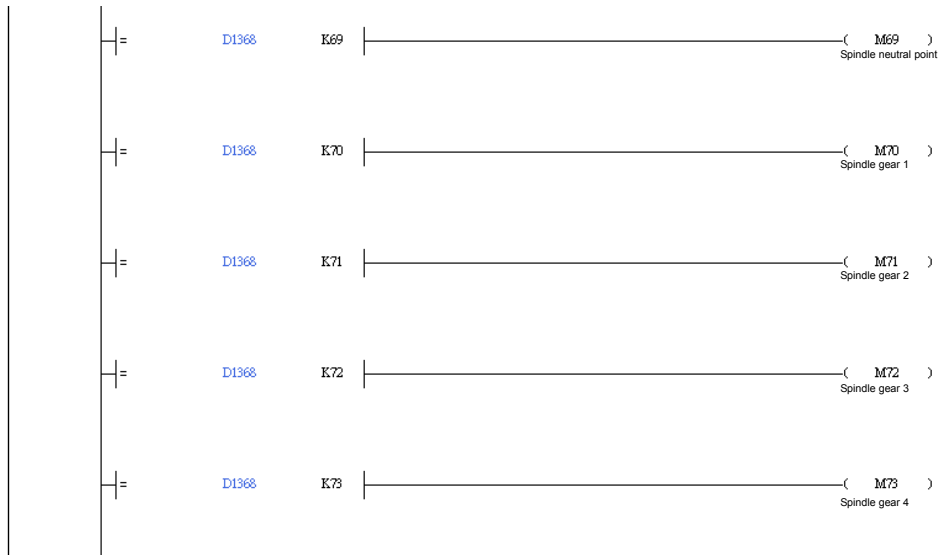
For example, when the program gives statement M3S1000, spindle at the 2nd gear (parameter 424/425) and gear ratio at 1/2, then the analog voltage will double, motor speed will be at S2000 rpm, and the spindle end speed will be at S1000 rpm after mechanical deceleration.

Spindle and MLC axis relevant special M output description

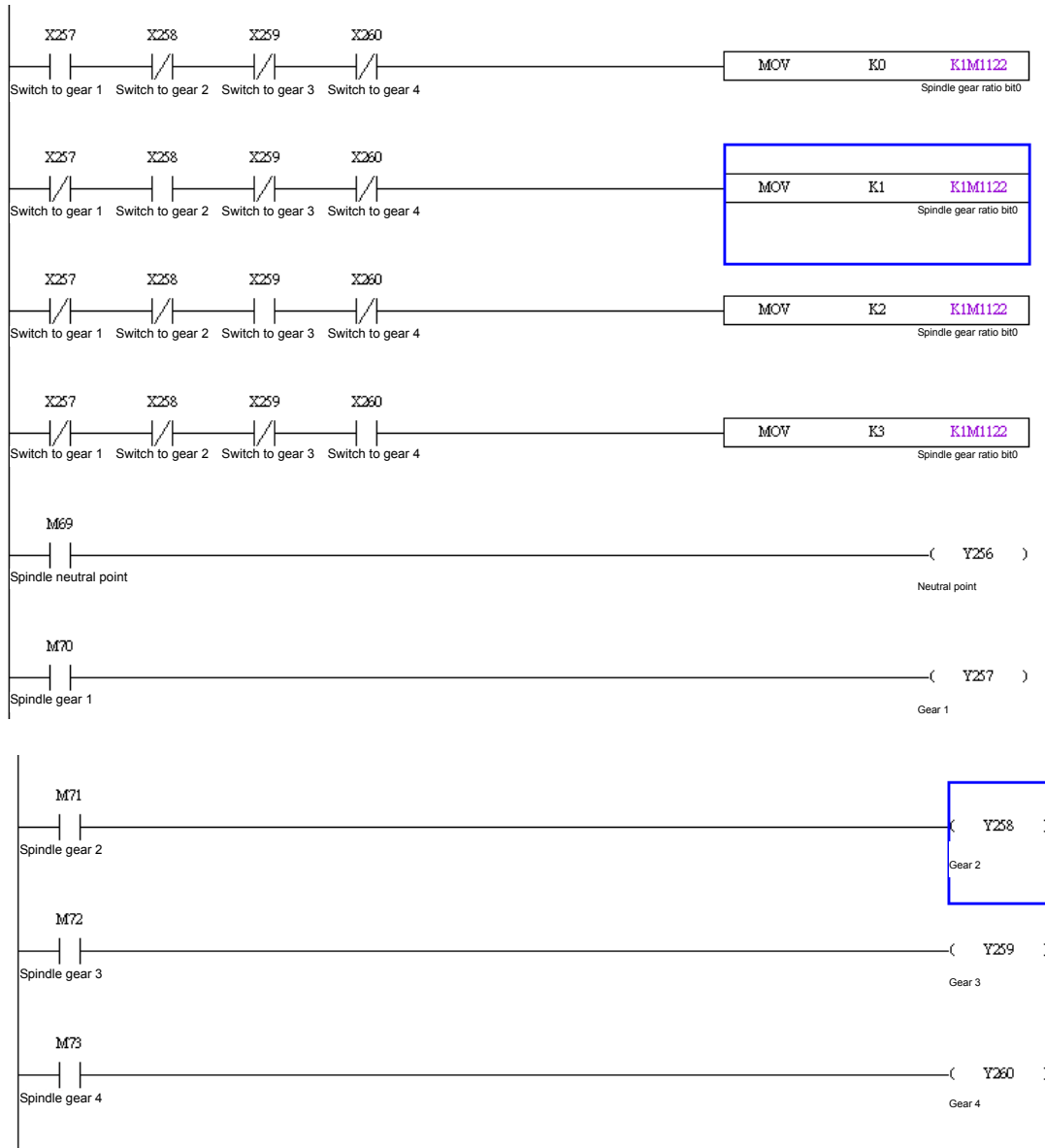
Spindle relevant output

| Function name | Special M code |
|-----------------------------------|----------------|
| Spindle forward | M1120 |
| Spindle backward | M1121 |
| Spindle gear ratio selection Bit0 | M1122 |
| Spindle gear ratio selection Bit1 | M1123 |
| Spindle positioning control | M1124 |

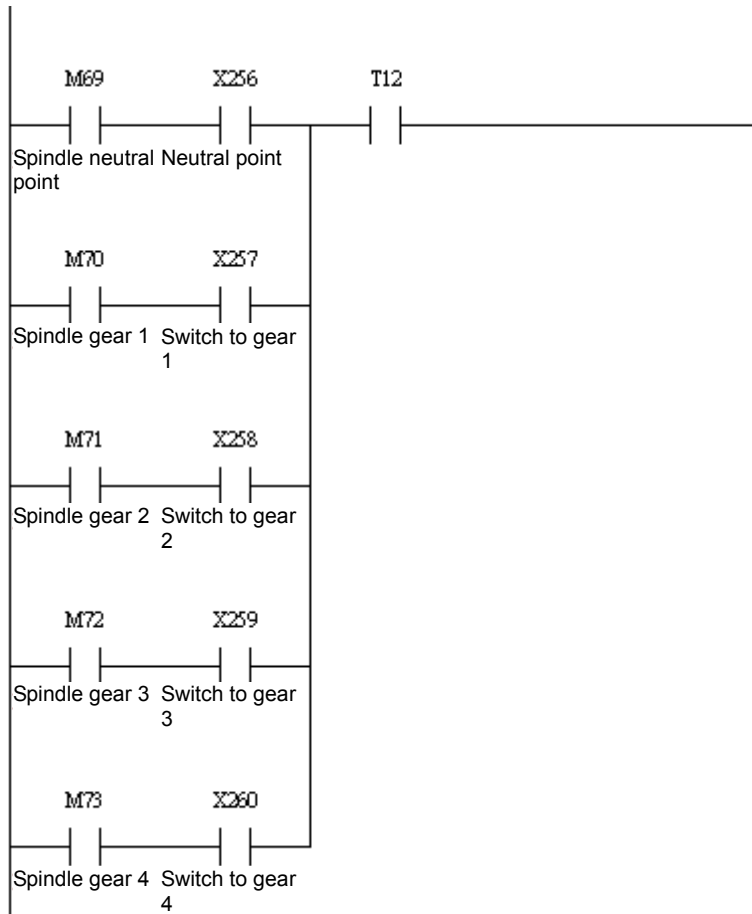
Switch gear with M Code calls, e.g. M70 to gear one



Relay DI and switch gear ratio after gear set, switch with M1122 and M1123



End M code after gear switched



Sample macro for spindle gear switch

#1 = 500 (define gear range)

#2 = 4000

#3 = 8000

#4 = 12000

#6 = 100 (define speed after gear switch)

IF [#19<#1] GOTO 10

IF [#19<#2] GOTO11

IF [#19<#3] GOTO12

IF [#19<#4] GOTO13

GOTO 1000

(1st stage)

N10

#10=70
GOTO 20

(2nd stage)
N11
#10=71
GOTO 20

(3rd stage)
N12
#10=72
GOTO 20

(4th stage)
N13
#10=73

N20
#11=#10-69
IF [#1833==#11] GOTO1000 (compare MLC gear against target gear of the command)
S#6 (enter the gear speed and wait until the given speed is reached)
M69 (neutral point)
M#10 (MLC is informed to trigger gear switch)
G4X2.
M99

N1000
S#19
M99

Chapter 5: MLC Special M&D Command

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Chapter 6: Troubleshooting

6.1 List of alarms of NC300 controller

6.1.1 PLC system alarms: (code range: 0x1200~0x1300)

| Code | Name | Description and troubleshooting |
|--------|------------------------------|--|
| 0x1200 | Memory access error | <ol style="list-style-type: none">1. Error occurs when accessing NC memory by MLC.2. Re-start the system or send the system back for servicing. |
| 0x1201 | System is not ready | <ol style="list-style-type: none">1. The NC startup procedure is not completed successfully.2. Re-start the system or send the system back for servicing. |
| 0x1202 | Buffer memory error | <ol style="list-style-type: none">1. NC buffer memory error or not ready.2. Re-start the system or send the system back for servicing. |
| 0x1203 | Output port is not found | <ol style="list-style-type: none">1. NC output port is not found.2. Verify axis parameter settings. |
| 0x1204 | MLC code clearance error | <ol style="list-style-type: none">1. MLC program code clearance failed.2. Send the system back for servicing. |
| 0x1205 | MLC flash memory error | <ol style="list-style-type: none">1. MLC program code writing failed.2. Re-start the system or send the system back for servicing. |
| 0x1206 | SRAM error | <ol style="list-style-type: none">1. SRAM writing error.2. Send the system back for servicing. |
| 0x1207 | Host I/O channel error | <ol style="list-style-type: none">1. Host I/O access error.2. Re-start the system or send the system back for servicing. |
| 0x1208 | Remote I/O channel error | <ol style="list-style-type: none">1. Remote I/O access error.2. Re-start the system or send the system back for servicing. |
| 0x1209 | Remote I/O channel error | <ol style="list-style-type: none">1. Remote I/O access error.2. Re-start the system or send the system back for servicing. |
| 0x120A | NC parameter error | <ol style="list-style-type: none">1. NC parameter is not set up or initialized.2. Re-initialize parameters |
| 0x120B | Compensation parameter error | <ol style="list-style-type: none">1. Compensation parameter write-in error.2. Re-write compensation parameters. |

| Code | Name | Description and troubleshooting |
|--------|--|---|
| 0x120C | Compensation parameter clearance error | 1. Compensation parameter memory clearance error. 2. Re-write compensation parameters. |
| 0x120D | Compensation parameter write-in error | 1. Compensation parameter memory write-in error. 2. Re-write compensation parameters. |
| 0x120E | Parameter initialization error | 1. Parameter initialization error. 2. Re-initialized parameters. |
| 0x120F | Memory clearance error | 1. Memory clearance error. 2. Re-start the system or send the system back for servicing. |
| 0x1210 | Memory write-in error | 1. Memory clearance error or initialization error. 2. Re-start the system or send the system back for servicing. |
| 0x1211 | Servo axis is not found | 1. Parameter setup error. 2. Verify parameter settings. |
| 0x1212 | Servo axis parameter format error | 1. Parameter setup error. 2. Verify parameter settings. |
| 0x1213 | DMCNET initialization error | 1. DMCNET initialization error. 2. Ensure the DMCNET is securely connected. |
| 0x1214 | Power-outage retaining memory error | 1. Power-outage retaining memory error. 2. Re-start the system or send the system back for servicing. |
| 0x1300 | Network communication error | 1. Verify network wiring. 2. Re-start the system or send the system back for servicing. |
| 0x1E00 | Servo error | 1. Servo error. 2. Verify servo status or replace servo. |
| 0x1F00 | Remote I/O error | 1. Remote I/O error. 2. Verify remote I/O connection or replace remote I/O board. |
| 0x4200 | Homing | 1. Homing |

6.1.2 NC alarm code (range: 0x4200 ~0x4300)

| Code | Name | Description and troubleshooting |
|--------|--|--|
| 0x4200 | Homing not ready | <ol style="list-style-type: none"> 1. Do homing operation. 2. Verify wiring or parameter settings. |
| 0x4300 | MLC is not ready | <ol style="list-style-type: none"> 1. MLC is not ready or memory access error. 2. Re-start the system or send the system back for servicing. |
| 0x4301 | MLC is not ready | <ol style="list-style-type: none"> 1. MLC is not ready. 2. Re-start the system or send the system back for servicing. |
| 0x4302 | I/O module program clearance failed | <ol style="list-style-type: none"> 1. I/O module program clearance failed. 2. Re-install the program. |
| 0x4303 | I/O module program write-in failure | <ol style="list-style-type: none"> 1. I/O module program write-in failed. 2. Re-install the program. |
| 0x4304 | NC system program clearance failure | <ol style="list-style-type: none"> 1. NC system program clearance failed 2. Re-install the program. |
| 0x4305 | NC system program installation failure | <ol style="list-style-type: none"> 1. NC system program installation failed. 2. Re-install the program. |
| 0x4306 | Macro clearance failure | <ol style="list-style-type: none"> 1. Macro program clearance failed. 2. Re-install the program. |
| 0x4307 | Macro installation failure | <ol style="list-style-type: none"> 1. Macro program installation failed. 2. Re-install the program. |
| 0x4308 | G code loading error | <ol style="list-style-type: none"> 1. G code loading error. 2. Verify the machining program. |
| 0x4309 | ILLEGAL_PROGRAM_ADDR Illegal program address | |
| 0x430A | EXCEED_MAX_RDCMD_RANGE Over the upper limit of the reading memory area | |
| 0x430B | EXCEED_MAX_WRCMD_RANGE Over the upper limit of the write-in memory area | |
| 0x4310 | I/O module program is not initialized | <ol style="list-style-type: none"> 1. I/O module program is not initialized. 2. Re-install I/O module program. |
| 0x4311 | I/O module memory error | <ol style="list-style-type: none"> 1. I/O module memory error. 2. Re-start the system or send the system back for servicing. |
| 0x4312 | I/O module memory error | <ol style="list-style-type: none"> 1. I/O module memory error. 2. Re-start the system or send the system back for servicing. |

| Code | Name | Description and troubleshooting |
|--------|------------------------------------|--|
| 0x4313 | I/O module status error | <ol style="list-style-type: none"> 1. I/O module status error. 2. Ensure the I/O board is inserted securely. |
| 0x4314 | I/O module program planning error | <ol style="list-style-type: none"> 1. I/O module program planning error. 2. Ensure the I/O board is inserted securely. |
| 0x4315 | I/O board hardware interface error | <ol style="list-style-type: none"> 1. I/O board hardware interface error. 2. Ensure the I/O board is inserted securely. |
| 0x4316 | I/O board hardware interface error | <ol style="list-style-type: none"> 1. I/O board hardware interface reading error. 2. Send the system back for servicing. |
| 0x4317 | NC system command error | <ol style="list-style-type: none"> 1. NC system command error. 2. Send the system back for servicing. |
| 0x4318 | NC parameter error | <ol style="list-style-type: none"> 1. NC parameter error or MLC not ready. 2. Re-start the system or send the system back for servicing. |
| 0x4319 | NC parameter error | <ol style="list-style-type: none"> 1. NC parameter error or MLC not ready. 2. Re-start the system or send the system back for servicing. |
| 0x431A | Tool magazine axis error | <ol style="list-style-type: none"> 1. Tool magazine axis is not defined or defined repeatedly. 2. Verify parameter settings. |

6.1.3 Channel alarm code: (range: 0xA000~0xD000) Description of illegal G code line number and error messages

| Code | Name | Description and troubleshooting |
|--------|---|--|
| 0xA000 | Illegal G code line number | 1. Illegal G code line number. 2. Verify the machining program. |
| 0xA001 | Illegal G code length | 1. Illegal G code length. 2. Verify the machining program. |
| 0xA002 | G code file is not found | 1. G code file is not found. 2. Verify file contents. |
| 0xA003 | Invalid name of the loaded file | 1. Invalid name of the loaded file. 2. Load the program file again. |
| 0xA004 | Workpiece coordinates computing error | 1. Workpiece coordinates computing error。 2. Reset workpiece coordinates. |
| 0xA005 | Workpiece coordinates computing error | 1. Workpiece coordinates computing error。 2. Reset workpiece coordinates. |
| 0xA006 | Workpiece coordinates computing error | 1. Workpiece coordinates computing error。 2. Reset workpiece coordinates. |
| 0xA007 | Conflicting servo port settings | 1. Conflicting servo port settings. 2. Verify parameter settings. |
| 0xA009 | G code buffer zone error | 1. G code buffer zone error. 2. Load machining program again. |
| 0xA00A | Invalid interpolator command index | |
| 0xA00B | Interpolator command buffer zone access error | |
| 0xA00C | Feed rate is not defined | 1. G code error. 2. Check G code and revise program. |
| 0xA00D | Invalid arc diameter | 1. G code error. 2. Check G code and revise program. |
| 0xA00E | Invalid tool ID selection | 1. G code error. 2. Check G code and revise program. |
| 0xA00F | Number of servo axis does not match with parameter settings | 1. Verify settings. |

| Code | Name | Description and troubleshooting |
|--------|--|---|
| 0xA010 | Break point sub-routine is not found | 1. G code error. 2. Check G code and revise program. |
| 0xA011 | SYSTEM_RESET System reset | |
| 0xA012 | INVALID_COMP_PLANE Invalid tool length compensation | 1. G code error. 2. Check G code and revise program. |
| 0xA013 | INVALID_COMMAND Illegal commands | 1. G code error. 2. Check G code and revise program. |
| 0xA014 | R_COMP_CONFLICT Invalid cutter compensation | 1. G code error. 2. Check G code and revise program. |
| 0xA015 | EMG_STOP_MSG Emergency stop | 1. Release EMG. |
| 0xA100 | Cutter interference | 1. G code error. 2. Check G code and revise program. |
| 0xA101 | Cancel diameter compensation in arc | 1. G code error. 2. Check G code and revise program. |
| 0xA102 | Enable diameter compensation in arc | 1. G code error. 2. Check G code and revise program. |
| 0xA103 | ARC_INTERF Incorrect cutter radius | 1. G code error. 2. Check G code and revise program. |
| 0xA104 | SHORT_COMP_LEN The amount of tool compensation is too small | 1. G code error. 2. Check G code and revise program. |
| 0xA600 | Invalid G code ID | 1. G code error. 2. Check G code and revise program. |
| 0xA601 | Too many subroutine nests | 1. The subroutine calls too many programs. 2. Revise program to reduce nesting layers. |
| 0xA603 | Invalid variable symbol | 1. Invalid variable symbol. 2. Check G code and revise program. |
| 0xA604 | Illegal G code symbol | 1. Illegal G code symbol. 2. Check G code and revise program. |
| 0xA605 | No G code symbol | 1. No G code symbol. 2. Check G code and revise program. |
| 0xA606 | Subroutine calling error | 1. Subroutine calling error. 2. Revise program. |

| Code | Name | Description and troubleshooting |
|--------|---------------------------------------|--|
| 0xA607 | Subroutine file name error | 1. Subroutine file name error. 2. Revise program. |
| 0xA608 | Subroutine nesting error | 1. Subroutine nesting error. 2. Revise program. |
| 0xA609 | G code executed before homing | 1. G code executed before homing. 2. Do homing for each axis. |
| 0xA60A | Syntax error of G04 | 1. Syntax error of G04. 2. Check G code and revise program. |
| 0xA60B | Invalid workpiece offset amount | 1. Workpiece offset amount calculation error. 2. Re-start the system or send the system back for servicing. |
| 0xA60D | Invalid intermediate point for homing | 1. Invalid intermediate point for homing. 2. Revise program. |

6.1.4 Description of macro form configuration error message

| Code | Name | Description and troubleshooting |
|--------|--|--|
| 0x0610 | Invalid macro variable form | 1. Invalid macro variable form. 2. Check macro and revise program. |
| 0x0611 | Macro command is not found | 1. Macro command is not found. 2. Check macro and revise program. |
| 0x0612 | Invalid macro command line number | 1. The target line N of GO TO command is not found. 2. Revise program. |
| 0x0613 | Bit setup error in macro | 1. Bit setup error in macro. 2. Check macro and revise program. |
| 0x0614 | Divided by zero error in macro | 1. Divided by zero error in macro. 2. Check macro and revise program. |
| 0x0615 | Macro command is too long | 1. Macro command is too long. 2. Check macro and revise program. |
| 0x0616 | Macro command operation is not found | 1. Macro command operation is not found. 2. Check macro and revise program. |
| 0x0617 | Macro command error | 1. Macro command error. 2. Check macro and revise program. |
| 0x0619 | Macro operand syntax error | 1. Macro operand syntax error. 2. Check macro and revise program. |
| 0x061A | Illegal macro command | 1. Illegal macro command. 2. Check macro and revise program. |
| 0xA61B | Goto tag is not found | 1. Revise program. |
| 0xA61C | Line number given by Goto tag is not found | 1. Revise program. |
| 0x0620 | | |
| 0x0621 | | |
| 0x0622 | | |
| 0x0623 | | |

| Code | Name | Description and troubleshooting |
|--------|---|---------------------------------|
| 0x0630 | FOLLOW_ERR_ALARM Excessive deviation of position | 1. Verify servo connection. |
| 0x0631 | HW_LIMIT_ERR Hardware limit error | 1. Revise program. |
| 0x0632 | SW_LIMIT_ERR Software limit error | 1. Revise program. |
| 0x0633 | SW_LIMIT_CLR First software limit clearance | 1. Revise program. |
| 0x0634 | SW_LIMIT_EXT_ERR Second software limit error | 1. Revise program. |
| 0xA635 | SW_LIMIT_EXT_CLR Second software limit clearance | 1. Revise program. |

6.1.5 HMI system alarm: (range: 0x3010~0x3FFF)

Description of HMI interface open error messages

| Code | Name | Description and troubleshooting |
|--------|--|---|
| 0x3010 | HMI communication interface creation error | <ol style="list-style-type: none"> 1. HMI communication interface creation error. 2. Re-start the system or send the system back for servicing. |
| 0x3011 | HMI communication memory zone creation error | <ol style="list-style-type: none"> 1. HMI communication memory zone creation error. 2. Re-start the system or send the system back for servicing. |
| 0x3012 | HMI interface command zone creation error | <ol style="list-style-type: none"> 1. HMI interface command zone creation error. 2. Re-start the system or send the system back for servicing. |
| 0x3013 | HMI interface memory zone error | <ol style="list-style-type: none"> 1. HMI interface memory zone error. 2. Re-start the system or send the system back for servicing. |
| 0x3014 | HMI interface communication port error | <ol style="list-style-type: none"> 1. HMI interface communication port error. 2. Re-start the system or send the system back for servicing. |
| 0x3015 | MLC interface memory zone error | <ol style="list-style-type: none"> 1. MLC interface memory zone error. 2. Re-start the system or send the system back for servicing. |
| 0x3016 | HMI file transmission error | <ol style="list-style-type: none"> 1. HMI file transmission error. 2. Re-start the system or send the system back for servicing. |
| 0x3017 | HMI data transmission error | <ol style="list-style-type: none"> 1. HMI data transmission error. 2. Re-start the system or send the system back for servicing. |
| 0x3100 | Illegal file name | <ol style="list-style-type: none"> 1. Illegal file name. 2. Revise file name. |
| 0x3101 | Too many subroutine nests | <ol style="list-style-type: none"> 1. Reduce number of subroutine calling nests. |
| 0x3102 | Non-G code character error | <ol style="list-style-type: none"> 1. Non-G code character error. 2. Check G code and revise program. |
| 0x3103 | MEM_CHECKSUM_ERR Memory error | <ol style="list-style-type: none"> 1. HMI interface error. 2. Re-start the system or send the system back for servicing. |
| 0x3200 | PAR_CRC_ERR Internal parameter error | Invalid system internal parameter memory zone. Please fix it by running the system recovery function or send the system back for servicing. |
| 0x3201 | MLC_CRC_ERR MLC program error | Invalid system MLC program memory zone. Please import the MLC program again or send the system back for servicing. |

| Code | Name | Description and troubleshooting |
|--------|---|--|
| 0x3202 | CF_READ_ERR CF card reading failure | No CF card inserted or invalid CF card is inserted. |
| 0x3203 | PAR_BK_FILE_ERR Parameter backup failure | Ensure CF card is inserted properly and has adequate free space. |
| 0x3204 | MLC_BK_FILE_ERR MLC backup failure | Ensure CF card is inserted properly and has adequate free space. |
| 0x3205 | MACHINE_LOCK Machine locked | Confirm that the validity of the machine has expired. Please call the supplier to remove or extend the machine validity. |

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