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EZMotion-NC E60/E68 Series

PLC INTERFACE MANUAL

IB-1500176(ENG)-A

Introduction

This manual describes the various signal interfaces and functions required when creating EZMotion-NC E60/E68 Series sequence programs (built-in PLC).
This manual also describes the standard PLC (device fixed) that controls the signals between the control unit and the machine.
Read this manual thoroughly before programming.
Thoroughly study the "Safety Precautions" on the following page to ensure safe use of the EZMotion-NC E60/E68 Series.

Details described in this manual

⚠ CAUTION

⚠ For items described in "Restrictions" or "Usable State", the instruction manual issued by the machine maker takes precedence over this manual.
⚠ Items not described in this manual must be interpreted as "not possible".
⚠ This manual is written on the assumption that all option functions are added. Refer to the specifications issued by the machine maker before starting use.
⚠ Some screens and functions may differ or may not be usable depending on the NC version.

General precautions

The following documents are available as documents related to the contents of this manual. Refer to these as required.

EZMotion-NC E60/E68 Series PLC Onboard Instruction Manual ..... IB-1500179(ENG)
EZMotion-NC E60/E68 Series PLC Development Software Manual (MELSEC Tool Section)..... IB-1500177(ENG)
EZMotion-NC E60/E68 Series PLC Programming Manual (Ladder section with MELSEC tool) ..... IB-1500178(ENG)
EZMotion-NC E60/E68 Series DDB Interface Manual ..... IB-1500180(ENG)

Precautions for Safety

Always read the specifications issued by the machine maker, this manual, related manuals and attached documents before installation, operation, programming, maintenance or inspection to ensure correct use. Understand this numerical controller, safety items and cautions before using the unit.
This manual ranks the safety precautions into "DANGER", "WARNING" and "CAUTION".

⚠ **DANGER**	When there is a great risk that the user could be subject to fatalities or serious injuries if handling is mistaken.
⚠ **WARNING**	When the user could be subject to fatalities or serious injuries if handling is mistaken.
⚠ **CAUTION**	When the user could be subject to injuries or when physical damage could occur if handling is mistaken.

Note that even items ranked as "⚠ **CAUTION**" may lead to major results depending on the situation. In any case, important information that must always be observed is described.

⚠ DANGER

There are no "Danger" items in this manual.

⚠ WARNING

1. Items related to prevention of electric shocks

⚠ Do not operate the switches with wet hands, as this may lead to electric shocks.

⚠ Do not damage, apply excessive stress, place heavy things on or sandwich the cables, as this may lead to electric shocks.

⚠ CAUTION

1. Items related to product and manual

⚠ For the items described in the "Restrictions" and "Usable State", the instruction manual issued by the machine maker takes a precedence over this instruction manual.

⚠ Items not described in this manual must be interpreted as "not possible".

⚠ This manual has been written on the assumption that all options are provided.

⚠ Check the specifications issued by the machine maker before starting use.

⚠ Some screens and functions may differ or may not be usable depending on the NC system version.

2. Items related to connection

❗ When using an inductive load such as relays, always contact a diode in parallel to the load as a noise measure.

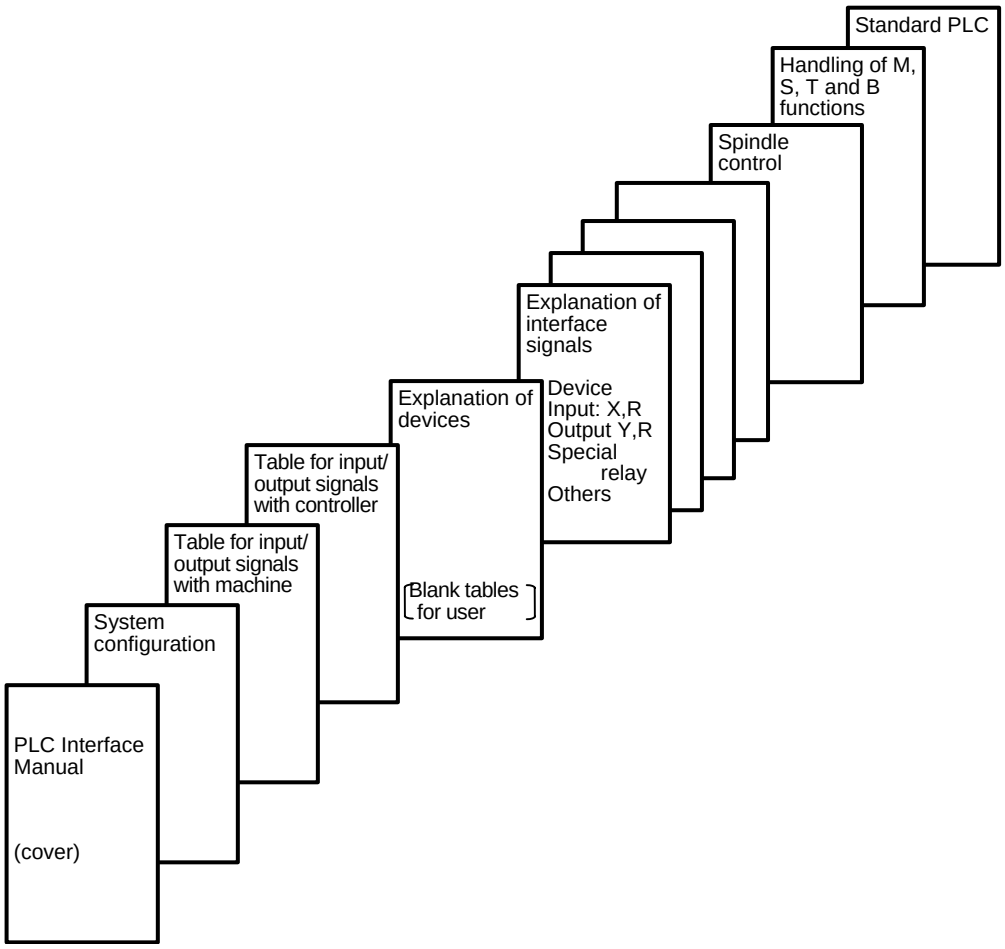
❗ When using a capacitive load such as a lamp, always connect a protective resistor serially to the load to suppress rush currents.

CONTENTS

1. OUTLINE

This manual is prepared to assist you to understand the various control signals necessary for creating the sequence program for the EZMotion-NC E60/E68 Series.

The manual is composed as shown below. Refer to related sections as necessary to gain the maximum benefit from the manual.

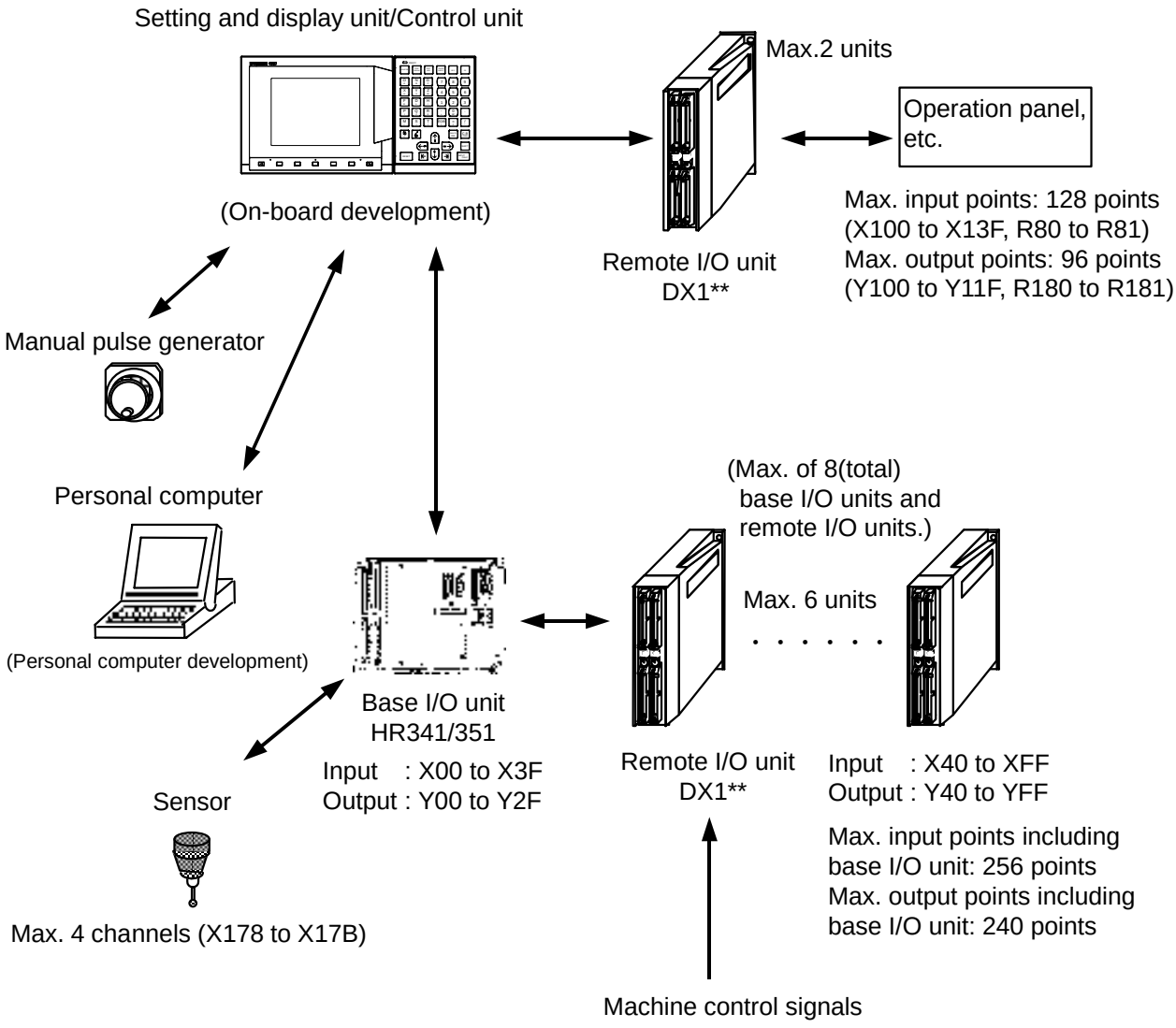


(Caution)

Please note that the specifications referred to in the text represents the maximum specifications which include also those under development.

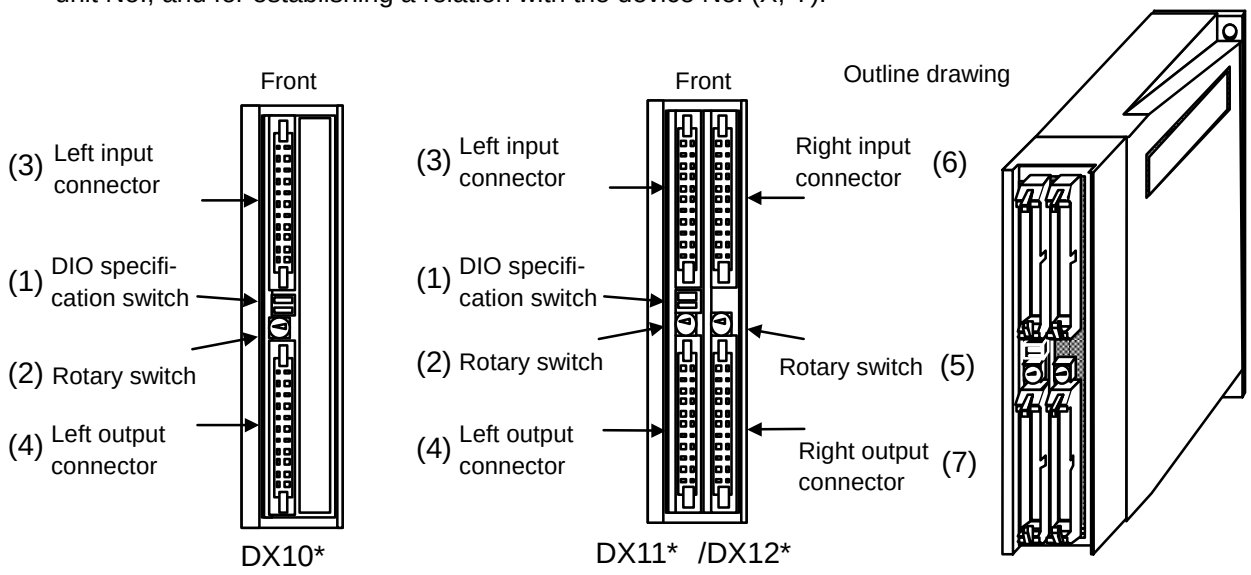
2. SYSTEM CONFIGURATION

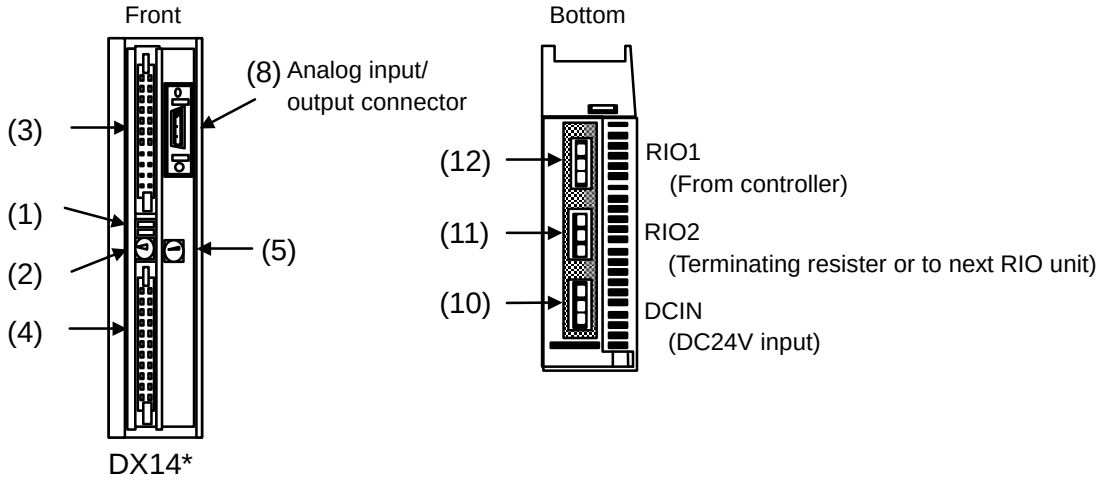
The system configuration for PLC development is shown below.



2.1 Relation of RIO Unit and Devices

Eight types of remote I/O units (hereafter RIO unit) are available as shown below. The specifications of each, DX10*, DX11*, DX12* and DX14* (* is "0" or "1") differ. Each unit has a rotary switch for setting the unit No., and for establishing a relation with the device No. (X, Y).





No. of remote I/O unit input/output points

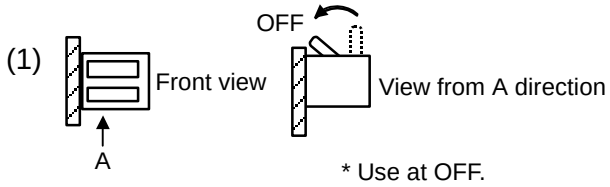
Unit model	Compatible machine control signal	Left	Right	Total
DX10* (FCUA-DX10*)	Digital input signal (DI) (Photocoupler insulation) Digital output signal(DO) (Non-insulated)	32 points 32 points	—	32 points 32 points
DX11* (FCUA-DX11*)	Digital input signal (DI) (Photocoupler insulation) Digital output signal(DO) (Non-insulated)	32 points 32 points	32 points 16 points	64 points 48 points
DX12* (FCUA-DX12*)	Digital input signal (DI) (Photocoupler insulation) Digital output signal(DO) (Non-insulated) Analog output (AO)	32 points 32 points —	32 points 16 points 1 point	64 points 48 points 1 point
DX14* (FCUA-DX14*)	Digital input signal (DI) (Photocoupler insulation) Digital output signal(DO) (Non-insulated) Analog input (AI) Analog output (AO)	32 points 32 points — —	— — 4 points 1 point	32 points 32 points 4 points 1 point

Note) The * mark in the table is 0 when the output is a sink type, and is 1 when the output is a source type. The input is changeable.
Items (1) to (7) are described in the following pages.

2.1.1 DIO Specification Setting Switch

This switch is not used currently, and must always be set to OFF.

DIO specification setting switch



2.1.2 Rotary Switch for Channel No. Setting

Rotary switch for channel No. setting (2) (5)


Set between 0 and 7.

The device used by the PLC is determined by the setting of the rotary switch for channel No. setting.

Rotary switch No.	Device No. read in	Output device No.	Analog output (AO)
	RIO channel 1	RIO channel 1	RIO channel 1
0	X00 to X1F	Y00 to Y1F(Y0F)	The rotary switches correspond to the file registers R100 to R103 in order of small numbers.
1	X20 to X3F	Y20 to Y3F(Y2F)	
2	X40 to X5F	Y40 to Y5F(Y4F)	
3	X60 to X7F	Y60 to Y7F(Y6F)	
4	X80 to X9F	Y80 to Y9F(Y8F)	
5	XA0 to XBF	YA0 to YBF(YAF)	
6	XC0 to XDF	YC0 to YDF(YCF)	
7	XE0 to XFF	YE0 to YFF(YEF)	

The values shown in parentheses are the device range of the card mounted to the right side of the unit.

No. of points occupied by each unit

No. of occupied points	Unit name
1	DX100/DX101
2	DX110/DX111, DX120/DX121, DX140/DX141, Base I/O unit HR341/HR351

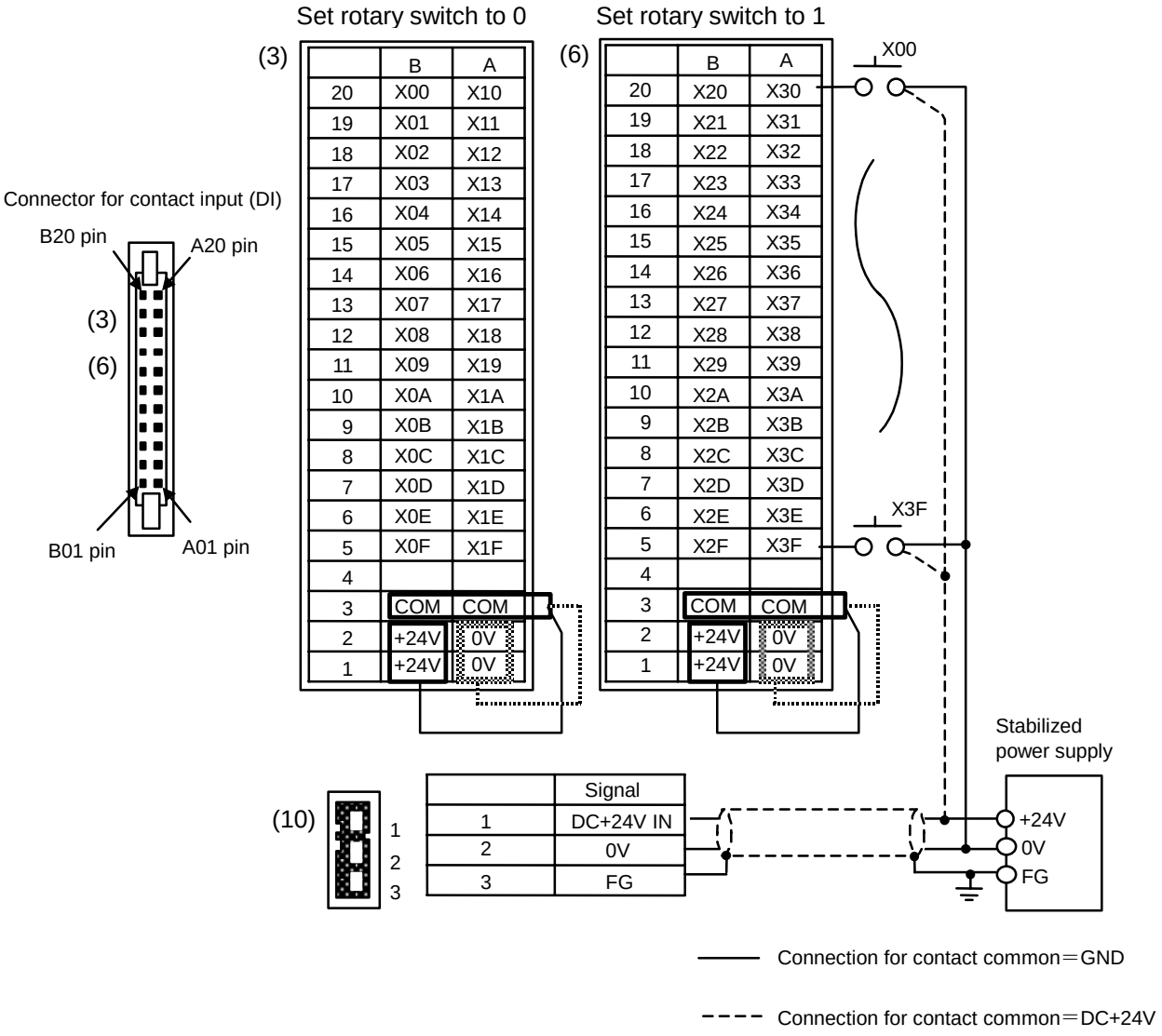
A max. of 8 units can be connected. The HR341/HR351 base I/O units and DX11*/DX12*/DX14* units are counted as 2 occupied points, and DX100/DX101 unit is counted as 1 occupied point.

Example 1) One base I/O unit (HR341/HR351) and three DX120 units.

Example 2) One base I/O unit (HR341/HR351), one DX110 unit and four DX100 units.

2.1.3 Relation of Connector Pins and Device

(1) Input (DI) signal

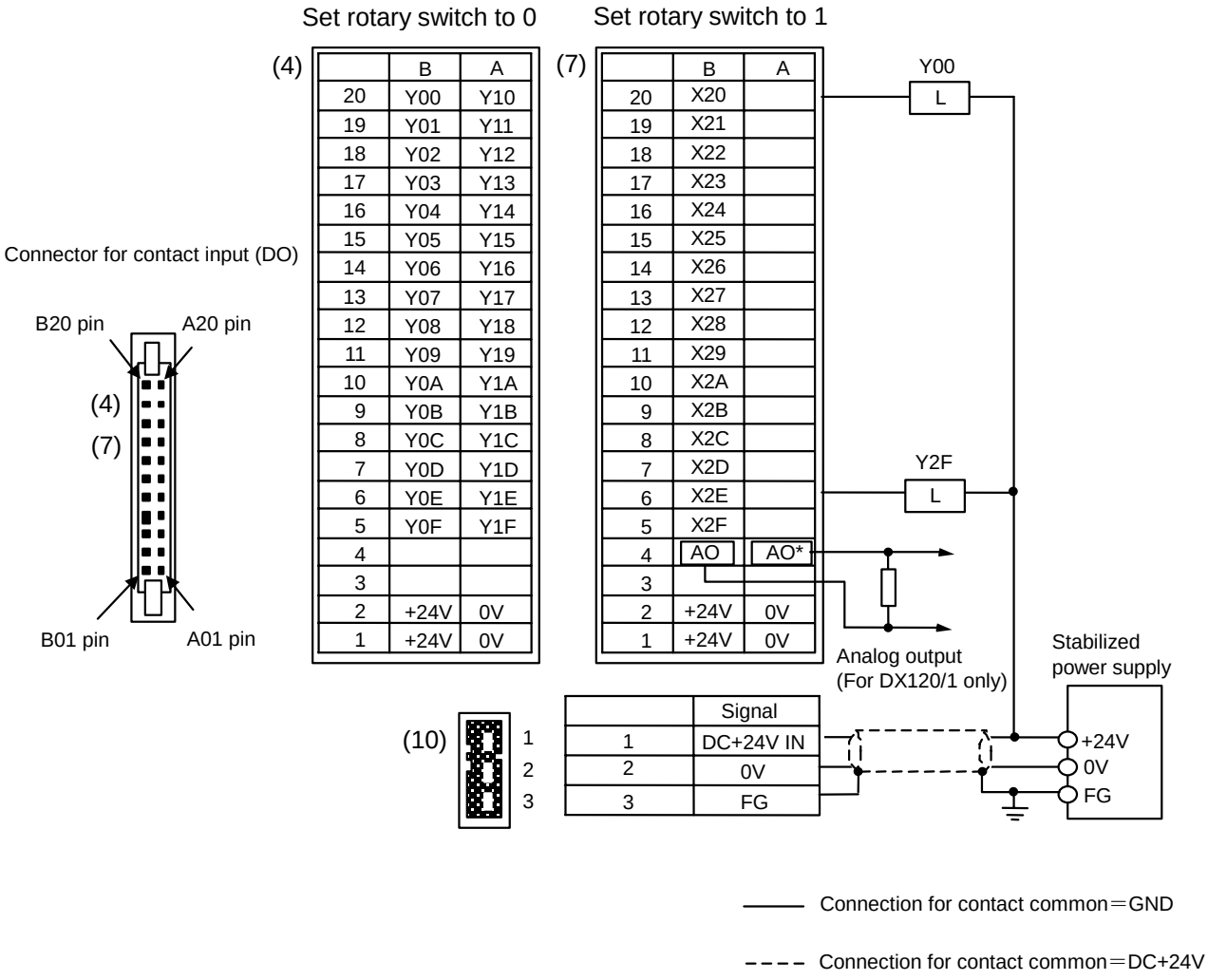


	B	A
20	X00	X10
19	X01	X11
18	X02	X12
17	X03	X13
16	X04	X14
15	X05	X15
14	X06	X16
13	X07	X17
12	X08	X18
11	X09	X19
10	X0A	X1A
9	X0B	X1B
8	X0C	X1C
7	X0D	X1D
6	X0E	X1E
5	X0F	X1F
4		
3	COM	COM
2	+24V	0V
1	+24V	0V

	B	A
20	X20	X30
19	X21	X31
18	X22	X32
17	X23	X33
16	X24	X34
15	X25	X35
14	X26	X36
13	X27	X37
12	X28	X38
11	X29	X39
10	X2A	X3A
9	X2B	X3B
8	X2C	X3C
7	X2D	X3D
6	X2E	X3E
5	X2F	X3F
4		
3	COM	COM
2	+24V	0V
1	+24V	0V

(Note 1) The No. of points (devices) will differ according to the RIO unit type.
(Note 2) The devices shown here show an example for when the rotary switch for channel No. setting on the RIO unit is set to "0" and set to "1".
Refer to section "2.1.2 Rotary Switch for Channel No. Setting" for details on the relation of the rotary switch and device No.

(2) Output (DO) signal



	B	A
20	Y00	Y10
19	Y01	Y11
18	Y02	Y12
17	Y03	Y13
16	Y04	Y14
15	Y05	Y15
14	Y06	Y16
13	Y07	Y17
12	Y08	Y18
11	Y09	Y19
10	Y0A	Y1A
9	Y0B	Y1B
8	Y0C	Y1C
7	Y0D	Y1D
6	Y0E	Y1E
5	Y0F	Y1F
4		
3		
2	+24V	0V
1	+24V	0V

	B	A
20	X20	
19	X21	
18	X22	
17	X23	
16	X24	
15	X25	
14	X26	
13	X27	
12	X28	
11	X29	
10	X2A	
9	X2B	
8	X2C	
7	X2D	
6	X2E	
5	X2F	
4	AO	AO*
3		
2	+24V	0V
1	+24V	0V

	Signal
1	DC+24V IN
2	0V
3	FG

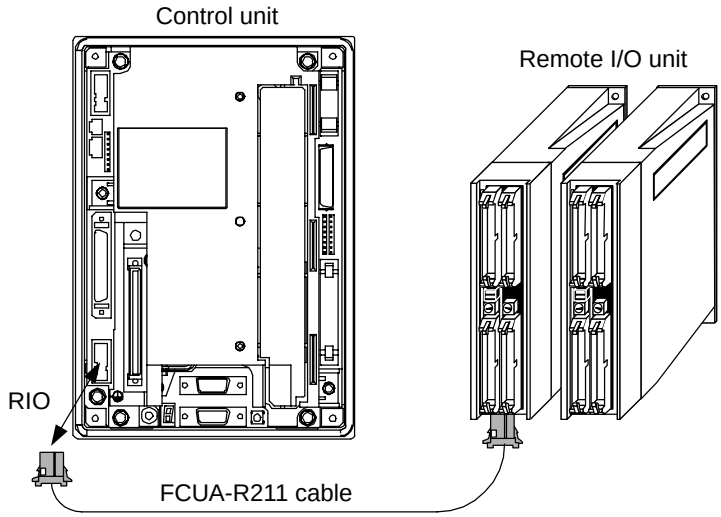
(Note 1) The No. of points (devices) will differ according to the RIO unit type.

(Note 2) The devices shown here show an example for when the rotary switch for channel No. setting on the RIO unit is set to "0" and set to "1".
Refer to section "2.1.2 Rotary switch for setting No. of channels" for details on the relation of the rotary switch and device No.

(Note 3) The A4 and B4 pin analog output (AO, AO*) in the output connector (7) is found only on the RIO unit DX120/DX121.

2.2 Operation Board Remote I/O Unit

With this function, the assignment of the operation board remote I/O directly connected with the control unit to the PLC device can be switched by the parameter. Depending on the parameter settings, the operation board remote I/O can be used as the remote I/O channel #2 equivalent.



Assignment of the operation board remote I/O unit to the PLC device includes the following two patterns and can be switched.

(a) Standard (M50 compatible) assignment method (Pattern 1)
PLC devices are assigned by the M50 compatible assignment method. That means that the input device Nos. are assigned to X100 and after, and the output device Nos. are assigned to Y100 and after.
Up to 4 stations can be used for the remote I/O units. Set the rotary switch within the range 0 to 3.

(b) Remote I/O channel #2 equivalent assignment method (Pattern 2)
PLC devices are assigned by the remote I/O channel #2 equivalent method. That means that the input device Nos. are assigned to X640 and after, and the output device Nos. are assigned to Y740 and after.
Up to 8 stations can be used for the remote I/O units. Set the rotary switch within the range 0 to 7.

Remote I/O unit Rotary switch No.	Device No. to be input		Device No. to be output	
	Pattern 1	Pattern 2	Pattern 1	Pattern 2
0	X100 to X11F	X640 to X65F	Y100 to Y11F	Y740 to Y75F
1	X120 to X13F	X660 to X67F	Y120 to Y13F	Y760 to Y77F
2	R80, R81	X680 to X69F	R180, R181	Y780 to Y79F
3	R82, R83	X6A0 to X6BF	R182, R183	Y7A0 to Y7BF
4	-	X6C0 to X6DF	-	Y7C0 to Y7DF
5	-	X6E0 to X6FF	-	Y7E0 to Y7FF
6	-	X700 to X71F	-	Y800 to Y81F
7	-	X720 to X73F	-	Y820 to Y83F

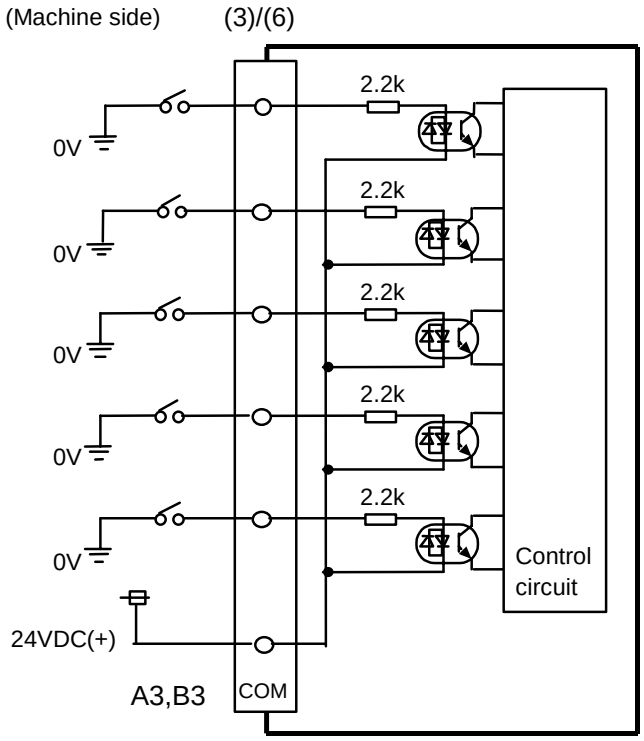
(Note 1) X108 is assigned for an operation board reset signal and cannot be used for the other applications.

(Note 2) Analog output is not possible even if DX12x or DX14x is connected.

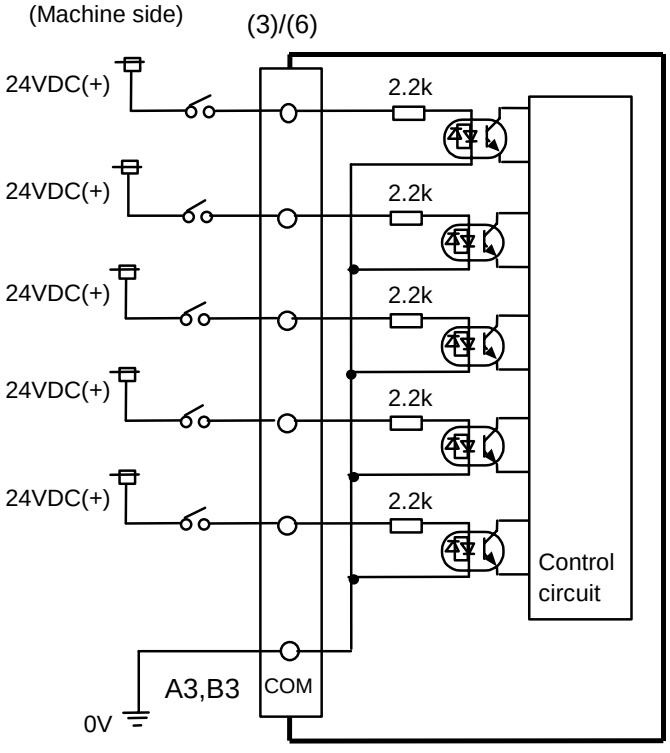
2.3 Outline of Digital Signal Input Circuit

There is a sink type digital signal input circuit and source type digital signal input circuit. Either method can be selected with each unit's card unit.

Input circuit



Sink type



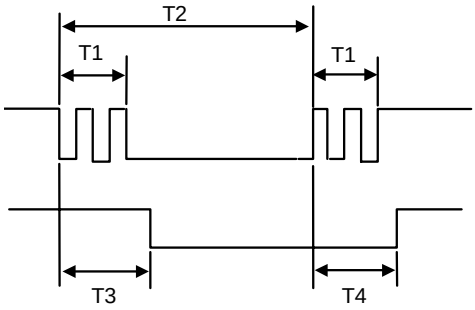
Source type

Input conditions

The input signal must be used within the conditions shown below.

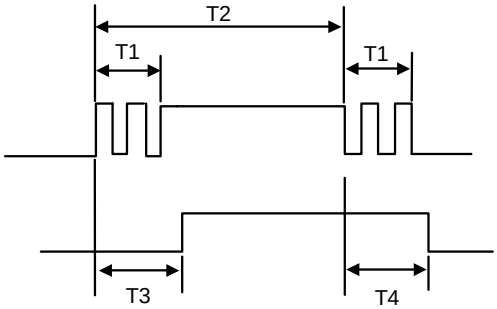
Sink type

Input voltage when external contact is ON	6V or less
Input current when external contact is ON	9mA or more
Input voltage when external contact is OFF	20V or more, 25.2V or less
Input current when external contact is OFF	2mA or less
Tolerable chattering time	3ms or less (Refer to T1 in drawing below)
Input signal hold time	40ms or more (Refer to T2 in drawing below)
Input circuit operation delay time	3ms <= T3 ≒ T4 <= 16ms
Machine side contact capacity	+30V or more, 16mA or more



Source type

Input voltage when external contact is ON	18V or more, 25.2V or less
Input current when external contact is ON	9mA or more
Input voltage when external contact is OFF	4V or less
Input current when external contact is OFF	2mA or less
Tolerable chattering time	3ms or less (Refer to T1 in drawing below)
Input signal hold time	40ms or more (Refer to T2 in drawing below)
Input circuit operation delay time	3ms <= T3 ≒ T4 <= 16ms
Machine side contact capacity	+30V or more, 16mA or more

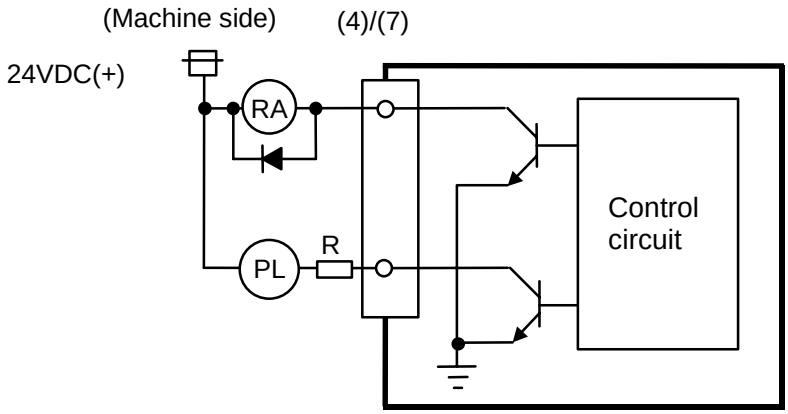


(Note) Input signal hold time : "40ms or more" is a standard value. Input signals can not be recognized unless input signals are hold for the ladder processing cycle period or more.

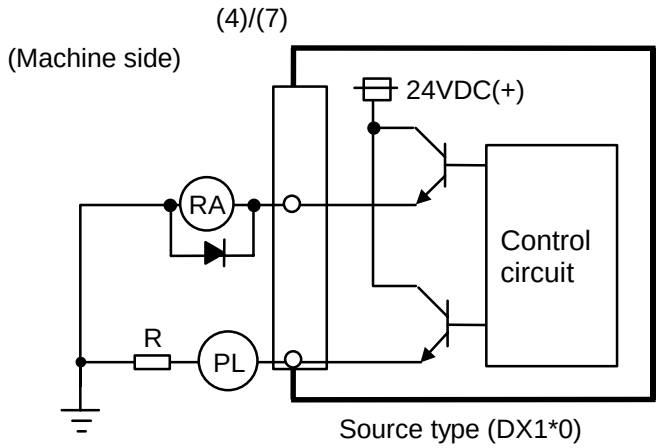
2.4 Outline of Digital Signal Output Circuit

There is a sink type (DX1*0) digital signal output circuit and source type (DX1*1) digital signal output circuit. Use this circuit within the range shown below.

Output circuit



Sink type (DX1*0)



Source type (DX1*0)

Output conditions

Insulation method	Non-insulating
Rated load voltage	+24VDC
Max. output current	60mA/1point
Output delay time	40μs

<Caution>

* When using a conductive load such as a relay, always connect a diode (withstand voltage 100V or more, 100mA or more) parallel to that load.
* When using a capacity load such as a lamp, connect a protective resistance (R=150ohm) serially to that load to limit the rush current. (Make sure that the current is lower than the tolerable current including the momentary current.)

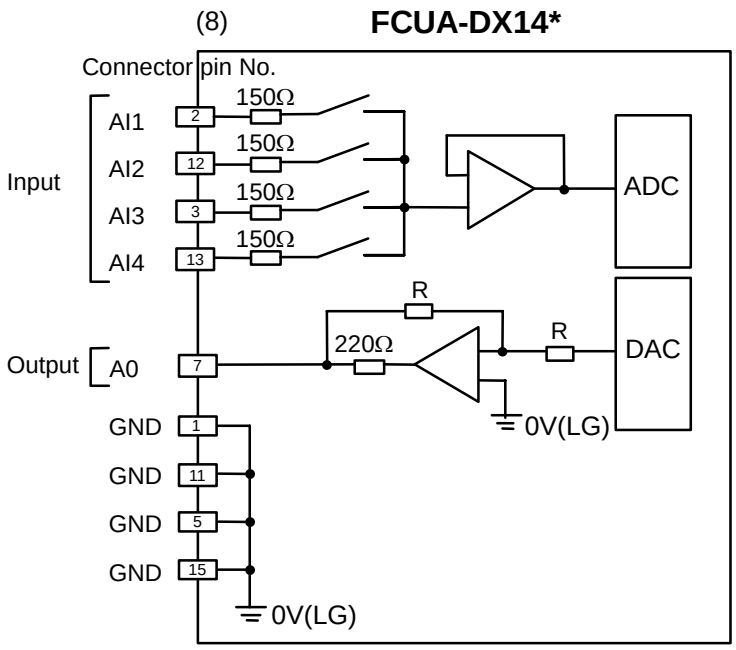
⚠CAUTION

- When using a conductive load such as relays, always contact a diode in parallel to the load as a noise measure.
- When using a capacity load such as a lamp, always connect a protective resistor serially to the load to suppress rush currents.

2.5 Outline of Analog Signal Input Circuit

The analog signal input circuit can be used only with the FCUA-DX140/DX141 unit.

Input circuit



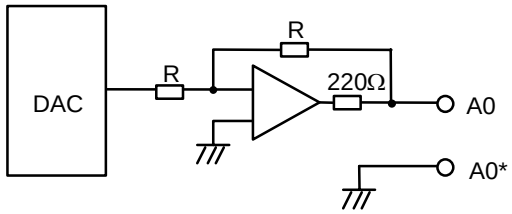
Input conditions

Input max. rate	± 15V
Resolution	10V/2000 (5mV)
Accuracy	± 25mV or less
AD input sampling time	14.2ms(AI0)/42.6ms(AI1 to 3)

2.6 Outline of Analog Signal Output Circuit

The analog signal circuit can be used also with the FCUA-DX120/DX121/DX140/DX141 unit in addition to the base I/O unit FCU6-HR341/351.

Output circuit



Output conditions

Output voltage	-10V to +10V (±5%)
Resolution	2^{12} (1/4095)
Load conditions	10kohm load resistance (standard)
Output impedance	220ohm

2.7 Fixed Signals

The connector pin Nos. in the input signals that are fixed are shown below.
Note that using the methods below can ignore fixed signals and change the allocations.

Signal name	Device	Signal name	Device
Emergency stop	EMG of main unit	Stroke end -1	X20
Stroke end +1	X28	Stroke end -2	X21
Stroke end +2	X29	Stroke end -3	X22
Stroke end +3	X2A	Stroke end -4	X23
Stroke end +4	X2B		
Reference position return near-point detection 1	X18		
Reference position return near-point detection 2	X19		
Reference position return near-point detection 3	X1A		
Reference position return near-point detection 4	X1B		

2.7.1 Ignoring Fixed Signals

The fixed signals can be used as other signals by ignoring them with file registers R156 and R157.

2.7.2 Changing the Addresses of Fixed Signals

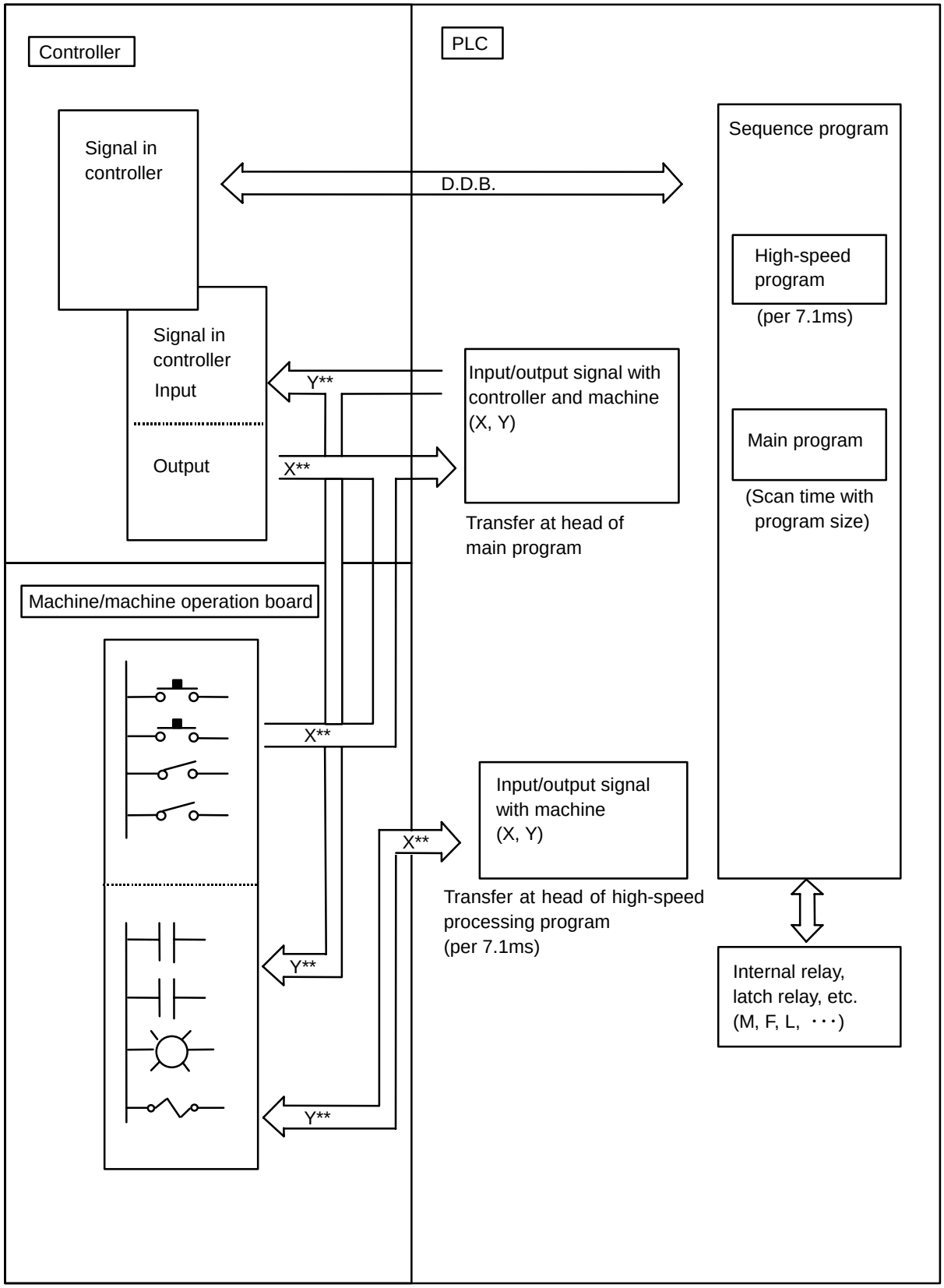
The fixed devices can be allocated arbitrarily with the following parameters.

The parameters #2073 to #2075 are valid when 1 is set in #1226 aux10 bit 5.
When the parameters #2073 to #2075 are valid, do not set the same device number. If the same device number exists, an emergency stop occurs. However, no device number check is performed for an axis to which a signal (R156, R157) that ignores the fixed signal is input.

When the arbitrary allocation is valid, the fixed signals (X400 to X40F) can be used as other signals.

#	Items		Details	Setting range (unit)
1226	aux10 (bit5)	Arbitrary allocation of dog signal	Specify whether to enable the arbitrary allocation parameter for the origin dog and H/W OT. 0: Disable arbitrary allocation. (Fixed device) 1: Enable arbitrary allocation. (Device specified by the parameter)	0/1
2073	zrn_dog	Origin dog	Under the standard specifications, the origin dog signal is assigned to a fixed device. When it is desired to assign the origin dog signal to a position other than the fixed device, specify the input device in this parameter. • This parameter is valid when 1 is set in #1226 aux10 bit 5. • When this parameter is valid, do not set the same device number. If the same device number exists, an emergency stop occurs. However, no device number check is performed for an axis to which a signal that ignores the near-point dog signal (R157) is input.	00 to FF (HEX)
2074	H/W_OT+	H/W OT+	Under the standard specifications, the OT (+) signal is assigned to a fixed device. When it is desired to assign the OT (+) signal to a position other than the fixed device, specify the input device in this parameter. • This parameter is valid when 1 is set in #1226 aux10 bit 5. • When this parameter is valid, do not set the same device number. If the same device number exists, an emergency stop occurs. However, no device number check is performed for an axis to which a signal that ignores the OT signal (R156) is input.	00 to FF (HEX)
2075	H/W_OT-	H/W OT-	Under the standard specifications, the OT (-) signal is assigned to a fixed device. When it is desired to assign the OT (-) signal to a position other than the fixed device, specify the input device in this parameter. • This parameter is valid when 1 is set in #1226 aux10 bit 5. • When this parameter is valid, do not set the same device number. If the same device number exists, an emergency stop occurs. However, no device number check is performed for an axis to which a signal that ignores the OT signal (R156) is input.	00 to FF (HEX)

2.8 Flow of Signals



2.9 List of Devices Used

The devices used by the PLC are shown below.

Device	Device number	Unit	Contents	Format
X ∗	X0 to XABF (2752)	1 bit	Input signal to PLC, such as machine input	—
Y ∗	Y0 to YDFF (3584)	1 bit	Output signal from PLC, such as machine output	—
M	M0 to M8191 (8192)	1 bit	Temporary storage	1
F	F0 to F127 (128)	1 bit	Temporary storage, alarm message interface	2
L	L0 to L255 (256)	1 bit	Latch relay (backup memory)	3
SM ∗	SM0 to SM127 (128)	1 bit	Special relay	—
T	T0 to T15 (16)	1 bit/16 bits	10 ms unit timer (parameter #6000 to #6015)	4, 5
	T16 to T55 (40)	1 bit/16 bits	10 ms unit timer (fixed timer)	
	T56 to T135 (80)	1 bit/16 bits	100 ms unit timer (parameter #6016 to #6095)	
	T136 to T231 (96)	1 bit/16 bits	100 ms unit timer (fixed timer)	
	T232 to T239 (8)	1 bit/16 bits	100 ms unit integrated timer (parameter #6096 to #6103)	
	T240 to T255 (16)	1 bit/16 bits	100 ms unit integrated timer (fixed timer)	
C	C0 to C23 (24)	1 bit/16 bits	Counter (parameter #6200 to #6223)	6, 7
	C24 to C127 (104)	1 bit/16 bits	Counter (fixed counter)	
D	D0 to D1023 (1024)	16 bits/32 bits	Data register, operation register	8
R ∗	R0 to R8191 (8192)	16 bits/32 bits	File register, PLC-NC interface The user released registers are R500 to R549 and R1900 to R2799. R1900 to R2799 are backed up by the battery.	9
Z	Z0 to Z1 (2)	16 bits	Index of D or R address (±n)	—
N	N0 to N7 (8)	—	Master control nesting level	—
P ∗	P0 to P255 (256)	—	Label of conditional jump and subroutine call.	—
K	K-32768 to K32767	—	Decimal constant for 16-bit instructions	—
	K-2147483648 to K2147483647	—	Decimal constant for 32-bit instructions	
H	H0 to HFFFF	—	Hexadecimal constant for 16-bit instructions	—
	H0 to HFFFFFFFF	—	Hexadecimal constant for 32-bit instructions	

Note 1) The application of devices indicated by a ∗ in the "Device" column is determined.
Do not use undefined device Nos., even when blank.

2.10 File Register General Map

R000	R00 to R99	••••	Controller → PLC signal I/F (M, S, T codes, etc.)
R100	R100 to R199	••••	PLC → controller signal I/F (feed override code, etc.)
R200	R200 to R499	••••	System reserve
R500	R500 to R549	••••	User release (non-backed up area)
R560	R560 to R567	••••	External machine coordinate system compensation I/F
R600	R600 to R1899	••••	System reserve
R1900	R1900 to R2799	••••	User release (backed up area)
R2800	R2800 to R2895	••••	Corresponding to parameters: PLC constants 1 to 48
R2900	R2900 to R2947	••••	Corresponding to parameters: Bit selection 1 to 96 (Note that 49 to 96 are the system reserve area)
R2950	R2950 to R2999	••••	ATC tool registration common data (spindle tool, etc.)
R3000	R3000 to R3159 (80)	••••	ATC tool registration magazine 1 data (corresponding to ATC tool registration screen) Tool life management data (Lathe system: R3000 to R3639)
R3240	R3240 to R3399 (80)	••••	ATC tool registration magazine 2 data
R3480	R3480 to R3639 (80)	••••	ATC tool registration magazine 3 data
R3720	R3720 to R3735	••••	Tool life management I/F (machining center system)
R3736	R3736 to R4399	••••	System reserve
R4400	R4400 to R4449	••••	Corresponding to parameters : Bit selection2 97 to 196
R4450	R4450 to R4899	••••	System reserve
R4900	R4900 to R4995		Corresponding to parameters: PLC constants 49 to 96
R4996	R4996 t0 R5479		System reserve
R5480	R5480 to R6279	••••	Tool life management I/F (for lathe system with spare tool life management)
R6280 R8191		••••	System reserve

(Note) The system reserve is used for function expansion by Mitsubishi, and must not be used by the user.

3. INPUT/OUTPUT SIGNALS WITH MACHINE

3.1 How to Read Input/Output Signal Table

The method of reading the input/output signal table is shown below.
Each card mounted on the RIO unit (DX***) uses 32 points. Thus, even the 16 point output card has 32 points, and the head of the next card number will be a serial No. on the assumption that there are 32 points.

Connector Pin. No.

Card No. determined by base I/O or remote RIO unit rotary switch.
The 0 in No. 0 is the rotary switch No.
The card for which the rotary switch setting is 0 will be the 1st card.

Head device of each card

Input Signals from Machine (for HR341/351)

NO.0: First card

Table 3-1-1

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X0			B20	X8			B12
X1			B19	X9			B11
X2			B18	XA			B10
X3			B17	XB			B09
X4			B16	XC			B08
X5			B15	XD			B07
X6			B14	XE			B06
X7			B13	XF			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X10			A20	X18		*Reference position return near point detection 1	A12
X11			A19	X19		*Reference position return near point detection 2	A11
X12			A18	X1A		*Reference position return near point detection 3	A10
X13			A17	X1B		*Reference position return near point detection 4	A09
X14			A16	X1C			A08
X15			A15	X1D			A07
X16			A14	X1E			A06
X17			A13	X1F			A05

NO.1: Second card

Table 3-1-2

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X20		* Stroke end -1	B20	X28		* Stroke end +1	B12
X21		* Stroke end -2	B19	X29		* Stroke end +2	B11
X22		* Stroke end -3	B18	X2A		* Stroke end +3	B10
X23		* Stroke end -4	B17	X2B		* Stroke end +4	B09
X24			B16	X2C			B08
X25			B15	X2D			B07
X26			B14	X2E			B06
X27			B13	X2F			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X30			A20	X38			A12
X31			A19	X39			A11
X32			A18	X3A			A10
X33			A17	X3B			A09
X34			A16	X3C			A08
X35			A15	X3D			A07
X36			A14	X3E			A06
X37			A13	X3F			A05

(Note 1) For the allocations of the reference position return near-point detection and stroke end signals, refer to the section "2.7 Fixed Signals".

(Note 1) ☐ are 1 word (16-bit) data.
(Note 2) Signals marked with * in the "Single name" column are handled as B contacts.

3.2 Classification of Machine Input/Output Signals

The signals handled by the PLC are classified as shown below.
Refer to the following table when making allocations during design.

	Signal type		Allocation table	Explanation
Input	DI	Machine	Table 3-1-1 to Table 3-1-8	(1) Allocated to device X. (2) Some connector pin allocations are determined. 1) Stroke end signal (+, -) 2) Reference point return near-point detection signal (3) The high-speed processing input is set with the parameters. (Read in at the head of the high-speed processing scan.) **(Note 1)** High-speed input of the machine operation board inputs is not possible.
		Machine operation board	Table 3-2-1 to Table 3-2-4	
	PLC switch input (Note)		Table 3-3-1	(1) The switches can be substituted for by the setting and display unit. (2) Allocated to device X. (3) The switch names displayed on the setting and display unit are user release switches, and can be created with the ladder message creation.
	Sensor input		Table 3-4-1	(1) This is only used for monitoring on the ladder side.
	AI (Analog Input)		Table 4-2-1	(1) The connector pin allocation is determined. (2) Allocated to device R.
Output	DO	Machine	Table 3-5-1 to Table 3-5-8	(1) Allocated to device Y. (2) The high-speed processing output is set with the parameters. (Output at end of the high-speed processing scan.) **(Note 1)** High-speed output of the machine operation board outputs is not possible.
		Machine operation board	Table 3-6-1 to Table 3-6-4	
	PLC switch output (Note)		Table 3-7-1	(1) Output used to show that setting and display unit PLC switch input is valid. (2) Allocated to device Y.
	AO (Analog Output)		Table 4-4-1	(1) The connector pin allocation is determined. (2) Data to be D/A converted and output can be output by reading it into the file register (R).

(Note) The PLC switches are not signals for directly inputting/outputting with the machine, and are hypothetical switches used by the user on the setting and display unit. When classified by property, they are as shown above.

3.3 Machine Input Signals

3.3.1 Using HR341/351 for Base I/O Unit

Input Signals from Machine (for HR341/351)

No.0: First card

Table 3-1-1

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X0			B20	X8			B12
X1			B19	X9			B11
X2			B18	XA			B10
X3			B17	XB			B09
X4			B16	XC			B08
X5			B15	XD			B07
X6			B14	XE			B06
X7			B13	XF			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X10			A20	X18		* Reference position return near point detection 1	A12
X11			A19	X19		* Reference position return near point detection 2	A11
X12			A18	X1A		* Reference position return near point detection 3	A10
X13			A17	X1B		* Reference position return near point detection 4	A09
X14			A16	X1C			A08
X15			A15	X1D			A07
X16			A14	X1E			A06
X17			A13	X1F			A05

No.1: Second card

Table 3-1-2

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X20		* Stroke end -1	B20	X28		* Stroke end +1	B12
X21		* Stroke end -2	B19	X29		* Stroke end +2	B11
X22		* Stroke end -3	B18	X2A		* Stroke end +3	B10
X23		* Stroke end -4	B17	X2B		* Stroke end +4	B09
X24			B16	X2C			B08
X25			B15	X2D			B07
X26			B14	X2E			B06
X27			B13	X2F			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X30			A20	X38			A12
X31			A19	X39			A11
X32			A18	X3A			A10
X33			A17	X3B			A09
X34			A16	X3C			A08
X35			A15	X3D			A07
X36			A14	X3E			A06
X37			A13	X3F			A05

(Note 1) For the allocations of the reference position return near-point detection and stroke end signals, refer to the section "2.7 Fixed Signals".

Input Signals from Machine (for DX1)**

No.2: Third card

Table 3-1-3

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X40			B20	X48			B12
X41			B19	X49			B11
X42			B18	X4A			B10
X43			B17	X4B			B09
X44			B16	X4C			B08
X45			B15	X4D			B07
X46			B14	X4E			B06
X47			B13	X4F			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X50			A20	X58			A12
X51			A19	X59			A11
X52			A18	X5A			A10
X53			A17	X5B			A09
X54			A16	X5C			A08
X55			A15	X5D			A07
X56			A14	X5E			A06
X57			A13	X5F			A05

No.3: Fourth card

Table 3-1-4

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X60			B20	X68			B12
X61			B19	X69			B11
X62			B18	X6A			B10
X63			B17	X6B			B09
X64			B16	X6C			B08
X65			B15	X6D			B07
X66			B14	X6E			B06
X67			B13	X6F			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X70			A20	X78			A12
X71			A19	X79			A11
X72			A18	X7A			A10
X73			A17	X7B			A09
X74			A16	X7C			A08
X75			A15	X7D			A07
X76			A14	X7E			A06
X77			A13	X7F			A05

Input Signals from Machine (for DX1)**

No.4: Fifth card

Table 3-1-5

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X80			B20	X88			B12
X81			B19	X89			B11
X82			B18	X8A			B10
X83			B17	X8B			B09
X84			B16	X8C			B08
X85			B15	X8D			B07
X86			B14	X8E			B06
X87			B13	X8F			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X90			A20	X98			A12
X91			A19	X99			A11
X92			A18	X9A			A10
X93			A17	X9B			A09
X94			A16	X9C			A08
X95			A15	X9D			A07
X96			A14	X9E			A06
X97			A13	X9F			A05

No.5: Sixth card

Table 3-1-6

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
XA0			B20	XA8			B12
XA1			B19	XA9			B11
XA2			B18	XAA			B10
XA3			B17	XAB			B09
XA4			B16	XAC			B08
XA5			B15	XAD			B07
XA6			B14	XAE			B06
XA7			B13	XAF			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
XB0			A20	XB8			A12
XB1			A19	XB9			A11
XB2			A18	XBA			A10
XB3			A17	XBB			A09
XB4			A16	XBC			A08
XB5			A15	XBD			A07
XB6			A14	XBE			A06
XB7			A13	XBF			A05

Input Signals from Machine (for DX1)**

No.6: Seventh card

Table 3-1-7

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
XC0			B20	XC8			B12
XC1			B19	XC9			B11
XC2			B18	XCA			B10
XC3			B17	XCB			B09
XC4			B16	XCC			B08
XC5			B15	XCD			B07
XC6			B14	XCE			B06
XC7			B13	XCF			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
XD0			A20	XD8			A12
XD1			A19	XD9			A11
XD2			A18	XDA			A10
XD3			A17	XDB			A09
XD4			A16	XDC			A08
XD5			A15	XDD			A07
XD6			A14	XDE			A06
XD7			A13	XDF			A05

No.7: Eighth card

Table 3-1-8

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
XE0			B20	XE8			B12
XE1			B19	XE9			B11
XE2			B18	XEA			B10
XE3			B17	XEB			B09
XE4			B16	XEC			B08
XE5			B15	XED			B07
XE6			B14	XEE			B06
XE7			B13	XEF			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
XF0			A20	XF8			A12
XF1			A19	XF9			A11
XF2			A18	XFA			A10
XF3			A17	XFB			A09
XF4			A16	XFC			A08
XF5			A15	XFD			A07
XF6			A14	XFE			A06
XF7			A13	XFF			A05

3.3.2 Using DX1** for Machine Operation Board

Input Signals from Machine Operation Board (for DX1＊＊)

No.0: First card

Table 3-2-1

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X100			B20	X108	MRST	NC reset (Note1)	B12
X101			B19	X109			B11
X102			B18	X10A			B10
X103			B17	X10B			B09
X104			B16	X10C			B08
X105			B15	X10D			B07
X106			B14	X10E			B06
X107			B13	X10F			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X110			A20	X118			A12
X111			A19	X119			A11
X112			A18	X11A			A10
X113			A17	X11B			A09
X114			A16	X11C			A08
X115			A15	X11D			A07
X116			A14	X11E			A06
X117			A13	X11F			A05

No.1: Second card

Table 3-2-2

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X120			B20	X128			B12
X121			B19	X129			B11
X122			B18	X12A			B10
X123			B17	X12B			B09
X124			B16	X12C			B08
X125			B15	X12D			B07
X126			B14	X12E			B06
X127			B13	X12F			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X130			A20	X138			A12
X131			A19	X139			A11
X132			A18	X13A			A10
X133			A17	X13B			A09
X134			A16	X13C			A08
X135			A15	X13D			A07
X136			A14	X13E			A06
X137			A13	X13F			A05

(Note 1) X108 is a keyboard unit reset button signal, and is always set to Y220 (NC reset 1), Y221 (NC reset 2) or Y222 (reset and rewind) by the sequence process.
This signal can be used without DX1**.

Input Signals from Machine Operation Board (for DX1)**

No.2: Third card

Table 3-2-3

File register R80							
Bit	**Abbreviation**	**Signal name**	**Connector**	**Bit**	**Abbreviation**	**Signal name**	**Connector**
0			B20	8			B12
1			B19	9			B11
2			B18	A			B10
3			B17	B			B09
4			B16	C			B08
5			B15	D			B07
6			B14	E			B06
7			B13	F			B05

File register R81							
Bit	**Abbreviation**	**Signal name**	**Connector**	**Bit**	**Abbreviation**	**Signal name**	**Connector**
0			A20	8			A12
1			A19	9			A11
2			A18	A			A10
3			A17	B			A09
4			A16	C			A08
5			A15	D			A07
6			A14	E			A06
7			A13	F			A05

No.3: Fourth card

Table 3-2-4

File register R82							
Bit	**Abbreviation**	**Signal name**	**Connector**	**Bit**	**Abbreviation**	**Signal name**	**Connector**
0			B20	8			B12
1			B19	9			B11
2			B18	A			B10
3			B17	B			B09
4			B16	C			B08
5			B15	D			B07
6			B14	E			B06
7			B13	F			B05

File register R83							
Bit	**Abbreviation**	**Signal name**	**Connector**	**Bit**	**Abbreviation**	**Signal name**	**Connector**
0			A20	8			A12
1			A19	9			A11
2			A18	A			A10
3			A17	B			A09
4			A16	C			A08
5			A15	D			A07
6			A14	E			A06
7			A13	F			A05

3.3.3 PLC Switch/Sensor

PLC Switch Input

Table 3-3-1

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
X140		PLC switch #1	X148		PLC switch #9
X141		PLC switch #2	X149		PLC switch #10
X142		PLC switch #3	X14A		PLC switch #11
X143		PLC switch #4	X14B		PLC switch #12
X144		PLC switch #5	X14C		PLC switch #13
X145		PLC switch #6	X14D		PLC switch #14
X146		PLC switch #7	X14E		PLC switch #15
X147		PLC switch #8	X14F		PLC switch #16

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
X150		PLC switch #17	X158		PLC switch #25
X151		PLC switch #18	X159		PLC switch #26
X152		PLC switch #19	X15A		PLC switch #27
X153		PLC switch #20	X15B		PLC switch #28
X154		PLC switch #21	X15C		PLC switch #29
X155		PLC switch #22	X15D		PLC switch #30
X156		PLC switch #23	X15E		PLC switch #31
X157		PLC switch #24	X15F		PLC switch #32

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
X160		Not used	X168		Not used
X161			X169		
X162			X16A		
X163			X16B		
X164			X16C		
X165			X16D		
X166			X16E		
X167			X16F		

Sensor Input

Table 3-4-1

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
X170		— —	X178		Skip input 1
X171		— —	X179		Skip input 2
X172		— —	X17A		Skip input 3
X173		— —	X17B		Skip input 4
X174		— —	X17C		Skip input 5
X175		— —	X17D		Skip input 6
X176		— —	X17E		Skip input 7
X177		— —	X17F		Skip input 8

3.4 Machine Output Signals

3.4.1 Using HR341/351 for Base I/O Unit

Output Signals to Machine (for HR341/351)

No.0: First card

Table 3-5-1

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
Y0			B20	Y8			B12
Y1			B19	Y9			B11
Y2			B18	YA			B10
Y3			B17	YB			B09
Y4			B16	YC			B08
Y5			B15	YD			B07
Y6			B14	YE			B06
Y7			B13	YF			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
Y10			A20	Y18			A12
Y11			A19	Y19			A11
Y12			A18	Y1A			A10
Y13			A17	Y1B			A09
Y14			A16	Y1C			A08
Y15			A15	Y1D			A07
Y16			A14	Y1E			A06
Y17			A13	Y1F			A05

No.1: Second card

Table 3-5-2

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
Y20			B20	Y28			B12
Y21			B19	Y29			B11
Y22			B18	Y2A			B10
Y23			B17	Y2B			B09
Y24			B16	Y2C			B08
Y25			B15	Y2D			B07
Y26			B14	Y2E			B06
Y27			B13	Y2F			B05

Output Signals to Machine (for DX1)**

No.2: Third card

Table 3-5-3

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
Y40			B20	Y48			B12
Y41			B19	Y49			B11
Y42			B18	Y4A			B10
Y43			B17	Y4B			B09
Y44			B16	Y4C			B08
Y45			B15	Y4D			B07
Y46			B14	Y4E			B06
Y47			B13	Y4F			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
Y50			A20	Y58			A12
Y51			A19	Y59			A11
Y52			A18	Y5A			A10
Y53			A17	Y5B			A09
Y54			A16	Y5C			A08
Y55			A15	Y5D			A07
Y56			A14	Y5E			A06
Y57			A13	Y5F			A05

No.3: Fourth card

Table 3-5-4

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
Y60			B20	Y68			B12
Y61			B19	Y69			B11
Y62			B18	Y6A			B10
Y63			B17	Y6B			B09
Y64			B16	Y6C			B08
Y65			B15	Y6D			B07
Y66			B14	Y6E			B06
Y67			B13	Y6F			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
Y70			A20	Y78			A12
Y71			A19	Y79			A11
Y72			A18	Y7A			A10
Y73			A17	Y7B			A09
Y74			A16	Y7C			A08
Y75			A15	Y7D			A07
Y76			A14	Y7E			A06
Y77			A13	Y7F			A05

Output Signals to Machine (for DX1)**

No.4: Fifth card

Table 3-5-5

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
Y80			B20	Y88			B12
Y81			B19	Y89			B11
Y82			B18	Y8A			B10
Y83			B17	Y8B			B09
Y84			B16	Y8C			B08
Y85			B15	Y8D			B07
Y86			B14	Y8E			B06
Y87			B13	Y8F			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
Y90			A20	Y98			A12
Y91			A19	Y99			A11
Y92			A18	Y9A			A10
Y93			A17	Y9B			A09
Y94			A16	Y9C			A08
Y95			A15	Y9D			A07
Y96			A14	Y9E			A06
Y97			A13	Y9F			A05

No.5: Sixth card

Table 3-5-6

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
YA0			B20	YA8			B12
YA1			B19	YA9			B11
YA2			B18	YAA			B10
YA3			B17	YAB			B09
YA4			B16	YAC			B08
YA5			B15	YAD			B07
YA6			B14	YAE			B06
YA7			B13	YAF			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
YB0			A20	YB8			A12
YB1			A19	YB9			A11
YB2			A18	YBA			A10
YB3			A17	YBB			A09
YB4			A16	YBC			A08
YB5			A15	YBD			A07
YB6			A14	YBE			A06
YB7			A13	YBF			A05

Output Signals to Machine (for DX1)**

No.6: Seventh card

Table 3-5-7

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
YC0			B20	YC8			B12
YC1			B19	YC9			B11
YC2			B18	YCA			B10
YC3			B17	YCB			B09
YC4			B16	YCC			B08
YC5			B15	YCD			B07
YC6			B14	YCE			B06
YC7			B13	YCF			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
YD0			A20	YD8			A12
YD1			A19	YD9			A11
YD2			A18	YDA			A10
YD3			A17	YDB			A09
YD4			A16	YDC			A08
YD5			A15	YDD			A07
YD6			A14	YDE			A06
YD7			A13	YDF			A05

No.7: Eighth card

Table 3-5-8

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
YE0			B20	YE8			B12
YE1			B19	YE9			B11
YE2			B18	YEA			B10
YE3			B17	YEB			B09
YE4			B16	YEC			B08
YE5			B15	YED			B07
YE6			B14	YEE			B06
YE7			B13	YEF			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
YF0			A20	YF8			A12
YF1			A19	YF9			A11
YF2			A18	YFA			A10
YF3			A17	YFB			A09
YF4			A16	YFC			A08
YF5			A15	YFD			A07
YF6			A14	YFE			A06
YF7			A13	YFF			A05

3.4.2 Using DX1** for Machine Operation Board

Output Signals to Machine Operation Board (for DX1**)

No.0: First card

Table 3-6-1

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
Y100			B20	Y108			B12
Y101			B19	Y109			B11
Y102			B18	Y10A			B10
Y103			B17	Y10B			B09
Y104			B16	Y10C			B08
Y105			B15	Y10D			B07
Y106			B14	Y10E			B06
Y107			B13	Y10F			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
Y110			A20	Y118			A12
Y111			A19	Y119			A11
Y112			A18	Y11A			A10
Y113			A17	Y11B			A09
Y114			A16	Y11C			A08
Y115			A15	Y11D			A07
Y116			A14	Y11E			A06
Y117			A13	Y11F			A05

No.1: Second card

Table 3-6-2

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
Y120			B20	Y128			B12
Y121			B19	Y129			B11
Y122			B18	Y12A			B10
Y123			B17	Y12B			B09
Y124			B16	Y12C			B08
Y125			B15	Y12D			B07
Y126			B14	Y12E			B06
Y127			B13	Y12F			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
Y130			A20	Y138			A12
Y131			A19	Y139			A11
Y132			A18	Y13A			A10
Y133			A17	Y13B			A09
Y134			A16	Y13C			A08
Y135			A15	Y13D			A07
Y136			A14	Y13E			A06
Y137			A13	Y13F			A05

Output Signals to Machine Operation Board (for DX1)**

No.2: Third card

Table 3-6-3

File register R180							
Bit	**Abbreviation**	**Signal name**	**Connector**	**Bit**	**Abbreviation**	**Signal name**	**Connector**
0			B20	8			B12
1			B19	9			B11
2			B18	A			B10
3			B17	B			B09
4			B16	C			B08
5			B15	D			B07
6			B14	E			B06
7			B13	F			B05

File register R181							
Bit	**Abbreviation**	**Signal name**	**Connector**	**Bit**	**Abbreviation**	**Signal name**	**Connector**
0			A20	8			A12
1			A19	9			A11
2			A18	A			A10
3			A17	B			A09
4			A16	C			A08
5			A15	D			A07
6			A14	E			A06
7			A13	F			A05

No.3: Fourth card

Table 3-6-4

File register R182							
Bit	**Abbreviation**	**Signal name**	**Connector**	**Bit**	**Abbreviation**	**Signal name**	**Connector**
0			B20	8			B12
1			B19	9			B11
2			B18	A			B10
3			B17	B			B09
4			B16	C			B08
5			B15	D			B07
6			B14	E			B06
7			B13	F			B05

3.4.3 PLC Switch

PLC Switch Output

Table 3-7-1

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
Y160		PLC switch highlight #1	Y168		PLC switch highlight #9
Y161		PLC switch highlight #2	Y169		PLC switch highlight #10
Y162		PLC switch highlight #3	Y16A		PLC switch highlight #11
Y163		PLC switch highlight #4	Y16B		PLC switch highlight #12
Y164		PLC switch highlight #5	Y16C		PLC switch highlight #13
Y165		PLC switch highlight #6	Y16D		PLC switch highlight #14
Y166		PLC switch highlight #7	Y16E		PLC switch highlight #15
Y167		PLC switch highlight #8	Y16F		PLC switch highlight #16

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
Y170		PLC switch highlight #17	Y178		PLC switch highlight #25
Y171		PLC switch highlight #18	Y179		PLC switch highlight #26
Y172		PLC switch highlight #19	Y17A		PLC switch highlight #27
Y173		PLC switch highlight #20	Y17B		PLC switch highlight #28
Y174		PLC switch highlight #21	Y17C		PLC switch highlight #29
Y175		PLC switch highlight #22	Y17D		PLC switch highlight #30
Y176		PLC switch highlight #23	Y17E		PLC switch highlight #31
Y177		PLC switch highlight #24	Y17F		PLC switch highlight #32

4. INPUT/OUTPUT SIGNALS TABLE WITH CONTROLLER

4.1 How to Read Input/Output Signal Table

CNC → PLC

Table 4-2-2

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R64		Display information	R72		User macro output #1032
R65			R73		**Note 1)**
R66			R74		User macro output #1033
R67			R75		
R68		PLC main scan time	R76		User macro output #1034
R69		Emergency stop cause	R77		
R70		DIO card data	R78		User macro output #1035
R71		— —	R79		

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R80		Add-on (expansion) operation board input signal 1	R88		Near reference position (per reference position)
R81		signal 2	R89		
R82		signal 3	R90		Presetter contact
R83		signal 4	R91		Presetting interlock
R84		M-NET OT check	R92		
R85			R93		
R86		— —	R94		
R87			R95		

PLC → CNC

Table 4-3-1

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y180	DTCH1	Control axis detach 1st axis	Y188	* SVF1	Servo OFF 1st axis
Y181	DTCH2	2nd axis	Y189	* SVF2	Servo OFF 2nd axis
Y182	DTCH3	3rd axis	Y18A	* SVF3	Servo OFF 3rd axis
Y183	DTCH4	4th axis	Y18B	* SVF4	Servo OFF 4th axis
Y184	DTCH5	— —	Y18C	* SVF5	— —
Y185	DTCH6	— —	Y18D	* SVF6	— —
Y186	DTCH7	— —	Y18E	* SVF7	— —

(Note 1) ☐ are 1 word (16-bit) data.

(Note 2) Signals marked with * in the abbreviation are handled as B contacts.

4.2 Classification of Input/Output Signals with Controller

There are 1-bit unit, and 16-bit or 32-bit unit controller input/output signals, which are classified as shown below.
Refer to the following allocation tables for the signal allocations.

	Signal type	Allocation table	Explanation
Input	DI	Table 4-1-1 to Table 4-1-11	(1) Allocated to device X. (2) Data calculated in bit units are allocated as a principle.
	Data	Table 4-2-1 to Table 4-2-7	(1) Allocated to device R. (2) Data handled in 16-bit or 32-bit units is allocated as a principle.
Output	DO	Table 4-3-1 to Table 4-3-13	(1) Allocated to device Y. (2) Data calculated in bit units are allocated as a principle.
	Data	Table 4-4-1 to Table 4-4-6	(1) Allocated to device R. (2) Data handled in 16-bit or 32-bit units is allocated as a principle.
Others	Special relay	Table 4-5-1 to Table 4-5-2	(1) Allocated to device SM. (2) The sequence command calculation state, results and the signals with special operations are allocated.
	Classified under purpose	(1) to (6)	(1) Devices are classified under the usage purpose.

CNC → PLC Table 4-1-1

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
X180	RDY1	Servo ready 1st axis	X188	AX1	Axis selected 1st axis
X181	RDY2	Servo ready 2nd axis	X189	AX2	Axis selected 2nd axis
X182	RDY3	Servo ready 3rd axis	X18A	AX3	Axis selected 3rd axis
X183	RDY4	Servo ready 4th axis	X18B	AX4	Axis selected 4th axis
X184		— —	X18C		— —
X185		— —	X18D		— —
X186		— —	X18E		— —
X187		— —	X18F		— —

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
X190	MVP1	In plus motion +1st axis	X198	MVM1	In minus motion -1st axis
X191	MVP2	In plus motion +2nd axis	X199	MVM2	In minus motion -2nd axis
X192	MVP3	In plus motion +3rd axis	X19A	MVM3	In minus motion -3rd axis
X193	MVP4	In plus motion +4th axis	X19B	MVM4	In minus motion -4th axis
X194		— —	X19C		— —
X195		— —	X19D		— —
X196		— —	X19E		— —
X197		— —	X19F		— —

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
X1A0	ZP11	1st reference position reached 1st axis	X1A8	ZP21	2nd reference position reached 1st axis
X1A1	ZP12	2nd axis	X1A9	ZP22	2nd axis
X1A2	ZP13	3rd axis	X1AA	ZP23	3rd axis
X1A3	ZP14	4th axis	X1AB	ZP24	4th axis
X1A4		— —	X1AC		— —
X1A5		— —	X1AD		— —
X1A6		— —	X1AE		— —
X1A7		— —	X1AF		— —

— — : Reserved for the system.

CNC → PLC Table 4-1-2

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
X1B0	ZP31	3rd reference position reached 1st axis	X1B8	ZP41	4th reference position reached 1st axis
X1B1	ZP32	2nd axis	X1B9	ZP42	2nd axis
X1B2	ZP33	3rd axis	X1BA	ZP43	3rd axis
X1B3	ZP34	4th axis	X1BB	ZP44	4th axis
X1B4		— —	X1BC		— —
X1B5		— —	X1BD		— —
X1B6		— —	X1BE		— —
X1B7		— —	X1BF		— —

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
X1C0			X1C8		— —
X1C1			X1C9		— —
X1C2	SSE	Search & start (error)	X1CA		— —
X1C3		Search & start (search)	X1CB		— —
X1C4		— —	X1CC		— —
X1C5			X1CD		— —
X1C6			X1CE		— —
X1C7			X1CF		— —

Device No.(Note)		Abbrev.	Signal name	Device No.	Abbrev.	Signal name
X1D0	X510		— —	X1D8	NR F1	Near reference position 1st axis
X1D1	X511		— —	X1D9	NR F2	2nd axis
X1D2	X512			X1DA	NR F3	3rd axis
X1D3	X513			X1DB	NR F4	4th axis
X1D4	X514			X1DC		— —
X1D5	X515	SD2	Speed detection 2	X1DD		— —
X1D6	X516	MCSA	In M coil selected	X1DE		— —
X1D7	X517		Index positioning complete	X1DF		— —

— — : Reserved for the system.

(Note) Devices having two device Nos. indicated in the device No. section are the spindle related devices. Device for the 1st spindle is indicated on the left, and device for the 2nd spindle is indicated on the right.

CNC → PLC Table 4-1-3

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
X1E0	JO	In jog mode	X1E8	MEMO	In memory mode
X1E1	HO	In handle mode	X1E9	TO	In tape mode
X1E2	SO	In incremental mode	X1EA		— —
X1E3	PTPO	In manual random feed mode	X1EB	DO	In MDI mode
X1E4	ZRNO	In reference position return mode	X1EC		— —
X1E5	ASTO	In automatic initial set mode	X1ED		— —
X1E6		In JOG-handle simultaneous mode	X1EE		
X1E7			X1EF		

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
X1F0	MA	Controller ready complete	X1F8	DEN	Motion command complete
X1F1	SA	Servo ready complete	X1F9	TIMP	All axes in-position
X1F2	OP	In auto operation "run"	X1FA	TSMZ	All axes smoothing zero
X1F3	STL	In auto operation "start"	X1FB		— —
X1F4	SPL	In auto operation "pause"	X1FC	CXFIN	Manual random feed complete
X1F5	RST	In "reset"	X1FD		
X1F6	CXN	In manual random feed	X1FE		
X1F7	RWD	In rewind	X1FF		In high-speed mode (G05)

Device No.	Abbrev.	Signal name	Device No.(Note)		Abbrev.	Signal name
X200	RPN	In rapid traverse	X208		INCH	In inch unit select
X201	CUT	In cutting feed	X209		DLKN	In display lock
X202	TAP	In tapping	X20A		F1DN	F1-digit commanded
X203	THRD	In thread cutting	X20B		TLFO	In tool life management
X204	SYN	In synchronous feed	X20C	X54C	SUPP	Spindle speed upper limit over
X205	CSS	In constant surface speed	X20D	X54D	SLOW	Spindle speed lower limit over
X206	SKIP	In skip	X20E		TLOV	Tool life over
X207	ZRNN	In reference position return	X20F		BATAL	Battery alarm

— — : Reserved for the system.

(Note) Devices having two device Nos. indicated in the device No. section are the spindle related devices. Device for the 1st spindle is indicated on the left, and device for the 2nd spindle is indicated on the right.

CNC → PLC Table 4-1-4

Device No.(Note)		Abbrev.	Signal name	Device No.	Abbrev.	Signal name
X210		AL1	NC alarm 1	X218	F11	F1-digit No.1
X211		AL2	NC alarm 2 (Servo alarm)	X219	F12	F1-digit No.2
X212		AL3	NC alarm 3 (Program error)	X21A	F14	F1-digit No.4
X213		AL4	NC alarm 4 (Operation error)	X21B	—	(Always "0")
X214	X554	SIGE	S-analog gear No. illegal	X21C		— —
X215	X555	SOVE	S-analog max./min. command value over	X21D		
X216	X556	SNGE	S-analog no gear selected	X21E		
X217		ASLE	Illegal axis selected	X21F		

Device No.(Note)		Abbrev.	Signal name	Device No.	Abbrev.	Signal name
X220		DM00	M code independent output M00	X228		(EF)
X221		DM01	M01	X229	MMS	Manual numerical command
X222		DM02	M02	X22A		— —
X223		DM30	M30	X22B	TCP	Tool change position return complete
X224				X22C	TCRQ	New tool change
X225	X565	GR1	Spindle gear shift 1	X22D		— —
X226	X566	GR2	Spindle gear shift 2	X22E		
X227	X567	—	(Always "0")	X22F		

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
X230	MF1	M function strobe 1	X238	TF1	T function strobe 1
X231	MF2	M function strobe 2	X239	—	— —
X232	MF3	M function strobe 3	X23A	—	— —
X233	MF4	M function strobe 4	X23B	—	— —
X234	SF1	S function strobe 1	X23C	BF1	2nd M function strobe 1
X235	SF2	S function strobe 2	X23D	—	— —
X236		— —	X23E	—	— —
X237		— —	X23F	—	— —

— — : Reserved for the system.

(Note) Devices having two device Nos. indicated in the device No. section are the spindle related devices. Device for the 1st spindle is indicated on the left, and device for the 2nd spindle is indicated on the right.

CNC → PLC Table 4-1-5

Device No.(Note)		Abbrev.	Signal name	Device No.(Note)		Abbrev.	Signal name
X240	X580		Spindle 2nd in-position	X248	X588	SMA	Spindle ready-ON
X241	X581	CDO	Current detect	X249	X589	SSA	Spindle servo-ON
X242	X582	VRO	Speed detect	X24A	X58A	SEMG	Spindle emergency stop
X243	X583	FLO	In spindle alarm	X24B	X58B	SSRN	Spindle normal rotating
X244	X584	ZSO	Zero speed	X24C	X58C	SSRI	Spindle reverse rotating
X245	X585	USO	Up-to-speed	X24D	X58D	SZPH	Z-phase passed
X246	X586	ORAO	Spindle in-position	X24E	X58E	SIMP	Position loop in-position
X247	X587	LCSA	In L coil selected	X24F	X58F	STLQ	Torque limit

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
X250		— —	X258		— —
X251		— —	X259		— —
X252		— —	X25A		— —
X253		— —	X25B		— —
X254		— —	X25C		— —
X255		— —	X25D		— —
X256		— —	X25E		— —
X257		— —	X25F		— —

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
X260	CHOP	In chopping start	X268		— —
X261	CHP1	Basic position – upper dead center point	X269		— —
X262	CHP2	Upper dead center point – bottom dead point	X26A		— —
X263	CHP3	Bottom dead center point – upper dead point	X26B		— —
X264	CHP4	Upper dead center point – basic position	X26C		
X265	CHPMD	In chopping mode	X26D	TRVE	Tap retract possible
X266			X26E	PCNT	No. of work machining over
X267			X26F	ABSW	Absolute position warning

— — : Reserved for the system.

(Note) Devices having two device Nos. indicated in the device No. section are the spindle related devices. Device for the 1st spindle is indicated on the left, and device for the 2nd spindle is indicated on the right.

CNC → PLC Table 4-1-6

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
X270	PSW1	Position switch 1	X278		— —
X271	PSW2	Position switch 2	X279		— —
X272	PSW3	Position switch 3	X27A		— —
X273	PSW4	Position switch 4	X27B		— —
X274	PSW5	Position switch 5	X27C		— —
X275	PSW6	Position switch 6	X27D		— —
X276	PSW7	Position switch 7	X27E		— —
X277	PSW8	Position switch 8	X27F		— —

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
X280	ZSF1	Zero point initializing completed 1st axis	X288	ZSE1	Zero point initializing error completed 1st axis
X281	ZSF2	2nd axis	X289	ZSE2	2nd axis
X282	ZSF3	3rd axis	X28A	ZSE3	3rd axis
X283	ZSF4	4th axis	X28B	ZSE4	4th axis
X284		— —	X28C		— —
X285		— —	X28D		— —
X286		— —	X28E		— —
X287		— —	X28F		— —

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
X290	ILI1	In current limit 1st axis	X298	ILA1	Current limit reached 1st axis
X291	ILI2	2nd axis	X299	ILA2	2nd axis
X292	ILI3	3rd axis	X29A	ILA3	3rd axis
X293	ILI4	4th axis	X29B	ILA4	4th axis
X294		— —	X29C		— —
X295		— —	X29D		— —
X296		— —	X29E		— —
X297		— —	X29F		— —

— — : Reserved for the system.

CNC → PLC Table 4-1-7

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
X2A0		— —	X2A8		
X2A1	AL5	NC alarm 5	X2A9		
X2A2		— —	X2AA		
X2A3		— —	X2AB		
X2A4			X2AC		
X2A5			X2AD		
X2A6			X2AE		
X2A7			X2AF		— —

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
X2B0		Up-to-speed 1st axis	X2B8		Unclamp command 1st axis
X2B1		2nd axis	X2B9		2nd axis
X2B2		3rd axis	X2BA		3rd axis
X2B3		4th axis	X2BB		4th axis
X2B4		— —	X2BC		— —
X2B5		— —	X2BD		— —
X2B6		— —	X2BE		— —
X2B7		— —	X2BF		— —

Device No.	Abbrev.	Signal name	Device No.(Note)		Abbrev.	Signal name
X2C0	RTAP	In synchronized tapping selection (M command)	X2C8	X608	ENB	Spindle enable
X2C1		— —	X2C9	X609		
X2C2		— —	X2CA	X60A		
X2C3		— —	X2CB	X60B		
X2C4		— —	X2CC	X60C		
X2C5		— —	X2CD	X60D		
X2C6		— —	X2CE	X60E		
X2C7		— —	X2CF	X60F		

— — : Reserved for the system.

(Note) Devices having two device Nos. indicated in the device No. section are the spindle related devices. Device for the 1st spindle is indicated on the left, and device for the 2nd spindle is indicated on the right.

CNC → PLC Table 4-1-8

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
X2D0		In barrier valid (left)	X2D8		
X2D1		In barrier valid (right)	X2D9		
X2D2			X2DA		
X2D3			X2DB		
X2D4			X2DC		
X2D5			X2DD		
X2D6			X2DE		
X2D7			X2DF		

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
X2E0		— —	X2E8		— —
X2E1		— —	X2E9		— —
X2E2		— —	X2EA		— —
X2E3		— —	X2EB		— —
X2E4		— —	X2EC		— —
X2E5		— —	X2ED		— —
X2E6		— —	X2EE		— —
X2E7		— —	X2EF		— —

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
X2F0			X2F8		
X2F1			X2F9		
X2F2			X2FA		
X2F3			X2FB		
X2F4			X2FC		
X2F5			X2FD		
X2F6			X2FE		
X2F7			X2FF		

— — : Reserved for the system.

CNC → PLC Table 4-1-9

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
X300	DROPNS	Door open enable	X308		— —
X301			X309		— —
X302		MELDASNET diagnosis output complete	X30A		— —
X303	NETSMP	MELDASNET in sampling	X30B		— —
X304	RPIN	In remote program input	X30C		— —
X305	RPFIN	Remote program input complete	X30D		— —
X306	RPERR	Remote program input error	X30E		— —
X307		— —	X30F		Power OFF required after parameter change

Device No.	Abbrev.	Signal name	Device No.(Note)		Abbrev.	Signal name
X310		— —	X318	X9D8		— —
X311		— —	X319	X9D9		— —
X312		— —	X31A	X9DA		— —
X313		— —	X31B	X9DB		— —
X314		— —	X31C	X9DC		— —
X315		— —	X31D	X9DD		— —
X316		— —	X31E	X9DE		— —
X317		— —	X31F	X9DF		— —

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
X320		Door open enable 1-2	X328		
X321		— —	X329		
X322			X32A		
X323			X32B		
X324			X32C		
X325			X32D		
X326			X32E		
X327			X32F		

— — : Reserved for the system.

(Note) Devices having two device Nos. indicated in the device No. section are the spindle related devices. Device for the 1st spindle is indicated on the left, and device for the 2nd spindle is indicated on the right.

CNC → PLC

Table 4-1-10

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
X330			X338		
X331			X339		
X332			X33A		
X333			X33B		
X334			X33C		
X335			X33D		
X336			X33E		
X337			X33F		

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
X340			X348		
X341			X349		
X342			X34A		
X343			X34B		
X344			X34C		
X345			X34D		
X346			X34E		
X347			X34F		

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
X350			X358		
X351			X359		
X352			X35A		
X353			X35B		
X354			X35C		
X355			X35D		
X356			X35E		
X357			X35F		

CNC → PLC

Table 4-1-11

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
X360			X368		
X361			X369		
X362			X36A		
X363			X36B		
X364			X36C		
X365			X36D		
X366			X36E		
X367			X36F		

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
X370			X378		
X371			X379		
X372			X37A		
X373			X37B		
X374			X37C		
X375			X37D		
X376			X37E		
X377			X37F		

CNC → PLC Table 4-2-1

Device No.	Abbrev.	Signal name	Device No.(Note)		Abbrev.	Signal name
R0	AI1	Analog input	R8	R208		Spindle command rotation speed input
R1	AI2	Analog input	R9	R209		
R2	AI3	Analog input	R10	R210		Spindle command final data (rotation speed)
R3	AI4	Analog input	R11	R211		
R4		— —	R12	R212		Spindle command final data (12-bit binary)
R5		— —	R13	R213		
R6		— —	R14			
R7		— —	R15			

Device No.(Note)		Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R16			KEY IN 1	R24		M code data 3
R17			FULL KEY IN	R25		
R18	R218		Spindle actual speed	R26		M code data 4
R19	R219			R27		
R20			M code data 1	R28		S code data 1
R21				R29		
R22			M code data 2	R30		S code data 2
R23				R31		

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R32		— —	R40		— —
R33			R41		
R34		— —	R42		— —
R35			R43		
R36		T code data 1	R44		2nd M function data 1
R37			R45		
R38		— —	R46		— —
R39			R47		

— — : Reserved for the system.

(Note) Devices having two device Nos. indicated in the device No. section are the spindle related devices. Device for the 1st spindle is indicated on the left, and device for the 2nd spindle is indicated on the right.

CNC → PLC Table 4-2-2

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R48		— —	R56		Battery drop cause
R49			R57		— —
R50		— —	R58		5V/24V error cause
R51			R59		— —
R52		— —	R60		CNC complete standby status output
R53		— —	R61		
R54		— —	R62		In initialization
R55		Group in tool life management	R63		Initialization incomplete

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R64		Display information	R72		User macro output #1032 **Note 1)**
R65			R73		
R66			R74		User macro output #1033
R67			R75		
R68		PLC main scan time	R76		User macro output #1034
R69		Emergency stop cause	R77		
R70		DIO card data	R78		User macro output #1035
R71		— —	R79		

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R80		Add-on (expansion) operation board input signal 1	R88		Near reference position (per reference position)
R81		signal 2	R89		
R82		signal 3	R90		Presetter contact
R83		signal 4	R91		Presetter interlock
R84		— —	R92		
R85			R93		
R86		PC high-speed process time	R94		
R87			R95		

— — : Reserved for the system.

Note 1) #1032 to #1035 are output from the PLC, and the direction is the opposite of the other R registers.

CNC → PLC Table 4-2-3

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R96		CNC software version code			
R97					
R98					
R99					

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R372					
R373					
R374					
R375					
R376					
R377					
R378			R458		— —
R379			R459		— —

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R460		Clock data Year/Month	R472		— —
R461		Date/Hour	R473		— —
R462		Minute/Second	R474		— —
R463		— —	R475		— —
R464		— —	R476		— —
R465		— —	R477		— —
R466		— —	R478		— —
R467		— —	R479		— —

— — : Reserved for the system.

CNC → PLC

Table 4-2-4

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R480		— —	R488		— —
R481		— —	R489		MELDASNET diagnosis output cause
R482		— —	R490		— —
R483		— —	R498		— —

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R614		Tool life usage data			
R615					

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
			R645		— —

— — : Reserved for the system.

CNC → PLC

Table 4-2-5

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R670		— —	R678		— —
R671		— —	R679		— —
R672		— —			
R673		— —			
R674		— —			
R675		— —			
R676		— —			
R677		— —			

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R690		— —			

— — : Reserved for the system.

CNC → PLC

Table 4-2-6

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R1100		Servo deflection amount	R1108		Servo deflection amount
R1101		1st axis	R1109		5th axis
R1102		2nd axis	R1110		6th axis
R1103			R1111		
R1104		3rd axis	R1112		— —
R1105			R1113		
R1106		4th axis	R1114		— —
R1107			R1115		

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R1350		— —	R1358		— —
R1351		— —	R1359		— —
R1352		— —	R1360		— —
R1353		— —	R1361		— —
R1354		— —	R1362		— —
R1355		— —	R1363		— —
R1356		— —	R1364		— —
R1357		— —	R1365		— —

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R1366		— —	R1374		— —
R1367		— —	R1375		— —
R1368		— —	R1376		— —
R1369		— —	R1377		— —
R1370		— —			
R1371		— —			
R1372		— —			
R1373		— —			

— — : Reserved for the system.

CNC → PLC Table 4-2-7

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R1502		Remote program input error information			
R1503		MELDAS-NET output			

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R2896		No. of work machining (current) (Low-order)			
R2897		(High-order)			
R2898		No. of work machining (max.) (Low-order)			
R2899		(High-order)			

— — : Reserved for the system.

PLC → CNC Table 4-3-1

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y180	DTCH1	Control axis detach 1st axis	Y188	* SVF1	Servo OFF 1st axis
Y181	DTCH2	2nd axis	Y189	* SVF2	Servo OFF 2nd axis
Y182	DTCH3	3rd axis	Y18A	* SVF3	Servo OFF 3rd axis
Y183	DTCH4	4th axis	Y18B	* SVF4	Servo OFF 4th axis
Y184		— —	Y18C		— —
Y185		— —	Y18D		— —
Y186		— —	Y18E		— —
Y187		— —	Y18F		— —

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y190	MI1	Mirror image 1st axis	Y198	* +EDT1	External deceleration +1st axis
Y191	MI2	Mirror image 2nd axis	Y199	* +EDT2	+2nd axis
Y192	MI3	Mirror image 3rd axis	Y19A	* +EDT3	+3rd axis
Y193	MI4	Mirror image 4th axis	Y19B	* +EDT4	+4th axis
Y194		— —	Y19C		— —
Y195		— —	Y19D		— —
Y196		— —	Y19E		— —
Y197		— —	Y19F		— —

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y1A0	* -EDT1	External deceleration -1st axis	Y1A8	* +AIT1	Auto interlock +1st axis
Y1A1	* -EDT2	-2nd axis	Y1A9	* +AIT2	+2nd axis
Y1A2	* -EDT3	-3rd axis	Y1AA	* +AIT3	+3rd axis
Y1A3	* -EDT4	-4th axis	Y1AB	* +AIT4	+4th axis
Y1A4		— —	Y1AC		— —
Y1A5		— —	Y1AD		— —
Y1A6		— —	Y1AE		— —
Y1A7		— —	Y1AF		— —

— — : Reserved for the system.

PLC → CNC Table 4-3-2

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y1B0	* -AIT1	Auto interlock -1st axis	Y1B8	* +MIT1	Manual interlock +1st axis
Y1B1	* -AIT2	-2nd axis	Y1B9	* +MIT2	+2nd axis
Y1B2	* -AIT3	-3rd axis	Y1BA	* +MIT3	+3rd axis
Y1B3	* -AIT4	-4th axis	Y1BB	* +MIT4	+4th axis
Y1B4		— —	Y1BC		— —
Y1B5		— —	Y1BD		— —
Y1B6		— —	Y1BE		— —
Y1B7		— —	Y1BF		— —

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y1C0	*-MIT1	Manual interlock -1st axis	Y1C8	AMLK1	Auto machine lock 1st axis
Y1C1	*-MIT2	-2nd axis	Y1C9	AMLK2	2nd axis
Y1C2	*-MIT3	-3rd axis	Y1CA	AMLK3	3rd axis
Y1C3	*-MIT4	-4th axis	Y1CB	AMLK4	4th axis
Y1C4		— —	Y1CC		— —
Y1C5		— —	Y1CD		— —
Y1C6		— —	Y1CE		— —
Y1C7		— —	Y1CF		— —

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y1D0	MMLK1	Manual machine lock 1st axis	Y1D8	+J1	Feed axis select +1st axis
Y1D1	MMLK2	2nd axis	Y1D9	+J2	+2nd axis
Y1D2	MMLK3	3rd axis	Y1DA	+J3	+3rd axis
Y1D3	MMLK4	4th axis	Y1DB	+J4	+4th axis
Y1D4		— —	Y1DC		— —
Y1D5		— —	Y1DD		— —
Y1D6		— —	Y1DE		— —
Y1D7		— —	Y1DF		— —

— — : Reserved for the system.

PLC → CNC Table 4-3-3

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y1E0	-J1	Feed axis select -1st axis	Y1E8	CHPS	Chopping
Y1E1	-J2	-2nd axis	Y1E9		
Y1E2	-J3	-3rd axis	Y1EA		
Y1E3	-J4	-4th axis	Y1EB		
Y1E4		— —	Y1EC		
Y1E5		— —	Y1ED		
Y1E6		— —	Y1EE		
Y1E7		— —	Y1EF		

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y1F0	MAE1	Manual/Auto simultaneous valid 1st axis	Y1F8		— —
Y1F1	MAE2	2nd axis	Y1F9		
Y1F2	MAE3	3rd axis	Y1FA	RSST	Search & start
Y1F3	MAE4	4th axis	Y1FB		Magazine index check valid (ATC high-speed)
Y1F4		— —	Y1FC		Spindle orientation complete standby valid (ATC high-speed)
Y1F5		— —	Y1FD		
Y1F6		— —	Y1FE		
Y1F7		— —	Y1FF		

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y200	ZSL1	Reference position select 1	Y208	J	Jog mode
Y201	ZSL2	Reference position select 2	Y209	H	Handle mode
Y202			Y20A	S	Incremental mode
Y203			Y20B	PTP	Manual random feed mode
Y204			Y20C	ZRN	Reference position return mode
Y205			Y20D	AST	Auto initialization mode
Y206			Y20E		
Y207		Reference position select method	Y20F		

— — : Reserved for the system.

PLC → CNC Table 4-3-4

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y210	MEM	Memory mode	Y218	ST	Auto operation "start" command
Y211	T	Tape mode	Y219	* SP	Auto operation "pause" command
Y212		— —	Y21A	SBK	Single block
Y213	D	MDI mode	Y21B	* BSL	Block start interlock
Y214		— —	Y21C	* CSL	Cutting block start interlock
Y215		— —	Y21D	DRN	Dry run
Y216			Y21E		
Y217			Y21F	ERD	Error detect

Device No.(Note)	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y220	NRST1	NC reset 1	Y228	TLM	Tool length measurement 1
Y221	NRST2	NC reset 2	Y229	TLMS	Tool length measurement 2 (L system)
Y222	RRW	Reset & rewind	Y22A		— —
Y223	* CDZ	Chamfering	Y22B	PRST	Program restart
Y224	ARST	Auto restart	Y22C	PB	Playback
Y225 Y5E5	GFIN	Gear shift complete	Y22D	UIT	Macro interrupt
Y226	FIN1	M function finish 1	Y22E	RT	Rapid traverse
Y227	FIN2	M function finish 2	Y22F		— —

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y230	ABS	Manual absolute	Y238	* KEY1	Data protect key 1
Y231	DLK	Display lock	Y239	* KEY2	Data protect key 2
Y232		F1-digit speed change valid	Y23A	* KEY3	Data protect key 3
Y233	CRQ	Recalculation request	Y23B	—	— —
Y234	RHD1	Integration time input 1	Y23C	PDISP	Program display during operation
Y235	RHD2	Integration time input 2	Y23D		Inclined axis control valid
Y236	PIT	PLC interrupt signal	Y23E		Inclined axis control: No Z axis compensation
Y237			Y23F	BDT1	Optional block skip

— — : Reserved for the system.

(Note) Devices having two device Nos. indicated in the device No. section are the spindle related devices. Device for the 1st spindle is indicated on the left, and device for the 2nd spindle is indicated on the right.

PLC → CNC Table 4-3-5

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y240	—	— —	Y248	HS11	1st handle axis No.
Y241	—	— —	Y249	HS12	
Y242	—	— —	Y24A	HS14	
Y243	—	— —	Y24B	HS18	
Y244	—	— —	Y24C	HS116	
Y245	—	— —	Y24D		
Y246	—	— —	Y24E		
Y247	—	— —	Y24F	HS1S	1st handle valid

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y250	HS21	2nd handle axis No.	Y258	HS31	3rd handle axis No.
Y251	HS22		Y259	HS32	
Y252	HS24		Y25A	HS34	
Y253	HS28		Y25B	HS38	
Y254	HS216		Y25C	HS316	
Y255			Y25D		
Y256			Y25E		
Y257	HS2S	2nd handle valid	Y25F	HS3S	3rd handle valid

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y260	FBE1	Manual feedrate B valid 1st axis	Y268	CX11	Manual random feed 1st axis No.
Y261	FBE2	2nd axis	Y269	CX12	
Y262	FBE3	3rd axis	Y26A	CX14	
Y263	FBE4	4th axis	Y26B	CX18	
Y264		— —	Y26C	CX116	
Y265		— —	Y26D		(Always "0")
Y266		— —	Y26E		(Always "0")
Y267		— —	Y26F	CX1S	Manual random feed 1st axis valid

— — : Reserved for the system.

PLC → CNC Table 4-3-6

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y270	CX21	Manual random feed 2nd axis No.	Y278	CX31	Manual random feed 3rd axis No.
Y271	CX22		Y279	CX32	
Y272	CX24		Y27A	CX34	
Y273	CX28		Y27B	CX38	
Y274	CX216		Y27C	CX316	
Y275		(Always "0")	Y27D		(Always "0")
Y276		(Always "0")	Y27E		(Always "0")
Y277	CX2S	Manual random feed 2nd axis valid	Y27F	CX3S	Manual random feed 3rd axis valid

Device No.	Abbrev.	Signal name	Device No.(Note)		Abbrev.	Signal name
Y280	CXS1	Smoothing off	Y288	Y648	SP1	Spindle override 1
Y281	CXS2	Axis independent	Y289	Y649	SP2	Spindle override 2
Y282	CXS3	EX.F/MODAL.F	Y28A	Y64A	SP4	Spindle override 4
Y283	CXS4	G0/G1	Y28B	Y64B		
Y284	CXS5	MC/WK	Y28C	Y64C		
Y285	CXS6	ABS/INC	Y28D	Y64D		
Y286	*CXS7	Stop	Y28E	Y64E		
Y287	CXS8	Strobe	Y28F	Y64F	SPS	Spindle override method select

Device No.(Note)		Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y290	Y650	GI1	Spindle gear select 1	Y298	OVC	Override cancel
Y291	Y651	GI2	Spindle gear select 2	Y299	OVSL	Manual override valid
Y292	Y652	—	(Always "0")	Y29A	AFL	Miscellaneous function lock
Y293	Y653			Y29B		
Y294	Y654	SSTP	Spindle stop	Y29C	TRV	Tap retract
Y295	Y655	SSFT	Spindle gear shift	Y29D	RTN	Reference position retract
Y296	Y656	SORC	Oriented spindle speed command	Y29E		
Y297	Y657			Y29F	QEMG	PLC emergency stop

(Note) Devices having two device Nos. indicated in the device No. section are the spindle related devices. Device for the 1st spindle is indicated on the left, and device for the 2nd spindle is indicated on the right.

PLC → CNC Table 4-3-7

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y2A0	* FV1	Cutting feedrate override	Y2A8	ROV1	Rapid traverse speed override
Y2A1	* FV2		Y2A9	ROV2	
Y2A2	* FV4		Y2AA		
Y2A3	* FV8		Y2AB		
Y2A4	* FV16		Y2AC		
Y2A5			Y2AD		
Y2A6	FV2E	2nd cutting feedrate override valid	Y2AE		
Y2A7	FVS	Cutting feedrade override method select	Y2AF	ROVS	Rapid traverse speed override method select

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y2B0	* JV1	Manual feedrate	Y2B8	PCF1	Feedrate least increment
Y2B1	* JV2		Y2B9	PCF2	
Y2B2	* JV4		Y2BA	JSYN	Jog synchronous feed valid
Y2B3	* JV8		Y2BB	JHAN	Jog•handle synchronous
Y2B4	* JV16		Y2BC		Each axis manual feedrate B valid
Y2B5			Y2BD		— —
Y2B6			Y2BE		— —
Y2B7	JVS	Manual feedrate method select	Y2BF		— —

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y2C0	MP1	Handle/Incremental feed multiplication	Y2C8	TAL1	Tool alarm 1/Tool-skip tool
Y2C1	MP2		Y2C9	TAL2	Tool alarm 2 (M system)
Y2C2	MP4		Y2CA	TCEF	Data count valid
Y2C3			Y2CB	TLFI	Tool life management input (M system)
Y2C4			Y2CC	TRST	Tool change reset (L system)
Y2C5			Y2CD		
Y2C6		— —	Y2CE		
Y2C7	MPS	Handle/Incremental feed multiplication method select	Y2CF		

— — : Reserved for the system.

PLC → CNC Table 4-3-8

Device No.(Note)		Abbrev.	Signal name	Device No.(Note)		Abbrev.	Signal name
Y2D0	Y690	SRN	Spindle forward run start	Y2D8	Y698		
Y2D1	Y691	SRI	Spindle reverse run start	Y2D9	Y699		
Y2D2	Y692	TL1	Torque limit 1	Y2DA	Y69A		C axis gain L
Y2D3	Y693	TL2	Torque limit 2	Y2DB	Y69B		C axis gain H
Y2D4	Y694	WRN	Spindle forward run index	Y2DC	Y69C		C axis zero point return
Y2D5	Y695	WRI	Spindle reverse run index	Y2DD	Y69D		
Y2D6	Y696	ORC	Spindle orient command	Y2DE	Y69E	LRSM	M coil selection
Y2D7	Y697	LRSL	L coil selection	Y2DF	Y69F		

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y2E0	* PCD1	PLC axis near point detect 1st axis	Y2E8		— —
Y2E1	* PCD2	PLC axis near point detect 2nd axis	Y2E9		— —
Y2E2		— —	Y2EA		
Y2E3		— —	Y2EB		
Y2E4	PCH1	PLC axis 1st handle valid	Y2EC		
Y2E5	PCH2	PLC axis 2nd handle valid	Y2ED		
Y2E6		— —	Y2EE		
Y2E7			Y2EF		

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y2F0		— —	Y2F8		— —
Y2F1		— —	Y2F9	CSRON	Screen display request
Y2F2		— —	Y2FA		
Y2F3		— —	Y2FB	NETSTP	MELDASNET sampling stop
Y2F4		— —	Y2FC	SMPTRG	Data sampling trigger
Y2F5		— —	Y2FD	MTBT	PLC snapshot
Y2F6		— —	Y2FE		— —
Y2F7		— —	Y2FF		— —

— — : Reserved for the system.

(Note) Devices having two device Nos. indicated in the device No. section are the spindle related devices. Device for the 1st spindle is indicated on the left, and device for the 2nd spindle is indicated on the right.

PLC → CNC Table 4-3-9

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y300	AZS1	Zero point initializing mode 1st axis	Y308	ZST1	Zero point initializing start 1st axis
Y301	AZS2	2nd axis	Y309	ZST2	2nd axis
Y302	AZS3	3rd axis	Y30A	ZST3	3rd axis
Y303	AZS4	4th axis	Y30B	ZST4	4th axis
Y304		— —	Y30C		— —
Y305		— —	Y30D		— —
Y306		— —	Y30E		— —
Y307		— —	Y30F		— —

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y310		Current limit mode 1	Y318		Current limit changeover 1st axis
Y311		Current limit mode 2	Y319		2nd axis
Y312		(Same as above, spare)	Y31A		3rd axis
Y313		— —	Y31B		4th axis
Y314		— —	Y31C		— —
Y315		— —	Y31D		— —
Y316		— —	Y31E		— —
Y317		— —	Y31F		— —

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y320		Droop release request 1st axis	Y328		— —
Y321		2nd axis	Y329		Ext. workpiece coordinate measurement 2nd axis
Y322		3rd axis	Y32A		— —
Y323		4th axis	Y32B		— —
Y324		— —	Y32C		— —
Y325		— —	Y32D		— —
Y326		— —	Y32E		— —
Y327		— —	Y32F		— —

— — : Reserved for the system.

PLC → CNC

Table 4-3-10

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y330	DTCH21	Control axis detach 2 1st axis	Y338		Unclamp complete 1st axis
Y331	DTCH22	2nd axis	Y339		2nd axis
Y332	DTCH23	3rd axis	Y33A		3rd axis
Y333	DTCH24	4th axis	Y33B		4th axis
Y334		— —	Y33C		— —
Y335		— —	Y33D		— —
Y336		— —	Y33E		— —
Y337		— —	Y33F		— —

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y340		Each axis reference position return 1st axis	Y348	* ZRIT	2nd reference position return interlock
Y341		2nd axis	Y349		— —
Y342		3rd axis	Y34A		— —
Y343		4th axis	Y34B		— —
Y344		— —	Y34C		— —
Y345		— —	Y34D		— —
Y346		— —	Y34E		— —
Y347		— —	Y34F		

Device No.(Note)		Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y350	Y710	SWS	Spindle command selection	Y358		— —
Y351	Y711			Y359		— —
Y352	Y712			Y35A		— —
Y353	Y713			Y35B		Spindle OFF mode
Y354	Y714			Y35C		
Y355	Y715			Y35D		
Y356	Y716			Y35E		
Y357	Y717	MPCSL	PLC coil changeover	Y35F		

— — : Reserved for the system.

(Note) Devices having two device Nos. indicated in the device No. section are the spindle related devices. Device for the 1st spindle is indicated on the left, and device for the 2nd spindle is indicated on the right.

PLC → CNC

Table 4-3-11

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y360		— —	Y368		
Y361		— —	Y369		
Y362		— —	Y36A		
Y363		— —	Y36B		
Y364		— —	Y36C		
Y365		— —	Y36D		
Y366		— —	Y36E		
Y367		— —	Y36F		

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y370		Position switch 1 interlock	Y378		Barrier valid (left)
Y371		Position switch 2 interlock	Y379		Barrier valid (right)
Y372		Position switch 3 interlock	Y37A		Tool presetter sub-side valid
Y373		Position switch 4 interlock	Y37B		
Y374		Position switch 5 interlock	Y37C		
Y375		Position switch 6 interlock	Y37D		
Y376		Position switch 7 interlock	Y37E		
Y377		Position switch 8 interlock	Y37F		

Device No.(Note)		Abbrev.	Signal name	Device No.(Note)		Abbrev.	Signal name
Y380			Door open	Y388	YCC8		— —
Y381			Door open II	Y389	YCC9		— —
Y382	YCC2		Door open signal input (spindle speed monitor)	Y38A	YCCA		— —
Y383			Door interlock spindle speed clamp	Y38B	YCCB		— —
Y384		RPN	Remote program input start	Y38C	YCCC		— —
Y385			— —	Y38D	YCCD		— —
Y386			— —	Y38E	YCCE		— —
Y387			— —	Y38F	YCCF		— —

— — : Reserved for the system.

(Note) Devices having two device Nos. indicated in the device No. section are the spindle related devices. Device for the 1st spindle is indicated on the left, and device for the 2nd spindle is indicated on the right.

PLC → CNC

Table 4-3-12

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y390		— —	Y398		— —
Y391		— —	Y399		— —
Y392			Y39A		— —
Y393			Y39B		— —
Y394			Y39C		— —
Y395		— —	Y39D		— —
Y396			Y39E		
Y397		— —	Y39F		

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y3A0		PLC skip 1	Y3A8		— —
Y3A1		PLC skip 2	Y3A9		— —
Y3A2		PLC skip 3	Y3AA		— —
Y3A3		PLC skip 4	Y3AB		— —
Y3A4		PLC skip 5	Y3AC		— —
Y3A5		PLC skip 6	Y3AD		— —
Y3A6		PLC skip 7	Y3AE		— —
Y3A7		PLC skip 8	Y3AF		— —

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y3B0		— —	Y3B8		Door open II 1-2
Y3B1		— —	Y3B9		— —
Y3B2		— —	Y3BA		Door open signal input 1-2
Y3B3		— —	Y3BB		— —
Y3B4		— —	Y3BC		
Y3B5		— —	Y3BD		
Y3B6		— —	Y3BE		
Y3B7		— —	Y3BF		

— — : Reserved for the system.

PLC → CNC

Table 4-3-13

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y3C0			Y3C8		
Y3C1			Y3C9		
Y3C2			Y3CA		
Y3C3			Y3CB		
Y3C4			Y3CC		
Y3C5			Y3CD		
Y3C6			Y3CE		
Y3C7			Y3CF		

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y3D0			Y3D8		
Y3D1			Y3D9		
Y3D2			Y3DA		
Y3D3			Y3DB		
Y3D4			Y3DC		
Y3D5			Y3DD		
Y3D6			Y3DE		
Y3D7			Y3DF		

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y3E0			Y3E8		
Y3E1			Y3E9		
Y3E2			Y3EA		
Y3E3			Y3EB		
Y3E4			Y3EC		
Y3E5			Y3ED		
Y3E6			Y3EE		
Y3E7			Y3EF		

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
Y3F0			Y3F8		
Y3F1			Y3F9		
Y3F2			Y3FA		
Y3F3			Y3FB		
Y3F4			Y3FC		
Y3F5			Y3FD		
Y3F6			Y3FE		
Y3F7			Y3FF		

PLC → CNC Table 4-4-1

Device No.	Abbrev.	Signal name	Device No.(Note)		Abbrev.	Signal name
R100	AO1	Analog output	R108	R308		Spindle command rotation speed output
R101	AO2	Analog output	R109	R309		
R102	AO3	Analog output	R110	R310		— —
R103	AO4	Analog output	R111	R311		
R104		— —	R112			KEY OUT 1
R105		— —	R113			
R106		— —	R114			
R107		— —	R115			

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R116		— —	R124		Encoder selection
R117		— —	R125		C axis selection
R118		— —	R126		
R119		— —	R127		
R120		Each axis reference position select	R128		
R121		Each axis reference position return interlock (ATC time reduction)	R129		
R122		— —	R130		PLC interrupt program number
R123			R131		

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R132		1st cutting feedrate override	R140		Handle/Incremental feed multiplication
R133		2nd cutting feedrate override	R141		
R134		Rapid traverse override	R142		Manual random feed 1st axis movement data
R135	CHPOV	Chopping override	R143		
R136		Manual feedrate	R144		Manual random feed 2nd axis movement data
R137			R145		
R138		Manual feedrate B	R146		Manual random feed 3rd axis movement data
R139			R147		

— — : Reserved for the system.

(Note) Devices having two device Nos. indicated in the device No. section are the spindle related devices. Device for the 1st spindle is indicated on the left, and device for the 2nd spindle is indicated on the right.

PLC → CNC Table 4-4-2

Device No.(Note)		Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R148	R348		S analog override	R156		OT ignored
R149	R349		Multi-point orientation position data	R157		Near-point ignored
R150			Tool group number designation	R158		Alarm message I/F 1
R151				R159		Alarm message I/F 2
R152			Load meter 1	R160		Alarm message I/F 3
R153				R161		Alarm message I/F 4
R154			Load meter 2	R162		Operator message I/F
R155				—		— —

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R164		— —	R172		User macro output #1132 **Note 1)**
R165		— —	R173		
R166		— —	R174		User macro output #1133
R167			R175		
R168			R176		User macro output #1134
R169			R177		
R170		Search & start program No.	R178		User macro output #1135
R171			R179		

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R180		Operation (expansion) board output 1	R188		— —
R181		Operation (expansion) board output 2	R189		— —
R182		Operation (expansion) board output 3	R190		
R183		— — (spare)	R191		
R184			R192		Ext. workpiece coordinate offset measurement tool compensation No. (main) **Note 2)**
R185		Current limit changeover	R193		
R186		Wear compensation No. (tool presetter)	R194		Ext. workpiece coordinate offset measurement tool No. (main) **Note 2)**
R187		— —	R195		

— — : Reserved for the system.

Note 1) #1132 to #1135 are input signals to the PLC, and the direction is opposite of the other registers.

Note 2) When the chuck barrier is checked, these are the "Selected tool compensation No. (main): R192, 193" and the "Selected tool No. (main): R194, 195"

(Note) Devices having two device Nos. indicated in the device No. section are the spindle related devices. Device for the 1st spindle is indicated on the left, and device for the 2nd spindle is indicated on the right.

PLC → CNC

Table 4-4-3

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R196		User PLC version code			
R197					
R198					
R199					

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R400		Each axis manual federate	R408		
R401		B 1st axis	R409		
R402		Each axis manual federate	R410		
R403		B 2nd axis	R411		
R404		Each axis manual federate	R412		
R405		B 3rd axis	R413		
R406		Each axis manual federate	R414		
R407		B 4th axis	R415		

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
			R435		— —

Table 4-4-4

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R438		— —	R446		— —
R439		— —	R447		— —
R440		— —	R448		— —
R441		— —	R449		
R442		— —	R450		
R443		— —	R451		
R444		— —	R452		
R445		— —	R453		

— — : Reserved for the system.

PLC → CNC

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R560		Ext. machine coordinate system compensation data 1st axis			
R561		2nd axis			
R562		3rd axis			
R563		4th axis			
R564		— —			
R565		— —			
R566		— —			
R567		— —			

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R627		— —			
R628		— —			
R629					
R630		— —			
R631					

Table 4-4-5

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R650		— —	R658		— —
R651		— —	R659		
R652		— —			
R653		— —	R669		— —
R656		— —			
R657					

— — : Reserved for the system.

PLC → CNC

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R1000		Selected tool	R1008	—	— —
R1001		compensation No.(sub)	R1009		
R1002		wear No. (sub)	R1010		
R1003			R1011		
R1004		Tool mounting information (1 to 16)	R1012		
R1005		Tool mounting information (17 to 32)	R1013		
R1006	—	— —	R1014		
R1007	—	— —	R1015		

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R1400		Remote program input No.	R1896		Setup parameter lock I/F
R1401					
R1402		(password No.)			
R1403					
R1404		MELDAS-NET input			

Table 4-4-6

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R4732		User PLC version code 2			
R4733					
R4734					
R4735					
R4736					
R4737					
R4738					

Device No.	Abbrev.	Signal name	Device No.	Abbrev.	Signal name
R5461		— —			
R5461		— —			

— — : Reserved for the system.

Special relay (1/2) Table 4-5-1

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
SM00			SM08		
SM01			SM09		
SM02			SM10		— —
SM03			SM11		
SM04			SM12	CARRY	Carry flag
SM05			SM13		
SM06			SM14		
SM07			SM15		

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
SM16		— —	SM24		
SM17		DIO error	SM25		
SM18		— —	SM26		
SM19		— —	SM27		
SM20			SM28		
SM21			SM29		
SM22			SM30		
SM23			SM31		

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
SM32			SM40		
SM33			SM41		
SM34			SM42		
SM35			SM43		
SM36			SM44		
SM37			SM45		
SM38			SM46		
SM39			SM47		

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
SM48			SM56		
SM49			SM57		
SM50			SM58		
SM51			SM59		
SM52			SM60		
SM53			SM61		
SM54			SM62		
SM55			SM63		— —

— — : Reserved for the system.

Special relay (2/2) Table 4-5-2

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
SM64	DSPRQ	Tool Registration and Life screen display request	SM72		
SM65	LSTIN	Life management data setting prohibited	SM73		— —
SM66		— —	SM74		
SM67		— —	SM75		
SM68			SM76		
SM69		— —	SM77		
SM70		— —	SM78		
SM71	TSTIN	Tool Registration screen setting prohibited	SM79		

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
SM80	PSW00	X140 Reverse signal	SM88	PSW08	X148 Reverse signal
SM81	PSW01	X141 Reverse signal	SM89	PSW09	X149 Reverse signal
SM82	PSW02	X142 Reverse signal	SM90	PSW10	X14A Reverse signal
SM83	PSW03	X143 Reverse signal	SM91	PSW11	X14B Reverse signal
SM84	PSW04	X144 Reverse signal	SM92	PSW12	X14C Reverse signal
SM85	PSW05	X145 Reverse signal	SM93	PSW13	X14D Reverse signal
SM86	PSW06	X146 Reverse signal	SM94	PSW14	X14E Reverse signal
SM87	PSW07	X147 Reverse signal	SM95	PSW15	X14F Reverse signal

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
SM96	PSW16	X150 Reverse signal	SM104	PSW24	X158 Reverse signal
SM97	PSW17	X151 Reverse signal	SM105	PSW25	X159 Reverse signal
SM98	PSW18	X152 Reverse signal	SM106	PSW26	X15A Reverse signal
SM99	PSW19	X153 Reverse signal	SM107	PSW27	X15B Reverse signal
SM100	PSW20	X154 Reverse signal	SM108	PSW28	X15C Reverse signal
SM101	PSW21	X155 Reverse signal	SM109	PSW29	X15D Reverse signal
SM102	PSW22	X156 Reverse signal	SM110	PSW30	X15E Reverse signal
SM103	PSW23	X157 Reverse signal	SM111	PSW31	X15F Reverse signal

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
SM112			SM120		
SM113			SM121		
SM114			SM122		
SM115			SM123		
SM116			SM124		
SM117			SM125		
SM118			SM126		
SM119			SM127		

— — : Reserved for the system.

(Note) SM80 to SM111 are signals to reverse the PLC switch inputs X140 to X15F.

(1) J2-CT link

Device No.		Abbrev.	Signal name
	bit		
R1784	bit0		J2CT operation adjustment mode valid signal (common for all axes)

Signal name	J2CT control command 4	J2CT control command 3	J2CT control command 2	J2CT control command 1	J2CT control command L	J2CT control command H
Abbrev.	CTCM4	CTCM3	CTCM2	CTCM1	CTCML	CTCMH
J2CT 1st axis	R1700	R1701	R1702	R1703	R1704	R1705
J2CT 2nd axis	R1706	R1707	R1708	R1709	R1710	R1711
J2CT 3rd axis	R1712	R1713	R1714	R1715	R1716	R1717
J2CT 4th axis	R1718	R1719	R1720	R1721	R1722	R1723

Device No.		Abbrev.	Signal name
	bit		
R1656	bit0		J2CT 1st axis in operation adjustment mode
	bit1		J2CT 2nd axis in operation adjustment mode
	bit2		J2CT 3rd axis in operation adjustment mode
	bit3		J2CT 4th axis in operation adjustment mode

Signal name	J2CT status 4	J2CT status 3	J2CT status 2	J2CT status 1
Abbrev.	CTST4	CTST3	CTST2	CTST1
J2CT 1st axis	R1600	R1601	R1602	R1603
J2CT 2nd axis	R1604	R1605	R1606	R1607
J2CT 3rd axis	R1608	R1609	R1610	R1611
J2CT 4th axis	R1612	R1613	R1614	R1615

(2) Other file registers (R)

Device No.	Signal name	
	M system	**L system**
R700 to R999	Computer link interfaces	
R2800 to R2895	PLC constant parameters (corresponds to parameters #6301 to #6348)	
R2900 to R2947	PLC bit selection parameters (corresponds to parameters #6401 to #6496)	
R2950 to R2999	ATC command control information	–
R2970, R2971	–	Tool compensation No. for tool length measurement 2
R3000 to R3719	ATC registration tools	–
R3000 to R3639	–	Life management data
R3720 to R3735	Life management interfaces	–
R4400 to R4449	Expansion bit selection parameters (correspond to parameters #6497 to #6596)	
R5480 to R6279	–	Tool life management data with spare tool

(3) Other inputs/outputs (X, Y)

Device No.	Signal name
X140 to X15F	PLC switch input 1 to 32
X178 to X17B	Skip input 1 to 4 for monitor
Y160 to Y17F	PLC switch for reversed display 1 to 32

(4) Fixed (semi-fixed) devices

Device No.	Signal name
X108	NC reset Reset is input (Y222, etc.) to the NC based on this signal.
X18 to X1B	Reference position return near-point detection 1 to 4
X20 to X23	Stroke end (–) 1 to 4
X28 to X2B	Stroke end (+) 1 to 4

(5) Maintenance

Device No.	Signal name
R1850	CRC count (servo #1)
R1851	CRC count (servo #2)
R1852	Address illegal (servo #1)
R1853	Address illegal (servo #2)
R1854	CRC count (display unit)
R1855	Address illegal (display unit)

(6) Spindle related devices

CNC -> PLC

Device No.	Abbrev.	Signal name
X234	SF1	S function strobe 1
X235	SF2	S function strobe 2

Device No.(Note)		Abbrev.	Signal name
X1D0	X510		— —
X1D1	X511		— —
X1D5	X515	SD2	Speed detection 2
X1D6	X516	MCSA	In M coil selected
X1D7	X517		Index positioning complete
X20C	X54C	SUPP	Spindle rotation speed upper limit over
X20D	X54D	SLOW	Spindle rotation speed lower limit over
X214	X554	SIGE	S-analog gear No. illegal
X215	X555	SOVE	S-analog max./min. command value over
X216	X556	SNGE	S-analog no gear selected
X225	X565	GR1	Spindle gear shift 1
X226	X566	GR2	Spindle gear shift 2
X227	X567	—	(Always "0")
X240	X580		Spindle 2nd in-position
X241	X581	CDO	Current detect
X242	X582	VRO	Speed detect
X243	X583	FLO	In spindle alarm
X244	X584	ZSO	Zero speed
X245	X585	USO	Up-to-speed
X246	X586	ORAO	Spindle in-position
X247	X587	LCSA	In L coil selected
X248	X588	SMA	Spindle ready-ON
X249	X589	SSA	Spindle servo-ON
X24A	X58A	SEMG	Spindle emergency stop
X24B	X58B	SSRN	Spindle normal rotating
X24C	X58C	SSRI	Spindle reverse rotating
X24D	X58D		Z-phase passed
X24E	X58E	SIMP	Position loop in-position
X24F	X58F	STLQ	Torque limit
X2C8	X608	ENB	Spindle enable

— — : Reserved for the system.

(Note) Devices having two device Nos. indicated in the device No. section are the spindle related devices. Device for the 1st spindle is indicated on the left, and device for the 2nd spindle is indicated on the right.

CNC → PLC

Device No.	Abbrev.	Signal name
R28		S code data 1
R29		
R30		S code data 2
R31		

Device No.(Note)		Abbrev.	Signal name
R8	R208		Spindle command rotation speed input
R9	R209		
R10	R210		Spindle command final data (rotation speed)
R11	R211		
R12	R212		Spindle command final data (12-bit binary)
R13	R213		
R18	R218		Spindle actual speed
R19	R219		

PLC → CNC

Device No.	Abbrev.	Signal name
Y1FC		Spindle orientation complete standby valid (ATC high-speed)
Y382		Door open signal input (spindle speed monitor)
Y383		Door interlock spindle speed clamp

(Note) Devices having two device Nos. indicated in the device No. section are the spindle related devices. Device for the 1st spindle is indicated on the left, and device for the 2nd spindle is indicated on the right.

Device No.(Note)		Abbrev.	Signal name
Y225	Y5E5	GFIN	Gear shift complete
Y288	Y648	SP1	Spindle override 1
Y289	Y649	SP2	Spindle override 2
Y28A	Y64A	SP4	Spindle override 4
Y28F	Y64F	SPS	Spindle override method select
Y290	Y650	GI1	Spindle gear select 1
Y291	Y651	GI2	Spindle gear select 2
Y292	Y652	—	(Always "0")
Y294	Y654	SSTP	Spindle stop
Y295	Y655	SSFT	Spindle gear shift
Y296	Y656	SORC	Oriented spindle speed command
Y2D0	Y690	SRN	Spindle forward run start
Y2D1	Y691	SRI	Spindle reverse run start
Y2D2	Y692	TL1	Torque limit 1
Y2D3	Y693	TL2	Torque limit 2
Y2D4	Y694	WRN	Spindle forward run index
Y2D5	Y695	WRI	Spindle reverse run index
Y2D6	Y696	ORC	Spindle orient command
Y2D7	Y697	LRSL	L coil selection
Y2DA	Y69A		C axis gain L
Y2DB	Y69B		C axis gain H
Y2DC	Y69C		C axis zero point return
Y2DE	Y69E	LRSM	M coil selection
Y350	Y710	SWS	Spindle selection
Y357	Y717	MPCSL	PLC coil changeover

(Note) Devices having two device Nos. indicated in the device No. section are the spindle related devices. Device for the 1st spindle is indicated on the left, and device for the 2nd spindle is indicated on the right.

PLC → CNC

Device No.	Abbrev.	Signal name
R124		Encoder selection

Device No.(Note)		Abbrev.	Signal name
R108	R308		Spindle command rotation speed output
R109	R309		
R148	R348		S analog override
R149	R349		Multi-point orientation position data

(Note) Devices having two device Nos. indicated in the device No. section are the spindle related devices. Device for the 1st spindle is indicated on the left, and device for the 2nd spindle is indicated on the right.

5. OTHER DEVICES

5.1 Devices

In addition to U, Y, W, E, and R devices described above, the following devices exist:

Name	Symbol	Description
Internal relay Latch relay	M F L	(1) Internal and latch relays are auxiliary relays in the sequence that cannot directly be output to the external. (2) The latch relay L will be backed up even if the power is turned OFF. (3) The internal relay F may be used as the interface for the alarm message display.
Timer	T	(1) Timer T is a count-up timer. (2) T0 to T15, T56 to T135, T232 to T239 can set the timer value for either the sequence program or setting and display unit. T16 to T55, T136 to T231, T240 to T255 can set the timer value setting only from the sequence program. (3) The 100ms, 10ms and 100ms integral timer are available.
Counter	C	(1) Addition system counter C. (2) C0 to C23 can set the counter value for either the sequence program or setting and display unit. C24 to C127 can set the counter value only from the sequence program.
Data register	D	(1) The data register stores sequence data. (2) One data register consists of 16 bits and can be read or written in 16-bit units. To handle 32-bit data, two data registers are used. The data register addressed by a 32-bit instruction is used as the low-order 16 bits; the data register addressed by the specified data register number +1 is used as the high-order 16 bits.
File register	R	(1) The file register release area can be used in the same manner as the data register. (2) The file register uses a 16-bit structure for 1 point, and reads and writes in 16-bit units. Two points are used to handle 32-bit data. The file register No. designated with the 32-bit command is the low-order 16-bit, and the designated file register plus one is the high-order 16-bit.

The assignment tables for the above tables are on the following pages. Copy and use them as necessary.

<Format 1>

<Internal relay>

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
M			M		
M			M		
M			M		
M			M		
M			M		
M			M		
M			M		
M			M		

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
M			M		
M			M		
M			M		
M			M		
M			M		
M			M		
M			M		
M			M		

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
M			M		
M			M		
M			M		
M			M		
M			M		
M			M		
M			M		
M			M		

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
M			M		
M			M		
M			M		
M			M		
M			M		
M			M		
M			M		
M			M		

<Format 2>

<Internal relay>

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
F			F		
F			F		
F			F		
F			F		
F			F		
F			F		
F			F		
F			F		

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
F			F		
F			F		
F			F		
F			F		
F			F		
F			F		
F			F		
F			F		

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
F			F		
F			F		
F			F		
F			F		
F			F		
F			F		
F			F		
F			F		

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
F			F		
F			F		
F			F		
F			F		
F			F		
F			F		
F			F		
F			F		

<Format 3>

<Latch relay>

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
L			L		
L			L		
L			L		
L			L		
L			L		
L			L		
L			L		
L			L		

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
L			L		
L			L		
L			L		
L			L		
L			L		
L			L		
L			L		
L			L		

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
L			L		
L			L		
L			L		
L			L		
L			L		
L			L		
L			L		
L			L		

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
L			L		
L			L		
L			L		
L			L		
L			L		
L			L		
L			L		
L			L		

<Format 4>

<Timer>

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
T			T		
T			T		
T			T		
T			T		
T			T		
T			T		
T			T		
T			T		

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
T			T		
T			T		
T			T		
T			T		
T			T		
T			T		
T			T		
T			T		

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
T			T		
T			T		
T			T		
T			T		
T			T		
T			T		
T			T		
T			T		

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
T			T		
T			T		
T			T		
T			T		
T			T		
T			T		
T			T		
T			T		

<Format 5>

<Timer numerical value setting data output> 16-bit unit

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
T			T		
T			T		
T			T		
T			T		
T			T		
T			T		
T			T		
T			T		

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
T			T		
T			T		
T			T		
T			T		
T			T		
T			T		
T			T		
T			T		

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
T			T		
T			T		
T			T		
T			T		
T			T		
T			T		
T			T		
T			T		

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
T			T		
T			T		
T			T		
T			T		
T			T		
T			T		
T			T		
T			T		

<Format 6>

<Counter>

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
C			C		
C			C		
C			C		
C			C		
C			C		
C			C		
C			C		
C			C		
Device	**Abbreviation**	**Signal name**	**Device**	**Abbreviation**	**Signal name**
C			C		
C			C		
C			C		
C			C		
C			C		
C			C		
C			C		
C			C		

<Format 7>

<Counter numerical value setting data> 16-bit unit

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
C			C		
C			C		
C			C		
C			C		
C			C		
C			C		
C			C		
C			C		
Device	**Abbreviation**	**Signal name**	**Device**	**Abbreviation**	**Signal name**
C			C		
C			C		
C			C		
C			C		
C			C		
C			C		
C			C		
C			C		

<Format 8>

<Data register>

16-bit unit

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
D			D		
D			D		
D			D		
D			D		
D			D		
D			D		
D			D		
D			D		

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
D			D		
D			D		
D			D		
D			D		
D			D		
D			D		
D			D		
D			D		

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
D			D		
D			D		
D			D		
D			D		
D			D		
D			D		
D			D		
D			D		

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
D			D		
D			D		
D			D		
D			D		
D			D		
D			D		
D			D		
D			D		

<Format 9>

<File register>

16-bit unit

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
R			R		
R			R		
R			R		
R			R		
R			R		
R			R		
R			R		
R			R		

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
R			R		
R			R		
R			R		
R			R		
R			R		
R			R		
R			R		
R			R		

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
R			R		
R			R		
R			R		
R			R		
R			R		
R			R		
R			R		
R			R		

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
R			R		
R			R		
R			R		
R			R		
R			R		
R			R		
R			R		
R			R		

6. EXPLANATION OF INTERFACE SIGNALS

The signals are explained in order of the tables of input/output signals with the controller as shown below.

How to read the signals

B contact	Signal name	Signal abbreviation	P C	Device
*	AUTO INTERLOCK + n-TH AXIS	*+AIT1 to 3		Y1A8 to A

Indicates valid only when built-in the PLC

Device No.

PLC → controller signal.
Indicates B contact signal which becomes valid when turned OFF.

6.1 PLC Input Signals (Bit Type: X***)

B contact	Signal name	Signal abbreviation		Device
—	SERVO READY nTH AXIS	RDY1 to 4	—	X180 to 3

[Function]

This signal indicates that the drive section of the n-th axis is ready for operation.

[Operation]

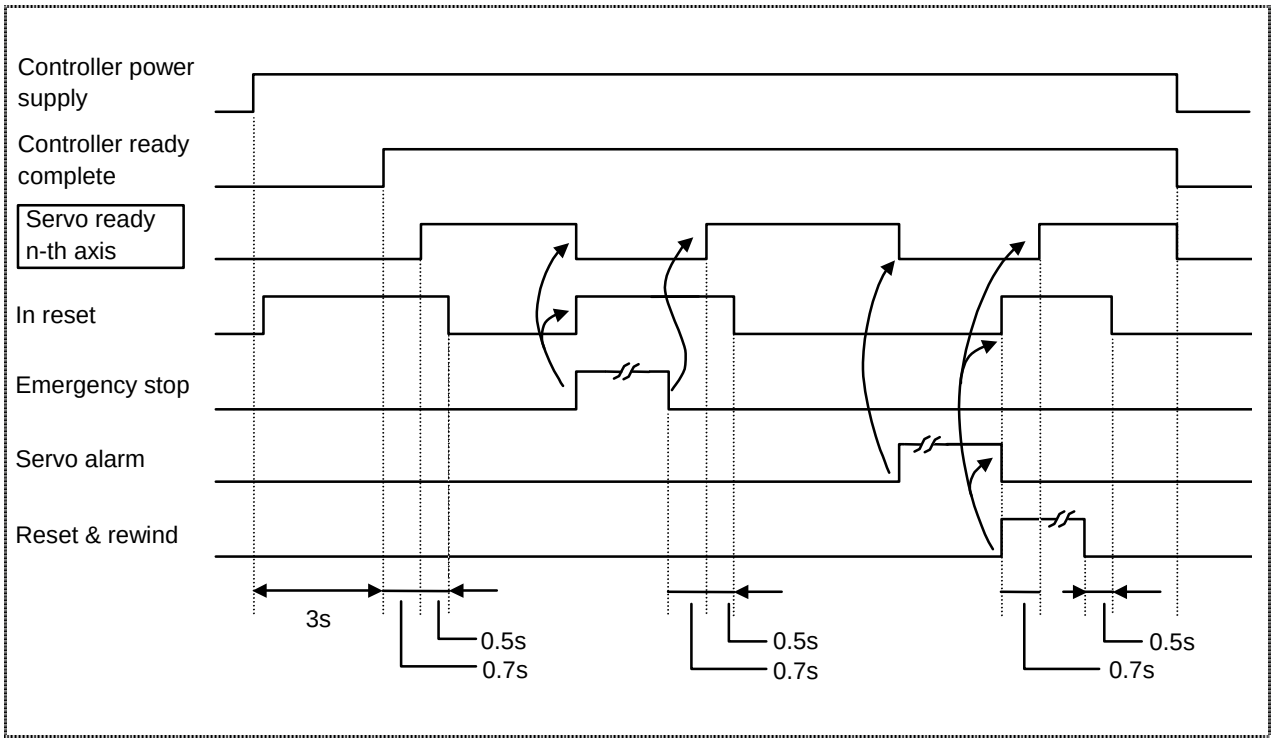
The signal turns on when:

(1) The power supply of the controller is turned on and the diagnosis on the servo system has been completed successfully.
(2) Servo alarm has been reset.
(3) Emergency stop has been reset.
(4) "Servo off" signal is reset.

The signal turns off when:

(1) Servo alarm occurs.
(2) Emergency stop is issued.
(3) "Servo off" signal is input.

[Operation sequence]



[Related signal]

(1) Servo ready complete (SA: X1F1)

B contact	Signal name	Signal abbreviation		Device
—	AXIS SELECTED nTH AXIS	AX1 to 4	—	X188 to B

[Function]

This signal indicates that motion command is issued to the control axis.

[Operation]

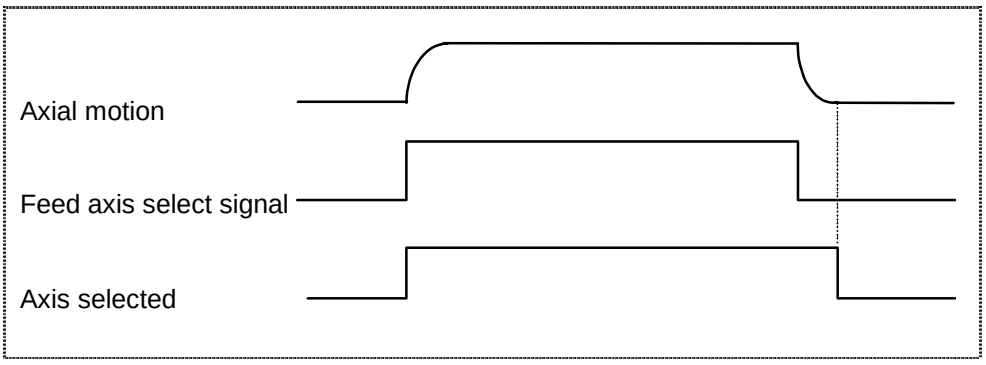
This signal turns on and off as follows:

(1) Automatic operation
The signal is on while the motion command is issued to the end of movement, or to when automatic operation pause turns on.

(2) Manual operation
(a) For JOG mode
The signal is on while "Feed axis select" signal (+Jn and -Jn) is on.
(b) For HANDLE mode
When "Handle axis No." signal (HS11 to 116, HS21 to 216, HS31 to 316) and "Handle valid" signal (HS1S, HS2S, HS3S) have been selected, the "Axis selected" signal for the axis specified by the "Handle axis No." signal is on.
(c) For INCREMENTAL mode
The signal turns on when "Feed axis select" signal turns on, and turns off when the specified motion is completed.
(d) For MANUAL RANDOM FEED mode
The signal turns on when "Strobe" signal (CXS8) turns on, and turns off when the specified motion is completed. Even when "Stop" signal (CXS7) is turned off (0) during motion, the axis select output signal remains on.
(e) For REFERENCE POSITION RETURN mode
The signal is on while "Feed axis select" signal (+Jn and -Jn) is on. After "Reference position return near point detect" signal is detected, and the motion speed changes to approach (creeping) speed, the "Axis selected" signal remains on until the motion stops at the reference position, even when "Feed axis select" signal turns off.

(3) Other conditions
(a) The signal can turn on even during machine lock (Z-axis is in cancellation). However, it does not turn on during machine lock in manual operation mode.
(b) The signal remains on even when motion stops due to feedrate override set at 0%, manual control feedrate set at 0 mm/min, or 0 inch/min.
(c) Interlock does not affect status of this signal (the signal remains on, or turns on).
(d) "Servo off" signal does not affect status of this signal.
(e) The signal cannot be turned on by G04 and G92.
(f) The signal turns off with "controller Reset & Rewind", or "Emergency stop".

Example)



B contact	Signal name	Signal abbreviation		Device
—	IN PLUS MOTION +nTH AXIS	MVP1 to 4	PC	X190 to 3

[Function]

This signal indicates that the specified axial motion is in plus (+) direction.
This signal is available per control axis, and the last number of the signal name indicates the control axis No.

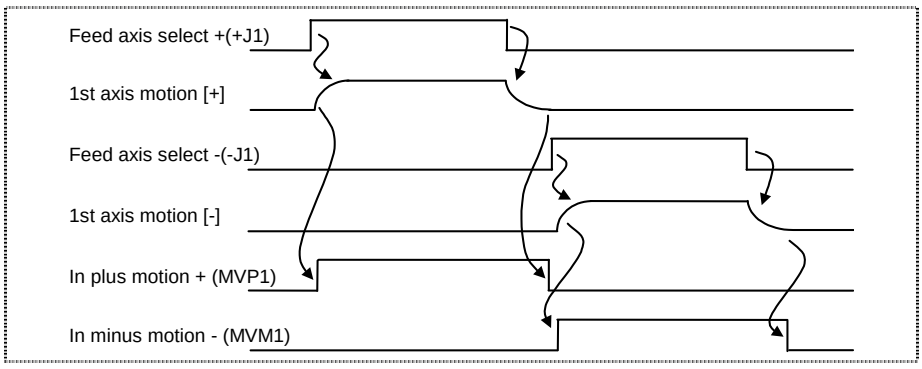
M V P n
- n: 1: 1st axis in motion … 4: 4th axis in motion
- P: P: In motion to plus direction, M: In motion to minus direction

[Operation]

The signal turns on when:
(1) The specified axial component starts moving in the plus direction or when moving.

The signal turns off when:
(2) The specified control axis stops moving or moves in the minus direction.

An example of the time chart for the jog mode is shown below.



Note 1) This signal operates regardless of the operation mode.
Note 2) The real movement direction is indicated.
Note 3) The signal does not turn on during machine lock.

[Related signals]

In minus motion –nth axis (MVM1 to 4: X198 to 19B)

B contact	Signal name	Signal abbreviation		Device
—	IN MINUS MOTION -nTH AXIS	MVM 1 to 4	PC	X198 to B

[Function]

This signal indicates that the control axis is moving in the minus direction.

[Operation]

This motion direction is the reverse of the plus motion, and the operation is the same as IN PLUS MOTION + (MVPn).

[Related signals]

In plus motion +nth axis (MVP1 to 4: X190 to 193)

B contact	Signal name	Signal abbreviation		Device
—	1ST REFERENCE POSITION REACHED, n-TH AXIS	ZP11 to 14	—	X1A0 to 3

[Function]

This signal indicates that the axial component of the n-th axis is on the 1st reference position.
This signal is available per control axis, and the last number of the signal name indicates the control axis No.

ZP1n
- 1: 1st reference position reached, 1st axis
- :
- :
- 4: 1st reference position reached, 4th axis

[Operation]

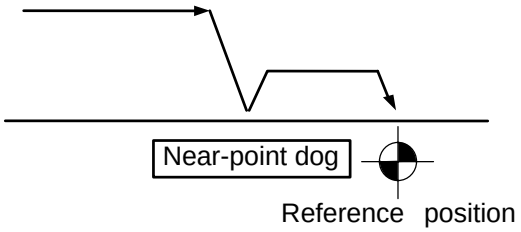
(1) The signal turns on when:
- "1st reference position reached" is attained with reference position return mode in manual operation.
  Refer to the REFERENCE POSITION RETURN (ZRN) section for details on returning.
- "1st reference position reached" is attained with G28 command in automatic operation.

Note) If "1st reference position reached" is achieved in other operation mode, or by other command, the signal does not turn on.

(2) The signal turns off when:
- The axial component in position is relocated from the 1st reference position by motion command.
- "Emergency stop" signal is input or servo alarm occurs, causing stop to the machine.

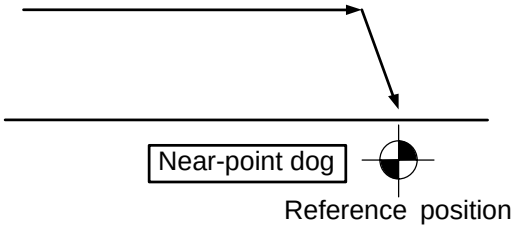
(3) Reference position return operation pattern

○ Dog-type reference position return



- When basic machine coordinate system is not established.
- When dog-type return is selected with setup parameters, basic specification parameter "#1063 mandog" in the manual mode.

○ High-speed reference position return



- When basic machine coordinate system is not established.
- When high-speed return is selected with setup parameters, basic specification parameter "#1063 mandog" in the manual mode.

Note)
Reference position return will be the high-speed return when the basic machine coordinate system is established (2nd time and following).

[Related signals]

2nd reference position reached nth axis (ZP21 to 24: X1A8 to 1AB)
3rd reference position reached nth axis (ZP31 to 34: X1B0 to 1B3)
4th reference position reached nth axis (ZP41 to 44: X1B8 to 1BB)

B contact	Signal name	Signal abbreviation		Device
—	2ND REFERENCE POSITION REACHED, n-TH AXIS	ZP21 to 24	—	X1A8 to B

[Function]

This signal indicates that the axial component of the n-th axis is on the 2nd reference position.
This signal is available per control axis, and the last number of the signal name indicates the control axis No.

ZP2n
- 1: 2nd reference position reached, 1st axis
- :
- :
- 4: 2nd reference position reached, 4th axis

[Operation]

(1) The signal turns on when:
- "2nd reference position reached" is attained with G30 command in automatic operation.

Note) If "2nd reference position reached" is achieved in other operation mode, or by other command, the signal does not turn on.

(2) The signal turns off when:
- The axial component in position is relocated from the 1st reference position by motion command.
- "Emergency stop" signal is input or servo alarm occurs, causing stop to the machine.

[Related signals]

1st reference position reached nth axis (ZP11 to 14: X1A0 to 1A3)
3rd reference position reached nth axis (ZP31 to 34: X1B0 to 1B3)
4th reference position reached nth axis (ZP41 to 44: X1B8 to 1BB)

B contact	Signal name	Signal abbreviation		Device
—	3RD REFERENCE POSITION REACHED, n-TH AXIS	ZP31 to 34	P C	X1B0 to 3

[Function] [Operation]

The function and operation of this signal are the same as those of "2nd reference position reached" signal, except for 2nd and 3rd reference positions and G command (G30P3 is used instead of G30P2 Xx Yy ...).
Refer to the section of "2nd reference position reached".

B contact	Signal name	Signal abbreviation		Device
—	4TH REFERENCE POSITION REACHED, n-TH AXIS	ZP41 to 44	P C	X1B8 to B

[Function] [Operation]

The function and operation of this signal are the same as those of "2nd reference position reached" signal, except for 2nd and 4th reference positions and G command (G30P4 is used instead of G30P2 Xx Yy ...).
Refer to the section of "2nd reference position reached".

B contact	Signal name	Signal abbreviation		Device
—	SEARCH & START (error)	SSE	P C	X1C2

[Function]

This signal is output when the program No. to be searched with search & start is illegally designated.

[Operation]

This signal is output when the No. of the program to be searched with search & start is illegal. Automatic start up will not be carried out if this signal is output. This signal will turn off if the program No. is correctly input and search & start is executed again, or when the reset signal is issued.
Refer to the "Search & start" signal (Y1FA) for details.

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	IN M COIL SELECTED	MCSA	P C	X1D6	X516

[Function]

This signal indicates that the middle-speed coil is being selected in the 3-step coil changeover specification of the spindle coil changeover function.

[Operation]

The state of the selected coil is combined with the "In L coil selected" (LCSA), and that is output.

Selected coil	L coil selection (LRSL)	M coil selection (LRSM)	In L coil selected (LCSA)	In M coil selected (MCSA)
High-speed (H)	OFF	OFF	OFF	OFF
Middle-speed (M)	OFF	ON	OFF	ON
Low-speed (L)	ON	OFF	ON	OFF
	ON	ON	ON	ON

[Related signals]

L coil selection (LRSL: Y2D7)
M coil selection (LRSM: Y2DE)
In L coil selected (LCSA: X247)

B contact	Signal name	Signal abbreviation		1st system	2nd system
—	INDEX POSITIONING COMPLETE		P C	X1D7	X517

[Function]

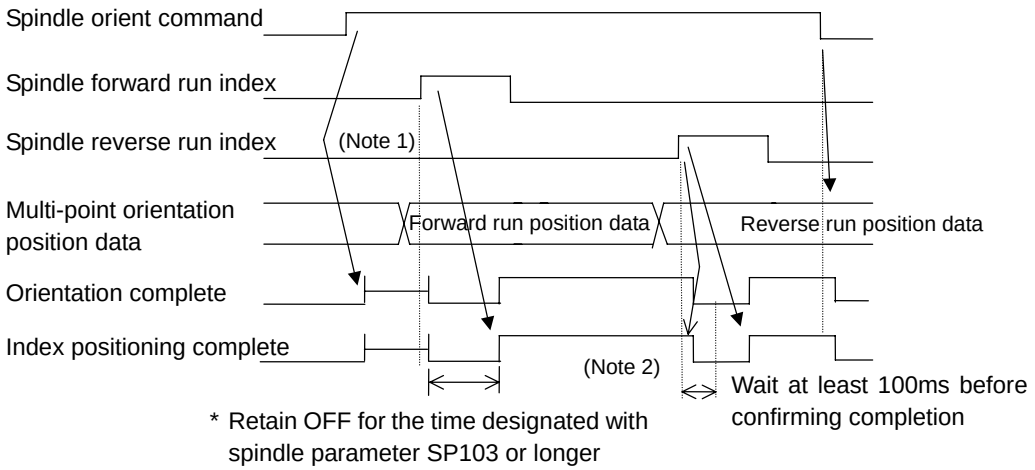
This signal informs that positioning for the spindle forward run and reverse run indexing functions has been completed.

[Operation]

(1) Orient the spindle.
If values are set in the parameters and multi-point orientation position data at this time, the spindle will be positioned to an angle shifted by the amount obtained by adding the two values.
If there is multi-point orientation position data during orientation, the spindle will be positioned to the angle shifted by that amount during forward run/reverse run indexing.
The basic orientation shift is carried out with parameters.

(2) Next, carry out positioning to an arbitrary angle using the forward run/reverse run indexing function.
At this time, set the angle data before turning the "Spindle forward run/reverse run index" signal ON. (Note 1)
The "Index positioning complete" signal will turn OFF when forward run/reverse run is started (turned ON), but it will take some time for the signal to turn OFF once, wait at least 100ms before confirming that the index positioning is completed after forward run/reverse run is completed. (Note 2)

(3) If the spindle orientation holding torque forces are overlapped, the torque limit function will be used.
An example of the turret control timing is shown below.



[Related signals]

Spindle orient command (ORC: Y2D6)
Spindle forward run index (WRN: Y2D4)
Spindle reverse run index (WRI: Y2D5)
Multi-point orientation position data (R149)

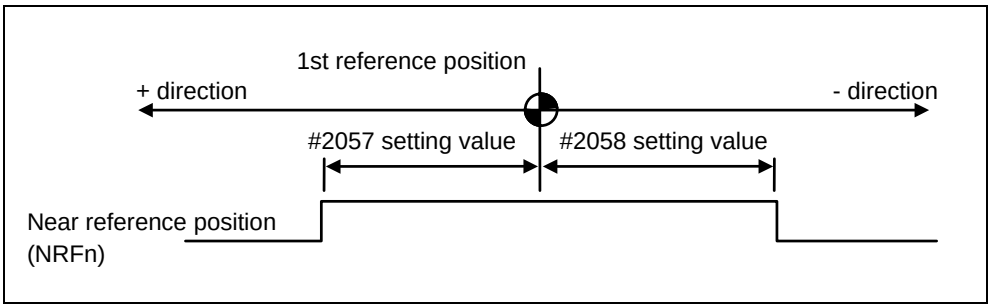
B contact	Signal name	Signal abbreviation		Device
—	NEAR REFERENCE POSITION nTH AXIS	NRF1 to 4	P C	X1D8 to B

[Function]

This signal indicates that the control axis is near the 1st reference position in the absolute position detection system.

[Operation]

This signal turns on when the control axis is in the range of the parameter set using the 1st reference position as a base point, and turns off when the range is exceeded. The parameter is set with #2057 (nrefp) and #2058 (nrefn) in the [ABS. POSI PARAM] screen.



Note 1) The "Near reference position" signal is output even while the axis is moving, but there may be a slight deviation with the actual machine position.
Rapid traverse : Approx. 19mm at 20m/min.
Cutting feed : Approx. 9.5mm at 10m/min.

Note 2) This signal is valid only with the absolute position detection system.

Note 3) When 0 is set for #2057 (nrefp) and #2058 (nrefn) in the [ABS. POSI PARAM] screen, it will be same as when the grid width is set.

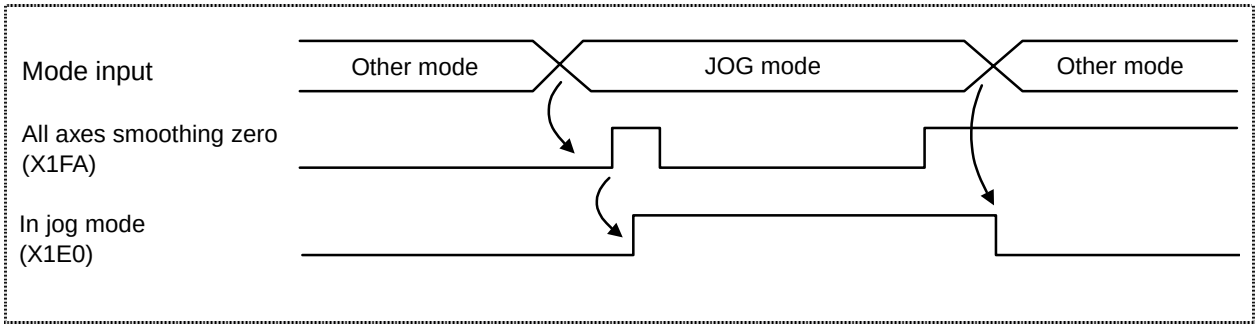
B contact	Signal name	Signal abbreviation		Device
—	IN JOG MODE	JO	P C	X1E0

[Function]

This signal indicates that JOG mode is selected.

[Operation]

Mode is changed to JOG mode from other mode after "All axes smoothing zero" (command acceleration/deceleration delay is zero) is verified.



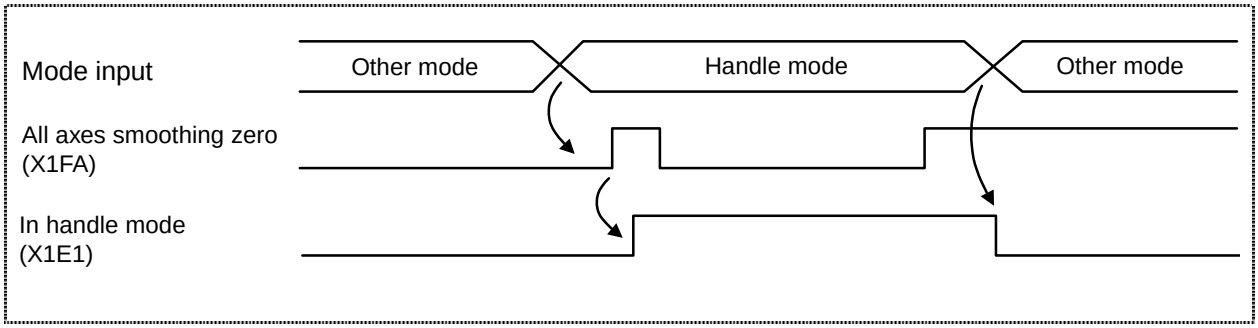
B contact	Signal name	Signal abbreviation		Device
—	IN HANDLE MODE	HO	P C	X1E1

[Function]

This signal indicates that HANDLE mode is selected.

[Operation]

Mode is changed to HANDLE mode from other mode after "All axes smoothing zero" (command acceleration/deceleration delay is zero) is verified.



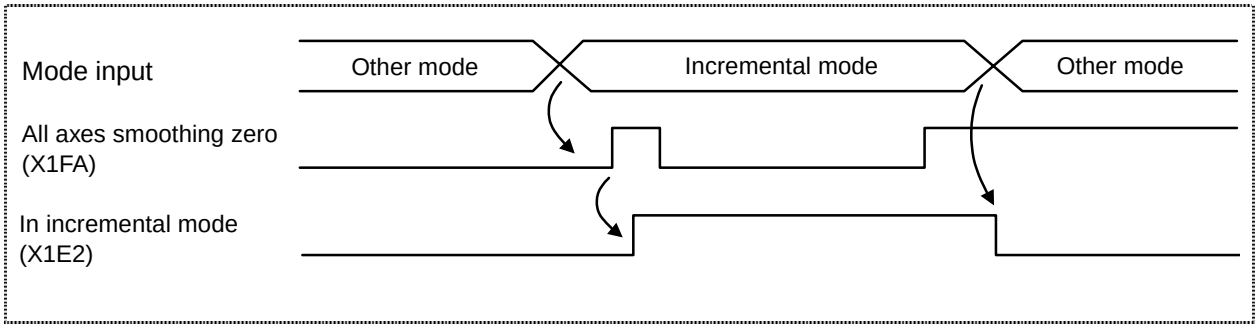
B contact	Signal name	Signal abbreviation		Device
—	IN INCREMENTAL MODE	SO	P C	X1E2

[Function]

This signal indicates that INCREMENTAL mode is selected.

[Operation]

Mode is changed to INCREMENTAL mode from other mode after "All axes smoothing zero" (command acceleration/deceleration delay is zero) is verified.



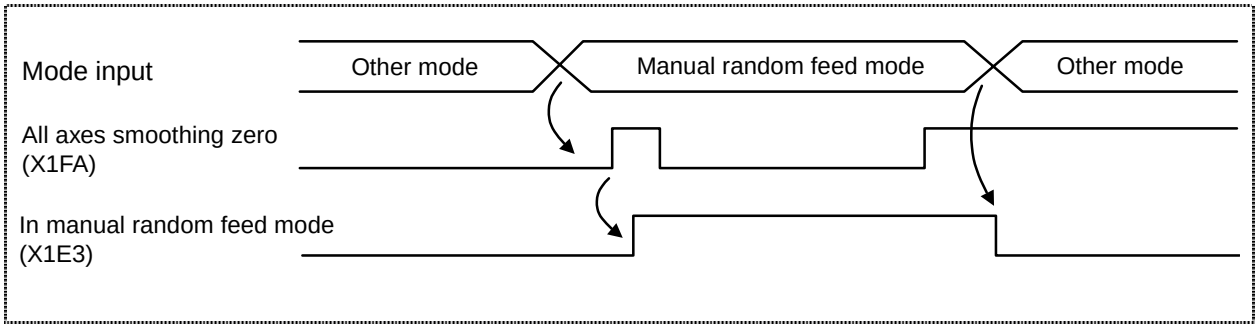
B contact	Signal name	Signal abbreviation		Device
—	IN MANUAL RANDOM FEED MODE	PTPO	P C	X1E3

[Function]

This signal indicates that MANUAL RANDOM FEED mode is selected.

[Operation]

Mode is changed to MANUAL RANDOM FEED mode from other mode after "All axes smoothing zero" (command acceleration/deceleration delay is zero) is verified.



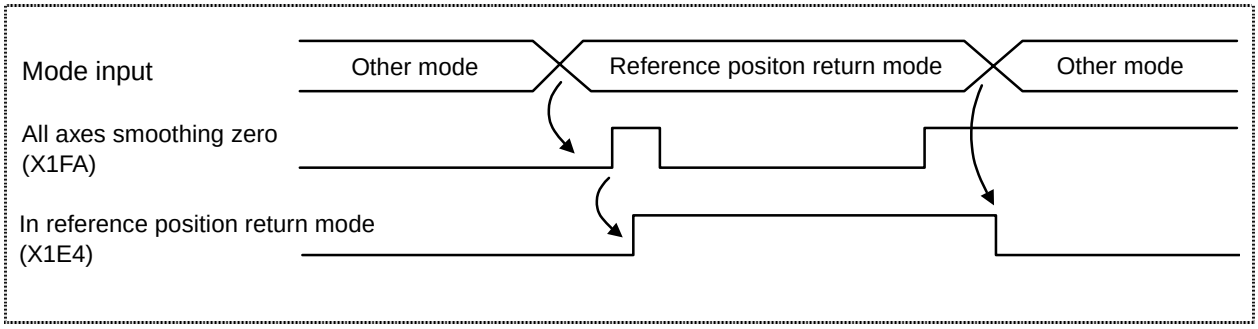
B contact	Signal name	Signal abbreviation		Device
—	IN REFERENCE POSITION RETURN MODE	ZRNO	P C	X1E4

[Function]

This signal indicates that REFERENCE POSITION RETURN mode is selected.

[Operation]

Mode is changed from other mode to REFERENCE POSITION RETURN mode after "All axes smoothing zero" (command acceleration/deceleration delay is zero) has been verified.



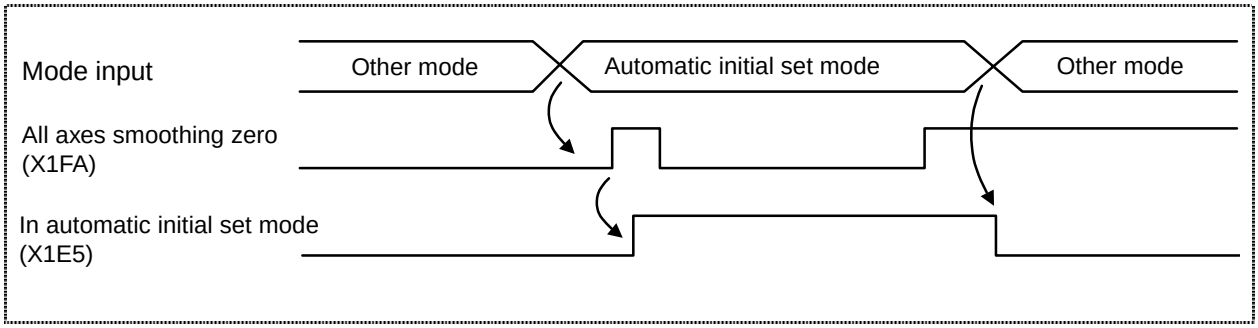
B contact	Signal name	Signal abbreviation		Device
—	IN AUTOMATIC INITIAL SET MODE	ASTO	P C	X1E5

[Function]

This signal indicates that AUTOMATIC INITIAL SET MODE is selected.

[Operation]

Mode is changed over from other mode to IN AUTOMATIC INITIAL SET MODE mode after "All axes smoothing zero" (command acceleration/deceleration delay is zero) has been verified.



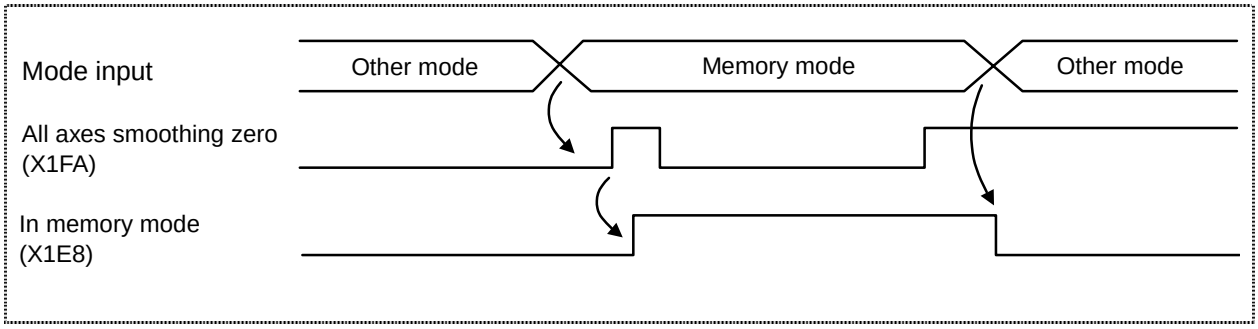
B contact	Signal name	Signal abbreviation		Device
—	IN MEMORY MODE	MEMO	P C	X1E8

[Function]

This signal indicates that MEMORY mode is selected.

[Operation]

Mode is changed from other mode to MEMORY mode after "All axes smoothing zero" (command acceleration/deceleration delay is zero) is verified.



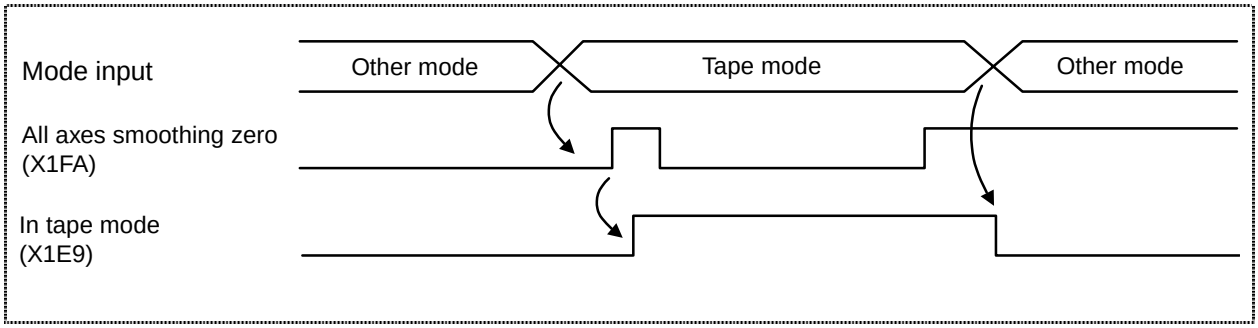
B contact	Signal name	Signal abbreviation		Device
—	IN TAPE MODE	TO	P C	X1E9

[Function]

This signal indicates TAPE mode is selected.

[Operation]

Mode is changed from other mode to TAPE mode when "All axes smoothing zero" (command acceleration/deceleration delay is zero) occurs.



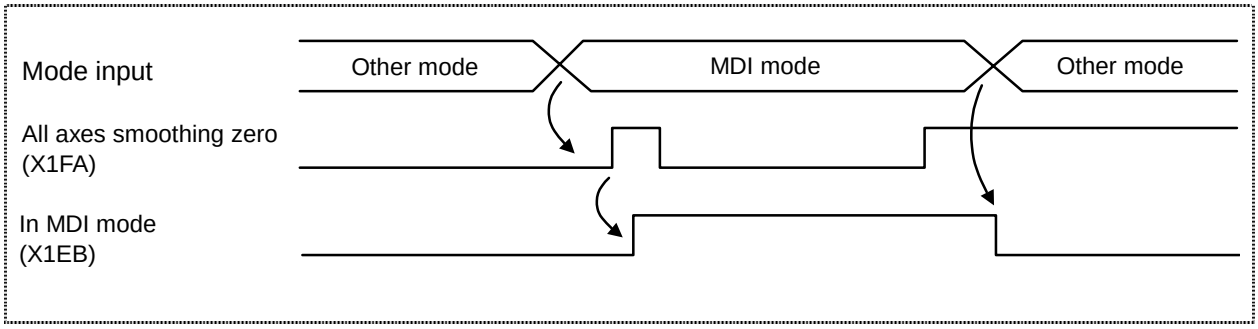
B contact	Signal name	Signal abbreviation		Device
—	IN MDI MODE	DO	P C	X1EB

[Function]

This signal indicates that MDI mode is selected.

[Operation]

Mode is changed from other mode to MDI mode when "All axes smoothing zero" (command acceleration/deceleration delay is zero) occurs.



B contact	Signal name	Signal abbreviation		Device
—	CONTROLLER READY COMPLETE	MA	—	X1F0

[Function]

This signal indicates that the controller is ready for normal operation.

[Operation]

The signal turns on when:

(1) The controller starts working successfully after it is turned on or when no off-condition exists.

The signal turns off when:

(1) The controller is turned off.
(2) Trouble occurs with the controller (such as failure in the CPU, memory, etc.).
(3) "Servo alarm" which cannot be reset without turning off the power supply of the controller occurs.

B contact	Signal name	Signal abbreviation		Device
—	SERVO READY COMPLETE	SA	—	X1F1

[Function]

This signal indicates that the servo system is ready for normal operation. In other words, the servo system (position control) is not working when the signal is off.

[Operation]

The signal turns on when:

(1) The diagnosis on the servo system is completed successfully after the control unit is turned on.
(2) "Servo alarm", if occurs, is reset. (Resetting may not be possible depending on the servo alarm contents.)
(3) "Emergency stop" input is removed.

The signal turns off when:

(1) "Servo alarm" occurs.
(2) "Emergency stop" is input.
(3) The power supply of controller is turned off.
(4) Trouble occurs with the controller (such as failure in the CPU or memory).

Note 1) This signal (SA) cannot be turned off only with the "Servo off" (*SVFn) signal.

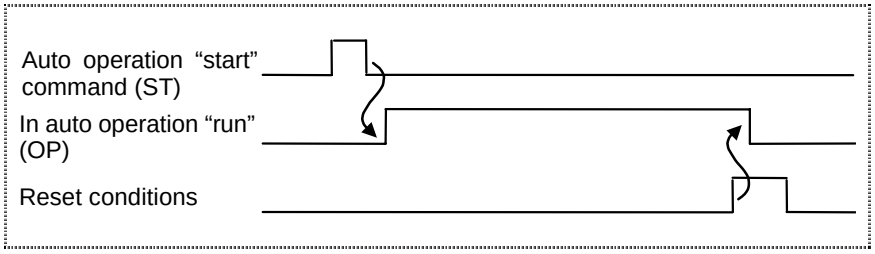
B contact	Signal name	Signal abbreviation		Device
—	IN AUTO OPERATION "RUN"	OP	—	X1F2

[Function]

This signal indicates that the controller is in automatic operation caused by "Auto operation "start" command" signal.

[Operation]

This signal stays on from when automatic operation starts with the "Auto operation "start" command (ST)" signal in the memory, MDI or tape mode, until the operation is reset.



(1) Reset conditions include the followings:
- "Reset & rewind (RRW)" is input.
- "Emergency stop" signal or "Servo alarm" signal is input.

(2) Signals related to "In auto operation "run" (OP)" include "In auto operation "start" (STL)", "In auto operation pause (SPL)", etc.
The ON/OFF state of these signals in each state are shown below.

	In auto operation "RUN" (OP)	In auto operation "START" (STL)	In auto operation "PAUSE" (SPL)
Reset condition	0	0	0
Auto operation stop condition	1	0	0
Auto operation pause condition	1	0	1
Auto operation start condition	1	1	0

The outline of each condition is as follows:
- Reset condition ……. Automatic operation is stopped by one of reset conditions described above. (All states not in automatic operation are this state.)
- Auto operation stop condition ……. Automatic operation is stopped after completion of one block. (This state is entered during single block stop.)
- Auto operation pause condition …….. Automatic operation suspended in the course of execution of one block. (This state is entered when the "Auto operation "pause" command signal (*SP)" is off.)
- Auto operation start condition ……. Automatic operation is being executed.

[Related signals]

In auto operation "start" (STL: X1F3)
In auto operation "pause" (SPL: X1F4)

B contact	Signal name	Signal abbreviation		Device
—	IN AUTO OPERATION "START"	STL	—	X1F3

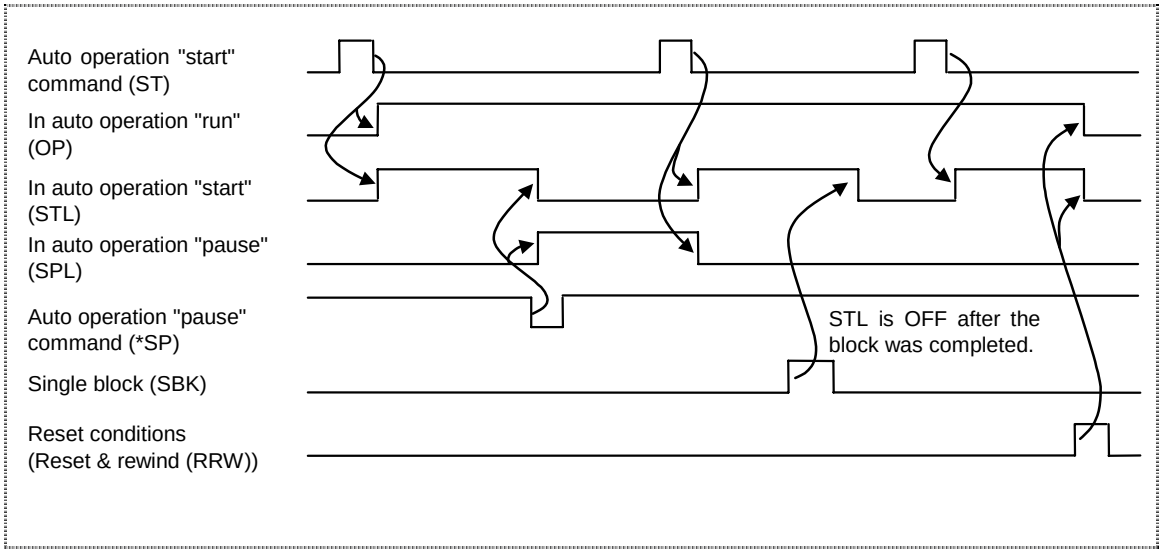
[Function]

This signal informs the PLC that automatic operation of the controller starts (started by automatic operation and motion command or M, S, T, B processing is in execution.

[Operation]

The signal turns on by the "Auto operation "start" command" signal (ST) in memory, MDI or tape mode, and off when auto operation pause, block stop or reset condition occurs.

The "In auto operation "start"" signal (STL) time chart, including automatic operation "pause" and block stop, is shown below.



Note 1) For reset conditions, refer to the section on "In auto operation "run"" (OP).

[Related signals]

In auto operation "run" (OP: X1F2)
In auto operation "pause" (SPL: X1F4)
Auto operation "start" command (ST: Y218)

B contact	Signal name	Signal abbreviation		Device
—	IN AUTO OPERATION "PAUSE"	SPL	—	X1F4

[Function]

This signal informs that the controller operation has been stopped due to the "Auto operation "pause" command" signal, etc., during motion command or miscellaneous function command.

[Operation]

The "In auto operation "pause"" signal (SPL) turns on with the following factors during automatic operation using the memory, MDI or tape mode.

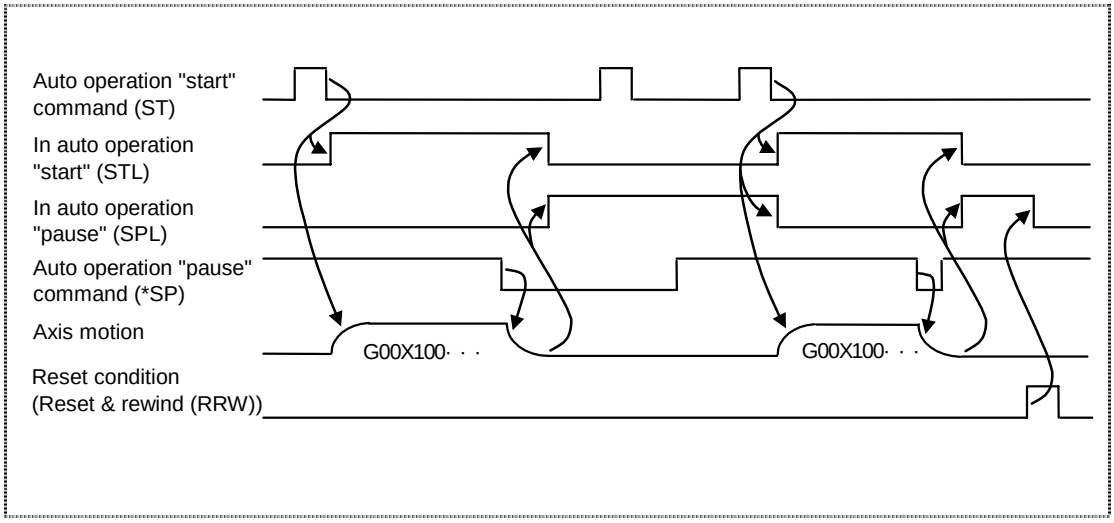
(1) When "Auto operation "pause" command" signal (*SP) turns off.
(2) When mode changes to manual operation mode (jog, handle, incremental, reference position return mode, etc.).

This signal will turn on even during machine lock or a miscellaneous function (M, S, T, B) command.

This signal will turn off in the following cases.

(1) When "Auto operation "start" command" signal (ST) turns on. However, this will be invalid if the "Auto operation "pause" command" signal (*SP) is not turned back on or if the mode is not automatic operation (memory, MDI, tape).
(2) When reset conditions are input.

The timing chart for the "In automatic operation "pause"" signal (SPL) is shown below.



Note 1) Refer to the section on "In auto operation "run"" (OP) for the rest conditions.

[Related signals]

In auto operation (OP: X1F2)
In auto operation "start" (STL: X1F3)
Auto operation "start" command (ST: Y218)
Auto operation "pause" command (*SP: Y219)

B contact	Signal name	Signal abbreviation		Device
—	IN "RESET"	RST	—	X1F5

[Function]

This signal informs that the controller is in reset condition.

[Operation]

The signal turns on:

(1) For about 4 to 5 seconds after the power is turned on.
(2) While "Reset and rewind" signal (RRW) is on, and for about 0.5 to 1 seconds after "Reset and rewind" signal (RRW) turns off.
(3) While "Emergency stop" signal is being input, and for 1 to 1.5 seconds after "Emergency stop" signal turns off.
(4) During "Servo alarm", and for 1 to 1.5 seconds after "Servo alarm" is removed.

B contact	Signal name	Signal abbreviation		Device
—	IN MANUAL RANDOM FEED	CXN	PC	X1F6

[Function]

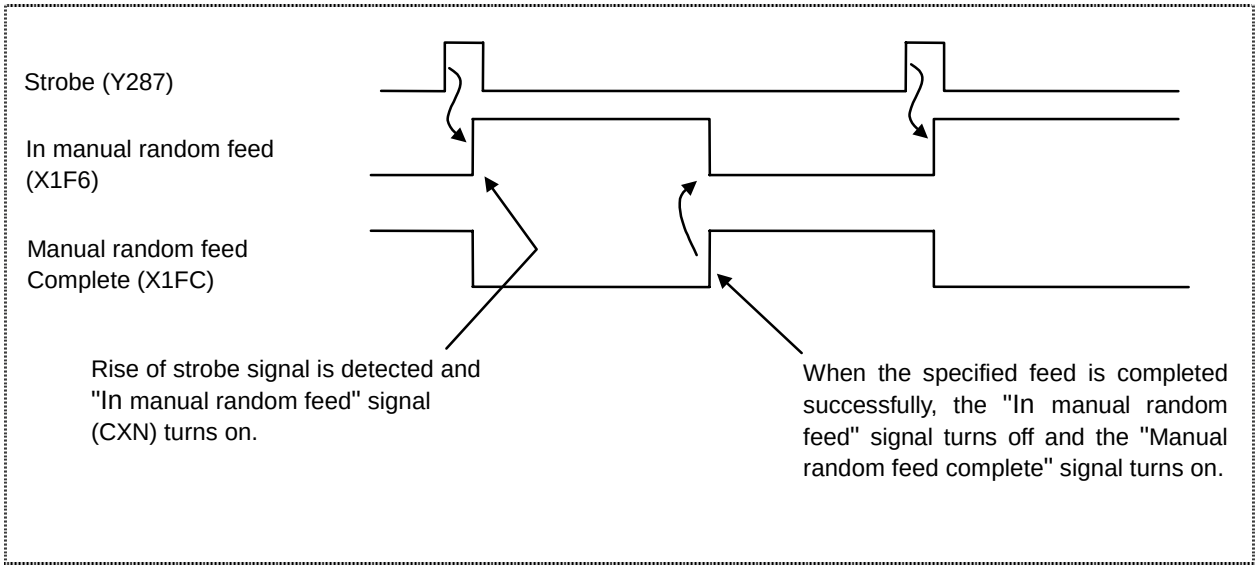
This signal is output during execution of manual random feed command.

[Operation]

The signal turns on when "Strobe" signal (Y287) turns on during MANUAL RANDOM FEED mode.

The signal turns off when commanded feed has been completed, and when "Reset & Rewind" signal is input during execution of manual random feed command.

[Timing chart]



B contact	Signal name	Signal abbreviation		Device
—	IN REWIND	RWD	—	X1F7

[Function]

This signal informs that the controller is indexing the memory mode.

[Operation]

The signal turns on when "Reset & rewind" signal (RRW) is turned on by the PLC in memory mode (with M02 or M30 command), and turns off when the controller completes indexing the program in execution.

Note 1) Since indexing of program in memory mode ends immediately, it may not be verified by user PLC.

[Related signals]

Reset & rewind (RRW: Y222)

B contact	Signal name	Signal abbreviation		Device
—	MOTION COMMAND COMPLETE	DEN	—	X1F8

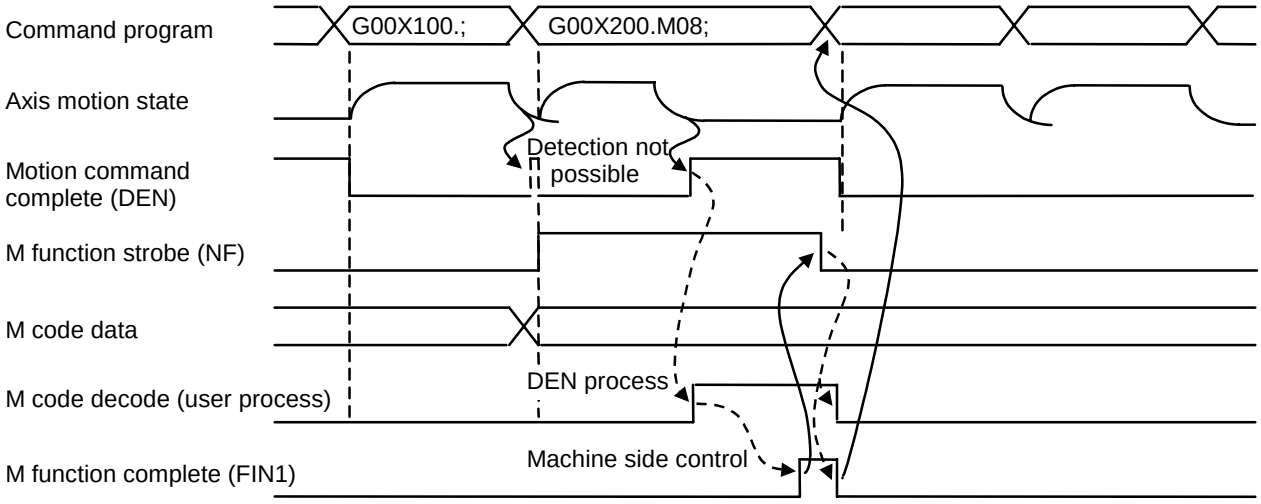
[Function]

This signal notifies that the commanded motion has been completed by the controller.
In the machining program when the motion command and miscellaneous function (M, S, T, B) command are specified in the same block, this signal can be used as a synchronization signal to determine whether miscellaneous function command is executed simultaneously with or after the motion command.

[Operation]

The signal turns on when:
(1) The system is initialized after the power is turned on.
(2) Execution of motion command is completed in automatic operation.
(3) Reset condition occurs.
(For reset conditions, refer to the section on "In auto operation "run"" signal (OP).)

The timing chart for the "Motion command complete" signal (DEN) is shown below.



Note 1) The "Motion command complete" signal is output even during machine lock.
Note 2) Unless commanded motion is completed, this signal does not turn on even when motion is suspended by interlock function or "Auto operation "pause" command" signal.

B contact	Signal name	Signal abbreviation		Device
—	ALL AXES IN-POSITION	TIMP	—	X1F9

[Function]

This signal informs the PLC that the all axis components of the controller are in commanded positions.

[Operation]

The signal turns on when there is no acceleration/deceleration delay in all control axes and servo errors (remaining pulses) in positioning are within the specified range.

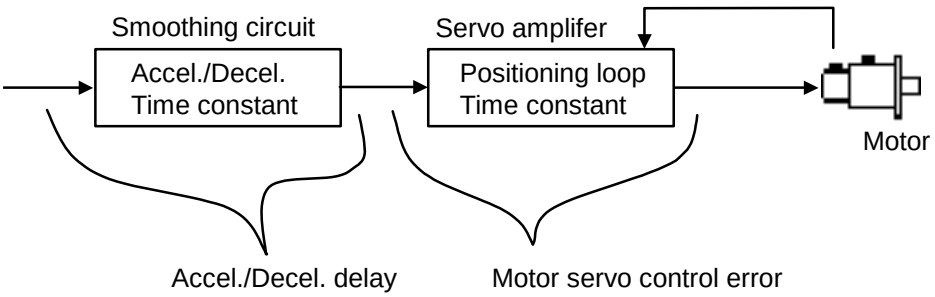
The signal turns off when:

(1) Acceleration/deceleration motion is delayed in a control axis.

(2) Servo positioning error (remaining pulses) for a control axis exceeds the specified range.

Note 1) The all axes in-position signal may turn on even during motion if the motion is an extremely low speed.

Note 2) The condition where the servo errors must be in a specific range to turn on the signal can be invalidated with parameters. In this case, the signal will turn on/off regardless of whether there is any delay in the acceleration/deceleration.



[Related signal]

All axes smoothing zero (TSMZ: X1FA)

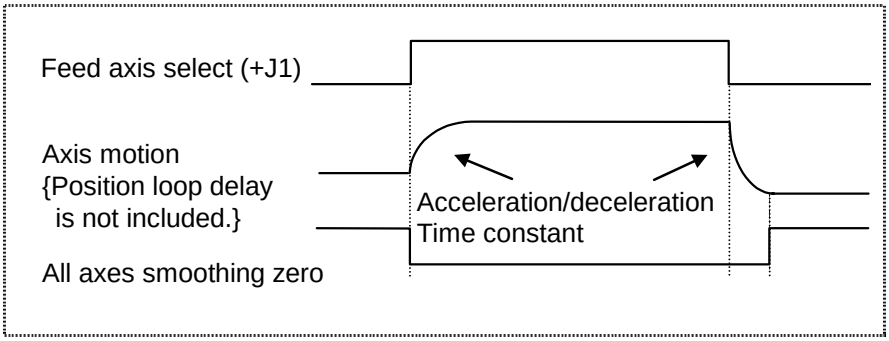
B contact	Signal name	Signal abbreviation		Device
—	ALL AXES SMOOTHING ZERO	TSMZ	—	X1FA

[Function]

This signal informs the PLC that there is no delay (caused by the acceleration/deceleration time constants) in any of the controller control axis command system.
The PLC axis is not included in the control axis.

[Operation]

The signal turns on when the motion commanded in automatic or manual operation is completed successfully without delay. The signal is off during execution of motion command, or if delay in execution of command occurs.



Note 1) The signal can turn on even during machine lock.
Note 2) The signal may turn on during motion if the motion is an extremely low speed.

[Related signals]

(1) All axes in-position (TIMP: X1F9)
(2) In plus motion +1st axis to +4th axis (MVP1 to MVP4: X190)
(3) In minus motion -1st axis to –4th axis (MVM1 to MVM4: X198)

"All axes smoothing zero" signal turns on when these signals are off.

B contact	Signal name	Signal abbreviation		Device
—	MANUAL RANDOM FEED COMPLETE	CXFIN	P C	X1FC

[Function]

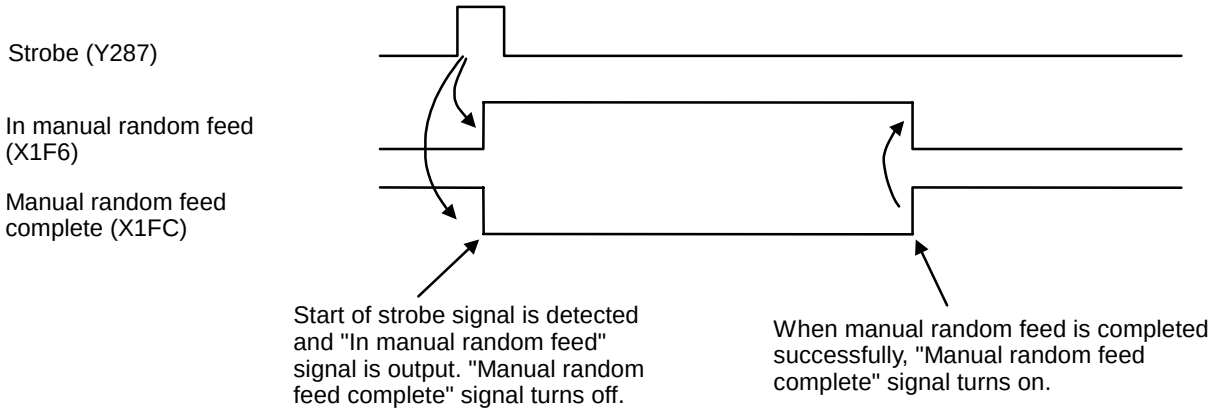
This signal is output when motion commanded in manual random feed mode is completed.

[Operation]

The signal turns on when:
(1) The motion commanded in manual random feed mode is completed.

The signal turns off when:
(1) During motion in manual random feed mode.
(The signal stays off when motion is interrupted by a reset & rewind signal.)
(2) The power is turned on.

[Timing chart]



B contact	Signal name	Signal abbreviation		Device
—	IN RAPID TRAVERSE	RPN	—	X200

[Function]

This signal is output during rapid traverse motion in automatic operation (memory, MDI, tape).

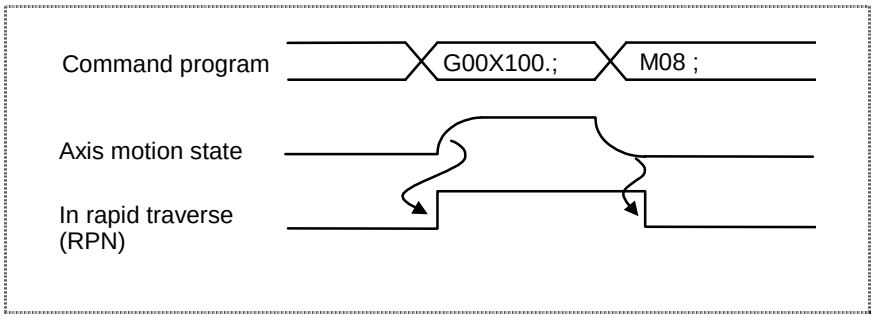
[Operation]

(1) The signal is on when:
- Rapid traverse motion in automatic operation.
  Canned cycle positioning and reference position return (G28), etc., are included in the automatic operation rapid traverse besides the motion command by the G00 command.

(2) The signal turns off when:
- The block in rapid traverse motion is completed during automatic operation.
- Rapid traverse motion is stopped by "Auto operation "pause" command" signal (*SP) during automatic operation.
- Rapid traverse motion axis is stopped by interlock during automatic operation.
- The ratio of the "Cutting feedrate override" (*FV1 to 16) becomes 0% during automatic rapid traverse operation.
- A stroke end (hardware or software) occurs during automatic rapid traverse operation.
- Reset condition occurs.

Note 1) "In rapid traverse" signal (RPN) can turn on and off even during machine lock.
Note 2) The signal is not output in manual operation.
Note 3) For reset condition, refer to the section on "In auto operation "run"" signal (OP).

The timing chart for "In rapid traverse" signal (RPN) is shown below.



B contact	Signal name	Signal abbreviation		Device
—	IN CUTTING FEED	CUT	—	X201

[Function]

This signal informs that given motion command is executed for cutting feed in automatic operation (memory, MDI, tape).

[Operation]

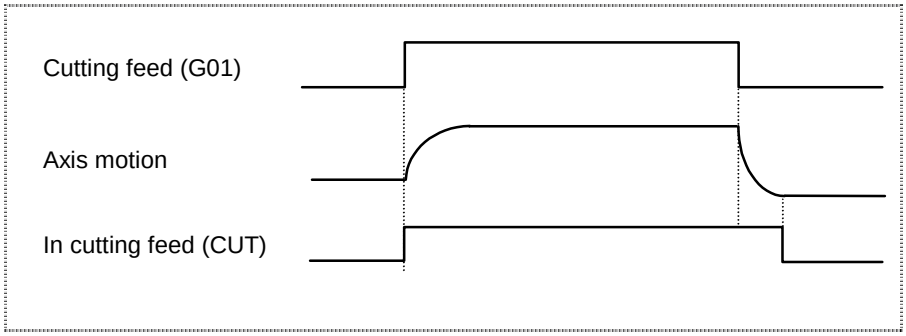
The signal turns on when:

(1) Motion command is given for cutting feed in automatic operation.

The signal turns off when:

(1) The block in cutting feed in automatic operation is completed.
(2) Execution of cutting feed is suspended by "Auto operation "pause" command" signal (*SP).
(3) Execution of cutting feed is stopped by interlock during auto operation.
(4) The ratio of the cutting feedrate override becomes 0% during automatic cutting feed operation.
(5) A stroke end (hardware or software) occurs during automatic cutting feed operation.
(6) Reset condition occurs.

Note 1) The signal (CUT) can be turned on and off during cutting feed even if machine interlock is applied.
Note 2) Cutting feed commands in automatic operation include G01, G02, G03 and G31.
Note 3) The signal is not output in manual operation.
Note 4) For reset condition, refer to the section on "In auto operation "run"" signal (OP).



B contact	Signal name	Signal abbreviation		Device
—	IN TAPPING	TAP	—	X202

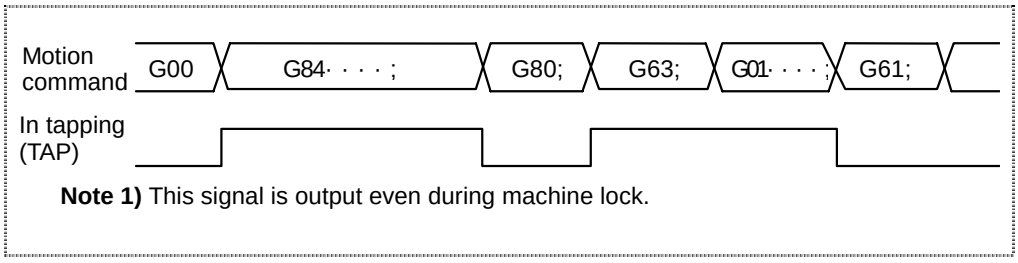
[Function]

This signal informs that commanded motion in automatic operation (memory, MDI, tape) is executed in canned tapping cycle, or tapping mode is selected for execution of commanded motion.

[Operation]

(1) The signal turns on when:
- Commanded motion in automatic operation is being executed in canned tapping cycle.
- Commanded motion in automatic operation is being executed in tapping mode (G63).

(2) The signal turns off when:
- Commanded motion is not being executed in fixed tapping cycle, nor in tapping mode.
  The signal is reset by G80 or "01" group G command (G00, G01, G02, G03, G33) during canned tapping cycle, and by G61, G62 and G64 during tapping mode.



Note 1) This signal is output even during machine lock.

B contact	Signal name	Signal abbreviation		Device
—	IN THREAD CUTTING	THRD	—	X203

[Function]

This signal is output during execution of thread cutting command.

[Operation]

The signal turns on when:
(1) Thread cutting command is given.

The signal turns off when:
(1) Motion command other than thread cutting command is given.
(2) Reset condition occurs during thread cutting.

(Note) Spindle override is invalid (100%) during thread cutting.

B contact	Signal name	Signal abbreviation		Device
—	IN SYNCHRONOUS FEED	SYN	—	X204

[Function]
This signal is output during execution of synchronous feed command.

[Operation]
The signal turns on when:
(1) Synchronous feed command (G94) is given.

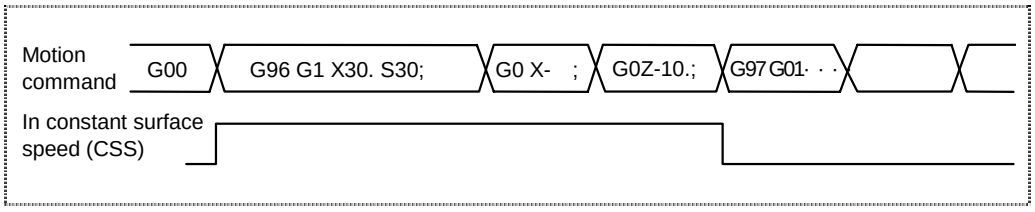
The signal turns off when:
(1) Asynchronous feed command (G95) is given.

B contact	Signal name	Signal abbreviation		Device
—	IN CONSTANT SURFACE SPEED	CSS	—	X205

[Function]
This signal informs that automatic operation is under constant circumferential (surface) speed control.

[Operation]
The signal turns on when:
(1) Constant surface speed control mode (G96) is selected during automatic operation.

The signal turns off when:
(1) Constant surface speed control off command (G97) is given.



Note 1) This signal (CSS) is output even during machine lock.

B contact	Signal name	Signal abbreviation		Device
—	IN SKIP	SKIP	—	X206

[Function]
This signal is output while skip command (G31) is being executed.

[Operation]
The signal turns on when:
(1) Skip command (G31) is being executed with automatic operation.

The signal turns off when:
(1) Block having a skip command is completed.

B contact	Signal name	Signal abbreviation		Device
—	IN REFERENCE POSITION RETURN	ZRNN	—	X207

[Function]
This signal is output while reference position return command is being executed.

[Operation]
The signal turns on when:
(1) G28 command is executed.
(2) G30 command is executed.
(3) Manual reference position return mode is selected.

The signal turns off when:
(1) All cases other than above.

B contact	Signal name	Signal abbreviation		Device
—	IN INCH UNIT SELECT	INCH	—	X208

[Function]
This signal informs that the controller uses inch unit for data input.

[Operation]
This signal turns on when inch unit is selected.
The inch unit mode is established when setup parameter [#1041 I_inch] is set and the power is turned on.

Note 1) With G20 command (inch unit command) or G21 command (metric unit command), the signal (INCH) does not change.

B contact	Signal name	Signal abbreviation		Device
—	IN DISPLAY LOCK	DLNK	P C	X209

[Function]

This signal informs that the results of the movement command executed by the control unit are not reflected onto POSITION screen (display locked).

[Operation]

This signal turns ON while the display lock signal (DLK) is input.
The display lock operation is validated immediately after the display lock signal (DLK) turns ON.

[Related signals]

Display lock (DLK: Y231)

B contact	Signal name	Signal abbreviation		Device
—	F1-DIGIT COMMANDED	F1DN	—	X20A

[Function]

This signal informs that the controller uses F1-digit commands (F1 to 5) to control operation.

[Operation]

The signal turns on when:
(1) F1-digit command (F1 to 5) is selected for feedrate command.

The signal turns off when:
(1) Block having a motion command specified with F1-digit code is completed.
(2) Operation is stopped by "Auto operation "pause" command" signal (*SP) during execution of F1-digit feedrate command.
(3) Operation is stopped by "Interlock" signal during execution of F1-digit feedrate command.
(4) Reset condition occurs.
(For details of reset conditions, refer to the description about "In auto operation "run"" signal (OP).)

Note 1) The setup parameter, basic specification parameter "#1079 F1digt" must be validated and "#1185 to 89 F1-digit feedrate" must be set to use the F1-digit command.

[Related signal]

(1) F1-digit No. (F11 to 14: X218)

B contact	Signal name	Signal abbreviation		Device
—	IN TOOL LIFE MANAGEMENT	TLFO	P C	X20B

[Function]

This signal is output while tool life is being managed.

[Operation]

The signal turns on when the parameter "#1103 T_Life" is on.

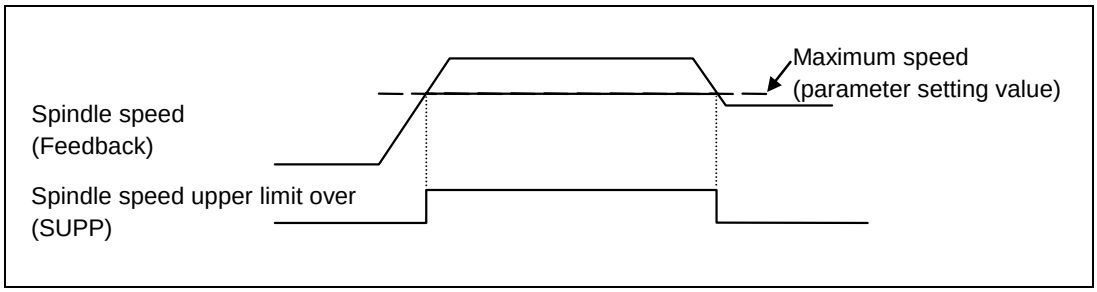
B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	SPINDLE SPEED UPPER LIMIT OVER	SUPP	P C	X20C	X54C

[Function]

This signal notifies that the feedback of the spindle motor has exceeded the maximum speed.

[Operation]

This signal turns on when the spindle motor's feedback exceeds the maximum speed regardless of the commanded speed.



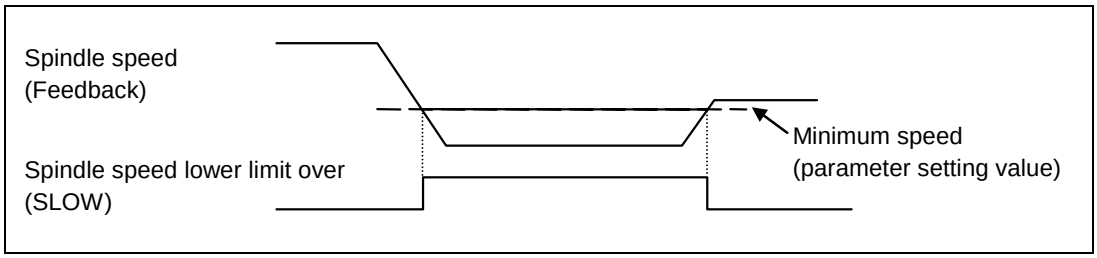
B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	SPINDLE SPEED LOWER LIMIT OVER	SLOW	P C	X20D	X54D

[Function]

This signal notifies that the feedback of the spindle motor has exceeded the minimum speed.

[Operation]

This signal turns on when the spindle motor's feedback exceeds the minimum speed regardless of the commanded speed.



B contact	Signal name	Signal abbreviation		Device
—	TOOL LIFE OVER	TLOV	P C	X20E

[Function]

This signal notifies the PLC that the lives of all tools in the same group have reached (usage data ≥ life data).
Note that for tool life management I, the data is controlled with tool units.

[Operation]

<For L system tool life management I>

This signal turns on when the usage data of the tool matches or exceeds the life data. Note that this signal is only output, and the automatic operation of the controller, etc., will not stop.

<For L system tool life management II>

This signal turns on when the usage data of the tool matches or exceeds the life data. Note that this signal is only output, and the automatic operation of the NC, etc., will not stop.
The signal turns on when:
(1) The final tool of the group current selected has reached the life (usage data >= life data). (Same timing as the count up of usage data.)
(2) When a "Tool change reset" (TRST) signal has been input in respect to the last tool in the currently selected group.
(3) If a group is selected, when the lives of all tools in the group have reached the life. (Same timing as tool function strobe 1 (TF1) signal.)

The signal turns off when:
(1) When the group selection has been completed. (At T command. Note that if the selected group is a life group, the signal will remain on.)
(2) When usage data of currently selected group is cleared. (When "Tool change reset" (TRST) signal is input, etc.)

<For M system tool life management II>

This signal turns ON when the life of all tools in the group mounted on the spindle is reached, or when erroneous tools are selected. Note that this signal is output only, and the automatic operation of the control unit, etc., will not stop.
This signal turns ON when:
(1) When the usage data >= life data of the final tool in the group mounted on the spindle.
(Same timing as the count up of usage data)
(2) When a tool error signal is input for the final tool in the group mounted on the spindle.
(3) When the lives have been reached of all the tools in the mounted group when the tools are mounted on the spindle.

This signal turns OFF when:
(1) When a tool from another group is mounted on the spindle.
(Note that if the life of all the tools in the mounted group is reached, the signal will remain ON.)
(2) When the usage data of the group mounted on the spindle is cleared.
(3) When the tool life management is invalidated.

[Caution]

When this signal is used in M system tool life management II, refer to the ladder cycle after the spindle tool is changed. (This signal will not change in the same cycle in which the spindle tool was changed.)

[Related signals]

(1) Tool change reset (TRST: Y2CC)
(2) Tool function strobe 1 (TF1: X238)
(3) In tool life management (TLFO: X20B)
(4) New tool change (TCRQ: X22C)
(5) Group in tool life management
(6) Tool life usage data

B contact	Signal name	Signal abbreviation		Device
—	BATTERY ALARM	BATAL	P C	X20F

[Function]

This signal notifies that the voltage of the data storage battery in the controller or the battery supplying to the absolute position detector has dropped below the specified value.

[Operation]

The signal turns on when:

(1) The voltage of the data storage battery is checked when the power is turned on and is below the specified voltage (approx. 2.6V). At this time, the system alarm (Z52) will display.
(2) A fault is detected in the power voltage supplied to the absolute position detector.
At this time, the absolute position detection system alarm (Z73 0001) and servo alarm (S52 9F) will display.
(3) A fault is detected in the power voltage for the speed detector in the absolute position detector.
At this time, the absolute position detection system alarm (Z71 0001) and servo alarm (S01) will display.

In the case of (1) and (2), automatic starting is possible.

The signal turns off when:

(1) For alarms caused by on condition (1), the signal can be turned off by resetting the setting and display unit. However, if the battery voltage is still below the specified value when the controller power is turned off and on, the signal will turn on again.
(2) For alarms caused by on conditions (2) and (3), the signal can be turned off by removing the power voltage fault and then turning the power on again.

[Related signals]

(1) Battery drop cause (R56)

[Caution]

If this battery alarm occurs (especially in the "on" conditions (1)) assume that the data which should be registered, such as the machining programs, has been damaged, and take suitable measure.
Always make a back up of the data in the controller as a safeguard for when this alarm occurs.

B contact	Signal name	Signal abbreviation		Device
—	NC ALARM 1	AL1	—	X210

[Function]

This signal informs that system error occurred in the controller.

[Operation]

If "watch dog error", "memory parity check error", etc. occurs on the controller side, the signal turns on. The system error can be reset by turning off.

Note 1) "NC alarm 1" (AL1) may not be detected as signal.
Note 2) For details of system alarms, refer to the relevant Operation Manual or Alarm/Parameter Manual.

B contact	Signal name	Signal abbreviation		Device
—	NC ALARM 2 (Servo alarm)	AL2	—	X211

[Function]

This signal informs that the controller is in servo alarm condition. If servo alarm occurs, "Servo ready complete" signal (SA) turns off.

[Operation]

The signal turns on when:

(1) Servo alarm occurs. Servo alarms include the following:
- Servo failure 1 (no signal, overcurrent, overvoltage, etc.)
- Servo failure 2 (motor overheat, excessive error, amplifier external emergency stop, etc.)
- Initial parameter error (parameter transferred to amplifier when the power is turned on is illegal)
- Amplifier not mounted (cable is not connected between controller and servo controller).
- Parameter error (a parameter that will disrupt movement of the control axis was found).

Alarm can be reset by turning off the power, or using controller reset, or by setting parameter again, etc., depending on type of alarm. For details of alarm resetting, and servo alarm, refer to the relevant Operation Manual or Alarm/Parameter Manual.

B contact	Signal name	Signal abbreviation		Device
—	NC ALARM 3 (Program error)	AL3	—	X212

[Function]

This signal informs that the controller is in program error condition.

[Operation]

This type of alarm occurs during automatic operation in memory, MDI or tape mode, mainly due to use of faulty machining program, or program incompatible with the controller specifications.

Some typical examples of program error are shown below. For details, refer to the relevant Operation Manual or Alarm/Parameter Manual.

(1) Illegal address (address not covered by the specifications is used)
(2) Absence of F command
(3) Arc end point excessive deviation
(4) Return incomplete axis found (a motion command was issued to an axis that has not completed reference position return)
(5) Program end error (M02 or M30 command is not inserted or reset & rewind process has not been performed)

B contact	Signal name	Signal abbreviation		Device
—	NC ALARM 4 (Operation error)	AL4	—	X213

[Function]

This signal informs that the controller is in operation error condition.

[Operation]

The signal turns on in case of operation alarm, and off when the alarm condition is removed.
Some typical examples of operation errors are shown below:
For details, refer to the relevant Operation Manual or Alarm/Parameter Manual.

(1) Hardware axis motion stroke end
(2) Software axis motion stroke end
(3) No operation mode set
(4) Cutting feedrate override set to "zero"
(5) Manual feedrate zero
(6) External interlock axis found
(7) Warning regarding absolute value detection

(Note) When the "NC alarm 5" (X2A1) is valid, the following alarms are not output to the "NC alarm 4".

Error No.	Details
0004	External interlock
0102	Cutting override zero
0103	External feed speed zero
0109	Block start interlock
0110	Cutting block start interlock
1033	Spindle-Spindle polygon (G51.2) cutting interlock

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	S-ANALOG INPUT GEAR NO. ILLEGAL	SIGE	P C	X214	X554

[Function]
This signal is output if specified gear No. is illegal.

[Operation]
The signal turns on if gear No. specified by user is beyond the maximum system gear No.

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	S-ANALOG MAX./MIN. COMMAND VALUE OVER	SOVE	P C	X215	X555

[Function]
This signal is output when S-analog command value is clamped to the maximum or minimum value.

[Operation]
The signal turns on if S-analog command value is larger than spindle maximum speed parameter (Smaxn) value, or smaller than spindle minimum speed parameter (Smin) value.

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	S-ANALOG NO GEAR SELECTED	SNGE	P C	X216	X556

[Function]
This signal is output if gear is not present for S function (S code) issued by automatic operation.

[Operation]
This signal will turn on when the S function (S code) is issued during automatic operation, and the S code does not match any gear set in the spindle maximum speed parameters.

This signal (SNGE) is output simultaneously with spindle function strobe signal (SF).

[Related signals]
Spindle function strobe (SF1: X234)
Spindle gear shift (GR1, GR2: X225)

B contact	Signal name	Signal abbreviation		Device
—	ILLEGAL AXIS SELECTED	ASLE	P C	X217

[Function]

This signal is output if axis (No.) selected in handle mode or manual random feed mode is illegal.

[Operation]

The signal turns on when:

(1) For handle mode
If specified handle axis No. is beyond the maximum number of axes.

(2) For manual random feed mode
If specified manual random feed axis No. is beyond the maximum number of axes.

B contact	Signal name	Signal abbreviation		Device
—	F1-DIGIT NO. (1,2,4)	F11 to 14	P C	X218 to A

[Function]

F1-digit feed function No. is output.

[Operation]

When F1-digit feed command specified in memory, MDI or tape operation is executed, No. of that F1-digit feed function is set with a code.

B contact	Signal name	Signal abbreviation		Device
—	M CODE INDEPENDENT OUTPUT M00	DM00	—	X220

[Function]

This signal informs that a special miscellaneous function (M00) is selected and commanded. When a special M function is specified, "Normal miscellaneous function strobe" signal and "M code data" are output.

M code independent outputs include M01, M02 and M30.

[Operation]

When M00, M01, M02 or M30 is specified during auto operation (memory, MDI or tape), or by manually set numerical command, this signal turns on. The signal turns off if M function finish signal, reset signal or reset & rewind signal is given.

Machining program	M code independent output	Abbr.	Answer back to controller
M00	M00	DM00	Fin 1 or Fin 2
M01	M01	DM01	Fin 1 or Fin 2
M02	M02	DM02	Reset & rewind signal ("Fin" is not sent back)
M30	M30	DM30	Reset & rewind signal ("Fin" is not sent back)

If motion command and/or dwell is present in the same block, the signal turns on after completion of dwell.

However, the signal is not output if M function finish signal turns on before completion of motion command or dwell.

Generally, each M code is used for the following purpose:

M00 ……..... Program stop
M01 ...……. Optional stop
M02, M30 ..... Program end

• Operation on user PLC side

(1)For M00

When M00 is input, single block signal (SBK) is turned on and M function finish signal (Fin 1 or Fin 2) is sent back.

(2)For M01

When M01 is input, optional stop switch setting (ON or OFF) is checked. If the setting is "ON", single block signal is turned on and M function finish signal is sent back, like the case with M00. If the setting is "OFF", M function finish signal is sent back immediately.

(3)For M02, M30

When motion where M02 or M30 was input (spindle stop, coolant stop, etc.) is completed, reset & rewind signal (RRW) is sent back instead of M function finish signal. If M function finish (Fin 1, Fin 2) signal is sent back, "program error" may occur.

[Related signals]

(1)M code independent output M01 (DM01: X221)
(2)M code independent output M02 (DM02: X222)
(3)M code independent output M30 (DM30: X223)

B contact	Signal name	Signal abbreviation		Device
—	M CODE INDEPENDENT OUTPUT M01	DM01	—	X221

[Function] [Operation]
Refer to "M CODE INDEPENDENT OUTPUT M00".

B contact	Signal name	Signal abbreviation		Device
—	M CODE INDEPENDENT OUTPUT M02	DM02	—	X222

[Function] [Operation]
Refer to "M CODE INDEPENDENT OUTPUT M00".

B contact	Signal name	Signal abbreviation		Device
—	M CODE INDEPENDENT OUTPUT M30	DM30	—	X223

[Function] [Operation]
Refer to "M CODE INDEPENDENT OUTPUT M00".

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	SPINDLE GEAR SHIFT 1,2	GR1, 2	—	X225, 6	X565, 6

[Function]

This signal informs which gear stage in the spindle applies to the S command (S code) issued in the automatic operation (memory, MDI or tape) machining program.
For machines that have gear stage shift, the gear will be shifted on the machine side when this signal is received.

[Operation]

When the S command (S code) is issued in automatic operation, the gear stage for the commanded S code is output with a 2-bit (GR1, GR2) code from the preset parameters (spindle max. speed).

The relation of the spindle max. speed parameter (Smax1 to Smax4) and the "Spindle gear shift" (GR1, GR2) signal output is shown below.

Gear stage	Max. spindle speed	Spindle gear shift		
		GR2	GR1	
1	Smax 1	0	0	← Range "S0 to S (Smax1)"
2	Smax 2	0	1	← Range "S (Smax1)+1 to S (Smax2)"
3	Smax 3	1	0	← Range "S (Smax2)+1 to S (Smax3)"
4	Smax 4	1	1	← When range over "S (Smax3)+1" is specified.

This signal (GR1, GR2) is output simultaneously with the "Spindle function strobe" (SF1).

Note 1) If the commanded S code does not match any of the gear stages, the "S-analog no gear selected" (SNGE) signal will be output separately from this signal.

[Related signals]

Spindle function strobe (SF1: X234)
S-analog no gear selected (SNGE: X216)

B contact	Signal name	Signal abbreviation		Device
—	MANUAL NUMERICAL COMMAND	MMS	—	X229

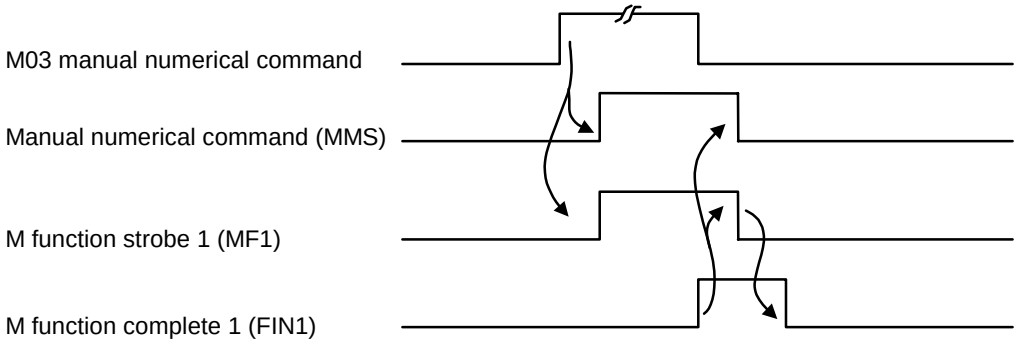
[Function]

This signal informs that M, S, T or B (2nd miscellaneous function) command is given with a specific display format selected on the setting and display unit.
With the signal, user PLC discriminates the command from that given in normal automatic operation.

[Operation]

The signal turns on when M, S, T or B signal is specified with a specific display format in manual or automatic operation (other than auto start). Like M function strobe signal, the signal turns off when M function finish 1 or 2 signal turns on, or in case of reset.

Example)



[Related signals]

(1)M function strobe (MFn: X230)
(2)S function strobe (SF1: X234)
(3)T function strobe 1 (TF1: X238)
(4)2nd M function strobe 1 (BF1: X23C)
(5)M function finish 1 (FIN 1: Y226)
(6)M function finish 2 (FIN 2: Y227)

B contact	Signal name	Signal abbreviation		Device
—	TOOL CHANGE POSITION RETURN COMPLETE	TCP	P C	X22B

[Function]

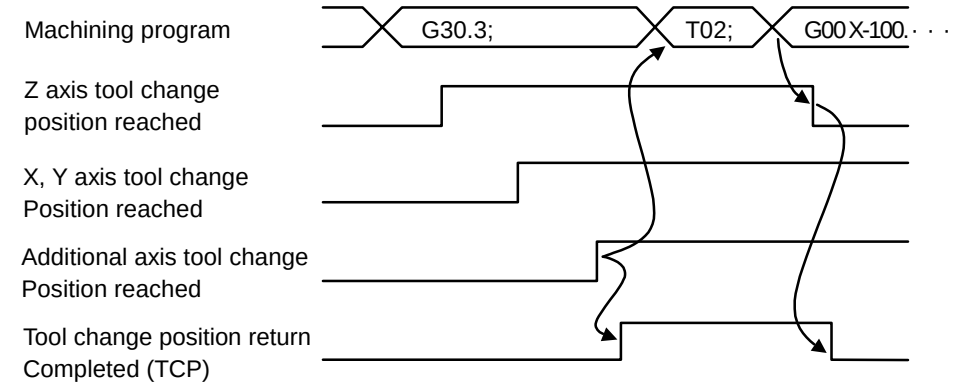
This signal notifies that the axis commanded with the tool change position return command has completed return to the tool change position.

[Operation]

This signal turns on when all axes commanded with the tool change position return command (G30.*) have moved to the tool change position. This signal turns off when even one of the axes moved to the tool change position with the command has moved from the tool change position.
Refer to the Programming Manual for details on the tool change return command.

[Time chart]

Example: When G30.3 command, additional axis tool change position return is valid



B contact	Signal name	Signal abbreviation		Device
—	NEW TOOL CHANGE	TCRQ	P C	X22C

[Function]

This signal notifies that a new tool (not used tool) in the group is to be selected for tool life management II.

[Operation]

<For L system tool life management II>

This signal turns ON when:

(1) When the tool selected by the T command tool selection is an unused tool (tool for which the status is 0).

This signal turns OFF when:

(1) When the T command is completed due to the input of the Miscellaneous function finish signal (FIN1, FIN2).

<For M system tool life management II>

This signal turns ON when:

(1)When the tool mounted as a standby tool is a not used tool (tool for which the status is 0).

This signal turns OFF when:

(1)When another tool is mounted as a standby tool.
Note that if the replacement tool is a not used tool, this signal will remain ON.

[Caution]

When this signal is used in M system tool life management II, refer to the ladder cycle after the standby tool is changed. (This signal will not change in the same cycle in which the standby tool was changed.)

B contact	Signal name	Signal abbreviation		Device
—	M FUNCTION STROBE 1	MF1	—	X230

[Function]

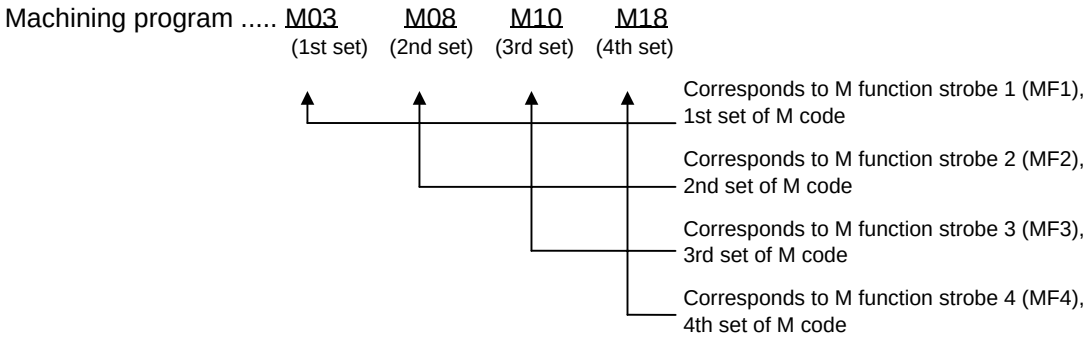
This signal informs that the 1st set of miscellaneous functions (M code) is commanded with the automatic operation (memory, MDI, tape) machining program or manual numerical command input.
The miscellaneous function is also called the M function, and is used to issue miscellaneous functions such as on/off of the cutting oil, and normal/reverse/stop of the spindle, etc., for the target machine.

[Operation]

This signal turns on when:
(1)The 1st set of M function (M code) is specified in automatic operation (memory, MDI or tape mode).
(2)M function (M code) is specified by manual numerical command input.

The signal turns off when:
(1)M function finish 1 signal (FIN1) or M function finish 2 signal (FIN2) turns on.
(2)Reset condition occurs.
Refer to the "In auto operation "run"" signal (OP) section for details on the reset conditions.

Note 1) When built-in PLC is used, four sets of M functions can be specified at the same time the relation of the machining program and M function strobe is shown below.

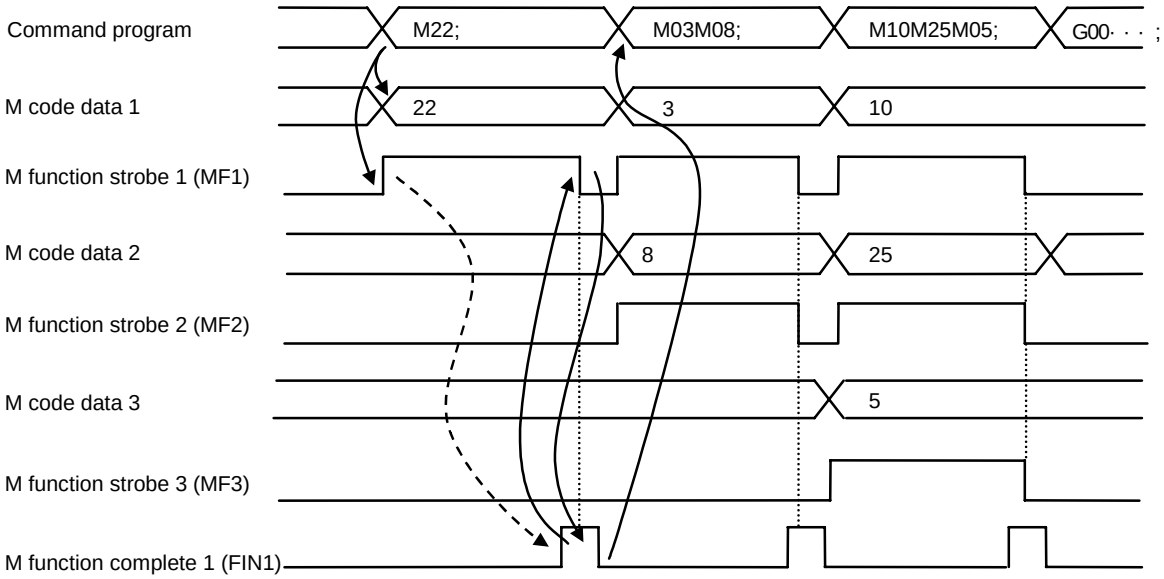


Note 2) During operation with miscellaneous function lock (AFL signal on), the "M function strobe" (MF1, MF2, MF3, MF4) will not be output. However, this signal will be output when the M code is commanded independently (M00, M01, M02, M30).

Note 3) Since M98 (read of subprogram call), M99 (return from subprogram), etc. are handled within the controller, "M function strobe" is not output.

Note 4) The "M function strobe" will not be output when the M function is output if the "M function finish 1" signal (FIN1) or "M function finish 2" signal (FIN 2) is on.

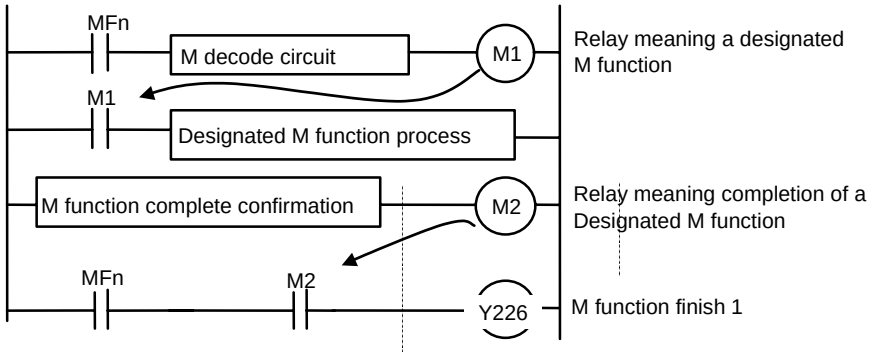
An example of the timing chart for the M function strobe signal (MF1, MF2 and MF3) is shown below.



Point The following points must be observed in the sequence process.

(a) When the M function is commanded, the MFn and M code data n is output.
(b) MFn is always the trigger in the sequence process to start the M function process.
(c) When the designated M function process is completed, the "M function finish" signal is returned to the controller.
(d) The controller waits for the rising of the M function finish signal and then turns MFn off.
(e) MFn off is confirmed in the sequence process and then the "M function finish" signal is turned off.
This completes the series of M function processes.

Handshaking with the controller and an accurate sequence process possible if the Mfn conditions are inserted at the M function start and completed signals.



[Related signals]

M function strobe 2 (MF2: X231)
M function strobe 3 (MF3: X232)
M function strobe 4 (MF4: X233)

M function finish 1 (FIN1: Y226)
M function finish 2 (FIN2: Y227)

B contact	Signal name	Signal abbreviation		Device
—	M FUNCTION STROBE 2	MF2	P C	X231

[Function]

This signal informs that the 2nd set of M function (M code) is specified in automatic operation.

[Operation]

The signal turns on when:

(1)Two or more M function commands (M code) are specified for one block in automatic operation (memory, MDI or tape mode).

The signal turns off when:

(1)"M function finish 1" signal (FIN1) or "M function finish 2" signal (FIN2) turns on.

(2)Reset condition occurs.

Other details are the same as those of "M function strobe 1" signal (MF1).
Refer to "M function strobe 1".

B contact	Signal name	Signal abbreviation		Device
—	M FUNCTION STROBE 3	MF3	P C	X232

[Function]

This signal informs that the 3rd set of M function (M code) is specified in automatic operation.

[Operation]

The signal turns on when:

(1)Three or more M function commands (M code) are specified for one block in automatic operation (memory, MDI or tape mode).

The signal turns off when:

(1)"M function finish 1" signal (FIN1) or "M function finish 2" signal (FIN2) turns on.

(2)Reset condition occurs.

Other details are the same as those of "M function strobe 1" signal (MF1).
Refer to "M function strobe 1".

B contact	Signal name	Signal abbreviation		Device
—	M FUNCTION STROBE 4	MF4	P C	X233

[Function]

This signal informs that the 4th set of M function (M code) is specified in automatic operation.

[Operation]

The signal turns on when:

(1)Four or more M function commands (M code) are specified for one block in automatic operation (memory, MDI or tape mode).

The signal turns off when:

(1)"M function finish 1" signal (FIN1) or "M function finish 2" signal (FIN2) turns on.

(2)Reset condition occurs.

Other details are the same as those of "M function strobe 1" signal (MF1).
Refer to "M function strobe 1".

B contact	Signal name	Signal abbreviation		Device
—	S FUNCTION STROBE 1 to 2	SF1 to 2	—	X234 to 5

[Function]

This signal informs that S (spindle) function (S code) is specified in automatic operation (memory, MDI or tape mode) machining program or by manual numerical command input.
The spindle function is also called the S function, and is used to command the spindle speed.
With the signal (SF1), user PLC reads S code data (1 to 2) respectively.

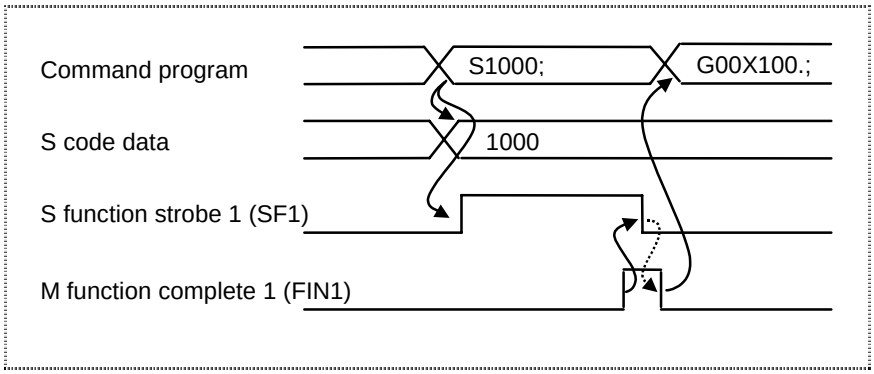
[Operation]

The signal turns on when:
(1)S function (S code) is specified in automatic operation (memory, MDI or tape mode).
(2)S function is specified by manual numerical command input.

The signal turns off when:
(1)"M function finish 1" signal (FIN1) or "M function finish 2" signal (FIN2) turns on.
(2)Reset condition occurs.
(Refer to the "In auto operation "run"" signal (OP) section for details on the reset conditions.)

Note 1) The S function strobe (SF1) is not output during operation with M function lock (AFL signal on).
Note 2) When the S function is commanded, the "Spindle gear shift" signal (GR1, GR2) and "S-analog no gear selected" signal (SNGE) are output in addition to this signal (SF1). Refer to the sections of each signal for details.
Note 3) By combining this signal (SF1), "Spindle gear select input" signal (GI1, GI2) and "Spindle gear shift complete" signal (GFIN), the data can be converted into S-analog data.
(Data is transferred when the spindle controller is the high-speed serial connection specification type.)

An example of the timing chart for the "S function strobe" signal (SF1) is shown below.



[Related signals]

S code data (R28)
Spindle gear shift (GR1, GR2: X225)
S-analog no gear selected (SNGE: X216)

Spindle gear selection input (GI1, GI2: Y290)
Spindle gear shift complete (GFIN: Y225)
M function finish 1 (FIN1: Y226)
M function finish 2 (FIN2: Y227)

B contact	Signal name	Signal abbreviation		Device
—	T FUNCTION STROBE 1	TF1	—	X238

[Function]

This signal informs that the tool function (T code) is specified in automatic operation (memory, MDI or tape mode), machining program or by manual numerical command input.
With the signal (TF1), user PLC reads T code data 1.
The tool function is also called the T function, and is used to command the tool No. in the lathe specification controller, the tool compensation (tool length offset, tool nose wear compensation) Nos. are also indicated.
The user PLC receives the T code data 1 with this signal.

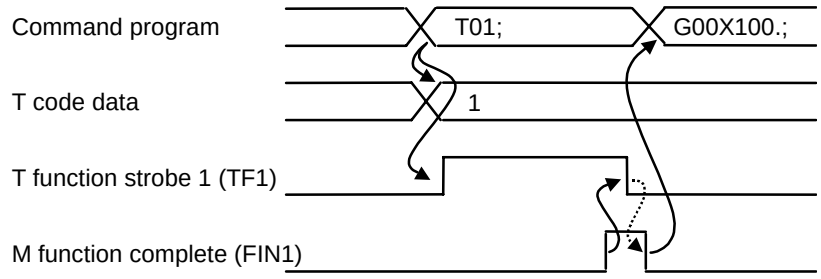
[Operation]

The signal turns on when:
(1)The T function (T code) is specified in automatic operation (memory, MDI or tape mode).
(2)T function (T) is specified by manual numerical command input.

The signal turns off when:
(1)"M function finish 1" signal (FIN1) or "M function finish 2" signal (FIN2) turns on.
(2)Reset condition occurs.
(Refer to the "In auto operation "run"" signal (OP) section for details on the reset conditions.)

Note 1) The "T function strobe" (TF) is not output during operation with the M function lock (AFL signal on).

An example of the timing chart for the "T function strobe 1" signal (TF1) is shown below.



[Related signals]

T code data (R36)
M function finish 1 (FIN1: Y226)
M function finish 2 (FIN2: Y227)

B contact	Signal name	Signal abbreviation		Device
—	2ND M FUNCTION STROBE 1	BF1	P C	X23C

[Function]

This signal informs that the 1st set of 2nd M function is selected in automatic operation (memory, MDI or tape) machining program or by manual numerical command input.
The 2nd M function is also called the B function.
With the signal (BF1), user PLC reads 2nd M function data 1.

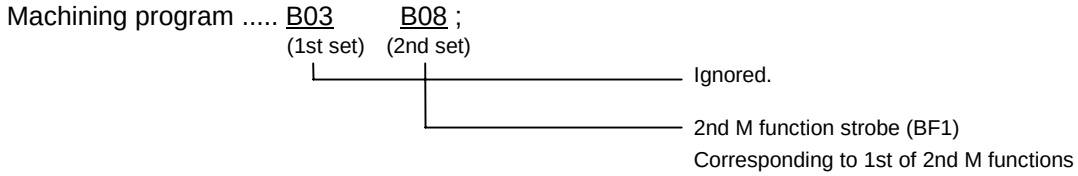
[Operation]

The signal turns on when:
(1)The 1st set of 2nd M function (B code) is specified in automatic operation (memory, MDI or tape).
(2)2nd M function (B code) is issued by manual numerical command input.

The signal turns off when:
(1)"M function finish 1" signal (FIN1) or "M function finish 2" signal (FIN2) is sent back.
(2)Reset condition occurs.
(Refer to the "In auto operation "run"" signal (OP) section for details on the reset conditions.)

Note 1) Only one 2nd M function can be issued in one block at a time.

The relation of the machining program and 2nd M function strobe is shown below.



Note 2) The "2nd M function strobe 1" (BF1) is not output during operation with M function lock (AFL signal on).
Note 3) In the case of manual numerical command input, outputs are in accordance with "2nd M function strobe 1" (BF1).
Note 4) Address for 2nd M function can be selected from addresses A, B and C by using Setup parameter. Set so that the address is different from the axis address.

[Related signals]

M function finish 1 (FIN1: Y226)
M function finish 2 (FIN2: Y227)

B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle
—	SPINDLE 2ND IN-POSITION		P C	X240	X580

[Function]

When the parameters are set, this function turns ON the PLC interface in-position signal and spindle monitor orientation complete signal, etc., when the spindle rotation speed enters the orientation in-position width ("#3204 SP004" OINP) and orientation advance in-position width ("#3301 SP101" DINP) during orientation.

The takt time can be shortened with this function since entry into the in-position width can be confirmed, and completion of orientation can be predicted.

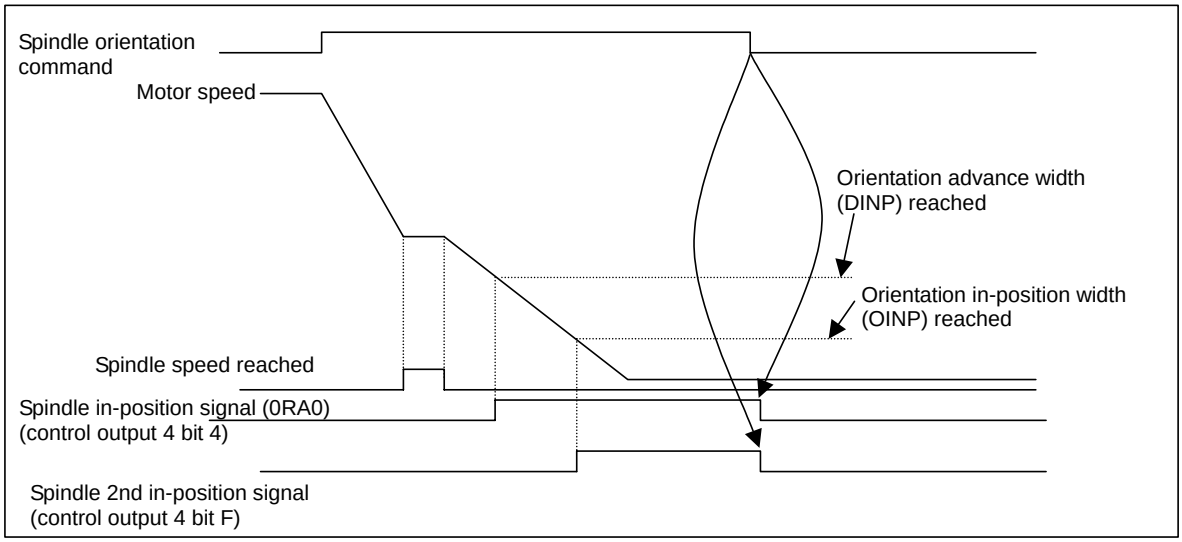
[Operation]

Within value set for orientation in-position advance width

→ Spindle in-position signal turns ON, and spindle monitor control output 4 bit 4 turns ON

Within value set for orientation in-position width

→ Spindle 2nd in-position signal turns ON, and spindle monitor control output 4 bit F turns ON



		Parameter in-position advance "#3297 SP097/bit2"	
		0: Invalid	1: Valid
Spindle 2nd in-position	0: Invalid	Spindle 2nd in-position signal = 0 Control output 4 bit F= 0 At OINP width, spindle in-position signal = 1 Control output 4 bit 4 = 1	Spindle 2nd in-position signal = 0 Control output 4 bit F= 0 At DINP width, spindle in-position signal = 1 Control output 4 bit 4 = 1
	1: Valid		At DINP width, spindle in-position signal = 1 Control output 4 bit 4 = 1 At OINP width, spindle 2nd in-position signal = 1 Control output 4 bit F = 1

[Related signals]

Spindle in-position (ORAO: X246)

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	CURRENT DETECT	CDO	P C	X241	X581

[Function]

This signal is output from the high-speed serial connection specification spindle controller (spindle drive) and informs that drive motor current is about to reach the permissible maximum current. The signal can be used to prevent stabbing of cutter into workpiece, for example.

[Operation]

The signal (CDO) turns on if motor current goes up to a level (110% output) close to the permissible maximum current (120%).

Note 1) This signal is valid only for the system that is high-speed serial connected with the controller.

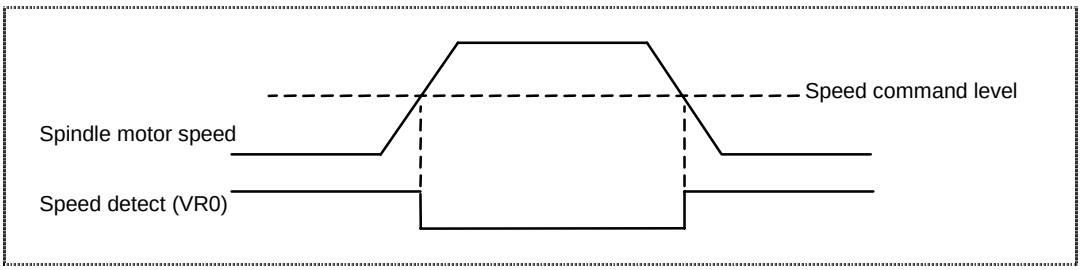
B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	SPEED DETECT	VRO	P C	X242	X582

[Function]

This signal is output from the high-speed serial connection specification spindle controller (spindle drive) and informs that motor speed is below the speed specified by parameter.

[Operation]

The signal (VRO) turns on when motor speed (motor speed) is below the speed specified by parameter #3220 Speed detection set value.



Note 1) This signal is valid only for the system that is high-speed serial connected with the controller.

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	IN SPINDLE ALARM	FLO	—	X243	X583

[Function]

This signal is output from the high-speed serial connection specification spindle controller (spindle drive) and informs that failure occurs in spindle controller.

[Operation]

The signal turns on if alarm which arises on spindle controller is detected.

To reset alarm, turn off the controller power or turn off the spindle controller power supply (reset method depends on type of alarm).
Typical examples of alarm are listed below. For details of alarm, refer to the Spindle Controller specifications and maintenance manual.
(1)Overcurrent
(2)Breaker trip
(3)Motor overheat

Note 1) This signal is valid only for the system that is high-speed serial connected with the controller.

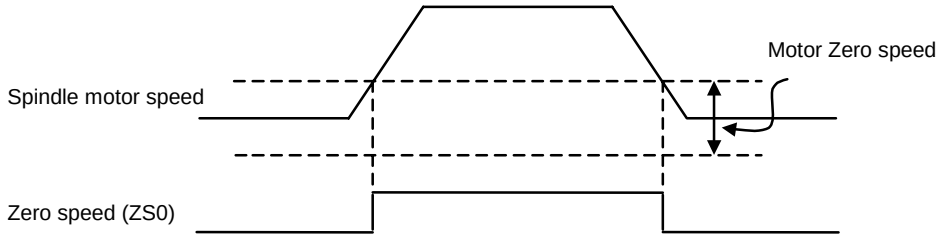
B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	ZERO SPEED	ZSO	—	X244	X584

[Function]

This signal is output from the high-speed serial connection specification spindle controller (spindle drive) and informs that motor speed has dropped below the set speed level.

[Operation]

This signal turns on when the true spindle motor speed drops below the speed set in the spindle parameter #3218 Motor zero speed.



Note 1) The signal is output, no matter whether direction of rotation is "Spindle forward run start" (SRN) or "Spindle reverse run start" (SRI).
Note 2) Minimum output pulse width of the signal is about 200ms.
Note 3) Speed at which the signal is output can be set within range from 1rpm to 1000rpm with the spindle parameters.
Note 4) This signal is valid only for the system that is high-speed serial connected with the controller.

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	UP-TO-SPEED	USO	—	X245	X585

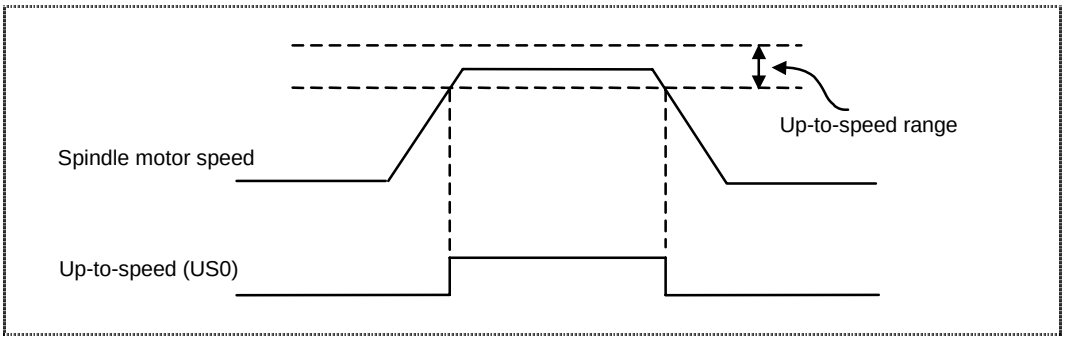
[Function]

This signal is output from the high-speed serial connection specification spindle controller (spindle drive) and informs that true spindle motor speed reaches the range set with the parameter SP048 (standard setting ±15%).

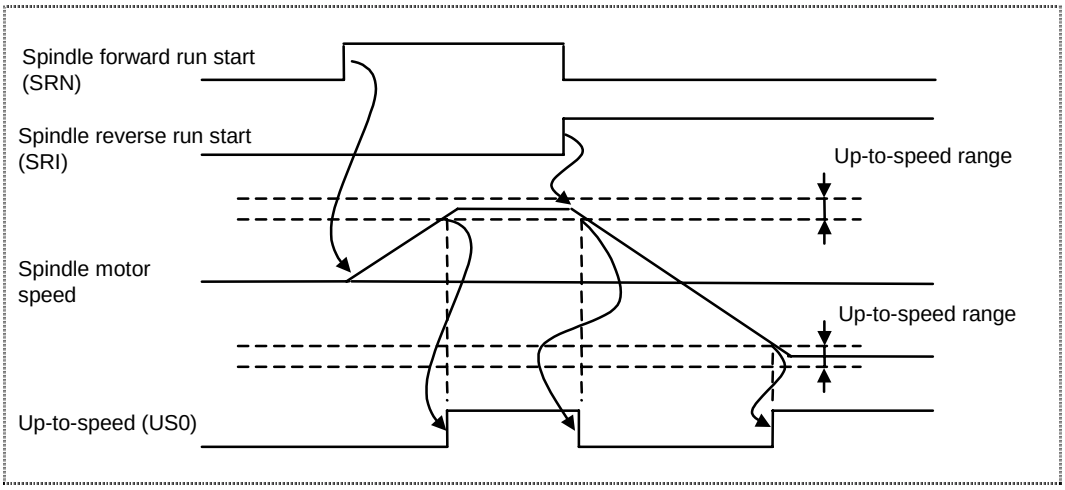
This signal is used for the S command complete conditions or control axis interlock during automatic operation.

[Operation]

The up-to-speed signal (USO) turns on when an alarm is detected on the spindle controller side.



When a command is given to change motor rotation from "forward" to "reverse", spindle motor speed starts going down and the signal (USO) is turned off. When motor speed enters the specified detection range, the signal turns on.



Note 1) The signal cannot be output if neither "Spindle forward run start" (SRN) signal nor "Spindle reverse run start" (SRI) signal is on.

Note 2) This signal is not output when operating with a command that is not a speed command such as synchronous tap.

Note 3) This signal is valid only for the system that is high-speed serial connected with the controller.

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	SPINDLE IN-POSITION	ORAO	—	X246	X586

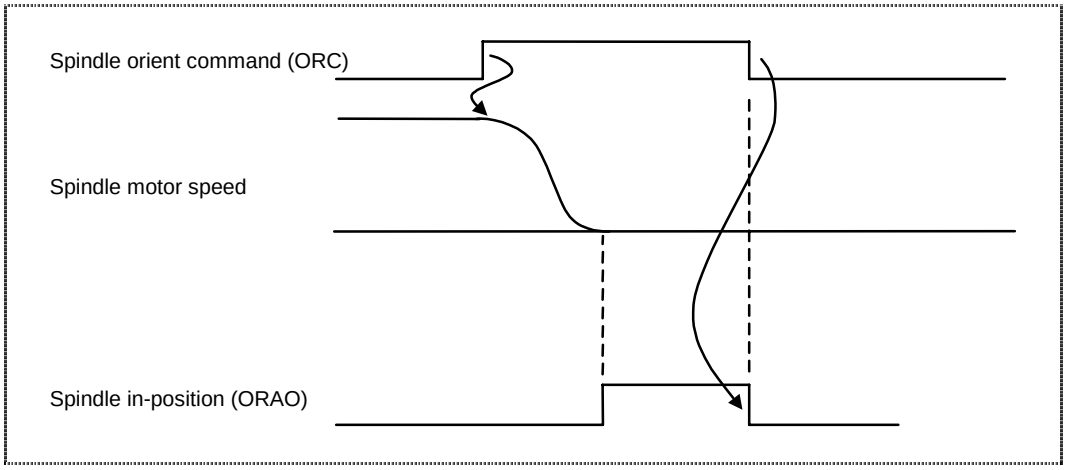
[Function]

This signal is output from the high-speed serial connection specification spindle controller (spindle drive) and informs that the spindle is positioned in accordance with spindle orient command.

[Operation]

The signal turns on when the spindle is stopped in the position specified by "Spindle orient command" (ORC).

(1)The in-position range is set with the spindle parameters.
(2)While the spindle is in position, it is under servo lock condition. If the spindle is rotated by external force, the signal (ORAO) may be turned off.
(3)The signal is reset when the "Spindle orient command" (ORC) is reset.



Note 1) When spindle orient command is given, spindle motion starts no matter where direction of spindle rotation is "Spindle forward run start (SRN)" or "Spindle reverse run start (SRI)".
Note 2) Range of in-position can be set within range from 0.001 deg. to 99.999 deg.
Note 3) This signal is valid only for the system that is high-speed serial connected with the controller.

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	IN L COIL SELECTED	LCSA	P C	X247	X587

[Function]

This signal indicates that the low-speed coil is being selected in the spindle coil changeover function.

[Operation]

The high-speed coil and low-speed coil are changed over only with the "L coil selection" (LRSL) in the 2-step coil changeover specification. The high-speed coil, middle-speed coil and low-speed coil are changed over with the combination of the "L coil selection" (LRSL) and "M coil selection" (LRSM) in the 3-step coil changeover specification.

(1) 2-step coil changeover

Selected coil	**L coil selection** (LRSL)	**In L coil selected** (LCSA)
High-speed (H)	OFF	OFF
Low-speed (L)	ON	ON

(2) 3-step coil changeover

Selected coil	**L coil selection** (LRSL)	**M coil selection** (LRSM)	**In L coil selected** (LCSA)	**In M coil selected** (MCSA)
H	OFF	OFF	OFF	OFF
M	OFF	ON	OFF	ON
L	ON	OFF	ON	OFF
	ON	ON	ON	ON

[Related signals]

L coil selection (LRSL: Y2D7)
M coil selection (LRSM: Y2DE)
In M coil selected (MCSA: X1D6)

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	SPINDLE READY-ON	SMA	P C	X248	X588

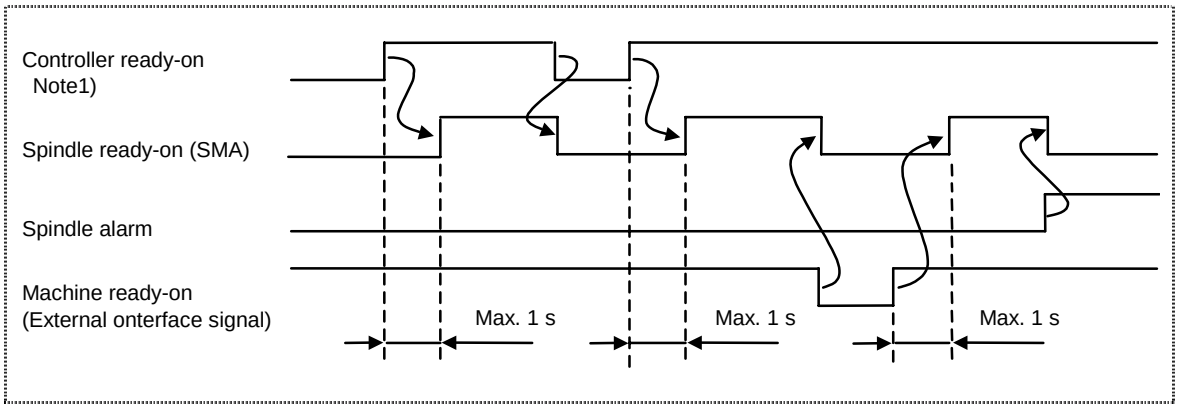
[Function]

This signal is output from the high-speed serial connection specification spindle controller (spindle drive) and informs that the spindle can operate.

[Operation]

This signal (SMA) turns on when the spindle controller is ready for operation. The signal turns off (ready off) in the following conditions.

(1)A spindle alarm is generated.
(2)"Ready-on" signal (internal signal) from controller is off.
(3)The "Machine ready-on" signal that is an external interface (DIO input) signal of the spindle controller is off.
(The machine ready signal can be invalidated with the spindle controller parameters.)



Note 1) The ready on signal is output from the controller to the spindle controller.
Note 2) This signal is valid only for the system that is high-speed serial connected with the controller.

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	SPINDLE SERVO-ON	SSA	P C	X249	X589

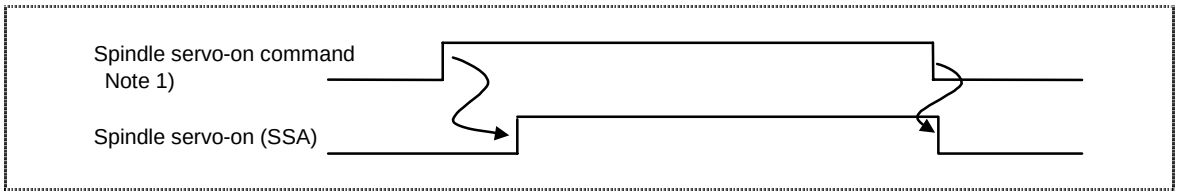
[Function]

This signal is output from the high-speed serial connection specification spindle controller (spindle drive) and informs that the spindle is under the position control state (synchronous tap control, C-axis control).

[Operation]

The "Spindle servo-on" signal (SSA) turns on when the spindle is ready (SMA signal is on), the servo-on command has been transferred from the controller to the spindle controller, and the spindle controller is in the servo-on state.

This signal (SSA) turns off when the servo-on command is canceled.



Note 1) The spindle servo-on command is output from the controller to the spindle controller, and is mainly output during synchronous tap control.

Note 2) While the "Spindle servo-on" signal is on, all input signals for "Spindle forward run start" (SRN), "Spindle reverse run start" (SRI), and "Spindle orient command" (ORC) are ignored.

Note 3) This signal is valid only for the system that is high-speed serial connected with the controller.

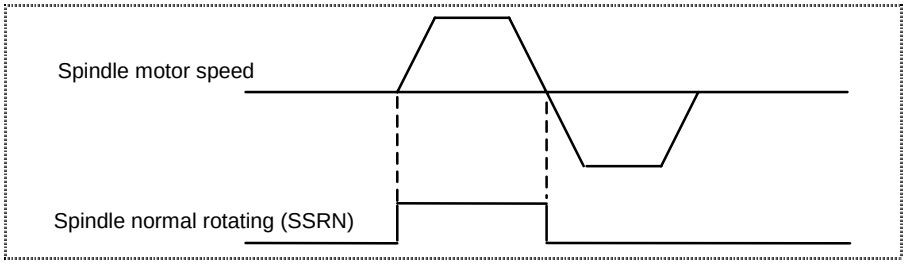
B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	SPINDLE NORMAL ROTATING	SSRN	PC	X24B	X58B

[Function]

This signal is output from the high-speed serial connection specification spindle controller (spindle drive) and informs that the spindle is rotating in the forward direction.

[Operation]

The "Spindle normal rotating" signal (SSRN) turns on when the spindle motor is rotating in the forward direction. This will also turn off if the spindle motor is rotating in the forward direction during orientation or synchronous tap.



Note 1) The "Spindle normal rotating" signal (SSRN) turns on and off while the spindle motor is in the stop state with servo features during oriented motion or synchronous tap.

Note 2) This signal is valid only for the system that is high-speed serial connected with the controller.

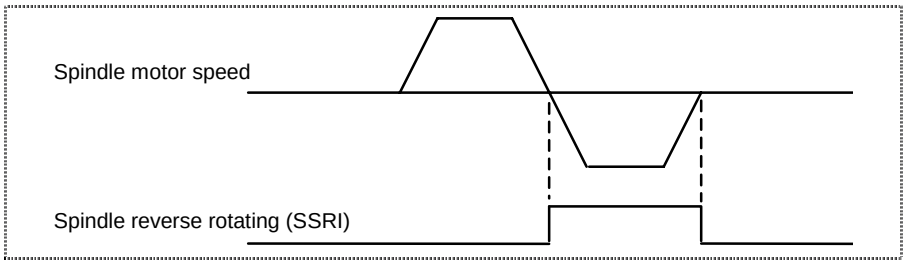
B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	SPINDLE REVERSE ROTATING	SSRI	PC	X24C	X58C

[Function]

This signal is output from the high-speed serial connection specification spindle controller (spindle drive) and informs that the spindle motor is rotating in the reverse direction.

[Operation]

The "Spindle reverse rotating" (SSRI) signal turns on when the spindle motor rotates in the reverse direction. It also turns on even during oriented motion or synchronous tap if the spindle rotates in the reverse.



Note 1) The "Spindle reverse rotating" (SSRI) signal turns on and off while the spindle motor is in the stop state with servo features during oriented motion or synchronous tap.

Note 2) This signal is valid only for the system that is high-speed serial connected with the controller.

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	Z-PHASE PASSED	SZPH		X24D	X58D

[Function]

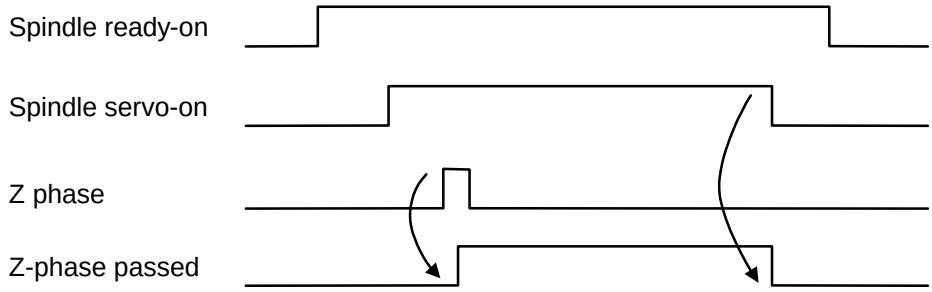
This signal is output from the spindle controller (spindle drive) for the MELDAS AC spindle drive high-speed serial connection specification, and informs that the encoder's Z phase has been passed.

[Operation]

The signal will turn on when:
(1)The Z phase is passed.

The signal will turn off when:
(1)The "Spindle servo-on" signal turns off.

(2)The "Spindle ready-on" signal turns off.



Note 1) This signal is valid only for the system in which the control unit and spindle controller are high-speed serial connected.

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	POSITION LOOP IN-POSITION	SIMP	P C	X24E	X58E

[Function]

If the spindle controller is connected with high-speed serial connection, this signal will inform that the spindle is in the in-position state during synchronous tap.

[Operation]

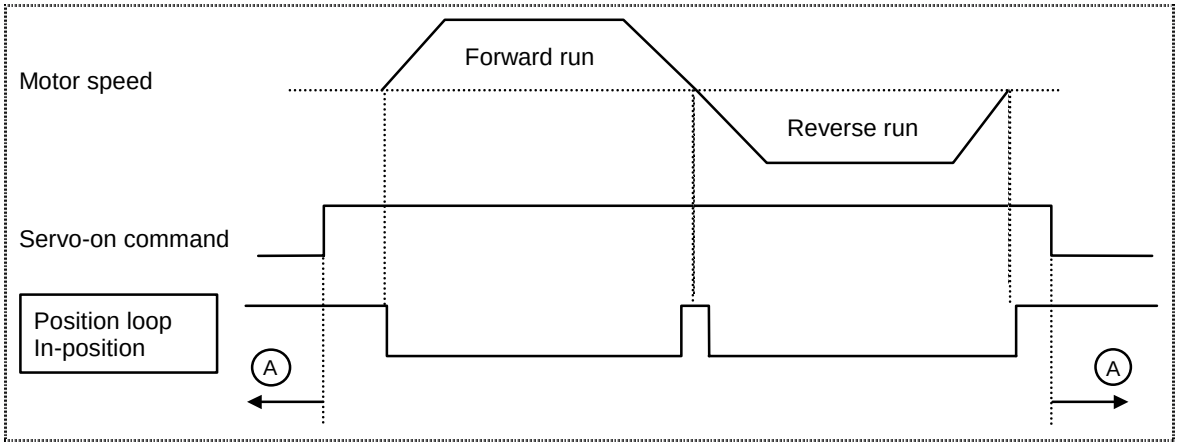
The signal will turn on when:

(1)The droop amount (servo tracking delay error) is within the in-position range during synchronous tap control (servo on).

(2)Synchronous tap control is not commanded. (Ⓐ in following drawing)

The signal will turn off when:

(1)The droop amount (servo tracking delay error) has exceeded the in-position range during synchronous tap control (servo on).



B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	TORQUE LIMIT	STLQ	P C	X24F	X58F

[Function]

This signal is output from the high-speed serial connection specification spindle controller (spindle drive) and informs that the spindle is in position under C-axis control or synchronous tap control.

[Operation]

The "STLQ" signal turns on when:

(1)Torque limit 1 (TL1) or torque limit 2 (TL2) signal is on.

The "STLQ" signal turns off when:

(1)Torque limit 1 (TL1) or torque limit 2 (TL2) signal is off.

Note 1) This signal is valid only for the system that is high-speed serial connected with the controller.

[Related signals]

Torque limit 1 (TL1: Y2D2)
Torque limit 2 (TL2: Y2D3)

B contact	Signal name	Signal abbreviation		Device
—	IN CHOPPING START	CHOP	P C	X260

[Function] [Operation]
For both the function and operation, refer to the section "Chopping" signal (Y1E8).

B contact	Signal name	Signal abbreviation		Device
—	BASIC POSITION – UPPER DEAD CENTER POINT	CHP1	P C	X261

[Function] [Operation]
For both the function and operation, refer to the section "Chopping" signal (Y1E8).

B contact	Signal name	Signal abbreviation		Device
—	UPPER DEAD CENTER POINT – BOTTOM DEAD CENTER POINT	CHP2	P C	X262

[Function] [Operation]
For both the function and operation, refer to the section "Chopping" signal (Y1E8).

B contact	Signal name	Signal abbreviation		Device
—	BOTTOM DEAD CENTER POINT – UPPER DEAD CENTER POINT	CHP3	P C	X263

[Function] [Operation]
For both the function and operation, refer to the section "Chopping" signal (Y1E8).

B contact	Signal name	Signal abbreviation		Device
—	UPPER DEAD CENTER POINT – BASIC POSITION	CHP4	P C	X264

[Function] [Operation]
For both the function and operation, refer to the section "Chopping" signal (Y1E8).

B contact	Signal name	Signal abbreviation		Device
—	IN CHOPPING MODE	CHPMD	P C	X265

[Function] [Operation]
For both the function and operation, refer to the section "Chopping" signal (Y1E8).

B contact	Signal name	Signal abbreviation		Device
—	TAP RETRACT POSSIBLE	TRVE	P C	X26D

[Function]

This signal informs that tap retract is possible, and is output if operation is stopped during tap cycle execution.

The "Tap retract" signal (TRV) will be valid when this signal (TRVE) is on.

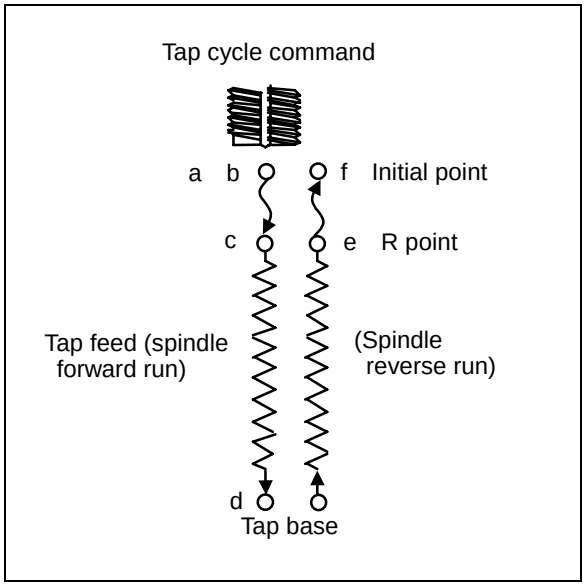
[Operation]

(1)This signal turns on if tap cycle is stopped in the cutting feed area (between c-d-e in the drawing) due to the following causes:

- Emergency stop.
- Reset stop.
- Power off (only in absolute position detection system).

(2)This signal turns off in the following cases:

- Tap retract is executed and completed.
- Tap axis is moved manually or with manual mode.



[Related signal]

Tap retract (TRV: Y29C)

B contact	Signal name	Signal abbreviation		Device
—	NO. OF WORK MACHINING OVER	PCNT	P C	X26E

[Function]

This signal is output when the No. of work machining matches or exceeds the maximum No. of work machining.

[Operation]

This signal turns on when the No. of work machining matches or exceeds the maximum work value (WRK LIMIT) set in the [Process parameter] screen.

Note 1) This signal turns on when the No. of work machining matches or exceeds the maximum work value regardless of the count up by the controller or user PLC.

Note 2) This signal is not output when "0" is set for the maximum work value.

[Related signals]

(1)No. of work machining (current value) (R2896, 7)
(2)No. of work machining (max. value) (R2898, 9)

B contact	Signal name	Signal abbreviation		Device
—	ABSOLUTE POSITION WARNING	ABSW	P C	X26F

[Function]

This signal notifies that the amount moved while the power is off has exceeded to the tolerable amount when using the absolute position detection system.

[Operation]

This signal turns on when the difference of the machine position at power off and at power on exceeds the tolerable value ([ABS. POSI PARAM] #2051 (check) setting value) when using the absolute position detection system.

Note) The movement amount during power off depends on the "PON POS (power on position)" and "POF POS (power off position)" on the [ABS SERVO MONITOR (absolute position monitor)] screen.

B contact	Signal name	Signal abbreviation		Device
—	POSITION SWITCH 1 to 8	PSW1 to 8	P C	X270 to 7

[Function]

This signal notifies that the machine position is within the area set by the parameters.

[Operation]

This signal turns on when the control axis machine position reaches the range set by the parameters, and turns off when the range is left. The axis name and range are set in parameters #7501 to #7573.
The validity of this signal differs in the following manner depending on the absolute position detection or incremental detection.

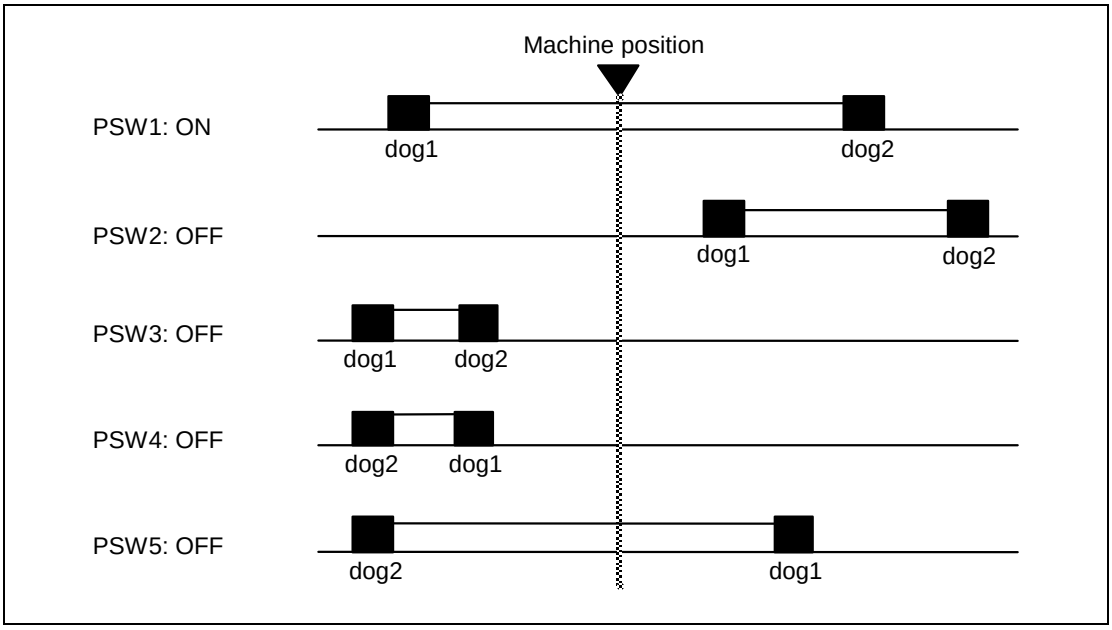
<For absolute position detection system>

This signal is valid when the power is turned on after zero point initialization is completed.

<For incremental detection>

This signal is not validated until the first reference position return is completed after the power is turned on. (PSW1 to PSW8 will all remain off until this signal is validated.)

[Example of signal output]



The setting range of the position switch uses the basic machine coordinate system as a reference.
The dog1 and dog2 setting values can be set to any size, and the area between the smaller setting and the larger setting will be used as the signal output range.
A slight delay will occur in the output signal fluctuation due to the actual machine position. The maximum delay time is as follows.

$$tmax = 0.06 \quad -TP \ [s]$$

TP: Position loop time constant ($\frac{1}{PGN}$ [s])

PNG: Position loop gain

B contact	Signal name	Signal abbreviation		Device
—	ZERO POINT INITIALIZING COMPLETED nth AXIS	ZSF1 to 4	P C	X280 to 3

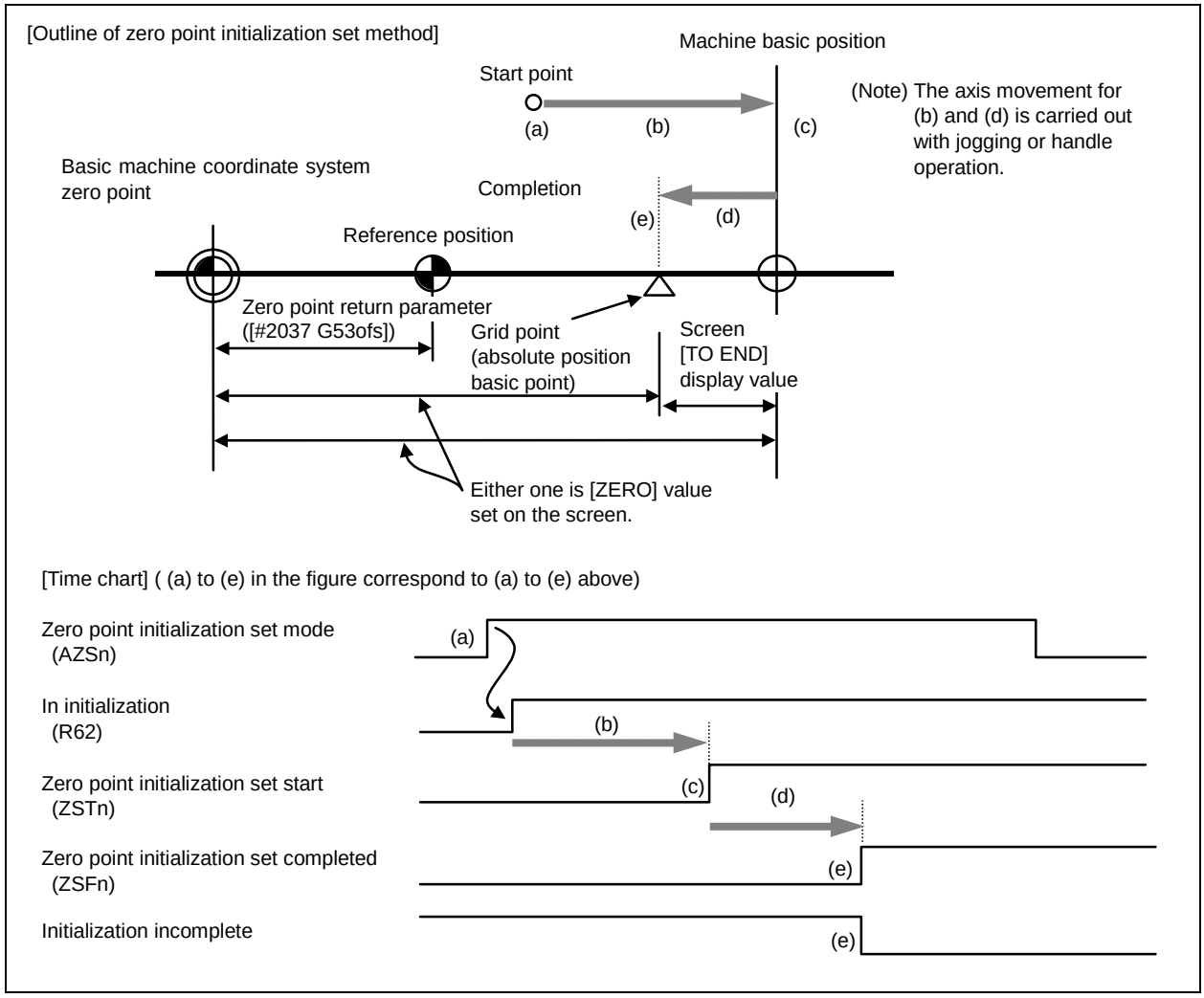
[Function]

This signal notifies that the basic machine coordinate system has been set (established) during zero point initializing using the marked point alignment method in the absolute position detection system.

[Operation]

This signal is valid when "#2049 TYPE" on the [ABS. POSI PARAM] screen is set to "2", and turns on when the basic machine coordinate system is set (established).
This signal will turn off if initializing is carried out again or if the power is turned on again.

<Zero point initializing method using marked point alignment method, and time chart>



[Related signals]

(1)Zero point initializing error completed (ZSE1 to 4: X288)
(2)In initialization (R62)
(3)Initialization incomplete (R63)
(4)Zero point initializing mode (AZS1 to 4: Y300)
(5)Zero point initializing start (ZST1 to 4: Y308)

B contact	Signal name	Signal abbreviation		Device
—	ZERO POINT INITIALIZING ERROR COMPLETED nth AXIS	ZSE1 to 4	P C	X288 to B

[Function]

This signal is output when initializing is not possible during the marked point alignment method of the absolute position detection system.

[Operation]

This signal turns on when the initializing is not possible at the rising edge of the "Zero point initializing start" (ZSTn) signal.

This signal is invalidated in the following cases:

- During emergency stop
- During reset
- When "Zero point initializing start" (ZSTn) signal is turned on before the "Zero point initializing mode" (AZSn) signal
- When grid has not been passed even once after the power has been turned on. (Depends on the detector type)

[Related signals]

(1)Zero point initializing completed (ZSF1 to 4: X280)
(2)In initialization (R62)
(3)Initialization incomplete (R63)
(4)Zero point initializing mode (AZS1 to 4: Y300)
(5)Zero point initializing start (ZST1 to 4: Y308)

B contact	Signal name	Signal abbreviation		Device
—	NC ALARM 5	AL5	—	X2A1

[Function]

This signal informs that the controller is in operation alarm (error) condition.

[Operation]

The signal turns ON when:

• The parameter "#1238 set10/bit7" is ON and the operation alarms below occur.

The signal turns OFF when:

• The parameter "#1238 set10/bit7" is OFF.

• The parameter "#1238 set10/bit7" is ON and the operation alarm conditions below do not exist.

For details on the operation alarms, refer to “Alarm/Parameter Manual”.

<Operation alarms output to NC alarm 5 >

• External interlock (M01 0004)

• Override zero (M01 0102)

• External feed speed zero (M01 0103)

• Block start interlock (M01 0109)

• Cutting block start interlock (M01 0110)

B contact	Signal name	Signal abbreviation		Device
—	UP-TO-SPEED n-TH AXIS	ARRFn	P C	X2B0 to 3

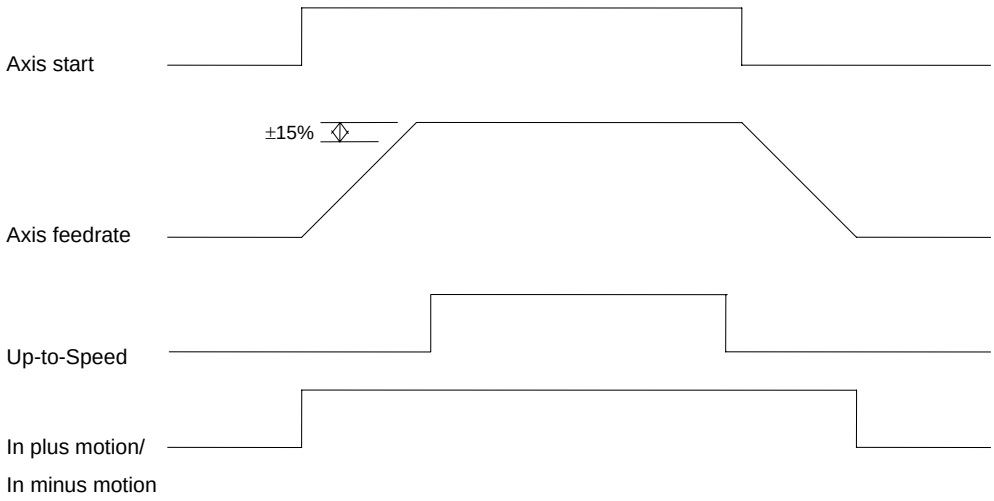
[Function]

This signal indicates that the actual axis feedrate has reached the feedrate commanded for each axis.

ARRFn
- 0: 1st axis speed reached
- :
- 3: 4th axis speed reached

[Operation]

This signal turns ON when the difference of the speed commanded for each axis and the motor feedback feedrate is within a set range (approx. ±15%).
This signal turns OFF when the speed difference exceeds the set range.



[Related signals]

In plus motion +nth axis (MVP1 to 4: X190 to 3)
In minus motion -nth axis (MVM1 to 4: X198 to B)

B contact	Signal name	Signal abbreviation		Device
—	UNCLAMP COMMAND		P C	X2B8 to B

[Function]

This signal is output when movement of the axis selected as the index table indexing axis is commanded.

[Operation]

When this signal turns ON, the index table indexing axis clamp is released by the ladder, and the unclamp complete signal is set.
This signal turns OFF when movement of the index table indexing axis is completed.

The signal turns ON when:

- Movement of the indexing axis is commanded during automatic operation.

This signal turns OFF when:

- Movement of the indexing axis is completed during automatic operation.
- The axis movement is forcibly ended with reset or emergency stop, etc.

(Note 1) The index command will not turn OFF if the axis movement is interrupted with an interlock or automatic operation pause, etc.

(Note 2) This signal is turned ON and OFF when the index table indexing axis acceleration/deceleration has completed.
Thus, if the in-position has to be confirmed during the clamp/unclamp operation, confirm with the PLC.

[Related signals]

Unclamp complete (Y338 to Y33B)

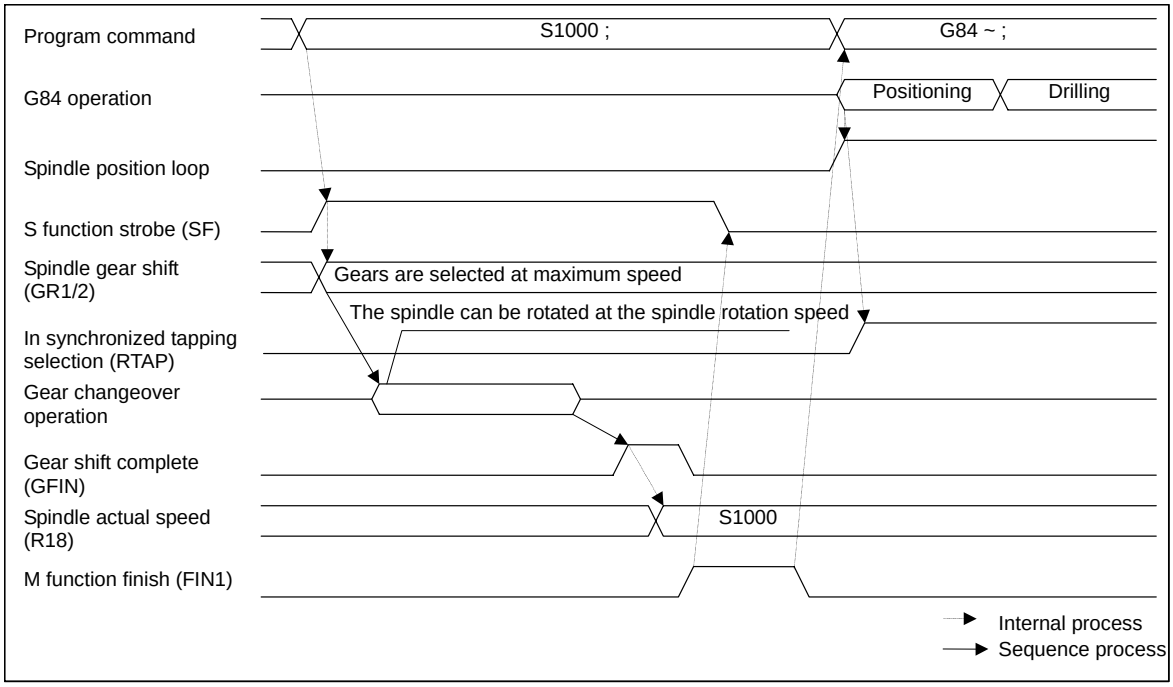
B contact	Signal name	Signal abbreviation		Device
—	IN SYNCHRONIZED TAPPING SELECTION (M COMMAND)	RTAP	P C	X2C0

[Function]

This signal informs that the synchronized tapping mode is active.
(This signal is output only when the M function synchronized tapping cycle valid parameter (#1272 ext08 bit1) is ON.)

[Operation]

(1) ON timing

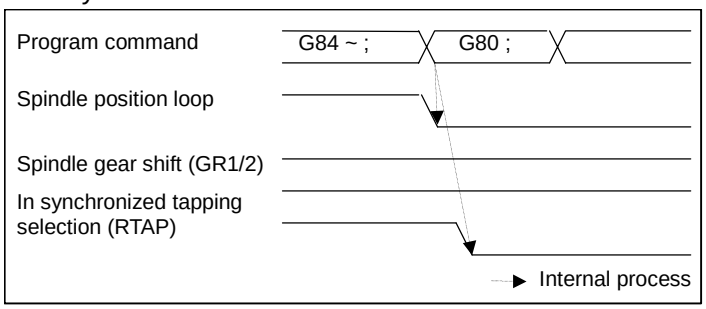


(Note 1) Spindle position loop and in synchronized tapping selection turn ON only during synchronized tapping.

(Note 2) If synchronized tapping is applied even during tap retract, "in synchronized tapping selection" signal will turn ON.

(2) OFF timing

This signal turns OFF when reset, G80 (hole drilling fixed cycle cancel), 01 group G codes or other fixed cycle G codes are commanded.



(Note 1) The gears are not selected until the S command is issued again.

(Note 2) This signal turns OFF when tap retract is canceled or completed.

[Related signals]

Gear shift complete (Y225: GFIN)
Spindle actual speed (R18)

B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle
—	SPINDLE ENABLE	ENB	PC	X2C8	X608

[Function]

This signal informs whether there are command outputs to the spindle or not.
0: No command output to spindle
1: With command output to spindle

[Related signals]

(1) Spindle selection (SWS: Y350)
(2) Spindle command selection (SLSP: R110)
(3) Spindle stop (SSTP: Y294)
(4) Encoder selection (R124)
(5) Spindle forward run start (SRN: Y2D0)
(6) Spindle reverse run start (SRI: Y2D1)

B contact	Signal name	Signal abbreviation		Device
—	IN BARRIER VALID (left)		PC	X2D0

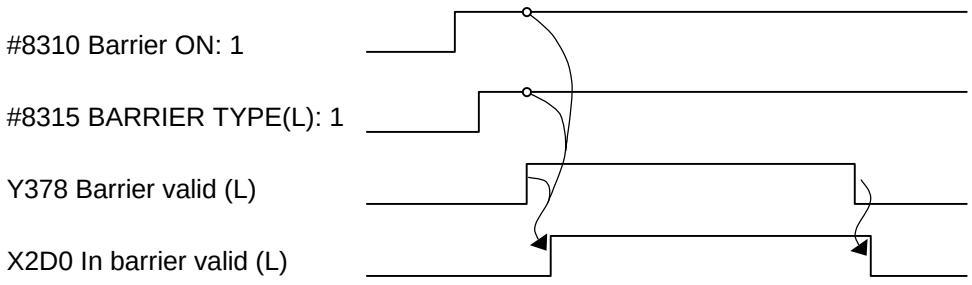
B contact	Signal name	Signal abbreviation		Device
—	IN BARRIER VALID (right)		PC	X2D1

[Function]

This signal informs that the barrier area of left side (right side) is valid in the chuck•tailstock barrier function.

[Operation]

When all conditions below are satisfied and the barrier area is valid, this signal is turned ON. (When this signal is OFF, the barrier check is not executed.)
- The option of chuck barrier check function is valid.
- The setting of parameter "#8310 Barrier ON" on the barrier data screen is "1".
- The setting of parameter "#8315 BARRIER TYPE (L)" ("#8316 BARRIER TYPE (R)") on the barrier data screen is other than "0".
- The "Barrier valid" signal input above is ON, or the G22 modal is valid.



B contact	Signal name	Signal abbreviation		Device
—	DOOR OPEN ENABLE		P C	X300

[Function]

This signal informs the PLC that the drive power to all axes is turned OFF due to the "Door open" signal, or that the same status is canceled.

[Operation]

This signal turns ON when the drive power to all axes is turned OFF due to the "Door open" signal turning ON.
This signal turns OFF at all axes ready ON and at all servo axes servo ON, due to the "Door open" signal turning OFF.
Release of the door lock is enabled at the rising edge of the "Door open enable" signal.
The operation is in a READY status at the falling edge of the "Door open enable" signal.

[Caution]

(1) Handling of the PLC axis
Set so a "Door open" signal is output to the NC after the PLC axis is stopped by the PLC.
If a "Door open" signal is input without stopping the PLC axis, the axis will stop with a dynamic brake method due to the ready OFF state.
The remaining distance will be held in the R register being used in the DDB.

(2) Handling of the analog spindle
When an analog spindle is connected, it is not possible to confirm that the spindle has completely stopped with the NC. Thus, confirm that the spindle has completely stopped using the PLC, before opening the door.
Because the spindle may start rotating again immediately after the door is closed, for safety turn the forward run and reverse run signals OFF when the door is open.

(3) Opening the door during ATC operation
When opening the door during ATC operation, apply an interlock with the user PLC.

[Related signals]

Door open (Y380, 1)

B contact	Signal name	Signal abbreviation		Device
—	MELDASNET IN SAMPLING	NETSMP	P C	X303

[Function]

This signal informs that sampling is being executed by the MELDASNET function.

[Operation]

This signal turns ON when sampling with the MELDASNET function is being executed.

[Related signals]

MELDASNET sampling stop (NETSTP: Y2FB)

B contact	Signal name	Signal abbreviation		Device
—	POWER OFF REQUIRED AFTER PARAMETER CHANGE		P C	X30F

[Function]

This signal informs that the set parameter is not valid without rebooting the power.

[Operation]

When the following operation is executed, the "Power OFF required after parameter change" signal is output, and the display symbol "PR" is displayed in the operation status part.

(1) The parameters to be valid after rebooting the power are set. / Such parameter data is input.
(2) The auxiliary axis parameters to be valid after rebooting the power are set. / Such data is input. / Such data backed up before is input.
(3) The maintenance data for the ALL1 is input.
(4) The backup data is input with the SRAM backup function.

If the power is rebooted, the "Power OFF required after parameter change" signal will turn OFF, and the "PR" display will disappear.

(Note 1) Even if the same value is set to the parameter which needs to reboot the power, the "Power OFF required parameter change" signal is output, and the "PR" is displayed.
(Note 2) Even if the value is returned to the original value after setting the parameter which needs to reboot the power, the "Power OFF required after parameter change" signal remains ON, and the "PR" also remains displayed.
(Note 3) The parameters which do not need to reboot the power are targeted for rewriting the parameters with DDB or G10, so the "Power OFF required after parameter change" signal is not output, and the "PR" is not displayed.

6.2 PLC Input Signals (Data Type: R***)

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	SPINDLE COMMAND ROTATION SPEED INPUT		P C	R8, 9	R208, 9

[Function]

This signal informs that spindle speed reference signal (S) specified in automatic operation (memory, MDI or tape) or by manual numerical data input. "Spindle command rotation input" speed output from the controller is binary data. Under the S analog mode, the data can be monitored in the "S display" on the command value screen.

[Operation]

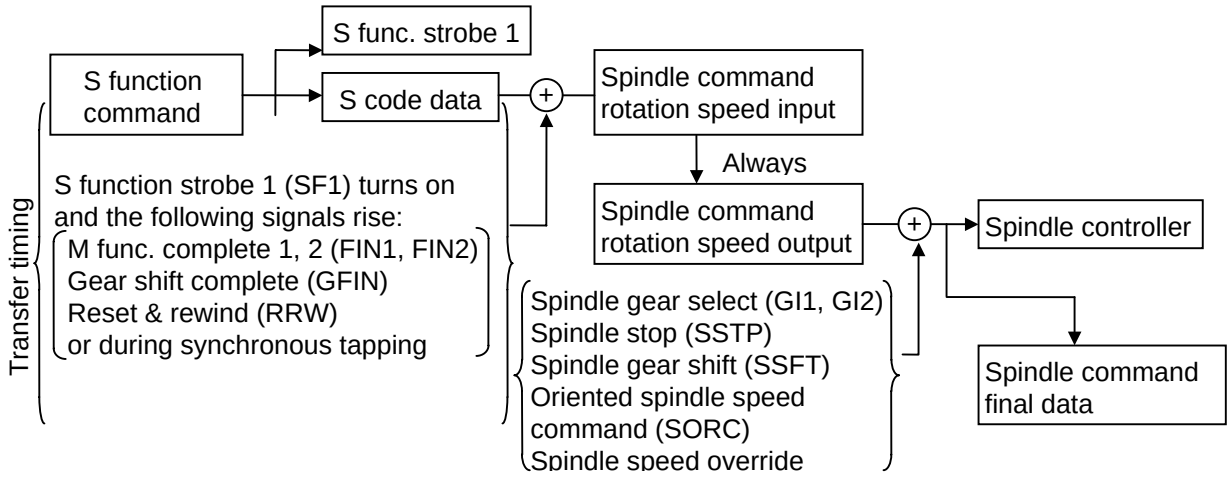
Set "Spindle command rotation speed input" is renewed when:

(1) "S**" is specified in automatic operation (memory, MDI or tape) and "M function finish 1 or 2" signal (FIN1 or FIN2) or "Gear shift complete" signal (GFIN) is sent back to the controller.

(2) "S**" is specified by manual numerical command input and "M function finish 1 or 2" signal (FIN1 or FIN2) or "Gear shift complete" signal (GFIN) is sent back to the controller.

Note 1) Data cannot be cleared by "Reset" or "Emergency stop".

<Data flow>



When the system is under constant surface speed control, constant surface speed data is set for "Spindle command rotation speed input".

Note 2) "Spindle command rotation speed input" directly denotes spindle speed (r/min) specified as S function command.

[Related signals]

(1) Spindle speed command rotation output (R108, 9)

(2) Spindle command final data (R10 to 13)

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	SPINDLE COMMAND FINAL DATA (rotation speed)		P C	R10, 1	R210, 1

[Function]

The command value is indicated to the spindle controller.

[Operation]

The "Spindle command rotation speed input" indicates the value for the spindle function (S) data commanded with the automatic operation or manual numeric value command, whereas this data indicates a value to which the "Spindle override", "Spindle gear select input" (GI1, GI2), "Spindle stop" (SSTP), "Spindle gear shift" (SSFT) and "Oriented spindle speed command" (SORC) conditions have been considered.

[Related signals]

(1) Spindle command rotation speed input (R8, 9)
(2) Spindle command rotation speed output (R108, 9)

B contact	Signal name	Signal abbreviation		Device
—	KEY IN 1		P C	R16

[Function]

Operator's key operation can be monitored on the user PLC side.

[Operation]

While operator is using the keyboard, the corresponding data is set to KEY-IN 1.
Refer to the "PLC Programming Manual" ("User PLC key operation") for details on the set key data.

[Related signals]

(1) KEY OUT 1 (R112)

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	SPINDLE ACTUAL SPEED		P C	R18, 9	R218, 9

[Function]

When the system has spindle equipped with encoder, actual spindle speed can be monitored.

[Operation]

True spindle speed is always set by feedback signal from spindle encoder.
Data are multiplied by 1000, and stored.

B contact	Signal name	Signal abbreviation		Device
—	M CODE DATA 1		P C	R20, 1

[Function]

When M function is specified, value following address "M" can be identified. The M code data output from the controller is a max. 8-digit BCD code.

[Operation]

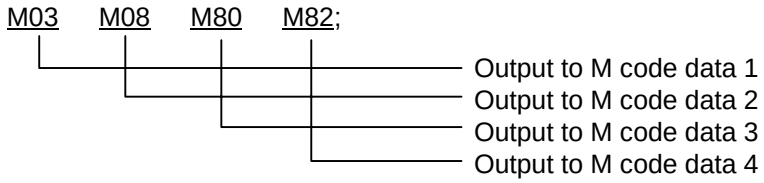
M code data are updated when:

(1) "M**" is issued in automatic operation (tape, memory or MDI).
(2) "M**" in fixed cycle causes motion during execution of the fixed cycle.
(3) "M**" is executed by manual numerical command input.

M code data is also updated when an "M code independent output" command is issued even during M function lock. The data is kept unchanged after "M function finish" signal (FIN1, FIN2) is sent back. "Reset" or "Emergency stop" does not clear the data.

[Cautions]

(1) Commands can be defined up to four in a block with parameters. (One command for the system when the standard PLC is available.) When plural M functions are placed in one block, the signals are output in the order at programming.



(2) M98 (read of subprogram), M99 (return to main program), etc. are processed within the CNC, and not output as M code data.

[Related signals]

(1) M function strobe (MFn: X230)
(2) M code data 2, 3, 4 (R22 to 27)

B contact	Signal name	Signal abbreviation		Device
—	M CODE DATA 2		P C	R22, 3

[Function]

When M function is specified, value following address "M" can be identified. The M code data output from the controller is a max. 8-digit BCD code.

[Operation]

M code data 2 are updated when:

(1) Two or more M functions are placed in one block in automatic operation (tape, memory or MDI).

For other details, refer to the section on "M CODE DATA 1".

B contact	Signal name	Signal abbreviation		Device
—	M CODE DATA 3		P C	R24, 5

[Function]

When M function is specified, value following address "M" can be identified. The M code data output from the controller is BCD code.

[Operation]

M code data 3 are updated when:

(1) Three or more M functions are placed in one block in automatic operation (tape, memory or MDI).

For other details, refer to the section on "M CODE DATA 1".

B contact	Signal name	Signal abbreviation		Device
—	M CODE DATA 4		P C	R26, 7

[Function]

When M function is specified, value following address "M" can be identified. The M code data output from the controller is a max. 8-digit BCD code.

[Operation]

M code data 4 are updated when:

(1) Four or more M functions are placed in one block in automatic operation (tape, memory or MDI).

For other details, refer to the section on "M CODE DATA 1".

B contact	Signal name	Signal abbreviation		Device
—	S CODE DATA 1 to 2		P C	R28, 9

[Function]

When S function is specified, value following address "S" can be identified. The S code data output from the controller is binary code.

[Operation]

S code data 1 are updated when:

(1) "S**" is specified in automatic operation (tape, memory or MDI).

(2) "S**" is executed by manual numerical command input.

Data remain unchanged even when "M function finish" signal (FIN1 or FIN2) is sent back. "Reset" and "Emergency stop" does not clear this data.

The S-code data is assigned in the following manner.

Signal name	Register
S code data 1	R28,29
S code data 2	R30,31

[Caution]

(1) If two or more S codes for one spindle are issued in a block, the S code defined last will be valid.

[Related signal]

(1) S function strobe (SFn: X234)

B contact	Signal name	Signal abbreviation		Device
—	T CODE DATA 1		P C	R36, 7

[Function]

When T function is specified, value following address "T" can be identified. The T code data output from the controller is a max. 8-digit BCD code.

[Operation]

T code data are updated when:

(1) "T**" is specified in automatic operation (tape, memory or MDI).

(2) "T**" is executed by manual numerical command input.

Data remain unchanged even when "M function finish" signal (FIN1 or FIN2) is sent back. "Reset" and "Emergency stop" does not clear this data.

[Cautions]

(1) Only one T code can be commanded in one block. The latter code will be valid if more than one code is commanded in one block.

[M system]

T05 T15;

Output to T code data 1

This T code data is invalid.

[L system]

T0505 T1515;

Output to T code data 1

This T code data is invalid.

[Related signals]

(1) Tool function strobe 1 (TF1: X238)

B contact	Signal name	Signal abbreviation		Device
—	2ND M FUNCTION DATA 1		P C	R44, 5

[Function]

When 2nd M function is specified, value following address "B" can be identified. The 2nd M function data output from the controller is a max. 8-digit BCD code.

Note 1) Select an address for the 2nd M function address from the setup parameters basic specification parameter "#1170 M2name" A, B or C address that is not being used for "#1013 axname" or "#1014 incax".

[Operation]

2ND M FUNCTION DATA 1 are updated when:

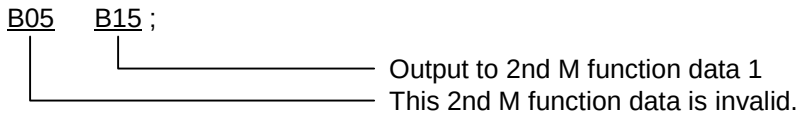
(1) "B (A, C)**" is specified in automatic operation (tape, memory or MDI).

(2) "B (A, C)**" is executed by manual numerical command input.

Data remain unchanged even when "M function finish" signal (FIN1 or FIN2) is sent back. "Reset" and "Emergency stop" does not clear this data.

[Cautions]

(1) Only one 2nd M function can be placed in one block. The latter code will be valid if more than one code is commanded in one block.



[Related signals]

(1) 2nd M function strobe 1 (BF1: X23C)

B contact	Signal name	Signal abbreviation		Device
—	GROUP OUTPUT IN LIFE MANAGEMENT		P C	R55

[Function]

The No. of the group currently in life management with the lathe system's tool life management II is output.

[Operation]

The No. of the group currently in life management is output.

B contact	Signal name	Signal abbreviation		Device
—	BATTERY DROP CAUSE		P C	R56

[Function]

This notifies a drop in the battery voltage.

[Operation]

A drop in voltage of the data storage battery located on the front door of the controller is checked when the power is turned ON. If the voltage is below the specified voltage (approx. 2.6V), the battery alarm (BATAL) signal turns ON, and bit 0 of this data is set to "1".

(Note) This data will not change until the battery voltage is recovered to a normal value.

[Related signal]

(1) Battery alarm (BATAL: X20F)

B contact	Signal name	Signal abbreviation		Device
—	CNC COMPLETE STANDBY STATUS OUTPUT		P C	R60

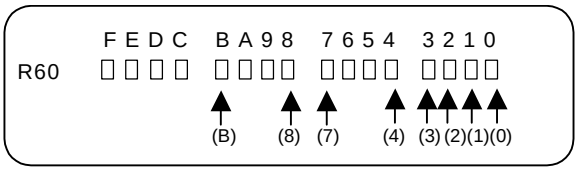
[Function]

The NC's operation state when the machine seems to be not operated in automatic operation without alarms occurring is output by the bit unit. The alarm messages can be displayed using this signal in the user PLC.

[Operation]

The corresponding bit below turns ON.

Bit0 : Complete standby status of M,S,T,B
Bit1 : In rapid traverse deceleration check
Bit2 : In cutting feed deceleration check
Bit3 : Waiting for spindle orientation complete
Bit4 : Waiting for spindle position loop
Bit7 : Door opened
Bit8 : In executing dwell
BitB : Waiting for unclamp signal



The right figure shows the bit correspondence.

B contact	Signal name	Signal abbreviation		Device
—	IN INITIALIZATION		P C	R62

[Function]

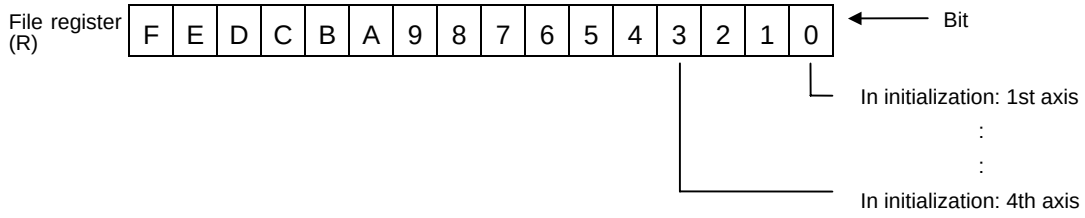
This signal is output when zero point initialization is being carried out in the absolute position detection system.

[Operation]

The axis for which "1" is set in #0 INIT. SET on the [ABS. POSITION SET] screen is set to "1", and is held until the power is turned off.

The stored stroke limit and stroke end signals are invalid while this signal is set to "1", and the current limit during initialization is valid.

This signal is also set to "1" when the "Zero point initializing mode" (AZS1 to 4) signal is on.



B contact	Signal name	Signal abbreviation		Device
—	INITIALIZATION INCOMPLETE		P C	R63

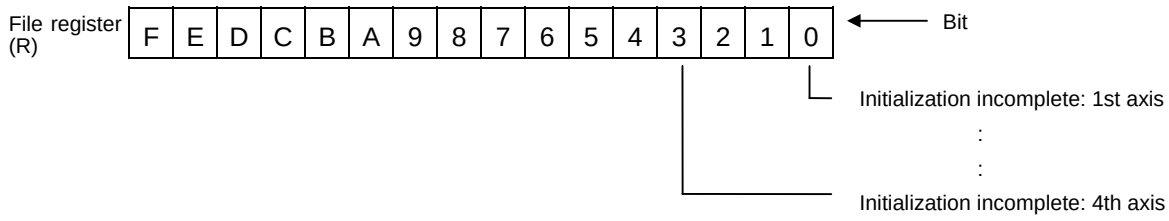
[Function]

This signal is output when the absolute position is not established in the absolute position detection system.

[Operation]

This signal indicates that the zero point initialization has not been established once or that the absolute position has been lost.

The stored stroke limit of the axis for which this signal is set to "1" in the absolute position detection system is invalid.



B contact	Signal name	Signal abbreviation		Device
—	SCREEN CONTROL INFORMATION		P C	R64 to 7

[Function]

This signal notifies which screen is currently being displayed by the controller.

[Operation]

The screen information changes in the following cases. Note that the information will not change when a screen that has already been displayed is re-displayed.

(1) When a function select key is pressed.
(2) When a menu key is pressed.
(3) When a page key is pressed.

The relation of each key operated and the screen information is as follows.

File register	Operated key	Screen information		
R65 bit F to 8	Function No.	MONITOR		00
		TOOL•PARAM	cmdtyp is 1, 2	0C
			cmdtyp is 3, 4	12
		EDIT•MDI		0D
		DIAGN•IN/OUT		10
		SFG		08
		F0		09
R65 bit 7 to 0	Menu No.	00 to 13 (0 to 19: decimal) Menu changeover: 00 01 02 03 04 / 05 06 07 08 09 / 0A 0B 0C 0D 0E / 0F 10 11 12 13		
R64 bit F to 8	Page No.	01 to n Change by next page key or previous page key		
R64 bit 7 to 0	_____	Not set. The data is not set.		

Note) File registers R66 and 67 are invalid.

B contact	Signal name	Signal abbreviation		Device
—	PLC SCAN TIME		P C	R68

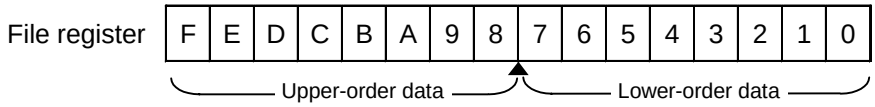
[Function]

Time taken for scanning in user PLC can be monitored.

[Operation]

Scanning time for user PLC main processing is continuously updated and set.

<File register contents and time calculation>



Time calculation

$$\boxed{\text{Upper-order data}} \times 7.1 + \frac{\boxed{\text{Lower-order data}}}{256} \times 7.1 \quad \text{(ms)}$$

Example)

F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
0	0	0	0	0	1	1	0	1	1	0	1	0	0	0	0

$$\boxed{\text{Upper-order data=6}} \times 7.1 + \frac{\boxed{\text{Lower-order data=208}}}{256} \times 7.1 \quad \text{(ms)}$$

Note 1) For this data, mean scanning time is about 1.8sec.

Note 2) I/O processing time for PLC control software (PLC BASIC) is included in this data processing time.

B contact	Signal name	Signal abbreviation		Device
—	EMERGENCY STOP CAUSE		P C	R69

[Function]

The causes of emergency stop are shown with bit correspondence.

[Operation]

The cause of the emergency stop state is shown as follows with bit correspondence.
If there are multiple causes, the multiple bits corresponding to each cause are output.
The bit of this signal that is set to "0" is the emergency stop cause.

File register (R)	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
← Bit	Servo drive unit emergency stop output	Spindle drive unit emergency stop output	Door interlock, dog/OT arbitrary allocation device illegal	PLC high-speed processing error	User PLC Illegal codes exist.		LINE		Built-in PLC Software emergency stop output device Y29F is "1".			Control unit EMG connector Emergency stop state	External PLC Communication error	External PLC Not ready	External PLC FROM, TO command not executed	Built-in PLC Stop state

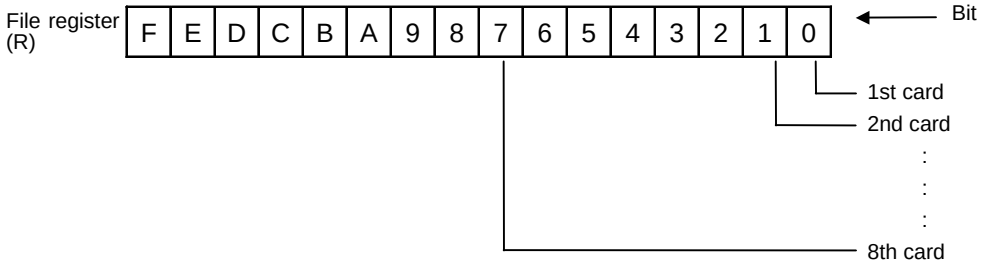
B contact	Signal name	Signal abbreviation		Device
—	DIO CARD INFORMATION		P C	R70

[Function]

The remote I/O unit connected to the controller can be found with the user PLC.
The user PLC finds the connection state of the remote I/O unit with this data.

[Operation]

(1) When a remote I/O card is connected "1" is set, and when not connected "0" is set. Note that for DC100/101, DX110/111, DX120/121 and DX140/141, two cards are used per unit, so the two bits corresponding to the connected unit will be set to "1".



(2) No. of cards mounted in remote I/O unit (DX***)

Unit	No. of cards
DX100/101	1 card
DX110/111, DX120/121, DX140/141	2 cards

(3) The position of the bit that turns on depends on the rotary switch on the remote I/O unit.

B contact	Signal name	Signal abbreviation		Device
—	USER MACRO OUTPUT #1032 PLC → Controller		P C	R72, 73

[Function]

This is interface function used to coordinate user PLC to user macro.

Note) The other signals from R0 to R99 are PLC inputs, but this signal is output to the controller from PLC.

[Operation]

The data set in file registers Rn and Rn+1 with the user PLCs, can be referred to on the user macro side with the user macro system variables #1000 to #1031 or #1032.
The relationship between system variable and file register is as follows:

System variable	Points	Interface output signal	System variable	Points	Interface output signal
#1000	1	Register R72 bit 0	#1016	1	Register R73 bit 0
#1001	1	Register R72 bit 1	#1017	1	Register R73 bit 1
#1002	1	Register R72 bit 2	#1018	1	Register R73 bit 2
#1003	1	Register R72 bit 3	#1019	1	Register R73 bit 3
#1004	1	Register R72 bit 4	#1020	1	Register R73 bit 4
#1005	1	Register R72 bit 5	#1021	1	Register R73 bit 5
#1006	1	Register R72 bit 6	#1022	1	Register R73 bit 6
#1007	1	Register R72 bit 7	#1023	1	Register R73 bit 7
#1008	1	Register R72 bit 8	#1024	1	Register R73 bit 8
#1009	1	Register R72 bit 9	#1025	1	Register R73 bit 9
#1010	1	Register R72 bit 10	#1026	1	Register R73 bit 10
#1011	1	Register R77 bit 11	#1027	1	Register R73 bit 11
#1012	1	Register R72 bit 12	#1028	1	Register R73 bit 12
#1013	1	Register R72 bit 13	#1029	1	Register R73 bit 13
#1014	1	Register R72 bit 14	#1030	1	Register R73 bit 14
#1015	1	Register R72 bit 15	#1031	1	Register R73 bit 15

System variable	Points	Interface output signal
#1032	32	Register R72, R73
#1033	32	Register R74, R75
#1034	32	Register R76, R77
#1035	32	Register R78, R79

This correspondence table shows the example for file registers R72 and R73.

File registers R72 and R73 correspond to system variables #1000 to #1031, and #1032 (32-bit data).

[Related signals]

(1) User macro output #1033, #1034, #1035 (R74 to 79)
(2) User macro input #1132, #1133, #1134, #1135 (R172 to 179)

B contact	Signal name	Signal abbreviation		Device
—	USER MACRO OUTPUT #1033 PLC → Controller		P C	R74, 75

[Function]

This provides interface function used to coordinate user PLC to user macro.

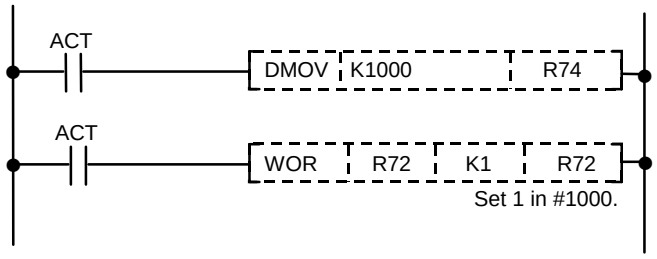
Note) The other signals from R0 to R99 are PLC inputs, but this signal is output to the controller from PLC.

[Operation]

The data set in file registers Rn and Rn+1 with the user PLCs, can be referred to on the user macro side with the user macro system variables #1033.

Example)

Sequence program



User macro program

```
IF [#1000 EQ 0] GOTO 100
#100 = #1033
N100
```

The #1033(R74, R75) data is read into #100
Other than when #1000 is set to 0.

[Related signals]

(1) User macro output #1032, #1034, #1035, #1000 to #1031

(2) User macro input #1132, #1133, #1134, #1135, #1100 to #1131

B contact	Signal name	Signal abbreviation		Device
	USER MACRO OUTPUT #1034 PLC → Controller		P C	R76, 77

[Function] [Operation]

The function, operation, etc. are the same as those of "USER MACRO OUTPUT #1033".

B contact	Signal name	Signal abbreviation		Device
	USER MACRO OUTPUT #1035 PLC → Controller		P C	R78, 79

[Function] [Operation]

The function, operation, etc. are the same as those of "USER MACRO OUTPUT #1033".

B contact	Signal name	Signal abbreviation		Device
—	ADD-ON (EXPANSION) OPERATION BOARD INPUT SIGNALS 1 to 4		P C	R80 to 3

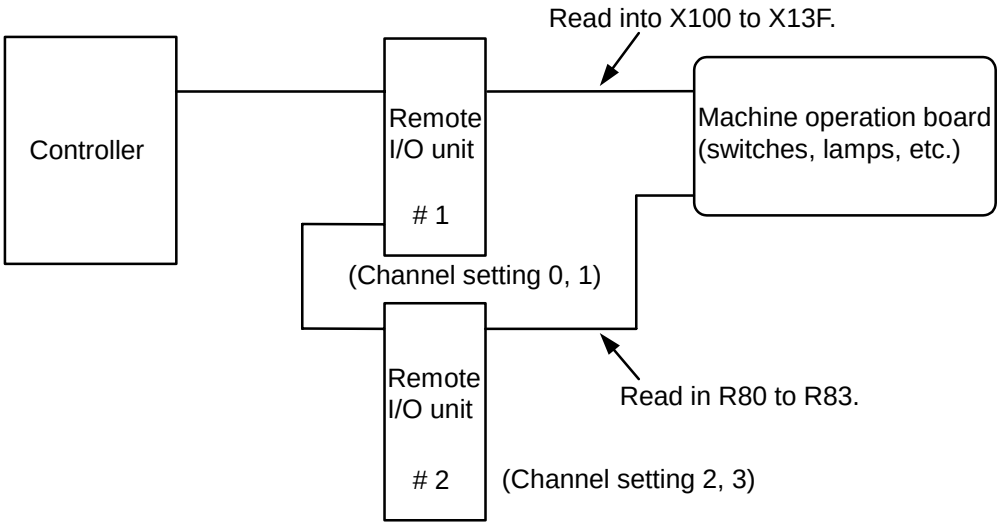
[Function]

By adding the remote I/O unit to the controller, the machine operation board input/output signals can be input and output with the controller control signals.
If the added remote I/O unit has less than 64 input points and 48 output points the input signals will be input to (X100 to X13F) and the output signals output to (Y100 to Y12F). If the number of input/output points is larger, the input signals will be R80 to R83 explained here, and the output signals R180 to R182 explained later. Generally, these signals are to be assigned to "bit-based arithmetic operation area (X**)". They, however, are input to file registers (R).

[Operation]

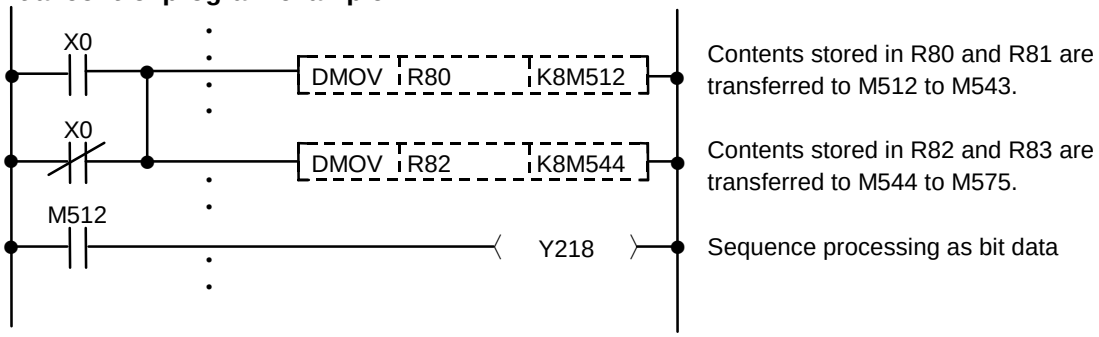
The signals are read together with other input signals at start of PLC main processing (medium speed).

<Hardware block diagram>



Note 1) This is conventionally a bit unit signal, so create it in the temporary memory (M) and then transfer it to the corresponding file register (R) before using.

Sequential control program example:



Note 2) Refer to the section "2.2 Operation board remote I/O unit" for the relation of the remote I/O channel setting switch and device.

Note 3) Refer to the section 3.2 "Classification of machine input/output signals" Tables 3-2-3 to 3-2-4 for the add-on (expansion) operation board input signals 1 to 4.

[Related signals]

(1) Add-on (expansion) operation board output signals 1 to 3 (R180 to R182)

B contact	Signal name	Signal abbreviation		Device
—	NEAR REFERENCE POSITION (PER REFERENCE POSITION)		P C	R88, 9

[Function]

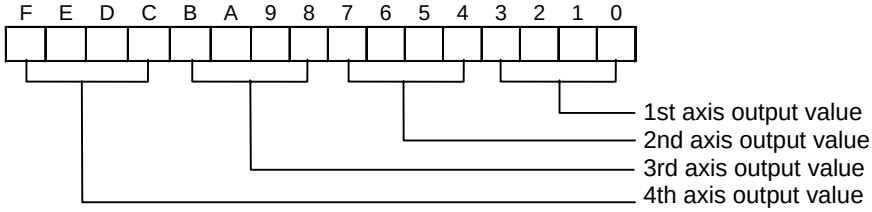
This signal indicates that the control axis is near the reference position when using the absolute position detection system.
This signal is output for the 1st reference position to the 4th reference position.
Near the 1st reference position, the time for outputting the signal is shorter than the "near reference position nth axis (NRFn)" signal (the ON/OFF timing accuracy during axis movement is improved).

[Operation]

(1) Using the nth reference position as a reference, when the control axis is in the range set with the parameters, this signal turns ON, and turns OFF when the axis is not within the range.
(2) The near reference position signal is output with four bits for each axis.

(a) R register and corresponding axes

R88



(b) Output value and near nth reference position

High-order bit ⟷ Low-order bit				Near nth reference position
0	0	0	1	Near 1st reference position
0	0	1	0	Near 2nd reference position
0	1	0	0	Near 3rd reference position
1	0	0	0	Near 4th reference position

(Note 1) The near reference position signal devices include X devices (X1D8 and following) which output signal only for the 1st reference position, and the R registers (R88/R89) which outputs a signal for each reference position (1st reference position to 4th reference position).
(Note 2) The near reference position signal output width is set with the absolute position parameters "#2057 nrefp" and "#2058 nrefn". The near reference position signal output width is the same width for the 1st reference position to the 4th reference position.
(Note 3) Near the 1st reference position, the signals are output to the conventional X device (X1D8 and following) and the R registers (R88/R89) which output signals to each reference position.

[Related signals]

Near reference position nth axis (NRF1 to 4: X1D8 to B)

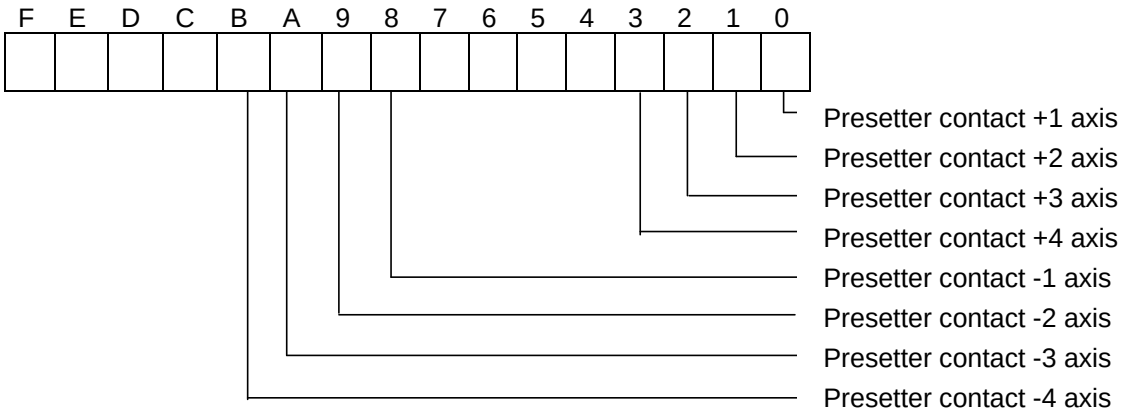
B contact	Signal name	Signal abbreviation		Device
—	PRESETTER CONTACT		P C	R90

[Function]

The axis movement direction at the moment when the "Skip" signal is entered is output in the tool presetter.

[Operation]

The axis movement direction at the moment when the tool contacts the sensor ("Skip" signal ON) during the tool measurement mode (TLMS ON) is set to the corresponding bit.
This signal is turned OFF by the sensor OFF.
This signal turns OFF when the "Tool measurement mode" signal is turned OFF.
This signal is not output when the tool measurement mode is not entered.
This signal is "0xFFFF" when an axis with no movement contacts the sensor.



1: Sensor ON
0: Sensor OFF or tool measurement mode OFF

[Related signals]

Tool length measurement 2 (TLMS: Y229)

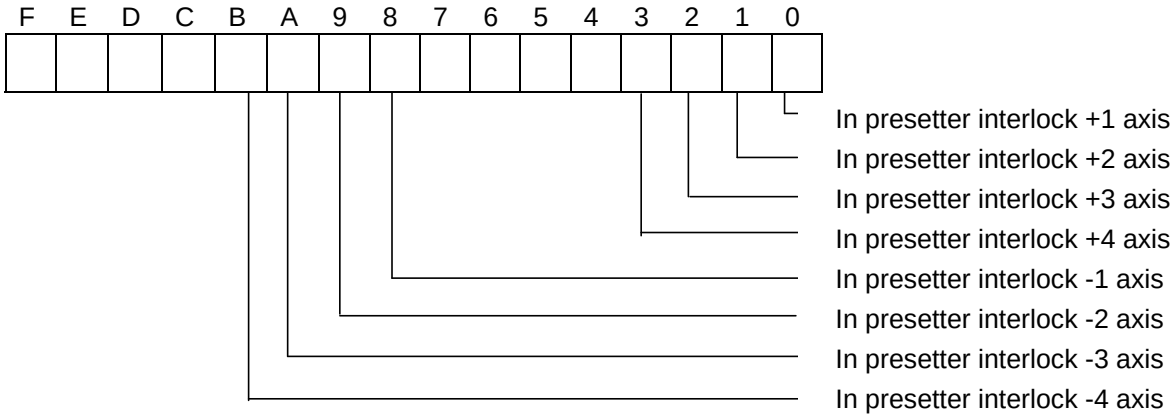
B contact	Signal name	Signal abbreviation		Device
—	PRESETTER INTERLOCK		P C	R91

[Function]

The interlock direction in the CNC is output after the sensor is entered in the tool presetter.

[Operation]

The interlock direction to the entrance direction in the CNC is output after the sensor is entered during the tool measurement mode (TLMS ON).
This signal is turned OFF when the escape operation complete conditions are satisfied.
This signal turns OFF when the "Tool measurement mode" signal is turned OFF.
This signal is not output when the tool measurement mode is not entered.



1: In interlock
0: Interlock cancel or tool measurement mode OFF

[Related signals]

Tool length measurement 2 (TLMS: Y229)

B contact	Signal name	Signal abbreviation		Device
—	SOFTWARE VERSION CODE FOR CONTROLLER CONTROL		P C	R96 to 9

[Function]

This indicates the version of the software for controller control.

[Operation]

The version displayed at "MP" on the [Software Directory] screen is indicated.

[S/W MODULE TREE] ALARM/DIAGN 8.1/2
MP BND - 867W000 – A0 SV1 BND-
OFFM

The file registers R96 to 99 are set to the following data.

Example) BND-867W000-A0 __
(1) (2) (3)

Item		File register	Type	Example
(1)	Mode function No.	R99	Binary	397=018D$_H$
(2)	Serial No.	R98	Binary	000=0000$_H$
(3)	Version	Bits F to 8 of R97	ASCII code	A=41$_H$
		Bits 7 to 0 of R97	ASCII code	0=30$_H$
		Bits F to 8 of R96	ASCII code (Note1)	Blank=00$_H$
—	———	Bits 7 to 0 of R96	Always FF$_H$ (Note2)	

Note 1) If the version is a 2-digit No., bits F to 8 of R96 are set to "00$_H$".
Note 2) Bits 7 to 0 on the R96 are always "FF$_H$".

B contact	Signal name	Signal abbreviation		Device
—	CLOCK DATA		P C	R460 to 2

[Function]

The year, month, date, hour, minute and second data is informed by the controller to the PLC as the current clock information.

[Operation]

The date and time data is output as shown below. The data is output as binary data.

	F 87 0	
R460	Month	Year
R461	Hour	Date
R462	Second	Minute

Example) For October 26, 2002, 14:56:36.

R460 ... 0 0 0 0 1 0 1 0 | 0 0 0 0 0 0 1 0 = $0A02_H$
October 2002

R461 ... 0 0 0 0 1 1 1 0 | 0 0 0 1 1 0 1 0 = $0E1A_H$
14 hundred hours 26th day

R462 ... 0 0 1 0 0 1 0 0 | 0 0 1 1 1 0 0 0 = 2438_H
36 seconds 56 minutes

Note 1) The time is displayed with the 24-hour system.
Note 2) The data and time are set with the [TIME] screen on the setting and display unit.

B contact	Signal name	Signal abbreviation		Device
—	TOOL LIFE USAGE DATA		P C	R614, 5

[Function]

The usage data of the tool currently being used with the lathe-system tool life management II is output. (When multiple compensation Nos. are used, the total of usage data per compensation No. is output.)

[Operation]

The relation of the usage data of the tool currently being used and the output file register is as follows.

Details	File register
Tool life usage data	R614
	R615

B contact	Signal name	Signal abbreviation		Device
—	SERVO DEFLECTION AMOUNT nTH AXIS		P C	R1100 to 11

[Function]

The deflection amount of the servo nth axis is output always in the command unit.

[Operation]

Servo 1st axis : R1100 (LOW) R1101 (HIGH)
:
Servo 6th axis : R1110 (LOW) R1111 (HIGH)

B contact	Signal name	Signal abbreviation		Device
—	NO. OF WORK MACHINING (current value, max. value)		P C	R2896 to 9

[Function]

The No. of work machining current value and maximum value are notified by the controller to the PLC.

[Operation]

If data is set in the No. of work machining (WRK COUNT M) and work machining maximum value (WRK LIMIT) of the [Process parameters], the current value or maximum value of the No. of work machining is output.

R2896	No. of work machining	Low-order side
R2897	Current value	High-order side

R2898	No. of work machining	Low-order side
R2899	Maximum value	High-order side

Note 1) If data is not set in "WRK COUNT M" and "WRK LIMIT" on the [Process Parameter] screen, data will not be output to the file register.

Note 2) If the No. of work machining matches or exceeds maximum value, the No. of work machining over signal (X26E) turns on.

<Counting of No. of work machining using user PLC>

(1) Set "0" in "WRK COUNT M" on the [Process Parameter] screen. With this setting, the controller side will not count up.
(2) Add "1" to R2896, 7 with the user PLC.
(3) The controller will display R2896, 7 as the No. of work machining on the [COORDINATE] screen. Even in this case, if the No. of work machining matches or exceeds the work maximum value, the No. of work machining over signal (X26E) will turn on.

6.3 PLC Output Signals (Bit Type: Y***)

B contact	Signal name	Signal abbreviation		Device
—	CONTROL AXIS DETACH n-TH AXIS	DTCH1 to 4	—	Y180 to 3

[Function]

Desired control axis can be specified to be exempted from control function.
Each control axis is provided with this signal. The last numeric of signal name indicates axis No. to be detached.

DTCHn

- 1 ..... 1st axis is detached
- :
- :
- 4 ..... 4th axis is detached

[Operation]

When "Control axis detach" signal (DTCHn) turns on, the corresponding axis is exempted from control.

(1) Specified axis is not under any positioning control (oriented spindle stop, index, etc.)
(2) "Servo alarm", "Stroke end alarm" and other alarms are not applied to specified axis.
(3) Interlock signal applied to specified axis is deemed to be on.
(4) Specified axis is displayed by the setting and display unit.

Note 1) The same function can be used by setting parameter on the setting and display unit. (See below)

The control axis detach is valid when the following are valid:

Control axis detach nth axis (DTCHn)	or	Basic specification parameter "#1070 axoff" (axis detach), and axis parameter of machining parameter "#8201 AX. RELEASE"

B contact	Signal name	Signal abbreviation		Device
*	SERVO OFF n-TH AXIS	*SVF1 to 4	—	Y188 to B

[Function]

Control axis (axis motion under control) can be set to "Servo off" (i.e., servo motor remains still).
In servo off condition, positioning control is impossible but the position detect function is alive.
Each control axis is provided with this signal. The last numeric of signal name indicates No. of control axis.

*SVFn
- 1 ..... 1st axis in "Servo off"
- :
- 4 ..... 4th axis in "Servo off"

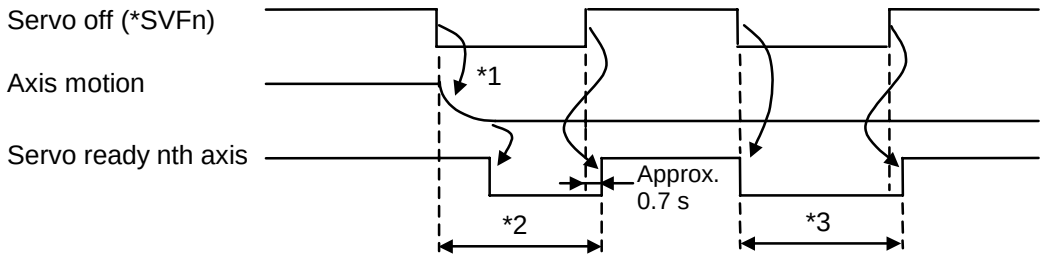
[Operation]

When "Servo off" signal (*SVFn) turns off, the corresponding control axis is set to servo off condition.
Whether displacement which was caused during servo off by external force is corrected when "Servo on" signal is given, or not, can be determined by setting parameter.

(1) When displacement is corrected (follow-up):
- An amount of motion equal to the displacement is commanded so that positioning error becomes zero.
- In this case, machine position remains deviated from in-position when "Servo off" signal is restored.
  The current position read by position counter is corrected and the machine position is corrected when the next absolute motion command is given ("Manual absolute" signal (ABS) is turned on when manual operation is selected).

(2) When displacement is not corrected:
- In this case, machine position should be corrected when "Servo off" signal is restored.

Example) Servo-off during motion



*1: Servo turns off after deceleration and stopping during axis motion.
*2, 3: Controller internal interlock by servo off (axis motion not possible)

[Caution]

These signals are all handled as B contacts.

B contact	Signal name	Signal abbreviation		Device
—	MIRROR IMAGE nTH AXIS	MI1 to 4	P C	Y190 to 3

[Function]

This signal is used to machine a symmetrical shape by reversing the sign for the movement amount per block.

Each control axis is provided with this signal. The last number of signal name indicates No. of control axis.

M I n

1: Mirror image is applied ON 1st axis.
:
:
4: Mirror image is applied ON 4th axis.

[Operation]

Symmetrical cutting is enabled by reversing the sign of the value commanded for memory or MDI operation.

(1) Regardless of whether the coordinate command value is an incremental value or absolute value, the mirror image is applied ON the incremental amount to be executed for all axes that can be controlled.

(Note) The mirror image is changed after block stop.

B contact	Signal name	Signal abbreviation		Device
*	EXTERNAL DECELERATION + n-TH AXIS	*+EDT1 to 4	P C	Y198 to B

[Function]

The feedrate when the control axis is moving in the + direction can be controlled while this signal (*+EDTn) is OFF, at a constant speed set with the parameters.

This signal is present for each control axis. The end numbers in the signal name indicate the control axis No.

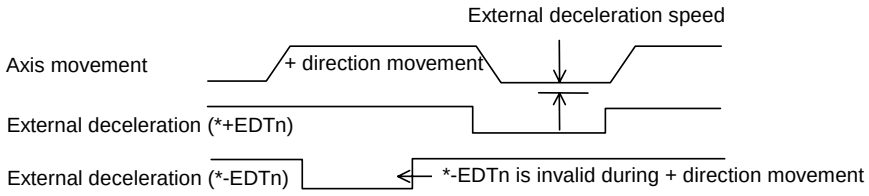
* + E D T n

1 ... The 1st axis is decelerated.
:
:
4 ... The 4th axis is decelerated.

[Operation]

During manual mode when the "External deceleration" signal (*+EDTn) turns OFF, each axis decelerates independently. However, during automatic mode, all axes will decelerate at the same deceleration speed when even one axis matches the external deceleration conditions. The deceleration occurs when the movement axis direction matches the "External deceleration" signal direction of the corresponding axis.

(1) The external deceleration speed can be randomly set with the parameters. (#1216 extdcc)
(2) When the speed is less than the external deceleration speed, it will not be affected even if this signal is OFF.
(3) The deceleration speed during automatic operation will be the combined deceleration speed, if the deceleration conditions match and the external deceleration speed is exceeded.
(4) When returning in the reverse direction, the speed will immediately return to the correct command speed.
(5) For G28, G29 and G30 commands, the speed will become the external deceleration speed for that axis only, even in automatic operation.
(6) The speed will become the external deceleration speed even in rapid traverse during synchronous tapping.



[Caution]

(1) The external deceleration signal is handled as a B contact (*) signal, but changes to 1 (ON) when the power is turned ON. When not being used, it is not necessary be concerned with external deceleration when programming.

B contact	Signal name	Signal abbreviation		Device
*	EXTERNAL DECELERATION -n-TH AXIS	*-EDT1 to 4	P C	Y1A0 to 3

[Function] [Operation]

The functions and operations of this signal are the same as those of "External deceleration + nth axis" signal (*+EDTn). The deceleration occurs when the movement is in the minus direction and the "External deceleration - nth axis" signal (*-EDTn) is OFF.

B contact	Signal name	Signal abbreviation		Device
*	AUTO INTERLOCK + n-TH AXIS	*+AIT1 to 4	PC	Y1A8 to B

[Function]

All axis motions of machine can be decelerated and stopped immediately during automatic operation when motion of a specific axis (n-th axis) in plus direction activates the interlock function.
These signals are for each control axis, and the number at the end of the signal name indicates the control axis No.

*+AITn
- 1 ..... Automatic interlock (+) 1st axis
- :
- :
- 4 ..... Automatic interlock (+) 4th axis

[Operation]

When this signal turns off for a specific axis in motion in the plus direction under automatic operation mode (memory, MDI, tape), motion of all axis decelerates and stops with "M01 operation error code 004" displayed. With this signal set off from the beginning, the system completes calculation for axis motion but makes it remain stopped with the same operation error code displayed. In either case, setting the signal on resumes or starts axis motion.

[Related signals]

Auto interlock, - n-th axis (*-AITn: Y1B0)
Manual interlock, +/- n-th axis (*+/-MITn: Y1B8/Y1C0)

[Cautions]

(1) All automatic interlock signals are for B contact.
(2) The "Automatic interlock" signal is set to 1 when the power is turned on, so an interlock cancel state in the sequence program does not need to be created for the axis not being used.

B contact	Signal name	Signal abbreviation		Device
*	AUTO INTERLOCK - n-TH AXIS	*-AIT1 to 4	PC	Y1B0 to 3

[Function] [Operation]

The details are the same as the "Automatic interlock +nth axis" signal, except that the direction is opposite.
The "Automatic interlock +nth axis" signal is valid for the axis moving in the plus direction, and this signal is valid for the axis moving in the minus direction.
These signals are for each control axis, and the number at the end of the signal name indicates the control axis No.

*-AITn
- 1 ..... Automatic interlock (-) 1st axis
- :
- :
- 4 ..... Automatic interlock (-) 4th axis

[Related signals]

Auto interlock, + n-th axis (*+AITn: Y1A8)
Manual interlock, +/- n-th axis (*+/-MITn: Y1B8/Y1C0)

B contact	Signal name	Signal abbreviation		Device
*	MANUAL INTERLOCK + n-TH AXIS	*+MIT1 to 4	PC	Y1B8 to B

[Function]

When the corresponding axis is moving in the plus direction with manual operation (jog, manual, incremental, reference position return), only the corresponding axis can be decelerated and stopped by turning off this signal that corresponds to that axis.
These signals are for each control axis, and the number at the end of the signal name indicates the control axis No.

*+MITn
- 1 ..... Manual interlock (+) 1st axis
- :
- :
- 4 ..... Manual interlock (+) 4th axis

[Operation]

When this signal turns off (0) for a specific axis in motion in the plus direction under manual operation mode (jog, handle, incremental, reference position return), motion of the axis decelerates and stops with NC alarm "M01 OPERATION ERROR 0004" displayed. With this signal set off from the beginning, the system completes calculation for axis motion but makes it remain stopped with the same operation error code displayed. In either case, setting the signal on (1) resumes or starts axis motion.

[Related signals]

Manual interlock, - n-th axis (*-MITn: Y1C0)
Auto interlock, +/- n-th axis (*+/-AITn: Y1A8/Y1B0)

[Cautions]

(1) All interlock signals are for B contact.
(2) The "Manual interlock" signal is set to 1 when the power is turned on, so an interlock cancel state in the sequence program does not need to be created for the axis not being used.

B contact	Signal name	Signal abbreviation		Device
*	MANUAL INTERLOCK - n-TH AXIS	*-MIT1 to 4	PC	Y1C0 to 3

[Function] [Operation]

The details are the same as the "Manual interlock +nth axis" signal, except that the direction is opposite.
The "Manual interlock +nth axis" signal is valid for the axis moving in the plus direction, and this signal is valid for the axis moving in the minus direction.
These signals are for each control axis, and the number at the end of the signal name indicates the control axis No.

*-MITn
- 1 ..... Manual interlock (-) 1st axis
- :
- :
- 4 ..... Manual interlock (-) 4th axis

[Related signals]

Manual interlock, + n-th axis (*+MITn: Y1B8)
Auto interlock, +/- n-th axis (*+/-AITn: Y1A8/Y1B0)

B contact	Signal name	Signal abbreviation		Device
—	AUTO MACHINE LOCK n-TH AXIS	AMLK1 to 4	PC	Y1C8 to B

[Function]

During automatic operation, current position (counter) can be changed without actual machine motion to check program.
These signals are for each control axis, and the number at the end of the signal name indicates the control axis No.

AMLKn
- 1 ..... Automatic machine lock 1st axis
- :
- 4 ..... Automatic machine lock 4th axis

[Operation]

In the automatic operation (memory, MDI or tape), when this signal is on, the current position (counter) can be changed on a specific axis (for which the signal is on) without actual machine motion. If the signal turns on in the middle of a block (during motion), block termination occurs after the completion of that block, and then the machine lock will be valid for the following blocks.

[Related signal]

Manual machine lock, n-th axis (MMLKn: Y1D0)

[Cautions]

(1) If "Auto machine lock" signal changes during automatic operation, block stop occurs after completion of the block in execution.
(2) To move only the table without drilling to confirm the drilling position, turn on the signal for the 3rd axis (AMLK3) if the drilling axis is the 3rd axis. (Equivalent to Z axis cancel)

B contact	Signal name	Signal abbreviation		Device
—	MANUAL MACHINE LOCK n-TH AXIS	MMLK1 to 4	PC	Y1D0 to 3

[Function]

During manual operation, current position (counter) can be changed without actual machine motion to check program.

[Operation]

When this signal is on, current position can be changed on a specific axis (n-th axis) without actual machine motion. If the signal turns on or off during execution of a block, the operation continues until it is completed. It is required to stop motion of all axes to validate the machine lock.
These signals are for each control axis, and the number at the end of the signal name indicates the control axis No.

MMLKn
- 1 ..... Manual machine lock 1st axis
- :
- 4 ..... Manual machine lock 4th axis

[Related signal]

Auto machine lock, n-th axis (AMLKn: Y1C8)

B contact	Signal name	Signal abbreviation		Device
—	FEED AXIS SELECT + n-TH AXIS	+J1 to 4	—	Y1D8 to B

[Function]

This signal is used to start motion (jog feed, incremental feed or reference position return mode) in plus direction during manual operation.

These signals are for each control axis, and the number at the end of the signal name indicates the control axis No.

+Jn

- 1 ... 1st axis is selected for feed motion
- :
- :
- 4 ... 4th axis is selected for feed motion

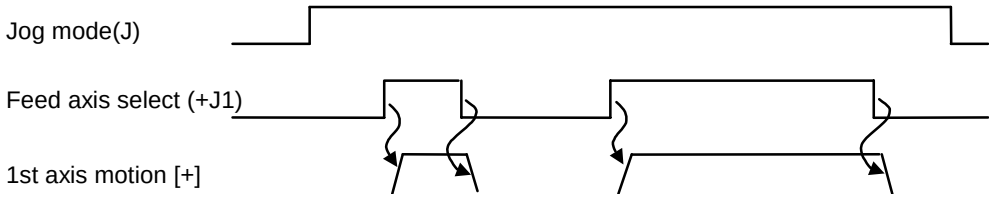
- +... Feed motion in + direction
- - ... Feed motion in - direction

[Operation]

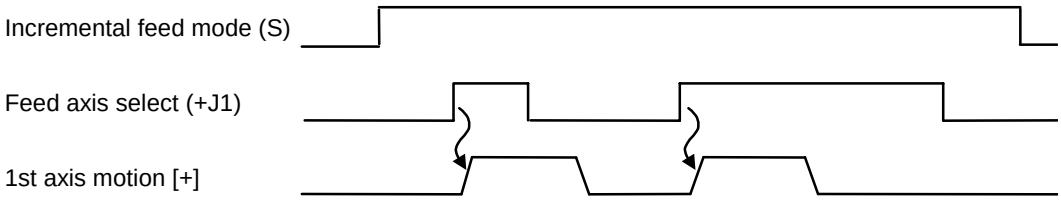
When "Feed axis select" signal (+Jn) turns on, the following motion occurs.

(1) When jog feed, incremental feed or reference position return is possible, motion in plus direction occurs on the selected axis.

(2) In jog feed, motion continues while the signal is on.



(3) In incremental feed, amount (length) of motion depends on setting of "Handle/Incremental feed multiplication". The motion is in plus direction. Even when signal (+Jn) turns off during motion, the motion (feed) does not stop. To start the motion again, turn on the signal after the preceding motion has been completed.



(4) After reference position return mode is decelerated to approach speed by the near point detect dog, the motion continues, even after the feed axis select signal is turned off, until motion reaches the reference position.

Note 1) If feed axis select plus [+] and minus [-] signals turn on at the same time, neither plus signal nor minus signal is selected (same as the case where feed axis select signal is off.)

Note 2) If "Feed axis select" signal turns on before jog, incremental or reference position return mode is selected, the "Feed axis select" signal is ignored. In this case, the signal should be turned off and then on.

Note 3) If reset is exerted while "Feed axis select" signal is on, or "Feed axis select" signal turns on during reset, the "Feed axis select" signal is ignored even when the reset condition is canceled. In this case, the this signal should be turned off and then on.

Note 4) The "Feed axis select" signal will be invalid even if turned on while the corresponding axis is decelerating (when command output is not completed). The signal must be turned off and on again after the deceleration has completed completely (command output is completed). Special care is required when the feed axis direction changes.

[Related signal]

(1) Feed axis select - n-th axis (-Jn: Y1E0)

B contact	Signal name	Signal abbreviation		Device
—	FEED AXIS SELECT - n-TH AXIS	-J1 to 4	—	Y1E0 to 3

[Function]

This signal is used to feed the axis in the minus (-) direction during jog feed, incremental feed or reference position return mode in manual operation.

These signals are for each control axis, and the number at the end of the signal name indicates the control axis No.

(Refer to the "Feed axis selection + n-th axis" for details.)

[Operation]

The operation is the same as the feed axis select (+).

Use this signal to move in the minus (-) direction.

[Related signals]

Feed axis select + n-th axis (+Jn: Y1D8)

B contact	Signal name	Signal abbreviation		Device
—	CHOPPING	CHPS	P C	Y1E8

[Function]

With this function, the chopping axis is always returned independently of the program operation during executing the program.

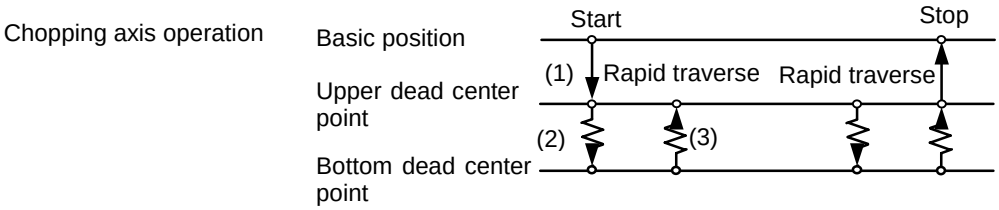
[Operation]

■ Chopping operation start

The chopping mode is entered when the "Chopping" (Y1E8) turns ON, and the chopping operation is started based on the position positioned with the program, etc.

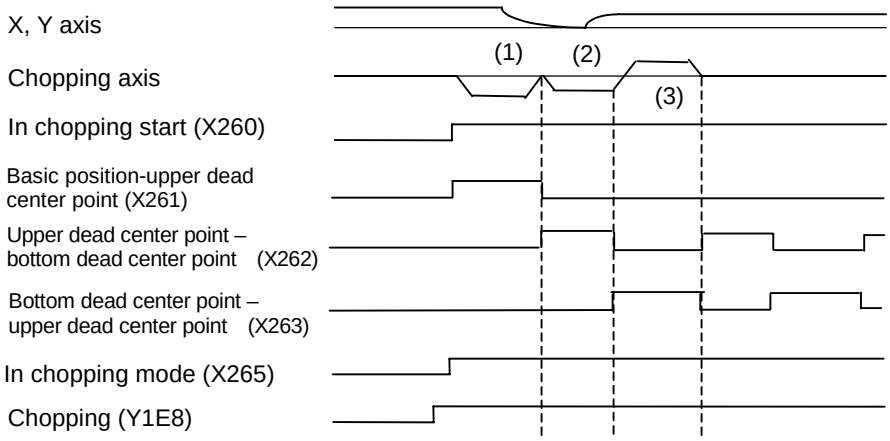
The chopping control sequence is the following.

1) When the chopping axis is not moving, chopping is started immediately.
2) When the chopping axis is moving, chopping is valid from the next block in the automatic mode, and an operation alarm will occur in the manual mode.

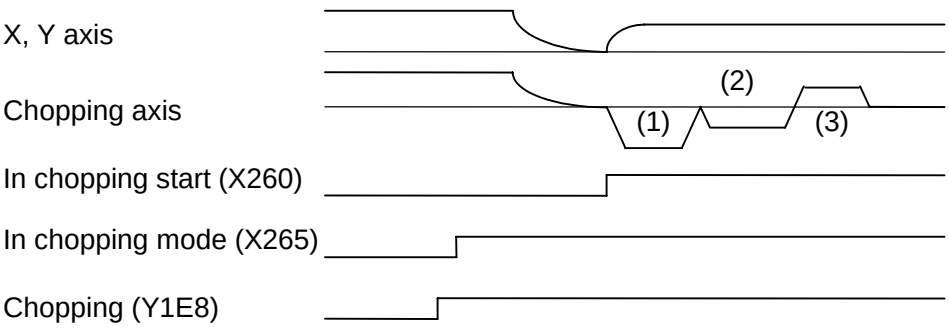


(1) In automatic mode

(a) When the chopping axis is not moving:



(b) When the chopping axis is moving:



The "In chopping start" is entered after the chopping axis movement has been finished.

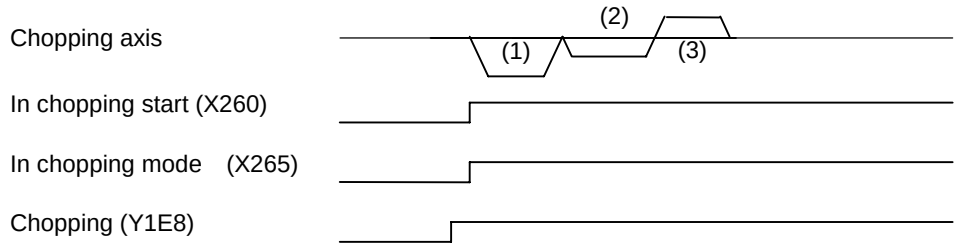
(2) In manual mode

In the jog and step mode, when the chopping axis is not moving, the chopping operation is started when the "Chopping" signal turns ON.

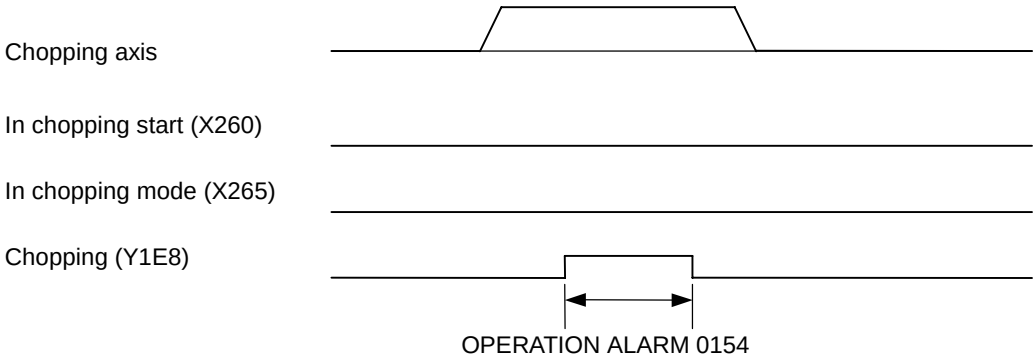
If the "Chopping" signal is turned ON when the chopping axis is moving, the OPERATION ALARM 0154 will occur, and the chopping will not be started.

(The "Chopping" signal's turning ON is ignored.)

(a) When the chopping axis is not moving:



(b) When the chopping axis is moving:



In the handle mode, when the chopping axis is not selected to the handle axis, the chopping operation is started when the "Chopping" signal turns ON

If the "Chopping" signal is turned ON when the chopping axis is selected to the handle axis, the OPERATION ALARM 0154 will occur, and the chopping is not started.

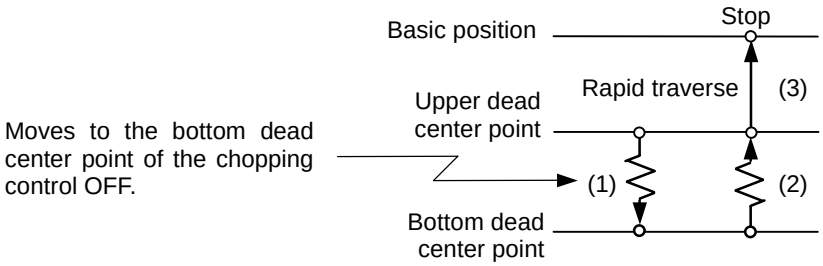
■ Chopping operation stop

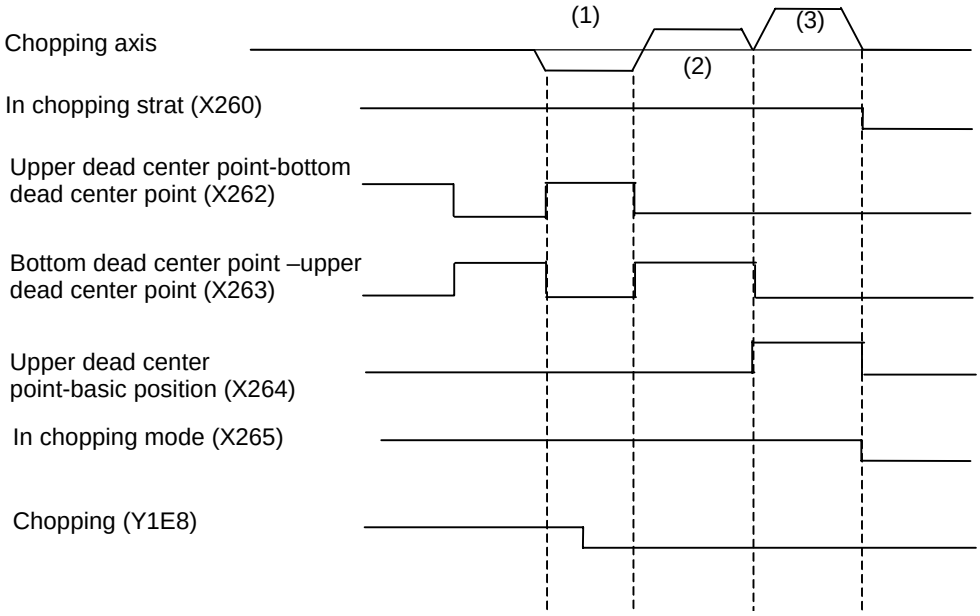
The chopping operation is stopped when the "Chopping" signal from the PLC turns OFF.

The chopping axis moves to the basic position with the rapid traverse after executing the chopping operation to the upper dead center point.

The chopping axis once moves to the bottom dead center point even when moving from the upper dead center point to the bottom dead center point.

Stop operation of chopping axis





The "In chopping start" and the "In chopping mode" signals are turned OFF after return to the basic position completes.

B contact	Signal name	Signal abbreviation		Device
—	MANUAL/AUTO SIMULTANEOUS VALID nTH AXIS	MAE1 to 4	P C	Y1F0 to 3

[Function]

The automatic mode (tape, MDI, memory) and manual mode (handle, step, jog, manual reference position return) can be simultaneously selected allowing manual operation during automatic operation. (Random feed with the PLC is also possible.)

[Operation]

The manual/auto simultaneous mode is entered when the automatic mode and manual mode are selected simultaneously. The manual operation axis is selected with this signal during the manual/auto mode. The manual operation axes are selected individually for the 1st to 4th axes (MAE1 to 4).
The axis selected with this signal can be operated in the manual mode during automatic operation.

Note 1) If an axis command is issued to a manual operation axis from the automatic mode, the "M01 OPERATION ERROR 0005" will occur. The automatic operation will be interlocked until the operation error is canceled.

Note 2) During the automatic mode (when manual is not selected and manual/auto simultaneous mode is not entered), this signal will be invalid and the interlock will not be applied.

Note 3) If this signal turns on in respect to an axis commanded with automatic during the manual/auto simultaneous mode, an interlock will be applied on the axis, and the axis will immediately decelerate and stop. (The "M01 OPERATION ERROR 0005" will occur.)
After decelerating and stopping, operation with the manual mode will be possible. Note that the interlock will also be applied during the tap modal.

Note 4) During the manual/auto simultaneous mode and the automatic mode, the manual axis command for which this signal is off will be invalid. Note that interruption with the manual handle will be possible.

Note 5) The feedrates for the automatic command axis and the manual command axis are different. The acceleration/deceleration mode (rapid traverse, cutting feed) are also independent.

Note 6) The rapid traverse override, cutting feed override and 2nd cutting feedrate override are valid for both the automatic command axis and manual command axis. (Note that the cutting and 2nd cutting overrides to the manual command axis are valid when the manual cutting override is valid.) Override cancel is valid for the automatic command axis.

Note 7) The manual interlock is valid for the manual command axis, and the automatic interlock is valid for the automatic command axis.

Note 8) The in-cutting feed and in-rapid traverse signals will follow the automatic command axis movement mode.

Note 9) The axis moving with manual movement will not stop with single block stop or feed hold.

Note 10) If the G92 and G53 commands are issued in the manual mode to an axis for which this signal is on, the G92 and G53 commands will be executed after the manual axis movement stops. (An axis command with G53 will cause an operation error after the manual axis movement stops.)

Note 11) If a soft limit or OT is applied on the manual command axis during the manual/auto simultaneous mode, the automatic command axis will also decelerate to a stop, and will enter the feed hold state.

<Relation with manual handle interrupt>

The operation of the automatic handle interruption during the manual/auto mode is as follows.

		Axis for which manual/auto simultaneous valid signal is on	Axis for which manual/auto simultaneous valid signal is off
Handle mode selection	Automatic handle interrupt	The specifications of the manual/auto simultaneous mode will be followed. The automatic axis command will cause an operation error, and only the manual axis command will be valid.	The specifications of the automatic handle interruption will be followed. Interruption with the handle can be applied in respect to the automatic axis movement.
Manual mode other than handle		Same as above	Same as above

B contact	Signal name	Signal abbreviation		Device
—	SEARCH & START	RSST	P C	Y1FA

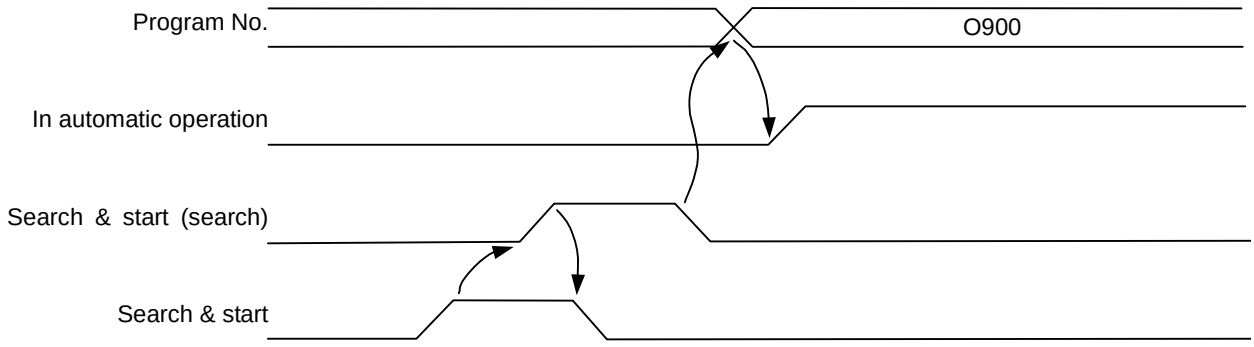
[Function]

This signal is input into the controller when executing operation search in the memory mode and carrying out automatic start up.

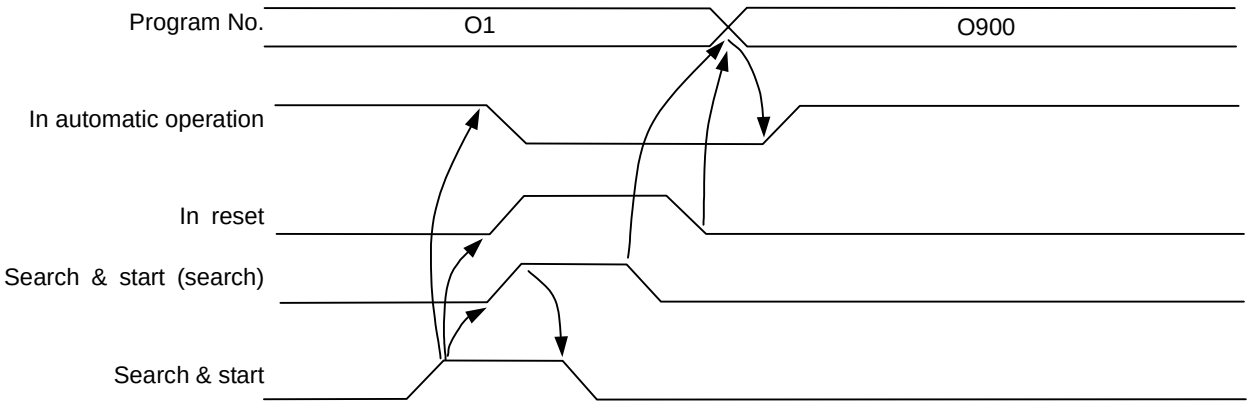
[Operation]

If this signal is input when the memory operation mode is selected, an operation search of the machining program with the designated No. (R170, 171) will be carried out. After the search, the program will be automatically started.
If this signal is input during automatic operation, the program will be reset before the search. After the resetting is completed, the search and automatic start operations will be executed.
Hold the search & start signal until the search & start (search) signal turns ON.

Example) When O900 machining program is designated in a state other than automatic operation, and search & start is executed.



Example) When O900 machining program is designated during operation of the O1 machining program, and search & start is executed.



Note 1) This signal is valid only when the memory mode is selected.
Note 2) An error signal will be output if the machining program No. is not designated or if the designated program No. is illegal (0 or exceeding 99999999).
Note 3) This signal is valid at the rising edge.
Note 4) If this signal is input during resetting, the search & start will not be executed.

[Related signals]
(1) Search & start (program No.) (R170, 171)
(2) Search & start (error) (X1C2)
(3) Search & start (search) (SSG: X1C3)

B contact	Signal name	Signal abbreviation		Device
—	REFERENCE POSITION SELECT 1, 2	ZSL1, 2	P C	Y200, 1

[Function]

It is also possible to return to the n-th reference position in the manual reference position return mode. This signal is used to select the number of the reference position (n) to return to. Normally both the reference position select signals 1 and 2 are turned off, and 1st point reference position return is performed.

[Operation]

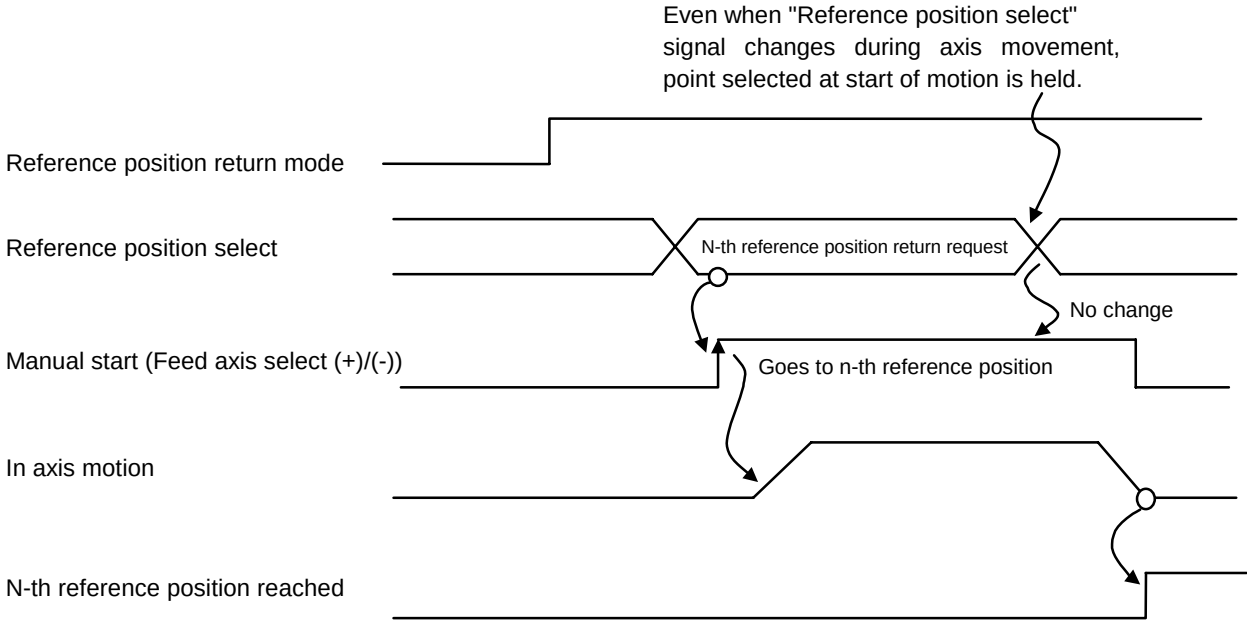
"Reference position select" signal 1, 2 is valid when:

(1) Reference position return mode is on ("1").
(2) Manual start condition is held.

Reference position select 2	Reference position select 1	Return position
0	0	1st reference position
0	1	2nd reference position
1	0	3rd reference position
1	1	4th reference position

Note 1) Returning to the first reference position must be performed before returning to the second, third or forth reference position.

[Operation sequence]



[Related signals]

(1) Reference position return mode (ZRN: Y20C)
(2) Feed axis select (+Jn: Y1D8, -Jn: Y1E0)
(3) N-th reference position reached (ZP11 to 44: X1A0 to X1BB)

B contact	Signal name	Signal abbreviation		Device
—	REFERENCE POSITION SELECT METHOD		P C	Y207

[Function]

This signal selects whether the reference position selection is common for all axes (Y200, Y201) or independent for each axis (R120).

[Operation]

When this signal is OFF, the reference position selection is common for all axes, and Y200 and Y201 are valid.

When this signal is ON, the reference position selection is independent for each axis, and R120 is valid.

[Related signals]

Reference position select 1, 2 (ZSL1, 2: Y200, Y201)

Each axis reference position select (R120)

B contact	Signal name	Signal abbreviation		Device
—	JOG MODE	J	—	Y208

[Function]

JOG operation mode (manual operation) is selected.

[Operation]

When JOG mode signal (J) turns on, JOG operation mode is selected.
Axis motion is started by turning on the "Feed axis select plus (+J1 to 4) or minus (-J1 to 4)" signal after turning on the jog mode and setting the manual feedrate (*JV1 to 16).
For rapid traverse, "Rapid traverse" signal (RT) is turned on together with this signal (J).
If the signal is the same as another operation mode or if it is removed, the NC alarm "M01 OPERATION ERROR 0101" will occur.

[Related signals]

(1) Feed axis select (+J1 to +4: Y1D8, -J1to -4: Y1E0)
(2) Manual feedrate (*JV1 to 16: Y2B0 to Y2B4)
(3) Rapid traverse (RT: Y22E)

B contact	Signal name	Signal abbreviation		Device
—	HANDLE MODE	H	—	Y209

[Function]

"Handle feed operation" mode (manual operation) is selected.

[Operation]

When HANDLE mode signal (H) is turned on, HANDLE FEED mode is selected.
Axis motion starts when the manual pulse generator handwheel is rotated after axis is selected by handle axis select code (HS11 to 116, HS1S, HS21 to 216, HS2S, HS31 to HS316, HS3S) and this signal is turned on. Speed of the axis motion depends on setting of feedrate multiplication (MP1 to 4).
If the signal is the same as another operation mode or if it is removed, the NC alarm "M01 OPERATION ERROR 0101" will occur.

[Related signals]

(1) 1st handle axis No. (HS11 to 116: Y248), 1st handle valid (HS1S: Y24F)
(2) 2nd handle axis No. (HS21 to 216: Y250), 2nd handle valid (HS2S: Y257) ..... Valid only for handle 2-axis spec.
(3) 3rd handle axis No. (HS31 to 316: Y258), 3rd handle valid (HS3S: Y25F) ..... Valid only for handle 3-axis spec.
(4) Handle/Incremental feed multiplication (MP1 to 4: Y2C0 to 2C2)

B contact	Signal name	Signal abbreviation		Device
—	INCREMENTAL MODE	S	—	Y20A

[Function]

INCREMENTAL FEED mode (manual operation) is selected.

[Operation]

When incremental mode command signal (S) is turned on, INCREMENTAL FEED mode is selected.
Each time "Feed axis select" signal (+J1 to 4, -J1 to 4) for desired axis is turned on, axis motion starts. Speed of the axis motion (incremental feed) depends on setting of "Handle/Incremental feed multiplication" (MP1 to 4).
When "Rapid traverse" signal (RT) is on, speed is the rapid traverse speed. When signal (RT) is off, speed is equal to "Manual federate" (*JV1 to 16).
If the signal is the same as another operation mode or if it is removed, the NC alarm "M01 OPERATION ERROR 0101" will occur.

Note 1) The incremental mode is also called the step mode.

[Related signals]

(1) Handle/Incremental feed multiplication (MP1 to 4: Y2C0 to 2C2)
(2) Feed axis select (+J1 to 4: Y1D8, -J1 to 4: Y1E0)
(3) Manual feedrate (*JV1 to 16: Y2B0)
(4) Rapid traverse (RT: Y22E)

B contact	Signal name	Signal abbreviation		Device
—	MANUAL RANDOM FEED MODE	PTP	P C	Y20B

[Function]

MANUAL RANDOM FEED mode in manual operation is selected.

[Operation]

MANUAL RANDOM FEED mode is selected when this signal is turned on ("1").

[Caution]

To turn the MANUAL RANDOM FEED mode on, the rest of the manual modes and the automatic mode must be off (0). Otherwise, this mode cannot be selected. (Note that this mode can be selected simultaneously when manual/automatic simultaneous is valid.)

[Related signals]

(1) Signals from PLC to controller

Device No.	Abbreviation	Signal name	Device No.	Abbreviation	Signal name
Y268	CX11	Manual random feed, 1st axis No.	Y270	CX21	Manual random feed, 2nd axis No.
Y269	CX12		Y271	CX22	
Y26A	CX14		Y272	CX24	
Y26B	CX18		Y273	CX28	
Y26C	CX116		Y274	CX216	
Y26D		(Always "0")	Y275		(Always "0")
Y26E		(Always "0")	Y276		(Always "0")
Y26F	CX1S	Manual random feed 1st axis valid	Y277	CX2S	Manual random feed 2nd axis valid

Device No.	Abbreviation	Signal name	Device No.	Abbreviation	Signal name
Y278	CX31	Manual random feed, 3rd axis No.	Y280	CXS1	Smoothing off
Y279	CX32		Y281	CXS2	Axis independent
Y27A	CX34		Y282	CXS3	EX. F/MODAL.F
Y27B	CX38		Y283	CXS4	G0/G1
Y27C	CX316		Y284	CXS5	MC/WK
Y27D		(Always "0")	Y285	CXS6	ABS/INC
Y27E		(Always "0")	Y286	*CXS7	Stop
Y27F	CX3S	Manual random feed 3rd axis valid	Y287	CXS8	Strobe

Device No.	Abbreviation	Signal name
R140		Handle/Incremental feed multiplication
R141		
R142		Manual random feed 1st axis movement data
R143		
R144		Manual random feed 2nd axis movement data
R145		
R146		Manual random feed 3rd axis movement data
R147		

(2) Signals from controller to PLC
- (a) In manual random feed mode (PTPO: X1E3)
- (b) In manual random feed (CXN: X1F6)
- (c) Manual random feed complete (CXFIN: X1FC)

(3) Other:
- (a) Feedrate least increment (PCF1: Y2B8, PCF2: Y2B9)
- (b) Manual/automatic simultaneous valid n-th axis (MAE1~4)

B contact	Signal name	Signal abbreviation		Device
—	REFERENCE POSITION RETURN MODE	ZRN	—	Y20C

[Function]

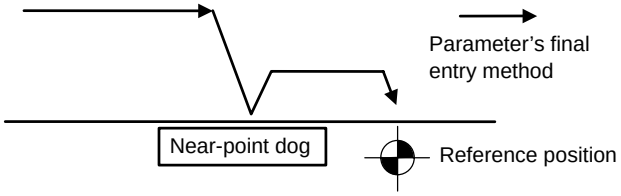
REFERENCE POSITION RETURN mode is selected.
"Reference position return" is that axis motion component (tool, table, etc.) is returned to the position previously determined for individual machine.

[Operation]

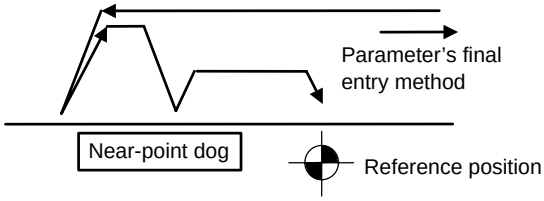
The reference position return mode is selected when the "Reference position return mode" signal (ZRN) is turned on.
Select the reference position return mode, and turn on the "Feed axis select" signal (+J1 to 4 -J1 to 4 of designated axis to return to the reference position.
If the signal is the same as another operation mode or if it is removed, the NC alarm "M01 OPERATION ERROR 0101" will occur.
The first reference position return after the controller power is turned on is the dog-type return (excluding when the basic machine coordinate system is established for the absolute position detection specifications). After the second manual reference position return (when basic machine coordinate system is established), the dog-type or high-speed return is selected with the setup parameters, basic specification parameter "#1063 mandog".

(1) Dog-type reference position return pattern
The return pattern is determined by the final entry method of the setup parameter reference position return.

(a) Operation when axis is moved in same direction as the final entry method, and dog is tripped.



(b) When axis is moved in opposite direction from final entry method, and dog is tripped.



- After the near-point dog is detected and the approach speed is applied, the axis will move to the reference position even if the "Feed axis select" signal is turned off. Thus, after the approach speed is applied, another axis can be switched to and reference position return executed.
- The entry direction (final entry direction) after the near-point dog is tripped is set with parameters.
- The feedrate before the approach speed is the reference position return feedrate if the "Rapid traverse" signal (RT) is on, and the "Manual feedrate" (*JV1 to 16) is off.
- The approach speed is set with the parameters.
- When the reference position is reached, the movement will stop even if the feed axis select signal is on, and the "1st reference position reached" signal (ZP1n) will turn on.

(2) High-speed reference position return
- The axis will move toward the reference position. The motion speed will be rapid traverse if the rapid traverse signal is on, and manual feedrate if off.
- When the reference position is reached, the movement will stop even if the feed axis select signal is on, and the "1st reference position reached" signal (ZP1n) will turn on.
- The feed axis select signal for high-speed return is valid only in the reference position direction. If the opposite direction signal is designated, the NC alarm "M01 Operation error 0003" will occur.

[Related signals]
(1) Feed axis select (+J1 to 4: Y1D8, -J1 to 4: Y1E0)
(2) Manual feedrate (*JV1 to 16: Y2B0)
(3) Rapid traverse (RT: Y22E)
(4) 1st reference position reached (ZP11 to 14: X1A0 to 1A3)

B contact	Signal name	Signal abbreviation		Device
—	AUTOMATIC INITIALIZATION MODE	AST	PC	Y20D

[Function]
The automatic initialization mode is selected.

[Operation]
This mode is selected when automatic initialization is to be carried out with the machine end stopper method of absolute position detection.
The initialization is started when the automatic initialization mode is selected, and the "Feed axis select" (+Jn, -Jn) signal in the direction of the machine end of the axis to be initialized is turned on.

Note 1) The automatic initialization mode is invalid when the absolute position detector is not provided and when the machine end stopper method is not selected for the absolute position detection. (During feed axis selection, "M01 OPERATION ERROR 0024" will occur.)

Note 2) This mode will not start in the following cases of the machine end stopper method absolute position detection.
(The message "Start not possible" will display.
• When #0 "INIT. SET" on the [ABS. POSITION SET] screen is not set to "1".
• When #2 "ZERO" on the [ABS. POSITION SET] screen has not been set.
• When #2055 [pushf] on the [ABS. POSI PARAM] screen has not been set.
• When "Z71 DETECTOR ERROR 0005" has occurred.

B contact	Signal name	Signal abbreviation		Device
—	MEMORY MODE	MEM	—	Y210

[Function]

MEMORY mode of automatic operation is selected.
In this mode of operation, automatic operation is based on programs stored in the memory.

[Operation]

- MEMORY mode is selected when "Memory mode" signal (MEM) turns on.
- The program is started with the "Auto operation "start" command" signal (ST).
- If the automatic operation mode is duplicated or canceled during automatic operation, the NC alarm "M01 OPERATION ERROR 0101" will occur, and the block will stop.
- If the manual operation mode is entered or the program is duplicated with the manual operation mode during automatic operation, the NC alarm will occur, and automatic operation will stop. However, the manual and automatic programs can be duplicated if manual/automatic simultaneous operation is valid.

Note 1) Even when operation mode is other than automatic operation, illegal mode, if selected, causes operation error.

[Related signals]

Auto operation "start" command (ST: Y218)
Auto operation "pause" command (*SP: Y219)

B contact	Signal name	Signal abbreviation		Device
—	TAPE MODE	T	—	Y211

[Function]

TAPE mode of automatic operation is selected.
In this mode of operation, automatic operation is based on tape command (RS232-C input) programs stored in NC tape.

[Operation]

- Tape mode is selected when "Tape moe" (T) signal turns on.
- The program is started with the "Auto operation "start" command" signal (ST).
- If the automatic operation mode is duplicated or canceled during automatic operation, the NC alarm "M01 OPERATION ERROR 0101" will occur, and the block will stop.
- If the manual operation mode is entered or the program is duplicated with the manual operation mode during automatic operation, the NC alarm will occur, and automatic operation will stop. However, the manual and automatic programs can be duplicated if manual/automatic simultaneous operation is valid.

Note 1) Even when operation mode is other than automatic operation, illegal mode, if selected, causes operation error.

[Related signals]

Auto operation "start" command (ST: Y218)
Auto operation "pause" command (*SP: Y219)

B contact	Signal name	Signal abbreviation		Device
—	MDI MODE	D	—	Y213

[Function]

MDI (Manual Data Input) mode of automatic operation is selected.
Automatic operation is performed with the program set in the MDI screen.

[Operation]

- MDI mode is selected when "MDI mode" (D) signal turns on.
- The program is started with the "Auto operation "start" command" signal (ST).
- If the automatic operation mode is duplicated or canceled during automatic operation, the NC alarm "M01 OPERATION ERROR 0101" will occur, and the block will stop.
- If the manual operation mode is entered or the program is duplicated with the manual operation mode during automatic operation, the NC alarm will occur, and automatic operation will stop. However, the manual and automatic programs can be duplicated if manual/automatic simultaneous operation is valid.

Note 1) Even when operation mode is other than automatic operation, illegal mode, if selected, causes operation error.

[Related signals]

Auto operation start command (ST: Y218)
Auto operation "pause" command (*SP: Y219)

B contact	Signal name	Signal abbreviation		Device
—	AUTO OPERATION "START" COMMAND (Cycle start)	ST	—	Y218

[Function]

This signal is used to start automatic operation in MEMORY mode, MDI mode or TAPE mode, or to restart after automatic operation pause (halt) or block stop.

[Operation]

(1) "Auto operation "start" command" (ST) signal arises when the pressed "auto operation start" pushbutton is released (i.e. at the time the signal turns off). The signal must be on for a min. of 100msec.
(2) "In auto operation "start"" signal (status signal "STL") turns on when the pressed "auto operation start" pushbutton is released, and turns off when "auto operation pause (or halt)" pushbutton is pressed or block stop occurs in single-block operation.
(3) Signal (ST) is invalid when:
    - Automatic operation starts.
    - "Auto operation "pause" command" (*SP) signal is off.
    - During reset ("Reset & rewind" signal is on).
    - During alarm.
    - Sequence No. is being searched for.

(4) Automatic operation stops or is suspended or block stops when:
- "Auto operation "pause" command" (*SP) signal turns off.
- Reset occurs ("Reset & rewind" signal turns on).
- Alarm which causes stop to automatic operation occurs.
- Automatic operation mode is changed to manual operation mode.
- Mode is changed to other automatic operation mode and then the block in execution is completed.
- Block in execution is completed after "Single-block" (SBK) signal turns on.
- Block in execution is completed after "Auto machine lock" signal (AMKL) turns on.
- Program specified in MDI mode has been executed completely.

[Related signals]

Memory mode (MEM: Y210)
Tape mode (T: Y211)
MDI mode (D: Y213)

B contact	Signal name	Signal abbreviation		Device
*	AUTO OPERATION "PAUSE" COMMAND (Feed hold)	*SP	—	Y219

[Function]

During automatic operation, axis motion can be decelerated and stopped with this command signal. To restart, press "Auto operation "start" command" (ST) signal pushbutton.

[Operation]

(1) When "Auto operation "pause" command" (*SP) signal turns off, automatic operation stops.
- During automatic operation, the operation stops. "In auto operation "pause"" (SPL) occurs.
- Restart with the automatic start (ST) button. (Press after turning *SP signal.)

(2) In the following cases, automatic operation does not immediately stop.
- During tapping in fixed cycle.
  Automatic operation stops when tapping is completed and the tool returns to "R" point.
- During thread cutting.
  Automatic operation stops when a block for axis motion (other than thread cutting), which comes first after the "Auto operation "pause" command" (*SP) signal turns off, is completed. If the "Auto operation "pause" command" (*SP) signal remains off, however, automatic operation stops immediately after a block (other than thread cutting) is given.
- When control variable "feed hold invalid" has been set by user macro.
  Automatic operation stops immediately after a block where the control variable "feed hold invalid" is cleared starts.

(3) "Auto operation "pause" command" (*SP) signal is valid even during machine lock.

[Related signals]

Memory mode (MEM: Y210)
Tape mode (T: Y211)
MDI mode (D: Y213)
Auto operation "start" command (ST: Y218)

B contact	Signal name	Signal abbreviation		Device
—	SINGLE BLOCK	SBK	—	Y21A

[Function]

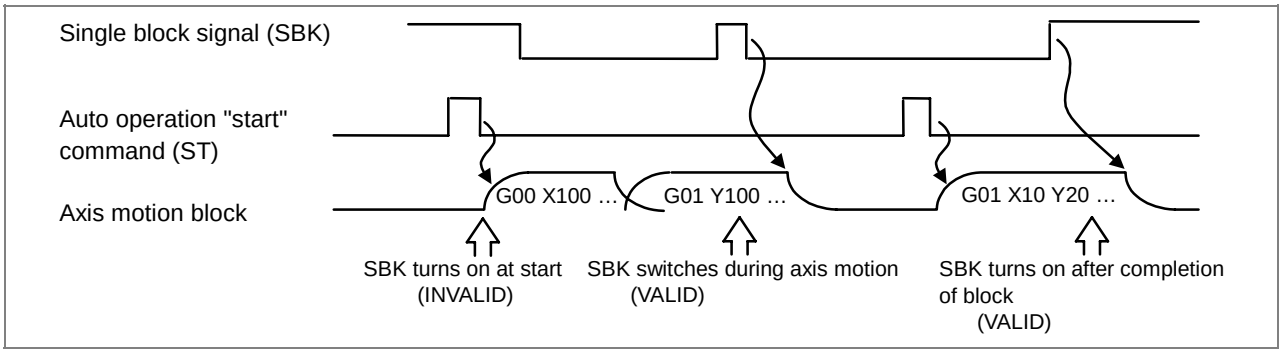
Machining program can be executed block by block in automatic operation.

[Operation]

(1) When "Single block" signal (SBK) turns on, operation of controller is as follows:
- During automatic operation
  After the block in execution has been completed, automatic operation stops. To start execution of the next block, "Auto operation "start" command" (ST) must be turned on to off.
- There will be no operation when automatic operation is not being executed but if automatic operation is started with the "Single block" signal (SBK) on, one block will be executed and then will stop. This allows the commanded program to be executed one block at a time.

(2) If the "Single block" signal (SBK) is on at the end of a block, operation will normally stop immediately. However, in the following case, operation will continue to where stopping is possible, and then will stop.
- During cycle operation such as a fixed cycle. The block where single block is being received will differ according to each cycle. Refer to the cycle sections in the Programming Manual.

<Example of operation pattern>



B contact	Signal name	Signal abbreviation		Device
*	BLOCK START INTERLOCK	*BSL	—	Y21B

[Function]

This signal prohibits start of the next block in automatic operation (memory, MDI or tape).

[Operation]

While the "Block start interlock" (*BSL) signal is off, execution of the next block may not be started in automatic operation. When the signal is given during execution of a block, the execution of the block continues until it is completed. Since the signal does not cause stop or suspension of automatic operation, execution of program starts when the "Block start interlock" (*BSL) signal turns on.

Note 1) This signal is valid to all blocks including blocks internally generated in controller by canned cycle, etc.

Note 2) The signal (*BSL) is on when the power is turned on. When the signal is not used, programming on the PLC is not required for this signal.

[Related signal]

(1) Cutting block start interlock (*CSL: Y21C)

B contact	Signal name	Signal abbreviation		Device
*	CUTTING BLOCK START INTERLOCK	*CSL	—	Y21C

[Function]

This signal prohibits start of an axis motion command block other than that for positioning in automatic operation (memory, MDI, tape).

[Operation]

While the "Cutting block start interlock" (*CSL) signal is off, execution of an axis motion command block other than that for positioning may not be started in automatic operation. When the signal is given during execution of a block, the execution of the block continues until it is completed. Since the signal does not cause stop or suspension of automatic operation, execution of program starts when the "Cutting block start interlock" (*CSL) signal is turned on.

Note 1) This signal is valid to all blocks including blocks internally generated by fixed cycle, etc.
Note 2) The signal (*CSL) is on when the power is turned on. When the signal is not used, programming on the PLC is not required for this signal.

[Related signal]

(1) Block start interlock (*BSL: Y21B)

B contact	Signal name	Signal abbreviation		Device
—	DRY RUN	DRN	—	Y21D

[Function]

Feedrate in automatic operation is specified by manually set value instead of program command value (F value).

[Operation]

(1) DRY RUN signal given during cutting feed
- When "Rapid traverse" (RT) signal is on, the cutting feedrate is equal to the maximum cutting feedrate.
  In this case, "cutting feedrate override" and "rapid traverse override" are ignored.
- When "Rapid traverse" (RT) signal is off, the set manual feedrate (*JV1 to 16) will apply. Cutting feed override will also be valid if the "Manual override valid" (OVSL) signal is on.

(2) Dry run signal given during rapid traverse
- The parameter must be turned on to validate dry run for rapid traverse (G0, G27, G28, G29, G30).
- When "Rapid traverse" (RT) signal is on, the "Dry run" signal is ignored.
- When "Rapid traverse" (RT) signal is off, the speed is equal to manually set speed.

Note 1) Dry run is not applicable to manual operation.
Note 2) Dry run is valid even during G84 or G74 operation.

[Related signals]

(1) Manual feedrate (*JV1 to 16: Y2B0)
(2) Rapid traverse (RT: Y22E)
(3) Manual feedrate override valid signal (OVSL: Y299)

B contact	Signal name	Signal abbreviation		Device
—	ERROR DETECT	ERD	—	Y21F

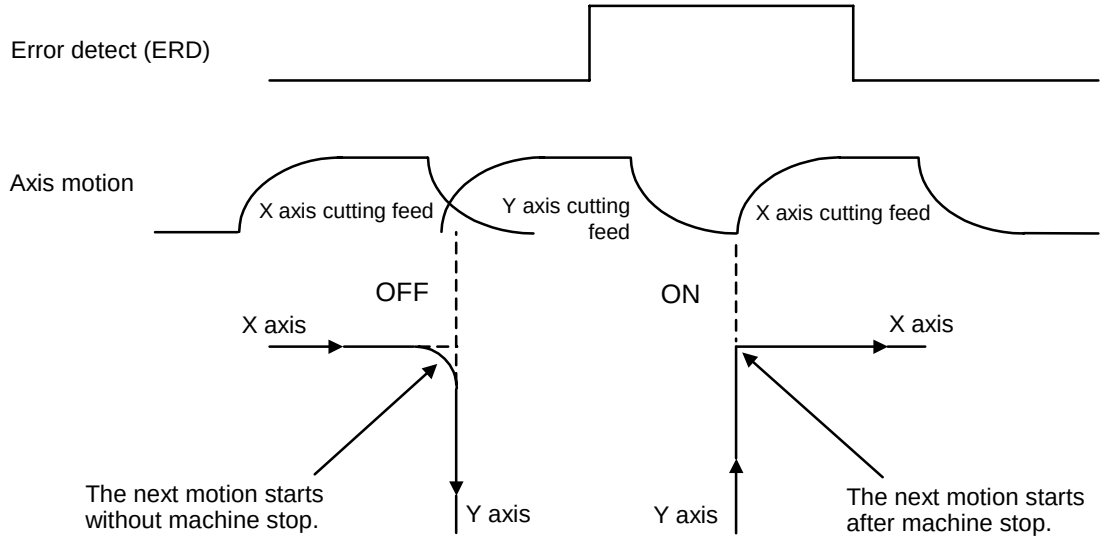
[Function]

Machine motion is stopped momentarily in transition from a cutting feed block to other block during automatic operation to provide time for determination whether in-position check is made or not before start of the next block.

Block-to-block transition may cause rounding in cutting because of delay caused by acceleration or deceleration, and servo response delay. Rounding can be eliminated by stopping the machine motion between the blocks by turning the "Error detect" signal (ERD) on.

[Operation]

When this "Error detect" signal (ERD) is on in block-to-block transition during cutting in automatic operation, in-position check is accomplished. If the signal is off, the next block starts after completion of the preceding block without stop.



Note 1) In general practice, the signal (ERD) is turned on and off using an appropriate miscellaneous function (M code, etc.) so that command program can determine whether machine motion should be stopped or not. When the signal is on, the status is same as the case where G09 is specified by the command program. Consequently, it is recommended to use G function unless otherwise required especially.

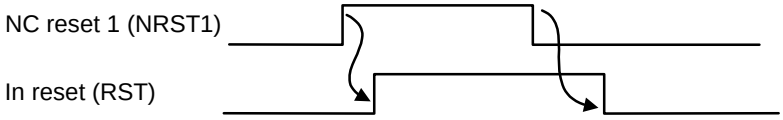
B contact	Signal name	Signal abbreviation		Device
—	NC RESET 1	NRST1	PC	Y220

[Function]

This signal is used to reset the control unit.

[Operation]

When this signal (NRST1) is turned ON, the control unit can be reset.
Generally, the signal for the reset button of the NC operation board is set to "NC reset 1" (NRST1). At this time, the control unit will take the following actions.
(1) The G command modal will be held.
(2) The tool compensation data will be held.
(3) The memory will be indexed.
(4) The error/alarm will be reset.
(5) The MST code output will be held.
(6) The M code independent output (M00, M01, M02, M30) will turn OFF.
(7) The axis movement will stop.
(8) The "In reset" signal (RST) will be output.



[Related signals]

NC reset 2 (NRST2:Y221)
Reset & rewind (RRW:Y222)
In "reset" (RST:X1F5)

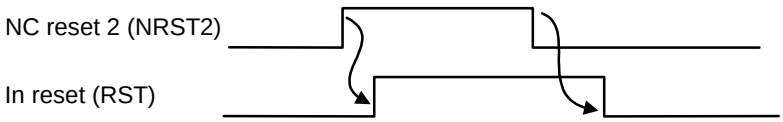
B contact	Signal name	Signal abbreviation		Device
—	NC RESET 2	NRST2	PC	Y221

[Function]

This signal is used to reset the control unit.

[Operation]

When this signal (NRST2) is turned ON, the control unit can be reset.
Generally, this is turned ON when the miscellaneous function M02 or M30 is executed. In some cases, the "Reset & Rewind" (RRW) explained later is used.
At this time, the control unit will take the following actions.
(1) The G command modal will be initialized.
(2) The tool compensation data will be canceled. (Will not be applied.)
(3) The memory will not be indexed.
(4) The error/alarm will be reset.
(5) The MST code output will be held.
(6) The M code independent output (M00, M01, M02, M30) will turn OFF.
(7) The axis movement will stop.
(8) The "In reset" signal (RST) will be output.



[Related signals]

NC reset 1 (NRST1:Y220)
Reset & rewind (RRW:Y222)
In “reset” (RST:X1F5)

B contact	Signal name	Signal abbreviation		Device
—	RESET & REWIND	RRW	—	Y222

[Function]

This signal resets the controller.
During memory operation, the head of the machining program currently being run can be called out.
The reset key (X108) in the keyboard unit is also set to Y222 by the sequence program.

[Operation]

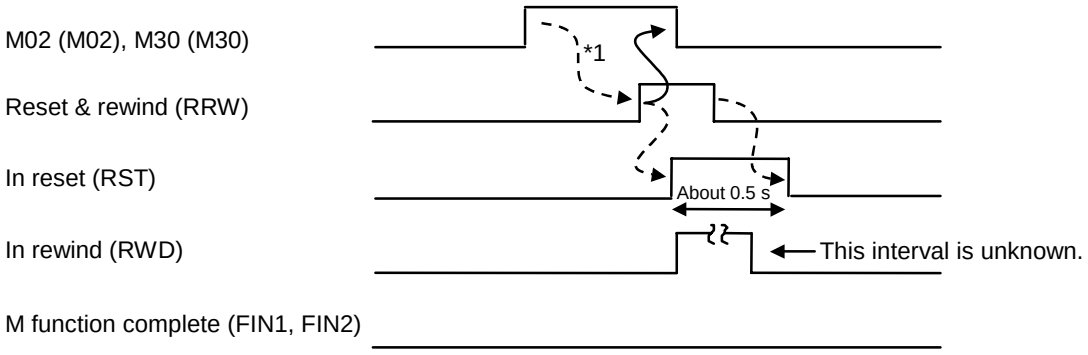
When this signal (RRW) turns on:

(1) Ongoing axis motion is decelerated and stopped.
(2) CNC is reset after axis motion stops. In about 0.5 second after CNC is reset, "In reset" signal (status signal RST) turns on.
(3) At the same time as CNC is reset, "In rewind" (RWD) signal turns on.
  • In memory operation mode, the head of program in execution is read (memory index).
(4) While the signal (RRW) is on, automatic operation and manual operation are impossible.
(5) G command modal is initialized.
(6) Tool compensation (offset) data are canceled (no motion).
(7) Error/alarm is reset.
(8) M, S, T code outputs are held. (strobe signal turns off)
(9) M code independent output (M00, M01, M02 and M30) is turned off.

<Operation example>

The process when M02 or M30 are commanded in the program is shown below.

Generally, when M02 (or M30) is executed by the program, this signal (RRW) will be returned when the designated operation is completed. M function finish 1 (FIN1) and M function finish 2 (FIN2) will not be returned.
(Refer to *1 in the following drawing.)



[Related signals]

In reset (RST: X1F5)
In rewind (RWD: X1F7)

B contact	Signal name	Signal abbreviation		Device
*	CHAMFERING	*CDZ	P C	Y223

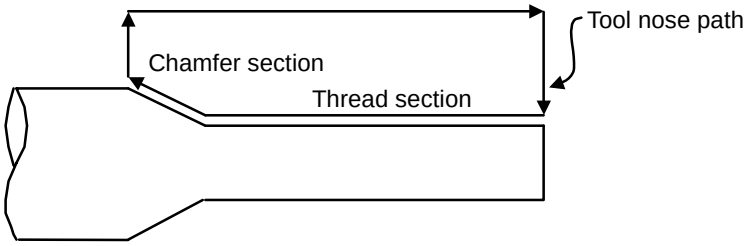
[Function]

In thread cutting cycle, chamfering can be ignored.

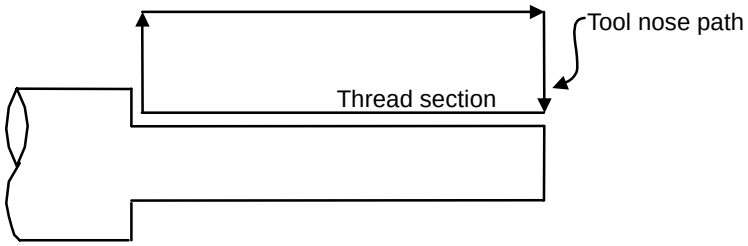
[Operation]

Status of this signal is determined at start of thread cutting cycle.

• CHAMFERING (*CDZ) is off.
Chamfering (at end of thread cutting) is accomplished.



• CHAMFERING (*CDZ) is on.
Chamfering is not accomplished (signal is ignored).



B contact	Signal name	Signal abbreviation		Device
—	AUTO RESTART	ARST	P C	Y224

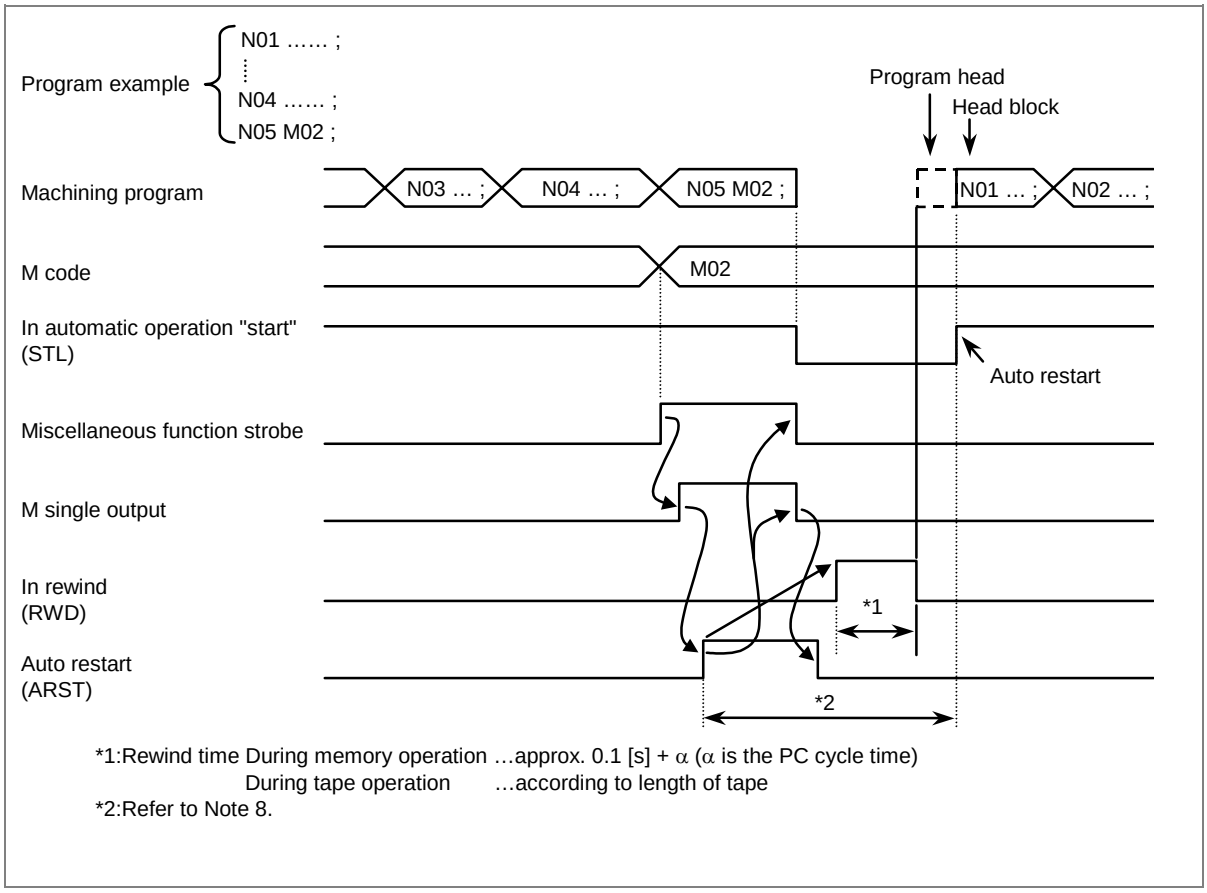
[Function]

If this signal is turned on after the end of the machining program execution, the same machining program will be restarted.

[Operation]

The same machining program will restart if this signal is turned on during automatic start.

[Time chart]



*1:Rewind time During memory operation …approx. 0.1 [s] + α (α is the PC cycle time)
During tape operation …according to length of tape
*2:Refer to Note 8.

Note 1) The modal is initialized with this signal.
Note 2) This signal is valid only during automatic start.
Note 3) This signal is valid during the memory and MDI automatic operation modes.
Note 4) Normally, "M code independent output" signal for M02 or M30 is input into this signal, but in this case, do not input the M02 or M30 completion signal (FIN1, FIN2).
Note 5) If the "Auto operation "pause" command" (*SP) signal is valid, the "Auto restart" signal will be invalid.
Note 6) This signal is invalid during single block stop.
Note 7) Note that if an M command other than M02 or M30 is input into this signal, the program will return to the start point without completing the program, and the program will be restarted.
Note 8) If "Reset & rewind" (RRW) are applied during the auto restart process (*2 section in time chart above), the modal will be initialized and the tape will be rewound, but the "Auto restart" signal will be invalid.

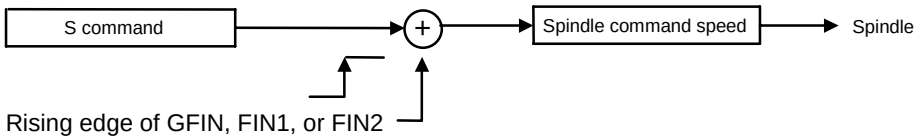
B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	GEAR SHIFT COMPLETE	GFIN	—	Y225	Y5E5

[Function]

This signal changes the spindle speed to the speed (S command) specified in the machining program. This signal is used to smoothly perform the spindle speed (S analog, etc.) control.

[Operation]

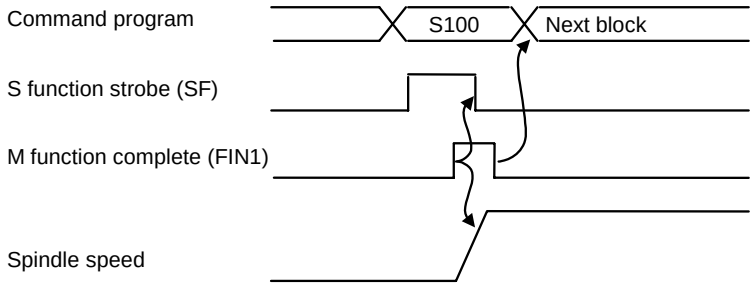
To change the spindle speed to the speed specified by the S command during automatic operation (memory, MDI, or tape), it is needed to turn on the "Gear shift complete" (GFIN), or "M function finish 1 (FIN1, FIN2)" signal.



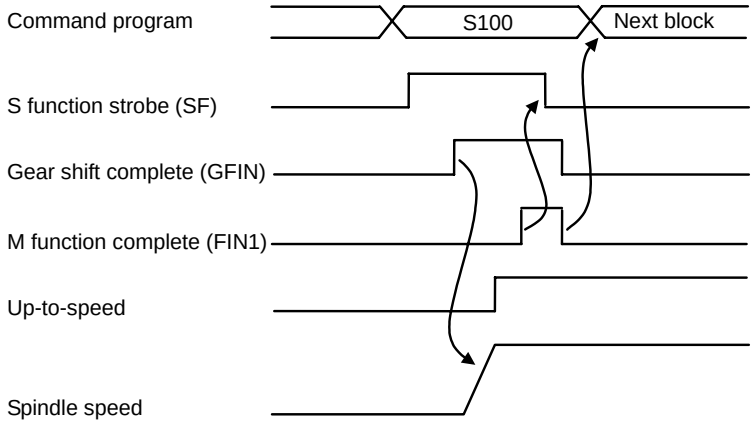
When using the "Gear shift complete" signal, the following two conditions should be considered:

- Whether gear shift (gear change) is applicable (whether there are two or more states of gear shift).
- Whether "Up-to-speed" signal output from the spindle controller is used for verification of spindle speed.

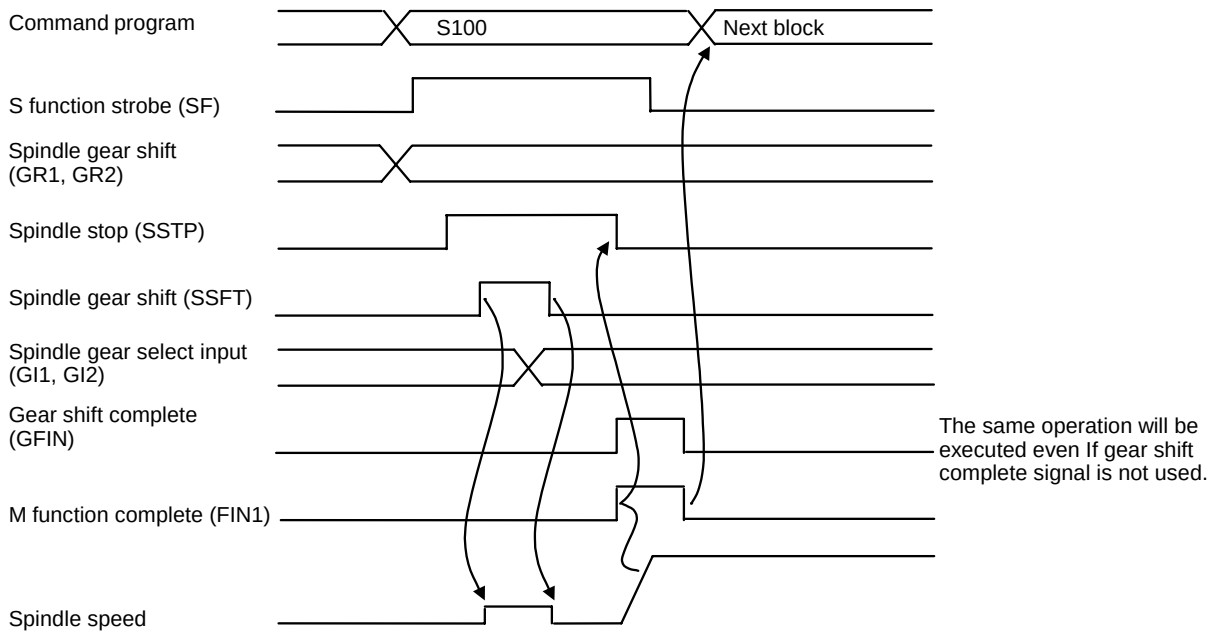
Operation example 1) There is no gear shift and the "Up-to-speed" signal is not used.



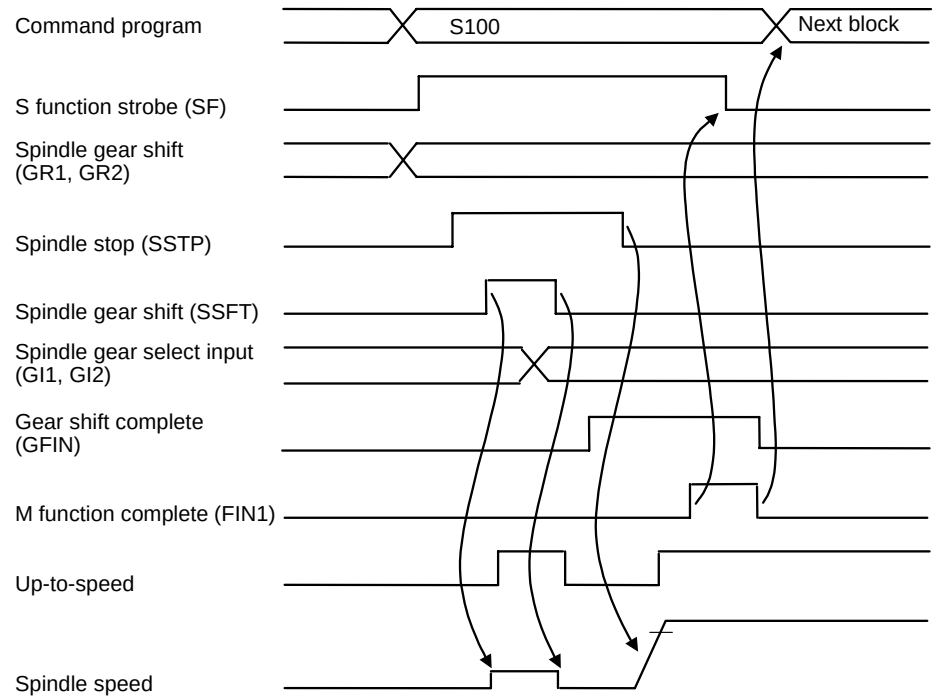
Operation example 2) There is no gear shift, but the "Up-to-speed" signal is used.



Operation example 3) There is gear shift, but the "Up-to-speed" signal is not used.



Operation example 4) There is gear shift and "Up-to-speed" signal are used.



[Related signals]

(1) S function strobe1, 2 (SF1: X234)
(2) Spindle gear shift (GR1, GR2: X225, X226)
(3) M function finish (FIN1, FIN2: Y226, Y227)
(4) Spindle gear selection input (GI1, GI2: Y290, Y291)
(5) Spindle stop (SSTP: Y294), Spindle gear shift (SSFT: Y295)

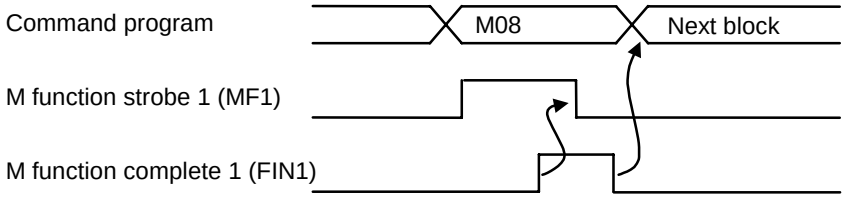
B contact	Signal name	Signal abbreviation		Device
—	M FUNCTION FINISH 1	FIN1	—	Y226

[Function]

This status signal informs the controller that specified miscellaneous (M) function, spindle (S) function, tool (T) function or 2nd miscellaneous function (A, B or C) is accomplished on the PLC side.

[Operation]

If the M, S, T or 2nd M function command is executed during automatic operation, the code and each function strobe (MF1 to 4, SF1 to 2, TF1, BF1) will turn on.
When the PLC verifies that one or more M, S, T and/or B function has been specified, it performs that function(s) and, after completion of the function(s), "M function finish 1" (FIN1) signal turns off.
When the controller verifies that signal FIN1 turns on, it turns off strobe signal of corresponding function.
The PLC checks that each strobe signal turns off, then turns off FIN1. With the signal FIN1 turned off, the controller proceeds to the next block.
An example of timing chart, where M function is specified, is as follows:



There are two "M function finish" signals, namely, "M function finish 1" and "M function finish 2" (Refer to the next page). The only difference is if the next block is proceeded to at the falling edge or at the rising edge. These can be used separately per operation in one PLC.

Note 1) "M function finish" (FIN1) signal is common to M, S, T and B functions.
Note 2) The "M function finish 1" signal is also the signal for upgrading the spindle speed output (S analog data, etc.) during S function execution.
Note 3) If signal FIN1 has been on before M, S, T or B function is specified, data pertinent to M, S, T or B function are not output. To output, the signal FIN1 should be turned off once.
Note 4) When "Reset & rewind" (RRW) signal is sent to the controller by M02 or M30, "M function finish 1 or 2" signal should not be sent back. If the "M function finish 1 (2)" signal is return with the M02 command at the end of the machining program, the NC alarm program error (P36) will occur.

[Related signals]

(1) M function finish 2 (FIN2: Y227)
(2) M function strobe 1 to 4 (MF1 to 4: X230)
(3) S function strobe 1 to 2 (SF1 to 2: X234)
(4) T function strobe 1 (TF1: X238)
(5) 2nd M function strobe 1 (BF1: X23C)
(6) M, S, T, B function data (output to file register R: R20 and later)
(7) Reset & rewind (RRW: Y222)

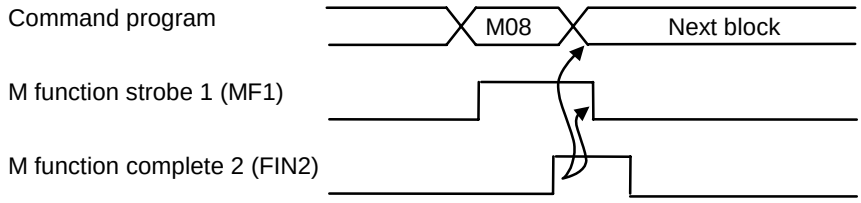
B contact	Signal name	Signal abbreviation		Device
—	M FUNCTION FINISH 2	FIN2	—	Y227

[Function]

This status signal informs the controller that specified miscellaneous (M) function, spindle (S) function, tool (T) function or 2nd miscellaneous function (A, B or C) is accomplished on the PLC side. When too much signals FIN1 must be used, this signal can be used instead of signal FIN1 to save time.

[Operation]

If the M, S, T or 2nd M function command is executed during automatic operation, the code and each function strobe (MF1 to 4, SF1 to 2, TF1, BF1) will turn on.
When the PLC verifies that one or more M, S, T and/or 2nd M function has been specified, it performs that function(s) and, after completion of the function(s), "M function finish 2" (FIN2) signal turns on.
When the controller verifies that signal FIN2 turns on, it turns off strobe signal of corresponding function.
When each strobe signal turns off, the PLC turns off signal FIN2. With the signal FIN2 turned off, the controller proceeds to the next block.
An example of timing chart, where M function is specified, is as follows:



There are two "M function finish" signals, namely, "M function finish 1" (refer to the previous page) and "M function finish 2". The only difference is if the next block is proceeded to at the falling edge or at the rising edge. These can be used separately per operation in one PLC.

Note 1) "M function finish 2" (FIN2) signal is common to M, S, T and B functions.
Note 2) The "M function finish 2" signal is also the signal for upgrading the spindle speed output (S analog data, etc.) during S function execution.
Note 3) If signal FIN2 has been on before M, S, T or B function is specified, data pertinent to M, S, T or B function are not output.
Note 4) When "Reset & rewind" signal (RRW) is sent to the controller by M02 or M30, "M function finish 2 or 1" signal should not be sent back. If the "M function finish 2 (1)" signal is return with the M02 command at the end of the machining program, the NC alarm program error (P36) will occur.

[Related signals]

(1) M function finish 1 (FIN1: Y226)
(2) M function strobe 1 to 4 (MF1 to 4: X230)
(3) S function strobe 1 to 2 (SF1 to 2: X234)
(4) T function strobe 1 (TF1: X238)
(5) 2nd M function strobe 1 (BF1: X23C)
(6) M, S, T, B function data (output to file register R: R20 and later)
(7) Reset & rewind (RRW: Y222)

B contact	Signal name	Signal abbreviation		Device
—	TOOL LENGTH MEASUREMENT	TLM	P C	Y228

[Function]

"Tool length manual measurement 1" is selected by this signal.
For M system, "Tool length manual measurement 1 and 2" functions are used by this signal.

[Operation]

When the signal (TLM) is turned on (1), amount of tool length to be corrected is calculated automatically in the controller.

[Caution]

(1) This signal is invalid if the tool length screen is not selected.
(2) The calculation result is read when INPUT key is pressed.

B contact	Signal name	Signal abbreviation		Device
—	TOOL LENGTH MEASUREMENT 2 (L system)	TLMS	P C	Y229

[Function]

"Tool length measurement 2" is selected by this signal.

[Operation]

When the signal (TLMS) is turned on, tool length measurement mode is established. When skip signal is input during tool length measurement, amount of tool length to be corrected is calculated.

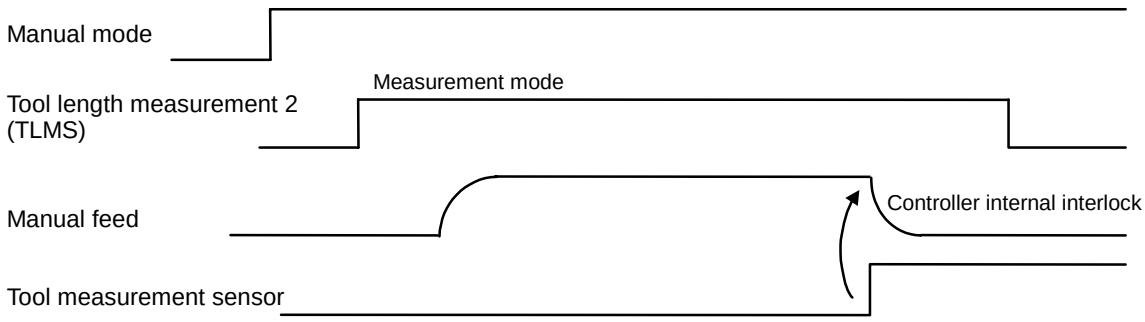
[Cautions]

(1) To use the tool length measurement 2 function, select manual operation mode.
Otherwise, tool length measurement mode cannot be established.
(2) "Tool length measurement 2" can be used with a machine equipped with tool measurement sensor.
The sensor for tool length measurement is connected to the connector "SENSOR" No. 2 pin on the controller unit.
(3) The calculation result is read automatically inside the controller.

[Related signals]

R2970 ...Tool No. of tool to be measured is specified (T 4-digit BCD).

[Timing chart]



B contact	Signal name	Signal abbreviation		Device
—	PROGRAM RESTART	PRST	P C	Y22B

[Function]

With the program restart function, when the axis is returned to the restart position with the manual mode after the restart search is performed, the direction can be checked, or the axis can be stopped at the restart position.

[Operation]

If the "Program restart" signal (PRST) is turned ON after the restart search is performed and the axis is moved to the restart position direction with the manual mode, the axis is stopped at the restart position automatically. The [RESTART-R] values on the program restart screen are set to zero and "RP" appears by the side of the [RESTART-P] values. If the axis is moved in the opposite direction to the restart position, an OPERATION ERROR will occur.

```
[RESTART- (G54)]      [RESTART-R]
X -130.000 RP         X        0.000
Y  -10.000 RP         Y        0.000
Z    0.000 RP         Z        0.000
```

B contact	Signal name	Signal abbreviation		Device
—	PLAYBACK	PB	—	Y22C

[Function]

This signal is used to convert amount of axis motion into controller command data for generation of operation program.

[Operation]

When the "Playback" (PB) signal turns on, the playback display mode appears on the operation screen. By moving and stopping axis motion components (tool or table) with JOG feed, rapid traverse or handle feed, the displayed coordinate value is read and converted into NC data in accordance with the operation program format. By repeating data read, an operation program can be created.

B contact	Signal name	Signal abbreviation		Device
—	MACRO INTERRUPT	UIT	—	Y22D

[Function]

When the controller is ready for user macro interrupt, the program being in execution can be interrupted, or other program can be executed after the former program has been executed, by turning on "Macro interrupt" (UIT) signal.

[Operation]

When "Macro interrupt" (UIT) signal turns on within time interval starting with M96 command(Note 1) and ending with M97 command or reset, the program being in execution can be interrupted for execution of other program.

"Macro interrupt" (UIT) signal becomes valid when:

(1) Memory, tape or MDI is selected.
(2) Automatic operation is selected (signal STL is on).
(3) Other user macro is not being executed.

"Macro interrupt" (UIT) signal is accepted in "status trigger" method or "edge trigger" method, either one of which can be selected by parameter #1112.

(1) Status trigger method
While "Macro interrupt" (UIT) signal is on, the signal can be accepted.
When M96 is used to make acceptable user macro interrupt, the inserted program is executed when the signal (UIT) turns on.
With the signal (UIT) kept turned on, inserted program can be executed repeatedly.

(2) Edge trigger method
The signal (UIT) is accepted when its status changes from "OFF" to "ON" (i.e., with rise edge of signal).
This method is advantageous when inserted program is executed only once.

<Command format>

M96 P_ H_ ; . . . . . User macro interrupt valid
H_ : Interrupt sequence No.
P_ : Interrupt program No.
M97 : . . . . . User macro interrupt invalid

Refer to the relevant "Programming Manual" for details on the user macro interrupt function such as interrupt method and call method for when the "Macro interrupt" (UIT) signal is on.

Note 1) M96 and M97 can be changed to other M code by using a parameter.
Note 2) User macro interrupt control M code is processed internally and not output to an external source (PLC).

B contact	Signal name	Signal abbreviation		Device
—	RAPID TRAVERSE	RT	—	Y22E

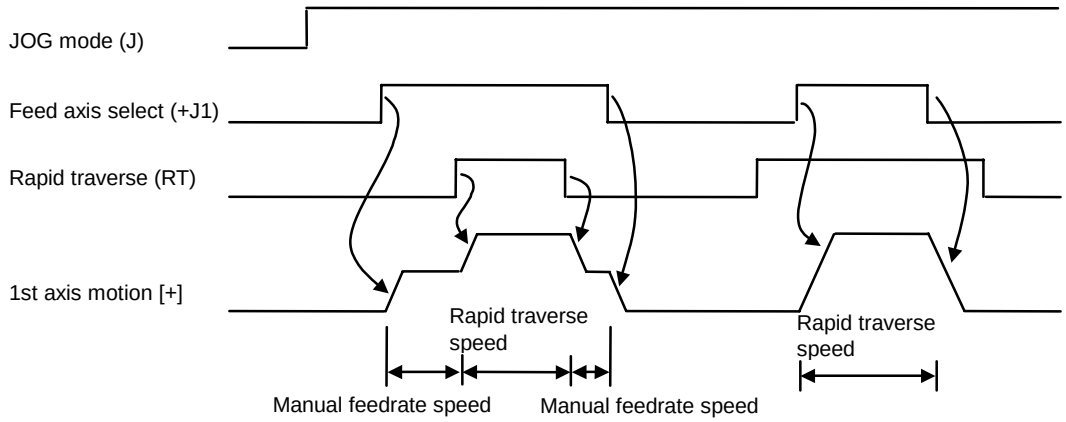
[Function]

Speed or feedrate of axis motion in "JOG" mode, "incremental feed" mode or "reference position return" mode can be changed to rapid traverse speed.

[Operation]

When the signal (RT) is turned on.

(1) The jog and incremental feedrate will be the rapid traverse feedrate set with parameters.
(2) The speed until the near-point detection dog signal is detected during dog-type reference position return will be the reference position return rapid traverse feedrate set with parameters.
(3) Speed or feedrate is changed at the same time as the signal is turned on.
When the signal (RT) is turned off, rapid traverse speed changes to the previous speed or feedrate. "Feed axis select" signal (±J1 to 4) may be kept turned on.
(4) The speed will be the rapid traverse feedrate until the near point dog signal is detected during jog, incremental feed or reference position return. The rapid traverse override will also be valid.
(5) The "Rapid traverse override" (ROV1, ROV2) will be validated when the "Rapid traverse" signal is on.



Note 1) "Rapid traverse" (RT) signal does not act as mode signal, but serves as interrupt signal for "JOG" mode, "INCREMENTAL FEED" mode, etc.
Note 2) This signal can be used likewise during machine lock.
Note 3) For handling of "Rapid traverse" (RT) signal during dry run, refer to the description about dry run signal (DRN).

[Related signals]

(1) Rapid traverse override (ROV1, ROV2: Y2A8, Y2A9)

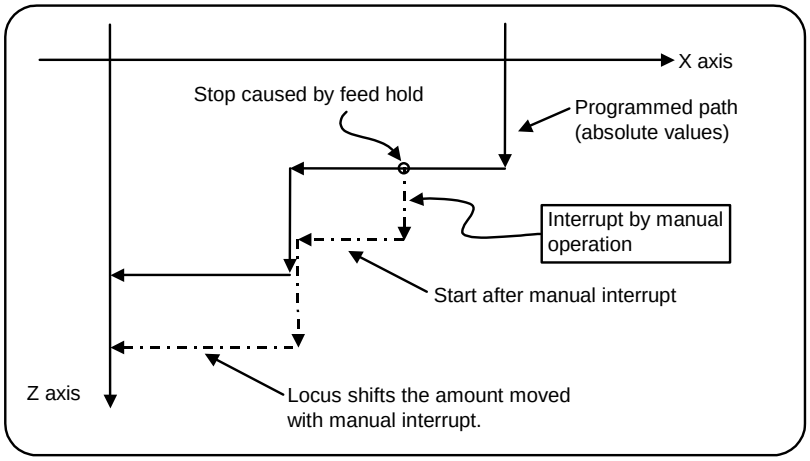
B contact	Signal name	Signal abbreviation		Device
—	MANUAL ABSOLUTE	ABS	—	Y230

[Function]

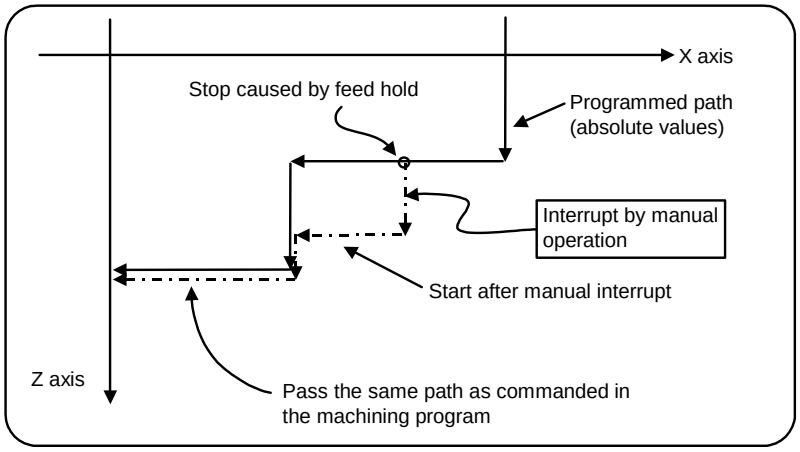
This signal selects whether to update the program coordinate system the amount moved with manual operation (jog, handle, etc.).

[Operation]

(1) When "Manual absolute" signal (ABS) is off:
The amount moved with manual operation is not added to the absolute position register in the controller. Thus, if manual is used during automatic operation, the axis will move in parallel the amount moved manually at the end point of the block and the end point of the following blocks. (The axis will move in parallel regardless of the absolute value/incremental value command in the machining program.)



(2) When "Manual absolute" signal (ABS) is on:
The amount moved by manual operation is added to the absolute position register in the controller, and the coordinate system is not changed. Thus, if manual operation is used during automatic operation by absolute value command, the axis will return to the position commanded at the end of the inserted block and following blocks. However, if the manual interrupt is an incremental value command, the axis will move in parallel the amount moved manually. (The axis will move in parallel regardless of the absolute value/incremental value command at the end of the inserted block.)



B contact	Signal name	Signal abbreviation		Device
—	DISPLAY LOCK	DLK	PC	Y231

[Function]

By using this signal, the current position displayed on the display unit is not updated even if the machine is moved with automatic operation or manual operation.

[Operation]

When the display lock signal (DLK) is ON, the machine movement and program coordinate system are updated in the normal state, but the current position displayed on the display unit is locked.

(Note 1) This signal (DLK) is valid at all times, and can be turned ON and OFF immediately.

(Note 2) This signal is valid during machine lock operation.

[Related signals]

In display lock (DLKN: X209)

B contact	Signal name	Signal abbreviation		Device
—	F1-DIGIT SPEED CHANGE VALID	F1D	PC	Y232

[Function]

When this signal is ON and F1-digit feed is commanded, the feedrate registered in the parameters can be increased or decreased by turning the manual handle.

[Operation]

When the program feedrate is commanded with an F1-digit, the feedrate can be increased or decreased by turning the manual handle.

(1) Speed fluctuation amount using manual handle
The speed fluctuation amount ΔF is expressed with the following expression.

$$\Delta F = \Delta P \times \frac{FM}{K}$$

ΔP : Handle pulse ($\pm$)
FM : Upper limit value for F1-F5 (parameter setting value #1506)
K : Speed fluctuation constant (parameter setting value #1507)

(Example) To increase/decrease by 10mm/min per handle feed scale
When Fmax 3600mm/min is set,

$$\Delta F = 10 = 1 \times \frac{3600}{K}$$ K =360 based on the following expression

(2) Validity conditions
(a) Automatic operation must be active.
(b) Automatic operation must be started.
(c) The operation must be in cutting feed, and the F1-digit feedrate must be designated.
(d) The F1-digit valid parameter must be ON.
(e) The F1-digit speed change valid signal must be ON.
(f) Dry run must not be active.

[Related signals]

F1-digit commanded (F1DN: X20A)
F1-digit No. (F11 to F14: X218 to X21A)

B contact	Signal name	Signal abbreviation		Device
—	RECALCULATION REQUEST	CRQ	P C	Y233

[Function]

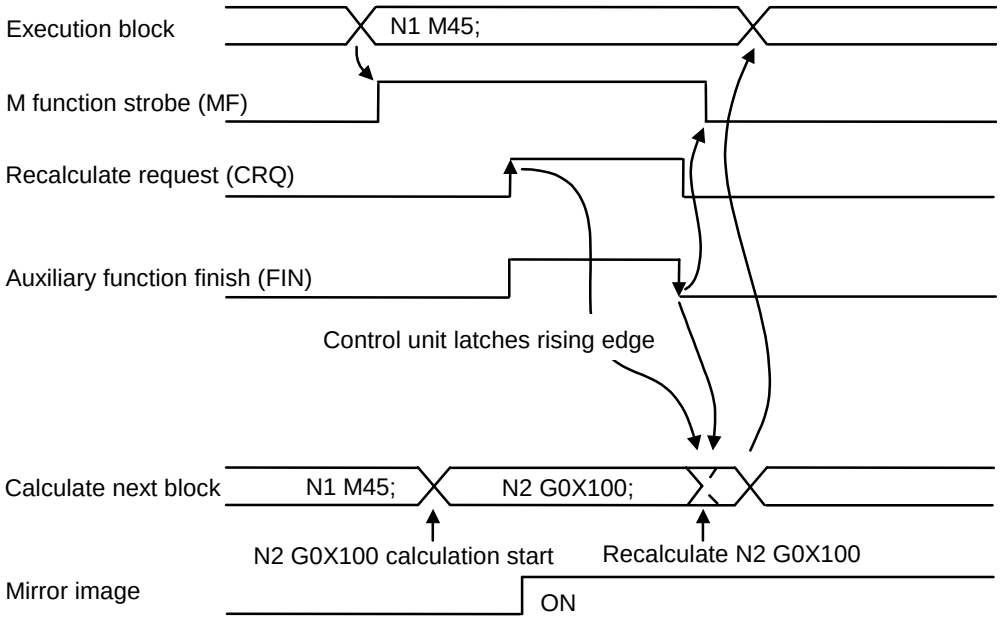
This signal is turned on if a calculated block (next block) is recalculated during operation of the machining program.

[Operation]

For example, to operate mirror image, etc., with the miscellaneous (M) command in the program.

```
                ≀
N1   M45;          To apply mirror image with this M command
N2   G0X100;
                ≀
```

When the N1 block is reached in the above program example, the "Recalculate request" signal will turn ON before FIN is output or simultaneously with FIN.
This will validate the mirror image from the N2 block.



[Caution]

The "Recalculation request" (CRQ) signal latches the rising edge in the controller. Thus, even if the "Recalculation request" (CRQ) signal is on (1), the "recalculation" will not take place unless at the rising edge.

B contact	Signal name	Signal abbreviation		Device
—	INTEGRATION TIME INPUT 1	RHD1	PC	Y234

[Function]

The total duration of a signal specified by a user PLC can be counted and displayed. For this, integration time input 1 and 2 are available.

[Operation]

The INTEGRAL TIME during this signal (RHD1) has been on is displayed in hours, minutes, and seconds.

The counted (integrated) time is held even when the power is turned off. The integration time can be preset or reset.

B contact	Signal name	Signal abbreviation		Device
—	INTEGRATION TIME INPUT 2	RHD2	PC	Y235

[Function] [Operation]

Both functions and operations are the same as those of "Integration time input 1 (RHD1)". See the descriptions on "Integration time input 1 (RHD1)".

B contact	Signal name	Signal abbreviation		Device
—	PLC INTERRUPT	PIT	P C	Y236

[Function]

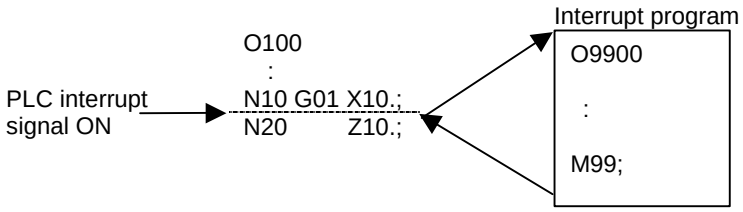
Interruption is executed with the interrupt program set with the R register when a signal is issued from the PLC during single block stop in program operation, or during the manual mode.

[Operation]

At the rising edge of this signal, the interrupt program (determined by the interrupt program No. input simultaneously with this signal) is executed during single block stop in program operation, or during the manual mode.
The interrupt program is ended with M99.
When the interrupt program ends, the operation mode returns to the same mode as before interruption was executed. For the memory or MDI mode, when the operation automatically starts, the block following the one ended just before interruption is executed. Note that if MDI operation is interrupted, the MDI program following the interrupted block will be canceled.

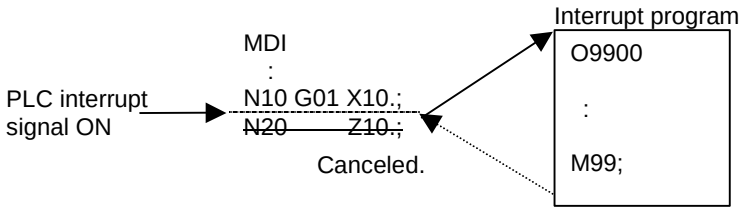
[Operation example]

Example 1: When program is interrupted during memory operation single block stop



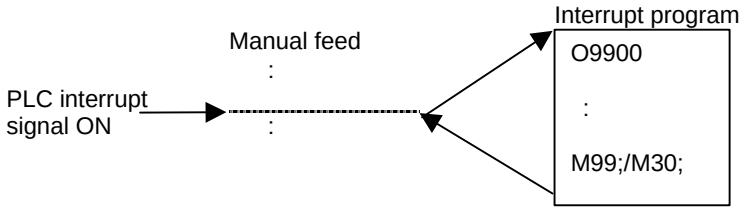
After the O100 N10 block ends, the designated interrupt program (O9900) is called when this signal turns ON. The PLC interrupt ends at the M99 block, and the block will stop. O100 N20 is executed from the next automatic start.

Example 2: When program is interrupted during MDI operation single block stop



After the MDI N10 block ends, the designated interrupt program (O9900) is called when this signal is turned ON. The PLC interrupt ends at the M99 block, and the block will stop. The next and subsequent blocks of the MDI program are canceled so operation cannot be continued.

Example 3: When program is interrupted during manual mode



During manual feed, the designated interrupt program (O9900) is called when this signal turns ON. The PLC interrupt ends at the M99 block, and the block will stop. The operation mode is returned to the manual mode by commanding reset.
If the PLC interrupt program is used in only in modes other than automatic operation, M30 can be commanded at the end of the program instead of M99 to command reset.

[Caution]

(1) Single block operation and automatic operation pause are valid even when the interrupt program is executed. To invalidate single block during the interrupt program execution, set system variable #3003. To invalidate automatic operation pause, set system variable #3004.
(2) Other PLC interrupt and MDI interrupt cannot be commanded during execution of the interrupt program.
(3) To disable the display of the interrupt program being executed on the Monitor screen, set the basic specification parameter "#1122 pglk-c" to 1 or 2.
(4) The PLC interrupt signal is ignored even if it is turned ON during automatic operation start or automatic operation pause.
(5) "In auto start" signal (OP) is output while the interrupt program is executed regardless of the operation mode which is active before the interruption.
(6) PLC interrupt is valid for each part system.
(7) If PLC interrupt is executed when there is no interrupt program or when program search has not been executed, a program error (P232) will occur when M99 is commanded.
(8) If the interrupt program No. set in the R register is not within the setting range, a program error (P232) will occur.
(9) This function is an option. If the option is not provided, the PLC interrupt signal will be ignored even if it is commanded.

[Related signals]

PLC interrupt program No. (R130)

B contact	Signal name	Signal abbreviation		Device
*	DATA PROTECT KEY 1	*KEY1	—	Y238

[Function]

Data pertinent to tool functions, and coordinate data (origin reset) can be protected with this signal.

[Operation]

When this signal is turned off (set to "0"), the tool data setting operation is prohibited.

[Caution]

(1) If a setting is changed while the signal (KEY1) is off, DATA PROTECT appears in the message section of screen.
Manual numerical command input is not applicable in "TOOL/OFFSET" display mode.

(2) The signal (KEY1) is on (set to "1") when the power is turned on (data are not protected). Therefore, if the signal is not turned off in sequential control program, it remains turned on ("1").

[Related signals]

Data protect key 2 (*KEY2: Y239)
Data protect key 3 (*KEY3: Y23A)

B contact	Signal name	Signal abbreviation		Device
*	DATA PROTECT KEY 2	*KEY2	—	Y239

[Function]

Data pertinent to user parameters and common variables can be protected.

[Operation]

When this signal (KEY2) is turned off (0), the parameter and common variable setting operation is prohibited.

[Cautions]

(1) If a setting is changed while the signal (KEY2) is off (0), DATA PROTECT appears in the message section of CRT screen.
(2) The signal (KEY2) is on (set to "1") when the power is turned on (data are not protected). Therefore, if the signal is not turned off in sequential control program, it remains turned on ("1").

[Related signals]

Data protect key 1 (*KEY1: Y238)
Data protect key 3 (*KEY3: Y23A)

B contact	Signal name	Signal abbreviation		Device
*	DATA PROTECT KEY 3	*KEY3	—	Y23A

[Function]

Data pertinent to machining program can be protected.

[Operation]

When this signal (KEY3) is turned off (0), the editing of the machining program is prohibited.

[Cautions]

(1) If data is edited when the data protect key 3 is off (0), DATA PROTECT will appear in the message section.
(2) The signal (KEY3) is on (set to "1") when the power is turned on (data are not protected). Therefore, if the signal is not turned on in sequential control program, it remains turned on ("1").

[Related signals]

Data protect key 1 (*KEY1: Y238)
Data protect key 2 (*KEY2: Y239)

B contact	Signal name	Signal abbreviation		Device
—	PROGRAM DISPLAY DURING OPERATION	PDISP	P C	Y23C

[Function]

This signal is used to display a program on the Word Edit screen during operation.

[Operation]

When the program display during operation signal (PDISP) turns ON, the program being operated will appear in the program display of the EDIT screen.

B contact	Signal name	Signal abbreviation		Device
—	INCLINED AXIS CONTROL VALID		P C	Y23D

[Function]

This signal validates the inclined axis control.

[Operation]

When this signal is turned ON, the inclined axis control is executed following the set parameter.
If this signal is turned OFF from ON, the inclined axis control will be invalid.

[Caution]

Even if this signal is changed over during the axis movement or the automatic operation, this signal will not be valid.
If this signal is changed over during the axis movement, this signal will be valid after the axis movement is stopped.
If this signal is changed over during the automatic operation, the block stop will occur.

B contact	Signal name	Signal abbreviation		Device
—	INCLINED AXIS CONTROL: NO Z AXIS COMPENSATION		P C	Y23E

[Function]

Select whether the movement for the inclined axis in the manual operation is affected to the corresponding basic axis or not.

[Operation]

When this signal is turned ON and the manual operation for the inclined axis is executed, the corresponding basic axis is not moved.
When this signal is turned OFF and the manual operation for the inclined axis is executed, the compensation operation attending the movement of the inclined axis is executed to the corresponding basic axis.

[Caution]

Even if this signal is changed over during the axis movement, this signal will not be valid.
If this signal is changed over during the axis movement, this signal will be valid after the axis movement is stopped.

B contact	Signal name	Signal abbreviation		Device
—	OPTIONAL BLOCK SKIP	BDT1	—	Y23F

[Function]

Block accompanying "/" (slash) can be skipped.
By creating a machining program with a "/" code inserted, a different part can be machined with one program.

[Operation]

When a program having a block with "/" (slash code) placed at the head of block is executed with "Optional block skip" (BDT1) signal turned on, the block is skipped. The block with the "/" code in the middle instead of at the head will be executed.
When the signal (BDT1) is off, block with "/" is executed.

```
 N1G90G00Z3. M03S1000 ;
 N2G00X50. ;
    G01Z-20. F100 ;
    G00Z3. ;
/N3G00X30. ;
/   G01Z-20. F100 ;
/   G00Z3. ;
 N4G00X10. ;
    G01Z-20. F100 ;
    G00Z3. ;
 N5G28X0Z0M05 ;
 N6M02 ;
```

When the "Optional block skip" signal (BDT1) is on, the block with "/" will not be executed.

B contact	Signal name	Signal abbreviation		Device
—	1ST HANDLE AXIS NO.	HS11 to 116	—	Y248 to C

[Function]

In HANDLE mode (handwheel is operated), axis component to be moved is selected.
In the case of 2-axis or 3-axis handle specification (two or three handles are required), axis is selected for the 1st handle.

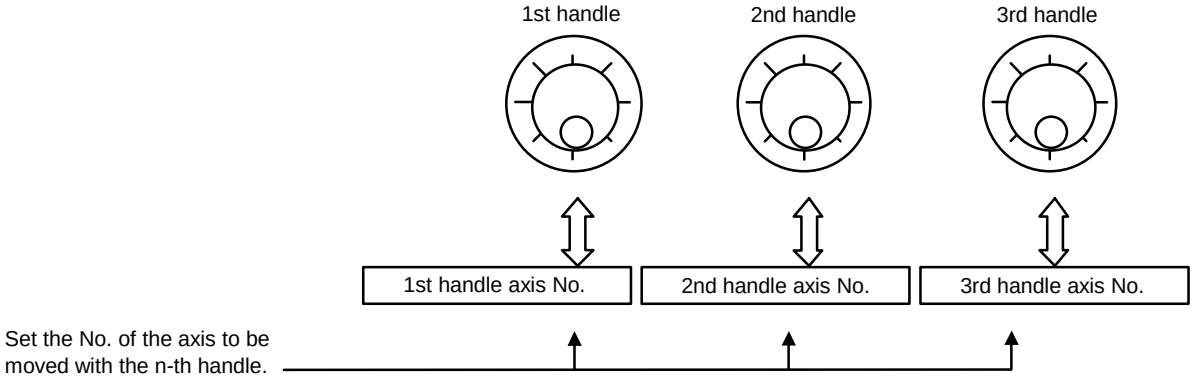
[Operation]

For axis motion in HANDLE mode:
1) Select HANDLE mode.
2) Specify axis No. for 1st handle axis No.
3) Turn on "1st handle valid" (HS1S) signal (later described).
4) Turn the handle (handwheel) ... motion will start.

The relationship between "handle axis No." and "motion axis" is as follows:

Handle axis No. / Motion axis	HS 1S	—	—	HS 116	HS 18	HS 14	HS 12	HS 11
X axis (1st axis) selected	1	—	—	0	0	0	0	1
Y axis (2nd axis) selected	1	—	—	0	0	0	1	0
Z axis (3rd axis) selected	1	—	—	0	0	0	1	1
#4 axis (4th axis) selected	1	—	—	0	0	1	0	0

"1st handle valid" signal



[Related signals]

(1) 2nd handle axis No. (HS21 to 216: Y250 to 254), 2nd handle valid (HS2S: Y257)
(2) 3rd handle axis No. (HS31 to 316: Y258 to Y25C), 3rd handle valid (HS3S: Y25F)

B contact	Signal name	Signal abbreviation		Device
—	1ST HANDLE VALID	HS1S	P C	Y24F

[Function]

In HANDLE mode, axis No. of axis motion component to be moved is set for 1st handle axis No. (HS11~HS116). To make valid the specified handle axis No., this signal is used.

[Operation]

Axis motion does not start when the 1st handle (handwheel) is rotated after HANDLE mode is selected and the desired axis No. is set for the 1st handle axis No. if this signal (HS1S) is not given. Although either the "1st handle axis No." signal or the "1st handle valid" signal can be given first, these two signals are to be given when manual axis motion is started.

[Related signal]

(1) 1st handle axis No. (HS11 to 116: Y248 to 24C)

B contact	Signal name	Signal abbreviation	PC	Device
—	2ND HANDLE AXIS NO.	HS21 to 216		Y250 to 4

[Function]

This signal selects which handle to move with the 2nd handle when using the 2-axis or 3-axis handle specifications (two or three handles are required).

[Operation]

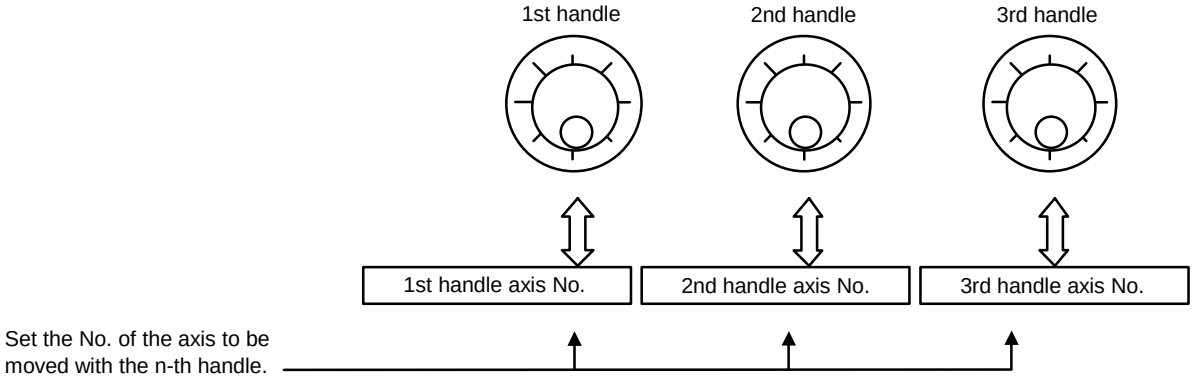
For axis motion controlled by the 2nd handle:

(1) Select HANDLE mode.
(2) Specify axis No. for 2nd handle axis No.
(3) Turn on "2nd handle valid" signal (HS2S).
(4) Turn the handle (handwheel) ... motion will start.

The relationship between "handle axis No." and "motion axis" is as follows:

Handle axis No. / Motion axis	HS 2S	—	—	HS 216	HS 28	HS 24	HS 22	HS 21
X axis (1st axis) selected	1	—	—	0	0	0	0	1
Y axis (2nd axis) selected	1	—	—	0	0	0	1	0
Z axis (3rd axis) selected	1	—	—	0	0	0	1	1
#4 axis (4th axis) selected	1	—	—	0	0	1	0	0

"2nd handle valid" signal



[Related signals]

(1) 1st handle axis No. (HS11 to 116: Y248 to 24C), 1st handle valid (HS1S: Y24F)
(2) 3rd handle axis No. (HS31 to 316: Y258 to Y25C), 3rd handle valid (HS3S: Y25F)

B contact	Signal name	Signal abbreviation	PC	Device
—	2ND HANDLE VALID	HS2S		Y257

[Function] [Operation]

This signal is the same as "1st handle valid" signal in function and operation, except that it is applicable only to 2-axis or 3-axis handle specification (two or three handles are required).
Refer to the above table for the relation with the "2nd handle axis No." (HS21 to 216).

[Related signal]

(1) 2nd handle axis No. (HS21 to 216: Y250 to 25C)

B contact	Signal name	Signal abbreviation		Device
—	3RD HANDLE AXIS NO.	HS31 to 316	—	Y258 to C

[Function]

This signal selects which handle to move with the 3rd handle when using the 3-axis handle specifications (three handles are required).

[Operation]

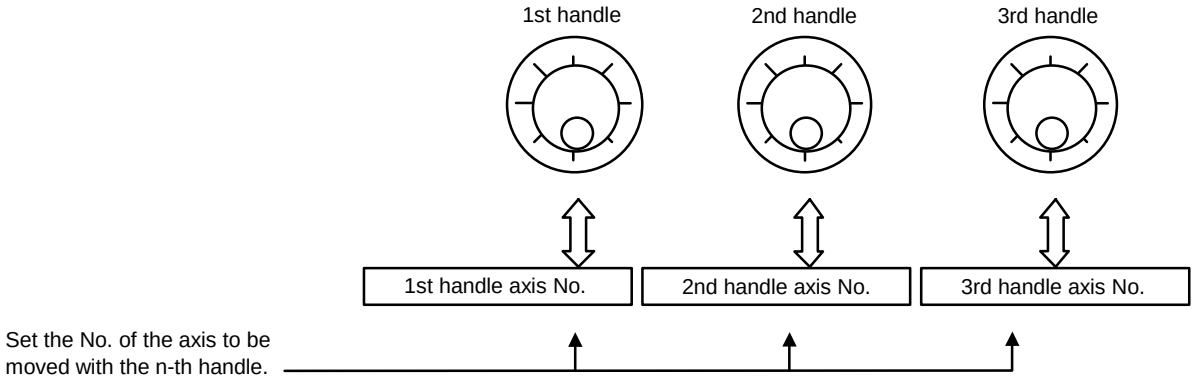
For axis motion in HANDLE mode:

(1) Select HANDLE mode.
(2) Specify axis No. for 3rd handle axis No.
(3) Turn ON "3rd handle valid" (HS3S) signal (later described).
(4) Turn the handle (handwheel) ... motion will start.

The relationship between "handle axis No." and "motion axis" is as follows:

Handle axis No. / Motion axis	HS 3S	—	—	HS 316	HS 38	HS 34	HS 32	HS 31
X axis (1st axis) selected	1	—	—	0	0	0	0	1
Y axis (2nd axis) selected	1	—	—	0	0	0	1	0
Z axis (3rd axis) selected	1	—	—	0	0	0	1	1
#4 axis (4th axis) selected	1	—	—	0	0	1	0	0

"3rd handle valid" signal



[Related signals]

(1) 1st handle axis No. (HS11 to 116: Y248 to Y24C), 1st handle valid (HS1S: Y24F)
(2) 2nd handle axis No. (HS21 to 216: Y250 to Y254), 2nd handle valid (HS2S: Y257)

B contact	Signal name	Signal abbreviation		Device
—	3RD HANDLE VALID	HS3S	P C	Y25F

[Function] [Operation]

This signal is the same as "1st handle valid" signal in function and operation, except that it is applicable only to 3-axis handle specification (three handles are required).
Refer to the above table for the relation with the "3rd handle axis No." (HS31 to 316).

[Related signal]

(1) 3rd handle axis No. (HS31 to 316: Y258 to Y25C)

B contact	Signal name	Signal abbreviation		Device
—	MANUAL FEEDRATE B VALID nTH AXIS		P C	Y260 to 3

[Function]

This signal validates manual feed using the manual feedrate B.

[Operation]

If this signal is validated when carrying out manual feed in the jog mode, the axis will move at the speed commanded by manual feedrate B which is commanded separately from the manual feedrate.
This signal is independent for the axes.

<Using the manual feedrate B> (Example for 1st part system)

(1) To set the feedrate common for all axes as the manual feedrate B
  (a) Select the JOG mode signal (Y208).
  (b) Turn ON the "manual feedrate B valid nth axis" signal (Y260 to 3) for the axis to be moved at the manual feedrate B.
  (c) Command the feedrate set with the manual feedrate B in the "Manual feedrate B" registers (R138, R139).
  (d) Turn ON the "Feed axis select +" signal or "Feed axis select -" signal for the axis to be moved at the manual feedrate B.

(2) To set the feedrate independent for each axis as the manual feedrate B
  (a) Select the JOG mode signal (Y208).
  (b) Turn ON the "manual feedrate B valid nth axis" signal (Y260 to 3) for the axis to be moved at the manual feedrate B. Also turn ON the "Each axis manual feedrate B valid" signal (Y2BC).
  (c) Command the feedrate set for each axis manual feedrate B in the "each axis manual feedrate B speed nth axis" registers (R400 to R407).
  (d) Turn ON the "Feed axis select +" signal or "Feed axis select -" signal for the axis to be moved at the each axis manual feedrate B.

(Note 1) Manual feedrate B is valid only for JOG feed, and is invalid in all other manual modes.

(Note 2) The rapid traverse mode is invalid for the manual feedrate B valid axis.

(Note 3) Manual override is invalid for the manual feedrate B valid axis.

(Note 4) The axis moving at the manual feedrate B will decelerate and stop when NC reset is input. To move the axis at the manual feedrate B again, cancel the NC reset, and then turn the axis selection signal OFF and ON.

(Note 5) Even if the feed axis selection signal is turned ON when the command speed is "0", an error will occur and the manual feedrate B valid axis will not move.

(Note 6) The manual/automatic simultaneous signal must be valid to move a random axis at the manual feedrate B during automatic operation.

(Note 7) The JOG mode signal must be validated simultaneously to move a random axis at the manual feedrate B during a manual operation mode other than the JOG mode.

(Note 8) During synchronous control, the "manual feedrate B valid nth axis" signal is invalid for the syncronous axis. The manual feedrate B signal issued for the basic axis is also valid for the syncronous axis.

B contact	Signal name	Signal abbreviation		Device
—	MANUAL RANDOM FEED 1ST AXIS NO.	CX11 to 116	P C	Y268 to C

[Function]

This signal specifies a number of the axis component to move in manual random feed mode.
Components of up to three axes can be moved simultaneously in manual random feed mode.
This signal is used to specify one of them.

[Operation]

(1) The "Manual random feed 1st axis number" (CX11 to CX116) must be set before strobe signal CXS8 is turned on. An attempt to set it during motion shall fail.
(2) Besides this signal (CX11 to CX116), there are two signals to specify a "Manual random feed 2nd axis number" (CX21 to CX216) and a "Manual random feed 3rd axis number" (CX31 to CX316). The axis numbers need not be specified in ascending order.
(3) The "Manual random feed 1st axis number" is validated by turning on the "Manual random feed 1st axis valid" (CX1S) signal explained later. Similarly, the "specific validity" signals (CX2S and CX3S) are also provided for the 2nd and 3rd axis number signals.
(4) Axis numbers can be specified as follows:

n: 1 to 3

Signal / Axis specification	CXnS	—	—	CXn16	CXn8	CXn4	CXn2	CXn1
1st axis	1	—	—	0	0	0	0	1
2nd axis	1	—	—	0	0	0	1	0
3rd axis	1	—	—	0	0	0	1	1
4th axis	1	—	—	0	0	1	0	0

Validity signal — Axis number

(5) Motion of the specified axis component is as follows:
  (a) The motion of the axis component specified by the "Manual random feed 1st axis number" signal corresponds to the contents of "Manual random feed 1st axis movement data" (R142 and R143).
  (b) The motion of the axis component specified by the "Manual random feed 2nd axis number" signal corresponds to the contents of "Manual random feed 1st axis movement data" (R144 and R145).
  (c) The motion of the axis component specified by the "Manual random feed 3rd axis number" signal corresponds to the contents of "Manual random feed 1st axis movement data" (R146 and R147).

[Related signal]

For related signals, see the section "Manual random feed mode (PTP: Y20B)."

B contact	Signal name	Signal abbreviation		Device
—	MANUAL RANDOM FEED 1ST AXIS VALID	CX1S	P C	Y26F

[Function]

This signal is used to validate the axis specified by the "Manual random feed 1st axis number" signal so that the axis component can move in manual random feed mode.

[Operation]

(1) The specification of the axis by the "Manual random feed 1st axis number" signal explained earlier is validated only when the "CX1S" signal is turned on.

[Related signal]

For related signal, see the section "Manual random feed mode (PTP: Y20B)."

B contact	Signal name	Signal abbreviation		Device
—	MANUAL RANDOM FEED 2ND AXIS NUMBER	CX21 to 216	P C	Y270 to 4

[Function] [Operation]

See the descriptions on the "Manual random feed 1st axis number" signal (CX11 to CX116: Y268 to C) explained above.

B contact	Signal name	Signal abbreviation		Device
—	MANUAL RANDOM FEED 2ND AXIS VALID	CX2S	P C	Y277

[Function] [Operation]

See the descriptions on the "Manual random feed 1st axis valid" signal (CX1S: Y26F).

B contact	Signal name	Signal abbreviation		Device
—	MANUAL RANDOM FEED 3RD AXIS NUMBER	CX31 to 316	P C	Y278 to C

[Function] [Operation]

See the descriptions on the "Manual random feed 1st axis number" signal (CX11 to CX116: Y268 to C) explained above.

B contact	Signal name	Signal abbreviation		Device
—	MANUAL RANDOM FEED 3RD AXIS VALID	CX3S	P C	Y27F

[Function] [Operation]

See the descriptions on the "Manual random feed 1st axis valid" signal (CX1S: Y26F).

B contact	Signal name	Signal abbreviation		Device
—	SMOOTHING OFF	CXS1	P C	Y280

[Function]

This signal is used to move an axis component under the condition where the acceleration/ deceleration time constant is 0 is manual random feed mode.

[Operation]

With the "Smoothing off" (CXS1) signal set off, axis motion in manual random feed mode is performed under the same conditions as when the acceleration/deceleration time constant is set to 0.

Note 1) When using this signal to move an axis component under the condition where the acceleration/deceleration time constant is 0, move it at a slow speed. Otherwise, a servo alarm (excess error) may occur.

[Related signal]

For related signal, see the section "Manual random feed mode" (PTP: Y20B) mode.

B contact	Signal name	Signal abbreviation		Device
—	AXIS INDEPENDENT	CXS2	P C	Y281

[Function]

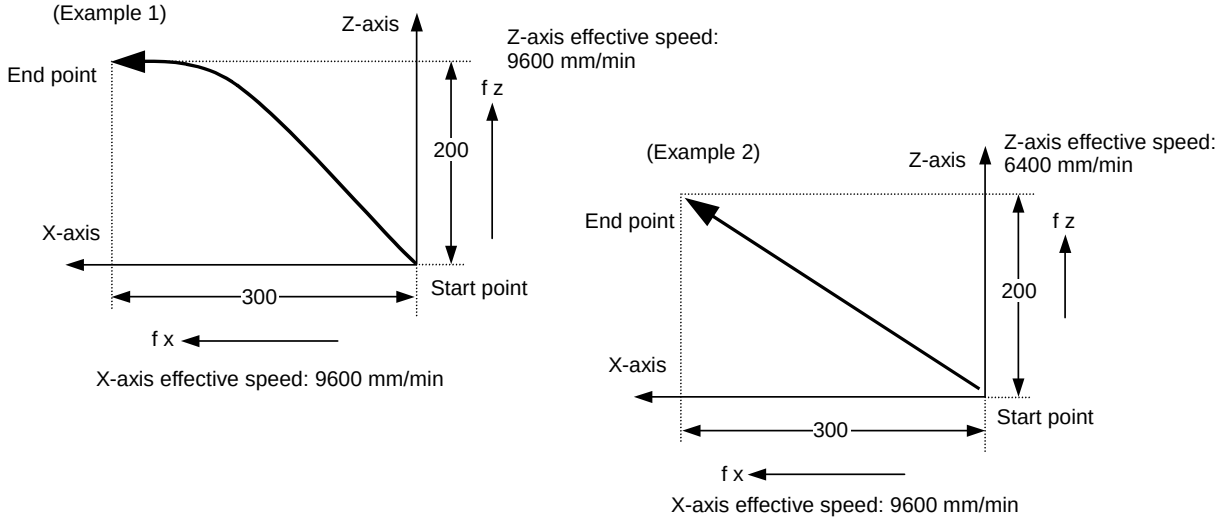
When moving two or more axis components simultaneously in "manual random feed" mode, this signal can be used to position each axis independently without performing interpolation.

[Operation]

When a manual random feed is executed for two or more axes at the same time with CXS2 on, each axis is positioned independently without being subjected to interpolation.

The "CXS2" signal is generally used when the "G0/G1 select" signal (CXS4) explained later is off (G0 selected).

The following is an example where the rapid traverse speeds of X-axis and Z-axis are both set to 9,600 mm/min, and the amounts of movement of X-axis and Z-axis are set to 300mm and 200mm respectively.



[Related signal]

For related signal, see the section "Manual random feed mode (PTP: Y20B)."

B contact	Signal name	Signal abbreviation	PC	Device
—	EX. F/MODAL. F	CXS3		Y282

[Function]

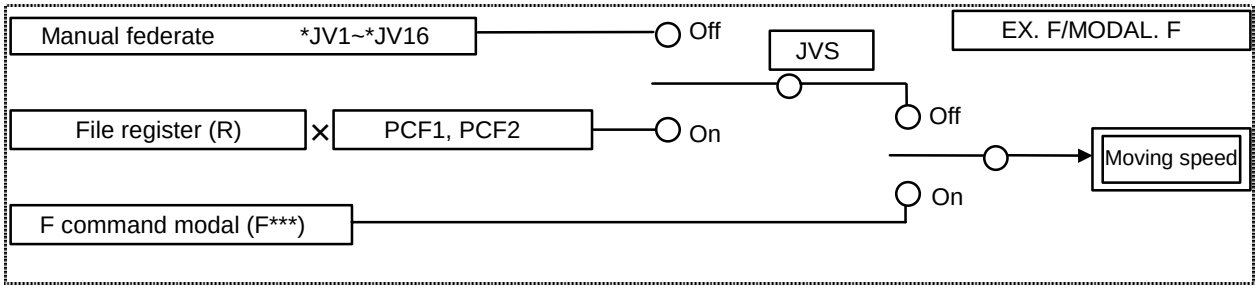
This signal selects whether a manual random feed in G1 mode is done at manual feed rate or at modal speed in automatic operation.

[Operation]

When the "G0/G1 select" (CXS4) signal explained later is on, the "CXS3" signal works as follows:

(1) When EX.F/MODAL.F (CXS3) is off:
   1) When the "Manual feedrate (JVS)" signal is off, the speed selected by the manual feed rate (*JV1 to 16) applies.
   2) When the "Manual feedrate (JVS)" signal is on, the applicable speed is determined by the relation between the contents of the corresponding file register (R) and the "Feedrate least increment" signal (PCF1 or PCF2).

(2) When EX.F/MODAL.F (CXS3) is on:
   Manual random feed is done at a modal speed (F***) set in automatic operation. However, manual random feed will not be done, if no F command has been executed before.



[Related signal]

For related signal, see the section "Manual random feed mode (PTP: Y20B)."

B contact	Signal name	Signal abbreviation	PC	Device
—	G0/G1	CXS4		Y283

[Function]

This signal selects a manual feed speed or rapid traverse speed in manual random feed mode.

[Operation]

This signal operates as shown below depending on the status of the "G0/G1 select" (CXS4) signal.

(1) When the "G0/G1 select" signal is off:
   The rapid traverse speed originally set to the corresponding axis applies. Rapid traverse override is also valid. The rapid traverse speed applicable when moving two or more axis components at the same time varies with the status of the "Axis independent (CXS2)" signal. See the descriptions on the "Axis independent (CXS2)" signal.

(2) When the "G0/G1 select" signal is on:
   The manual feed speed or the speed specified by the F command in automatic operation apply. For details, see the description on the EX.F/MODAL.F (CXS3).

[Related signal]

For related signal, see the section "Manual random feed mode (PTP: Y20B)."

B contact	Signal name	Signal abbreviation		Device
—	MC/WK	CXS5	P C	Y284

[Function]

This signal selects a machine coordinate system or a modal workpiece coordinate system on which positioning is done in manual random feed mode.

[Operation]

The "MC/WK (CXS5)" signal becomes valid when the "ABS/INC (CXS6)" signal explained later is off in manual random feed mode.

(1) When the "MC/WK" signal is off:
"Manual random feed nth axis movement data" set in a file register (R) is used for positioning on the machine coordinate system.

Amount of motion = Manual random feed nth movement data - Coordinate value on machine coordinate system

(2) When the "MC/WK" signal is on:
"Manual random feed nth axis movement data" set in a file register (R) is used for positioning on the modal workpiece coordinate system.

Amount of motion = Manual random feed nth movement data - Coordinate value on modal workpiece coordinate system

[Related signal]

For related signal, see the section "Manual random feed mode (PTP: Y20B)."

B contact	Signal name	Signal abbreviation		1st systvem
—	ABS/INC	CXS6	P C	Y285

[Function]

This signal selects whether movement data is given in an absolute value or incremental value for manual random feed.

[Operation]

(1) When the "ABS/INC" (CXS6) signal is off:
"Manual random feed nth axis movement data" set in a file register (R) is handled as an absolute value. For details, see the descriptions on the "MC/WK (CXS5)" signal explained before.

(2) When the "ABS/INC" signal is on:
"Manual random feed nth axis movement data" set in a file register (R) is handled as a real movement value.

[Related signal]

For related signal, see the section "Manual random feed mode (PTP: Y20B)."

B contact	Signal name	Signal abbreviation		Device
*	STOP	*CXS7	PC	Y286

[Function]

This signal stops an ongoing axis component halfway in manual random feed mode.
The function of this signal is equivalent to those of the "Manual interlock +nth axis (*+MITn) and -nth axis (*-MITn)" signals.

[Operation]

Turning the "Stop" signal (*CXS7) off (0) causes the following:

(1) Motion of axis in manual random feed mode is decelerated and stopped.
(2) The axis component which is going to move in manual random feed mode remains stopped.
When the "Stop" (*CXS7) signal is turned on (1) while an axis component is in the stop state, it immediately restarts the operation.

Note 1) When the power is turned on, the "Stop" (*CXS7) signal is automatically set to "1". If the "Stop" signal is not to be used, there is no need to make a sequence program for it.

[Related signal]

For related signal, see the "Manual random feed mode (PTP: Y20B)."

B contact	Signal name	Signal abbreviation	P C	Device
—	STROBE	CXS8		Y287

[Function]

This signal is a trigger signal for moving an axis component in manual random feed mode. The axis component starts moving at the rising edge of this signal.

[Operation]

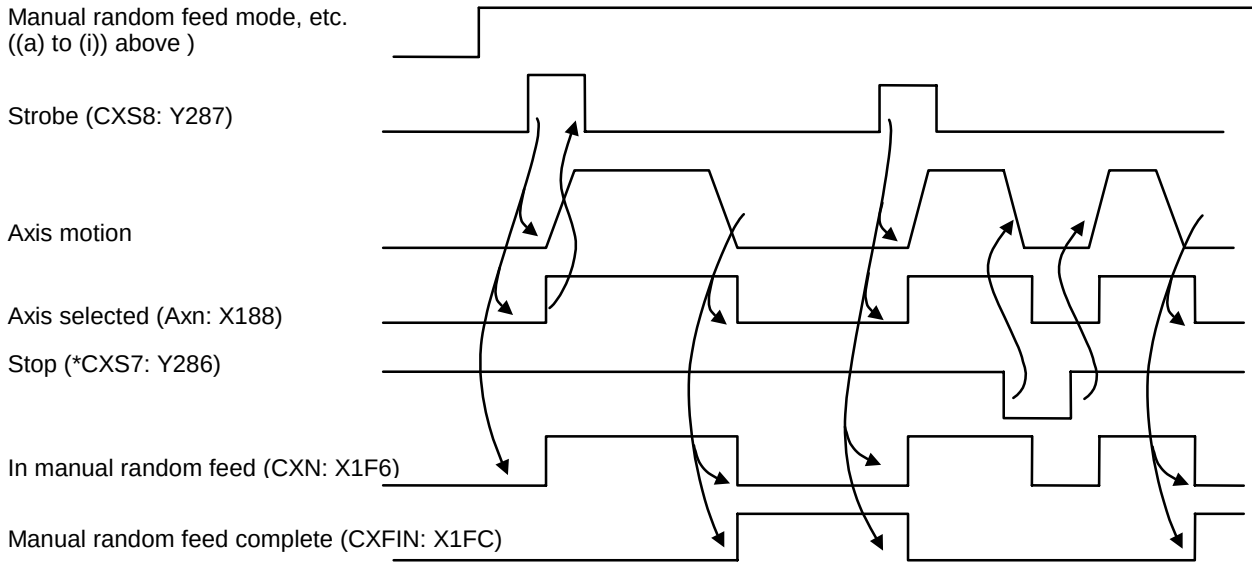
The "Strobe" signal (CXS8) should be turned on after all signal values necessary for manual random feed are set appropriately.

(1) The following signals must be appropriately set before turning on the "Strobe" signal:
- (a) Manual random feed mode (PTP)
- (b) Manual random feed nth axis number (CXn1 to CXn16) and manual random feed nth axis valid (CXnS)
- (c) Manual random feed nth axis movement data (file registers R142 to R147)
- (d) Smoothing off (CXS1)
- (e) Axis independent (CXS2)
- (f) EX.F/MODAL.F (CXS3)
- (g) G0/G1 (CXS4)
- (h) MC/WK (CXS5)
- (i) ABS/INC (CXS6)

(2) The following signals can be changed even after the "Strobe" signal is turned on:
- (j) Manual feed speed
- (k) Rapid traverse override for a rapid traverse speed when the G0/G1 signal (CXS4) is off.
- (l) Stop (*CXS7)

Note 1) The "Strobe" signal can be accepted even when the "Stop" signal (*CXS7) is off (0).

The following shows a timing chart of an example of operation.



Note 2) The "Strobe" signal (CXS8) must be on for at least 100ms.

[Related signals]

Signals listed in (a) to (l) above

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	SPINDLE SPEED OVERRIDE	SP1 to 4	—	Y288 to A	Y648 to A

[Function]

This signal applies override (multiplication) on the S command issued in the automatic operation (memory, MDI, tape).

[Operation]

When "Override mode select" (SPS) signal is off, this signal is valid.
By selecting "Spindle speed override" (SP1 to 4) signal, override ratio can be selected within range from 50% to 120% (increment: 10%).
Override cannot be set when:

(1) "Spindle stop" signal is on.
(2) TAP mode is selected.
(3) Thread cutting mode is selected.

This signal (SP1 to 4) is set with the code method. The relation is shown below.

SP4	SP2	SP1	Spindle override
1	1	1	50%
0	1	1	60%
0	1	0	70%
1	1	0	80%
1	0	0	90%
0	0	0	100%
0	0	1	110%
1	0	1	120%

[Related signal]

(1) Spindle override method select (SPS:Y28F)

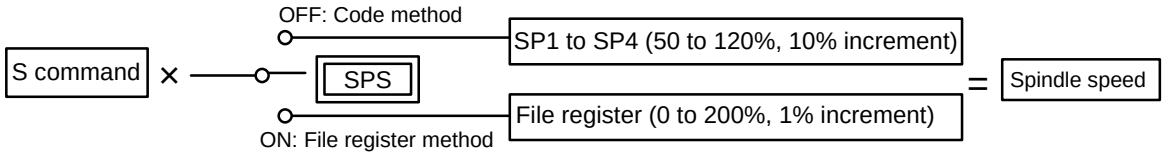
B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	SPINDLE OVERRIDE METHOD SELECT	SPS	PC	Y28F	Y64F

[Function]

When override is applied on the S command issued in automatic operation (memory, MDI or tape), "code method" or "file register method" is selected for override method.

[Operation]

When the "Spindle override method select" (SPS) is off, code method override (signal SP1 to 4 is applicable) is selected.
When the "Spindle override method select" (SPS) is on, register method override (value set in file register is applicable) is selected.



Note 1) For details of "code method override" and "file register method override", refer to the respective description.

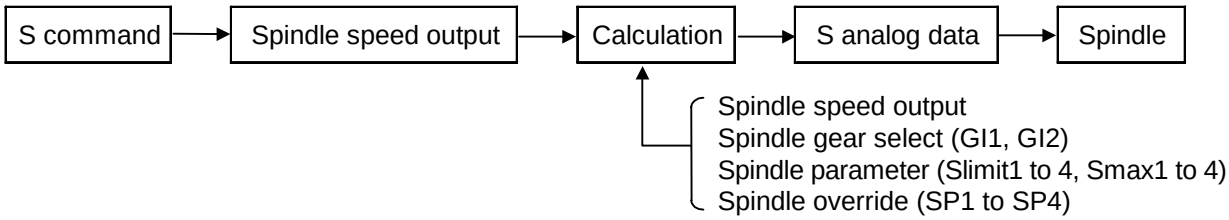
B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	SPINDLE GEAR SELECT 1, 2	GI1, 2	—	Y290, 1	Y650, 1

[Function]

This signal informs the controller which spindle gear has been selected on the machine side.

[Operation]

This "Spindle gear select" signal (GI1, GI2) is set according to the machine's spindle gear stage. The controller calculates the S analog data (data is transferred when the spindle controller is the high-speed serial connection specification) based on this "Spindle gear selection" (GI1, GI2).
The flow after the S command is executed and output to the spindle is shown below.



The relation of the gear stage, spindle gear select input signal and spindle limit speed is as shown below.

Gear stage	Spindle gear select signal		Spindle speed limit
	GI2	GI1	
1	0	0	Slimt1
2	0	1	Slimt2
3	1	0	Slimt3
4	1	1	Slimt4

(1) Slimt1 to 4 are set with parameters. The spindle speed for when the S analog data is the max. (the motor is run at the max. speed) is set.
This setting is used for each gear unit, and is determined by the deceleration ratio (gear ratio) of the motor and spindle.
For example, if the max. motor speed is 6000 r/min, and the 1st gear stage is decelerated to half, "3000" will be set in parameter Slimit1.

(2) The controller calculates the spindle speed output data as shown below.
For example, if S command is issued, gear selection input is the 2nd stage (GI1=on, GI2=off), spindle override value (%) is SOVR, and S analog data's max. value is "10":

$$\text{S analog data} = \frac{\text{S command}}{\text{Slimt2}} \times \frac{\text{SOVR}}{100} \times 10$$

(3) If S1300 is executed when using S analog output (max. 10V), Slimt2 = "2000", and spindle override "100%":

$$\text{S analog output} = \frac{1300}{2000} \times \frac{100}{100} \times 10\ (\text{V}) = 6.5\ (\text{V})$$

(4) The S command is clamped with the Smaxn (n=1 to 4).
If Smax2="1000" in the above state, the S analog output will be:

$$\text{S analog output} = \frac{1000}{2000} \times \frac{100}{100} \times 10\ (\text{V}) = 5.0\ (\text{V})$$

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	SPINDLE STOP	SSTP	—	Y294	Y654

[Function]

In spindle control, S analog data (spindle speed) can be set to "0" by using this signal (SSTP). Usually, the signal is not used alone, but combined with "Spindle gear shift" signal (SSFT) explained later.

[Operation]

When the signal (SSTP) is turned on, S analog data is set to "0". Analog data is restored when the signal is turned off.

When "Spindle gear shift" (SSFT) signal turns on while the signal is on, S analog data which corresponds to speed set by the spindle speed parameter is output.

"Spindle speed override" (SP1 to 4) is ignored while the signal is on.

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	SPINDLE GEAR SHIFT	SSFT	—	Y295	Y655

[Function]

This signal is used to run the spindle motor at low speed, when spindle gear is shifted, so that spindle gear can be engaged smoothly.

[Operation]

When the signal (SSFT) turns on, the S analog data equivalent to the low speed previously set by parameter is output.

If gears are not engaged properly, the signal is turned on. It should be noted that "Spindle stop" (SSTP) signal should be on beforehand to use the signal (SSFT).

Spindle gear shift speed is selected by "Spindle gear select" input (GI1, GI2).

The relation is as follows:

Gear stage	Spindle gear select signal		Spindle speed at gear shift	Spindle speed limit
	GI2	GI1		
1	0	0	Ssift1	Slimt1
2	0	1	Ssift2	Slimt2
3	1	0	Ssift3	Slimt3
4	1	1	Ssift4	Slimt4

S analog data (spindle speed data) while "Spindle gear shift" (SSFT) signal is on can be determined from the formula shown below.

For example, if the gear selection is the 1st stage (GI1= off, GI2= off), and the S analog data max. value is "10":

$$\text{S analog data for gear shift} = \frac{\text{Ssift1}}{\text{Slimt1}} \times 10$$

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	ORIENTED SPINDLE SPEED COMMAND	SORC	—	Y296	Y656

[Function]

This signal is used to run the spindle motor at low speed when executing mechanical orientation during spindle control.

<Supplement>

Since most spindle drive/control units recently marketed are equipped with oriented spindle stop function, and therefore this signal is rarely used for mechanical orientation. The signal (SORC) can be used for other application such as constant rotation.

[Operation]

When the signal (SORC) turns on, spindle speed is changed to the low speed previously set by parameter.
It should be noted that "Spindle stop" signal (SSTP) must be on to use the signal (SORC).
Spindle gear shift data is selected by spindle gear select signal.

Gear stage	Gear select signal		Spindle speed limit	Oriented spindle stop speed
	GI2	GI1		
1	0	0	Slimt1	SORI
2	0	1	Slimt2	
3	1	0	Slimt3	
4	1	1	Slimt4	

Spindle speed data while "Oriented spindle speed command" (SORC) signal is on can be determined from the formula shown below.
When "Spindle gear select" signal combination is GI2=0 and GI1=1 and maximum spindle speed is 10, for example.

$$\text{Oriented spindle stop speed data} = \frac{\text{SORI}}{\text{Slimt2}} \times 10$$

B contact	Signal name	Signal abbreviation		Device
—	OVERRIDE CANCEL	OVC	—	Y298

[Function]

With this signal, override to cutting feedrate input to the controller during automatic operation is ignored.

[Operation]

When the signal (OVC) turns on ...

(1) Cutting feedrate override (*FV1 to 16) is ignored and feedrate specified by F command is selected.
(2) When cutting feedrate override is set at "0%", the signal (OVC) is not valid (feedrate is zero and no motion occurs).
(3) The signal does not affect to "Manual feedrate override" and "Rapid traverse override".

[Related signals]

Cutting feedrate override (*FV1 to 16: Y2A0)

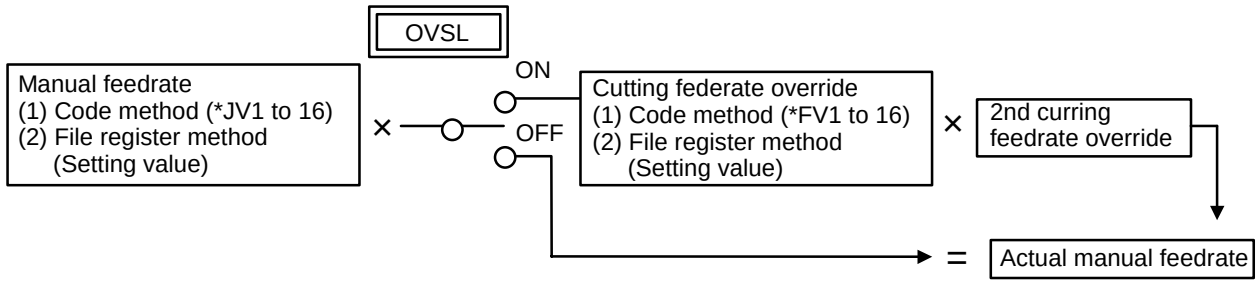
B contact	Signal name	Signal abbreviation		Device
—	MANUAL OVERRIDE VALID	OVSL	—	Y299

[Function]

Override can be exerted on "manual feedrate" (feedrate in JOG feed, incremental feed, etc. during manual operation).

[Operation]

When this signal (OVSL) is turned on when manual feedrate has been set, the previously set cutting feedrate override (%) is applied to that feedrate.



Note) For details of "manual feedrate", "cutting feedrate override" and "2nd cutting feedrate override", refer to the relevant descriptions.

B contact	Signal name	Signal abbreviation		Device
—	MISCELLANEOUS FUNCTION LOCK	AFL	—	Y29A

[Function]

Strobe signal for miscellaneous function (M, S, T and B) specified during automatic operation cannot be output when this signal is used. The signal (AFL) can be used to check machining program, for example.

[Operation]

When the signal (AFL) turns on ...

(1) Miscellaneous function (M, S, T and B) specified in automatic operation cannot be executed, i.e. output of code data and function strobe signal (MF1 to 4, SF1 to 2, TF1, BF1) are withheld.
(2) If the signal turns on after code data is output, that output is accepted and the corresponding function can be completed (FIN1 or FIN2 is received and strobe signal is set to "0").
(3) Miscellaneous function M00, M01, M02 or M30 is, however, accepted and realized even when the signal (AFL) is on ... code data and "M function strobe" signal are output.
(4) Miscellaneous function which is executed within the controller and not output, such as M98 and M99, is executed even when the signal is on.

[Related signals]

- M function strobe (MFn: X230)
- M code data (R20)
- S function strobe (SFn: X234)
- S code data (R28)
- T function strobe 1 (TF1: X238)
- T code data (R36)
- 2nd M function strobe 1 (BF1: X23C)
- 2nd M function data (R44)

B contact	Signal name	Signal abbreviation		Device
—	TAP RETRACT	TRV	P C	Y29C

[Function]

This function is used to remove the tap from the workpiece when tap cycle has been stopped due to emergency stop, etc.

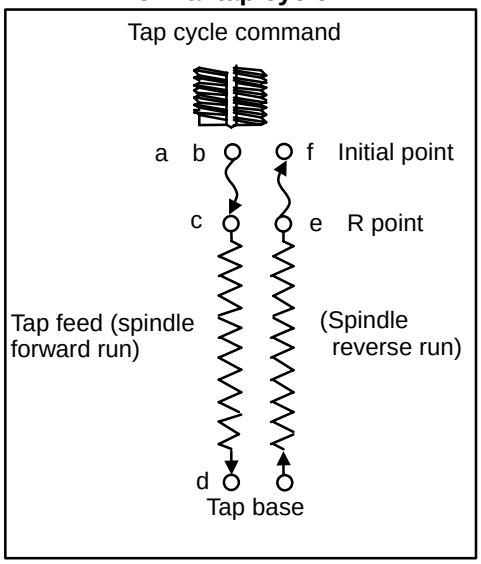
[Operation]

If the "Tap retract" signal (TRV) is turned on while the "Tap retract possible" signal (TRVE) is on due to an interruption in the tap cycle, the tap retract operation can be started.

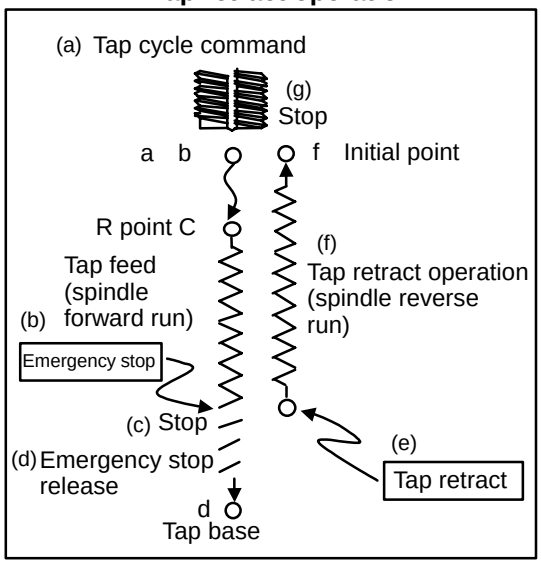
(1) The following items are conditions for tap retract. (The "Tap retract possible" signal will turn on at this time.)
- Emergency stop during tap cycle
- Reset during tap cycle
- Power off during tap cycle (Only for absolute position detection system)

(2) Tap retract is executed as follows:
- Execute the synchronous tap cycle command. → (a)
- Stop the tap cycle with emergency stop. → (b)
- The "Tap retract possible" signal (TRVE) turns on. → (c)
- Release the emergency stop. (The "Servo ready complete" signal (SA) turns on.) → (d)
- Turn on the "Tap retract" signal (TRV). → (e)
- The spindle will rotate in reverse, and the tap axis will move toward the tap cycle's initial point. The feedrate is the tap cycle feedrate. → (f)
- When the tap axis reaches the tap cycle initial point, the spindle and tap axis will stop, and tap retract will be completed. → (g)
- The "Tap retract possible" signal (TRVE) will turn off.

Normal tap cycle



Tap retract operation



Note 1) The area between "c" and "e" above is the tap cycle. The "Tap retract possible" signal will not be output if the operation is not stopped in this area.

Note 2) This signal is valid only during rising in the tap cycle.

Note 3) When this signal turns on, emergency stop and reset will not function.

[Related signals]
- Tap retract possible (TRVE: X26D)

B contact	Signal name	Signal abbreviation		Device
—	REFERENCE POSITION RETRACT	RTN	P C	Y29D

[Function]

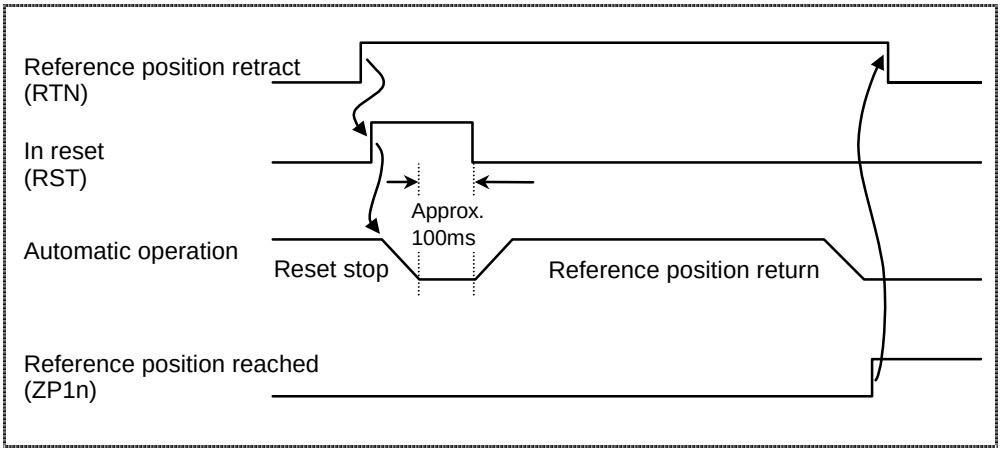
This function returns immediately to a set reference position when the return signal is input. This function is used to return to a set position for changing the tool.

[Operation]

Reference position return is executed when this signal is turned on. At the rising edge of the signal, the program is automatically reset (reset & rewind) and then reference position return is executed.
During the automatic or MDI operation, the operation is interrupted and stopped by the reset, and reference position return is executed.
If this signal is input during execution of a tap cycle in the automatic or MDI operation modes, the "Tap retract possible" signal will be output by the reset interruption, and the return operation will be the tap retract operation. The tap retract is completed at the initial point, and after that the reference position return will be carried out.

(1) If there are two or more axes, set the return order with parameter (#2019 revnum).
(2) When the reference position is reached, the corresponding "Reference position reached" signal will be output.
(3) This signal must be held until the "Reference position reached" signal is output. If it is turned off midway, the return operation will be interrupted and stop. If the signal is input again, the operation will restart from execution of resetting.
(4) The reference position return speed is handled in the same manner as the normal reference position return speed.
(5) The reference position returned to during reference position retract depends on the Y200 and Y201 reference position selection.
(6) Even if the return signal is input during the thread cutting cycle, it will be invalid. However, if the return signal is executed in a block other than the thread cutting block, the return operation will be executed.
(7) The return signal is invalid if the coordinate system is not established. An operation error will occur when the return signal is input. (M01 OPERATION ERROR 0020)

[Time chart]



[Related signals]

Tap retract possible (TRVE: X26D)
Tap retract (TRV: X29C)

B contact	Signal name	Signal abbreviation		Device
—	PLC EMERGENCY STOP	QEMG	P C	Y29F

[Function]

The controller can be set to emergency stop condition, like the case where emergency stop signal is given by user PLC.

[Operation]

Emergency stop occurs in the controller when the signal (QEMG) is turned on. In this case, "Servo ready complete (SA)" is turned off.

Note) Since this signal is processed in software, response is somewhat slower, as compared with external emergency stop signal. Approximate response is equal to 1 scan by user PLC plus 100ms.

B contact	Signal name	Signal abbreviation		Device
*	CUTTING FEEDRATE OVERRIDE	*FV1 to 16	—	Y2A0 to 4

[Function]

Override (multiplication) can be exerted to cutting feedrate (F feedrate) during automatic operation with this signal.

[Operation]

When the signal is valid, true feedrate is the product obtained by multiplying referenced speed by override ratio (%) specified by the signal.
Override is 100%, even when the signal is given, in the following cases:

(1) When "Override cancel" (OVC) signal is on.
(2) During tapping mode.
(3) During thread cutting.

These signals (*FV1 to 16) are set with the code method. The relation is shown below.

*FV16	*FV8	*FV4	*FV2	*FV1	Cutting feedrate override
1	1	1	1	1	0%
1	1	1	1	0	10%
1	1	1	0	1	20%
1	1	1	0	0	30%
1	1	0	1	1	40%
1	1	0	1	0	50%
1	1	0	0	1	60%
1	1	0	0	0	70%
1	0	1	1	1	80%
1	0	1	1	0	90%
1	0	1	0	1	100%
1	0	1	0	0	110%
1	0	0	1	1	120%
1	0	0	1	0	130%
1	0	0	0	1	140%
1	0	0	0	0	150%
0	1	1	1	1	160%
0	1	1	1	0	170%
0	1	1	0	1	180%
0	1	1	0	0	190%
0	1	0	1	1	200%
0	1	0	1	0	210%
0	1	0	0	1	220%
0	1	0	0	0	230%
0	0	1	1	1	240%
0	0	1	1	0	250%
0	0	1	0	1	260%
0	0	1	0	0	270%
0	0	0	1	1	280%
0	0	0	1	0	290%
0	0	0	0	1	300%

Generally, the rotary switch (5-step, 21-notch, compliment binary code output) is connected to the operation board, and used between 0 and 200%.

If *FV1 to *FV16 are all off, the previous value will be maintained. The value will change to 0% when the power is turned off.

[Related signals]

(1) Override cancel (OVC: Y298)
(2) 2nd cutting feedrate override valid (FV2E: Y2A6)
(3) Cutting feedrate override method select (FVS: Y2A7)

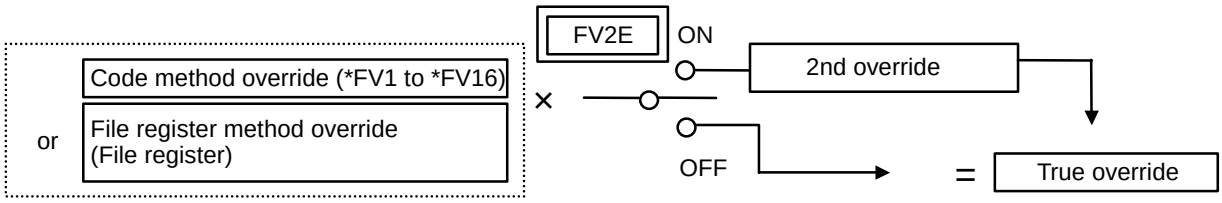
B contact	Signal name	Signal abbreviation		Device
—	2ND CUTTING FEEDRATE OVERRIDE VALID	FV2E	P C	Y2A6

[Function]

Override normally exerted on cutting feedrate in automatic operation is within a range from 0% to 300%. When this signal is used, another override (ranging from 0% to 327.67%) can be exerted on overridden feedrate.

[Operation]

When the signal (FV2E) is on, override can be exerted on feedrate previously overridden in code method (*FV1 to 16), or file register method (by setting numerals manually). Applicable range of the 2nd override is 0% to 327.6% (0.01% increment). Value (override ratio) is set to file register in binary code.



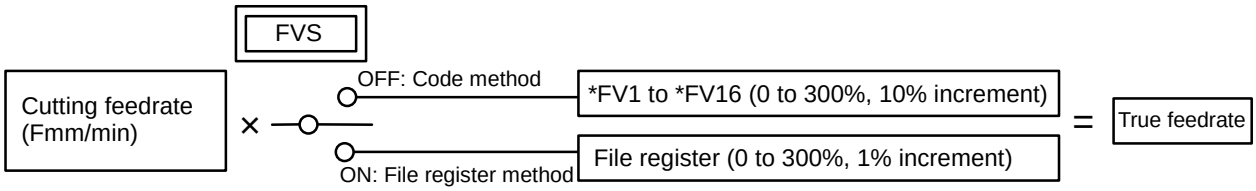
B contact	Signal name	Signal abbreviation		Device
—	CUTTING FEEDRATE OVERRIDE METHOD SELECT	FVS	P C	Y2A7

[Function]

When override is exerted on cutting feedrate in automatic operation, override method can be selected between "code method" and "file register method".

[Operation]

When the signal (FVS) is off, code method (*FV1 to 16) is selected.
When the signal (FVS) is on, file register method (value is specified by manual setting) is selected.



Note) For details of code method and file register method, refer to the relevant descriptions.

B contact	Signal name	Signal abbreviation		Device
—	RAPID TRAVERSE SPEED OVERRIDE	ROV1, 2	—	Y2A8, 9

[Function]

This signal is used to exert override on rapid traverse speed set by parameter (for rapid traverse) in automatic operation (memory, MDI or tape) or manual operation.

[Operation]

The true rapid traverse speed is that obtained by multiplying rapid traverse speed (set by parameter) by override ratio specified by this signal.
This signal is invalid if the "Rapid traverse" signal (RT) is off during cutting feed during automatic operation or during manual operation.

These signals (ROV1, 2) are set with the code method. The relation is shown below.

ROV2	ROV1	Rapid traverse speed override
0	0	100%
0	1	50%
1	0	25%
1	1	1%

[Related signal]

(1) Rapid traverse speed override method select (ROVS)

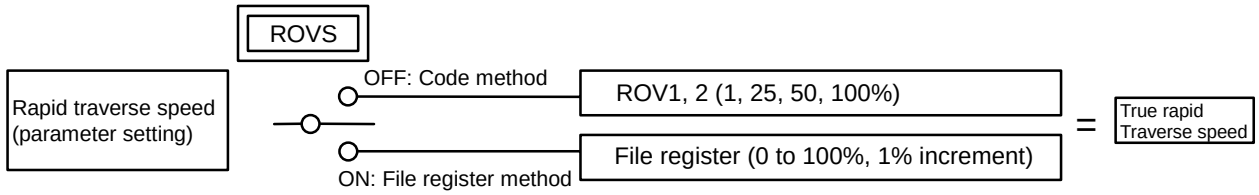
B contact	Signal name	Signal abbreviation		Device
—	RAPID TRAVERSE SPEED OVERRIDE METHOD SELECT	ROVS	P C	Y2AF

[Function]

When speed override is exerted on rapid traverse speed specified in automatic operation or manual operation, override method is selected between code method and file register method (manually set).

[Operation]

When the signal (ROVS) is off, code method (ROV1, 2) is used.
When the signal (ROVS) is on, file register method is used.



Note) For details of "code method override" and "file register method", refer to the respective description.

B contact	Signal name	Signal abbreviation		Device
*	MANUAL FEEDRATE	*JV1 to 16	—	Y2B0 to 4

[Function]

Feedrate in manual operation (JOG mode, incremental feed mode, etc.) or in dry run of automatic operation (memory, MDI, tape) is selected.

[Operation]

This signal is valid in the following cases, but will be invalid when the "Rapid traverse" signal (RT) is on.

(1) Jog mode, incremental mode or reference position return mode is on.
(2) During cutting feed in automatic operation and "Dry run" signal (DRN) is on.
(3) Dry run signal is on during rapid traverse in the automatic operation. Note that parameter #1085 "G00 dry run" must be on.

These signals (*JV1 to 16) are set with the code method. The relation is shown below.

*JV16	*JV8	*JV4	*JV2	*JV1	Manual feedrate			
					Machine parameter set in meters		Machine parameter set in inches	
					Metric mode (mm/min)	Inch mode (inch/min)	Metric mode (mm/min)	Inch mode (inch/min)
1	1	1	1	1	0.00	0.000	0.00	0.000
1	1	1	1	0	1.00	0.040	0.51	0.020
1	1	1	0	1	1.40	0.054	0.71	0.028
1	1	1	0	0	2.00	0.079	1.02	0.040
1	1	0	1	1	2.70	0.106	1.37	0.054
1	1	0	1	0	3.70	0.146	1.88	0.074
1	1	0	0	1	5.20	0.205	2.64	0.104
1	1	0	0	0	7.20	0.283	3.66	0.144
1	0	1	1	1	10.00	0.394	5.08	0.200
1	0	1	1	0	14.00	0.551	7.11	0.280
1	0	1	0	1	20.00	0.787	10.16	0.400
1	0	1	0	0	27.00	1.060	13.72	0.540
1	0	0	1	1	37.00	1.460	18.80	0.740
1	0	0	1	0	52.00	2.050	26.42	1.040
1	0	0	0	1	72.00	2.830	36.58	1.440
1	0	0	0	0	100.00	3.940	50.80	2.000
0	1	1	1	1	140.00	5.510	71.12	2.800
0	1	1	1	0	200.00	7.870	101.60	4.000
0	1	1	0	1	270.00	10.600	137.16	5.400
0	1	1	0	0	370.00	14.600	187.96	7.400
0	1	0	1	1	520.00	20.500	264.16	10.400
0	1	0	1	0	720.00	28.300	365.76	14.400
0	1	0	0	1	1000.00	39.400	508.00	20.000
0	1	0	0	0	1400.00	55.100	711.20	28.000
0	0	1	1	1	2000.00	78.700	990.60	39.000
0	0	1	1	0	2700.00	106.000	1371.60	54.000
0	0	1	0	1	3700.00	146.000	1879.60	74.000
0	0	1	0	0	5200.00	205.000	2641.60	104.000
0	0	0	1	1	7200.00	283.000	3657.60	144.000
0	0	0	1	0	10000.00	394.000	5080.00	200.000
0	0	0	0	1	14000.00	551.000	7112.00	280.000

If *JV 1 to *JV16 are all off, the previous value will be maintained. The value will be set to 0 when the power is turned off.

Note 1) In JOG mode, true feedrate changes if this signal changes during feed motion.
Note 2) In incremental feed mode, true feedrate does not change if this signal changes during feed motion.

[Related signal]

(1) Manual feedrate method select (JVS: Y2B7)
(2) Manual override valid (OVSL: Y299)

(3)

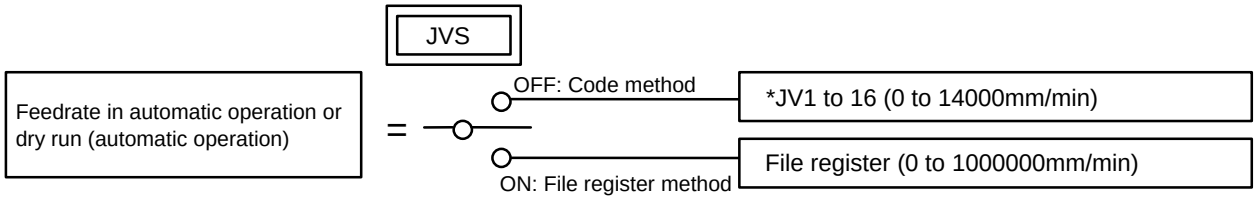
B contact	Signal name	Signal abbreviation		Device
—	MANUAL FEEDRATE METHOD SELECT	JVS	P C	Y2B7

[Function]

When feedrate is specified in manual operation (JOG mode, incremental feed mode, etc.) or dry run (automatic operation), feedrate command method is selected between code method and file register method.

[Operation]

When the signal (JVS) is off, code method (*JV1 to 16) is selected.
When the signal (JVS) is on, file register method is selected.



Note) For details of "code method feedrate" and "file register method feedrate", refer to the relevant description.

B contact	Signal name	Signal abbreviation		Device
—	FEEDRATE LEAST INCREMENT	PCF1, 2	P C	Y2B8, 9

[Function]

When manual feedrate is specified in file register method (JVS: "ON") or in random manual feed mode, file registers R (R136 and R137) are used. In this case, least increment of feedrate entered into file registers R136 and R137 is specified by this signal.

[Operation]

The relationship between PCF1/PCF2 and least feed increment is as follows:

PCF2	PCF1	Least increment (mm/min or inch/min)	Operation
0	0	10	10mm/min (inch/min) when "1" is set in file registers.
0	1	1	1mm/min (inch/min) when "1" is set in file registers.
1	0	0.1	0.1mm/min (inch/min) when "1" is set in file registers.
1	1	0.01	0.01mm/min (inch/min) when "1" is set in file registers.

B contact	Signal name	Signal abbreviation	PC	Device
—	JOG SYNCHRONOUS FEED VALID	JSYN		Y2BA

[Function]

This is used when the manual feedrate designation is to be per rotation feed (feed rate per spindle rotation).

[Operation]

(1) The following operation mode feedrates will immediately become per rotation feed when the "Jog synchronous feed valid" signal is turned ON.
- Jog mode
- Incremental feed mode
- Reference position return mode
- When EX.F/MODAL.F is OFF and G0/G1 is ON in the manual random feed mode.

(2) Even if the jog synchronous feed valid signal is ON, the per minute feed will be used in the following states.
- When the "Dry run" signal is ON.
- When the "Rapid traverse" signal is ON in the jog, incremental or reference position return modes.

[Designation of Feedrates]

The designation of the per rotation feedrate is the same as the per minute feed input.
The cutting feedrate override will be valid when the manual override valid signal is ON.

(1) Code designation method (*JV1 to 16)

*JV16 (Y2B4)	*JV8 (Y2B3)	*JV4 (Y2B2)	*JV2 (Y2B1)	*JV1 (Y2B0)	Feed per minute		Feed per rotation	
					mm/min	inch/min	mm/rev	inch/rev
1	1	1	1	1	0.00	0.000	0.0000	0.00000
1	1	1	1	0	1.00	0.040	0.0100	0.00040
1	1	1	0	1	1.40	0.054	0.0140	0.00054
1	1	1	0	0	2.00	0.079	0.0200	0.00079
1	1	0	1	1	2.70	0.106	0.0270	0.00106
1	1	0	1	0	3.70	0.146	0.0370	0.00146
1	1	0	0	1	5.20	0.205	0.0520	0.00205
1	1	0	0	0	7.20	0.283	0.0720	0.00283
1	0	1	1	1	10.00	0.394	0.1000	0.00394
1	0	1	1	0	14.00	0.551	0.1400	0.00551
1	0	1	0	1	20.00	0.787	0.2000	0.00787
1	0	1	0	0	27.00	1.060	0.2700	0.01060
1	0	0	1	1	37.00	1.460	0.3700	0.01460
1	0	0	1	0	52.00	2.050	0.5200	0.02050
1	0	0	0	1	72.00	2.830	0.7200	0.02830
1	0	0	0	0	100.00	3.940	1.0000	0.03940
0	1	1	1	1	140.00	5.510	1.4000	0.05510
0	1	1	1	0	200.00	7.870	2.0000	0.07870
0	1	1	0	1	270.00	10.600	2.7000	0.10600
0	1	1	0	0	370.00	14.600	3.7000	0.14600
0	1	0	1	1	520.00	20.500	5.2000	0.20500
0	1	0	1	0	720.00	28.300	7.2000	0.28300
0	1	0	0	1	1000.00	39.400	10.0000	0.39400
0	1	0	0	0	1400.00	55.100	14.0000	0.55100
0	0	1	1	1	2000.00	78.700	20.0000	0.78700
0	0	1	1	0	2700.00	106.000	27.0000	1.06000
0	0	1	0	1	3700.00	146.000	37.0000	1.46000
0	0	1	0	0	5200.00	205.000	52.0000	2.05000
0	0	0	1	1	7200.00	283.000	72.0000	2.83000
0	0	0	1	0	10000.00	394.000	100.0000	3.94000
0	0	0	0	1	14000.00	551.000	140.0000	5.51000

(2) Numeric value setting method (R136, 7)

The feedrate when the "Manual feedrate method select" signal (JVS) is selected will be set in R136 and R137 with the binary value. The designation unit will be as follows according to the "Feedrate least increment" signals (PCF1, PCF2).

PCF2 (Y2B9)	PCF1 (Y2B8)	Feed per minute	Feed per rotation
		Speed unit mm/min. or inch min.	Speed unit mm/rev. or inch rev.
0	0	10	0.1
0	1	1	0.01
1	0	0.1	0.001
1	1	0.01	0.0001

B contact	Signal name	Signal abbreviation		Device
—	JOG•HANDLE SYNCHRONOUS	JHAN	P C	Y2BB

[Function]

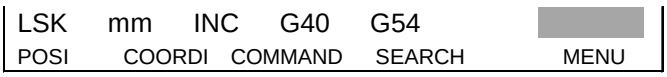
Jog feed and handle feed can be carried out without changing the operation mode.

[Operation]

If the "Jog mode" (J) signal and this signal are input simultaneously, the "jog/handle synchronous mode" will be entered.
If the "Rapid traverse" (RT) signal is turned on during the "jog/handle synchronous mode", the jog feed will be carried out at the rapid traverse feedrate. When the "Rapid traverse" turns off, the jog feed will be carried out at the manual feedrate.

Operation mode	Jog•handle synchronous signal (Y2BB)	Rapid traverse signal (Y22E)	Operation during jog feed	Handle feed
Jog feed	On	On	Rapid traverse feedrate	Possible
		Off	Manual feedrate	Possible
	Off	On	Rapid traverse feedrate	Impossible
		Off	Manual feedrate	Impossible

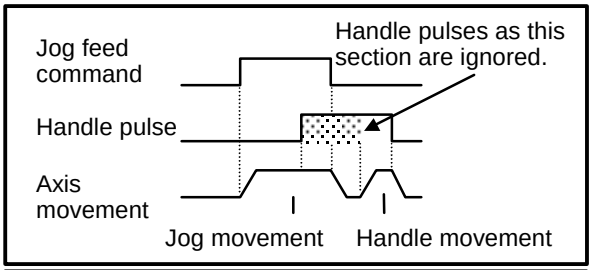
(1) During the "jog/handle synchronous mode", the operation status mode display at the lower part of the setting and display unit screen will be as shown below.



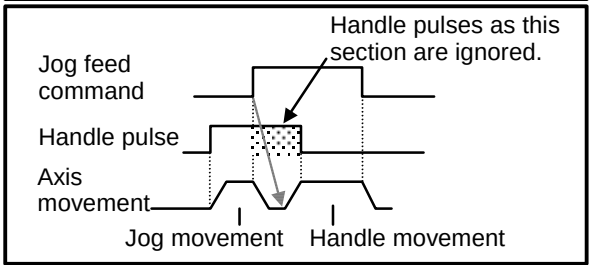
Rapid traverse hand
When jog feed is carried out at rapid traverse feedrate
Manual hand
When jog feed is carried out at manual feedrate

(2) During "jog/handle synchronous mode", jog feed and handle feed can be carried out randomly. However, jog feed and handle feed cannot be carried out simultaneously on the same axis. If carried out simultaneously, the jog feed will have a priority. The changeover between jog feed and handle feed on the same axis is carried out when the relevant axis has stopped.

- If handle feed is carried out on an axis that is being jog fed, the jog feed will have a priority, so after movement with jog feed has completed (the axis has stopped), handle feed movement will start.



- If jog feed is carried out on an axis that is being handle fed, the handle feed movement will stop at the rising edge of the jog feed command. After the axis stops, the jog feed movement will start.



Note) If only the "Jog•handle synchronous" signal is output, "M01 OPERATION ERROR 0101" will occur. If the "Jog•handle synchronous" signal is input simultaneously with an operation mode signal other than the jog mode, the "Jog•handle synchronous" signal will be ignored.

B contact	Signal name	Signal abbreviation		Device
—	EACH AXIS MANUAL FEEDRATE B VALID		P C	Y2BC

[Function]

This signal validates manual feed using each axis manual feedrate B.

[Operation]

(1) If this signal and the manual feedrate B valid signal for the corresponding axis are validated when carrying out manual feed in the jog mode, the axis will move at the speed commanded by each axis manual feedrate B which is commanded separately from the manual feedrate or manual feedrate B.
(2) This signal is common for all axes.

[Related signal]

- Manual feedrate B valid (Y260 to 263)
- Each axis manual feedrate B (R400 to 407)

B contact	Signal name	Signal abbreviation		Device
—	HANDLE/INCREMENTAL FEED MULTIPLICATION	MP1 to 4	P C	Y2C0 to 2

[Function]

Amount of feed motion per pulse from the manual pulse generator in HANDLE feed mode, or amount of feed motion per shot in incremental feed mode (±J1 to 4: "ON") is multiplied by this signal.

[Operation]

This signal (MP1 to 4) is set with the code method.
When this code mode is selected, the true amount of feed motion (per pulse feed in handle feed mode, and per on/off of ±Jn value in incremental feed mode) is the product obtained by multiplying originally set amount of feed by multiplier MP1, MP2, MP4.

The relationship between multiplier code (MP1 to 4) and multiplication in each feed mode is as follows.

MP4	MP2	MP1	Multiplication in HANDLE feed	Multiplication in INCREMENTAL feed
0	0	0	1	1
0	0	1	10	10
0	1	0	100	100
0	1	1	1000	1000
1	0	0	1	5000
1	0	1	10	10000
1	1	0	100	50000
1	1	1	1000	100000

[Related signal]

- Handle mode (H: Y209)
- Incremental mode (S: Y208)

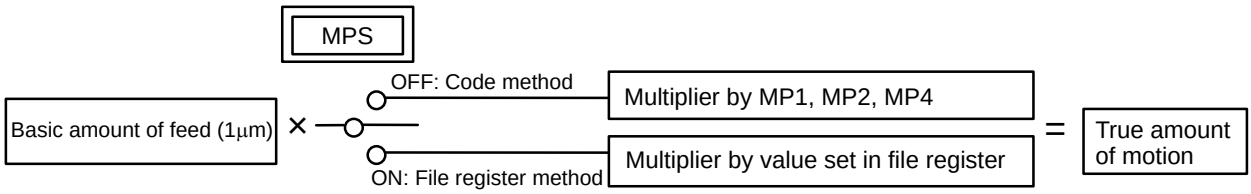
B contact	Signal name	Signal abbreviation		Device
—	HANDLE/INCREMENTAL FEED MULTIPLICATION METHOD SELECT	MPS	P C	Y2C7

[Function]

Feed multiplication method in handle feed or incremental feed is selected between "code method" and "file register method" by this signal.

[Operation]

When the signal (MPS) is off, "code feed multiplication method" is selected.
When the signal (MPS) is on, "file register multiplication method" is selected.



Note) For details of feed multiplication code method and feed multiplication file register method, refer to the relevant descriptions.

B contact	Signal name	Signal abbreviation		Device
—	TOOL ALARM 1/TOOL-SKIP TOOL	TAL1	P C	Y2C8

[Function]

Set the tool data status during tool life management to status "3" (M system: Tool alarm 1, L system: Tool-skip tool).

[Operation]

When the signal (TAL1) is turned on (for tool life management specification), status of tool data is changed to status "3".
For M system, this signal becomes valid when "Tool life management input" signal (Y2CB) is on.

[Related signals]

Tool life management input (TLF1: Y2CB)
Tool alarm 2 (TAL2: Y2C9)
Data count valid (TCEF: Y2CA)

B contact	Signal name	Signal abbreviation		Device
—	TOOL ALARM 2 (M system)	TAL2	PC	Y2C9

[Function]
Set the tool data status during tool life management to status "4" (Tool alarm 2).

[Operation]
When the signal (TAL2) is turned on (for tool life management specification), status of tooling data is changed to status "4". This signal becomes valid when "Tool life management input" signal (Y2CB) is on.

[Related signals]
Tool life management input (TLF1: Y2CB)
Tool alarm 1/Tool-skip tool (TAL1: Y2C8)
Data count valid (TCEF: Y2CA)

B contact	Signal name	Signal abbreviation		Device
—	DATA COUNT VALID	TCEF	PC	Y2CA

[Function]
Tool life counter becomes applicable when this signal is used during tool life control.

[Operation]
When tool life control function is available, counter (count of tool service time or cycles) becomes valid. For M system, this signal becomes valid when "Tool life management input" signal (Y2CB) is on.

[Related signals]
Tool life management input (TLF1: Y2CB)
Tool alarm 1/Tool-skip tool (TAL1: Y2C8)
Tool alarm 2 (TAL2: Y2C9)

B contact	Signal name	Signal abbreviation		Device
—	TOOL LIFE MANAGEMENT INPUT (M system)	TLF1	PC	Y2CB

[Function]
Tool life management function becomes valid when this signal is given.

[Operation]
When tool life management function is available, tool life can be controlled with this signal turned on.

[Related signals]
Tool alarm 1/Tool-skip tool (TAL1: Y2C8)
Tool alarm 2 (TAL2: Y2C9)
Data count valid (TCEF: Y2CA)

B contact	Signal name	Signal abbreviation		Device
—	TOOL CHANGE RESET (L system)	TRST	P C	Y2CC

[Function]

This signal is used to clear all tool usage data in the group of the lathe system tool life management II function.

[Operation]

Select whether the group to be cleared is all groups which have exceeded the life or specific group with the "Tool group No. designation" (file register R150, 151).
When the next group is selected after this signal is input, the head tool of that group will be selected.

Note) The usage data will be counted in respect to the tool used when the signal is input until the tool change is reset or until the next tool is selected when tool skip is carried out on the currently selected group. Thus, when changing the selected tool along with the signal input, select the group beforehand. However, if there is no movement command up to the next group selection after this signal is input, a tool may not be selected because of the preceding process. In this case, turn the "Recalculation request" (CRQ) signal on before selecting the group to invalidate the details of the preceding process.

[Related signals]

(1) Recalculation request (CRQ: Y233)
(2) Tool group No. designation (R150, 151)

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	SPINDLE FORWARD RUN START	SRN	—	Y2D0	Y690

[Function]

This signal is issued to the high speed serial connection specification spindle controller (spindle drive). When the signal turns on, the spindle motor starts rotating in normal direction (CCW as viewed from the shaft side).

[Operation]

Spindle motor starts running at speed specified by S command (S analog data) when the signal (SRN) is turned on.

When the signal is turned off, spindle motion decelerates and stops (transistor base current is shut off).

(1) Spindle motor stops if "Spindle forward run start" signal (SRN) and "Spindle reverse run start" signal (SRI) are turned on at the same time. To resume forward run, both signals off once and then turn the "Spindle forward run start" signal on.
(2) The operation may stop during forward run due to emergency stop, spindle alarm or resetting. Turn the forward run signal off and on once after the "Servo ready complete" signal (SA) turns on.
(3) The motor will not run if the S analog data is 0. The motor will run at the corresponding rotation speed when the S analog data changes.
(4) When "Spindle orient command" signal (ORC) is turned on at the same as "Spindle forward run start" signal (SRN) is turned on, priority is given to the former signal.

[Related signals]

(1) Spindle reverse run start (SRI: Y2D1)
(2) Spindle orient command (ORC: Y2D6)

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	SPINDLE REVERSE RUN START	SRI	—	Y2D1	Y691

[Function]

This signal is issued to the high speed serial connection specification spindle controller (spindle drive). When the signal turns on, the spindle motor starts rotating in inverse direction (CW as viewed from the shaft side).

[Operation]

Spindle motor starts running at speed specified by S command (S analog data) when the signal (SRI) is turned on.

When the signal is turned off, spindle motion decelerates and stops (transistor base current is shut off).

(1) Spindle motor stops if "Spindle reverse run start" signal (SRI) and "Spindle forward run start" signal (SRN) turn on at the same time. To resume reverse run, both signals off once and then turn the "Spindle reverse run start" signal on.
(2) The operation may stop during reverse run due to emergency stop, spindle alarm or resetting. Turn the reverse run signal off and on once after the "Servo ready complete" signal (SA) turns on.
(3) The motor will not run if the S analog data is 0. The motor will run at the corresponding rotation speed when the S analog data changes.
(4) When "Spindle orient command" signal (ORC) is turned on at the same time "Spindle reverse run start" signal (SRI) is turned on, priority is given to the former signal.

[Related signals]

(1) Spindle forward run start (SRN: Y2D0)
(2) Spindle orient command (ORC: Y2D6)

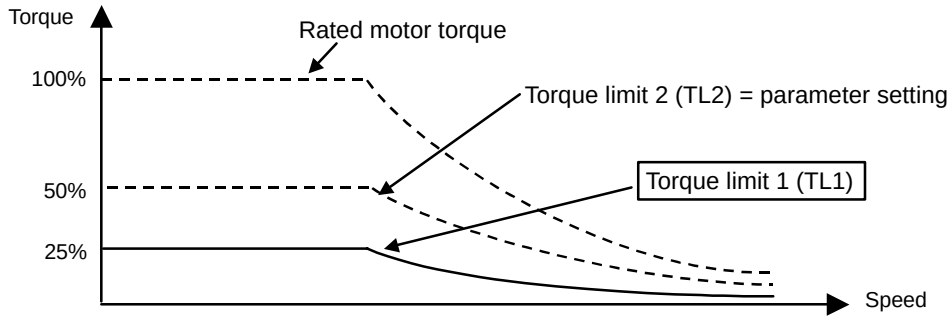
B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	TORQUE LIMIT 1	TL1	P C	Y2D2	Y692

[Function]

This signal is issued to the high-speed serial connection specification spindle controller (spindle drive). When the signal turns on, spindle motor torque is reduced temporarily.
The signal is used in mechanical oriented spindle stop, or gear shift.

[Operation]

There are torque limit 1 (TL1) and torque limit 2 (TL2) signals.
When the torque limit 1 signal (TL1) turns on, the output torque will drop with the set torque limit ratio (half of the torque limit ratio when torque limit 2 set with parameters is on).



Note 1) This signal is valid only for systems that are high-speed serial connected with the spindle controller.

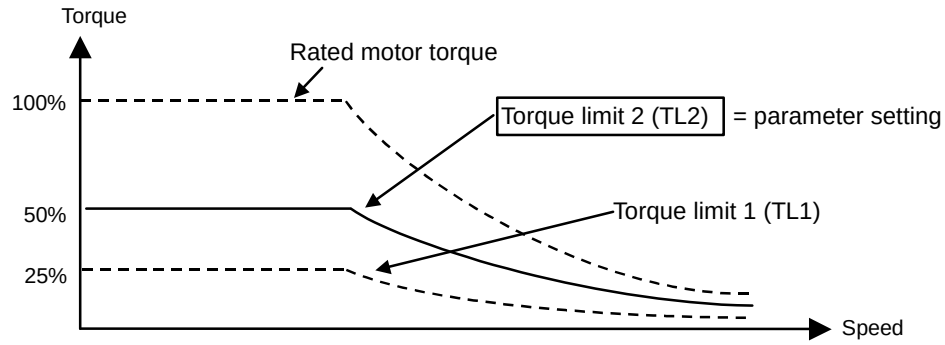
B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	TORQUE LIMIT 2	TL2	P C	Y2D3	Y693

[FUNCTION]

This signal is used for the same purpose as torque limit 1 (TL1).

[Operation]

When torque limit 2 (TL2) turns on, the output torque will drop by the torque limit ratio set with parameters.



Note 1) The torque limit ratio can be set within the range of 0% to 120% with parameters only for torque limit 2.

Note 2) This signal is valid only for systems that are high-speed serial connected with the spindle controller.

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	SPINDLE FORWARD RUN INDEX	WRN	P C	Y2D4	Y694

[Function]

This signal is issued to the high-speed serial connection specification spindle controller (spindle drive), and used for the following purpose.

(1) Spindle forward run index in multi-point indexing

[Operation]

(1) Multi-point indexing

(a) This signal turns on after the "Spindle in-position (ORAO)" signal is output.

(b) Continuous indexing can be carried out by turning this signal on and off while the "Spindle orient command" (ORC) signal is on.

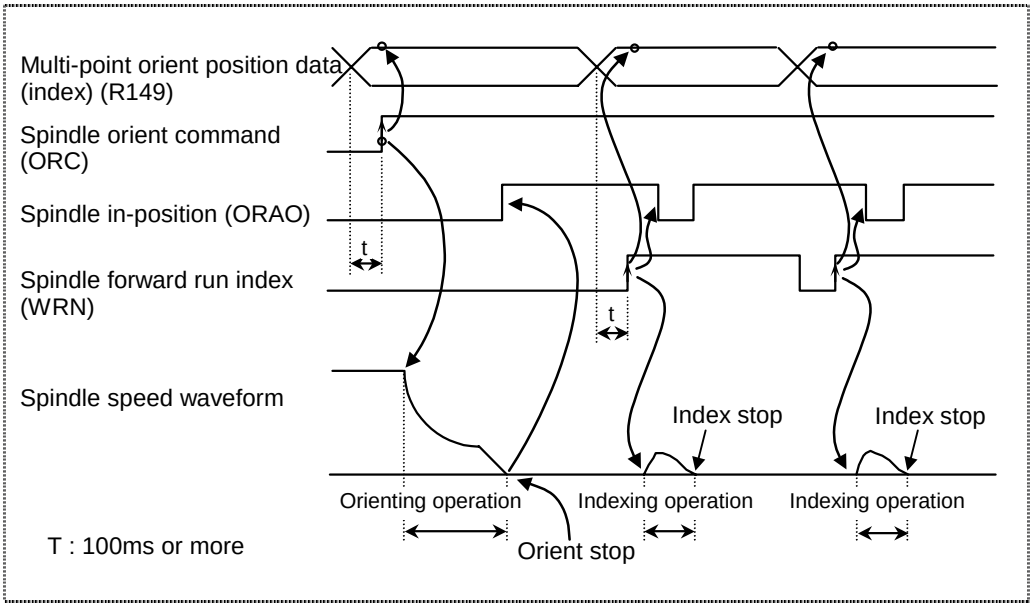
(c) If this signal is turned on before the "Spindle orient command" (ORC) signal is turned on and the "Spindle in-position" (ORAO) signal is output, first the "Spindle orient command" (ORC) signal will turn on, and the orientation will be completed at the multi-point orientation position data (R149) read in. Then, the spindle will be indexed to the position command value read in when this signal is turned on. If the position command value is the same when the "Spindle orient command" (ORC) turns on and this signal turns on, the indexing operation will not be carried out.

(d) The index position command value (12-bit) is read in at the rising edge of this signal. Thus, even if the index position command value is changed after this signal is input, the stop position will not change.

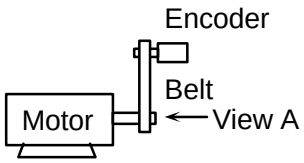
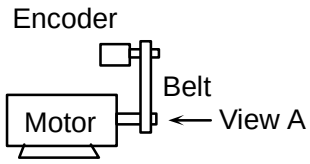
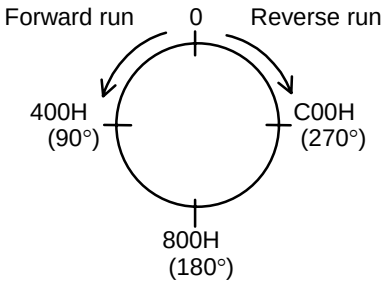
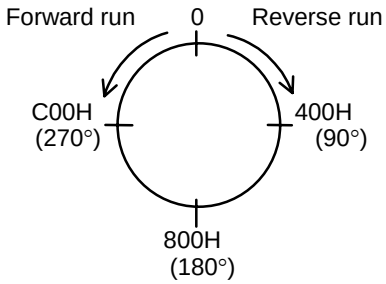
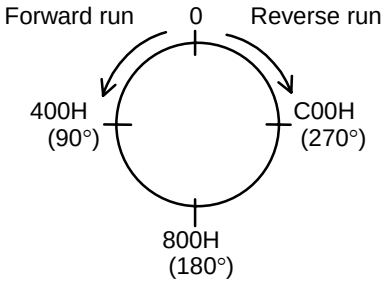
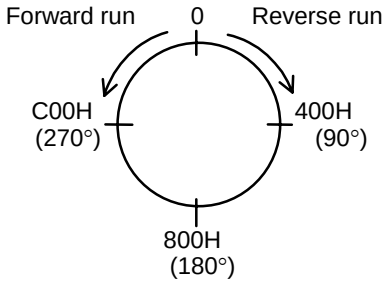
(e) Even if this signal is turned off while the "Spindle orient command" (ORC) is on, the spindle will continue to stop at the position before this signal was turned off. Even if this signal is turned off during the indexing operation, the spindle will stop at the position command value read at the rising edge of this signal.

(f) If the stop point and index position command value are close (within the in-position range), the "Spindle in-position" (ORAO) signal may not turn off and the indexing may be carried out.

(g) If the "Spindle orient command" (ORC) signal is turned off during indexing or when stopped, the servo lock will turn off and the motor will coast. Orientation must be carried out again when executing indexing again.



[Indexing operation according to encoder installation direction]

	Case 1	Case 2
Installation method		
Indexing	Viewed from the shaft side (View A) 	Viewed from the shaft side (View A) 
Orienting	Viewed from the shaft side (View A) 	Viewed from the shaft side (View A) 

Note) Case 1 above applies when using the motor built-in encoder with Z-phase.

[Related signals]

(1) Multi-point orientation position data (R149)
(2) Spindle in-position (ORAO: X246)
(3) Spindle orient command (ORC: X2D6)

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	SPINDLE REVERSE RUN INDEX	WRI	P C	Y2D5	Y695

[Function]

This signal is issued to the high-speed serial connection specification spindle controller (spindle drive), and used for the following purpose.

(1) Spindle reverse run index in multi-point indexing

[Operation]

The operation is the same as forward run indexing, except that the direction is different. Refer to the section on "Spindle forward run index".

[Related signal]

(1) Spindle forward run index (WRN: Y2D4)

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	SPINDLE ORIENT COMMAND	ORC	P C	Y2D6	Y696

[Function]

This signal is issued to the high-speed serial connection specification spindle controller (spindle drive). When the signal is turned on, the spindle is indexed in position.

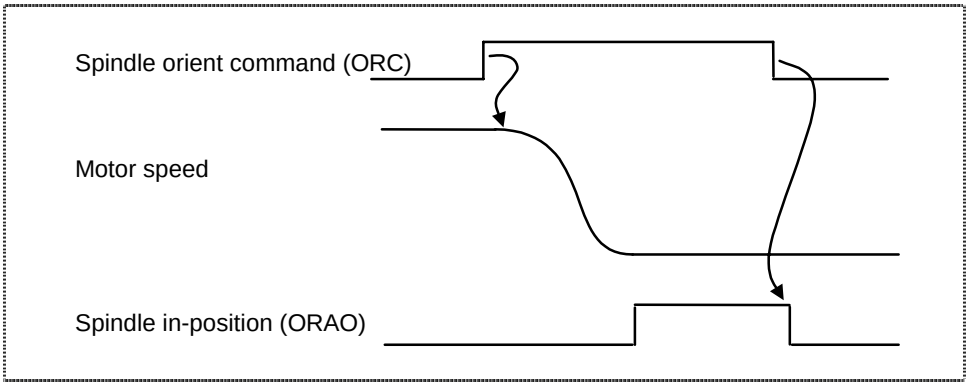
[Operation]

If the "Spindle orient command" signal (ORC) turns on during spindle rotation or when stopped, the spindle will start orientation (stopping at set position). When positioning at the set position is completed, the "Spindle in-position" signal (ORAO) will be output, and orientation will stop.
During oriented spindle stop, the control system is under "servo lock" condition. Servo lock is released when the signal (ORC) is turned off. When servo lock must be maintained, the signal, therefore, should be kept turned on.
The encoder or magnetic sensor method can be used for orientation.

The orientation rotation direction is determined with the parameters.
The orientation stop position is determined by the Z-phase for the encoder method, and by the sensor installation position for the magnetic sensor method. The stopping position can be changed with the following items when using the encoder method.

(1) By parameters (position shift amount)
(2) By multi-point orientation position data (data specification by R149) value
The multi-point orient position data by the parameter and R149 is added.

The timing chart for basic orientation is shown below.



Note 1) The "Spindle orient command" (ORC) takes precedence over the forward run (SRN) and reverse run (SRI) commands.
Note 2) This signal is valid only for systems that are high-speed serial connected with the spindle controller.

[Related signals]

(1) Multi-point orientation position data (R149)
(2) Spindle in-position (ORAO: X246)

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	L COIL SELECTION	LRSL	P C	Y2D7	Y697

[Function]

This signal is used to select the low-speed coil in the spindle coil changeover function.

[Operation]

The high-speed coil and low-speed coil are changed over only with the "L coil selection" (LRSL) in the 2-step coil changeover specification. The high-speed coil, middle- speed coil and low-speed coil are changed over with the combination of the "L coil selection" (LRSL) and "M coil selection" (LRSM) in the 3-step coil changeover specification.

(Note) The coil is not changed over during the position loop control mode even if this signal is changed. The coil selected immediately before the position loop control mode is entered is retained.

(1) 2-step coil changeover

Selected coil	L coil selection (LRSL)	In L coil selected (LCSA)
High-speed (H)	OFF	OFF
Low-speed (L)	ON	ON

(2) 3-step coil changeover

Selected coil	L coil selection (LRSL)	M coil selection (LRSM)	In L coil selected (LCSA)	In M coil selected (MCSA)
High-speed (H)	OFF	OFF	OFF	OFF
Middle-speed (M)	OFF	ON	OFF	ON
Low-speed (L)	ON	OFF	ON	OFF
	ON	ON	ON	ON

[Related signals]

M coil selection (LRSM: Y2DE)
In L coil selected (LCSA: X247)
In M coil selected (MCSA: X1D6)

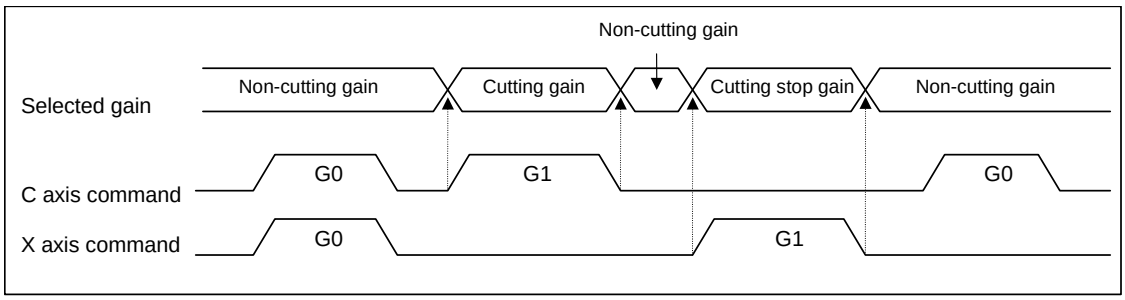
B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle
—	C AXIS GAIN L, H		P C	Y2DA, B	Y69A, B

[Function]

This signal selects whether to change the C axis gain (select optimum gain) according the C axis cutting state.

During C axis cutting feed, cutting gain is applied. During other axis' cutting feed (C axis face turning), non-cutting stop gain is applied. Non-cutting gain is applied in all other cases.

[Operation]



(Note 1) There are 1st to 3rd cutting gains, which are selected with the ladder.

Signal / Selected details	C axis gain L	C axis gain H	Remarks	
Non-cutting gain	–	–	Spindle parameter SP003 selection	Selected during rapid traverse
1st cutting gain	0	0	Spindle parameter SP130 selection	Selected during cutting feed
	1	1		
2nd cutting gain	1	0	Spindle parameter SP131 selection	
3rd cutting gain	0	1	Spindle parameter SP132 selection	
Cutting stop gain	–	–	Spindle parameter SP133 selection	

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	M COIL SELECTION	LRSM	P C	Y2DE	Y69E

[Function]

This signal is used to select the middle-speed coil in the 3-step coil changeover specification of the spindle coil changeover function.

[Operation]

The coil is selected depending on the combination of this signal and the "L coil selection" (LRSL).

(Note) The coil is not changed over during the position loop control mode even if this signal is changed. The coil selected immediately before the position loop control mode is entered is retained.

Selected coil	L coil selection (LRSL)	M coil selection (LRSM)	In L coil selected (LCSA)	In M coil selected (MCSA)
High-speed (H)	OFF	OFF	OFF	OFF
Middle-speed (M)	OFF	ON	OFF	ON
Low-speed (L)	ON	OFF	ON	OFF
	ON	ON	ON	ON

[Related signals]

L coil selection (LRSL: Y2D7)
In L coil selected (LCSA: X247)
In M coil selected (MCSA: X1D6)

B contact	Signal name	Signal abbreviation		Device
*	PLC CONTROL AXIS NEAR-POINT DOG n-TH AXIS	*PCD1, 2	PC	Y2E0, 1

[Function]

The PLC axis reference position near-point dog signal is input.

[Operation]

The PLC axis reference position near-point dog signal is set in the following devices by the PLC.

Device No.		Signal name
Y2E0	PCD1	PLC control axis near-point dog 1st axis
Y2E1	PCD2	PLC control axis near-point dog 2nd axis

Note) If the dog signal is set during the PLC middle-speed process, the response will be poorer than when the dog signal is set with the PLC high-speed process.

B contact	Signal name	Signal abbreviation		Device
—	PLC CONTROL AXIS nTH HANDLE VALID	PCH1, 2	PC	Y2E4, 5

[Function]

This is designated when handle feed is to be carried out with the PLC axis.

[Operation]

Designate with the following devices when carrying out handle feed with the PLC axis.

Device No.		Signal name
Y2E4	PCH1	PLC control axis 1st handle valid
Y2E5	PCH2	PLC control axis 2nd handle valid

Note 1) When this signal is on, each handle will be exclusive for the PLC axis. The handle will not be valid for the NC control axis.
The "1st handle axis No." (HS11 to 116, HS11S), the "2nd handle axis No." (HS21 to 216, HS21S) and "3rd handle axis No." (HS31 to 316, HS31S) are used to select each handle axis.

Note 2) The handle feed magnification is common with that for the NC control axis.

B contact	Signal name	Signal abbreviation		Device
—	SCREEN DISPLAY REQUEST	CSRON	P C	Y2F9

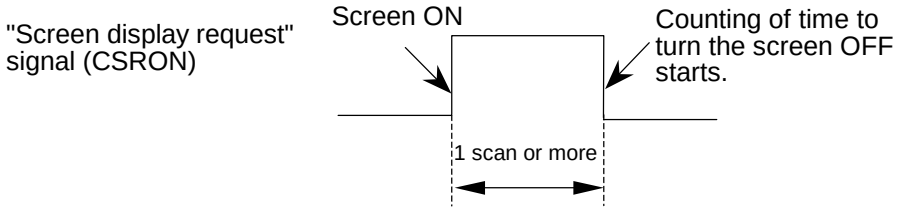
[Function]

The screen turned OFF with the screen saver function can be turned ON again.

[Operation]

(1) The screen is turned ON again when this signal turns ON. Counting of the time to turn the screen OFF will start when this signal turns OFF.

(2) If this signal is output to the CNC while the screen is ON, counting of the time to turn the screen OFF will restart.



(Note 1) The screen is not turned OFF with the screen saver time while the "Screen display request" signal is ON, but the screen can be turned OFF using the SHIFT and C.B CAN keys.

(Note 2) If the "Screen display request" signal (Y2F9) is changed again after that has changed once, intervals of 1scan or more must be taken.

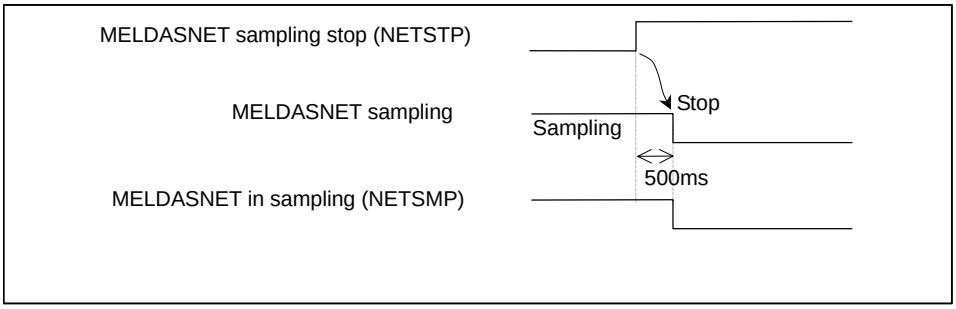
B contact	Signal name	Signal abbreviation		Device
—	MELDASNET SAMPLING STOP	NETSTP	P C	Y2FB

[Function]

When sampling with the MELDASNET function, the sampling will stop when this signal turns ON.

[Operation]

The MELDASNET sampling stop signal (NETSTP) is valid when this signal changes from OFF to ON. When sampling with the MELDASNET function (when the MELDASNET in sampling signal (NETSMP) is ON), the sampling will stop when this signal is turned ON. The sampling will stop approx. 500ms after this signal is turned ON. The sampling will stop, and the MELDASNET in sampling signal(NETSMP) will turn OFF.



(Note 1) If this signal is turned ON at the first scan after the power is turned ON, the sampling will not stop.
Turn this signal OFF and then ON again.

[Related signals]

MELDASNET in sampling (NETSMP: X303)

B contact	Signal name	Signal abbreviation		Device
—	DATA SAMPLING TRIGGER	SMPTRG	P C	Y2FC

[Function]

The start and end of data sampling are controlled.

[Operation]

If PLC device is selected as the conditions (#5, #22) for starting and ending data sampling, the start and end of data sampling will be controlled with this signal (Y2FC). Note that if a random device is designated (#24), the data sampling will start and end by turning the designated device ON and OFF.

The following parameters are set on the NC data sampling screen.

# No.	name	Detail
5	S-CONDITION	When this parameter is set to "2", the condition for starting data sampling is the PLC device ON (OFF when using B contact).
22	E-CONDITION	When this parameter is set to "2", the condition for ending data sampling is the PLC device OFF (ON when using B contact).
24	PLC-DEVICE	When #5 or #22 is set to "2", the device for controlling the start and end of data sampling is set. When this parameter is set to "0", the device for controlling the start and end of data sampling is the data sampling trigger (Y2FC).

Note) When "#0 SMT START" is set to "0", this signal is invalid.

B contact	Signal name	Signal abbreviation		Device
—	PLC SNAPSHOT	MTBT	—	Y2FD

[Function]

The PLC snapshot data is saved in the CNC memory.
The saved data can be transmitted using the data transmission function of machine builder network system.
For example, if a ladder is created to turn MTBT ON when a PLC alarm occurs, the PLC snapshot data can be retrieved when a PLC alarm occurs.
The machine builder network system specifications are required to use this signal.

[Operation]

The following data is saved as the PLC snapshot data at the rising edge of this signal.

- Bit devices (X device, Y device)
- Registers (R register, D register)
- PLC timer

[Caution]

This signal is used for the machine builder network system.
Contact the machine manufacturer for details on the machine builder network system.

B contact	Signal name	Signal abbreviation		Device
—	ZERO POINT INITIALIZING MODE nTH AXIS	AZS1 to 4	P C	Y300 to 3

[Function]

This selects the zero point initializing mode with the reference position alignment method in the absolute position detection system.

[Operation]

The zero point initializing mode is selected with this signal.
Refer to the section on "Zero point initializing completed" (ZSFn) signal for details on the operations.

Note 1) This signal is a function signal for zero point initializing, and is not a signal that selects the operation mode. Select the jog mode or handle mode to move the axis to a required position.

Note 2) This signal is valid for the following specifications.
- When servo detection specification (motor detector, servo system) is the absolute position detection system.
- When "TYPE" on the [ABS. POSI PARAM] screen is set to "2".

[Related signals]

(1) Zero point initializing completed (ZSFn : X280 to 3)
(2) Zero point initializing error completed (ZSEn : X288 to B)
(3) In initialization (R62)
(4) Initialization incomplete (R63)
(5) Zero point initializing start (ZSTn : Y308 to B)

B contact	Signal name	Signal abbreviation		Device
—	ZERO POINT INITIALIZING START nTH AXIS	ZST1 to 4	P C	Y308 to B

[Function]

This is used to set a random position as the origin during zero point initializing using the marked point alignment method in the absolute position detection system.

[Operation]

This signal turns on when the relevant axis is moved and reached an arbitrary position designated as the zero point in the zero point initializing mode.
Refer to the section on "Zero point initializing completed" (ZSFn) signal for details on the operations.

Note 1) This signal is a function signal for zero point initializing, and is not a signal that selects the operation mode. Select the jog mode or handle mode to move the axis to a required position.

Note 2) This signal is valid for the following specifications.
- When servo detection specification (motor detector, servo system) is the absolute position detection system.
- When "TYPE" on the [ABS. POSI PARAM] screen is set to "2".

Note 3) This signal will be invalid in the following states.
- During emergency stop
- During reset
- When the "Zero point initializing start" (ZSTn) signal is turned on before the "Zero point initializing mode" (AZSn) signal. In this case, turn this signal off once, and then turn it on again.
- When the grid (Z-phase signal provided per motor rotation) has not been passed once after the power is turned on.

[Related signals]

(1) Zero point initializing completed (ZSFn : X280 to 3)
(2) Zero point initializing error completed (ZSEn : X288 to B)
(3) In initialization (R62)
(4) Initialization incomplete (R63)
(5) Zero point initializing mode (AZSn : Y300 to B)

B contact	Signal name	Signal abbreviation		Device
—	EXTERNAL WORKPIECE COORDINATE MEASUREMENT 2ND AXIS		PC	Y329

[Function] (L system)

The Z axis external workpiece coordinate OFFset data can be set by cutting the workpiece face with manual operations and inputting external workpiece coordinate measurement 2nd axis.

[Operation]

(1) Mode selection
Set the mode selection switch to the manual mode ([Handle], [Jog] or [Rapid Traverse]).

(2) Tool measurement mode signal input
Set the tool measurement mode signal to "1".

(3) Main/sub selection
Using the tool presetter sub-side valid signal, select whether to measure the workpiece coordinates on the main spindle side or sub-spindle side.

<Tool presetter sub-side valid signal>

OFF : The compensation No. is retrieved from the main spindle side R registers.
ON : The compensation No. is retrieved from the sub-spindle side R registers.

(Note 1) Hold the state of this signal until the measurement with the selected tool is completed.

(4) Tool selection
Issue the T command with MDI operation, etc., and select the tool.

(Note 1) Set the selected tool compensation No. in the R register.
The set R register differs according to the parameter setting and the state of the tool presetter sub-side valid signal.

(Note 2) Set the "tool length/wear data" for the tool being used beforehand.

Compensation No. R registers

#1098 Tlno.	#1130 set_t	#1218 aux02 bit4	Tool length compensation No.		Tool nose wear compensation No.	
			Main side	Sub-side	Main side	Sub-side
0	0	0/1	R192, R193	R1000, R1001	R192, R193	R1000, R1001
	1	0/1				
1	0	0	R36, R37		R192, R193	R1000, R1001
		1	R194, R195	R1002, R1003	R192, R193	R1000, R1001
	1	0/1	R194, R195	R1002, R1003	R192, R193	R1000, R1001

- When the compensation No. is 0, the compensation amount will be calculated as "0".
- If the compensation No. exceeds the number of specified offset sets, the "Compensation No. illegal" error will occur.
- Whether to use the main side or sub-side is selected with the tool presetter sub-side valid signal. (OFF: Main side, ON: Sub-side)

(5) Cutting the workpiece face
If the workpiece face has not been cut, cut the workpiece face slightly to even it.

(Note 1) Do not move the tool in the detection of Z axis after cutting the workpiece face.

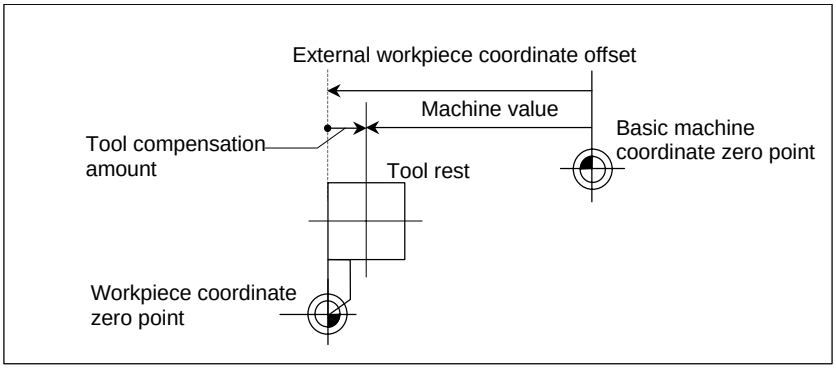
(Note 2) If the workpiece does not need to be cut, carry out positioning to the measurement position.

(6) Setting the Z axis external workpiece coordinate offset data with the external workpiece coordinate measurement 2nd axis signal input
Input the external workpiece coordinate measurement 2nd axis signal (this signal). The Z axis external workpiece coordinate offset data is automatically calculated from the tool compensation data of the used tool and the machine value at the point this signal is input. The results are set as the data.
(a) Details of automatic calculation expression
The external workpiece coordinate offset data is automatically calculated with the following expression.

External workpiece coordinate offset = Machine coordinate value - tool compensation data

The tool compensation data used for the measurement is selected with the base specification parameter "#1226 aux10 bit0".

aux10 bit0	Tool compensation data
0	Tool length data + nose wear data
1	Tool length data



(7) Turning the tool measurement mode signal OFF
Measurement of the external workpiece coordinate offset is completed.

[Related signals]
Tool presetter sub-side valid (Y37A)
Tool compensation No. (Main side: R192-R195, Sub side: R1000-R1003)
Tool length measurement 2 (L system) (TLMS: Y229)

B contact	Signal name	Signal abbreviation		Device
—	CONTROL AXIS DETACH 2 n-TH AXIS	DTCH21 to 24	P C	Y330 to 3

[Function]

A control axis can be excluded from the control targets with this function.
This signal is present for each control axis. The end numbers in the signal name indicate the control axis No.

DTCH2n
- 1: The 1st axis is set as axis detach 2.
- :
- :
- 4: The 4th axis is set as axis detach 2.

[Operation]

When the "Control axis detach 2" signal (DTCH2n) turns ON, the corresponding axis is excluded from the control targets.
(1) Position control cannot be carried out, but the position is not lost because the position detection is valid.
(2) The "Interlock" signal of the corresponding axis is considered turned ON.
(3) The corresponding axis also appears in the CRT position display.

[Related signals]

Control axis detach nth axis (DTCHn: Y180)

B contact	Signal name	Signal abbreviation		Device
—	UNCLAMP COMPLETE n-TH AXIS		P C	Y338 to B

[Function]

This signal indicates that unclamping has been completed in respect to the unclamp command from the CNC.

[Operation]

When the unclamp command signal turns ON, the clamp on the corresponding axis is released by the PLC, and then this signal turns ON.
When the unclamp command turns OFF, the corresponding axis is clamped by the PLC, and then this signal turns OFF.

[Related signals]

Unclamp command (X2B8 to X2BB)

B contact	Signal name	Signal abbreviation		Device
*	2ND REFERENCE POSITION RETURN INTERLOCK	ZRIT	P C	Y348

[Function]

The axis is interlocked at a designated position during manual 2nd reference position return.

[Operation]

During 2nd reference point return while this signal is valid (base specification parameter "#1505 ckref2" is "1"), if this signal turns OFF, movement of axes that have reached the designated position will stop, and an interlock will be applied. Axes that have not reached the designated position will be interlocked after reaching the designated position.

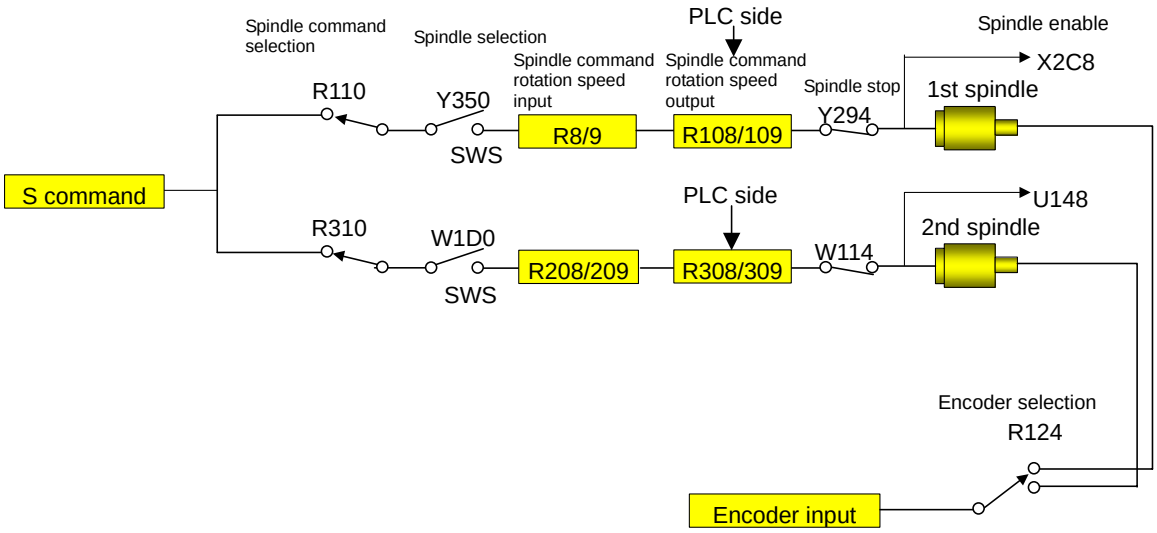
When this signal is ON, the axis movement will not stop, and the 2nd reference position return will continue.

B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle
—	SPINDLE SELECTION	SWS	P C	Y350	Y710

[Function]

The spindle to which the S command for the spindle is output is selected when the multi-spindle control II is valid.
0: Not select
1: Select

[Operation]



The S command for a spindle is output as the rotation speed command to the spindle which has been selected by the "Spindle selection" signal (SWS) ON from the PLC. The selected spindle rotates at the rotation speed which was output. The spindles which were de-selected by the "Spindle selection" signal (SWS) OFF continue to rotate at the same rotation speed as the speed immediately before their de-selection. This allows each spindle to be rotated simultaneously at a different rotation speed.

[Related signals]

(1) Spindle stop (SSTP: Y294)
(2) Spindle enable (ENB: X2C8)
(3) Encoder selection (R124)
(4) Spindle forward run start (SRN: Y2D0)
(5) Spindle reverse run start (SRI: Y2D1)

B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle
—	PLC COIL CHANGEOVER	MPCSL	P C	Y357	Y717

[Function]

When the coil changeover is the NC internal process, the coil changeover with the PLC signal can be performed with this signal.

[Operation]

If the coil changeover is the NC internal process, the NC internal process selection is interrupted and changed to the selection with the PLC signal when this signal is turned ON.
The coil changeover in the NC internal process and the coil changeover via the PLC are changed over with the parameter #1239 set11/bit0.

0: Via PLC
1: NC internal process

(1) H/L coil changeover

- The L -> H coil changeover is changed over at the same time when the H coil selection is entered.
- The H -> L coil changeover is not changed over during the "Speed detect" signal (VRO) OFF even if the L coil selection is entered.
  The coil changeover is changed over after the "Speed detect" signal (SD) is turned ON.

(2) H/M/L coil changeover

- The L -> M coil changeover is changed over at the same time when the M coil selection is entered.
- The L -> H coil changeover is changed over at the same time when the H coil selection is entered.
- The M -> H coil changeover is changed over at the same time when the M coil selection is entered.
- The H -> M coil changeover is not changed over during the "Speed detect 2" signal (SD2) OFF even if the M coil selection is entered.
  The coil changeover is changed over after the "Speed detect 2" signal (SD2) is turned ON.
- The H -> L coil changeover is not changed over during the "Speed detect" signal (VRO) OFF even if the L coil selection is entered.
  The coil changeover is changed over after the "Speed detect" signal (VRO) is turned ON.
- The M -> L coil changeover is not changed over during the "Speed detect" signal (VRO) OFF even if the L coil selection is entered.
  The coil changeover is changed over after the "Speed detect" signal (VRO) is turned ON.

(Note) This signal must be turned ON after the "L coil selection" (LRSL)/ "M coil selection" (LRSM) signal has been decided. The NC internal changeover process is entered when this signal is turned OFF, so note the spindle rotation speed.

[Related signals]

L coil selection (LRSL: Y2D7)
M coil selection (LRSM: Y2DE)
In L coil selected (LCSA: X247)
In M coil selected (MCSA: X1D6)

B contact	Signal name	Signal abbreviation		Device
—	POSITION SWITCH n INTERLOCK		P C	Y370 to 7

[Function]

An interlock is applied on the axis when outside the position switch range, and movement of the axis targeted by the position switch is prohibited.

[Operation]

When this signal turns ON and the axis targeted for the corresponding position switch is outside the range, an interlock will be applied on the axis, and movement will be prohibited. Movement is possible within the set range.

- Movement in interlock range

  [For linear axis]

  The axis can move only in the direction toward the position switch range.
  If a command is issued in the direction that moves away from the position switch range, "M01 OPERATION ERROR 0004 *" (* is axis name) will occur.

  [For rotary axis]

  If axis movement is commanded in the interlock state, "M01 OPERATION ERROR 0004 *" (* is axis name) will occur. To move the axis, turn the "Position switch interlock" signal input OFF and cancel the interlock state. Note that even if the axis is moved away from the position switch range in this state, the interlock will not be applied.

- Coasting distance

  The coasting distance when outside the position switch range by axis movement depends on the commanded speed and parameter setting.

[Coasting distance for position switch interlock]

Pcheck	<check>	Coasting distance
0	0	The acceleration/deceleration delay is added to the movement distance within the commanded speed × 0.060 [s] or less.
0	1	Same as the above distance. (When Pcheck is 0, the <check> setting is invalid.)
1	0	Within commanded speed × 0.015 [s] or less (During manual mode, commanded speed × 0.030 [s] or less)
1	1	Acceleration/deceleration delay or position loop gain delay is added to above distance.

[Cautions]

(1) When moving from the set range to outside the range, the coasting distance up to when the axis stops will differ according to the position switch method.
(2) The position switch interlock is invalid for a reference position return incomplete axis (incremental specifications) absolute position initialization incomplete axis and an axis for which absolute position initialization is being carried out.

[Related signal]

Position switch (PSW1 to 7: X270 to 7)

B contact	Signal name	Signal abbreviation		Device
—	BARRIER VALID (LEFT)		P C	Y378

B contact	Signal name	Signal abbreviation		Device
—	BARRIER VALID (RIGHT)		P C	Y379

[Function]

This signal is used to validate the left (right) barrier range for the chuck•tailstock barrier function.

[Operation]

The chuck/tailstock barrier function's barrier range is validated when this signal turns ON. If the tool nose attempts to enter the range, an error will occur.

Note that to validate the barrier function, this signal must be ON, and the parameter "#8310 Barrier ON" must be set to "1", and "#8315 BARRIER TYPE (L)" ("#8316 BARRIER TYPE (R)") must not be set to "0" on the BARRIER screen. (Excluding when using a special display unit.)

The barrier range validity can also be changed with the G22/G23 command instead of this signal input. In this case, the left and right settings will change simultaneously. (There are some systems with which G22/G23 cannot be commanded because of the selected G code system.)

B contact	Signal name	Signal abbreviation		Device
—	DOOR OPEN		P C	Y380

[Function]

This signal stops all axes, and cuts off contactor power.

[Operation]

The NC carries out the following operations when the "Door open" signal turns ON.

(1) A deceleration stop is carried out for all axes (servo axes and spindles).
(2) A ready OFF state occurs after all axes stop, and the contactor power of each amplifier is cut off.
(3) The "Door open enable" signal turns ON.

The NC carries out the following operations when the "Door open" signal turns OFF.

(1) A ready ON and servo ON state occurs for all axes.
(2) The "Door open enable" signal turns OFF.

[Caution]

(1) Handling of the PLC axis
Set so a "Door open" signal is output to the NC after the PLC axis is stopped by the PLC.
If a "Door open" signal is input without stopping the PLC axis, the axis will stop with a dynamic brake method due to the ready OFF state.
The remaining distance will be held in the R register being used in the DDB.

(2) Handling of the analog spindle
When an analog spindle is connected, it is not possible to confirm that the spindle has completely stopped with the NC. Thus, confirm that the spindle has completely stopped using the PLC, before opening the door.
Because the spindle may start rotating again immediately after the door is closed, for safety turn the forward run and reverse run signals OFF when the door is open.

(3) Opening the door during ATC operation
When opening the door during ATC operation, apply an interlock with the user PLC.

[Related signals]

Door open enable (X300)

B contact	Signal name	Signal abbreviation		Device
—	DOOR OPEN II		P C	Y381

[Function]

This signal stops all axes, and cuts off contactor power.

[Operation]

The NC carries out the following operations when the "Door open II" signal turns ON.

(1) A deceleration stop is carried out for all axes (servo axes and spindles). (Axis interlock)
(2) After all axes stop, the contactor power of each amplifier is cut off. The "Servo ready complete" signal (SA) does not turn OFF.
(3) The "Door open enable" signal turns ON.

The NC carries out the following operations when the "Door open II" signal turns OFF.

(1) A ready ON and servo ON state occurs for all axes.
(2) The "Door open enable" signal turns OFF.

[Caution]

(1) Handling of the PLC axis
Set so a "Door open" signal is output to the NC after the PLC axis is stopped by the PLC.
If a "Door open" signal is input without stopping the PLC axis, the axis will stop with a dynamic brake method due to the ready OFF state.
The remaining distance will be held in the R register being used in the DDB.

(2) Handling of the analog spindle
When an analog spindle is connected, it is not possible to confirm that the spindle has completely stopped with the NC. Thus, confirm that the spindle has completely stopped using the PLC, before opening the door.
Because the spindle may start rotating again immediately after the door is closed, for safety turn the forward run and reverse run signals OFF when the door is open.

(3) Opening the door during ATC operation
When opening the door during ATC operation, apply an interlock with the user PLC.

[Related signals]

Door open enable (X300)

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	DOOR OPEN SIGNAL INPUT (spindle speed monitor)		P C	Y382	YCC2

[Function]

This signal informs the door open or close state to the spindle amplifier with the spindle speed monitor function.

[Operation]

"1" is entered in the door open state.
The compatibility check of this signal and the door close signal connected with the spindle amplifier is performed in the spindle amplifier.
If those signals are not compatible for continuous 3 seconds, the servo alarm (5D) will occur.

[Related signals]

Door open enable (X300)

B contact	Signal name	Signal abbreviation		Device
—	DOOR INTERLOCK SPINDLE SPEED CLAMP		P C	Y383

[Function]

This signal is used to change the spindle's clamp speed.

[Operation]

When the "Door interlock spindle speed clamp" signal is turned ON, the spindle rotation speed will be limited by the set clamp speed value.

The relation of the "Door interlock spindle speed clamp" signal and the clamp speed parameter in each operation is shown below.

Spindle operation	Clamp speed parameter (spindle parameter)	
	Door interlock spindle speed clamp OFF	Door interlock spindle speed clamp ON
Orientation (multi-point orientation)	#3205 SP005	#3315 SP115
Synchronized tapping (zero point return)	#3414 SP214	#3315 SP115
Spindle C axis (C axis zero point return)	#3349 SP149	#3315 SP115

[Cautions]

(1) This signal is valid only when the door interlock spindle clamp speed valid parameter "#1239 set11 BIT5" is set to "1".

(2) The clamp speed parameter setting value validated when the "Door interlock spindle speed clamp" signal is ON must always be set smaller than the original clamp speed setting value (clamp speed valid when signal is OFF). The clamp speed will change when the signal turns ON regardless of the size of the parameter setting values.

(3) Do not change the state of the "Door interlock spindle speed clamp" signal during multi-point indexing. The clamp speed will change if the signal state is changed during operation.

(4) Even if the "Door interlock spindle speed clamp" signal is changed during orientation, during zero point return at synchronized tapping or during zero point return after changing from the spindle mode to the C axis mode under the spindle/C-axis control function, the clamp speed will not change. The rotation speed is clamped by the clamp speed set with the signal state before each operation is executed.

B contact	Signal name	Signal abbreviation		Device
—	PLC SKIP 1 to 8		P C	Y3A0 to 7

[Function]

This is the skip input signal from the PLC. Skip conditions are created with the built-in PLC to realize skip operation. With the skip conditions created with the built-in PLC, skip operation is performed by high-speed skip (fixed signal for hardware) and OR (logical sum).

[Operation]

This can be used for the skip related functions. (G31 skip, tool length measurement, etc.)

[Cautions]

(1) The "PLC skip" signal is output to the skip input (X178 to X17F).

(2) When PLC skip is used, the coasting amount from the skip signal input will be slightly longer than the high speed skip.

6.4 PLC Output Signals (Data Type: R***)

B contact	Signal name	Signal abbreviation		Device
—	ANALOG OUTPUT	AOn	P C	R100 to 3

[Function]

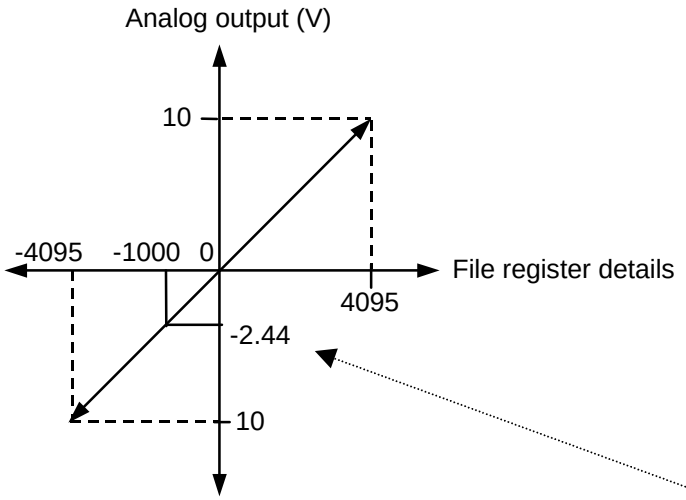
An analog voltage can be output from the designated connector pins (see below) on the remote I/O unit DX120 by setting designated data in the file registers.

[Operation]

"Analog voltage" signal (for speed control) can be output by setting signed binary data to the corresponding file register.
The analog output interface is explained below.

Channel	File register (R)	Remote I/O unit DX120 output destination
A01	R100	Channel setting switch is set to 1st card B04, A04 (Common)
A02	R101	Channel setting switch is set to 3rd card B04, A04 (Common)
A03	R102	Channel setting switch is set to 5th card B04, A04 (Common)
A04	R103	Channel setting switch is set to 7th card B04, A04 (Common)

<Relation of file register details and analog output voltage>



Output voltage : -10V to +10V (±5%)
Resolution : 2^{12} (1/4095) x Fullscal
Load conditions : 10kohm resistance load (standard)
Output impedance: 220ohm

Output voltage = $\frac{-1000}{4095}$ x 10V = -2.44V

The output voltage is

<Relation of file register details and output voltage>

Rn n = 100 to 103															
2^{15}	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}
1	1	1	1	1	1	0	0	0	0	0	1	1	0	0	0

When -1000
(FC18 with hexadecimal)

The data is input as binary coded data.

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	SPINDLE COMMAND ROTATION SPEED OUTPUT		P C	R108, 9	R308, 9

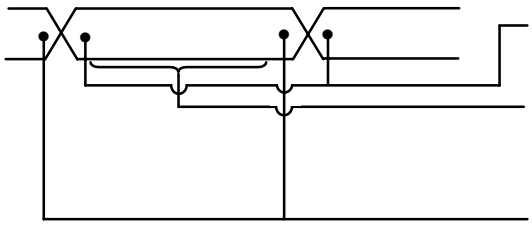
[Function]

By setting data of desired spindle speed to this signal, the spindle can be run at that speed.

[Operation]

When this signal is used, operation is same as the case where usual spindle command rotation speed input signal (R8, 9) is given. Difference is that when data is set by user PLC, priority is given to that data over spindle (S) command data specified in automatic operation, or by manual command setting.

User PLC main (medium-speed) operation pattern



(1) "Spindle command rotation speed input data" is set to the "output data" at the head of user PLC main program (controller process).
(2) "Spindle command rotation speed output data" can be rewritten by user PLC within this interval if necessary (PLC process).
(3) "Spindle command rotation speed output data" is processed at the end of user PLC and signal is given to spindle controller (controller process).

Note 1) "Spindle command rotation speed output data" is rewritten by user PLC for each scan (constant).

Note 2) "Spindle speed override", "Spindle gear select input (GI1, GI2)", "Spindle stop (SSTP)", "Spindle gear shift (SSFT)" and "Oriented spindle speed command (SORC)" conditions are added to "Spindle command rotation speed output data" and sent to the spindle controller.

Note 3) For flow of spindle (S) function command data, data update timing, etc., refer to the section for normal "Spindle command rotation speed input" signal (R8, 9).

[Related signals]

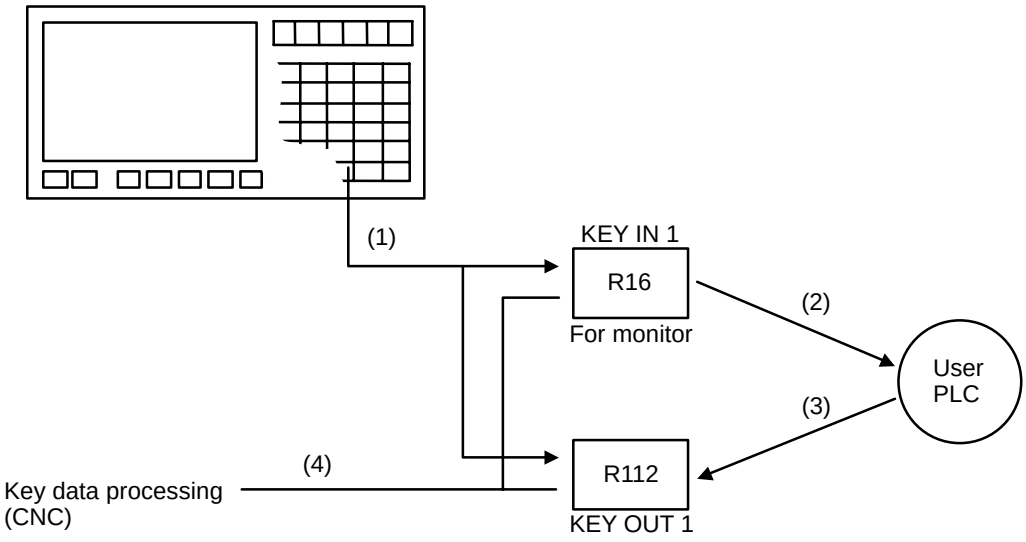
(1) Spindle command rotation speed input (R8, 9)
(2) Spindle command final data (R10 to 13)

B contact	Signal name	Signal abbreviation		Device
—	KEY OUT 1		P C	R112

[Function]

When this signal is used, key data can be entered on the user PLC side instead of the CNC keyboard.

[Operation]



(1) Key data is set to file registers R16 and R112 at the head of user PLC main program.
(2) The user PLC refers to the key data, and performs required processing.
(3) The user PLC sets the key data which meets the keyboard currently in use to register R112.
(4) The controller processes the effective key data after the main program of user PLC has been processed, referring to the settings of R16 and R112.

Note 1) For details of key data and processing timing, refer to the Instruction Manual for "PLC programming" ("key operation using user PLC").

[Related signals]

(1) KEY IN 1 (R16)

B contact	Signal name	Signal abbreviation		Device
—	EACH AXIS REFERENCE POSITION SELECT		P C	R120

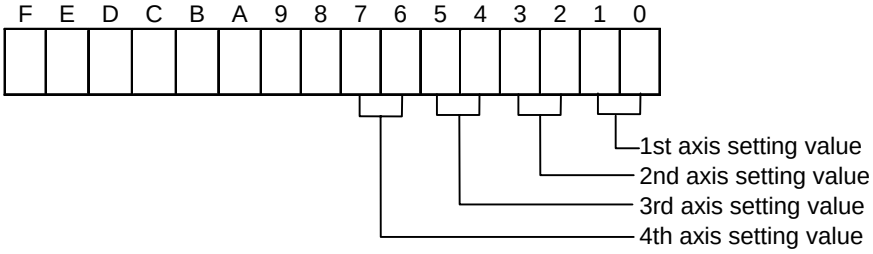
[Function]

Select the each axis reference position return position for manual reference position return.

[Operation]

(1) This signal is valid when the reference position select method (Y207/W87) is ON.
(2) Two bits are used for each axis to select the reference position.
(a) R register and corresponding axis

R120 (R320)



(b) Setting value and reference position No.

High-order bit	Low-order bit	Return position
0	0	1st reference position
0	1	2nd reference position
1	0	3rd reference position
1	1	4th reference position

[Related signals]

Reference position select method (Y207)

B contact	Signal name	Signal abbreviation		Device
—	ENCODER SELECTION		P C	R124

[Function]

Using a binary setting, select which spindle's encoder feedback to use.
0: 1st spindle
1: 2nd spindle

(Note) If a setting exceeds the number of connected spindles, it will be interpreted that a selection has not been made.

[Related signals]

(1) Spindle selection (SWS: X350)
(2) Spindle command selection (SLSP: R110)
(3) Spindle stop (SSTP: Y294)
(4) Spindle enable (ENB: X2C8)
(5) Spindle forward run start (SRN: Y2D0)
(6) Spindle reverse run start (SRI: Y2D1)

B contact	Signal name	Signal abbreviation		Device
—	C AXIS SELECTION		P C	R125

[Function]

The "C axis selection" signal is used to issue the commands with the axis name command address to the axis selected from the Spindle/C-axis.

[Operation]

Using the axis number, set which spindle or C axis to output the commands to.
0: First C axis, 1: 1st axis, 2: 2nd axis, 3: 3rd axis, 4: 4th axis, ... 8: 8th axis
The setting is made with the axis number.

(Note 1) This signal must always be input simultaneously with the "Recalculation request" signal (CRQ).
(Note 2) This signal is valid even when the multi-spindle function is invalid.
(Note 3) If an axis name (#1013 axname) is different from the initial C axis name, "M01 OPERATION ERROR 1031" will occur.

B contact	Signal name	Signal abbreviation		Device
—	PLC INTERRUPT PROGRAM NO.		P C	R130

[Function]

Designate the program No. for PLC interrupt.
The interrupt program No. is 9000 to 9999.

[Operation]

Input the number of the program to be executed at PLC interrupt.

(Example) When program No. 9705 is to be executed at PLC interrupt

(1) Set the PLC interrupt program No. to 9705.
(2) Turn PLC interrupt signal ON.

The PLC interrupt program 9705 will be executed with the above settings.

[Related signals]

PLC interrupt (PIT: Y236)

B contact	Signal name	Signal abbreviation		Device
—	1ST CUTTING FEEDRATE OVERRIDE (File register method)		P C	R132

[Function]

When "Cutting feedrate override method select" (FVS) is set to "file register method", override (0 to 300%, 1% increment) can be exerted on the cutting feedrate. Desired value is set to file register (R) in binary code.

[Operation]

When override is exerted to the preset feedrate, the true feedrate is the product obtained by multiplying the preset feedrate by the specified override ratio (provided that "2nd cutting feedrate override" is not valid).

The override ratio is fixed to 100%, irrespective of "1st feedrate override" setting, under the following condition:

(1) "Override cancel" (OVC) signal is on.
(2) During tapping in canned cycle.
(3) During TAPPING mode.
(4) During thread cutting.

Note) Only when override setting is 0%, override is exerted even on rapid traverse speed in automatic operation. That is, cutting feed as well as rapid traverse stop if the 1st feedrate override is set to 0% during automatic operation. When override setting is 0%, "M01 OPERATION ERROR" appears in the alarm display section of setting and display unit, and "M01 OPERATION ERROR 0102" in the ALARM DIAGNOSIS display.

[Related signals]

(1) Cutting feedrate override (*FV1 to 16: Y2A0)
(2) Cutting feedrate override method select (FVS: Y2A7)
(3) 2nd cutting feedrate override valid (FV2E: Y2A6)
(4) 2nd cutting feedrate override (R133) (File register method)

} For relationship among these signals, refer to the description the cutting feedrate override.

B contact	Signal name	Signal abbreviation		Device
—	2ND CUTTING FEEDRATE OVERRIDE (File register method)		P C	R133

[Function]

When the "2nd cutting feedrate override valid" function (FV2E) is used, another override can be exerted on cutting feedrate overrided by "Feedrate override" (*FV1 to 16) in code method, or by "1st cutting feedrate override" when the "Cutting feedrate override method select" (FVS) is set to file register method. The 2nd feedrate override can be set within range from 0% to 327.67% with 0.01% increment. Value of override ratio is set in binary code system to file register.

[Operation]

When this override function is used, the true feedrate is the product obtained by multiplying commanded feedrate (F) by "1st cutting feedrate override" ratio and "2nd cutting feedrate override" ratio.
Since the least increment of 2nd feedrate override is 0.01%, override setting "10000" corresponds to 100%.
The override ratio is fixed to 100%, irrespective of "1st cutting feedrate override" or "2nd cutting feedrate override" setting, under the following condition:

(1) "Override cancel" (OVC) signal is on.
(2) During tapping in canned cycle.
(3) During TAPPING mode.
(4) During thread cutting.

Note) Only when the 1st cutting feedrate override or 2nd cutting feedrate override is 0% or both of them are 0%, override is exerted even on rapid traverse speed in automatic operation. That is, cutting feed as well as rapid traverse stop if the 1st override feedrate is set to 0% during automatic operation. When override setting is 0%, "M01 OPERATION ERROR" appears in the alarm display section of setting and display unit, and "M01 OPERATION ERROR 0102" in the ALARM DIAGNOSIS display.

[Related signals]

(1) Cutting feedrate override (*FV1 to 16: Y2A0)
(2) Cutting feedrate override method select (FVS: Y2A7)
(3) 2nd cutting feedrate override valid (FV2E: Y2A6)
(4) 1st cutting feedrate override (R132) (File register method)

} For relationship among these signals, refer to the description about the cutting feedrate override.

B contact	Signal name	Signal abbreviation		Device
—	RAPID TRAVERSE OVERRIDE (File register method)		PC	R134

[Function]

When "Rapid traverse speed override method select" signal (ROVS) is set to "file register method", override can be exerted, besides the code method override (ROV1, ROV2), by setting within the range of 0% to 100% by 1% increments. The value is set in the file register (R) in binary.

[Operation]

During rapid traverse in the automatic or manual operation, the actual feedrate will be the result of multiplying the rapid traverse speed set in a parameter by this override ratio.

Note 1) The override will be clamped at 100%.
Note 2) No operation error messages are indicated even if the value is set to 0%.

[Related signals]

(1) Rapid traverse speed override (code method) (ROV1, ROV2: Y2A8, Y2A9)
(2) Rapid traverse speed override method select (ROVS: Y2AF)

B contact	Signal name	Signal abbreviation		Device
—	CHOPPING OVERRIDE	CHPOV	PC	R135

[Function]

The chopping override can be set as a value between 0 and 100% (1% unit).
The value is set directly in the R register for chopping override. (This cannot be set with a code method.)
The data is set in R135.

[Operation]

(1) Only the chopping override is valid for the chopping operation.
When rapid traverse override valid is commanded with the DDB function command, the rapid traverse override can be validated for rapid traverse between the basic position and upper dead center point.
The rapid traverse override can be set with either the code method (1, 25, 50, 100%) or the file register (value setting) method (0 to 100%, 1% increment).
(2) The chopping override is set between 0 and 100% with a 1% increment.
If a value exceeding 0 to 100% is set, the override will be clamped at 100%.
(3) The chopping override is set as binary word data in the R register.
Set the data with one command.
(4) If the "Chopping override" signal is set to "0", "M01 OPERATION ERROR 0150" will occur.

B contact	Signal name	Signal abbreviation	P C	Device
—	MANUAL FEEDRATE (File register method)			R136, 7

[Function]

When "Manual feedrate method select" signal (JVS) is set to "file register method", feedrate can be specified, besides code method (*JV1 to 16) setting, by setting desired feedrate ratio manually. The value is set in file register (R).

[Operation]

This mode of feedrate setting can be used in JOG feed, incremental feed, reference position return feed and manual random feed mode. For JOG, incremental and reference position return mode, "Rapid traverse speed" (RT) signal should be off. For manual random feed mode, "EX.F/MODAL.F" signal (CXS3) should be off. Feedrate specified in this mode can be applied to feed motion in dry run (automatic operation).

The use of this signal is conditioned as follows:

(1) When "Manual feedrate override valid" signal (OVSL) is OFF, the originally set feedrate is applied.
(2) When "Manual feedrate override valid" signal (OVSL) is ON, the feedrate override ratios of "1st cutting feedrate override" and "2nd cutting feedrate override" are applied to the originally set feedrate.
(3) Manual feedrate is set to file registers Rn and Rn+1. The feedrate depends on "Feedrate least increment" (PCF1, PCF2) as listed below.

PCF2	PCF1	Least increment (mm/min or inch/min)	Operation
0	0	10	10mm/min (inch/min) when "1" is set in file registers.
0	1	1	1mm/min (inch/min) when "1" is set in file registers.
1	0	0.1	0.1mm/min (inch/min) when "1" is set in file registers.
1	1	0.01	0.01mm/min (inch/min) when "1" is set in file registers.

(4) Feedrate clamp (max. feedrate) depends on setting of axis parameter (cutting feedrate clamp) when "Rapid traverse" signal (RT) is off.

Note 1) During incremental feed mode, the true feedrate does not change even when the manual feedrate setting is changed while feed motion is going on.

Note 2) As for file registers (Rn and Rn+1), Rn is of lower order.
Of the file registers Rn and Rn+1 to designate the feedrate, if the value is 2-bytes (one word), the high-order side does not need to do anything.

[Related signals]

(1) Manual feedrate (code method) (*JV1 to 16: Y2B0 to Y2B4)
(2) Manual feedrate method select (JVS: Y2B7)

B contact	Signal name	Signal abbreviation		Device
—	MANUAL FEEDRATE B		P C	R138, 9

[Function] [Operation]

Designate the manual feedrate for the axis selected with the manual feedrate B valid signal.

[Caution]

(1) The speed designated with this register is valid for the manual feedrate of an axis for which the manual feedrate B valid signal is valid.
(2) Cutting override and manual override are invalid for this register's speed.
(3) This register is not related to the dry run speed.
(4) A binary value is directly set for this register. The setting unit is 0.01mm/min (°/min).
(5) This signal is a register common for all axes.

[Related signals]

Manual feedrate B valid (Y260 to 267)

B contact	Signal name	Signal abbreviation		Device
—	HANDLE/INCREMENTAL FEED MULTIPLICATION (File register method)		P C	R140, 1

[Function]

When "Handle/Incremental feed multiplication method select" (MPS) signal is set to "file register method", amount of feed per pulse or per command signal can be multiplied by value set to file register. Multiplication value (multiplier), binary code, is set in file register (R).

[Operation]

Multiplication is applied to amount of feed per pulse in handle feed mode (output from manual pulse generator), or to amount of feed per signal in incremental feed mode (+J1, –J1, etc.).
When multiplier is "500" and one pulse is given in handle feed mode, for example, 500µm of feed motion occurs. When multiplier is "30000" and one feed command signal is given in incremental feed mode, 30mm of feed motion occurs (time constant for feed motion is equal to time constant for rapid traverse or step).

Note 1) Change of multiplication setting during feed motion is ignored.
Note 2) Since considerably large multiplication can be used, the signal should be used carefully.

[Related signals]

(1) Handle/Incremental feed multiplication (code method) (MP1, MP2, MP4: Y2C0, Y2C1, Y2C2)
(2) Handle/Incremental feed multiplication method select (MPS: Y2C7)

B contact	Signal name	Signal abbreviation		Device
—	MANUAL RANDOM FEED 1ST AXIS MOVEMENT DATA		P C	R142, 3

[Function]

This data specifies the amount of movement or positioning point in manual random feed mode.

[Operation]

"Manual random feed 1st axis movement data" is for the axis whose number is specified by "Manual random feed 1st axis No." (CX11 to 116: Y268 to 26C).

"Manual random feed 1st axis movement data" means differently depending on the statuses of the "MC/WK (CXS5)" and "ABS/INC (CXS6)" signals.

(1) When the ABS/INC (CXS6) signal is on:
"Manual random feed 1st axis movement data" specifies the amount of movement (increment).

(2) When the "ABS/INC (CXS6)" signal is off, it depends on the status of the "MC/WK (CXS5)" signal as follows:

(a) When the "MC/WK (CXS5)" signal is off:
"Manual random feed 1st axis movement data" specifies a coordinate value (positioning point) of the machine coordinate system.

(b) When the "MC/WK (CXS5)" signal is on:
"Manual random feed 1st axis movement data" specifies a coordinate value (positioning point) of the modal workpiece coordinate system.

"Manual random feed 1st axis movement data" is written in binary notation with a sign. The unit of the specified value matches that of data entered.

Ex.: When (R143, R142)=1 is specified in micrometer system, axis motion is 1µm (at incremental specification).

[Caution]

"Manual random feed 1st axis movement data" forms a data item by R142 and R143.
Handle negative data carefully.

[Related signals]

For related signals, see the descriptions on "Manual random feed mode (PTP: Y20B)".

B contact	Signal name	Signal abbreviation		Device
—	MANUAL RANDOM FEED 2ND AXIS MOVEMENT DATA		P C	R144, 5

[Function] [Operation]

"Manual random feed 2nd axis movement data" is for the axis whose number is specified by "Manual random feed 2nd axis No. (CX21 to 216)".

The other conditions are the same as for "Manual random feed 1st axis movement data" explained in the previous section.

B contact	Signal name	Signal abbreviation		Device
—	MANUAL RANDOM FEED 3RD AXIS MOVEMENT DATA		P C	R146, 7

[Function] [Operation]

"Manual random feed 3rd axis movement data" is for the axis whose number is specified by "Manual random feed 3rd axis No. (CX31 to 316)."
The other conditions are the same as for "Manual random feed 1st axis movement data" explained in the previous section.

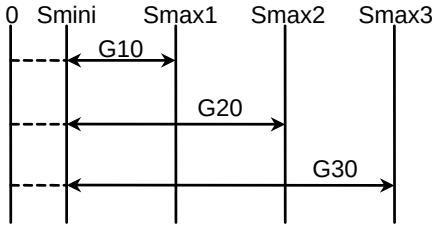
B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	S ANALOG OVERRIDE (File register method)		P C	R148	R348

[Function]

When "Spindle override method select" signal (SPS) is set to "file register method", override can be exerted on the spindle rotation speed besides the code method override (SP1 to SP4). Override can be exerted within range of 0% to 200% (1% increment). Value is set in binary code to file register (R).

[Operation]

When this function is used, the true spindle speed is obtained by multiplying the originally set spindle speed by override ratio set with this signal.
Clamp spindle speed is the maximum or minimum speed set with parameters, which depends on "Spindle gear select" signal (GI1, GI2).
Even when spindle speed exceeds the maximum or minimum speed at the currently selected gear stage, due to change of override setting, "Spindle gear shift" signal (GR1, GR2) does not automatically change.



Applicable override range at gear stage 3

GR10 : Applicable override range at gear stage 1
GR20 : Applicable override range at gear stage 2
GR30 : Applicable override range at gear stage 3
Smini : Minimum spindle speed (parameter)
Smax1 : Maximum spindle speed at gear stage 1 (parameter)
Smax2 : Maximum spindle speed at gear stage 2 (parameter)
Smax3 : Maximum spindle speed at gear stage 3 (parameter)

Note) Override is not valid (100%) under the following condition:
(1) "Spindle stop" signal (SSTP) is ON.
(2) During tapping mode.
(3) During thread cutting.

[Related signals]

(1) S analog override (SPn: Y288)
(2) Spindle override method select (SPS: Y28F)
(3) Spindle gear select (GI1, GI2: Y290, Y291)
(4) Spindle stop (SSTP: Y294)
(5) Spindle gear shift (SSFT: Y295)
(6) Oriented spindle speed command (SORC: Y296)

B contact	Signal name	Signal abbreviation		1stSP	2ndSP
—	MULTI-POINT ORIENTATION POSITION DATA		P C	R149	R349

[Function]

This signal, having the following two functions, is issued in respect to the high-speed serial connection specification spindle controller (spindle drive).

(1) Notification of orientation position to control unit (spindle controller) at orientation command.
Position data where the "Spindle orient command" (ORC: Y2D6) is turned ON.

(2) During multi-point indexing, notification of indexing position during forward run indexing or reverse run indexing to control unit (spindle controller).
Position data where the "Spindle forward run index" (WRN: Y2D4), the "Spindle reverse run index" (WR1: Y2D5) is turned ON.

[Operation]

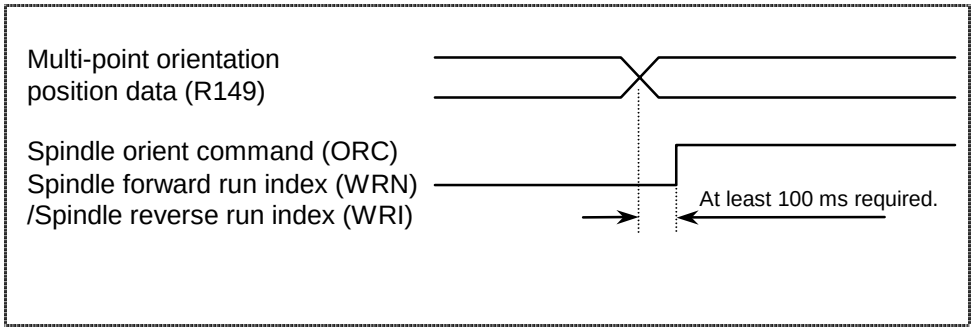
(1) Orientation command
The orient position at when the "Spindle orient command" (ORC) turns on is input.
The values designated with the spindle parameter (SP007 OPST: in-position shift amount for orientation) and with "Multi-point orientation position data" signal are totaled to determine the orientation position.

(2) Multi-point indexing
Each time the "Spindle forward run index" (WRN) and "Spindle reverse run index" (WRI) turn ON, the axis rotates by the amount designated with the multi-point orientation position data.

The command is a 12-bit binary, and the command unit is as follows.

Command increment = 360/4096 [◦]

This signal must be validated before the "Spindle orient command" signal turns on (at least 100 ms before).



[Related signals]

(1) Spindle orient command (ORC: Y2D6)
(2) Spindle forward run index (WRN: Y2D4)
(3) Spindle reverse run index (WRI: Y2D5)

B contact	Signal name	Signal abbreviation		Device
—	TOOL GROUP NUMBER DESIGNATION		P C	R150, 1

[Function]

The group number is designated when the usage data of the group of which the tool life has been exceeded with tool life management II is to be cleared, or when the tool being used is to be forcibly changed.

[Operation]

The group designation range is as follows.

For group designation: 1 to 9999 of group number
For all groups : 65535 (all 1)

[Related signal]

(1) Tool change reset (TRST: Y2CC)

B contact	Signal name	Signal abbreviation		Device
—	LOAD METER 1, 2		P C	R152 to 5

[Function] [Operation]

The load meter can be displayed on the coordinate value screen by just setting a value in the corresponding file register.
Refer to the section on "Load meter display" in the "PLC Programming Manual" for details.

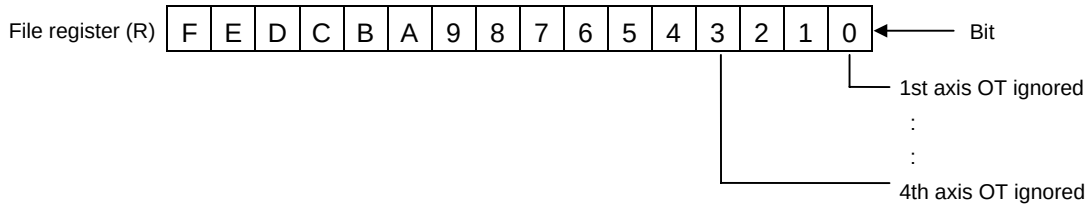
B contact	Signal name	Signal abbreviation		Device
—	OT IGNORED		P C	R156

[Function]

When this signal is used, "stroke end error" can be avoided without eternal wiring for stroke end signal (remote I/O connector pin No. fixed signal) provided for each axis. "Stroke end" signal on axis for which the "OT ignored" signal is set can be used for other purpose.

[Operation]

"Stroke end error" signal associated with a specific axis motion can be ignored.
The interface for this signal is as follows:



Note 1) The signal is applicable to (+) and (-) motion at the same time (ignored when "ON").
Note 2) "OT" is abbreviation of "Over Travel".

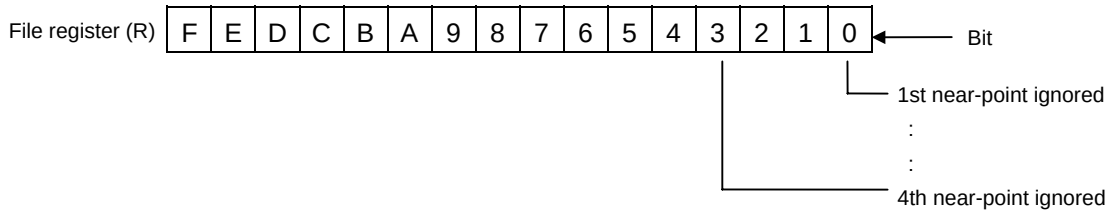
B contact	Signal name	Signal abbreviation		Device
—	NEAR-POINT IGNORED		P C	R157

[Function]

When this signal is used, "Near point detect" signal (remote I/O connector pin No. fixed signal) which is used for dog type reference position return can be ignored (dog not-passed state).
Furthermore, the "Near point detect" signal for an axis to which the "Near-point ignored" signal is set can be used for other applications.

[Operation]

When the signal is turned on, "Near point detect" signal for the corresponding control axis can be ignored.
The interface is shown below:



B contact	Signal name	Signal abbreviation		Device
—	ALARM INTERFACE 1 to 4		PC	R158 to 161

[Function]

Desired alarm messages prepared using PLC development tool (personal computer) can be displayed in ALARM DIAGNOSIS screen of the setting and display unit by setting values (binary code) to alarm interface file registers (Rn, Rn+1, Rn+2, Rn+3).

[Operation]

If table No. of previously prepared alarm message table has been set to alarm interface file registers, alarm message, if alarm occurs, can be displayed in ALARM DIAGNOSIS screen.
Maximum 4 alarm messages can be displayed at the same time.
Alarm message can be cleared by setting "0" to alarm interface file registers.
For details of alarm message display, refer to the "PLC Programming Manual".

[Caution]

1) Set setup parameter PLC "#6450 bit 0" to 1 to display the alarm messages.
2) For alarm message interface, file register (R method) or temporary storage (F method) can be used. The selection is made with Setup parameter PLC "#6450 bit 1".
3) In both R method (file register) and F method (temporary storage), alarm does extend to the controller.
   When it is desirous to stop controller operation according to alarm type, signals such as "Auto operation "pause" command" (*SP) signal, "Single block" (SBK) signal and "Interlock" signal should be processed on the PLC side.

B contact	Signal name	Signal abbreviation		Device
—	OPERATOR MESSAGE INTERFACE		PC	R162

[Function]

Desired operator message prepared using PLC development tool (personal computer) can be displayed by setting value (binary code) to operator message interface file register (Rn). Operator message appears in ALARM DIAGNOSIS screen of the setting and display unit.

[Operation]

If table No. of previously prepared operator message table has been set to operator message interface file register, operator message can be displayed in ALARM DIAGNOSIS screen.
Operator message can be cleared by setting "0" to operator message interface file register.
For details of operator messages, refer to the "PLC Programming Manual".

[Caution]

1) Set setup parameter PLC "#6450 bit 2" to 1 to display the operator messages.
2) Display of operator message does not cause alarm on the controller side. When it is desirous to stop controller operation according to operator message, signals such as "Auto operation "pause" command" (*SP) signal, "Single block" (SBK) signal and "Interlock" signal should be processed on the PLC side.

B contact	Signal name	Signal abbreviation		Device
—	SEARCH & START PROGRAM NO.		P C	R170, 1

[Function]

The No. of the program to be searched with search & start is designated.

[Operation]

Set the No. of the program to be searched with search & start with a binary value.

Note 1) The program No. must be set before the "Search & start" signal is input.

Note 2) If a machining program No. is not designated or if an illegal No. is designated, and error signal will be output when the search operation is executed.

[Related signals]

(1) Search & start (RSST: Y1FA)
(2) Search & start (error) (SSE: X1C2)

B contact	Signal name	Signal abbreviation		Device
—	USER MACRO INPUT #1132 Controller → PLC		P C	R172, 3

[Function]

This is interface function used to coordinate user PLC to user macro.

Note) The other signals from R100 to R199 are output from PLC, but this signal is input to PLC.

[Operation]

When a value is set in the system variables #1100 to #1131 or #1132 with the user macro system, the user PLC output to the file register Rn and Rn+1 corresponding to the user PLC can be referred to with that value.

The relationship between system variable and file register is as follows:

System variable	Points	Interface input signal	System variable	Points	Interface input signal
#1100	1	Register R172 bit 0	#1116	1	Register R173 bit 0
#1101	1	Register R172 bit 1	#1117	1	Register R173 bit 1
#1102	1	Register R172 bit 2	#1118	1	Register R173 bit 2
#1103	1	Register R172 bit 3	#1119	1	Register R173 bit 3
#1104	1	Register R172 bit 4	#1120	1	Register R173 bit 4
#1105	1	Register R172 bit 5	#1121	1	Register R173 bit 5
#1106	1	Register R172 bit 6	#1122	1	Register R173 bit 6
#1107	1	Register R172 bit 7	#1123	1	Register R173 bit 7
#1108	1	Register R172 bit 8	#1124	1	Register R173 bit 8
#1109	1	Register R172 bit 9	#1125	1	Register R173 bit 9
#1110	1	Register R172 bit 10	#1126	1	Register R173 bit 10
#1111	1	Register R172 bit 11	#1127	1	Register R173 bit 11
#1112	1	Register R172 bit 12	#1128	1	Register R173 bit 12
#1113	1	Register R172 bit 13	#1129	1	Register R173 bit 13
#1114	1	Register R172 bit 14	#1130	1	Register R173 bit 14
#1115	1	Register R172 bit 15	#1131	1	Register R173 bit 15

System variable	Points	Interface input signal
#1132	32	Register R172, R173
#1133	32	Register R174, R175
#1134	32	Register R176, R177
#1135	32	Register R178, R179

This correspondence table shows the example for file registers R172 and R173.

File registers R172 and R173 correspond to system variables #1100 to #1131, and #1132 (32-bit data).

[Related signals]

(1) User macro input #1133, #1134, #1135
(2) User macro output #1032, #1033, #1034, #1035, #1000 to #1031

B contact	Signal name	Signal abbreviation		Device
—	USER MACRO INPUT #1133 Controller → PLC		P C	R174, 5

[Function]

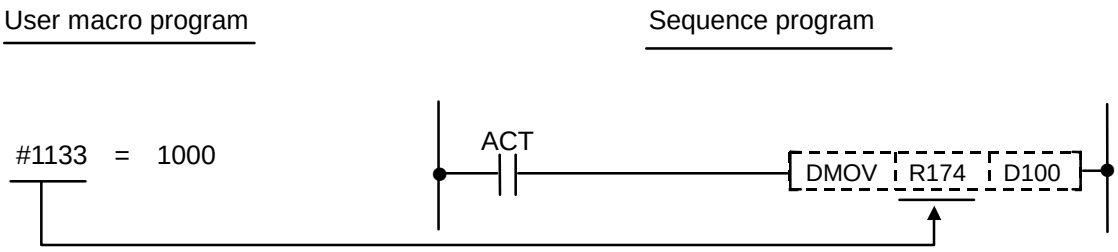
This provides interface function used to coordinate user PLC to user macro.

Note) The other signals from R100 to R199 are output from PLC, but this signal is input to PLC.

[Operation]

When a value is set in the system variable #1133 with the user macro system, the user PLC output to the file register Rn and Rn+1 corresponding to the user PLC can be referred to with that value.

(Example)



1000 is input in D100 and 101 when the ACT signal turns on.

[Related signals]

(1) User macro input #1132, #1134, #1135, #1100 to #1131
(2) User macro output #1032, #1033, #1034, #1035, #1000 to #1031

B contact	Signal name	Signal abbreviation		Device
—	USER MACRO INPUT #1134 Controller → PLC		P C	R176, 7

[Function] [Operation]

The function operation, etc. are the same as those of "USER MACRO INPUT #1133".

B contact	Signal name	Signal abbreviation		Device
—	USER MACRO INPUT #1135 Controller → PLC		P C	R178, 9

[Function] [Operation]

The function operation, etc. are the same as those of "USER MACRO INPUT #1133".

B contact	Signal name	Signal abbreviation		Device
—	ADD-ON (EXPANSION) OPERATION BOARD OUTPUT 1 to 3		P C	R180 to 2

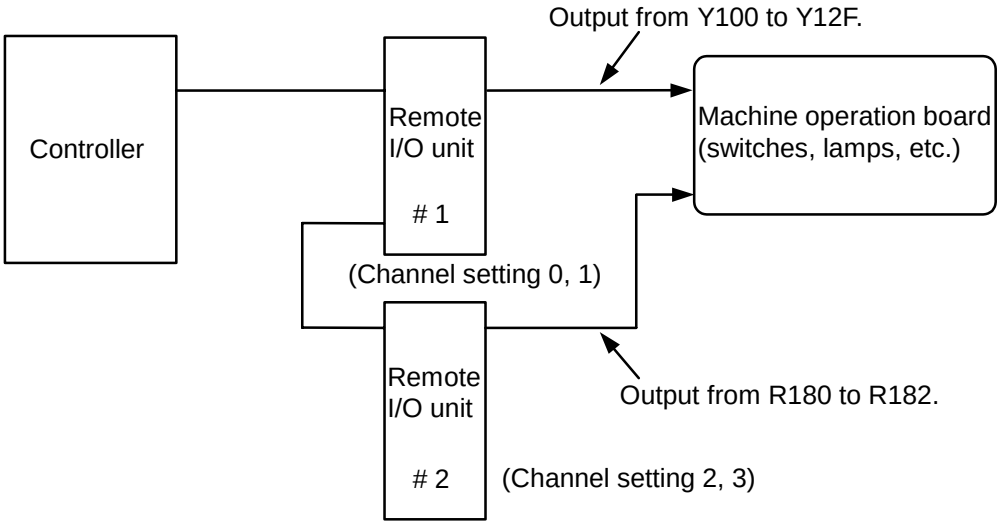
[Function]

By adding the remote I/O unit to the controller, the machine operation board input/output signals can be input and output with the controller control signals.
If the added remote I/O unit has less than 64 input points and 48 output points the input signals will be input to (X100 to X13F) and the output signals output to (Y100 to Y12F). If the number of input/output points is larger, the input signals will be R80 to R83 explained before, and the output signals R180 to R183 explained here. Generally, these signals are to be assigned to "bit-based arithmetic operation area (Y**)". They, however, are input to file registers (R).

[Operation]

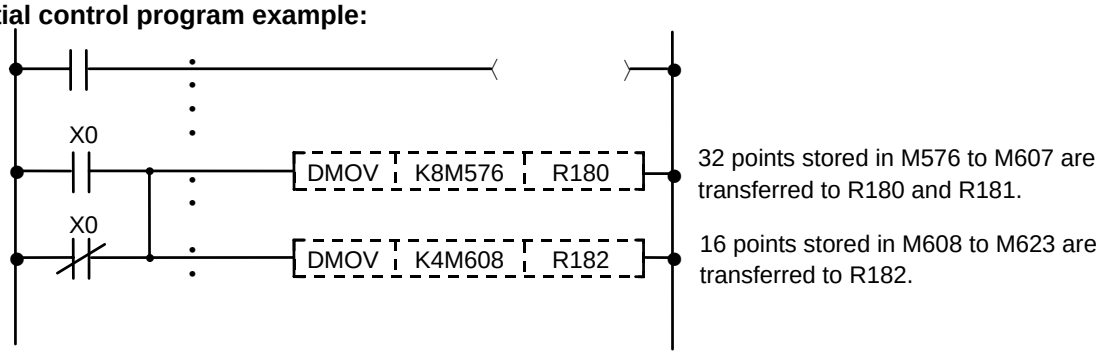
The signals are output together with other output signals at start of PLC main processing (medium speed).

<Hardware block diagram>



Note 1) This is conventionally a bit unit signal, so create it in the temporary memory (M) and then transfer it to the corresponding file register (R) before using.

Sequential control program example:



Note 2) Refer to the section "2.2 Operation board remote I/O unit" for the relation of the remote I/O channel setting switch and device.

Note 3) Refer to the section "3.2 Classification of machine input/output signals" Tables 3-6-3 to 3-6-4 for the add-on (expansion) operation board output 1 to 3.

[Related signals]

(1) Add-on (expansion) operation board input 1 to 4 (R80 to R83)

B contact	Signal name	Signal abbreviation		Device
—	WEAR COMPENSATION NO. (Tool presetter)		P C	R186

[Function]

To clear the wear compensation amount after measuring the tool compensation amount with manual tool length measurement, set the wear compensation No. in a BCD code.

[Operation]

To clear the wear compensation amount after measuring the tool compensation amount with manual tool length measurement, set the wear compensation No. in a BCD code.
If 0 or an non-existing compensation No. is set, the wear data will not be cleared.

B contact	Signal name	Signal abbreviation		Device
—	EXTERNAL WORKPIECE COORDINATE OFFSET MEASUREMENT TOOL COMPENSATION NO. /SELECTION TOOL COMPENSATION NO. (Main)		P C	R192, 3

[Function]

1. External workpiece coordinate offset measurement function
   Set the tool No. (R194, 195) and the tool compensation No. (R192, R193) used for external workpiece coordinate offset measurement in a BCD code.
2. Chuck barrier check
   Set the tool No. (R194, 195) and the compensation No. (R192, R193) selected for the chuck barrier check.

[Operation]

1. External workpiece coordinate offset measurement function
   Set the tool No. and the tool compensation No. used for external workpiece coordinate offset measurement in a BCD code.
   This is set with the user PLC.
   This tool No. (R194, 195) is interpreted as the tool offset No. by the CNC.
2. Chuck barrier check
   The file register used differs according to the parameter (#1097 Tlno.)

#1097 Tlno.	R192,193	R194,195
0	Tool length, tool nose wear offset No.	Tool No.
1	Tool nose wear offset No.	Tool No., tool length offset No.

   If the tool length offset No. is not designated (if the contents are 0), the tool length and tool nose wear offset will both follow the T command modal.
   The T command modal will also be followed if the designated offset No. is not within the specified range.
   If the T command modal value is 0, the compensation amount will be interpreted as 0.

B contact	Signal name	Signal abbreviation		Device
—	EXTERNAL WORKPIECE COORDINATE OFFSET MEASUREMENT TOOL NO. /SELECTION TOOL NO. (Main)		P C	R194, 5

[Function] [Operation]

Refer to the explanation for R192 and R193 for details.

B contact	Signal name	Signal abbreviation		Device
—	USER PLC VERSION CODE		P C	R196 to 9

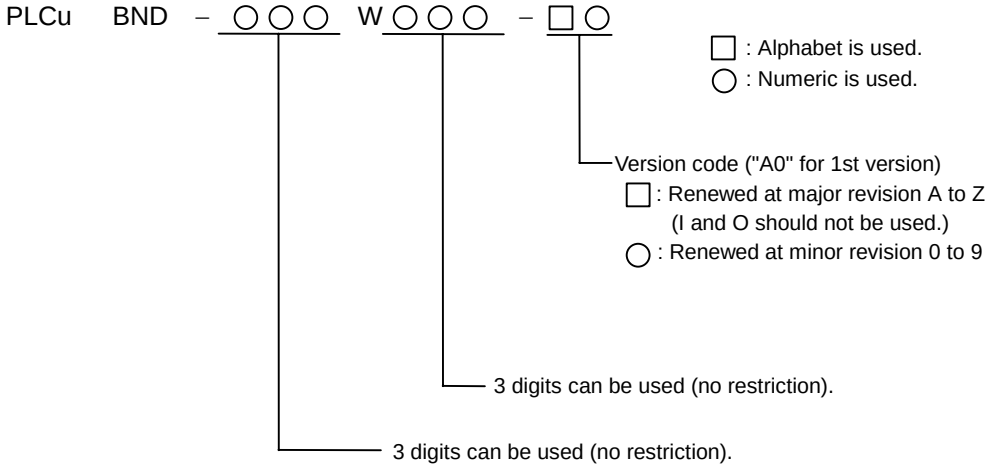
[Function]

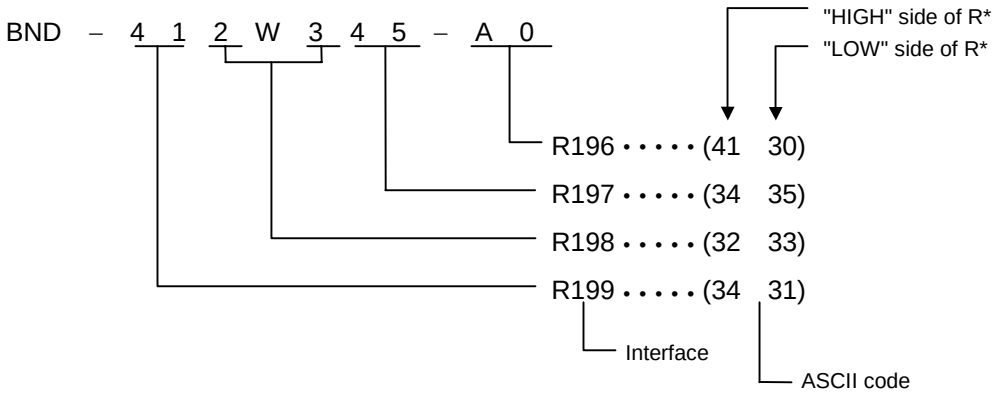
The user PLC version can be displayed with the software version that controls the other controller on the setting and display unit DIAGN/IN/OUT screen.

[Operation]

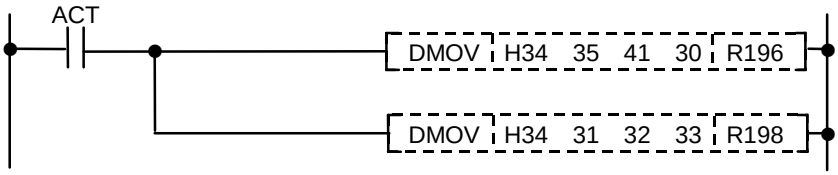
Characters to be displayed are placed in ASCII code.

<Display format>





Program example)



B contact	Signal name	Signal abbreviation		Device
—	EACH AXIS MANUAL FEEDRATE B nth		P C	R400 to 415

[Function] [Operation]

When the each axis manual feedrate B valid signal is valid, designate the manual feedrate for the axis selected with the manual feedrate B valid signal.

[Caution]

(1) When the each axis manual feedrate B valid signal is valid, the each axis speed designated with this register is valid for the manual feedrate of an axis for which the manual feedrate B valid signal is valid.
(2) Cutting override and manual override are invalid for this register's speed.
(3) This register is not related to the dry run speed.
(4) A binary value is directly set for this register. The setting unit is 0.01mm/min (°/min).
(5) This signal is a register independent for each axis.

[Related signals]

Manual feedrate B valid (Y260)
Each axis manual feedrate B valid (Y2BC)

B contact	Signal name	Signal abbreviation		Device
—	EXTERNAL MACHINE COORDINATE SYSTEM COMPENSATION DATA		P C	R560 to 3

[Function]

This data compensates the basic machine coordinate system. The axis moves the amount equivalent to the set data (interpolation unit). The entire coordinate system value, including the basic machine coordinate system, will not change.

[Operation]

When the "External machine coordinate system compensation data" (R560 to 3) is set, the axis will move the amount equivalent to that set value.
The entire coordinate system value, including the basic machine coordinate system, will not change.
<Data range>
8000 (HEX) to 7FFF (HEX) (Absolute compensation amount –32768 to 32767)
Unit: Interpolation unit (0.5µm)

B contact	Signal name	Signal abbreviation		Device
—	SELECTION TOOL COMPENSATION NO. (Sub)		P C	R1000, 1

[Function]

Designate the tool No. and compensation No. selected on the sub-spindle side for chuck barrier check.

[Operation]

The file register used differs according to the parameter (#1097 Tlno.)

#1097 Tlno.	R1000,1001/R1050,1051	R1002,1003/R1052,1053
0	Tool length, tool nose wear offset No.	Tool No.
1	Tool nose wear offset No.	Tool No., tool length offset No.

If the tool length offset No. is not designated (if the contents are 0), both the tool length and tool nose wear offset follow the details designated for the main spindle. The details for the main spindle will also be set if the designated offset No. is not within the specified range.

B contact	Signal name	Signal abbreviation		Device
—	SELECTION TOOL WEAR NO. (Sub)		P C	R1002, 3

[Function] [Operation]

Refer to the section for the "Selection tool compensation No. (sub) (R1000, 1)".

B contact	Signal name	Signal abbreviation		Device
—	TOOL MOUNTING INFORMATION		P C	R1004, 5

[Function]

Designate the presence of a tool mounted on the tool post (tool compensation amount validity).

[Operation]

When the tool designated for tool mounting is selected, the tool compensation amount will be added to the chuck barrier check.

<Bit allocation>

Tool mounting information (high order) R1005/R1055	bitF	bitE	bitD	bitC	bitB	bitA	bit9	bit8
	Tool 32	Tool 31	Tool 30	Tool 29	Tool 28	Tool 27	Tool 26	Tool 25
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	Tool 24	Tool 23	Tool 22	Tool 21	Tool 20	Tool 19	Tool 18	Tool 17

Tool mounting information (low order) R1005/R1055	bitF	bitE	bitD	bitC	bitB	bitA	bit9	bit8
	Tool 16	Tool 15	Tool 14	Tool 13	Tool 12	Tool 11	Tool 10	Tool 9
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	Tool 8	Tool 7	Tool 6	Tool 5	Tool 4	Tool 3	Tool 2	Tool 1

Bit OFF: Tool not mounted (tool compensation amount not added)
Bit ON: Tool mounted (tool compensation amount added)

In a machine that uses tools 1 to 12 on the main spindle's tool post and tools 17 to 28 on the sub-spindle's tool post, if the tools are mounted in either tool post, H0FFF is set for both R1004 and R1005.
When tool 28 is detached from the sub-spindle side next, R1005 will be set to H07FF.

[Remark]

This signal is initialized to HFFFF when the power is turned ON.
Thus, if this signal is not used, the tool compensation amount will always be added to the chuck barrier check.

B contact	Signal name	Signal abbreviation		Device
—	(PASSWORD NO.)		P C	R1402, 3

[Function]

This function uses a password No. to prohibit editing and input/output of the user PLCs to prevent these user PLCs prepared by the machine manufacturer from being incorrect overwritten by the end user.
This function is an option.

[Operation]

The machine manufacturer's original password No. is registered in R1402[L]/R1403[H] with the user PLCs.
Set the password No. in the range of "2" to "99999999". "0" and "1" cannot be set. Note that if the R1402/R1403 value is "0" or "1", the default value "5963" will be used as the password No.

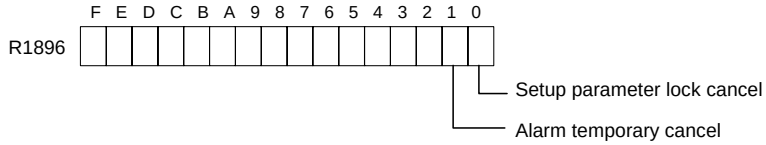
B contact	Signal name	Signal abbreviation		Device
—	SETUP PARAMETER LOCK I/F		P C	R1896

[Function]

This is the input signal used with the setup parameter lock function.

[Operation]

This signal is validated when the base specification parameter #1222 aux06 bit3 (setup parameter setting lock valid) is set to 1.



(1) Setup parameter lock cancel (bit 0)

The setup parameter lock is canceled when this bit is turned ON, and the following operations take place.

(a) Setting of the setup parameters is enabled.
(b) Alarm "M90 PARAM SET MODE" is displayed.
(c) "T01 STOP CODE (0190)" occurs when automatic start is activated.
(d) Parameters can be input via RS-232C.

The setup parameters are locked when this bit is turned OFF, and the following operations take place.

(a) Setting of the setup parameters is disabled.
(b) An operation error (E84 CAN'T IN/OUT) occurs when inputting parameters via RS-232C.
(c) Automatic start is enabled allowing automatic operation to be started.
(d) When this bit is changed from ON to OFF, the settings are validated after resetting.

(2) Alarm temporary cancel (bit1)

(a) When R1896 bit 0 is ON and setup parameter lock is canceled, alarms can be temporarily canceled by turning this bit ON.
(b) This bit will turn OFF when the power is turned ON again.

B contact	Signal name	Signal abbreviation		Device
—	TOOL COMPENSATION NO. FOR TOOL LENGTH MEASUREMENT 2		P C	R2970

[Function]

Set the number of the tool for measuring the tool compensation amount in a BCD code.

[Operation]

Set the number of the tool for measuring the tool compensation amount in a BCD code. This tool No. is interpreted as the tool compensation No. by the CNC.

B contact	Signal name	Signal abbreviation		Device
—	USER PLC VERSION CODE 2		P C	R4732 to 8

[Function]

This signal enables the user PLC version to be displayed, together with the software version controlling another control unit, in the DIAGN/IN/OUT screen of the setting display unit.

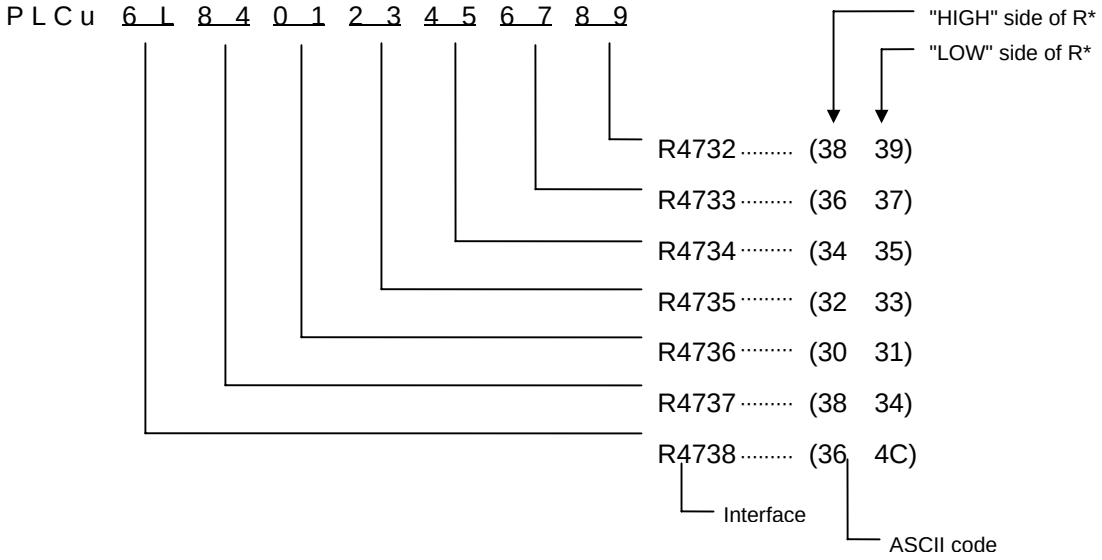
[Operation]

The ASCII code that corresponds to the character to be displayed in the version display interface is set.

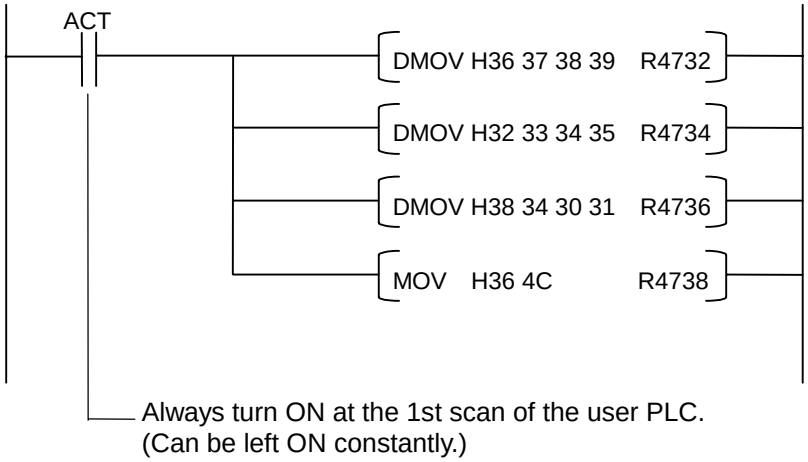
<Display format and usage example>

P L C u □ □ □ □ □ □ □ □ □ □ □ □ □ □
Total of 14 characters

□ : Random alphanumeric characters are used.



(Program example)



6.5 Explanations for Each Application

6.5.1 MR-J2-CT Link

(1) Outline

The MR-J2-CT link function connects the NC and MR-J2-CT (auxiliary axis), and controls up to four MR-J2-CT axes using command signals from the NC.
The number of connected MR-J2-CT axes is set with the parameters.

#	Item		Details	Setting range
1044 (PR)	auxno	MR-J2-CT Connections	Specify the number of MR-J2-CTs connected.	0 to 4

(Note) The MR-J2-CT will not start up if the set number of axes is not greater than the number of actual axes.

(2) List of signals

(a) NC → MR-J2-CT (R1700 to R1723, R1784)

Signal name	J2CT control command 4	J2CT control command 3	J2CT control command 2	J2CT control command 1	J2CT control command L	J2CT control command H
Abbrev.	CTCM4	CTCM3	CTCM2	CTCM1	CTCML	CTCMH
J2CT 1st axis	R1700	R1701	R1702	R1703	R1704	R1705
J2CT 2nd axis	R1706	R1707	R1708	R1709	R1710	R1711
J2CT 3rd axis	R1712	R1713	R1714	R1715	R1716	R1717
J2CT 4th axis	R1718	R1719	R1720	R1721	R1722	R1723

J2CT control command 4 (R1700: CTCM4)		
bit	Abbrev.	Name
bit0	OV1	Override 1
bit1	OV2	Override 2
bit2	OV4	Override 4
bit3	OV8	Override 8
bit4	OV16	Override 16
bit5	OV32	Override 32
bit6	OV64	Override 64
bit7	OV	Override valid
bit8		Spare
bit9		Spare
bit10		Spare
bit11		Spare
bit12		Spare
bit13		Spare
bit14		Spare
bit15		Spare

J2CT control command 3 (R1701: CTCM3)		
bit	Abbrev.	Name
bit0	ST1	Station selection 1
bit1	ST2	Station selection 2
bit2	ST4	Station selection 4
bit3	ST8	Station selection 8
bit4	ST16	Station selection 16
bit5	ST32	Station selection 32
bit6	ST64	Station selection 64
bit7	ST128	Station selection 128
bit8	ST256	Station selection 256
bit9		Spare
bit10		Spare
bit11		Spare
bit12		Spare
bit13		Spare
bit14		Spare
bit15		Spare

J2CT control command 2 (R1702: CTCM2)		
bit	**Abbrev.**	**Name**
bit0	ST	Operation start
bit1	DIR	Rotation direction
bit2	STS	Arbitrary point feed command valid
bit3	PUS	Stopper positioning command valid
bit4	MP1	Incremental feed magnification 1
bit5	MP2	Incremental feed magnification 2
bit6	PR1	Operation parameter selection 1
bit7	PR2	Operation parameter selection 2
bit8		Spare
bit9		Spare
bit10		Spare
bit11		Spare
bit12		Spare
bit13		Spare
bit14		Spare
bit15		Spare

J2CT control command 1 (R1703: CTCM1)		
bit	**Abbrev.**	**Name**
bit0	*SVR	Servo OFF
bit1	QEMG	PLC emergency stop
bit2	*PRT1	Data protect 1
bit3	MRST	MC reset
bit4	*IT+	Interlock +
bit5	*IT-	Interlock -
bit6	RDF	Ready OFF
bit7	H	Handle mode
bit8	AUT	Automatic operation mode
bit9	MAN	Manual operation mode
bit10	J	Jog mode
bit11	ZRN	Reference position mode
bit12		
bit13	AZS	Zero point initialization mode
bit14	ZST	Basic position set
bit15	S	Incremental mode

Control command coordinate L (R1704: CTCML)		
bit	**Abbrev.**	**Name**
bit0 to bit15		Arbitrary coordinate (low-order) 1/1000mm (°) unit

Control command coordinate H (R1705: CTCMH)		
bit	**Abbrev.**	**Name**
bit0 to bit15		Arbitrary coordinate (high-order) 1/1000mm (°) unit

J2CT operation adjustment mode valid (R1784)		
bit	**Abbrev.**	**Name**
bit0	-	J2CT operation adjustment mode valid signal (common for all axes)

(b) MR-J2-CT → NC (R1600 to R1615, R1656)

Signal name	J2CT status 4	J2CT status 3	J2CT status 2	J2CT status 1
Abbrev.	CTST4	CTST3	CTST2	CTST1
J2CT 1st axis	R1600	R1601	R1602	R1603
J2CT 2nd axis	R1604	R1605	R1606	R1607
J2CT 3rd axis	R1608	R1609	R1610	R1611
J2CT 4th axis	R1612	R1613	R1614	R1615

J2CT status 4 (R1600: CTST4)		
bit	Abbrev.	Name
bit0	PSW1	Position switch 1
bit1	PSW2	Position switch 2
bit2	PSW3	Position switch 3
bit3	PSW4	Position switch 4
bit4	PSW5	Position switch 5
bit5	PSW6	Position switch 6
bit6	PSW7	Position switch 7
bit7	PSW8	Position switch 8
bit8	PMV	In positioning operation
bit9	PFN	Positioning complete
bit10	PSI	In stopper
bit11		Spare
bit12		Spare
bit13		Spare
bit14		Spare
bit15		Spare

J2CT status 3 (R1601: CTST3)		
bit	Abbrev.	Name
bit0	ST01	Station position 1
bit1	ST02	Station position 2
bit2	ST04	Station position 4
bit3	ST08	Station position 8
bit4	ST016	Station position 16
bit5	ST032	Station position 32
bit6	ST064	Station position 64
bit7	ST0128	Station position 128
bit8	ST0256	Station position 256
bit9		Spare
bit10		Spare
bit11		Spare
bit12		Spare
bit13		Spare
bit14		Spare
bit15		Spare

J2CT status 2 (R1602: CTST2)		
bit	Abbrev.	Name
bit0	AUTO	In automatic operation mode
bit1	MANO	In manual operation mode
bit2	JO	In jog mode
bit3	ARNN	In reference position return
bit4	ZRNO	In reference position return mode
bit5		
bit6	AZSO	In zero point initialization mode
bit7	SO	In incremental mode
bit8	AL1	MC alarm 1
bit9	AL2	MC alarm 2
bit10	AL4	MC alarm 4
bit11	BAL	Battery drop
bit12	ABS	Absolute position power shutoff movement over
bit13	ZSN	Absolute position loss
bit14	ZSF	Initialization set completed
bit15	ZSE	Initialization set error completed

J2CT status 1 (R1603: CTST1)		
bit	Abbrev.	Name
bit0	RDY	Servo ready
bit1	INP	In-position
bit2	SMZ	Smoothing zero
bit3	AX1	Axis selection output
bit4	MVP	In axis movement +
bit5	MVM	In axis movement -
bit6	TLQ	Reaching torque limit
bit7	ADJ	Adjusting machine
bit8	ZP	Reference position reached
bit9	RST	In reset
bit10	HO	In handle mode
bit11	MA	Controller preparation complete
bit12	SA	Servo preparation complete
bit13	JSTA	Automatic set position reached
bit14	JST	Set position reached
bit15	NEAR	Near set position

J2CT In n-th axis operation adjustment mode (R1656)		
bit	Abbrev.	Name
bit0	-	In J2CT 1st axis operation adjustment mode
bit1	-	In J2CT 2nd axis operation adjustment mode
bit2	-	In J2CT 3rd axis operation adjustment mode
bit3	-	In J2CT 4th axis operation adjustment mode

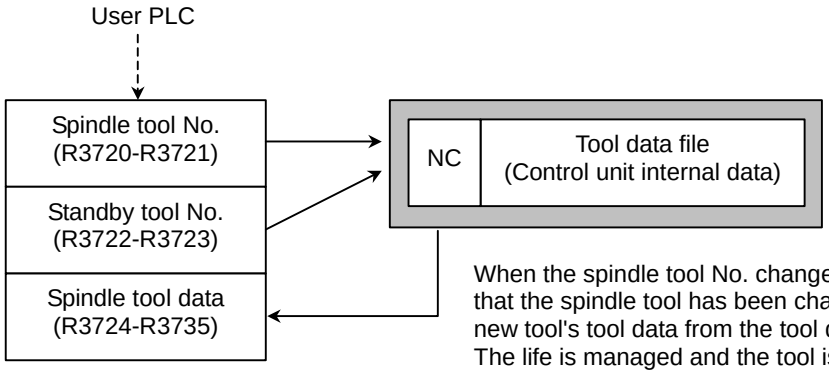
6.5.2 Other File Registers

(1) Life management interface

(a) Outline

The tool life is managed based on the spindle tool No. and standby tool No.
The spindle tool No. is used for the screen display data and for the tool for which the tool life is to be managed. The life management data for the tool to be managed is set in the spindle tool data.
The standby tool data is used as screen data.

(b) Operation



When the spindle tool No. changes, the control unit regards that the spindle tool has been changed, and searches for the new tool's tool data from the tool data file.
The life is managed and the tool is compensated based on this data.
This tool data is output to R3724 to R3735 at the user PLC's main cycle.

(c) Related signals

Tool alarm 1 (TAL1: Y2C8)
Tool alarm 2 (TAL2: Y2C9)
Data count valid (TCFF: Y2CA)
Tool life management input (TLF1: Y2CB)
Tool group number designation (R150, R151)
In tool life management (TLF0: X20B)
Tool life over (TL0V: X20E)
New tool change (TCRQ: X22C)

(2) NSK Megatorque Motor Connection Interface

(a) Outline

This function transmits commands by serial communication (RS232C specifications) to the dedicated drive unit of the NSK megatorque motor by assigning commands to the control unit from the 2nd miscellaneous function, the PLC and pulse train input.

(b) Command method

The command and numeric value following address B designated by the 2nd miscellaneous function are set as a signed binary in the R register used by the PLC. Then, the control unit creates a positioning command from the command and numeric command, and sends this to the drive unit with serial communication (RS232C specifications).
When the handle mode of the R register used by the PLC is turned ON, the pulse train input by the handle will be sent to the drive unit as a movement command.
Issue the command with the number of connected megatorque axes set in base specification parameter "#1045 nskno" (number of connected megatorque motors) and the input/output base parameter for communication set. Up to 16 axes can be connected as the megatorque motor axes.

(c) R register details

PLC → NC

B contact	Signal name		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
—	NSK AXIS COMMAND	PC	R5000	R5006	R5012	R5018	R5024	R5030	R5036	R5042
			9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
			R5048	R5054	R5060	R5066	R5072	R5078	R5084	R5090

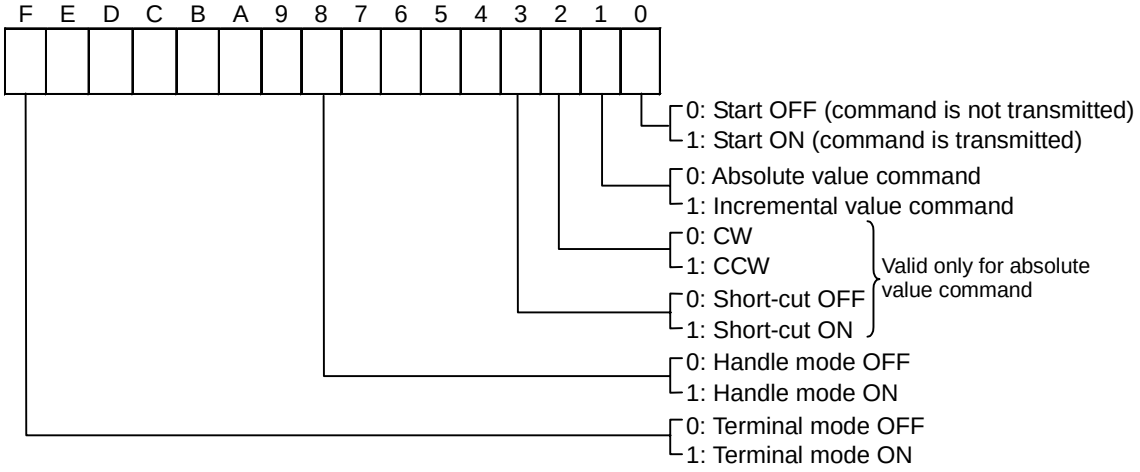
[Function]

This signal sets the commands for creating and transmitting the commands to the NSK drive unit.

[Operation]

(1) This signal is valid for the axis set in the base specification parameters "#1045 nskno" (number of connected megatorque motors).

(2) Set the other commands before turning ON the start axis designation bit (bit0) for this signal.



[Cautions]

(1) Start axis designation (bit0)
- (a) When this bit is ON for several axes, the command will be set in order from the smallest axis No.
- (b) After this bit turns ON, do not turn it OFF until the status (R5001) command transmission complete bit (bit1) turns ON.
- (c) Do not turn this bit ON while the motor is rotating. If a command is transmitted while the motor is rotating, an error will occur.
- (d) Always turn this bit OFF if a command does not need to be transmitted.
- (e) When this bit is turned OFF, all statuses (R5001) other than the R232C error (R5001 bitC) will be cleared.
- (f) The positioning command will not be transmitted during the handle mode or terminal mode.

(2) CW/CCW designation (bit2)
- (a) This bit designation is valid only for the absolute value command (bit1 OFF). It is invalid for the incremental value command (bit1 ON), when the drive unit coordinate mode is set to direct coordinate system designation, or when the shortcut is ON (bit3 ON).
- (b) If the rotation direction is reversed by the drive unit's coordinate direction setting, the direction will be CCW when this bit is OFF, and CW when ON.

(3) Short-cut designation (bit3)
- (a) This bit designation is valid only for the absolute value command (bit1 OFF). It is invalid for the incremental value command (bit1 ON), or when the drive unit coordinate mode is set to direct coordinate system designation.

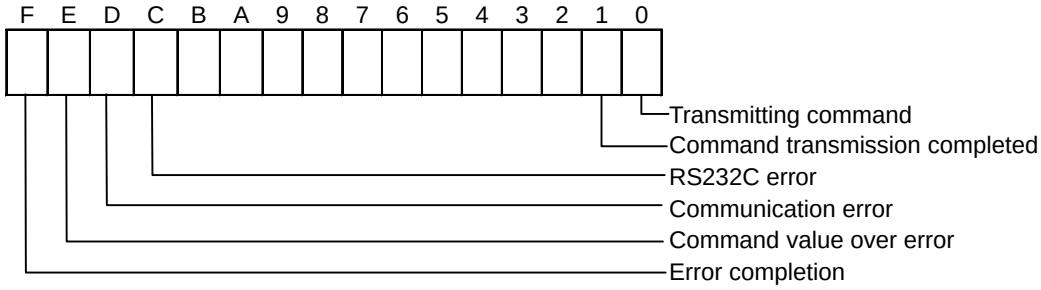
(4) Handle mode designation (bit8)
(a) While this bit is ON, the other control axes (NC axis, PLC axis) cannot be selected as handle feed axes. The pulse train can be input to the megatorque axis only with the 1st handle.
(b) If pulse train is input by the handle while the motor is rotating (rotating with a command other than the movement command by the pulse train input), an error will occur.
(c) Turn the handle mode designation bit OFF for axes that do not need to be started.
(d) The start axis designation bit (bit0) will be invalid even if turned ON while this bit is ON.
(e) The movement command by the pulse train input will not be transmitted during the terminal mode.
(5) Terminal mode designation (bitF)
(a) If this bit is ON for even one axis, the command for the megatorque axis by the 2nd miscellaneous function, the PLC and pulse train input will not be transmitted to any axes. The current position will not be updated.
(b) Always turn this bit OFF when not using the NSK Terminal screen.

NC → PLC

B contact	Signal name		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
—	NSK AXIS STATUS	PC	R5001	R5007	R5013	R5019	R5025	R5031	R5037	R5043
			9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
			R5049	R5055	R5061	R5067	R5073	R5079	R5085	R5091

[Function]
This signal informs the status regarding the command transmitted to the NSK drive unit.

[Operation]
(1) This signal makes a notice regarding the axis set in the base specification parameter "#1045 nskno" (Megatorque motor connections).



(a) Transmitting command (bit0) turns ON while a command is being transmitted from the control unit to the drive unit.
(b) Command transmission completed (bit1) turns ON when the transmission of the command from the control unit to the drive unit is completed normally.
(c) RS232C error (bitC) turns ON when an error occurs in the communication control between the control unit and drive unit. This bit turns OFF when the communication control is recovered to the normal state.
(d) Communication error (bitD) turns ON when the command was not correctly transmitted from the control unit to the drive unit.
(e) Command value over error (bitE) turns ON when the command value sent from the control unit to the drive unit exceeds the valid range of the command value set in the drive unit, or when the start axis designation bit (R5000 bit0) turns ON while a command value (R5002/R5003) exceeding the setting range is set.
(f) Error completion (bitF) turns ON when a command is transmitted from the control unit to the drive unit while the motor is rotating.

[Cautions]

(1) When the start axis designation bit (R5000 bit0) turns OFF, the status command transmission completed (bit1), communication error (bitD), command value over error (bitE) and error completion (bitF) signals will turn OFF.
(2) Command transmission complete (bit1) will not be output during the handle mode (R5000 bit8 ON).
(3) During the handle mode (R5000 bit8 ON), the communication error (bitD), command value over error (bitE) and error completion (bitF) signals will be turned OFF by the control unit when the command transmission by the pulse train input is completed.

PLC → NC

B contact	Signal name		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
—	NSK AXIS COMMAND VALUE	PC	R5002,3	R5008,9	R5014,5	R5020,1	R5026,7	R5032,3	R5038,9	R5044,5
			9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
			R5050,1	R5056,7	R5062,3	R5068,9	R5074,5	R5080,1	R5086,7	R5092,3

[Function]

The command's numerical data is notified to the control unit by setting numerical data of the command to be transmitted to the NSK drive unit as a signed binary.

[Operation]

(1) This signal is valid for the axis set in the base specification parameter "#1045 nskno" (number of connected megatorque motors).
(2) The setting range is -99999999 to 99999999 [0.001° unit].

[Cautions]

(1) When the start axis designation bit (R5000 bit0) turns OFF, the status command transmission completed (bit1), communication error (bitD), command value over error (bitE) and error completion (bitF) signals will turn OFF.

NC → PLC

B contact	Signal name		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
—	NSK AXIS CURRENT POSITION	PC	R5004,5	R5010,1	R5016,7	R5022,3	R5028,9	R5033,5	R5040,1	R5046,7
			9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
			R5052,3	R5058,9	R5064,5	R5070,1	R5076,7	R5082,3	R5088,9	R5094,5

[Function]

This signal informs the current position of the NSK megatorque axis.

[Operation]

(1) The control unit outputs the user coordinate value of angle unit as a signed binary. (The unit is 0.001°.)
(2) This signal is valid only for the axis set in the base specification parameter "#1045 nskno" (Megatorque motor connections), and is always updated.

(3) Expanded PLC constants

(a) Outline

The parameters #6349 to #6396 can newly be used as PLC constants.
The setting range is ±8 digits. (-99999999 to 99999999).
The set data is set in the file register and backed up.

(b) Operation

#	Corresponding file register	
	HIGH side	LOW side
6349	R4901	R4900
6350	R4903	R4902
6351	R4905	R4904
6352	R4907	R4906
6353	R4909	R4908
6354	R4911	R4910
6355	R4913	R4912
6356	R4915	R4914
6357	R4917	R4916
6358	R4919	R4918
6359	R4921	R4920
6360	R4923	R4922
6361	R4925	R4924
6362	R4927	R4926
6363	R4929	R4928
6364	R4931	R4930

#	Corresponding file register	
	HIGH side	LOW side
6365	R4933	R4932
6366	R4935	R4934
6367	R4937	R4936
6368	R4939	R4938
6369	R4941	R4940
6370	R4943	R4942
6371	R4945	R4944
6372	R4947	R4946
6373	R4949	R4948
6374	R4951	R4950
6375	R4953	R4952
6376	R4955	R4954
6377	R4957	R4956
6378	R4959	R4958
6379	R4961	R4960
6380	R4963	R4962

#	Corresponding file register	
	HIGH side	LOW side
6381	R4965	R4964
6382	R4967	R4966
6383	R4969	R4968
6384	R4971	R4970
6385	R4973	R4972
6386	R4975	R4974
6387	R4977	R4976
6388	R4979	R4978
6389	R4981	R4980
6390	R4983	R4982
6391	R4985	R4984
6392	R4987	R4986
6393	R4989	R4988
6394	R4991	R4990
6395	R4993	R4992
6396	R4995	R4994

The expanded PLC constant data can be input and output with the parameters and maintenance data.

(1) Parameter input/output

The data can be input and output with "#3 PARAMETER" on the DATA IN/OUT screen.
The PLC constants in the expanded section are output with N6349 to N6396 after the conventional N6301 to N6348.

(2) Maintenance data input/output

The data can be input/output by selecting "ALL1" for "#99 MAINTENANCE DATA" on the DATA IN/OUT screen.
The PLC constants in the expanded section are input and output with the new 0 No. "0120".
The conventional PLC constants are input and output with "0105" so when backing up all PLC constants by independently designating the 0 No., output "0105" and "0120". ("0105" contains the conventional PLC constants and workpiece counter.)

7. SPINDLE CONTROL

7.1 Outline of Functions

Spindle speed can be directly controlled by a 6-digit S code command.
When the S analog function specifications are valid, the controller selects an appropriate spindle speed corresponding to the 6-digit command following the S code and outputs (spindle gear shift command) it to the machine side (PLC). The controller also outputs S command data (analog voltage or serial connection data) corresponding to the gear input (spindle gear select input) and spindle speed specified by the machine side (PLC).

7.1.1 Related Parameters

The PLC can have up to four gear stages.
The table below lists the four gear stages and the corresponding parameters.

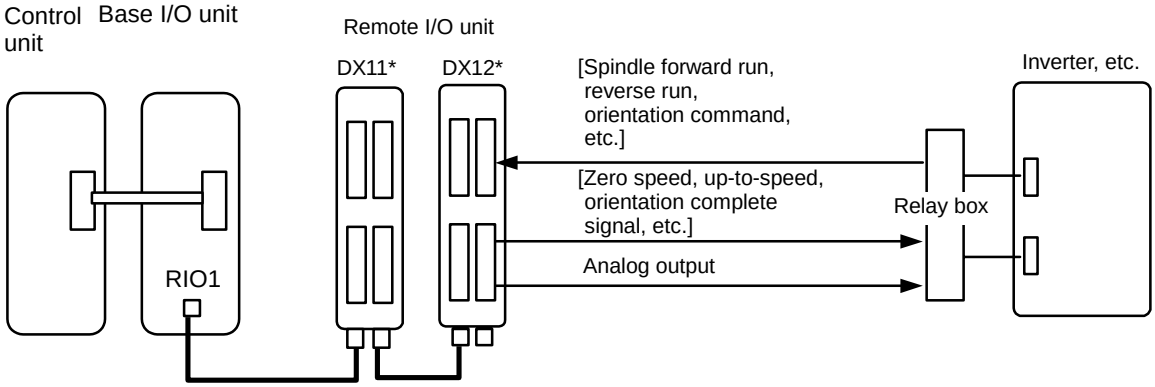
Parameters

Parameter name / Gear stage	Spindle limit speed	Maximum spindle speed	Spindle shift speed	Tap cycle maximum speed	Oriented speed	Minimum speed	Output signal		Input signal	
							GR2	GR1	GI1	GI2
1	Slimt1 #3001	Smax1 #3005	Ssift1 #3009	Stap1 #3013	Sori #3021	Smin #3023	0	0	0	0
2	Slimt2 #3002	Smax2 #3006	Ssift2 #3010	Stap2 #3014			0	1	0	1
3	Slimt3 #3003	Smax3 #3007	Ssift3 #3011	Stap3 #3015			1	0	1	0
4	Slimt4 #3004	Smax4 #3007	Ssift4 #3012	Stap4 #3016			1	1	1	1

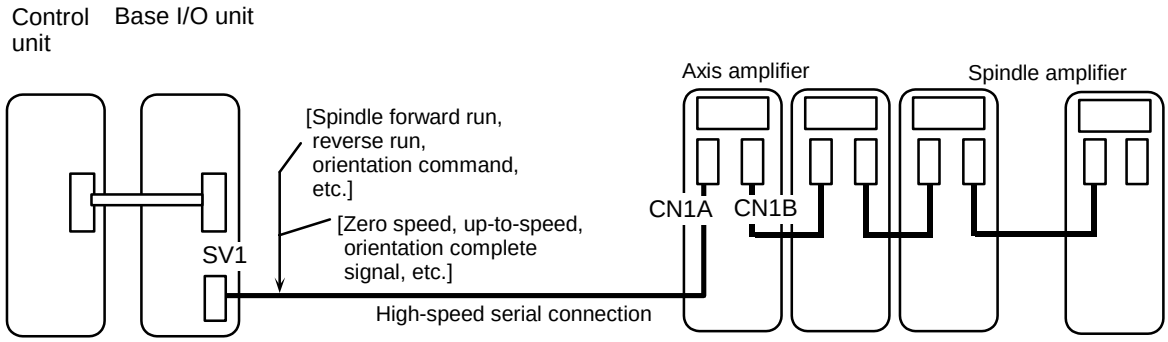
Note 1) The upper line shows the parameter name, and the bottom line shows the parameter No.
Note 2) Set the parameter for the gear stage not being used to 0.

7.1.2 Connection Method

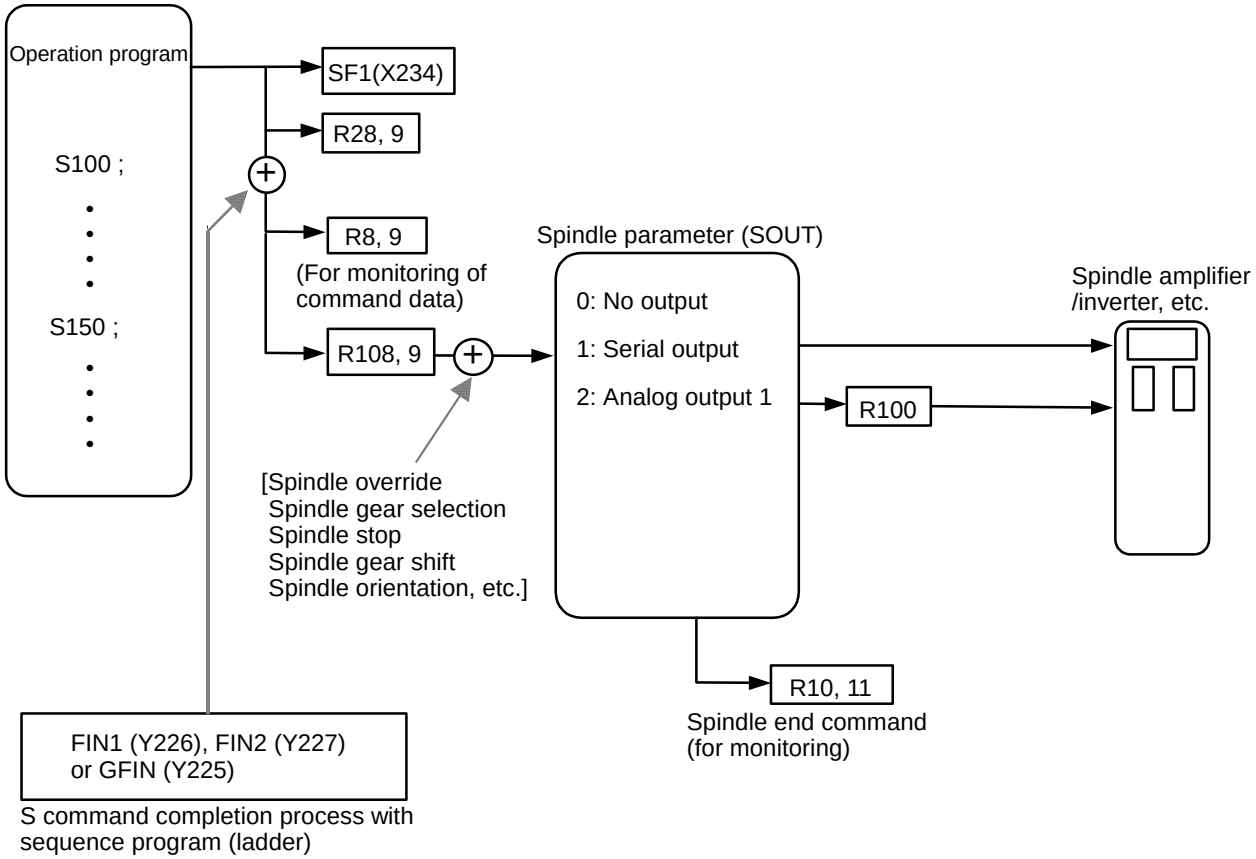
(1) To analog connect the controller and spindle controller



(2) To serially connect the controller and spindle controller



7.1.3 Flow of Spindle (S) Data



Outline explanation

(1) The spindle command start signal (SF1) is output when the spindle (S) command is issued.
(2) After the designated processes is executed by SF1 with the sequence program, the M function finish or gear shift complete signal is returned to the controller.
(3) Data corresponding to the S command is output to file registers R8 and 9 or R108 or 109 with the completion signal. The speed is output to R8, 9 and R108, 109.
(4) The R108 and 109 data is transferred to the spindle amplifier with serial communication according to the spindle parameter SOUT value or is transferred to the inverter, etc., as analog voltage via the remote I/O unit.

8. HANDLING OF M, S, T, B FUNCTIONS

The following abbreviations are used in the subsequent explanations.

(1) Miscellaneous function (command) ——— M function (command)

(2) Spindle function (command) ——— S function (command)

(3) Tool function (command) ——— T function (command)

(4) 2nd miscellaneous function (command) ——— B function (command)

(5) Miscellaneous function strobe 1 to 4 ——— MF (MF1, 2, 3, 4)

(6) Spindle function strobe 1 to 2 ——— SF

(7) Tool function strobe 1 to 4 ——— TF

(8) 2nd miscellaneous function strobe ——— BF

(9) Miscellaneous function finish 1, 2 ——— FIN1, FIN2

8.1 Command Format

(1) The maximum number of commands that can be issued in one block are shown below.

Function	When using built-in PLC (When opened to user)	Standard PLC
M function	4 commands	1 command (BCD 2 digits)
S function	2 commands	1 command (8-bit binary)
T function	1 command	1 command (BCD 2 digits)
B function	1 command	-

(2) The command can have up to eight digits for the built-in PLC, and two digits for the standard PLC.

(3) A program error will not occur even if more commands than the maximum number are issued. The latter commands will be valid.

EX.) When four T commands are issued though only one T command can be used.

T01 T02 T03 T04 ;

The last T command will be valid.

8.2 Miscellaneous Function Finish

After the PLC (machine) finished the specified operations for the M, S, T, B commands output with automatic operation (memory, MDI, or tape) or manual numerical commands from the CNC, the finish signal will be returned to the CNC. However, there are two types of finish signals as shown below. Use these accordingly in one sequence.

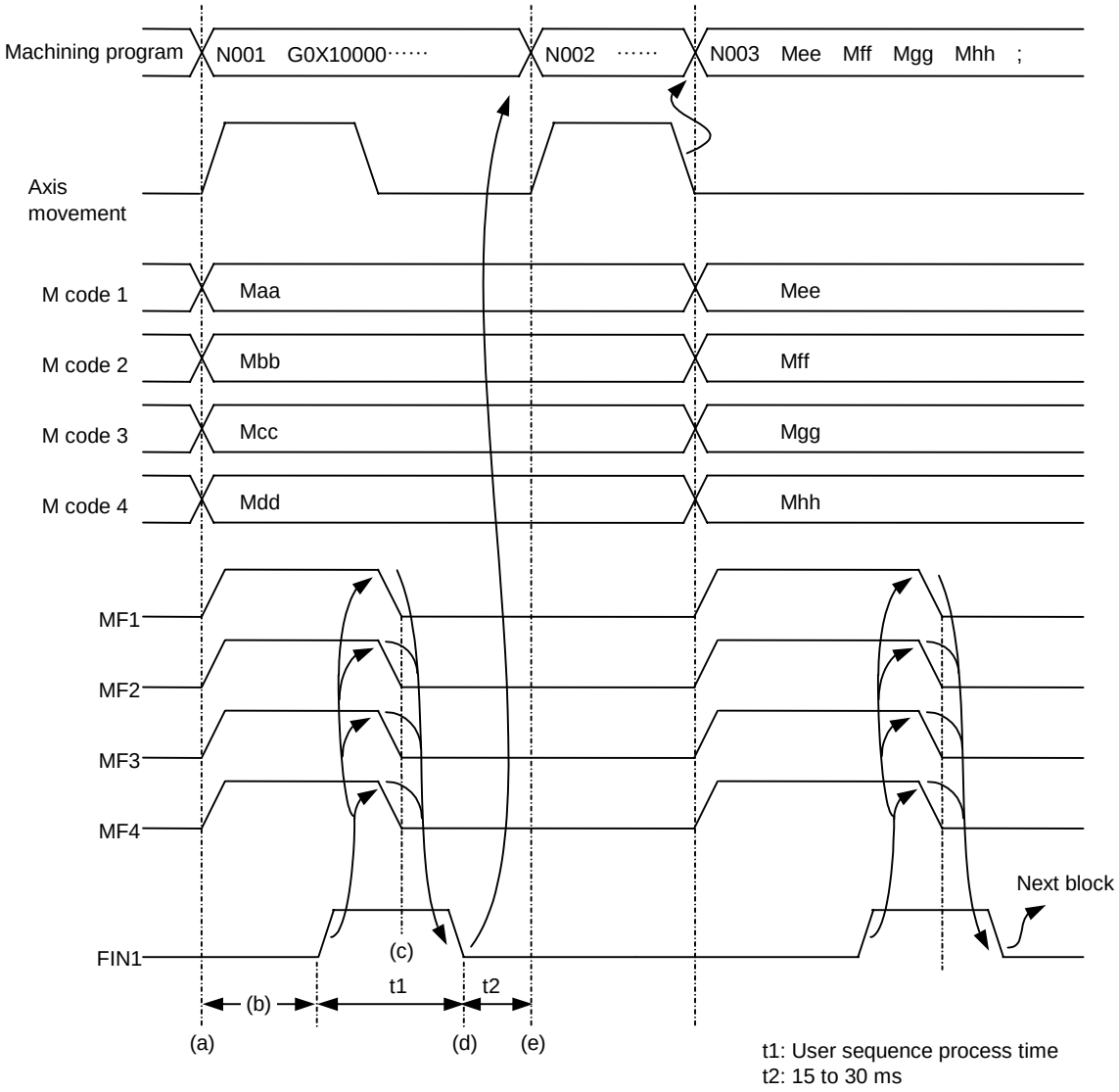
(1) FIN1 ... CNC proceeds to next block at falling edge of finish signal (FIN1).
(2) FIN2 ... CNC proceeds to next block at rising edge of finish signal (FIN2).

The details for FIN1 and FIN2 are also described in the section "6. Explanation of Interface Signals". Examples of the M function are given in the following section.

8.2.1 Operation sequence 1 (Using FIN1 with M command)

Machining program **(Example)**

```
N001  G0X10000  Maa  Mbb  Mcc  Mdd;
N002  G0Z–2000;
N003  Mee  Mff  Mgg  Mhh;
```



[Explanation of operation]

(a) The CNC outputs the M code data n (BCD) and MFn to the PLC (machine).
Refer to the section "8.5 Precautions Related to M, S, T, B Functions" for details on the M code data and MF output timing.

(b) The PLC (machine) confirms that the MF signal has turned ON, reads the M code data, and executes the specified operation. Then, it turns FIN1 ON.

(c) The CNC confirms that FIN1 has turned ON, and then turns MF OFF.

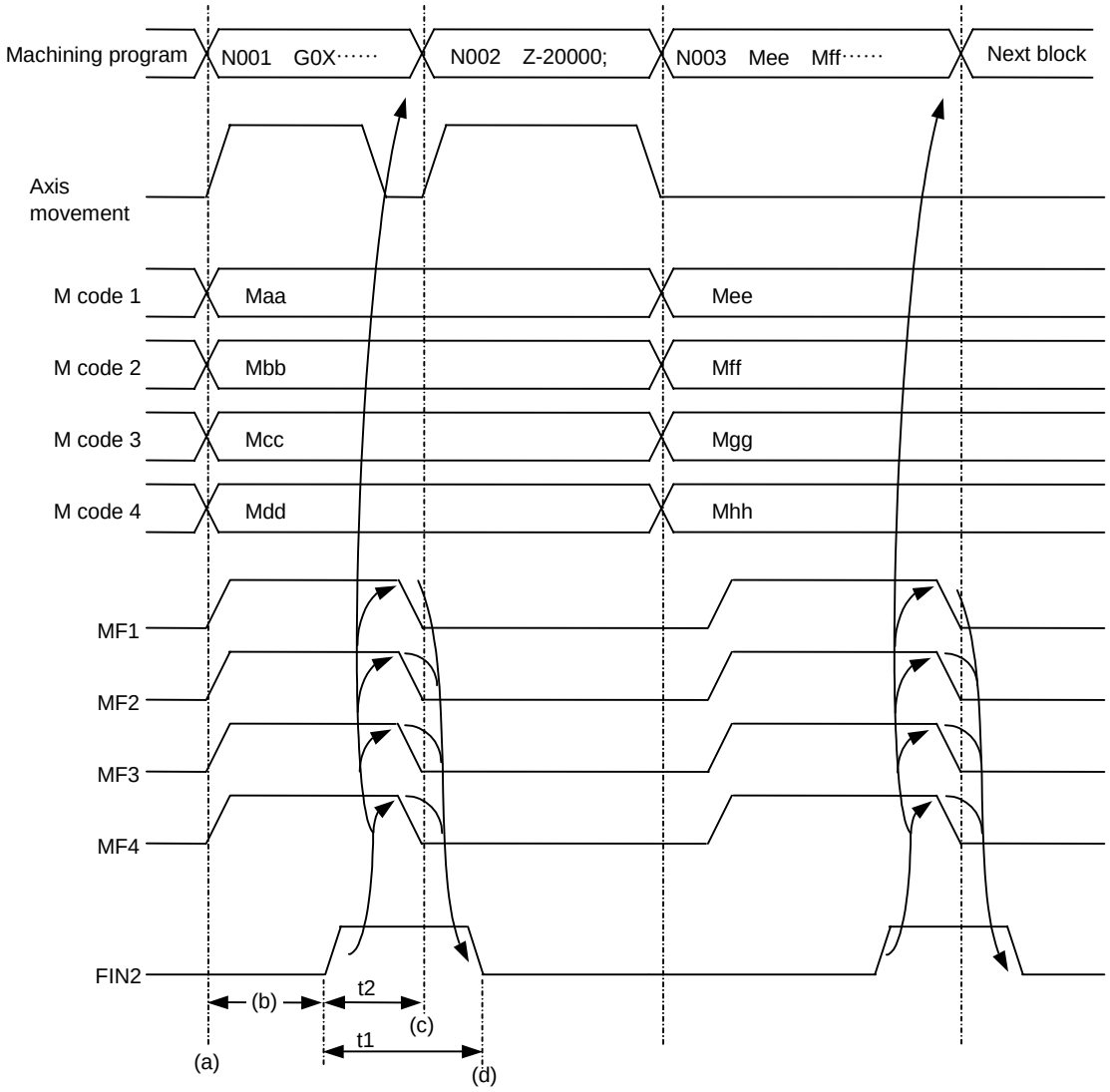
(d) The PLC (machine) confirms that MF has turned OFF, and then turns FIN1 OFF.

(e) The CNC confirms that FIN1 has turned OFF, and then proceeds to the next block.

8.2.2 Operation sequence 2 (Using FIN2 with M command)

Machining program **(Example)**

```
N001  G0X10000  Maa  Mbb  Mcc  Mdd;
N002  G0Z–20000;
N003  Mee  Mff  Mgg  Mhh;
```



[Explanation of operation]

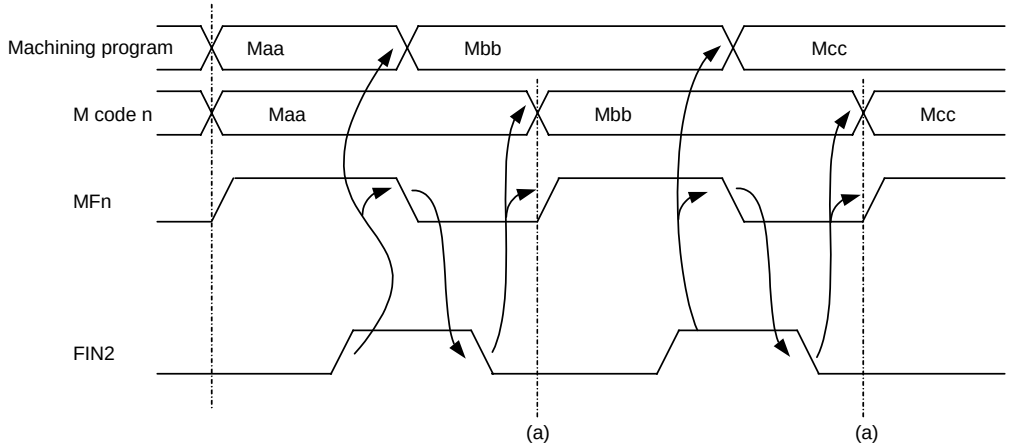
(a) The CNC outputs the M code data n (BCD) and MFn to the PLC (machine).
Refer to the section "8.5 Precautions Related to M, S, T, B Functions" for details on the M code data and MF output timing.

(b) The PLC (machine) confirms that the MF signal has turned ON, reads the M code data, and executes the specified operation. Then, it turns FIN2 ON.

(c) The CNC confirms that FIN2 has turned ON, and proceeds to the next block simultaneously with the turning OFF of MF.

(d) The PLC (machine) confirms that MF has turned OFF, and then turns FIN2 OFF.

8.2.3 When M commands continue (Using FIN2 with M command)



[Explanation of operation]

The general operation is the same as "8.2.2 Operation sequence 2" on the previous page.

(a) The CNC confirms that FIN2 has turned OFF, and then output the next code signal and MF.

8.3 M Code Independent Output

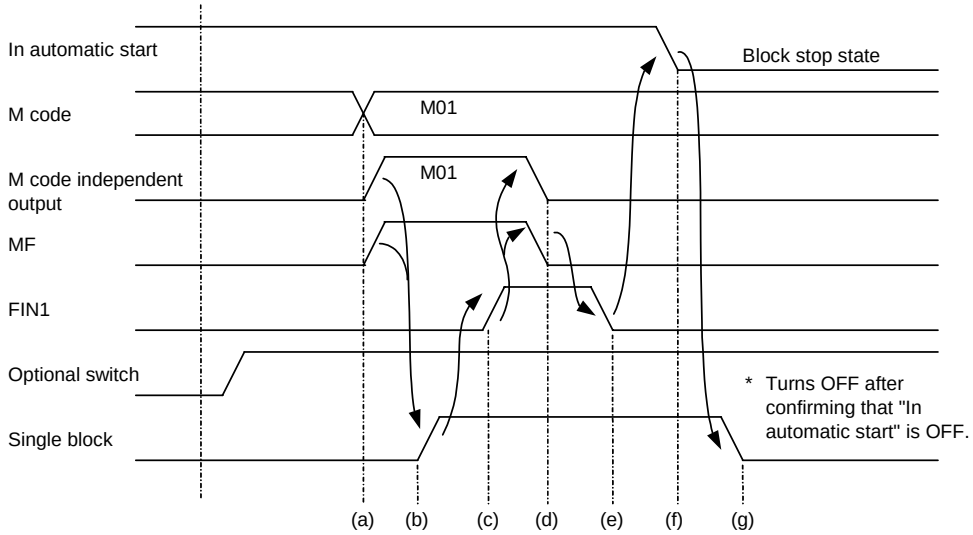
The following four types of M codes output "M code independent output" signal (decode signals) separately from their code signals and MF.
The M code independent output is generally used with the following details, but the CNC outputs only the decode signal, and the operation and finish signal processes, etc., are carried out by the user PLC (machine).

M00	Program stop <Example of process> The block stop state is entered when M00 is commanded.
M01	Optional stop <Example of process> The optional stop state is entered when M01 is commanded and the optional stop selection switch is selected.
M02, M30	Program end <Example of process> When M02 or M30 is commanded, "Reset" or "Reset & rewind" is returned to the CNC, and the reset state is entered.

8.3.1 Operation sequence

The "M code independent output" signal turns ON when M00, M01, M02 or M30 is commanded during automatic operation (memory, MDI or tape) or by the manual numerical command, and turns OFF with the "FIN1", "FIN2", "Reset 1", "Reset 2" or "Reset & rewind" signal.

(1) Example of M01 process (stopping the block with the M01 command)



[Explanation of operation]

(a) The CNC outputs the M code data and MF to the PLC (machine).
Refer to the section "8.5 Precautions Related to M, S, T, B Functions" for details on the M code data and MF output timing.

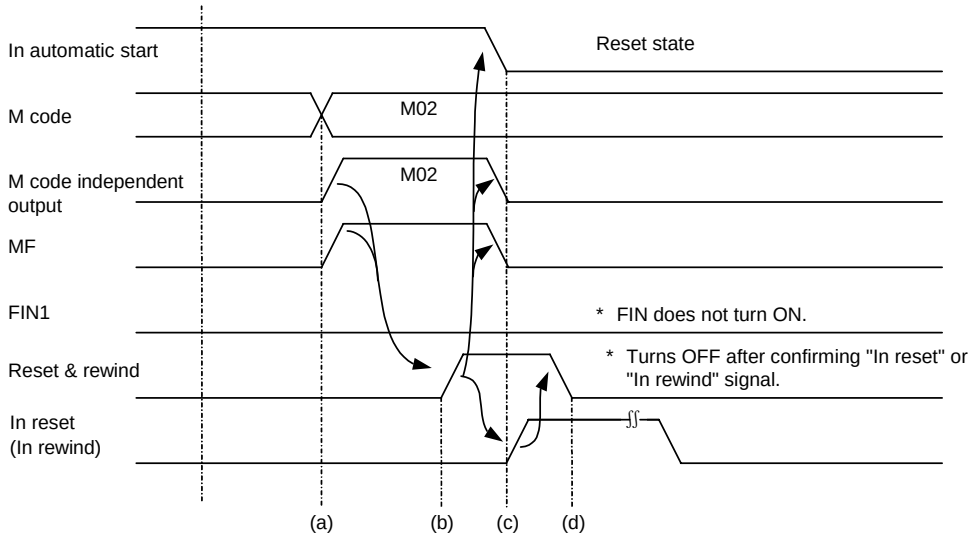
(b) (c) The PLC (machine) confirms that the MF signal has turned ON, and then carries out the specified operation. It then confirms that the "Optional switch" is ON, and then turns "Single block" and "FIN1" ON.

(d) (e) The CNC confirms that FIN1 has turned ON, and then turns the MF and "M code independent output" signal OFF. The PLC (machine) confirms that MF has turned OFF, and then turns FIN1 OFF.

(f) The CNC confirms that FIN1 has turned OFF, and then turns "In automatic start" signal OFF.

(g) The PLC (machine) confirms that "In automatic start" signal has turned OFF, and then turns the "Single block" OFF at the next automatic start.

(2) Example of M02 process (carrying out "Reset & rewind" with M02 command)



[Explanation of operation]

(a) The CNC outputs the M code data and MF to the PLC (machine).
Refer to the section "8.5 Precautions Related to M, S, T, B Functions" for details on the M code data and MF output timing.

(b) The PLC (machine) confirms that the MF signal has turned ON, and then carries out the specified operation. It then turns "Reset & rewind" ON.

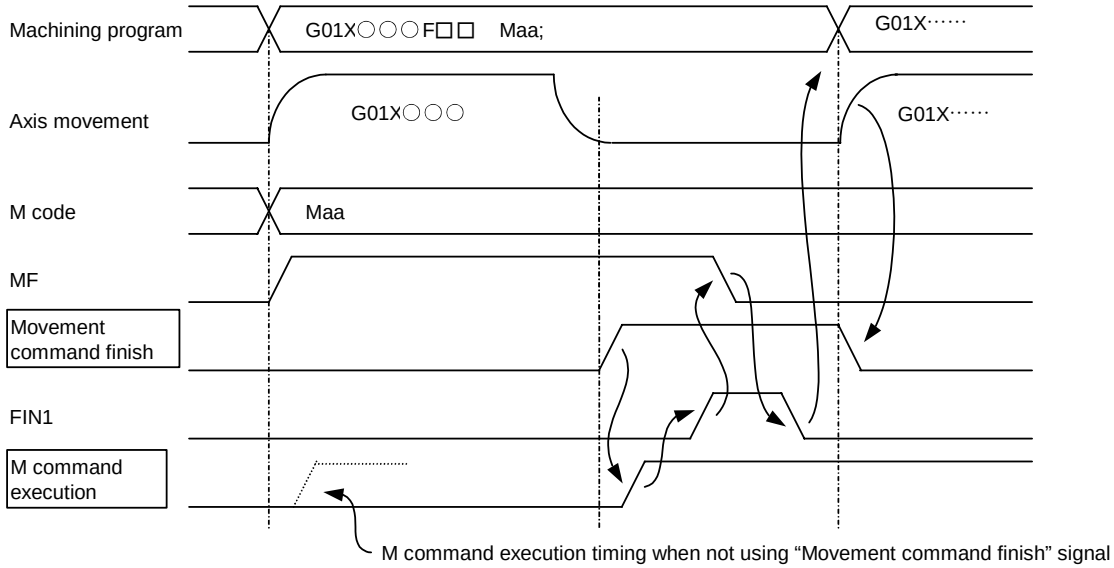
(c) The CNC confirms that "Reset & rewind" has turned ON, then turns MF, "M code independent output" and "In automatic start" OFF, and then starts the rewinding operation.

(d) The PLC (machine) confirms the "In reset" or "In rewind" signals, and then turns the "Reset & rewind" signal OFF.

8.4 Axis Movement and M Commands

If an M command is issued in the same block as a movement command, whether to process the M command simultaneously with the movement command or to process it after the movement is finished, depends on the "Movement command finish (DEN)" signal output from the CNC.

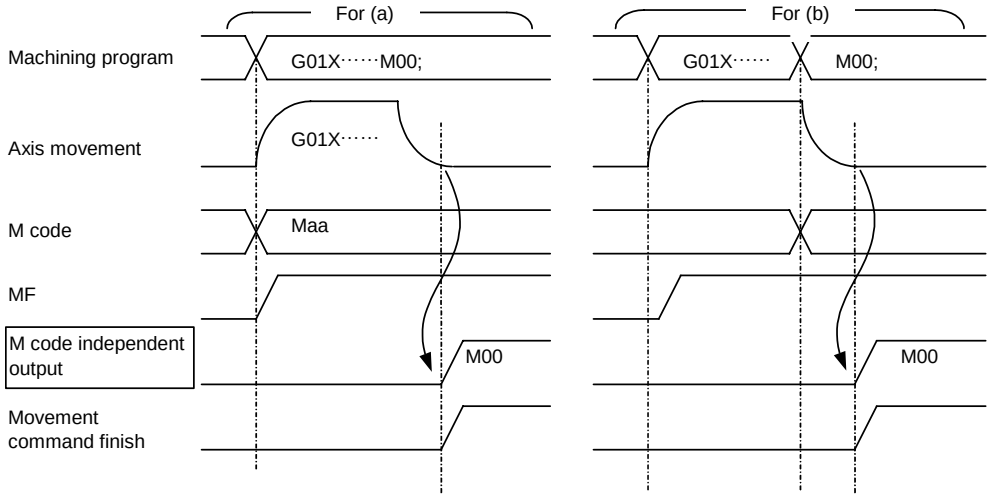
(1) Axis movement and general M command (To execute M command after movement command is finished)



(2) Axis movement and M code independent output command

(a) When the M code independent output command is issued in the same block as a movement command, the M code independent output will be output after the movement command is finished.

(b) Even when the M code independent output command is issued without movement command, it will be output after the axis movement in the previous command block is finished.



(Note 1) Refer to the section "8.3 M code Independent Output" for details on the PLC (machine) process for the M code independent output.

8.5 Precautions Related to M, S, T, B Functions

(1) M code data and MF output timing (Also applies to S, T, B signal)
When the built-in PLC is used, the M code data n and MFn are output simultaneously to the user PLC.
When the standard PLC is used, MF is output to the machine approx. 40 to 60 ms behind the M code data.
When outputting the M code data and MF to the machine with the user PLC of built-in PLC, insert an appropriate time timer on the MF side.

(2) The finish signals (FIN1, FIN2) are commonly used for the M, S, T, B functions, so turn them ON in conditions where all function operations have been finished.

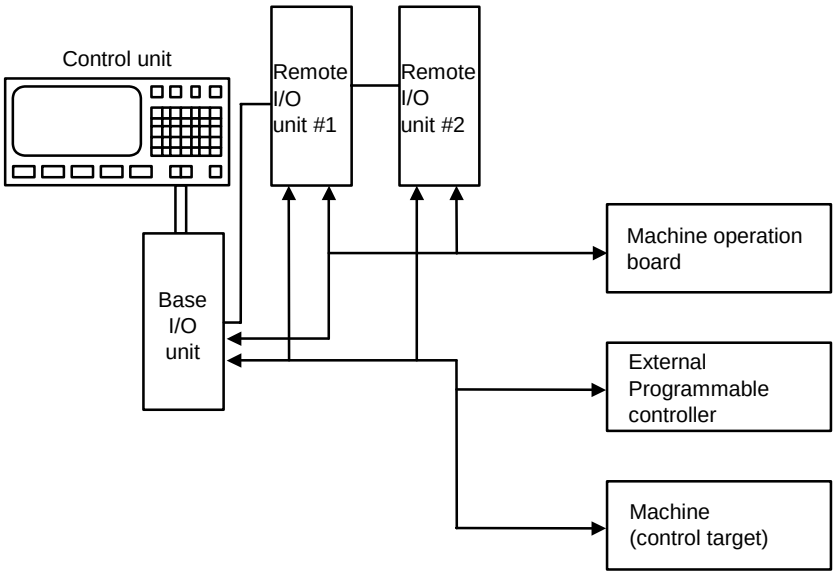
(3) When the "M function lock" signal (AFL) is turned ON, the M, S, T, B functions (including M commands in fixed cycle) issued during automatic operation (memory, MDI or tape) and manual numerical command, will not be executed. In other words, the code signal, MF, SF, TF and BF signals will not be output (updated). However, when the M code independent output (M00, M01, M02, M30) is commanded, the "M code independent output", "M code data" and MF will be output as usual.

(4) The 2nd miscellaneous (B) function can be selected from address A, B or C using the setup parameters. The "B function" refers to when address "B" is selected.

9. STANDARD PLC INTERFACE

By setting Setup parameter "#1038 plcsel" to "1", the standard PLC with fixed signal name can be selected for the base I/O Unit, remote I/O unit connector.
In this case, the required sequence processes will be carried out by the external programmable controller.

Outline configuration diagram

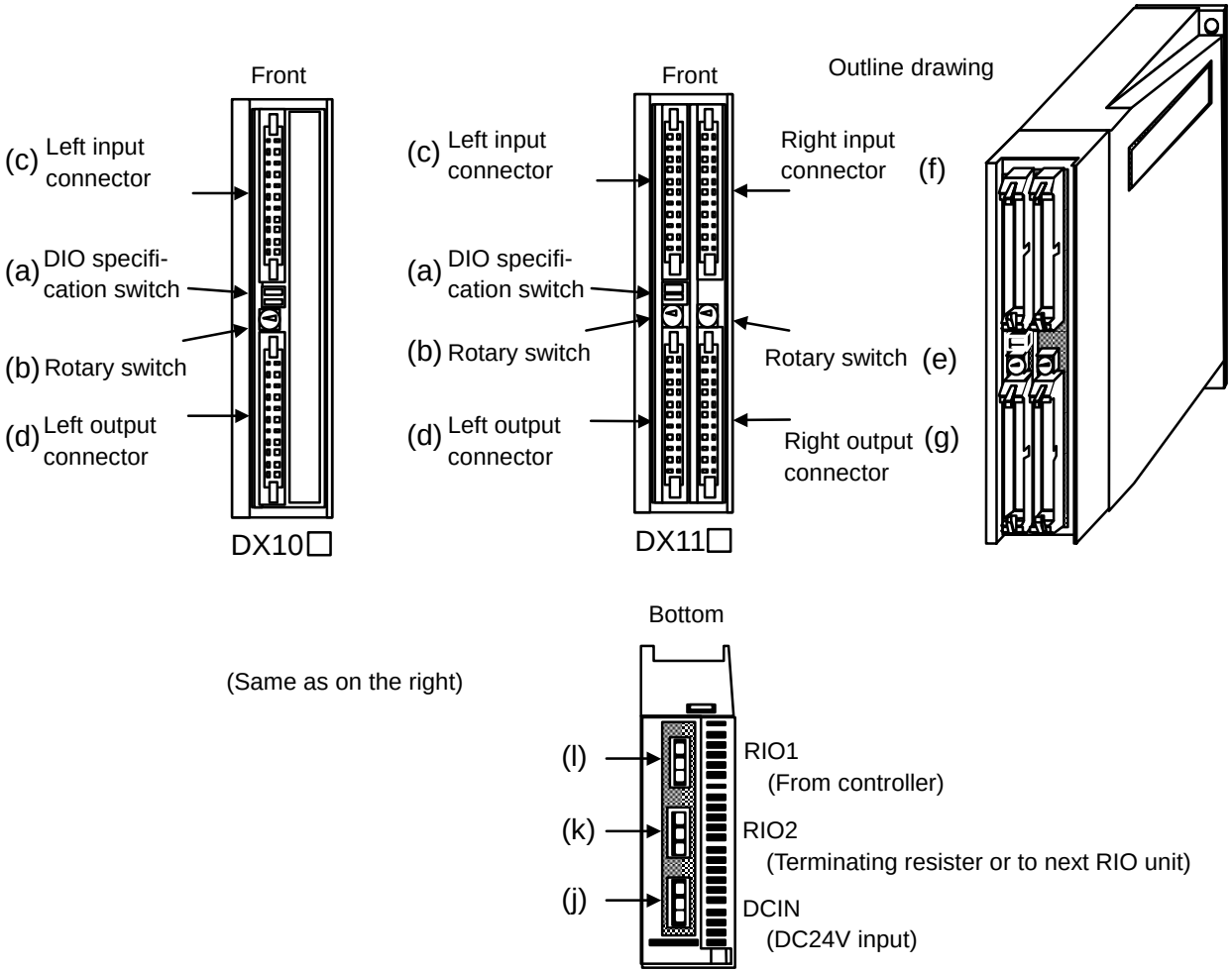


9.1 Relation of Functions and Remote I/O Unit

When using the standard PLC, Base I/O unit will be required. However, all of the functions provided with the standard PLC cannot be realized only with the base I/O unit. If the remaining functions provided by the standard PLC are to be used, another DX10* or DX11* will be required.

9.1.1 Relation of RIO Unit and Devices

The configuration of the remote I/O units (hereafter RIO unit) DX10* and DX11* are shown below. Each unit has a rotary switch for setting the unit No., and for establishing a relation with the device No. (X, Y).



No. of remote I/O unit input/output points

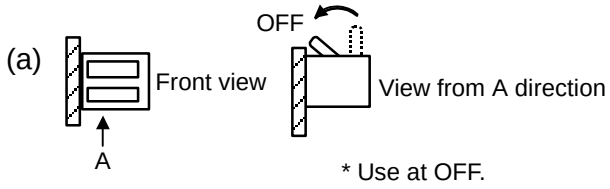
Unit model	Compatible machine control signal	Left	Right	Total
DX10* (FCUA-DX10*)	Digital input signal (DI) (Photocoupler insulation)	32 points	—	32 points
	Digital output signal (DO) (Non-insulated)	32 points		32 points
DX11* (FCUA-DX11*)	Digital input signal (DI) (Photocoupler insulation)	32 points	32 points	64 points
	Digital output signal (DO) (Non-insulated)	32 points	16 points	48 points

Note) The * mark in the table is 0 when the output is a sink type, and is 1 when the output is a source type. The input is changeable.
Items (a) to (g) are described in the following pages.

(1) DIO specification setting switch

This switch is not used currently, and must always be set to OFF.

DIO specification setting switch



(2) Rotary switch for setting No. of channels

Rotary switch for setting No. of channels (b) (e)


Set between 0 and 3.

The devices to be input are determined according to the rotary switch for setting No. of channels are shown below. The signals (function) corresponding to those devices will be valid. Refer to Tables 9-1-X and Tables 9-2-X for the correspondence of the devices and signals (functions).

RIO unit		Rotary switch setting No.		Read in device No.	Output device No.
First I/O unit	Left card	Rotary switch (b)	0	X00 to X1F from connector (c)	Y00 to Y1F from connector (d)
	Right card	Rotary switch (e)	1	X20 to X3F from connector (f)	Y20 to Y2F from connector (g)
Second I/O unit	Left card	Rotary switch (b)	2	X40 to X5F from connector (c)	Y40 to Y5F from connector (d)
	Right card	Rotary switch (e)	3	X60 to X7F from connector (f)	Y60 to Y6F from connector (g)

(3) Relation of connector pins and devices

Refer to the section "2.1.3 Relation of Connector Pins and Devices".

9.2 Special Process Signals

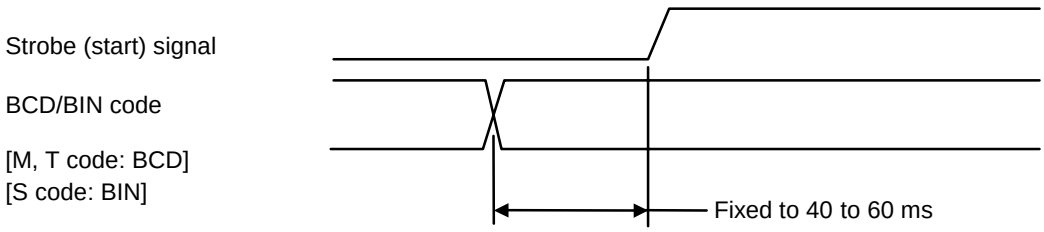
(1) Reset & rewind
The input (X24) on the second card and the reset button on the key board unit are processed in the same manner as reset & rewind.

(2) Manual absolute
The manual absolute signal is assigned to the option remote I/O unit (third card) pins.
If there is no option remote I/O unit (third card), the manual absolute will constantly operate in the on state.
If the option remote I/O unit (third card) is mounted, the state of the X41 input signal will be followed.

(3) The data protect key, servo off, block start interlock, cutting start interlock and interlock signals are assigned to the option remote I/O unit (third/fourth card) pins. These signals are back contact handled (significant when input is open) signals, so the conventional input signal must be short circuited with the common (+24 V) to prevent the signals from operating. However, if the option remote I/O unit (third/fourth card) is not mounted, the equivalent processes will be carried out.

(4) NC alarm 1
The conventional details of the NC alarm 1 output to the second card (Y24) are the system alarm. However, if the option remote I/O unit (fourth card) is not mounted, the other alarms (NC alarms 2, 3, 4) will not be output. Thus, as long as the option remote I/O unit (fourth card) is not mounted, the logical AND of the NC alarms 1, 2, 3 and 4 will be output.
Even in this case, the output of NC alarm 4 can be prevented by setting the Setup parameter "bit selection parameter #6469 bit 0" to on.

(5) M command start, S command start, T command start output timing
The BCD/BIN code and strobe (start) timing of the M, S and T commands is shown below.



9.3 Standard PLC Input/Output Signals

The method of reading the input/output signal table is shown below.

Input Signal Table from Machine

No.0: First card • • • Base I/O unit

Table 9-1-1

Device	Abbreviation	Signal name	Left upper line	Device	Abbreviation	Signal name	Left upper line
X0	ST	Automatic operatio start	B20	X8	MEM	Memory mode	B12
X1	*SP	*Automatic operation halt	B19	X9	T	Tape mode	B11
X2	SBK	Single block	B18	XA	D	MDI mode	B10
X3	DRN	Dry run	B17	XB	J	Jog mode	B09
X4	MLK	Machine lock (Supplement 1)	B16	XC	H	Handle mode	B08
X5	BDT	Optional block skip	B15	XD	S	Incremental mode	B07
X6		Z axis cancel (Supplement 2)	B14	XE	ZRN	Reference position return mode	B06
X7	AFL	Miscellaneous function lock	B13	XF	RT	Rapid traverse	B05

Device	Abbreviation	Signal name	Left upper line	Device	Abbreviation	Signal name	Left upper line
X10	HS11	Handle axis selection 1	A20	X18		* Reference position return near point detection 1	A12
X11	HS12	Handle axis selection 2	A19	X19		* Reference position return near point detection 2	A11
X12	HS14	Handle axis selection 4	A18	X1A		* Reference position return near point detection 3	A10
X13	GFIN	Gear shift completed	A17	X1B		* Reference position return near point detection 4	A09
X14	*JV1	*Manual feedrate 1	A16	X1C	ROV1	Rapid traverse override 1	A08
X15	*JV2	*Manual feedrate 2	A15	X1D	ROV2	Rapid traverse override 2	A07
X16	*JV4	*Manual feedrate 4	A14	X1E	GI1	Spindle gear select input 1	A06
X17	*JV8	*Manual feedrate 8	A13	X1F	GI2	Spindle gear select input 2	A05

No.1: Second card • • • Base I/O unit

Table 9-1-2

Device	Abbreviation	Signal name	Right upper line	Device	Abbreviation	Signal name	Right upper line
X20		*Stroke end -1	B20	X28		*Stroke end +1	B12
X21		*Stroke end -2	B19	X29		*Stroke end +2	B11
X22		*Stroke end -3	B18	X2A		*Stroke end +3	B10
X23		*Stroke end -4	B17	X2B		*Stroke end +4	B09
X24	RRW	Reset & rewind	B16	X2C	FIN1	Miscellaneous function completed 1	B08
X25		(Reset & rewind)	B15	X2D	SP1	Spindle override 1	B07
X26	*JV16	*Manual feedrate 16	B14	X2E	SP2	Spindle override 2	B06
X27		Emergency stop	B13	X2F	SP3	Spindle override 4	B05

Device	Abbreviation	Signal name	Right upper line	Device	Abbreviation	Signal name	Right upper line
X30	+J1	Axis feed direction +1	A20	X38	MP1	Incremental feed magnification 1	A12
X31	+J2	Axis feed direction +2	A19	X39	MP2	Incremental feed magnification 2	A11
X32	+J3	Axis feed direction +3	A18	X3A	MP4	Incremental feed magnification 4	A10
X33	+J4	Axis feed direction +4	A17	X3B	*FV1	*Cutting override 1	A09
X34	-J1	Axis feed direction -1	A16	X3C	*FV2	*Cutting override 2	A08
X35	-J2	Axis feed direction -2	A15	X3D	*FV4	*Cutting override 4	A07
X36	-J3	Axis feed direction -3	A14	X3E	*FV8	*Cutting override 8	A06
X37	-J4	Axis feed direction -4	A13	X3F	*FV16	*Cutting override 16	A05

Note 1) The connector pin No. of the reference position return near-point detection and stroke end are basically fixed.
(Refer to the section "2.7 Fixed Signals".)

Supplement 1) Machine lock is applied on all axes by turning the "Machine lock" signal on.
Supplement 2) Machine lock is applied on the Z axis by turning the "Z axis cancel" signal on.

Note 1) Signals marked with * in the signal name are handled as B contacts.

Note 2) Do not connect anything to the inputs corresponding to blank columns in the table.

Input Signals from Machine

No.0: First card • • • Base I/O unit

Table 9-1-1

Device	Abbreviation	Signal name	Left upper line	Device	Abbreviation	Signal name	Left upper line
X0	ST	Auto operation start	B20	X8	MEM	Memory mode	B12
X1	*SP	*Auto operation pause	B19	X9	T	Tape mode	B11
X2	SBK	Single block	B18	XA	D	MDI mode	B10
X3	DRN	Dry run	B17	XB	J	Jog mode	B09
X4	MLK	Machine lock (Supplement 1)	B16	XC	H	Handle mode	B08
X5	BDT	Optional block skip	B15	XD	S	Incremental mode	B07
X6		Z axis cancel (Supplement 2)	B14	XE	ZRN	Reference position return mode	B06
X7	AFL	Miscellaneous function lock	B13	XF	RT	Rapid traverse	B05

Device	Abbreviation	Signal name	Left upper line	Device	Abbreviation	Signal name	Left upper line
X10	HS11	Handle axis selection 1	A20	X18		* Reference position return near point detection 1	A12
X11	HS12	Handle axis selection 2	A19	X19		* Reference position return near point detection 2	A11
X12	HS14	Handle axis selection 4	A18	X1A		* Reference position return near point detection 3	A10
X13	GFIN	Gear shift completed	A17	X1B		* Reference position return near point detection 4	A09
X14	*JV1	*Manual feedrate 1	A16	X1C	ROV1	Rapid traverse override 1	A08
X15	*JV2	*Manual feedrate 2	A15	X1D	ROV2	Rapid traverse override 2	A07
X16	*JV4	*Manual feedrate 4	A14	X1E	GI1	Spindle gear select input 1	A06
X17	*JV8	*Manual feedrate 8	A13	X1F	GI2	Spindle gear select input 2	A05

No.1: Second card • • • Base I/O unit

Table 9-1-2

Device	Abbreviation	Signal name	Right upper line	Device	Abbreviation	Signal name	Right upper line
X20		*Stroke end -1	B20	X28		*Stroke end +1	B12
X21		*Stroke end -2	B19	X29		*Stroke end +2	B11
X22		*Stroke end -3	B18	X2A		*Stroke end +3	B10
X23		*Stroke end -4	B17	X2B		*Stroke end +4	B09
X24	RRW	Reset & rewind	B16	X2C	FIN1	Miscellaneous function completed 1	B08
X25		(Reset & rewind)	B15	X2D	SP1	Spindle override 1	B07
X26	*JV16	*Manual feedrate 16	B14	X2E	SP2	Spindle override 2	B06
X27		Emergency stop	B13	X2F	SP3	Spindle override 4	B05

Device	Abbreviation	Signal name	Right upper line	Device	Abbreviation	Signal name	Right upper line
X30	+J1	Axis feed direction +1	A20	X38	MP1	Incremental feed magnification 1	A12
X31	+J2	Axis feed direction +2	A19	X39	MP2	Incremental feed magnification 2	A11
X32	+J3	Axis feed direction +3	A18	X3A	MP4	Incremental feed magnification 4	A10
X33	+J4	Axis feed direction +4	A17	X3B	*FV1	*Cutting override 1	A09
X34	-J1	Axis feed direction -1	A16	X3C	*FV2	*Cutting override 2	A08
X35	-J2	Axis feed direction -2	A15	X3D	*FV4	*Cutting override 4	A07
X36	-J3	Axis feed direction -3	A14	X3E	*FV8	*Cutting override 8	A06
X37	-J4	Axis feed direction -4	A13	X3F	*FV16	*Cutting override 16	A05

Note 1) The connector pin No. of the reference position return near-point detection and stroke end signal are basically fixed.
(Refer to the section "2.7 Fixed Signals".)

Supplement 1) Machine lock is applied on all axes by turning the "Machine lock" signal on.

Supplement 2) Machine lock is applied on the Z axis by turning the "Z axis cancel" signal on.

Input Signals from Machine

No.2: Third card • • • DX1**

Table 9-1-3

Device	Abbreviation	Signal name	Left upper line	Device	Abbreviation	Signal name	Left upper line
X40	ERD	Error detect	B20	X48		(Reset & rewind)	B12
X41	ABS	Manual absolute	B19	X49	FIN2	Miscellaneous function completed 2	B11
X42	*KEY1	*Data protection key 1	B18	X4A		—	B10
X43	*KEY2	*Data protection key 2	B17	X4B		—	B09
X44	*KEY3	*Data protection key 3	B16	X4C	PB	Play back	B08
X45	SSTP	Spindle stop	B15	X4D		—	B07
X46	SSFT	Spindle gear shift	B14	X4E	OVSL	Manual override valid	B06
X47	SORC	Spindle orientation	B13	X4F	OVC	Override cancel	B05

Device	Abbreviation	Signal name	Left upper line	Device	Abbreviation	Signal name	Left upper line
X50	DTCH1	Axis detach 1	A20	X58	*SVF1	*Servo off 1	A12
X51	DTCH2	Axis detach 2	A19	X59	*SVF2	*Servo off 2	A11
X52	DTCH3	Axis detach 3	A18	X5A	*SVF3	*Servo off 3	A10
X53	DTCH4	Axis detach 4	A17	X5B	*SVF4	*Servo off 4	A09
X54		—	A16	X5C			A08
X55		—	A15	X5D			A07
X56		—	A14	X5E	SRN	Spindle forward run (For SPJ)	A06
X57		—	A13	X5F	UIT	Macro interrupt	A05

No.3: Fourth card • • • DX1**

Table 9-1-4

Device	Abbreviation	Signal name	Right upper line	Device	Abbreviation	Signal name	Right upper line
X60		—	B20	X68		—	B12
X61		—	B19	X69		—	B11
X62		—	B18	X6A		—	B10
X63		—	B17	X6B		—	B09
X64			B16	X6C			B08
X65			B15	X6D			B07
X66	*BSL	*Block start interlock	B14	X6E	SRI	Spindle reverse run (For SPJ)	B06
X67	*CSL	*Cutting block start interlock	B13	X6F	ITLK	*Interlock (Supplement 1)	B05

Device	Abbreviation	Signal name	Right upper line	Device	Abbreviation	Signal name	Right upper line
X70			A20	X78			A12
X71			A19	X79			A11
X72			A18	X7A			A10
X73			A17	X7B			A09
X74			A16	X7C			A08
X75			A15	X7D			A07
X76			A14	X7E			A06
X77			A13	X7F			A05

Supplement 1) An interlock is applied on all axes by turning the "Interlock" signal on (actually by "turning off" as this is a B contact).

Output Signals to Machine

No.0: First card • • • Base I/O unit

Table 9-2-1

Device	Abbreviation	Signal name	Left lower line	Device	Abbreviation	Signal name	Left lower line
Y0	MA	Controller ready	B20	Y8		M-BCD code M11	B12
Y1	SA	Servo ready	B19	Y9		M-BCD code M12	B11
Y2	OP	In auto operation	B18	YA		M-BCD code M14	B10
Y3	STL	In auto operation start	B17	YB		M-BCD code M18	B09
Y4	SPL	In auto operation pause	B16	YC		M-BCD code M21	B08
Y5	RST	In reset	B15	YD		M-BCD code M22	B07
Y6	GR1	Spindle gear shift 1	B14	YE		M-BCD code M24	B06
Y7	GR2	Spindle gear shift 2	B13	YF		M-BCD code M28	B05

Device	Abbreviation	Signal name	Left lower line	Device	Abbreviation	Signal name	Left lower line
Y10		S-BIN code S1	A20	Y18		T-BCD code T11	A12
Y11		S-BIN code S2	A19	Y19		T-BCD code T12	A11
Y12		S-BIN code S4	A18	Y1A		T-BCD code T14	A10
Y13		S-BIN code S8	A17	Y1B		T-BCD code T18	A09
Y14		S-BIN code S16	A16	Y1C		T-BCD code T21	A08
Y15		S-BIN code S32	A15	Y1D		T-BCD code T22	A07
Y16		S-BIN code S64	A14	Y1E		T-BCD code T24	A06
Y17		S-BIN code S128	A13	Y1F		T-BCD code T28	A05

No.1: Second card • • • Base I/O unit

Table 9-2-2

Device	Abbreviation	Signal name	Right lower line	Device	Abbreviation	Signal name	Right lower line
Y20	ZP11	1st reference position reached 1	B20	Y28	DM00	M code independent output M00	B12
Y21	ZP12	1st reference position reached 2	B19	Y29	DM01	M code independent output M01	B11
Y22	ZP13	1st reference position reached 3	B18	Y2A	DM02	M code independent output M02	B10
Y23	ZP14	1st reference position reached 4	B17	Y2B	DM03	M code independent output M30	B09
Y24	AL1	NC alarm 1	B16	Y2C	MF1	M command strobe MF	B08
Y25			B15	Y2D	SF1	S command strobe SF	B07
Y26			B14	Y2E	TF1	T command strobe TF	B06
Y27			B13	Y2F	DEN	Motion command complete	B05

Device	Abbreviation	Signal name	—	Device	Abbreviation	Signal name	—
Y30	—	—	A20	Y38	—	—	A12
Y31	—	—	A19	Y39	—	—	A11
Y32	—	—	A18	Y3A	—	—	A10
Y33	—	—	A17	Y3B	—	—	A09
Y34	—	—	A16	Y3C	—	—	A08
Y35	—	—	A15	Y3D	—	—	A07
Y36	—	—	A14	Y3E	—	—	A06
Y37	—	—	A13	Y3F	—	—	A05

Output Signals to Machine

No.2: Third card • • • DX1**

Table 9-2-3

Device	Abbreviation	Signal name	Left lower line	Device	Abbreviation	Signal name	Left lower line
Y40	RWD	In rewind	B20	Y48	AX1	Axis selected 1st axis	B12
Y41	RPN	In rapid traverse	B19	Y49	AX2	Axis selected 2nd axis	B11
Y42	CUT	In cutting feed	B18	Y4A	AX3	Axis selected 3rd axis	B10
Y43	TAP	In tap	B17	Y4B	AX4	Axis selected 4th axis	B09
Y44	THRD	In thread cutting	B16	Y4C	RDY1	Servo ready 1st axis	B08
Y45	INCH	In inch unit select	B15	Y4D	RDY2	Servo ready 2nd axis	B07
Y46			B14	Y4E	RDY3	Servo ready 3rd axis	B06
Y47			B13	Y4F	RDY4	Servo ready 4th axis	B05

Device	Abbreviation	Signal name	Left lower line	Device	Abbreviation	Signal name	Left lower line
Y50	CSS	In constant surface speed	A20	Y58	ORAO	Spindle in-position (For SPJ)	A12
Y51	SKIP	In skip	A19	Y59			A11
Y52	F1DN	In F1-digit command	A18	Y5A			A10
Y53			A17	Y5B			A09
Y54	SYN	In synchronous feed	A16	Y5C			A08
Y55	FLO	In spindle alarm (For SPJ)	A15	Y5D			A07
Y56	ZSO	Spindle zero speed (For SPJ)	A14	Y5E			A06
Y57	USO	Spindle speed reached (For SPJ)	A13	Y5F			A05

No.3: Fourth card • • • DX1**

Table 9-2-4

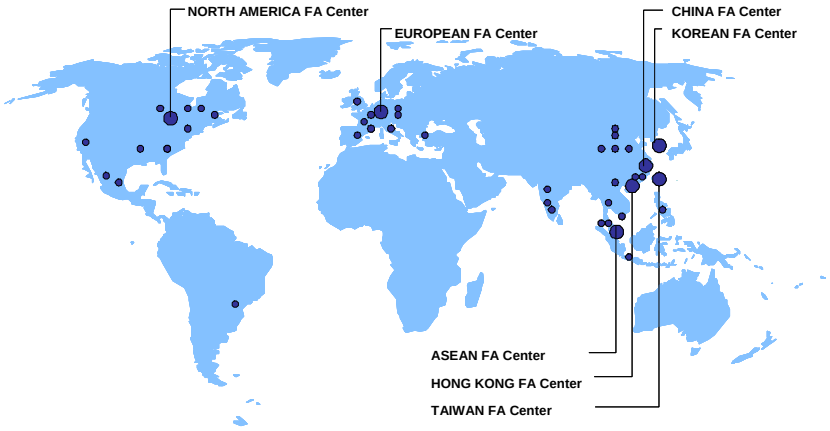
Device	Abbreviation	Signal name	Right lower line	Device	Abbreviation	Signal name	Right lower line
Y60	ZP21	2nd reference position reached 1	B20	Y68	AL2	NC alarm 2	B12
Y61	ZP22	2nd reference position reached 2	B19	Y69	AL3	NC alarm 3	B11
Y62	ZP23	2nd reference position reached 3	B18	Y6A	AL4	NC alarm 4	B10
Y63	ZP24	2nd reference position reached 4	B17	Y6B	TIMP	All axes in-position	B09
Y64	MMS	Manual numeric value command	B16	Y6C	TSMZ	All axes smoothing zero	B08
Y65			B15	Y6D			B07
Y66			B14	Y6E	ZRNN	In reference position return	B06
Y67			B13	Y6F			B05

Device	Abbreviation	Signal name	—	Device	Abbreviation	Signal name	—
Y70	—	—	A20	Y78	—	—	A12
Y71	—	—	A19	Y79	—	—	A11
Y72	—	—	A18	Y7A	—	—	A10
Y73	—	—	A17	Y7B	—	—	A09
Y74	—	—	A16	Y7C	—	—	A08
Y75	—	—	A15	Y7D	—	—	A07
Y76	—	—	A14	Y7E	—	—	A06
Y77	—	—	A13	Y7F	—	—	A05

Revision History

Date of revision	Manual No.	Revision details
Jun. 2006	IB(NA)1500176-A	First edition created.

Global service network



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Lyon CNC Service Satellite

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Notice

Every effort has been made to keep up with software and hardware revisions in the contents described in this manual. However, please understand that in some unavoidable cases simultaneous revision is not possible.

Please contact your Mitsubishi Electric dealer with any questions or comments regarding the use of this product.

Duplication Prohibited

MITSUBISHI ELECTRIC CORPORATION
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MODEL	EZMotion-NC E60/E68 Series
MODEL CODE	008—402
Manual No.	IB-1500176(ENG)-A

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