SUPER-1NC

Super Single Axis Numerical Controller

Technical Manual **V5.00**

SUPER-1NC Overview

SUPER-1NC is a servo/stepper controller (400Kpps) with powerful functions and superior quality. It is suitable for use on slider benches, CNC lathes, plastic band sealers, computer sheet (tape) cutters, CNC rotary tables, capacitor winding machines, capacitor sampling machines, spot welding machines, spot gluing machines, NCT roller feeding machines, grinding machines, bending machines, shearing machines, automatic labeling machines, CD packing machines, 3-side cutting machines, position swivel melting machines, screening printing machines, computer panel saws, cold metal saws, drilling/boring machines, computer slotting machines, packing machines, computer painting machines, robots, key machines, aluminum grounding machines, card printing feeding and stamping machines, plastic band cutting machines, CD color processing printing machines, transporter lines, fold filling machines, computer packing machines, computer tin plating machines, coil winding machines, automatic stencils
processors, gear hobbing machines, etc.

Quality: SUPER-1NC uses the 4-layer SMT technology to provide excellent noise-resistance (2800V/us) that complies with industrial standards.

Functionality: in addition to basic functions like absolute value, relative value shift, equal division, mechanical coordinates, 2-speed, speed, acceleration and deceleration, shift frequency, electronic gear ratio, etc, Super-1NC is equipped with various outstanding functions that are rarely found on single axis controller, such as teach, automatic trace of feeding speed (for sealer), 2-speed marking search (for printing machine), encoder pulse tracking (for labeling machines), and electrical hand wheel, etc.

Controllability: on top of the easy-to-understand programming format, the exclusive selective locking design of Super-1NC makes easy programming for field operators. More importantly, after the lock is enabled, programs and parameters that have been set on the controller by electrical designers will be saved from damage due to improper operation.

Panel layout: two columns of 7-segment x 7 high power LED display and input indicators that arranged by group are equipped on the front panel to enable easy troubleshooting. Sockets designed with different pins located at the back of the front panel prevent mis-connection and tool-free connection.

Hardware: in addition to start, stop, positive/negative poles and DOG, Super-1NC provides 8 outputs (X0-X7) and 5 inputs (Y0-Y4). Users can set different input actions or different output functions. For example, users may set X0 for forward jog (PJG command), X1 for home (HOM command), X2 for absolute coordinate 45.00 (ABS command), and X3 for other actions. Users may use the default output functions (Y0=single session complete, Y1=program end, Y2=motor run, Y3=current coordinate at 0, and Y4=driver fault) or set ON/OFF freely with command OUT. These product characteristics allow Super-1NC to display its greatest power in any relay-controlled automatic control system or the simplest and most economical PLC system and make system

integration reliable and economical. Super-1NC is an independent controller, which enables simple positioning machines to achieve full position control with just 1 In and 1 Out. Therefore, Super-1NC is easy to use.

Besides the excellence performance in servo/stepper control, SUPER-1NC is equipped with PLC data access to enable expansion of servo/stepper controller with PLC at any level. Any PLC that can connect to Super -1NC via RS-422 port can use Super-1NC as a data access, control Super-1NC through controlling M auxiliary contact, and set D buffer of the PLC or read data stored in the D buffer and display them on the LED display (such as counter value, timer value, etc.)

SUPER-1NC is a quality product that is easy to use and helps reduce system costs.

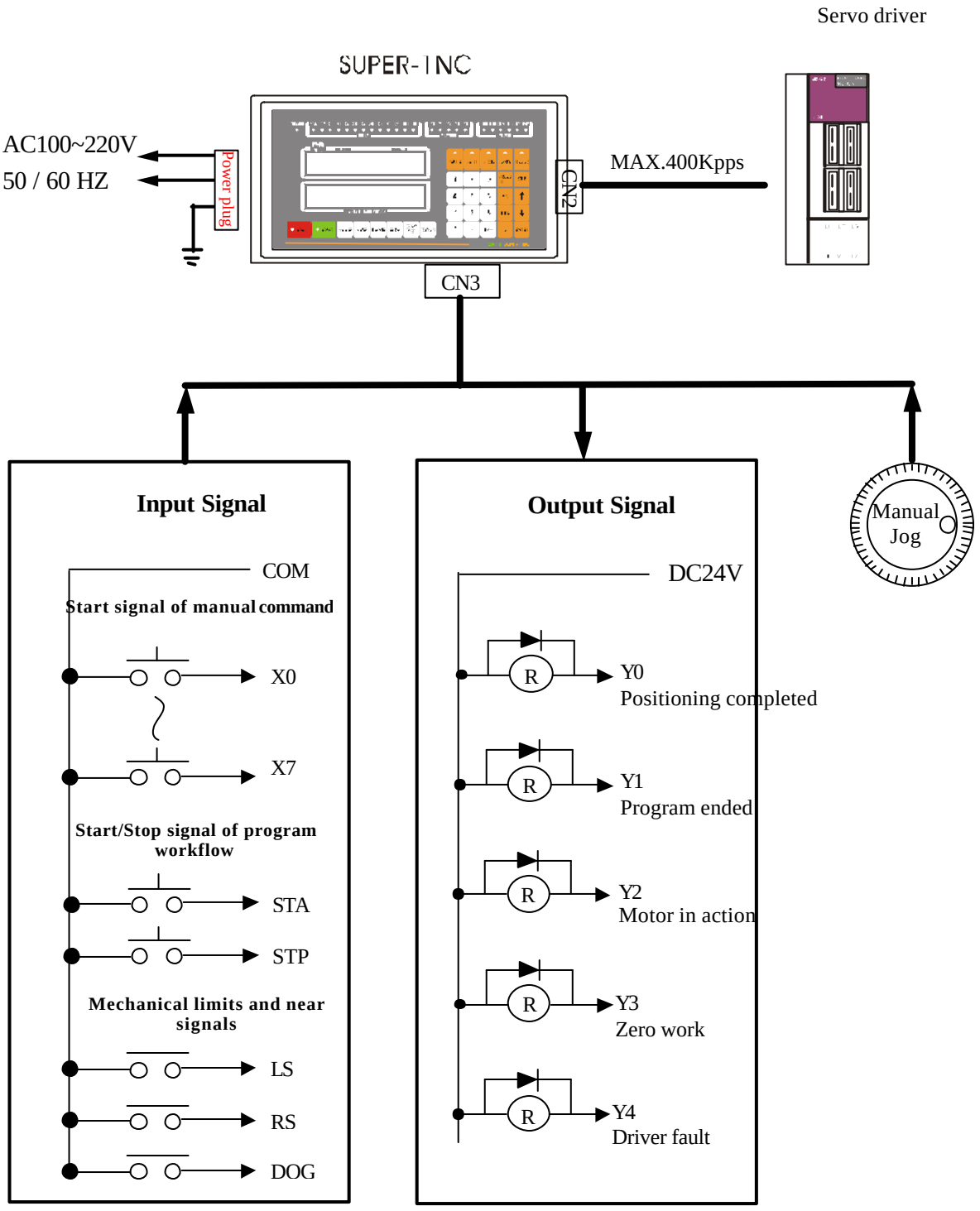
1NC Features

1. High-speed pulse output: 400kpps, maxi.
2. MPG function: 1x, 10x and 100x, etc.
3. Teach: forward/backward (+/-) jog or manual jog knob to teach every position; when using with program editing, users may easily achieve any motion and positioning process. Teach can also write the current coordinate in a specific D buffer, users may even omit any programming to make operation much simpler.
4. Flexible locking function: the exclusive flexible locking function of Super-1NC offers full/single key locking to prevent improper operation or mis-operation. During programming, users may replace data to be modified by end users with variants. Then, through parameter setup, users may open data setup modes, in order to prevent modification of programs by end users.
5. Data access: Super-1NC is a full-function stand-alone controller. Where connection with a PLC is needed, users may achieve I/O connection to Super-1NC with an economical PLC or via the RS-422 port.
6. Combining program encoder and control panel: Super-1NC combines program encoder to the control panel, so that users will never fear of forgetting the program encoder. It is convenient and easy to use.
7. Easy programming format: many operators have been brought to the servo environment successfully, the easy planning of the programming format saves much time and labor.
8. Practical position control over servo/stepper/micro stepper motors
9. Single machine operation—no need to buy additional encoder and easy connection with PLC or relays.
10. Easy setup—the favorite of field operators.
11. Pulse output frequency: 400KPPS
12. About 30 commands, including absolute coordinate/relative coordinate/equal division/mechanical origin/forward and backward jog, etc.
13. Storage of 1 or 10 sets of motion programs (program capacity up to 400 steps)
14. Manual jog knob (1x, 10x and 100x)
15. 15 IN/8 OUT (8 IN/ 5 OUT free motion planning)
16. Encoder proportion function
17. Man-machine interface for PLC connection (RS-422)
18. Connects up to 8 controllers when using PLC as the master control

SUPER-1NC Specifications

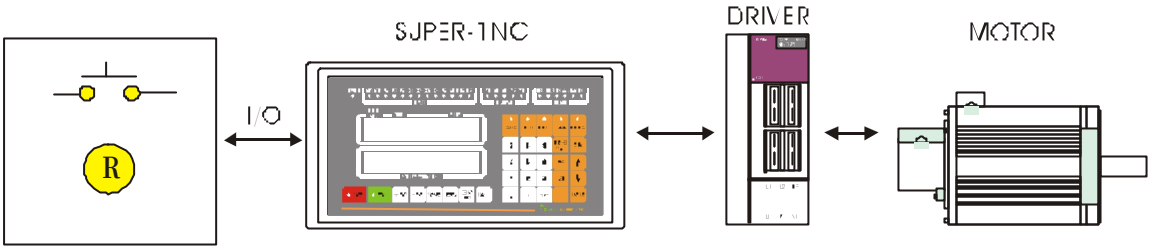
Item	Specification
Driving power	● AC 100~240V, 50/60HZ ● Internally generated DC 5V for internal control ● DC24V for 1NC I/O and driver I/O
Display	● One row of 13-segment x 7 LED display for command and message ● One row of 7-segment display for position/speed/ data ● Both rows are open for display of D buffer contents when connecting to PLC
Keyboard	● Full-function panel, no need of additional program encoder ● 25 keys for editing with locking; no less than 17 keys can be reserved for data modification by operators. ● 8 function keys with locking for direct control over start, stop, home, reset and adjustment; no less than the Stop key can be reserved for operation.
LED Indicator	● Individual LEDs on the front panel for I/O status display (power, input, output, driver, display status, start/stop indication)
Program capacity	● Total of 400 steps ● Programmable to 1 x 400 steps or 10 x 40 steps.
Output pixel	● Optically coupled isolator with LED indicators for individual I/Os to facilitate error detection. ● Total of 15IN/8OUT (8IN/5OUT with free motion planning)
Control axis	● 1 axis ● Synchronous operation of 8 independent axes (maxi) via RS422 connection
Command speed	● 1RPM to 3000RPM (maximum output pulse frequency 400KppS)
Pulse setup	● Assignment of absolute position/relative motion position ● Command unit: PULSE、um、deg、inch ● Decimals : 3, maxi
Pulse output format	● pulse (PLS)/direction (DIR), LINE DRIVER differential output
Manual input interface	● Manual jog knob 1x, 10x and 100x proportional.
Serial transfer	● RS-422 ● Active connection: quasi DATA ACCESS (or man-machine) transfer ● Passive connection: active connection via PLC or PC with a maximum of 8 controllers
Noise resistance	● Over 2800V/1us
Installation	● Panel embedding, opening size at 175*92mm

SUPER-1NC Hardware Architecture

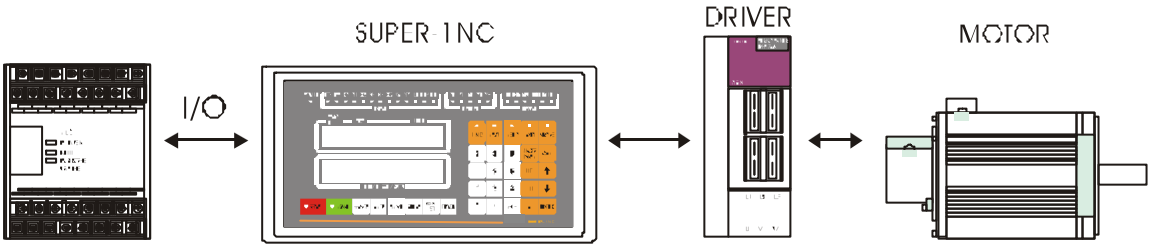


SUPER-1NC System Composition

The simplest system: independent operation without PLC, easy to learn for users who are not familiar with PLC.



Super-1NC with PLC: expanding I/O with the most basic method—sending a Start signal to Super-1NC from PLC; after the session is completed, 1NC will send back a Finish signal to PLC to confirm action completion. This is the easiest communication that all end users are familiar with.



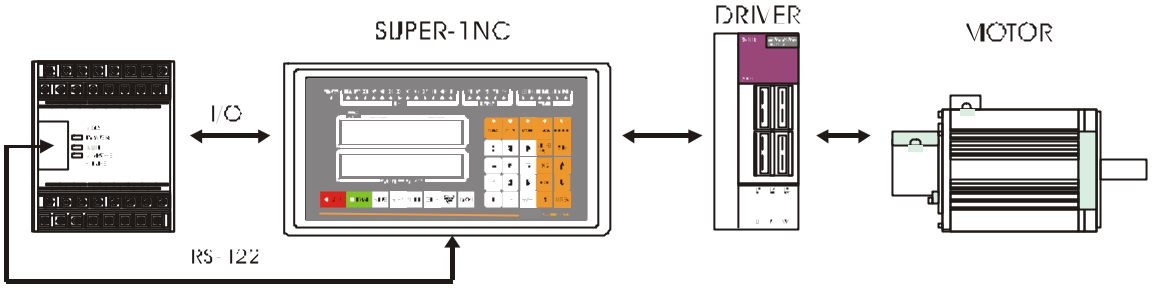
Super-1NC with RS-422 (active connection) ：

SUPER-1NC is now equipped with a data access function.

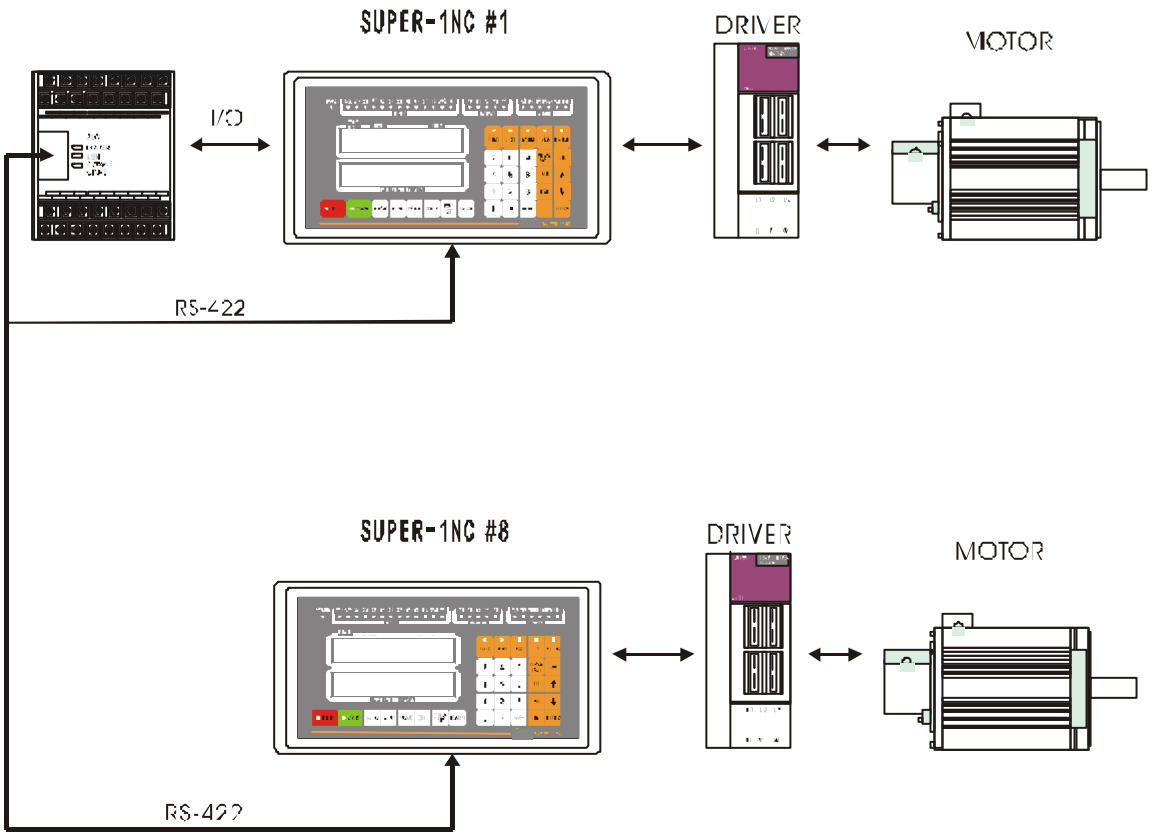
PLC can input and display all data buffers via the Super-1NC control panel.

PLC can modify position and speed values of Super-1NC via RS-422.

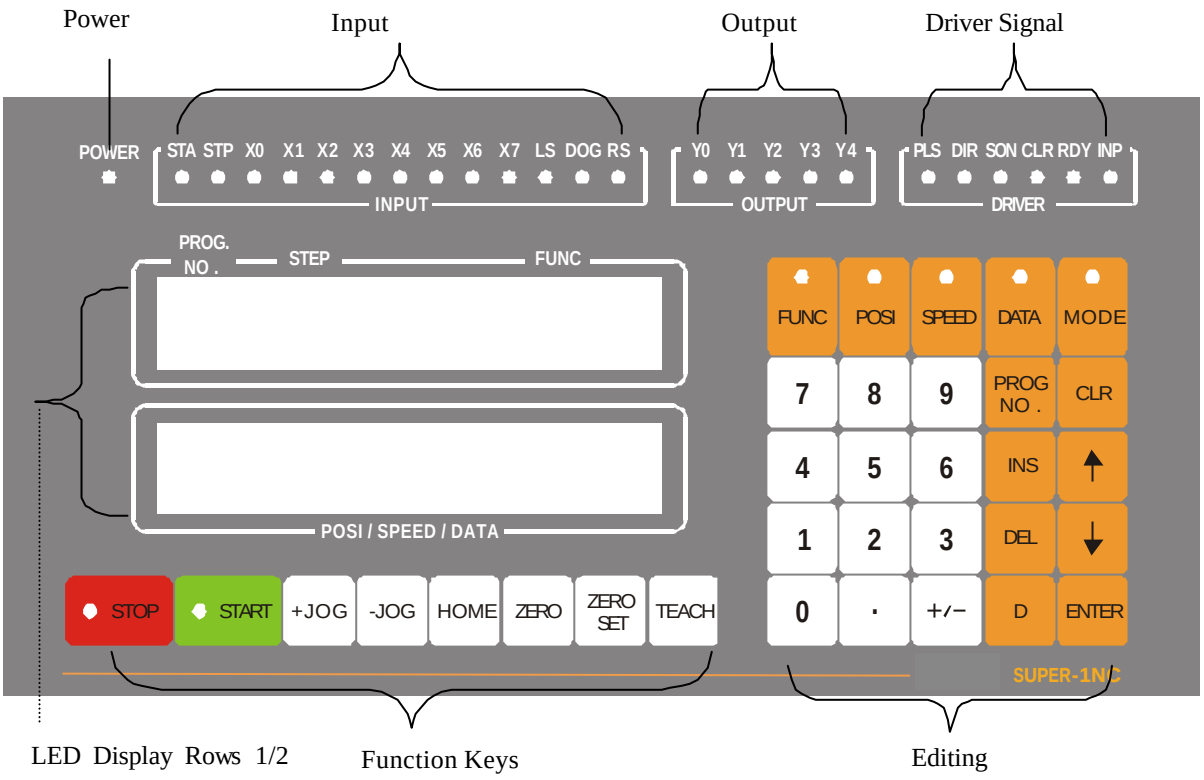
PLC can transmit start program signal via RS-422.



Multiple connection system (passive connection): a maximumof 8 controllers



SUPER - 1NC Control Panel



Power indicator: indicates if power supply is normal.

Input indicators: directly connected in parallel to the optically coupled circuit to indicate if input circuit works normally and to facilitate troubleshooting.

Output indicators: indicate if there is output signal at the output to check if output circuit works normally and to facilitate troubleshooting.

Driver signal indicators: PLS, DIR, SON and CLR are output indicators for driver connections. RDY and INP are input indicators for driver connections. They are specially designed to facilitate troubleshooting of driver connections.

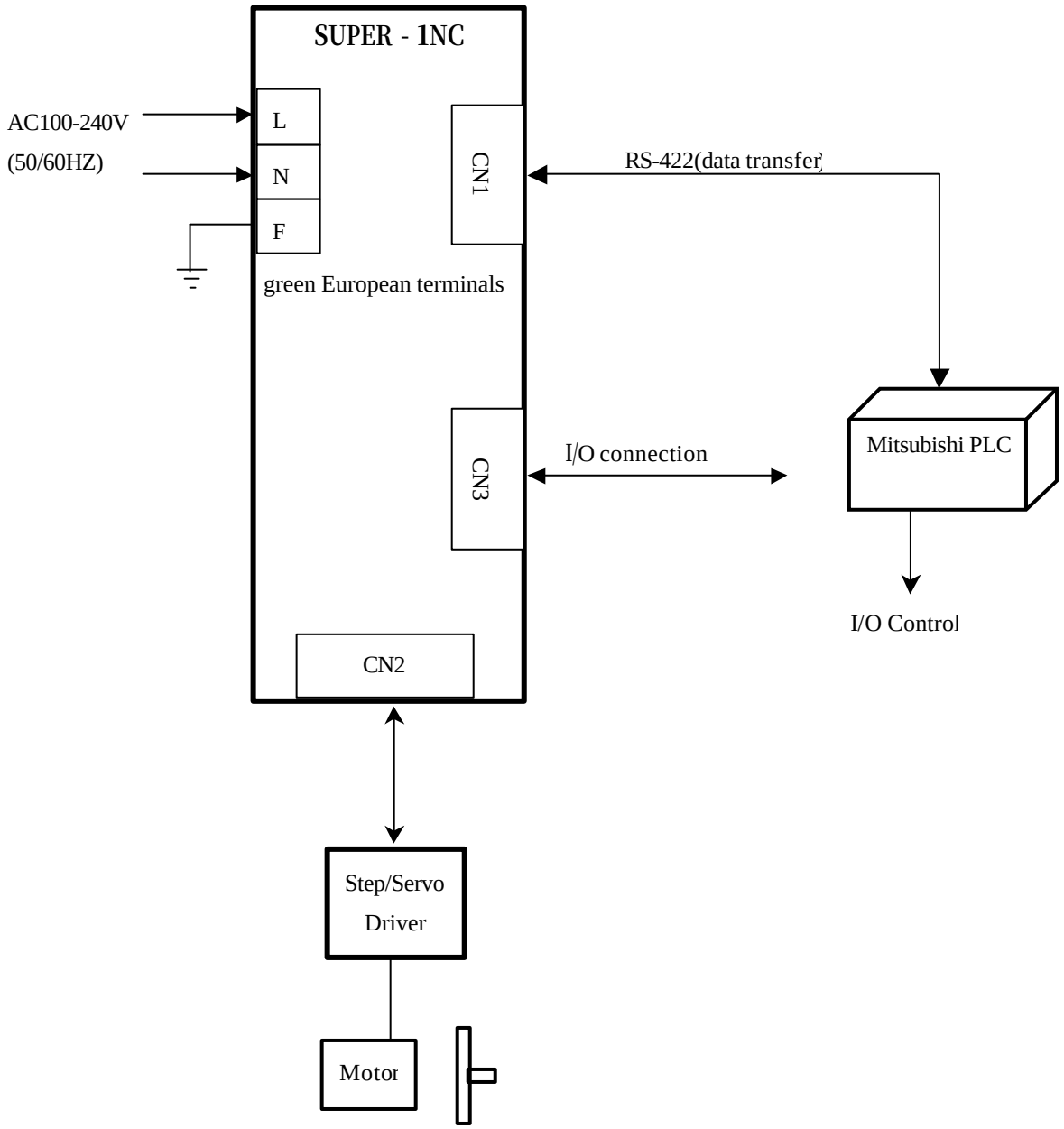
LED Display Row 1: displays group numbers, steps and command codes of program (default). Users may modify parameters 17 and 18 to display D buffer of PLC, timer and counter.

LED Display Row 2: displays motor position in Auto mode and command code, position, speed and reference data or new input value in Program mode. Users may modify parameters 17 and 18 to display D buffer of PLC, timer and counter.

Function keys: Start/Stop programs in Auto mode (Mode indicator goes on); manually adjust forward/backward jog (+JOG/-JOG); return to home (HOME); reset (ZERO); set work zero (ZERO SET); and adjust current position to current step.

Editing keys: set or check function codes, positions, speed, reference data values, parameters and D buffer value of PLC.

SUPER-1NC and PLC Connection



SUPER-1NC Software Architecture

SUPER-1NC falls into program setup mode (000-939), motion setup mode (X0-X39), data setup mode (D000-D126), parameter setup mode (P00-P33) and program version inquiry (V216).

Program setup mode: through program setup, users may store the position of every processing point in the controller memory in advance and start the preset control program by pushing the Start key or STA on the control panel.

Manual motion setup mode: after receiving a signal from the input, 1NC collect corresponding commands in manual operation mode for execution.

Examples

When 1NC receives signal from X0, it will collect commands from X00 in manual motion mode for execution.
When 1NC receives signal from X1, it will collect commands from X01 in manual motion mode for execution.
When 1NC receives signal from X2, it will collect commands from X00 in manual motion mode for execution.
When 1NC receives signal from X3, it will collect commands from X03 in manual motion mode for execution.
When 1NC receives signal from X4, it will collect commands from X04 in manual motion mode for execution.
When 1NC receives signal from X5, it will collect commands from X05 in manual motion mode for execution.
When 1NC receives signal from X6, it will collect commands from X06 in manual motion mode for execution.
When 1NC receives signal from X7, it will collect commands from X07 in manual motion mode for execution.
When 1NC receives signal from +JOG, it will collect commands from X08 in manual motion mode for execution.
When 1NC receives signal from -JOG, it will collect commands from X09 in manual motion mode for execution.
When 1NC receives signal from HOME, it will collect commands from X10 in manual motion mode for execution.
When 1NC receives signal from ZERO, it will collect commands from X11in manual motion mode for execution.
When 1NC receives signal from ZERO SET, it will collect commands from X12 in manual motion mode for execution.
When 1NC receives signal from TEACH, it will collect commands fromX13 in manual motion mode for execution.

Data setup mode: ◎ D buffer content setup

◎This is an easy-to-use mode and is suitable for use by line operators. Together with the values in the Program Setup Mode and the Motion Setup Mode that are assigned by D buffer, operators may modify the position, speed, frequency and other parameters that need frequent changes in the program.

◎When 1NC is connected to PLC via RS-422, operators can modify the content of D buffer in PLC and set timer or counter values with the content in D buffer. See SUPER-1NC and PLC D Buffer Cross Reference for details of data transfer.

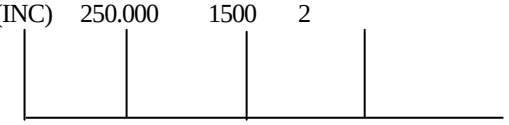
Parameter setup mode: applied engineers may modify the function of 1NC to meet the requirements of machines with this mode. Setup items include gear ratio, acceleration/deceleration, back seem compensation… See Parameter Description for details.

Command Set

Every step of SUPER-1NC is a complete command and has 4 sets of data. Users will need to set up every data set for some functions. Though users will not need to set up every data set of some functions, they will need to set up the function set. Data in the function set can be a constant or a variant to facilitate data modification from PLC via serial connection (RS-422) and in Data Setup Mode. The format of motion commands and program commands is identical. The difference between both types of commands is that program commands are started by automatic start signals (STA), while motion commands are started by external signals (X00-X07).

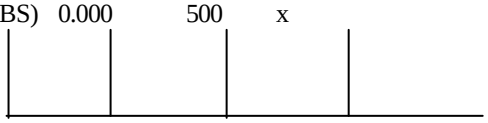
Program commands and motion commands (setting up manual motion):

Step	Function	Position	Speed	Reference Data
000	1(INC)	250.000	1500	2



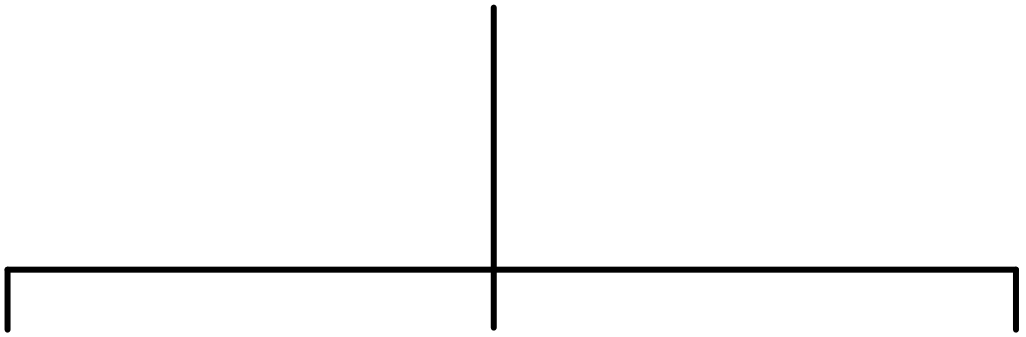
Every step has 4 sets of data

Step	Function	Position	Speed	Reference Data
X0	0(ABS)	0.000	500	x



Users will not need to enter data to all data sets for some commands, even if they do so the system will reject such entries (set with X).
Users will not need to worry if data sets should be completed; 1NC will make the judgment automatically and instruct users to complete these data sets.

Memory Architecture and Start Source of SUPER-1NC



Motion Setup Mode (setting up manual motions)

Step	Function	Position	Speed	Data	Start Point
X00					X00
X01					X01
X02					X02
X03					X03
X04					X04
X05					X05
X06					X06
X07					X07
X08	PJG	0.01	100		0P1*1
X09	MJG	0.01	100		OP2*2
X10	HOM	0.00	500	1	OP3*3
X11	ABS	0.00	1000		OP4*4
X12	DFP	0.00			OP5*5
X13	TCH		1000		OP6*6
X39					

Program Setup Mode

Group	Step	Function	Position	Speed	Data	Start Point
0 *7	000	INC	100.00	1000	4	STA
	001	ABS	0.00	1000		STA
	002	END				STA
						STA
	039					STA
1 *7	100					STA
						STA
						STA
						STA
	139					STA
9 *7	900					STA
						STA
						STA
						STA
	939					STA

Parameter Setup Mode

Parameter	Value
P00	500
P01	2
P02	0
P03	0
P04	0
P05	4000
P06	2000
P07	0
P08	000000
P09	0000
P10	0000
P11	1
P12	1
P13	50
P14	0
P37	1

Data Setup Mode

Data	Value
D000*8	0
D002*8	0
D004*8	0
D006*8	0
D008*8	0
D010*8	0
D126*8	0

*1 +JOG key on the front panel

*2 -JOG key on the front panel

*3 HOME key on the front panel

*4 ZERO key on the front panel

*5 ZERO SET key on the front panel

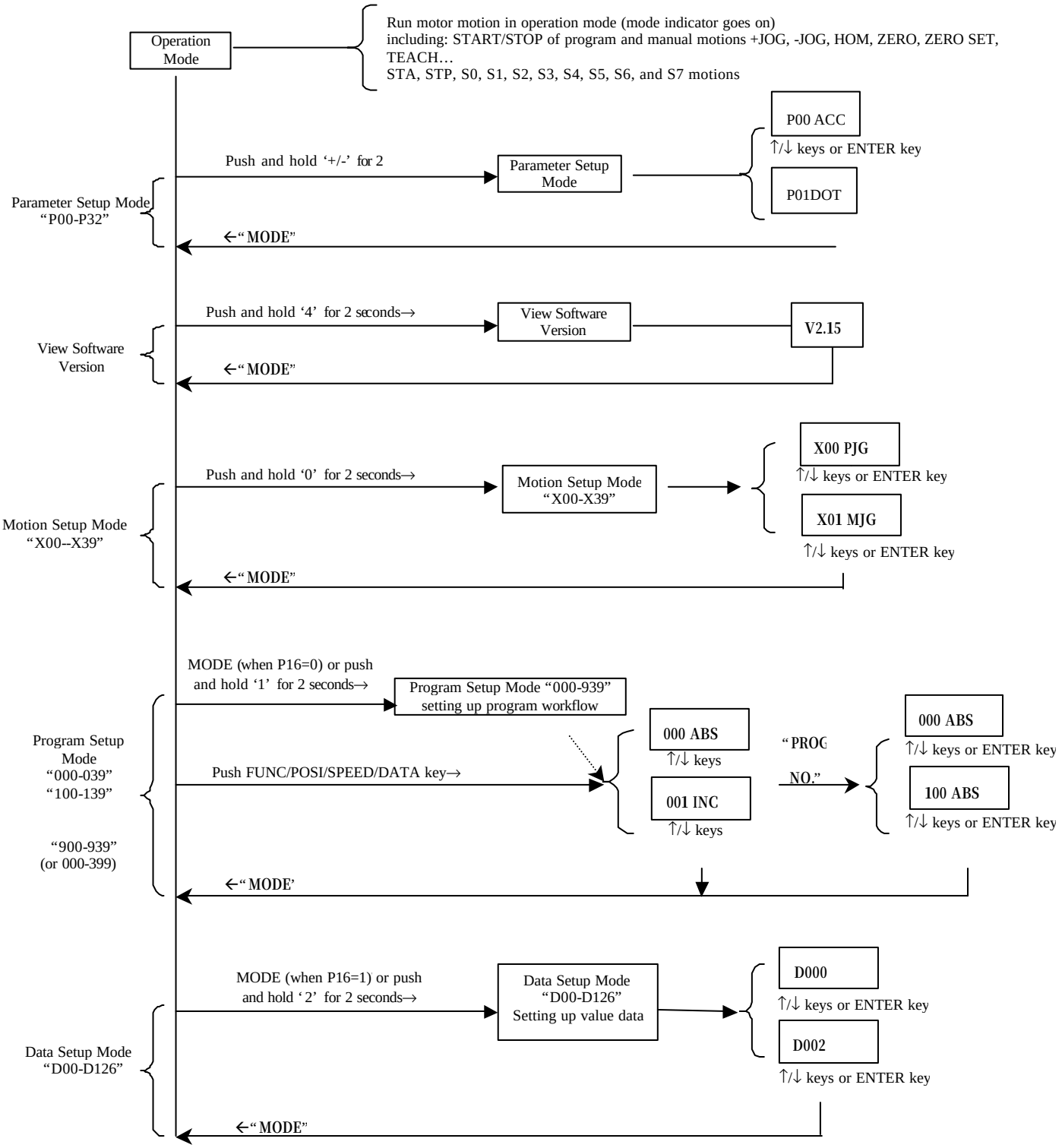
*6 TEACH key on the front panel

*7 When P28=0, there is only one group of program at steps 000~399.

When P28=1, a program is divided into 10 groups (0-9), every group has steps between 00~39.

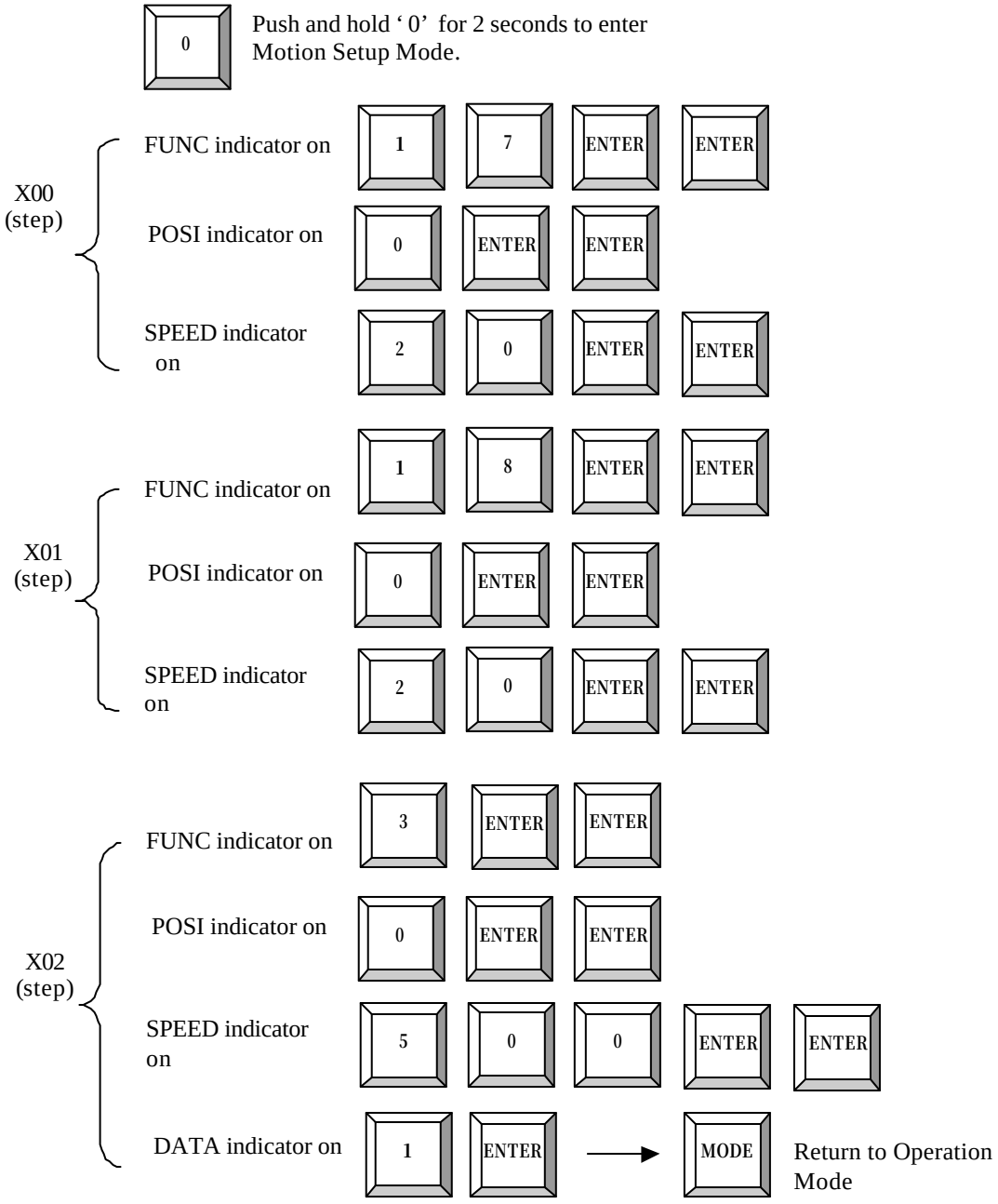
*8 This can only be accessed at start in Data Setup Mode. Users can modify data in D0~D126 at start.

Entering/Exiting Different Setup Modes in SUPER - 1NC



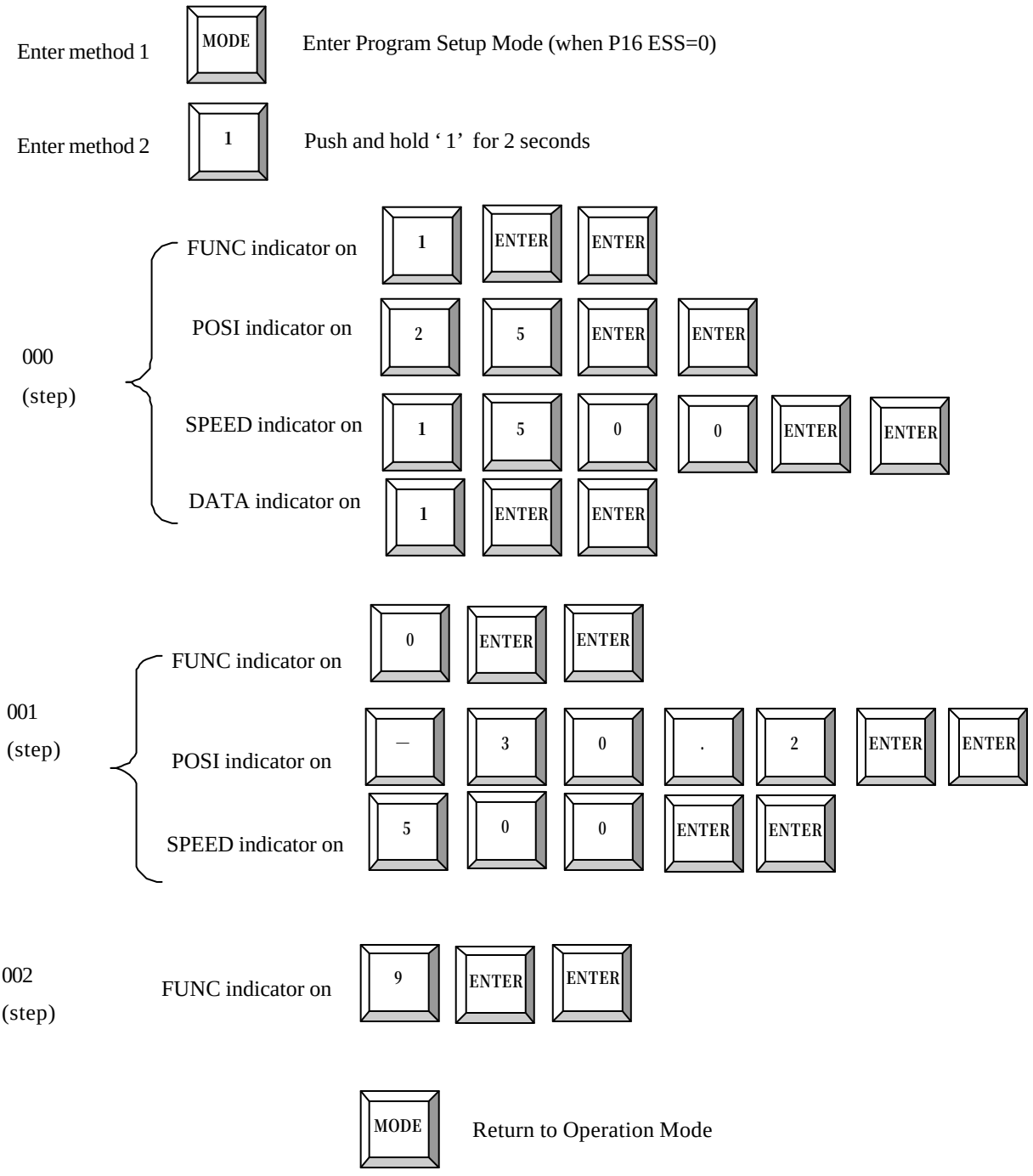
Example of X01-X08 Manual Motion Setup Mode Operation

STEP	FUNC	POSI (mm)	SPEED(RPM)	DATA	Description
X00	17(PJG)	0	20	X	Motor runs forward when X00 is ON
X01	18(MJG)	0	20	X	Motor runs in reverse when X01 is ON
X02	3(HOM)	0	500	1	Motor returns to home when X02 is ON



Example of Program Setup Mode Operation: (Programming)

STEP	FUNC	POSI (mm)	SPEED(RPM)	DATA	Description
000	1(INC)	25.00	1500	1	Run 25.00mm once at 1500RPM
001	0(ABS)	-30.20	500	X	Run to absolute coordinate -30.2 at 500RPM
002	9(END)	X	X	X	End program and return to step 00 of the group



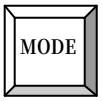
Example of Data Setup Mode Operation

**Users can only enter setup mode and modify data values in this mode during operation.

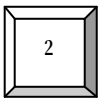
STEP	FUNC	POSI	SPEED	DATA	Description
000	1(INC)	D0	D2	D4	Runs D2 (length) for D4 (frequency) for at D0 (speed)

Step	Data	
D000	100	*1
D002	25	
D004	66	

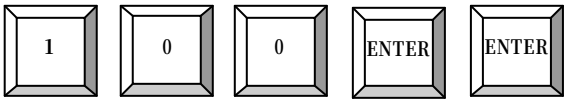
D000 refers to the position value=1.00mm of INC command. Skip all decimals and enter 100
D002 refers to the speed value=25RPM of INC command
D004 refers to the frequency=66 times of INC command
In the example, it refers to running 1.00mm/time for 66 times at 25RPM.
*1: no decimal in the value. Add '0' if any data is assigned as the position of any command.

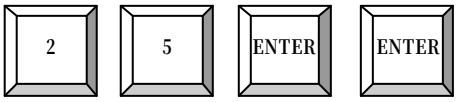
Enter method 1: 

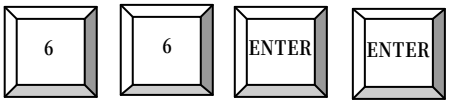
Enter Program Setup Mode (when P16 ESS=1)

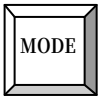
Enter method 2: 

Push and hold ' 2' for 2 seconds to enter Program Setup Mode

D00 

D02 

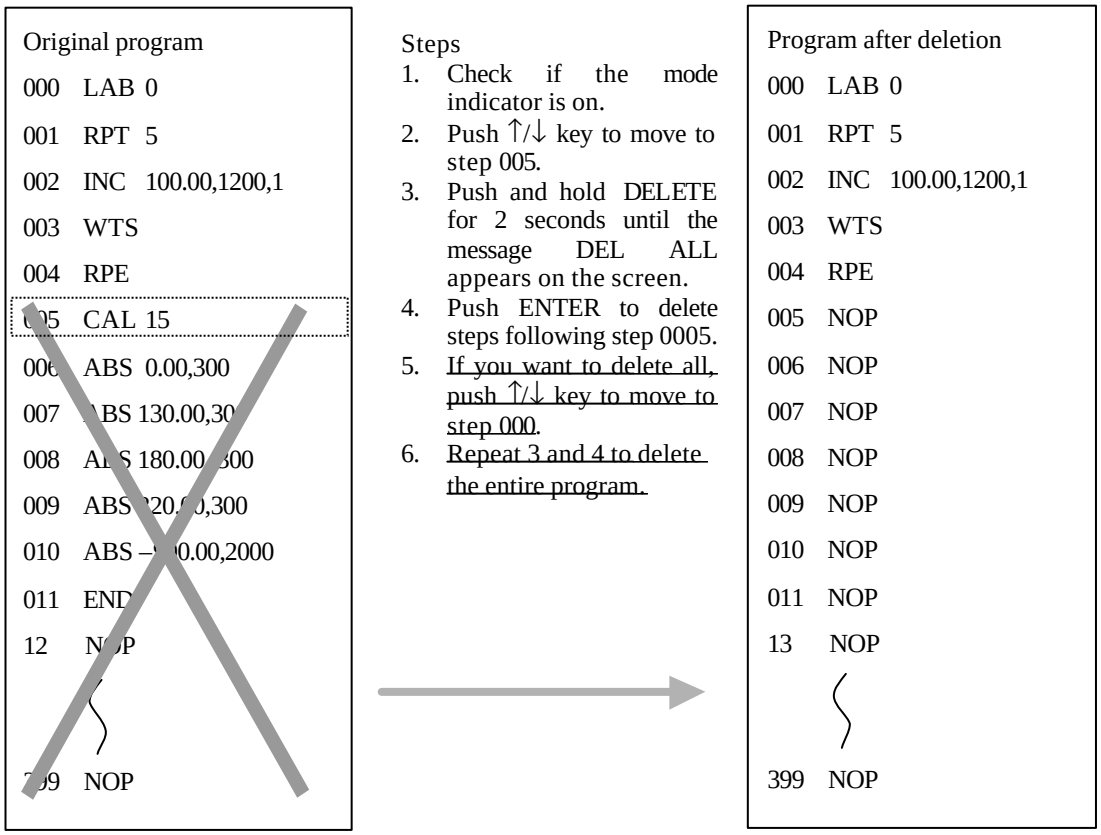
D04 



Return to Operation Mode

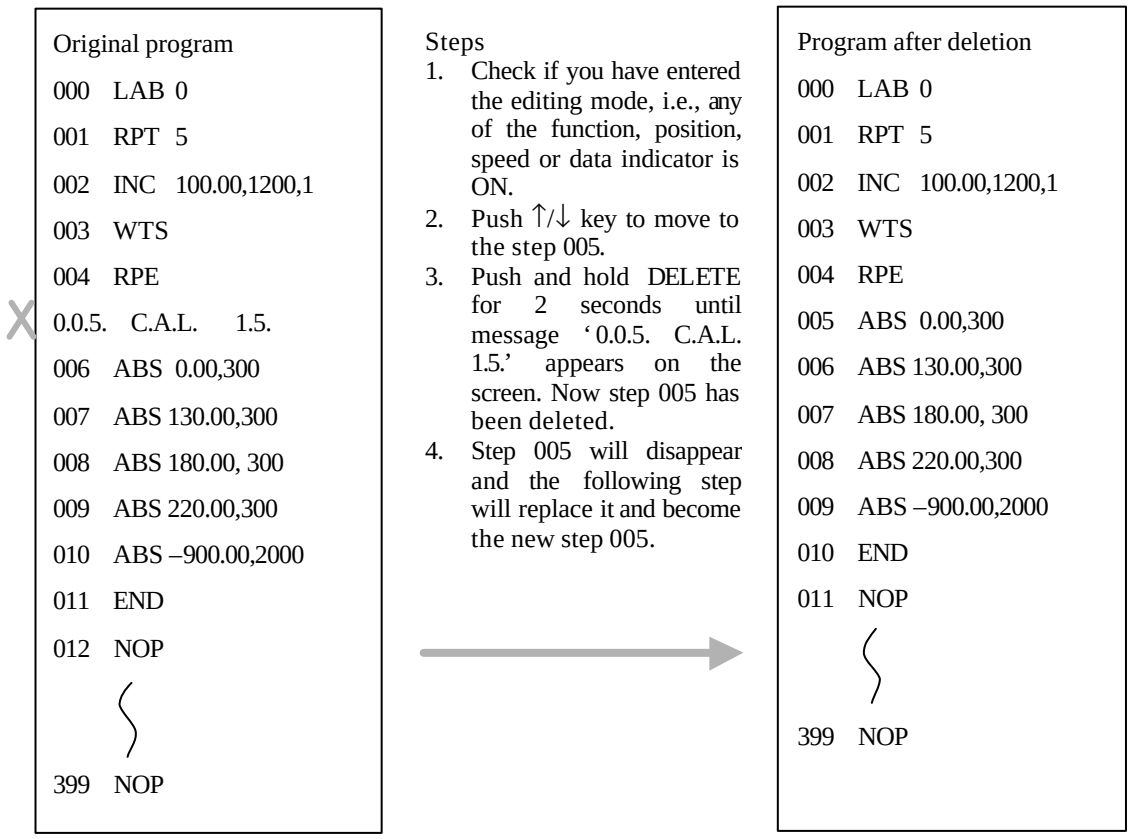
Deleting a program or part of a program

Push MODE to switch to operation mode (MODE indicator on). Push ↑/↓ key to move to the step you want to delete (deleting steps following the selected step). Push and hold DELETE for 2 seconds. If you want to delete steps following the selected step, push ENTER when the message DEL ALL appears on the screen. If you want to abort deletion, push CLR when the message DEL ALL appears on the screen.



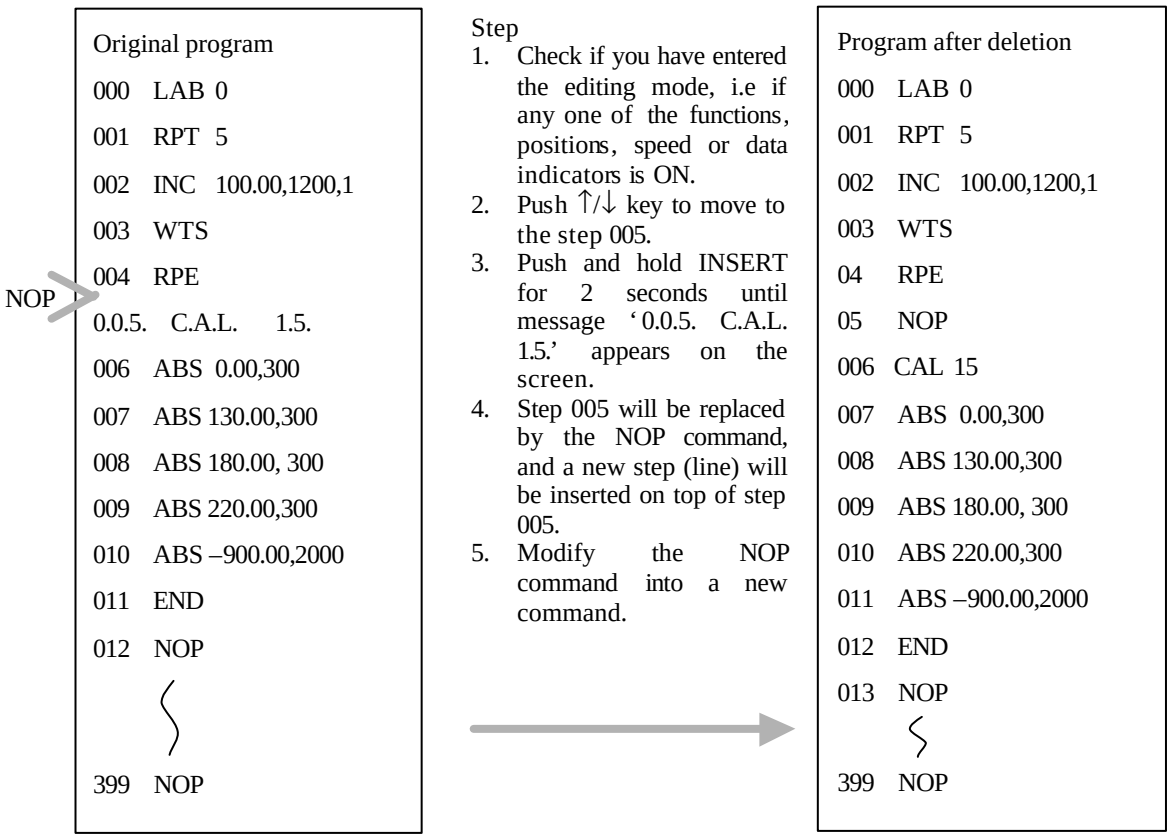
Deleting a step (line) in the program

Push MODE to switch to editing mode (MODE indicator off). Push ↑/↓ key to move to the step (line) you want to delete (the step you want to delete). Push and hold DELETE for 2 seconds. The decimals of the line will go on and then the step (line) will disappear. The selected step (line) has been deleted and the following step (line) will replace the deleted step (line).



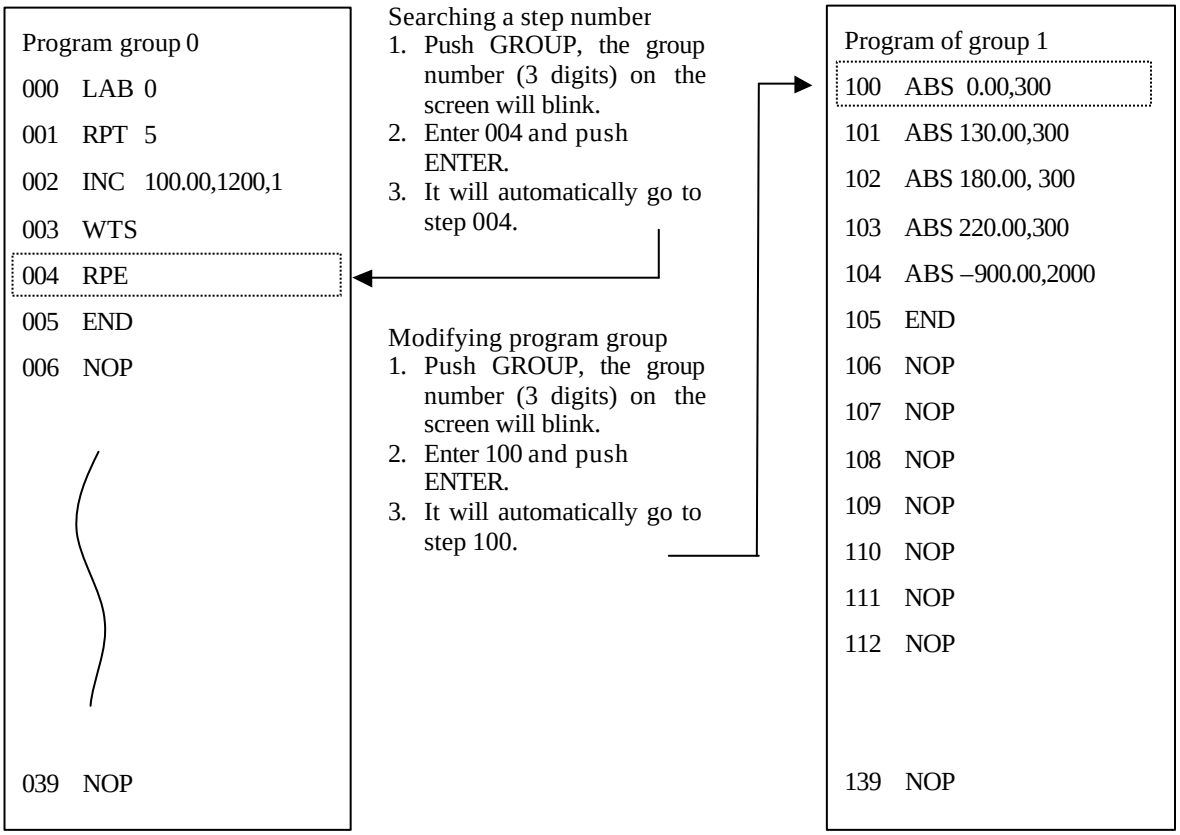
Inserting a step (line)

Push MODE to switch to editing mode (MODE indicator off). Push ↑/↓ key to move to the step (line) where a new step (line) will be inserted. Push and hold INSERT for 2 seconds. The decimals of the line will go on and then the step (line) will be replaced by the NOP command, and a new step (line) will be inserted on top of the selected step (line).

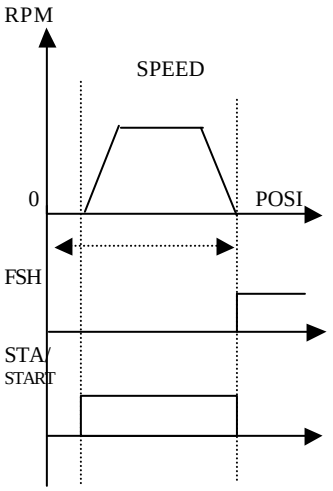


Modifying program groups (or searching a step number)

Users can change the program group (or search a step number) in operation or program setup modes.



Command Description

<table>
<tr><th rowspan="2">FUNC (function code)</th><th rowspan="2">POSI (position)</th><th rowspan="2">SPEED (speed)</th><th rowspan="2">DATA (data)</th><th colspan="2">Command application</th><th rowspan="2">Description</th></tr>
<tr><th>Program Editing Mode</th><th>Manual Motion Editing Mode</th></tr>
<tr><td rowspan="2">0(ABS)
Absolute Value Motion</td><td>Absolute Position
● -999999-99999 99 unit
● d0-d30 (AX0s model)
● d0-d126 (other models)
● d buffer is 32-bit data (for Mitsubishi PLC)</td><td>● 1-4000RPM
● d0-d30 (AX0S MODEL)
● d0-d126 (other models)
● d buffer is 32-bit data (for Mitsubishi PLC)</td><td>No setup required</td><td>√</td><td>√</td><td>● Based on the position of zero work (home), the motor will move from any position to the absolute position as defined in POSI at the speed as defined in SPEED and send FSH signal.
 
</td></tr>
<tr><td colspan="4">Example:

Group/Step Function Position Speed Data
0 00 0(ABS) 50.00 1500 x
0 01 0(ABS) 300.00 1500 x
0 02 0(ABS) 0.00 2000 x
0 03 9(END) x x x

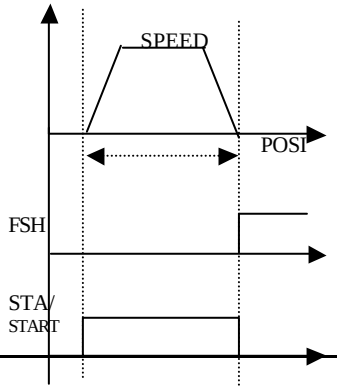
‘X’ means no data is needed, and the controller will reject any data.</td><td colspan="3">Description

The motor will move to absolute position 50.00 at 1500RPM/minute.

The motor will move to absolute position 300.00.

The motor will move to absolute position 0.00 (home) at 2000RPM/minute.

Program ends and resets to step 00 of the group.</td></tr>
</table>

FUNC (function code)	POSI (position)	SPEED (speed)	DATA (data)	Command application: Program Editing Mode	Command application: Manual Motion Editing Mode	Description
	Absolute Position ● -999999-99999 99 unit ● d0-d30 (AX0s model) ● d0-d126 (other models) ● d buffer is 32-bit data (for Mitsubishi PLC) ●	● 1-4000RPM ● d0-d30 (AX0S MODEL) ● d0-d126 (other models) ● d buffer is 32-bit data (for Mitsubishi PLC)	Repeat frequency ● 1-32767 ● d0-d30 (AX0S MODEL) ● d0-d126 (other models) ● d buffer is 32-bit data (for Mitsubishi PLC) ● Motion mode is limited to one time.	√	√	● Based on the current position, the motor will move forward/ backward at the distance as defined in POSI at the speed as defined in SPEED and send FSH signal. 
1(INC) Relative value motion	Example: Group/Step Function Position Speed Data 0 00 1(INC) 50.00 1500 x 0 01 1(INC) -250.00 1500 x 0 02 0(ABS) 0.00 2000 x 0 03 9(END) x x x 'X' means no data is needed, and the controller will reject any data.					Description The motor will move to the position at 50.00 away from the current position at 1500RPM/minute. The motor will move in reverse to the position 250.00 away from the current position. The motor will move to absolute position 0.00 (zero work) at 2000RPM/minute. Program ends and resets to step 00 of the group.

<table>
<tr><th rowspan="2">FUNC (function code)</th><th rowspan="2">POSI (position)</th><th rowspan="2">SPEED (speed)</th><th rowspan="2">DATA (data)</th><th colspan="2">Command application</th><th rowspan="2">Description</th></tr>
<tr><th>Program Editing Mode</th><th>Manual Motion Editing Mode</th></tr>
<tr><td rowspan="2">OSET</td><td>Relative position
●-999999-999999 unit
●d0-d30 (AX0S MODEL)
●d0-d126 (other models)
●d buffer is 32-bit data (for Mitsubishi PLC)</td><td>●1-4000RPM
●d0-d30 (AX0S MODEL)
●d0-d126 (other models)
●d buffer is 32-bit data (for Mitsubishi PLC)</td><td>Division frequency
●1-32767
●d0-d30 (AX0S MODEL)
●d0-d126 (other models)
●d buffer is 32-bit data (for Mitsubishi PLC)
●d buffer is 32-bit data (for Mitsubishi PLC)</td><td>√</td><td>X</td><td>●Based on the current position, motor will move forward/backward to the distance as defined (POSI÷DATA) at the speed as defined in SPEED and send FSH signal
●After moving according to the division frequency as defined by DATA, the cursor will automatically move to the next step.</td></tr>
<tr><td colspan="4">Example:

Group/Step Function Position Speed Data
0 00 2(DIV) 360.000 1500 7
0 01 2(DIV) -250.00 1500 2
0 02 0(ABS) 0.00 2000 x
0 03 9(END) x x x

‘X’ means no data is needed, and the controller will reject any data.</td><td colspan="3">Description

The motor will move to 360.000 away from the current position 7 times at 1500RPM/minute before moving to the next step.

The motor will move reversely to the position at 250.00 away from the current position twice before moving to the next step.

The motor will move to absolute position 0.00 (zero work) at 2000RPM/minute.

Program ends and resets to step 00 of the group.</td></tr>
</table>

<table>
<tr><th rowspan="2">FUNC (function code)</th><th rowspan="2">POSI (position)</th><th rowspan="2">SPEED (speed)</th><th rowspan="2">DATA (data)</th><th colspan="2">Command application</th><th rowspan="2">Description</th></tr>
<tr><th>Program Editing Mode</th><th>Manual Motion Editing Mode</th></tr>
<tr><td rowspan="2">3(HOM) Origin Motion</td><td>Origin deviation
● -999999-999999 unit
● d0-d30 (AX0S MODEL)
● d0-d126 (other models)
● d buffer is 32-bit data (for Mitsubishi PLC)</td><td>Origin speed 1-4000RPM
● d0-d30 (AX0S MODEL)
● d0-d126 (other models)
● d buffer is 32-bit data (for Mitsubishi PLC)</td><td>Origin reset direction
● 0: return to origin towards positive direction.
1: return to origin towards negative direction
● d0-d30 (AX0S MODEL)
● d0-d126 (other models)
● d buffer is 32-bit data (for Mitsubishi PLC)</td><td>√</td><td>√</td><td>● Search the DOG (and servo motor C signal) according to the direction as defined in DATA at the origin speed as defined in SPEED. After locating the origin, move origin deviation as defined in POSI and set deviation to ‘0’ (new origin). Then send FSH signal and ZERO output signal.
● Connect contact ‘a’ to DOG signal IN for origin extreme switch.</td></tr>
<tr><td colspan="4">Example: please program as follows (set origin to 25.00) if you don’t want to set origin to 0.

Group/Step Function Position Speed Data
X 00 21(MAC) x x 20
X 01 0(ABS) 0.00 2000 x
9 00 23(LAB) x x 20
9 01 3(HOM) -10.00 500 2
9 02 20(DFP) 25.00 x x
9 03 22(EDM) x x x

‘X’ means no data is needed, and the controller will reject any data.</td><td colspan="2">Description
Call Macro
After setting X00 to ON, the controller will search the assigned label in the program. In this example, it is to search LAB 20 command and run commands that lie between LAB 20 and EDM.

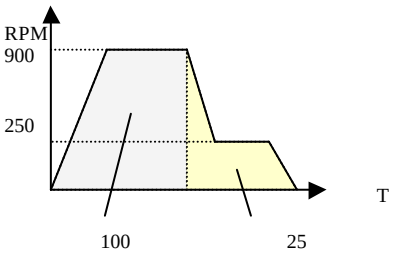
After setting X01 to ON, the motor will move to absolute position 0.00 (zero work) at 2000RPM/minute.

Label 20 (label will appear only in the program zone)

The motor will return to the origin by search DOG and C signal in the negative (reverse) direction at 500RPM. After locating the origin, the motor will move to a distance at 10.00 at 500RPM.

Write 25.00 to current position buffer.

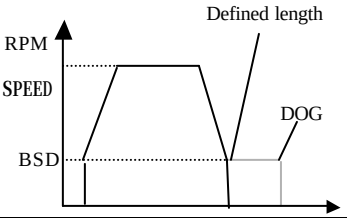
Macro ends and returns.</td></tr>
</table>

FUNC (function code)	POSI (position)	SPEED (speed)	DATA (data)	Command application: Program Editing Mode	Command application: Manual Motion Editing Mode	Description
4(TSP) 2-speed motion	Relative position ● -999999-999999 unit ● d0-d30 (AX0S MODEL) ● d0-d126 (other models) ● d buffer is 32-bit data (for Mitsubishi PLC) ● 2 command lines will be needed	● 1-4000RPM ● d0-d30 (AX0S MODEL) ● d0-d126 (other models) ● d buffer is 32-bit data (for Mitsubishi PLC)	No setup is required	√	√	● This command will need 2 command lines: 000:FUNC TSP,POSI 100,SPEED 900 001:FUNC TSP,POSI 25,SPEED 250  ● Based on the current position, the motor will move forward/ backward to the distance as defined in POSI at the speed as defined in SPEED. Then the controller will capture the speed as defined in SPEED of the following step and move the motor to the distance as defined in POSI and send FSH signal.

Example:

Group/Step	Function	Position	Speed	Data	Description
0 00	0(ABS)	200.00	1500	X	Position towards 200.00
0 01	4(TSP)	200.00	1500	X	2-speed towards 450.00
0 02	4(TSP)	50.00	80	X	
0 03	4(TSP)	-50.00	100	X	2-speed returns to 200.00
0 04	4(TSP)	-200.00	1500	X	
0 05	0(ABS)	0.00	1500	X	Return to position 0.00
0 06	9(END)				

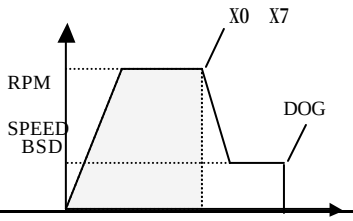
<table>
<tr><th rowspan="2">FUNC (function code)</th><th rowspan="2">POSI (position)</th><th rowspan="2">SPEED (speed)</th><th rowspan="2">DATA (data)</th><th colspan="2">Command application</th><th rowspan="2">Description</th></tr>
<tr><th>Program Editing Mode</th><th>Manual Motion Editing Mode</th></tr>
<tr><td>5(IN2)
Relative position motion 2</td><td>Relative position
●-999999-999999 unit
●d0-d30 (AX0S MODEL)
● d0-d126 (other models)
●d buffer is 32-bit data (for Mitsubishi PLC)</td><td>●1-4000RPM
●d0-d30 (AX0S MODEL)
● d0-d126 (other models)
●d buffer is 32-bit data (for Mitsubishi PLC)</td><td>Repeat frequency
●1-32767
●d0-d30 (AX0S MODEL)
● d0-d126 (other models)
●d buffer is 32-bit data (for Mitsubishi PLC)
●Motion is limited to one time</td><td>√</td><td>√</td><td>●Based on the current position, the motor will move forward/ backward at the distance as defined in POSI at the speed as defined in SPEED and send FSH signal.
●The difference between IN2 and INC commands is that IN2 will reset the origin every time before starting.

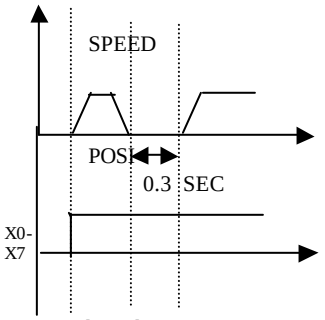
See examples for MK1.</td></tr>
<tr><td rowspan="2">6(MK1)
2-speed mark search motion</td><td>High speed feeding length
●-999999-999999 unit
●d0-d30 (AX0S MODEL)
● d0-d126 (other models)
●d buffer is 32-bit data (for Mitsubishi PLC)</td><td>●1-4000RPM
●d0-d30 (AX0S MODEL)
● d0-d126 (other models)
●d buffer is 32-bit data (for Mitsubishi PLC)</td><td>No setup is required</td><td>√</td><td>√</td><td>●The controller will reset the origin every time before starting.
●Based on the current position, the motor will move forward/ backward at the distance as defined in POSI at the speed as defined in SPEED. Then the motor will move at a low speed as defined in BSD until the sensor detects the mark and sends FSH signal.
●Connect contact ‘a’ to DOG signal IN for sensor mark.
 
</td></tr>
<tr><td colspan="4">Example:

Group/Step Function Position Speed Data
0 00 35(LD) X X 0
0 01 43(CJ) X X 10
0 02 5(IN2) 150.00 2000 1
0 03 26(JMP) X X 11
0 04 23(LAB) X X 10
0 05 6(MK1) 150.00 2000 X
0 06 23(LAB) X X 11
0 07 9(END)</td><td colspan="3">Description

Go to LAB 10 if X0 is ON.
Feeding 150.00
Go to LAB 11

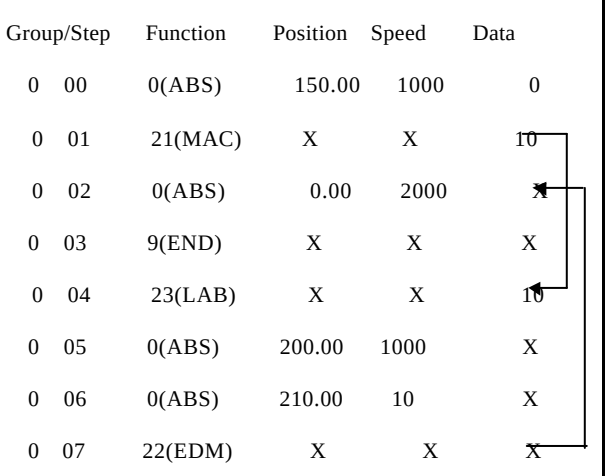
2-speed signal search</td></tr>
<tr><td>7(NOP)
Reserved</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

FUNC (function code)	POSI (position)	SPEED (speed)	DATA (data)	Command application		Description
				Program Editing Mode	Manual Motion Editing Mode	
8(NOP) Reserved	●					●
9(END) Program ends	No setup is required	No setup is required	No setup is required	√	√	●When the program runs to the END command, the program will end and return to step 0 of the group and wait for the next Start signal to repeat the program.
10(NOP) Reserved						
11 (NOP) Reserved						●
12(MK3) Mark Command 3 2-speed mark search	No setup is required	●1-4000RPM ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	Low speed mark search input point ●0-7(X0-X7) ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	√	√	● Based on the current position, the motor will move forward/backward at the distance as defined in POSI at the high speed as defined in SPEED until reaching the sensor mark input point (X0-X7). Then the motor will run at a low speed as defined in BSD until the DOG signal is ON and then send the FSH signal. 
13(NOP) Reserved						
14(NOP) Reserved						
15(NOP) Reserved						
16(NOP) Reserved						

FUNC (function code)	POSI (position)	SPEED (speed)	DATA (data)	Command application: Program Editing Mode	Command application: Manual Motion Editing Mode	Description
17(PJG) +JOG motion	Motion length ●1-999999 unit ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	Jog speed ●1-4000RPM ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ● d buffer is 32-bit data (for Mitsubishi PLC)	No setup is required		√	●When the corresponding motion input point (X0-X7) is ON, the motor will run forward at the length as defined in POSI. If the corresponding input point is set to ON for over 0.3 seconds, the motor will run forward at the speed as defined in SPEED and reduce the speed and stop until the corresponding input point (X0-X7) is OFF. ●The corresponding motion input point can be any point between X0-X7, depending on the data as defined in steps X00-X07.  ●Ex.: when the PJG is programmed at X00 (X00 PJG), PJG will be executed at input point X0.
	See examples for MPG commands.					
18(MJG) -JOG motion	Motion length ●1-999999 unit ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	Jog speed ●1-4000RPM ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	No setup is required		√	●When the corresponding motion input point (X0-X7) is ON, the motor will run backward at the length as defined in POSI. If the corresponding input point is set to ON for over 0.3 seconds, the motor will run backward at the speed as defined in SPEED and reduce the speed and stop until the corresponding input point (X0-X7) is OFF. ●The corresponding motion input point can be any point between X0-X7, depending on the data as defined in steps X00-X07. ●Ex.: when the MJG is programmed at X00 (X00 MJG), MJG will be executed at input point X0.
	See examples for MPG commands.					

<table>
<tr><th rowspan="2">FUNC (function code)</th><th rowspan="2">POSI (position)</th><th rowspan="2">SPEED (speed)</th><th rowspan="2">DATA (data)</th><th colspan="2">Command application</th><th rowspan="2">Description</th></tr>
<tr><th>Program Editing Mode</th><th>Manual Motion Editing Mode</th></tr>
<tr><td rowspan="2">19(MPG) Manual Jog Motion</td><td>Corresponding length of movement of every MPG pulse
●1-999999 unit
●d0-d30 (AX0S MODEL)
● d0-d126 (other models)
●d buffer is 32-bit data (for Mitsubishi PLC)</td><td>No setup is required</td><td>No setup is required</td><td></td><td>√</td><td>●When the corresponding motion input point (X0-X7) is ON, SUPER-1NC will scan the manual jog knob input port. When pulse from the knob is detected, the motor will run in the direction and at the length as defined in POSI by the knob. The speed of knob rotation will determine the motor speed. The MPG command will end when the corresponding input point (X0-X7) is OFF.
●The corresponding motion input point can be any point between X0-X7, depending on the data as defined in steps X00-X07.
●Ex.: when the MJG is programmed at X04 (X04 MJG), MJG will be executed at input point X4.</td></tr>
<tr><td colspan="6">●Different speeds of manual jog knob (1x,10x, 100x); external connections of +/- jog and teach keys.

Example
Group/Step Function Position Speed Data Description
X 00 17(PJG) 0.10 100 X Set input point X0 to +jog
X 01 18(MJG) 0.10 100 X Set input point X1 to -jog
X 02 19(MPG) 0.01 X X Set input point X2 to manual jog 1x
X 03 19(MPG) 0.10 X X Set input point X3 to manual jog 10x
X 04 19(MPG) 1.00 X X Set input point X4 to manual jog 100x
X 05 28(TCH) 0 1000 X Set input point X5 to teach absolute position command
X 06 28(TCH) 9 1000 X Set input point X6 to teach command end. When the teach command ends, speed becomes meaningless.</td></tr>
<tr><td>20(DFP) Defining Position</td><td>Newly defined position coordinate
●-999999-999999 unit
●d0-d30 (AX0S MODEL)
● d0-d126 (other models)
●d buffer is 32-bit data (for Mitsubishi PLC)</td><td>No setup is required</td><td>No setup is required</td><td>√</td><td>√</td><td>●Modify current position to the position as defined in POSI.
●DFP only modifies the position that is displayed on the screen without moving the motor to such position.</td></tr>
</table>

<table>
<tr><th rowspan="2">FUNC
(function code)</th><th rowspan="2">POSI
(position)</th><th rowspan="2">SPEED
(speed)</th><th rowspan="2">DATA
(data)</th><th colspan="2">Command application</th><th rowspan="2">Description</th></tr>
<tr><th>Program Editing Mode</th><th>Manual Motion Editing Mode</th></tr>
<tr><td>21(MAC)
Call Macro</td><td>No setup is required</td><td>No setup is required</td><td>Macro start label (LAB) number
● 0-99
● d0-d30 (AX0S MODEL)
● d0-d126 (other models)
● d buffer is 32-bit data (for Mitsubishi PLC)</td><td>√</td><td>√</td><td>● When Super-1NC runs the MAC command, the cursor will point to the LAB number as defined in DATA and continue to run commands between that label number and EDM command, in order to make commands between MAC and EDM become a series of compound motions.
● The MAC command in motion mode can only call the corresponding LAB in the program mode, for users cannot write any LAB in the motion mode.</td></tr>
<tr><td rowspan="2">22(EDM)
End of Macro</td><td>No setup is required</td><td>No setup is required</td><td>No setup is required</td><td>√</td><td></td><td>● EDM is the corresponding command of MAC. That is to say, when there is a MAC command, there must be an EDM command in the syntax.
● EDM refers to end the corresponding MAC command, in order to complete this compound macro command and send FSH signal. When the program runs to EDM, the cursor will return to the command line under the corresponding MAC command and waits for another start signal.</td></tr>
<tr><td colspan="4">Example:
 
Group/Step Function Position Speed Data
0 00 0(ABS) 150.00 1000 0
0 01 21(MAC) X X 10
0 02 0(ABS) 0.00 2000 X
0 03 9(END) X X X
0 04 23(LAB) X X 10
0 05 0(ABS) 200.00 1000 X
0 06 0(ABS) 210.00 10 X
0 07 22(EDM) X X X</td><td colspan="2">Description
Send FSH signal at position 150.00.
Call macro 10
Send FSH signal at position 0.00.
End macro
Move to 200.00
Move again to 210.00
Send FSH signal</td></tr>
</table>

FUNC (function code)	POSI (position)	SPEED (speed)	DATA (data)	Command application		Description
				Program Editing Mode	Manual Motion Editing Mode	
23(LAB) Label	No setup is required	No setup is required	Label number ●0-99 (program mode) ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	√		●LAB commands set in program mode (000-939 or 0-399). Label numbers must be between 0-99 without repetition. ●LAB commands cannot be set in motion mode (X00-X32). ●A label number is a memory position indicator as reference for MAC, CAL and JMP commands and the indication of the following command. ●SUPER 1-NC will add '1' to the program indication when running a LAB command and run the command in the following line automatically.
24 (CAL) Call Subroutine	No setup is required	No setup is required	Start LAB number of subroutines ●0-19 (program mode) ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	√		●SUPER-1NC will move the command cursor to the command line under the LAB number as defined in DATA when meeting a CAL command and run the commands on that line. ●A subroutine is a group of commands. In application, it refers to the same group of commands that will be run in different lines of a program, so we program them in a subroutine and add the CAL command to the program to run the subroutine to save space for the program. ●Both CAL and MAC refer to a group of commands. The difference between them is that when there are motor motion commands (ABS, INC, HOM, etc.) between CAL and RET, CAL will send a FSH signal after completing every motion command; while MAC will only send the FSH signal until the EDM.
25(RET) Return to Subroutine	No setup is required	No setup is required	No setup is required	√		●RET is the corresponding command to CAL. That is to say, when there is a CAL command, there must be a RET command in the syntax. ●RET refers to end a CAL command. When the program runs to RET, the cursor will return to the line under CAL and wait for the next start signal. ●No multiple calls are allowed between CAL and RET.

FUNC (function code)	POSI (position)	SPEED (speed)	DATA (data)	Command application		Description
				Program Editing Mode	Manual Motion Editing Mode	
26(JMP) Jump	No setup is required	No setup is required	●Unconditional jump LAB number ● ●0-19 (program mode) ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	√		●SUPER-1NC will move the command cursor to the command line under the LAB number as defined in DATA when meeting a JMP command and run the commands on that line.
27(OUT) Multi-point output or reset	No setup is required	No setup is required	●00000-11111 ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	√	√	●When the corresponding BIT=1, the output point is ON. On the contrary, when the corresponding BIT=0, the output point is OFF. ●BIT0 controls Y4 BIT1 controls Y3 BIT2 controls Y2 BIT3 controls Y1 BIT4 controls Y0 Ex.: FUNT OUT,DATA 01100 represents Y1 and Y2 ON; and Y0, Y3 and Y4 OFF ● Y0-Y4 have two ways of output determined by parameters FNH (Y0), END (Y1), INM (Y2), ZRO (Y3), and ALM (Y4). Users must set the corresponding parameter to '0' to enable real action of the OUT command, in order to tell SUPER-1NC to stop any specific function at that output point and accept the control of the OUT command.

FUNC (function code)	POSI (position)	SPEED (speed)	DATA (data)	Command application		Description
				Program Editing Mode	Manual Motion Editing Mode	
28(TCH) Teach	0: write current position to the current command and set start command code to absolute position command. 9: set command code in the current command line to end command. Dn: write current position to the specific D buffer.	●1-4000RPM ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	No setup is required		√	●Move to the expected teach position by +/-JOG or Manual JOG. When you execute the TCH command, the current position coordinate and speed as defined in TCH will be written to the step where the cursor is located with an ABS command. The cursor will be moved to the following command line automatically to facilitate the teaching of the next coordinate. ●If you push TCH in Data Setup Mode, the current position will be written to the D buffer of the current screen. ●You cannot execute other commands at the same time when MPG is executed. Therefore, you must exit the MPG manual jog function before running the TCH command. After executing the TCH command, you will need to run MPG manual jog again. ●SUPER-1NC prevents repeated entries of the same coordinate in consecutive steps. That is to say, if you run TCH twice at the same position, SUPER-1NC will only accept the first TCH command and reject the second one.
29(PCR) Program Cursor Reset	No setup is required	No setup is required	No setup is required		√	●Reset program cursor to the start of the group.
30(WAT) Waiting ON	No setup is required	No setup is required	●0-7 ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	√		● Waiting for the input point (X0-X7) as defined in DATA is ON.
31(TMR) Pause 1	No setup is required	No setup is required	●0-32767 (unit: 0.01 second) ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	√		● Pause 1—pause for a period of time as defined in DATA.

FUNC (function code)	POSI (position)	SPEED (speed)	DATA (data)	Command application		Description
				Program Editing Mode	Manual Motion Editing Mode	
32(PGS) Program Group Select	No setup is required	No setup is required	●0-9 (Group n) ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)		√	●When Super-1NC runs to the command as defined by the PGS, the program cursor will move to line 0 of the group that defined in DATA and execute commands on that line.
33(RPT) Repeat Start	No setup is required	No setup is required	●0-32767 (unit: times) ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	√		●Program repeated motions between RPT and RPE commands to repeat these motions at the defined frequency. ●Under RPT, you can program up to 8 levels of RPT commands.
34(RPE) Repeat End	No setup is required	No setup is required	No setup is required	√		●Repeat end.

FUNC (function code)	POSI (position)	SPEED (speed)	DATA (data)	Command application: Program Editing Mode	Command application: Manual Motion Editing Mode	Description
	Example: Group/Step Function Position Speed Data 0 00 33(RPT) x x 3 0 01 0(ABS) 300.00 1500 x 0 02 1(INC) 1.00 10 2 0 03 34(RPE) x x x 0 04 0(ABS) 0.00 3000 x 0 05 9(END) x x x 'X' means no data is needed, and the controller will reject any data.					Description Repeat steps 01 and 02, 3 times The motor will move to absolute coordinate 300.00 at 1500RPM/minute. The motor will move to a distance at 1.00 away from the current position twice before the program executing commands in the following command line. Repeat end and return to step 00. Executing frequency will be reduced by one. The motor will move to absolute coordinate 0.00 (zero work) at 2000RPM/minute. Program ends and reset cursor to step 00 of the group.
35(LD) Logic start Contact 'a'	No setup is required	No setup is required	X0~X7 Setup range:0~7 Y0~Y4 Setup range:10~14	√		●Logic start Contact 'a'
36(LDI) Logic start Contact 'b'	No setup is required	No setup is required	X0~X7 Setup range:0~7 Y0~Y4 Setup range:10~14	√		●Logic start Contact 'b'

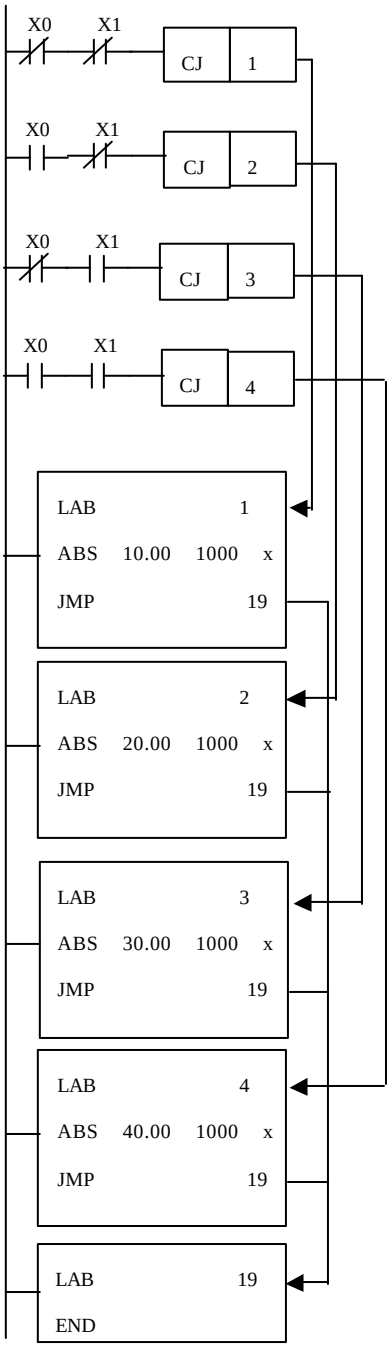
FUNC (function code)	POSI (position)	SPEED (speed)	DATA (data)	Command application		Description
				Program Editing Mode	Manual Motion Editing Mode	
37(AND) Connect Contact ‘a’ in series	No setup is required	No setup is required	X0~X7 Setup range:0~7 Y0~Y4 Setup range:10~14	√		●Connect Contact ‘a’ in series
38(ANI) Connect Contact ‘b’ in series	No setup is required	No setup is required	X0~X7 Setup range:0~7 Y0~Y4 Setup range:10~14	√		●Connect Contact ‘b’ in series
39(OR) Connect Contact ‘a’ in parallel	No setup is required	No setup is required	X0~X7 Setup range:0~7 Y0~Y4 Setup range:10~14	√		●Connect Contact ‘a’ in parallel
40(ORI) Connect Contact ‘b’ in parallel	No setup is required	No setup is required	X0~X7 Setup range:0~7 Y0~Y4 Setup range:10~14	√		●Connect Contact ‘b’ in parallel
41(ANB) Connect two loops in series	No setup is required	No setup is required	No setup is required	√		●Connect two loops in series
42(ORB) Connect two loops in parallel	No setup is required	No setup is required	No setup is required	√		●Connect two loops in parallel
43(CJ) Conditional Jump	No setup is required	No setup is required	●LAB number 00-19 (Program mode) ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	√		●Conditional jump of commands
44(CJN) Conditional Jump Reverse	No setup is required	No setup is required	●LAB number 1=00-19 (Program mode) ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	√		●Jump commands when condition is OFF

FUNC (function code)	POSI (position)	SPEED (speed)	DATA (data)	Command application		Description
				Program Editing Mode	Manual Motion Editing Mode	

Example:

Group/Step	Function	Position	Speed	Data
0 00	36(LDI)	x	x	0
0 01	38(ANI)	x	x	1
0 02	43(CJ)	x	x	1
0 03	35(LD)	x	x	0
0 04	38(ANI)	x	x	1
0 05	43(CJ)	x	x	2
0 06	36(LDI)	x	x	0
0 07	37(AND)	x	x	1
0 08	43(CJ)	x	x	3
0 09	35(LD)	x	x	0
0 10	37(AND)	x	x	1
0 11	43(CJ)	x	x	4
0 12	23(LAB)	x	x	1
0 13	0(ABS)	10.00	1000	x
0 14	26(JMP)	x	x	19
0 15	23(LAB)	x	x	2
0 16	0(ABS)	20.00	1000	x
0 17	26(JMP)	x	x	19
0 18	23(LAB)	x	x	3
0 19	0(ABS)	30.00	1000	x
0 20	26(JMP)	x	x	19
0 21	23(LAB)	x	x	4
0 22	0(ABS)	40.00	1000	x
0 23	26(JMP)	x	x	19
0 24	23(LAB)	x	x	19
0 25	9(END)	x	x	x

Description



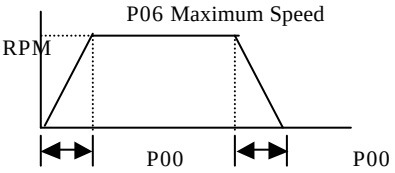
'X' means no data is needed, and the controller will reject any data.

FUNC (function code)	POSI (position)	SPEED (speed)	DATA (data)	Command application		Description
				Program Editing Mode	Manual Motion Editing Mode	
45(WTN) Waiting OFF	No setup is required	No setup is required	●0-7 ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	√		● Waiting for input point (X0-X7) as defined in DATA is OFF.
46(WTS) Waiting for Start	No setup is required	No setup is required	No setup is required	√		● Waiting for external STA raising end signal.
47(ADD) Addition of values	Summand ●-999999-999999 ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	Addend ●1~4000 ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	Sum ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC) ●Once in motion mode	√	√	●Addition FUNC POSI SPEED DATA ADD 6930.00 25 D4 ADD 360000 D0 D4 ADD D0 1 D4 ADD D0 D2 D4 693000+25=D4 (decimal omitted) 360000+D0=D4 D0+1=D4 D0+D2=D4
48(SUB) Subtraction of values	Minuend ●-999999-999999 ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	Subtrahend ●1~4000 ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	Balance ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC) ●Once in motion mode	√	√	●Subtraction FUNC POSI SPEED DATA SUB 6930.00 25 D4 SUB 360000 D0 D4 SUB D0 1 D4 SUB D0 D2 D4 693000-25=D4 (decimal omitted) 360000-D0=D4 D0-1=D4 D0-D2=D4
49(MUL) Multiplication of values	Multiplicand ●-999999-999999 ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	Multiplier ●1~4000 ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	Product ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC) ●Once in motion mode	√	√	●Multiplication ●Do not cross digit over in 32-bit calculation FUNC POSI SPEED DATA MUL 6930.00 25 D4 MUL 360000 D0 D4 MUL D0 1 D4 MUL D0 D2 D4 693000×25=D4 (decimal omitted) 360000×D0=D4 D0×1=D4 D0×D2=D4

FUNC (function code)	POSI (position)	SPEED (speed)	DATA (data)	Command application: Program Editing Mode	Command application: Manual Motion Editing Mode	Description
50(DV2) Division of values	Dividend ●-999999-999999 ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	Divisor ●1~4000 ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	Quotient ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC) ●Once in motion mode	√	√	●Division ●The quotient will be saved in the buffer as defined in DATA. Remainder will be saved in the buffer next to the buffer as defined in DATA. FUNC POSI SPEED DATA DV2 6930.00 25 D4 DV2 360000 D0 D4 DV2 D0 1 D4 DV2 D0 D2 D4 693000÷25=D4 (decimal omitted) …..D6 360000÷D0=D4…..D6 D0÷1=D4……D6 D0÷D2=D4……D6
51(GRT) Greater Than	First Value ●-999999-999999 ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	Second Value ●1~4000 ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	No setup is required	√		Example If D0>100, jump to LAB 9. FUNC POSI SPEED DATA GRT D0 100 CJ 9 …… …… …… LAB 9 …… ……
52(EQU) Equal To	First Value ●-999999-999999 ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	Second Value ●1~4000 ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	No setup is required	√		Example If 100000=D0, jump to LAB 9. FUNC POSI SPEED DATA GRT 1000.00 D0 CJ 9 …… …… …… LAB 9 …… ……
53(LES) Less Than	First Value ●-999999-999999 ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	Second Value ●1~4000 ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	No setup is required	√		Example If D0<D2, jump to LAB 9. FUNC POSI SPEED DATA LES D0 D2 CJ 9 …… …… …… LAB 9 …… ……

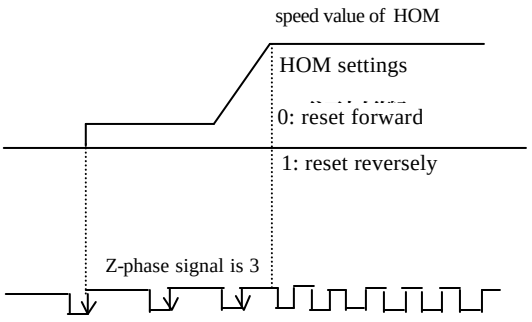
FUNC (function code)	POSI (position)	SPEED (speed)	DATA (data)	Command application		Description
				Program Editing Mode	Manual Motion Editing Mode	
54(SET) Single Point Out	No setup is required	No setup is required	●50-54 ●400-431 ●50=Y0 ●51=Y1 ●52=Y2 ●53=Y3 ●54=Y4 ●400=M400 ●431=M431 ●M400-M431 correspond to M400-M431 of PLC connected via RS422 ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	√	√	Example Y0 ON for 1 second and then Y0 OFF FUNC POSI SPEED DATA SET 50 TMR 100 RST 50 SET 400 TMR 200 RST 400 ● Y0-Y4 have two ways of output determined by parameters FNH (Y0), END (Y1), INM (Y2), ZRO (Y3), and ALM (Y4). Users must set the corresponding parameter to '0' to enable real action of the SET command, in order to tell SUPER-1NC to stop any specific function at that output point and accept the control of the SET command.
55(RST) Single Point Reset	No setup is required	No setup is required	●50-54 ●400-431 ●50=Y0 ●51=Y1 ●52=Y2 ●53=Y3 ●54=Y4 ●400=M400 ●431=M431 ●M400-M431 correspond to M400-M431 of PLC connected via RS422 ●d0-d30 (AX0S MODEL) ● d0-d126 (other models) ●d buffer is 32-bit data (for Mitsubishi PLC)	√	√	Example Y0 ON for 1 second and then Y0 OFF FUNC POSI SPEED DATA SET 50 TMR 100 RST 50 SET 400 TMR 200 RST 400 ● Y0-Y4 have two ways of output determined by parameters FNH (Y0), END (Y1), INM (Y2), ZRO (Y3), and ALM (Y4). Users must set the corresponding parameter to '0' to enable real action of the SET command, in order to tell SUPER-1NC to stop any specific function at that output point and accept the control of the SET command.

Parameter Descriptions

Parameter	Setup Range/Unit	Functions
P00 ACC (Acceleration/Deceleration Duration)	0-5000 ms	● The duration of motor accelerating to the RPM as defined in parameter P06 MSD. Deceleration duration equals to acceleration duration. ● 
P01 DOT (Decimal Places of Position Value)	0-3 decimal places	● Number of decimal places of position value as displayed in POSI or auto mode P02=0 000000 P02=1 00000.0 P02=2 0000.00 P02=3 000.000 } Position displayed value
P02 DIR (Rotation Direction)	0-1	● 0=Forward and 1=Reverse. ● When the motor rotates in a different direction, set parameter '0' to '1' or '1' to '0' to change the direction of motor rotation. Do not change motor wiring.
P03 ARN (Auto Run Mode)	0-99 unit:0.1sec	● After receiving a STA signal or pushing the START key on the front panel: 0: Run one step for every STA signal (for use in program debug). 1: Super-1NC will run automatically through the program step-by-step from the current command (for use in normal operation). 2-99: Super-1NC will run through the program step-by-step automatically and hold for 1-98 time units (unit=0.1sec) between steps before continuing to the next step until the 'END' command (for use in checking motor operation).
P04 BAK (Back Seam Compensation Value)	0-65535 Pulses	● Single side compensation of seams between gear seams.
P05 PPR (Pulses of Motor 1 Rotation)	1-16384 PPR	● Number of pulses of servo/stepper motor 1 rotation.
P06 MSD (Maximum Speed)	1-4000 RPM	● The motor will not run faster than this value. It helps to prevent the motor from speeding due to erroneous data input by operators. ● Acceleration/deceleration settings are related to this parameter.
P07 BSD (Auto Start Speed)	1-300 RPM	● Auto start speed of stepper motors. ● Set value to '0' when using servo motors.
P08 OLK (Operation Key Lock)	0-1	● 0 0 0 0 0 0 0 0 TEACH ZERO SET ZERO HOME -JOG +JOG START ● 0: Key Unlocked ● 1: Key Locked

Parameter	Setup Range/Unit	Functions
P09 EL1 (Editing Key Lock 1)	0-1	● 0 0 0 0 DATA SPEED POSI FUNC ● 0: Key Unlocked ● 1: Key Locked
P10 EL2 (Editing Key Lock 2)	0-1	● 0 0 0 0 D DEL INS PROG NO ● 0: Key Unlocked ● 1: Key Locked
P11 CMX (Electronic Gear Ratio Multipliers)	1-65535	Example Guide screw length is 5mm, motor to screw deceleration ratio is 1:2, motor 1 rotation is 4000PPR, expected setup unit is mm, two decimal places (i.e., the minimal setup unit is 100 threads). What is the setup value of CMX and CDV? 4000 * 2 = 500 threads 8000 = 500 threads 1 Thread = 8000/500 = 80/5 = 16/1 → CMX (P11) → CDV (P12) Example Roller diameter is 77mm, motor to roller deceleration ratio is 20:30, motor 1 rotation is 4000PPR, expected setup unit is mm, and one decimal place (i.e., the minimal setup unit is 10 threads). What is the setup value of CMX and CDV? 4000 * 30/20 = 770 * 3.14159 (10 threads) 6000 = 2419 1= 6000/2420 = 600/242 → CMX (P11) → CDV (P12)
P12 CDV (Electronic Gear Ratio Divisor)	1-65535	
P13 NOP		●
P14 PSL (Positive Software Limit)	0-999999 unit	● The forward running motor will decelerate and stop when meeting the positive limit switch or exceeding the position as defined in this parameter.
P15 MSL (Negative Software Limit)	0-999999 unit	● The reverse running motor will decelerate and stop when meeting the positive limit switch or exceeding the position as defined in this parameter.
P16 ESS (Edit Shortcut Select)	0-1	● 0: push MODE to enter program-editing mode. ● 1: push MODE to enter data editing mode

<table>
<tr><th>Parameter</th><th>Setup Range/Unit</th><th colspan="5">Functions</th></tr>
<tr><td rowspan="4">P17 DSP
(Display mode of LEDs in auto mode)</td><td rowspan="4">0-3</td><td>Setup Value</td><td>0</td><td>1</td><td>2</td><td>3</td></tr>
<tr><td>LED Display Row 1</td><td>Step/ Command</td><td>Step/ Command</td><td>Dn</td><td>Dn</td></tr>
<tr><td>LED Display Row 2</td><td>Position</td><td>Dn</td><td>Position</td><td>Dn</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td>P18 Dn1
(LED Display Row 1—Dn in auto mode)</td><td>AX0S: 0-30
Others: 0-126
(even numbers only)</td><td colspan="5">● When parameter P17DSP is set to 2 or 3, display value of LED display row 1 will be determined by this parameter. The value of this parameter represents Dxx in D buffer.
Ex.: P17=2
P18=10
Instead of step/command, LED display row 1 will display the content of D10 in auto mode.</td></tr>
<tr><td>P19 Dn2
(LED Display Row 2—Dn in auto mode)</td><td>AX0S : 0-30
Others : 0-126
(even numbers only)</td><td colspan="5">● When parameter P17DSP is set to 1 or 3, display value of LED display row 2 will be determined by this parameter. The value of this parameter represents Dxx in D buffer.
Ex.: P17=1
P19=6
Instead of position, LED display row 1 will display the content of D6 in auto mode.</td></tr>
<tr><td>P20 BRK
(Brake Function)</td><td>0-1</td><td colspan="5">● 0 : without braking system
● 1 : with braking system</td></tr>
<tr><td>P21
FNH (Finish Signal)</td><td>0-100</td><td colspan="5">● 0: controlled by Bit 4 of an OUT command.
● 1: switch Y0 to ON after motion commands are completed and switch Y0 to OFF after the next motion command starts.
● 2-100: switch Y0 to ON for 0.1-10 seconds after motion commands are completed.</td></tr>
<tr><td>P22
END (End Signal)</td><td>0-100</td><td colspan="5">● 0: controlled by Bit 3 of an OUT command.
● 1: switch Y1 to ON when executing an END command and switch Y1 to OFF after the next motion command starts.
● 2-100: switch Y1 to ON for 0.1-10 seconds when executing an END command.</td></tr>
<tr><td>P23
INM (Motor in Action Signal)</td><td>0-1</td><td colspan="5">● 0: controlled by Bit 2 of an OUT command.
● 1: switch Y2 to ON when the motor is in action and switch Y2 to OFF when the motor stops.</td></tr>
<tr><td>P24
ZRO (Zero Work Signal)</td><td>0-1</td><td colspan="5">● 0: controlled by Bit 1 of an OUT command.
● 1: switch Y3 to ON when the motor is at zero work position and switch Y3 to OFF when the motor leaves that position.</td></tr>
<tr><td>P25
ARM (Driver Fault Signal)</td><td>0-100</td><td colspan="5">● 0: controlled by Bit 0 of an OUT command.
● 1: switch Y4 to ON when there is a driver fault and set Y4 to OFF when the driver works normally.</td></tr>
<tr><td>P26
ROT (Rotary Table Version)</td><td>0-1</td><td colspan="5">● 0: straight line feeding, e.g., ball screw and cylinder feeding.
● 1: Rotary table, display value will reset to ‘0’ automatically at 360°.</td></tr>
<tr><td>P27
MAT (Manual Acceleration/Deceleration Time)</td><td>10-500 ms</td><td colspan="5">● To facilitate the smooth rotation of motor when using manual jog, users can set a suitable acceleration/deceleration speed.</td></tr>
<tr><td>P28
GRP (Program Grouping)</td><td>0-1</td><td colspan="5">● 0: one group with 400 steps.
● 1: ten groups with 40 steps each group.</td></tr>
</table>

Parameter	Setup Range/Unit	Functions
P29 DPL (Edit Display Limits)	0-1	● 0: view full program space ● 1: view and edit program from START to END, excluding END commands. It can be use to regulate the format of program.
P30 MDR (Manual Jog Direction)	0-1	● 0: manual jog and motor rotation are in the same direction. ● 1: manual jog and motor rotation are in reverse direction. When to use: when the motor is driven by manual jog or the encoder, if users desires to reverse the rotation of motor, set P30 from '0' to '1' or '1' to '0'. Do not change manual jog wiring.
P31 MUL (ENCODER Multiplier)	1, 2 and 4	● Users will need to adjust the multiplier when using manual jog or encoder to enter Super-1NC. Ex. Manual jog is 25PPR, and users expect Super-1NC to run at 100PPR, then set P31 to '4'.
P32 PLC (PLC Item Name)	0-3 ● 0:FX0S(AX0S) ● 1:FX0N(AX0N) ● 2:FX2 ● 3:FX2N	● When Super-1NC is connected to PLC, users will need to set the PLC item name to determine the transfer format and corresponding position of D buffer.
P33 NOP		●
P34 STN (Workstation Number)	0~8	● 0: the controller will connect to a PLC via RS-422 according to the PLC item name as defined in P32 in a way identical to any man-machine interface available on the market. That is to say, Super-1NC will continue to request data from the PLC. ● 1-8: use of one PC or PLC as master control and connect to a maximum of 8 controllers, in order to multipoint control from one PC or PLC. ● Caution: do not repeat workstation number, data transfer will be intrigued.
P35 ZRS (origin low speed setup)	1-100 RPM Default: 5RPM	● The speed that 1NC runs between the origin (DOG) and Z–phase after running the home (HOM) command.
P36 ZSC (Z-phase signal)	0~255 Default: 1	● 1NC will decelerate when approaching the origin and stop at the Z-phase. ● If the speed is high (500RPM or above) and the Z-phase signal frequency is low (2 or less), machines will vibrate due to emergency stop. ● Set value to '0' when using stepper motors. 
P37 SPM (Stop Mode)	0~1 Default: 1	● 0: the motor will stop in stop mode and continue in the incomplete motion after restart. If users push any key or run any command after stop, the program will reset. ● 1: the motor will stop and reset automatically, and will run from step 0 after restart.

Parameter	Setup Range/Unit	Functions
P38 PWD (Password Setup)	0~9999	● 0: no password for entering parameter setup ● 0001-9999: users will need to enter a password before entering parameter setup. The controller will return to automatic display screen automatically if the password is incorrect.

CN1 PIN Descriptions (9-PIN D Connector , RS-422 TO PLC):

PIN	Name	Description
1	RXD+	RXD+ of RS-422
2	RXD-	RXD- of RS-422
3	5G	5G
4	TXD+	TXD+ of RS-422
5	TXD-	TXD- of RS-422
6	NC(TXD2+)	Reserved
7	NC(TXD2-)	Reserved
8	5G	5G
9	5G	5G

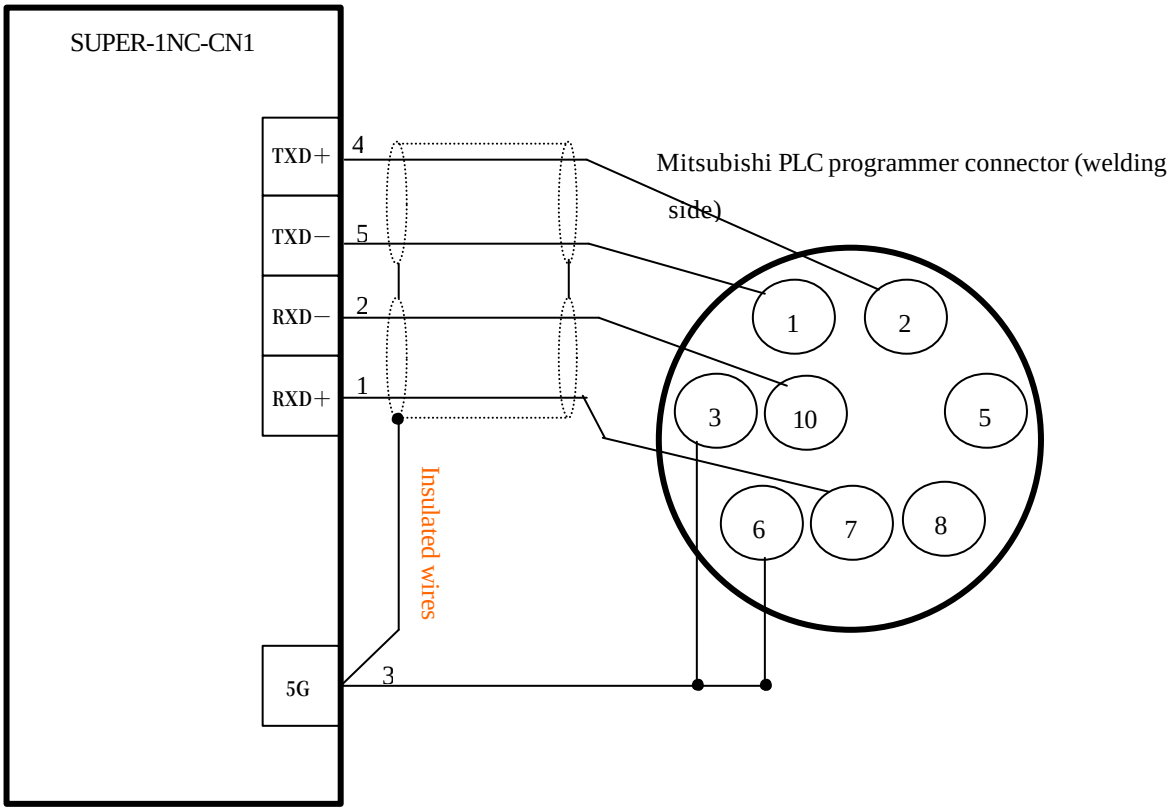
CN2 PIN Descriptions (26-PIN High Density D Connector, TO DRIVER):

PIN	Name	Description
1	PULSE-	Negative Pulse Signal
2	PULSE+	Positive Pulse Signal
3	DIR-	Negative Direction Signal
4	DIR+	Positive Direction Signal
5	A	ENCODER Feedback Signal A
6	A/	ENCODER Feedback Signal A/
7	B	ENCODER Feedback Signal B
8	B/	ENCODER Feedback Signal B/
9	24V	24V/0.1A output for use by drivers
10	5V	
11	5V	
12	5G	ENCODER common ground
13	5G	ENCODER common ground
14	NC	Reserved
15	NC	Reserved
16	NC	Reserved
17	NC	Reserved
18	24V	24V/0.1A output for use by drivers
19	C	ENCODER Feedback Signal C
20	C/	ENCODER Feedback Signal C/
21	NO USE	Wiring Forbidden
22	CLEAR	Clear Follow Error Output Signal
23	SERVO READY	Servo Ready Input Signal
24	IN-POSITION	Servo In-position Input Signal
25	COM	I/O common point
26	COM	I/O common point

CN3 PIN Descriptions (25-PIN D Connector for I/O Connection)

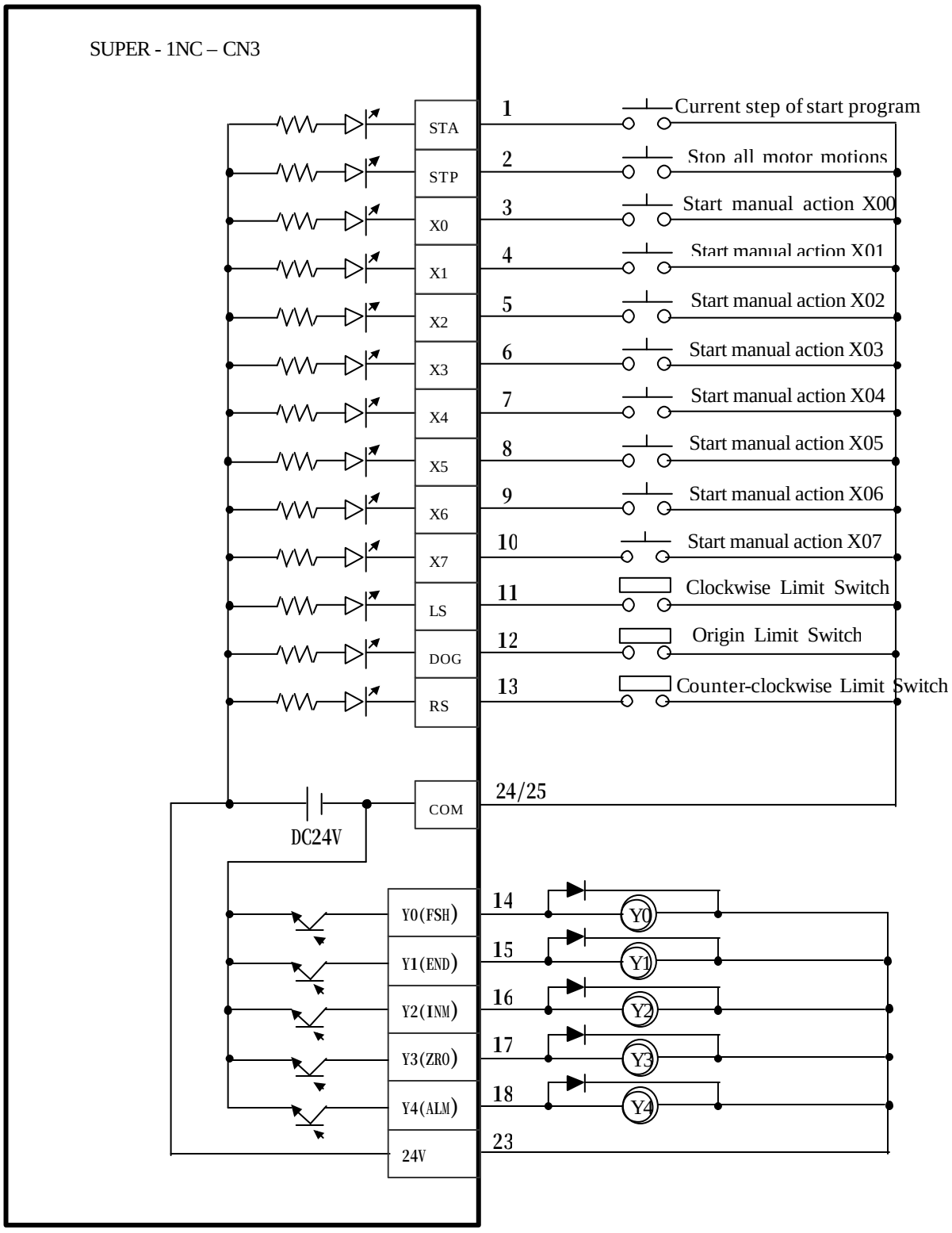
PIN	Name	Description
1	START	Programmed start action as programmed
2	STOP	Execute programmed END action (CONTACT ‘A’)
3	X0	Programmed start action at X00
4	X1	Programmed start action at X01
5	X2	Programmed start action at X02
6	X3	Programmed start action at X03
7	X4	Programmed start action at X04
8	X5	Programmed start action at X05
9	X6	Programmed start action at X06
10	X7	Programmed start action at X07
11	LS	Motor clockwise rotation limit switch (CONTACT ‘A’)
12	DOG	Origin limit switch
13	RS	Motor counter-clockwise rotation limit switch (CONTACT ‘A’)
14	Y0 (FINISH)	Parameter P21=0: controlled by Bit 4 of an OUT command Parameter P21=1: switch Y0 to ON when motion commands end and switch Y0 to OFF in the next start command.
15	Y1 (END)	Parameter P22=0: controlled by Bit 3 of an OUT command Parameter P22=1: switch Y1 to ON when executing an END command and switch Y1 to OFF in the next start command.
16	Y2 (IN-MOTION)	Parameter P23=0: controlled by Bit 2 of an OUT command Parameter P23=1: switch Y2 to ON when the motor is running and switch Y2 to OFF when the motor stops to facilitate chain protection from PLC.
17	Y3 (ZERO)	Parameter P24=0: controlled by Bit 1 of an OUT command Parameter P24=1: switch Y3 to ON when the motor is at zero work position and switch Y3 to OFF when the motor leaves zero work position.
18	Y4 (ALARM)	Parameter P25=0: controlled by Bit 0 of an OUT command Parameter P25=1: switch Y4 to ON when there is a driver fault and switch Y5 to OFF when the driver works normally.
19	MPG A Phase	A-phase of manual jog pulse generator (MPG/ENCODER)
20	MPG B Phase	B-phase of manual jog pulse generator (MPG/ENCODER)
21	5V	5V of manual jog pulse generator (MPG/ENCODER)
22	5G	5G of manual jog pulse generator (MPG/ENCODER)
23	24V	24V/0.1A Output
24	COM	I/O common point
25	COM	I/O common point

RS-422 and PLC Connections

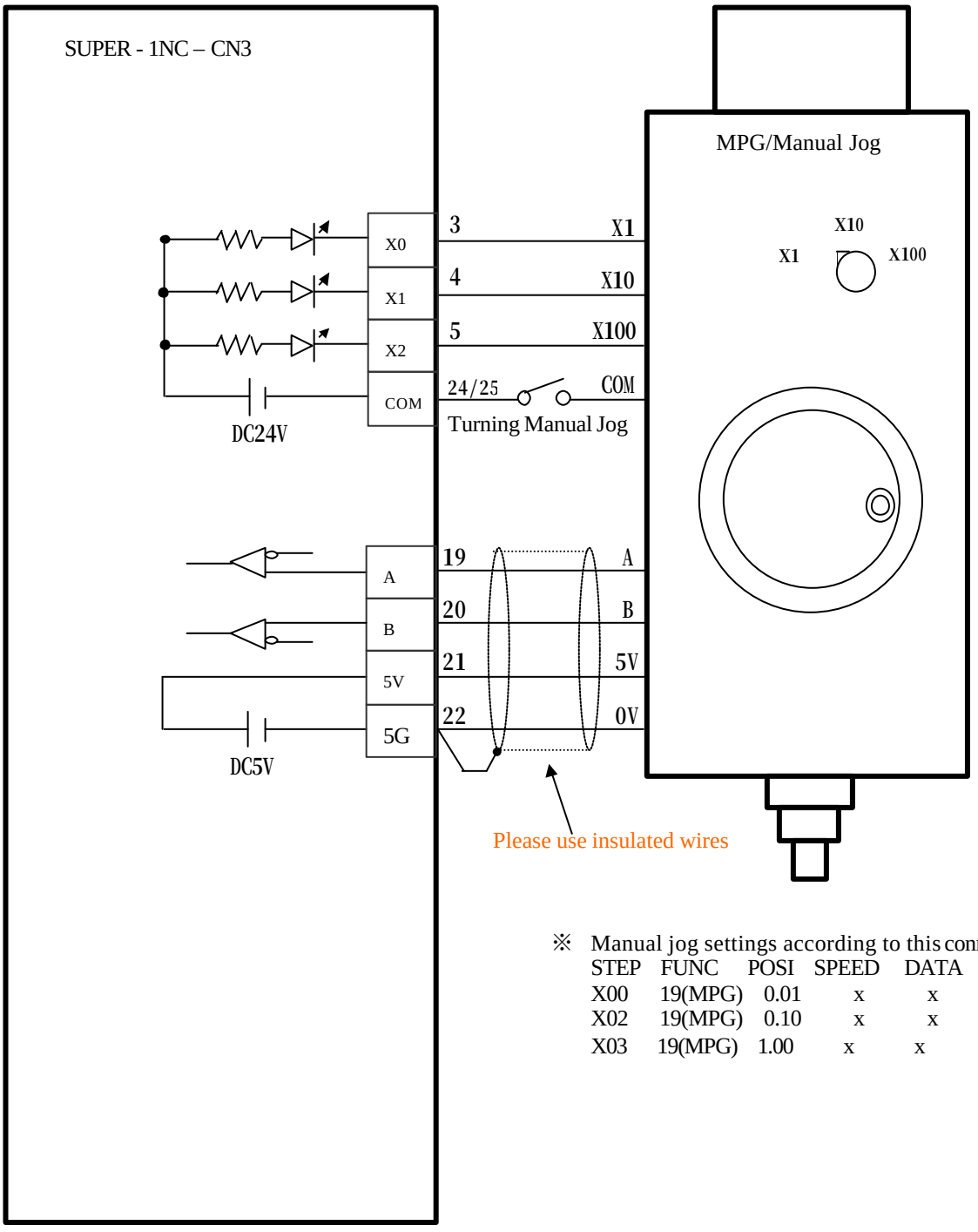


※When a PLC is successfully connected to SUPER-1NC, the decimal places on the first 13-segment LED indicator on row 1 will blink. If it does not blink, it means there is a connection error, please check wiring.

SUPER - 1NC and External I/O Connections



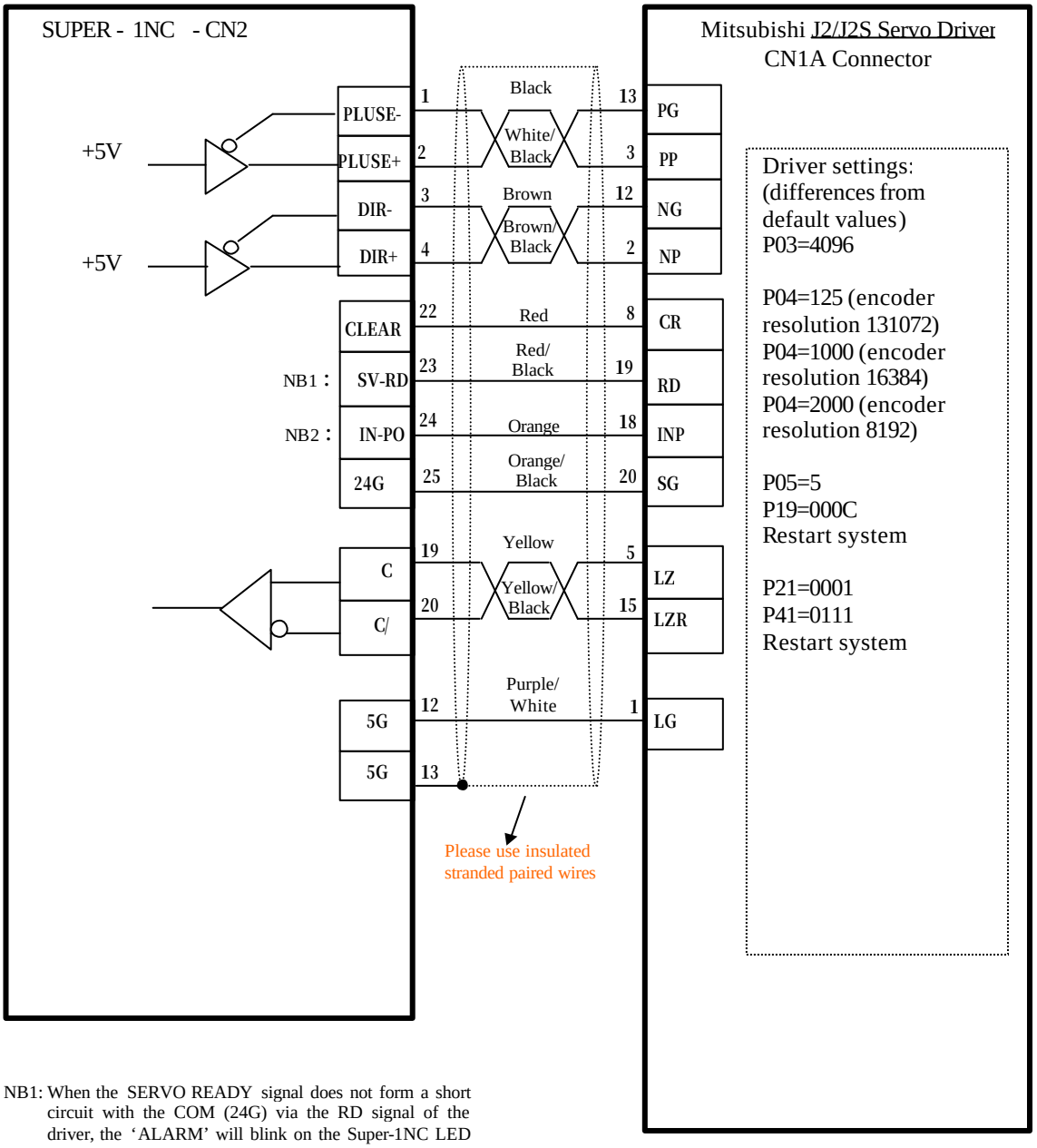
SUPER - 1NC and MPG (Manual Jog) Connections



※ Manual jog settings according to this connection

STEP	FUNC	POSI	SPEED	DATA
X00	19(MPG)	0.01	x	x
X02	19(MPG)	0.10	x	x
X03	19(MPG)	1.00	x	x

SUPER - 1NC and Mitsubishi J2/J2S Servo Driver Connections

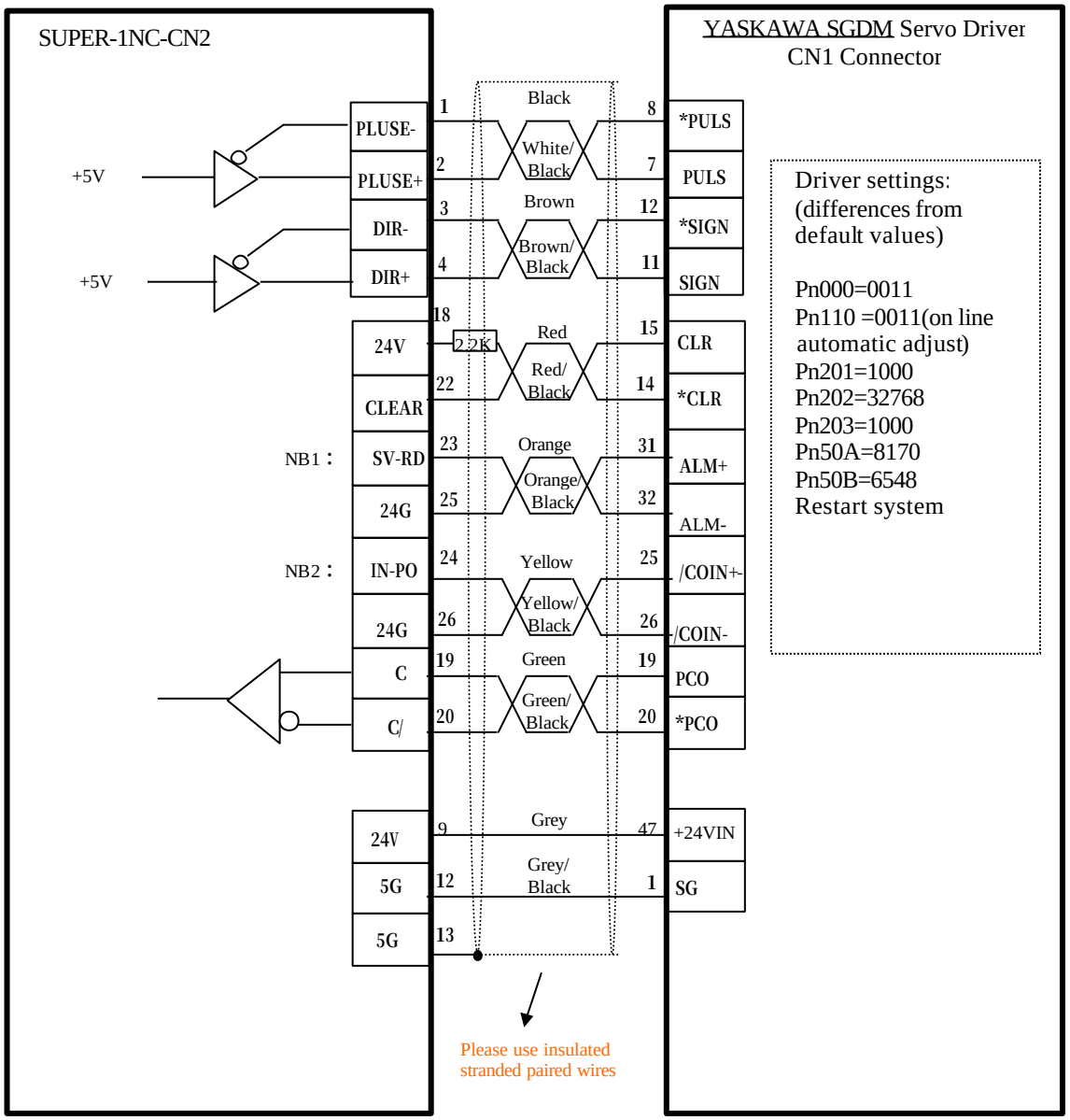


NB1: When the SERVO READY signal does not form a short circuit with the COM (24G) via the RD signal of the driver, the 'ALARM' will blink on the Super-1NC LED display to alert users of driver fault, and all keyboards will fail.

NB2: If the IN-POSITION signal does not form a short circuit with COM (24G) via the INP signal of the driver, Super-1NC will be unable to start normally.

*** Mitsubishi J2/J2S Servo Driver CN1B Connector
Short 3 and 13
Short 10 and 15

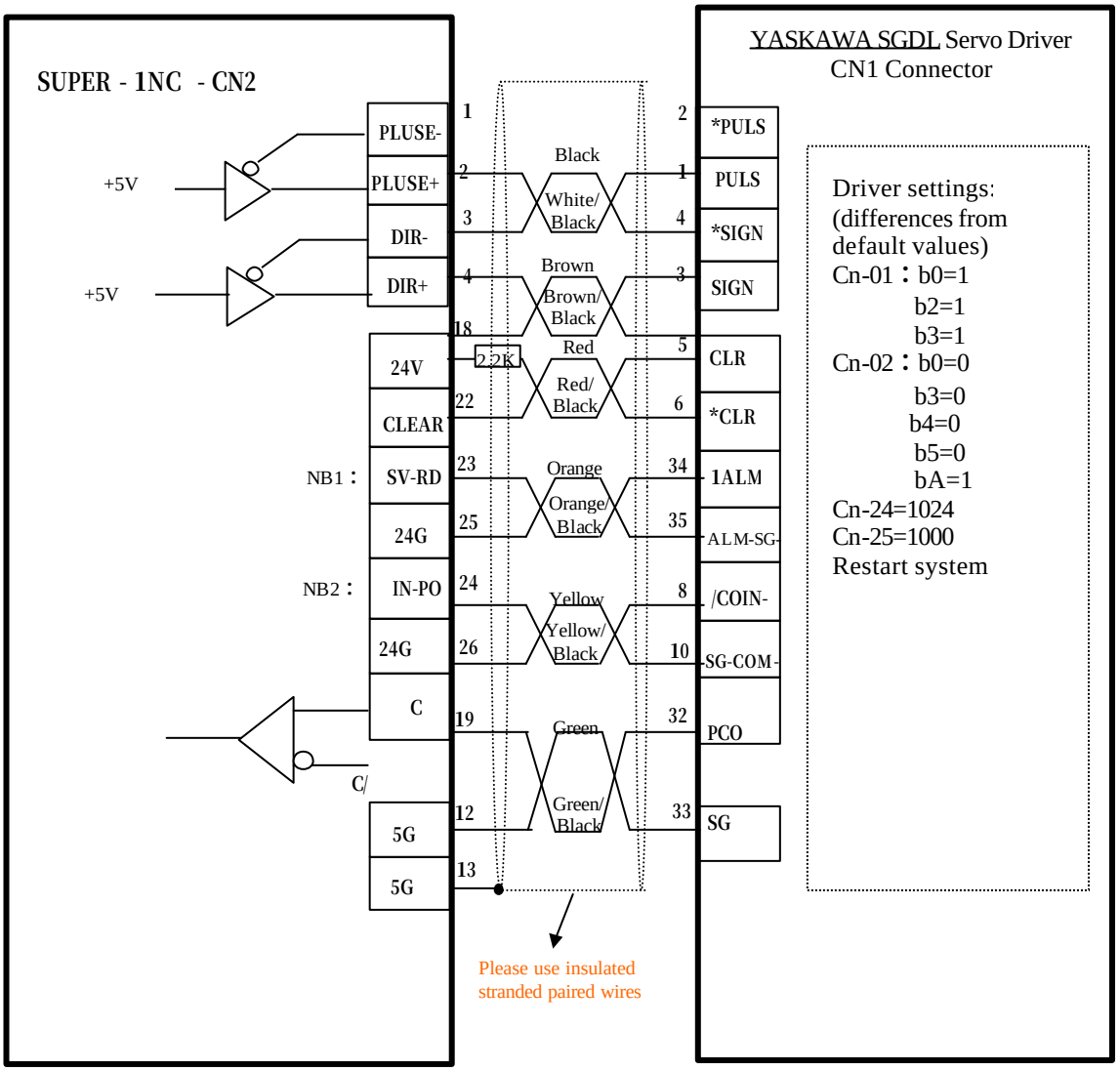
SUPER - 1NC and YASKAWA SGDM Servo Driver Connections



NB1: When the SERVO READY signal does not form a short circuit with the COM (24G) via the ALM+ and ALM- signals of the driver, the 'ALARM' will blink on the Super-1NC LED display to alert users of driver fault, and all keyboards will fail.

NB2: If the IN-POSITION signal does not form a short circuit with COM (24G) via the /COIN+ and /COIN- signals of the driver, Super-1NC will be unable to start normally.

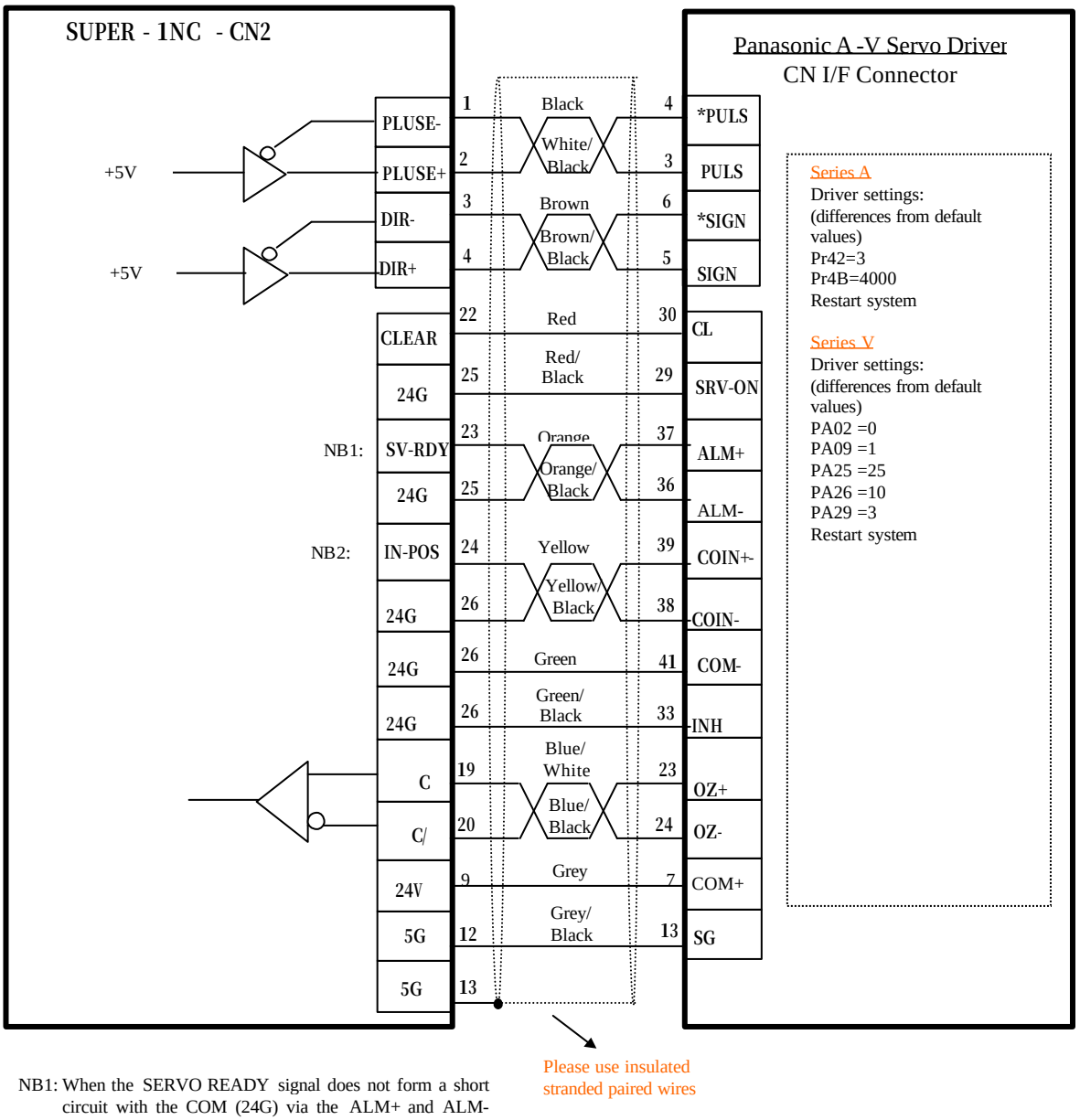
SUPER - 1NC and YASKAWA SGDL Servo Driver Connections



NB1: When the SERVO READY signal does not form a short circuit with the COM (24G) via the 1ALM+ and ALM-SG signals of the driver, the 'ALARM' will blink on the Super-1NC LED display to alert users of driver fault, and all keyboards will fail.

NB2: If the IN-POSITION signal does not form a short circuit with COM (24G) via the /COIN+ and SG-COM signals of the driver, Super-1NC will be unable to start normally.

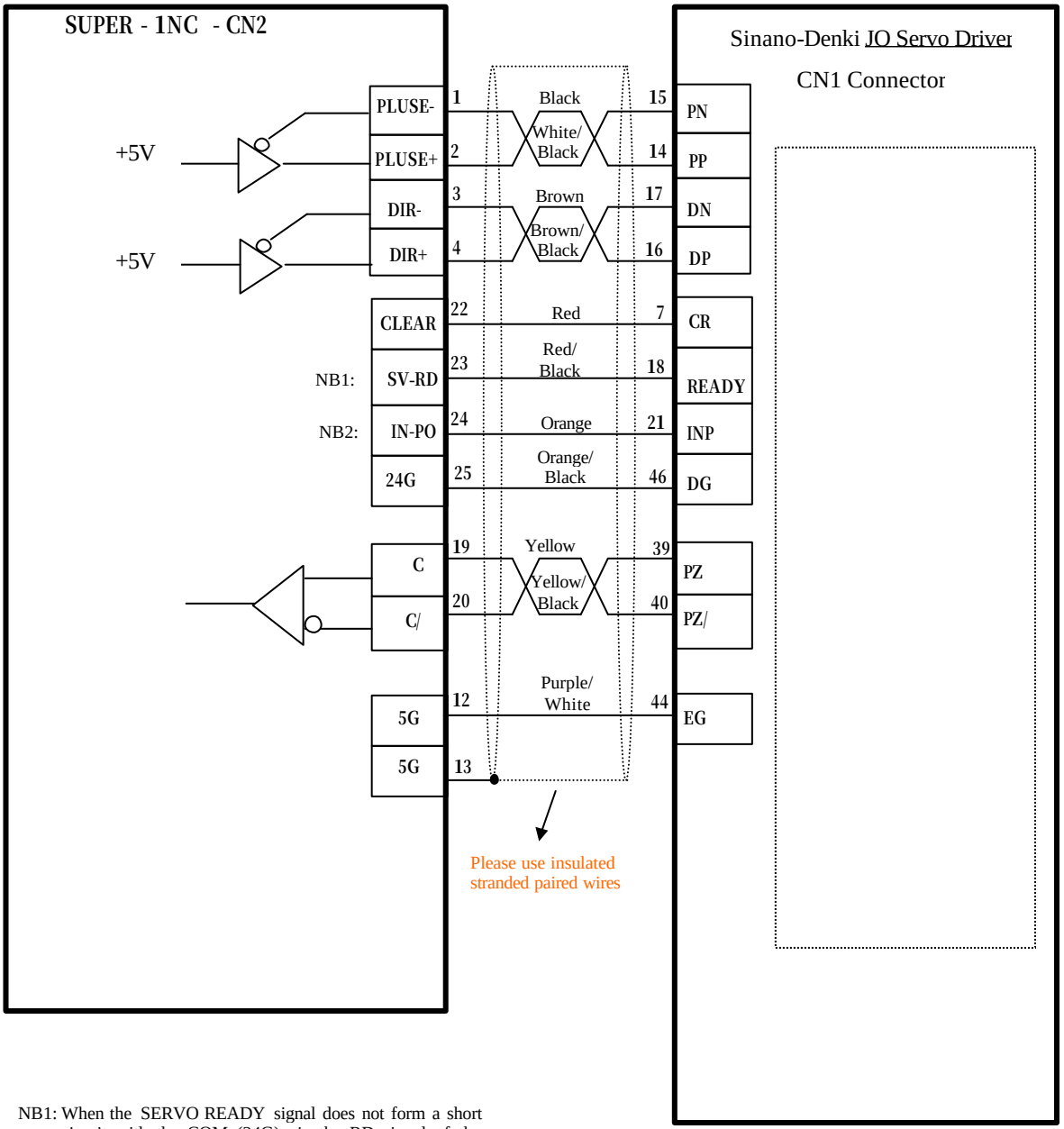
SUPER - 1NC and Panasonic A/V Servo Driver Connections



NB1: When the SERVO READY signal does not form a short circuit with the COM (24G) via the ALM+ and ALM- signals of the driver, the 'ALARM' will blink on the Super-1NC LED display to alert users of driver fault, and all keyboards will fail.

NB2: If the IN-POSITION signal does not form a short circuit with COM (24G) via the COIN+ and COIN- signals of the driver, Super-1NC will be unable to start normally.

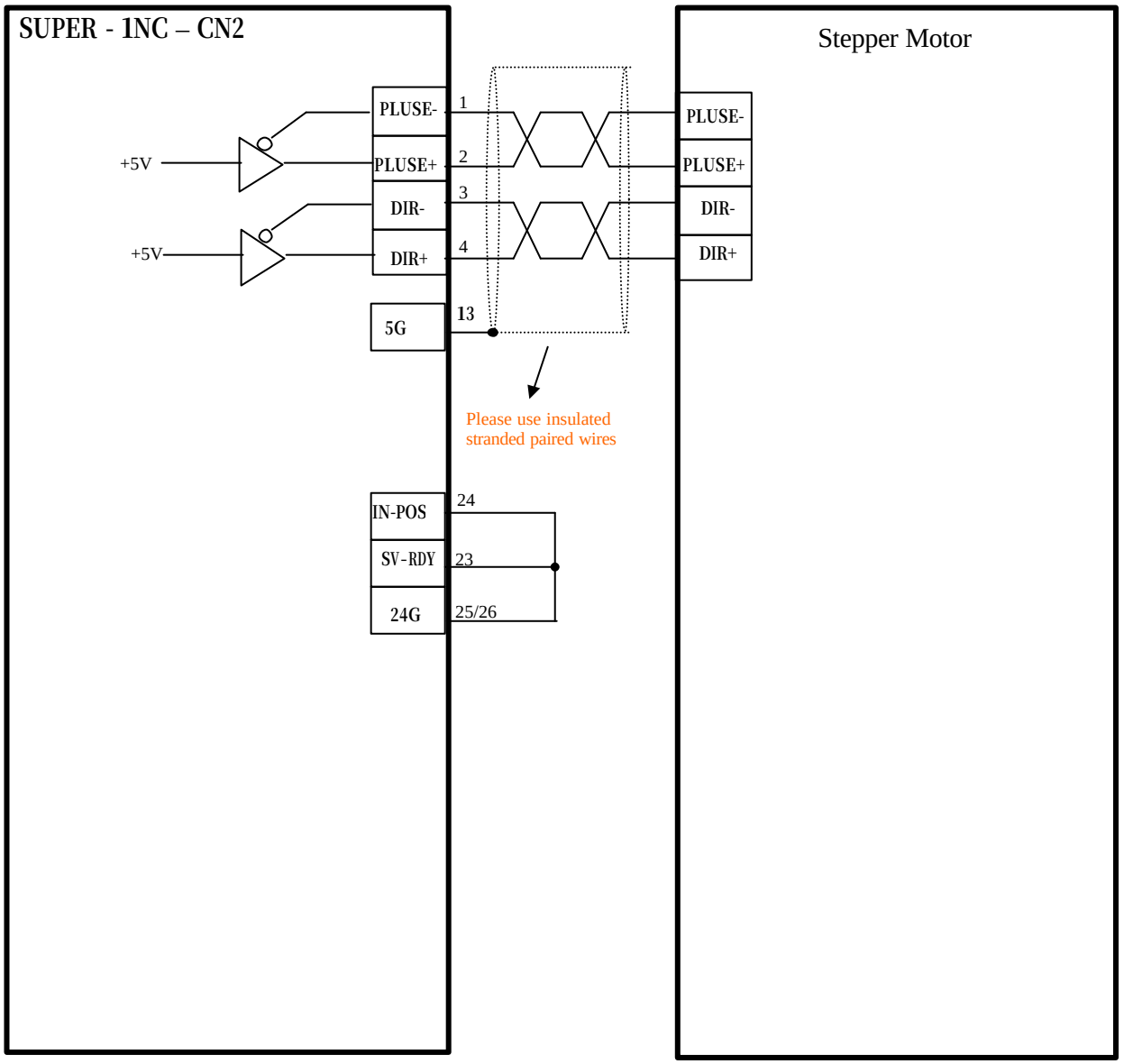
SUPER - 1NC and Sinano-Denki JO Servo Driver Connections



NB1: When the SERVO READY signal does not form a short circuit with the COM (24G) via the RD signal of the driver, the 'ALARM' will blink on the Super-1NC LED display to alert users of driver fault, and all keyboards will fail.

NB2: If the IN-POSITION signal does not form a short circuit with COM (24G) via the INP signal of the driver, Super-1NC will be unable to start normally.

SUPER - 1NC and Stepper Motor Driver



NB1: When the SERVO READY signal does not form a short circuit with the COM (24G), the 'ALARM' will blink on the Super-1NC LED display to alert users of driver fault, and all keyboards will fail.

NB2: If the IN-POSITION signal does not form a short circuit with COM (24G), Super-1NC will be unable to start normally.

SUPER-1NC and PLC Auxiliary Contacts Cross Reference Table

SUPER-1NC		**PLC**
Stop Key	?	M304
Start Key	?	M305
X0	?	M306
X1	?	M307
X2	?	M308
X3	?	M309
X4	?	M310
X5	?	M311
X6	?	M312
X7	?	M313
X8	?	M314
X9	?	M315
X10	?	M316
X11	?	M317
X12	?	M318
X13	?	M319
LS Input Point	?	M320
DOG Input Point	?	M321
RS Input Point	?	M322
FSH Output Point	?	M323
END Output Point	?	M324
INM Output Point	?	M325
ZRO Output Point	?	M326
ALM Output Point	?	M327
RDY	?	M328
INP	?	M329

Start Indicator	?	M330
Stop Indicator	?	M331
Command Indicator	?	M332
Command Indicator	?	M332
Length Indicator	?	M333
Speed Indicator	?	M334
Data Indicator	?	M335

Stop	?	M352
Start	?	M353

X0	?	M354
X1	?	M355
X2	?	M356
X3	?	M357
X4	?	M358
X5	?	M359
X6	?	M360
X7	?	M361
X8	?	M362
X9	?	M363
X10	?	M364
X11	?	M365
X12	?	M366
X13	?	M367

M400	?	M400
M401	?	M401
M402	?	M402
M403	?	M403
M404	?	M404
M405	?	M405
M406	?	M406
M407	?	M407
M408	?	M408
M409	?	M409
M410	?	M410

M411	?	M411
M412	?	M412
M413	?	M413
M414	?	M414
M415	?	M415
M416	?	M416
M417	?	M417
M418	?	M418
M419	?	M419
M420	?	M420
M421	?	M421
M422	?	M422
M423	?	M423
M424	?	M424
M425	?	M425
M426	?	M426
M427	?	M427
M428	?	M428
M429	?	M429
M430	?	M430
M431	?	M431

SUPER-1NC and PLC FX0S D Buffer Cross Reference Table

SUPER-1NC		**FX0S**
D0	?	D0
D2	?	D2
D4	?	D4
D6	?	D6
D8	?	D8
D10	?	D10
D12	?	D12
D14	?	D14
D16	?	D16
D18	?	D18
D20	?	D20
D22	?	D22
D24	?	D24
D26	?	D26
D28	?	D28
D30	?	D30

SUPER-1NC and PLC FX0N/FX2/FX2N D Buffer Cross Reference Table

SUPER-1NC		**FX0N/FX2/FX2N**
D0	?	D0
D2	?	D2
D4	?	D4
D6	?	D6
D8	?	D8
D10	?	D10
D12	?	D12
	⋮	
D62	?	D62
D64	?	D64
D66	?	D66
D68	?	D68
D70	?	D70
D72	?	D72
D74	?	D74
D76	?	D76
	⋮	
D126	?	D126

SUPER-1NC Multiple Connections Protocol

1. Electrical characteristics: same as RS-422 protocol
2. Suggested transfer rate: 9600 bps
3. Transfer format: PARITY EVEN
   DATA BIT 7
   STOP BIT 1
4. SUPER-1NC parameters: P32 PLC ＝ 3
   P34 STN ＝ 1-8 (workstation number)

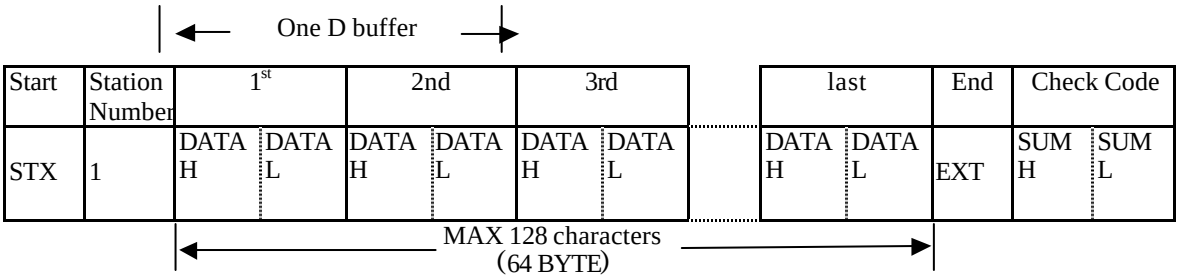
PROTOCOL

(1) n BYTE Read

Start	Station Number	Command Code		Initial Address				Reading		END	Check Code	
STX	1	E	0	TOP ADDRESS H3	H2	H1	H0	BYTE H	BYTE L	EXT	SUM H	SUM L

1. STX：02H。
2. EXT：03H。
3. A TOP ADDRESS has 4 characters
4. BYTE H/L reads the number of bytes from TOP ADDRESS (1-64 bytes)
5. Station number: 1-8
6. Check Code＝station number + command code + initial address + reading + end (the last byte)

SUPER-1NC Response



1. STX：02H。
2. EXT：03H。
3. Check Code＝station number＋1st＋2nd＋3rd＋…＋last＋end (last byte)

(2) n BYTE Write To SUPER-1NC

Start	Station Number	Command Code		Initial Address				Writing		1st		2nd			End	Check Code	
STX	1	E	1	TOP ADDRESS H3	H2	H1	H0	BYTE H	BYTE L	DATA H	DATA L	DATA H	DATA L	.....	EXT	SUM H	SUM L

1. STX：02H。
2. EXT：03H。
3. A TOP ADDRESS has 4 characters
4. BYTE H/L writes the number of bytes from TOP ADDRESS (1-64 bytes)
5. Station number: 1-8
6. Check Code＝station number + command code + initial address + writing + end (the last byte)

SUPER-1NC Response

ACK

1. ACK：06H。

Communication Error Response

NAK

1. NAK：15H

PLC and 1NC Active Connections

SUPER-1NC Station Number (P34 STN) is '1'

Command	Position	Speed	Data
INC	D0(32bits)	D2(32bits)	1

1. Write D0（4 BYTES） = 40000
2. Transfer command:

02 31 45 31 34 30 30 30 30 34 34 30 39 43 30 30 30 30

03 37 32

Initial code: STX = 02, station: 1 = 31, command: E1 = 45 31

Initial address: 4000H = 3430 30 30, writing: 4 BYTES = 30 34

Data: 40000 = 00 00 9C 40 = 34 30 39 43 30 30 30 30

End: EXT = 03

Check code: 31+45+31+34+30+30+30+30+34+34+30+39+43+30+30+30+30+03 = 372H

Load 72H = 37 32

Response:

06

3. Write D2 = 1500(rpm) = 05DCH

Transfer command:

02 31 45 31 34 30 30 34 30 32 44 43 30 35 03 43 30

Initial code: STX = 02, station: 1 = 31, command: E1 = 45 31

Initial address: 4004H = 3430 30 34, writing: 2 BYTES = 30 32

Data: 1500 = 05 DC = 44 43 30 35

End: EXT = 03

Check code: 31+45+31+34+30+30+34+30+32+44+43+30+35+03 = 2C0H

Load C0H = 43 30

Response:

06

4. Read current position

Transfer code:

02 31 45 30 34 30 46 43 30 34 03 46 41

Initial code: STX ＝ 02, station: 1 ＝ 31, command: E1 ＝ 45 30

Initial address: 40FCH ＝ 34 30 46 43, reading: 4 BYTES ＝ 30 34

End: EXT ＝ 03

Check code: 31+45+30+34+30+46+43+30+34+03 ＝ 1FAH

Load FAH ＝ 46 41

Response: set current position ＝ 40000 ＝ 00 00 9C 40（HEX）32Bits

02 31 34 30 39 43 30 30 30 30 03 44 34

Initial code: STX ＝ 02, station: 1 ＝ 31

Data: 34 30 39 43 30 30 30 30 ＝ 40 9C 00 00（HEX）＝ 00009C40 ＝ 40000

End: EXT ＝ 03

Check code: 31+34+30+39+43+30+30+30+30+03 ＝ 1D4H

Load D4H ＝ 44 34

Contact ‘M’

Address	0-1	2-3	4-5	6-7	8-9	A-B	C-D	E-F
0020	×	×	×	M304~	M320~	M336~	M352~	M368~

Table 1

Address	B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
0026	M319	M318	M317	M316	M315	M314	M313	M312	M311	M310	M309	M308	M307	M306	M305	M304

Table 2

D Buffer

位址	0-1	2-3	4-5	6-7	8-9	A-B	C-D	E-F
4000	D0	D1	D2	D3	D4	D5	D6	D7
4010	D8	D9	D10	D11	D12	D13	D14	D15
4020	D16	D17	D18	D19	D20	D21	D22	D23
4030	D24	D25	D26	D27	D28	D29	D30	D31
4040	D32	D33	D34	D35	D36	D37	D38	D39
4050	D40	D41	D42	D43	D44	D45	D46	D47
4060	D48	D49	D50	D51	D52	D53	D54	D55
4070	D56	D57	D58	D59	D60	D61	D62	D63
4080	D64	D65	D66	D67	D68	D69	D70	D71
4090	D72	D73	D74	D75	D76	D77	D78	D79
40A0	D80	D81	D82	D83	D84	D85	D86	D87
40B0	D88	D89	D90	D91	D92	D93	D94	D95
40C0	D96	D97	D98	D99	D100	D101	D102	D103
40D0	D104	D105	D106	D107	D108	D109	D110	D111
40E0	D112	D113	D114	D115	D116	D117	D118	D119
40F0	D120	D121	D122	D123	D124	D125	$D126_{(NB1)}$	$D127_{(NB1)}$

Table 3

NB1: D127 and D126 save current position (read only)

D0-D63: memory buffer during power failure

D64-D127: memory buffer for non-power failure

ASCII

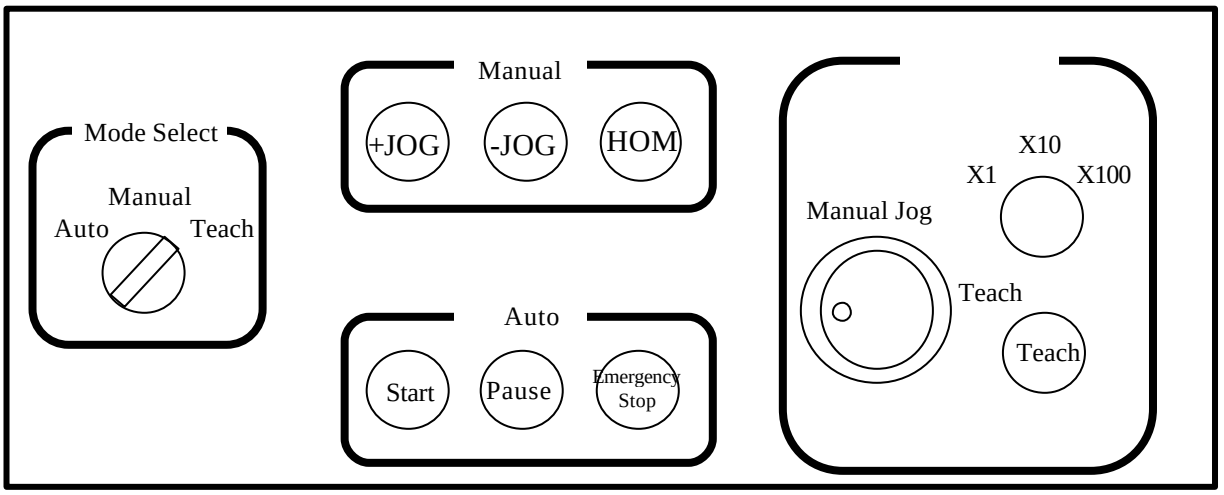
Character	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
ASCII(HEX)	30	31	32	33	34	35	36	37	38	39	41	42	43	44	45	46

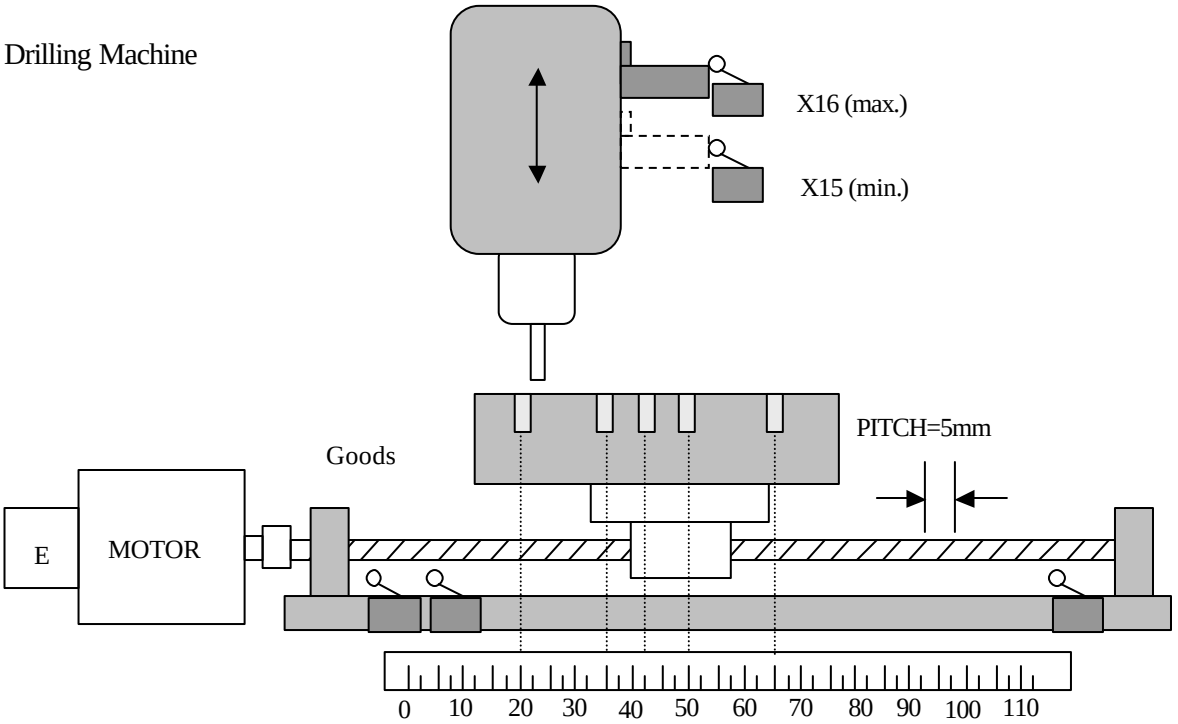
Table 4

Implementation Example 1

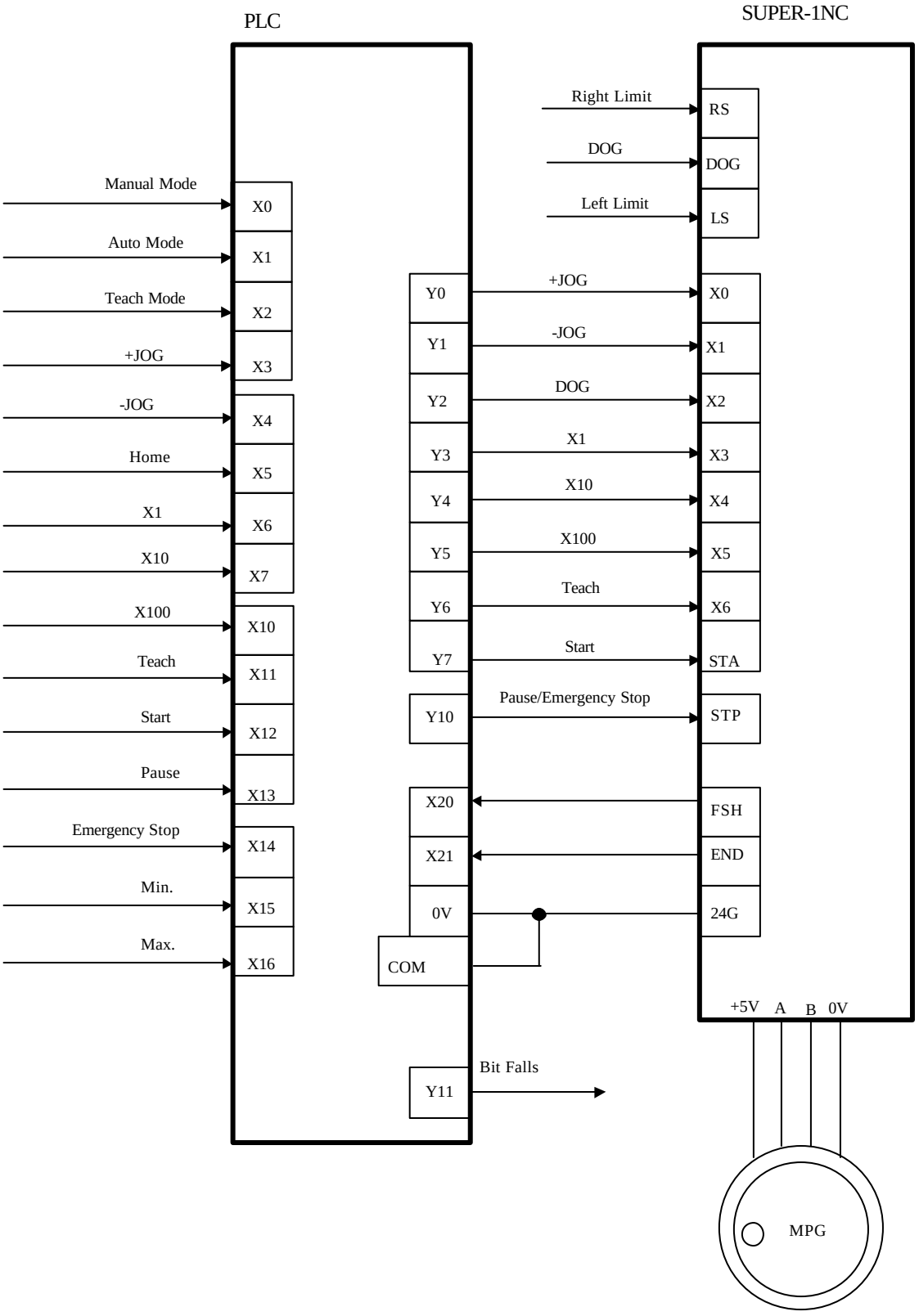
This example is based on a drilling machine, with a PLC as the central control and gives orders to Super-1NC. For example, if it is in manual +JOG mode, when you push the +JOG key, the PLC will set Y0 to ON as planned in the wiring and starts step X00 (PJG) in motion mode of Super-1NC. For another example, if it is in manual –JOG mode, when you push the –JOG key, the PLC will set Y1 to ON as planned in the wiring and start step X01 (MJG) in motion mode of Super-1NC.

Now it is in teach mode and the manual jog is set at 10x, and the operator wants to move the machine position with manual jog to teach every processing position. The PLC will set Y4 to ON as planned in the wiring and start step X04 (MGP) in motion mode of Super-1NC. If the operator switches the manual jog to 1x, the PLC will set Y3 to ON as planned in the wiring and start step X03 (MPG) in motion mode of Super-1NC. Then, if the operator pushes the TEACH key, the PLC will set Y6 to ON as planned in the wiring and start step X06 (TCH) in motion mode of Super-1NC.





PLC and SUPER-1NC Connections



SUPER-1NC Parameter Setup

P00 set acceleration/deceleration time to 0.5 seconds: 500
P01 set decimal places to 2 (minimal unit 2 threads): 2
P02 set direction to '0' (test machine direction with +JOG during commissioning; set value to '1' if reverse motion is desired): 0
P03 set auto run mode to '0' (run one step every time after receiving a start signal): 0
P04 set back seam compensation to '0'. Make compensation if back seam occurs in reverse motion in normal operation:0
P05 set motor rotation pulse to 4000 and set driver resolution to 4000:4000.
P06 set motor maximum speed to: 2000
P07 set start speed to servomotor start speed to '0'; set stepper motor vibration to '0': 0
P08 set operation key to locked—unlocked during commissioning and locked after commissioning: 0000000
P09 set editing key 1 to locked—unlocked during commissioning and locked after commissioning: 0000
P10 set editing key 2 to locked—unlocked during commissioning and locked after commissioning: 0000
P11 and P12 set electronic gear ratio (CMX and CDV) to input the desired size to the input length, so that the computer can calculate the number of pulses according to P11 and P12 settings.
P05=4000 deceleration ratio 1:1 P01 set decimal places to '2' 4000*(1/1)=5.00mm=500 threads
1 thread=4000/500 P11=4000 and P12=500
P13 set master shaft cam angle (%) for special machines (so leave it): 50
P14 set positive software limit (PSL) to '0' (most people use hardware limit switch). If double protection is desired, set limit program to '0'.
P15 set negative software limit (NSL) to '0' (most people use hardware limit switch). If double protection is desired, set limit program to '0'.
P16 set editing shortcut select (ESS) to '0' if general editing mode (FUNC, POSI, SPEED and DATA) is opened to operators; set to '1' if only data setup mode (D0-Dn) is opened to operators.
P17 set LED display (rows 1 and 2) if you want to display PLC buffer values on the LED display of Super-1NC, when Super-1NC is connected to a PLC via the RS-422 port. Set to '0' to display the command and position of Super-1NC.: 0
P18 set LED display row 1 to '0' if you want to display PLC buffer values on the LED display of Super-1NC, see P17 for details: 0
P19 set LED display row 2 to '0' if you want to display PLC buffer values on the LED display of Super-1NC, see P17 for details: 0
P20 always set to 0:0
P21 set FSH signal to '1': 1
P22 set END signal to '1' if OUT command is not used for control, SUPER-1NC will run in auto control: 1
P23 set Motor Operation signal to '1' if OUT command is not used for control, SUPER-1NC will run in auto control: 1
P24 set ZERO signal to '1' if OUT command is not used for control, SUPER-1NC will run in auto control: 1
P25 set driver fault signal to '1' if OUT command is not used for control, SUPER-1NC will run in auto control: 1
P26 set rotary table version to '0' for guide screw setup: 0
P27 set manual jog acceleration/deceleration time to '200' and adjust speed according to performance: 20
P28 set program grouping to '1' if the processing point per piece is under 400 points: 1
P29 set editing display limit to '0' and set lock ON if you want to prevent operators from viewing the entire program: 0
P30 set manual jog direction to '0', change it to '1' if the direction is found incorrect in commissioning: 0
P31 set ENCODER input multiple to '4' for manual jog at 25PPR and '1' for manual jog at 100PPR: 1
P32 set PLC item name: set to '0' if no PLC is connected to Super-1NC via RS-422: 0
P33 set sensor activation length to '1000' if no mark is made on the machine: 1000
P34 set workstation number to '0' if no workstation is connected. Set number to 1-8 when using a PLC or PC as the command: 0
P35 set zero low speed: 5RPM (default)
P36 set Z-phase signal to default. Change value if severe vibration is found during emergency stop: 1 (default)

Planning of SUPER-1NC in Manual Mode with PLC Control

Step	Function	Position	Speed	Data
X00	PJG	0.01	10	
X01	MJG	0.01	10	
X02	MAC			20
X03	MPG	1		
X04	MPG	10		
X05	MPG	100		
X06	TCH		1500	
X07	NOP			
X08	PJG	0.01	10	
X09	MJG	0.01	10	
X10	MAC			20
X11	ABS	0	1000	
X12	DFP	0		
X13	TCH		1500	
X14	NOP			
X39	NOP			

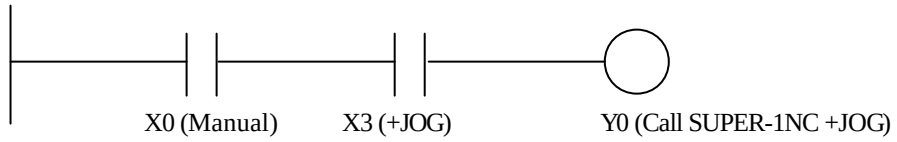
Call LAB 20 Macro

SUPER-1NC Program Planning

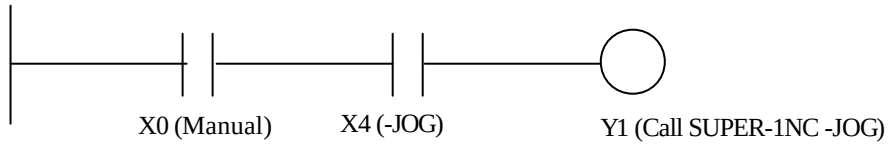
Step	Function	Position	Speed	Data
000	ABS	20.00	1500	
001	ABS	35.00	1500	
002	ABS	42.50	1500	
003	ABS	50.00	1500	
004	ABS	65.00	1500	
005	ABS	0.00	1500	
006	END			
007	NOP			
008	NOP			
009	NOP			
010	LAB			20
011	HOM	200.00	500	1
012	DFP	1530.00		
013	EDM			

PLC Program Planning

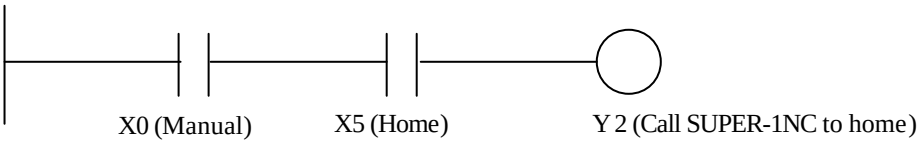
Manual +Jog



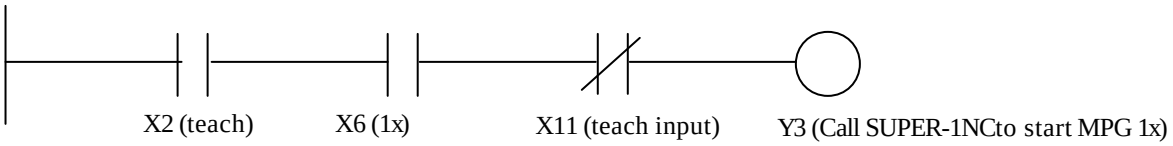
Manual -Jog



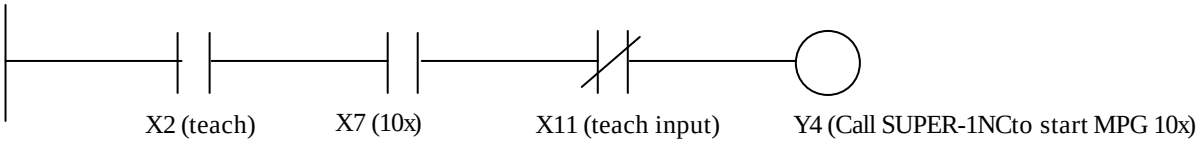
Manual Home



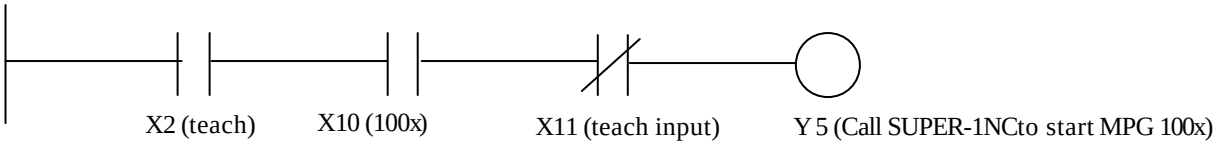
Teach Mode/Manual Jog 1x



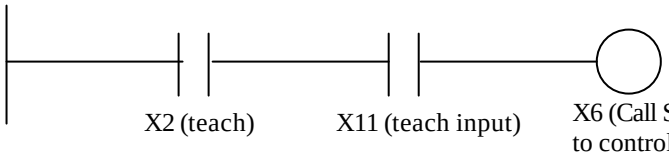
Teach Mode/Manual Jog 10x



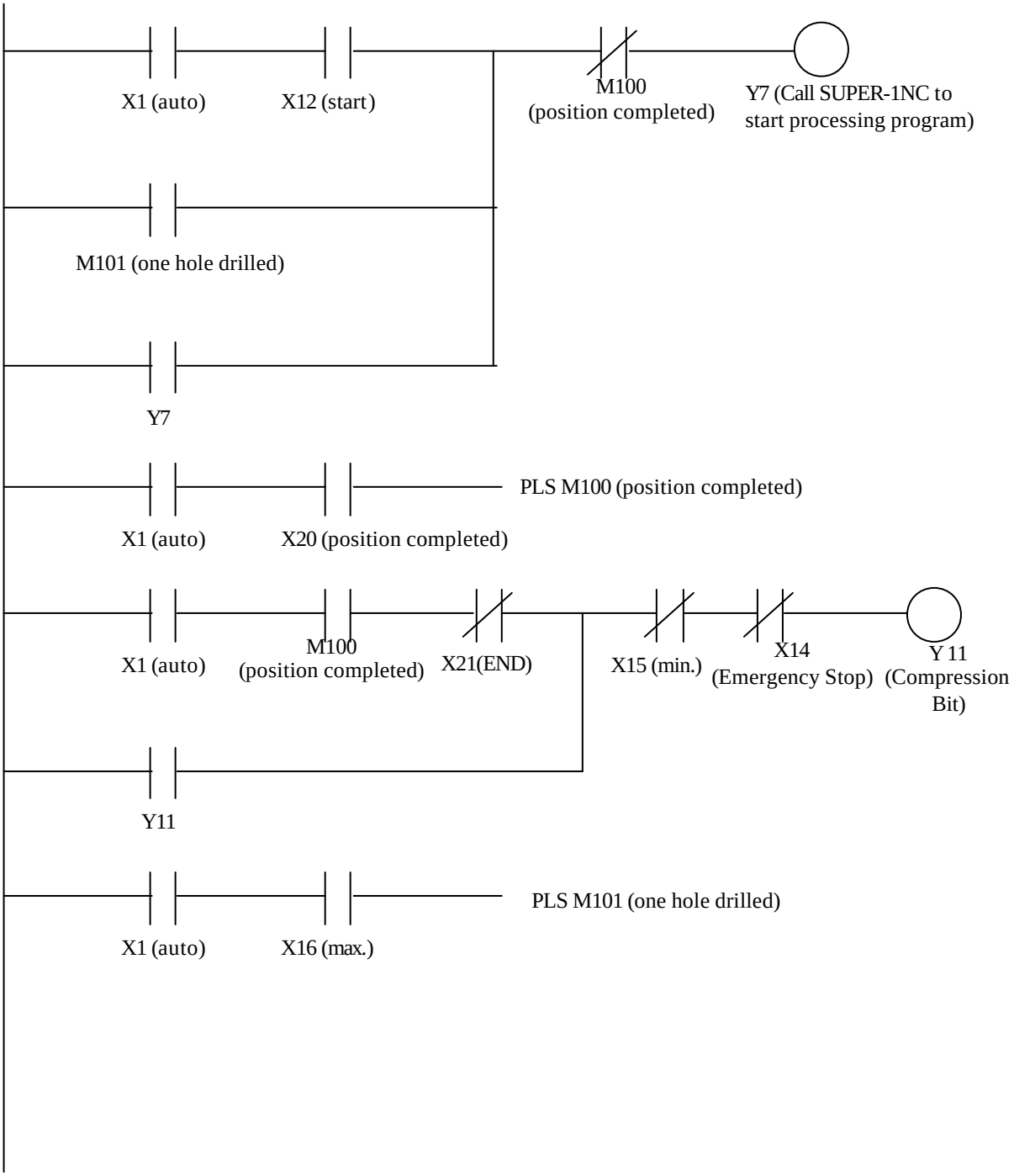
Teach Mode/Manual Jog 100x



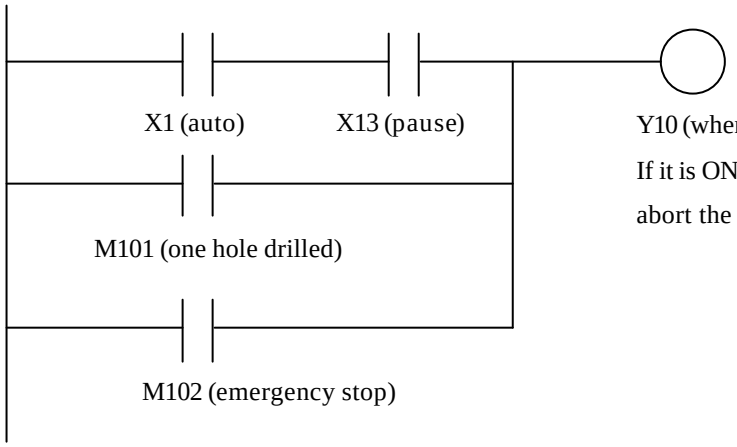
Teach Mode/Teach Input



Auto Mode/Start

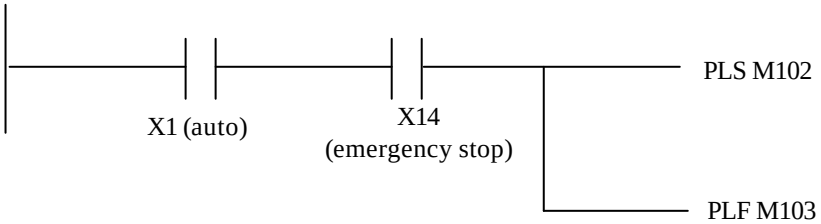


Pause and Emergency Stop



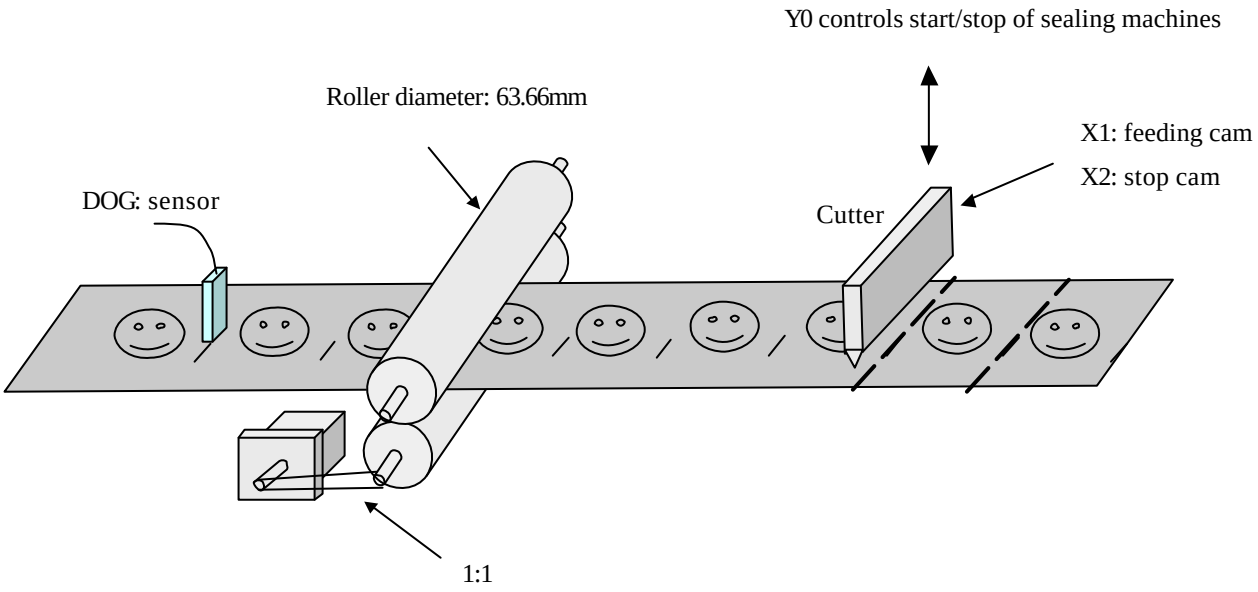
Y10 (when it is ON once, SUPER-1NC will pause. If it is ON twice or more times, SUPER-1NC will abort the current step and reset step to 000)

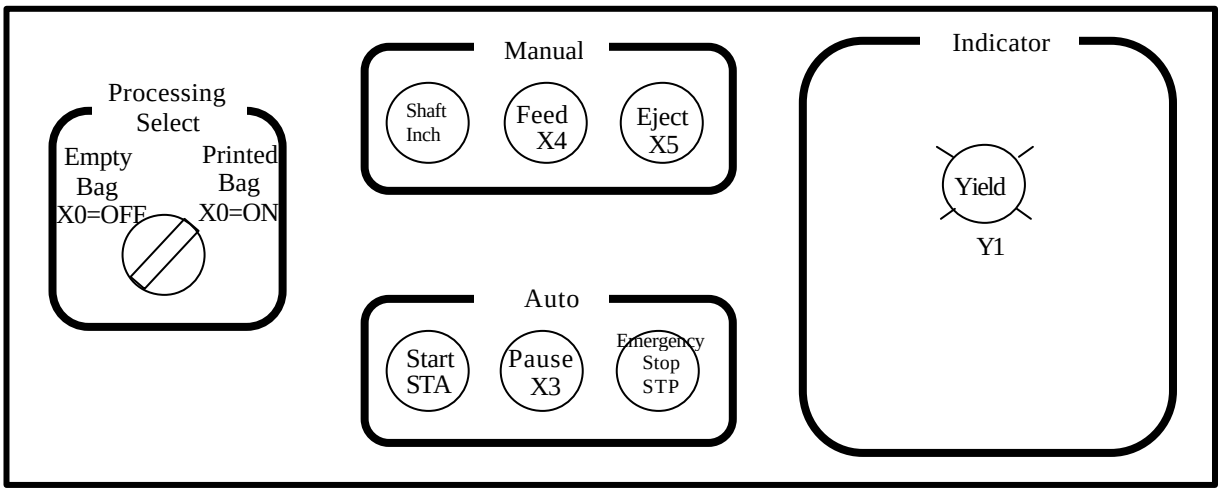
Emergency Stop



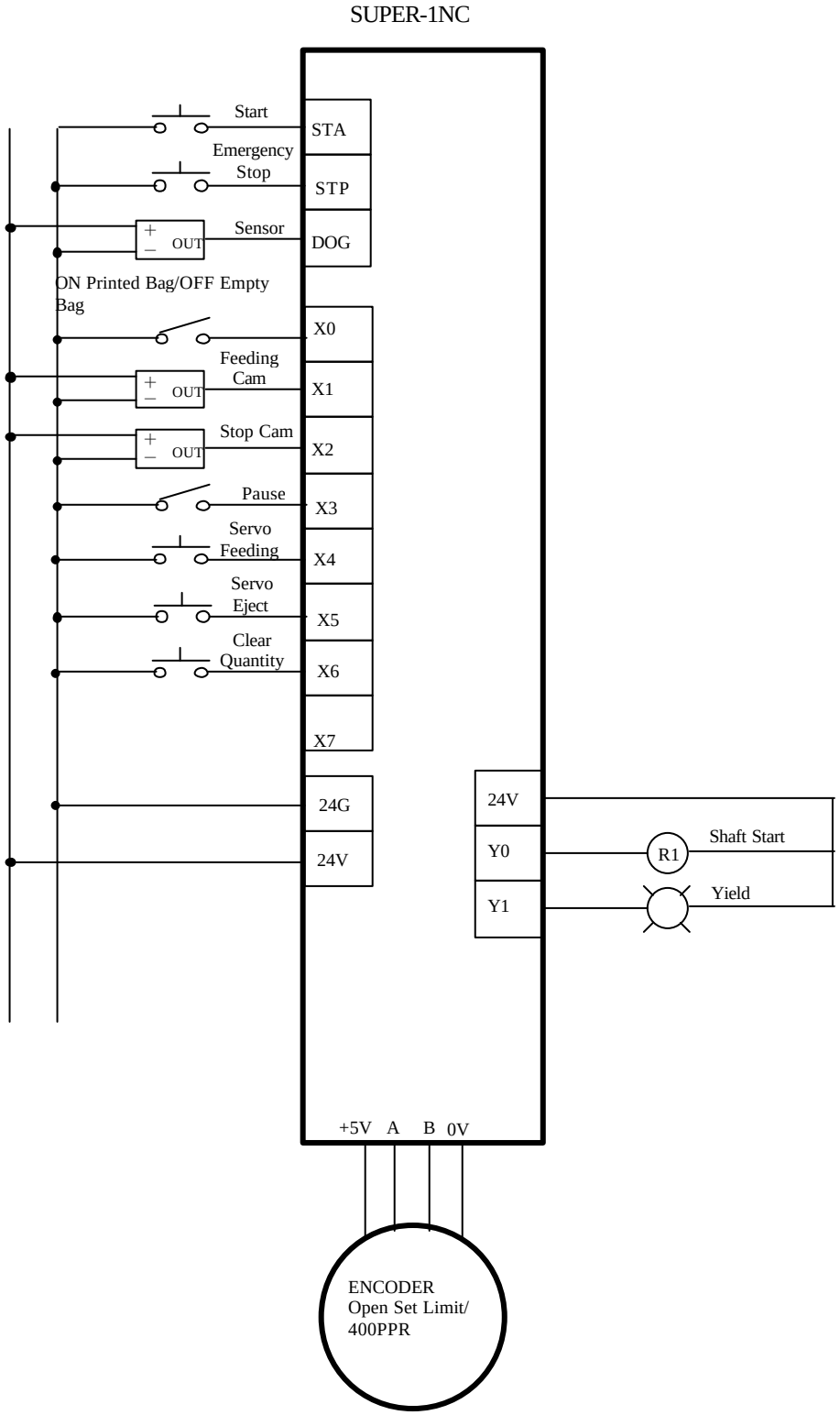
END

Implementation Example 2





SUPER-1NC Connections



SUPER-1NC Parameter Setup

P00 set acceleration/deceleration at 0.5 second: 500

P01 set decimal place to 1 (minimal unit at 0.1 mm): 1

P02 set direction to '0' (test machine direction with +JOG during commissioning; set value to '1' if reverse motion is desired): 0

P03 set auto run mode to '1' (run program until the END command after receiving a start signal): 1

P04 set back seam compensation to '0'. Make compensation if back seam occurs in reverse motion in normal operation: 0

P05 set motor rotation pulse to 4000 and set driver resolution to 4000:4000.

P06 set motor maximum speed to: 2000

P07 set start speed to servomotor start speed to '0'; set stepper motor vibration to '0'. As MK1 is used in this example, set zero low speed to '10': 10RMP

P08 set operation key to locked—unlocked during commissioning and locked after commissioning: 0000000

P09 set editing key 1 to locked—unlocked during commissioning and locked after commissioning: 0000

P10 set editing key 2 to locked—unlocked during commissioning and locked after commissioning: 0000

P11 and P12 set electronic gear ratio (CMX and CDV) to input the desired size to the input length, so that the computer can calculate the number of pulses according to P11 and P12 settings.

P05=4000 deceleration ratio 1:1 P01 set decimal places to '1' 4000*(1/1)=63.66*3.14159mm=200.0mm

0.1mm=4000/2000 Simplify values to avoid calculation errors → 0.1mm=4/2=2/1 P11=2 and P12=1

P13 set master shaft cam angle (%): if feeding angle is 180°, 180°/360°=0.5=50%: 50

P14 set positive software limit (PSL) to '0', no PSL is required in the example: 0

P15 set negative software limit (NSL) to '0', no PSL is required in the example: 0

P16 set editing shortcut select (ESS) to '1' for only data setup mode: 1

P17 set LED display (rows 1 and 2) to '2' to let row 1 display current quantity (D10) and row 2 display default data: 2

P18 set LED display row 1 to '10': D10

P19 set LED display row 2 to '0' if you want to display default data as '2' has been set in P17 for details: 0

P20 always set to 0:0

P21 set FSH signal to '0' for SET 50 command has been used to control Y0 in this example: 0

P22 set END signal to '1' if OUT command is not used for control, SUPER-1NC will run in auto control: 1

P23 set Motor Operation signal to '1' if OUT command is not used for control, SUPER-1NC will run in auto control: 1

P24 set ZERO signal to '1' if OUT command is not used for control, SUPER-1NC will run in auto control: 1

P25 set driver fault signal to '1' if OUT command is not used for control, SUPER-1NC will run in auto control: 1

P26 set rotary table version to '0' for roller setup in this example: 0

P27 set manual jog acceleration/deceleration time to '200' and adjust speed according to performance: 200

P28 set program grouping to '1' if the processing point per piece is less than 40 points: 1

P29 set editing display limit to '0' and set lock ON if you want to prevent operators from viewing the entire program: 0

P30 set manual jog direction to '0'. It is used in auto speed tracking in the example (TRC or TMK command), so jog direction will not affect the tracking function: 0

P31 set ENCODER input multiple to '4' for manual jog at 25PPR and '1' for manual jog at 100PPR, it is used in auto speed tracking in the example (TRC or TMK command): 1

P32 set PLC item name: set to '0' if no PLC is connected to Super-1NC via RS-422: 0

P33 set sensor activation length to '1000' if no mark is made on the machine: 1000

P34 set workstation number to '0' if no workstation is connected. Set number to 1-8 when using a PLC or PC as the command: 0

P35 set zero low speed, if the roller machine in the example has no zero work point: 5RPM (default)

P36 set Z-phase signal to default, if the roller machine in the example has no zero work point: 1 (default)

SUPER-1NC Manual Action Program Planning

Step	Function	Position	Speed	Data	Notes
X00	NOP				Reserved for printed bag/empty bag select
X01	NOP				Reserved for feeding cam
X02	NOP				Reserve for stop cam
X03	NOP				Reserve for pause
X04	PJG	0.01	10		Servo feeding
X05	MJG	0.01	10		Servo eject
X06	MAC			70	Reset quantity to 0, call macro LAB 70
X07	NOP				
X08	PJG	0.01	10		+JOG key on 1NC control panel
X09	MJG	0.01	10		-JOG key on 1NC control panel
X10	HOM	0	500	1	HOM key on 1NC control panel
X11	ABS	0	1000		ZERO key on 1NC control panel
X12	DFP	0			ZERO SET key on 1NC control panel
X13	TCH		1000		TEACH key on 1NC control panel
X14	NOP				
X39	NOP				

SUPER-1NC Program Planning

Buffer Planning
D0 Length Settings
D2 Quantity Settings
D8 Printed Bag Length (=D0-2.00mm)
D10 Current Counter Value

```
LAB     0
SUB     D0,200,D8       ;obtain printed bag length by subtracting 2.00mm from customer input length D0, the balance
                         will be saved in D8
LES     D10,D2          ;check quantity before starting
CJN     10              ;if current quantity (D10) is not less than default quantity (D2), jump to LAB 10
RST     51              ;set quantity finished indicator OFF
SET     50              ;master shaft variation starts
LAB     1
WAN     1               ;waiting for upraise end of feeding cam
WAT     1
LD      0               ;jump to LAB 2 if it is printed bag
CJ      2
IN2     D0,1000,1       ;empty bag feeding, apply to auto tracking if encoder installed, otherwise use TRC D0,2000
JMP     3
LAB     2
MK1     D8,1000,1       ; printed bag feeding, apply to auto tracking if encoder is installed, otherwise use TMK
D8,2000
LAB     3
ADD     D10,1,D10       ;D10+1? D10, add '1' to current counter value
LES     D10,D2          ;check quantity
CJN     9               ; if current quantity (D10) is not less than default quantity (D2), jump to LAB 9
LD      3               ;jump to LAB 1 if not pause
CJN     1
CAL     60              ;set master shaft variation OFF
WTN     3               ;cancel waiting for pause
SET     50              ;restart master shaft variation
JMP     1               ;jump to LAB 1
LAB     9
CAL     60              ;set master shaft variation OFF
LAB     10
SET     51              ;quantity finished indicator
END


LAB     60              ;set master shaft variation subroutines OFF
WTN     2               ;waiting for upraise end of stop cam
WAT     2
RST     50              ;set master shaft variation OFF
RET

LAB     70              ;reset quantity
SUB     D10,D10,D10     ;D10－D10? D10, then D10=0
RST     51              ;set quantity finished indicator OFF
EDM
```

Appendix A: Customer Data Record

Parameter Log

Parameter	English Display	Function	Default Value	Customer 1				
P00	ACC	Acceleration/Deceleration Time	500					
P01	DOT	Decimal Place	2					
P02	DIR	Direction	0					
P03	ARN	Consecutive Start	0					
P04	BAK	Back Seam Compensation	0					
P05	PPR	Motor 1 Pulse	4000					
P06	MSD	Maximum Speed	2000					
P07	BSD	Auto Start Speed	0					
P08	OLK	Operation Key Locked	0000000					
P09	EL1	Editing Key Locked 1	0000					
P10	EL2	Editing Key Locked 2	0000					
P11	CMX	Electronic Gear Multiplier	1					
P12	CDV	Electronic Gear Divisor	1					
P13	SCP	Master Shaft Cam %	50					
P14	PSL	Positive Software Limit	0					
P15	MSL	Negative Software Limit	0					
P16	ESS	Editing Shortcut Select	0					
P17	DSP	Display Planning	0					
P18	DN1	LED Display Row 1	0					
P19	DN2	LED Display Row 2	0					
P20	BRK	Reserved (set to '0')	0					
P21	FSH	Set Y0 to FSH Signal	1					
P22	END	Set Y1 to END signal	1					
P23	INM	Set Y2 to motor in operation signal	1					
P24	ZRO	Set Y3 to zero signal	1					
P25	ALM	Set Y4 to driver fault signal	1					
P26	ROT	Rotary Table Version	0					
P27	MAT	Manual Jog Deceleration	200					
P28	GRP	Program Grouping	1					
P29	DPL	Edit Limit	0					
P30	MDR	Manual Jog Direction	0					
P31	MUL	ENCODER Multiplier	1					
P32	PLC	PLC Item Number	0					
P33	TME	Sensor Activation Length	0					
P34	STN	Workstation Number	0					
P35	ZRS	Low Speed To Original	5					
P36	ZSC	Z-phase Signal to Origin	1					
P37	SPM	Stop Mode	0					
P38	PWD	Password Setup	0					

Manual Action Program Log

Step	Function	Position	Speed	Data	Notes
X00					
X01					
X02					
X03					
X04					
X05					
X06					
X07					
X08	PJG	0.01	50		
X09	MJG	0.01	50		
X10	HOM	0.00	500	1	
X11	ABS	0.00	500		
X12	DFP	0.00			
X13	TCH			1000	

Program Log

Step	Function	Position	Speed	Data	Notes
000					
001					
002					
003					
004					
005					
006					
007					
008					
009					
010					
011					
012					
013					
014					
015					
016					
017					
018					
019					
020					
021					
022					
023					
024					
025					
026					
027					
028					
029					
030					
031					
032					
033					
034					
035					
036					
037					
038					
039					

Program Log

Step	Program F P S D	Step	Program F P S D	Step	Program F P S D	Step	Program F P S D	Step	Program F P S D
000		100		200		300		400	
001		101		201		301		401	
002		102		202		302		402	
003		103		203		303		403	
004		104		204		304		404	
005		105		205		305		405	
006		106		206		306		406	
007		107		207		307		407	
008		108		208		308		408	
009		109		209		309		409	
010		110		210		310		410	
011		111		211		311		411	
012		112		212		312		412	
013		113		213		313		413	
014		114		214		314		414	
015		115		215		315		415	
016		116		216		316		416	
017		117		217		317		417	
018		118		218		318		418	
019		119		219		319		419	
020		120		220		320		420	
021		121		221		321		421	
022		122		222		322		422	
023		123		223		323		423	
024		124		224		324		424	
025		125		225		325		425	
026		126		226		326		426	
027		127		227		327		427	
028		128		228		328		428	
029		129		229		329		429	
030		130		230		330		430	
031		131		231		331		431	
032		132		232		332		432	
033		133		233		333		433	
034		134		234		334		434	
035		135		235		335		435	
036		136		236		336		436	
037		137		237		337		437	
038		138		238		338		438	
039		139		239		339		439	

Program Log

Step	Program F P S D	Step	Program F P S D	Step	Program F P S D	Step	Program F P S D	Step	Program F P S D
500		600		700		800		900	
501		601		701		801		901	
502		602		702		802		902	
503		603		703		803		903	
504		604		704		804		904	
505		605		705		805		905	
506		606		706		806		906	
507		607		707		807		907	
508		608		708		808		908	
509		609		709		809		909	
510		610		710		810		910	
511		611		711		811		911	
512		612		712		812		912	
513		613		713		813		913	
514		614		714		814		914	
515		615		715		815		915	
516		616		716		816		916	
517		617		717		817		917	
518		618		718		818		918	
519		619		719		819		919	
520		620		720		820		920	
521		621		721		821		921	
522		622		722		822		922	
523		623		723		823		923	
524		624		724		824		924	
525		625		725		825		925	
526		626		726		826		926	
527		627		727		827		927	
528		628		728		828		928	
529		629		729		829		929	
530		630		730		830		930	
531		631		731		831		931	
532		632		732		832		932	
533		633		733		833		933	
534		634		734		834		934	
535		635		735		835		935	
536		636		736		836		936	
537		637		737		837		937	
538		638		738		838		938	
539		639		739		839		939	