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CNC

MELDAS C6/C64/C64T

PLC INTERFACE MANUAL

BNP-B2261E(ENG)

Introduction

This manual describes the various signal interfaces and functions required when creating MELDAS C6/C64/C64T sequence programs (built-in PLC).
Read this manual thoroughly before programming.
Thoroughly study the "Safety Precautions" on the following page to ensure safe use of the MELDAS C6/C64/C64T.

Details described in this manual

⚠ CAUTION

⚠ For items described in "Restrictions" or "Usable State", the instruction manual issued by the machine manufacturer 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 manufacturer 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.

(1) MELDAS C6/C64 PLC Programming Manual (Ladder section with MELSEC tool)..... BNP-B2309

(2) MELDAS C6/C64 Network Manual.................................. BNP-B2373

Precautions for Safety

Always read the specifications issued by the machine manufacturer, 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 manufacturer takes a precedence over this instruction manual.

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

⚠ This instruction manual has been written on the assumption that all options are provided.
Check the specifications issued by the machine manufacturer 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.

⚠ CAUTION

3. Items related to design

⚠ Always turn the spindle phase synchronization complete signal ON before chucking both ends of the workpiece to the basic spindle and synchronous spindle. If the spindle phase synchronization signal is turned ON when both ends of the workpiece are chucked to the basic spindle and synchronous spindle, the chuck or workpiece could be damaged by the torsion that occurs during phase alignment.

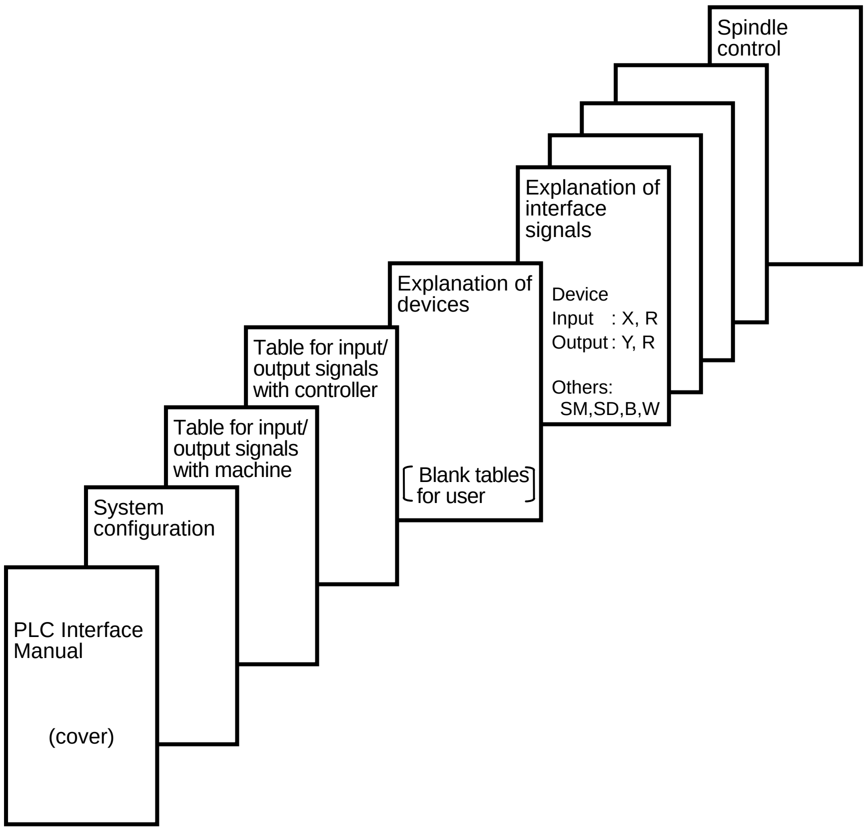
❗ If the temperature rise detection function is invalidated with the parameters, the control could be disabled when the temperature is excessive. This could result in machine damage or personal injuries due to runaway axis, and could damage the device. Enable the detection function for normal use.

CONTENTS

1. OUTLINE

This manual is prepared to assist you to understand the various control signals necessary for creating the built-in sequence for the MELDAS C6/C64/C64T.

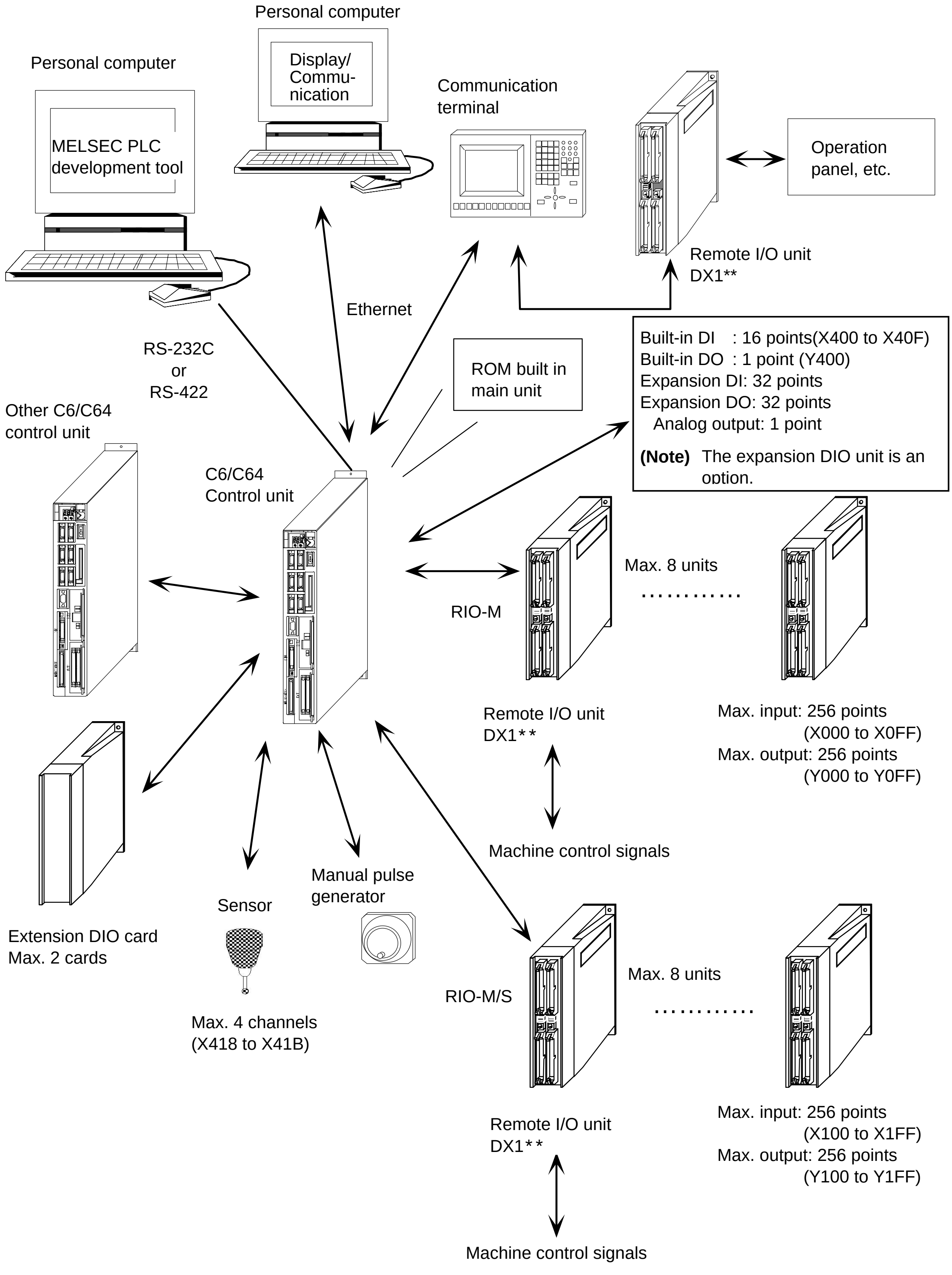
The manual is composed as shown below. Refer to related sections as necessary to gain the maximum benefit from the manual.



(Caution)

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

2. SYSTEM CONFIGURATION

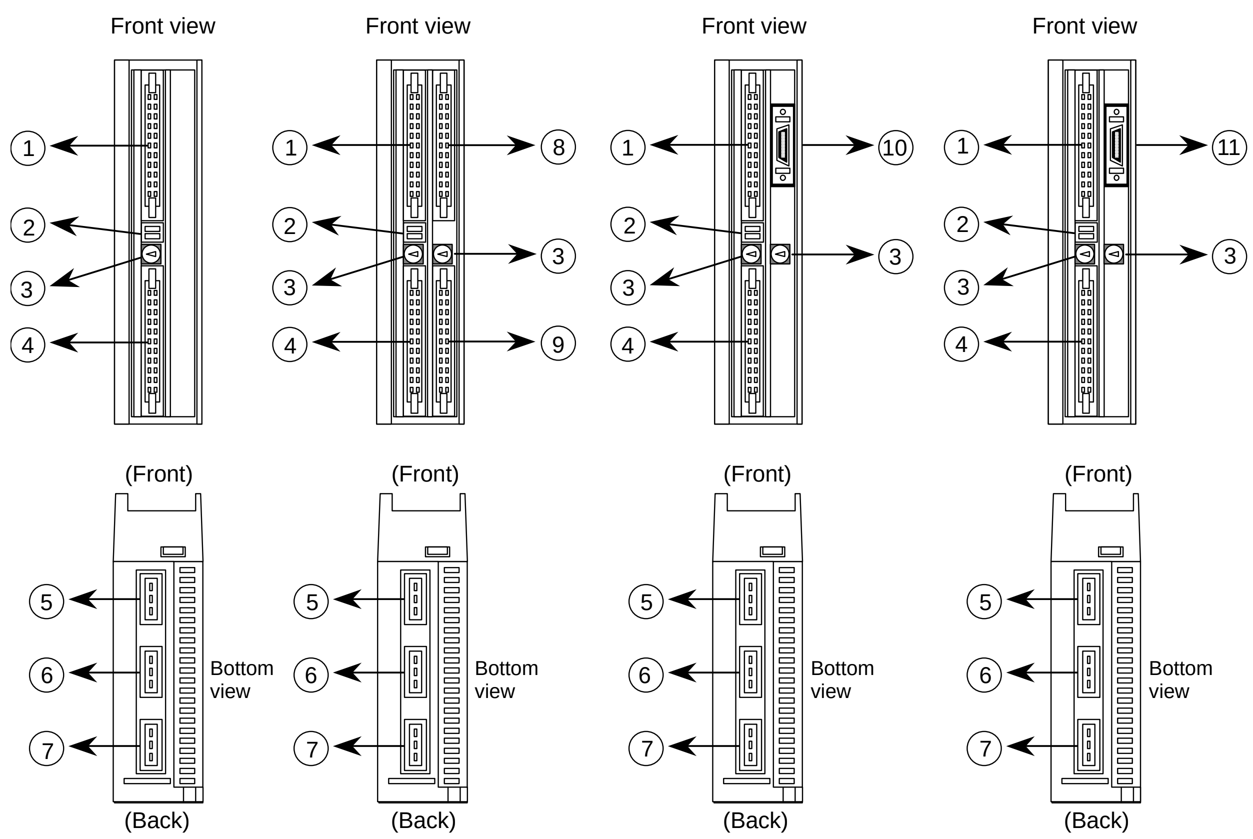


(Note) Refer to the following document for details on the PLC development with the MELSEC PLC development tool.
MELDAS C6/C64 PLC Programming Manual
(Ladder section with MELSEC tool) BNP-B2309

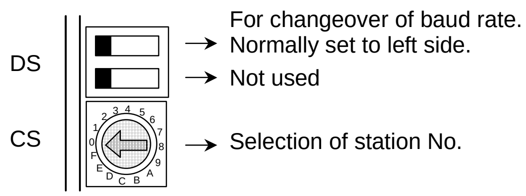
2.1 Relation of RIO Unit and Devices

The remote I/O units (hereafter RIO unit) connected to the RIO-M or RIO-M/S have different specifications respectively as shown below. Each unit has a rotary switch for setting the unit No., and for establishing a relation with the device No. (X, Y).

FCUA-DX10□ **FCUA-DX11□/FCUA-DX12□** **FCUA-DX13□** **FCUA-DX14□**



① DI-L (machine input signal connector)
② DS (baud rate changeover switch)
③ CS (station No. changeover switch)
④ DO-L (machine output signal connector)
⑤ RIO1 (serial connection connector #1)
⑥ RIO2 (serial connection connector #2)
⑦ DCIN (24VDC(+) power input connector)
⑧ DI-R (machine input signal connector)
⑨ DO-R (machine output signal connector)
⑩ HANDLE (manual pulse generator signal input connector)
⑪ AIO (analog signal input/output connector)



Enlarged drawing of DS and CS

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

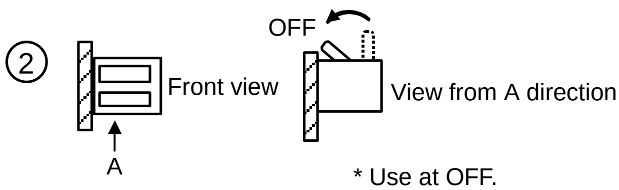
Unit model	Compatible machine control signal	Left	Right	Total
DX10* (FCUA-DX10*)	Digital input signal (DI) (Photocoupler insulation) Digital output signal(DO) (Non-insulated)	32 points 32 points	—	32 points 32 points
DX11* (FCUA-DX11*)	Digital input signal (DI) (Photocoupler insulation) Digital output 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.

2.1.1 DIO Specification Setting Switch

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

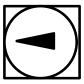
DIO specification setting switch



* Use at OFF.

2.1.2 Rotary Switch for Channel No. Setting

Rotary switch for setting No. of channels (3)



Set between 0 and 7.

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

Rotary switch No.	Device No. read in		Output device No.		Analog output (AO)
	RIO-M	RIO-M/S	RIO-M	RIO-M/S	
0	X00~X1F	X100~X11F	Y00~Y1F (Y0F)	Y100~Y11F (Y10F)	The rotary switches correspond to the file registers R100 to R103 in order of small numbers.
1	X20~X3F	X120~X13F	Y20~Y3F (Y2F)	Y120~Y13F (Y12F)	
2	X40~X5F	X140~X15F	Y40~Y5F (Y4F)	Y140~Y15F (Y14F)	
3	X60~X7F	X160~X17F	Y60~Y7F (Y6F)	Y160~Y17F (Y16F)	
4	X80~X9F	X180~X19F	Y80~Y9F (Y8F)	Y180~Y19F (Y18F)	
5	XA0~XBF	X1A0~X1BF	YA0~YBF (YAF)	Y1A0~Y1BF (Y1AF)	
6	XC0~XDF	X1C0~X1DF	YC0~YDF (YCF)	Y1C0~Y1DF (Y1CF)	
7	XE0~XFF	X1E0~X1FF	YE0~YFF (YEF)	Y1E0~Y1FF (Y1EF)	

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

No. of channels occupied by each unit

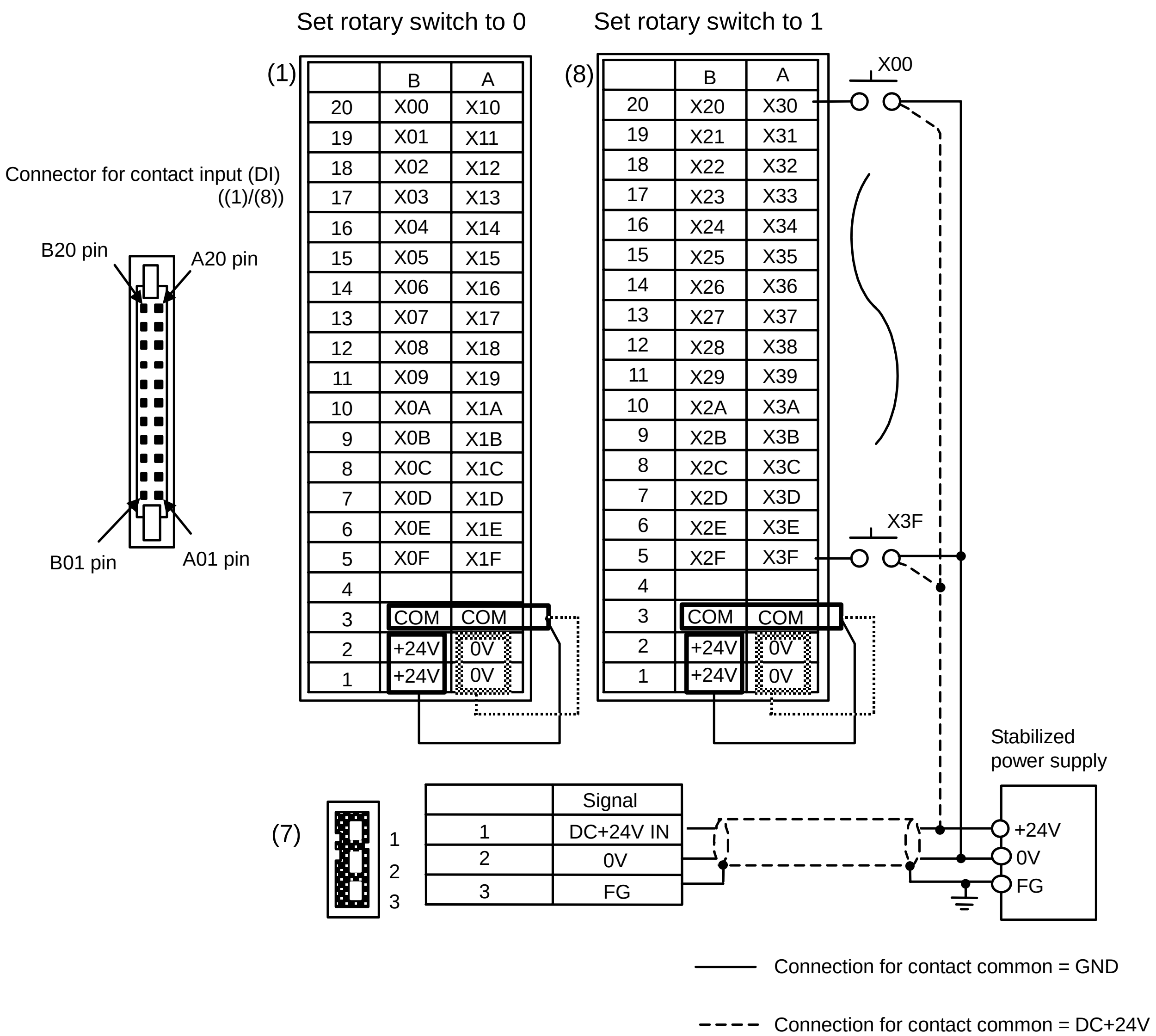
No. of occupied channels	Unit name
1	DX100/DX101
2	DX110/DX111, DX120/DX121, DX140/DX141

Several remote I/O units can be used in combination. Make sure that the total of stations possessed by the serial link connection (MC link B) is 8 stations or less. Set a unique station No. for each unit and make sure that these station numbers are not duplicated. There is one station No. setting rotary switch on the DX10* unit, and two on the DX11*/12*/14* unit.
Set as shown below when connected to the communication terminal (CR05).

Rotary switch No.	Device No. read in	Output device No.
0	R90, R91	R190, R191
1	R92, R93	R192
2	R94, R95	R193, R194
3	R96, R97	R195

2.1.3 Relation of Connector Pins and Device

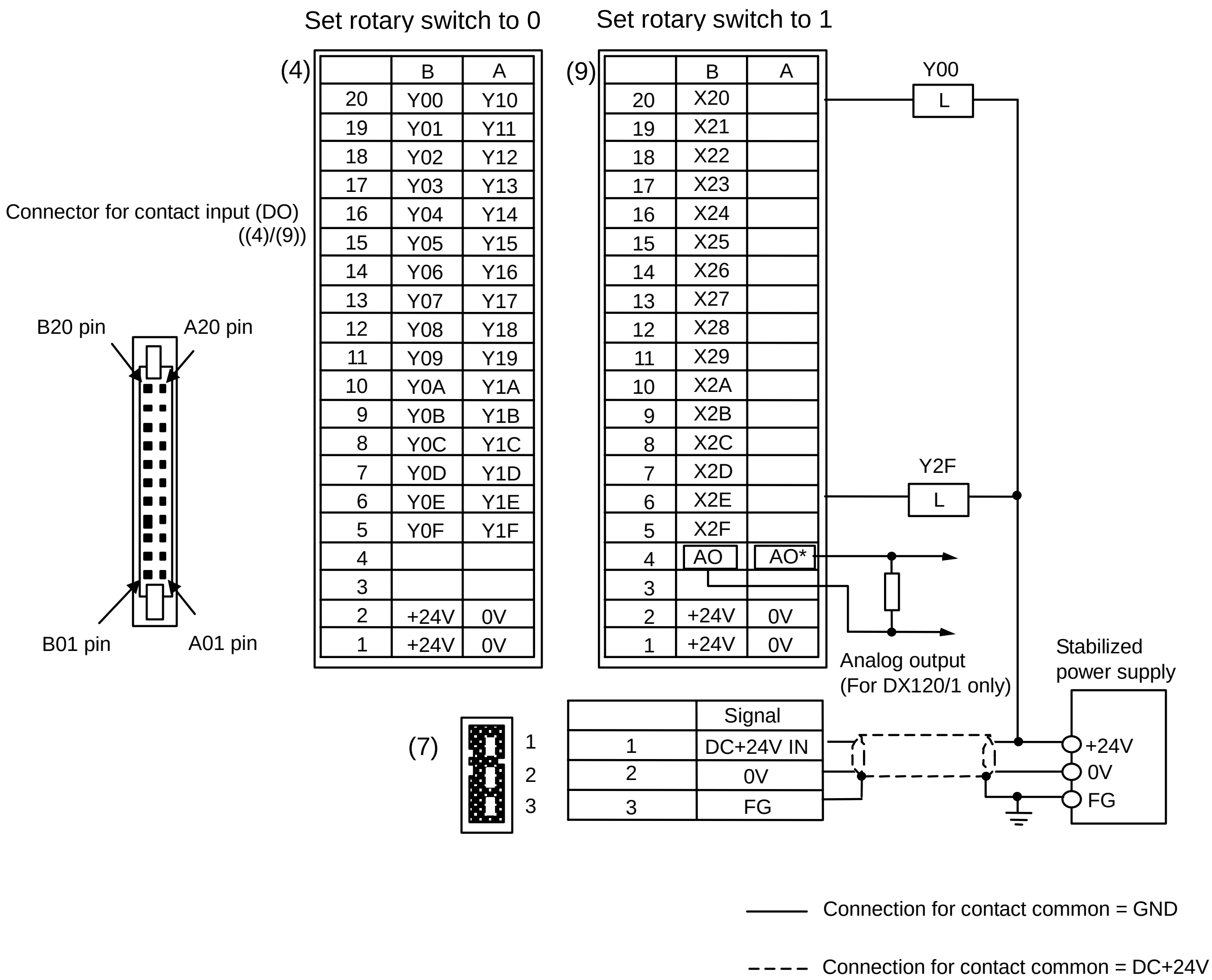
(1) Input (DI) signal ((1)/(8))



(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 ((4)/(9))



(4) Set rotary switch to 0

	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

(9) Set rotary switch to 1

	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

(7)

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

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

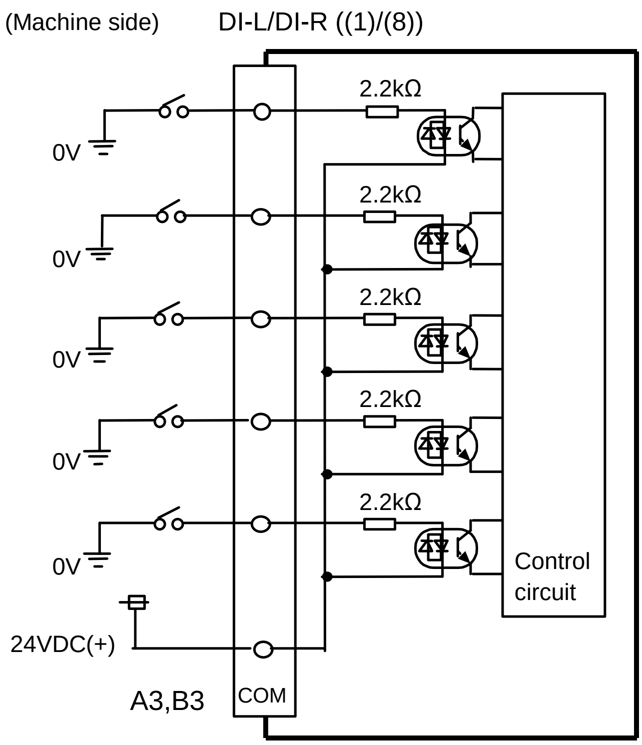
(Note 2) The devices shown here show an example for when the rotary switch for channel No. setting on the RIO unit is set to 0 and set to 1.
Refer to section "2.1.2 Rotary Switch for Channel No. Setting" for details on the relation of the rotary switch and device No.

(Note 3) The A4 and B4 pin analog output (AO, AO*) in the output connector (5) is found only on the RIO unit DX120/DX121.

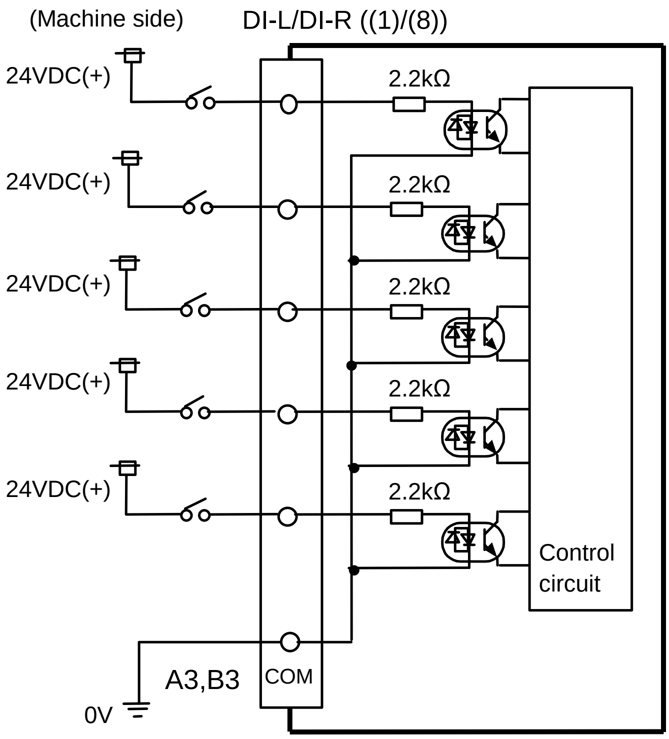
2.2 Outline of Digital Signal Input Circuit

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



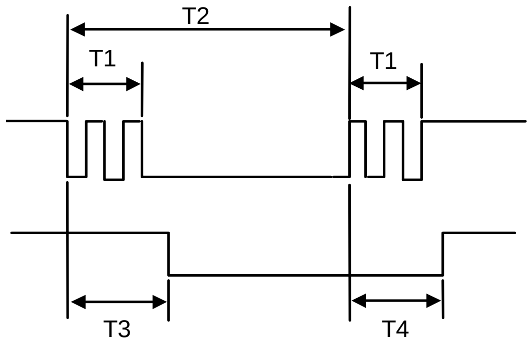
Source type

Input conditions

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

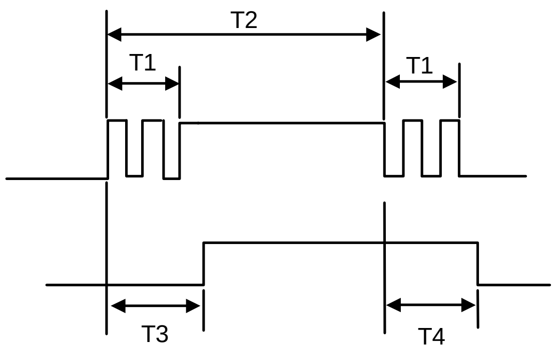
Sink type

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

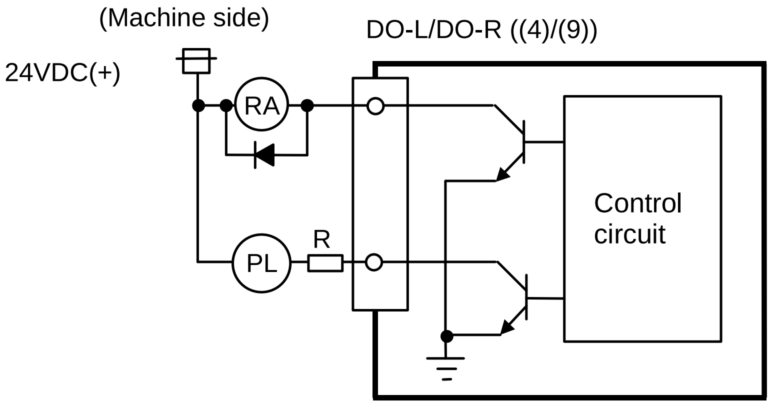


(Note) The input signal hold time 40ms or more is a reference. The input signal will not be recognized unless the input signal is held for longer than the ladder process cycle time.

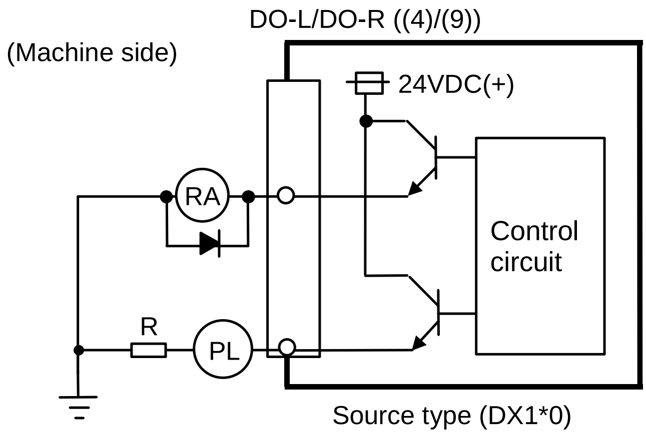
2.3 Outline of Digital Signal Output Circuit

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/point
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

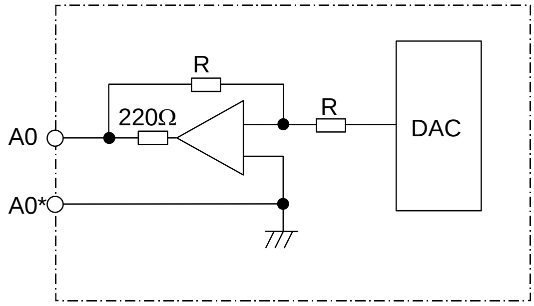
When using a conductive load such as relays, always contact a diode in parallel to the load as a noise measure.

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

2.4 Outline of Analog Signal Output Circuit

The analog signal circuit can be used only with the FCUA-DX120/DX121/DX140/DX141 unit.

Output circuit



Output conditions

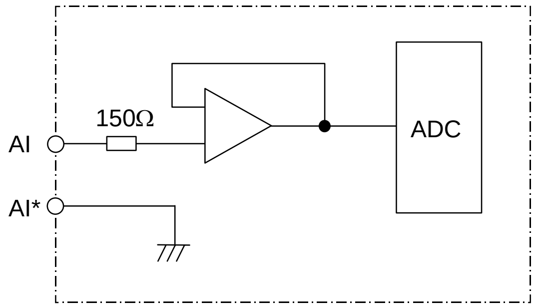
Output voltage	0V to ±10V (±5%)
Resolution	12 bit (±10V x n/4096) (Note)
Load conditions	10kΩ load resistance (standard)
Output impedance	220Ω

(Note) n = (2^0 ~ 2^{11})

2.5 Outline of Analog Signal Input Circuit

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

Input circuit



Input conditions

Max. input rating	±15V
Resolution	10V/2000 (5mV)
Precision	Within ±25mV
AD input sampling time	14.2ms (AI0)/42.6ms (AI1 to 3)

2.6 Fixed Signals

The connector pin Nos. in the input signals that are fixed are shown below.
The pin No. cannot be changed because the signals are fixed in the controller.

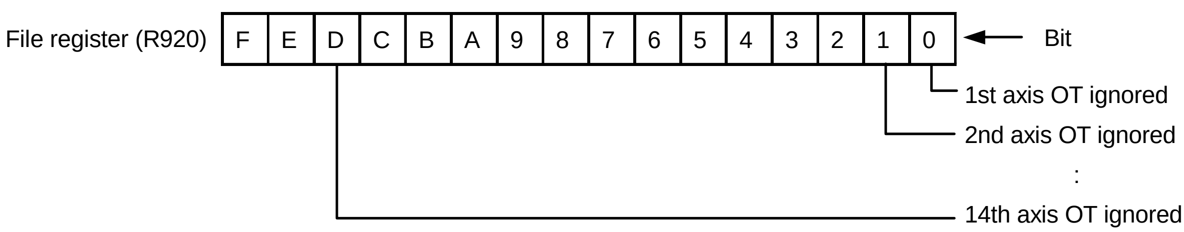
Signal name	Connector
Emergency stop	X407
Reference point return near-point detection 1	X400
Reference point return near-point detection 2	X401
Reference point return near-point detection 3	X402
Reference point return near-point detection 4	X403
Reference point return near-point detection 5	X404
Sensor signal 1	X418
Sensor signal 2	X419
Sensor signal 3	X41A
Sensor signal 4	X41B

Signal name	Connector
Stroke end –1	X408
Stroke end –2	X409
Stroke end –3	X40A
Stroke end –4	X40B
Stroke end –5	X405
Stroke end +1	X40C
Stroke end +2	X40D
Stroke end +3	X40E
Stroke end +4	X40F
Stroke end +5	X406

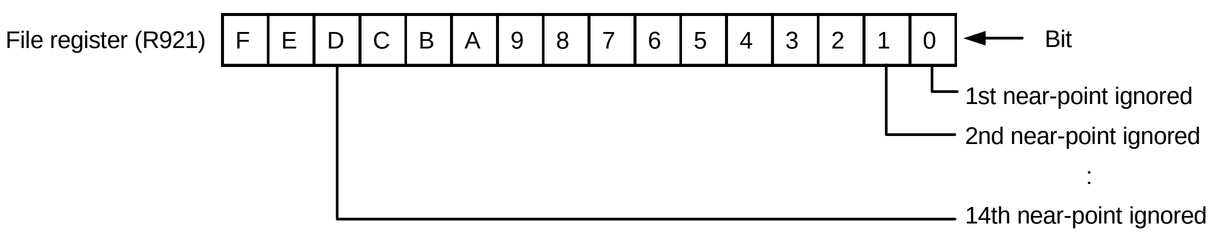
2.6.1 Ignoring Fixed Signals

The fixed signals can be used as other signals by ignoring them with file registers. (Refer to the following table.)
Note that the emergency stop signal (X407) can not be ignored with the following registers.

Part system	File register	
	Ignore stroke end signals	Ignore near-point detection signals
$1	R920	R921
$2	R1020	R1021
$3	R1120	R1121
$4	R1220	R1221
$5	R1320	R1321
$6	R1420	R1421
$7	R1520	R1521



(Note 1) The signal is applicable to (+) and (-) motion at the same time (ignored when "ON").



2.6.2 Changing the Addresses of Fixed Signals

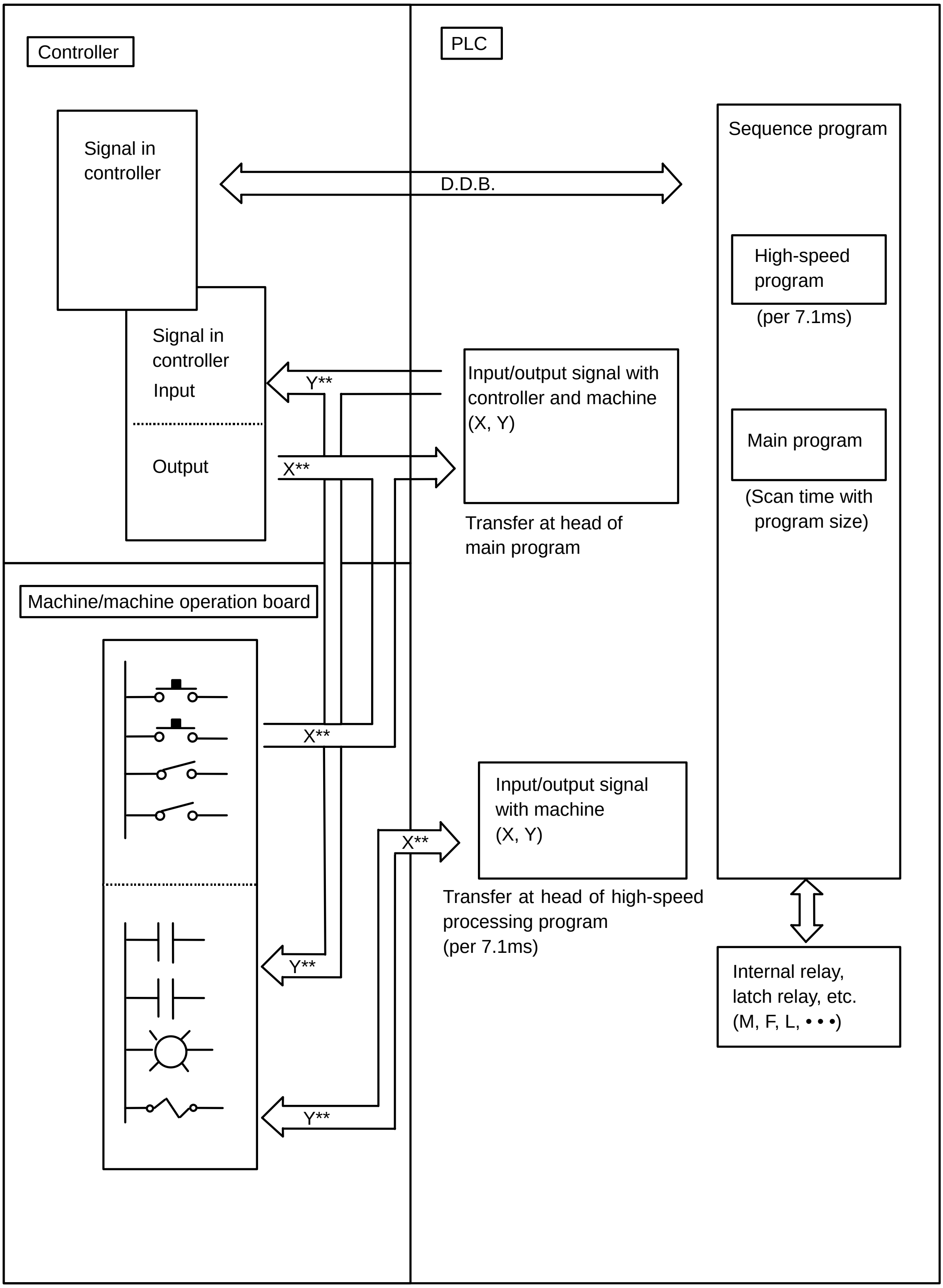
The fixed devices can be allocated arbitrarily with the following parameters.

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 (R920~) 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·OT signal valid	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 parameters #2073 to #2075)	0/1
2073	zrn_dog	Origin dog arbitrary allocation 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.	00 to FF (HEX)
2074	H/W_OT+	H/W OT+ arbitrary allocation 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.	00 to FF (HEX)
2075	H/W_OT-	H/W OT- arbitrary allocation 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.	00 to FF (HEX)

2.7 Flow of Signals



2.8 List of Devices Used

The devices used by the PLC are shown below.
Device No. of device X, Y, B, W and H are indicated with hexadecimal, the others with decimal.

Device	Device range		Units	Details
X*	X0 to XAFF	2816 points	1-bit	Input signals to the PLC. Machine input, etc.
Y*	Y0 to YE7F	3712 points	1-bit	Output signals from the PLC. Machine output, etc.
M	M0 to M8191	8192 points	1-bit	For temporary memory
L	L0 to L255	256 points	1-bit	Latch relay (Backup memory)
F	F0 to F127	128 points	1-bit	For temporary memory. Alarm message interface
SB	SB0 to SB1FF	512 points	1-bit	Special relay for links
B	B0 to B1FFF	8192 points	1-bit	Link relay
SM*	SM0 to SM127	128 points	1-bit	Special relay
V	V0 to V255	256 points	1-bit	Edge relay
SW	SW0 to SW1FF	512 points	16-bit	Special register for links
SD	SD0 to SD127	128 points	16-bit	Special register
T	T0 to T15	16 points	1-bit/16-bit	10ms unit timer
	T16 to T95	80 points	1-bit/16-bit	100ms unit timer
	T96 to T103	8 points	1-bit/16-bit	100ms incremented timer
	T104 to T143	40 points	1-bit/16-bit	10ms unit timer (Fixed timers)
	T144 to T239	96 points	1-bit/16-bit	100ms unit timer (Fixed timers)
	T240 to T255	16 points	1-bit/16-bit	100ms incremented timer (Fixed timers)
	T0000 to T0255	256 points	1-bit	T1: Timer coil
	T1000 to T1255	256 points	1-bit	T0: Timer contact
	T2000 to T2255	256 points	16-bit	TS: Timer setting value
	T3000 to T3255	256 points	16-bit	TA: Timer current value
C	C0 to C23	24 points	1-bit/16-bit	Counter
	C24 to C127	104 points	1-bit/16-bit	Counter (Fixed counters)
	C0000 to C0127	128 points	1-bit	C1: Counter coil
	C1000 to C1127	128 points	1-bit	C0: Counter contact
	C2000 to C2127	128 points	16-bit	CS: Counter setting value
	C3000 to C3127	128 points	16-bit	CA: Counter current value
D	D0 to D8191	8192 points	16-bit/32-bit	Data register
R*	R0 to R8191	8192 points	16-bit/32-bit	File register. CNC word I/F
W	W0 to W1FFF	8192 points	16-bit/32-bit	Link register
Z	Z0 to Z13	14 points	16-bit	Address index
N	N0 to N7			Master control's nesting level
P*	P0 to P255 P360 to P379			Conditional jump, subroutine call label
K	K-32768 to K32767			Decimal constant for 16-bit command
	K-2147483647 to K2147483647			Decimal constant for 32-bit command
H	H0 to HFFFF			Hexadecimal constant for 16-bit command
	H0 to HFFFFFFFF			Hexadecimal constant for 32-bit command

(Note 1) Device marked with * in the device column have designated applications. Do not use such devices for other purposes.
(Note 2) The fixed timer and fixed counter can not be changed with the numerical setting. Note that those can be changed with the numerical setting when D or R device is specified.
(Note 3) D0 to D8191 can be used with the software version D0 and above.

2.9 File Register General Map

R0	System common NC -> PLC
R100	System common PLC -> NC
R200	Part system control NC -> PLC
R300	Max. 7 part systems
R400	
R500	
R600	
R700	
R800	
R900	Part system control PLC -> NC
R1000	Max. 7 part systems
R1100	
R1200	
R1300	
R1400	
R1500	
R1600	Axis control NC -> PLC
R1700	Max. 14 axes
R1800	
R1900	
R2000	
R2100	
R2200	
R2300	Axis control PLC -> NC
R2400	Max. 14 axes
R2500	
R2600	
R2700	
R2800	
R2900	
R3000	Spindle control NC -> PLC
R3100	Max. 7 spindles
R3200	Spindle control PLC -> NC
R3300	Max. 7 spindles
R3400	
R3500	MR-J2-CT NC -> PLC (Max. 7 axes)
R3600	MR-J2-CT PLC -> NC (Max. 7 axes)
R3700	(Do not use.)
R3800	
R3900	

R4000	User area (non-backup)
R4100	
R4200	
R4300	
R4400	
R4500	PLC constant
R4600	Bit select
R4700	
R4800	M type: Tool registration
R4900	L type: Tool life management I
R5000	
R5100	
R5200	
R5300	
R5400	
R5500	
R5600	L type: Tool life management II
R5700	
R5800	
R5900	
R6000	
R6100	
R6200	
R6300	
R6400	M type: Tool life management
R6500	L type: Tool life management I, II
R6600	**(Note)** These registers are available in the 2nd part system or above.
R6700	R6720
R6800	
R6900	User area (backup)
R7000	
R7100	
R7200	
R7300	
R7400	
R7500	System reserve
R7600	**(Note)** The system reserve area is used
R7700	for function expansion by
R7800	Mitsubishi, and must not be used
R7900	by the user.
R8000	
R8100	

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 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.

Remote I/O connection destination of C64 main unit

Connector Pin. No.

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

Interface Table

Input Signal Table from Machine

RIO-M | 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			A12
X11			A19	X19			A11
X12			A18	X1A			A10
X13			A17	X1B			A09
X14			A16	X1C			A08
X15			A15	X1D			A07
X16			A14	X1E			A06
X17			A13	X1F			A05

RIO-M | No.1:Second card

Table 3-1-2

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X20			B20	X28			B12
X21			B19	X29			B11
X22			B18	X2A			B10
X23			B17	X2B			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) are 1 word (16-bit) data.

(Note 2) Signals marked with — in the column for the 2nd part system indicate there is no signal corresponding to the 2nd part system, or the signal for the 1st part system side is used commonly.

(Note 3) D0 to D8191 can be used with the software version D0 and above.

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.

<table>
<tr><th></th><th colspan="2">Signal type</th><th>Allocation table</th><th>Explanation</th></tr>
<tr><td rowspan="5">Input</td><td rowspan="2">RI</td><td>RIO-M</td><td>Table 3-1-1 to 3-1-8</td><td rowspan="4">(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.)
(4) The device used for EXT differs according to the network type and specifications. Refer to section "6.6 Network related functions" for details.</td></tr>
<tr><td>RIO-M/S</td><td>Table 3-2-1 to 3-2-8</td></tr>
<tr><td colspan="2">EXT</td><td>-</td></tr>
<tr><td colspan="2">DI</td><td>Table 3-3</td></tr>
<tr><td colspan="2">AI
(Analog input)</td><td>Table 4-2-1</td><td>(1) The connector pin allocation is determined.
(2) Allocated to the file register (R).</td></tr>
<tr><td rowspan="5">Output</td><td rowspan="2">RO</td><td>RIO-M</td><td>Table 3-4-1 to 3-4-8</td><td rowspan="4">(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.)
(3) The device used for EXT differs according to the network type and specifications. Refer to section "6.6 Network related functions" for details.</td></tr>
<tr><td>RIO-M/S</td><td>Table 3-5-1 to 3-5-8</td></tr>
<tr><td colspan="2">EXT</td><td>-</td></tr>
<tr><td colspan="2">DO</td><td>Table 3-6</td></tr>
<tr><td colspan="2">AO
(Analog Output)</td><td>Table 4-4-1</td><td>(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).</td></tr>
<tr><td>Others</td><td colspan="2">CR05</td><td>Table 3-7</td><td>(1) This is the operation board remote I/O connection device.
(2) Allocated to the file register (R).</td></tr>
</table>

3.3 Allocation of Machine Input/Output Signals

The signals are allocated to the devices of machine input/output signals X and Y, and the device Nos. are determined automatically depending on the connection destinations.
The connection destinations and allocated device Nos. are as below:

Destination	Input device	Output device	Points	Remarks
RIO-M	X0~XFF	Y0~YFF	256	Remote I/O connection
RIO-M/S	X100~X1FF	Y100~Y1FF	256	Remote I/O connection
EXT1	X200~X27F	Y200~Y27F	128	Expansion slot 1
EXT2	X280~X2FF	Y280~Y2FF	128	Expansion slot 2
EXT3 (Note 1)	X300~X37F	Y300~Y37F	128	Expansion slot 3 (External slot)
EXT4 (Note 1)	X380~X3FF	Y380~Y3FF	128	Expansion slot 4 (Not used)
DIO	X400~X40F	Y400~Y40F	16	Built-in DIO
CR05 (Note 2)	R90~R97	R190~R195	128/96	Operation board remote I/O connection

(Note 1) Another unit for extension is necessary to use the expansion slot 3 and 4.
(Note 2) This is connected to the communication terminal.
(Note 3) The unused I/O can be used as input/output device of each type network. Furthermore, the input/output devices of slot with the expansion cards (Ethernet cards, etc.) which do not need the input/output devices is also unused, and that can be used.

Input Signal Table from Machine

RIO-M	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			A12
X11			A19	X19			A11
X12			A18	X1A			A10
X13			A17	X1B			A09
X14			A16	X1C			A08
X15			A15	X1D			A07
X16			A14	X1E			A06
X17			A13	X1F			A05

RIO-M	No.1: Second card

Table 3-1-2

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X20			B20	X28			B12
X21			B19	X29			B11
X22			B18	X2A			B10
X23			B17	X2B			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

Input Signal Table from Machine

RIO-M	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

RIO-M	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 Signal Table from Machine

RIO-M	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

RIO-M	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 Signal Table from Machine

RIO-M	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

RIO-M	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

Input Signal Table from Machine

RIO-M/S	No.0: First card

Table 3-2-1

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X100			B20	X108			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

RIO-M/S	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

Input Signal Table from Machine

RIO-M/S	No.2: Third card

Table 3-2-3

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X140			B20	X148			B12
X141			B19	X149			B11
X142			B18	X14A			B10
X143			B17	X14B			B09
X144			B16	X14C			B08
X145			B15	X14D			B07
X146			B14	X14E			B06
X147			B13	X14F			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X150			A20	X158			A12
X151			A19	X159			A11
X152			A18	X15A			A10
X153			A17	X15B			A09
X154			A16	X15C			A08
X155			A15	X15D			A07
X156			A14	X15E			A06
X157			A13	X15F			A05

RIO-M/S	No.3: Fourth card

Table 3-2-4

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X160			B20	X168			B12
X161			B19	X169			B11
X162			B18	X16A			B10
X163			B17	X16B			B09
X164			B16	X16C			B08
X165			B15	X16D			B07
X166			B14	X16E			B06
X167			B13	X16F			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X170			A20	X178			A12
X171			A19	X179			A11
X172			A18	X17A			A10
X173			A17	X17B			A09
X174			A16	X17C			A08
X175			A15	X17D			A07
X176			A14	X17E			A06
X177			A13	X17F			A05

Input Signal Table from Machine

RIO-M/S	No.4: Fifth card

Table 3-2-5

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X180			B20	X188			B12
X181			B19	X189			B11
X182			B18	X18A			B10
X183			B17	X18B			B09
X184			B16	X18C			B08
X185			B15	X18D			B07
X186			B14	X18E			B06
X187			B13	X18F			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X190			A20	X198			A12
X191			A19	X199			A11
X192			A18	X19A			A10
X193			A17	X19B			A09
X194			A16	X19C			A08
X195			A15	X19D			A07
X196			A14	X19E			A06
X197			A13	X19F			A05

RIO-M/S	No.5: Sixth card

Table 3-2-6

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X1A0			B20	X1A8			B12
X1A1			B19	X1A9			B11
X1A2			B18	X1AA			B10
X1A3			B17	X1AB			B09
X1A4			B16	X1AC			B08
X1A5			B15	X1AD			B07
X1A6			B14	X1AE			B06
X1A7			B13	X1AF			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X1B0			A20	X1B8			A12
X1B1			A19	X1B9			A11
X1B2			A18	X1BA			A10
X1B3			A17	X1BB			A09
X1B4			A16	X1BC			A08
X1B5			A15	X1BD			A07
X1B6			A14	X1BE			A06
X1B7			A13	X1BF			A05

Input Signal Table from Machine

RIO-M/S	No.6: Seventh card

Table 3-2-7

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X1C0			B20	X1C8			B12
X1C1			B19	X1C9			B11
X1C2			B18	X1CA			B10
X1C3			B17	X1CB			B09
X1C4			B16	X1CC			B08
X1C5			B15	X1CD			B07
X1C6			B14	X1CE			B06
X1C7			B13	X1CF			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X1D0			A20	X1D8			A12
X1D1			A19	X1D9			A11
X1D2			A18	X1DA			A10
X1D3			A17	X1DB			A09
X1D4			A16	X1DC			A08
X1D5			A15	X1DD			A07
X1D6			A14	X1DE			A06
X1D7			A13	X1DF			A05

RIO-M/S	No.7: Eighth card

Table 3-2-8

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X1E0			B20	X1E8			B12
X1E1			B19	X1E9			B11
X1E2			B18	X1EA			B10
X1E3			B17	X1EB			B09
X1E4			B16	X1EC			B08
X1E5			B15	X1ED			B07
X1E6			B14	X1EE			B06
X1E7			B13	X1EF			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
X1F0			A20	X1F8			A12
X1F1			A19	X1F9			A11
X1F2			A18	X1FA			A10
X1F3			A17	X1FB			A09
X1F4			A16	X1FC			A08
X1F5			A15	X1FD			A07
X1F6			A14	X1FE			A06
X1F7			A13	X1FF			A05

Table of Input Signal from Machine

DIO	Built-in DI

The X400 to X40F signal assignments are fixed.

Table 3-3

(1) When power failure backup module is not mounted

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
X400	DI0	*Built-in DI reference point return near-point detection 1	X408	DI8	*Built-in DI stroke end -1
X401	DI1	*Built-in DI reference point return near-point detection 2	X409	DI9	*Built-in DI stroke end -2
X402	DI2	*Built-in DI reference point return near-point detection 3	X40A	DIA	*Built-in DI stroke end -3
X403	DI3	*Built-in DI reference point return near-point detection 4	X40B	DIB	*Built-in DI stroke end -4
X404	DI4	*Built-in DI reference point return near-point detection 5	X40C	DIC	*Built-in DI stroke end +1
X405	DI5	*Built-in DI stroke end -5	X40D	DID	*Built-in DI stroke end +2
X406	DI6	*Built-in DI stroke end +5	X40E	DIE	*Built-in DI stroke end +3
X407	DI7	*Built-in DI emergency stop	X40F	DIF	*Built-in DI stroke end +4

(2) When power failure backup module is mounted

IO mounted on C6/C64 unit (hotline)

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
X400	DI0	ACFAIL	X408	DI8	*Built-in DI stroke end -1
X401	DI1	Invalid	X409	DI9	*Built-in DI stroke end -2
X402	DI2	Invalid	X40A	DIA	*Built-in DI stroke end -3
X403	DI3	Invalid	X40B	DIB	*Built-in DI stroke end -4
X404	DI4	Invalid	X40C	DIC	*Built-in DI stroke end +1
X405	DI5	*Built-in DI stroke end -5	X40D	DID	*Built-in DI stroke end +2
X406	DI6	*Built-in DI stroke end +5	X40E	DIE	*Built-in DI stroke end +3
X407	DI7	*Built-in DI emergency stop	X40F	DIF	*Built-in DI stroke end +4

(3) Relation with dog and OT arbitrary assignment

Condition		X400 meaning	Handling of dog and OT signal
Power failure backup module	**#1226 qaux10/Bit5 (dog, OT arbitrary assignment)**		
Mounted	ON	ACFAIL	Dog and OT arbitrary assignment valid
	OFF		Dog signal invalid for all axes OT fixed assignment valid
Not mounted	ON	Arbitrary	Dog and OT arbitrary assignment valid
	OFF	*DOG1	Dog and OT fixed assignment

Output Signal Table to Machine

RIO-M	No.0: First card

Table 3-4-1

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

RIO-M	No.1: Second card

Table 3-4-2

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

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
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 Signal Table to Machine

RIO-M	No.2: Third card

Table 3-4-3

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

RIO-M	No.3: Fourth card

Table 3-4-4

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 Signal Table to Machine

RIO-M	No.4: Fifth card

Table 3-4-5

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

RIO-M	No.5: Sixth card

Table 3-4-6

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 Signal Table to Machine

RIO-M	No.6: Seventh card

Table 3-4-7

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

RIO-M	No.7: Eighth card

Table 3-4-8

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

Output Signal Table to Machine

RIO-M/S	No.0: First card

Table 3-5-1

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

RIO-M/S	No.1: Second card

Table 3-5-2

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 Signal Table to Machine

RIO-M/S	No.2: Third card

Table 3-5-3

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
Y140			B20	Y148			B12
Y141			B19	Y149			B11
Y142			B18	Y14A			B10
Y143			B17	Y14B			B09
Y144			B16	Y14C			B08
Y145			B15	Y14D			B07
Y146			B14	Y14E			B06
Y147			B13	Y14F			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
Y150			A20	Y158			A12
Y151			A19	Y159			A11
Y152			A18	Y15A			A10
Y153			A17	Y15B			A09
Y154			A16	Y15C			A08
Y155			A15	Y15D			A07
Y156			A14	Y15E			A06
Y157			A13	Y15F			A05

RIO-M/S	No.3: Fourth card

Table 3-5-4

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
Y160			B20	Y168			B12
Y161			B19	Y169			B11
Y162			B18	Y16A			B10
Y163			B17	Y16B			B09
Y164			B16	Y16C			B08
Y165			B15	Y16D			B07
Y166			B14	Y16E			B06
Y167			B13	Y16F			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
Y170			A20	Y178			A12
Y171			A19	Y179			A11
Y172			A18	Y17A			A10
Y173			A17	Y17B			A09
Y174			A16	Y17C			A08
Y175			A15	Y17D			A07
Y176			A14	Y17E			A06
Y177			A13	Y17F			A05

Output Signal Table to Machine

RIO-M/S	No.4: Fifth card

Table 3-5-5

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
Y180			B20	Y188			B12
Y181			B19	Y189			B11
Y182			B18	Y18A			B10
Y183			B17	Y18B			B09
Y184			B16	Y18C			B08
Y185			B15	Y18D			B07
Y186			B14	Y18E			B06
Y187			B13	Y18F			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
Y190			A20	Y198			A12
Y191			A19	Y199			A11
Y192			A18	Y19A			A10
Y193			A17	Y19B			A09
Y194			A16	Y19C			A08
Y195			A15	Y19D			A07
Y196			A14	Y19E			A06
Y197			A13	Y19F			A05

RIO-M/S	No.5: Sixth card

Table 3-5-6

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
Y1A0			B20	Y1A8			B12
Y1A1			B19	Y1A9			B11
Y1A2			B18	Y1AA			B10
Y1A3			B17	Y1AB			B09
Y1A4			B16	Y1AC			B08
Y1A5			B15	Y1AD			B07
Y1A6			B14	Y1AE			B06
Y1A7			B13	Y1AF			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
Y1B0			A20	Y1B8			A12
Y1B1			A19	Y1B9			A11
Y1B2			A18	Y1BA			A10
Y1B3			A17	Y1BB			A09
Y1B4			A16	Y1BC			A08
Y1B5			A15	Y1BD			A07
Y1B6			A14	Y1BE			A06
Y1B7			A13	Y1BF			A05

Output Signal Table to Machine

RIO-M/S	No.6: Seventh card

Table 3-5-7

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
Y1C0			B20	Y1C8			B12
Y1C1			B19	Y1C9			B11
Y1C2			B18	Y1CA			B10
Y1C3			B17	Y1CB			B09
Y1C4			B16	Y1CC			B08
Y1C5			B15	Y1CD			B07
Y1C6			B14	Y1CE			B06
Y1C7			B13	Y1CF			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
Y1D0			A20	Y1D8			A12
Y1D1			A19	Y1D9			A11
Y1D2			A18	Y1DA			A10
Y1D3			A17	Y1DB			A09
Y1D4			A16	Y1DC			A08
Y1D5			A15	Y1DD			A07
Y1D6			A14	Y1DE			A06
Y1D7			A13	Y1DF			A05

RIO-M/S	No.7:Eighth card

Table 3-5-8

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
Y1E0			B20	Y1E8			B12
Y1E1			B19	Y1E9			B11
Y1E2			B18	Y1EA			B10
Y1E3			B17	Y1EB			B09
Y1E4			B16	Y1EC			B08
Y1E5			B15	Y1ED			B07
Y1E6			B14	Y1EE			B06
Y1E7			B13	Y1EF			B05

Device	Abbreviation	Signal name	Connector	Device	Abbreviation	Signal name	Connector
Y1F0			A20	Y1F8			A12
Y1F1			A19	Y1F9			A11
Y1F2			A18	Y1FA			A10
Y1F3			A17	Y1FB			A09
Y1F4			A16	Y1FC			A08
Y1F5			A15	Y1FD			A07
Y1F6			A14	Y1FE			A06
Y1F7			A13	Y1FF			A05

Table of Output Signal to Machine

DIO	Built-in DO

The Y400 to Y40F signal assignments are fixed.

Table 3-6

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
Y400	SA	Servo ready complete	Y408		Not used
Y401		Not used	Y409		Not used
Y402		Not used	Y40A		Not used
Y403		Not used	Y40B		Not used
Y404		Not used	Y40C		Not used
Y405		Not used	Y40D		Not used
Y406		Not used	Y40E		Not used
Y407		Not used	Y40F		Not used

Operation board remote I/O input/output signal table

CR05	Communication terminal

Table 3-7

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
R90		Expansion operation board input #1 (R90 Bit8: board reset signal)	R190		Expansion operation board output #1
R91			R191		
R92			R192		
R93		Expansion operation board input #2	R193		Expansion operation board output #2
R94			R194		
R95			R195		
R96					
R97					

4. TABLE OF INPUT/OUTPUT SIGNALS WITH CONTROLLER

4.1 How to Read Input/Output Signal Table

How to read input/output signal table is shown below.

Head device of each card

Interface table Input R

Controller -> PLC (system)

Device	Abbrev.	Signal details	Device	Abbrev.	Signal details
R20		PLC main scan time	R30		User macro input #1035
R21		Emergency stop cause	R31		(PLC -> Controller)
R22		DIO card information	R32		CNC software version code
R23			R33		
R24		User macro input #1032	R34		
R25		(PLC -> Controller)	R35		
R26		User macro input #1033	R36		
R27		(PLC -> Controller)	R37		
R28		User macro input #1034	R38		PLC switch (#1~16)
R29		(PLC -> Controller)	R39		PLC switch (#17~32)

Device	Abbrev.	Signal details	Device	Abbrev.	Signal details
R40		Battery drop cause	R50		Clock data Month/Year
R41		Temperature warning cause	R51		Hour/Date
R42		Remote I/O communication stop channel	R52		Second/Minute
R43		(CT100 connection status)	R53		PLC High-speed process time
R44		(Chara-gene-error)	R54		
R45			R55		
R46			R56		
R47			R57		
R48			R58		
R49			R59		

Interface table Output Y

PLC -> Controller (Axis state signal)

Table 4-3-2

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis	9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	B	Signal details
Y440	Y470	Y4A0	Y4D0	Y500	Y530	Y560	Y590	Y5C0	Y5F0	Y620	Y650	Y680	Y6B0		Control axis removal
Y441	Y471	Y4A1	Y4D1	Y501	Y531	Y561	Y591	Y5C1	Y5F1	Y621	Y651	Y681	Y6B1	*	Servo OFF
Y442	Y472	Y4A2	Y4D2	Y502	Y532	Y562	Y592	Y5C2	Y5F2	Y622	Y652	Y682	Y6B2		Mirror image
Y443	Y473	Y4A3	Y4D3	Y503	Y533	Y563	Y593	Y5C3	Y5F3	Y623	Y653	Y683	Y6B3	*	External deceleration +
Y444	Y474	Y4A4	Y4D4	Y504	Y534	Y564	Y594	Y5C4	Y5F4	Y624	Y654	Y684	Y6B4	*	External deceleration -
Y445	Y475	Y4A5	Y4D5	Y505	Y535	Y565	Y595	Y5C5	Y5F5	Y625	Y655	Y685	Y6B5	*	Auto interlock +
Y446	Y476	Y4A6	Y4D6	Y506	Y536	Y566	Y596	Y5C6	Y5F6	Y626	Y656	Y686	Y6B6	*	Auto interlock -
Y447	Y477	Y4A7	Y4D7	Y507	Y537	Y567	Y597	Y5C7	Y5F7	Y627	Y657	Y687	Y6B7	*	Auto interlock +

(Note 1) ☐ is 1 word (16-bit) data.

(Note 2) Signals marked with * in the abbreviation column or B column 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) Allocated to device X410 and following. (2) Data calculated in bit units are allocated as a principle.
	Data	Table 4-2-□	(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) Allocated to device Y410 and following. (2) Data calculated in bit units are allocated as a principle.
	Data	Table 4-4-□	(1) Allocated to device R. (2) Data handled in 16-bit or 32-bit units is allocated as a principle.
Others	Special relay Special register	Table 4-5-□	(1) Allocated to device SM and SD. (2) The sequence command calculation state, results and the signals with special operations are allocated.
	Slot information	Table 4-6-□	(1) This device is used for the expansion slot. The meaning and operation of the device differ according to the application. Refer to section"6.6 Network related functions" for details on the assignments.

Controller->PLC (Common to system) **Table 4-1-1**

Device	Abbrev.	Signal name
X410		
X411		
X412		
X413		
X414		
X415		
X416		
X417		

Device	Abbrev.	Signal name
X418		SKIP0 Input signal state
X419		SKIP1 Input signal state
X41A		SKIP2 Input signal state
X41B		SKIP3 Input signal state
X41C		
X41D		
X41E		
X41F		

Device	Abbrev.	Signal name
X420	MA	Controller ready complete
X421	SA	Servo ready complete
X422		
X423		
X424		
X425		
X426		
X427		

Device	Abbrev.	Signal name
X428		
X429	DROPNS	Door open enable
X42A	SPSYN1	In spindle synchronous control
X42B	FSPRV	Spindle rotation speed synchronization complete
X42C	FSPPH	Spindle phase synchronization complete
X42D	SPCMP	Chuck close confirmation
X42E	BATWR	Battery warning
X42F	BATAL	Battery alarm

Device	Abbrev.	Signal name
X430	AL1	NC alarm 1
X431	AL2	NC alarm 2 (Servo alarm)
X432		
X433		
X434		
X435		
X436		
X437	BRST	Board reset

Device	Abbrev.	Signal name
X438	WNG	In door interlock
X439		
X43A		
X43B		
X43C		
X43D		
X43E		
X43F		

Controller->PLC (Axis state signal) **Table 4-1-2**

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis	9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	Signal details
X440	X460	X480	X4A0	X4C0	X4E0	X500	X520	X540	X560	X580	X5A0	X5C0	X5E0	Servo ready
X441	X461	X481	X4A1	X4C1	X4E1	X501	X521	X541	X561	X581	X5A1	X5C1	X5E1	Axis select output
X442	X462	X482	X4A2	X4C2	X4E2	X502	X522	X542	X562	X582	X5A2	X5C2	X5E2	Plus motion+
X443	X463	X483	X4A3	X4C3	X4E3	X503	X523	X543	X563	X583	X5A3	X5C3	X5E3	Minus motion -
X444	X464	X484	X4A4	X4C4	X4E4	X504	X524	X544	X564	X584	X5A4	X5C4	X5E4	1st reference point reached
X445	X465	X485	X4A5	X4C5	X4E5	X505	X525	X545	X565	X585	X5A5	X5C5	X5E5	2nd reference point reached
X446	X466	X486	X4A6	X4C6	X4E6	X506	X526	X546	X566	X586	X5A6	X5C6	X5E6	3rd reference point reached
X447	X467	X487	X4A7	X4C7	X4E7	X507	X527	X547	X567	X587	X5A7	X5C7	X5E7	4th reference point reached
X448	X468	X488	X4A8	X4C8	X4E8	X508	X528	X548	X568	X588	X5A8	X5C8	X5E8	Near 1st reference point
X449	X469	X489	X4A9	X4C9	X4E9	X509	X529	X549	X569	X589	X5A9	X5C9	X5E9	Up-to-speed
X44A	X46A	X48A	X4AA	X4CA	X4EA	X50A	X52A	X54A	X56A	X58A	X5AA	X5CA	X5EA	Zero point initialization completed
X44B	X46B	X48B	X4AB	X4CB	X4EB	X50B	X52B	X54B	X56B	X58B	X5AB	X5CB	X5EB	Zero point initialization error completed
X44C	X46C	X48C	X4AC	X4CC	X4EC	X50C	X52C	X54C	X56C	X58C	X5AC	X5CC	X5EC	In zero point initialization
X44D	X46D	X48D	X4AD	X4CD	X4ED	X50D	X52D	X54D	X56D	X58D	X5AD	X5CD	X5ED	Zero point initialization incomplete
X44E	X46E	X48E	X4AE	X4CE	X4EE	X50E	X52E	X54E	X56E	X58E	X5AE	X5CE	X5EE	In current limit
X44F	X46F	X48F	X4AF	X4CF	X4EF	X50F	X52F	X54F	X56F	X58F	X5AF	X5CF	X5EF	Current limit reached

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis	9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	Signal details
X450	X470	X490	X4B0	X4D0	X4F0	X510	X530	X550	X570	X590	X5B0	X5D0	X5F0	Unclamp command
X451	X471	X491	X4B1	X4D1	X4F1	X511	X531	X551	X571	X591	X5B1	X5D1	X5F1	In-position
X452	X472	X492	X4B2	X4D2	X4F2	X512	X532	X552	X572	X592	X5B2	X5D2	X5F2	
X453	X473	X493	X4B3	X4D3	X4F3	X513	X533	X553	X573	X593	X5B3	X5D3	X5F3	
X454	X474	X494	X4B4	X4D4	X4F4	X514	X534	X554	X574	X594	X5B4	X5D4	X5F4	
X455	X475	X495	X4B5	X4D5	X4F5	X515	X535	X555	X575	X595	X5B5	X5D5	X5F5	
X456	X476	X496	X4B6	X4D6	X4F6	X516	X536	X556	X576	X596	X5B6	X5D6	X5F6	
X457	X477	X497	X4B7	X4D7	X4F7	X517	X537	X557	X577	X597	X5B7	X5D7	X5F7	
X458	X478	X498	X4B8	X4D8	X4F8	X518	X538	X558	X578	X598	X5B8	X5D8	X5F8	
X459	X479	X499	X4B9	X4D9	X4F9	X519	X539	X559	X579	X599	X5B9	X5D9	X5F9	
X45A	X47A	X49A	X4BA	X4DA	X4FA	X51A	X53A	X55A	X57A	X59A	X5BA	X5DA	X5FA	
X45B	X47B	X49B	X4BB	X4DB	X4FB	X51B	X53B	X55B	X57B	X59B	X5BB	X5DB	X5FB	
X45C	X47C	X49C	X4BC	X4DC	X4FC	X51C	X53C	X55C	X57C	X59C	X5BC	X5DC	X5FC	
X45D	X47D	X49D	X4BD	X4DD	X4FD	X51D	X53D	X55D	X57D	X59D	X5BD	X5DD	X5FD	
X45E	X47E	X49E	X4BE	X4DE	X4FE	X51E	X53E	X55E	X57E	X59E	X5BE	X5DE	X5FE	
X45F	X47F	X49F	X4BF	X4DF	X4FF	X51F	X53F	X55F	X57F	X59F	X5BF	X5DF	X5FF	

Controller->PLC (Part system state signal) **Table 4-1-3**

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Abbrev.	Signal details
X600	X680	X700	X780	X800	X880	X900	JO	In jog mode
X601	X681	X701	X781	X801	X881	X901	HO	In handle mode
X602	X682	X702	X782	X802	X882	X902	SO	In incremental mode
X603	X683	X703	X783	X803	X883	X903	PTPO	In manual random feed mode
X604	X684	X704	X784	X804	X884	X904	ZRNO	In reference point return mode
X605	X685	X705	X785	X805	X885	X905	ASTO	In automatic initialization mode
X606	X686	X706	X786	X806	X886	X906		
X607	X687	X707	X787	X807	X887	X907		
X608	X688	X708	X788	X808	X888	X908	MEMO	In memory mode
X609	X689	X709	X789	X809	X889	X909		
X60A	X68A	X70A	X78A	X80A	X88A	X90A		
X60B	X68B	X70B	X78B	X80B	X88B	X90B	DO	In MDI mode
X60C	X68C	X70C	X78C	X80C	X88C	X90C		
X60D	X68D	X70D	X78D	X80D	X88D	X90D		
X60E	X68E	X70E	X78E	X80E	X88E	X90E		
X60F	X68F	X70F	X78F	X80F	X88F	X90F		

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Abbrev.	Signal details
X610	X690	X710	X790	X810	X890	X910		
X611	X691	X711	X791	X811	X891	X911		
X612	X692	X712	X792	X812	X892	X912	OP	In auto operation "run"
X613	X693	X713	X793	X813	X893	X913	STL	In auto operation "start"
X614	X694	X714	X794	X814	X894	X914	SPL	In auto operation "pause"
X615	X695	X715	X795	X815	X895	X915	RST	In "reset"
X616	X696	X716	X796	X816	X896	X916	CXN	In manual random feed
X617	X697	X717	X797	X817	X897	X917	RWD	In rewind
X618	X698	X718	X798	X818	X898	X918	DEN	Motion command complete
X619	X699	X719	X799	X819	X899	X919	TINP	All-axis in-position
X61A	X69A	X71A	X79A	X81A	X89A	X91A	TSMZ	All-axis smoothing zero
X61B	X69B	X71B	X79B	X81B	X89B	X91B		
X61C	X69C	X71C	X79C	X81C	X89C	X91C	CXFIN	Manual random feed complete
X61D	X69D	X71D	X79D	X81D	X89D	X91D		
X61E	X69E	X71E	X79E	X81E	X89E	X91E		
X61F	X69F	X71F	X79F	X81F	X89F	X91F		

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Abbrev.	Signal details
X620	X6A0	X720	X7A0	X820	X8A0	X920	RPN	In rapid traverse
X621	X6A1	X721	X7A1	X821	X8A1	X921	CUT	In cutting feed
X622	X6A2	X722	X7A2	X822	X8A2	X922	TAP	In tapping
X623	X6A3	X723	X7A3	X823	X8A3	X923	THRD	In thread cutting
X624	X6A4	X724	X7A4	X824	X8A4	X924	SYN	In synchronous feed
X625	X6A5	X725	X7A5	X825	X8A5	X925	CSS	In constant circumferential speed
X626	X6A6	X726	X7A6	X826	X8A6	X926	SKIP	In skip
X627	X6A7	X727	X7A7	X827	X8A7	X927	ZRNN	In reference point return
X628	X6A8	X728	X7A8	X828	X8A8	X928	INCH	In inch unit select
X629	X6A9	X729	X7A9	X829	X8A9	X929		
X62A	X6AA	X72A	X7AA	X82A	X8AA	X92A	F1DN	F1-digit commanded
X62B	X6AB	X72B	X7AB	X82B	X8AB	X92B	TLFO	In tool life management
X62C	X6AC	X72C	X7AC	X82C	X8AC	X92C		
X62D	X6AD	X72D	X7AD	X82D	X8AD	X92D		
X62E	X6AE	X72E	X7AE	X82E	X8AE	X92E	TLOV	Tool life over
X62F	X6AF	X72F	X7AF	X82F	X8AF	X92F		

Controller->PLC (Part system state signal) **Table 4-1-4**

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Abbrev.	Signal details
X630	X6B0	X730	X7B0	X830	X8B0	X930		
X631	X6B1	X731	X7B1	X831	X8B1	X931		
X632	X6B2	X732	X7B2	X832	X8B2	X932	AL3	Alarm 3 (Program error)
X633	X6B3	X733	X7B3	X833	X8B3	X933	AL4	Alarm 4 (Operation error)
X634	X6B4	X734	X7B4	X834	X8B4	X934		
X635	X6B5	X735	X7B5	X835	X8B5	X935	SSE	Search & start (error)
X636	X6B6	X736	X7B6	X836	X8B6	X936	SSG	Search & start (search)
X637	X6B7	X737	X7B7	X837	X8B7	X937	ASLE	Illegal axis selected
X638	X6B8	X738	X7B8	X838	X8B8	X938	F11	F1-digit No.1
X639	X6B9	X739	X7B9	X839	X8B9	X939	F12	F1-digit No.2
X63A	X6BA	X73A	X7BA	X83A	X8BA	X93A	F14	F1-digit No.4
X63B	X6BB	X73B	X7BB	X83B	X8BB	X93B		
X63C	X6BC	X73C	X7BC	X83C	X8BC	X93C		In synchronization
X63D	X6BD	X73D	X7BD	X83D	X8BD	X93D		
X63E	X6BE	X73E	X7BE	X83E	X8BE	X93E		
X63F	X6BF	X73F	X7BF	X83F	X8BF	X93F		

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Abbrev.	Signal details
X640	X6C0	X740	X7C0	X840	X8C0	X940	DM00	M code independent output M00
X641	X6C1	X741	X7C1	X841	X8C1	X941	DM01	M code independent output M01
X642	X6C2	X742	X7C2	X842	X8C2	X942	DM02	M code independent output M02
X643	X6C3	X743	X7C3	X843	X8C3	X943	DM30	M code independent output M30
X644	X6C4	X744	X7C4	X844	X8C4	X944	MF1	M function strobe 1
X645	X6C5	X745	X7C5	X845	X8C5	X945	MF2	M function strobe 2
X646	X6C6	X746	X7C6	X846	X8C6	X946	MF3	M function strobe 3
X647	X6C7	X747	X7C7	X847	X8C7	X947	MF4	M function strobe 4
X648	X6C8	X748	X7C8	X848	X8C8	X948		
X649	X6C9	X749	X7C9	X849	X8C9	X949	MMS	Manual numerical command
X64A	X6CA	X74A	X7CA	X84A	X8CA	X94A		
X64B	X6CB	X74B	X7CB	X84B	X8CB	X94B	TCP	Tool change position return complete
X64C	X6CC	X74C	X7CC	X84C	X8CC	X94C	TCRQ	New tool change
X64D	X6CD	X74D	X7CD	X84D	X8CD	X94D		
X64E	X6CE	X74E	X7CE	X84E	X8CE	X94E		
X64F	X6CF	X74F	X7CF	X84F	X8CF	X94F		

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Abbrev.	Signal details
X650	X6D0	X750	X7D0	X850	X8D0	X950	TF1	T function strobe 1
X651	X6D1	X751	X7D1	X851	X8D1	X951	TF2	T function strobe 2
X652	X6D2	X752	X7D2	X852	X8D2	X952	TF3	T function strobe 3
X653	X6D3	X753	X7D3	X853	X8D3	X953	TF4	T function strobe 4
X654	X6D4	X754	X7D4	X854	X8D4	X954	BF1	2nd M function strobe 1
X655	X6D5	X755	X7D5	X855	X8D5	X955	BF2	2nd M function strobe 2
X656	X6D6	X756	X7D6	X856	X8D6	X956	BF3	2nd M function strobe 3
X657	X6D7	X757	X7D7	X857	X8D7	X957	BF4	2nd M function strobe 4
X658	X6D8	X758	X7D8	X858	X8D8	X958	SF1	S function strobe 1
X659	X6D9	X759	X7D9	X859	X8D9	X959	SF2	S function strobe 2
X65A	X6DA	X75A	X7DA	X85A	X8DA	X95A	SF3	S function strobe 3
X65B	X6DB	X75B	X7DB	X85B	X8DB	X95B	SF4	S function strobe 4
X65C	X6DC	X75C	X7DC	X85C	X8DC	X95C	SF5	S function strobe 5
X65D	X6DD	X75D	X7DD	X85D	X8DD	X95D	SF6	S function strobe 6
X65E	X6DE	X75E	X7DE	X85E	X8DE	X95E	SF7	S function strobe 7
X65F	X6DF	X75F	X7DF	X85F	X8DF	X95F		

Controller->PLC (Part system state signal) **Table 4-1-5**

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Abbrev.	Signal details
X660	X6E0	X760	X7E0	X860	X8E0	X960	PSW1	Position switch 1
X661	X6E1	X761	X7E1	X861	X8E1	X961	PSW2	Position switch 2
X662	X6E2	X762	X7E2	X862	X8E2	X962	PSW3	Position switch 3
X663	X6E3	X763	X7E3	X863	X8E3	X963	PSW4	Position switch 4
X664	X6E4	X764	X7E4	X864	X8E4	X964	PSW5	Position switch 5
X665	X6E5	X765	X7E5	X865	X8E5	X965	PSW6	Position switch 6
X666	X6E6	X766	X7E6	X866	X8E6	X966	PSW7	Position switch 7
X667	X6E7	X767	X7E7	X867	X8E7	X967	PSW8	Position switch 8
X668	X6E8	X768	X7E8	X868	X8E8	X968		
X669	X6E9	X769	X7E9	X869	X8E9	X969		
X66A	X6EA	X76A	X7EA	X86A	X8EA	X96A		
X66B	X6EB	X76B	X7EB	X86B	X8EB	X96B		
X66C	X6EC	X76C	X7EC	X86C	X8EC	X96C		
X66D	X6ED	X76D	X7ED	X86D	X8ED	X96D	TRVE	Tap retract possible
X66E	X6EE	X76E	X7EE	X86E	X8EE	X96E	PCNT	No. of work machining over
X66F	X6EF	X76F	X7EF	X86F	X8EF	X96F	ABSW	Absolute position warning

1 system	2 system	3 system	4 system	5 system	6 system	7 system	Abbrev.	Signal details
X670	X6F0	X770	X7F0	X870	X8F0	X970	PSW9	Position switch 9
X671	X6F1	X771	X7F1	X871	X8F1	X971	PSW10	Position switch 10
X672	X6F2	X772	X7F2	X872	X8F2	X972	PSW11	Position switch 11
X673	X6F3	X773	X7F3	X873	X8F3	X973	PSW12	Position switch 12
X674	X6F4	X774	X7F4	X874	X8F4	X974	PSW13	Position switch 13
X675	X6F5	X775	X7F5	X875	X8F5	X975	PSW14	Position switch 14
X676	X6F6	X776	X7F6	X876	X8F6	X976	PSW15	Position switch 15
X677	X6F7	X777	X7F7	X877	X8F7	X977	PSW16	Position switch 16
X678	X6F8	X778	X7F8	X878	X8F8	X978		
X679	X6F9	X779	X7F9	X879	X8F9	X979		
X67A	X6FA	X77A	X7FA	X87A	X8FA	X97A		
X67B	X6FB	X77B	X7FB	X87B	X8FB	X97B		
X67C	X6FC	X77C	X7FC	X87C	X8FC	X97C		
X67D	X6FD	X77D	X7FD	X87D	X8FD	X97D		
X67E	X6FE	X77E	X7FE	X87E	X8FE	X97E		
X67F	X6FF	X77F	X7FF	X87F	X8FF	X97F		

PLC->Controller (Spindle state signal) **Table 4-1-6**

1st spindle	2nd spindle	3rd spindle	4th spindle	5th spindle	6th spindle	7th spindle	Abbrev.	Signal details
X980	X9B0	X9E0	XA10	XA40	XA70	XAA0		
X981	X9B1	X9E1	XA11	XA41	XA71	XAA1		
X982	X9B2	X9E2	XA12	XA42	XA72	XAA2		
X983	X9B3	X9E3	XA13	XA43	XA73	XAA3		
X984	X9B4	X9E4	XA14	XA44	XA74	XAA4	SIGE	S-analog gear No. illegal
X985	X9B5	X9E5	XA15	XA45	XA75	XAA5	SOVE	S-analog max. /min. command value over
X986	X9B6	X9E6	XA16	XA46	XA76	XAA6	SNGE	S-analog no gear selected
X987	X9B7	X9E7	XA17	XA47	XA77	XAA7		
X988	X9B8	X9E8	XA18	XA48	XA78	XAA8		
X989	X9B9	X9E9	XA19	XA49	XA79	XAA9		
X98A	X9BA	X9EA	XA1A	XA4A	XA7A	XAAA		
X98B	X9BB	X9EB	XA1B	XA4B	XA7B	XAAB	SUPP	Spindle speed upper limit over
X98C	X9BC	X9EC	XA1C	XA4C	XA7C	XAAC	SLOW	Spindle speed lower limit over
X98D	X9BD	X9ED	XA1D	XA4D	XA7D	XAAD	GR1	Spindle gear shift 1
X98E	X9BE	X9EE	XA1E	XA4E	XA7E	XAAE	GR2	Spindle gear shift 2
X98F	X9BF	X9EF	XA1F	XA4F	XA7F	XAAF		

1st spindle	2nd spindle	3rd spindle	4th spindle	5th spindle	6th spindle	7th spindle	Abbrev.	Signal details
X990	X9C0	X9F0	XA20	XA50	XA80	XAB0		
X991	X9C1	X9F1	XA21	XA51	XA81	XAB1	CDO	Spindle current detect
X992	X9C2	X9F2	XA22	XA52	XA82	XAB2	VRO	Spindle speed detect
X993	X9C3	X9F3	XA23	XA53	XA83	XAB3	FLO	In spindle alarm
X994	X9C4	X9F4	XA24	XA54	XA84	XAB4	ZSO	Spindle zero speed
X995	X9C5	X9F5	XA25	XA55	XA85	XAB5	USO	Spindle up-to-speed
X996	X9C6	X9F6	XA26	XA56	XA86	XAB6	ORAO	Spindle in-position
X997	X9C7	X9F7	XA27	XA57	XA87	XAB7	LRSO	In L coil selected
X998	X9C8	X9F8	XA28	XA58	XA88	XAB8	SMA	Spindle ready-ON
X999	X9C9	X9F9	XA29	XA59	XA89	XAB9	SSA	Spindle servo-ON
X99A	X9CA	X9FA	XA2A	XA5A	XA8A	XABA	SEMG	Spindle emergency stop
X99B	X9CB	X9FB	XA2B	XA5B	XA8B	XABB	SSRN	Spindle forward run
X99C	X9CC	X9FC	XA2C	XA5C	XA8C	XABC	SSRI	Spindle reverse run
X99D	X9CD	X9FD	XA2D	XA5D	XA8D	XABD	SZPH	Z-phase passed
X99E	X9CE	X9FE	XA2E	XA5E	XA8E	XABE	SINP	Position loop in-position
X99F	X9CF	X9FF	XA2F	XA5F	XA8F	XABF	STLQ	Torque limit

1st spindle	2nd spindle	3rd spindle	4th spindle	5th spindle	6th spindle	7th spindle	Abbrev.	Signal details
X9A0	X9D0	XA00	XA30	XA60	XA90	XAC0	M1SEL	In motor1 select
X9A1	X9D1	XA01	XA31	XA61	XA91	XAC1	M2SEL	In motor2 select
X9A2	X9D2	XA02	XA32	XA62	XA92	XAC2		
X9A3	X9D3	XA03	XA33	XA63	XA93	XAC3		
X9A4	X9D4	XA04	XA34	XA64	XA94	XAC4		
X9A5	X9D5	XA05	XA35	XA65	XA95	XAC5		
X9A6	X9D6	XA06	XA36	XA66	XA96	XAC6		
X9A7	X9D7	XA07	XA37	XA67	XA97	XAC7		
X9A8	X9D8	XA08	XA38	XA68	XA98	XAC8	SZPF	Spindle zero point memory complete
X9A9	X9D9	XA09	XA39	XA69	XA99	XAC9		
X9AA	X9DA	XA0A	XA3A	XA6A	XA9A	XACA		
X9AB	X9DB	XA0B	XA3B	XA6B	XA9B	XACB		
X9AC	X9DC	XA0C	XA3C	XA6C	XA9C	XACC		
X9AD	X9DD	XA0D	XA3D	XA6D	XA9D	XACD		
X9AE	X9DE	XA0E	XA3E	XA6E	XA9E	XACE		
X9AF	X9DF	XA0F	XA3F	XA6F	XA9F	XACF		

Controller->PLC (System) **Table 4-2-1**

Device	Abbrev.	Signal details
R0	AI1	Analog input
R1	AI2	Analog input
R2	AI3	Analog input
R3	AI4	Analog input
R4		
R5		
R6		
R7		
R8		KEY IN 1
R9		(Full key)

Device	Abbrev.	Signal details
R10		
R11		
R12		
R13		
R14		
R15		(Display release)
R16		Display information
R17		
R18		
R19		

Device	Abbrev.	Signal details
R20		PLC main scan time
R21		Emergency stop cause
R22		DIO card information
R23		
R24		User macro input #1032
R25		(PLC –> controller)
R26		User macro input #1033
R27		(PLC –> controller)
R28		User macro input #1034
R29		(PLC –> controller)

Device	Abbrev.	Signal details
R30		User macro input #1035
R31		(PLC –> controller)
R32		CNC software version code
R33		
R34		
R35		
R36		
R37		
R38		PLC switch
R39		

Device	Abbrev.	Signal details
R40		Battery drop cause
R41		Temperature warning cause
R42		Remote I/O communication stop channel
R43		(CT100 connection status)
R44		(Chara-gene-error)
R45		
R46		
R47		
R48		Spindle synchronization phase error 1
R49		Spindle synchronization phase error 2

Device	Abbrev.	Signal details
R50		Clock data Month/Year
R51		Hour/Date
R52		Second/Minute
R53		PLC high-speed process time
R54		
R55		Spindle synchronization phase error output
R56		Spindle synchronization phase error monitor
R57		Spindle synchronization phase error monitor (lower limit value)
R58		Spindle synchronization phase error monitor (upper limit value)
R59		Spindle synchronization phase offset data

Device	Abbrev.	Signal details
R80		TOYOPUC status (Updated error details)
R81		TOYOPUC status (Updated error memo)
R82		TOYOPUC status (PC -> NC complete)
R83		TOYOPUC status (NC -> PC complete)
R84		TOYOPUC status (Updated error memo hold)
R85		Modal task data update synchronization
R86		
R87		
R88		
R89		

Device	Abbrev.	Signal details
R90		Add-on (expansion) operation board input #1
R91		(R90 Bit8:Communication terminal board reset signal)
R92		Refer to section "3.3 Allocation of
R93		machine input/output signals" for details.
R94		Add-on (expansion) operation board input #2
R95		(R90 Bit8:Communication terminal board reset signal)
R96		Refer to section "3.3 Allocation of
R97		machine input/output signals" for details.
R98		
R99		

Controller->PLC (Data per part system) **Table 4-2-2**

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Signal details
R200	R300	R400	R500	R600	R700	R800	
R201	R301	R401	R501	R601	R701	R801	
R202	R302	R402	R502	R602	R702	R802	
R203	R303	R403	R503	R603	R703	R803	
R204	R304	R404	R504	R604	R704	R804	M code data 1
R205	R305	R405	R505	R605	R705	R805	
R206	R306	R406	R506	R606	R706	R806	M code data 2
R207	R307	R407	R507	R607	R707	R807	
R208	R308	R408	R508	R608	R708	R808	M code data 3
R209	R309	R409	R509	R609	R709	R809	

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Signal details
R210	R310	R410	R510	R610	R710	R810	M code data 4
R211	R311	R411	R511	R611	R711	R811	
R212	R312	R412	R512	R612	R712	R812	S code data 1
R213	R313	R413	R513	R613	R713	R813	
R214	R314	R414	R514	R614	R714	R814	S code data 2
R215	R315	R415	R515	R615	R715	R815	
R216	R316	R416	R516	R616	R716	R816	S code data 3
R217	R317	R417	R517	R617	R717	R817	
R218	R318	R418	R518	R618	R718	R818	S code data 4
R219	R319	R419	R519	R619	R719	R819	

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Signal details
R220	R320	R420	R520	R620	R720	R820	T code data 1
R221	R321	R421	R521	R621	R721	R821	
R222	R322	R422	R522	R622	R722	R822	T code data 2
R223	R323	R423	R523	R623	R723	R823	
R224	R324	R424	R524	R624	R724	R824	T code data 3
R225	R325	R425	R525	R625	R725	R825	
R226	R326	R426	R526	R626	R726	R826	T code data 4
R227	R327	R427	R527	R627	R727	R827	
R228	R328	R428	R528	R628	R728	R828	2nd M function data 1
R229	R329	R429	R529	R629	R729	R829	

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Signal details
R230	R330	R430	R530	R630	R730	R830	2nd M function data 2
R231	R331	R431	R531	R631	R731	R831	
R232	R332	R432	R532	R632	R732	R832	2nd M function data 3
R233	R333	R433	R533	R633	R733	R833	
R234	R334	R434	R534	R634	R734	R834	2nd M function data 4
R235	R335	R435	R535	R635	R735	R835	
R236	R336	R436	R536	R636	R736	R836	Tool No.
R237	R337	R437	R537	R637	R737	R837	Machining program exists or not
R238	R338	R438	R538	R638	R738	R838	Group No. in tool life management
R239	R339	R439	R539	R639	R739	R839	

Controller->PLC (Data per part system) **Table 4-2-3**

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Signal details
R240	R340	R440	R540	R640	R740	R840	No. of work machining (current value)
R241	R341	R441	R541	R641	R741	R841	
R242	R342	R442	R542	R642	R742	R842	Near reference point
R243	R343	R443	R543	R643	R743	R843	(For each reference point)
R244	R344	R444	R544	R644	R744	R844	Tool life usage data
R245	R345	R445	R545	R645	R745	R845	
R246	R346	R446	R546	R646	R746	R846	
R247	R347	R447	R547	R647	R747	R847	
R248	R348	R448	R548	R648	R748	R848	SKIP 1
R249	R349	R449	R549	R649	R749	R849	SKIP 2

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Signal details
R250	R350	R450	R550	R650	R750	R850	SKIP 3
R251	R351	R451	R551	R651	R751	R851	Droop invalid axis
R252	R352	R452	R552	R652	R752	R852	
R253	R353	R453	R553	R653	R753	R853	
R254	R354	R454	R554	R654	R754	R854	
R255	R355	R455	R555	R655	R755	R855	
R256	R356	R456	R556	R656	R756	R856	Error code output
R257	R357	R457	R557	R657	R757	R857	
R258	R358	R458	R558	R658	R758	R858	
R259	R359	R459	R559	R659	R759	R859	

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Signal details
R260	R360	R460	R560	R660	R760	R860	
R261	R361	R461	R561	R661	R761	R861	
R262	R362	R462	R562	R662	R762	R862	
R263	R363	R463	R563	R663	R763	R863	
R264	R364	R464	R564	R664	R764	R864	S code data 5
R265	R365	R465	R565	R665	R765	R865	
R266	R366	R466	R566	R666	R766	R866	S code data 6
R267	R367	R467	R567	R667	R767	R867	
R268	R368	R468	R568	R668	R768	R868	S code data 7
R269	R369	R469	R569	R669	R769	R869	

Controller->PLC (Data per part system) **Table 4-2-4**

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Signal details
R270	R370	R470	R570	R670	R770	R870	Macro interface output for each part system #1132
R271	R371	R471	R571	R671	R771	R871	Controller → PLC (Up to three part systems for C64T)
R272	R372	R472	R572	R672	R772	R872	Macro interface output for each part system #1133
R273	R373	R473	R573	R673	R773	R873	Controller → PLC (Up to three part systems for C64T)
R274	R374	R474	R574	R674	R774	R874	Macro interface output for each part system #1134
R275	R375	R475	R575	R675	R775	R875	Controller → PLC (Up to three part systems for C64T)
R276	R376	R476	R576	R676	R776	R876	Macro interface output for each part system #1135
R277	R377	R477	R577	R677	R777	R877	Controller → PLC (Up to three part systems for C64T)
R278	R378	R478	R578	R678	R778	R878	
R279	R379	R479	R579	R679	R779	R879	

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Signal details
R280	R380	R480	R580	R680	R780	R880	
R281	R381	R481	R581	R681	R781	R881	
R282	R382	R482	R582	R682	R782	R882	
R283	R383	R483	R583	R683	R783	R883	
R284	R384	R484	R584	R684	R784	R884	
R285	R385	R485	R585	R685	R785	R885	
R286	R386	R486	R586	R686	R786	R886	
R287	R387	R487	R587	R687	R787	R887	
R288	R388	R488	R588	R688	R788	R888	
R289	R389	R489	R589	R689	R789	R889	

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Signal details
R290	R390	R490	R590	R690	R790	R890	
R291	R391	R491	R591	R691	R791	R891	
R292	R392	R492	R592	R692	R792	R892	
R293	R393	R493	R593	R693	R793	R893	
R294	R394	R494	R594	R694	R794	R894	(Reserved for system)
R295	R395	R495	R595	R695	R795	R895	
R296	R396	R496	R596	R696	R796	R896	
R297	R397	R497	R597	R697	R797	R897	
R298	R398	R498	R598	R698	R798	R898	
R299	R399	R499	R599	R699	R799	R899	

Controller->PLC (Axis data) **Table 4-2-5**

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis	9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	Signal details
R1600	R1650	R1700	R1750	R1800	R1850	R1900	R1950	R2000	R2050	R2100	R2150	R2200	R2250	Thermal displacement compensation amount
R1601	R1651	R1701	R1751	R1801	R1851	R1901	R1951	R2001	R2051	R2101	R2151	R2201	R2251	
R1602	R1652	R1702	R1752	R1802	R1852	R1902	R1952	R2002	R2052	R2102	R2152	R2202	R2252	
R1603	R1653	R1703	R1753	R1803	R1853	R1903	R1953	R2003	R2053	R2103	R2153	R2203	R2253	
R1604	R1654	R1704	R1754	R1804	R1854	R1904	R1954	R2004	R2054	R2104	R2154	R2204	R2254	
R1605	R1655	R1705	R1755	R1805	R1855	R1905	R1955	R2005	R2055	R2105	R2155	R2205	R2255	
R1606	R1656	R1706	R1756	R1806	R1856	R1906	R1956	R2006	R2056	R2106	R2156	R2206	R2256	
R1607	R1657	R1707	R1757	R1807	R1857	R1907	R1957	R2007	R2057	R2107	R2157	R2207	R2257	
R1608	R1658	R1708	R1758	R1808	R1858	R1908	R1958	R2008	R2058	R2108	R2158	R2208	R2258	
R1609	R1659	R1709	R1759	R1809	R1859	R1909	R1959	R2009	R2059	R2109	R2159	R2209	R2259	

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis	9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	Signal details
R1610	R1660	R1710	R1760	R1810	R1860	R1910	R1960	R2010	R2060	R2110	R2160	R2210	R2260	
R1611	R1661	R1711	R1761	R1811	R1861	R1911	R1961	R2011	R2061	R2111	R2161	R2211	R2261	
R1612	R1662	R1712	R1762	R1812	R1862	R1912	R1962	R2012	R2062	R2112	R2162	R2212	R2262	
R1613	R1663	R1713	R1763	R1813	R1863	R1913	R1963	R2013	R2063	R2113	R2163	R2213	R2263	
R1614	R1664	R1714	R1764	R1814	R1864	R1914	R1964	R2014	R2064	R2114	R2164	R2214	R2264	
R1615	R1665	R1715	R1765	R1815	R1865	R1915	R1965	R2015	R2065	R2115	R2165	R2215	R2265	
R1616	R1666	R1716	R1766	R1816	R1866	R1916	R1966	R2016	R2066	R2116	R2166	R2216	R2266	
R1617	R1667	R1717	R1767	R1817	R1867	R1917	R1967	R2017	R2067	R2117	R2167	R2217	R2267	
R1618	R1668	R1718	R1768	R1818	R1868	R1918	R1968	R2018	R2068	R2118	R2168	R2218	R2268	
R1619	R1669	R1719	R1769	R1819	R1869	R1919	R1969	R2019	R2069	R2119	R2169	R2219	R2269	

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis	9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	Signal details
R1620	R1670	R1720	R1770	R1820	R1870	R1920	R1970	R2020	R2070	R2120	R2170	R2220	R2270	
R1621	R1671	R1721	R1771	R1821	R1871	R1921	R1971	R2021	R2071	R2121	R2171	R2221	R2271	
R1622	R1672	R1722	R1772	R1822	R1872	R1922	R1972	R2022	R2072	R2122	R2172	R2222	R2272	
R1623	R1673	R1723	R1773	R1823	R1873	R1923	R1973	R2023	R2073	R2123	R2173	R2223	R2273	
R1624	R1674	R1724	R1774	R1824	R1874	R1924	R1974	R2024	R2074	R2124	R2174	R2224	R2274	
R1625	R1675	R1725	R1775	R1825	R1875	R1925	R1975	R2025	R2075	R2125	R2175	R2225	R2275	
R1626	R1676	R1726	R1776	R1826	R1876	R1926	R1976	R2026	R2076	R2126	R2176	R2226	R2276	
R1627	R1677	R1727	R1777	R1827	R1877	R1927	R1977	R2027	R2077	R2127	R2177	R2227	R2277	
R1628	R1678	R1728	R1778	R1828	R1878	R1928	R1978	R2028	R2078	R2128	R2178	R2228	R2278	
R1629	R1679	R1729	R1779	R1829	R1879	R1929	R1979	R2029	R2079	R2129	R2179	R2229	R2279	

Controller->PLC (Axis data) **Table 4-2-6**

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis	9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	Signal details
R1630	R1680	R1730	R1780	R1830	R1880	R1930	R1980	R2030	R2080	R2130	R2180	R2230	R2280	
R1631	R1681	R1731	R1781	R1831	R1881	R1931	R1981	R2031	R2081	R2131	R2181	R2231	R2281	
R1632	R1682	R1732	R1782	R1832	R1882	R1932	R1982	R2032	R2082	R2132	R2182	R2232	R2282	
R1633	R1683	R1733	R1783	R1833	R1883	R1933	R1983	R2033	R2083	R2133	R2183	R2233	R2283	
R1634	R1684	R1734	R1784	R1834	R1884	R1934	R1984	R2034	R2084	R2134	R2184	R2234	R2284	
R1635	R1685	R1735	R1785	R1835	R1885	R1935	R1985	R2035	R2085	R2135	R2185	R2235	R2285	
R1636	R1686	R1736	R1786	R1836	R1886	R1936	R1986	R2036	R2086	R2136	R2186	R2236	R2286	
R1637	R1687	R1737	R1787	R1837	R1887	R1937	R1987	R2037	R2087	R2137	R2187	R2237	R2287	
R1638	R1688	R1738	R1788	R1838	R1888	R1938	R1988	R2038	R2088	R2138	R2188	R2238	R2288	
R1639	R1689	R1739	R1789	R1839	R1889	R1939	R1989	R2039	R2089	R2139	R2189	R2239	R2289	

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis	9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	Signal details
R1640	R1690	R1740	R1790	R1840	R1890	R1940	R1990	R2040	R2090	R2140	R2190	R2240	R2290	
R1641	R1691	R1741	R1791	R1841	R1891	R1941	R1991	R2041	R2091	R2141	R2191	R2241	R2291	
R1642	R1692	R1742	R1792	R1842	R1892	R1942	R1992	R2042	R2092	R2142	R2192	R2242	R2292	
R1643	R1693	R1743	R1793	R1843	R1893	R1943	R1993	R2043	R2093	R2143	R2193	R2243	R2293	
R1644	R1694	R1744	R1794	R1844	R1894	R1944	R1994	R2044	R2094	R2144	R2194	R2244	R2294	
R1645	R1695	R1745	R1795	R1845	R1895	R1945	R1995	R2045	R2095	R2145	R2195	R2245	R2295	
R1646	R1696	R1746	R1796	R1846	R1896	R1946	R1996	R2046	R2096	R2146	R2196	R2246	R2296	
R1647	R1697	R1747	R1797	R1847	R1897	R1947	R1997	R2047	R2097	R2147	R2197	R2247	R2297	
R1648	R1698	R1748	R1798	R1848	R1898	R1948	R1998	R2048	R2098	R2148	R2198	R2248	R2298	
R1649	R1699	R1749	R1799	R1849	R1899	R1949	R1999	R2049	R2099	R2149	R2199	R2249	R2299	

Controller–>PLC (Spindle command) **Table 4-2-7**

1st spindle	2nd spindle	3rd spindle	4th spindle	5th spindle	6th spindle	7th spindle	Signal details
R3000	R3030	R3060	R3090	R3120	R3150	R3180	Spindle command rotation speed input
R3001	R3031	R3061	R3091	R3121	R3151	R3181	
R3002	R3032	R3062	R3092	R3122	R3152	R3182	Spindle command final data
R3003	R3033	R3063	R3093	R3123	R3153	R3183	(Rotation speed)
R3004	R3034	R3064	R3094	R3124	R3154	R3184	Spindle command final data
R3005	R3035	R3065	R3095	R3125	R3155	R3185	(12-bit binary)
R3006	R3036	R3066	R3096	R3126	R3156	R3186	Spindle actual speed
R3007	R3037	R3067	R3097	R3127	R3157	R3187	
R3008	R3038	R3068	R3098	R3128	R3158	R3188	
R3009	R3039	R3069	R3099	R3129	R3159	R3189	

1st spindle	2nd spindle	3rd spindle	4th spindle	5th spindle	6th spindle	7th spindle	Signal details
R3010	R3040	R3070	R3100	R3130	R3160	R3190	Spindle load
R3011	R3041	R3071	R3101	R3131	R3161	R3191	
R3012	R3042	R3072	R3102	R3132	R3162	R3192	
R3013	R3043	R3073	R3103	R3133	R3163	R3193	
R3014	R3044	R3074	R3104	R3134	R3164	R3194	
R3015	R3045	R3075	R3105	R3135	R3165	R3195	
R3016	R3046	R3076	R3106	R3136	R3166	R3196	
R3017	R3047	R3077	R3107	R3137	R3167	R3197	
R3018	R3048	R3078	R3108	R3138	R3168	R3198	
R3019	R3049	R3079	R3109	R3139	R3169	R3199	

1st spindle	2nd spindle	3rd spindle	4th spindle	5th spindle	6th spindle	7th spindle	Signal details
R3020	R3050	R3080	R3110	R3140	R3170	R3200	
R3021	R3051	R3081	R3111	R3141	R3171	R3201	
R3022	R3052	R3082	R3112	R3142	R3172	R3202	
R3023	R3053	R3083	R3113	R3143	R3173	R3203	
R3024	R3054	R3084	R3114	R3144	R3174	R3204	
R3025	R3055	R3085	R3115	R3145	R3175	R3205	
R3026	R3056	R3086	R3116	R3146	R3176	R3206	
R3027	R3057	R3087	R3117	R3147	R3177	R3207	
R3028	R3058	R3088	R3118	R3148	R3178	R3208	
R3029	R3059	R3089	R3119	R3149	R3179	R3209	

Controller->PLC (MR-J2-CT control status) Table 4-2-8

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	Signal details
R3500	R3504	R3508	R3512	R3516	R3520	R3524	J2CT control status 4
R3501	R3505	R3509	R3513	R3517	R3521	R3525	J2CT control status 3
R3502	R3506	R3510	R3514	R3518	R3522	R3526	J2CT control status 2
R3503	R3507	R3511	R3515	R3519	R3523	R3527	J2CT control status 1
R3556							Another control status (common to all axes)

Controller->PLC (Index control axis status)

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	Signal details
R3560	R3565	R3570	R3575	R3580	R3585	R3590	Control status 1
R3561	R3566	R3571	R3576	R3581	R3586	R3591	Control status 2
R3562	R3567	R3572	R3577	R3582	R3587	R3592	Control status 3
R3563	R3568	R3573	R3578	R3583	R3588	R3593	Control status 4
R3564	R3569	R3574	R3579	R3584	R3589	R3594	Control status 5

PLC->Controller (Common to system) **Table 4-3-1**

Device	Abbrev.	Signal details
Y410		
Y411		
Y412		
Y413		
Y414	RHD1	Integration time input 1
Y415	RHD2	Integration time input 2
Y416		
Y417	TMAC	T macro ignore

Device	Abbrev.	Signal details
Y418	*KEY1	Data protect key 1
Y419	*KEY2	Data protect key 2
Y41A	*KEY3	Data protect key 3
Y41B		
Y41C		
Y41D	CRTFN	CRT changeover complete
Y41E	DISP1	Display changeover $1
Y41F	DISP2	Display changeover $2

Device	Abbrev.	Signal details
Y420	TSTIN	Tool Registration screen setting prohibited
Y421		
Y422		
Y423		
Y424		
Y425		
Y426		Automatic power OFF
Y427	QEMG	PLC emergency stop

Device	Abbrev.	Signal details
Y428	DOOR1	Door open
Y429	DOOR2	Door open II
Y42A	SPVC	(Spindle speed monitor)
Y42B		
Y42C	RPN	Remote program input
Y42D	PCH1	PLC axis 1st handle valid
Y42E	PCH2	PLC axis 2nd handle valid
Y42F	PCH3	PLC axis 3rd handle valid

Device	Abbrev.	Signal details
Y430	SPSYC	Spindle synchronization cancel
Y431	SPCMPC	Chuck close
Y432	SPSY	Spindle synchronous control
Y433	SPPHS	Spindle phase synchronous control
Y434	SPSDR	Spindle synchronous rotation direction
Y435	SSPHM	Phase shift calculation request
Y436	SSPHF	Phase offset request
Y437	SPDRPO	Error temporary cancel

Device	Abbrev.	Signal details
Y438	*PCD1	PLC axis near point detect 1
Y439	*PCD2	PLC axis near point detect 2
Y43A	*PCD3	PLC axis near point detect 3
Y43B	*PCD4	PLC axis near point detect 4
Y43C	*PCD5	PLC axis near point detect 5
Y43D	*PCD6	PLC axis near point detect 6
Y43E	*PCD7	PLC axis near point detect 7
Y43F		

PLC->Controller (Axis state signal) **Table 4-3-2**

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis	9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	B	Signal details
Y440	Y470	Y4A0	Y4D0	Y500	Y530	Y560	Y590	Y5C0	Y5F0	Y620	Y650	Y680	Y6B0		Control axis removal
Y441	Y471	Y4A1	Y4D1	Y501	Y531	Y561	Y591	Y5C1	Y5F1	Y621	Y651	Y681	Y6B1	*	Servo OFF
Y442	Y472	Y4A2	Y4D2	Y502	Y532	Y562	Y592	Y5C2	Y5F2	Y622	Y652	Y682	Y6B2		Mirror image
Y443	Y473	Y4A3	Y4D3	Y503	Y533	Y563	Y593	Y5C3	Y5F3	Y623	Y653	Y683	Y6B3	*	External deceleration +
Y444	Y474	Y4A4	Y4D4	Y504	Y534	Y564	Y594	Y5C4	Y5F4	Y624	Y654	Y684	Y6B4	*	External deceleration -
Y445	Y475	Y4A5	Y4D5	Y505	Y535	Y565	Y595	Y5C5	Y5F5	Y625	Y655	Y685	Y6B5	*	Auto interlock +
Y446	Y476	Y4A6	Y4D6	Y506	Y536	Y566	Y596	Y5C6	Y5F6	Y626	Y656	Y686	Y6B6	*	Auto interlock -
Y447	Y477	Y4A7	Y4D7	Y507	Y537	Y567	Y597	Y5C7	Y5F7	Y627	Y657	Y687	Y6B7	*	Manual interlock +
Y448	Y478	Y4A8	Y4D8	Y508	Y538	Y568	Y598	Y5C8	Y5F8	Y628	Y658	Y688	Y6B8	*	Manual interlock -
Y449	Y479	Y4A9	Y4D9	Y509	Y539	Y569	Y599	Y5C9	Y5F9	Y629	Y659	Y689	Y6B9		Auto machine lock
Y44A	Y47A	Y4AA	Y4DA	Y50A	Y53A	Y56A	Y59A	Y5CA	Y5FA	Y62A	Y65A	Y68A	Y6BA		Manual machine lock
Y44B	Y47B	Y4AB	Y4DB	Y50B	Y53B	Y56B	Y59B	Y5CB	Y5FB	Y62B	Y65B	Y68B	Y6BB		Feed axis select +
Y44C	Y47C	Y4AC	Y4DC	Y50C	Y53C	Y56C	Y59C	Y5CC	Y5FC	Y62C	Y65C	Y68C	Y6BC		Feed axis select -
Y44D	Y47D	Y4AD	Y4DD	Y50D	Y53D	Y56D	Y59D	Y5CD	Y5FD	Y62D	Y65D	Y68D	Y6BD		Manual/Auto simultaneous valid
Y44E	Y47E	Y4AE	Y4DE	Y50E	Y53E	Y56E	Y59E	Y5CE	Y5FE	Y62E	Y65E	Y68E	Y6BE		Control axis removal 2
Y44F	Y47F	Y4AF	Y4DF	Y50F	Y53F	Y56F	Y59F	Y5CF	Y5FF	Y62F	Y65F	Y68F	Y6BF		

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis	9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	B	Signal details
Y450	Y480	Y4B0	Y4E0	Y510	Y540	Y570	Y5A0	Y5D0	Y600	Y630	Y660	Y690	Y6C0		Current limit changeover
Y451	Y481	Y4B1	Y4E1	Y511	Y541	Y571	Y5A1	Y5D1	Y601	Y631	Y661	Y691	Y6C1		Droop release request
Y452	Y482	Y4B2	Y4E2	Y512	Y542	Y572	Y5A2	Y5D2	Y602	Y632	Y662	Y692	Y6C2		Zero point initialization mode
Y453	Y483	Y4B3	Y4E3	Y513	Y543	Y573	Y5A3	Y5D3	Y603	Y633	Y663	Y693	Y6C3		Zero point initialization start
Y454	Y484	Y4B4	Y4E4	Y514	Y544	Y574	Y5A4	Y5D4	Y604	Y634	Y664	Y694	Y6C4		Each axis reference point return
Y455	Y485	Y4B5	Y4E5	Y515	Y545	Y575	Y5A5	Y5D5	Y605	Y635	Y665	Y695	Y6C5		Unclamp complete
Y456	Y486	Y4B6	Y4E6	Y516	Y546	Y576	Y5A6	Y5D6	Y606	Y636	Y666	Y696	Y6C6		
Y457	Y487	Y4B7	Y4E7	Y517	Y547	Y577	Y5A7	Y5D7	Y607	Y637	Y667	Y697	Y6C7		
Y458	Y488	Y4B8	Y4E8	Y518	Y548	Y578	Y5A8	Y5D8	Y608	Y638	Y668	Y698	Y6C8		
Y459	Y489	Y4B9	Y4E9	Y519	Y549	Y579	Y5A9	Y5D9	Y609	Y639	Y669	Y699	Y6C9		
Y45A	Y48A	Y4BA	Y4EA	Y51A	Y54A	Y57A	Y5AA	Y5DA	Y60A	Y63A	Y66A	Y69A	Y6CA		
Y45B	Y48B	Y4BB	Y4EB	Y51B	Y54B	Y57B	Y5AB	Y5DB	Y60B	Y63B	Y66B	Y69B	Y6CB		
Y45C	Y48C	Y4BC	Y4EC	Y51C	Y54C	Y57C	Y5AC	Y5DC	Y60C	Y63C	Y66C	Y69C	Y6CC		
Y45D	Y48D	Y4BD	Y4ED	Y51D	Y54D	Y57D	Y5AD	Y5DD	Y60D	Y63D	Y66D	Y69D	Y6CD		
Y45E	Y48E	Y4BE	Y4EE	Y51E	Y54E	Y57E	Y5AE	Y5DE	Y60E	Y63E	Y66E	Y69E	Y6CE		
Y45F	Y48F	Y4BF	Y4EF	Y51F	Y54F	Y57F	Y5AF	Y5DF	Y60F	Y63F	Y66F	Y69F	Y6CF		

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis	9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	B	Signal details
Y460	Y490	Y4C0	Y4F0	Y520	Y550	Y580	Y5B0	Y5E0	Y610	Y640	Y670	Y6A0	Y6D0		
Y461	Y491	Y4C1	Y4F1	Y521	Y551	Y581	Y5B1	Y5E1	Y611	Y641	Y671	Y6A1	Y6D1		
Y462	Y492	Y4C2	Y4F2	Y522	Y552	Y582	Y5B2	Y5E2	Y612	Y642	Y672	Y6A2	Y6D2		
Y463	Y493	Y4C3	Y4F3	Y523	Y553	Y583	Y5B3	Y5E3	Y613	Y643	Y673	Y6A3	Y6D3		
Y464	Y494	Y4C4	Y4F4	Y524	Y554	Y584	Y5B4	Y5E4	Y614	Y644	Y674	Y6A4	Y6D4		
Y465	Y495	Y4C5	Y4F5	Y525	Y555	Y585	Y5B5	Y5E5	Y615	Y645	Y675	Y6A5	Y6D5		
Y466	Y496	Y4C6	Y4F6	Y526	Y556	Y586	Y5B6	Y5E6	Y616	Y646	Y676	Y6A6	Y6D6		
Y467	Y497	Y4C7	Y4F7	Y527	Y557	Y587	Y5B7	Y5E7	Y617	Y647	Y677	Y6A7	Y6D7		
Y468	Y498	Y4C8	Y4F8	Y528	Y558	Y588	Y5B8	Y5E8	Y618	Y648	Y678	Y6A8	Y6D8		
Y469	Y499	Y4C9	Y4F9	Y529	Y559	Y589	Y5B9	Y5E9	Y619	Y649	Y679	Y6A9	Y6D9		
Y46A	Y49A	Y4CA	Y4FA	Y52A	Y55A	Y58A	Y5BA	Y5EA	Y61A	Y64A	Y67A	Y6AA	Y6DA		
Y46B	Y49B	Y4CB	Y4FB	Y52B	Y55B	Y58B	Y5BB	Y5EB	Y61B	Y64B	Y67B	Y6AB	Y6DB		
Y46C	Y49C	Y4CC	Y4FC	Y52C	Y55C	Y58C	Y5BC	Y5EC	Y61C	Y64C	Y67C	Y6AC	Y6DC		
Y46D	Y49D	Y4CD	Y4FD	Y52D	Y55D	Y58D	Y5BD	Y5ED	Y61D	Y64D	Y67D	Y6AD	Y6DD		
Y46E	Y49E	Y4CE	Y4FE	Y52E	Y55E	Y58E	Y5BE	Y5EE	Y61E	Y64E	Y67E	Y6AE	Y6DE		
Y46F	Y49F	Y4CF	Y4FF	Y52F	Y55F	Y58F	Y5BF	Y5EF	Y61F	Y64F	Y67F	Y6AF	Y6DF		

PLC->Controller (Part system state signal) **Table 4-3-3**

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Abbrev.	Signal details
Y700	Y7E0	Y8C0	Y9A0	YA80	YB60	YC40	J	Jog mode
Y701	Y7E1	Y8C1	Y9A1	YA81	YB61	YC41	H	Handle mode
Y702	Y7E2	Y8C2	Y9A2	YA82	YB62	YC42	S	Incremental mode
Y703	Y7E3	Y8C3	Y9A3	YA83	YB63	YC43	PTP	Manual random feed mode
Y704	Y7E4	Y8C4	Y9A4	YA84	YB64	YC44	ZRN	Reference point return mode
Y705	Y7E5	Y8C5	Y9A5	YA85	YB65	YC45	AST	Auto initialization mode
Y706	Y7E6	Y8C6	Y9A6	YA86	YB66	YC46		
Y707	Y7E7	Y8C7	Y9A7	YA87	YB67	YC47		
Y708	Y7E8	Y8C8	Y9A8	YA88	YB68	YC48	MEM	Memory mode
Y709	Y7E9	Y8C9	Y9A9	YA89	YB69	YC49		
Y70A	Y7EA	Y8CA	Y9AA	YA8A	YB6A	YC4A		
Y70B	Y7EB	Y8CB	Y9AB	YA8B	YB6B	YC4B	D	MDI mode
Y70C	Y7EC	Y8CC	Y9AC	YA8C	YB6C	YC4C		
Y70D	Y7ED	Y8CD	Y9AD	YA8D	YB6D	YC4D		
Y70E	Y7EE	Y8CE	Y9AE	YA8E	YB6E	YC4E		
Y70F	Y7EF	Y8CF	Y9AF	YA8F	YB6F	YC4F		

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Abbrev.	Signal details
Y710	Y7F0	Y8D0	Y9B0	YA90	YB70	YC50	ST	Auto operation "start" command
Y711	Y7F1	Y8D1	Y9B1	YA91	YB71	YC51	*SP	Auto operation "pause" command
Y712	Y7F2	Y8D2	Y9B2	YA92	YB72	YC52	SBK	Single block
Y713	Y7F3	Y8D3	Y9B3	YA93	YB73	YC53	*BSL	Block start interlock
Y714	Y7F4	Y8D4	Y9B4	YA94	YB74	YC54	*CSL	Cutting block start interlock
Y715	Y7F5	Y8D5	Y9B5	YA95	YB75	YC55	DRN	Dry run
Y716	Y7F6	Y8D6	Y9B6	YA96	YB76	YC56		
Y717	Y7F7	Y8D7	Y9B7	YA97	YB77	YC57	ERD	Error detect
Y718	Y7F8	Y8D8	Y9B8	YA98	YB78	YC58	NRST1	NC reset 1
Y719	Y7F9	Y8D9	Y9B9	YA99	YB79	YC59	NRST2	NC reset 2
Y71A	Y7FA	Y8DA	Y9BA	YA9A	YB7A	YC5A	RRW	Reset & rewind
Y71B	Y7FB	Y8DB	Y9BB	YA9B	YB7B	YC5B	*CDZ	Chamfering
Y71C	Y7FC	Y8DC	Y9BC	YA9C	YB7C	YC5C	ARST	Auto restart
Y71D	Y7FD	Y8DD	Y9BD	YA9D	YB7D	YC5D		
Y71E	Y7FE	Y8DE	Y9BE	YA9E	YB7E	YC5E	FIN1	M function finish 1
Y71F	Y7FF	Y8DF	Y9BF	YA9F	YB7F	YC5F	FIN2	M function finish 2

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Abbrev.	Signal details
Y720	Y800	Y8E0	Y9C0	YAA0	YB80	YC60	TLM	Tool length measurement 1
Y721	Y801	Y8E1	Y9C1	YAA1	YB81	YC61	TLMS	Tool length measurement 2 (L system)
Y722	Y802	Y8E2	Y9C2	YAA2	YB82	YC62		Synchronized correction mode
Y723	Y803	Y8E3	Y9C3	YAA3	YB83	YC63		
Y724	Y804	Y8E4	Y9C4	YAA4	YB84	YC64		
Y725	Y805	Y8E5	Y9C5	YAA5	YB85	YC65	UIT	Macro interrupt
Y726	Y806	Y8E6	Y9C6	YAA6	YB86	YC66	RT	Rapid traverse
Y727	Y807	Y8E7	Y9C7	YAA7	YB87	YC67		Reverse run
Y728	Y808	Y8E8	Y9C8	YAA8	YB88	YC68	ABS	Manual absolute
Y729	Y809	Y8E9	Y9C9	YAA9	YB89	YC69		
Y72A	Y80A	Y8EA	Y9CA	YAAA	YB8A	YC6A		
Y72B	Y80B	Y8EB	Y9CB	YAAB	YB8B	YC6B	CRQ	Recalculation request
Y72C	Y80C	Y8EC	Y9CC	YAAC	YB8C	YC6C	PDISP	Program display during operation
Y72D	Y80D	Y8ED	Y9CD	YAAD	YB8D	YC6D	BDT1	Optional block skip
Y72E	Y80E	Y8EE	Y9CE	YAAE	YB8E	YC6E		
Y72F	Y80F	Y8EF	Y9CF	YAAF	YB8F	YC6F		

PLC->Controller (Part system state signal) **Table 4-3-4**

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Abbrev.	Signal details
Y730	Y810	Y8F0	Y9D0	YAB0	YB90	YC70	ZSL1	Reference point position select 1
Y731	Y811	Y8F1	Y9D1	YAB1	YB91	YC71	ZSL2	Reference point position select 2
Y732	Y812	Y8F2	Y9D2	YAB2	YB92	YC72		
Y733	Y813	Y8F3	Y9D3	YAB3	YB93	YC73		
Y734	Y814	Y8F4	Y9D4	YAB4	YB94	YC74		
Y735	Y815	Y8F5	Y9D5	YAB5	YB95	YC75		
Y736	Y816	Y8F6	Y9D6	YAB6	YB96	YC76		
Y737	Y817	Y8F7	Y9D7	YAB7	YB97	YC77	M	Reference point position select method
Y738	Y818	Y8F8	Y9D8	YAB8	YB98	YC78		
Y739	Y819	Y8F9	Y9D9	YAB9	YB99	YC79		
Y73A	Y81A	Y8FA	Y9DA	YABA	YB9A	YC7A		
Y73B	Y81B	Y8FB	Y9DB	YABB	YB9B	YC7B		
Y73C	Y81C	Y8FC	Y9DC	YABC	YB9C	YC7C		
Y73D	Y81D	Y8FD	Y9DD	YABD	YB9D	YC7D		
Y73E	Y81E	Y8FE	Y9DE	YABE	YB9E	YC7E		
Y73F	Y81F	Y8FF	Y9DF	YABF	YB9F	YC7F		

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Abbrev.	Signal details
Y740	Y820	Y900	Y9E0	YAC0	YBA0	YC80	HS11	1st handle axis No. 1
Y741	Y821	Y901	Y9E1	YAC1	YBA1	YC81	HS12	1st handle axis No. 2
Y742	Y822	Y902	Y9E2	YAC2	YBA2	YC82	HS14	1st handle axis No. 4
Y743	Y823	Y903	Y9E3	YAC3	YBA3	YC83	HS18	1st handle axis No. 8
Y744	Y824	Y904	Y9E4	YAC4	YBA4	YC84	HS116	1st handle axis No. 16
Y745	Y825	Y905	Y9E5	YAC5	YBA5	YC85		
Y746	Y826	Y906	Y9E6	YAC6	YBA6	YC86		
Y747	Y827	Y907	Y9E7	YAC7	YBA7	YC87	HS1S	1st handle axis valid
Y748	Y828	Y908	Y9E8	YAC8	YBA8	YC88	HS21	2nd handle axis No. 1
Y749	Y829	Y909	Y9E9	YAC9	YBA9	YC89	HS22	2nd handle axis No.2
Y74A	Y82A	Y90A	Y9EA	YACA	YBAA	YC8A	HS24	2nd handle axis No. 4
Y74B	Y82B	Y90B	Y9EB	YACB	YBAB	YC8B	HS28	2nd handle axis No. 8
Y74C	Y82C	Y90C	Y9EC	YACC	YBAC	YC8C	HS216	2nd handle axis No. 16
Y74D	Y82D	Y90D	Y9ED	YACD	YBAD	YC8D		
Y74E	Y82E	Y90E	Y9EE	YACE	YBAE	YC8E		
Y74F	Y82F	Y90F	Y9EF	YACF	YBAF	YC8F	HS2S	2nd handle axis valid

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Abbrev.	Signal details
Y750	Y830	Y910	Y9F0	YAD0	YBB0	YC90	HS31	3rd handle axis No. 1
Y751	Y831	Y911	Y9F1	YAD1	YBB1	YC91	HS32	3rd handle axis No. 2
Y752	Y832	Y912	Y9F2	YAD2	YBB2	YC92	HS34	3rd handle axis No. 4
Y753	Y833	Y913	Y9F3	YAD3	YBB3	YC93	HS38	3rd handle axis No. 8
Y754	Y834	Y914	Y9F4	YAD4	YBB4	YC94	HS316	3rd handle axis No. 16
Y755	Y835	Y915	Y9F5	YAD5	YBB5	YC95		
Y756	Y836	Y916	Y9F6	YAD6	YBB6	YC96		
Y757	Y837	Y917	Y9F7	YAD7	YBB7	YC97	HS3S	3rd handle axis valid
Y758	Y838	Y918	Y9F8	YAD8	YBB8	YC98	OVC	Override cancel
Y759	Y839	Y919	Y9F9	YAD9	YBB9	YC99	OVSL	Manual override valid
Y75A	Y83A	Y91A	Y9FA	YADA	YBBA	YC9A	AFL	Miscellaneous function lock
Y75B	Y83B	Y91B	Y9FB	YADB	YBBB	YC9B		
Y75C	Y83C	Y91C	Y9FC	YADC	YBBC	YC9C	TRV	Tap retract
Y75D	Y83D	Y91D	Y9FD	YADD	YBBD	YC9D	RTN	Reference point retract
Y75E	Y83E	Y91E	Y9FE	YADE	YBBE	YC9E		
Y75F	Y83F	Y91F	Y9FF	YADF	YBBF	YC9F		

PLC->Controller (Part system state signal) **Table 4-3-5**

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Abbrev.	Signal details
Y760	Y840	Y920	YA00	YAE0	YBC0	YCA0	*FV1	Cutting feedrate override 1
Y761	Y841	Y921	YA01	YAE1	YBC1	YCA1	*FV2	Cutting feedrate override 2
Y762	Y842	Y922	YA02	YAE2	YBC2	YCA2	*FV4	Cutting feedrate override 4
Y763	Y843	Y923	YA03	YAE3	YBC3	YCA3	*FV8	Cutting feedrate override 8
Y764	Y844	Y924	YA04	YAE4	YBC4	YCA4	*FV16	Cutting feedrate override 16
Y765	Y845	Y925	YA05	YAE5	YBC5	YCA5		
Y766	Y846	Y926	YA06	YAE6	YBC6	YCA6	FV2E	2nd cutting feedrate override valid
Y767	Y847	Y927	YA07	YAE7	YBC7	YCA7	FVS	Cutting feedrate override method select
Y768	Y848	Y928	YA08	YAE8	YBC8	YCA8	ROV1	Rapid traverse speed override 1
Y769	Y849	Y929	YA09	YAE9	YBC9	YCA9	ROV2	Rapid traverse speed override 2
Y76A	Y84A	Y92A	YA0A	YAEA	YBCA	YCAA		
Y76B	Y84B	Y92B	YA0B	YAEB	YBCB	YCAB		
Y76C	Y84C	Y92C	YA0C	YAEC	YBCC	YCAC		
Y76D	Y84D	Y92D	YA0D	YAED	YBCD	YCAD		
Y76E	Y84E	Y92E	YA0E	YAEE	YBCE	YCAE		
Y76F	Y84F	Y92F	YA0F	YAEF	YBCF	YCAF	ROVS	Rapid traverse speed override method select

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Abbrev.	Signal details
Y770	Y850	Y930	YA10	YAF0	YBD0	YCB0	*JV1	Manual feedrate 1
Y771	Y851	Y931	YA11	YAF1	YBD1	YCB1	*JV2	Manual feedrate 2
Y772	Y852	Y932	YA12	YAF2	YBD2	YCB2	*JV4	Manual feedrate 4
Y773	Y853	Y933	YA13	YAF3	YBD3	YCB3	*JV8	Manual feedrate 8
Y774	Y854	Y934	YA14	YAF4	YBD4	YCB4	*JV16	Manual feedrate 16
Y775	Y855	Y935	YA15	YAF5	YBD5	YCB5		
Y776	Y856	Y936	YA16	YAF6	YBD6	YCB6		
Y777	Y857	Y937	YA17	YAF7	YBD7	YCB7	JVS	Manual feedrate method select
Y778	Y858	Y938	YA18	YAF8	YBD8	YCB8	PCF1	Feedrate least increment 1
Y779	Y859	Y939	YA19	YAF9	YBD9	YCB9	PCF2	Feedrate least increment 2
Y77A	Y85A	Y93A	YA1A	YAFA	YBDA	YCBA	JSYN	Jog synchronous feed valid
Y77B	Y85B	Y93B	YA1B	YAFB	YBDB	YCBB	JHAN	Jog•handle simultaneous
Y77C	Y85C	Y93C	YA1C	YAFC	YBDC	YCBC		
Y77D	Y85D	Y93D	YA1D	YAFD	YBDD	YCBD	ILMT1	Current limit mode 1
Y77E	Y85E	Y93E	YA1E	YAFE	YBDE	YCBE	ILMT2	Current limit mode 2
Y77F	Y85F	Y93F	YA1F	YAFF	YBDF	YCBF		

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Abbrev.	Signal details
Y780	Y860	Y940	YA20	YB00	YBE0	YCC0	MP1	Handle feed/incremental feed multiplication 1
Y781	Y861	Y941	YA21	YB01	YBE1	YCC1	MP2	Handle feed/incremental feed multiplication 2
Y782	Y862	Y942	YA22	YB02	YBE2	YCC2	MP4	Handle feed/incremental feed multiplication 4
Y783	Y863	Y943	YA23	YB03	YBE3	YCC3		
Y784	Y864	Y944	YA24	YB04	YBE4	YCC4		
Y785	Y865	Y945	YA25	YB05	YBE5	YCC5		
Y786	Y866	Y946	YA26	YB06	YBE6	YCC6	MPP	Multiplication independent
Y787	Y867	Y947	YA27	YB07	YBE7	YCC7	MPS	Handle feed/incremental feed multiplication method select
Y788	Y868	Y948	YA28	YB08	YBE8	YCC8	TAL1	Tool alarm 1/Tool-skip tool
Y789	Y869	Y949	YA29	YB09	YBE9	YCC9	TAL2	Tool alarm 2 (M system)
Y78A	Y86A	Y94A	YA2A	YB0A	YBEA	YCCA	TCEF	Data count valid
Y78B	Y86B	Y94B	YA2B	YB0B	YBEB	YCCB	TLF1	Tool life management input (M system)
Y78C	Y86C	Y94C	YA2C	YB0C	YBEC	YCCC	TRST	Tool change reset (L system)
Y78D	Y86D	Y94D	YA2D	YB0D	YBED	YCCD		
Y78E	Y86E	Y94E	YA2E	YB0E	YBEE	YCCE		
Y78F	Y86F	Y94F	YA2F	YB0F	YBEF	YCCF		

PLC->Controller (Part system state signal) **Table 4-3-6**

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Abbrev.	Signal details
Y790	Y870	Y950	YA30	YB10	YBF0	YCD0	CX11	Manual random feed 1st axis Axis No.1
Y791	Y871	Y951	YA31	YB11	YBF1	YCD1	CX12	Manual random feed 1st axis Axis No.2
Y792	Y872	Y952	YA32	YB12	YBF2	YCD2	CX14	Manual random feed 1st axis Axis No.4
Y793	Y873	Y953	YA33	YB13	YBF3	YCD3	CX18	Manual random feed 1st axis Axis No.8
Y794	Y874	Y954	YA34	YB14	YBF4	YCD4	CX116	Manual random feed 1st axis Axis No.16
Y795	Y875	Y955	YA35	YB15	YBF5	YCD5		
Y796	Y876	Y956	YA36	YB16	YBF6	YCD6		
Y797	Y877	Y957	YA37	YB17	YBF7	YCD7	CX1S	Manual random feed 1st axis valid
Y798	Y878	Y958	YA38	YB18	YBF8	YCD8	CX21	Manual random feed 2nd axis Axis No.1
Y799	Y879	Y959	YA39	YB19	YBF9	YCD9	CX22	Manual random feed 2nd axis Axis No.2
Y79A	Y87A	Y95A	YA3A	YB1A	YBFA	YCDA	CX24	Manual random feed 2nd axis Axis No.4
Y79B	Y87B	Y95B	YA3B	YB1B	YBFB	YCDB	CX28	Manual random feed 2nd axis Axis No.8
Y79C	Y87C	Y95C	YA3C	YB1C	YBFC	YCDC	CX216	Manual random feed 2nd axis Axis No.16
Y79D	Y87D	Y95D	YA3D	YB1D	YBFD	YCDD		
Y79E	Y87E	Y95E	YA3E	YB1E	YBFE	YCDE		
Y79F	Y87F	Y95F	YA3F	YB1F	YBFF	YCDF	CX2S	Manual random feed 2nd axis valid

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Abbrev.	Signal details
Y7A0	Y880	Y960	YA40	YB20	YC00	YCE0	CX31	Manual random feed 3rd axis Axis No.1
Y7A1	Y881	Y961	YA41	YB21	YC01	YCE1	CX32	Manual random feed 3rd axis Axis No.2
Y7A2	Y882	Y962	YA42	YB22	YC02	YCE2	CX34	Manual random feed 3rd axis Axis No.4
Y7A3	Y883	Y963	YA43	YB23	YC03	YCE3	CX38	Manual random feed 3rd axis Axis No.8
Y7A4	Y884	Y964	YA44	YB24	YC04	YCE4	CX316	Manual random feed 3rd axis Axis No.16
Y7A5	Y885	Y965	YA45	YB25	YC05	YCE5		
Y7A6	Y886	Y966	YA46	YB26	YC06	YCE6		
Y7A7	Y887	Y967	YA47	YB27	YC07	YCE7	CX3S	Manual random feed 3rd axis valid
Y7A8	Y888	Y968	YA48	YB28	YC08	YCE8	CXS1	Smoothing off
Y7A9	Y889	Y969	YA49	YB29	YC09	YCE9	CXS2	Axis independent
Y7AA	Y88A	Y96A	YA4A	YB2A	YC0A	YCEA	CXS3	EX.F/MODAL.F
Y7AB	Y88B	Y96B	YA4B	YB2B	YC0B	YCEB	CXS4	G0/G1
Y7AC	Y88C	Y96C	YA4C	YB2C	YC0C	YCEC	CXS5	MC/WK
Y7AD	Y88D	Y96D	YA4D	YB2D	YC0D	YCED	CXS6	ABS/INC
Y7AE	Y88E	Y96E	YA4E	YB2E	YC0E	YCEE	*CXS7	Stop
Y7AF	Y88F	Y96F	YA4F	YB2F	YC0F	YCEF	CXS8	Strobe

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Abbrev.	Signal details
Y7B0	Y890	Y970	YA50	YB30	YC10	YCF0	ZRIT	2nd reference point return interlock
Y7B1	Y891	Y971	YA51	YB31	YC11	YCF1	WM	Workpiece measurement
Y7B2	Y892	Y972	YA52	YB32	YC12	YCF2	RSST	Search & start
Y7B3	Y893	Y973	YA53	YB33	YC13	YCF3	MGEN	Magazine index complete valid
Y7B4	Y894	Y974	YA54	YB34	YC14	YCF4	SINPI	Orient complete ignore
Y7B5	Y895	Y975	YA55	YB35	YC15	YCF5	ZIGN	Z axis compensation ignore
Y7B6	Y896	Y976	YA56	YB36	YC16	YCF6		
Y7B7	Y897	Y977	YA57	YB37	YC17	YCF7		
Y7B8	Y898	Y978	YA58	YB38	YC18	YCF8		
Y7B9	Y899	Y979	YA59	YB39	YC19	YCF9		
Y7BA	Y89A	Y97A	YA5A	YB3A	YC1A	YCFA		
Y7BB	Y89B	Y97B	YA5B	YB3B	YC1B	YCFB		
Y7BC	Y89C	Y97C	YA5C	YB3C	YC1C	YCFC		
Y7BD	Y89D	Y97D	YA5D	YB3D	YC1D	YCFD		
Y7BE	Y89E	Y97E	YA5E	YB3E	YC1E	YCFE		
Y7BF	Y89F	Y97F	YA5F	YB3F	YC1F	YCFF		

PLC->Controller (Part system state signal) **Table 4-3-7**

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Abbrev.	Signal details
Y7C0	Y8A0	Y980	YA60	YB40	YC20	YD00		
Y7C1	Y8A1	Y981	YA61	YB41	YC21	YD01		
Y7C2	Y8A2	Y982	YA62	YB42	YC22	YD02		
Y7C3	Y8A3	Y983	YA63	YB43	YC23	YD03		
Y7C4	Y8A4	Y984	YA64	YB44	YC24	YD04		
Y7C5	Y8A5	Y985	YA65	YB45	YC25	YD05		
Y7C6	Y8A6	Y986	YA66	YB46	YC26	YD06		
Y7C7	Y8A7	Y987	YA67	YB47	YC27	YD07		
Y7C8	Y8A8	Y988	YA68	YB48	YC28	YD08		
Y7C9	Y8A9	Y989	YA69	YB49	YC29	YD09		
Y7CA	Y8AA	Y98A	YA6A	YB4A	YC2A	YD0A		
Y7CB	Y8AB	Y98B	YA6B	YB4B	YC2B	YD0B		
Y7CC	Y8AC	Y98C	YA6C	YB4C	YC2C	YD0C		
Y7CD	Y8AD	Y98D	YA6D	YB4D	YC2D	YD0D		
Y7CE	Y8AE	Y98E	YA6E	YB4E	YC2E	YD0E		
Y7CF	Y8AF	Y98F	YA6F	YB4F	YC2F	YD0F		

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Abbrev.	Signal details
Y7D0	Y8B0	Y990	YA70	YB50	YC30	YD10		
Y7D1	Y8B1	Y991	YA71	YB51	YC31	YD11		
Y7D2	Y8B2	Y992	YA72	YB52	YC32	YD12		
Y7D3	Y8B3	Y993	YA73	YB53	YC33	YD13		
Y7D4	Y8B4	Y994	YA74	YB54	YC34	YD14		
Y7D5	Y8B5	Y995	YA75	YB55	YC35	YD15		
Y7D6	Y8B6	Y996	YA76	YB56	YC36	YD16		
Y7D7	Y8B7	Y997	YA77	YB57	YC37	YD17		
Y7D8	Y8B8	Y998	YA78	YB58	YC38	YD18		
Y7D9	Y8B9	Y999	YA79	YB59	YC39	YD19		
Y7DA	Y8BA	Y99A	YA7A	YB5A	YC3A	YD1A		
Y7DB	Y8BB	Y99B	YA7B	YB5B	YC3B	YD1B		
Y7DC	Y8BC	Y99C	YA7C	YB5C	YC3C	YD1C		
Y7DD	Y8BD	Y99D	YA7D	YB5D	YC3D	YD1D		
Y7DE	Y8BE	Y99E	YA7E	YB5E	YC3E	YD1E		
Y7DF	Y8BF	Y99F	YA7F	YB5F	YC3F	YD1F		

PLC->Controller (Spindle state signal) **Table 4-3-8**

1st spindle	2nd spindle	3rd spindle	4th spindle	5th spindle	6th spindle	7th spindle	Abbrev.	Signal details
YD20	YD50	YD80	YDB0	YDE0	YE10	YE40		
YD21	YD51	YD81	YDB1	YDE1	YE11	YE41		
YD22	YD52	YD82	YDB2	YDE2	YE12	YE42		
YD23	YD53	YD83	YDB3	YDE3	YE13	YE43		
YD24	YD54	YD84	YDB4	YDE4	YE14	YE44		
YD25	YD55	YD85	YDB5	YDE5	YE15	YE45		
YD26	YD56	YD86	YDB6	YDE6	YE16	YE46	GFIN	Gear shift finish
YD27	YD57	YD87	YDB7	YDE7	YE17	YE47		
YD28	YD58	YD88	YDB8	YDE8	YE18	YE48	SP1	Spindle override 1
YD29	YD59	YD89	YDB9	YDE9	YE19	YE49	SP2	Spindle override 2
YD2A	YD5A	YD8A	YDBA	YDEA	YE1A	YE4A	SP4	Spindle override 4
YD2B	YD5B	YD8B	YDBB	YDEB	YE1B	YE4B		
YD2C	YD5C	YD8C	YDBC	YDEC	YE1C	YE4C		
YD2D	YD5D	YD8D	YDBD	YDED	YE1D	YE4D		
YD2E	YD5E	YD8E	YDBE	YDEE	YE1E	YE4E		
YD2F	YD5F	YD8F	YDBF	YDEF	YE1F	YE4F	SPS	Spindle override method select

1st spindle	2nd spindle	3rd spindle	4th spindle	5th spindle	6th spindle	7th spindle	Abbrev.	Signal details
YD30	YD60	YD90	YDC0	YDF0	YE20	YE50	GI1	Spindle gear select 1
YD31	YD61	YD91	YDC1	YDF1	YE21	YE51	GI2	Spindle gear select 2
YD32	YD62	YD92	YDC2	YDF2	YE22	YE52		
YD33	YD63	YD93	YDC3	YDF3	YE23	YE53		
YD34	YD64	YD94	YDC4	YDF4	YE24	YE54	SSTP	Spindle stop
YD35	YD65	YD95	YDC5	YDF5	YE25	YE55	SSFT	Spindle gear shift
YD36	YD66	YD96	YDC6	YDF6	YE26	YE56	SORC	Oriented spindle speed command
YD37	YD67	YD97	YDC7	YDF7	YE27	YE57		
YD38	YD68	YD98	YDC8	YDF8	YE28	YE58	SRN	Spindle forward run start
YD39	YD69	YD99	YDC9	YDF9	YE29	YE59	SRI	Spindle reverse run start
YD3A	YD6A	YD9A	YDCA	YDFA	YE2A	YE5A	TL1	Spindle torque limit 1
YD3B	YD6B	YD9B	YDCB	YDFB	YE2B	YE5B	TL2	Spindle torque limit 2
YD3C	YD6C	YD9C	YDCC	YDFC	YE2C	YE5C	WRN	Spindle forward run index
YD3D	YD6D	YD9D	YDCD	YDFD	YE2D	YE5D	WRI	Spindle reverse run index
YD3E	YD6E	YD9E	YDCE	YDFE	YE2E	YE5E	ORC	Spindle orient command
YD3F	YD6F	YD9F	YDCF	YDFF	YE2F	YE5F	LRSL	L coil selection

1st spindle	2nd spindle	3rd spindle	4th spindle	5th spindle	6th spindle	7th spindle	Abbrev.	Signal details
YD40	YD70	YDA0	YDD0	YE00	YE30	YE60	M1SL	1st spindle motor select
YD41	YD71	YDA1	YDD1	YE01	YE31	YE61	M2SL	2nd spindle motor select
YD42	YD72	YDA2	YDD2	YE02	YE32	YE62		
YD43	YD73	YDA3	YDD3	YE03	YE33	YE63		
YD44	YD74	YDA4	YDD4	YE04	YE34	YE64		
YD45	YD75	YDA5	YDD5	YE05	YE35	YE65		
YD46	YD76	YDA6	YDD6	YE06	YE36	YE66		
YD47	YD77	YDA7	YDD7	YE07	YE37	YE67		
YD48	YD78	YDA8	YDD8	YE08	YE38	YE68	ZPM	Spindle zero point memory
YD49	YD79	YDA9	YDD9	YE09	YE39	YE69		
YD4A	YD7A	YDAA	YDDA	YE0A	YE3A	YE6A		
YD4B	YD7B	YDAB	YDDB	YE0B	YE3B	YE6B		
YD4C	YD7C	YDAC	YDDC	YE0C	YE3C	YE6C		
YD4D	YD7D	YDAD	YDDD	YE0D	YE3D	YE6D		
YD4E	YD7E	YDAE	YDDE	YE0E	YE3E	YE6E		
YD4F	YD7F	YDAF	YDDF	YE0F	YE3F	YE6F		

As for the following signals, initial values at power ON are different depending on the model.
C6/C64 : “1” is set when the power is turned ON. If the following signals are not used, processing by PLC is not necessary.
C64T : “0” is set when the power is turned ON. If necessary, do process using PLC.

(1) Axis state signal

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis	9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	B	Signal details
Y441	Y471	Y4A1	Y4D1	Y501	Y531	Y561	Y591	Y5C1	Y5F1	Y621	Y651	Y681	Y6B1	*	Servo OFF
Y443	Y473	Y4A3	Y4D3	Y503	Y533	Y563	Y593	Y5C3	Y5F3	Y623	Y653	Y683	Y6B3	*	External deceleration +
Y444	Y474	Y4A4	Y4D4	Y504	Y534	Y564	Y594	Y5C4	Y5F4	Y624	Y654	Y684	Y6B4	*	External deceleration -
Y445	Y475	Y4A5	Y4D5	Y505	Y535	Y565	Y595	Y5C5	Y5F5	Y625	Y655	Y685	Y6B5	*	Auto interlock +
Y446	Y476	Y4A6	Y4D6	Y506	Y536	Y566	Y596	Y5C6	Y5F6	Y626	Y656	Y686	Y6B6	*	Auto interlock -
Y447	Y477	Y4A7	Y4D7	Y507	Y537	Y567	Y597	Y5C7	Y5F7	Y627	Y657	Y687	Y6B7	*	Manual interlock +
Y448	Y478	Y4A8	Y4D8	Y508	Y538	Y568	Y598	Y5C8	Y5F8	Y628	Y658	Y688	Y6B8	*	Manual interlock -

(2) Part system state signal

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Abbrev.	Signal details
Y711	Y7F1	Y8D1	Y9B1	YA91	YB71	YC51	*SP	Auto operation "pause" command
Y713	Y7F3	Y8D3	Y9B3	YA93	YB73	YC53	*BSL	Block start interlock
Y714	Y7F4	Y8D4	Y9B4	YA94	YB74	YC54	*CSL	Cutting block start interlock
Y71B	Y7FB	Y8DB	Y9BB	YA9B	YB7B	YC5B	*CDZ	Chamfering
Y728	Y808	Y8E8	Y9C8	YAA8	YB88	YC68	ABS	Manual absolute
Y760	Y840	Y920	YA00	YAE0	YBC0	YCA0	*FV1	Cutting feedrate override 1
Y762	Y842	Y922	YA02	YAE2	YBC2	YCA2	*FV4	Cutting feedrate override 4
Y764	Y844	Y924	YA04	YAE4	YBC4	YCA4	*FV16	Cutting feedrate override 16
Y774	Y854	Y934	YA14	YAF4	YBD4	YCB4	*JV16	Manual feedrate 16
Y7AE	Y88E	Y96E	YA4E	YB2E	YC0E	YCEE	*CXS7	Stop

PLC->Controller (System) **Table 4-4-1**

Device	Abbrev.	Signal details
R100	AO1	Analog output
R101	AO2	Analog output
R102	AO3	Analog output
R103	AO4	Analog output
R104		
R105		
R106		
R107		
R108		
R109		

Device	Abbrev.	Signal details
R110		Part system designation for TSRH command
R111		
R112		KEY OUT 1
R113		(Full key)
R114		(Base key)
R115		Power OFF indication device No.
R116		Data link stop
R117		Display part system changeover
R118		Alarm message I/F 1
R119		Alarm message I/F 2

Device	Abbrev.	Signal details
R120		Alarm message I/F 3
R121		Alarm message I/F 4
R122		Operator message I/F
R123		Response monitor timer
R124		User macro output #1132
R125		(Controller -> PLC)
R126		User macro output #1133
R127		(Controller -> PLC)
R128		User macro output #1134
R129		(Controller -> PLC)

Device	Abbrev.	Signal details
R130		User macro output #1135
R131		(Controller -> PLC)
R132		User PLC version code
R133		
R134		
R135		
R136		NC changeover
R137		Part system changeover
R138		PLC switch
R139		

Device	Abbrev.	Signal details
R140		1st axis index
R141		2nd axis index
R142		3rd axis index
R143		4th axis index
R144		5th axis index
R145		6th axis index
R146		7th axis index
R147		8th axis index
R148		9th axis index
R149		10th axis index

Device	Abbrev.	Signal details
R150		11th axis index
R151		12th axis index
R152		13th axis index
R153		14th axis index
R154		
R155		
R156		
R157		Spindle synchronous function basic spindle select
R158		Spindle synchronous function synchronous spindle select
R159		Spindle synchronous function phase shift amount

PLC->Controller (System) **Table 4-4-2**

Device	Abbrev.	Signal details
R160		User PLC version code (method 2)
R161		
R162		
R163		
R164		
R165		
R166		
R167		
R168		
R169		

Device	Abbrev.	Signal details
R170		
R171		
R172		
R173		
R174		
R175		
R176		
R177		
R178		
R179		

Device	Abbrev.	Signal details
R180		(APLC version)
R181		
R182		
R183		
R184		
R185		
R186		
R187		
R188		
R189		

Device	Abbrev.	Signal details
R190		Add-on (expansion) operation board output #1 Refer to Section "3.3 Allocation of machine input/output signals" for details.
R191		
R192		
R193		Add-on (expansion) operation board output #2 Refer to Section "3.3 Allocation of machine input/output signals" for details.
R194		
R195		
R196		Direct display Command
R197		Function menu
R198		Page
R199		Screen type

PLC->Controller (Data per part system) **Table 4-4-3**

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Signal details
R900	R1000	R1100	R1200	R1300	R1400	R1500	1st cutting feedrate override
R901	R1001	R1101	R1201	R1301	R1401	R1501	2nd cutting feedrate override
R902	R1002	R1102	R1202	R1302	R1402	R1502	Rapid traverse override
R903	R1003	R1103	R1203	R1303	R1403	R1503	
R904	R1004	R1104	R1204	R1304	R1404	R1504	Manual feedrate
R905	R1005	R1105	R1205	R1305	R1405	R1505	
R906	R1006	R1106	R1206	R1306	R1406	R1506	
R907	R1007	R1107	R1207	R1307	R1407	R1507	
R908	R1008	R1108	R1208	R1308	R1408	R1508	Handle 1 feed random multiplication/ Incremental feed random multiplication
R909	R1009	R1109	R1209	R1309	R1409	R1509	

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Signal details
R910	R1010	R1110	R1210	R1310	R1410	R1510	2nd handle feed random multiplication
R911	R1011	R1111	R1211	R1311	R1411	R1511	
R912	R1012	R1112	R1212	R1312	R1412	R1512	3rd handle feed random multiplication
R913	R1013	R1113	R1213	R1313	R1413	R1513	
R914	R1014	R1114	R1214	R1314	R1414	R1514	Manual random feed 1st axis movement data
R915	R1015	R1115	R1215	R1315	R1415	R1515	
R916	R1016	R1116	R1216	R1316	R1416	R1516	Manual random feed 2nd axis movement data
R917	R1017	R1117	R1217	R1317	R1417	R1517	
R918	R1018	R1118	R1218	R1318	R1418	R1518	Manual random feed 3rd axis movement data
R919	R1019	R1119	R1219	R1319	R1419	R1519	

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Signal details
R920	R1020	R1120	R1220	R1320	R1420	R1520	OT ignored
R921	R1021	R1121	R1221	R1321	R1421	R1521	Near-point ignored
R922	R1022	R1122	R1222	R1322	R1422	R1522	
R923	R1023	R1123	R1223	R1323	R1423	R1523	
R924	R1024	R1124	R1224	R1324	R1424	R1524	
R925	R1025	R1125	R1225	R1325	R1425	R1525	
R926	R1026	R1126	R1226	R1326	R1426	R1526	
R927	R1027	R1127	R1227	R1327	R1427	R1527	
R928	R1028	R1128	R1228	R1328	R1428	R1528	
R929	R1029	R1129	R1229	R1329	R1429	R1529	

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Signal details
R930	R1030	R1130	R1230	R1330	R1430	R1530	Tool group number designation
R931	R1031	R1131	R1231	R1331	R1431	R1531	Tool tip No.
R932	R1032	R1132	R1232	R1332	R1432	R1532	Synchronized control operation method
R933	R1033	R1133	R1233	R1333	R1433	R1533	Droop put out valid axis
R934	R1034	R1134	R1234	R1334	R1434	R1534	
R935	R1035	R1135	R1235	R1335	R1435	R1535	
R936	R1036	R1136	R1236	R1336	R1436	R1536	
R937	R1037	R1137	R1237	R1337	R1437	R1537	
R938	R1038	R1138	R1238	R1338	R1438	R1538	Search & start program No.
R939	R1039	R1139	R1239	R1339	R1439	R1539	

PLC->Controller (Data per part system) **Table 4-4-4**

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Signal details
R940	R1040	R1140	R1240	R1340	R1440	R1540	No. of work machining (maximum value)
R941	R1041	R1141	R1241	R1341	R1441	R1541	
R942	R1042	R1142	R1242	R1342	R1442	R1542	Load meter display interface 1
R943	R1043	R1143	R1243	R1343	R1443	R1543	
R944	R1044	R1144	R1244	R1344	R1444	R1544	Load meter display interface 2
R945	R1045	R1145	R1245	R1345	R1445	R1545	
R946	R1046	R1146	R1246	R1346	R1446	R1546	Workpiece coordinate offset measurement compensation No.
R947	R1047	R1147	R1247	R1347	R1447	R1547	
R948	R1048	R1148	R1248	R1348	R1448	R1548	Selection tool No.
R949	R1049	R1149	R1249	R1349	R1449	R1549	

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Signal details
R950	R1050	R1150	R1250	R1350	R1450	R1550	Skip retract valid
R951	R1051	R1151	R1251	R1351	R1451	R1551	
R952	R1052	R1152	R1252	R1352	R1452	R1552	Skip retract speed
R953	R1053	R1153	R1253	R1353	R1453	R1553	
R954	R1054	R1154	R1254	R1354	R1454	R1554	Skip retract amount
R955	R1055	R1155	R1255	R1355	R1455	R1555	
R956	R1056	R1156	R1256	R1356	R1456	R1556	
R957	R1057	R1157	R1257	R1357	R1457	R1557	
R958	R1058	R1158	R1258	R1358	R1458	R1558	
R959	R1059	R1159	R1259	R1359	R1459	R1559	

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Signal details
R960	R1060	R1160	R1260	R1360	R1460	R1560	
R961	R1061	R1161	R1261	R1361	R1461	R1561	
R962	R1062	R1162	R1262	R1362	R1462	R1562	
R963	R1063	R1163	R1263	R1363	R1463	R1563	
R964	R1064	R1164	R1264	R1364	R1464	R1564	
R965	R1065	R1165	R1265	R1365	R1465	R1565	
R966	R1066	R1166	R1266	R1366	R1466	R1566	
R967	R1067	R1167	R1267	R1367	R1467	R1567	
R968	R1068	R1168	R1268	R1368	R1468	R1568	
R969	R1069	R1169	R1269	R1369	R1469	R1569	

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Signal details
R970	R1070	R1170	R1270	R1370	R1470	R1570	Macro interface output for each part system #1032 PLC → controller (Up to three part systems for C64T)
R971	R1071	R1171	R1271	R1371	R1471	R1571	
R972	R1072	R1172	R1272	R1372	R1472	R1572	Macro interface output for each part system #1033 PLC → controller (Up to three part systems for C64T)
R973	R1073	R1173	R1273	R1373	R1473	R1573	
R974	R1074	R1174	R1274	R1374	R1474	R1574	Macro interface output for each part system #1034 PLC → controller (Up to three part systems for C64T)
R975	R1075	R1175	R1275	R1375	R1475	R1575	
R976	R1076	R1176	R1276	R1376	R1476	R1576	Macro interface output for each part system #1035 PLC → controller (Up to three part systems for C64T)
R977	R1077	R1177	R1277	R1377	R1477	R1577	
R978	R1078	R1178	R1278	R1378	R1478	R1578	
R979	R1079	R1179	R1279	R1379	R1479	R1579	

PLC->Controller (Data per part system) **Table 4-4-5**

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Signal details
R980	R1080	R1180	R1280	R1380	R1480	R1580	
R981	R1081	R1181	R1281	R1381	R1481	R1581	
R982	R1082	R1182	R1282	R1382	R1482	R1582	
R983	R1083	R1183	R1283	R1383	R1483	R1583	
R984	R1084	R1184	R1284	R1384	R1484	R1584	
R985	R1085	R1185	R1285	R1385	R1485	R1585	
R986	R1086	R1186	R1286	R1386	R1486	R1586	
R987	R1087	R1187	R1287	R1387	R1487	R1587	
R988	R1088	R1188	R1288	R1388	R1488	R1588	
R989	R1089	R1189	R1289	R1389	R1489	R1589	

1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	Signal details
R990	R1090	R1190	R1290	R1390	R1490	R1590	
R991	R1091	R1191	R1291	R1391	R1491	R1591	
R992	R1092	R1192	R1292	R1392	R1492	R1592	
R993	R1093	R1193	R1293	R1393	R1493	R1593	
R994	R1094	R1194	R1294	R1394	R1494	R1594	
R995	R1095	R1195	R1295	R1395	R1495	R1595	
R996	R1096	R1196	R1296	R1396	R1496	R1596	
R997	R1097	R1197	R1297	R1397	R1497	R1597	
R998	R1098	R1198	R1298	R1398	R1498	R1598	
R999	R1099	R1199	R1299	R1399	R1499	R1599	

PLC->Controller (Axis data) **Table 4-4-6**

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis	9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	Signal details
R2300	R2350	R2400	R2450	R2500	R2550	R2600	R2650	R2700	R2750	R2800	R2850	R2900	R2950	External machine coordinate system compensation data
R2301	R2351	R2401	R2451	R2501	R2551	R2601	R2651	R2701	R2751	R2801	R2851	R2901	R2951	Each axis reference point select
R2302	R2352	R2402	R2452	R2502	R2552	R2602	R2652	R2702	R2752	R2802	R2852	R2902	R2952	Thermal expansion offset compensation amount
R2303	R2353	R2403	R2453	R2503	R2553	R2603	R2653	R2703	R2753	R2803	R2853	R2903	R2953	Thermal expansion max. compensation amount
R2304	R2354	R2404	R2454	R2504	R2554	R2604	R2654	R2704	R2754	R2804	R2854	R2904	R2954	
R2305	R2355	R2405	R2455	R2505	R2555	R2605	R2655	R2705	R2755	R2805	R2855	R2905	R2955	
R2306	R2356	R2406	R2456	R2506	R2556	R2606	R2656	R2706	R2756	R2806	R2856	R2906	R2956	
R2307	R2357	R2407	R2457	R2507	R2557	R2607	R2657	R2707	R2757	R2807	R2857	R2907	R2957	
R2308	R2358	R2408	R2458	R2508	R2558	R2608	R2658	R2708	R2758	R2808	R2858	R2908	R2958	
R2309	R2359	R2409	R2459	R2509	R2559	R2609	R2659	R2709	R2759	R2809	R2859	R2909	R2959	

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis	9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	Signal details
R2310	R2360	R2410	R2460	R2510	R2560	R2610	R2660	R2710	R2760	R2810	R2860	R2910	R2960	
R2311	R2361	R2411	R2461	R2511	R2561	R2611	R2661	R2711	R2761	R2811	R2861	R2911	R2961	
R2312	R2362	R2412	R2462	R2512	R2562	R2612	R2662	R2712	R2762	R2812	R2862	R2912	R2962	
R2313	R2363	R2413	R2463	R2513	R2563	R2613	R2663	R2713	R2763	R2813	R2863	R2913	R2963	
R2314	R2364	R2414	R2464	R2514	R2564	R2614	R2664	R2714	R2764	R2814	R2864	R2914	R2964	
R2315	R2365	R2415	R2465	R2515	R2565	R2615	R2665	R2715	R2765	R2815	R2865	R2915	R2965	
R2316	R2366	R2416	R2466	R2516	R2566	R2616	R2666	R2716	R2766	R2816	R2866	R2916	R2966	
R2317	R2367	R2417	R2467	R2517	R2567	R2617	R2667	R2717	R2767	R2817	R2867	R2917	R2967	
R2318	R2368	R2418	R2468	R2518	R2568	R2618	R2668	R2718	R2768	R2818	R2868	R2918	R2968	
R2319	R2369	R2419	R2469	R2519	R2569	R2619	R2669	R2719	R2769	R2819	R2869	R2919	R2969	

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis	9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	Signal details
R2320	R2370	R2420	R2470	R2520	R2570	R2620	R2670	R2720	R2770	R2820	R2870	R2920	R2970	
R2321	R2371	R2421	R2471	R2521	R2571	R2621	R2671	R2721	R2771	R2821	R2871	R2921	R2971	
R2322	R2372	R2422	R2472	R2522	R2572	R2622	R2672	R2722	R2772	R2822	R2872	R2922	R2972	
R2323	R2373	R2423	R2473	R2523	R2573	R2623	R2673	R2723	R2773	R2823	R2873	R2923	R2973	
R2324	R2374	R2424	R2474	R2524	R2574	R2624	R2674	R2724	R2774	R2824	R2874	R2924	R2974	
R2325	R2375	R2425	R2475	R2525	R2575	R2625	R2675	R2725	R2775	R2825	R2875	R2925	R2975	
R2326	R2376	R2426	R2476	R2526	R2576	R2626	R2676	R2726	R2776	R2826	R2876	R2926	R2976	
R2327	R2377	R2427	R2477	R2527	R2577	R2627	R2677	R2727	R2777	R2827	R2877	R2927	R2977	
R2328	R2378	R2428	R2478	R2528	R2578	R2628	R2678	R2728	R2778	R2828	R2878	R2928	R2978	
R2329	R2379	R2429	R2479	R2529	R2579	R2629	R2679	R2729	R2779	R2829	R2879	R2929	R2979	

PLC->Controller (Axis data)

Table 4-4-7

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis	9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	Signal details
R2330	R2380	R2430	R2480	R2530	R2580	R2630	R2680	R2730	R2780	R2830	R2880	R2930	R2980	
R2331	R2381	R2431	R2481	R2531	R2581	R2631	R2681	R2731	R2781	R2831	R2881	R2931	R2981	
R2332	R2382	R2432	R2482	R2532	R2582	R2632	R2682	R2732	R2782	R2832	R2882	R2932	R2982	
R2333	R2383	R2433	R2483	R2533	R2583	R2633	R2683	R2733	R2783	R2833	R2883	R2933	R2983	
R2334	R2384	R2434	R2484	R2534	R2584	R2634	R2684	R2734	R2784	R2834	R2884	R2934	R2984	
R2335	R2385	R2435	R2485	R2535	R2585	R2635	R2685	R2735	R2785	R2835	R2885	R2935	R2985	
R2336	R2386	R2436	R2486	R2536	R2586	R2636	R2686	R2736	R2786	R2836	R2886	R2936	R2986	
R2337	R2387	R2437	R2487	R2537	R2587	R2637	R2687	R2737	R2787	R2837	R2887	R2937	R2987	
R2338	R2388	R2438	R2488	R2538	R2588	R2638	R2688	R2738	R2788	R2838	R2888	R2938	R2988	
R2339	R2389	R2439	R2489	R2539	R2589	R2639	R2689	R2739	R2789	R2839	R2889	R2939	R2989	

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis	9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	Signal details
R2340	R2390	R2440	R2490	R2540	R2590	R2640	R2690	R2740	R2790	R2840	R2890	R2940	R2990	
R2341	R2391	R2441	R2491	R2541	R2591	R2641	R2691	R2741	R2791	R2841	R2891	R2941	R2991	
R2342	R2392	R2442	R2492	R2542	R2592	R2642	R2692	R2742	R2792	R2842	R2892	R2942	R2992	
R2343	R2393	R2443	R2493	R2543	R2593	R2643	R2693	R2743	R2793	R2843	R2893	R2943	R2993	
R2344	R2394	R2444	R2494	R2544	R2594	R2644	R2694	R2744	R2794	R2844	R2894	R2944	R2994	
R2345	R2395	R2445	R2495	R2545	R2595	R2645	R2695	R2745	R2795	R2845	R2895	R2945	R2995	
R2346	R2396	R2446	R2496	R2546	R2596	R2646	R2696	R2746	R2796	R2846	R2896	R2946	R2996	
R2347	R2397	R2447	R2497	R2547	R2597	R2647	R2697	R2747	R2797	R2847	R2897	R2947	R2997	
R2348	R2398	R2448	R2498	R2548	R2598	R2648	R2698	R2748	R2798	R2848	R2898	R2948	R2998	
R2349	R2399	R2449	R2499	R2549	R2599	R2649	R2699	R2749	R2799	R2849	R2899	R2949	R2999	

PLC->Controller (Spindle command) **Table 4-4-8**

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	Signal details
R3210	R3240	R3270	R3300	R3330	R3360	R3390	Spindle command rotation speed output
R3211	R3241	R3271	R3301	R3331	R3361	R3391	
R3212	R3242	R3272	R3302	R3332	R3362	R3392	
R3213	R3243	R3273	R3303	R3333	R3363	R3393	
R3214	R3244	R3274	R3304	R3334	R3364	R3394	
R3215	R3245	R3275	R3305	R3335	R3365	R3395	
R3216	R3246	R3276	R3306	R3336	R3366	R3396	
R3217	R3247	R3277	R3307	R3337	R3367	R3397	
R3218	R3248	R3278	R3308	R3338	R3368	R3398	
R3219	R3249	R3279	R3309	R3339	R3369	R3399	

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	Signal details
R3220	R3250	R3280	R3310	R3340	R3370	R3400	S analog override
R3221	R3251	R3281	R3311	R3341	R3371	R3401	Multi-point orientation position data
R3222	R3252	R3282	R3312	R3342	R3372	R3402	
R3223	R3253	R3283	R3313	R3343	R3373	R3403	
R3224	R3254	R3284	R3314	R3344	R3374	R3404	
R3225	R3255	R3285	R3315	R3345	R3375	R3405	
R3226	R3256	R3286	R3316	R3346	R3376	R3406	
R3227	R3257	R3287	R3317	R3347	R3377	R3407	
R3228	R3258	R3288	R3318	R3348	R3378	R3408	
R3229	R3259	R3289	R3319	R3349	R3379	R3409	

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	Signal details
R3230	R3260	R3290	R3320	R3350	R3380	R3410	
R3231	R3261	R3291	R3321	R3351	R3381	R3411	
R3232	R3262	R3292	R3322	R3352	R3382	R3412	
R3233	R3263	R3293	R3323	R3353	R3383	R3413	
R3234	R3264	R3294	R3324	R3354	R3384	R3414	
R3235	R3265	R3295	R3325	R3355	R3385	R3415	
R3236	R3266	R3296	R3326	R3356	R3386	R3416	
R3237	R3267	R3297	R3327	R3357	R3387	R3417	
R3238	R3268	R3298	R3328	R3358	R3388	R3418	
R3239	R3269	R3299	R3329	R3359	R3389	R3419	

PLC->Controller (MR-J2-CT control command) **Table 4-4-9**

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	Signal details
R3600	R3606	R3612	R3618	R3624	R3630	R3636	J2CT control command 4
R3601	R3607	R3613	R3619	R3625	R3631	R3637	J2CT control command 3
R3602	R3608	R3614	R3620	R3626	R3632	R3638	J2CT control command 2
R3603	R3609	R3615	R3621	R3627	R3633	R3639	J2CT control command 1
R3604	R3610	R3616	R3622	R3628	R3634	R3640	J2CT command coordinate Low order
R3605	R3611	R3617	R3623	R3629	R3635	R3641	J2CT command coordinate High order
R3684							Another control command (Common to all axes)

PLC–>Controller PLC (Index control axis command)

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	Signal details
R3650	R3654	R3658	R3662	R3666	R3670	R3674	Control command 1
R3651	R3655	R3659	R3663	R3667	R3671	R3675	Control command 2
R3652	R3656	R3660	R3664	R3668	R3672	R3676	Control command 3
R3653	R3657	R3661	R3665	R3669	R3673	R3677	Control command 4

Special relay

Table 4-5-1

Device	Abbrev.	Signal name
SM0		
SM1		
SM2		
SM3		
SM4		
SM5		
SM6		
SM7		

Device	Abbrev.	Signal name
SM8		
SM9		
SM10		
SM11		
SM12	CARRY	Carry flag
SM13		
SM14		
SM15		

Device	Abbrev.	Signal name
SM16	THER	Temperature rise warning
SM17		Remote I/O communication stop
SM18		
SM19		
SM20		
SM21		
SM22	CLE	Calculation error
SM23	QSTOP	PLC STOP

Device	Abbrev.	Signal name
SM24		
SM25		
SM26		
SM27		
SM28		
SM29		
SM30		
SM31		

Device	Abbrev.	Signal name
SM32	ON	Always ON
SM33	OFF	Always OFF
SM34	BSCN	Only 1 scan ON after RUN
SM35	ASCN	Only 1 scan OFF after RUN
SM36	01CLK	0.1-second clock
SM37	02CLK	0.2-second clock
SM38	1CLK	1-second clock
SM39	2CLK	2-second clock

Device	Abbrev.	Signal name
SM40	2NCLK	2n-second clock
SM41		
SM42		
SM43		
SM44		
SM45		
SM46		
SM47		

Device	Abbrev.	Signal name
SM48		
SM49		
SM50		
SM51		
SM52		
SM53		
SM54		
SM55		

Device	Abbrev.	Signal name
SM56		
SM57		
SM58		
SM59		
SM60		
SM61		
SM62		
SM63		

Special relay **Table 4-5-2**

Device	Abbrev.	Signal name
SM64	DSPRQ	Tool registration and Life screen display request
SM65	LSTIN	Life management data setting prohibited
SM66		
SM67		
SM68		
SM69		
SM70		API protect avoidance
SM71	TSTIN	Tool registration screen setting prohibited

Device	Abbrev.	Signal name
SM72		
SM73		
SM74		
SM75		
SM76	PDISP	Program display during operation
SM77		
SM78		
SM79		

Device	Abbrev.	Signal name
SM80	SWALT1	PLC switch for reverse #1
SM81	SWALT2	PLC switch for reverse #2
SM82	SWALT3	PLC switch for reverse #3
SM83	SWALT4	PLC switch for reverse #4
SM84	SWALT5	PLC switch for reverse #5
SM85	SWALT6	PLC switch for reverse #6
SM86	SWALT7	PLC switch for reverse #7
SM87	SWALT8	PLC switch for reverse #8

Device	Abbrev.	Signal name
SM88	SWALT9	PLC switch for reverse #9
SM89	SWALT10	PLC switch for reverse #10
SM90	SWALT11	PLC switch for reverse #11
SM91	SWALT12	PLC switch for reverse #12
SM92	SWALT13	PLC switch for reverse #13
SM93	SWALT14	PLC switch for reverse #14
SM94	SWALT15	PLC switch for reverse #15
SM95	SWALT16	PLC switch for reverse #16

Device	Abbrev.	Signal name
SM96	SWALT17	PLC switch for reverse #17
SM97	SWALT18	PLC switch for reverse #18
SM98	SWALT19	PLC switch for reverse #19
SM99	SWALT20	PLC switch for reverse #20
SM100	SWALT21	PLC switch for reverse #21
SM101	SWALT22	PLC switch for reverse #22
SM102	SWALT23	PLC switch for reverse #23
SM103	SWALT24	PLC switch for reverse #24

Device	Abbrev.	Signal name
SM104	SWALT25	PLC switch for reverse #25
SM105	SWALT26	PLC switch for reverse #26
SM106	SWALT27	PLC switch for reverse #27
SM107	SWALT28	PLC switch for reverse #28
SM108	SWALT29	PLC switch for reverse #29
SM109	SWALT30	PLC switch for reverse #30
SM110	SWALT31	PLC switch for reverse #31
SM111	SWALT32	PLC switch for reverse #32

Device	Abbrev.	Signal name
SM112	DLSMS	In data link master channel stop
SM113	DLSS1	In data link slave 1 channel stop
SM114	DLSS2	In data link slave 2 channel stop
SM115	DLSS3	In data link slave 3 channel stop
SM116	DLSS4	In data link slave 4 channel stop
SM117		
SM118		
SM119		

Device	Abbrev.	Signal name
SM120		
SM121		
SM122		
SM123		
SM124		
SM125		
SM126		
SM127		

Special register **Table 4-5-3**

Device	Abbrev.	Signal name
SD0		
SD1		
SD2		
SD3		
SD4		
SD5		
SD6		
SD7		

Device	Abbrev.	Signal name
SD8		
SD9		
SD10		
SD11		
SD12		
SD13		
SD14		
SD15		

Device	Abbrev.	Signal name
SD16		
SD17		
SD18		
SD19		
SD20		
SD21		
SD22	CLES	Calculation error code
SD23	QSTOPS	PLC STOP cause

Device	Abbrev.	Signal name
SD24		
SD25		
SD26		
SD27		
SD28		
SD29		
SD30		
SD31		

Device	Abbrev.	Signal name
SD32		
SD33		
SD34	1S	1-second counter
SD35	SCAN	Scan counter
SD36		
SD37	SCTCR	Current scan time
SD38	SCTMI	Minimum scan time
SD39	SCTMX	Maximum scan time

Device	Abbrev.	Signal name
SD40	2NS	2n-second clock set
SD41		
SD42		
SD43		
SD44		
SD45		
SD46		
SD47		

Device	Abbrev.	Signal name
SD112	DLER1	Data link Error number between master and slave 1 channels
SD113	DLER2	Data link Error number between master and slave 2 channels
SD114	DLER3	Data link Error number between master and slave 3 channels
SD115	DLER4	Data link Error number between master and slave 4 channels
SD116		
SD117		
SD118		
SD119		

Device	Abbrev.	Signal name
SD120		
SD121		
SD122		
SD123		
SD124		
SD125		
SD126		
SD127		

5. OTHER DEVICES

5.1 Devices

In addition to X, Y, and R, SM, SD 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 count-up timer. (2) Timer T can set the timer value from either the sequence program or display. (3) The 100ms, 10ms and 100ms integral timer are available.
Counter	C	(1) Addition system counter C. (2) Counter C can set the counter value from either the sequence program or screen.
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. Refer to section "2.9 File Register General Map" for details on the release area of file register.

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
C0			C8		
C1			C9		
C2			C10		
C3			C11		
C4			C12		
C5			C13		
C6			C14		
C7			C15		
Device	**Abbreviation**	**Signal name**	**Device**	**Abbreviation**	**Signal name**
C16					
C17					
C18					
C19					
C20					
C21					
C22					
C23					

<Format 7>

<Counter numerical value setting data>

16-bit unit

Device	Abbreviation	Signal name	Device	Abbreviation	Signal name
C0			C8		
C1			C9		
C2			C10		
C3			C11		
C4			C12		
C5			C13		
C6			C14		
C7			C15		
Device	**Abbreviation**	**Signal name**	**Device**	**Abbreviation**	**Signal name**
C16					
C17					
C18					
C19					
C20					
C21					
C22					
C23					

<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.

6.1 PLC input signals (bit type: X***)
6.2 PLC input signals (data type: R***)
6.3 PLC output signals (bit type: Y***)
6.4 PLC output signals (data type: R***)
6.5 Special relay/register signals (SM**, SD**)
6.6 Signals related to communication

How to read the signals

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
*	PLC AXIS NEAR POINT DETECT nTH AXIS	*PCDn		Y438~43E	—	—

Device No. for 1st part system

Device No. for 3rd part system

Device No. for 2nd part system
— indicates that there is no corresponding device.

Refer to the list for device Nos. of 4th part system and following.

Indicates (B contact) signal that is valid when PLC -> controller signal is OFF.

B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
—	AXIS SELECT OUTPUT	AX1~AX14		X441	X461	X481

Device No. for 1st axis

Device No. for 3rd axis

Device No. for 2nd axis
— indicates that there is no corresponding device.

Refer to the list for device Nos. of 4th axis and following.

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

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	CONTROLLER READY COMPLETE	MA		X420	—	—

[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		1st system	2nd system	3rd system
—	SERVO READY COMPLETE	SA		X421	—	—

[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, etc.).

(Note 1) This signal (SA) cannot be turned OFF only with the servo OFF (*SVFn) signal.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	DOOR OPEN ENABLE	DROPNS		X429	—	—

[Function]

This signal notifies the PLC that the drive power to all axes is turned OFF due to "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 "Door open" signal turning ON.
This signal turns OFF at all axes ready ON and at all servo axes servo ON, due to "Door open" signal turning OFF.
Release of the door lock is enabled at the rising edge of "Door open enable" signal.
The operation is in a READY status at the falling edge of "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 (DOOR1, DOOR2: Y428, 429)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	IN SPINDLE SYNCHRONOUS CONTROL	SPSYN1		X42A	—	—

[Function]

This signal informs that the spindle synchronous control mode has been entered.

[Operation]

The signal turns ON when:

- The G114.1 is commanded, and spindle synchronous control is entered. (Spindle synchronous control I)
- The spindle synchronous control signal (Y432) turns ON. (Spindle synchronous control II)

The signal turns OFF when:

- Spindle synchronous control is canceled with the G113 command. Or, when the spindle synchronization cancel signal (Y430) turns ON. (Spindle synchronous control I)
- When the spindle synchronous control signal (Y432) turns OFF. (Spindle synchronous control II)

[Related signal]

Spindle rotation speed synchronization complete (FSPRV: X42B)
Spindle phase synchronization complete (FSPPH: X42C)
Spindle synchronous control (SPSY: Y432)
Spindle phase synchronous control (SPPHS: Y433)
Spindle synchronization cancel (SPSYC: Y430)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	SPINDLE ROTATION SPEED SYNCHRONIZATION COMPLETE	FSPRV		X42B	—	—

[Function]

This signal informs that the spindle synchronization state mode is entered.

[Operation]

The signal turns ON when:

- The difference of the rotation speeds of the basic spindle and synchronous spindle reaches the value set for the spindle rotation speed attainment level during the spindle synchronous control mode.

The signal turns OFF when:

- The actual rotation speed of the synchronous basic spindle or synchronous spindle, in respect to the spindle synchronous rotation speed command value, widely exceeds or deviates value set for the spindle synchronization rotation speed attainment level during the rotation synchronization mode.
- The spindle synchronous control mode is canceled.

[Related signal]

In spindle synchronous control (SPSYN1: X42A)
Spindle phase synchronization complete (FSPPH: X42C)
Spindle synchronous control (SPSY: Y432)
Spindle phase synchronous control (SPPHS: Y433)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	SPINDLE PHASE SYNCHRONIZATION COMPLETE	FSPPH		X42C	—	—

[Function]

This signal informs that the spindle synchronization state is entered.

[Operation]

The signal turns ON when:

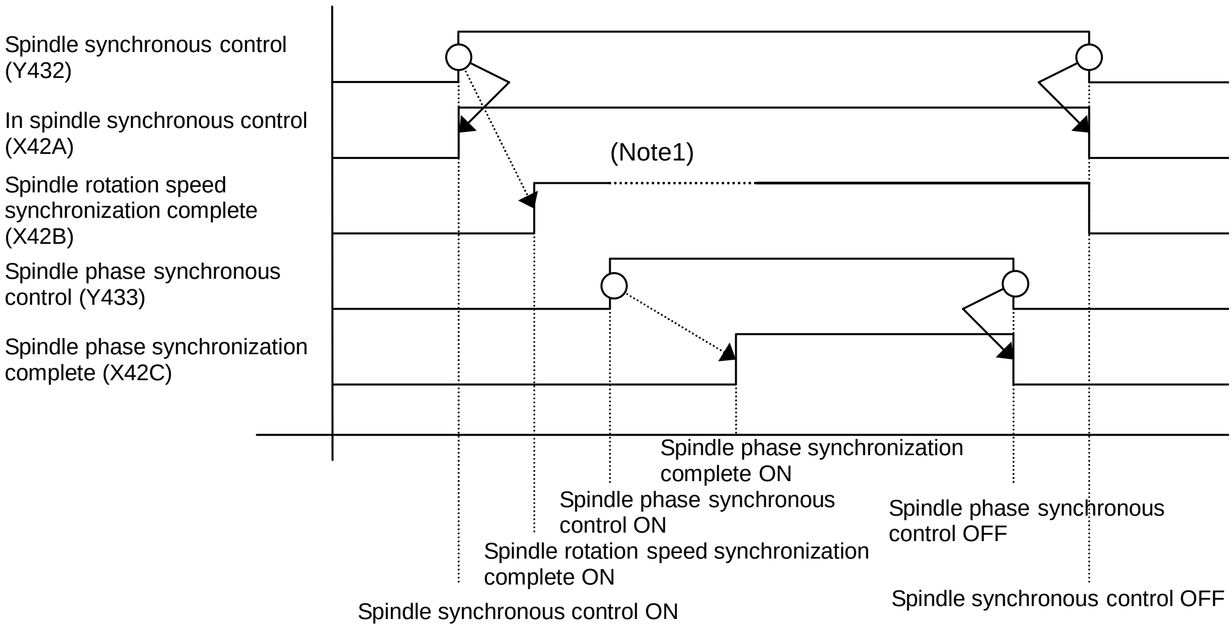
- The phase alignment of the basic spindle and synchronous spindle is completed during the phase synchronization mode.

The signal turns OFF when:

- The phase difference of the basic spindle and synchronous spindle exceeds the value set for the spindle synchronization phase attainment level during the phase synchronization mode.
- The spindle synchronous control mode is canceled.

⚠ CAUTION

⚠ Always turn the spindle phase synchronization complete signal ON before chucking both ends of the workpiece to the basic spindle and synchronous spindle. If the spindle phase synchronization signal is turned ON when both ends of the workpiece are chucked to the basic spindle and synchronous spindle, the chuck or workpiece could be damaged by the torsion that occurs during phase alignment.



(Note1) Temporary OFF to change the rotation speed during the phase synchronization.

[Related signals]

In spindle synchronous control (SPSYN1: X42A)
Spindle rotation speed synchronization complete (FSPRV: X42B)
Spindle synchronous control (SPSY: Y432)
Spindle phase synchronous control (SPPHS: Y433)

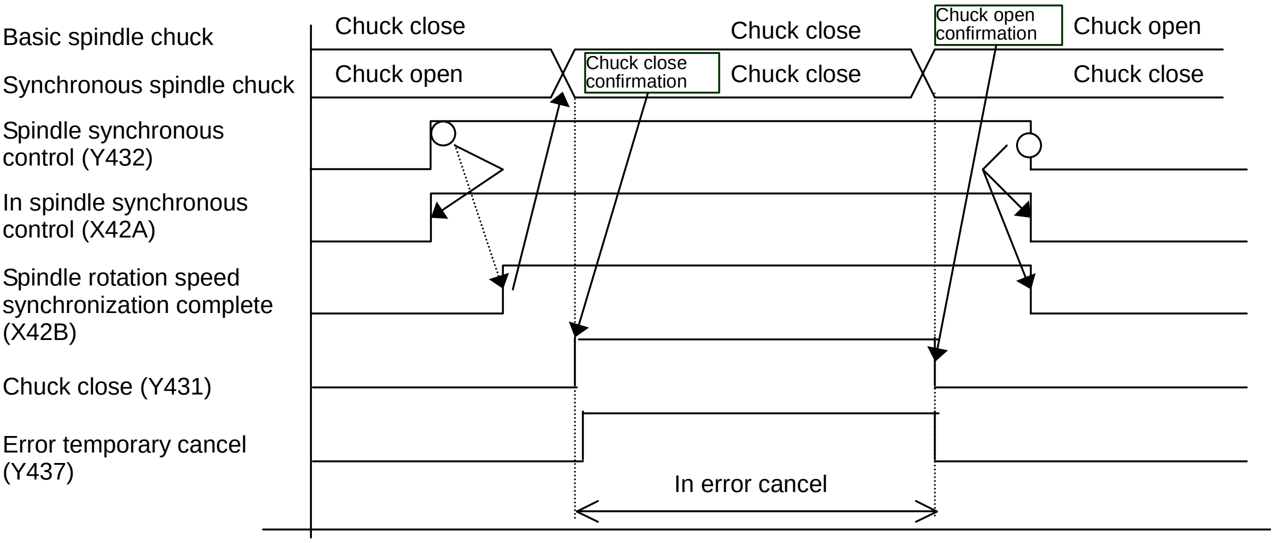
B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	CHUCK CLOSE CONFIRMATION	SPCMP		X42D	—	—

[Function]

This signal informs that chuck close (SPCMPC: Y431) is input during spindle synchronous control.

[Operation]

This signal turns ON when the "Chuck close" (Y431) is ON.
This signal turns OFF when the "Chuck close" (Y431) is OFF.
This signal turns OFF when the spindle synchronous control is canceled.



(Note) Use "Error temporary cancel" signal only when the position error between two spindles still occurs even after the "Chuck close" signal is turned ON.

[Related signal]

Chuck close (SPCMPC: Y431)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	BATTERY ALARM	BATAL		X42F	—	—

[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 BATTERY FAULT" will display.

(2) A fault is detected in the power voltage supplied to the absolute position detector.
At this time, "Z73 ABS. WARNING 0001" and "S52 SERVO WARNING 9F" will display.

(3) A fault is detected in the power voltage for the speed detector in the absolute position detector.
At this time, "Z71 DETECTOR ERR 0001" and "S01 SERVO ALARM" 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 signal]

(1) Battery drop cause (R40)

[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		1st system	2nd system	3rd system
—	ALARM 1	AL1		X430	—	—

[Function]

This signal informs that system error occured 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) Alarm 1 (AL1) may not be detected as signal.
(Note 2) For details of system alarms, refer to the relevant Instruction Manual.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	ALARM 2 (SERVO ALARM)	AL2		X431	—	—

[Function]

This signal informs that the controller is in servo alarm condition. If servo alarm occurs, "servo ready complete output" 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 Instruction Manual.

B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
—	SERVO READY nTH AXIS	RDY1~14		X440	X460	X480

[Function]

This signal indicates that the drive section of the nth axis is ready for operation.

[Operation]

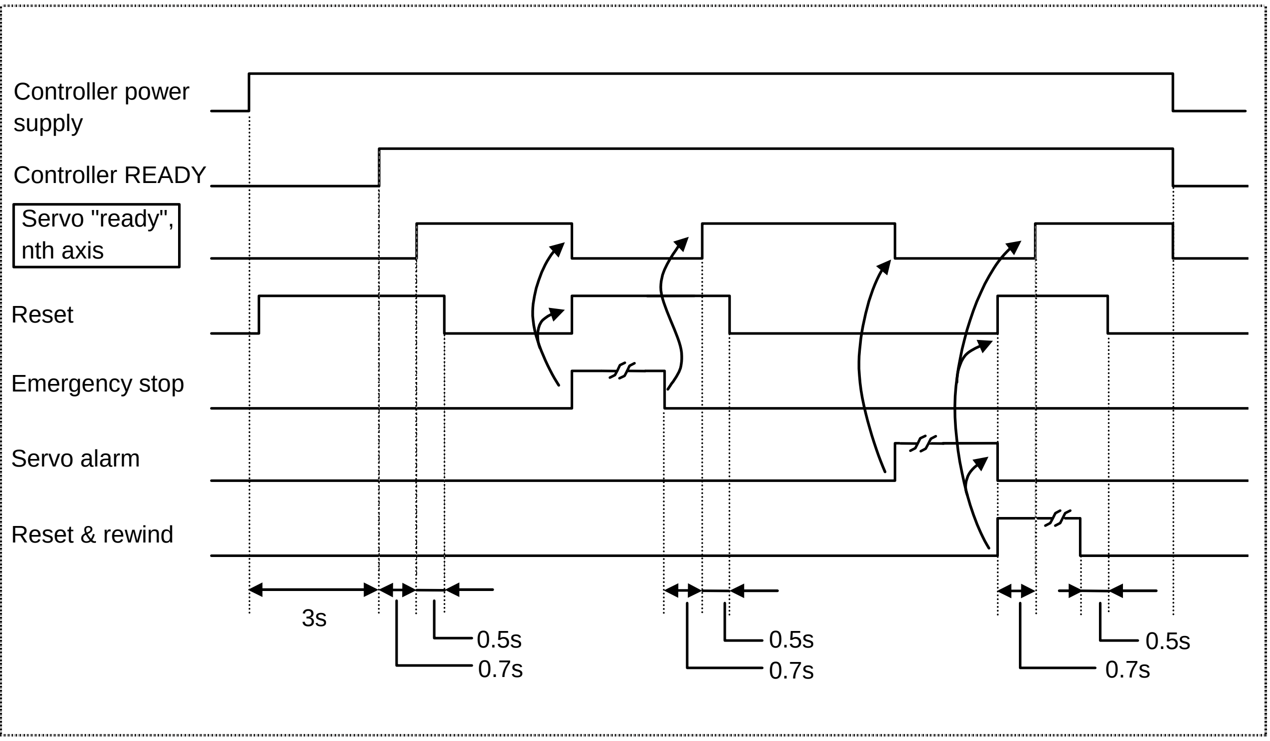
The signal turns ON when:

(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: X421)

B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
—	AXIS SELECT OUTPUT	AX1~AX14		X441	X461	X481

[Function]

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

[Operation]

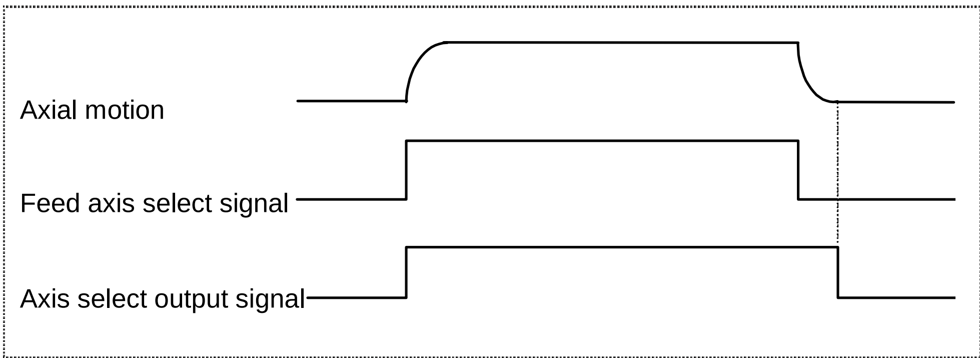
This signal turns ON and OFF as follows:

(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
- For JOG mode
  The signal is ON while "Feed axis select" signal (+Jn and -Jn) is ON.
- For HANDLE mode
  When "Handle axis No." signal (HS11 to 116) and "Handle valid" signal (HS1S) have been selected, "Axis select output" signal for the axis specified by the "Handle axis No." signal is ON.
- For INCREMENTAL mode
  The signal turns ON when "Feed axis select" signal turns ON, and turns OFF when the specified motion is completed.
- For MANUAL RANDOM FEED mode
  The signal turns ON when "Strobe" signal (CXS8) turns ON, and turns OFF when the specified motion is completed.
- For REFERENCE POINT RETURN mode
  The signal is ON while "Feed axis select" signal (+Jn and -Jn) is ON. After "Reference point return near-point detect" signal is detected, and the motion speed changes to approach (creeping) speed, the "Axis select output" signal remains ON until the motion stops at the reference point, even when "Feed axis select" signal turns OFF.

(3) Other conditions
- 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.
- 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.
- Interlock does not affect status of this signal (the signal remains ON, or turns ON).
- "Servo OFF" signal does not affect status of this signal.
- The signal cannot be turned ON by G04 and G92.
- The signal turns OFF with controller reset & rewind, or emergency stop.

(Example)



B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
—	PLUS MOTION (+)	MVP1~14		X442	X462	X482

[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 abbreviation indicates the control axis No.

M V P n

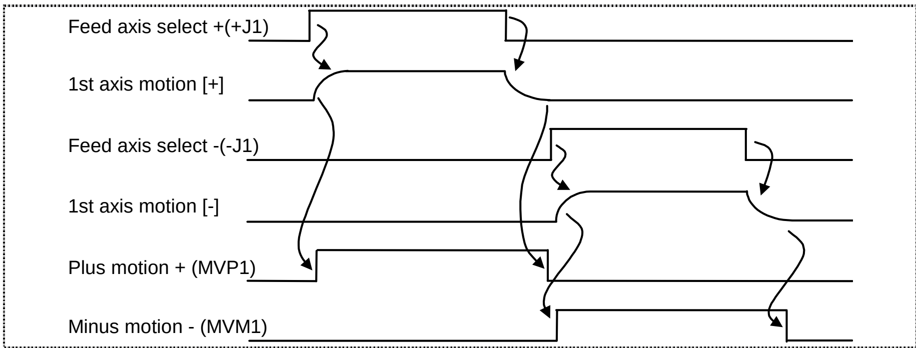
- n:
  - 1 : 1st axis in motion
  - 2 : 2nd axis in motion
  - : :
  - 14 : 14th axis in motion
- P/M:
  - P : In motion to plus direction
  - M : In motion to minus direction

[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]

Minus motion (-) (MVMn: X443)

B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
—	MINUS MOTION (-)	MVM1~14		X443	X463	X483

[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 "Plus motion + (MVPn)".

[Related signals]

Plus motion (+) (MVPn: X442)

B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
—	1ST REFERENCE POINT REACHED, nTH AXIS	ZP11~ZP114		X444	X464	X484

[Function]

This signal indicates that the axial component of the nth axis is ON the 1st reference point.
This signal is available per control axis, and the last number of the signal abbreviation indicates the control axis No.

ZP1n
- 1 : 1st reference point reached, 1st axis
- 2 : 1st reference point reached, 2nd axis
- : :
- 14 : 1st reference point reached, 14th axis

[Operation]

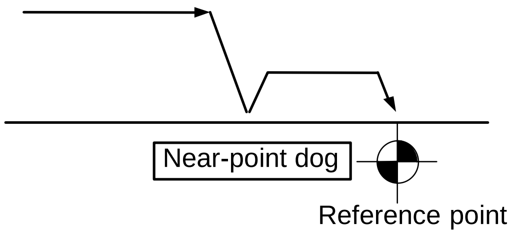
(1) The signal turns ON when:
- 1st reference point reached is attained with reference point return mode in manual operation. Refer to the REFERENCE POINT RETURN (ZRN) section for details on returning.
- 1st reference point reached is attained with G28 command in automatic operation.

(Note) If 1st reference point 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 point by motion command.
- "Emergency stop" signal is input or servo alarm occurs, causing stop to the machine.

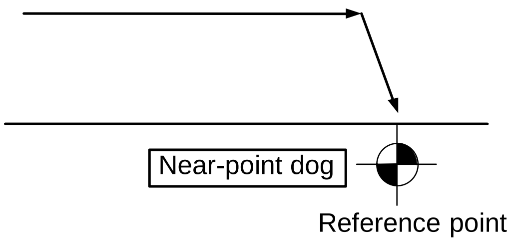
(3) Reference point return operation pattern

○ Dog-type reference point 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 point return



- When basic machine coordinate system is established.
- When high-speed return is selected with setup parameters, basic specification parameter "#1063 mandog" in the manual mode.

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

[Related signals]

2nd reference point reached (ZP21~ZP214: X445~X5E5)
3rd reference point reached (ZP31~ZP314: X446~X5E6)
4th reference point reached (ZP41~ZP414: X447~X5E7)

B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
—	2ND REFERENCE POINT REACHED, nTH AXIS	ZP21~ZP214		X445	X465	X485

[Function]

This signal indicates that the axial component of the nth axis is ON the 2nd reference point.
This signal is available per control axis, and the last number of the signal abbreviation indicates the control axis No.

ZP2n
- 1 : 2nd reference point reached, 1st axis
- 2 : 2nd reference point reached, 2nd axis
- : :
- 14 : 2nd reference point reached, 14th axis

[Operation]

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

(Note) If 2nd reference point 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 2nd reference point by motion command.
- "Emergency stop" signal is input or servo alarm occurs, causing stop to the machine.

[Related signals]

1st reference point reached (ZP11~ZP114: X444~X5E4)
3rd reference point reached (ZP31~ZP314: X446~X5E6)
4th reference point reached (ZP41~ZP414: X447~X5E7)

B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
—	3RD REFERENCE POINT REACHED, nTH AXIS	ZP31~ZP314		X446	X466	X486

[Function] [Operation]

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

B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
—	4TH REFERENCE POINT REACHED, nTH AXIS	ZP41~ZP414		X447	X467	X487

[Function] [Operation]

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

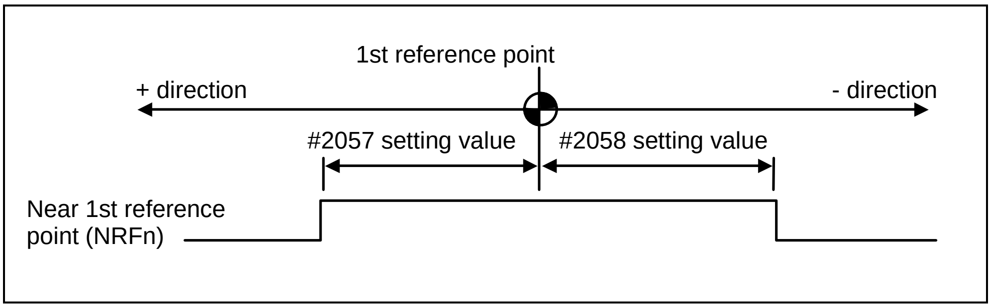
B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
—	NEAR 1ST REFERENCE POINT nTH AXIS	NRFn		X448	X468	X488

[Function]

This signal indicates that the control axis is near the 1st reference point 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 point 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) "Near 1st reference point" 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 that this signal may not be output when the setting value is too small.

(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		1st axis	2nd axis	3rd axis
—	UP-TO-SPEED nTH AXIS	ARRFn		X449	X469	X480

[Function]

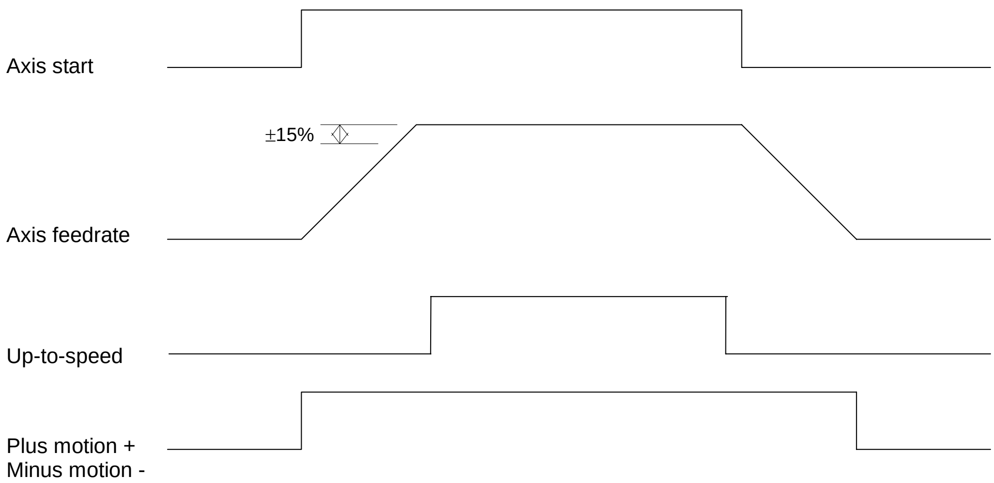
This signal is indicates that the actual axis feedrate has reached the feedrate commanded for each axis.

ARRFn

- 0: 1st axis speed reached
- 1: 2nd axis speed reached
- 2: 3rd axis speed reached
- :
- 13: 14th 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]

Plus motion + (MVPn: X442 to)
Minus motion - (MVMn: X443 to)

B con-tact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
—	ZERO POINT INITIALIZATION COMPLETED nTH AXIS	ZSFn		X44A	X46A	X48A

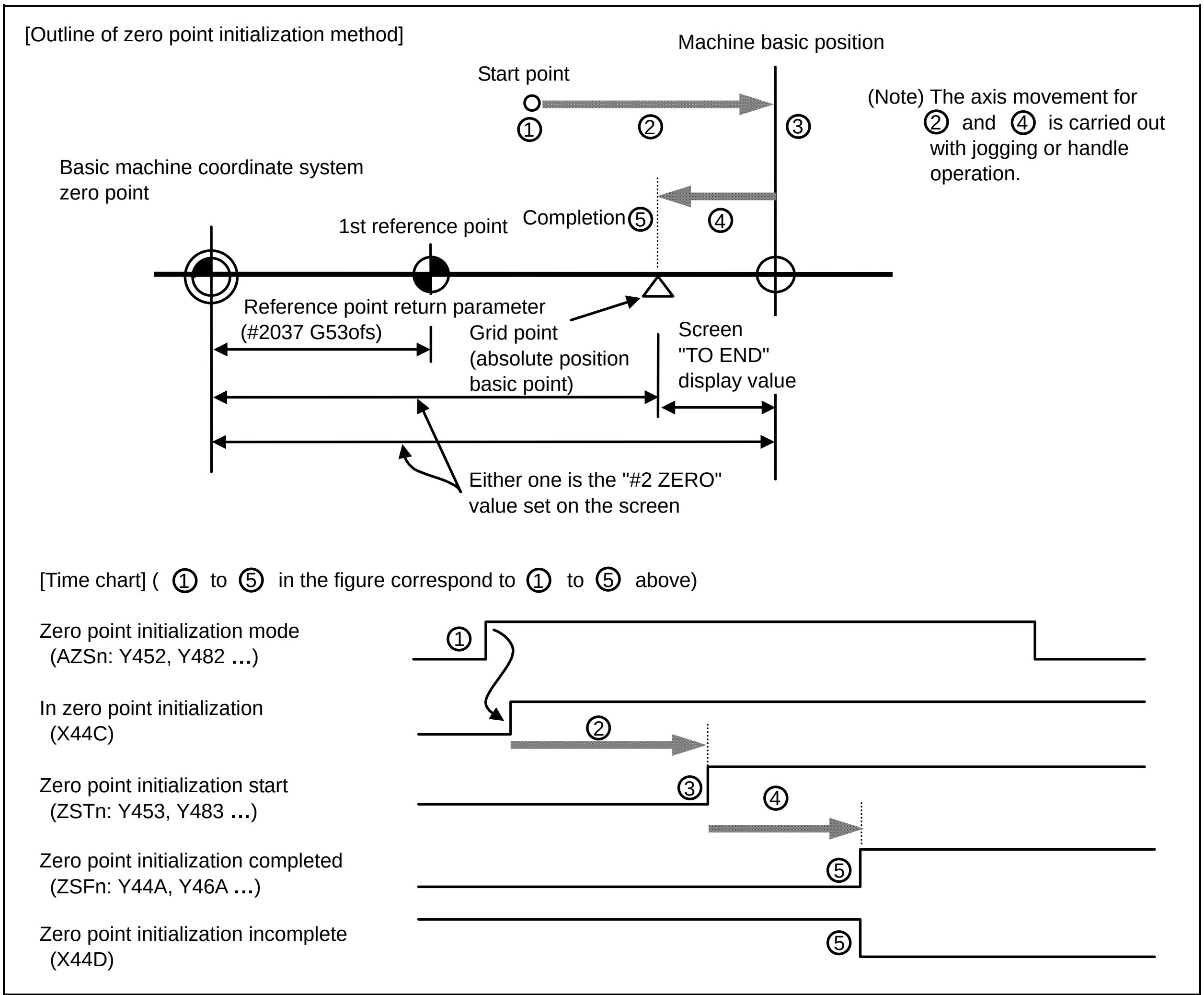
[Function]

This signal notifies that the basic machine coordinate system has been set (established) during zero point initialization using the marked point alignment method in the absolute position detection system.

[Operation]

This signal is valid when "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 initialization is carried out again or if the power is turned ON again.

<Zero point initialization method using marked point alignment method, and time chart>



[Related signals]

(1) Zero point initialization error completed (ZSEn: X44B)
(2) In zero point initialization (X44C)
(3) Zero point initialization incomplete (X44D)
(4) Zero point initialization mode (AZSn: Y452)
(5) Zero point initialization start (ZSTn: Y453)

B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
—	ZERO POINT INITIALIZATION ERROR COMPLETED nTH AXIS	ZSEn		X44B	X46B	X48B

[Function]

This signal is output when initialization is not possible during the marked point alignment method of the absolute position detection system.

[Operation]

This signal turns ON when the initialization is not possible at the rising edge of the "Zero point initialization start (ZSTn)" signal.
This signal is invalidated in the following cases:

- During emergency stop
- During reset
- When "Zero point initialization start (ZSTn)" signal is turned ON before the "Zero point initialization mode (AZSn)"
- 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 initialization completed (ZSFn: X44A)
(2)In zero point initialization (X44C)
(3)Zero point initialization incomplete (X44D)
(4)Zero point initialization mode (AZSn: Y452)
(5)Zero point initialization start (ZSTn: Y453)

B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
—	IN ZERO POINT INITIALIZATION			X44C	X46C	X48C

[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 initialization mode (AZS1~14) signal is ON.

B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
—	ZERO POINT INITIALIZATION INCOMPLETE			X44D	X46D	X48D

[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		1st axis	2nd axis	3rd axis
—	UNCLAMP COMMAND			X450	X470	X490

[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 (Y455)

B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
—	IN-POSITION nTH AXIS			X451	X471	X491

[Function]

This signal informs the PLC that the control axis is in the in-position state.

[Operation]

This signal turns ON when:

(1) The control axis' acceleration/deceleration delay is zero, and the servo error (droop pulse) is within the range set with the parameters.

This signal turns OFF when:

(1) The control axis' acceleration/deceleration delay is not zero.
(2) The servo error (droop pulse) is not within the range set with the parameters.

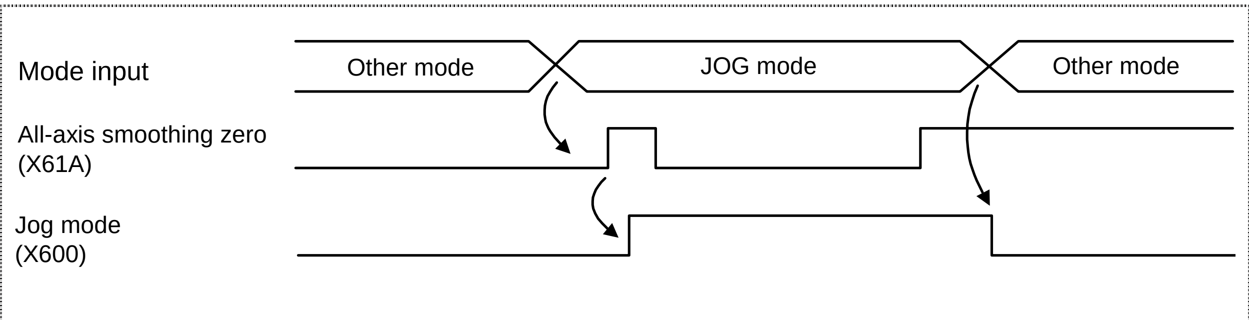
B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	IN JOG MODE	JO		X600	X680	X700

[Function]

This signal indicates that JOG mode is selected.

[Operation]

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



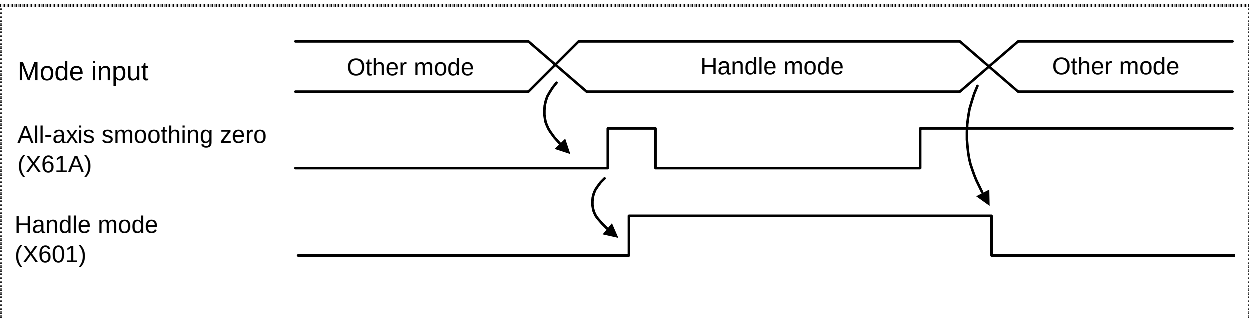
B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	IN HANDLE MODE	HO		X601	X681	X701

[Function]

This signal indicates that HANDLE mode is selected.

[Operation]

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



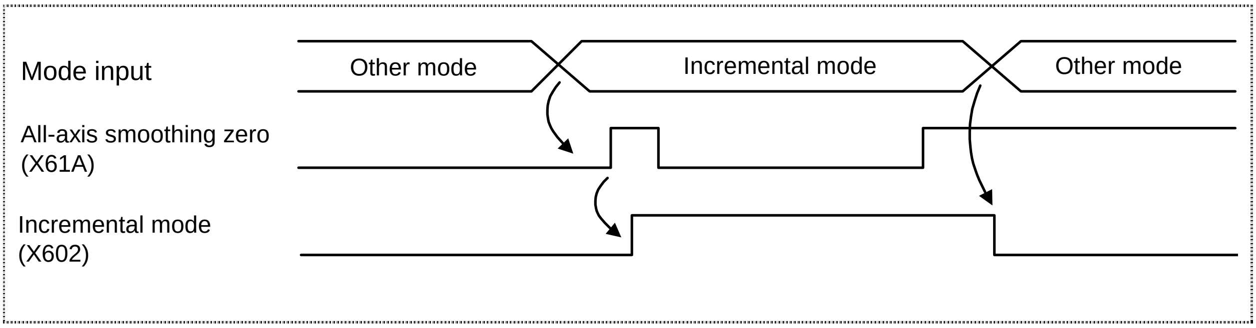
B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	IN INCREMENTAL MODE	SO		X602	X682	X702

[Function]

This signal indicates that INCREMENTAL mode is selected.

[Operation]

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



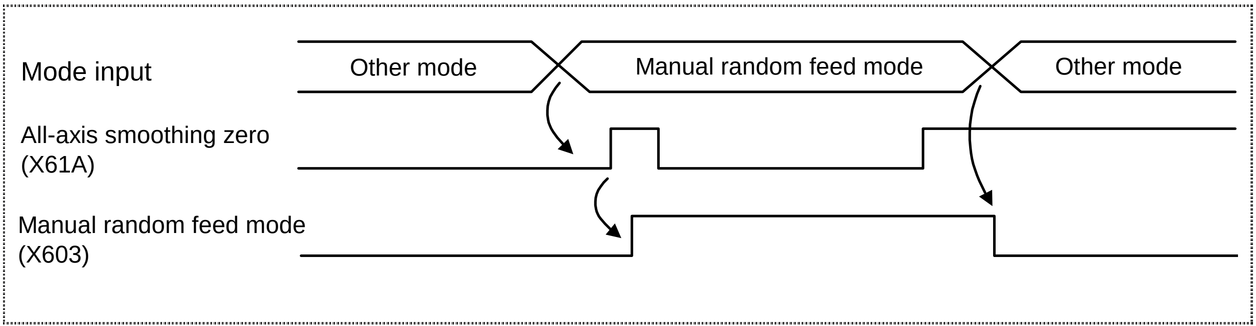
B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	IN MANUAL RANDOM FEED MODE	PTPO		X603	X683	X703

[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-axis smoothing zero" (command acceleration/deceleration delay is zero) is verified.



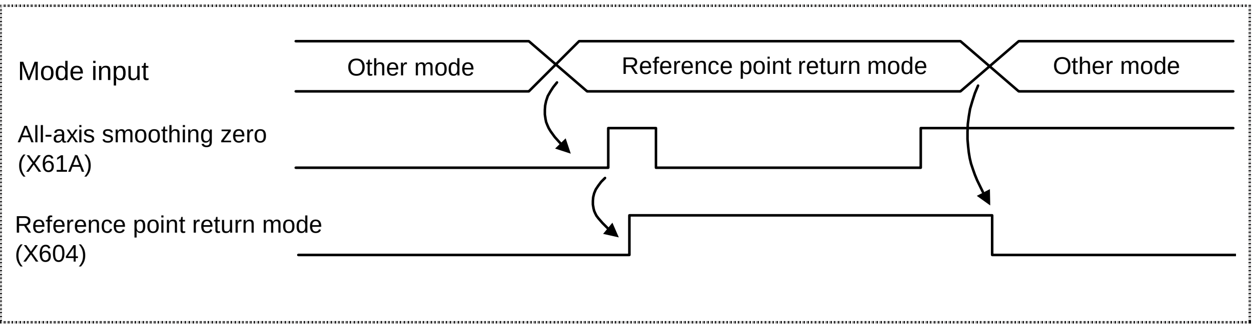
B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	IN REFERENCE POINT RETURN MODE	ZRNO		X604	X684	X704

[Function]

This signal indicates that REFERENCE POINT RETURN mode is selected.

[Operation]

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



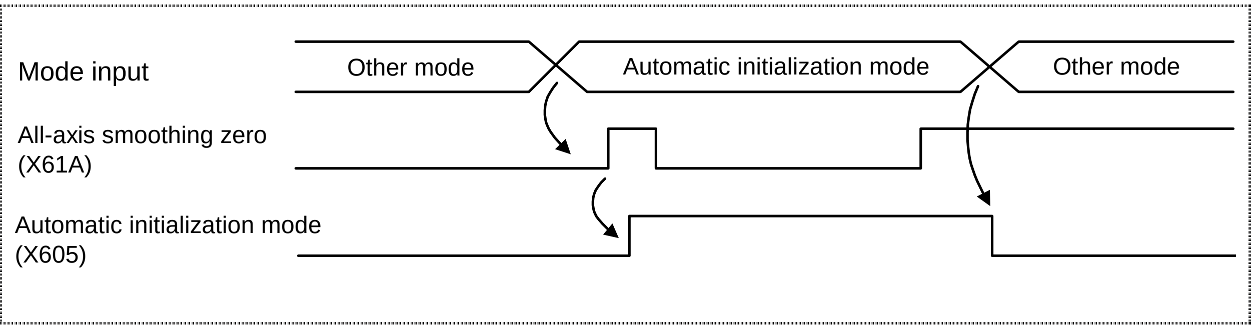
B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	IN AUTOMATIC INITIALIZATION MODE	ASTO		X605	X685	X705

[Function]

This signal indicates that AUTOMATIC INITIAL SETTING MODE is selected.

[Operation]

Mode is changed over from other mode to AUTOMATIC INITIALIZATION mode after "All-axis smoothing zero" (command acceleration/deceleration delay is zero) has been verified.



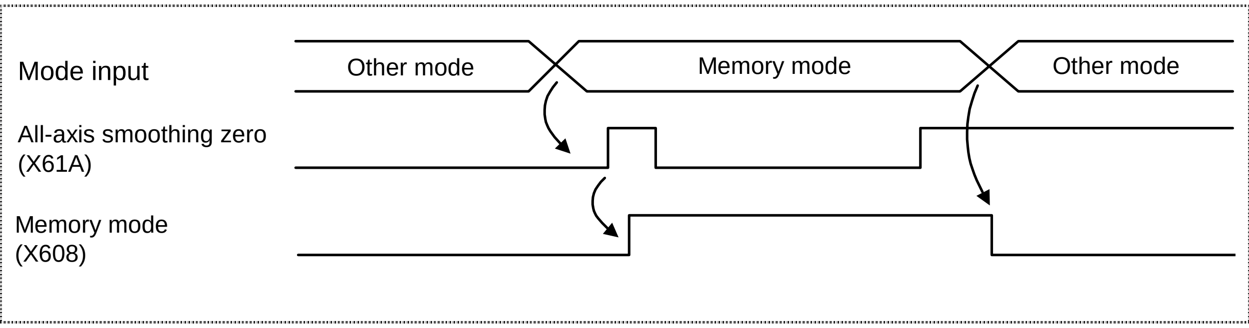
B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	IN MEMORY MODE	MEMO		X608	X688	X708

[Function]

This signal indicates that MEMORY mode is selected.

[Operation]

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



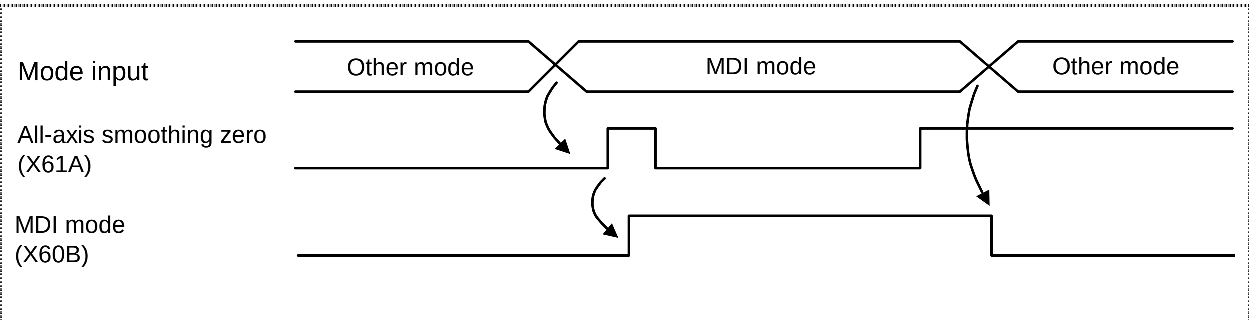
B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	IN MDI MODE	DO		X60B	X68B	X70B

[Function]

This signal indicates that MDI mode is selected.

[Operation]

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



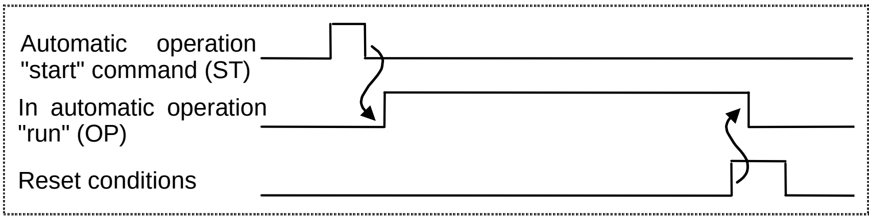
B con-tact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	IN AUTO OPERATION "RUN"	OP		X612	X692	X712

[Function]

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

[Operation]

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



(1) Reset conditions include the followings:
- Reset & REWIND (RRW) is input.
- "Emergency stop" signal is input or servo alarm occurs, causing stop the machine.

(2) Signals related to automatic operation (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 "Automatic operation pause" signal (*SP) is OFF.)
- Auto operation start condition•••••• Automatic operation is being executed.

[Related signals]

In auto operation "start" (STL: X613)
In auto operation "pause" (SPL: X614)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	IN AUTO OPERATION "START"	STL		X613	X693	X713

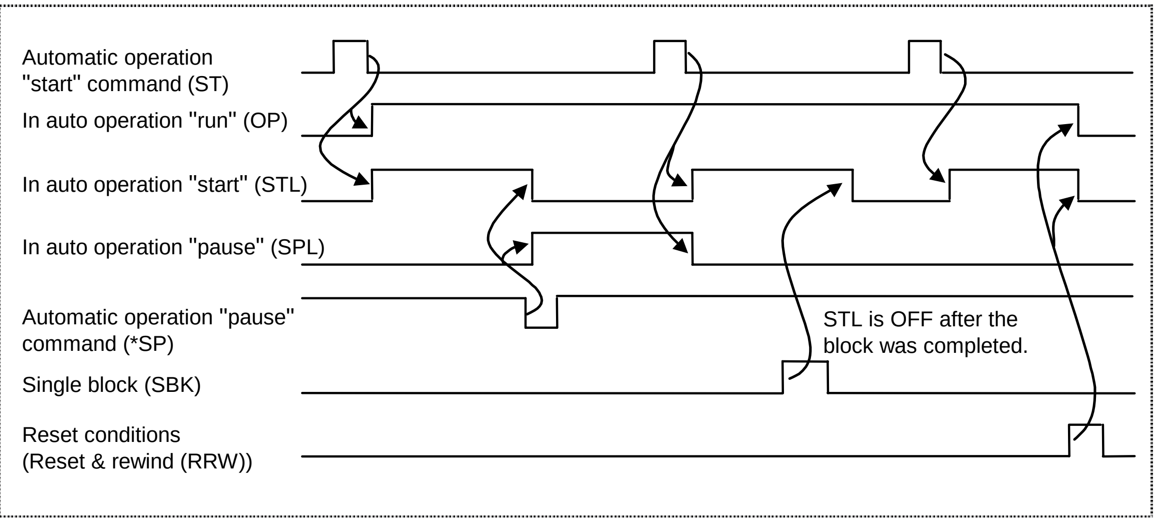
[Function]

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

[Operation]

The signal turns ON by "Automatic operation "start" command" (ST) in memory or MDI, 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: X612)
In auto operation "pause" (SPL: X614)
Automatic operation "start" command (ST: Y710)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	IN AUTO OPERATION "PAUSE"	SPL		X614	X694	X714

[Function]

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

[Operation]

"Automatic operation "pause" command" signal (SPL) turns ON with the following factors during automatic operation using the memory or MDI mode.

(1) When "Automatic operation "pause" command" signal (*SP) turns OFF.

(2) When mode changes to manual operation mode (jog, handle, incremental, reference point return mode, etc.).

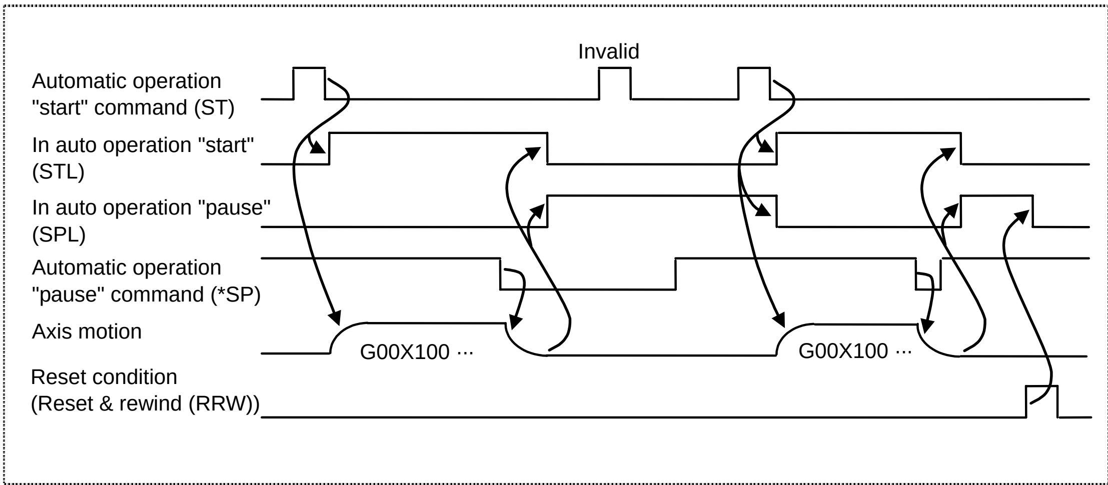
This signal will turn ON even during machine lock or a miscellaneous function (M, S, T) command.

This signal will turn OFF in the following cases.

(1) When "Automatic operation "start" command" signal (ST) turns from ON to OFF. However, this will be invalid if the "Automatic operation "pause" command" signal (*SP) is not turned back ON or if the mode is not automatic operation (memory, MDI).

(2) When reset conditions are input.

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



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

[Related signals]

In auto operation "run" (OP: X612)
In auto operation "start" (STL: X613)
Automatic operation "start" command (ST: Y710)
Automatic operation "pause" command (*SP: Y711)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	IN "RESET"	RST		X615	X695	X715

[Function]

This signal informs that the controller is in reset condition.

[Operation]

The signal turns ON:

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

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	IN MANUAL RANDOM FEED	CXN		X616	X696	X716

[Function]

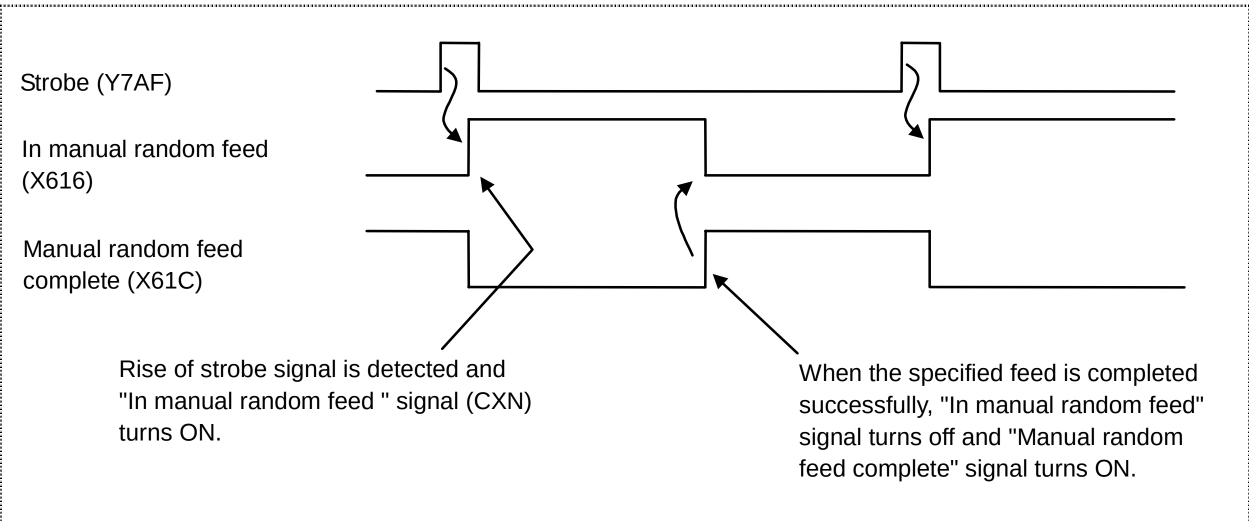
This signal is output during execution of manual random feed command.

[Operation]

The signal turns ON when "Strobe" signal (Y7AF) 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		1st system	2nd system	3rd system
—	IN REWIND	RWD		X617	X697	X717

[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 (Y71A)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	MOTION COMMAND COMPLETE	DEN		X618	X698	X718

[Function]

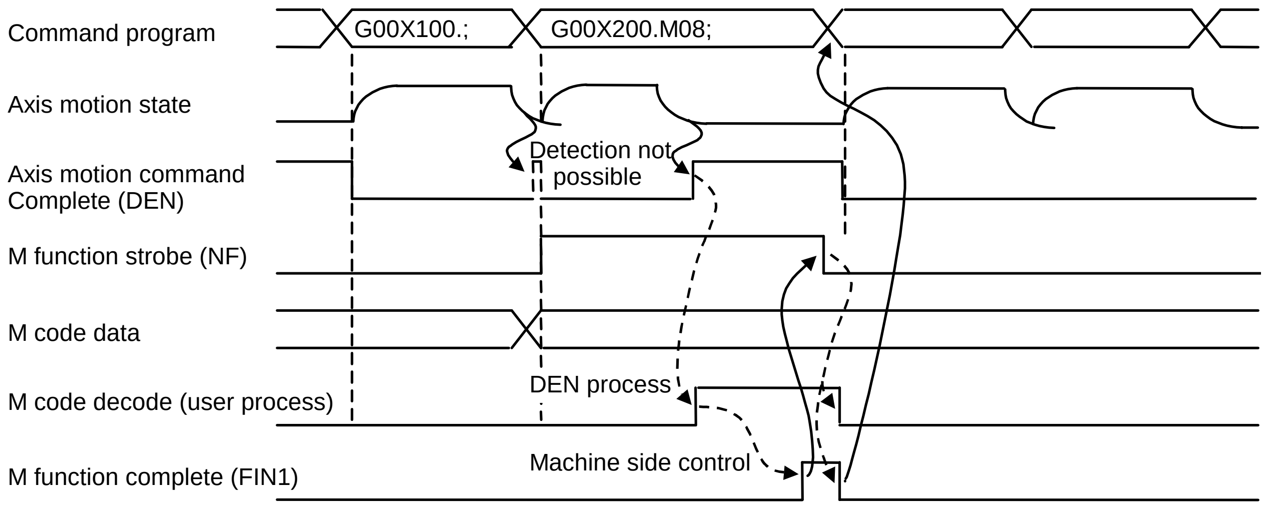
This signal notifies that the commanded motion has been completed by the controller.
In the machining program when the motion command and miscellaneous function (M, S, T) command are specified in the same block, this signal can be used as a synchronization signal to determine whether miscellaneous function 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 "Motion command complete" signal (DEN) is shown below.



(Note 1) "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 "Automatic operation "pause" command" signal.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	ALL-AXIS IN-POSITION	TINP		X619	X699	X719

[Function]

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

[Operation]

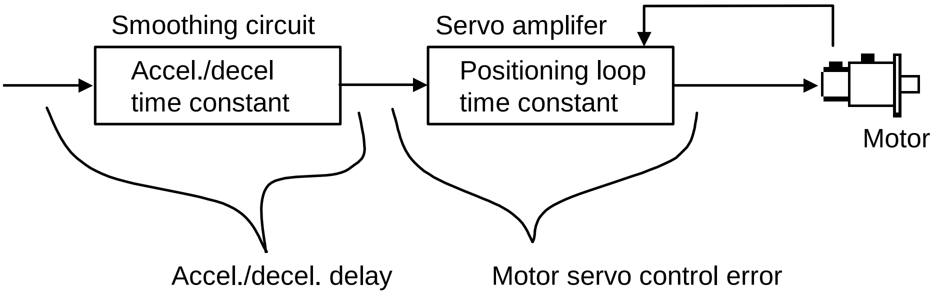
The signal turns ON when:

(1) 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 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 by the condition whether there is any delay in the acceleration/deceleration.



[Related signal]

All-axis smoothing zero signal (TSMZ: X61A)

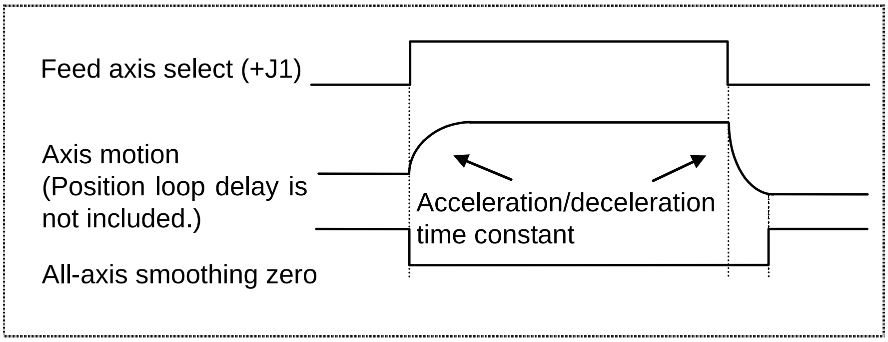
B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	ALL-AXIS SMOOTHING ZERO	TSMZ		X61A	X69A	X71A

[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 including delay amount of acceleration/deceleration time constant.
The signal turns 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-axis in-position signal (TINP)
(2) Plus motion +1st axis through +14th axis (MVP1~MVP14)
(3) Minus motion -1st axis through -14th axis (MVM1~MVM14)

"All-axis smoothing zero" signal turns ON when these signals are OFF.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	MANUAL RANDOM FEED COMPLETE	CXFIN		X61C	X69C	X71C

[Function]

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

[Operation]

The signal turns ON when:

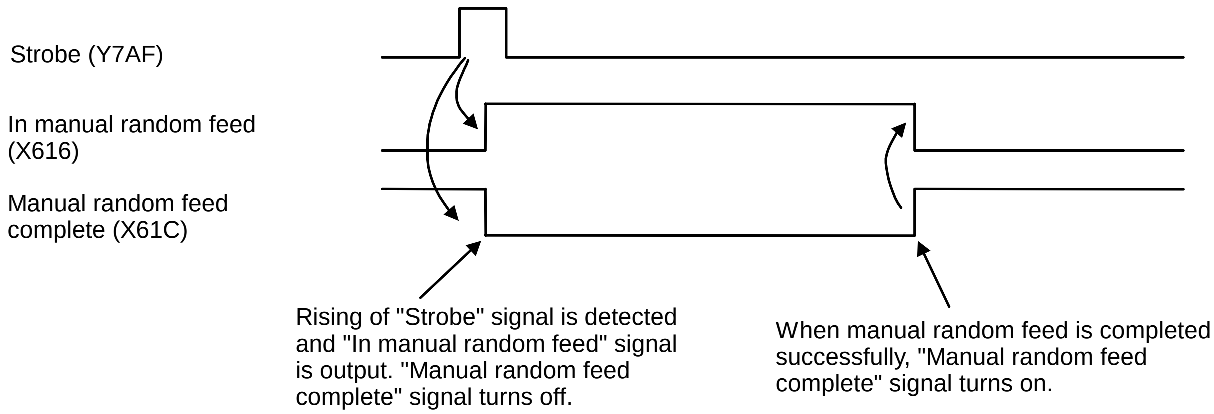
(1) Motion commanded in manual random feed mode is completed.

The signal turns OFF when:

(1) During motion in manual random feed mode.
(The signal stays OFF when motion is interrupted by "Reset & rewind" signal.)

(2) The power is turned ON.

[Timing chart]



B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	IN RAPID TRAVERSE	RPN		X620	X6A0	X720

[Function]

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

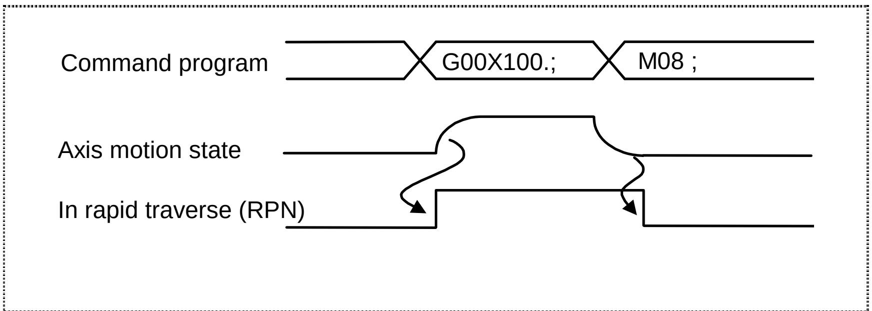
[Operation]

(1) The signal is ON when:
- Rapid traverse motion is executed in automatic operation.
  Fixed cycle positioning and reference point 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 "Automatic 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~*FV16) 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 rapid traverse signal (RPM) is shown below.



B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	IN CUTTING FEED	CUT		X621	X6A1	X721

[Function]

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

[Operation]

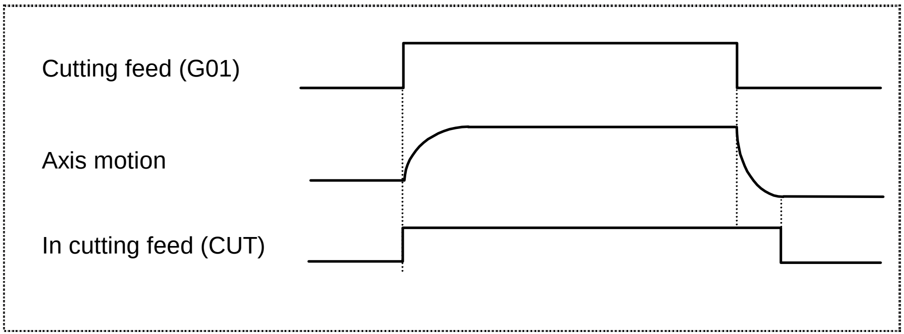
The signal turns ON when:

(1) Cutting feed is executed 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 "Automatic operation "pause" command" signal (*SP).
(3) Execution of cutting feed is stopped by interlock during automatic 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 even during machine interlock.
(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 automatic operation "run"" signal (OP).



B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	IN TAPPING	TAP		X622	X6A2	X722

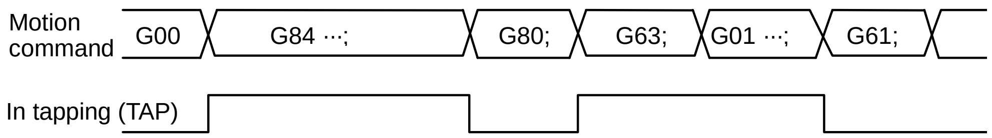
[Function]

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

[Operation]

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

(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 fixed 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		1st system	2nd system	3rd system
—	IN THREAD CUTTING	THRD		X623	X6A3	X723

[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		1st system	2nd system	3rd system
—	IN SYNCHRONOUS FEED	SYN		X624	X6A4	X724

[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		1st system	2nd system	3rd system
—	IN CONSTANT SURFACE SPEED	CSS		X625	X6A5	X725

[Function]

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

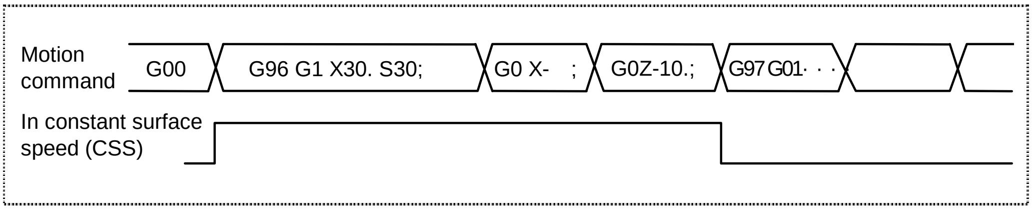
[Operation]

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		1st system	2nd system	3rd system
—	IN SKIP	SKIP		X626	X6A6	X726

[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		1st system	2nd system	3rd system
—	IN REFERENCE POINT RETURN	ZRNN		X627	X6A7	X727

[Function]

This signal is output while reference point return command is being executed.

[Operation]

The signal turns ON when:

(1) G28 command is executed.
(2) G30 command is executed.
(3) Manual reference point return mode is selected.

The signal turns OFF when:

(1) All cases other than above.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	IN INCH UNIT SELECT	INCH		X628	X6A8	X728

[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		1st system	2nd system	3rd system
—	F1-DIGIT COMMANDED	F1DN		X62A	X6AA	X72A

[Function]

This signal informs that the controller uses F1-digit commands (F1~F5) to control operation.

[Operation]

The signal turns ON when:

(1) F1-digit command (F1~F5) is selected for feedrate command currently being executed.

The signal turns OFF when:

(1) Block having a motion command specified with F1-digit code is completed.
(2) Operation is stopped by "Automatic 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, or
(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, base specification parameter "#1079 F1digt" must be validated and "#1185~#1189 speed during F1-digit command" must be set to use the F1-digit command.

[Related signal]

(1) F1-digit No. (F11~F14)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	IN TOOL LIFE MANAGEMENT	TLFO		X62B	X6AB	X72B

[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		1st system	2nd system	3rd system
—	TOOL LIFE OVER	TLOV		X62E	X6AE	X72E

[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 "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: Y78C)
(2) Tool function strobe 1 (TF1: X650)
(3) In tool life management (TLFO: X62B)
(4) New tool change (TCRQ: X64C)
(5) Tool life management group (R238)
(6) Tool life usage data (R244, 245)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	ALARM 3 (PROGRAM ERROR)	AL3		X632	X6B2	X732

[Function]

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

[Operation]

This type of alarm occurs during automatic operation in memory or MDI 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 Instruction 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 point 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		1st system	2nd system	3rd system
—	ALARM 4 (OPERATION ERROR)	AL4		X633	X6B3	X733

[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 Instruction 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 position detection

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	SEARCH & START (ERROR)	SSE		X635	X6B5	X735

[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 operation start 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 (Y7B2) for details.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	SEARCH & START (SEARCH)	SSG		X636	X6B6	X736

[Function]

Output when searching for a program with search & start.

[Operation]

Informs the PLC that the NC is searching for the program with search & start.
Hold search & start signal until the search & start (start) signal turns ON.
If the No. of the program to be searched is illegal, the search & start (error) signal (SSE) will be output.

[Related signals]

(1) Search & start program No. (R938/939)
(2) Search & start (error) (SSE: X635)
(3) Search & start (RSST: Y7B2)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	ILLEGAL AXIS SELECTED	ASLE		X637	X6B7	X737

[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		1st system	2nd system	3rd system
—	F1-DIGIT NO. (1, 2, 4)	F11~F14		X638~63A	X6B8~6BA	X738~73A

[Function]

F1-digit feed function No. is output.

[Operation]

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

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	IN SYNCHRONIZATION			X63C	X6BC	X73C

[Function]

This signal indicates the in synchronization state.

[Operation]

This signal turns ON when the synchronization command is issued from one part system, and retains ON until the corresponding synchronization command is issued from the other part system.
This signal turns OFF when synchronization is completed.
This signal remains OFF when synchronization is not used.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	M CODE INDEPENDENT OUTPUT M00	DM00		X640	X6C0	X740

[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 single outputs include M01, M02 and M30.

[Operation]

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

Machining program	M 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: X641)
(2) M code independent output M02 (DM02: X642)
(3) M code independent output M30 (DM30: X643)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	M CODE INDEPENDENT OUTPUT M01	DM01		X641	X6C1	X741

[Function] [Operation]

Refer to "M CODE INDEPENDENT OUTPUT M00".

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	M CODE INDEPENDENT OUTPUT M02	DM02		X642	X6C2	X742

[Function] [Operation]

Refer to "M CODE INDEPENDENT OUTPUT M00".

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	M CODE INDEPENDENT OUTPUT M30	DM30		X643	X6C3	X743

[Function] [Operation]

Refer to "M CODE INDEPENDENT OUTPUT M00".

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	M FUNCTION STROBE 1	MF1		X644	X6C4	X744

[Function]

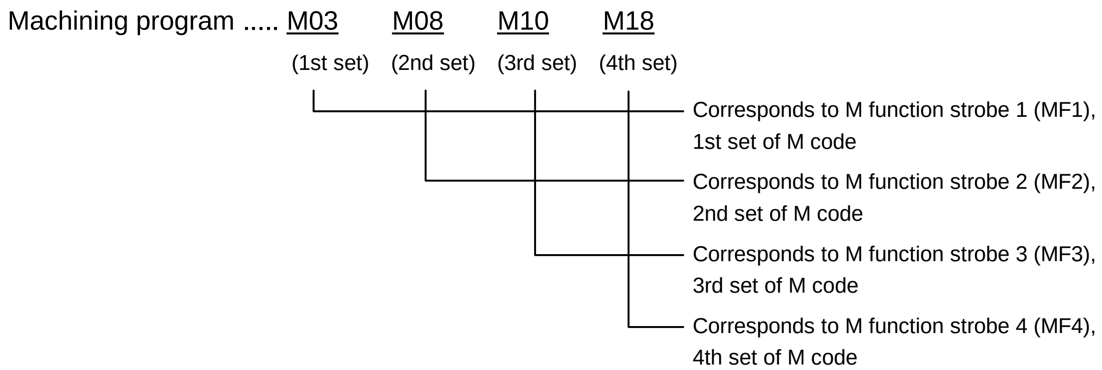
This signal informs that the 1st set of miscellaneous functions (M code) is commanded with the automatic operation (memory, MDI) machining program or manual numerical command input.
The miscellaneous function is also called the M function, and is used to issue miscellaneous functions such as ON/OFF of 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 or MDI).
(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" 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.

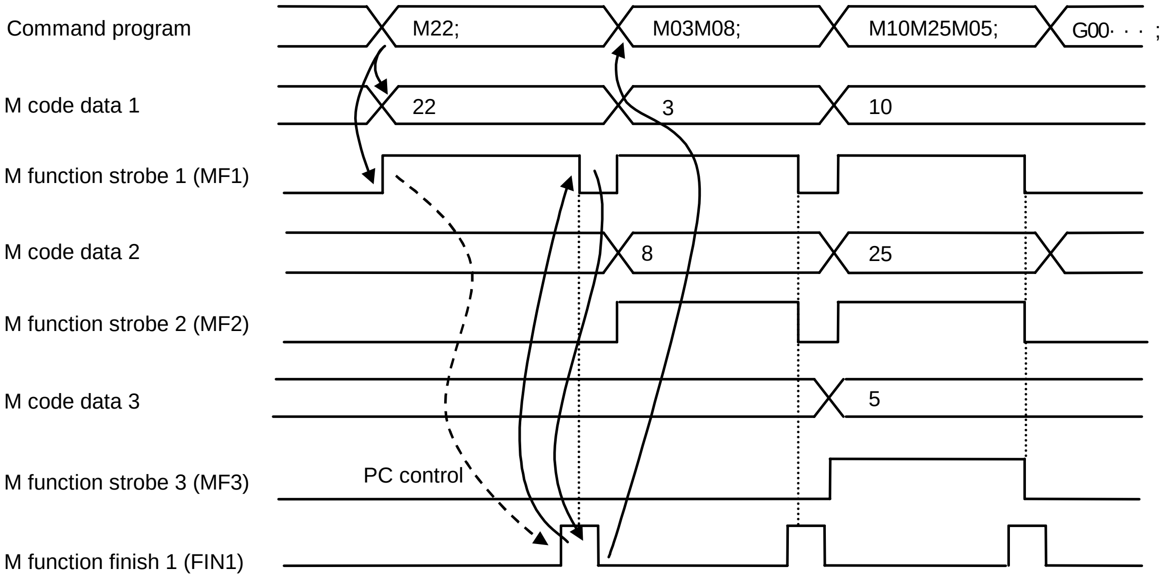


(Note 2) During operation with miscellaneous function lock (AFL signal ON), the M function strobe (MF1, MF2, MF3, MF4) will not be output. However, this signal will be output when the M code is commanded independently (M00, M01, M02, M30).

(Note 3) Since M98 (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.

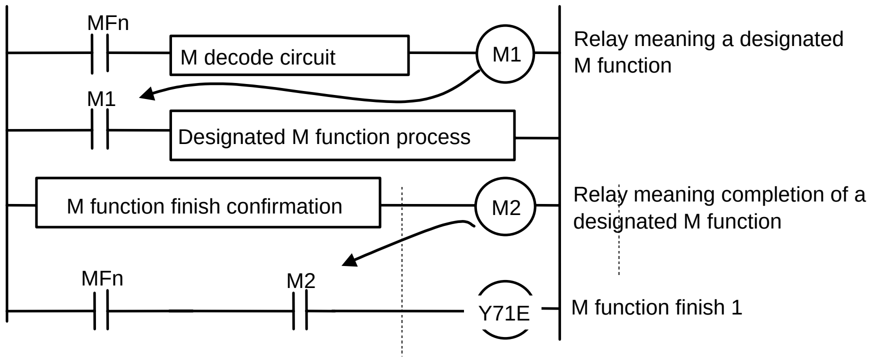
An example of the timing chart for the "M function strobe" signal (MF1, MF2 and MF3) is shown below.



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

(1) When the M function is commanded, the MFn and M code data n is output.
(2) MFn is always the trigger in the sequence process to start the M function process.
(3) When the designated M function process is completed, the M function finish signal is returned to the controller.
(4) The controller waits for the rising of the M function finish signal and then turns MFn OFF.
(5) 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: X645)
M function strobe 3 (MF3: X646)
M function strobe 4 (MF4: X647)
M function finish 1 (FIN1: Y71E)
M function finish 2 (FIN2: Y71F)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	M FUNCTION STROBE 2	MF2		X645	X6C5	X745

[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 in one block in automatic operation (memory or MDI).

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		1st system	2nd system	3rd system
—	M FUNCTION STROBE 3	MF3		X646	X6C6	X746

[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 in one block in automatic operation (memory or MDI).

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		1st system	2nd system	3rd system
—	M FUNCTION STROBE 4	MF4		X647	X6C7	X747

[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 in one block in automatic operation (memory or MDI).

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		1st system	2nd system	3rd system
—	MANUAL NUMERICAL COMMAND	MMS		X649	X6C9	X749

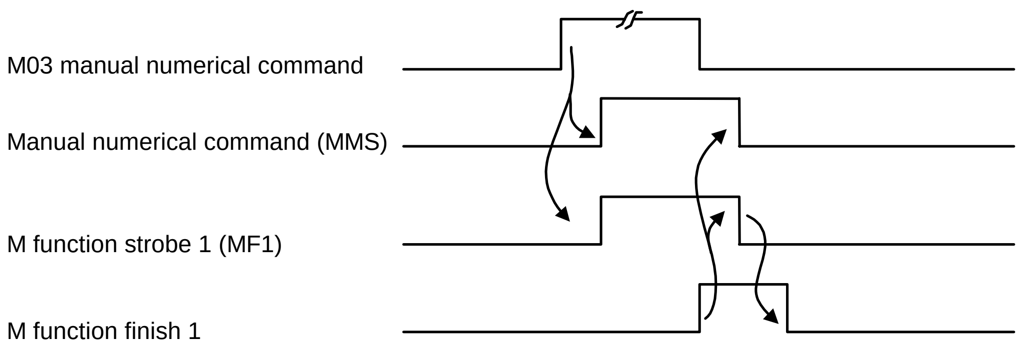
[Function]

This signal informs that M, S, T or B (2nd miscellaneous function) command is given 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 on the setting and display unit 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: X644~)
(2) S function strobe (SFn: X658~)
(3) T function strobe (TFn: X650~)
(4) 2nd M function strobe (BFn: X654~)
(5) M function finish 1 (Fin 1: Y71E)
(6) M function finish 2 (Fin 2: Y71F)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	TOOL CHANGE POSITION RETURN COMPLETE	TCP		X64B	X6CB	X74B

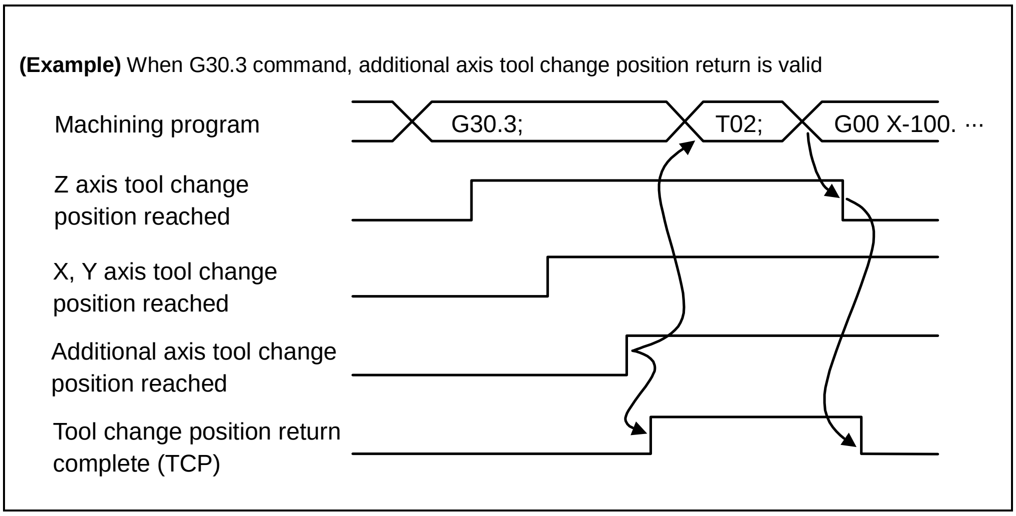
[Function]

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 (G30.3) 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]



B con-Tact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	NEW TOOL CHANGE	TCRQ		X64C	X6CC	X74C

[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		1st system	2nd system	3rd system
—	T FUNCTION STROBE 1	TF1		X650	X6D0	X750

[Function]

This signal informs that the tool function (T code) is specified in automatic operation (memory or MDI), machining program or by manual numerical command input.

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:

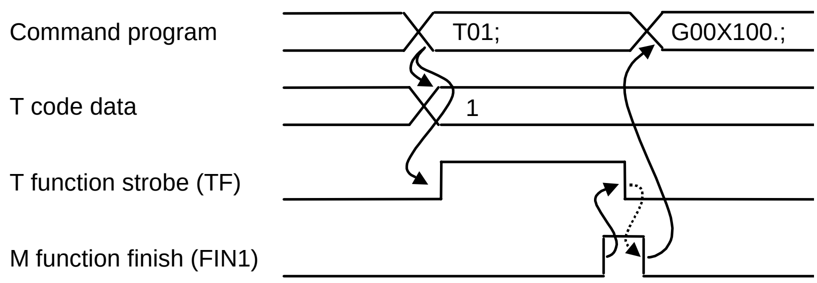
(1) The T function (T code) is specified in automatic operation (memory or MDI).
(2) T function (T) is specified by manual numerical command input.

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" 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" signal (TF1) is shown below.



[Related signals]

T code data (R220 to 227)

M function finish 1 (FIN1: Y71E)
M function finish 2 (FIN2: Y71F)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	2ND M FUNCTION STROBE 1	BF1		X654	X6D4	X754

[Function]

This signal informs that the 1st set of 2nd M function is selected in automatic operation (memory or MDI) 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 or MDI).
(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" 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.

Machining program ..... B03 B08 ;
(1st set) (2nd set)
Ignored.
2nd M function strobe (BF1)
Corresponding to 1st of 2nd M functions

(Note 2) The 2nd M function strobe (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: Y71E)
M function finish 2 (FIN2: Y71F)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	S FUNCTION STROBE 1	SF1		X658	X6D8	X758

[Function]

This signal informs that S (spindle) function (S code) is specified in automatic operation (memory or MDI) 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.

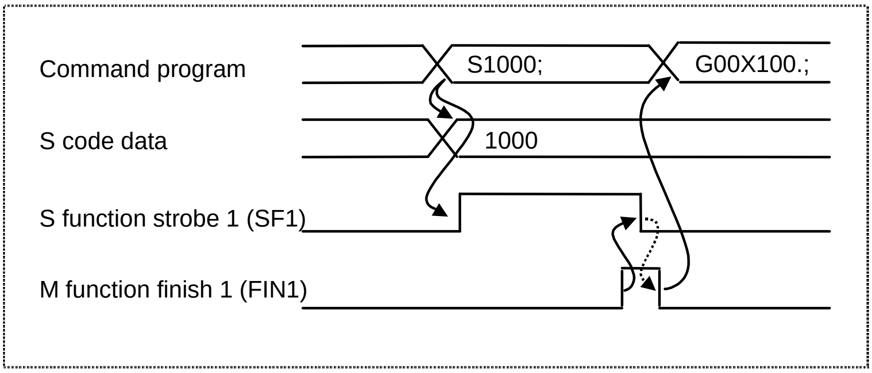
[Operation]

The signal turns ON when:
(1) S function (S code) is specified in automatic operation (memory or MDI).
(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" signal (OP) section for details on the reset conditions.)

(Note 1) The S function strobe (SF) is not output during operation with M function lock (AFL signal ON).
(Note 2) When the S function is commanded, the "Spindle gear shift command" signal (GR1, GR2) and "Spindle 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 "Gear shift completed" 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 (R212 to 219, R264 to 269)
Spindle gear shift command (GR1, GR2: X98D, X98E)
Spindle no gear selected (SNGE: X986)

Spindle gear selection input (GI1, GI2: YD30, YD31)
Spindle gear shift complete (GFIN: YD26)
M function finish 1 (FIN1: Y71E)
M function finish 2 (FIN2: Y71F)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	POSITION SWITCH 1~16	PSWn		X660~667 X670~677	X6E0~6E7 X6F0~6F7	X760~767 X770~777

[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 #7653.

The validity of this signal differs in the following manner depending on the absolute position detection or incremental detection.

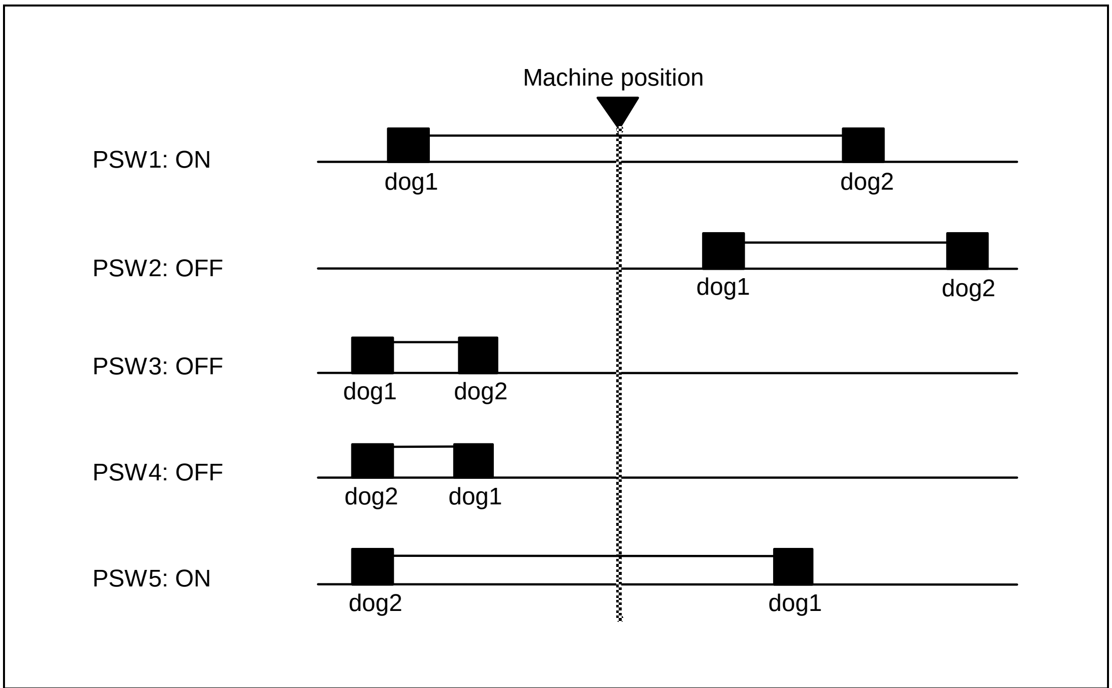
<For absolute position detection system>

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

<For incremental position detection system>

This signal is not validated until the first zero point return is completed after the power is turned ON. (PSW1 to PSW16 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 are available even if which of them is lager, 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 - TP [s]

TP: Position loop time constant ($\frac{1}{PGN}$ [s])

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	TAP RETRACT POSSIBLE	TRVE		X66D	X6ED	X76D

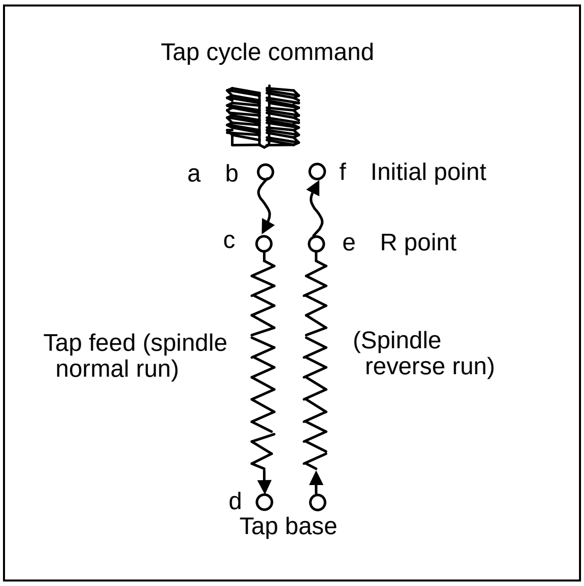
[Function]

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 when 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: Y75C)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	NO. OF WORK MACHINING OVER	PCNT		X66E	X6EE	X76E

[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) (R240)
(2) No. of work machining (maximum value) (R940)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	ABSOLUTE POSITION WARNING	ABSW		X66F	X6EF	X76F

[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 con-tact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	S-ANALOG GEAR NO. ILLEGAL	SIGE		X984	X9B4	X9E4

[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 con-tact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	S-ANALOG MAX./MIN. COMMAND VALUE OVER	SOVE		X985	X9B5	X9E5

[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 machine parameter (Smax) value, or smaller than machine parameter (Smin) value.

B con-tact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	SPINDLE NO GEAR SELECTED	SNGE		X986	X9B6	X9E6

[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 parameters.

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

[Related signals]

Spindle function strobe (SFn: X658 to)
Spindle gear shift command (GR1, GR2: X98D, X98E)

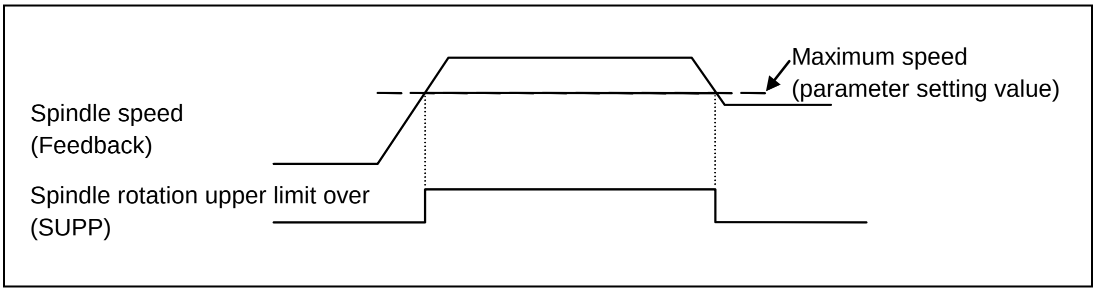
B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	SPINDLE SPEED UPPER LIMIT OVER	SUPP		X98B	X9BB	X9EB

[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.



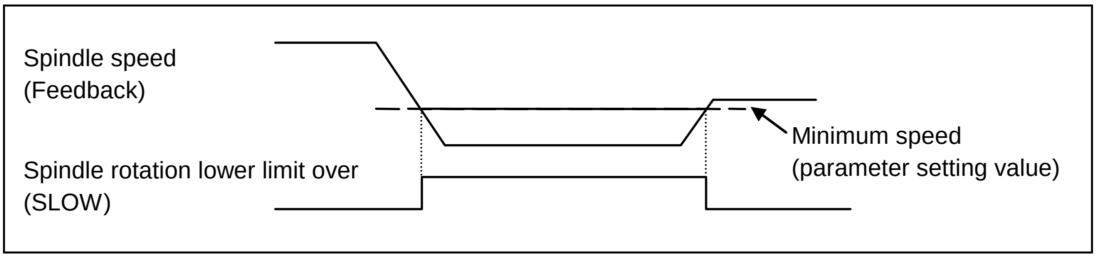
B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	SPINDLE SPEED LOWER LIMIT OVER	SLOW		X98C	X9BC	X9EC

[Function]

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

[Operation]

This signal turns ON when the spindle motor's feedback drops below the minimum speed regardless of the commanded speed.



B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	SPINDLE GEAR SHIFT	GR1, GR2		X98D, 98E	X9BD, 9BE	X9ED, 9EE

[Function]

This signal informs which gear stage in the spindle applies to the S command (S code) issued in the automatic operation (memory, MDI) 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 command (GR1, GR2) signal output is shown below.

Gear stage	Max. spindle speed	Spindle gear shift command		
		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 (SFn).

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

[Related signals]

Spindle function strobe (SFn: X658 to)
Spindle no gear selected (SNGE: X986)

B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	SPINDLE CURRENT DETECT	CDO		X991	X9C1	X9F1

[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 serially connected with the spindle controller.

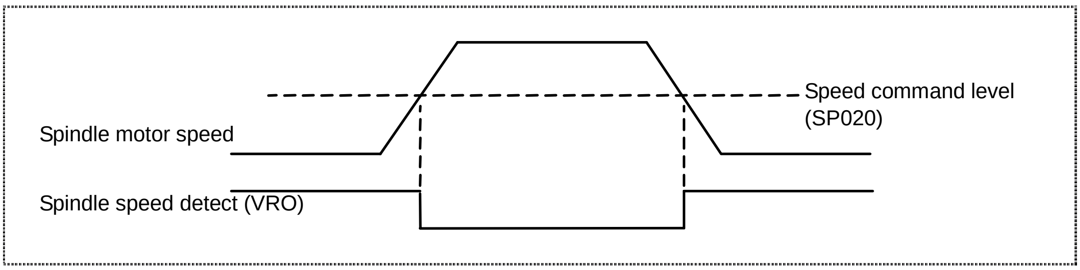
B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	SPINDLE SPEED DETECT	VRO		X992	X9C2	X9F2

[Function]

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

[Operation]

The signal (VRO) turns ON when motor speed (motor rotation speed) drops below the speed specified by parameter "#3220 SP020 (speed detection set value)".
The speed level at which the signal is output can be set within range from 1% to 120% (standard setting: 10%) with the spindle parameters.



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

B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	IN SPINDLE ALARM	FLO		X993	X9C3	X9F3

[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 occurs in the spindle controller is detected.

To cancel alarm, reset the controller (by reset & rewind), turn the controller power OFF or turn the spindle controller power supply OFF. Note that reset method depends on type of alarm.
Typical examples of alarm are listed below. For details of alarm (contents and cancel procedures) and reset methods, 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 serially connected with the spindle controller.

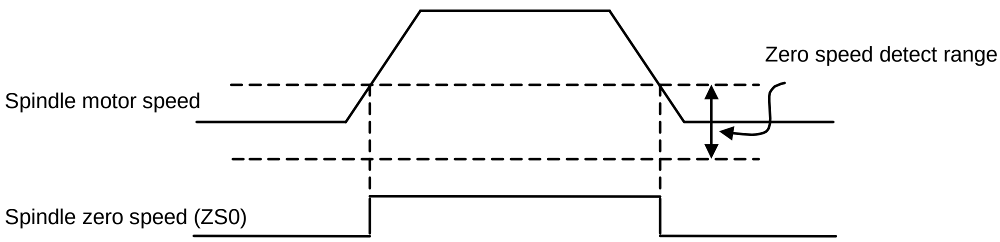
B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	SPINDLE ZERO SPEED	ZSO		X994	X9C4	X9F4

[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 actual spindle motor speed drops below the speed set in the spindle parameter #3218 (zero speed detection speed).



(Note 1) The signal is output, no matter whether direction of rotation is forward (SRN) or reverse (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 1r/min to 1000r/min with the spindle parameters.
(Note 4) This signal is valid only for the system that is high-speed serially connected with the spindle controller.

B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	SPINDLE UP-TO-SPEED	USO		X995	X9C5	X9F5

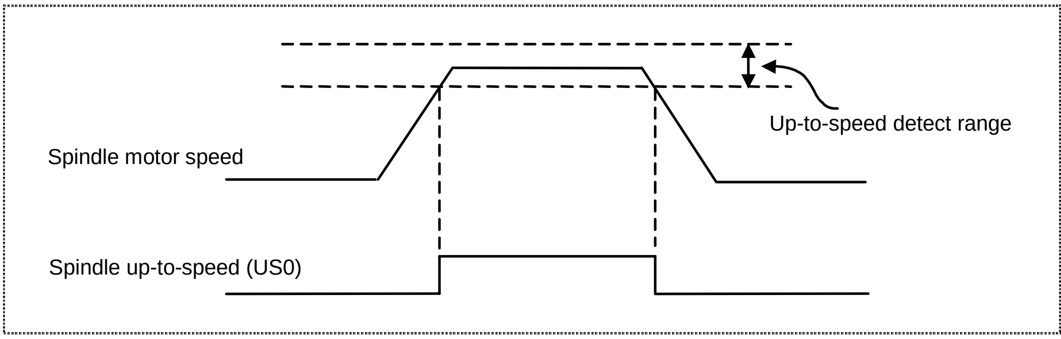
[Function]

This signal is output from the high-speed serial connection specification spindle controller (spindle drive) and informs that actual spindle motor speed reaches the range designated with the parameter SP048.

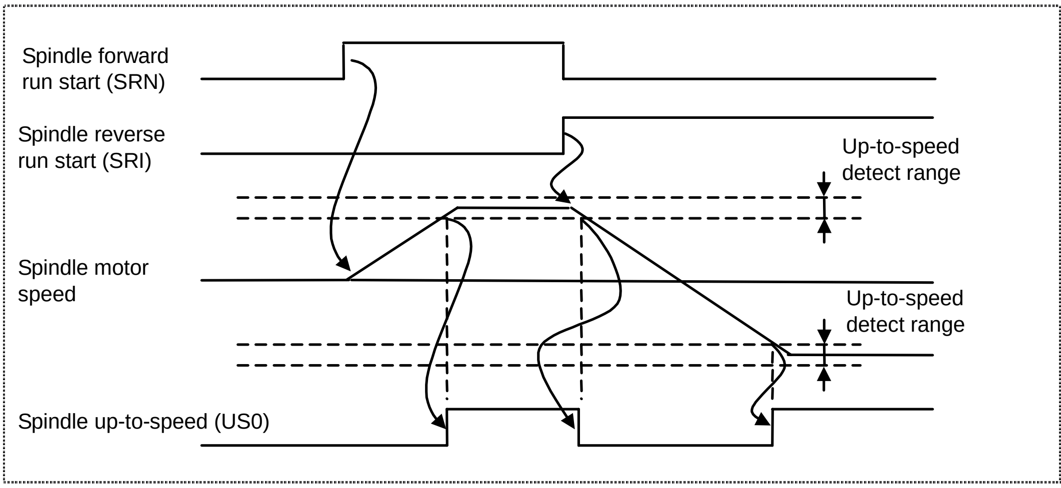
This signal is used for the S command complete conditions or control axis interlock during automatic operation.

[Operation]

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



When the operation is changed from spindle forward run to spindle reverse run, the spindle motor starts to decelerate, and the spindle up-to-speed signal turns OFF. When the motor enters the detection range again, the spindle up-to-speed signal turns ON again.



(Note 1) This signal is not output unless the "spindle forward run start" (SRN) signal or "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 serially connected with the spindle controller.

B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	SPINDLE IN-POSITION	ORAO		X996	X9C6	X9F6

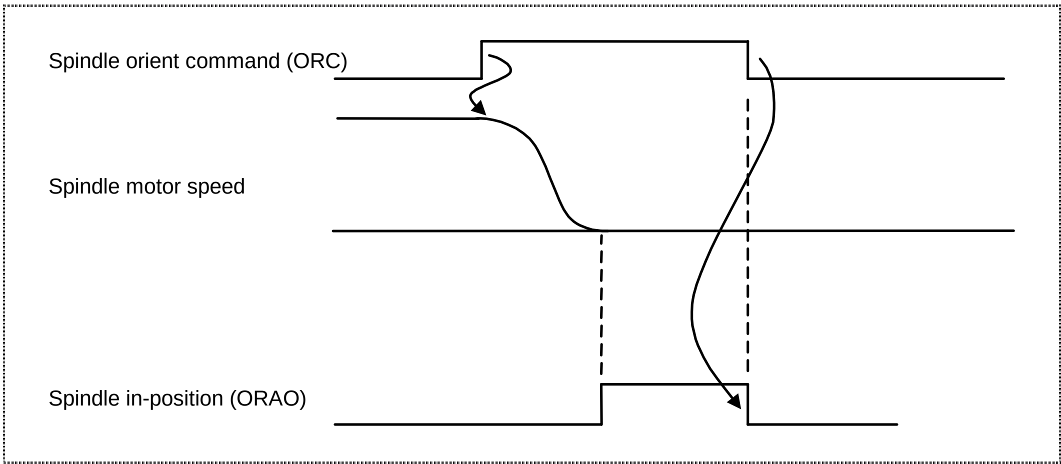
[Function]

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

[Operation]

When the spindle positioning in the set range completes, this signal will turn ON. The spindle orientation is stored by "Spindle orient command" signal (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. However, if the spindle is rotated by external force, the signal (ORAO) may be turned OFF.
(3) The signal is turned OFF when the "Spindle orient command" (ORC) is turned OFF.



(Note 1) When spindle orient command is given, orientation starts regardless of the "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 to 99.999 degrees.
(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		1st spindle	2nd spindle	3rd spindle
—	IN L COIL SELECTED	LRSO		X997	X9C7	X9F7

[Function]

This signal informs that the L coil select function is being executed. This function changes the spindle motor coil to attain constant output characteristics over a wide range including low speed ranges.

[Operation]

Turn the "L coil selection" (LRSL) ON after attaining a speed (parameter SP020) at which the rotation speed can be changed.
When "L coil selection" (LRSL) turns ON and the coil is changed, "In L coil selected" (LRSO) will be output to the PLC.

(Note 1) L coil selection control can be selected when the following parameter is set.
Parameter SP034/bit2 is set to "1".

(Note 2) This signal is valid for a system having a control unit high-speed serially connected with the spindle controller and a coil changeover specification spindle motor.
As a principle, the built-in type is the target.

[Related signal]

L coil selection (LRSL: YD3F)

B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	SPINDLE READY-ON	SMA		X998	X9C8	X9F8

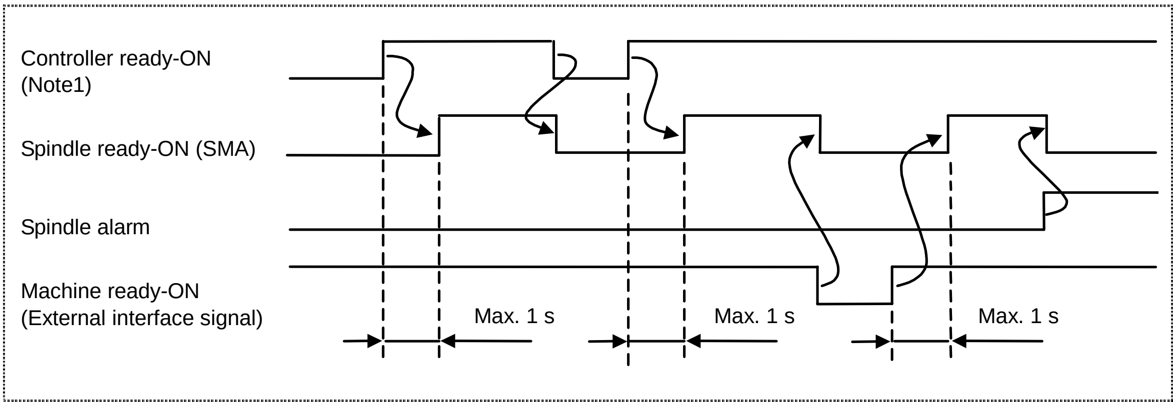
[Function]

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

[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) "Spindle 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 serially connected with the spindle controller.

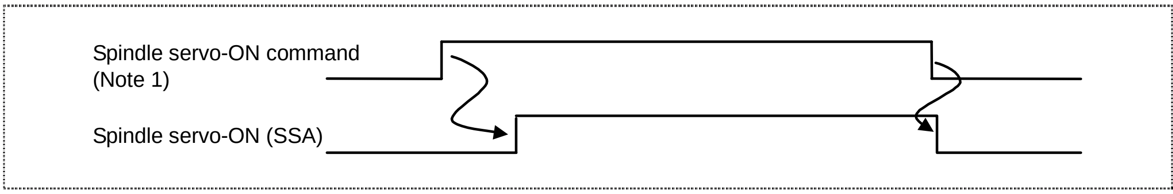
B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	SPINDLE SERVO-ON	SSA		X999	X9C9	X9F9

[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, etc.).

[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 serially connected with the spindle controller.

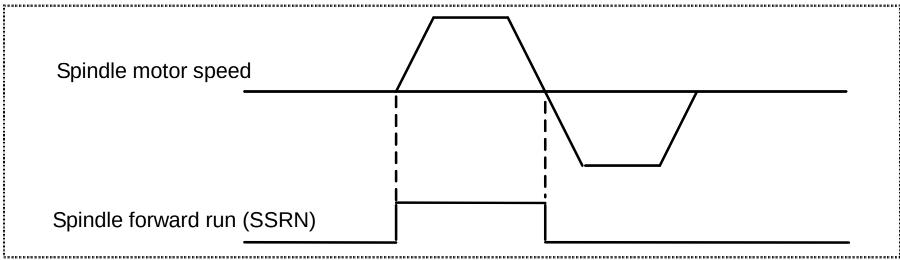
B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	SPINDLE FORWARD RUN	SSRN		X99B	X9CB	X9FB

[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]

This signal (SSRN) turns ON when the spindle motor is rotating in the forward direction. It also turns ON even during oriented motion or synchronous tap if the spindle rotates in the forward direction.



(Note 1) The "SSRN" 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 serially connected with the spindle controller.

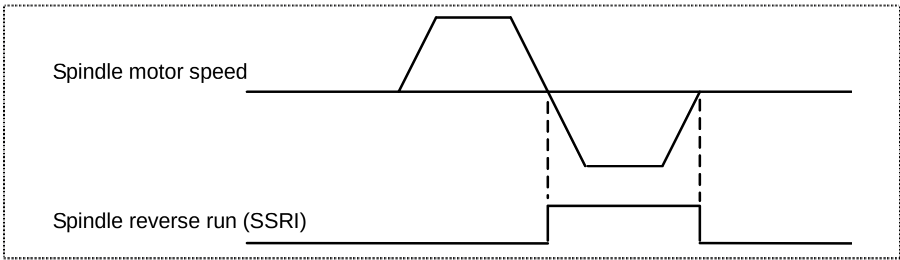
B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	SPINDLE REVERSE RUN	SSRI		X99C	X9CC	X9FC

[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]

This signal (SSRI) 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 direction.



(Note 1) The "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 serially connected with the spindle controller.

B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	Z-PHASE PASSED	SZPH		X99D	X9CD	X9FD

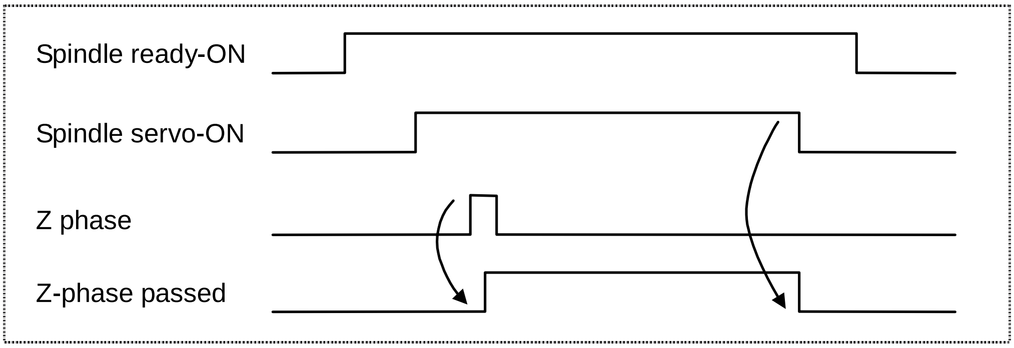
[Function]

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

[Operation]

The signal turns ON when:
(1) The Z phase is passed during C axis control.

The signal turns OFF when:
(1) The "Spindle servo-ON" signal turns OFF.
(2) The "Spindle ready-ON" signal turns OFF.



(Note) This signal is valid only for a system having a control unit high-speed serially connected with the spindle controller.

B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	POSITION LOOP IN-POSITION	SINP		X99E	X9CE	X9FE

[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]

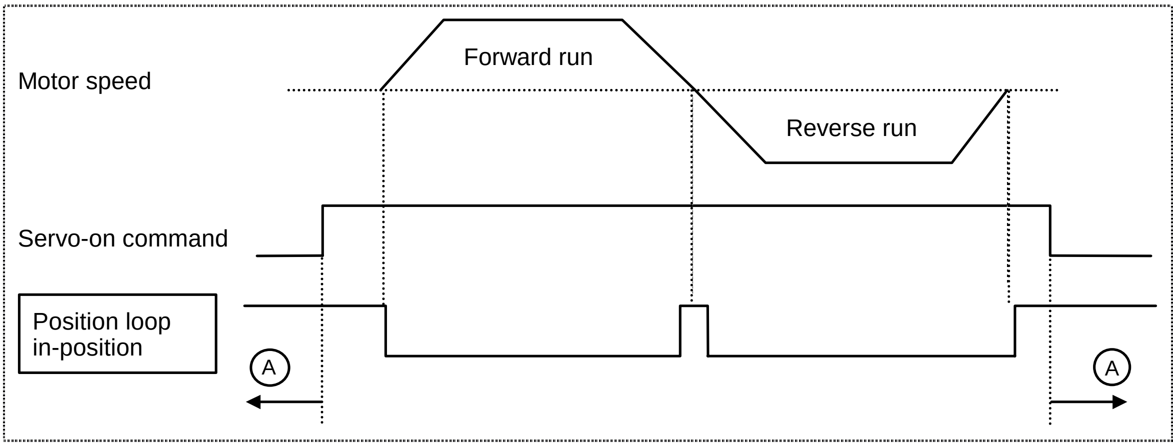
The signal will turn ON when:

(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		1st spindle	2nd spindle	3rd spindle
—	TORQUE LIMIT	STLQ		X99F	X9CF	X9FF

[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" signal (TL1) or "Torque limit 2" signal (TL2) is ON.

The "STLQ" signal turns OFF when:

(1)"Torque limit 1" signal (TL1) and "Torque limit 2" signal (TL2) are both OFF.

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

[Related signals]

Torque limit 1 signal (TL1: YD3A)
Torque limit 2 signal (TL2: YD3B)

6.2 PLC Input Signals (Data Type: R***)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	KEY IN 1			R8	—	—

[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 "User PLC key operation" section of "PLC Programming Manual" for details on the set key data.

[Related signals]

(1) KEY OUT 1 (R112)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	DISPLAY INFORMATION			R16~19	—	—

[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.

<table>
<tr><th>File register</th><th>Operated key</th><th colspan="3">Screen information</th></tr>
<tr><td rowspan="7">R17
bit F ~ 8</td><td rowspan="7">Function No.</td><td colspan="2">MONITOR</td><td>00</td></tr>
<tr><td rowspan="2">TOOL•PARAM</td><td>cmdtyp is 1, 2</td><td>0C</td></tr>
<tr><td>cmdtyp is 3, 4</td><td>12</td></tr>
<tr><td colspan="2">EDIT•MDI</td><td>0D</td></tr>
<tr><td colspan="2">DIAGN•IN/OUT</td><td>10</td></tr>
<tr><td colspan="2">SFG</td><td>08</td></tr>
<tr><td colspan="2">F0</td><td>09</td></tr>
<tr><td>R17
bit 7 ~ 0</td><td>Menu No.</td><td colspan="3">00~13
(0~19: decimal)
Menu changeover
00 01 02 03 04
05 06 07 08 09
0A 0B 0C 0D 0E
0F 10 11 12 13</td></tr>
<tr><td>R16
bit F ~ 8</td><td>Page No.</td><td colspan="3">01~n
Change by next page key or previous page key</td></tr>
<tr><td>R16
bit 7 ~ 0</td><td>———</td><td colspan="3">Not set.
The data is not set.</td></tr>
</table>

(Note) File registers R18 and 19 are invalid.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	PLC MAIN SCAN TIME			R20	—	—

[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>

File register

F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0

$\underbrace{\text{F E D C B A 9 8}}_{\text{Upper-order data}}\ \underbrace{\text{7 6 5 4 3 2 1 0}}_{\text{Lower-order data}}$

Time calculation

$$\boxed{\text{Upper-order data}} \times 7.1 + \frac{\boxed{\text{Lower-order data}}}{256} \times 7.1 \qquad \text{(ms)}$$

(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

$$\boxed{\text{Upper-order data=6}} \times 7.1 + \frac{\boxed{\text{Lower-order data=208}}}{256} \times 7.1 \qquad \text{(ms)}$$

(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		1st system	2nd system	3rd system
—	EMERGENCY STOP CAUSE			R21	—	—

[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) — Bit

Bit	Cause
F	Servo drive unit emergency stop output
E	Spindle drive unit emergency stop output
D	Door interlock, dog/OT arbitrary allocation device illegal
C	PLC high-speed processing error
B	User PLC Illegal codes exist
A	
9	
8	
7	
6	Built-in PLC Software emergency stop output device Y427 is "1"
5	
4	External PLC Emergency stop output
3	External PLC Communication error
2	External PLC Not ready
1	External PLC No hardware
0	Built-in PLC Software stop state

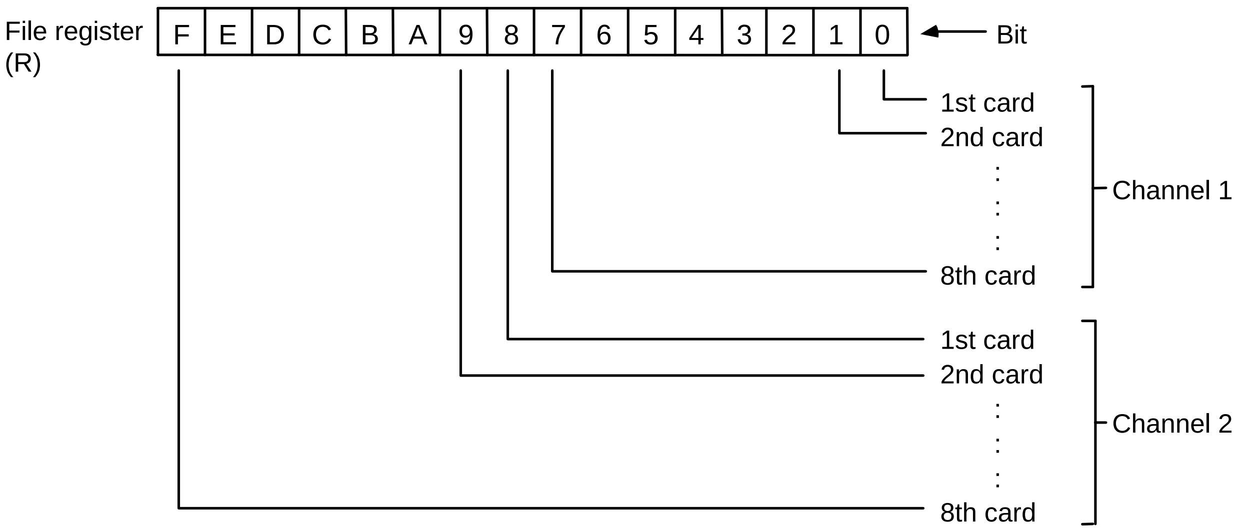
B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	DIO CARD INFORMATION			R22	—	—

[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 DX100/101, 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	One-card unit
DX110/111, DX120/121, DX140/141	Two-card unit

(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		1st system	2nd system	3rd system
—	USER MACRO INPUT #1032 (PLC → Controller)			R24, 25	—	—

[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 input signal	System variable	Points	Interface input signal
#1000	1	Register R24 bit 0	#1016	1	Register R25 bit 0
#1001	1	Register R24 bit 1	#1017	1	Register R25 bit 1
#1002	1	Register R24 bit 2	#1018	1	Register R25 bit 2
#1003	1	Register R24 bit 3	#1019	1	Register R25 bit 3
#1004	1	Register R24 bit 4	#1020	1	Register R25 bit 4
#1005	1	Register R24 bit 5	#1021	1	Register R25 bit 5
#1006	1	Register R24 bit 6	#1022	1	Register R25 bit 6
#1007	1	Register R24 bit 7	#1023	1	Register R25 bit 7
#1008	1	Register R24 bit 8	#1024	1	Register R25 bit 8
#1009	1	Register R24 bit 9	#1025	1	Register R25 bit 9
#1010	1	Register R24 bit 10	#1026	1	Register R25 bit 10
#1011	1	Register R24 bit 11	#1027	1	Register R25 bit 11
#1012	1	Register R24 bit 12	#1028	1	Register R25 bit 12
#1013	1	Register R24 bit 13	#1029	1	Register R25 bit 13
#1014	1	Register R24 bit 14	#1030	1	Register R25 bit 14
#1015	1	Register R24 bit 15	#1031	1	Register R25 bit 15

System variable	Points	Interface input signal
#1032	32	Register R24, R25
#1033	32	Register R26, R27
#1034	32	Register R28, R29
#1035	32	Register R30, R31

This correspondence table shows the example for file registers R24 and R25.

File registers R24 and R25 correspond to system variables #1000~#1031, and #1032 (32-bit data).

[Related signals]

(1) User macro input #1033, #1034, #1035 (R26/27, R28/29, R30/31)
(2) User macro output #1132, #1133, #1134, #1135 (R124/125, R126/127, R128/129, R130/131)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	USER MACRO INPUT #1033 (PLC → Controller)			R26, 27	—	—

[Function]

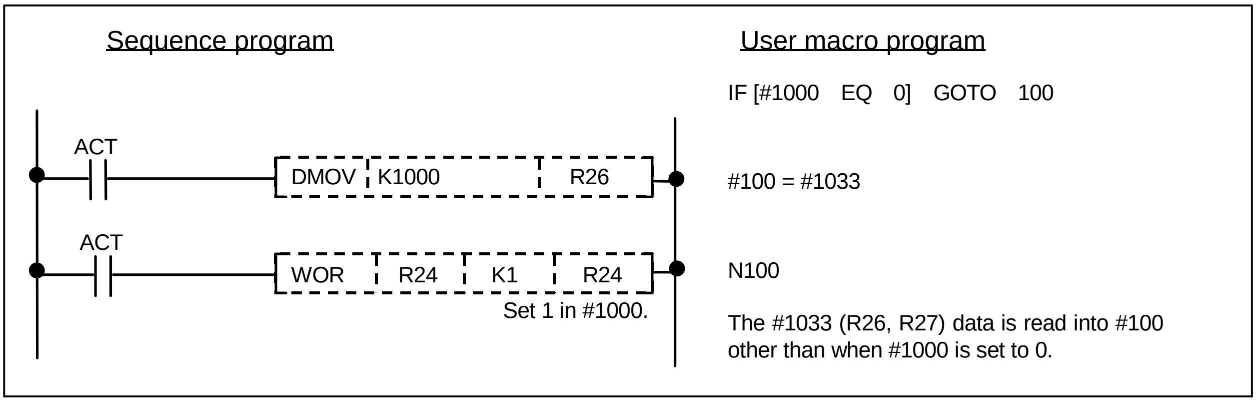
This provides interface function used to coordinate user PLC to user macro.

(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)



[Related signals]

(1) User macro input #1032, #1034, #1035, #1000~#1031 (R24/25, R28/29, R30/31)
(2) User macro output #1132, #1133, #1134, #1135, #1100~#1131 (R124/125, R126/127, R128/129, R130/131)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
	USER MACRO INPUT #1034 (PLC → Controller)			R28, 29	—	—

[Function] [Operation]

The function, operation, etc. are the same as those of "USER MACRO INPUT #1033".

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
	USER MACRO INPUT #1035 (PLC → Controller)			R30, 31	—	—

[Function] [Operation]

The function, operation, etc. are the same as those of "USER MACRO INPUT #1033".

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	CNC SOFTWARE VERSION CODE			R32~5	—	—

[Function]

This indicates the version of the CNC software.

[Operation]

The version of the software for controller is set.

```
[S/W MODULE TREE]                         ALARM/DIAGN    8.1/2
MP      BND – 377W000 – A0   SV1    BND-
OFFM
```

The file registers R32 to 35 are set to the following data.

(Example) BND-377W000-A 0 __
(1) (2) (3)

Item		File register	Type	Example
(1)	Mode function No.	R35	Binary	377=179AH
(2)	Serial No.	R34	Binary	000=0000H
(3)	Version	Bits F~8 of R33	ASCII code	A=41H
		Bits 7~0 of R33	ASCII code	0=30H
		Bits F~8 of R32	ASCII code	Blank=00H
—	———	Bits 7~0 of R32	Always FFH	

(Note 1) If the version is a 2-digit No., bits F~8 of R32 are set to "00H".
(Note 2) Bits 7~0 on the R32 are always "FFH".

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	BATTERY DROP CAUSE			R40	—	—

[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.

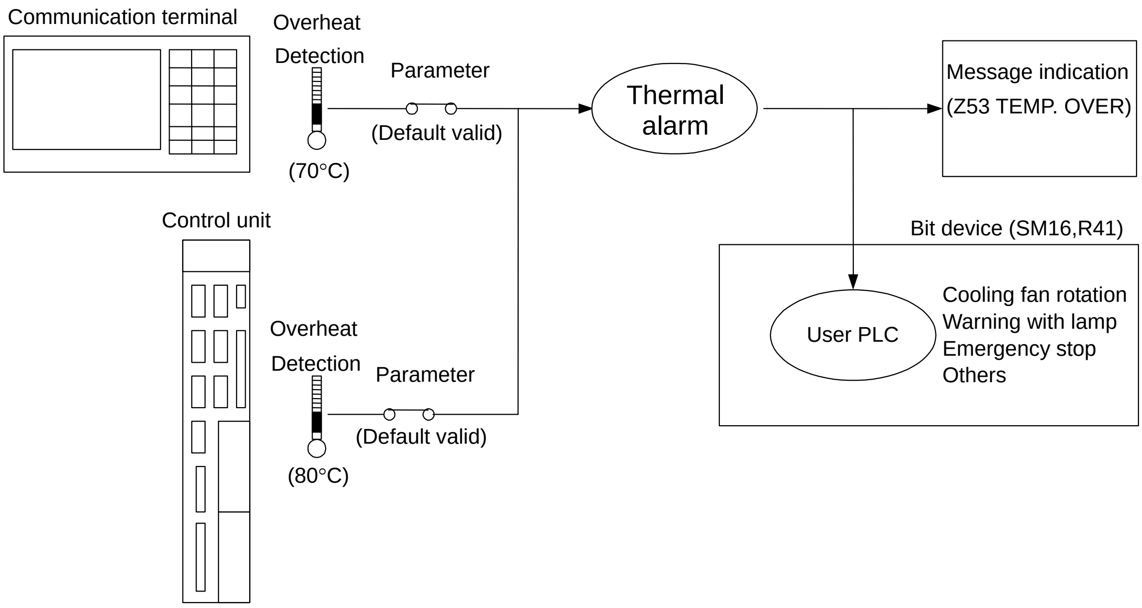
[Related signal]

(1) Battery alarm (BATAL: X42F)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	TEMPERATURE WARNING CAUSE			R41	—	—

[Function]

If the alarm is displayed when an overheat alarm is detected in the control unit or communication terminal, the overheat signal will be output simultaneously. If the machine is in automatic operation, the operation will be continued, but restarting will not be possible after resetting or stopping with M02/M30. (Starting will be possible after block stop or feed hold.)
The alarm will be reset and the overheat signal will turn OFF when the temperature drops below the specified temperature.
The alarm of overheat occurs when the temperature in the control unit is above 80°C, and when the ambient temperature of the communication terminal is above 70°C.

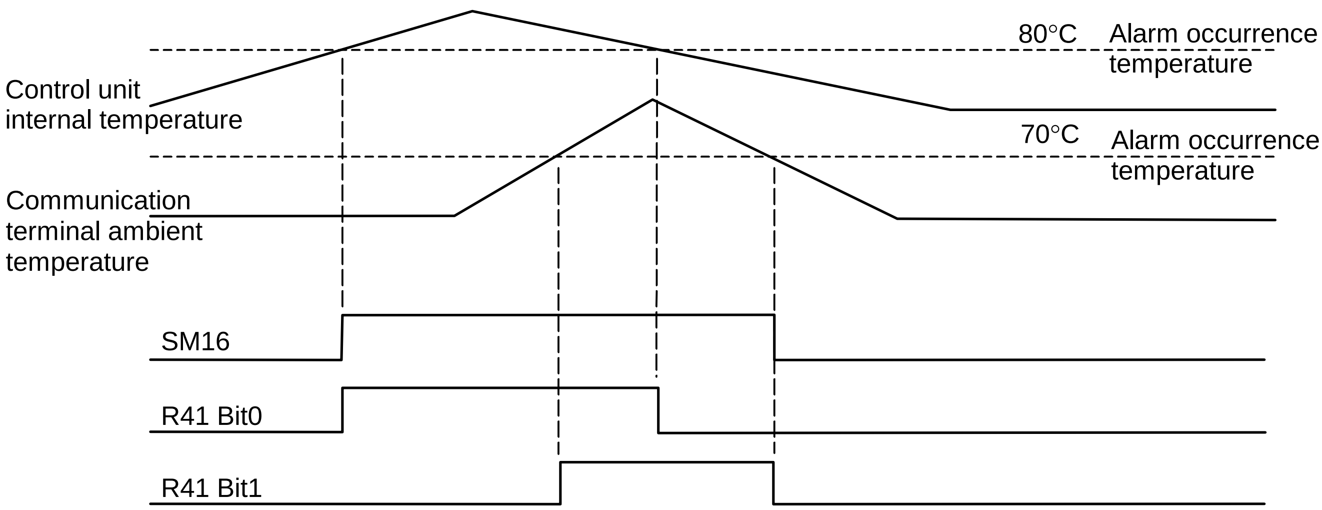


[Operation]

(1) If the internal temperature of control unit rises above 80°C (the ambient temperature of control unit is about 60°C) or the ambient temperature of communication terminal rises above 70°C, the overheat will be detected.
(2) The overheat detection will be the thermal alarm when the parameter is set to the thermal detection valid (default). If the machine is in automatic operation, the automatic operation will be continued until the machine is stopped with M02/M30 or the reset. In case of the thermal alarm in the control unit, if the automatic start signal is input in that state, the alarm will be “T01 CAN’T CYCLE ST 0113”.
When only the overheat of communication terminal occurs, the operation start is possible.
(3) The alarm message of “ Z53 TEMP. OVER” is indicated because of the thermal alarm.
(4) The state that the overheat occurs is informed to the built-in PLC with the bit device.
(5) The thermal alarm is released because of the temperature dropping. The alarm message and bit device to the built-in PLC are reset by the release.

Device	Signal name	Details
SM16	Temperature rise warning	OFF: Normal ON: Overheat

Device	Signal name			Details
R41	Temperature warning cause	Bit0	Control unit overheat	OFF: Normal ON: Overheat
		Bit1	Communication terminal overheat	OFF: normal ON: Overheat



The device output is turned ON when:
- The internal temperature of control unit rises over 80°C or the ambient temperature of communication terminal rises over 70°C.

The device output is turned OFF when:
- The internal temperature of control unit drops below 80°C and the ambient temperature of communication terminal drops below 70°C.

PLC bit select parameter

#	Items	Details	Setup range (unit)
6449 bit7	Control unit overheat detection	Designate whether to detect the control unit overheat alarm or not.	0: Detection valid 1: Detection invalid
6449 bit6	Communication terminal overheat detection	Designate whether to detect the communication terminal overheat alarm or not.	0: Detection valid 1: Detection invalid

⚠ **CAUTION**

When setting the parameter (#6449/bit6, 7) not to check the overheat, the control unit and the communication terminal may not be controlled because of overheat.
In such case, axis runaway may cause a machine breakage, an accident resulting in injury or death, or device breakage.
To prevent the serious results, ordinarily set the parameters so that the overheat check is valid.

[Related signal]

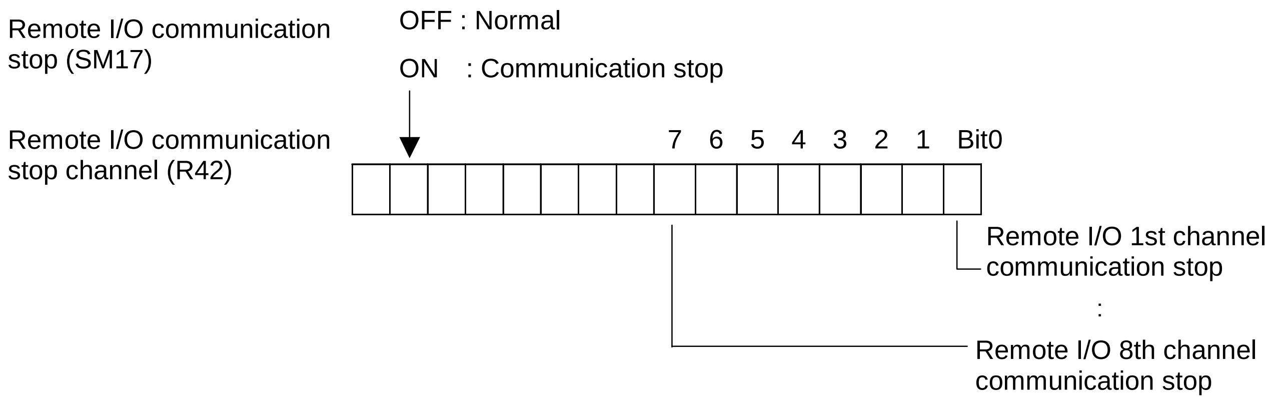
(1) Temperature rise warning (SM16)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	REMOTE I/O COMMUNICATION STOP CHANNEL			R42	—	—

[Function]

The channel No. in the remote I/O communication stop can be read.

[Operation]



[Related signal]

Remote I/O communication stop (SM17)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	SPINDLE SYNCHRONOUS CONTROL PHASE ERROR 1 (degree) (including phase shift calc.)			R48	—	—

[Function]

This signal informs the phase error (value including the phase error memorized with the spindle synchronization phase shift calculation function) when the phase synchronization (with R command) or the "Phase shift calculation request" signal (Y435) is ON. The phase error is output by 1° increment.

The data has no meaning in cases other than above.

[Operation]

When the phase synchronization (with R command) or the "Phase shift calculation request" signal (Y435) is ON, and when the speeds of the basic spindle and the synchronous spindle are constant, the phase error between the basic spindle and the synchronous spindle is output.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	SPINDLE SYNCHRONOUS CONTROL PHASE ERROR 2 (degree) (excluding phase shift calc.)			R49	—	—

[Function]

This signal informs the phase error (value excluding the phase error memorized with the spindle synchronization phase shift calculation function) when the phase synchronization (with R command) or the "Phase shift calculation request" signal (Y435) is ON. The phase error is output by 1° increment.
The data has no meaning in cases other than above.

[Operation]

When the phase synchronization (with R command) or the "Phase shift calculation request" signal (Y435) is ON, and when the speeds of the basic spindle and the synchronous spindle are constant, the phase error between the basic spindle and the synchronous spindle is output.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	CLOCK DATA			R50~52	—	—

[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 8	7 0
R50	Month	Year
R51	Hour	Date
R52	Second	Minute

(Example) For October 26, 2002, 14:56:36.

$$\text{R50 ... }\underbrace{0\,0\,0\,0\,1\,0\,1\,0}_{\text{October}}\,\underbrace{0\,0\,0\,0\,0\,0\,1\,0}_{\text{2002}} = \text{0A02H}$$

$$\text{R51 ... }\underbrace{0\,0\,0\,0\,1\,1\,1\,0}_{\text{14 hundred hours}}\,\underbrace{0\,0\,0\,1\,1\,0\,1\,0}_{\text{26th day}} = \text{0E1AH}$$

$$\text{R52 ... }\underbrace{0\,0\,1\,0\,0\,1\,0\,0}_{\text{36 seconds}}\,\underbrace{0\,0\,1\,1\,1\,0\,0\,0}_{\text{56 minutes}} = \text{1438H}$$

(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		1st system	2nd system	3rd system
—	SPINDLE SYNCHRONOUS CONTROL PHASE ERROR OUTPUT			R55	—	—

[Function]

The synchronous spindle delay to the basic spindle is output in the spindle synchronous function.

[Operation]

The synchronous spindle delay to the basic spindle is output.
Unit: 360°/4096

(Note 1) If the phase cannot be calculated because, for instance, the basic spindle or synchronous spindle has not passed the Z-phase, "-1" will be output.

(Note 2) This data is output only during the phase shift calculation or the spindle phase synchronization.

[Related signals]

Phase shift calculation request (SSPHM: Y435)
Phase offset request (SSPHF: Y436)
Spindle synchronous control phase offset data (R59)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	SPINDLE SYNCHRONOUS CONTROL PHASE ERROR MONITOR			R56	—	—

[Function]

The phase error during the spindle phase synchronous state can be monitored.

[Operation]

The phase error during the spindle phase synchronous control is output by the pulse unit.

[Related signals]

Spindle synchronous control phase error monitor (lower limit value) (R57)
Spindle synchronous control phase error monitor (upper limit value) (R58)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	SPINDLE SYNCHRONOUS CONTROL PHASE ERROR MONITOR (lower limit value)			R57	—	—

[Function]

The phase error during the spindle phase synchronous state can be monitored.

[Operation]

The lower limit value of the phase error during the spindle phase synchronous control is output by the pulse unit.

[Related signals]

Spindle synchronous control phase error monitor (R56)
Spindle synchronous control phase error monitor (upper limit value) (R58)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	SPINDLE SYNCHRONOUS CONTROL PHASE ERROR MONITOR (upper limit value)			R58	—	—

[Function]

The phase error during the spindle phase synchronous state can be monitored.

[Operation]

The upper limit value of the phase error during the spindle phase synchronous control is output by the pulse unit.

[Related signals]

Spindle synchronous control phase error monitor (R56)
Spindle synchronous control phase error monitor (lower limit value) (R57)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	SPINDLE SYNCHRONOUS CONTROL PHASE OFFSET DATA			R59	—	—

[Function]

With the spindle phase shift amount calculation function, the phase error of the basic spindle and synchronous spindle is obtained and memorized by turning the PLC signal ON at executing the spindle synchronization. The synchronous spindle can be rotated with the handle during the spindle phase shift calculation, so the relation between spindles can be adjusted by seeing.

If the "Spindle phase synchronous control" (SPPHS) signal is input while the "Phase offset request" signal (SSPHF) is ON, the phase error will be aligned based on the position shifted by the memorized phase shift amount.

Such operation makes the phase alignment easy when clamping an irregular material over.

[Operation]

The phase error memorized by the phase shift calculation is output.

Unit: 360°/4096

(Note 1) This data is output only during the spindle synchronous control.

[Related signals]

Spindle phase synchronous control (SPPHS: Y433)
Phase shift calculation request (SSPHM: Y435)
Phase offset request (SSPHF: Y436)
Spindle synchronous control phase error output (R55)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	ADD-ON (EXPANSION) OPERATION BOARD INPUT			#1: R90~93 #2: R94~97	—	—

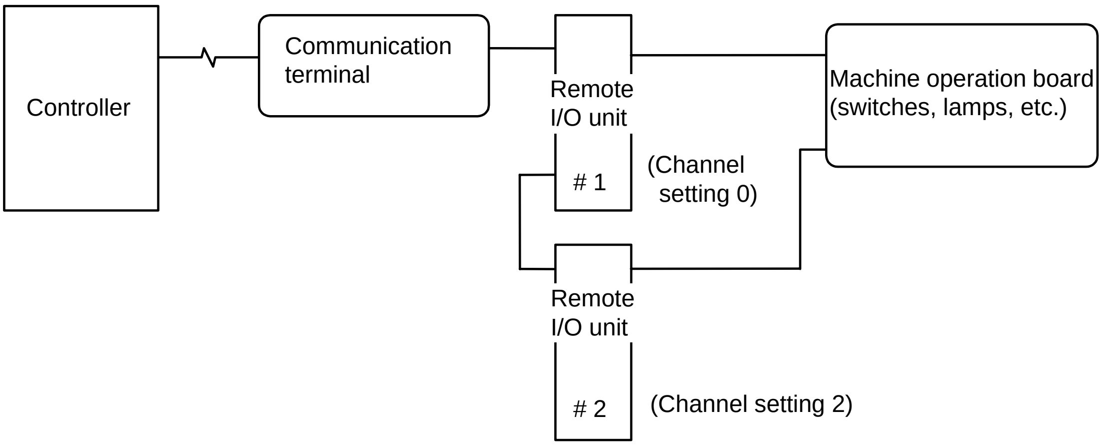
[Function]

By adding the remote I/O unit to the communication terminal, the add-on (expansion) operation board input/output signals can be input and output with the communication terminal control signals.
R90 bit8 is used as the communication terminal board reset signal.

[Operation]

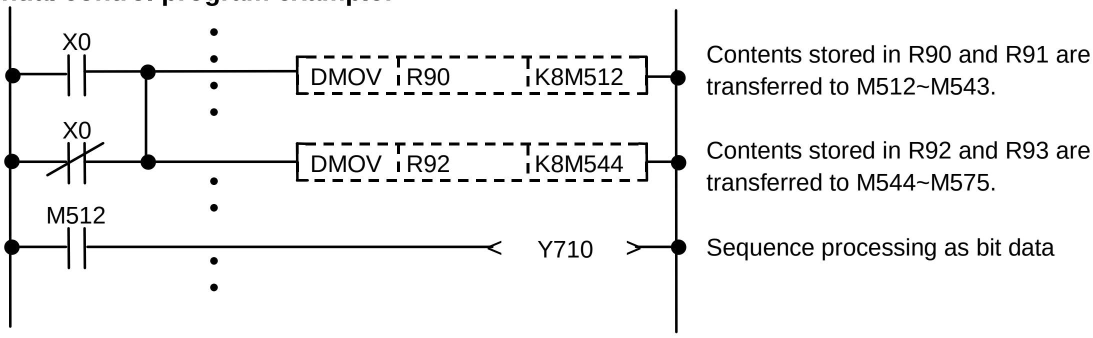
The signals are read together with other input signals at start of PLC main processing (medium speed).

<Hardware block diagram>



(Note 1) Since these signals are based on bit unit, they must be once transferred to buffer (M), etc.

Sequential control program example:



(Note 2) Refer to the section "2.1 Relation of RIO unit and devices" for the relation of the remote I/O channel setting switch and device.

[Related signals]

(1) Add-on (expansion) operation board output (#1: R190~192, #2: R193~195)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	M CODE DATA 1			R204, 205	R304, 305	R404, 405

[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]

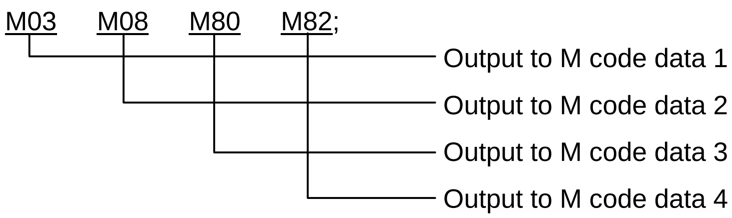
"M code data 1" are updated when:

(1) "M**" is issued in automatic operation (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 1" is also updated when an "M single 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 built-in PLC is not available.) When plural M functions are placed in one block, the signals are output in the order at programming.



(2) M98 (call 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 1~4 (MF1~MF4: X644~X647)
(2) M code data 2, 3, 4 (R206/207, R208/209, R210/211)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	M CODE DATA 2			R206, 207	R306, 307	R406, 407

[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 (memory or MDI).

For other details, refer to the section on "M CODE DATA 1".

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	M CODE DATA 3			R208, 209	R308, 309	R408, 409

[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 3" are updated when:

(1) Three or more M functions are placed in one block in automatic operation (memory or MDI).

For other details, refer to the section on "M CODE DATA 1".

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	M CODE DATA 4			R210, 211	R310, 311	R410, 411

[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 (memory or MDI).

For other details, refer to the section on "M CODE DATA 1".

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	S CODE DATA (1 to 7)			R212, 213	R312, 313	R412, 413

[Function]

When S function is specified, value following address "S" can be identified. The S code data output from the controller is binary code with a sign.

[Operation]

"S code data" are updated when:

(1) "S**" is specified in automatic operation (memory or MDI).

(2) "S**" is executed by manual numerical command input.

Data remain unchanged when M function finish signal (FIN1 or FIN2) is sent back. "Reset" and "Emergency stop" does not cause clear to data.

The S code data is assigned in the following manner.

Signal name	Register (1st part system)
S code data 1	R212, 213
S code data 2	R214, 215
S code data 3	R216, 217
S code data 4	R218, 219
S code data 5	R264, 265
S code data 6	R266, 267
S code data 7	R268, 269

[Caution]

(1) Seven S codes can be placed in one block. If the number of S codes defined exceeds the specified number, the S codes defined last is valid.

[Related signal]

(1) S function strobe (SFn: X658 to)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	T CODE DATA (1 to 4)			R220, 221	R320, 321	R420, 421

[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 (memory or MDI).
(2) "T**" is executed by manual numerical command input.

Data remain unchanged when "M function finish" signal (FIN1 or FIN2) is sent back. "Reset" and "Emergency stop" does not cause clear to data.

The T-code data is issued in the following manner.

Signal name	Register (1st part system)
T code data 1	R220, 221
T code data 2	R222, 223
T code data 3	R224, 225
T code data 4	R226, 227

[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.

T05 T15;

T15: Output to T code data 1
T05: This T code data is invalid.

[Related signals]

(1) Tool function strobe (TFn: X650 to)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	2ND M FUNCTION DATA (1 to 4)			R228, 229	R328, 329	R428, 429

[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" are updated when:
(1) "B (A, C)**" is specified in automatic operation (memory or MDI).
(2) "B (A, C)**" is executed by manual numerical command input.

Data remain unchanged even after "M function finish" signal (FIN1 or FIN2) is sent back. Data cannot be cleared by "Reset" or "Emergency stop".

The 2nd M function data is issued in the following manner.

Signal name	Register (1st part system)
2nd M function data 1	R228, 229
2nd M function data 2	R230, 231
2nd M function data 3	R232, 233
2nd M function data 4	R234, 235

[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.

B05 B15 ;
Output to 2nd M function data 1
This 2nd M function data is invalid.

[Related signals]

(1) 2nd M function strobe (BFn: X654 to)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	GROUP IN LIFE MANAGEMENT			R238	R338	R438

[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		1st system	2nd system	3rd system
—	NO. OF WORK MACHINING (CURRENT VALUE)			R240, 241	R340, 341	R440, 441

[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.

R240	No. of work machining	Low-order side
R241	Current value	High-order side

R940	No. of work machining	Low-order side
R941	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 the work maximum value, the "No. of work machining over" signal (X66E) 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 R240, 241 with the user PLC.
(3) The controller will display R240, 241 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 (X66E) will turn ON.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	NEAR REFERENCE POINT (FOR EACH REFERENCE POINT)			R242, 243	R342, 343	R442, 443

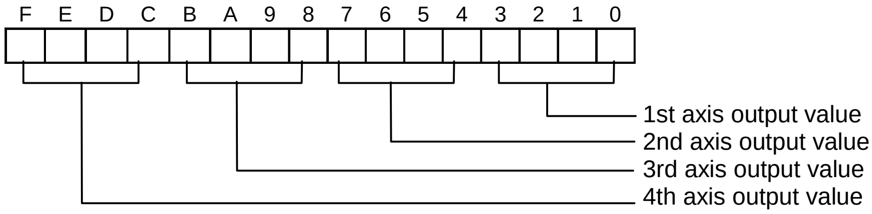
[Function]

This signal indicates that the control axis is near the reference point when using the absolute point detection system.
This signal is output for the 1st reference point to the 4th reference point.
Near the 1st reference point, the time for outputting the signal is shorter than the “near reference point nth” signal (the ON/OFF timing accuracy during axis movement is improved).

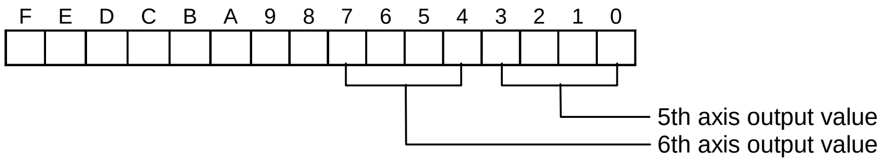
[Operation]

(1) Using the nth reference point 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 point signal is output with four bits for each axis.
(a) R register and corresponding axes

R242



R243



(b) Output value and near nth reference point

High-order bit ←→ Low-order bit				Near n-th reference point
0	0	0	1	Near 1st reference point
0	0	1	0	Near 2nd reference point
0	1	0	0	Near 3rd reference point
1	0	0	0	Near 4th reference point

(Note 1) The near reference point signal device has X devices (X448 to) which output signal only for the 1st reference point, and the R registers (R242 to) which outputs a signal for each reference point (1st reference point to 4th reference point).
(Note 2) The near reference point signal output width is set with the absolute point parameters "#2057 nrefp" and "#2058 nrefn". The near reference point signal output width is the same width for the 1st reference point to the 4th reference point.
(Note 3) Near the 1st reference point, the signals are output to the conventional X device (X448 to) and the R registers (R242 to) which output signals to each reference point.

[Related signals]

Near reference point nth axis (NRFn: X448 to)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	TOOL LIFE USAGE DATA			R244, 245	R344, 345	R444, 445

[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 (1st part system)	R244
	R245
Tool life usage data (2nd part system)	R344
	R345
Tool life usage data (3rd part system)	R444
	R445

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	ERROR CODE OUTPUT			R256~258	R356~358	R456~458

[Function]

With this function, the NC alarms and errors which are normally output to NC screen are partially coded and output to PLC I/F device. Thus, the contents of alarms and errors can be confirmed without NC screen.

[Operation]

The following output will be made when an alarm occurs.
The message displayed in NC screen is not converted.
(Example) When servo alarm S03 occurs

S03 SERVO WARNING 0052 XZ

- XZ → Axis name
- 0052 → Alarm No.
- SERVO WARNING → Alarm message
- S03 → Alarm type

The output is as shown above on the NC screen. However, this can be coded and output to PLC I/F device as shown below using this function.

Alarm type ··················	Converted into a 2-digit numeral code. (Refer to the code table.)
Alarm message ··········	Not coded, and not output.
Alarm No. ···················	The No. is output as HEX.
Axis name ··················	Error occurrence axis is expressed as a bit, and the bit of servo and spindle are output separately. The head digit of the alarm without axis name will be “0”.

The output to PLC I/F device is as follows.

R258 (Higher side)	R258 (Lower side)	R257 (Higher side)	R257 (Lower side)	R256 (Higher side)	R256 (Lower side)
0 0 0 0 0 0 0 0	0 0 1 1 0 0 1 1	0 0 0 0 0 0 0 0	0 1 0 1 0 0 1 0	0 0 0 0 0 1 0 1	0 0 0 0 0 0 0 0
PLC axis name	Alarm type	Alarm No.		Servo axis name	Spindle name

	bit 7	6	5	4	3	2	1	0
1st axis	0	0	0	0	0	0	0	1
2nd axis	0	0	0	0	0	0	1	0
3rd axis	0	0	0	0	0	1	0	0
4th axis	0	0	0	0	1	0	0	0
5th axis	0	0	0	1	0	0	0	0
6th axis	0	0	1	0	0	0	0	0
7th axis	0	1	0	0	0	0	0	0
8th axis	1	0	0	0	0	0	0	0

As for the servo axis name and spindle name, the bit corresponding to the No. of axis in which the alarm occurs is turned on.
The max servo axis Nos. in the 1st part system are 6, and the max spindle Nos. in the 1st part system are 7. The spindle alarm is output to the 1st part system.
The PLC axis name is output to the 1st part system.

Axis name is added for the messages such as some of M01, S01 to S52, and Z70 to Z73.
The following 48 bits are used as the output PLC I/F devices.

1st part system: R256 (Lower and Higher), R257 (Lower and Higher), R258 (Lower and Higher)

2nd part system: R356 (Lower and Higher), R357 (Lower and Higher), R358 (Lower and Higher)

Code table
The alarm type is coded as the contents of following code table.

Alarm code table

Alarm		Contents	Alarm type	Axis name	Order of priority
Operation error	M01	OPERATION ERROR	11	Some are added.	8
Stop code	T01 T02 T03 T04 T10	CAN'T CYCLE ST FEED HOLD BLOCK STOP COLLATION STOP FIN WAIT	21 22 23 24 26	Not added.	9
Servo/spindle alarm	S01 S02 S03 S04	SERVO ALARM:PR INIT PARAM ERR SERVO ALARM:NR SERVO ALARM:AR	31 32 33 36	Added.	2
	S51 S52	PARAMETER ERROR SERVO WARNING	34 35	Added.	6
MCP alarm	Y02 Y03 Y10 Y51 Y90	SYSTEM ALARM AMP. UNEQUIPPED AMPLIFIER MISMATCH PARAMETER ERROR SP. NON SIGNAL	41 42 48 45 47	Some are added.	3
System alarm	Z52 Z53 Z55 Z59	BATTERY FAULT TEMP. OVER RIO NOT CONNECT TIME CONSTANT	52 53 54 59	Not added.	7
	Z70 Z71 Z72 Z73	ABS. ILLEGAL DETECTOR ERROR COMPARE ERROR ABS. WARNING	55 56 57 58	Added.	1
	P990	PREPRO S/W ERR	61	Not added.	5
Program error	POOO	(Program error)	71	Not added.	5
Auxiliary axis (MR-J2-CT) alarm (Note 1)	M00 M01	AUX OPER. ALM AUX OPER. ALM	81 82	Added.	8
	S01 S02 S03 S52	AUX SERVO ALM AUX SERVO ALM AUX SERVO ALM AUX SERVO. WRN	83 84 85 86	Added.	2
	Y02 Y03 EMG	AUX SYSTEM ALM AUX AMP UNEQU. EMERGENC	87 88 89	Some are added.	3
	Z70 Z71 Z73	AUX POS. ERR AUX DETEC. ERR AUX SYSTEM WRN	8A 8B 8C	Added.	1
Emergency stop message	EMG	EMERGENC	01	Not added.	4

The NC alarm is given priority when the NC alarm of same order of priority occurs.
The auxiliary axis name is output to the servo axis name area.

The message at emergency stop is displayed in NC screen shown below.
(Example) EMG EMERGENCY STOP PLC

When the emergency stop occurs, the message is coded and an alarm No. is output.

Emergency stop code list

Error message		Details	Alarm No.
EMG EMERGENCY	EXIN	External emergency stop	0000
	PLC	User PLC emergency stop	0001
	SRV	Servo Amp not ready	0002
	STOP	User PLC not running	0003
	SPIN	Spindle Amp not ready	0004
	PC_H	PLC high-speed process error	0005
	PARA	Door-open II fixed device setting illegal	0006
	LINK	Communication error	0007
	WAIT	Waiting connection	0008
	XTEN	External emergency stop	0009
	LAD	User PLC illegal code	0010

(Note 1) If the MCP alarm "Y02 SYSTEM ALARM" occurs, part of the data will not be coded. Confirm the data on the display unit.
(Example) Y02 SYSTEM ALARM 0051 0104
In this case, only "Y02" and "0051" are coded and output to the PLC I/F device.

(Note 2) If an alarm without an alarm No. occurs, "0" will be set as the alarm No. and output to the PLC I/F device.

(Note 3) If an alarm that does not have an axis name occurs, "0" will be set as the axis name and output to the PLC I/F device.

(Note 4) Alarms not shown in the code table are not output to the PLC I/F device.

(Note 5) If multiple alarms occur simultaneously, only the alarm with the highest order of priority in the code table will be output.

(Note 6) The "OOO" section of the program error "POOO" is output to the alarm No. area.
(Example) "P34 G-CODE ERROR 0 0"

The code output becomes 71003400, and the output to PLC I/F devices is as follows.

Alarm type		Alarm No.				Axis name			
0 1 1 1	0 0 0 1	0 0 0 0	0 0 0 0	0 0 1 1	0 1 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	USER MACRO INTERFACE OUTPUT FOR EACH PART SYSTEM #1132 to 1135			R270, 271	R370, 371	R470, 471

[Function]

This interface is used between the user PLC and user macro program.
The interface output signal can be sent by substituting a value in the variables #1100 to #1135 and #1300 to #1395. Only 0 and 1 are used as the output signals.
Output here refers to outputting from the NC to the PLC.

[Operation]

When a value is substituted in variable #1132 with the user macro, all output numbers between #1100 and #1131 are sent out at once. These values can be referred to with the user PLC. When a value is substituted in variables #1133 to #1135, the #1300 to #1331, #1332 to #1363 and #1364 to #1395 output signals can be sent.
The status of the writing and output signals can be read to offset the #1100 to #1135 and #1300 to #1395 output signals (2^0 to 2^{31}).
The bit selection parameter (#6454/bit0) must be set to use the macro interface function for each part system.
Refer to R24, 25 (#1032: PLC → controller) and R124, 125 (#1132: controller → PLC) for details on the user macro interface signals common for the part systems.

(Note 1) The last system variable #1100 to #1135 values sent are saved as 1 or 0.
(These are not cleared with reset.)

(Note 2) The following applies when any number other than 1 or 0 is substituted into #1100 to #1131.
<Blank> is treated as 0.
Any number other than <Blank> or 0 is treated as 1.
Any value less than 0.00000001 is indefinite.

(Note) This function's input and output signals are valid for up to three part systems when using the C64T system.

System variable	No. of points	Interface output signal						
		1st system	2nd system	3rd system	4th system	5th system	6th system	7th system
		R270	R370	R470	R570	R670	R770	R870
#1100	1	bit0	bit0	bit0	bit0	bit0	bit0	bit0
#1101	1	bit1	bit1	bit1	bit1	bit1	bit1	bit1
#1102	1	bit2	bit2	bit2	bit2	bit2	bit2	bit2
#1103	1	bit3	bit3	bit3	bit3	bit3	bit3	bit3
#1104	1	bit4	bit4	bit4	bit4	bit4	bit4	bit4
#1105	1	bit5	bit5	bit5	bit5	bit5	bit5	bit5
#1106	1	bit6	bit6	bit6	bit6	bit6	bit6	bit6
#1107	1	bit7	bit7	bit7	bit7	bit7	bit7	bit7
#1108	1	bit8	bit8	bit8	bit8	bit8	bit8	bit8
#1109	1	bit9	bit9	bit9	bit9	bit9	bit9	bit9
#1110	1	bit10	bit10	bit10	bit10	bit10	bit10	bit10
#1111	1	bit11	bit11	bit11	bit11	bit11	bit11	bit11
#1112	1	bit12	bit12	bit12	bit12	bit12	bit12	bit12
#1113	1	bit13	bit13	bit13	bit13	bit13	bit13	bit13
#1114	1	bit14	bit14	bit14	bit14	bit14	bit14	bit14
#1115	1	bit15	bit15	bit15	bit15	bit15	bit15	bit15

System variable	No. of points	Interface output signal						
		1st system	2nd system	3rd system	4th system	5th system	6th system	7th system
		R271	R371	R471	R571	R671	R771	R871
#1116	1	bit0	bit0	bit0	bit0	bit0	bit0	bit0
#1117	1	bit1	bit1	bit1	bit1	bit1	bit1	bit1
#1118	1	bit2	bit2	bit2	bit2	bit2	bit2	bit2
#1119	1	bit3	bit3	bit3	bit3	bit3	bit3	bit3
#1120	1	bit4	bit4	bit4	bit4	bit4	bit4	bit4
#1121	1	bit5	bit5	bit5	bit5	bit5	bit5	bit5
#1122	1	bit6	bit6	bit6	bit6	bit6	bit6	bit6
#1123	1	bit7	bit7	bit7	bit7	bit7	bit7	bit7
#1124	1	bit8	bit8	bit8	bit8	bit8	bit8	bit8
#1125	1	bit9	bit9	bit9	bit9	bit9	bit9	bit9
#1126	1	bit10	bit10	bit10	bit10	bit10	bit10	bit10
#1127	1	bit11	bit11	bit11	bit11	bit11	bit11	bit11
#1128	1	bit12	bit12	bit12	bit12	bit12	bit12	bit12
#1129	1	bit13	bit13	bit13	bit13	bit13	bit13	bit13
#1130	1	bit14	bit14	bit14	bit14	bit14	bit14	bit14
#1131	1	bit15	bit15	bit15	bit15	bit15	bit15	bit15

System variable	No. of points	Interface output signal							Sent variable No.
		1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	
#1132	32	R270, R271	R370, R371	R470, R471	R570, R571	R670, R671	R770, R771	R870, R871	#1100 to 1131
#1133	32	R272, R273	R372, R373	R472, R473	R572, R573	R672, R673	R772, R773	R872, R873	#1300 to 1331
#1134	32	R274, R275	R374, R375	R474, R475	R574, R575	R674, R675	R774, R775	R874, R875	#1332 to 1363
#1135	32	R276, R277	R376, R377	R476, R477	R576, R577	R676, R677	R776, R777	R876, R877	#1364 to 1395

B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
—	THERMAL DISPLACEMENT COMPENSATION AMOUNT			R1600	R1650	R1700

[Function]

During ball screw thermal expansion compensation, the compensation amount calculated based on the "thermal expansion offset compensation amount" (R2302) and "thermal expansion max. compensation amount" (R2303) is set in this register by the NC.

[Operation]

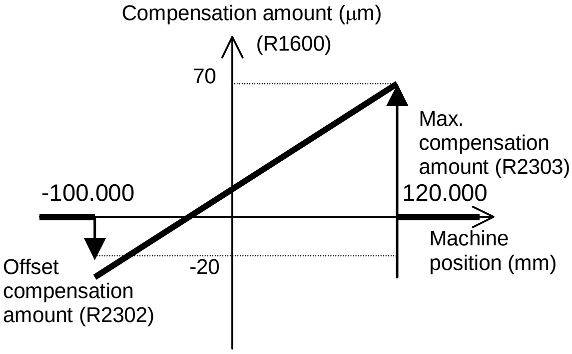
The "thermal expansion offset compensation amount" and the "thermal displacement max. compensation amount" is set as a set for each axis in the R register.
The current compensation amount is set by the NC into the "thermal displacement compensate amount" (R1600).
The thermal expansion compensation is invalid for the axis if the "thermal expansion offset compensation amount" and "thermal expansion max. compensation amount" are set to 0.
These R registers are cleared to zero when the power is turned ON.

	Thermal expansion offset compensation amount (PLC → NC) Unit: Minimum command unit/2	**Thermal expansion max. compensation amount** (PLC → NC) Unit: Minimum command unit/2	**Thermal displacement compensation amount** (NC → PLC) Unit: Minimum command unit/2
No.1 axis	R2302	R2303	R1600
No.2 axis	R2352	R2353	R1650
No.3 axis	R2402	R2403	R1700
No.4 axis	R2452	R2453	R1750
No.5 axis	R2502	R2503	R1800
No.6 axis	R2552	R2553	R1850
No.7 axis	R2602	R2603	R1900
No.8 axis	R2652	R2653	R1950
No.9 axis	R2702	R2703	R2000
No.10 axis	R2752	R2753	R2050
No.11 axis	R2802	R2803	R2100
No.12 axis	R2852	R2853	R2150
No.13 axis	R2902	R2903	R2200
No.14 axis	R2952	R2953	R2250

A unit half of the minimum command unit is the setting unit.
If the minimum command unit is 1µm and 100 is set, for example, the compensation amount will be 50µm.

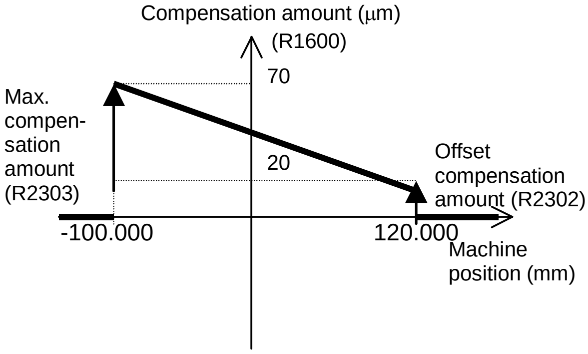
Setting example

(1) When the compensation basic point is in the minus area, and the plus area is to be compensated.



Data	Setting value
bscmp-	-100.000
bscmp+	120.000
Offset compensation amount (R2302)	-40
Max. compensation amount (R2303)	180

(2) When the compensation basic point is in the plus area, and the minus area is to be compensated.



Data	Setting value
bscmp-	120.000
bscmp+	-100.000
Offset compensation amount (R2302)	40
Max. compensation amount (R2303)	100

[Caution]

The compensation amount calculated with this compensation function is added to the machine error compensation amount and output to the servo system.

Make sure that the ball screw thermal expansion compensation amount + machine error compensation amount does not exceed -32768 to +32767.

[Related signals]

Thermal expansion compensation offset compensation amount (R2302)

Thermal expansion compensation maximum compensation amount (R2303)

B con-tact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	SPINDLE COMMAND ROTATION SPEED INPUT			R3000, 3001	R3030, 3031	R3060, 3061

[Function]

This signal informs the value of S function (S) data specified in automatic operation (memory or MDI) or by manual numerical data input. "Spindle command rotation speed" output from the controller is binary data. The data can be monitored in the "S display" on the command value screen. (For type A, the "S display" displays the contents of file registers R212 and R213.)

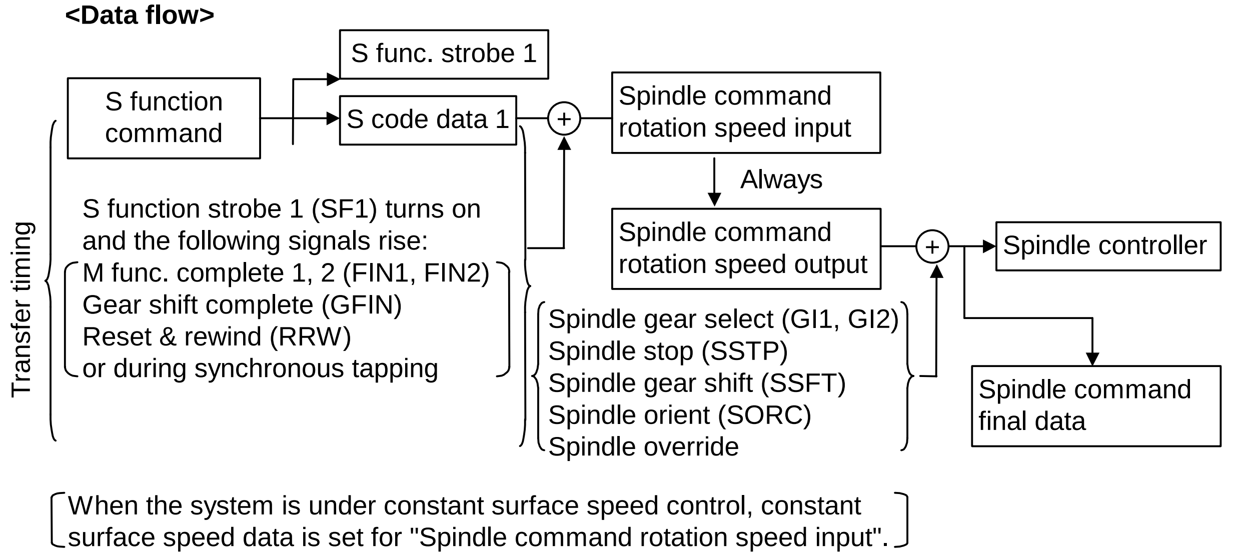
[Operation]

Set "Spindle command rotation speed input" is renewed when:

(1) "S**" is specified in automatic operation (memory or MDI) 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>



(Note 2) "Spindle command rotation speed input" directly denotes spindle speed (r/min) specified as S function command.

[Related signals]

(1) Spindle command rotation speed output (R3210, R3211)
(2) Spindle command final data (R3002, R3003)
(R3004, R3005) (for D/A output method)

B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	SPINDLE COMMAND FINAL DATA			R3002, 3003	R3032, 3033	R3062, 3063

[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 (R3000, R3001)
(2) Spindle command rotation speed output (R3210, R3211)

B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	SPINDLE ACTUAL SPEED			R3006, 3007	R3036, 3036	R3066, 3066

[Function]

When the system has spindle equipped with encoder, spindle actual speed can be monitored.

[Operation]

Spindle actual speed is always set by feedback signal from spindle encoder.
Data are multipled by 1000, and stored.

B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
—	J2CT CONTROL STATUS	CTST1 to 4		R3500 to 3503	R3504 to 3507	R3508 to 3511

[Function]

The MR-J2-CT link function connects the NC and MR-J2-CT (auxiliary axis), and controls up to 7 axis (C6: Maximum 5 axis) MR-J2-CT axes using command signals from the NC.

[Operation]

Signal name	J2CT status 4	J2CT status 3	J2CT status 2	J2CT status 1
Abbrev.	**CTST4**	**CTST3**	**CTST2**	**CTST1**
J2CT 1st axis	R3500	R3501	R3502	R3503
J2CT 2nd axis	R3504	R3505	R3506	R3507
J2CT 3rd axis	R3508	R3509	R3510	R3511
J2CT 4th axis	R3512	R3513	R3514	R3515
J2CT 5th axis	R3516	R3517	R3518	R3519
J2CT 6th axis	R3520	R3521	R3522	R3523
J2CT 7th axis	R3524	R3525	R3526	R3527

J2CT status 4 (R3500: 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 (R3501: 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 (R3502: 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 low
bit12	ABS	Absolute position power shutoff movement over
bit13	ZSN	Absolute position loss
bit14	ZSF	Initialization complete
bit15	ZSE	Initialization error complete

J2CT status 1 (R3503: 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	Resetting
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

Refer to the "MR-J2-CT Specifications and Instruction Manual" for detailed explanations and operation of the control signal.

[Related signals]

J2CT In operation adjustment mode (R3556)
J2CT Control command (CTCM1 to 4, L, H: R3600 to 3603, 3604, 3605)
J2CT Operation adjustment mode valid (common for all axes) (R3684)

B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
—	J2CT IN OPERATION ADJUSTMENT MODE			R3556	—	—

[Function] [Operation]

J2CT In operation adjustment mode (R3556)		
bit	**Abbrev.**	**Name**
bit0	-	J2CT in 1st axis operation adjustment mode
bit1	-	J2CT in 2nd axis operation adjustment mode
bit2	-	J2CT in 3rd axis operation adjustment mode
bit3	-	J2CT in 4th axis operation adjustment mode
bit4	-	J2CT in 5th axis operation adjustment mode
bit5	-	J2CT in 6th axis operation adjustment mode
bit6	-	J2CT in 7th axis operation adjustment mode

[Related signals]

J2CT Control status (CTST1 to 4: R3500 to 3527)
J2CT Control command (CTCM1 to 4, L, H: R3600 to 3603, 3604, 3605)
J2CT Operation adjustment mode valid (common for all axes) (R3684)

6.3 PLC Output Signals (Bit Type: Y***)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	INTEGRATION TIME INPUT 1	RHD1		Y414	—	—

[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		1st system	2nd system	3rd system
—	INTEGRATION TIME INPUT 2	RHD2		Y415	—	—

[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		1st system	2nd system	3rd system
*	DATA PROTECT KEY 1	*KEY1		Y418	—	—

[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 display area of screen.
Manual numerical command input is not applicable in "TOOL/OFFSET" display mode.

(2) In C6/C64, 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: Y419)
Data protect key 3 (*KEY3: Y41A)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
*	DATA PROTECT KEY 2	*KEY2		Y419	—	—

[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 display area of screen.
(2) In C6/C64, 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: Y418)
Data protect key 3 (*KEY3: Y41A)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
*	DATA PROTECT KEY 3	*KEY3		Y41A	—	—

[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 display area of screen.
(2) In C6/C64, 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: Y418)
Data protect key 2 (*KEY2: Y419)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	CRT CHANGEOVER COMPLETE	CRTFN		Y41D	—	—

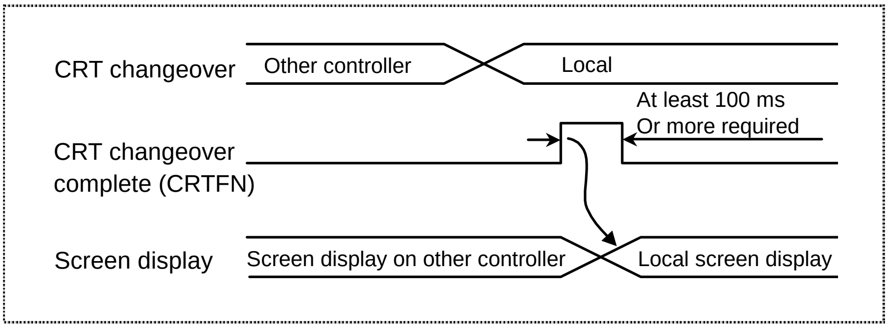
[Function]

When using one setting and display unit as the display unit for multiple control units, this signal is used to inform the control unit that it has been changed as the local display unit.

[Operation]

When this signal turns ON, the currently selected screen reappears at the rising edge of the signal. The setting and display unit's screen is still showing the display screen for the control unit before the changeover, so the local screen display is changed by inputting this signal.

[Time chart]



B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	DISPLAY CHANGEOVER $1, $2	DISPn		Y41E, 41F	—	—

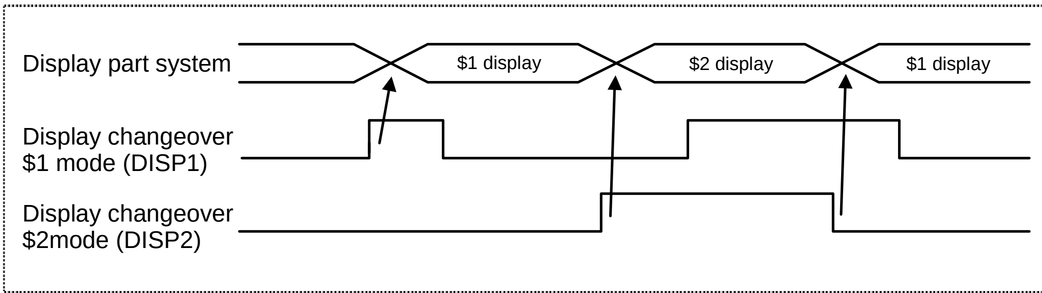
[Function]

The display part system of a dual part system can be changed.

[Operation]

The display part system is changed at the rising edge of each display changeover signal.
The screen display for a dual part system is a screen for displaying one of the part systems. Thus, which part system to be displayed is determined by these signals.
If both of these signals are started up simultaneously, they will be invalid.

[Time chart]



B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	PLC EMERGENCY STOP	QEMG		Y427	—	—

[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 (SA)", etc. are 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 100msec.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	DOOR OPEN	DOOR1		Y428	—	—

[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 signal (X429)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	DOOR OPEN II	DOOR2		Y429	—	—

[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 drive unit is cut off. The servo READY signal does not turn OFF.
(3) The "Door open enable" signal turns ON.
(4) Automatic operation start is valid during door interlock. Note that an interlock is applied on the axis movement.
(5) If the door interlock (door open signal) turns ON during axis movement, the axis will decelerate to a stop. The axis movement will resume when the door interlock (door open signal) turns OFF.

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 signal (X429)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	PLC CONTROL AXIS nTH HANDLE VALID	PCHn		Y42D~42F	—	—

[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
Y42D	PCH1	PLC control axis 1st handle valid
Y42E	PCH2	PLC control axis 2nd handle valid
Y42F	PCH3	PLC control axis 3rd 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~HS116, HS11S), the 2nd handle axis No. (HS21~HS216, HS21S) and the 3rd handle axis No. (HS31~HS316, 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		1st system	2nd system	3rd system
—	SPINDLE SYNCHRONIZATION CANCEL	SPSYC		Y430	—	—

[Function]

This signal is used to cancel the spindle synchronous control with the G114.1 command.
The spindle synchronous control with the "Spindle synchronous control" (Y432) is not canceled.

[Operation]

The spindle synchronous control mode can be canceled by turning this signal ON.

[Related signals]

In spindle synchronous control (SPSYN1: X42A)
Spindle rotation speed synchronization complete (FSPRV: X42B)
Spindle phase synchronization complete (FSPPH: X42C)
Spindle phase synchronous control (SPPHS: Y433)
Spindle synchronous control phase error 1 (degree) (R48)
Spindle synchronous control phase error 2 (degree) (R49)

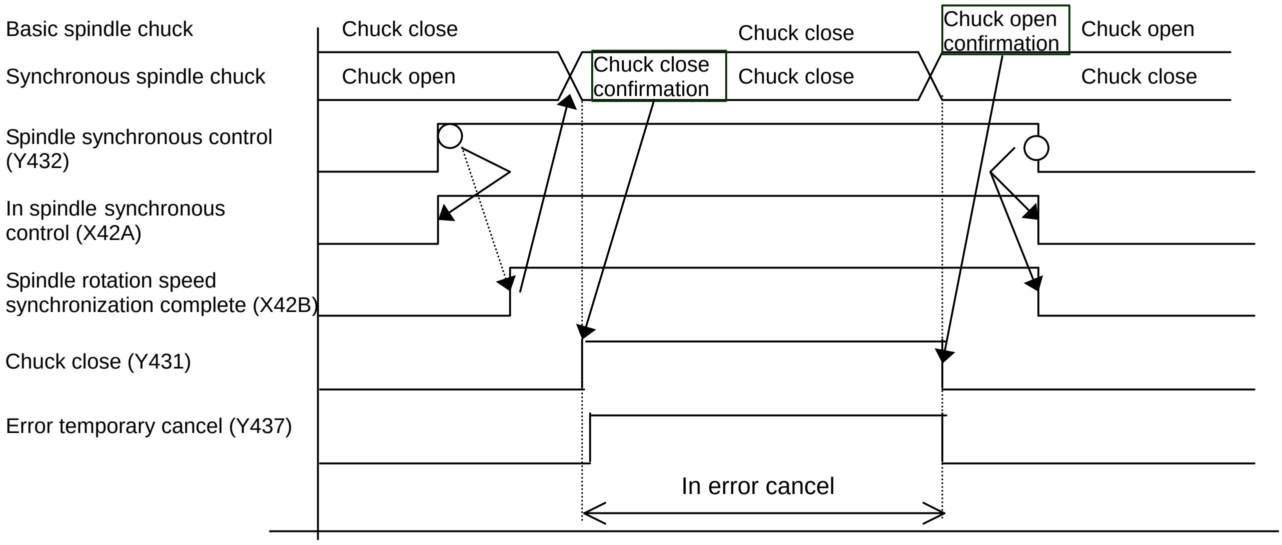
B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	CHUCK CLOSE	SPCMPC		Y431	—	—

[Function]

This signal is turned ON while the basic spindle and synchronous spindle clamp the same workpiece.

[Operation]

The "Spindle chuck close confirmation" signal is turned ON when the "Chuck close" signal is ON.
The "Spindle chuck close confirmation" signal is turned OFF when the "Chuck close" signal is OFF.



(Note) Use "Error temporary cancel" signal only when the position error between two spindles still occurs even after the "Chuck close" signal is turned ON.

[Related signals]

"Chuck close confirmation" signal (SPCMP: X42D)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	SPINDLE SYNCHRONOUS CONTROL	SPSY		Y432	—	—

[Function]

The spindle synchronous control mode is entered by turning this signal ON.

[Operation]

The spindle synchronous control mode is entered by inputting the "Spindle synchronous control" signal (SPSY). During the spindle synchronous control mode, the synchronous spindle is controlled in synchronization with the rotation speed commanded for the basic spindle.
Set the basic spindle, synchronous spindle and rotation direction beforehand.

Device No.	Signal name	Abbrev.	Explanation
R157	Spindle synchronous control Basic spindle select	–	Select a serially connected spindle to be controlled as the basic spindle. (0: 1st spindle), 1: 1st spindle, 2: 2nd spindle ... 7: 7th spindle **(Note 1)** Spindle synchronization control will not take place if a spindle not connected in serial is selected. **(Note 2)** If "0" is designated, the 1st spindle will be controlled as the basic spindle.
R158	Spindle synchronous control Synchronous spindle select	–	Select a serially connected spindle to be controlled as the synchronous spindle. (0: 2nd spindle), 1: 1st spindle, 2: 2nd spindle ... 7: 7th spindle **(Note 1)** Spindle synchronization control will not take place if a spindle not connected in serial is selected or if the same spindle as the basic spindle is selected. **(Note 2)** If "0" is designated, the 2nd spindle will be controlled as the synchronous spindle.
Y434	Spindle synchronous rotation direction	–	Designate the basic spindle and synchronous spindle rotation directions for spindle synchronous control. 0: The synchronous spindle rotates in the same direction as the basic spindle. 1: The synchronous spindle rotates in the reverse direction of the basic spindle.

[Related signals]

In spindle synchronous control (SPSYN1: X42A)
Spindle rotation speed synchronization complete (FSPRV: X42B)
Spindle synchronous rotation direction (SPSDR: Y434)
Spindle phase synchronous control (SPPHS: Y433)
Spindle phase synchronization complete (FSPPH: X42C)
Spindle synchronous control Basic spindle select (R157)
Spindle synchronous control Synchronous spindle select (R158)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	SPINDLE PHASE SYNCHRONOUS CONTROL	SPPHS		Y433	—	—

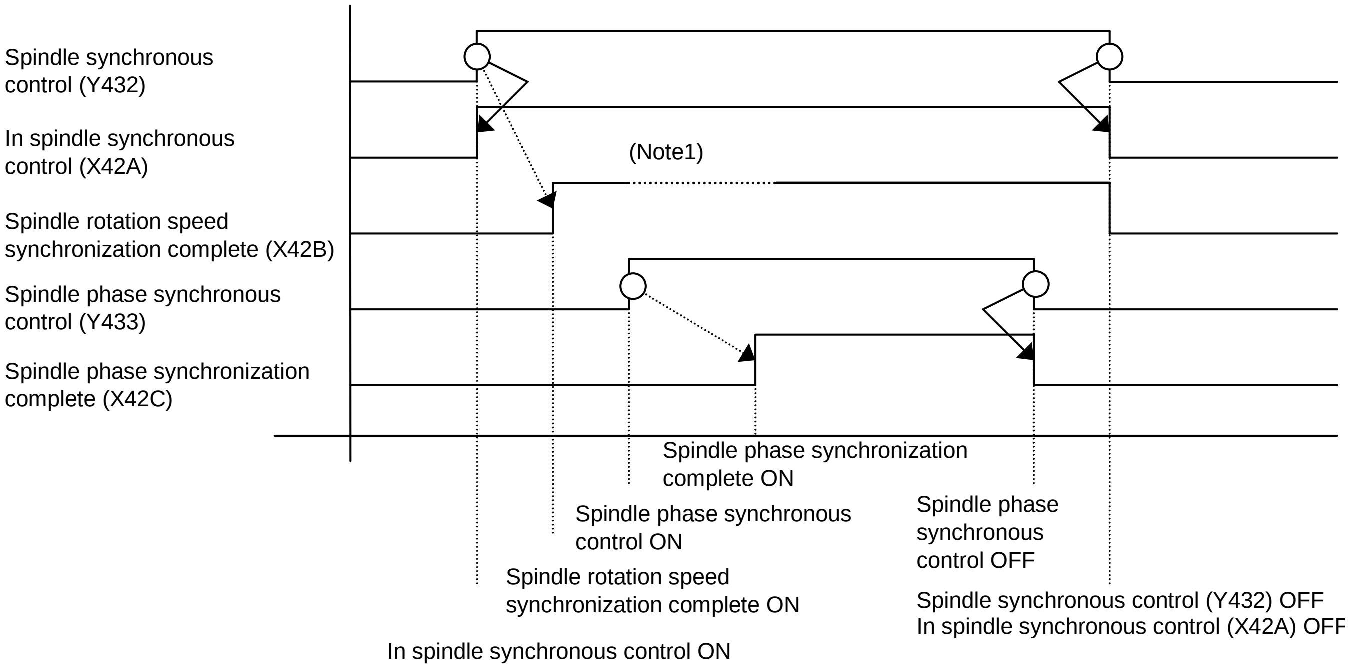
[Function]

Spindle phase synchronization starts this signal is turned ON during the spindle synchronous control mode.

[Operation]

Spindle phase synchronization starts when the "Spindle phase synchronous control" signal (SPPHS) is input during the spindle synchronous control mode. The "Spindle phase synchronization complete" signal is output when the spindle phase synchronization attainment level setting value (#3051 spplv) is reached.

(Note 1) This signal will be ignored even if it is turned ON during a mode other than the spindle synchronous control mode.



(Note 2) This is turned OFF once to change the rotation speed during phase synchronization.

[Related signals]

In spindle synchronous control (SPSYN1: X42A)
Spindle rotation speed synchronization complete (FSPRV: X42B)
Spindle synchronous control (SPSYC: Y432)
Spindle synchronous rotation direction (SPSDR: Y434)
Spindle phase synchronization complete (FSPPH: X42C)
Spindle synchronization phase shift amount (R159)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	SPINDLE SYNCHRONOUS ROTATION DIRECTION	SPSDR		Y434	—	—

[Function]

The synchronous spindle's rotation direction is designated with this signal. Select whether the direction is the same as or the reverse of the basic spindle.

[Operation]

Designate the rotation direction for the basic spindle and synchronous spindle during spindle synchronous control.
0: Synchronous spindle rotates in same direction as basic spindle.
1: Synchronous spindle rotates in reverse direction of basic spindle.

[Related signals]

In spindle synchronous control (SPSYN1: X42A)
Spindle rotation speed synchronization complete (FSPRV: X42B)
Spindle synchronous control (SPSY: Y432)
Spindle phase synchronous control (SPPHS: Y433)
Spindle phase synchronization complete (FSPPH: X42C)
Spindle synchronization phase shift amount (R159)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	PHASE SHIFT CALCULATION REQUEST	SSPHM		Y435	—	—

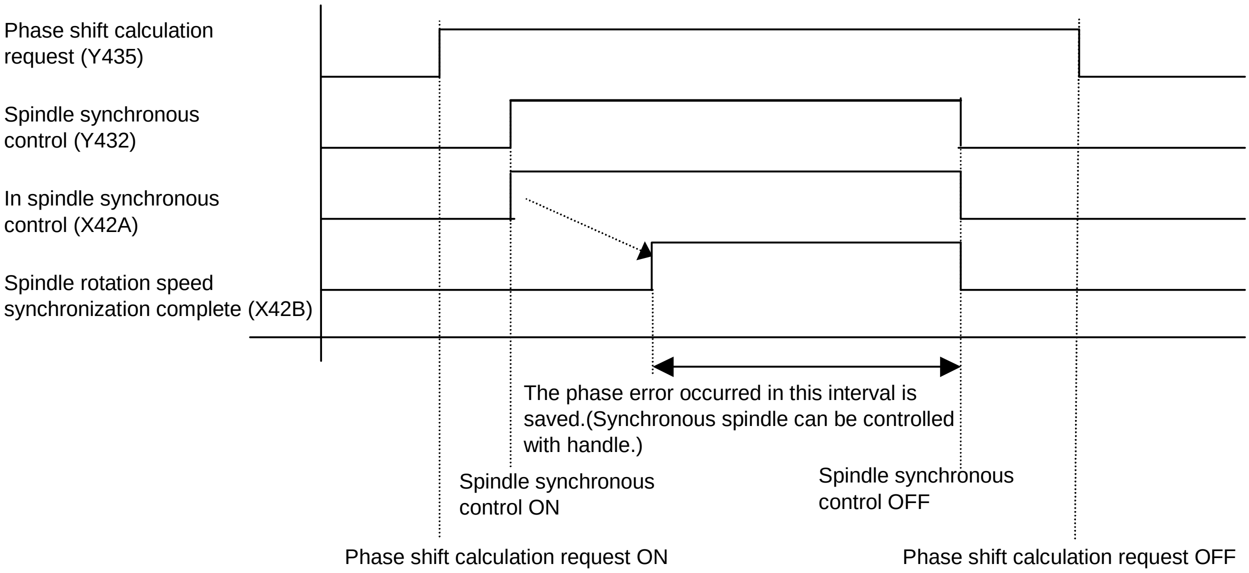
[Function]

This signal calculates the phase error of the basic spindle during rotation synchronization, and save it in the NC memory.

[Operation]

The phase error of the basic spindle and synchronous spindle is saved in the NC memory when this signal is ON and the rotation synchronization command's (with no R address command) spindle synchronization is completed (when "Spindle rotation speed synchronization complete" signal is ON).
This signal turns ON when the spindle rotation is stopped before the rotation synchronization command.

(Note 1) The phase cannot be aligned when calculating the phase shift.
(Note 2) If the handle mode is selected as the manual operation mode, the synchronous spindle cannot be rotated with the handle.



[Related signals]

Phase offset request (SSPHF: Y436)
Spindle synchronous control phase error output (R55)
Spindle synchronous control phase offset data (R59)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	PHASE OFFSET REQUEST	SSPHF		Y436	—	—

[Function]

This signal requests that the phase be aligned to the value obtained by adding the value commanded with the phase synchronization command's R address to the phase error of the basic spindle and synchronous spindle saved with the "Phase shift calculation request" signal (Y435).

[Operation]

If phase synchronization is commanded (with R address command) while this signal is ON, the basic spindle and synchronous spindle phases will be aligned to attain the phase error obtained by adding the value commanded with the R address command to the phase error of the basic spindle and synchronous spindle saved in the NC memory.

[Related signals]

Phase shift calculation request (SSPHM: Y435)
Spindle synchronous control phase error output (R55)
Spindle synchronous control phase offset data (R59)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	ERROR TEMPORARY CANCEL	SPDRPO		Y437	—	—

[Function]

This signal temporarily cancels the error caused by the speed fluctuation when the chuck is closed.
When the chuck is closed, the speed will fluctuate due to external causes. An error will occur between the basic spindle's position and the synchronous spindle's position due to this speed fluctuation. This signal is used to cancel this error. (If spindle synchronization is attempted when closing the chuck without canceling this error, torsion could occur.)

[Operation]

The error between the basic spindle's position and synchronous spindle's position is saved when this signal changes from OFF to ON. The saved error is canceled and the spindle is synchronized while this signal is ON. (Even if the chuck close signal is OFF, the error will be canceled while the "Error temporary cancel" signal is ON.)

(Note 1) Turn this signal ON after the chucks on both the basic spindle side and synchronous spindle side have closed and grasped the chuck.

(Note 2) Turn this signal OFF when the either the basic spindle side or synchronous spindle side chuck is open.

(Example)

(1) Close the basic spindle side chuck.
(2) Start spindle synchronization (G114.1).
(3) Close the synchronous spindle side chuck.
(The speed will fluctuate due to external causes at this time, and an error will occur.)
(4) Using the "Chuck close confirmation" signal (SPCMP), check that the chucks are closed.
(5) Turn the "Error temporary cancel" signal (SPDRPO) ON, and cancel the error.
(6) Execute machining with spindle synchronous control.
(7) Open the chuck on the synchronous spindle side.
(8) Using the "Chuck close confirmation" signal (SPCMP), check that the chuck is opened.
(9) Turn the "Error temporary cancel" signal (SPDRPO) OFF, and stop the error cancellation.

[Related signals]

In spindle synchronous control (SPSYN1: X42A)
Spindle rotation speed synchronization complete (FSPRV: X42B)
Spindle phase synchronization complete (FSPPH: X42C)
Chuck close confirmation (SPCMP: X42D)
Chuck close (SPCMPC: Y431)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
*	PLC CONTROL AXIS NEAR-POINT DOG nTH AXIS	*PCDn		Y438~43E	—	—

[Function]

The PLC axis reference point near-point dog signal is input.

[Operation]

The PLC axis reference point near-point dog signal is set in the following devices by the PLC.

Device No.		Signal name
Y438	PCD1	PLC control axis near-point dog 1st axis
:	:	:
Y43E	PCD7	PLC control axis near-point dog 7th 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		1st axis	2nd axis	3rd axis
—	CONTROL AXIS REMOVAL nTH AXIS	DTCHn		Y440	Y470	Y4A0

[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 removed.

DTCHn

1 : 1st axis is removed
2 : 2nd axis is removed
: :
14 :14th axis is removed

[Operation]

When control axis removal signal (DTCHn) turns ON, the corresponding axis is exempted from control.

(1) Specified axis is not under any positioning control.
(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 screen.

(Note 1) The same function can be used by setting parameter on the screen. (See below)

The control axis removal is valid when the following are valid:

Control axis removal n-th axis (DTCHn)	or	Basic specification parameter "#1070 axoff" (independent axis), and Machining parameter and axis parameter "#8201 AX. RELEASE" (independent axis)

B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
*	SERVO OFF nTH AXIS	*SVFn		Y441	Y471	Y4A1

[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"
2 : 2nd axis in "Servo OFF"
: :
14 :14th axis in "Servo OFF"

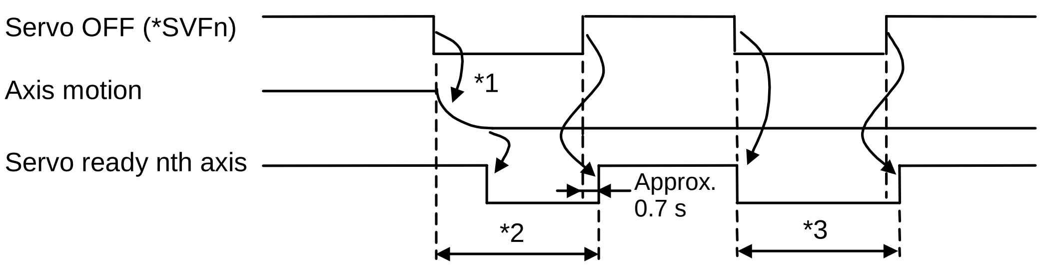
[Operation]

When servo OFF signal (*SVn) 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		1st axis	2nd axis	3rd axis
*	EXTERNAL DECELERATION + nTH AXIS	*+EDTn		Y443	Y473	Y4A3

[Function]

The feedrate when the control axis is moving in the + direction can be forcibly 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.

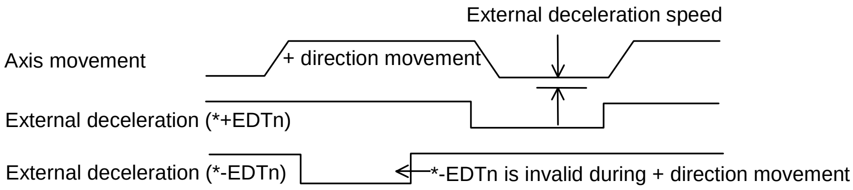
*+EDTn

1 : The 1st axis is decelerated.
2 : The 2nd axis is decelerated.
: :
14 : The 14th 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) in C6/C64 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		1st axis	2nd axis	3rd axis
*	EXTERNAL DECELERATION - nTH AXIS	*-EDTn		Y444	Y474	Y4A4

[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		1st axis	2nd axis	3rd axis
*	AUTO INTERLOCK (+) nTH AXIS	*+AITn		Y445	Y475	Y4A5

[Function]

All axis motions of machine can be decelerated and stopped immediately during automatic operation when motion of a specific axis (nth 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
2 : Automatic interlock (+) 2nd axis
: :
14 : Automatic interlock (+) 14th axis

[Operation]

When this signal turns OFF for a specific axis in motion in the plus direction under automatic operation mode (memory, MDI), motion of all axis decelerates and stops with "M01 operation error code 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 resumes or starts axis motion.

[Related signals]

Auto interlock, (-) nth axis (Y446)
Manual interlock, (+)/(-) nth axis (Y447/Y448)

[Cautions]

(1) All automatic interlock signals are for B contact.
(2) In C6/C64, 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		1st axis	2nd axis	3rd axis
*	AUTO INTERLOCK (–) nTH AXIS	*-AITn		Y446	Y476	Y4A6

[Function] [Operation]

The details are the same as the automatic interlock +nth axis, 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
2 : Automatic interlock (-) 2nd axis
: :
14 : Automatic interlock (-) 14th axis

[Related signals]

Auto interlock, (+) nth axis (Y445)
Manual interlock, (+)/(-) nth axis (Y447/Y448)

B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
*	MANUAL INTERLOCK (+) nTH AXIS	*+MITn		Y447	Y477	Y4A7

[Function]

When the corresponding axis is moving in the plus direction with manual operation (jog, manual, incremental, reference point 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
2 : Manual interlock (+) 2nd axis
: :
14 : Manual interlock (+) 14th 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 point 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, (-) nth axis (Y448)
Auto interlock, (+)/(-) nth axis (Y445/Y446)

[Cautions]

(1) All interlock signals are for B contact.
(2) In C6/C64, 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		1st axis	2nd axis	3rd axis
*	MANUAL INTERLOCK (-) nTH AXIS	*-MITn		Y448	Y478	Y4A8

[Function] [Operation]

The details are the same as the "Manual interlock +nth axis", 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
2 : Manual interlock (-) 2nd axis
: :
14 : Manual interlock (-) 14th axis

[Related signals]

Manual interlock, (+) nth axis (Y447)
Auto interlock, (+)/(-) nth axis (Y445/446)

B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
—	AUTO MACHINE LOCK nTH AXIS	AMLKn		Y449	Y479	Y4A9

[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
2 : Automatic machine lock 2nd axis
: :
14 : Automatic machine lock 14th axis

[Operation]

In the automatic operation (memory or MDI), 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: Y44A)

[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		1st axis	2nd axis	3rd axis
—	MANUAL MACHINE LOCK nTH AXIS	MMLKn		Y44A	Y47A	Y4AA

[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 (nth 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
2 : Manual machine lock 2nd axis
: :
14 : Manual machine lock 14th axis

[Related signal]

Auto machine lock, nth axis (AMLKn: Y44A)

B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
—	FEED AXIS SELECT (+) nTH AXIS	+Jn		Y44B	Y47B	Y4AB

[Function]

This signal is used to start motion (jog feed, incremental feed or reference point 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
2 : 2nd axis is selected for feed motion
: :
14 : 14th axis is selected for feed motion

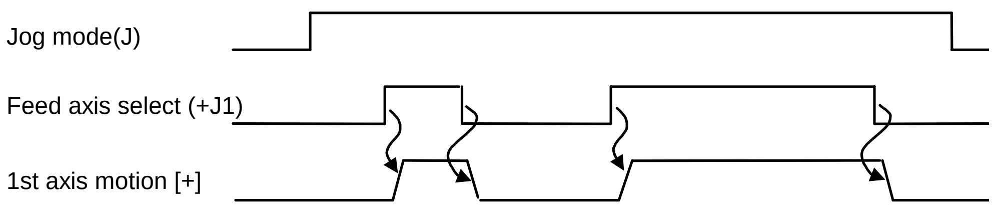
+ ... Feed motion in + direction
- ... Feed motion in - direction

[Operation]

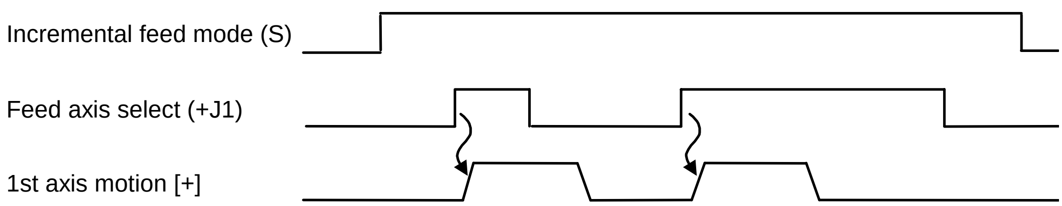
When feed axis select signal (+Jn) turns ON, the following motion occurs.

(1) When jog feed, incremental feed or reference point 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 point 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 point.

(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 point 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 signal is ignored even when the reset condition is canceled. In this case, the "Feed axis select" 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.

(Note 5) When two or more part systems are used, even if the 1st part system and 2nd part system feed axis select turn ON in the same cycle (scan) of the sequence, the start up may not be completely simultaneous.

[Related signal]

(1) Feed axis select (-) nth axis (-Jn: Y44C)

B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
—	FEED AXIS SELECT (-) nTH AXIS	-Jn		Y44C	Y47C	Y4AC

[Function]

This signal is used to feed the axis in the minus (-) direction during jog feed, incremental feed or reference point 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 (+) nth 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 (+) nth axis (+Jn: Y44B)

B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
—	MANUAL/AUTO SIMULTANEOUS VALID nTH AXIS	MAEn		X44D	X47D	X4AD

[Function]

The automatic mode (MDI, memory) and manual mode (handle, step, jog, manual reference point 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 axis is selected individually with (MAE1~14) for the 1st to 14th axes.

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 will be invalid toward an axis for which this signal is OFF. 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 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 valid signal is ON	Axis for which manual/ auto 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		1st axis	2nd axis	3rd axis
—	CONTROL AXIS REMOVAL 2 nTH AXIS	DTC2n		Y44E	Y47E	Y4AE

[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.

DTC2n

1: The 1st axis is set as axis removal 2.
2: The 2nd axis is set as axis removal 2.
3: The 3rd axis is set as axis removal 2.
: :
14: The 14th axis is set as axis removal 2.

[Operation]

When the control axis removal 2 signal (DTC2n) 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 screen.

[Related signals]

Control axis removal n-th axis (DTCHn: Y440)

B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
—	ZERO POINT INITIALIZATION SET MODE nTH AXIS	AZSn		Y452	Y482	Y4B2

[Function]

This selects the zero point initialization mode with the marked point alignment method in the absolute position detection system.

[Operation]

The zero point initialization mode is selected with this signal.
Refer to the section on "Zero point initialization set complete (ZSFn)" signal for details on the operations.

(Note 1) This signal is a function signal for zero point initialization, 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 initialization set complete (ZSFn: X44A)
(2) Zero point initialization set error complete (ZSEn: X44B)
(3) In zero point initialization set (X44C)
(4) Zero point initialization set incomplete (X44D)
(5) Zero point initialization set start (ZSTn: Y453)

B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
—	ZERO POINT INITIALIZATION SET START nTH AXIS	ZSTn		Y453	Y483	Y4B3

[Function]

This is used to set a random position as the origin during zero point initialization using the marked point alignment method in the absolute position detection system.

[Operation]

This signal turns ON when a random position is to be used as the zero point after moving the relevant axis in the zero point initialization mode.
Refer to the section on "Zero point initialization set complete (ZSFn)" signal for details on the operations.

(Note 1) This signal is a function signal for zero point initialization, 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 initialization set start (ZSTn)" signal is turned ON before the "Zero point initialization set 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 initialization set complete (ZSFn: Y44A)
(2) Zero point initialization set error complete (ZSEn: X44B)
(3) In zero point initialization set (X44C)
(4) Zero point initialization set incomplete (X44D)
(5) Zero point initialization set mode (AZSn: Y452)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	JOG MODE	J		Y700	Y7E0	Y8C0

[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~+J14) or minus (-J1~-J14) signal after turning ON the jog mode and setting the manual feedrate (*JV1~*JV16).
For rapid traverse, rapid traverse command signal (RT) is turned ON together with this signal (J).
If the operation mode duplicates the other mode or if it is removed, the NC alarm "M01 OPERATION ERROR 0101" will occur.

[Related signals]

Feed axis select (+Jn, -Jn: Y44B, Y44C)
Manual feedrate (*JV1~*JV16: Y770~774)
Rapid traverse (RT: Y726)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	HANDLE MODE	H		Y701	Y7E1	Y8C1

[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~HS116, HS1S) and this signal is turned ON. Speed of the axis motion depends on setting of feedrate multiplication (MP1~4).
If the operation mode duplicates the other mode or if it is removed, the NC alarm "M01 OPERATION ERROR 0101" will occur.

[Related signals]

(1) 1st handle axis No. (HS11~HS116: Y740~744), 1st handle axis valid (HS1S: Y747)
(2) 2nd handle axis No. (HS21~HS216: Y748~74C), 2nd handle axis valid (HS2S: Y74F) ..... For 2-axis handle specification
(3) 3rd handle axis No. (HS31~HS316: Y750~754), 3rd handle axis valid (HS3S: Y757) ..... For 3-axis handle specification
(4) Handle feedrate/incremental feedrate multiplication (MP1~MP4: Y780~782)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	INCREMENTAL MODE	S		Y702	Y7E2	Y8C2

[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~+J14, -J1~-J14) for desired axis is turned ON, axis motion starts. Speed of the axis motion (incremental feed) depends on setting of feedrate multiplication (MP1~MP4).
When rapid traverse command signal (RT) is ON, speed is the rapid traverse speed. When signal (RT) is OFF, speed is equal to manual feedrate (*JV1~*JV16).
If the operation mode duplicates the other 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 feedrate/incremental feedrate multiplication (MP1~MP4: Y780~782)
(2) Feed axis select (+Jn, -Jn: Y44B, Y44C)
(3) Manual feedrate (*JV1~*JV16: Y770~774)
(4) Rapid traverse (RT: Y726)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	MANUAL RANDOM FEED MODE	PTP		Y703	Y7E3	Y8C3

[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. 1st system	Device No. 2nd system	Abbreviation	Signal name	Device No. 1st system	Device No. 2nd system	Abbreviation	Signal name
Y790	Y870	CX11	Manual random feed, 1st axis Axis No.	Y798	Y878	CX21	Manual random feed, 2nd axis Axis No.
Y791	Y871	CX12		Y799	Y879	CX22	
Y792	Y872	CX14		Y79A	Y87A	CX24	
Y793	Y873	CX18		Y79B	Y87B	CX28	
Y794	Y874			Y79C	Y87C	CX216	
Y795	Y875			Y79D	Y87D		
Y796	Y876			Y79E	Y87E		
Y797	Y877	CX1S	Manual random feed 1st axis valid	Y79F	Y87F	CX2S	Manual random feed 2nd axis valid

Device No. 1st system	Device No. 2nd system	Abbreviation	Signal name	Device No. 1st system	Device No. 2nd system	Abbreviation	Signal name
Y7A0	Y880	CX31	Manual random feed, 3rd axis Axis No.	Y7A8	Y888	CXS1	Smoothing OFF
Y7A1	Y881	CX32		Y7A9	Y889	CXS2	Independent axis
Y7A2	Y882	CX34		Y7AA	Y88A	CXS3	EX. F/MODAL.F
Y7A3	Y883	CX38		Y7AB	Y88B	CXS4	G0/G1
Y7A4	Y884	CX316		Y7AC	Y88C	CXS5	MC/WK
Y7A5	Y885			Y7AD	Y88D	CXS6	ABS/INC
Y7A6	Y886			Y7AE	Y88E	*CXS7	Stop
Y7A7	Y887	CX3S	Manual random feed 3rd axis valid	Y7AF	Y88F	CXS8	Strobe

Device No. 1st system	Device No. 2nd system	Abbreviation	Signal name
R908	R1008		
R909	R1009		
R914	R1014		Manual random feed The 1st axis movement data
R915	R1015		
R916	R1016		Manual random feed The 2nd axis movement data
R917	R1017		
R918	R1018		Manual random feed The 3rd axis movement data
R919	R1019		

(2) Signals from controller to PLC
1) Manual random feed mode (PTPO: X603)
2) In manual random feed (CXN: X616)
3) Manual random feed complete (CXFIN: X61C)

(3) Other:
1) Feed rate unit (PCF1, PCF2: Y778, 779)
2) Manual/automatic simultaneous valid nth axis (MAEn: Y44D)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	REFERENCE POINT RETURN MODE	ZRN		Y704	Y7E4	Y8C4

[Function]

REFERENCE POINT RETURN mode is selected.
"Reference point return" is that axis motion component (tool, table, etc.) is returned to the position previously determined for individual machine.

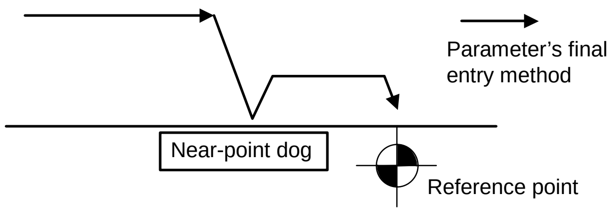
[Operation]

The reference point return mode is selected when the reference point return mode signal (ZRN) is turned ON.
Select the reference point return mode, and turn ON the designated feed axis select signal (+J1~+J14, -J1~-J14) to return to the reference point.
If the operation mode duplicates the other mode or if it is removed, the NC alarm "M01 OPERATION ERROR 0101" will occur.

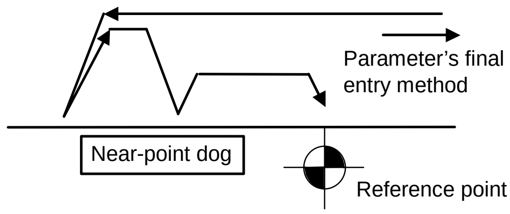
The first reference point return after the controller power is turned ON is the dog-type return (excluding when the basic machine coordinate system is established for the absolute position detection specifications). After the second manual reference point return (when basic machine coordinate system is established), the dog-type or high-speed return is selected with the setup parameters, base specification parameter "#1063 mandog".

(1) Dog-type reference point return pattern
The return pattern is determined by the final entry method of the setup parameter zero point return.

1) Operation when axis is moved in same direction as the final entry method, and dog is tripped.



2) 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 point 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 point 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 zero point return feedrate if the feedrate signal (RT) is ON, and the manual feedrate (*JV1~*JV16) is OFF.
- The approach speed is set with the parameters.
- When the reference point is reached, the movement will stop even if the feed axis select signal is ON, and the 1st reference point reached signal (ZP1n) will turn ON.

(2) High-speed return, reference point return
- The axis will move toward the reference point. The motion speed will be rapid traverse if the rapid traverse signal is ON, and manual feedrate if OFF.
- When the reference point is reached, the movement will stop even if the feed axis select signal is ON, and the 1st reference point reached signal (ZP1n) will turn ON.
- The feed axis select signal for high-speed return is valid only in the reference point direction. If the opposite direction signal is designated, the NC alarm "M01 Operation error 0003" will occur.

[Related signals]

(1) Feed axis select (+Jn, -Jn: Y44B, Y44C)
(2) Manual feedrate (*JV1~*JV16: Y770~774)
(3) Rapid traverse (RT: Y726)
(4) 1st reference point reached (ZP11~ZP114: X444~X5E4)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	AUTOMATIC INITIALIZATION MODE	AST		Y705	Y7E5	Y8C5

[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		1st system	2nd system	3rd system
—	MEMORY MODE	MEM		Y708	Y7E8	Y8C8

[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: Y710)
Auto operation "pause" command (*SP: Y711)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	MDI MODE	D		Y70B	Y7EB	Y8CB

[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: Y710)
Auto operation "pause" command (*SP: Y711)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	AUTO OPERATION "START" COMMAND (Cycle start)	ST		Y710	Y7F0	Y8D0

[Function]

This signal is used to start automatic operation in MEMORY mode or MDI 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 100ms.

(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 has started.
- "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 "Machine lock" signal (MKL) turns ON.
- Program specified in MDI mode has been executed completely.

[Related signals]

Memory mode (MEM: Y708)
MDI mode (D: 70B)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
*	AUTO OPERATION "PAUSE" COMMAND (Feed hold)	*SP		Y711	Y7F1	Y8D1

[Function]

During automatic operation, axis motion can be decelerated and stopped with this command signal. To restart, press "automatic operation start" pushbutton ((ST) signal).

[Operation]

(1) When "Auto operation "pause" command" (*SP) signal turns OFF, automatic operation stops.
- During automatic operation, the operation stops. Automatic stop (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 signal (*SP) turns OFF, is completed. If the signal (*SP) 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: Y708)
MDI mode (D: Y70B)
Auto operation "start" command (ST: Y710)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	SINGLE BLOCK	SBK		Y712	Y7F2	Y8D2

[Function]

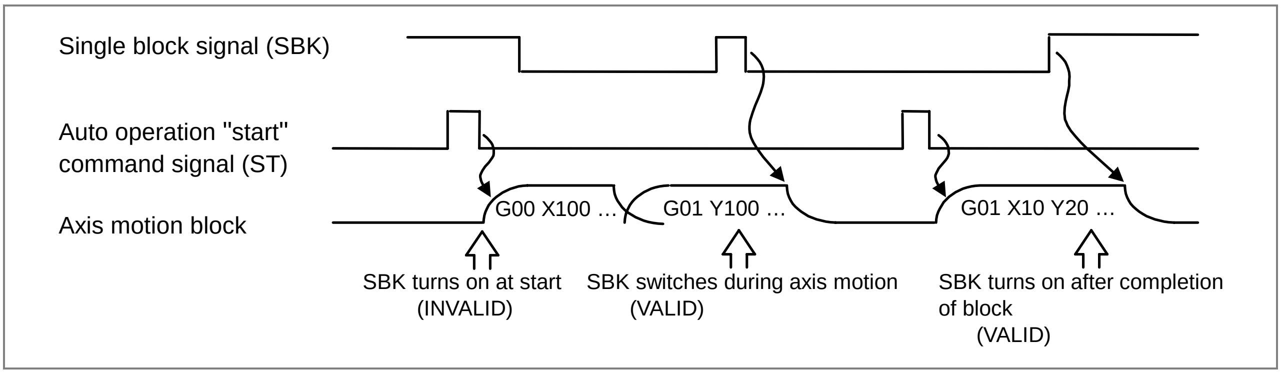
Machining program can be executed block by block in automatic operation.

[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 SBK signal 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 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		1st system	2nd system	3rd system
*	BLOCK START INTERLOCK	BSL		Y713	Y7F3	Y8D3

[Function]

This signal prohibits start of the next block in automatic operation (memory or MDI).

[Operation]

While the signal (*BSL) 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 *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) In C6/C64, 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: Y714)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
*	CUTTING BLOCK START INTERLOCK	*CSL		Y714	Y7F4	Y8D4

[Function]

This signal prohibits start of an axis motion command block other than that for positioning in automatic operation (memory or MDI).

[Operation]

While the signal (*CSL) 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 signal is turned ON.

(Note 1) This signal is valid to all blocks including blocks internally generated by fixed cycle, etc.
(Note 2) In C6/C64, 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: Y713)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	DRY RUN	DRN		Y715	Y7F5	Y8D5

[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 command" (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 command" (RT) signal is OFF, the set manual feedrate (*JV1~*JV16) 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 command" (RT) signal is ON, the DRY RUN signal is ignored.
- When "Rapid traverse command" (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~*JV16: Y770~774)
(2) Rapid traverse command signal (RT: Y726)
(3) Manual feedrate override valid signal (OVSL: Y759)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	ERROR DETECT	ERD		Y717	Y7F7	Y8D7

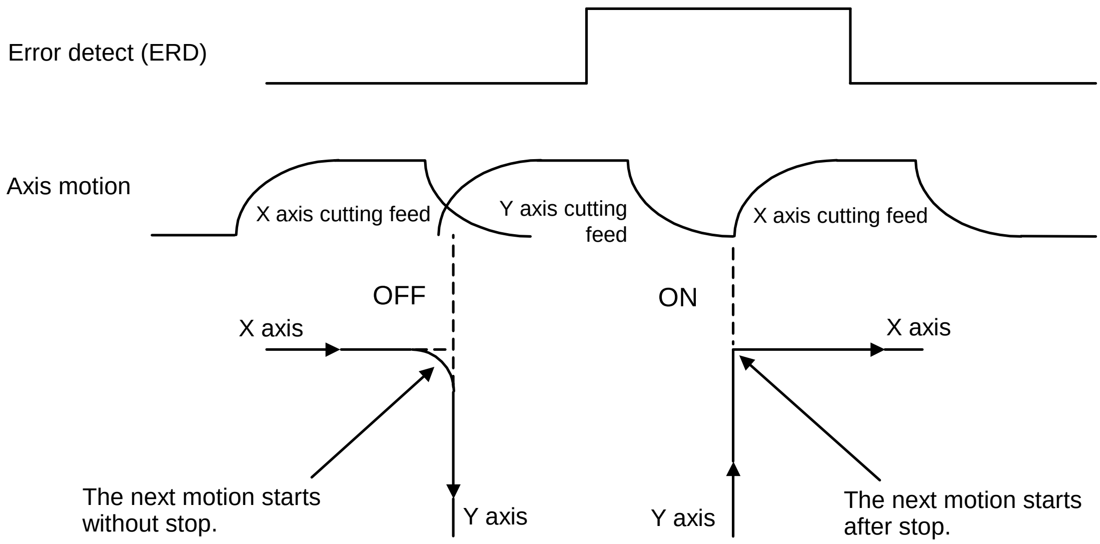
[Function]

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		1st system	2nd system	3rd system
—	NC RESET 1	NRST1		Y718	Y7F8	Y8D8

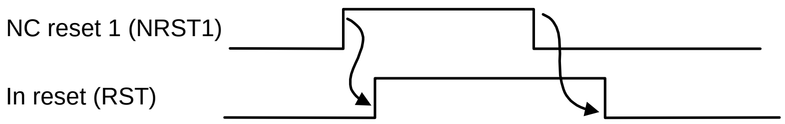
[Function]

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: Y719)
Reset & rewind (RRW: Y71A)
In "reset" (RST: X615)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	NC RESET 2	NRST2		Y719	Y7F9	Y8D9

[Function]

This signal is used to reset the control unit.

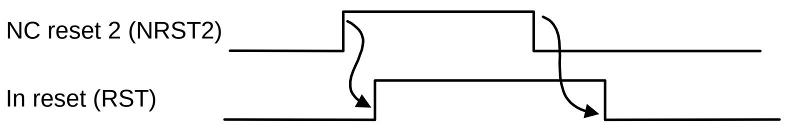
[Operation]

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: Y718)
Reset & rewind (RRW: Y71A)
In "reset" (RST: X615)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	RESET & REWIND	RRW		Y71A	Y7FA	Y8DA

[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 in the communication terminal is also set to Y71A by the sequence program.

[Operation]

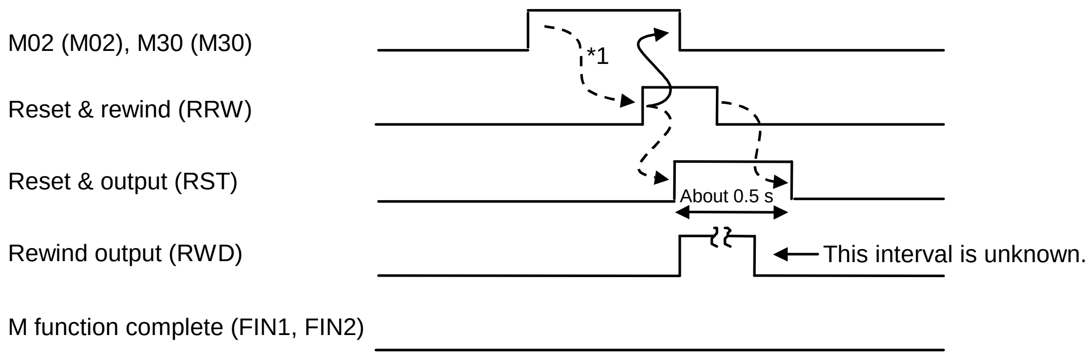
When this signal (RRW) turns ON:

(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, reset output signal (status signal RST) turns ON.
(3) At the same time as CNC is reset, "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) MST 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: X615)
In rewind (RWD: X617)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
*	CHAMFERING	*CDZ		Y71B	Y7FB	Y8DB

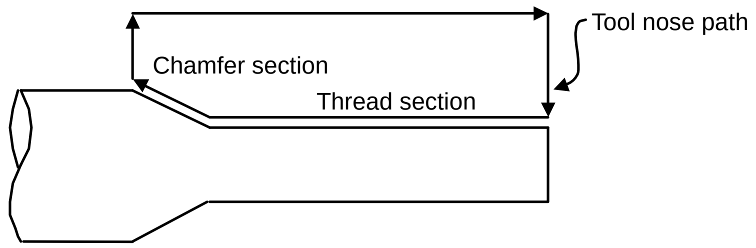
[Function]

In thread cutting cycle, chamfering can be ignored.

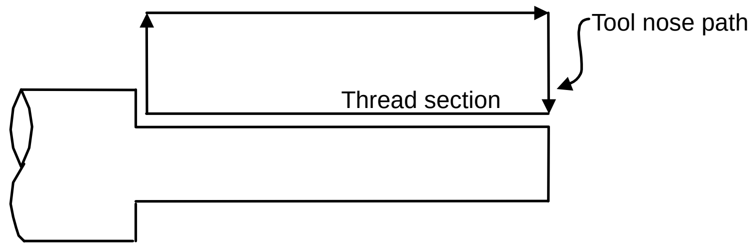
[Operation]

Status of this signal is determined at start of thread cutting cycle.

(1) CHAMFERING (*CDZ) is OFF.
Chamfering (at end of thread cutting) is accomplished.



(2) CHAMFERING (*CDZ) is ON.
Chamfering is not accomplished (signal is ignored).



B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	AUTO RESTART	ARST		Y71C	Y7FC	Y8DC

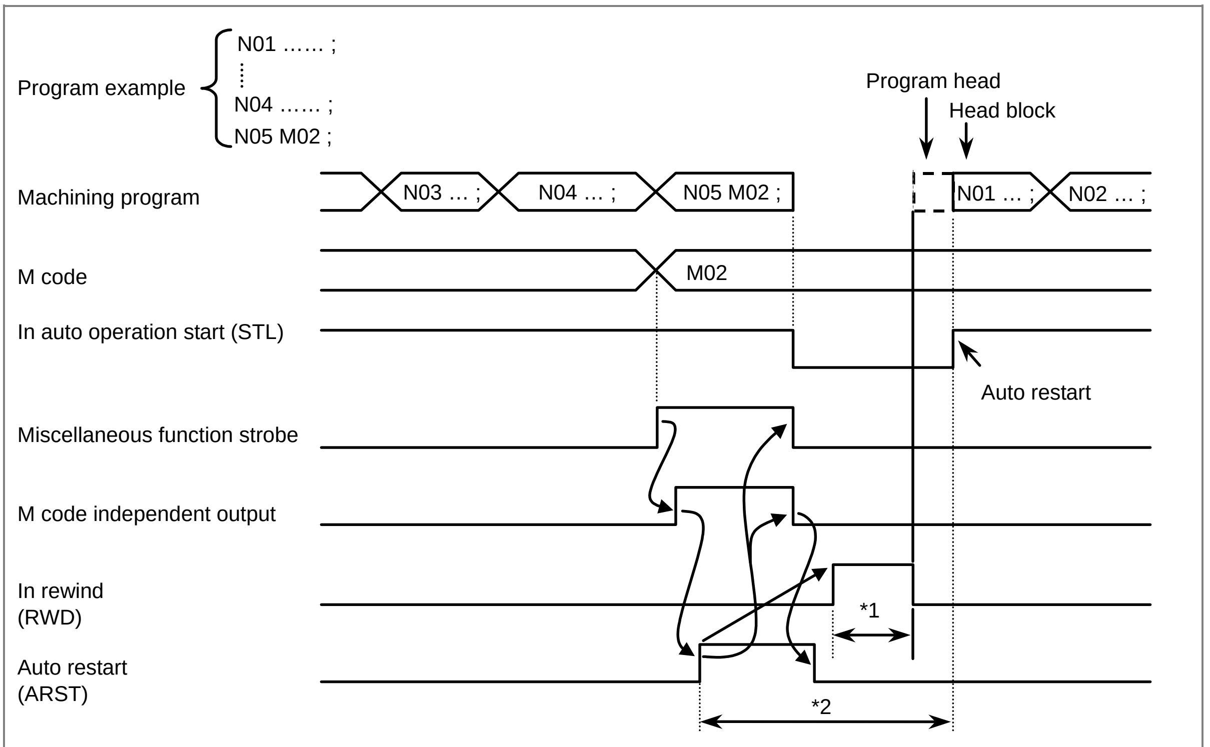
[Function]

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)
*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, the M02 or M30 single output signal is input into this signal, but in this case, do not input the M02 or M30 completion signal (FIN1, FIN2).
(Note 5) If the automatic operation halt (*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.

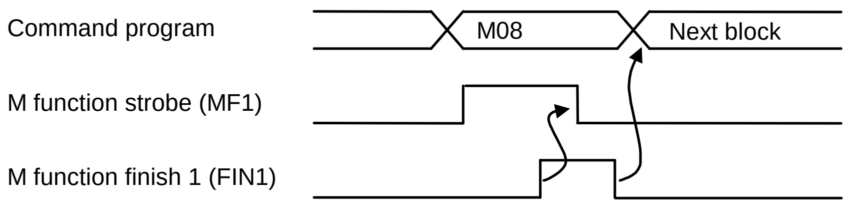
B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	M FUNCTION FINISH 1	FIN1		Y71E	Y7FE	Y8DE

[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 MF4, SF1 to 7, TF1 to 4, BF1 to BF4) 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 "P36 PROGRAM END ERR" will occur.

[Related signals]

(1) M function finish 2 (FIN2: Y71F)
(2) M, S, T, B function strobe (MF1 to MF4, SF1 to 7, TF1 to 4, BF1 to 4: X644 to 647, X658 to 65E, X650 to 653, X654 to 657)
(3) M, S, T, B function data (output to file register R)
(4) Reset & rewind (RRW: Y71A)

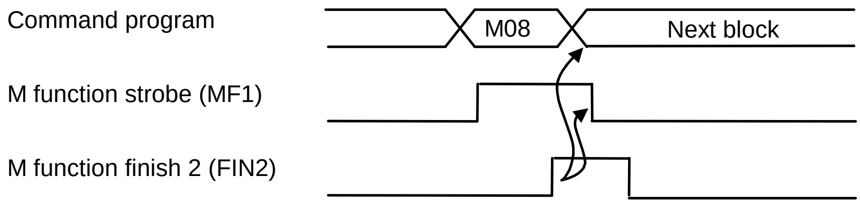
B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	M FUNCTION FINISH 2	FIN2		Y71F	Y7FF	Y8DF

[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 MF4, SF1 to 7, TF1 to 4, BF1 to BF4) 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 types of 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 "P36 PROGRAM END ERR" will occur.

[Related signals]

(1) M function finish 1 (FIN1: Y71E)
(2) M, S, T, B function strobe (MF1 to MF4, SF1 to 7, TF1 to 4, BF1 to 4: X644 to 647, X658 to 65E, X650 to 653, X654 to 657)
(3) M, S, T, B function data (output to file register R)
(4) Reset & rewind (RRW: Y71A)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	TOOL LENGTH MEASUREMENT	TLM		Y720	Y800	Y8E0

[Function]

"Tool length measurement 1" is selected 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 data screen is not selected.
(2) The calculation result is read when entry key is pressed.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	TOOL LENGTH MEASUREMENT 2 (L ONLY)	TLMS		Y721	Y801	Y8E1

[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.

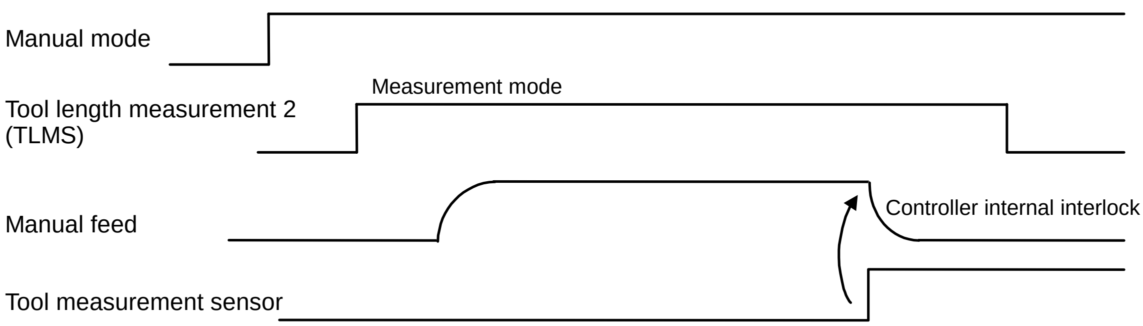
[Cautions]

(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]

R4720 ...Tool No. of tool to be measured is specified (T 4-digit BCD).

[Timing chart]



B con-tact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	SYNCHRONIZATION CORRECTION MODE			Y722	Y802	Y8E2

[Function]

When the OPERATION ERROR 51 (Synchronization error too large) occurs, the occurring error is corrected without changing the operation method with this mode.

[Operation]

In the correction mode, the operation is as follows.

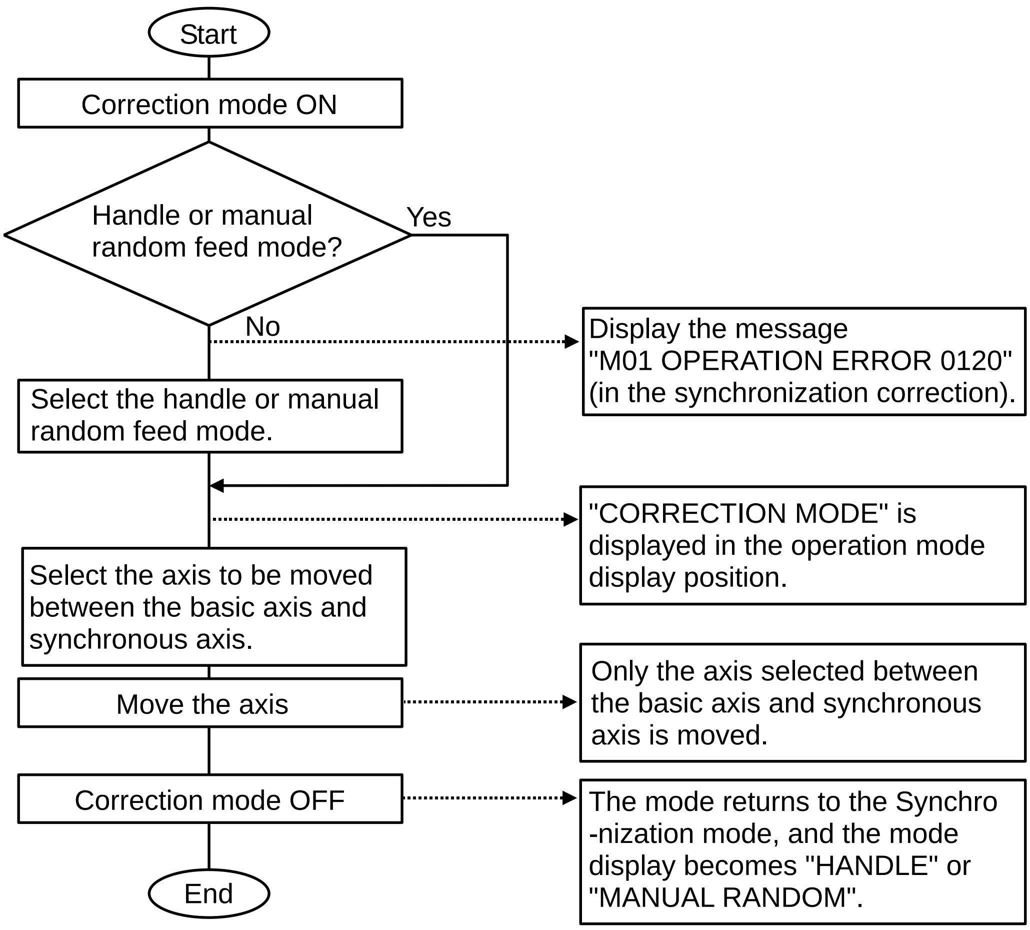
(1) Synchronous control is not carried out even for the synchronous axis, and the basic axis and synchronous axis are handled as two independent axis by each control section. Thus, basic axis and synchronous axis can be move moved individually.

(2) If the zero point has established, the synchronization error check is carried out.

(3) If the correction mode switch is turned ON during selecting the mode except the handle or manual random feed mode, the OPERATION ERROR 120 (Synchronization correction mode ON) will occur.

In the handle or manual random feed mode, if the correction mode switch (1st part system: Y722, 2nd part system: Y802 … 7th part system: YC62) is turned ON, the correction mode can be set and "CORRECTION MODE" will be displayed in the operation mode display position.

The operation procedure is shown below.



[Related signal]

Synchronization control operation method (R932)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	MACRO INTERRUPT	UIT		Y725	Y805	Y8E5

[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)".

[Operation]

When "Macro interrupt (UIT)" signal turns ON within time interval starting with M96 command 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 or MDI is selected.
(2) Automatic operation is selected (signal STL is ON).
(3) Other user macro is not being executed.
(4) Parameter "user macro interrupt valid" is selected.

"Macro interrupt (UIT)" signal is accepted in "status trigger" method or "edge trigger" method, either one of which can be selected by parameter.

(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 con-tact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	RAPID TRAVERSE	RT		Y726	Y806	Y8E6

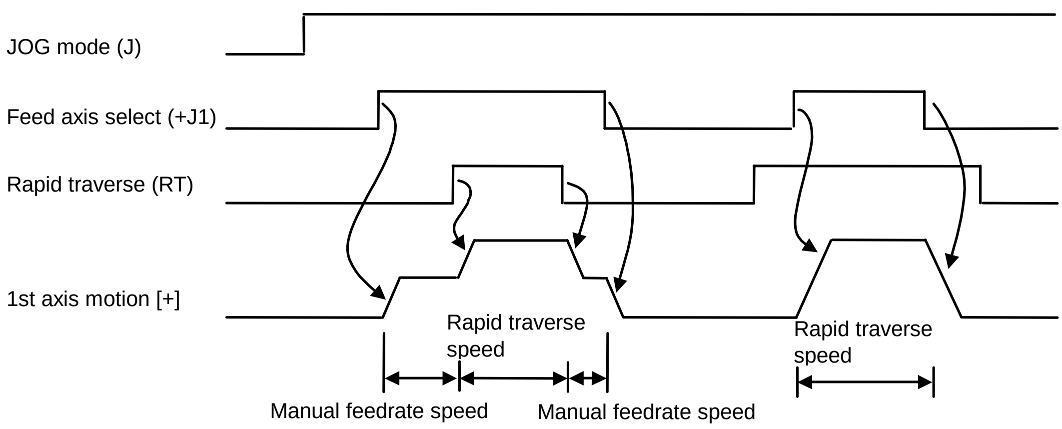
[Function]

Speed or feedrate of axis motion in "JOG" mode, "incremental feed" mode or "reference point 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 point return will be the reference point 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~±J14) 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 point 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: Y768, 769)

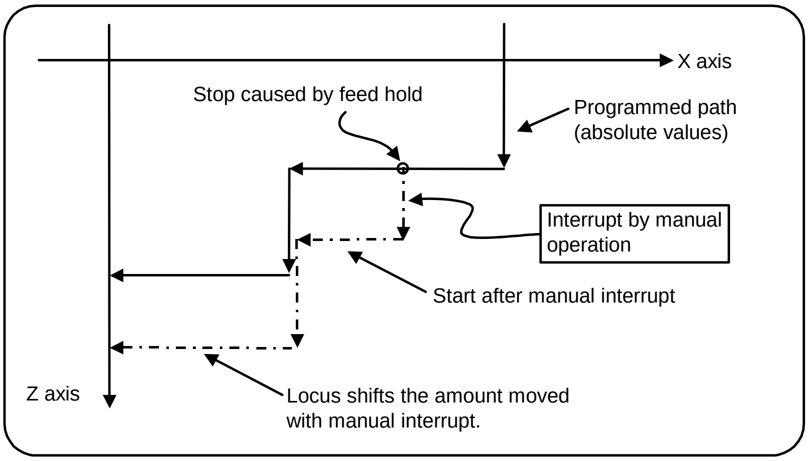
B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	MANUAL ABSOLUTE	ABS		Y728	Y808	Y8E8

[Function]

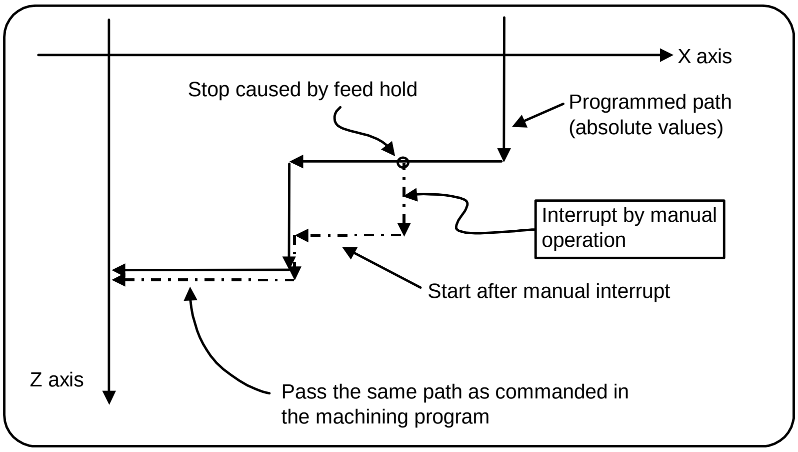
This signal selects whether to update the program coordinate system the amount moved with manual operation (jog, handle, etc.).

[Operation]

(1) When "Manual absolute (ABS)" signal 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 (ABS)" signal 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 con-tact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	RECALCULATION REQUEST	CRQ		Y72B	Y80B	Y8EB

[Function]

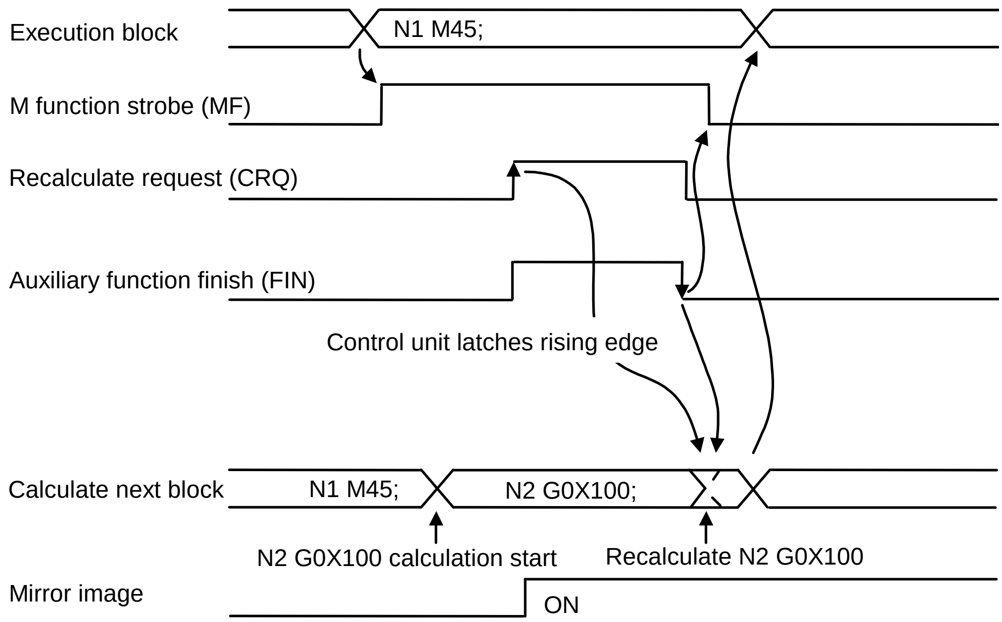
This signal is turned ON if a calculated block (next block) is recalculated during operation of the machining program.

[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 CRQ signal latches the rising edge in the controller. Thus, even if the CRQ signal is ON (1), the "recalculation" will not take place unless at the rising edge.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	PROGRAM DISPLAY DURING OPERATION	PDISP		Y72C	Y80C	Y8EC

[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		1st system	2nd system	3rd system
—	OPTIONAL BLOCK SKIP	BDT1		Y72D	Y80D	Y8ED

[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]

(1) 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		1st system	2nd system	3rd system
—	REFERENCE POINT POSITION SELECT 1, 2	ZSL1, 2		Y730, 731	Y810, 811	Y8F0, 8F1

[Function]

It is also possible to return to the nth reference point in the manual reference point return mode. This signal is used to select the number of the reference point (n) to return to. Normally both the reference point position select signals 1 and 2 are turned OFF, so 1st point reference return is performed.

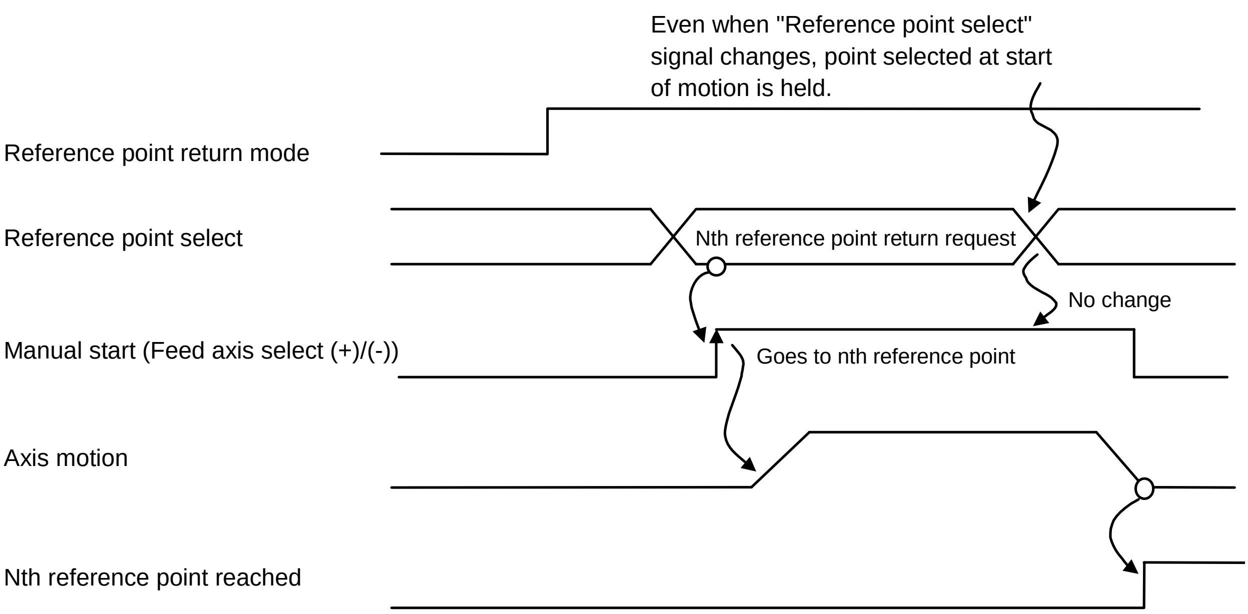
[Operation]

Reference point position select signal 1, 2 is valid when:
(1) Reference point return mode is ON ("1").
(2) Manual start condition is held.

Reference point position select 2	Reference point position select 1	Return point
0	0	1st reference point
0	1	2nd reference point
1	0	3rd reference point
1	1	4th reference point

(Note 1) Returning to the first reference point must be performed before returning to the second, third or forth reference point.

[Operation sequence]



[Related signals]

(1) Reference point return mode (ZRN: X604)
(2) Feed axis select (+Jn, -Jn: Y44B, Y44C)
(3) N-th reference point reached (ZP11~ZP41: X444~X447)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	REFERENCE POINT SELECT METHOD	M		Y737	Y817	Y8F7

[Function]

This signal selects whether the reference point selection is common for all axes (Y730, Y731) or independent for each axis (R2301).

[Operation]

When this signal is OFF, the reference point selection is common for all axes, and Y730 and Y731 are valid.

When this signal is ON, the reference point selection is independent for each axis, and R2301 is valid.

[Related signals]

Reference point select 1, 2 (ZSL1, 2: Y730, Y731)
Each axis reference point select (R2301)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	1ST HANDLE AXIS NO.	HS11~HS116		Y740~744	Y820~824	Y900~904

[Function]

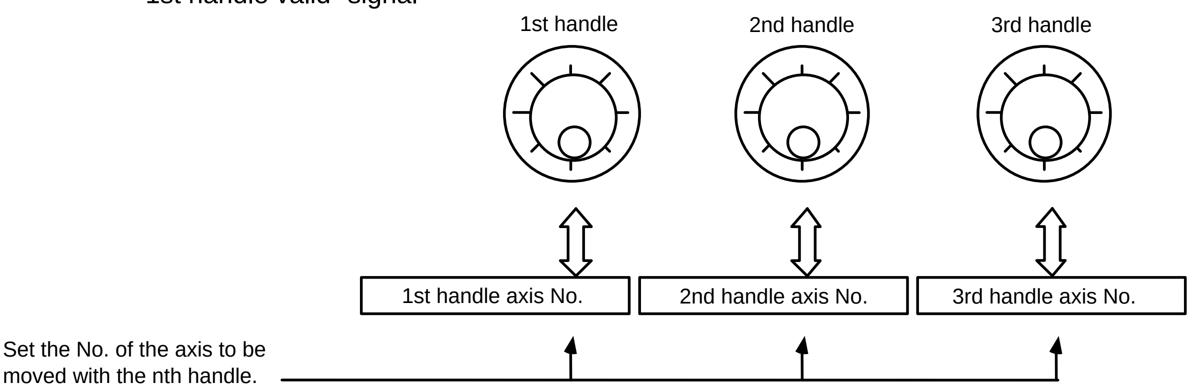
In HANDLE mode (handwheel is operated), axis component to be moved is selected.
In the case of 2-axis handle specification, axis is selected for the 1st handle.

[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~HS216: Y748~74C) 2nd handle valid (HS2S: Y74F)
(2) 3rd handle axis No. (HS31~HS316: Y750~754) 3rd handle valid (HS3S: Y757)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	1ST HANDLE VALID	HS1S		Y747	Y827	Y907

[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~HS116: Y740~744)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	2ND HANDLE AXIS NO.	HS21~HS216		Y748~74C	Y828~82C	Y908~90C

[Function]

This signal selects which handle to move with the 2nd handle when using the 2-axis or 3-axis handle specifications (when two or three handles are required).

[Operation]

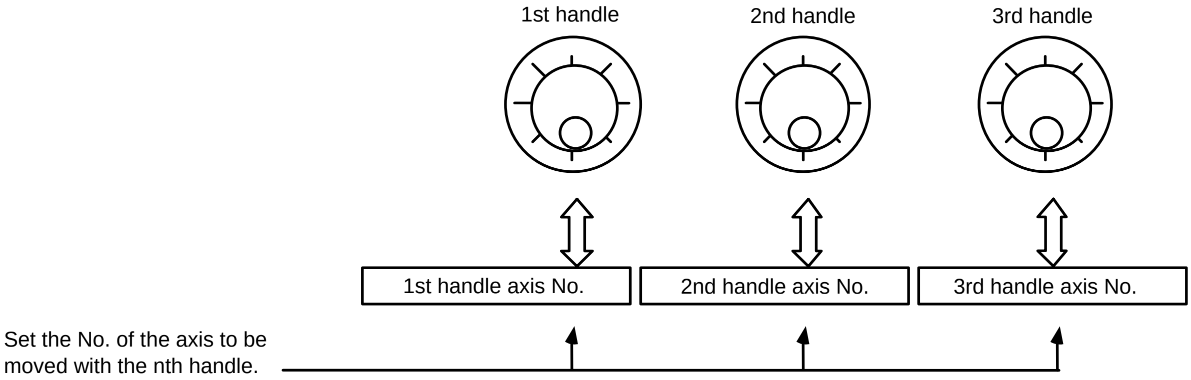
For axis motion controlled by the 2nd handle:

(1) Select HANDLE mode.
(2) Specify axis No. for 2nd handle axis No.
(3) Turn ON "1st handle valid" signal (HS2S).
(4) Turn the handle (handwheel) ... motion will start.

The relationship between "handle axis No." and "motion axis" is as follows:

Motion axis \ Handle axis No.	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~HS116: Y740~744) 1st handle valid (HS1S: Y747)
(2) 3rd handle axis No. (HS31~HS316: Y750~754) 3rd handle valid (HS3S: Y757)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	2ND HANDLE VALID	HS2S		Y74F	Y82F	Y90F

[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~HS216).

[Related signal]

(1) 2nd handle axis No. (HS21~HS216: Y748~74C)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	3RD HANDLE AXIS NO.	HS31~HS316		Y750~754	Y830~834	Y910~914

[Function]

This signal selects which handle to move with the 3rd handle when using the 3-axis handle specifications (when three handles are required).

[Operation]

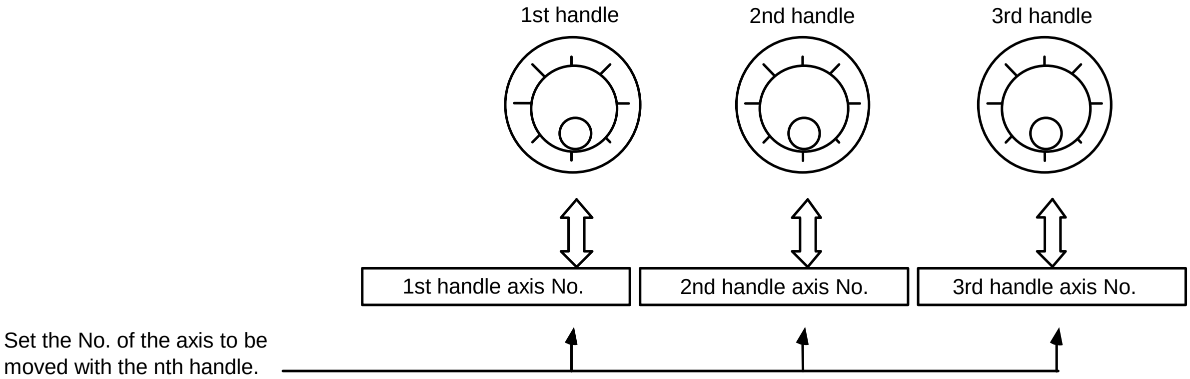
For axis motion controlled by the 3rd handle:

(1) Select HANDLE mode.
(2) Specify axis No. for 2nd handle axis No.
(3) Turn ON "1st 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 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~HS116: Y740~744) 1st handle valid (HS1S: Y747)
(2) 2nd handle axis No. (HS21~HS216: Y748~74C) 2nd handle valid (HS2S: Y74F)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	3RD HANDLE VALID	HS3S		Y757	Y837	Y917

[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~HS316).

[Related signal]

(1) 3rd handle axis No. (HS31~HS316: Y757)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	OVERRIDE CANCEL	OVC		Y758	Y838	Y918

[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~*FV16) is ignored and feedrate specified by F command is selected.
(2) When 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 override (*FV1~*FV16: Y760~764)

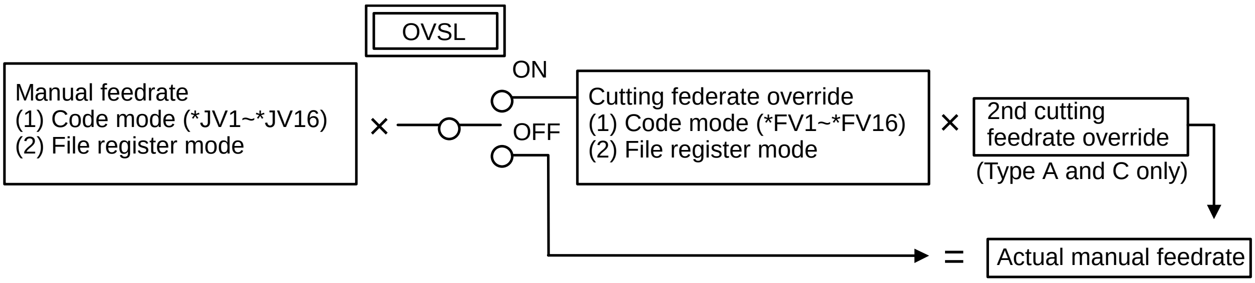
B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	MANUAL OVERRIDE VALID	OVSL		Y759	Y839	Y919

[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		1st system	2nd system	3rd system
—	MISCELLANEOUS FUNCTION LOCK	AFL		Y75A	Y83A	Y91A

[Function]

Strobe signal for miscellaneous function (M, S, and T) 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, and T) specified in automatic operation cannot be executed, i.e. output of code data and function strobe signal (MF1~MF4, SF1, TF1) 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 (MF1~MF4: X644~647)
- M code data (R204~211)
- S function strobe (SF1~SF7: X658~65E)
- S code data (R212~219, R264~269)
- T function strobe (TF1~TF4: X650~653)
- T code data (R220~227)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	TAP RETRACT	TRV		Y75C	Y83C	Y91C

[Function]

This function is used to remove the tap from the workpiece when tap cycle has been stopped due to emergency stop, etc.

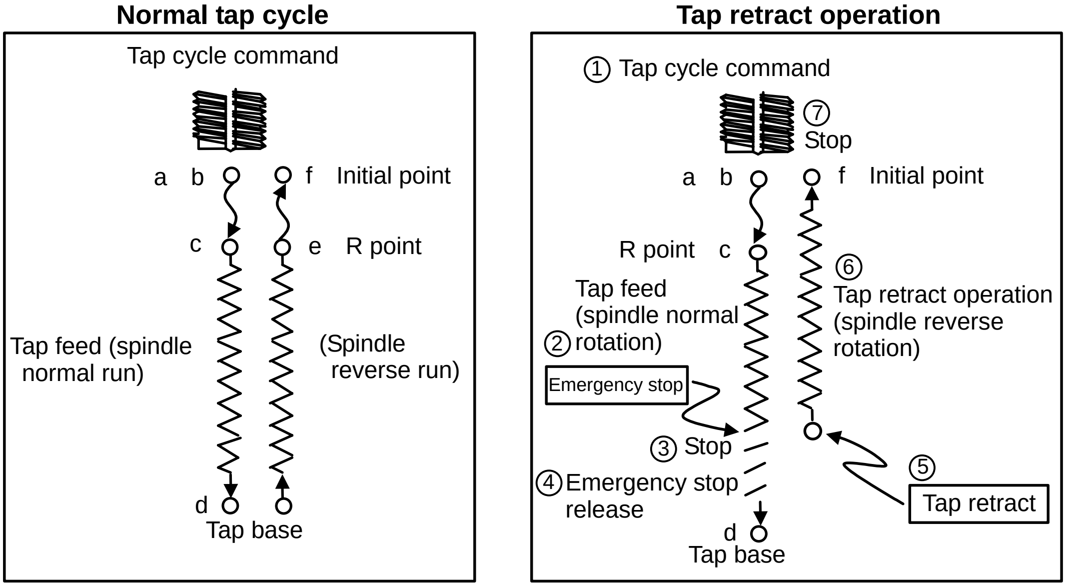
[Operation]

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. → (1)
- Stop the tap cycle with emergency stop. → (2)
- The "Tap retract possible" signal (TRVE) turns ON. → (3)
- Release the emergency stop. (The "Servo-ready" signal (SA) turns ON.) → (4)
- Turn ON the "Tap retract" signal (TRV). → (5)
- 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. → (6)
- When the tap axis reaches the tap cycle initial point, the spindle and tap axis will stop, and tap retract will be completed. → (7)
- 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 during emergency stop or reset state, tap retract will not be executed.

[Related signals]
- Tap retract possible (TRVE: X66D)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	REFERENCE POINT RETRACT	RTN		Y75D	Y83D	Y91D

[Function]

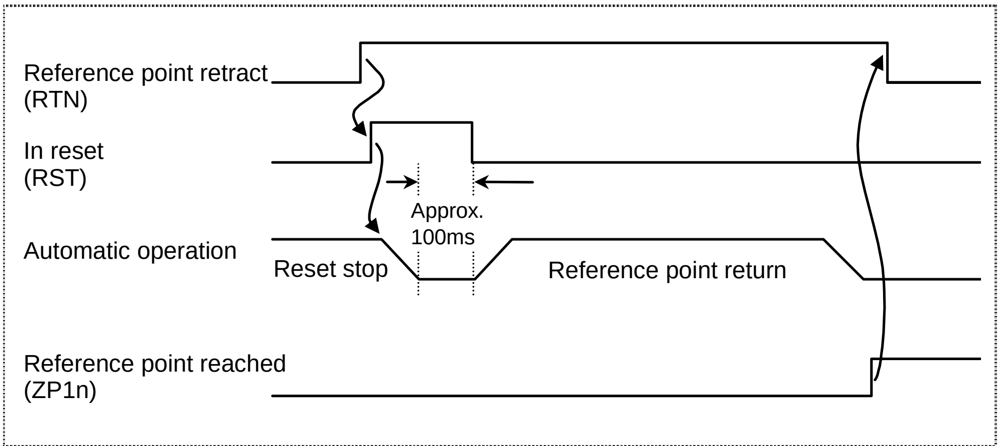
This function returns immediately to a set reference point when the retract signal is input. This function is used to return to a set position for changing the tool.

[Operation]

Reference point 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 point return is executed.
During the automatic or MDI operation, the operation is interrupted and stopped by the reset, and reference point 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 retract operation will be the tap retract operation. The tap retract is completed at the initial point, and after that the reference point return will be carried out.

(1) If there are two or more axes, set the retract order with parameter (#2019 revnum).
(2) When the reference point is reached, the corresponding "Reference point reached" signal will be output.
(3) This signal must be held until the "Reference point 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 point return speed is handled in the same manner as the normal reference point return speed.
(5) The reference point returned to by "Reference point retract" depends on the Y730 and Y731 zero point position selection.
(6) Even if the retract signal is input during the thread cutting cycle, it will be invalid. However, if the retract signal is executed in a block other than the thread cutting block, the return operation will be executed.
(7) The retract signal is invalid if the coordinate system is not established. An operation error will occur when the retract signal is input. (M01 OPERATION ERROR 0020)

[Time chart]



[Related signals]

Tap retract possible (TRVE: X66D)
Tap retract (TRV: Y75C)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
*	CUTTING FEEDRATE OVERRIDE	*FV1~*FV16		Y760~764	Y840~844	Y920~924

[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~*FV16) 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: Y758)
(2) 2nd cutting feedrate override valid (FV2E: Y766)
(3) Cutting feedrate override method select (FVS: Y767)

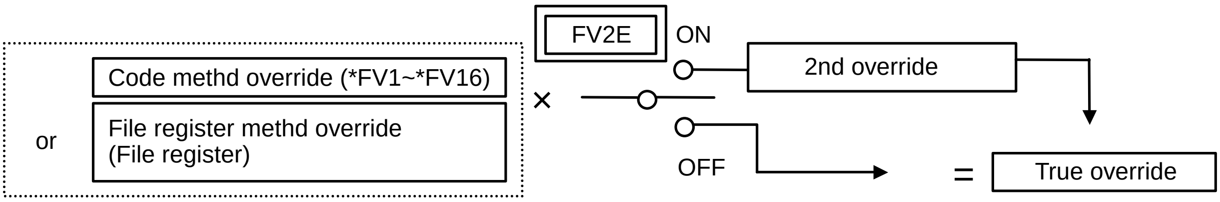
B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	2ND CUTTING FEEDRATE OVERRIDE VALID	FV2E		Y766	Y846	Y926

[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~*FV16), or file register method (by setting numerals manually). Applicable range of the 2nd override is 0%~327.6% (0.01% increment). Value (override ratio) is set to file register in binary code.



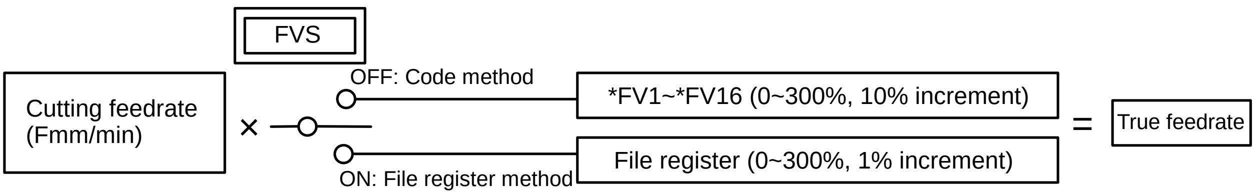
B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	CUTTING FEEDRATE OVERRIDE METHOD SELECT	FVS		Y767	Y847	Y927

[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~*FV16 is selected.
When the signal (FVS) is ON, file register method is selected.



(Note) For details of code method and file register method, refer to the relevant descriptions.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	RAPID TRAVERSE SPEED OVERRIDE	ROV1, ROV2		Y768, 769	Y848, 849	Y928, 929

[Function]

This signal is used to exert override on rapid traverse speed set by parameter (for rapid traverse) in automatic operation (memory or MDI) 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~ROV2) 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: Y76F)

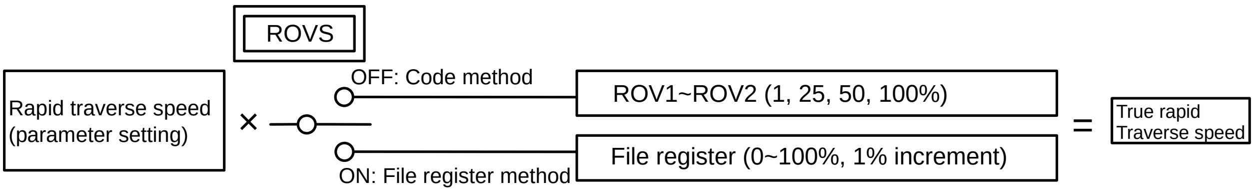
B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	RAPID TRAVERSE SPEED OVERRIDE METHOD SELECT	ROVS		Y76F	Y84F	Y92F

[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, ROV1 to ROV2 code method is selected.
When the signal (ROVS) is ON, file register method is used.



(Note) For details of "code method" and "file register method", refer to the respective description.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
*	MANUAL FEEDRATE	*JV1~*JV16		Y770~774	Y850~854	Y930~934

[Function]

Feedrate in manual operation (JOG mode, INCREMENT mode, etc.) or in dry run of automatic operation (memory or MDI) 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 point 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 "G00 dry run" must be ON.

These signals (*JV1~*JV16) 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: Y777)
(2) Manual override valid (OVSL: Y759)

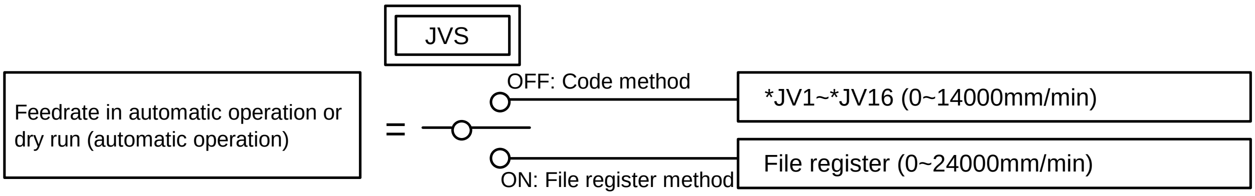
B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	MANUAL FEEDRATE METHOD SELECT	JVS		Y777	Y857	Y937

[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~*JV16) is selected.
When the signal (JVS) is ON, file register method is selected.



(Note) For details of "code method" and "file register method", refer to the relevant description.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	FEEDRATE LEAST INCREMENT	PCF1, 2		Y778, 779	Y858, 859	Y938, 939

[Function]

When manual feedrate is specified in file register mode (JVS: "ON") or in random manual feed mode, file registers R (R904 and R905) are used. In this case, least increment of feedrate entered into file registers R904 and R905 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		1st system	2nd system	3rd system
—	JOG SYNCHRONOUS FEED VALID	JSYN		Y77A	Y85A	Y93A

[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 point 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 point return modes.

[Designation of feedrates]

The designation of the per rotation feedrate is the same as the per minute feed input.
The cutting override will be valid when the "Manual override valid" signal is ON.

(a) Code method (*JV1~*JV16)

*JV16 (Y774)	*JV8 (Y773)	*JV4 (Y772)	*JV2 (Y771)	*JV1 (Y770)	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

(b) File register method (R904, 905)

The feedrate when the "Manual feedrate method select" (JVS: ON) is selected will be set in R904 and R905 with the binary value. However, the designation unit will be as follows according to the feedrate unit (PCF1, PCF2).

PCF2 (Y779)	PCF1 (Y778)	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		1st system	2nd system	3rd system
—	JOG • HANDLE SIMULTANEOUS	JHAN		Y77B	Y85B	Y93B

[Function]

Jog feed and handle feed can be carried out without changing the operation mode.

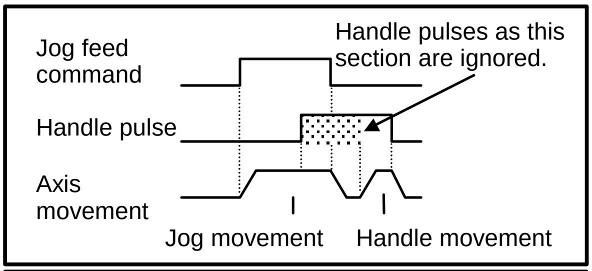
[Operation]

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 feedrate turns OFF, the jog feed will be carried out at the manual feedrate.

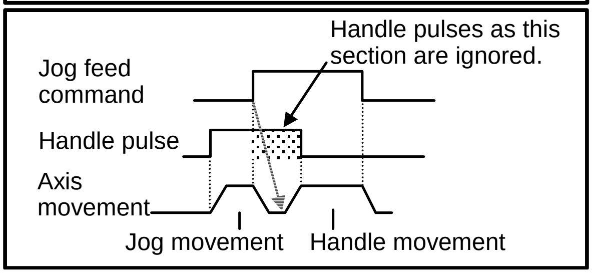
Operation mode	Jog•handle synchronous signal (Y77B)	Rapid traverse signal (Y726)	Operation during jog feed	Handle feed
Jog feed	ON	ON	Rapid traverse feedrate	Possible
		OFF	Manual feedrate	Possible
	OFF	ON	Rapid traverse feedrate	Impossible
		OFF	Manual feedrate	Impossible

(1) During "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, "OPERATION ERROR 0101 (NO OPERATION MODE ERROR)" 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		1st system	2nd system	3rd system
—	HANDLE/INCREMENTAL FEED MULTIPLICATION (Code method)	MP1~MP4		Y780~782	Y860~862	Y940~942

[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~±J14: "ON") is multiplied by this signal.

[Operation]

This signal (MP1~4) 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 (MP1~4) 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: Y701)
- Incremental mode (S: Y702)

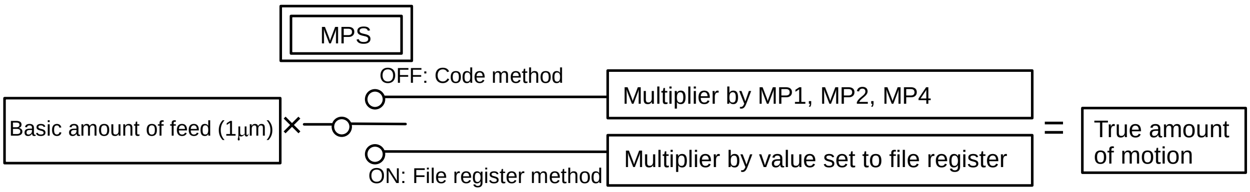
B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	HANDLE/INCREMENTAL FEED RANDOM MULTIPLICATION METHOD SELECT	MPS		Y787	Y867	Y947

[Function]

Feed multiplication mode 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 method of MP1, MP2 or MP4" is selected.
When the signal (MPS) is ON, "file register multiplication method" is selected.



(Note) For details of code method and file register method, refer to the relevant descriptions.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	TOOL ALARM 1/ TOOL SKIP TOOL	TAL1		Y788	Y868	Y948

[Function]

Sets "1" to the tool alarm status during tool life management.

[Operation]

When the signal (TAL1) is turned ON (for tool life management specification), status of tooling data is changed to status "3". This signal is valid when "In tool life management input" signal (Y78B) is ON.

[Related signals]

In tool life management input (TLF1: Y78B), tool alarm 2 (TAL2: Y789) and data count valid (TCEF: Y78A)

B conTact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	TOOL ALARM 2 (M SYSTEM)	TAL2		Y789	Y869	Y949

[Function]

Sets "2" to the tool alarm status during tool life management.

[Operation]

When the signal (TAL2) is turned ON (for tool life management specification), status of tooling data is changed to status "4". This signal is valid when "In tool life management input" (Y78B) is ON.

[Related signals]

In tool life management input (TLF1: Y78B), tool alarm 1/tool skip tool (TAL1: Y788) and data count valid (TCEF: Y78A)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	DATA COUNT VALID	TCEF		Y78A	Y86A	Y94A

[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. This signal becomes valid when "In tool life management input" (Y78B) is ON.

[Related signals]

In tool life management input (TLF1: Y78B), tool alarm 1/tool skip tool (TAL1: Y788) and tool alarm 2 (TAL2: Y789)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	TOOL LIFE MANAGEMENT INPUT (M SYSTEM)	TLF1		Y78B	Y86B	Y94B

[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: Y788), tool alarm 2 (TAL2: Y789) and data count valid (TCEF: Y78A)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	TOOL CHANGE RESET (L SYSTEM)	TRST		Y78C	Y86C	Y94C

[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 R930).
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: Y72B)
(2) Tool group No. designation (R930)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	MANUAL RANDOM FEED 1ST AXIS NO.	CX11~CX116		Y790~794	Y870~874	Y950~954

[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~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~CX116), there are two signals, "Manual random feed 2nd axis number" (CX21~CX216) and "Manual random feed 3rd axis number" (CX31~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 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

Valid signal (CXnS) Axis number (CXn16–CXn1)

(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 (R914 and R915).

(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 2nd axis movement data (R916 and R917).

(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 3rd axis movement data (R918 and R919).

[Related signal]

For related signals, see the section "Manual random feed mode (PTP)."

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	MANUAL RANDOM FEED 1ST AXIS VALID	CX1S		Y797	Y877	Y957

[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)."

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	MANUAL RANDOM FEED 2ND AXIS NUMBER	CX21~CX216		Y798~79C	Y878~87C	Y958~95C

[Function] [Operation]

See the descriptions on the "Manual random feed 1st axis number" signal (CX11~CX116) explained above.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	MANUAL RANDOM FEED 2ND AXIS VALID	CX2S		Y79F	Y87F	Y95F

[Function] [Operation]

See the descriptions on the "Manual random feed 1st axis valid" signal (CX1S).

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	MANUAL RANDOM FEED 3RD AXIS NUMBER	CX31~CX316		Y7A0~7A4	Y880~884	Y960~964

[Function] [Operation]

See the descriptions on the "Manual random feed 1st axis number" signal (CX11~CX116) explained above.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	MANUAL RANDOM FEED 3RD AXIS VALID	CX3S		Y7A7	Y887	Y967

[Function] [Operation]

See the descriptions on the "Manual random feed 1st axis valid" signal (CX1S).

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	SMOOTHING OFF	CXS1		Y7A8	Y888	Y968

[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)".

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	AXIS INDEPENDENT	CXS2		Y7A9	Y889	Y969

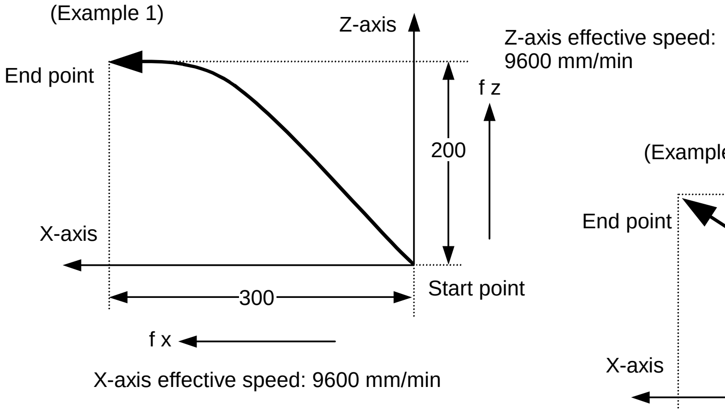
[Function]

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.

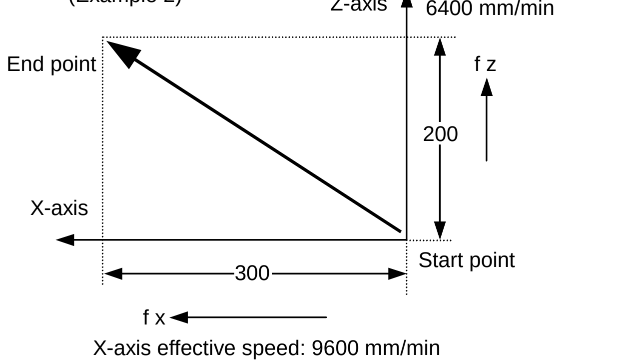
[Operation]

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.

(Example 1)



(Example 2)



[Related signal] For related signal, see the section "Manual random feed mode (PTP)".

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	EX. F/MODAL. F	CXS3		Y7AA	Y88A	Y96A

[Function]

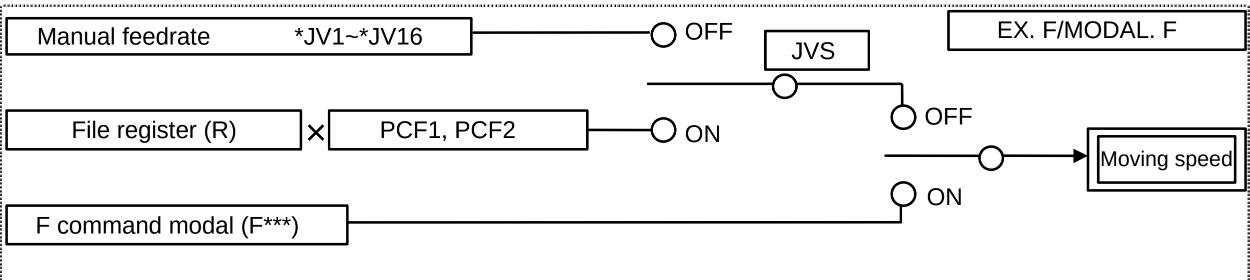
This signal selects whether a manual random feed in G1 mode is done at manual feed rate or at modal speed in automatic operation.

[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:
When the "Manual feedrate (JVS)" signal is OFF, the speed selected by the manual feed rate (*JV1~*JV16) applies.
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 feed rate unit (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)".

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	G0/G1	CXS4		Y7AB	Y88B	Y96B

[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)".

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	MC/WK	CXS5		Y7AC	Y88C	Y96C

[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 n-th 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)".

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	ABS/INC	CXS6		Y7AD	Y88D	Y96D

[Function]

This signal selects whether motion 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 n-th 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 n-th 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)".

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
*	STOP	*CXS7		Y7AE	Y88E	Y96E

[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 resumes the operation.

(Note 1) In C6/C64, 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)".

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	STROBE	CXS8		Y7AF	Y88F	Y96F

[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]

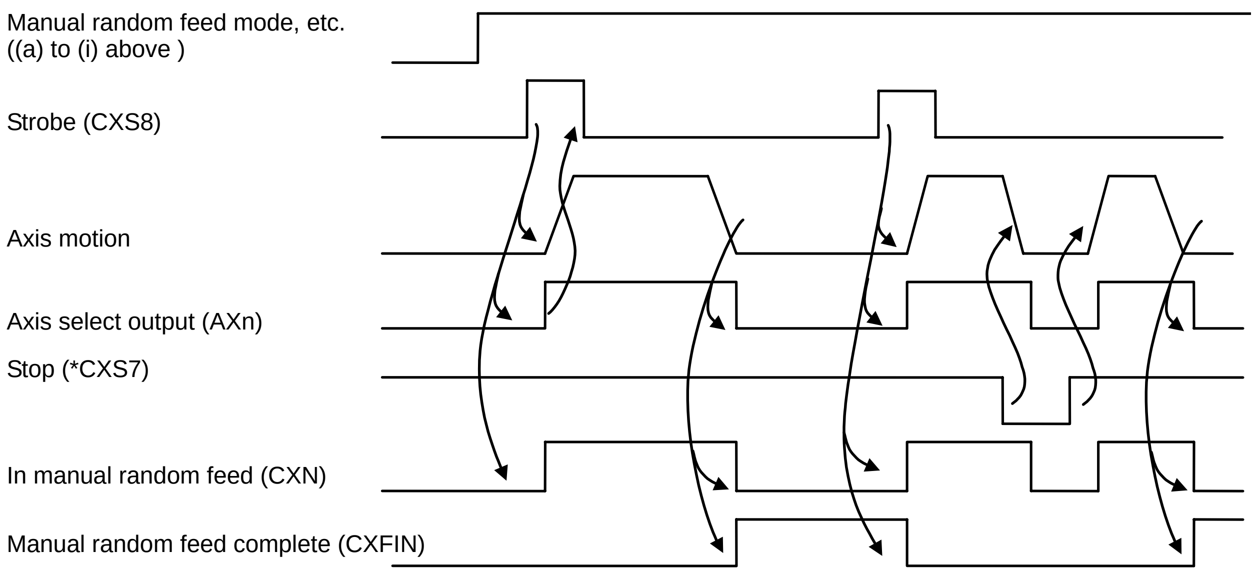
The STROBE (CXS8) should be turned ON after all signal values necessary for manual random feed are set appropriately.

(1) The following signals must be appropriately set before turning ON the strobe signal:
- (a) Manual random feed mode
- (b) Manual random feed nth axis number (CXn1~CXn16) and manual random feed nth axis valid (CXnS)
- (c) Manual random feed nth axis movement data (file registers R914~R919)
- (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:
- (a) Manual feed speed
- (b) Rapid traverse override for a rapid traverse speed when the G0/G1 signal (CXS4) is OFF.
- (c) 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]

Refer to signals (1) (a) to (i) and (2) (a) to (c) above for the related signals.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
*	2ND REFERENCE POINT RETURN INTERLOCK	*ZRIT		Y7B0	Y890	Y970

[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 "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 point return will continue.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	SEARCH & START	RSST		Y7B2	Y892	Y972

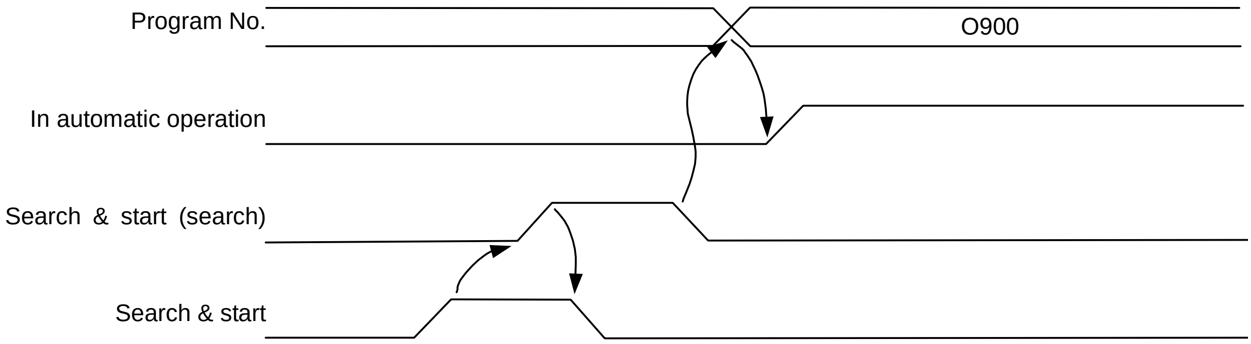
[Function]

This signal is input into the controller when executing operation search in the memory mode and carrying out automatic start up.

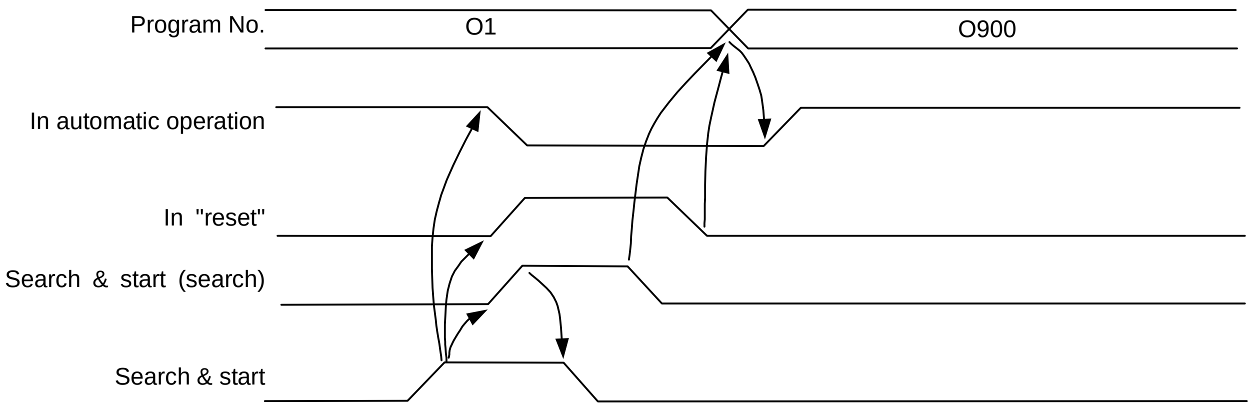
[Operation]

If this signal is input when the memory operation mode is selected, an operation search of the machining program with the designated No. (R938/939) 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 (start) signal turns ON.

(Example) The O900 machining program is designated and search & start is executed in a state other than automatic operation.



(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. (R938/939)
(2) Search & start error (SSE: X635)
(3) Search & start (search) (SSG: X636)

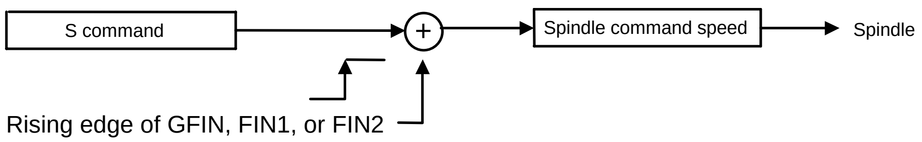
B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	GEAR SHIFT FINISH	GFIN		YD26	YD56	YD86

[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.

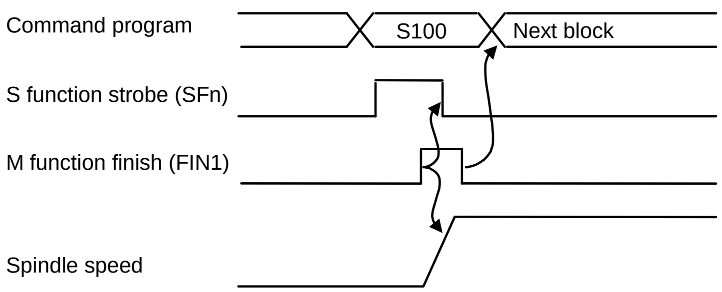
[Operation]

To change the spindle speed to the speed specified by the S command during automatic operation (memory or MDI), it is needed to turn ON the "Gear shift finish (GFIN)" signal, or "M function finish 1 (FIN1, FIN2)" signal.

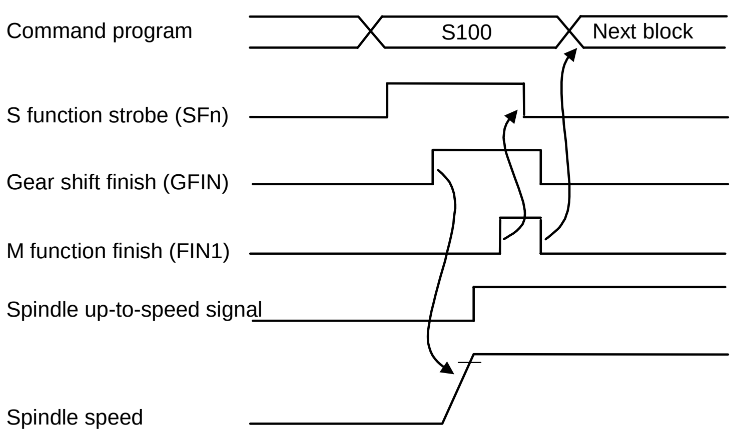


When using the "Gear shift finish" signal, the following two conditions should be considered:
○ Whether gear shift (gear change) is applicable (whether there are two or more states of gear shift).
○ Whether "spindle up-to-speed" signal output from the spindle controller is used for verification of spindle speed.

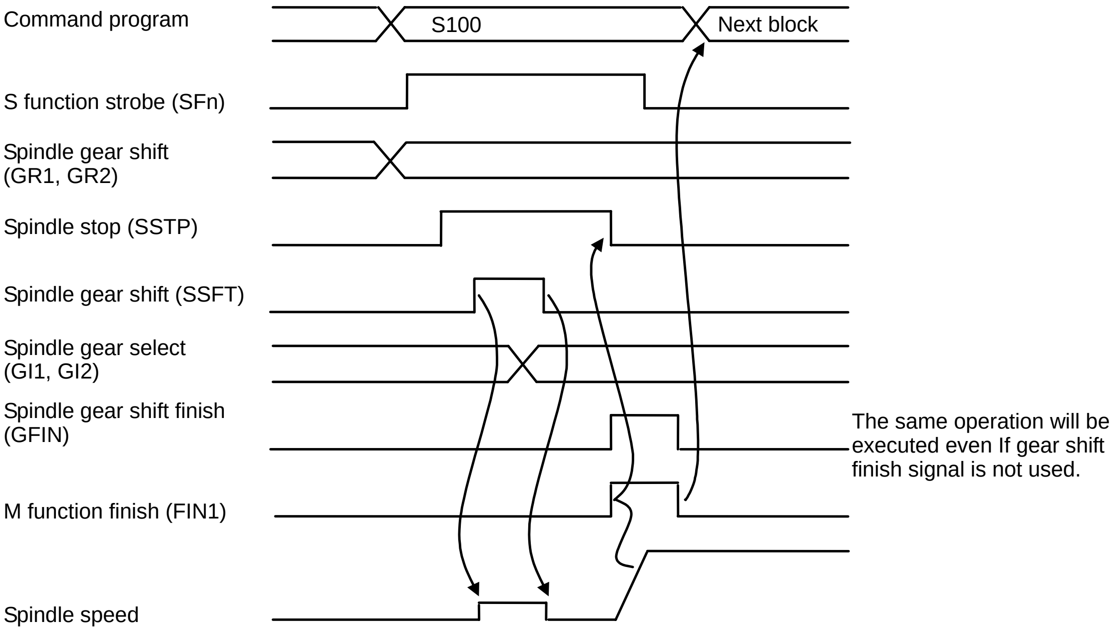
Operation example (1) There is no gear shift and the "Spindle up-to-speed" signal is not used.



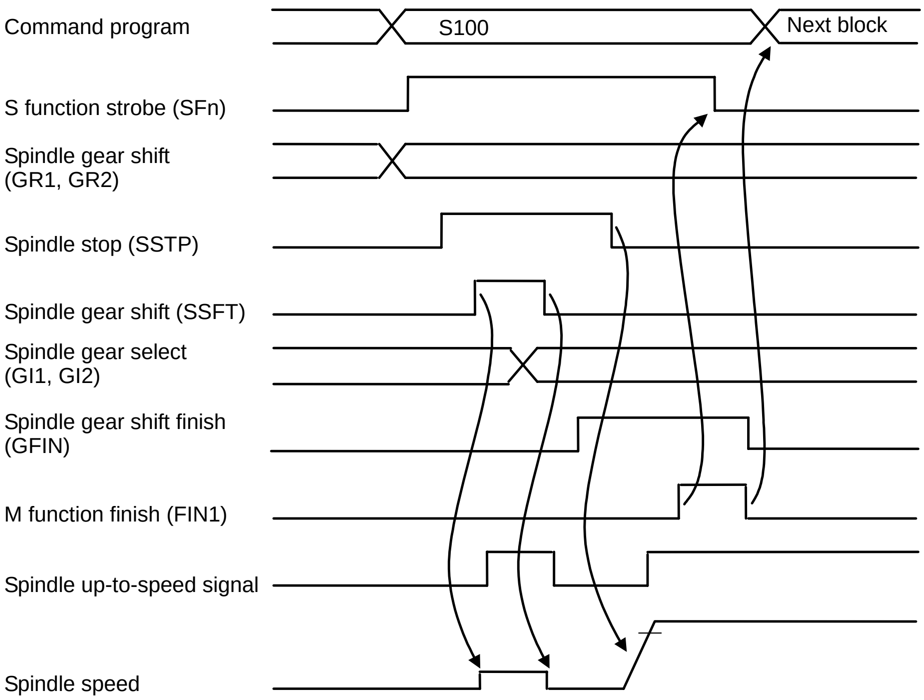
Operation example (2) There is no gear shift, but the "Spindle up-to-speed" signal is used.



Operation example (3)　There is gear shift, but the "Spindle up-to-speed" signal is not used.



Operation example (4)　There is gear shift and "Spindle up-to-speed" signal are used.



[Related signals]

(1) S function strobe (SF1~SF7: X658~65E)
(2) Spindle gear shift (GR1, GR2: X98D, 98E)
(3) M function finish (FIN1, FIN2: Y71E, 71F)
(4) Spindle gear selection (GI1, GI2: YD30, D31)
(5) Spindle stop (SSTP: YD34), Spindle gear shift (SSFT: YD35)

B con-tact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	SPINDLE OVERRIDE	SP1~SP4		YD28~D2A	YD58~D5A	YD88~D8A

[Function]

This signal applies override (multiplication) on the S command issued in the automatic operation (memory, MDI) for type B and C.

[Operation]

By selecting "Spindle override (SP1~4)" signal, override ratio can be selected within range from 50% to 120% (increment: 10%).
Override cannot be set when:
(1) "Spindle stop input" signal is ON.
(2) TAP mode is selected.
(3) Thread cutting mode is selected.
This signal (SP1~SP4) 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: YD2F)

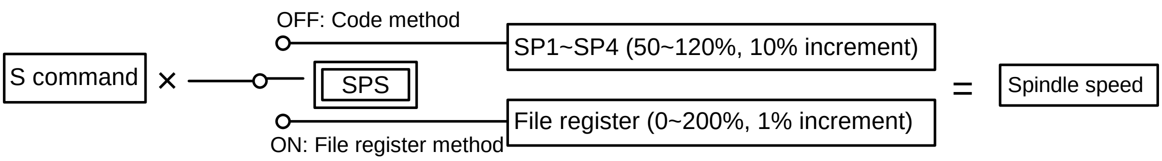
B con-tact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	SPINDLE OVERRIDE METHOD SELECT	SPS		YD2F	YD5F	YD8F

[Function]

When speed override is exerted on spindle speed specified by S command (S5-digit analog specification) in automatic operation (memory or MDI) for types B or C either "code method" or "file register method" is selected for override method.

[Operation]

When the signal (SPS) is OFF, SP1~SP4 code is selected.
When the signal (SPS) is ON, value set in file register 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		1st spindle	2nd spindle	3rd spindle
—	SPINDLE GEAR SELECT 1, 2	GI1, GI2		YD30, D31	YD60, D61	YD90, D91

[Function]

This signal informs the controller which spindle gear has been selected on the machine side.

[Operation]

This "Spindle gear select input" 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 input" signal (GI1, GI2).

The flow after the S command is executed and output to the spindle is shown below.

S command → Spindle speed output → Calculation → S analog data → Spindle

Calculation ← { Spindle speed output
Spindle gear select input (GI1, GI2)
Spindle parameter (Slimit1~4, Smax1~4)
Spindle override (SP1~SP4) }

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) Slimt1~4 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=1~4).
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		1st spindle	2nd spindle	3rd spindle
—	SPINDLE STOP	SSTP		YD34	YD64	YD94

[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 override (SP1~SP4)" is ignored while the signal is ON.

B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	SPINDLE GEAR SHIFT	SSFT		YD35	YD65	YD95

[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 input 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 con-tact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	ORIENTED SPINDLE SPEED COMMAND	SORC		YD36	YD66	YD96

[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 spindle orient command 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).
The relation of spindle orientation rotation speed and "Spindle gear select input" signal is as follows.

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" 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.

$$\text{Oriented spindle speed command speed data} = \frac{\text{SORI}}{\text{Slimt2}} \times 10$$

B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	SPINDLE FORWARD RUN START	SRN		YD38	YD68	YD98

[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 spindle forward run start signal (SRN) is turned ON.
When the spindle forward run start 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 spindle forward run start signal OFF and ON once after the "Servo ready" 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: YD39)
(2) Spindle orient command (ORC: YD3E)

B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	SPINDLE REVERSE RUN START	SRI		YD39	YD69	YD99

[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 spindle reverse run start signal (SRI) is turned ON.
When the spindle reverse run start 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 spindle reverse run start signal OFF and ON once after the "Servo ready" 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: YD38)
(2) Spindle orient command (ORC: YD3E)

B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	SPINDLE TORQUE LIMIT 1, 2	TL1, TL2		YD3A, D3B	YD6A, D6B	YD9A, D9B

[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 spindle orientation, or gear shift.

[Operation]

There are a spindle torque limit 1 (TL1) and spindle torque limit 2 (TL2) signal.
The spindle torque limit ratio is set to the spindle parameter.
The spindle torque limit ratio parameter which is used is determined by the combination of spindle torque limit 1 (TL1) and spindle torque limit 2 (TL2).

TL2	TL1	Selected spindle torque limit ratio parameter	Standard set value	Setup range (unit)
0	1	SP021	10	1~120(%)
1	0	SP049	20	1~120(%)
1	1	SP050	30	1~120(%)

(Note 1) These signals are valid only for systems that are high-speed serially connected with the spindle controller.

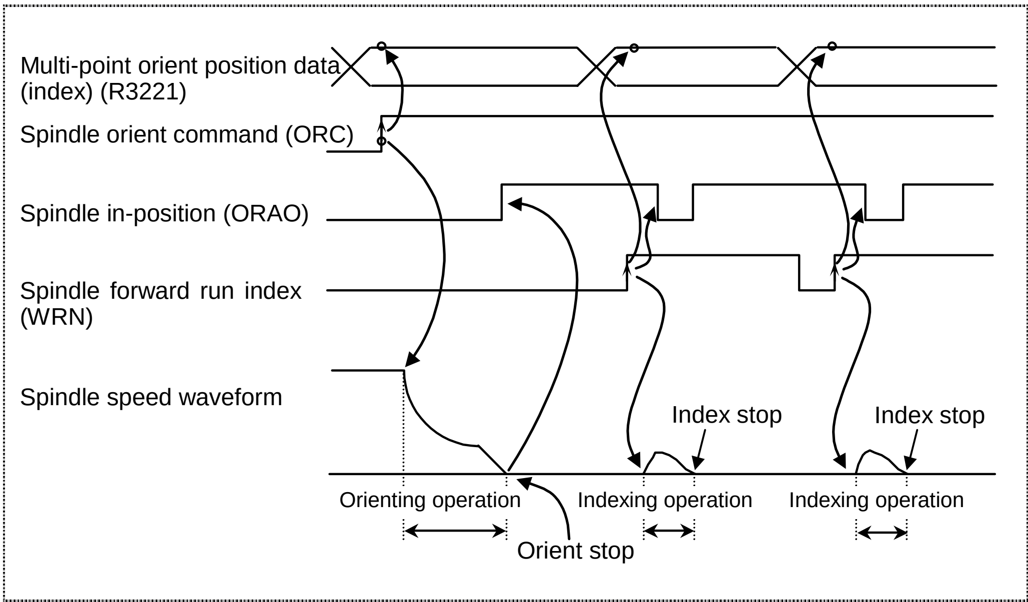
B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	SPINDLE FORWARD RUN INDEX	WRN		YD3C	YD6C	YD9C

[Function]

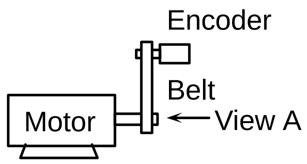
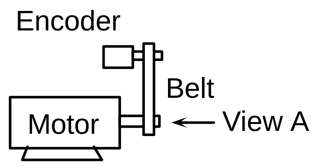
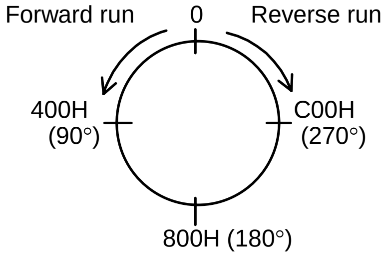
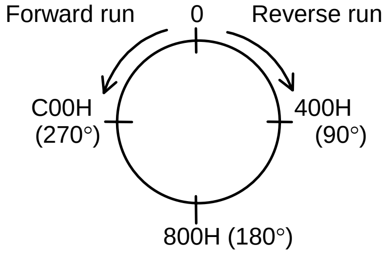
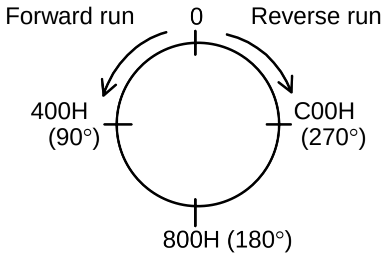
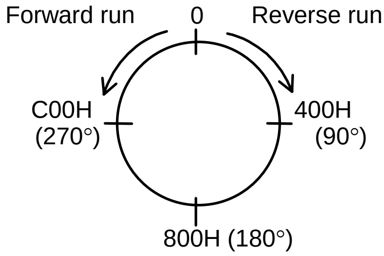
Forward run indexing of the spindle is carried out.

[Operation]

(1) This signal turns ON after the "Spindle in-position (ORAO)" signal is output.
(2) Continuous indexing can be carried out by turning this signal ON and OFF while the "Spindle orient command (ORC)" signal is ON.
(3) If this signal is turned ON before the "Spindle orient command (ORC)" signal is turned ON and the "In-position (ORAO)" signal is output, first the "Spindle orient command (ORC)" signal will turn ON, and the orientation will be completed at the position command value (R3221) 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.
(4) 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.
(5) 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.
(6) 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.
(7) 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	See from the axis end (view A) 	See from the axis end (view A) 
Orienting	See from the axis end (view A) 	See from the axis end (view A) 

(Note) Case 1 above applies when using the motor built-in encoder with Z-phase.

[Related signals]

(1) Multi-point orient position data (File register)
(2) Spindle in-position (ORAO: X996)
(3) Spindle orient command (ORC: YD3E)

B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	SPINDLE REVERSE RUN INDEX	WRI		YD3D	YD6D	YD9D

[Function]

Reverse run indexing of the spindle is carried out.

[Operation]

The operation is the same as spindle forward run indexing, except that the direction is different. Refer to the section on spindle forward run indexing.

[Related signal]

(1) Spindle forward run index (WRN: YD3C)

B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	SPINDLE ORIENT COMMAND	ORC		YD3E	YD6E	YD9E

[Function]

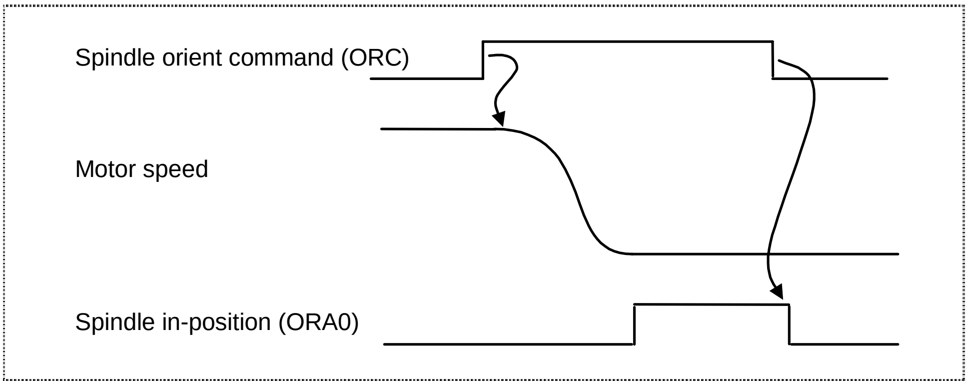
This signal is issued to the high-speed serial connection specification spindle controller (spindle drive). When the signal is turned ON, the spindle is indexed in position.

[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 (ORA0) 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 (ORC1) is turned OFF during oriented spindle stop. 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 data (data specification) value

The timing chart for basic orientation is shown below.



(Note 1) The spindle orient command (ORC) takes precedence over the spindle forward run start (SRN) and spindle reverse run start (SRI) commands.
(Note 2) This signal is valid only for systems that are high-speed serially connected with the spindle controller.

[Related signals]

(1) Multi-point orientation specification data (File register)
(2) Spindle in-position (ORA0: X996)

B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	L COIL SELECTION	LRSL		YD3F	YD6F	YD9F

[Function]

The L coil selection control is a function that obtains constant output characteristics in a wide range including low speed ranges by changing the spindle motor coils.

[Operation]

Set the rotation speed to a changeable speed (parameter SP020) before turning the "L coil selection" (LRSL) ON.
When "L coil selection" (LRSL) turns ON, the "In L coil selected" (LRSO) will be notified to the PLC after the changeover is completed.
During "In L coil selected" ON, the spindle parameters (SP321 to SP384) will be used instead of (SP257 to SP320).

(Note 1) L coil selection control can be selected when the following parameter is set.
Parameter SP034/bit2 is set to 1.

(Note 2) This signal is valid for a system having a control unit high-speed serially connected with the spindle controller and a coil changeover specification spindle motor.
As a principle, the built-in type is the target.

[Related signal]

In L coil selected (LRSO: X997)

6.4 PLC Output Signals (Data Type: R***)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	ANALOG OUTPUT	AOn		R100~103	—	—

[Function]

An analog voltage can be output from the designated connector pins (see below) on the remote I/O unit DX120/DX121 by setting designated data in the file registers.

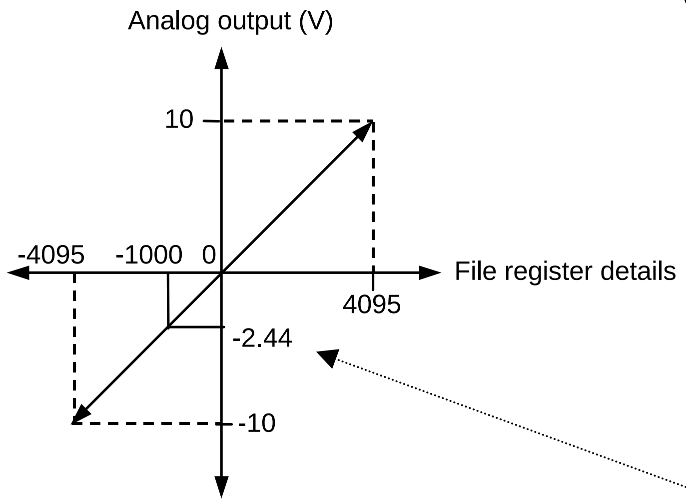
[Operation]

"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/DX121 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>



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

$$\text{Output voltage} = \frac{-1000}{4095} \times 10\text{V} = -2.44\text{V}$$

The output voltage is

<Relation of file register details and output voltage>

When -1000
(FC18 with hexadecimal)

Rn n = 100~103															
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

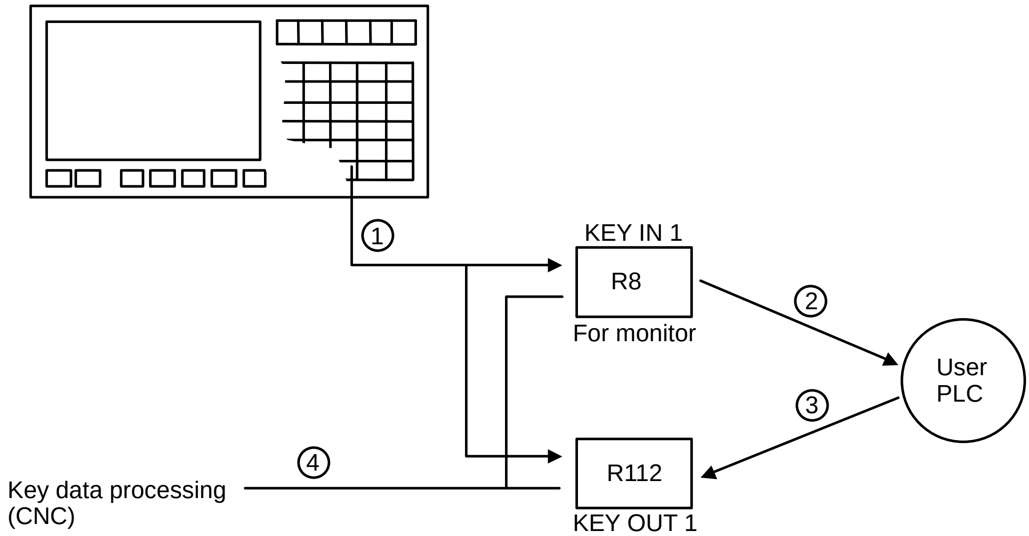
The data is input as binary coded data.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	KEY OUT 1			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 R8 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 R8 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 (R8)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	ALARM MESSAGE I/F 1~4			R118~121	—	—

[Function]

PLC development tool or alarm message prepared can be displayed in ALARM DIAGNOSIS screen when values (binary code) is set to alarm interface file registers (Rn, Rn+1, Rn+2, Rn+3).

[Operation]

When 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) or temporary storage (F) can be used. The selection is made with Setup parameter PLC "#6450 bit 1".
(3) In both file register method and temporary storage method, alarm does extend to the controller. When it is desirous to stop controller operation in case of alarm, "Auto operation "pause" command (*SP)" signal, "Single block" (SBK) signal or interlock signal should be prepared on the PLC side.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	OPERATOR MESSAGE I/F			R122	—	—

[Function]

Desired operator message prepared by PLC development tool can be displayed by setting value (binary code) to operator message interface file register (Rn). Operator message appears in ALARM DIAGNOSIS screen.

[Operation]

When table No. of previously prepared operator message table is 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 in case of operator message display, "Auto operation "pause" command (*SP)" signal, "Single block" (SBK) signal or interlock signal should be prepared on the PLC side.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	RESPONSE MONITOR TIMER			R123	—	—

[Function]

The maximum time to wait, after the data is transmitted, for a response from the client device to which data was sent is set.

[Operation]

When the send connection is opened with "procedural", once the data is sent, the system will wait for a response from the client device to which the data was sent. Set the maximum value for this wait time as the response monitor timer value. If a response is not received within the set timer, the BUFSND command will end as an error. (The control data complete status will become $C022_H$.)
The setting range is 2 to 32767 (0.5s unit).
The default is "60".

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	USER MACRO OUTPUT #1132 (Controller **->** PLC)			R124, 125	—	—

[Function]

This is interface function used to coordinate user PLC to user macro.

(Note) The other signals from R100 to R199 are PLC outputs, but this signal is the PLC input signal.

[Operation]

When a value is set in the system variables #1100~#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 output signal	System variable	Points	Interface output signal
#1100	1	Register R124 bit 0	#1116	1	Register R125 bit 0
#1101	1	Register R124 bit 1	#1117	1	Register R125 bit 1
#1102	1	Register R124 bit 2	#1118	1	Register R125 bit 2
#1103	1	Register R124 bit 3	#1119	1	Register R125 bit 3
#1104	1	Register R124 bit 4	#1120	1	Register R125 bit 4
#1105	1	Register R124 bit 5	#1121	1	Register R125 bit 5
#1106	1	Register R124 bit 6	#1122	1	Register R125 bit 6
#1107	1	Register R124 bit 7	#1123	1	Register R125 bit 7
#1108	1	Register R124 bit 8	#1124	1	Register R125 bit 8
#1109	1	Register R124 bit 9	#1125	1	Register R125 bit 9
#1110	1	Register R124 bit 10	#1126	1	Register R125 bit 10
#1111	1	Register R124 bit 11	#1127	1	Register R125 bit 11
#1112	1	Register R124 bit 12	#1128	1	Register R125 bit 12
#1113	1	Register R124 bit 13	#1129	1	Register R125 bit 13
#1114	1	Register R124 bit 14	#1130	1	Register R125 bit 14
#1115	1	Register R124 bit 15	#1131	1	Register R125 bit 15

System variable	Points	Interface output signal
#1132	32	Register R124, R125
#1133	32	Register R126, R127
#1134	32	Register R128, R129
#1135	32	Register R130, R131

This correspondence table shows the example for file registers R124 and R125.

File registers R124 and R125 correspond to system variables #1100~#1131, and #1132 (32-bit data).

[Related signals]

(1) User macro output #1133, #1134, #1135 (R126/127, R128/129, R130/131)
(2) User macro input #1032, #1033, #1034, #1035, #1000~#1031 (R24/25, R26/27, R28/29, R30/31)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	USER MACRO OUTPUT #1133 (Controller **->** PLC)			R126, 127	—	—

[Function]

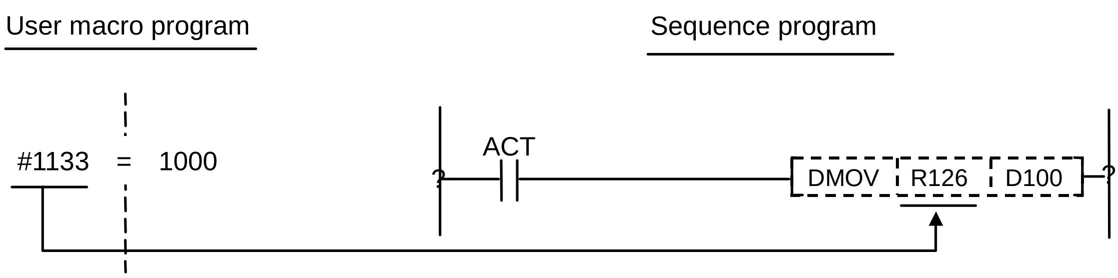
This provides interface function used to coordinate user PLC to user macro.

(Note) The other signals from R100 to R199 are PLC outputs, but this signal is the PLC input signal.

[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 output #1132, #1134, #1135, #1100~#1131 (R124/125, R128/129, R130/131)
(2) User macro input #1032, #1033, #1034, #1035, #1000~#1031 (R24/25, R26/27, R28/29, R30/31)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
	USER MACRO OUTPUT #1134 (Controller **->** PLC)		PC	R128, 129	—	—

[Function] [Operation]

The function operation, etc. are the same as those of "USER MACRO OUTPUT #1133".

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
	USER MACRO OUTPUT #1135 (Controller **->** PLC)		PC	R130, 131	—	—

[Function] [Operation]

The function operation, etc. are the same as those of "USER MACRO OUTPUT #1133".

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	USER PLC VERSION CODE			R132~135	—	—

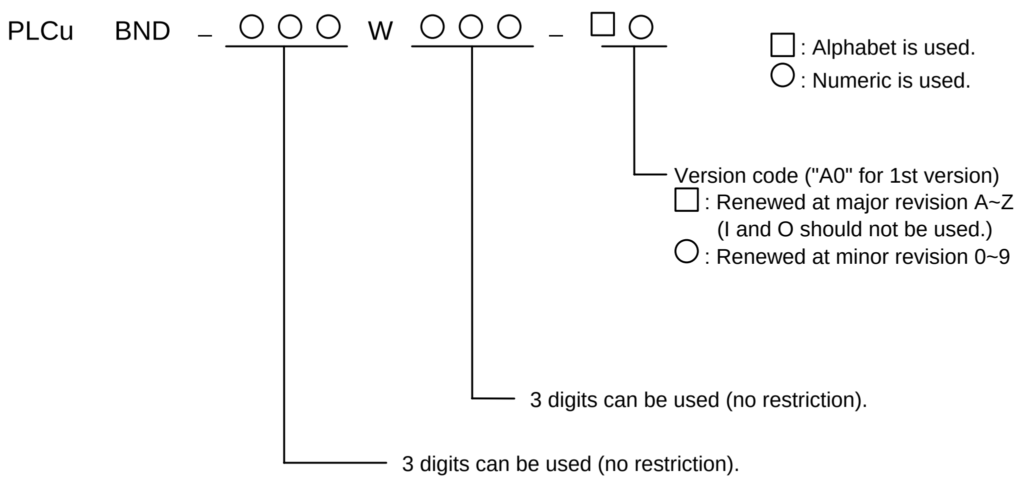
[Function]

The user PLC version can be displayed with the software version that controls the other controller on the setting and display unit (communication terminal) DIAGN/IN/OUT **->** menu changeover configuration (menu).

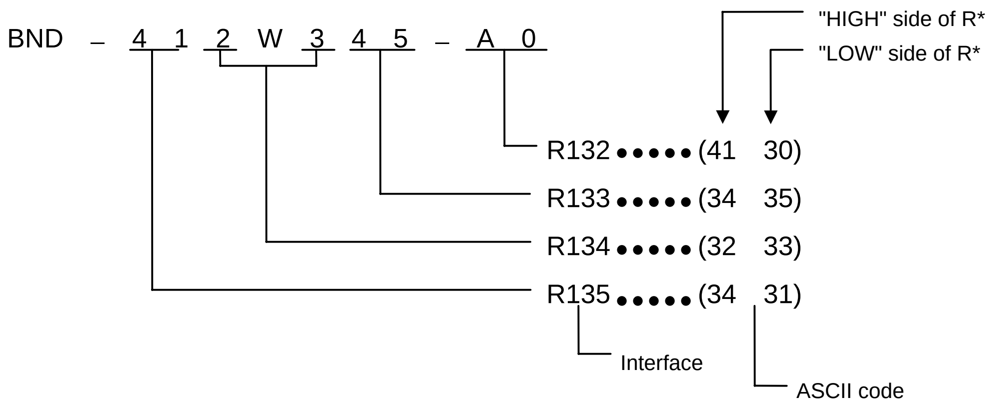
[Operation]

Characters to be displayed are placed in ASCII code.

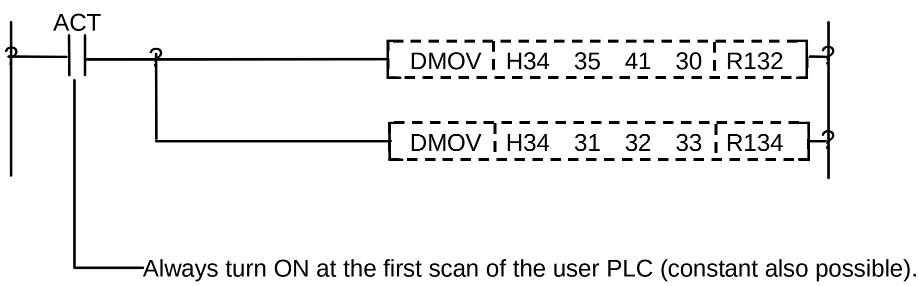
<Display format>



<Interface>



<Program example>



B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
—	AXIS INDEX			R140	R141	R142

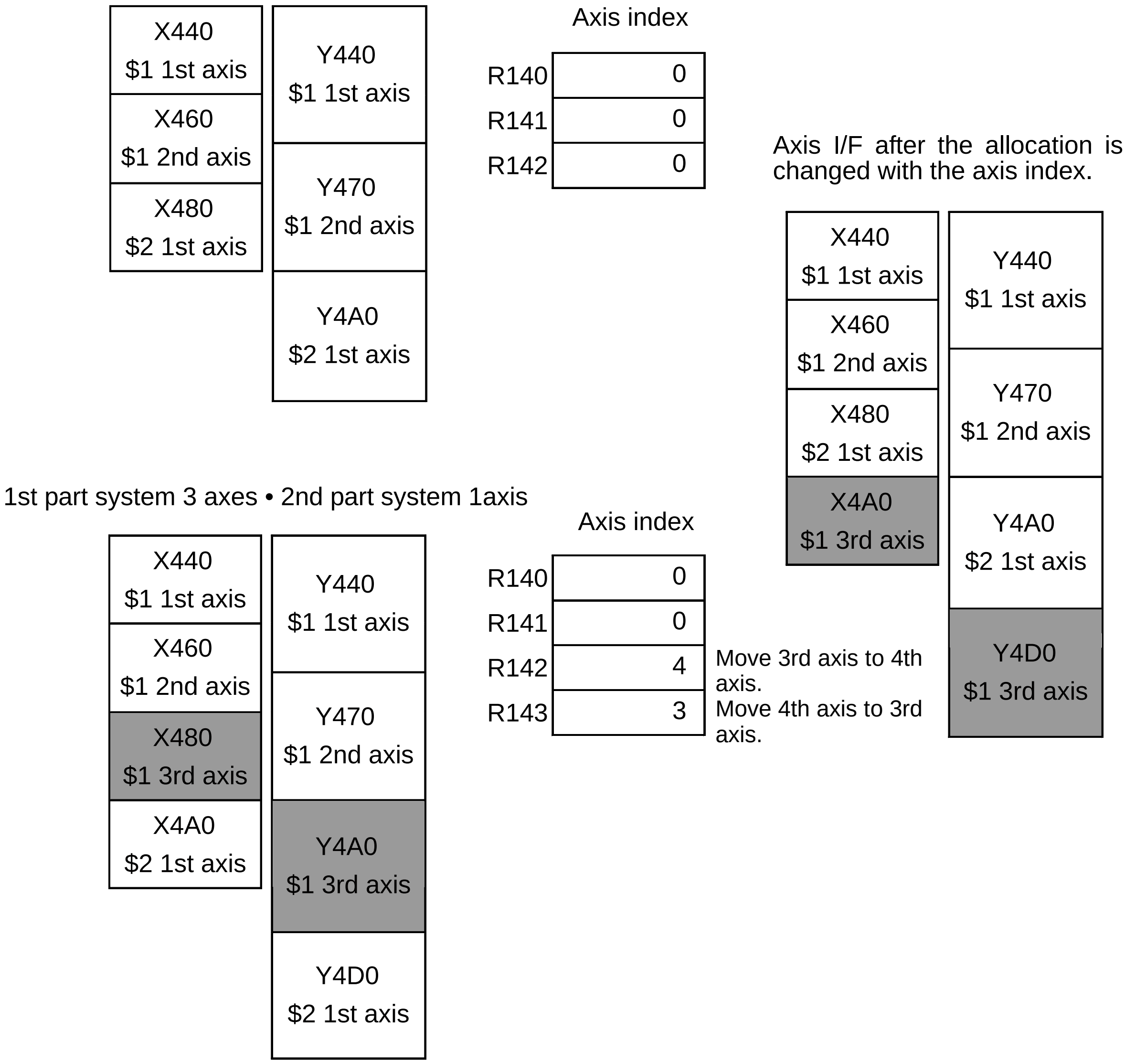
[Function]

PLC I/F of each axis is allocated from the 1st axis of 1st part system in order, but if the axis structure of each part system is changed, PLC I/F corresponding to that will be changed. In that case, the PLC I/F's allocation of each axis is set randomly to make the PLC program in common with the I/F.

[Operation]

In the following example, when the 1st part system is a two or three-axes structure and the 2nd part system is a one-axis structure, it is impossible to make the PLC program in common because the axis I/F of 2nd part system is changed by the axis structure of 1st part system. Then, by changing the allocation with the axis index, the allocation of 2nd part system is fixed and the PLC program can be made in common.

1st part system 2 axes • 2nd system part 1 axis



B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	SPINDLE SYNCHRONOUS FUNCTION BASIC SPINDLE SELECT			R157	—	—

[Function]

Select the basic spindle to be used for synchronous control from the PLC.

[Operation]

Select the spindle to be controlled as the basic spindle from the serially connected spindles.
(0: 1st spindle), 1: 1st spindle, 2: 2nd spindle … 7: 7th spindle

(Note 1) If a spindle that is not serially connected is selected, spindle synchronous control will not be executed.

(Note 2) If "0" is designated, the 1st spindle will be controlled as the basic spindle.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	SPINDLE SYNCHRONOUS FUNCTION SYNCHRONOUS SPINDLE SELECT			R158	—	—

[Function]

Select the synchronous spindle to be used for synchronous control from the PLC.

[Operation]

Select the spindle to be controlled as the synchronous spindle from the serially connected spindles.
(0: 2nd spindle), 1: 1st spindle, 2: 2nd spindle … 7: 7th spindle

(Note 1) If a spindle that is not serially connected is selected or if the same spindle as the basic spindle is selected, spindle synchronous control will not be executed.

(Note 2) If "0" is designated, the 2nd spindle will be controlled as the synchronous spindle.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	SPINDLE SYNCHRONOUS FUNCTION PHASE SHIFT AMOUNT			R159	—	—

[Function]

The synchronous spindle's phase shift amount can be designated from the PLC.

[Operation]

Designate the phase shift amount for the synchronous spindle.
Unit: 360°/4096

[Related signals]

In spindle synchronous control (SPSYN1: X42A)
Spindle rotation speed synchronization complete (FSPRV: X42B)
Spindle phase synchronization complete (FSPPH: X42C)
Spindle synchronous control (SPSY: Y432)
Spindle phase synchronous control (SPPHS: Y433)
Spindle synchronous rotation direction (SPSDR: Y434)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	USER PLC VERSION CODE 2			R160~166	—	—

[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 → configuration display (menu) of the setting display unit (communication terminal).

[Operation]

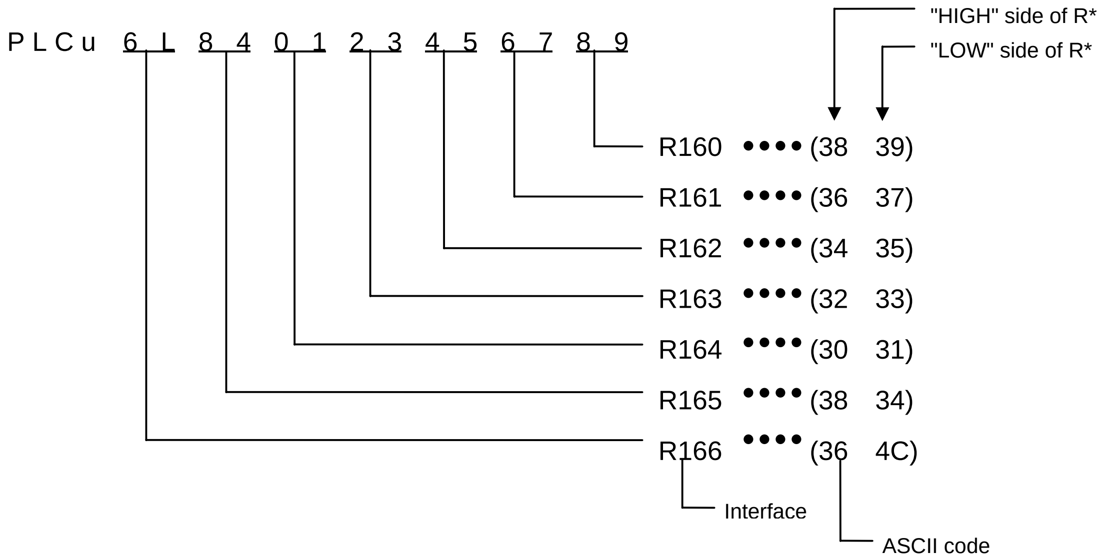
The ASCII code that corresponds to the character to be displayed in the version display interface is set.

<Display format and usage example>

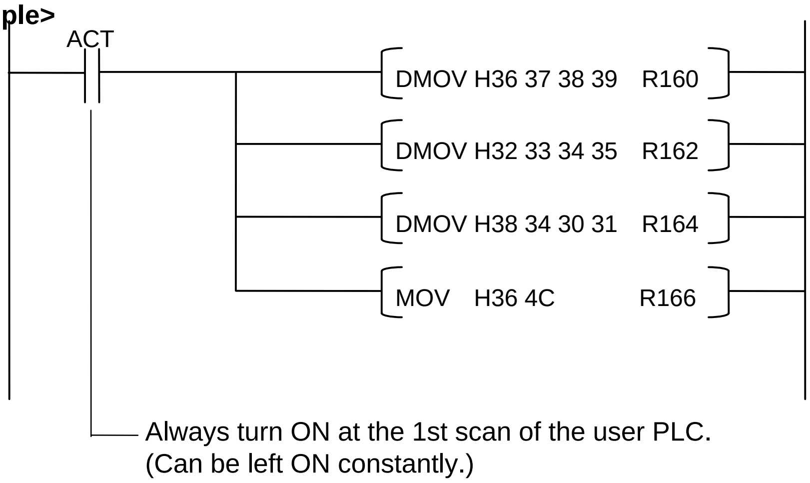
P L C u □□□□□□□□□□□□□□ □ : Random alphanumeric characters are used.

Total of 14 characters

<Display example>



<Program example>



B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	ADD-ON (EXPANSION) OPERATION BOARD OUTPUT			#1:R190~192 #2:R193~195	—	—

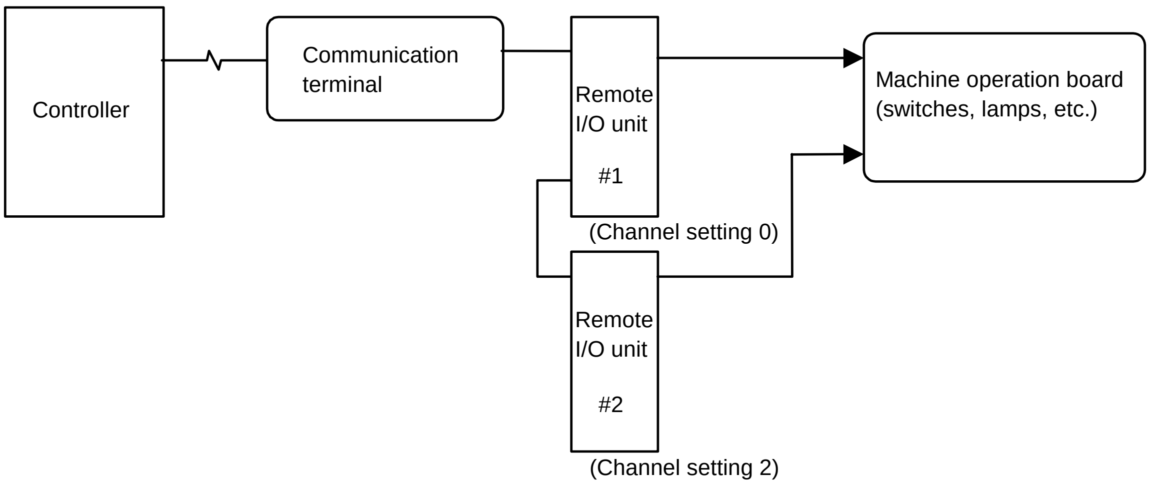
[Function]

By adding the remote I/O unit to the communication terminal, the machine operation board input/output signals can be input and output with the communication terminal control signals.

[Operation]

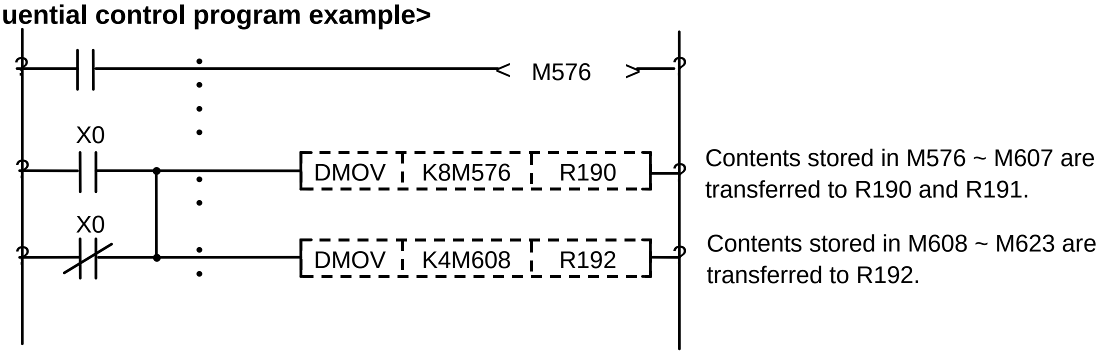
The signals are output together with other output signals at start of PLC main processing (medium speed).

<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 "2.1 Relation of RIO Unit and Devices" for the relation of the remote I/O channel setting switch and device.

[Related signals]

(1) Add-on (expansion) operation board input (#1: R90~93, #2: R94~97)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	1ST CUTTING FEEDRATE OVERRIDE (File register method)			R900	R1000	R1100

[Function]

When "Cutting feedrate override method select " (FVS) is set to "file register method", override (0~300%, 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 cutting feedrate override setting, under the following condition:

(1) "Override cancel" (OVC) signal is ON
(2) During tapping in fixed 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 cutting feedrate override is set to 0% during automatic operation. When override setting is 0%, "M01 OPERATION ERROR" appears in the alarm display section of screen, and "M01 OPERATION ERROR 0102" in the ALARM DIAGNOSIS display.

[Related signals]

(1) Cutting feedrate override (*FV1~*FV16: Y760~764)
(2) Cutting feedrate override method select (FVS: Y767)
(3) 2nd cutting feedrate override valid (FV2E: Y766)
(4) 2nd cutting feedrate override (file register method)

For relationship among these signals, refer to the description the cutting feedrate override.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	2ND CUTTING FEEDRATE OVERRIDE (File register method)			R901	R1001	R1101

[Function]

When the 2nd cutting feedrate override valid function (FV2E) is used, another override can be exerted on feedrate overrided by "Cutting feedrate override" (*FV1~*FV16) in code feedrate method, or by "1st cutting feedrate override (file register method)". The 2nd cutting 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 cutting feedrate override is 0.01%, override setting "10000" corresponds to 100%.

The override ratio is fixed to 100%, irrespective of 1st cutting feedrate override setting, under the following condition:

(1) "Override cancel" (OVC) signal is ON
(2) During tapping in fixed 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 override feedrate is set to 0% during automatic operation. When override setting is 0%, "M01 OPERATION ERROR" appears in the alarm display section of CRT screen, and "M01 OPERATION ERROR 0102" in the ALARM DIAGNOSIS display.

[Related signals]

(1) Cutting feedrate override (*FV1~*FV16: Y760~764)
(2) Cutting feedrate override method select (FVS: Y767)
(3) 2nd cutting feedrate override (file register)
(4) 2nd cutting feedrate override valid (FV2E: Y766)

For relationship among these signals, refer to the description about the cutting feedrate override.

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	RAPID TRAVERSE OVERRIDE (File register method)			R902	R1002	R1102

[Function]

The rapid traverse override specified with values (ROVS) provides the override control within the range of 0% to 100% by 1% increments in addition to the normal override specified with codes (ROV1, ROV2). The value is set in the file register (R) in binary.

[Operation]

During rapid traverse in the automatic or manual operation, the actual feed rate will be the result of multiplying this override ratio by the rapid traverse speed set in a parameter.

(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: Y768, 769)
(2) Rapid traverse override method select (ROVS: Y76F)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	MANUAL FEEDRATE (File register method)			R904, 905	R1004, 1005	R1104, 1105

[Function]

When file register method (JVS) is selected for feedrate setting, feedrate can be specified, besides code method (*JV1~JV16) setting, by setting desired feedrate ratio manually (value is set to file register (R)).

[Operation]

This method of feedrate setting can be used in JOG feed, incremental feed, reference point return feed and manual random feed mode. For JOG, INCREMENTAL and reference point 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 method 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 which 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~*JV16: Y770~774)

(2) Manual feedrate method select (JVS: Y777)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	HANDLE 1 HANDLE FEED RANDOM MULTIPLICATION/ INCREMENTAL FEED RANDOM MULTIPLICATION (File register method)			R908, 909	R1008, 1009	R1108, 1109

[Function]

When "Handle 1 handle feed random multiplication/incremental feed random multiplication mode (MPS)" signal is used, amount of feed per pulse or command signal can be multiplied by value set to file register. Multiplication value (multiplier) is set in binary code to 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 feed multiplication/Incremental feed multiplication (code method: MP1, MP2, MP4: Y780, 781, 782)
(2) Handle/incremental feed multiplication method select (MPS: Y787)

B conTact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	HANDLE 2 HANDLE FEED RANDOM MULTIPLICATION HANDLE 3 HANDLE FEED RANDOM MULTIPLICATION (File register method)			2: R910, 911 3: R912, 913	R1010, 1011 R1012, 1013	R1110, 1111 R1112, 1113

[Function]

When the random multiplication setting method (MPS) is selected for the handle feed multiplication, a random multiplication can be designated separately from the multiplication using the normal code method. The multiplication value is set as a binary in the file register (R).
The random multiplication for handle 2 and handle 3 is designated here.

[Operation]

The amount moved when one pulse is sent with handle 2 or handle 3 is the rate following this feed multiplication. For example, if the multiplier is set as "500", the axis will move 500µm when one pulse is fed with the handle mode. (The time constant for movement is the cutting feed time constant or stop.)

(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 feed multiplication/Incremental feed multiplication (code method: MP1, MP2, MP4: Y780, 781, 782)
(2) Handle 1 handle feed random multiplication/ Incremental feed multiplication (R908)
(3) Handle/incremental feed multiplication method select (MPS: Y787)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	MANUAL RANDOM FEED 1ST AXIS MOVEMENT DATA			R914, 915	R1014, 1015	R1114, 1115

[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 axis number (CX11~CX116)".

"Manual random feed 1st axis movement data" (R914, R915) 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:
This file register (R914, R915) 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:

1) When the MC/WK (CXS5) signal is OFF:
This file register (R914, R915) specifies a coordinate value (positioning point) of the machine coordinate system.

2) When the MC/WK (CXS5) signal is ON:
This file register (R914, R915) specifies a coordinate value (positioning point) of the modal workpiece coordinate system.

This file register (R914, R915) is written in binary notation with a sign. The unit of the specified value matches that of data entered.

Ex.: When (R915, R914)=1 is specified in micro meter system, axis motion is one µm (at incremental specification).

[Caution]

MANUAL RANDOM FEED 1ST AXIS MOVEMENT DATA forms a data item by R914 and R915 or R1014 and R1015. Handle negative data carefully.

[Related signals]

For related signals, see the descriptions on "Manual random feed mode (PTP)."

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	MANUAL RANDOM FEED 2ND AXIS MOVEMENT DATA			R916, 917	R1016, 1017	R1116, 1117

[Function] [Operation]

"Manual random feed 2nd axis movement data" is for the axis whose number is specified by "Manual random feed 2nd axis axis number (CX21~CX216)."

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		1st system	2nd system	3rd system
—	MANUAL RANDOM FEED 3RD AXIS MOVEMENT DATA			R918, 919	R1018, 1019	R1118, 1119

[Function] [Operation]

"Manual random feed 3rd axis movement data" is for the axis whose number is specified by "Manual random feed 3rd axis axis number (CX31~CX316)."
The other conditions are the same as for "Manual random feed 1st axis movement data" explained in the previous section.

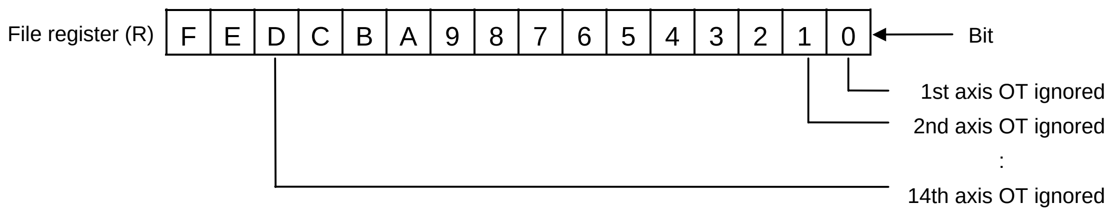
B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	OT IGNORED			R920	R1020	R1120

[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 singal) 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" 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		1st system	2nd system	3rd system
—	NEAR-POINT DOG IGNORED			R921	R1021	R1121

[Function]

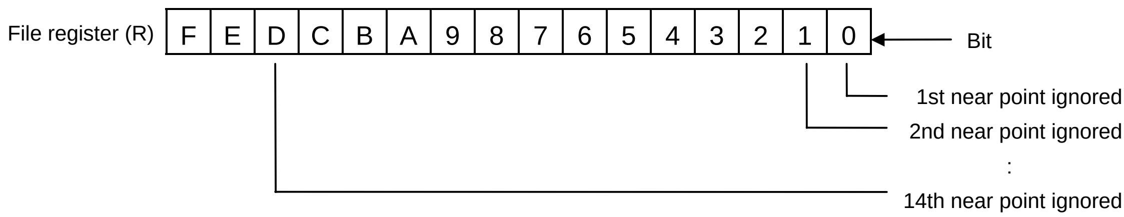
When this signal is used, "Near-point detected" signal (remote I/O connector pin No. fixed signal) which is used for dog type reference point return can be ignored (tripping of near switch can be ignored).

The selection of two or more near-point dogs with conditions, or the activation of the "Near-point detected" signal at a position not desirable due to the machine structure can seemingly be ignored. Furthermore, the "Near-point detected" signal for an axis to which the "Near-point dog ignored" signal is set can be used for other applications.

[Operation]

When the signal is turned ON, "Near-point detected" signal corresponding to the control axis can be ignored.

The interface is shown below:



B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	TOOL GROUP NUMBER DESIGNATION			R930	R1030	R1130

[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 ~ 9999 of group number
For all groups : 65535 (all 1)

[Related signal]

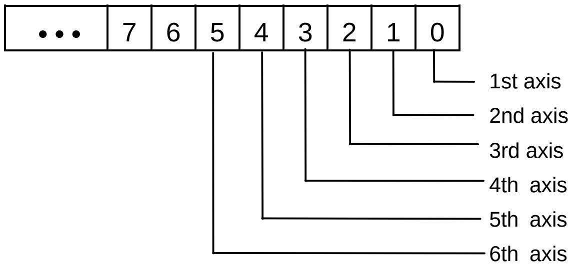
(1) Tool change reset (TRST)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	SYNCHRONIZATION CONTROL OPERATION METHOD SELECTION			R932	R1032	R1132

[Function]

The synchronization control's ON/OFF can be changed over by operating the bit corresponding to each axis of this signal. NC changes over the operation at the point when all axes enter in-position state.

Synchronization control operation method selection (R932)



[Operation]

(1) Designation of the synchronization operation method
Turn ON both the bits corresponding to the basic axis and synchronous axis with the base specifications parameters "slavno".
(Example) When the 2nd axis (basic axis) and 3rd axis (synchronous axis) are operated by the synchronous operation…

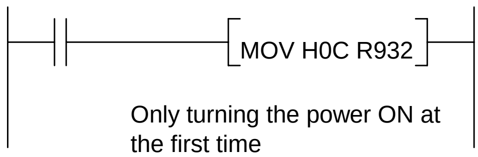
	7 6 5 4 3 2 1 0 HEX
R932	o o o o o o o o 00 o o o o o 1 1 o 06

(2) Designation of the independent operation method
Turn ON the bit corresponding to only one of the axes to be moved with the basic axis command.
(Example) When only the 2nd axis (synchronous axis) is moved...

	7 6 5 4 3 2 1 0 HEX
R932	o o o o o o o o 00 o o o o o 1 o o 04

For the machine structure reasons, if the synchronous state must always be kept from immediately after the power is turned ON, set R932 register when the ladder power is turned ON at the first time.

Example of the ladder creation



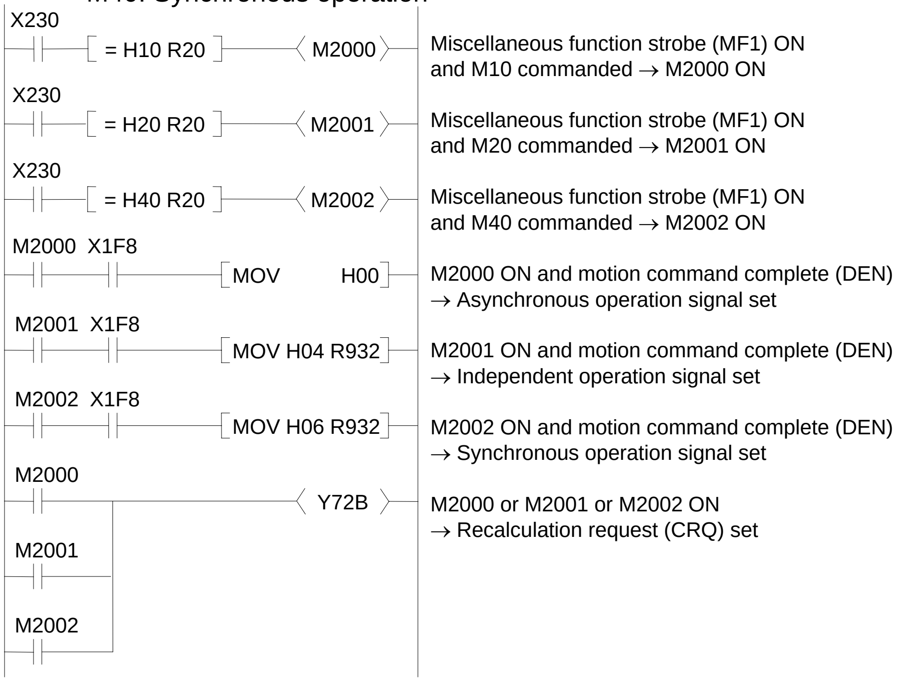
When changing the operation with the R932 register during automatic operation, calculate the coordinates again.
After synchronous axis independent operation is carried out, the end point coordinates of the synchronous axis are substituted in the program end point coordinates for the basic axis. Thus, if the coordinates are not recalculated, the basic axis' movement command will not be created properly.
Request recalculation immediately after the R932 register is changed.

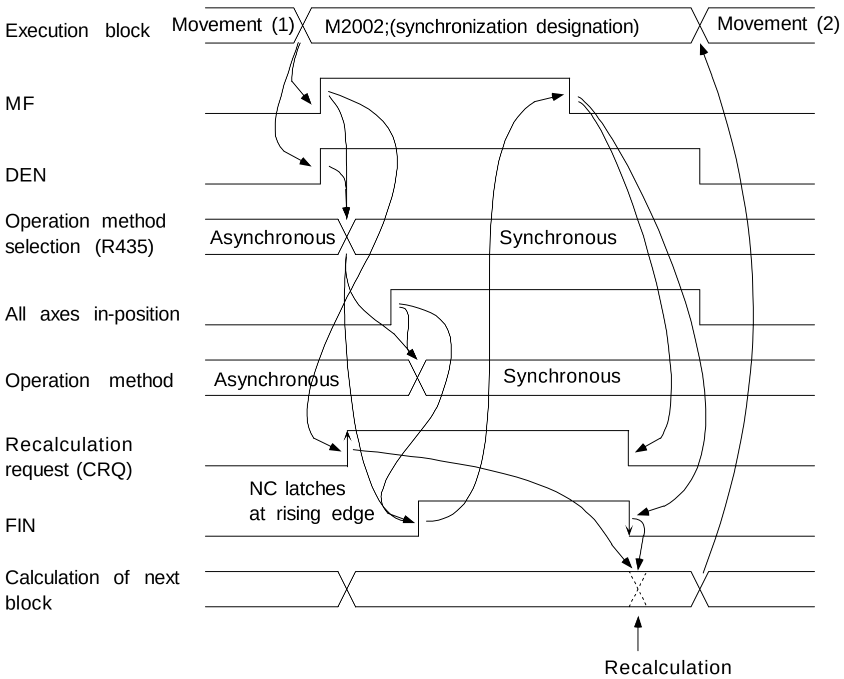
<Example of ladder creation>

Basic axis: 2nd axis   Synchronous axis: 3rd axis

When M code is assigned to each:

M10: Asynchronous operation
M20: Independent operation
M40: Synchronous operation





[Cautions]

(1) During synchronous operation or independent operation, the basic axis signals are valid for the "Interlock" and "Machine lock" signals, etc.

(2) The synchronous axis will return to the reference position in synchronization with the basic axis if G27, G28 or G30 is commanded during synchronous operation. If the synchronous axis is at the reference position when the basic axis completes reference position return, the reference position return will be completed. If the synchronous axis is not at the reference position when the basic axis completes reference position return, the "Reference position reached" signal for the basic axis will not be output.

(3) The position switches are processed independently for the basic axis and synchronous axis.

(4) Input the same OT signal for the basic axis and synchronous axis.
Set the same soft limit value for the basic axis and synchronous axis.
If the above settings cannot be made because of the machine specifications, observe the following points.
- If OT or soft limit occurs during the manual operation mode, an alarm will occur only for the synchronous axis, and the basic axis will not stop.
Thus, make sure that the basic axis alarm turns ON before the synchronous axis.
- OT during the manual operation mode will cause the synchronous axis to stop when the OT signal for only the basic axis turns ON. The basic axis is stopped by the position controller, and the synchronous axis is stopped by the NC control unit.
Thus, there may be a difference in the stop positions. If an excessive error alarm occurs because of OT, enter the editing mode, and cancel the alarm.

(5) The basic axis independent operation is handled as asynchronous, so the PLC input/output signal is not reflected on the synchronous axis.

(6) The error offset amount "Δ" of "FB error (synchronous axis FB value, basic axis FB value, error offset amount "Δ")" displayed on the screen:
The error offset amount "Δ" is made when the operation method is changed because the R932 register is changed.
Note that if the zero point has not established, the error offset amount "Δ" is made immediately after the zero point is established.

[Related signals]

Synchronized correction mode (Y722)
Recalculation request (CRQ: Y72B)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	SEARCH & START PROGRAM NO.			R938, R939	R1038, 1039	R1138, 1139

[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 (SS: Y7B2)
(2) Search & start error (SSE: X635)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	NO. OF WORK MACHINING (MAXIMUM VALUE)			R940, R941	R1040, 1041	R1140, 1141

[Function]

The No. of work machining maximum value are notified by the controller to the PLC.

[Operation]

Refer to the No. of work machining current value (R240, 241).

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	LOAD METER 1, 2			R942~945	R1042~1045	R1142~1145

[Function] [Operation]

The load meter can be displayed on the coordinate value screen just be 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		1st system	2nd system	3rd system
—	USER MACRO INTERFACE INPUT FOR EACH PART SYSTEM #1032 TO 1035			R970, 971	R1070, 1071	R1170, 1171

[Function]

This interface is used between the user PLC and user macro program.
The state of the interface input signal can be seen by reading the values for variables #1000 to #1035 and #1200 to #1295.
Only 1 or 0 (1 = contact closed, 0 = contact open) is read as variable value.
"Input" here refers to input from the PLC to NC.

[Operation]

All input signals from #1000 to #1031 can be read at once on the user macro side by reading the variable #1032 value. Similarly, the #1200 to #1231, #1232 to #1263 and #1264 to #1295 input signals can be read by reading the variable #1033 to #1035 values.
#1000 to #1035 and #1200 to #1295 are read-only, and cannot be set on the left side of a calculation expression.
Bit selection parameter (#6454/bit0) must be set to use the macro interface function for each part system.

Refer to R24, R25 (#1032: PLC → controller) and R124, 125 (#1132: controller → PLC) for details on the user macro interface signals common for the part system.

(Note) This function's input and output signals are valid for up to three part systems when using the C64T system.

System variable	No. of points	Interface input signal						
		1st system	2nd system	3rd system	4th system	5th system	6th system	7th system
		R970	R1070	R1170	R1270	R1370	R1470	R1570
#1000	1	bit0	bit0	bit0	bit0	bit0	bit0	bit0
#1001	1	bit1	bit1	bit1	bit1	bit1	bit1	bit1
#1002	1	bit2	bit2	bit2	bit2	bit2	bit2	bit2
#1003	1	bit3	bit3	bit3	bit3	bit3	bit3	bit3
#1004	1	bit4	bit4	bit4	bit4	bit4	bit4	bit4
#1005	1	bit5	bit5	bit5	bit5	bit5	bit5	bit5
#1006	1	bit6	bit6	bit6	bit6	bit6	bit6	bit6
#1007	1	bit7	bit7	bit7	bit7	bit7	bit7	bit7
#1008	1	bit8	bit8	bit8	bit8	bit8	bit8	bit8
#1009	1	bit9	bit9	bit9	bit9	bit9	bit9	bit9
#1010	1	bit10	bit10	bit10	bit10	bit10	bit10	bit10
#1011	1	bit11	bit11	bit11	bit11	bit11	bit11	bit11
#1012	1	bit12	bit12	bit12	bit12	bit12	bit12	bit12
#1013	1	bit13	bit13	bit13	bit13	bit13	bit13	bit13
#1014	1	bit14	bit14	bit14	bit14	bit14	bit14	bit14
#1015	1	bit15	bit15	bit15	bit15	bit15	bit15	bit15

System variable	No. of points	Interface input signal						
		1st system	2nd system	3rd system	4th system	5th system	6th system	7th system
		R971	R1071	R1171	R1271	R1371	R1471	R1571
#1016	1	bit0	bit0	bit0	bit0	bit0	bit0	bit0
#1017	1	bit1	bit1	bit1	bit1	bit1	bit1	bit1
#1018	1	bit2	bit2	bit2	bit2	bit2	bit2	bit2
#1019	1	bit3	bit3	bit3	bit3	bit3	bit3	bit3
#1020	1	bit4	bit4	bit4	bit4	bit4	bit4	bit4
#1021	1	bit5	bit5	bit5	bit5	bit5	bit5	bit5
#1022	1	bit6	bit6	bit6	bit6	bit6	bit6	bit6
#1023	1	bit7	bit7	bit7	bit7	bit7	bit7	bit7
#1024	1	bit8	bit8	bit8	bit8	bit8	bit8	bit8
#1025	1	bit9	bit9	bit9	bit9	bit9	bit9	bit9
#1026	1	bit10	bit10	bit10	bit10	bit10	bit10	bit10
#1027	1	bit11	bit11	bit11	bit11	bit11	bit11	bit11
#1028	1	bit12	bit12	bit12	bit12	bit12	bit12	bit12
#1029	1	bit13	bit13	bit13	bit13	bit13	bit13	bit13
#1030	1	bit14	bit14	bit14	bit14	bit14	bit14	bit14
#1031	1	bit15	bit15	bit15	bit15	bit15	bit15	bit15

System variable	No. of points	Interface input signal							Read variable No.
		1st system	2nd system	3rd system	4th system	5th system	6th system	7th system	
#1032	32	R970, R971	R1070, R1071	R1170, R1171	R1270, R1271	R1370, R1371	R1470, R1471	R1570, R1571	#1000 to 1035
#1033	32	R972, R973	R1072, R1073	R1172, R1173	R1272, R1273	R1372, R1373	R1472, R1473	R1572, R1573	#1200 to 1231
#1034	32	R974, R975	R1074, R1075	R1174, R1175	R1274, R1275	R1374, R1375	R1474, R1475	R1574, R1575	#1232 to 1263
#1035	32	R976, R977	R1076, R1077	R1176, R1177	R1276, R1277	R1376, R1377	R1476, R1477	R1576, R1577	#1264 to 1295

B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
—	EXTERNAL MACHINE COORDINATE COMPENSATION DATA			R2300	R2350	R2400

[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 compensation data" (R2300) 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 (0.05µm when using sub-micrometer specifications.)

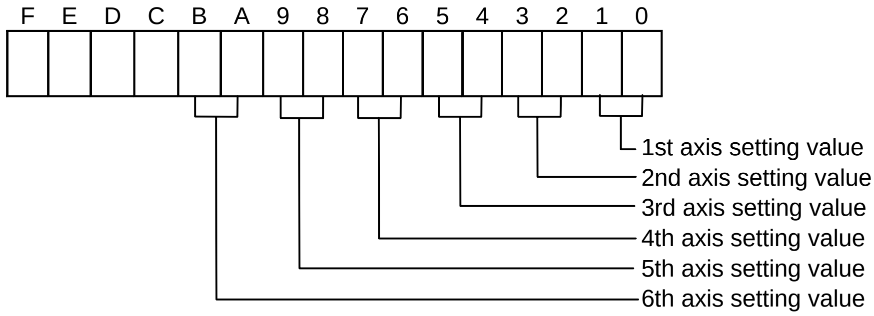
B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	EACH AXIS REFERENCE POINT SELECT			R2301	—	—

[Function]

Select the each axis reference point return position for manual reference point return.

[Operation]

(1) This signal is valid when the reference point select method (Y207/W87) is ON.
(2) Two bits are used for each axis to select the reference point.
 (a) R register and corresponding axis
 R2301



 (b) Setting value and reference point No.

High-order bit	Low-order bit	Return position
0	0	1st reference point
0	1	2nd reference point
1	0	3rd reference point
1	1	4th reference point

[Related signals]

Reference point select method (M: Y737)

B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
—	THERMAL EXPANSION OFFSET COMPENSATION AMOUNT			R2302	R2352	R2402

[Function] [Operation]

Set the compensation amount for the axis feed error caused by the ball screw's thermal expansion. Set "thermal expansion offset compensation amount" and "thermal expansion max. compensation amount" as a set for each axis. Refer to "thermal displacement compensation amount" (R1600) for details.

[Related signals]

Thermal expansion max. compensation amount (R2303)
Thermal displacement compensation amount (R1600)

B contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis
—	THERMAL EXPANSION MAX. COMPENSATION AMOUNT			R2303	R2353	R2403

[Function] [Operation]

Set the maximum compensation amount of the axis feed error caused by the ball screw's thermal expansion. Set "thermal expansion offset compensation amount" and "thermal expansion max. compensation amount" as a set for each axis. Refer to "displacement expansion compensation amount" (R1600) for details.

[Related signals]

Thermal expansion offset compensation amount (R2302)
Thermal displacement compensation amount (R1600)

B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	SPINDLE COMMAND ROTATION SPEED OUTPUT			R3210	R3240	R3270

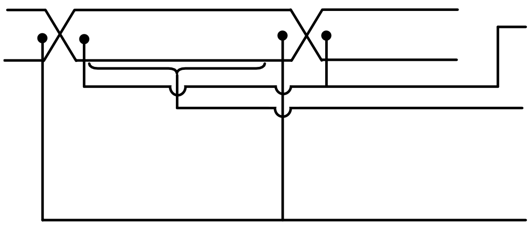
[Function]

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" is set at the head of user PLC main program (controller process).
(2) "Spindle command rotation speed output" data is 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 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 "Spindle command rotation speed input (R3000, 1)".

[Related signals]

(1) Spindle command rotation speed input	(R3000, 3001)	
(2) Spindle command final data	(R3002, 3003)	
	(R3004, 3005)	(D/A output method)

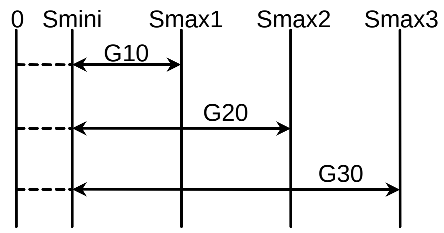
B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	S ANALOG OVERRIDE (File register method)			R3220	R3250	R3280

[Function]

When "S analog override" signal (SPS) is used, override can be exerted on S analog speed reference in file register method instead of the rapid traverse override with the code method (SP1~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 spindle actual speed is the product obtained by multiplying the originally set spindle speed by override ratio set with this signal.
Clamp spindle speed is the maximum or minimum speed which depends on "Spindle gear select input" signal (GI1, GI2) ... clamp spindle speed is set by a parameter. Even when spindle speed exceeds the maximum or minimum speed, due to change of override setting, "Spindle gear select input" signal (GR1, GR2) does not automatically change.



Applicable override range at gear stage 3

GR10 : Applicable override range at gear stage
GR20 : Applicable override range at gear stage
GR30 : Applicable override range at gear stage
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 is invalid (100%)
(2) Spindle override method select (SPS: YD2F)
(3) Spindle gear select input (GI1, GI2: YD30, D31)
(4) Spindle stop (SSTP: YD34), Spindle gear shift (SSFT: YD35), Oriented spindle speed command (SORC: YD36)

B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	MULTI-POINT ORIENTATION POSITION DATA			R3221	R3251	R3281

[Function]

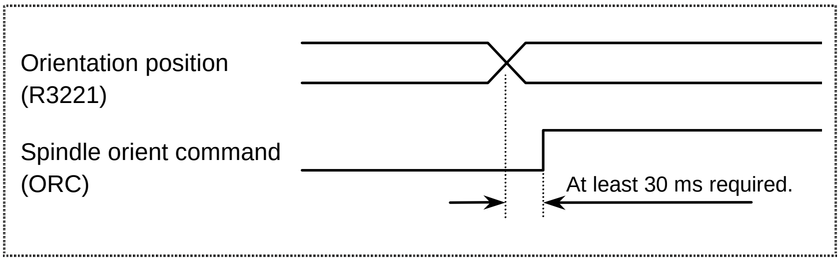
This signal notifies the orientation position to the controller (spindle controller).

[Operation]

The orient position at when the "Spindle orient command (ORC)" turns ON is input.
The command is a 12-bit binary, and the command unit is as follows.

Command unit = 360/4096 [deg.]

This signal must be validated before the "Spindle orient command" signal turns ON (at least 30 ms before).



[Related signal]

(1) Spindle orient command (ORC: YD3E)

B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	J2CT CONTROL COMMAND	CTCM1~4, L, H		R3600~3603 R3604, 3605	R3606~3609 R3610, 3611	R3612~3615 R3616, 3617

[Function]

The MR-J2-CT link function connects the NC and MR-J2-CT (auxiliary axis), and controls up to 7 axis (C6: Maximum 5 axis) MR-J2-CT axes using command signals from the NC.

[Operation]

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	R3600	R3601	R3602	R3603	R3604	R3605
J2CT 2nd axis	R3606	R3607	R3608	R3609	R3610	R3611
J2CT 3rd axis	R3612	R3613	R3614	R3615	R3616	R3617
J2CT 4th axis	R3618	R3619	R3620	R3621	R3622	R3623
J2CT 5th axis	R3624	R3625	R3626	R3627	R3628	R3629
J2CT 6th axis	R3630	R3631	R3632	R3633	R3634	R3635
J2CT 7th axis	R3636	R3637	R3638	R3639	R3640	R3641

J2CT control command 4 (R3600: 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 (R3601: 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 (R3602: CTCM2)		
bit	**Abbrev.**	**Name**
bit0	ST	Operation start
bit1	DIR	Rotation direction
bit2	STS	Random 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 (R3603: 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 point mode
bit12		
bit13	AZS	Zero point initialization mode
bit14	ZST	Reference position set
bit15	S	Incremental mode

Control command coordinate L (R3604: CTCML)		
bit	**Abbrev.**	**Name**
bit0 to bit15		Random coordinate (low-order) 1/1000mm (°) unit

Control command coordinate H (R3605: CTCMH)		
bit	**Abbrev.**	**Name**
bit0 to bit15		Random coordinate (high-order) 1/1000mm (°) unit

Refer to the "MR-J2-CT Specifications and Instruction Manual" for detailed explanations and operation of the control signal.

[Related signals]

J2CT Control status (CTST1 to 4: R3500 to 3503)
J2CT Operation adjustment mode valid (common for all axes) (R3684)
J2CT In operation adjustment mode valid (common for all axes) (R3556)

B contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle
—	J2CT OPERATION ADJUSTMENT MODE VALID			R3684/bit0		

[Function]

J2CT operation adjustment mode valid (R3684)		
bit	**Abbrev.**	**Name**
bit0	-	J2CT operation adjustment mode valid signal (common for all axes)

[Related signals]

J2CT Control status (CTST1 to 4: R3500 to 3503)
J2CT Control command (CTCM1 to 4, L, H: R3600 to 3603, 3604, 3605)
J2CT In operation adjustment mode valid (common for all axes) (R3556)

6.5 Explanation of Special Relay/Register Signals (Data Type: SM**, SD**)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	TEMPERATURE RISE WARNING			SM16	—	—

[Function]

If the alarm is displayed when an overheat alarm is detected in the control unit or communication terminal, the overheat signal will be output simultaneously. If the machine is in automatic operation, the operation will be continued, but restarting will not be possible after resetting or stopping with M30. (Starting will be possible after block stop or feed hold.)
For details on the operation, etc., refer to "Temperature warning cause (R41)".

⚠ CAUTION

❗ If the temperature rise detection function is invalidated with the parameters, the control could be disabled when the temperature is excessive. This could result in machine damage or personal injuries due to runaway axis, and could damage the device. Enable the detection function for normal use.

[Related signals]

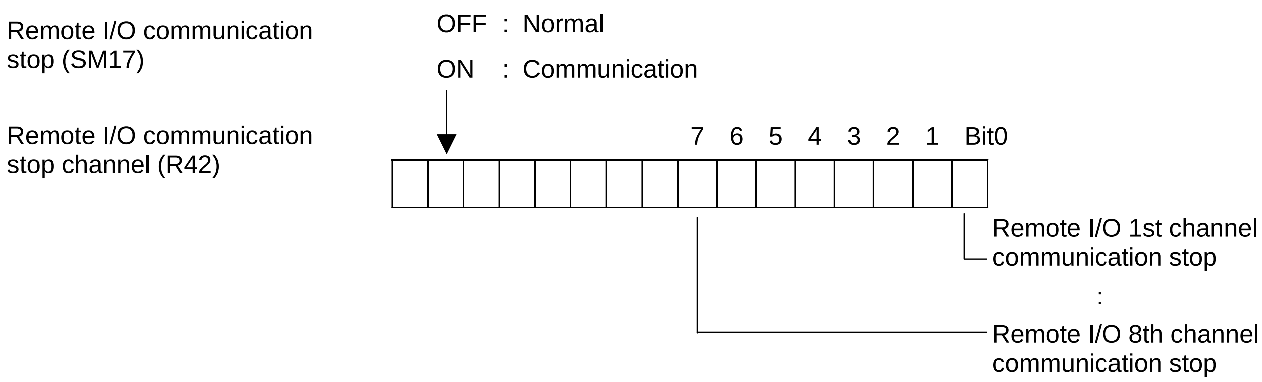
(1) Temperature warning cause (R41)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	REMOTE I/O COMMUNICATION STOP			SM17	—	—

[Function]

The communication state of remote I/O can be read.

[Operation]



[Related signals]

Remote I/O communication stop channel (R42)

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	SEQUENCER SYSTEM CLOCK/COUNTER			SM32~SM40 SD34, SD35, SD40	—	—

[Function]

The system clock/counter of sequencer can be read.

[Operation]

Signal	Name	Operation	Operation details	Set time
SM32	Always ON	ON OFF	• Always ON	Every time END
SM33	Always OFF	ON OFF	• Always OFF	Every time END
SM34	After Run, turned ON by only 1 scan	ON 1 scan OFF	• After RUN, turned ON by only 1 scan.	Every time END
SM35	After Run, turned OFF by only 1 scan	ON OFF 1 scan	• After RUN, turned OFF by only 1 scan.	Every time END
SM36	0.1-second clock	0.05 s 0.05 s	• ON/OFF is repeated by the specified time. • The clock operation is continued even in STOP. • Starts from OFF at the power OFF or the reset.	State change
SM37	0.2-second clock	0.1 s 0.1 s		
SM38	1-second clock	0.5 s 0.5 s		
SM39	2-second clock	1 s 1 s		
SM40	2n-second clock	n s n s	• ON/OFF is repeated according to the specified second.	
SD34	1-second counter	Count Nos. of 1 second unit	• After sequencer CPU RUN, 1 is added by a second. • With the count, 0→32767→-32768→ 0 is repeated.	State change
SD35	Scan counter	Count Nos. by 1 scan	• After sequencer CPU RUN, 1 is added by 1 scan. • With the count, 0→32767→-32768→ 0 is repeated.	Every time END
SD40	2n-second clock set	2n-second clock unit	• Stores the n of 2n-second clock. (The default is 30.) • The setting range is from 1 to 32767.	

B contact	Signal name	Signal abbreviation		1st system	2nd system	3rd system
—	SEQUENCER SCAN INFORMATION			SD37~SD39	—	—

[Function]

The scan information of sequencer can be read.

[Operation]

Signal	Name	Operation	Operation details	Set time
SD37	Sequencer current scan time	Current scan time (1ms unit)	• Stores the current scan time. (1ms unit) • Range from 0 to 65535	Every time END
SD38	Sequencer minimum scan time	Minimum scan time (1ms unit)	• Stores the minimum value of scan time. (1ms unit) • Range from 0 to 65535	Every time END
SD39	Sequencer maximum scan time	Maximum scan time (1ms unit)	• Stores the maximum value of scan time except 1st scan. (1ms unit) • Range from 0 to 65535	Every time END

6.6 Signals Related to Communication

The control signals for the expansion slot are assigned to the built-in expansion slots (slot 1: EXT1, slot 2: EXT2) and the external expansion slot (slot 3: external EXT). The assignment of these areas differs according to the mounted interface card.

Data type	Mounted slot		
	Slot 1	Slot 2	Slot 3 (Note 2)
Communication card → controller (X: 256 points)	X200 to X27F	X280 to X2FF	X300 to X37F
Controller → communication card (Y: 256 points)	Y200 to Y27F	Y280 to Y2FF	Y300 to Y37F
R register (R: 10 words)	R60 to R69	R70 to R79	

(Note 1) This interface assignment differs according to the communication card being used. Thus, when sharing the PLC program with a different interface card, each mounted communication card must be identified.
(Note 2) Depending on the mounted interface card, expansion slot 3 may not be usable.
(Note 3) Refer to the "C6/C64/C64T Network Manual BNP-B2373" for details on each communication function.

● During DeviceNet communication

(Input to PLC)

Signal			Name
Slot 1	Slot 2	Slot 3	
X200	X280	–	(Not used)
X201	X281	–	Refreshing
X202	X282	–	Message communication completed
X203	X283	–	Error set
X204	X284	–	Slave down
X205	X285	–	Message communication error
X206	X286	–	Setting parameter
X207	X287	–	Parameter setting completed
X208	X288	–	(Not used)
X209	X289	–	(Not used)
X20A	X28A	–	(Not used)
X20B	X28B	–	(Not used)
X20C	X28C	–	(Not used)
X20D	X28D	–	(Not used)
X20E	X28E	–	(Not used)
X20F	X28F	–	System ready

(Output from PLC) (For DeviceNet)

Signal			Name
Slot 1	Slot 2	Slot 3	
Y200	Y280	–	(Not used)
Y201	Y281	–	Refresh request
Y202	Y282	–	Message request
Y203	Y283	–	Error reset request
Y204	Y284	–	(Not used)
Y205	Y285	–	(Not used)
Y206	Y286	–	(Not used)
Y207	Y287	–	Parameter set request
Y208	Y288	–	(Not used)
Y209	Y289	–	(Not used)
Y20A	Y28A	–	(Not used)
Y20B	Y28B	–	(Not used)
Y20C	Y28C	–	(Not used)
Y20D	Y28D	–	(Not used)
Y20E	Y28E	–	(Not used)
Y20F	Y28F	–	(Not used)

(For DeviceNet)

Signal			Name
Slot 1	Slot 2	Slot 3	
R60	R70	–	Mounted card information (0871H)
R61	R71	–	Master communication status
R62	R72	–	Error information
R63	R73	–	(Not used)
R64	R74	–	Head register No. of set parameter
R65	R75	–	Number of set parameters
R66	R76	–	
R67	R77	–	Down station detection prohibit setting
R68	R78	–	
R69	R79	–	

Signal			Name
Slot 1	Slot 2	Slot 3	
SD48	SD80	–	Master communication status
SD49	SD81	–	Error information
SD50	SD82	–	Bus error counter
SD51	SD83	–	Bus OFF counter
SD52	SD84	–	
SD53	SD85	–	Each station configuration state
SD54	SD86	–	
SD55	SD87	–	
SD56	SD88	–	
SD57	SD89	–	Each station communication state
SD58	SD90	–	
SD59	SD91	–	
SD60	SD92	–	
SD61	SD93	–	Each station disturbance state
SD62	SD94	–	
SD63	SD95	–	

Signal			Name
Slot 1	Slot 2	Slot 3	
SD64	SD96	–	(Not used)
SD65	SD97	–	(Not used)
SD66	SD98	–	(Not used)
SD67	SD99	–	(Not used)
SD68	SD100	–	(Not used)
SD69	SD101	–	(Not used)
SD70	SD102	–	(Not used)
SD71	SD103	–	(Not used)
SD72	SD104	–	
SD73	SD105	–	
SD74	SD106	–	Communication PCB version information
SD75	SD107	–	(ASCII)
SD76	SD108	–	
SD77	SD109	–	
SD78	SD110	–	
SD79	SD111	–	

Data type		HR871 mounting slot		
		Expansion slot 1	Expansion slot 2	External slot
Input/output data	Input data : 2048 points	B0000 to B07FF	B1000 to B17FF	
	Output data : 2048 points	B0800 to B0FFF	B1800 to B1FFF	
Message communication	Message communication command (16word, W)	W0000 to W000F	W1000 to W100F	
	Message communication results (16word, R)	W0010 to W001F	W1010 to W101F	
	Message communication data (120word, R/W)	W0020 to W0097	W1020 to W1097	

(For DeviceNet)

Signal			Name
Slot 1	Slot 2	Slot 3	
W0000	W1000	–	Command No.
W0001	W1001	–	Slave station No./Class ID
W0002	W1002	–	Instance ID
W0003	W1003	–	Attribute ID/Data length
W0004	W1004	–	
W0005	W1005	–	
W0006	W1006	–	
W0007	W1007	–	
W0008	W1008	–	
W0009	W1009	–	
W000A	W100A		
W000B	W100B		
W000C	W100C		
W000D	W100D		
W000E	W100E		
W000F	W100F		

Signal			Name
Slot 1	Slot 2	Slot 3	
W0020	W1020		Slave status
W0021	W1021		(Not used)
W0022	W1022		Communication error
W0023	W1023		General error code
W0024	W1024		Additional error code
W0025	W1025		Number of heartbeat timeout times
W0026	W1026	–	
W0027	W1027	–	
W0028	W1028	–	
W0029	W1029	–	
W002A	W102A		
W002B	W102B		
W002C	W102C		
W002D	W102D		
W002E	W102E		
W002F	W102F		

Signal			Name
Slot 1	Slot 2	Slot 3	
W0010	W1010	–	Command No.
W0011	W1011	–	Execution error code
W0012	W1012	–	Slave station No./Class ID
W0013	W1013	–	Instance ID
W0014	W1014	–	Attribute ID/Data length
W0015	W1015	–	
W0016	W1016	–	
W0017	W1017	–	
W0018	W1018	–	
W0019	W1019	–	
W001A	W101A		
W001B	W101B		
W001C	W101C		
W001D	W101D		
W001E	W101E		
W001F	W101F		

Signal			Name
Slot 1	Slot 2	Slot 3	
W0030	W1030	–	
W0031	W1031	–	
W0032	W1032	–	
W0033	W1033	–	
W0034	W1034	–	
W0035	W1035	–	
W0036	W1036	–	
W0037	W1037	–	
W0038	W1038	–	
W0039	W1039	–	
W003A	W103A		
W003B	W103B		
W003C	W103C		
W003D	W103D		
W003E	W103E		
W003F	W103F		

● During MELSECNET/10 communication

(Input to PLC)

Signal			Name
Slot 1	Slot 2	Slot 3	
X200	X280	–	(Not used)
X201	X281	–	
X202	X282	–	
X203	X283	–	
X204	X284	–	
X205	X285	–	
X206	X286	–	
X207	X287	–	
X208	X288	–	
X209	X289	–	
X20A	X28A	–	
X20B	X28B	–	
X20C	X28C	–	
X20D	X28D	–	
X20E	X28E	–	
X20F	X28F	–	

(Output from PLC) (For MELSECNET/10)

Signal			Name
Slot 1	Slot 2	Slot 3	
Y200	Y280	–	
Y201	Y281	–	
Y202	Y282	–	
Y203	Y283	–	
Y204	Y284	–	
Y205	Y285	–	
Y206	Y286	–	
Y207	Y287	–	
Y208	Y288	–	
Y209	Y289	–	
Y20A	Y28A	–	
Y20B	Y28B	–	
Y20C	Y28C	–	
Y20D	Y28D	–	
Y20E	Y28E	–	
Y20F	Y28F	–	

Signal			Name
Slot 1	Slot 2	Slot 3	
R60	R70	–	
R61	R71	–	
R62	R72	–	Error information
R63	R73	–	
R64	R74	–	
R65	R75	–	
R66	R76	–	
R67	R77	–	
R68	R78	–	
R69	R79	–	

Signal			Name
Slot 1	Slot 2	Slot 3	
SB0000	SB0100	–	(Refresh range)
:	:	–	
:	:	–	
SB00FF	SB01FF	–	

Signal			Name
Slot 1	Slot 2	Slot 3	
SW0000	SW0100	–	(Refresh range)
:	:	–	
:	:	–	
SW00FF	SW01FF	–	

● During Ethernet communication

(Input to PLC)

Signal			Name
Slot 1	Slot 2	Slot 3	
X200	X280	X300	Initialization normal completion
X201	X281	X301	(Not used)
X202	X282	X302	(Not used)
X203	X283	X303	(Not used)
X204	X284	X304	(Not used)
X205	X285	X305	(Not used)
X206	X286	X306	(Not used)
X207	X287	X307	(Not used)
X208	X288	X308	(Not used)
X209	X289	X309	(Not used)
X20A	X28A	X30A	(Not used)
X20B	X28B	X30B	(Not used)
X20C	X28C	X30C	(Not used)
X20D	X28D	X30D	(Not used)
X20E	X28E	X30E	(Not used)
X20F	X28F	X30F	(Not used)

Signal			Name
Slot 1	Slot 2	Slot 3	
X210	X290	X310	Connection 1 open completed
X211	X291	X311	Connection 2 open completed
X212	X292	X312	Connection 3 open completed
X213	X293	X313	Connection 4 open completed
X214	X294	X314	Connection 5 open completed
X215	X295	X315	Connection 6 open completed
X216	X296	X316	Connection 7 open completed
X217	X297	X317	Connection 8 open completed
X218	X298	X318	(Not used)
X219	X299	X319	(Not used)
X21A	X29A	X31A	(Not used)
X21B	X29B	X31B	(Not used)
X21C	X29C	X31C	(Not used)
X21D	X29D	X31D	(Not used)
X21E	X29E	X31E	(Not used)
X21F	X29F	X31F	(Not used)

(Output from PLC) (For Ethernet)

Signal			Name
Slot 1	Slot 2	Slot 3	
Y200	Y280	Y300	(Not used)
Y201	Y281	Y301	(Not used)
Y202	Y282	Y302	(Not used)
Y203	Y283	Y303	(Not used)
Y204	Y284	Y304	(Not used)
Y205	Y285	Y305	(Not used)
Y206	Y286	Y306	(Not used)
Y207	Y287	Y307	(Not used)
Y208	Y288	Y308	(Not used)
Y209	Y289	Y309	(Not used)
Y20A	Y28A	Y30A	(Not used)
Y20B	Y28B	Y30B	(Not used)
Y20C	Y28C	Y30C	(Not used)
Y20D	Y28D	Y30D	(Not used)
Y20E	Y28E	Y30E	(Not used)
Y20F	Y28F	Y30F	(Not used)

Signal			Name
Slot 1	Slot 2	Slot 3	
Y210	Y290	Y310	(Not used)
Y211	Y291	Y311	(Not used)
Y212	Y292	Y312	(Not used)
Y213	Y293	Y313	(Not used)
Y214	Y294	Y314	(Not used)
Y215	Y295	Y315	(Not used)
Y216	Y296	Y316	(Not used)
Y217	Y297	Y317	(Not used)
Y218	Y298	Y318	(Not used)
Y219	Y299	Y319	(Not used)
Y21A	Y29A	Y31A	(Not used)
Y21B	Y29B	Y31B	(Not used)
Y21C	Y29C	Y31C	(Not used)
Y21D	Y29D	Y31D	(Not used)
Y21E	Y29E	Y31E	(Not used)
Y21F	Y29F	Y31F	(Not used)

(For Ethernet)

Signal			Name
Slot 1	Slot 2	Slot 3	
X220	X2A0	X320	Connection 1 Data received
X221	X2A1	X321	Connection 2 Data received
X222	X2A2	X322	Connection 3 Data received
X223	X2A3	X323	Connection 4 Data received
X224	X2A4	X324	Connection 5 Data received
X225	X2A5	X325	Connection 6 Data received
X226	X2A6	X326	Connection 7 Data received
X227	X2A7	X327	Connection 8 Data received
X228	X2A8	X328	(Not used)
X229	X2A9	X329	(Not used)
X22A	X2AA	X32A	(Not used)
X22B	X2AB	X32B	(Not used)
X22C	X2AC	X32C	(Not used)
X22D	X2AD	X32D	(Not used)
X22E	X2AE	X32E	(Not used)
X22F	X2AF	X32F	(Not used)

Signal			Name
Slot 1	Slot 2	Slot 3	
Y220	Y2A0	Y320	(Not used)
Y221	Y2A1	Y321	(Not used)
Y222	Y2A2	Y322	(Not used)
Y223	Y2A3	Y323	(Not used)
Y224	Y2A4	Y324	(Not used)
Y225	Y2A5	Y325	(Not used)
Y226	Y2A6	Y326	(Not used)
Y227	Y2A7	Y327	(Not used)
Y228	Y2A8	Y328	(Not used)
Y229	Y2A9	Y329	(Not used)
Y22A	Y2AA	Y32A	(Not used)
Y22B	Y2AB	Y32B	(Not used)
Y22C	Y2AC	Y32C	(Not used)
Y22D	Y2AD	Y32D	(Not used)
Y22E	Y2AE	Y32E	(Not used)
Y22F	Y2AF	Y32F	(Not used)

● During CC-Link communication

(Input to PLC)

Signal			Name
Slot 1	**Slot 2**	**Slot 3**	
X200	X280	X300	Unit error
X201	X281	X301	Data link state at host station
X202	X282	X302	Parameter setting status
X203	X283	X303	Data link status at other station
X204	X284	X304	Unit reset acceptance completed
X205	X285	X305	(Prohibited to use)
X206	X286	X306	Data link startup normal completion
X207	X287	X307	Data link startup error completion
X208	X288	X308	Data link startup by EEPROM parameter normal completion
X209	X289	X309	Data link startup by EEPROM parameter error completion
X20A	X28A	X30A	Parameter registration to EEPROM normal completion
X20B	X28B	X30B	Parameter registration to EEPROM error completion
X20C	X28C	X30C	(Prohibited to use)
X20D	X28D	X30D	
X20E	X28E	X30E	
X20F	X28F	X30F	Unit ready

(Output from PLC) (For CC-Link)

Signal			Name
Slot 1	**Slot 2**	**Slot 3**	
Y200	Y280	Y300	Refresh command
Y201	Y281	Y301	(Prohibited to use)
Y202	Y282	Y302	
Y203	Y283	Y303	
Y204	Y284	Y304	Unit reset request
Y205	Y285	Y305	(Prohibited to use)
Y206	Y286	Y306	Data link start request
Y207	Y287	Y307	(Prohibited to use)
Y208	Y288	Y308	Data link startup request from EEPROM parameter
Y209	Y289	Y309	(Prohibited to use)
Y20A	Y28A	Y30A	Parameter registration request to EEPROM
Y20B	Y28B	Y30B	(Prohibited to use)
Y20C	Y28C	Y30C	
Y20D	Y28D	Y30D	
Y20E	Y28E	Y30E	
Y20F	Y28F	Y30F	

Signal			Name
Slot 1	**Slot 2**	**Slot 3**	
X210	X290	X310	(Not used)
X211	X291	X311	(Not used)
X212	X292	X312	(Not used)
X213	X293	X313	(Not used)
X214	X294	X314	(Not used)
X215	X295	X315	(Not used)
X216	X296	X316	(Not used)
X217	X297	X317	(Not used)
X218	X298	X318	(Not used)
X219	X299	X319	(Not used)
X21A	X29A	X31A	(Not used)
X21B	X29B	X31B	(Not used)
X21C	X29C	X31C	(Not used)
X21D	X29D	X31D	(Not used)
X21E	X29E	X31E	(Not used)
X21F	X29F	X31F	(Not used)

Signal			Name
Slot 1	**Slot 2**	**Slot 3**	
Y210	Y290	Y310	(Not used)
Y211	Y291	Y311	(Not used)
Y212	Y292	Y312	(Not used)
Y213	Y293	Y313	(Not used)
Y214	Y294	Y314	(Not used)
Y215	Y295	Y315	(Not used)
Y216	Y296	Y316	(Not used)
Y217	Y297	Y317	(Not used)
Y218	Y298	Y318	(Not used)
Y219	Y299	Y319	(Not used)
Y21A	Y29A	Y31A	(Not used)
Y21B	Y29B	Y31B	(Not used)
Y21C	Y29C	Y31C	(Not used)
Y21D	Y29D	Y31D	(Not used)
Y21E	Y29E	Y31E	(Not used)
Y21F	Y29F	Y31F	(Not used)

(For CC-Link)

Signal			Name
Slot 1	Slot 2	Slot 3	
SB0000	SB0100	(Note 1)	Refresh range (C64 → CC-Link)
:	:		
SB002F	SB012F		
SB0030	SB0130		Refresh range (CC-Link → C64)
:	:		
SB00FF	SB01FF		

Signal			Name
Slot 1	Slot 2	Slot 3	
SW0000	SW0100	(Note 1)	Refresh range (C64 → CC-Link)
:	:		
SW003F	SW013F		
SW0040	SW0140		Refresh range (CC-Link → C64)
:	:		
SW00FF	SW01FF		

(Note 1) The assigned devices differ according to the system.

● **Input/output intelligent function**

(For input/output intelligent function)

Intelligent unit	Input device	Output device
FL-net unit 1	X000 to X01F	Y000 to Y01F
AS-i master unit	X020 to X03F	Y020 to Y03F

• **FL-net unit 1**

Device	Abbrev.	Signal name	Device	Abbrev.	Signal name
X0		Message send normal completed	X8		
X1		Message send error completion	X9		
X2		Receiving message	XA		
X3			XB		
X4			XC		
X5			XD		
X6			XE		
X7			XF		

Device	Abbrev.	Signal name	Device	Abbrev.	Signal name
X10		Network parameter write completed	X18		Parameter setting status
X11		Network parameter read completed	X19		Token participation status
X12			X1A		
X13		Device profile read completed	X1B		
X14		Log information clear completed	X1C		Unit ready
X15		Log information read completed	X1D		
X16			X1E		
X17			X1F		Watch dog timer error detection

• **AS-i master unit**

Device	Abbrev.	Signal name	Device	Abbrev.	Signal name
X20			X28		
X21			X29		
X22			X2A		
X23			X2B		
X24			X2C		
X25			X2D		
X26			X2E		
X27			X2F		

Device	Abbrev.	Signal name	Device	Abbrev.	Signal name
X30			X38		
X31			X39		
X32			X3A		
X33			X3B		
X34			X3C		
X35			X3D		
X36			X3E		
X37			X3F		

(For input/output intelligent function)

- **FL-net unit 1**

Device	Abbrev.	Signal name	Device	Abbrev.	Signal name
Y0		Message send request	Y8		
Y1			Y9		
Y2		Message reception completed	YA		
Y3			YB		
Y4			YC		
Y5			YD		
Y6			YE		
Y7			YF		

Device	Abbrev.	Signal name	Device	Abbrev.	Signal name
Y10		Network parameter write request	Y18		
Y11		Network parameter read request	Y19		
Y12			Y1A		
Y13		Device profile read request	Y1B		
Y14		Log information clear request	Y1C		
Y15		Log information read request	Y1D		
Y16			Y1E		
Y17			Y1F		

- **AS-i master unit**

Device	Abbrev.	Signal name	Device	Abbrev.	Signal name
Y20			Y28		
Y21			Y29		
Y22			Y2A		
Y23			Y2B		
Y24			Y2C		
Y25			Y2D		
Y26			Y2E		
Y27			Y2F		

Device	Abbrev.	Signal name	Device	Abbrev.	Signal name
Y30			Y38		
Y31			Y39		
Y32			Y3A		
Y33			Y3B		
Y34			Y3C		
Y35			Y3D		
Y36			Y3E		
Y37			Y3F		

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.

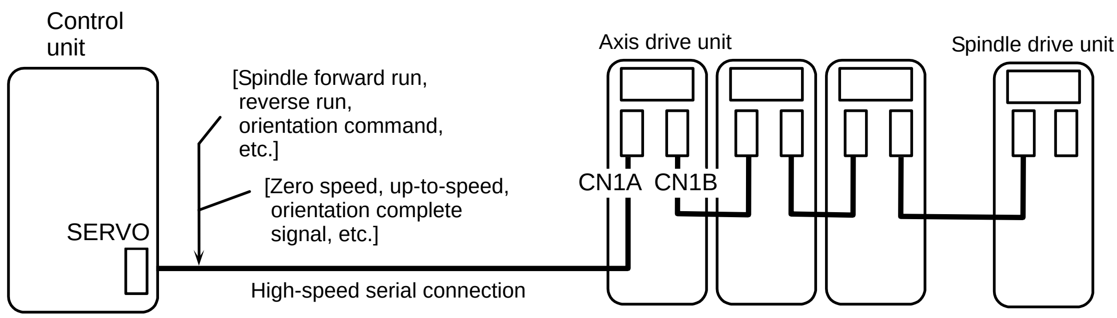
Parameters

Parameter name / Gear stage	Spindle limit speed	Spindle maximum 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

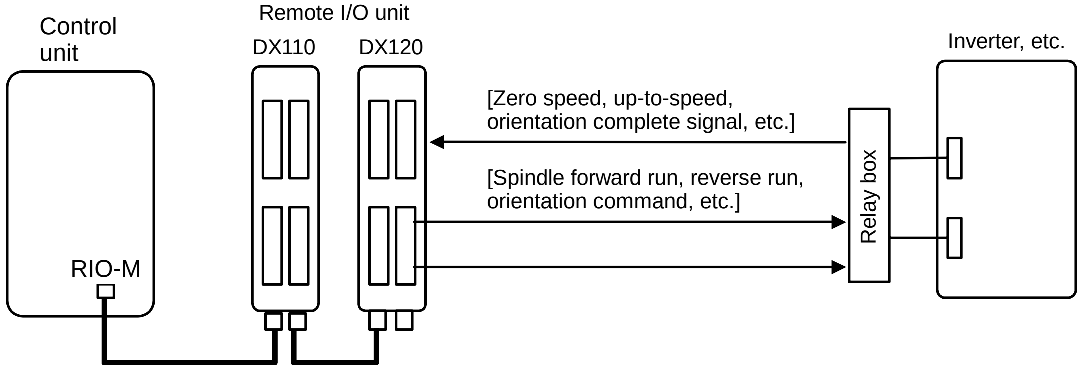
(Note 1) The upper line shows the parameter name, and the bottom line shows the parameter No.
(Note 2) Set the parameter for the gear stage not being used to 0.

7.1.2 Connection Method

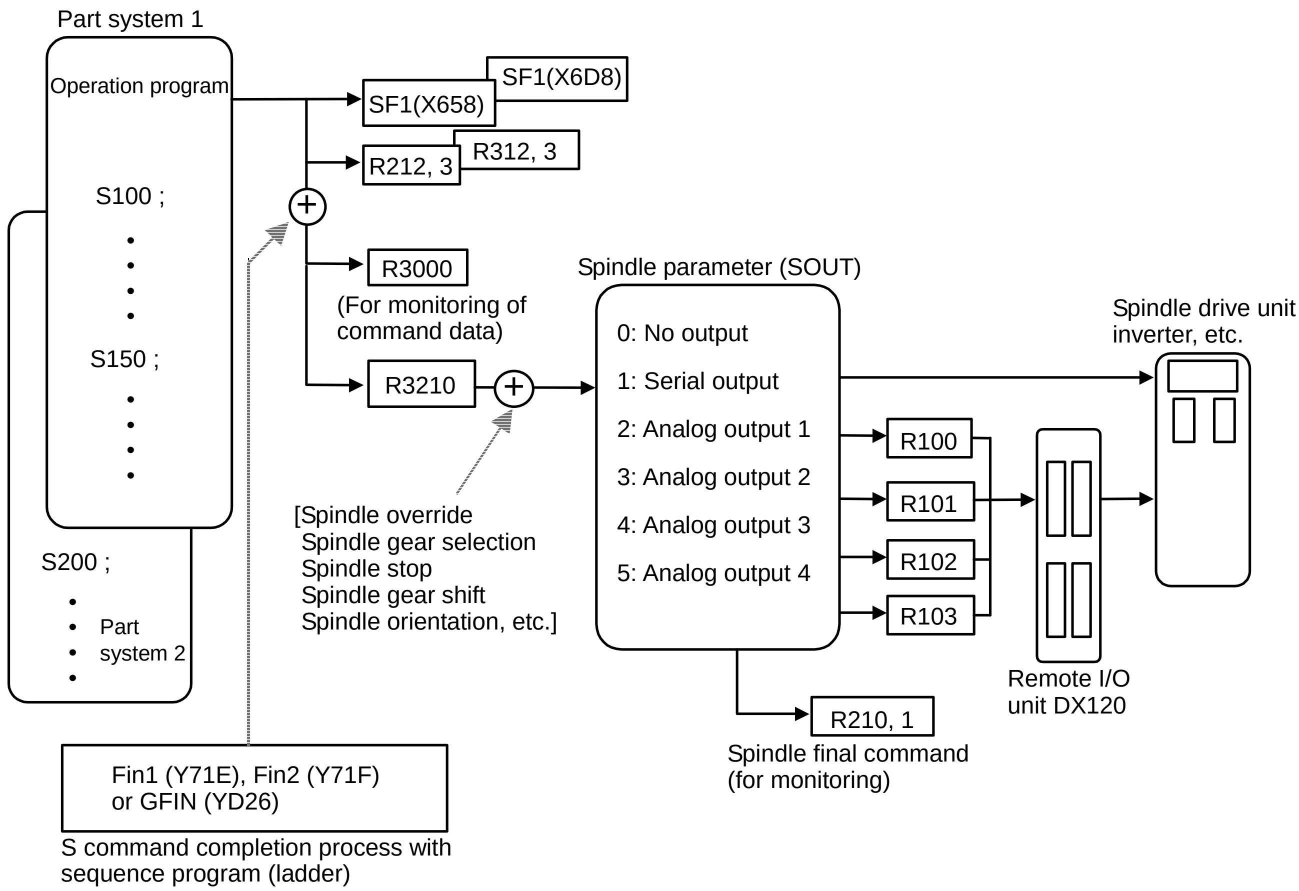
(1) To serially connect the controller and spindle controller



(2) To analog 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 R3000 or R3210 with the completion signal. The speed is output to R3000 and R3210.
(4) The R3210 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.

(Note) If the spindle command is issued from both the 1st and 2nd part systems, the command issued later will be applied.

Revision History

Date of revision	Manual No.	Revision details
Jan. 2002	BNP-B2261C	First edition created.
May 2004	BNP-B2261E	Details for system software version D provided. Explanation on interface signals added. The section “6.6 Signals Related to Communication” added. Mistakes corrected.

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