MITSUBISHI ELECTRIC

Changes for the Better

MITSUBISHI CNC

PLC Interface Manual

C70

IB-1500263(ENG)-J

Introduction

This manual describes the various signal interfaces and functions required when creating sequence program of PLC CPU to operate C70.
Read this manual thoroughly before programming.
Thoroughly study the "Safety Precautions" on the following page to ensure safe use of this CNC unit.

Details described in this manual

⚠ CAUTION

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

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

⚠ This manual is written on the assumption that all option functions are added. Refer to the specifications issued by the machine maker before starting use.

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

Precautions for Safety

Always read the specifications issued by the machine tool builder, 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.

The following signs indicate prohibition and compulsory.

	This sign indicates prohibited behavior (must not do). For example,  indicates "Keep fire away".
	This sign indicated a thing that is pompously (must do). For example,  indicates "it must be grounded".

The meaning of each pictorial sign is as follows.

 **CAUTION**	 **CAUTION rotated object**	 **CAUTION HOT**	 **Danger Electric shock risk**	 **Danger explosive**
 **Prohibited**	 **Disassembly is prohibited**	 **KEEP FIRE AWAY**	 **General instruction**	 **Earth ground**

⚠DANGER

There are no "Danger" items in this manual.

⚠ WARNING

1. Items related to prevention of electric shocks

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

⚠ CAUTION

1. Items related to product and manual

- ⚠ For the items described in the "Restrictions" and "Usable State", the instruction manual issued by the machine maker takes precedence over this instruction manual.
- ⚠ Items not described in this manual must be interpreted as "not possible".
- ⚠ This manual has been written on the assumption that all options are provided.
  Check the specifications issued by the machine maker before starting use.
- ⚠ Some screens and functions may differ or may not be usable depending on the CNC 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.

3. Items related to design

- ⚠ Always turn the spindle phase synchronization completion 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.
- ⚠ In order to prevent illegal transfer of bit data, use data update program.

Disposal

(Note) This symbol mark is for EU countries only.
This symbol mark is according to the directive 2006/66/EC Article 20 Information for end-users and Annex II.

Your MITSUBISHI ELECTRIC product is designed and manufactured with high quality materials and components which can be recycled and/or reused.
This symbol means that batteries and accumulators, at their end-of-life, should be disposed of separately from your household waste.
If a chemical symbol is printed beneath the symbol shown above, this chemical symbol means that the battery or accumulator contains a heavy metal at a certain concentration. This will be indicated as follows:
Hg: mercury (0,0005%), Cd: cadmium (0,002%), Pb: lead (0,004%)
In the European Union there are separate collection systems for used batteries and accumulators.
Please, dispose of batteries and accumulators correctly at your local community waste collection/ recycling centre.

Please, help us to conserve the environment we live in!

Trademarks

MELDAS, MELSEC, EZSocket, EZMotion, iQ Platform, MELSOFT, GOT, CC-Link, CC-Link/LT, CC-Link IE are either trademarks or registered trademarks of Mitsubishi Electric Corporation in Japan and/or other countries.

Ethernet is a registered trademark of Xerox Corporation in the United States and/or other countries.
Microsoft®, Windows® are either trademarks or registered trademarks of Microsoft Corporation in the United States and/or other countries.
CompactFlash and CF are either trademarks or registered trademarks of SanDisk Corporation in the United States and/or other countries.

Other company and product names that appear in this manual are trademarks or registered trademarks of the respective companies.

本製品の取扱いについて

(日本語 /Japanese)
本製品は工業用 (クラス A) 電磁環境適合機器です。販売者あるいは使用者はこの点に注意し、住商業環境以外での使用をお願いいたします。

Handling of our product

(English)
This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

본 제품의 취급에 대해서

(한국어 /Korean)
이 기기는 업무용 (A 급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며 가정외의 지역에서 사용하는 것을 목적으로 합니다 .

CONTENTS

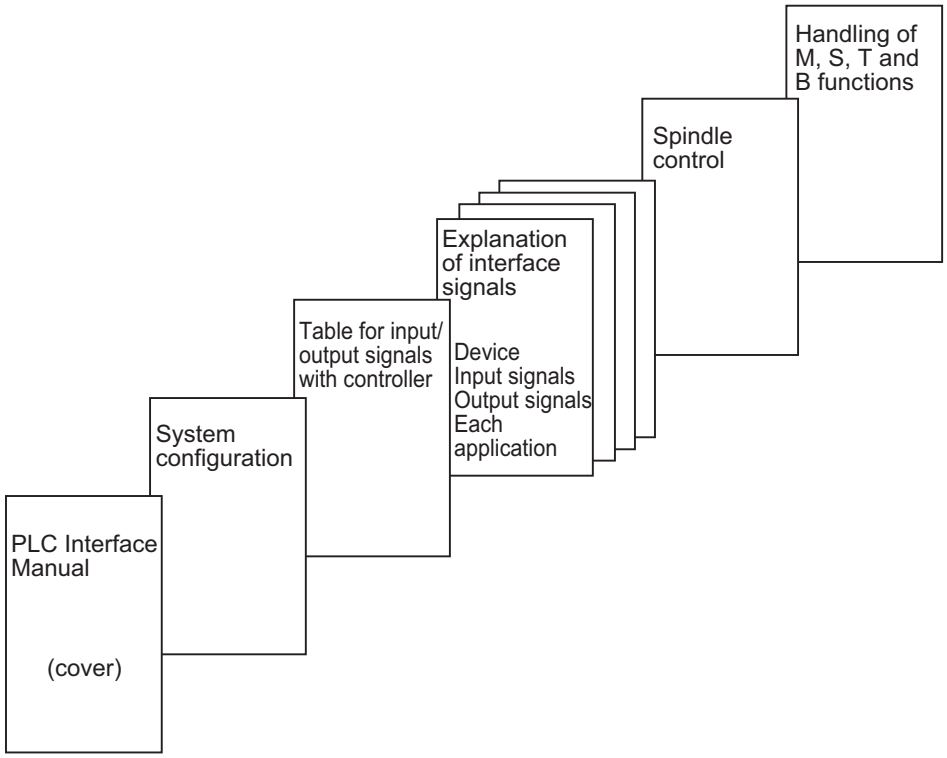
1

Outline

1 Outline

This manual is prepared to assist you to understand the various control signals necessary for creating the sequence program.

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

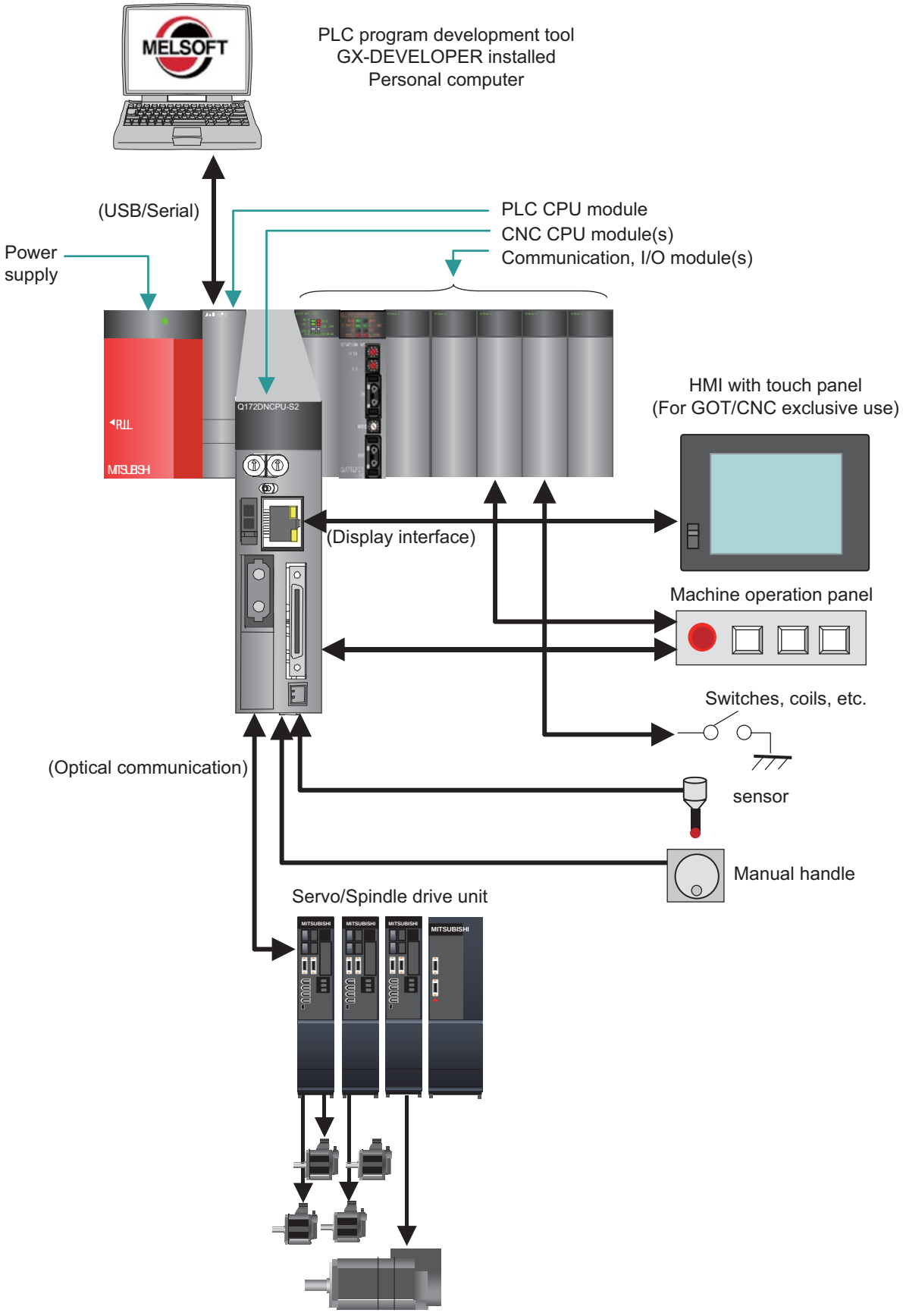


<Caution>

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

2

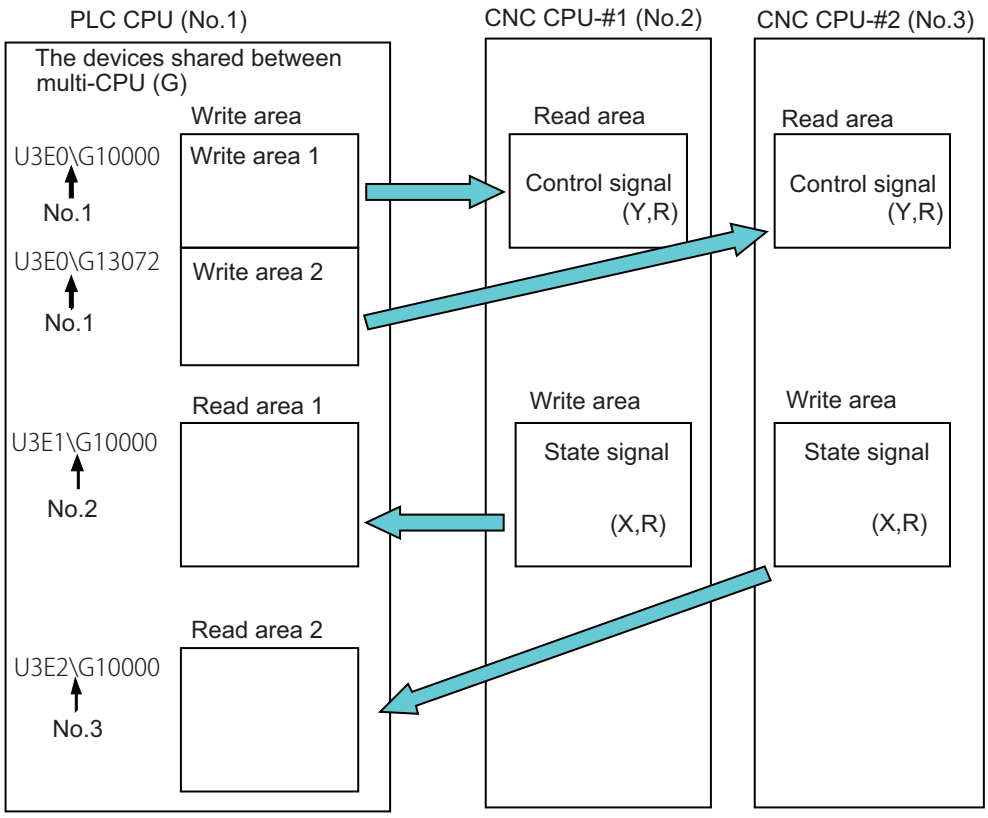
System Configuration


PLC program development tool
GX-DEVELOPER installed
Personal computer
(USB/Serial)
Power supply
PLC CPU module
CNC CPU module(s)
Communication, I/O module(s)
Q172DNCPU-S2
HMI with touch panel
(For GOT/CNC exclusive use)
(Display interface)
Machine operation panel
Switches, coils, etc.
(Optical communication)
sensor
Manual handle
Servo/Spindle drive unit

2.1 Flow of Signals

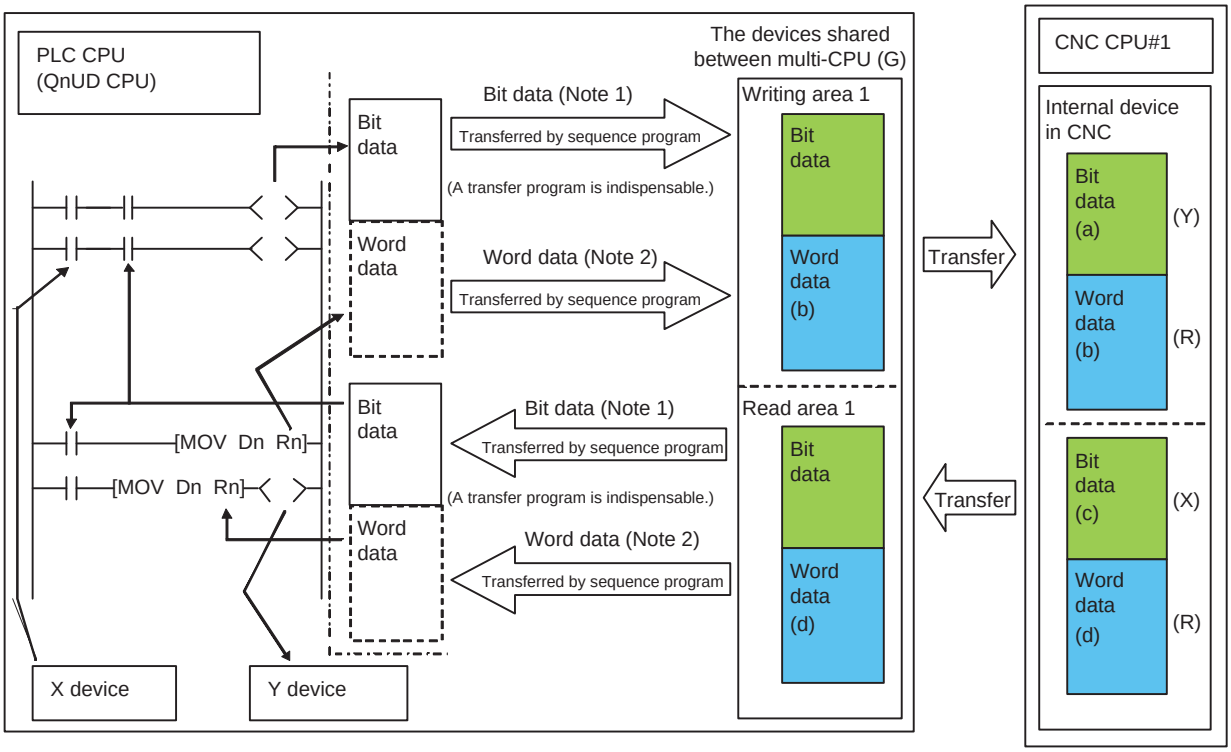
2.1.1 Flow of PLC CPU and CNC CPU Data

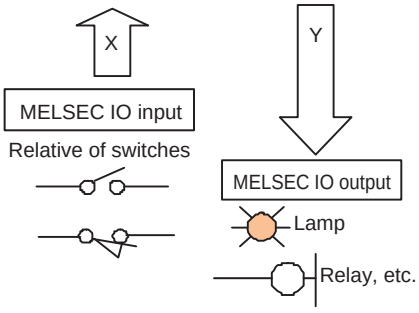
The flow of PLC CPU and CNC CPU data is shown below.



(1) The data PLC CPU wrote into G device is automatically transmitted to each CNC CPU by the high-speed bus.
(2) The CNC data (state signal) is automatically written into the read area corresponding to each CNC CPU of PLC CPU by the high-speed bus.
(3) For the writing area of PLC CPU (G device), the writing area (G device) is different depending on the signal for which CNC CPU.
(4) Writing area 1 and 2 are the same data structures.
(5) Read area 1 and 2 are the same data structures.
(6) When one CNC CPU is used, writing area 1 and read area 1 are used.
(7) When two CNC CPUs are used, writing area 1 and read area 1 are used for CNC CPU#1, writing area 2 and read area 2 are used for CNC CPU#2.
(8) Note that the head address of G device in writing area 2 corresponding to CNC CPU#2 and the head address of G device in writing area 1 corresponding to CNC CPU#1 is different. In "3 INPUT/OUTPUT SIGNALS TABLE WITH CONTROLLER", this is indicated like "Sharing G+1234".
(9) It is possible to change the head address "U3E0\G13072" for a writing area 2 to "U3E0\G14000" to start from a round number.

2.1.2 Handling of Devices





The examples of “devices shared between multi-CPU (G)” and “internal device in CNC” tables are shown below.

Example for control signal (Bit data (a))

$1	abbrev.	Signal name
G+064	<- Sharing G	
Y700	Jn	Jog mode
Y701	Hn	Handle mode
Y702	Sn	Incremental mode
Y703	PTPn	Manual arbitrary feed mode
Y704	ZRNn	Reference position return mode
Y705	ASTn	Automatic initialization mode
Y706		
Y707		

Example for control signal (Word data (b))

$1		abbrev.	Signal name
Sharing G	Internal		
+300	R2400		1st cutting feedrate override
+301	R2401		2nd cutting feedrate override
+302	R2402		Rapid traverse override
+303	R2403		
+304	R2404		Manual feedrate
+305	R2405		
+306	R2406		
+307	R2407		
+308	R2408		1st handle/incremental feed magnification
+309	R2409		

Example for state signal (Bit data (c))

$1	abbrev.	Signal name
G10048	<- Sharing G	
X600	J0n	In jog mode
X601	H0n	In handle mode
X602	S0n	In incremental mode
X603	PTP0n	In manual arbitrary feed mode
X604	ZRN0n	In reference position return mode
X605	AST0n	In automatic initial set mode
X606		
X607		

Example for state signal (Word data (d))

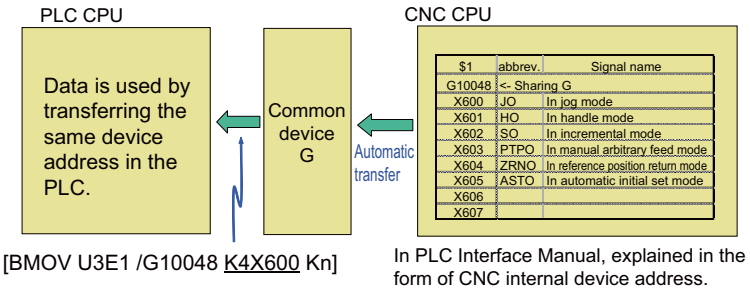
$1		abbrev.	Signal name
Sharing G	Internal		
10300	R100		External search status
10301	R101		
10302	R102		
10303	R103		
10304	R104		M code data 1
10305	R105		
10306	R106		M code data 2
10307	R107		
10308	R108		M code data 3
10309	R109		

(Note1) Transfer "G device" to "device in PLC CPU" by sequence program when using a bit device.
(Similarly, transfer "device in PLC CPU" to "G device".)
(When writing/reading is executed directly into "G device", correct operation might not be executed according to timing with CNC.)

(Note2) A word-data can be written/read directly into "G device". However, we will recommend using the device after a word-data is transferred into "device in PLC CPU".
For a word-data not so used, directly access "G device".
For a word-data often used, use the device after a word-data is transferred into "device in PLC CPU".
However, do not use BMOV command to copy between "G device" and PLC device.

2.1.3 Data update program with NC

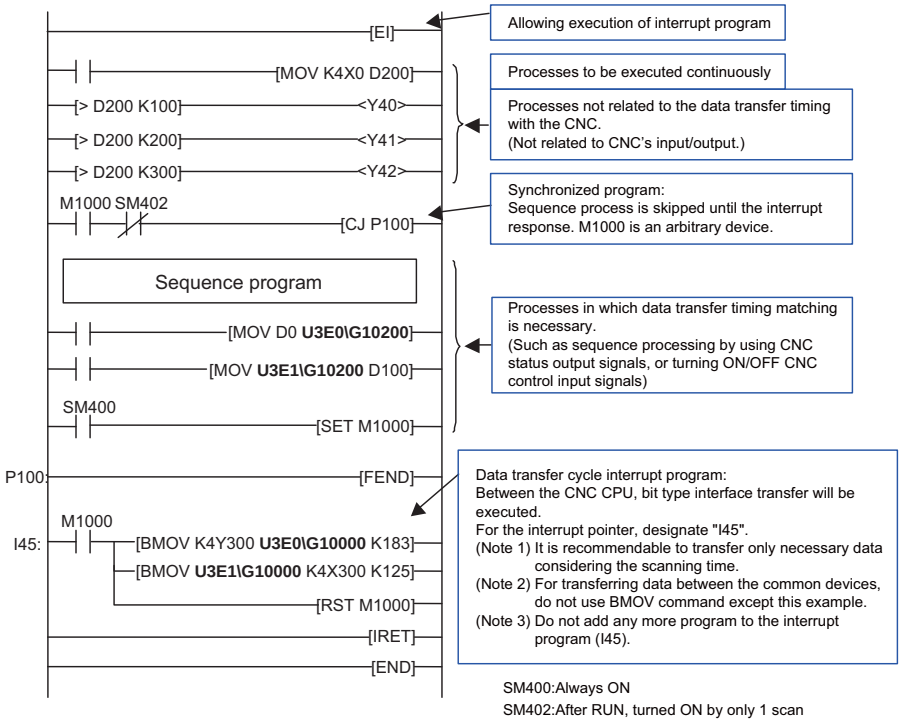
In this manual, inputs to CNC (Y***), outputs from CNC (X***), and registers for data register (R***) are described as device addresses in the CNC.
Thus, use the PLC internal device later than X300 for transferring from the G device to the PLC internal device and use the PLC internal device later than Y300 for output in order to have better correspondences with this manual.
It is necessary to avoid using the same names of the devices of I/O units mounted to the PLC.
Same conditions apply when transferring R*** to the PLC internal device and use it.



⚠CAUTION **In order to prevent illegal transfer of bit data, use data update program.**

[Data update program]

If input/output signals with CNC and PLC programs for machine control are separately programmed, the PLC program for machine control will be processed at every process cycle, whose advantage is high-speed processing.



Precautions

(1) Do not buildt the process to multi-CPU synchronous interrupt program other than bit data transfer program. The execution time exceeds the interrupt cycle as it is executed in about 1ms cycle, so it may not operate normally.

(2) The word data can read and write to the shared device at the arbitrary positon of the PLC program, however do not transfer the data by BMOV (block transfer) command. To transfer to the internal device, use MOV (16 bit) or DMOV (32 bit) command.

(3) Although the shared device is the word device, a bit expression that designated the bit position is enabled.
(The example indicates bit 7 of U3E0/G10321.7 No.1 CPU shared device G10321.)
Note that if the multi-CPU synchronous interrput occurs during the two or more bit process, it may not operate normally as it might be transfered to the CNC CPU in the middle of process. Do not use the bit expression to write to the shared device.

(4) The processing time to read and write in the shared device takes longer conpared with the internal device. Thus, when reading and writing to the same address of the shared device a number of times, process it in the internal device. So that the number of read or write times to the shared device will be reduced and the scanning time can be shorten.

(5) For the process of the device that turns ON only one scan at the completion, program it to the position where the scan takes place each time ("processes not related to the data transfer timing with the CNC" of the data update program).

(6) When the timer is not executed for each scan
Do not jump OUT T1 command with CJ command while the coil of the timer (e.g. T1) has been turning ON.
When OUT T □command is jumped, the current value for the timer will not be updated.

(7) Following signals used to be set to "1" by CNC at power ON for C64 but not for C70. So make sure to execute PLC processing depending on necessity.

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis	Abbreviation	Signal name
+016	+019	+022	+025	+028	+031	+034	+037	<- Sharing G	
Y401	Y431	Y461	Y491	Y4C1	Y4F1	Y521	Y551	*SVFn	Servo OFF
Y403	Y433	Y463	Y493	Y4C3	Y4F3	Y523	Y553	*+EDTn	External deceleration +
Y404	Y434	Y464	Y494	Y4C4	Y4F4	Y524	Y554	*-EDTn	External deceleration -
Y405	Y435	Y465	Y495	Y4C5	Y4F5	Y525	Y555	*+AITn	Automatic interlock+
Y406	Y436	Y466	Y496	Y4C6	Y4F6	Y526	Y556	*-AITn	Automatic interlock-
Y407	Y437	Y467	Y497	Y4C7	Y4F7	Y527	Y557	*+MITn	Manual interlock+
Y408	Y438	Y468	Y498	Y4C8	Y4F8	Y528	Y558	*-MITn	Manual interlock-

9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis	Abbreviation	Signal name
+040	+043	+046	+049	+052	+055	+058	+061	<- Sharing G	
Y581	Y5B1	Y5E1	Y611	Y641	Y671	Y6A1	Y6D1	*SVFn	Servo OFF
Y583	Y5B3	Y5E3	Y613	Y643	Y673	Y6A3	Y6D3	*+EDTn	External deceleration +
Y584	Y5B4	Y5E4	Y614	Y644	Y674	Y6A4	Y6D4	*-EDTn	External deceleration -
Y585	Y5B5	Y5E5	Y615	Y645	Y675	Y6A5	Y6D5	*+AITn	Automatic interlock+
Y586	Y5B6	Y5E6	Y616	Y646	Y676	Y6A6	Y6D6	*-AITn	Automatic interlock-
Y587	Y5B7	Y5E7	Y617	Y647	Y677	Y6A7	Y6D7	*+MITn	Manual interlock+
Y588	Y5B8	Y5E8	Y618	Y648	Y678	Y6A8	Y6D8	*-MITn	Manual interlock-

1st part system	2nd part system	3rd part system	4th part system	5th part system	6th part system	7th part system	Abbrevi-ation	Signal name
+065	+079	+093	+107	+121	+135	+149	<- Sharing G	
Y711	Y7F1	Y8D1	Y9B1	YA91	YB71	YC51	*SPn	Automatic operation "pause" command (Feed hold)
Y713	Y7F3	Y8D3	Y9B3	YA93	YB73	YC53	*BSLn	Block start interlock
Y714	Y7F4	Y8D4	Y9B4	YA94	YB74	YC54	*CSLn	Cutting block start interlock
Y71B	Y7FB	Y8DB	Y9BB	YA9B	YB7B	YC5B	*CDZn	Chamfering
Y728	Y808	Y8E8	Y9C8	YAA8	YB88	YC68	ABSn	Manual absolute
Y760	Y840	Y920	YA00	YAE0	YBC0	YCA0	*FV11n	Cutting feedrate override 1
Y762	Y842	Y922	YA02	YAE2	YBC2	YCA2	*FV14n	Cutting feedrate override 4
Y764	Y844	Y924	YA04	YAE4	YBC4	YCA4	*FV116n	Cutting feedrate override 16
Y774	Y854	Y934	YA14	YAF4	YBD4	YCB4	*JV16n	Manual feedrate
Y7AE	Y88E	Y96E	YA4E	YB2E	YC0E	YCEE	*CXS7n	Manual arbitrary feed stop

(Note) Even though ABSn is not a B-contact signal, it used to be set to "1" for safety as it is usually used without the manual interruption amount offset.

2.1.4 Shared Device CNC Internal Device Correspondence Table

Input signal (CNC CPU -> PLC CPU)

Type	Shared device (G)	CNC device	Points (Word)	Total (Word)	Detail
Bit type	G10000	X300	16	125	Interface used in part systems
	G10016	X400	32		Interface used in each axis (16 axes)
	G10048	X600	56		Interface used in each part system (7 part systems)
	G10104	X980	21		Interface used in spindle (7 spindles)
	G10125	-	75	75	Vacancy
Word type	G10200	R0	100	960	Interface used in part systems
	G10300	R100	700		Interface used in each part system (7 part systems)
	G11000	R800	160		Interface used in each axis (16 axes)
	G11160	R1600	210	210	Interface used in spindle (7 spindles)
	G11370	R1900	80	80	Interface used in PLC axis (7 axes)
	G11450	R4700	770	770	- M system ATC data - L system Tool life management 1 (1st and 2nd part system)
	G12220	R6724	48	48	M system Tool life management
	G12270	R9000	200	200	PLC window response interface
	G12470	R2150	50	50	Safety observing data
	G12520	R4500	96	96	PLC constant parameter setting value
	G12616	R4600	24	24	PLC bit selection parameter setting value
	G12660	R1980	8	8	Interface used in PLC axis (8 axes)
	G12668	-	12	12	Vacancy
	G12680	R2000	47	47	PLC axis indexing interface
	G12728	-	173	173	Vacancy
Vacancy	G13020	-	52	52	Vacancy

Output signal (PLC CPU -> CNC CPU)

Type	Shared device (G)	CNC device	Points (Word)	Total (Word)	Detail
Bit type	+0	Y300	16	183	Interface used in part systems
	+16	Y400	48		Interface used in each axis (16 axes)
	+64	Y700	98		Interface used in each part system (7 part systems)
	+162	YD20	21		Interface used in spindle (7 spindles)
	+183	-	17	17	Vacancy
Word type	+200	R2300	100	960	Interface used in part systems
	+300	R2400	700		Interface used in each part system (7 part systems)
	+1000	R3100	160		Interface used in each axis (16 axes)
	+1160	R3900	210	210	Interface used in spindle (7 spindles)
	+1370	R4200	80	80	Interface used in PLC axis (7 axes)
	+1450	R6720	4	4	M system Tool life management
	+1454	-	6	6	Vacancy
	+1460	D4300 (Note 1)	640	640	GOT window command interface
	+2100	R8500	480	480	PLC window command interface
	+2580	R4450	50	50	Safety observing data
	+2638	-	22	22	Vacancy
	+2660	R4280	8	8	Interface used in PLC axis (8 axes)
	+2668	-	12	12	Vacancy
	+2680	R4300	47	47	PLC axis indexing interface
	+2728	-	173	173	Vacancy
Vacancy	+3036	-	36	36	Vacancy

(Note 1) GOT window command interface is stored in D register.

3

Input/Output Signals Table with Controller

Types of Input/Output Signals Tables

The followings are the types of input/output signals tables to be used.

For common devices used in part systems (Sample)

Common		abbrev.	Signal name
Sharing G	Internal		
10002	X320	MA	Controller ready completion
	X321	SA	Servo ready completion
	X322		
	X323		
	X324		
	X325		
	X326		
	X327		

Common		abbrev.	Signal name
Sharing G	Internal		
10002	X328	INCH	In inch unit selection
	X329	DROPNS	Door open enable
	X32A	SPSYN1	In spindle synchronization
	X32B	FSPRV	Spindle rotation speed synchronization completion
	X32C	FSPPH	Spindle phase synchronization completion
	X32D	SPCMP	Chuck close confirmation
	X32E	BATWR	Battery warning
	X32F	BATAL	Battery alarm

For devices used in each axis (Sample)

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis	abbrev.	Signal name
G10016	G10018	G10020	G10022	G10024	G10026	G10028	G10030	<- Sharing G	
X400	X420	X440	X460	X480	X4A0	X4C0	X4E0	RDYn	Servo ready
X401	X421	X441	X461	X481	X4A1	X4C1	X4E1	AXn	Axis selection
X402	X422	X442	X462	X482	X4A2	X4C2	X4E2	MVPn	In axis plus motion
X403	X423	X443	X463	X483	X4A3	X4C3	X4E3	MVMn	In axis minus motion
X404	X424	X444	X464	X484	X4A4	X4C4	X4E4	ZP1n	1st reference position reached
X405	X425	X445	X465	X485	X4A5	X4C5	X4E5	ZP2n	2nd reference position reached
X406	X426	X446	X466	X486	X4A6	X4C6	X4E6	ZP3n	3rd reference position reached
X407	X427	X447	X467	X487	X4A7	X4C7	X4E7	ZP4n	4th reference position reached

For devices used in each part system (Sample)

$1	$2	$3	$4	$5	$6	$7	abbrev.	Signal name
G10048	G10056	G10064	G10072	G10080	G10088	G10096	<- Sharing G	
X600	X680	X700	X780	X800	X880	X900	JOn	In jog mode
X601	X681	X701	X781	X801	X881	X901	HOn	In handle mode
X602	X682	X702	X782	X802	X882	X902	SOn	In incremental mode
X603	X683	X703	X783	X803	X883	X903	PTPOn	In manual arbitrary feed mode
X604	X684	X704	X784	X804	X884	X904	ZRNOn	In reference position return mode
X605	X685	X705	X785	X805	X885	X905	ASTOn	In automatic initial set mode

For devices used in each spindle (Sample)

1st SP	2nd SP	3rd SP	4th SP	5th SP	6th SP	7th SP	abbrev.	Signal name
G10105	G10108	G10111	G10114	G10117	G10120	G10123	<- Sharing G	
X990	X9C0	X9F0	XA20	XA50	XA80	XAB0		
X991	X9C1	X9F1	XA21	XA51	XA81	XAB1	CDOn	Current detection
X992	X9C2	X9F2	XA22	XA52	XA82	XAB2	VROn	Speed detection
X993	X9C3	X9F3	XA23	XA53	XA83	XAB3	FLOn	In spindle alarm
X994	X9C4	X9F4	XA24	XA54	XA84	XAB4	ZSOn	Zero speed
X995	X9C5	X9F5	XA25	XA55	XA85	XAB5	USOn	Spindle up-to-speed

(Note 1) Signals marked with "*" in the "Abbrev." column are handled as B contacts. Signals marked with "*" in the "Abbrev." column are handled as B contacts.

(Note 2) Signals marked with "——" are reserved for the system.

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. When designing, refer to the section indicated below and make allocations according to the table in the respective section.

	Signal type	Explanation	Reference
Input	DI	(1) Allocated to device X. (2) Data calculated in bit units are allocated as a principle. (3) Signals with only $1 or 1stSP section filled are common for all part systems or all spindles.	3.1
	Data	(1) Allocated to device R. (2) Data handled in 16-bit or 32-bit units is allocated as a principle.	3.2
Output	DO	(1) Allocated to device Y. (2) Data calculated in bit units are allocated as a principle. (3) Signals with only $1 or 1stSP section filled are common for all part systems or all spindles.	3.3
	Data	(1) Allocated to device R. (2) Data handled in 16-bit or 32-bit units is allocated as a principle.	3.4
Each application		Devices are classified under the usage purpose.	3.5

3.1 Bit Type Input Signals (CNC->PLC)

3.1.1 System State

Common		abbrev.	Signal name
Sharing G	Internal		
10000	X300		
	X301		
	X302		
	X303		
	X304		
	X305		
	X306		
	X307		

Common		abbrev.	Signal name
Sharing G	Internal		
10000	X308		
	X309		
	X30A		
	X30B		
	X30C		
	X30D		
	X30E		
	X30F		

Common		abbrev.	Signal name
Sharing G	Internal		
10001	X310	CNOP	24 hours continuous operation
	X311	SSUCHK	Dual signals unconfirmed after compare error
	X312	NOFFCHK	Output OFF check not complete
	X313	*PSDNTF	Power shutoff notification
	X314		
	X315		
	X316		
	X317		

Common		abbrev.	Signal name
Sharing G	Internal		
10001	X318	SKIP1C	SKIP1 Input signal state
	X319	SKIP2C	SKIP2 Input signal state
	X31A	SKIP3C	SKIP3 Input signal state
	X31B	SKIP4C	SKIP4 Input signal state
	X31C		
	X31D		
	X31E		
	X31F		

Common		abbrev.	Signal name
Sharing G	Internal		
10002	X320	MA	Controller ready completion
	X321	SA	Servo ready completion
	X322		
	X323		
	X324		
	X325		
	X326		
	X327		

Common		abbrev.	Signal name
Sharing G	Internal		
10002	X328		
	X329	DROPNS	Door open enable
	X32A	SPSYN1	In spindle synchronization
	X32B	FSPRV	Spindle rotation speed synchronization completion
	X32C	FSPPH	Spindle phase synchronization completion
	X32D	SPCMP	Chuck close confirmation
	X32E	BATWR	Battery warning
	X32F	BATAL	Battery alarm

Common		abbrev.	Signal name
Sharing G	Internal		
10003	X330	AL1	NC alarm 1
	X331	AL2	NC alarm 2 (Servo alarm)
	X332		
	X333		
	X334		
	X335		
	X336		
	X337		

Common		abbrev.	Signal name
Sharing G	Internal		
10003	X338	WNG	In door interlock
	X339	MSON	Macro single valid
	X33A	PARACHG	Power OFF required after parameter change
	X33B	EDITDO	Edited data in processing
	X33C	EDITERR	Edited data error
	X33D		
	X33E	SMPFIN	NC data sampling completed
	X33F	ATS	ATS valid

Common		abbrev.	Signal name
Sharing G	Internal		
10004	X340		
	X341		
	X342		
	X343		
	X344		
	X345		
	X346		
	X347		

Common		abbrev.	Signal name
Sharing G	Internal		
10004	X348		
	X349		
	X34A		
	X34B		
	X34C		
	X34D		
	X34E		
	X34F		

Common		abbrev.	Signal name
Sharing G	Internal		
10005	X350	DLOAD0	Download in progress
	X351	DLDFIN	Download completed
	X352	DLDERR	Download error
	X353		
	X354		
	X355		
	X356		
	X357		

Common		abbrev.	Signal name
Sharing G	Internal		
10005	X358		
	X359		
	X35A		
	X35B		
	X35C		
	X35D		
	X35E		
	X35F		

Common		abbrev.	Signal name
Sharing G	Internal		
10006	X360	PSWP1	PLC axis position switch 1
	X361	PSWP2	PLC axis position switch 2
	X362	PSWP3	PLC axis position switch 3
	X363	PSWP4	PLC axis position switch 4
	X364	PSWP5	PLC axis position switch 5
	X365	PSWP6	PLC axis position switch 6
	X366	PSWP7	PLC axis position switch 7
	X367	PSWP8	PLC axis position switch 8

Common		abbrev.	Signal name
Sharing G	Internal		
10006	X368	PSWP9	PLC axis position switch 9
	X369	PSWP10	PLC axis position switch 10
	X36A	PSWP11	PLC axis position switch 11
	X36B	PSWP12	PLC axis position switch 12
	X36C	PSWP13	PLC axis position switch 13
	X36D	PSWP14	PLC axis position switch 14
	X36E	PSWP15	PLC axis position switch 15
	X36F	PSWP16	PLC axis position switch 16

Common		abbrev.	Signal name
Sharing G	Internal		
10007	X370		
	X371		
	X372		
	X373		
	X374		
	X375		
	X376		
	X377		

Common		abbrev.	Signal name
Sharing G	Internal		
10007	X378		
	X379		
	X37A		
	X37B		
	X37C		
	X37D		
	X37E		
	X37F		

Common		abbrev.	Signal name
Sharing G	Internal		
10008	X380	APLCIN1	APLC input signal 1
	X381	APLCIN2	APLC input signal 2
	X382	APLCIN3	APLC input signal 3
	X383	APLCIN4	APLC input signal 4
	X384	APLCIN5	APLC input signal 5
	X385	APLCIN6	APLC input signal 6
	X386	APLCIN7	APLC input signal 7
	X387	APLCIN8	APLC input signal 8

Common		abbrev.	Signal name
Sharing G	Internal		
10008	X388	APLCIN9	APLC input signal 9
	X389	APLCIN10	APLC input signal 10
	X38A	APLCIN11	APLC input signal 11
	X38B	APLCIN12	APLC input signal 12
	X38C	APLCIN13	APLC input signal 13
	X38D	APLCIN14	APLC input signal 14
	X38E	APLCIN15	APLC input signal 15
	X38F	APLCIN16	APLC input signal 16

Common		abbrev.	Signal name
Sharing G	Internal		
10009	X390	APLCIN17	APLC input signal 17
	X391	APLCIN18	APLC input signal 18
	X392	APLCIN19	APLC input signal 19
	X393	APLCIN20	APLC input signal 20
	X394	APLCIN21	APLC input signal 21
	X395	APLCIN22	APLC input signal 22
	X396	APLCIN23	APLC input signal 23
	X397	APLCIN24	APLC input signal 24

Common		abbrev.	Signal name
Sharing G	Internal		
10009	X398	APLCIN25	APLC input signal 25
	X399	APLCIN26	APLC input signal 26
	X39A	APLCIN27	APLC input signal 27
	X39B	APLCIN28	APLC input signal 28
	X39C	APLCIN29	APLC input signal 29
	X39D	APLCIN30	APLC input signal 30
	X39E	APLCIN31	APLC input signal 31
	X39F	APLCIN32	APLC input signal 32

Common		abbrev.	Signal name
Sharing G	Internal		
10010	X3A0		
	X3A1		
	X3A2		
	X3A3		
	X3A4		
	X3A5		
	X3A6		
	X3A7		

Common		abbrev.	Signal name
Sharing G	Internal		
10010	X3A8		
	X3A9		
	X3AA		
	X3AB		
	X3AC		
	X3AD		
	X3AE		
	X3AF		

Common		abbrev.	Signal name
Sharing G	Internal		
10011	X3B0		
	X3B1		
	X3B2		
	X3B3		
	X3B4		
	X3B5		
	X3B6		
	X3B7		

Common		abbrev.	Signal name
Sharing G	Internal		
10011	X3B8		
	X3B9		
	X3BA		
	X3BB		
	X3BC		
	X3BD		
	X3BE		
	X3BF		

Common		abbrev.	Signal name
Sharing G	Internal		
10012	X3C0		
	X3C1		
	X3C2		
	X3C3		
	X3C4		
	X3C5		
	X3C6		
	X3C7		

Common		abbrev.	Signal name
Sharing G	Internal		
10012	X3C8		
	X3C9		
	X3CA		
	X3CB		
	X3CC		
	X3CD		
	X3CE		
	X3CF		

Common		abbrev.	Signal name
Sharing G	Internal		
10013	X3D0		
	X3D1		
	X3D2		
	X3D3		
	X3D4		
	X3D5		
	X3D6		
	X3D7		

Common		abbrev.	Signal name
Sharing G	Internal		
10013	X3D8		
	X3D9		
	X3DA		
	X3DB		
	X3DC		
	X3DD		
	X3DE		
	X3DF		

Common		abbrev.	Signal name
Sharing G	Internal		
10014	X3E0		
	X3E1		
	X3E2		
	X3E3		
	X3E4		
	X3E5		
	X3E6		
	X3E7		

Common		abbrev.	Signal name
Sharing G	Internal		
10014	X3E8		
	X3E9		
	X3EA		
	X3EB		
	X3EC		
	X3ED		
	X3EE		
	X3EF		

Common		abbrev.	Signal name
Sharing G	Internal		
10015	X3F0		
	X3F1		
	X3F2		
	X3F3		
	X3F4		
	X3F5		
	X3F6		
	X3F7		

Common		abbrev.	Signal name
Sharing G	Internal		
10015	X3F8		
	X3F9		
	X3FA		
	X3FB		
	X3FC		
	X3FD		
	X3FE		
	X3FF		

3.1.2 Axis State

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis	abbrev.	Signal name
G10016	G10018	G10020	G10022	G10024	G10026	G10028	G10030	<- Sharing G	
X400	X420	X440	X460	X480	X4A0	X4C0	X4E0	RDYn	Servo ready
X401	X421	X441	X461	X481	X4A1	X4C1	X4E1	AXn	Axis selection
X402	X422	X442	X462	X482	X4A2	X4C2	X4E2	MVPn	In axis plus motion
X403	X423	X443	X463	X483	X4A3	X4C3	X4E3	MVMn	In axis minus motion
X404	X424	X444	X464	X484	X4A4	X4C4	X4E4	ZP1n	1st reference position reached
X405	X425	X445	X465	X485	X4A5	X4C5	X4E5	ZP2n	2nd reference position reached
X406	X426	X446	X466	X486	X4A6	X4C6	X4E6	ZP3n	3rd reference position reached
X407	X427	X447	X467	X487	X4A7	X4C7	X4E7	ZP4n	4th reference position reached
X408	X428	X448	X468	X488	X4A8	X4C8	X4E8	NRFn	Near reference position
X409	X429	X449	X469	X489	X4A9	X4C9	X4E9	ARRFn	NC axis up-to-speed
X40A	X42A	X44A	X46A	X48A	X4AA	X4CA	X4EA	ZSFn	Zero point initialization set completed
X40B	X42B	X44B	X46B	X48B	X4AB	X4CB	X4EB	ZSEn	Zero point initialization set error completed
X40C	X42C	X44C	X46C	X48C	X4AC	X4CC	X4EC	ZSn	In zero point initialization
X40D	X42D	X44D	X46D	X48D	X4AD	X4CD	X4ED	ZLSn	Zero point initialization incomplete
X40E	X42E	X44E	X46E	X48E	X4AE	X4CE	X4EE	ILIn	In current limit
X40F	X42F	X44F	X46F	X48F	X4AF	X4CF	X4EF	ILAn	Current limit reached

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis	abbrev.	Signal name
G10017	G10019	G10021	G10023	G10025	G10027	G10029	G10031	<- Sharing G	
X410	X430	X450	X470	X490	X4B0	X4D0	X4F0	UCLPn	Unclamp command
X411	X431	X451	X471	X491	X4B1	X4D1	X4F1	INPn	In-position
X412	X432	X452	X472	X492	X4B2	X4D2	X4F2	MSOEn	In multi-step speed monitor
X413	X433	X453	X473	X493	X4B3	X4D3	X4F3	MSOMO1n	Multi-step speed monitor mode output 1
X414	X434	X454	X474	X494	X4B4	X4D4	X4F4	MSOMO2n	Multi-step speed monitor mode output 2
X415	X435	X455	X475	X495	X4B5	X4D5	X4F5		
X416	X436	X456	X476	X496	X4B6	X4D6	X4F6	AXCHGISn	Axis switching invalid status
X417	X437	X457	X477	X497	X4B7	X4D7	X4F7	PLCMODn	In PLC axis control
X418	X438	X458	X478	X498	X4B8	X4D8	X4F8		
X419	X439	X459	X479	X499	X4B9	X4D9	X4F9		
X41A	X43A	X45A	X47A	X49A	X4BA	X4DA	X4FA		
X41B	X43B	X45B	X47B	X49B	X4BB	X4DB	X4FB		
X41C	X43C	X45C	X47C	X49C	X4BC	X4DC	X4FC		
X41D	X43D	X45D	X47D	X49D	X4BD	X4DD	X4FD		
X41E	X43E	X45E	X47E	X49E	X4BE	X4DE	X4FE		
X41F	X43F	X45F	X47F	X49F	X4BF	X4DF	X4FF		

9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis	abbrev.	Signal name
G10032	G10034	G10036	G10038	G10040	G10042	G10044	G10046	<- Sharing G	
X500	X520	X540	X560	X580	X5A0	X5C0	X5E0	RDYn	Servo ready
X501	X521	X541	X561	X581	X5A1	X5C1	X5E1	AXn	Axis selection
X502	X522	X542	X562	X582	X5A2	X5C2	X5E2	MVPn	In plus motion
X503	X523	X543	X563	X583	X5A3	X5C3	X5E3	MVMn	In minus motion
X504	X524	X544	X564	X584	X5A4	X5C4	X5E4	ZP1n	1st reference position reached
X505	X525	X545	X565	X585	X5A5	X5C5	X5E5	ZP2n	2nd reference position reached
X506	X526	X546	X566	X586	X5A6	X5C6	X5E6	ZP3n	3rd reference position reached
X507	X527	X547	X567	X587	X5A7	X5C7	X5E7	ZP4n	4th reference position reached
X508	X528	X548	X568	X588	X5A8	X5C8	X5E8	NRFn	Near reference position
X509	X529	X549	X569	X589	X5A9	X5C9	X5E9	ARRFn	NC axis up-to-speed
X50A	X52A	X54A	X56A	X58A	X5AA	X5CA	X5EA	ZSFn	Zero point initialization set completed
X50B	X52B	X54B	X56B	X58B	X5AB	X5CB	X5EB	ZSEn	Zero point initialization set error completed
X50C	X52C	X54C	X56C	X58C	X5AC	X5CC	X5EC	ZSn	In zero point initialization
X50D	X52D	X54D	X56D	X58D	X5AD	X5CD	X5ED	ZLSn	Zero point initialization incomplete
X50E	X52E	X54E	X56E	X58E	X5AE	X5CE	X5EE	ILIn	In current limit
X50F	X52F	X54F	X56F	X58F	X5AF	X5CF	X5EF	ILAn	Current limit reached

9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis	abbrev.	Signal name
G10033	G10035	G10037	G10039	G10041	G10043	G10045	G10047	<- Sharing G	
X510	X530	X550	X570	X590	X5B0	X5D0	X5F0	UCLPn	Unclamp command
X511	X531	X551	X571	X591	X5B1	X5D1	X5F1	INPn	In-position
X512	X532	X552	X572	X592	X5B2	X5D2	X5F2	MSOEn	In multi-step speed monitor
X513	X533	X553	X573	X593	X5B3	X5D3	X5F3	MSOMO1n	Multi-step speed monitor mode output 1
X514	X534	X554	X574	X594	X5B4	X5D4	X5F4	MSOMO2n	Multi-step speed monitor mode output 2
X515	X535	X555	X575	X595	X5B5	X5D5	X5F5		
X516	X536	X556	X576	X596	X5B6	X5D6	X5F6	AXCHGISn	Axis switching invalid status
X517	X537	X557	X577	X597	X5B7	X5D7	X5F7	PLCMODn	In PLC axis control
X518	X538	X558	X578	X598	X5B8	X5D8	X5F8		
X519	X539	X559	X579	X599	X5B9	X5D9	X5F9		
X51A	X53A	X55A	X57A	X59A	X5BA	X5DA	X5FA		
X51B	X53B	X55B	X57B	X59B	X5BB	X5DB	X5FB		
X51C	X53C	X55C	X57C	X59C	X5BC	X5DC	X5FC		
X51D	X53D	X55D	X57D	X59D	X5BD	X5DD	X5FD		
X51E	X53E	X55E	X57E	X59E	X5BE	X5DE	X5FE		
X51F	X53F	X55F	X57F	X59F	X5BF	X5DF	X5FF		

3.1.3 Part System State

$1	$2	$3	$4	$5	$6	$7	abbrev.	Signal name
G10048	G10056	G10064	G10072	G10080	G10088	G10096	<- Sharing G	
X600	X680	X700	X780	X800	X880	X900	JOn	In jog mode
X601	X681	X701	X781	X801	X881	X901	HOn	In handle mode
X602	X682	X702	X782	X802	X882	X902	SOn	In incremental mode
X603	X683	X703	X783	X803	X883	X903	PTPOn	In manual arbitrary feed mode
X604	X684	X704	X784	X804	X884	X904	ZRNOn	In reference position return mode
X605	X685	X705	X785	X805	X885	X905	ASTOn	In automatic initial set mode
X606	X686	X706	X786	X806	X886	X906		
X607	X687	X707	X787	X807	X887	X907		
X608	X688	X708	X788	X808	X888	X908	MEMOn	In memory mode
X609	X689	X709	X789	X809	X889	X909		
X60A	X68A	X70A	X78A	X80A	X88A	X90A		
X60B	X68B	X70B	X78B	X80B	X88B	X90B	DOn	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		

$1	$2	$3	$4	$5	$6	$7	abbrev.	Signal name
G10049	G10057	G10065	G10073	G10081	G10089	G10097	<- Sharing G	
X610	X690	X710	X790	X810	X890	X910		
X611	X691	X711	X791	X811	X891	X911		
X612	X692	X712	X792	X812	X892	X912	OPn	In automatic operation "run"
X613	X693	X713	X793	X813	X893	X913	STLn	In automatic operation "start"
X614	X694	X714	X794	X814	X894	X914	SPLn	In automatic operation "pause"
X615	X695	X715	X795	X815	X895	X915	RSTn	In "reset"
X616	X696	X716	X796	X816	X896	X916	CXNn	In manual arbitrary feed
X617	X697	X717	X797	X817	X897	X917	RWDn	In rewind
X618	X698	X718	X798	X818	X898	X918	DENn	Motion command completion
X619	X699	X719	X799	X819	X899	X919	TIMPn	All axes in-position
X61A	X69A	X71A	X79A	X81A	X89A	X91A	TSMZn	All axes smoothing zero
X61B	X69B	X71B	X79B	X81B	X89B	X91B		
X61C	X69C	X71C	X79C	X81C	X89C	X91C	CXFINn	Manual arbitrary feed completion
X61D	X69D	X71D	X79D	X81D	X89D	X91D	ETSEn	External search finished
X61E	X69E	X71E	X79E	X81E	X89E	X91E		
X61F	X69F	X71F	X79F	X81F	X89F	X91F		

$1	$2	$3	$4	$5	$6	$7	abbrev.	Signal name
G10050	G10058	G10066	G10074	G10082	G10090	G10098	<- Sharing G	
X620	X6A0	X720	X7A0	X820	X8A0	X920	RPNn	In rapid traverse
X621	X6A1	X721	X7A1	X821	X8A1	X921	CUTn	In cutting feed
X622	X6A2	X722	X7A2	X822	X8A2	X922	TAPn	In tapping
X623	X6A3	X723	X7A3	X823	X8A3	X923	THRDn	In thread cutting
X624	X6A4	X724	X7A4	X824	X8A4	X924	SYNn	In synchronous feed
X625	X6A5	X725	X7A5	X825	X8A5	X925	CSSn	In constant surface speed
X626	X6A6	X726	X7A6	X826	X8A6	X926	SKIPn	In skip
X627	X6A7	X727	X7A7	X827	X8A7	X927	ZRNNn	In reference position return
X628	X6A8	X728	X7A8	X828	X8A8	X928	INCHn	In inch unit selection
X629	X6A9	X729	X7A9	X829	X8A9	X929		
X62A	X6AA	X72A	X7AA	X82A	X8AA	X92A	F1DNn	F 1-digit commanded
X62B	X6AB	X72B	X7AB	X82B	X8AB	X92B	TLFOn	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	TLOVn	Tool life over
X62F	X6AF	X72F	X7AF	X82F	X8AF	X92F		

$1	$2	$3	$4	$5	$6	$7	abbrev.	Signal name
G10051	G10059	G10067	G10075	G10083	G10091	G10099	<- Sharing G	
X630	X6B0	X730	X7B0	X830	X8B0	X930		
X631	X6B1	X731	X7B1	X831	X8B1	X931		
X632	X6B2	X732	X7B2	X832	X8B2	X932	AL3n	NC alarm 3 (Program error)
X633	X6B3	X733	X7B3	X833	X8B3	X933	AL4n	NC alarm 4 (Operation error)
X634	X6B4	X734	X7B4	X834	X8B4	X934		
X635	X6B5	X735	X7B5	X835	X8B5	X935	SSEn	Search & start (error)
X636	X6B6	X736	X7B6	X836	X8B6	X936	SSGn	Search & start (search)
X637	X6B7	X737	X7B7	X837	X8B7	X937	ASLEn	Illegal axis selected
X638	X6B8	X738	X7B8	X838	X8B8	X938	F11n	F 1-digit No. code 1
X639	X6B9	X739	X7B9	X839	X8B9	X939	F12n	F 1-digit No. code 2
X63A	X6BA	X73A	X7BA	X83A	X8BA	X93A	F14n	F 1-digit No. code 4
X63B	X6BB	X73B	X7BB	X83B	X8BB	X93B		
X63C	X6BC	X73C	X7BC	X83C	X8BC	X93C		Waiting between part systems
X63D	X6BD	X73D	X7BD	X83D	X8BD	X93D		
X63E	X6BE	X73E	X7BE	X83E	X8BE	X93E	VAMODOn	In hypothetical axis command mode
X63F	X6BF	X73F	X7BF	X83F	X8BF	X93F	HSST	In high-speed synchronous tapping

$1	$2	$3	$4	$5	$6	$7	abbrev.	Signal name
G10052	G10060	G10068	G10076	G10084	G10092	G10100	<- Sharing G	
X640	X6C0	X740	X7C0	X840	X8C0	X940	DM00n	M code independent output M00
X641	X6C1	X741	X7C1	X841	X8C1	X941	DM01n	M code independent output M01
X642	X6C2	X742	X7C2	X842	X8C2	X942	DM02n	M code independent output M02
X643	X6C3	X743	X7C3	X843	X8C3	X943	DM30n	M code independent output M30
X644	X6C4	X744	X7C4	X844	X8C4	X944	MF1n	M function strobe 1
X645	X6C5	X745	X7C5	X845	X8C5	X945	MF2n	M function strobe 2
X646	X6C6	X746	X7C6	X846	X8C6	X946	MF3n	M function strobe 3
X647	X6C7	X747	X7C7	X847	X8C7	X947	MF4n	M function strobe 4
X648	X6C8	X748	X7C8	X848	X8C8	X948		
X649	X6C9	X749	X7C9	X849	X8C9	X949	MMSn	Manual numerical command
X64A	X6CA	X74A	X7CA	X84A	X8CA	X94A		
X64B	X6CB	X74B	X7CB	X84B	X8CB	X94B	TCPn	Tool change position return completion
X64C	X6CC	X74C	X7CC	X84C	X8CC	X94C	TCRQn	New tool change
X64D	X6CD	X74D	X7CD	X84D	X8CD	X94D		
X64E	X6CE	X74E	X7CE	X84E	X8CE	X94E		
X64F	X6CF	X74F	X7CF	X84F	X8CF	X94F		

$1	$2	$3	$4	$5	$6	$7	abbrev.	Signal name
G10053	G10061	G10069	G10077	G10085	G10093	G10101	<- Sharing G	
X650	X6D0	X750	X7D0	X850	X8D0	X950	TF1n	T function strobe 1
X651	X6D1	X751	X7D1	X851	X8D1	X951		
X652	X6D2	X752	X7D2	X852	X8D2	X952		
X653	X6D3	X753	X7D3	X853	X8D3	X953		
X654	X6D4	X754	X7D4	X854	X8D4	X954	BF1n	2nd M function strobe 1
X655	X6D5	X755	X7D5	X855	X8D5	X955		
X656	X6D6	X756	X7D6	X856	X8D6	X956		
X657	X6D7	X757	X7D7	X857	X8D7	X957		
X658	X6D8	X758	X7D8	X858	X8D8	X958	SF1n	S function strobe 1
X659	X6D9	X759	X7D9	X859	X8D9	X959	SF2n	S function strobe 2
X65A	X6DA	X75A	X7DA	X85A	X8DA	X95A	SF3n	S function strobe 3
X65B	X6DB	X75B	X7DB	X85B	X8DB	X95B	SF4n	S function strobe 4
X65C	X6DC	X75C	X7DC	X85C	X8DC	X95C	SF5n	S function strobe 5
X65D	X6DD	X75D	X7DD	X85D	X8DD	X95D	SF6n	S function strobe 6
X65E	X6DE	X75E	X7DE	X85E	X8DE	X95E	SF7n	S function strobe 7
X65F	X6DF	X75F	X7DF	X85F	X8DF	X95F		

$1	$2	$3	$4	$5	$6	$7	abbrev.	Signal name
G10054	G10062	G10070	G10078	G10086	G10094	G10102	<- Sharing G	
X660	X6E0	X760	X7E0	X860	X8E0	X960	PSW1n	Position switch 1
X661	X6E1	X761	X7E1	X861	X8E1	X961	PSW2n	Position switch 2
X662	X6E2	X762	X7E2	X862	X8E2	X962	PSW3n	Position switch 3
X663	X6E3	X763	X7E3	X863	X8E3	X963	PSW4n	Position switch 4
X664	X6E4	X764	X7E4	X864	X8E4	X964	PSW5n	Position switch 5
X665	X6E5	X765	X7E5	X865	X8E5	X965	PSW6n	Position switch 6
X666	X6E6	X766	X7E6	X866	X8E6	X966	PSW7n	Position switch 7
X667	X6E7	X767	X7E7	X867	X8E7	X967	PSW8n	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	DLWAITn	Waiting for data to be downloaded
X66D	X6ED	X76D	X7ED	X86D	X8ED	X96D	TRVEn	Tap retract possible
X66E	X6EE	X76E	X7EE	X86E	X8EE	X96E	PCNTn	No. of work machining over
X66F	X6EF	X76F	X7EF	X86F	X8EF	X96F	ABSWn	Power shutoff movement over

$1	$2	$3	$4	$5	$6	$7	abbrev.	Signal name
G10055	G10063	G10071	G10079	G10087	G10095	G10103	<- Sharing G	
X670	X6F0	X770	X7F0	X870	X8F0	X970	PSW9n	Position switch 9
X671	X6F1	X771	X7F1	X871	X8F1	X971	PSW10n	Position switch 10
X672	X6F2	X772	X7F2	X872	X8F2	X972	PSW11n	Position switch 11
X673	X6F3	X773	X7F3	X873	X8F3	X973	PSW12n	Position switch 12
X674	X6F4	X774	X7F4	X874	X8F4	X974	PSW13n	Position switch 13
X675	X6F5	X775	X7F5	X875	X8F5	X975	PSW14n	Position switch 14
X676	X6F6	X776	X7F6	X876	X8F6	X976	PSW15n	Position switch 15
X677	X6F7	X777	X7F7	X877	X8F7	X977	PSW16n	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		

3.1.4 Spindle State

1st SP	2nd SP	3rd SP	4th SP	5th SP	6th SP	7th SP	abbrev.	Signal name
G10104	G10107	G10110	G10113	G10116	G10119	G10122	<- Sharing G	
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	SIGEn	S command gear No. illegal
X985	X9B5	X9E5	XA15	XA45	XA75	XAA5	SOVEn	S command max./min. command value over
X986	X9B6	X9E6	XA16	XA46	XA76	XAA6	SNGEn	S command 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	SUPPn	Spindle speed upper limit over
X98C	X9BC	X9EC	XA1C	XA4C	XA7C	XAAC	SLOWn	Spindle speed lower limit over
X98D	X9BD	X9ED	XA1D	XA4D	XA7D	XAAD	GR1n	Spindle gear shift command 1
X98E	X9BE	X9EE	XA1E	XA4E	XA7E	XAAE	GR2n	Spindle gear shift command 2
X98F	X9BF	X9EF	XA1F	XA4F	XA7F	XAAF		

1st SP	2nd SP	3rd SP	4th SP	5th SP	6th SP	7th SP	abbrev.	Signal name
G10105	G10108	G10111	G10114	G10117	G10120	G10123	<- Sharing G	
X990	X9C0	X9F0	XA20	XA50	XA80	XAB0		
X991	X9C1	X9F1	XA21	XA51	XA81	XAB1	CDOn	Current detection
X992	X9C2	X9F2	XA22	XA52	XA82	XAB2	VROn	Speed detection
X993	X9C3	X9F3	XA23	XA53	XA83	XAB3	FLOn	In spindle alarm
X994	X9C4	X9F4	XA24	XA54	XA84	XAB4	ZSOn	Zero speed
X995	X9C5	X9F5	XA25	XA55	XA85	XAB5	USOn	Spindle up-to-speed
X996	X9C6	X9F6	XA26	XA56	XA86	XAB6	ORAOn	Spindle in-position
X997	X9C7	X9F7	XA27	XA57	XA87	XAB7	LCSAn	In L coil selection
X998	X9C8	X9F8	XA28	XA58	XA88	XAB8	SMAn	Spindle ready-ON
X999	X9C9	X9F9	XA29	XA59	XA89	XAB9	SSAn	Spindle servo-ON
X99A	X9CA	X9FA	XA2A	XA5A	XA8A	XABA		
X99B	X9CB	X9FB	XA2B	XA5B	XA8B	XABB	SSRNn	In spindle forward run
X99C	X9CC	X9FC	XA2C	XA5C	XA8C	XABC	SSRIn	In spindle reverse run
X99D	X9CD	X9FD	XA2D	XA5D	XA8D	XABD	SZPHn	Z-phase passed
X99E	X9CE	X9FE	XA2E	XA5E	XA8E	XABE	SIMPn	Position loop in-position
X99F	X9CF	X9FF	XA2F	XA5F	XA8F	XABF	STLQn	In spindle torque limit

1st SP	2nd SP	3rd SP	4th SP	5th SP	6th SP	7th SP	abbrev.	Signal name
G10106	G10109	G10112	G10115	G10118	G10121	G10124	<- Sharing G	
X9A0	X9D0	XA00	XA30	XA60	XA90	XAC0		
X9A1	X9D1	XA01	XA31	XA61	XA91	XAC1		
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		
X9A9	X9D9	XA09	XA39	XA69	XA99	XAC9	SMSOEn	In spindle multi-step speed monitor
X9AA	X9DA	XA0A	XA3A	XA6A	XA9A	XACA	SMSOMO1n	In spindle multi-step speed monitor output 1
X9AB	X9DB	XA0B	XA3B	XA6B	XA9B	XACB	SMSOMO2n	In spindle multi-step speed monitor output 2
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		

3.2 Data Type Input Signals (CNC->PLC)

3.2.1 System State

Common		abbrev.	Signal name
Sharing G	Internal		
10200	R0		
10201	R1		
10202	R2		
10203	R3		
10204	R4		
10205	R5		
10206	R6		
10207	R7		
10208	R8		KEYIN
10209	R9	SMODEN	Speed monitor door open possible

Common		abbrev.	Signal name
Sharing G	Internal		
10210	R10		1st handle pulse counter
10211	R11		2nd handle pulse counter
10212	R12		3rd handle pulse counter
10213	R13		
10214	R14		
10215	R15		
10216	R16		CRT display information
10217	R17		
10218	R18		
10219	R19		

Common		abbrev.	Signal name
Sharing G	Internal		
10220	R20		
10221	R21		Emergency stop cause
10222	R22		
10223	R23		
10224	R24		User macro output #1132 (Controller -> PLC)
10225	R25		
10226	R26		User macro output #1133 (Controller -> PLC)
10227	R27		
10228	R28		User macro output #1134 (Controller -> PLC)
10229	R29		

Common		abbrev.	Signal name
Sharing G	Internal		
10230	R30		User macro output #1135 (Controller -> PLC)
10231	R31		
10232	R32		CNC software version code
10233	R33		
10234	R34		
10235	R35		
10236	R36		
10237	R37		
10238	R38		
10239	R39		

Common		abbrev.	Signal name
Sharing G	Internal		
10240	R40		Battery drop cause
10241	R41		Temperature warning cause
10242	R42		
10243	R43		
10244	R44		
10245	R45		
10246	R46		
10247	R47		
10248	R48		Spindle synchronization phase error 1
10249	R49		Spindle synchronization phase error 2

Common		abbrev.	Signal name
Sharing G	Internal		
10250	R50		
10251	R51		
10252	R52		
10253	R53		
10254	R54		
10255	R55		Spindle synchronization phase error output
10256	R56		Spindle synchronization Phase error monitor
10257	R57		Spindle synchronization Phase error monitor (lower limit)
10258	R58		Spindle synchronization Phase error monitor (upper limit)
10259	R59		Spindle synchronization Phase offset data

Common		abbrev.	Signal name
Sharing G	Internal		
10260	R60		APLC input data 1
10261	R61		APLC input data 2
10262	R62		APLC input data 3
10263	R63		APLC input data 4
10264	R64		APLC input data 5
10265	R65		APLC input data 6
10266	R66		APLC input data 7
10267	R67		APLC input data 8
10268	R68		APLC input data 9
10269	R69		APLC input data 10

Common		abbrev.	Signal name
Sharing G	Internal		
10270	R70		
10271	R71		
10272	R72		
10273	R73		
10274	R74		
10275	R75		
10276	R76		
10277	R77		
10278	R78		
10279	R79		

Common		abbrev.	Signal name
Sharing G	Internal		
10280	R80	NCVERR	ZR device No. at occurrence of NC exclusive instruction (DDWR/DDRD) error
10281	R81		
10282	R82	ZRECVNO	Common variable No. at occurrence of ZR device error
10283	R83	ZRECVFC	Error cause at occurrence of ZR device error
10284	R84		
10285	R85		
10286	R86		
10287	R87		
10288	R88		
10289	R89		

Common		abbrev.	Signal name
Sharing G	Internal		
10290	R90		GOT window Data changeover completion
10291	R91		
10292	R92		
10293	R93		
10294	R94		
10295	R95		
10296	R96		
10297	R97		
10298	R98		
10299	R99		

3.2.2 Part System State

$1		$2		$3		$4		$5		$6		$7		abbrev.	Signal name
Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal		
10300	R100	10400	R200	10500	R300	10600	R400	10700	R500	10800	R600	10900	R700		External search status
10301	R101	10401	R201	10501	R301	10601	R401	10701	R501	10801	R601	10901	R701		
10302	R102	10402	R202	10502	R302	10602	R402	10702	R502	10802	R602	10902	R702		
10303	R103	10403	R203	10503	R303	10603	R403	10703	R503	10803	R603	10903	R703		
10304	R104	10404	R204	10504	R304	10604	R404	10704	R504	10804	R604	10904	R704		M code data 1
10305	R105	10405	R205	10505	R305	10605	R405	10705	R505	10805	R605	10905	R705		
10306	R106	10406	R206	10506	R306	10606	R406	10706	R506	10806	R606	10906	R706		M code data 2
10307	R107	10407	R207	10507	R307	10607	R407	10707	R507	10807	R607	10907	R707		
10308	R108	10408	R208	10508	R308	10608	R408	10708	R508	10808	R608	10908	R708		M code data 3
10309	R109	10409	R209	10509	R309	10609	R409	10709	R509	10809	R609	10909	R709		

$1		$2		$3		$4		$5		$6		$7		abbrev.	Signal name
Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal		
10310	R110	10410	R210	10510	R310	10610	R410	10710	R510	10810	R610	10910	R710		M code data 4
10311	R111	10411	R211	10511	R311	10611	R411	10711	R511	10811	R611	10911	R711		
10312	R112	10412	R212	10512	R312	10612	R412	10712	R512	10812	R612	10912	R712		S code data 1
10313	R113	10413	R213	10513	R313	10613	R413	10713	R513	10813	R613	10913	R713		
10314	R114	10414	R214	10514	R314	10614	R414	10714	R514	10814	R614	10914	R714		S code data 2
10315	R115	10415	R215	10515	R315	10615	R415	10715	R515	10815	R615	10915	R715		
10316	R116	10416	R216	10516	R316	10616	R416	10716	R516	10816	R616	10916	R716		S code data 3
10317	R117	10417	R217	10517	R317	10617	R417	10717	R517	10817	R617	10917	R717		
10318	R118	10418	R218	10518	R318	10618	R418	10718	R518	10818	R618	10918	R718		S code data 4
10319	R119	10419	R219	10519	R319	10619	R419	10719	R519	10819	R619	10919	R719		

$1		$2		$3		$4		$5		$6		$7		abbrev.	Signal name
Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal		
10320	R120	10420	R220	10520	R320	10620	R420	10720	R520	10820	R620	10920	R720		T code data 1
10321	R121	10421	R221	10521	R321	10621	R421	10721	R521	10821	R621	10921	R721		
10322	R122	10422	R222	10522	R322	10622	R422	10722	R522	10822	R622	10922	R722		
10323	R123	10423	R223	10523	R323	10623	R423	10723	R523	10823	R623	10923	R723		
10324	R124	10424	R224	10524	R324	10624	R424	10724	R524	10824	R624	10924	R724		
10325	R125	10425	R225	10525	R325	10625	R425	10725	R525	10825	R625	10925	R725		
10326	R126	10426	R226	10526	R326	10626	R426	10726	R526	10826	R626	10926	R726		
10327	R127	10427	R227	10527	R327	10627	R427	10727	R527	10827	R627	10927	R727		
10328	R128	10428	R228	10528	R328	10628	R428	10728	R528	10828	R628	10928	R728		2nd M function data 1
10329	R129	10429	R229	10529	R329	10629	R429	10729	R529	10829	R629	10929	R729		

$1		$2		$3		$4		$5		$6		$7		abbrev.	Signal name
Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal		
10330	R130	10430	R230	10530	R330	10630	R430	10730	R530	10830	R630	10930	R730		
10331	R131	10431	R231	10531	R331	10631	R431	10731	R531	10831	R631	10931	R731		
10332	R132	10432	R232	10532	R332	10632	R432	10732	R532	10832	R632	10932	R732		
10333	R133	10433	R233	10533	R333	10633	R433	10733	R533	10833	R633	10933	R733		
10334	R134	10434	R234	10534	R334	10634	R434	10734	R534	10834	R634	10934	R734		
10335	R135	10435	R235	10535	R335	10635	R435	10735	R535	10835	R635	10935	R735		
10336	R136	10436	R236	10536	R336	10636	R436	10736	R536	10836	R636	10936	R736		Tool No.
10337	R137	10437	R237	10537	R337	10637	R437	10737	R537	10837	R637	10937	R737		
10338	R138	10438	R238	10538	R338	10638	R438	10738	R538	10838	R638	10938	R738		Group in tool life management
10339	R139	10439	R239	10539	R339	10639	R439	10739	R539	10839	R639	10939	R739		

$1		$2		$3		$4		$5		$6		$7		abbrev.	Signal name
Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal		
10340	R140	10440	R240	10540	R340	10640	R440	10740	R540	10840	R640	10940	R740		No. of work machining (current value)
10341	R141	10441	R241	10541	R341	10641	R441	10741	R541	10841	R641	10941	R741		
10342	R142	10442	R242	10542	R342	10642	R442	10742	R542	10842	R642	10942	R742		Near reference position (per reference position)
10343	R143	10443	R243	10543	R343	10643	R443	10743	R543	10843	R643	10943	R743		
10344	R144	10444	R244	10544	R344	10644	R444	10744	R544	10844	R644	10944	R744		Tool life usage data
10345	R145	10445	R245	10545	R345	10645	R445	10745	R545	10845	R645	10945	R745		
10346	R146	10446	R246	10546	R346	10646	R446	10746	R546	10846	R646	10946	R746		No. of work machining (maximum value)
10347	R147	10447	R247	10547	R347	10647	R447	10747	R547	10847	R647	10947	R747		
10348	R148	10448	R248	10548	R348	10648	R448	10748	R548	10848	R648	10948	R748		
10349	R149	10449	R249	10549	R349	10649	R449	10749	R549	10849	R649	10949	R749		

$1		$2		$3		$4		$5		$6		$7		abbrev.	Signal name
Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal		
10350	R150	10450	R250	10550	R350	10650	R450	10750	R550	10850	R650	10950	R750		
10351	R151	10451	R251	10551	R351	10651	R451	10751	R551	10851	R651	10951	R751		
10352	R152	10452	R252	10552	R352	10652	R452	10752	R552	10852	R652	10952	R752		
10353	R153	10453	R253	10553	R353	10653	R453	10753	R553	10853	R653	10953	R753		
10354	R154	10454	R254	10554	R354	10654	R454	10754	R554	10854	R654	10954	R754		
10355	R155	10455	R255	10555	R355	10655	R455	10755	R555	10855	R655	10955	R755		
10356	R156	10456	R256	10556	R356	10656	R456	10756	R556	10856	R656	10956	R756		Error code output
10357	R157	10457	R257	10557	R357	10657	R457	10757	R557	10857	R657	10957	R757		
10358	R158	10458	R258	10558	R358	10658	R458	10758	R558	10858	R658	10958	R758		
10359	R159	10459	R259	10559	R359	10659	R459	10759	R559	10859	R659	10959	R759		

$1		$2		$3		$4		$5		$6		$7		abbrev.	Signal name
Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal		
10360	R160	10460	R260	10560	R360	10660	R460	10760	R560	10860	R660	10960	R760		Error code output extension
10361	R161	10461	R261	10561	R361	10661	R461	10761	R561	10861	R661	10961	R761		
10362	R162	10462	R262	10562	R362	10662	R462	10762	R562	10862	R662	10962	R762		
10363	R163	10463	R263	10563	R363	10663	R463	10763	R563	10863	R663	10963	R763		

$1		$2		$3		$4		$5		$6		$7		abbrev.	Signal name
Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal		
10364	R164	10464	R264	10564	R364	10664	R464	10764	R564	10864	R664	10964	R764		S code data 5
10365	R165	10465	R265	10565	R365	10665	R465	10765	R565	10865	R665	10965	R765		
10366	R166	10466	R266	10566	R366	10666	R466	10766	R566	10866	R666	10966	R766		S code data 6
10367	R167	10467	R267	10567	R367	10667	R467	10767	R567	10867	R667	10967	R767		
10368	R168	10468	R268	10568	R368	10668	R468	10768	R568	10868	R668	10968	R768		S code data 7
10369	R169	10469	R269	10569	R369	10669	R469	10769	R569	10869	R669	10969	R769		
10370	R170	10470	R270	10570	R370	10670	R470	10770	R570	10870	R670	10970	R770		User Macro output #1132 (Controller -> PLC)
10371	R171	10471	R271	10571	R371	10671	R471	10771	R571	10871	R671	10971	R771		
10372	R172	10472	R272	10572	R372	10672	R472	10772	R572	10872	R672	10972	R772		User Macro output #1133 (Controller -> PLC)
10373	R173	10473	R273	10573	R373	10673	R473	10773	R573	10873	R673	10973	R773		
10374	R174	10474	R274	10574	R374	10674	R474	10774	R574	10874	R674	10974	R774		User Macro output #1134 (Controller -> PLC)
10375	R175	10475	R275	10575	R375	10675	R475	10775	R575	10875	R675	10975	R775		
10376	R176	10476	R276	10576	R376	10676	R476	10776	R576	10876	R676	10976	R776		User Macro output #1135 (Controller -> PLC)
10377	R177	10477	R277	10577	R377	10677	R477	10777	R577	10877	R677	10977	R777		
10378	R178	10478	R278	10578	R378	10678	R478	10778	R578	10878	R678	10978	R778		
10379	R179	10479	R279	10579	R379	10679	R479	10779	R579	10879	R679	10979	R779		

$1		$2		$3		$4		$5		$6		$7		abbrev.	Signal name
Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal		
10380	R180	10480	R280	10580	R380	10680	R480	10780	R580	10880	R680	10980	R780		Chopping status
10381	R181	10481	R281	10581	R381	10681	R481	10781	R581	10881	R681	10981	R781		Chopping error No.
10382	R182	10482	R282	10582	R382	10682	R482	10782	R582	10882	R682	10982	R782		Chopping axis
10383	R183	10483	R283	10583	R383	10683	R483	10783	R583	10883	R683	10983	R783		
10384	R184	10484	R284	10584	R384	10684	R484	10784	R584	10884	R684	10984	R784		
10385	R185	10485	R285	10585	R385	10685	R485	10785	R585	10885	R685	10985	R785		
10386	R186	10486	R286	10586	R386	10686	R486	10786	R586	10886	R686	10986	R786		
10387	R187	10487	R287	10587	R387	10687	R487	10787	R587	10887	R687	10987	R787		
10388	R188	10488	R288	10588	R388	10688	R488	10788	R588	10888	R688	10988	R788		
10389	R189	10489	R289	10589	R389	10689	R489	10789	R589	10889	R689	10989	R789		

$1		$2		$3		$4		$5		$6		$7		abbrev.	Signal name
Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal		
10390	R190	10490	R290	10590	R390	10690	R490	10790	R590	10890	R690	10990	R790		
10391	R191	10491	R291	10591	R391	10691	R491	10791	R591	10891	R691	10991	R791		
10392	R192	10492	R292	10592	R392	10692	R492	10792	R592	10892	R692	10992	R792		
10393	R193	10493	R293	10593	R393	10693	R493	10793	R593	10893	R693	10993	R793		
10394	R194	10494	R294	10594	R394	10694	R494	10794	R594	10894	R694	10994	R794		
10395	R195	10495	R295	10595	R395	10695	R495	10795	R595	10895	R695	10995	R795		
10396	R196	10496	R296	10596	R396	10696	R496	10796	R596	10896	R696	10996	R796		
10397	R197	10497	R297	10597	R397	10697	R497	10797	R597	10897	R697	10997	R797		
10398	R198	10498	R298	10598	R398	10698	R498	10798	R598	10898	R698	10998	R798		
10399	R199	10499	R299	10599	R399	10699	R499	10799	R599	10899	R699	10999	R799		

3.2.3 Axis State

1st axis		2nd axis		3rd axis		4th axis		5th axis		6th axis		7th axis		8th axis		abbrev.	Signal name
Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal		
11000	R800	11010	R810	11020	R820	11030	R830	11040	R840	11050	R850	11060	R860	11070	R870		Thermal expansion compensation amount
11001	R801	11011	R811	11021	R821	11031	R831	11041	R841	11051	R851	11061	R861	11071	R871		
11002	R802	11012	R812	11022	R822	11032	R832	11042	R842	11052	R852	11062	R862	11072	R872		Machine position n-th axis
11003	R803	11013	R813	11023	R823	11033	R833	11043	R843	11053	R853	11063	R863	11073	R873		
11004	R804	11014	R814	11024	R824	11034	R834	11044	R844	11054	R854	11064	R864	11074	R874		Feedback machine position n-th axis
11005	R805	11015	R815	11025	R825	11035	R835	11045	R845	11055	R855	11065	R865	11075	R875		
11006	R806	11016	R816	11026	R826	11036	R836	11046	R846	11056	R856	11066	R866	11076	R876		
11007	R807	11017	R817	11027	R827	11037	R837	11047	R847	11057	R857	11067	R867	11077	R877		
11008	R808	11018	R818	11028	R828	11038	R838	11048	R848	11058	R858	11068	R868	11078	R878		
11009	R809	11019	R819	11029	R829	11039	R839	11049	R849	11059	R859	11069	R869	11079	R879		

9th axis		10th axis		11th axis		12th axis		13th axis		14th axis		15th axis		16th axis		abbrev.	Signal name
Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal		
11080	R880	11090	R890	11100	R900	11110	R910	11120	R920	11130	R930	11140	R940	11150	R950		Thermal expansion compensation amount
11081	R881	11091	R891	11101	R901	11111	R911	11121	R921	11131	R931	11141	R941	11151	R951		
11082	R882	11092	R892	11102	R902	11112	R912	11122	R922	11132	R932	11142	R942	11152	R952		Machine position n-th axis
11083	R883	11093	R893	11103	R903	11113	R913	11123	R923	11133	R933	11143	R943	11153	R953		
11084	R884	11094	R894	11104	R904	11114	R914	11124	R924	11134	R934	11144	R944	11154	R954		Feedback machine position n-th axis
11085	R885	11095	R895	11105	R905	11115	R915	11125	R925	11135	R935	11145	R945	11155	R955		
11086	R886	11096	R896	11106	R906	11116	R916	11126	R926	11136	R936	11146	R946	11156	R956		
11087	R887	11097	R897	11107	R907	11117	R917	11127	R927	11137	R937	11147	R947	11157	R957		
11088	R888	11098	R898	11108	R908	11118	R918	11128	R928	11138	R938	11148	R948	11158	R958		
11089	R889	11099	R899	11109	R909	11119	R919	11129	R929	11139	R939	11149	R949	11159	R959		

3.2.4 Spindle State

1st SP		2nd SP		3rd SP		4th SP		5th SP		6th SP		7th SP		abbrev.	Signal name
Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal		
11160	**R1600**	**11190**	**R1630**	**11220**	**R1660**	**11250**	**R1690**	**11280**	**R1720**	**11310**	**R1750**	**11340**	**R1780**	SRPMINn	Spindle command rotation speed input
11161	R1601	11191	R1631	11221	R1661	11251	R1691	11281	R1721	11311	R1751	11341	R1781		
11162	R1602	11192	R1632	11222	R1662	11252	R1692	11282	R1722	11312	R1752	11342	R1782	SRPMn	Spindle command final data (Rotation speed)
11163	R1603	11193	R1633	11223	R1663	11253	R1693	11283	R1723	11313	R1753	11343	R1783		
11164	R1604	11194	R1634	11224	R1664	11254	R1694	11284	R1724	11314	R1754	11344	R1784	SBINn	Spindle command final data (12-bit binary)
11165	R1605	11195	R1635	11225	R1665	11255	R1695	11285	R1725	11315	R1755	11345	R1785		
11166	R1606	11196	R1636	11226	R1666	11256	R1696	11286	R1726	11316	R1756	11346	R1786	SREALn	Spindle actual speed
11167	R1607	11197	R1637	11227	R1667	11257	R1697	11287	R1727	11317	R1757	11347	R1787		
11168	R1608	11198	R1638	11228	R1668	11258	R1698	11288	R1728	11318	R1758	11348	R1788		
11169	R1609	11199	R1639	11229	R1669	11259	R1699	11289	R1729	11319	R1759	11349	R1789		

1st SP		2nd SP		3rd SP		4th SP		5th SP		6th SP		7th SP		abbrev.	Signal name
Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal		
11170	R1610	11200	R1640	11230	R1670	11260	R1700	11290	R1730	11320	R1760	11350	R1790		
11171	R1611	11201	R1641	11231	R1671	11261	R1701	11291	R1731	11321	R1761	11351	R1791		Spindle motor temperature
11172	R1612	11202	R1642	11232	R1672	11262	R1702	11292	R1732	11322	R1762	11352	R1792		
11173	R1613	11203	R1643	11233	R1673	11263	R1703	11293	R1733	11323	R1763	11353	R1793		
11174	R1614	11204	R1644	11234	R1674	11264	R1704	11294	R1734	11324	R1764	11354	R1794		
11175	R1615	11205	R1645	11235	R1675	11265	R1705	11295	R1735	11325	R1765	11355	R1795		
11176	R1616	11206	R1646	11236	R1676	11266	R1706	11296	R1736	11326	R1766	11356	R1796		
11177	R1617	11207	R1647	11237	R1677	11267	R1707	11297	R1737	11327	R1767	11357	R1797		
11178	R1618	11208	R1648	11238	R1678	11268	R1708	11298	R1738	11328	R1768	11358	R1798		
11179	R1619	11209	R1649	11239	R1679	11269	R1709	11299	R1739	11329	R1769	11359	R1799		

1st SP		2nd SP		3rd SP		4th SP		5th SP		6th SP		7th SP		abbrev.	Signal name
Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal		
11180	R1620	11210	R1650	11240	R1680	11270	R1710	11300	R1740	11330	R1770	11360	R1800		
11181	R1621	11211	R1651	11241	R1681	11271	R1711	11301	R1741	11331	R1771	11361	R1801		
11182	R1622	11212	R1652	11242	R1682	11272	R1712	11302	R1742	11332	R1772	11362	R1802		
11183	R1623	11213	R1653	11243	R1683	11273	R1713	11303	R1743	11333	R1773	11363	R1803		
11184	R1624	11214	R1654	11244	R1684	11274	R1714	11304	R1744	11334	R1774	11364	R1804		
11185	R1625	11215	R1655	11245	R1685	11275	R1715	11305	R1745	11335	R1775	11365	R1805		
11186	R1626	11216	R1656	11246	R1686	11276	R1716	11306	R1746	11336	R1776	11366	R1806		
11187	R1627	11217	R1657	11247	R1687	11277	R1717	11307	R1747	11337	R1777	11367	R1807		
11188	R1628	11218	R1658	11248	R1688	11278	R1718	11308	R1748	11338	R1778	11368	R1808		
11189	R1629	11219	R1659	11249	R1689	11279	R1719	11309	R1749	11339	R1779	11369	R1809		

3.3 Bit Type Output Signals (PLC->CNC)

3.3.1 System Command

Common		abbrev.	Signal name
Sharing G	Internal		
+000	Y300		
	Y301		
	Y302		
	Y303		
	Y304		
	Y305		
	Y306		
	Y307		

Common		abbrev.	Signal name
Sharing G	Internal		
+000	Y308		
	Y309		
	Y30A		
	Y30B		
	Y30C		
	Y30D		
	Y30E		
	Y30F		

Common		abbrev.	Signal name
Sharing G	Internal		
+001	Y310	MCT	Contactor shutoff test
	Y311	CHKTRG	Dual signals check start
	Y312	OFFCHK	Output OFF check
	Y313		
	Y314	RHD1	Integration time input 1
	Y315	RHD2	Integration time input 2
	Y316		
	Y317		

Common		abbrev.	Signal name
Sharing G	Internal		
+001	Y318	*KEY1	Data protect key 1
	Y319	*KEY2	Data protect key 2
	Y31A	*KEY3	Data protect key 3
	Y31B		
	Y31C		
	Y31D	CRTFN	CRT changeover completion
	Y31E	DISP1	Display changeover $1
	Y31F	DISP2	Display changeover $2

Common		abbrev.	Signal name
Sharing G	Internal		
+002	Y320		
	Y321	SMPTRG	NC data sampling trigger
	Y322	HISAVE	Saving operation history data
	Y323	EDITOK	Edited data recovery confirmation
	Y324		
	Y325		
	Y326		
	Y327	QEMG	PLC emergency stop

Common		abbrev.	Signal name
Sharing G	Internal		
+002	Y328	DOOR1	Door open I
	Y329	DOOR2	Door open II
	Y32A		
	Y32B	PABMI	PLC axis control buffering mode valid
	Y32C		
	Y32D	PCH1	PLC axis 1st handle valid
	Y32E	PCH2	PLC axis 2nd handle valid
	Y32F	PCH3	PLC axis 3rd handle valid

Common		abbrev.	Signal name
Sharing G	Internal		
+003	Y330	SSYNI	Spindle synchronization cancel
	Y331	SPCMPC	Chuck close
	Y332	SPSY	Spindle synchronization
	Y333	SPPHS	Spindle phase synchronization
	Y334	SPSDR	Spindle synchronous rotation direction
	Y335	SSPHM	Phase shift calculation request
	Y336	SSPHF	Phase offset request
	Y337	SPDRPO	Error temporary cancel

Common		abbrev.	Signal name
Sharing G	Internal		
+003	Y338	*PCD1	PLC axis near point detection 1st axis
	Y339	*PCD2	PLC axis near point detection 2nd axis
	Y33A	*PCD3	PLC axis near point detection 3rd axis
	Y33B	*PCD4	PLC axis near point detection 4th axis
	Y33C	*PCD5	PLC axis near point detection 5th axis
	Y33D	*PCD6	PLC axis near point detection 6th axis
	Y33E	*PCD7	PLC axis near point detection 7th axis
	Y33F	*PCD8	PLC axis near point detection 8th axis

Common		abbrev.	Signal name
Sharing G	Internal		
+004	Y340	PLCAE1	PLC axis control valid 1st axis
	Y341	PLCAE2	PLC axis control valid 2nd axis
	Y342	PLCAE3	PLC axis control valid 3rd axis
	Y343	PLCAE4	PLC axis control valid 4th axis
	Y344	PLCAE5	PLC axis control valid 5th axis
	Y345	PLCAE6	PLC axis control valid 6th axis
	Y346	PLCAE7	PLC axis control valid 7th axis
	Y347	PLCAE8	PLC axis control valid 8th axis

Common		abbrev.	Signal name
Sharing G	Internal		
+004	Y348		
	Y349		
	Y34A		
	Y34B		
	Y34C		
	Y34D		
	Y34E		
	Y34F		

Common		abbrev.	Signal name
Sharing G	Internal		
+005	Y350	DLDREQ	Download request
	Y351		
	Y352		
	Y353		
	Y354		
	Y355		
	Y356		
	Y357		

Common		abbrev.	Signal name
Sharing G	Internal		
+005	Y358		
	Y359		
	Y35A		
	Y35B		
	Y35C		
	Y35D		
	Y35E		
	Y35F		

Common		abbrev.	Signal name
Sharing G	Internal		
+006	Y360		
	Y361		
	Y362		
	Y363		
	Y364		
	Y365		
	Y366		
	Y367		

Common		abbrev.	Signal name
Sharing G	Internal		
+006	Y368		
	Y369		
	Y36A		
	Y36B		
	Y36C		
	Y36D		
	Y36E		
	Y36F		

Common		abbrev.	Signal name
Sharing G	Internal		
+007	Y370		
	Y371		
	Y372		
	Y373		
	Y374		
	Y375		
	Y376		
	Y377		

Common		abbrev.	Signal name
Sharing G	Internal		
+007	Y378		
	Y379		
	Y37A		
	Y37B		
	Y37C		
	Y37D		
	Y37E		
	Y37F		

Common		abbrev.	Signal name
Sharing G	Internal		
+008	Y380	APLCOUT1	APLC output signal 1
	Y381	APLCOUT2	APLC output signal 2
	Y382	APLCOUT3	APLC output signal 3
	Y383	APLCOUT4	APLC output signal 4
	Y384	APLCOUT5	APLC output signal 5
	Y385	APLCOUT6	APLC output signal 6
	Y386	APLCOUT7	APLC output signal 7
	Y387	APLCOUT8	APLC output signal 8

Common		abbrev.	Signal name
Sharing G	Internal		
+008	Y388	APLCOUT9	APLC output signal 9
	Y389	APLCOUT10	APLC output signal 10
	Y38A	APLCOUT11	APLC output signal 11
	Y38B	APLCOUT12	APLC output signal 12
	Y38C	APLCOUT13	APLC output signal 13
	Y38D	APLCOUT14	APLC output signal 14
	Y38E	APLCOUT15	APLC output signal 15
	Y38F	APLCOUT16	APLC output signal 16

Common		abbrev.	Signal name
Sharing G	Internal		
+009	Y390	APLCOUT17	APLC output signal 17
	Y391	APLCOUT18	APLC output signal 18
	Y392	APLCOUT19	APLC output signal 19
	Y393	APLCOUT20	APLC output signal 20
	Y394	APLCOUT21	APLC output signal 21
	Y395	APLCOUT22	APLC output signal 22
	Y396	APLCOUT23	APLC output signal 23
	Y397	APLCOUT24	APLC output signal 24

Common		abbrev.	Signal name
Sharing G	Internal		
+009	Y398	APLCOUT25	APLC output signal 25
	Y399	APLCOUT26	APLC output signal 26
	Y39A	APLCOUT27	APLC output signal 27
	Y39B	APLCOUT28	APLC output signal 28
	Y39C	APLCOUT29	APLC output signal 29
	Y39D	APLCOUT30	APLC output signal 30
	Y39E	APLCOUT31	APLC output signal 31
	Y39F	APLCOUT32	APLC output signal 32

Common		abbrev.	Signal name
Sharing G	Internal		
+010	Y3A0	PSKIP1	PLC skip 1
	Y3A1	PSKIP2	PLC skip 2
	Y3A2	PSKIP3	PLC skip 3
	Y3A3	PSKIP4	PLC skip 4
	Y3A4	PSKIP5	PLC skip 5
	Y3A5	PSKIP6	PLC skip 6
	Y3A6	PSKIP7	PLC skip 7
	Y3A7	PSKIP8	PLC skip 8

Common		abbrev.	Signal name
Sharing G	Internal		
+010	Y3A8	PSKIP9	PLC skip 9
	Y3A9	PSKIP10	PLC skip 10
	Y3AA	PSKIP11	PLC skip 11
	Y3AB	PSKIP12	PLC skip 12
	Y3AC	PSKIP13	PLC skip 13
	Y3AD	PSKIP14	PLC skip 14
	Y3AE	PSKIP15	PLC skip 15
	Y3AF	PSKIP16	PLC skip 16

Common		abbrev.	Signal name
Sharing G	Internal		
+011	Y3B0	PSKIP17	PLC skip 17
	Y3B1	PSKIP18	PLC skip 18
	Y3B2	PSKIP19	PLC skip 19
	Y3B3	PSKIP20	PLC skip 20
	Y3B4	PSKIP21	PLC skip 21
	Y3B5	PSKIP22	PLC skip 22
	Y3B6	PSKIP23	PLC skip 23
	Y3B7	PSKIP24	PLC skip 24

Common		abbrev.	Signal name
Sharing G	Internal		
+011	Y3B8	PSKIP25	PLC skip 25
	Y3B9	PSKIP26	PLC skip 26
	Y3BA	PSKIP27	PLC skip 27
	Y3BB	PSKIP28	PLC skip 28
	Y3BC	PSKIP29	PLC skip 29
	Y3BD	PSKIP30	PLC skip 30
	Y3BE	PSKIP31	PLC skip 31
	Y3BF	PSKIP32	PLC skip 32

Common		abbrev.	Signal name
Sharing G	Internal		
+012	Y3C0		
	Y3C1		
	Y3C2		
	Y3C3		
	Y3C4		
	Y3C5		
	Y3C6		
	Y3C7		

Common		abbrev.	Signal name
Sharing G	Internal		
+012	Y3C8		
	Y3C9		
	Y3CA		
	Y3CB		
	Y3CC		
	Y3CD		
	Y3CE		
	Y3CF		

Common		abbrev.	Signal name
Sharing G	Internal		
+013	Y3D0		
	Y3D1		
	Y3D2		
	Y3D3		
	Y3D4		
	Y3D5		
	Y3D6		
	Y3D7		

Common		abbrev.	Signal name
Sharing G	Internal		
+013	Y3D8		
	Y3D9		
	Y3DA		
	Y3DB		
	Y3DC		
	Y3DD		
	Y3DE		
	Y3DF		

Common		abbrev.	Signal name
Sharing G	Internal		
+014	Y3E0		
	Y3E1		
	Y3E2		
	Y3E3		
	Y3E4		
	Y3E5		
	Y3E6		
	Y3E7		

Common		abbrev.	Signal name
Sharing G	Internal		
+014	Y3E8		
	Y3E9		
	Y3EA		
	Y3EB		
	Y3EC		
	Y3ED		
	Y3EE		
	Y3EF		

Common		abbrev.	Signal name
Sharing G	Internal		
+015	Y3F0		
	Y3F1		
	Y3F2		
	Y3F3		
	Y3F4		
	Y3F5		
	Y3F6		
	Y3F7		

Common		abbrev.	Signal name
Sharing G	Internal		
+015	Y3F8		
	Y3F9		
	Y3FA		
	Y3FB		
	Y3FC		
	Y3FD		
	Y3FE		
	Y3FF		

3.3.2 Axis Command

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis	abbrev.	Signal name
+016	+019	+022	+025	+028	+031	+034	+037	<- Sharing G	
Y400	Y430	Y460	Y490	Y4C0	Y4F0	Y520	Y550	DTCHn	Control axis detach
Y401	Y431	Y461	Y491	Y4C1	Y4F1	Y521	Y551	*SVFn	Servo OFF
Y402	Y432	Y462	Y492	Y4C2	Y4F2	Y522	Y552	MIn	Mirror image
Y403	Y433	Y463	Y493	Y4C3	Y4F3	Y523	Y553	*+EDTn	External deceleration +
Y404	Y434	Y464	Y494	Y4C4	Y4F4	Y524	Y554	*-EDTn	External deceleration -
Y405	Y435	Y465	Y495	Y4C5	Y4F5	Y525	Y555	*+AITn	Automatic interlock +
Y406	Y436	Y466	Y496	Y4C6	Y4F6	Y526	Y556	*-AITn	Automatic interlock -
Y407	Y437	Y467	Y497	Y4C7	Y4F7	Y527	Y557	*+MITn	Manual interlock +
Y408	Y438	Y468	Y498	Y4C8	Y4F8	Y528	Y558	*-MITn	Manual interlock -
Y409	Y439	Y469	Y499	Y4C9	Y4F9	Y529	Y559	AMLKn	Automatic machine lock
Y40A	Y43A	Y46A	Y49A	Y4CA	Y4FA	Y52A	Y55A	MMLKn	Manual machine lock
Y40B	Y43B	Y46B	Y49B	Y4CB	Y4FB	Y52B	Y55B	+Jn	Feed axis selection +
Y40C	Y43C	Y46C	Y49C	Y4CC	Y4FC	Y52C	Y55C	-Jn	Feed axis selection -
Y40D	Y43D	Y46D	Y49D	Y4CD	Y4FD	Y52D	Y55D	MAEn	Manual/Automatic simultaneous valid
Y40E	Y43E	Y46E	Y49E	Y4CE	Y4FE	Y52E	Y55E	DTCH2n	Control axis detach 2
Y40F	Y43F	Y46F	Y49F	Y4CF	Y4FF	Y52F	Y55F		

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis	abbrev.	Signal name
+017	+020	+023	+026	+029	+032	+035	+038	<- Sharing G	
Y410	Y440	Y470	Y4A0	Y4D0	Y500	Y530	Y560	ILCn	Current limit changeover
Y411	Y441	Y471	Y4A1	Y4D1	Y501	Y531	Y561	DORn	Droop release request
Y412	Y442	Y472	Y4A2	Y4D2	Y502	Y532	Y562	AZSn	Zero point initialization set mode
Y413	Y443	Y473	Y4A3	Y4D3	Y503	Y533	Y563	ZSTn	Zero point initialization set start
Y414	Y444	Y474	Y4A4	Y4D4	Y504	Y534	Y564		
Y415	Y445	Y475	Y4A5	Y4D5	Y505	Y535	Y565	UCLPFn	Unclamp completion
Y416	Y446	Y476	Y4A6	Y4D6	Y506	Y536	Y566	MSORn	Multi-step speed monitor request
Y417	Y447	Y477	Y4A7	Y4D7	Y507	Y537	Y567	MSOMI1n	Multi-step speed monitor mode input 1
Y418	Y448	Y478	Y4A8	Y4D8	Y508	Y538	Y568	MSOMI2n	Multi-step speed monitor mode input 2
Y419	Y449	Y479	Y4A9	Y4D9	Y509	Y539	Y569		
Y41A	Y44A	Y47A	Y4AA	Y4DA	Y50A	Y53A	Y56A	CNT0n	Counter zero
Y41B	Y44B	Y47B	Y4AB	Y4DB	Y50B	Y53B	Y56B	CHGPLCn	PLC axis switching
Y41C	Y44C	Y47C	Y4AC	Y4DC	Y50C	Y53C	Y56C		
Y41D	Y44D	Y47D	Y4AD	Y4DD	Y50D	Y53D	Y56D		
Y41E	Y44E	Y47E	Y4AE	Y4DE	Y50E	Y53E	Y56E		
Y41F	Y44F	Y47F	Y4AF	Y4DF	Y50F	Y53F	Y56F		

1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis	abbrev.	Signal name
+018	+021	+024	+027	+030	+033	+036	+039	<- Sharing G	
Y420	Y450	Y480	Y4B0	Y4E0	Y510	Y540	Y570		
Y421	Y451	Y481	Y4B1	Y4E1	Y511	Y541	Y571		
Y422	Y452	Y482	Y4B2	Y4E2	Y512	Y542	Y572		
Y423	Y453	Y483	Y4B3	Y4E3	Y513	Y543	Y573		
Y424	Y454	Y484	Y4B4	Y4E4	Y514	Y544	Y574		
Y425	Y455	Y485	Y4B5	Y4E5	Y515	Y545	Y575		
Y426	Y456	Y486	Y4B6	Y4E6	Y516	Y546	Y576		
Y427	Y457	Y487	Y4B7	Y4E7	Y517	Y547	Y577		
Y428	Y458	Y488	Y4B8	Y4E8	Y518	Y548	Y578		
Y429	Y459	Y489	Y4B9	Y4E9	Y519	Y549	Y579		
Y42A	Y45A	Y48A	Y4BA	Y4EA	Y51A	Y54A	Y57A		
Y42B	Y45B	Y48B	Y4BB	Y4EB	Y51B	Y54B	Y57B		
Y42C	Y45C	Y48C	Y4BC	Y4EC	Y51C	Y54C	Y57C		
Y42D	Y45D	Y48D	Y4BD	Y4ED	Y51D	Y54D	Y57D		
Y42E	Y45E	Y48E	Y4BE	Y4EE	Y51E	Y54E	Y57E		
Y42F	Y45F	Y48F	Y4BF	Y4EF	Y51F	Y54F	Y57F		

9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis	abbrev.	Signal name
+040	+043	+046	+049	+052	+055	+058	+061	<- Sharing G	
Y580	Y5B0	Y5E0	Y610	Y640	Y670	Y6A0	Y6D0	DTCHn	Control axis detach
Y581	Y5B1	Y5E1	Y611	Y641	Y671	Y6A1	Y6D1	*SVFn	Servo OFF
Y582	Y5B2	Y5E2	Y612	Y642	Y672	Y6A2	Y6D2	MIn	Mirror image
Y583	Y5B3	Y5E3	Y613	Y643	Y673	Y6A3	Y6D3	*+EDTn	External deceleration +
Y584	Y5B4	Y5E4	Y614	Y644	Y674	Y6A4	Y6D4	*-EDTn	External deceleration -
Y585	Y5B5	Y5E5	Y615	Y645	Y675	Y6A5	Y6D5	*+AITn	Automatic interlock +
Y586	Y5B6	Y5E6	Y616	Y646	Y676	Y6A6	Y6D6	*-AITn	Automatic interlock -
Y587	Y5B7	Y5E7	Y617	Y647	Y677	Y6A7	Y6D7	*+MITn	Manual interlock +
Y588	Y5B8	Y5E8	Y618	Y648	Y678	Y6A8	Y6D8	*-MITn	Manual interlock -
Y589	Y5B9	Y5E9	Y619	Y649	Y679	Y6A9	Y6D9	AMLKn	Automatic machine lock
Y58A	Y5BA	Y5EA	Y61A	Y64A	Y67A	Y6AA	Y6DA	MMLKn	Manual machine lock
Y58B	Y5BB	Y5EB	Y61B	Y64B	Y67B	Y6AB	Y6DB	+Jn	Feed axis selection +
Y58C	Y5BC	Y5EC	Y61C	Y64C	Y67C	Y6AC	Y6DC	-Jn	Feed axis selection -
Y58D	Y5BD	Y5ED	Y61D	Y64D	Y67D	Y6AD	Y6DD	MAEn	Manual/Automatic simultaneous valid
Y58E	Y5BE	Y5EE	Y61E	Y64E	Y67E	Y6AE	Y6DE	DTCH2n	Control axis detach 2
Y58F	Y5BF	Y5EF	Y61F	Y64F	Y67F	Y6AF	Y6DF		

9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis	abbrev.	Signal name
+041	+044	+047	+050	+053	+056	+059	+062	<- Sharing G	
Y590	Y5C0	Y5F0	Y620	Y650	Y680	Y6B0	Y6E0	ILCn	Current limit changeover
Y591	Y5C1	Y5F1	Y621	Y651	Y681	Y6B1	Y6E1	DORn	Droop release request
Y592	Y5C2	Y5F2	Y622	Y652	Y682	Y6B2	Y6E2	AZSn	Zero point initialization set mode
Y593	Y5C3	Y5F3	Y623	Y653	Y683	Y6B3	Y6E3	ZSTn	Zero point initialization set start
Y594	Y5C4	Y5F4	Y624	Y654	Y684	Y6B4	Y6E4		
Y595	Y5C5	Y5F5	Y625	Y655	Y685	Y6B5	Y6E5	UCLPFn	Unclamp completion
Y596	Y5C6	Y5F6	Y626	Y656	Y686	Y6B6	Y6E6	MSORn	Multi-step speed monitor request
Y597	Y5C7	Y5F7	Y627	Y657	Y687	Y6B7	Y6E7	MSOMI1n	Multi-step speed monitor mode input 1
Y598	Y5C8	Y5F8	Y628	Y658	Y688	Y6B8	Y6E8	MSOMI2n	Multi-step speed monitor mode input 2
Y599	Y5C9	Y5F9	Y629	Y659	Y689	Y6B9	Y6E9		
Y59A	Y5CA	Y5FA	Y62A	Y65A	Y68A	Y6BA	Y6EA	CNT0n	Counter zero
Y59B	Y5CB	Y5FB	Y62B	Y65B	Y68B	Y6BB	Y6EB	CHGPLCn	PLC axis switching
Y59C	Y5CC	Y5FC	Y62C	Y65C	Y68C	Y6BC	Y6EC		
Y59D	Y5CD	Y5FD	Y62D	Y65D	Y68D	Y6BD	Y6ED		
Y59E	Y5CE	Y5FE	Y62E	Y65E	Y68E	Y6BE	Y6EE		
Y59F	Y5CF	Y5FF	Y62F	Y65F	Y68F	Y6BF	Y6EF		

9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis	abbrev.	Signal name
+042	+045	+048	+051	+054	+057	+060	+063	<- Sharing G	
Y5A0	Y5D0	Y600	Y630	Y660	Y690	Y6C0	Y6F0		
Y5A1	Y5D1	Y601	Y631	Y661	Y691	Y6C1	Y6F1		
Y5A2	Y5D2	Y602	Y632	Y662	Y692	Y6C2	Y6F2		
Y5A3	Y5D3	Y603	Y633	Y663	Y693	Y6C3	Y6F3		
Y5A4	Y5D4	Y604	Y634	Y664	Y694	Y6C4	Y6F4		
Y5A5	Y5D5	Y605	Y635	Y665	Y695	Y6C5	Y6F5		
Y5A6	Y5D6	Y606	Y636	Y666	Y696	Y6C6	Y6F6		
Y5A7	Y5D7	Y607	Y637	Y667	Y697	Y6C7	Y6F7		
Y5A8	Y5D8	Y608	Y638	Y668	Y698	Y6C8	Y6F8		
Y5A9	Y5D9	Y609	Y639	Y669	Y699	Y6C9	Y6F9		
Y5AA	Y5DA	Y60A	Y63A	Y66A	Y69A	Y6CA	Y6FA		
Y5AB	Y5DB	Y60B	Y63B	Y66B	Y69B	Y6CB	Y6FB		
Y5AC	Y5DC	Y60C	Y63C	Y66C	Y69C	Y6CC	Y6FC		
Y5AD	Y5DD	Y60D	Y63D	Y66D	Y69D	Y6CD	Y6FD		
Y5AE	Y5DE	Y60E	Y63E	Y66E	Y69E	Y6CE	Y6FE		
Y5AF	Y5DF	Y60F	Y63F	Y66F	Y69F	Y6CF	Y6FF		

3.3.3 Part System Command

$1	$2	$3	$4	$5	$6	$7	abbrev.	Signal name
+064	+078	+092	+106	+120	+134	+148	<- Sharing G	
Y700	Y7E0	Y8C0	Y9A0	YA80	YB60	YC40	Jn	Jog mode
Y701	Y7E1	Y8C1	Y9A1	YA81	YB61	YC41	Hn	Handle mode
Y702	Y7E2	Y8C2	Y9A2	YA82	YB62	YC42	Sn	Incremental mode
Y703	Y7E3	Y8C3	Y9A3	YA83	YB63	YC43	PTPn	Manual arbitrary feed mode
Y704	Y7E4	Y8C4	Y9A4	YA84	YB64	YC44	ZRNn	Reference position return mode
Y705	Y7E5	Y8C5	Y9A5	YA85	YB65	YC45	ASTn	Automatic initialization mode
Y706	Y7E6	Y8C6	Y9A6	YA86	YB66	YC46		
Y707	Y7E7	Y8C7	Y9A7	YA87	YB67	YC47		
Y708	Y7E8	Y8C8	Y9A8	YA88	YB68	YC48	MEMn	Program operation mode (Memory mode)
Y709	Y7E9	Y8C9	Y9A9	YA89	YB69	YC49	FTPn	FTP mode
Y70A	Y7EA	Y8CA	Y9AA	YA8A	YB6A	YC4A	EDTn	EDIT mode
Y70B	Y7EB	Y8CB	Y9AB	YA8B	YB6B	YC4B	Dn	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		

$1	$2	$3	$4	$5	$6	$7	abbrev.	Signal name
+065	+079	+093	+107	+121	+135	+149	<- Sharing G	
Y710	Y7F0	Y8D0	Y9B0	YA90	YB70	YC50	STn	Automatic operation "start" command (Cycle start)
Y711	Y7F1	Y8D1	Y9B1	YA91	YB71	YC51	*SPn	Automatic operation "pause" command (Feed hold)
Y712	Y7F2	Y8D2	Y9B2	YA92	YB72	YC52	SBKn	Single block
Y713	Y7F3	Y8D3	Y9B3	YA93	YB73	YC53	*BSLn	Block start interlock
Y714	Y7F4	Y8D4	Y9B4	YA94	YB74	YC54	*CSLn	Cutting block start interlock
Y715	Y7F5	Y8D5	Y9B5	YA95	YB75	YC55	DRNn	Dry run
Y716	Y7F6	Y8D6	Y9B6	YA96	YB76	YC56		
Y717	Y7F7	Y8D7	Y9B7	YA97	YB77	YC57	ERDn	Error detect
Y718	Y7F8	Y8D8	Y9B8	YA98	YB78	YC58	NRST1n	NC reset 1
Y719	Y7F9	Y8D9	Y9B9	YA99	YB79	YC59	NRST2n	NC reset 2
Y71A	Y7FA	Y8DA	Y9BA	YA9A	YB7A	YC5A	RRWn	Reset & rewind
Y71B	Y7FB	Y8DB	Y9BB	YA9B	YB7B	YC5B	*CDZn	Chamfering
Y71C	Y7FC	Y8DC	Y9BC	YA9C	YB7C	YC5C	ARSTn	Automatic restart
Y71D	Y7FD	Y8DD	Y9BD	YA9D	YB7D	YC5D	EXTSSn	External search strobe
Y71E	Y7FE	Y8DE	Y9BE	YA9E	YB7E	YC5E	FIN1n	M function finish 1
Y71F	Y7FF	Y8DF	Y9BF	YA9F	YB7F	YC5F	FIN2n	M function finish 2

$1	$2	$3	$4	$5	$6	$7	abbrev.	Signal name
+066	+080	+094	+108	+122	+136	+150	<- Sharing G	
Y720	Y800	Y8E0	Y9C0	YAA0	YB80	YC60	TLMn	Tool length measurement 1
Y721	Y801	Y8E1	Y9C1	YAA1	YB81	YC61	TLMSn	Tool length measurement 2
Y722	Y802	Y8E2	Y9C2	YAA2	YB82	YC62	SYCMn	Synchronization correction mode
Y723	Y803	Y8E3	Y9C3	YAA3	YB83	YC63	SRN	Program restart
Y724	Y804	Y8E4	Y9C4	YAA4	YB84	YC64		
Y725	Y805	Y8E5	Y9C5	YAA5	YB85	YC65	UITn	Macro interrupt
Y726	Y806	Y8E6	Y9C6	YAA6	YB86	YC66	RTn	Rapid traverse
Y727	Y807	Y8E7	Y9C7	YAA7	YB87	YC67		
Y728	Y808	Y8E8	Y9C8	YAA8	YB88	YC68	ABSn	Manual absolute
Y729	Y809	Y8E9	Y9C9	YAA9	YB89	YC69		
Y72A	Y80A	Y8EA	Y9CA	YAAA	YB8A	YC6A		
Y72B	Y80B	Y8EB	Y9CB	YAAB	YB8B	YC6B	CRQn	Recalculation request
Y72C	Y80C	Y8EC	Y9CC	YAAC	YB8C	YC6C	PDISPn	Program display during operation
Y72D	Y80D	Y8ED	Y9CD	YAAD	YB8D	YC6D	BDT1n	Optional block skip 1
Y72E	Y80E	Y8EE	Y9CE	YAAE	YB8E	YC6E		
Y72F	Y80F	Y8EF	Y9CF	YAAF	YB8F	YC6F		

$1	$2	$3	$4	$5	$6	$7	abbrev.	Signal name
+067	+081	+095	+109	+123	+137	+151	<- Sharing G	
Y730	Y810	Y8F0	Y9D0	YAB0	YB90	YC70	ZSL1n	Reference position selection code 1
Y731	Y811	Y8F1	Y9D1	YAB1	YB91	YC71	ZSL2n	Reference position selection code 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	Mn	Reference position selection method
Y738	Y818	Y8F8	Y9D8	YAB8	YB98	YC78	BDT2n	Optional block skip 2
Y739	Y819	Y8F9	Y9D9	YAB9	YB99	YC79	BDT3n	Optional block skip 3
Y73A	Y81A	Y8FA	Y9DA	YABA	YB9A	YC7A	BDT4n	Optional block skip 4
Y73B	Y81B	Y8FB	Y9DB	YABB	YB9B	YC7B	BDT5n	Optional block skip 5
Y73C	Y81C	Y8FC	Y9DC	YABC	YB9C	YC7C	BDT6n	Optional block skip 6
Y73D	Y81D	Y8FD	Y9DD	YABD	YB9D	YC7D	BDT7n	Optional block skip 7
Y73E	Y81E	Y8FE	Y9DE	YABE	YB9E	YC7E	BDT8n	Optional block skip 8
Y73F	Y81F	Y8FF	Y9DF	YABF	YB9F	YC7F	BDT9n	Optional block skip 9

$1	$2	$3	$4	$5	$6	$7	abbrev.	Signal name
+068	+082	+096	+110	+124	+138	+152	<- Sharing G	
Y740	Y820	Y900	Y9E0	YAC0	YBA0	YC80	HS11n	1st handle axis selection code 1
Y741	Y821	Y901	Y9E1	YAC1	YBA1	YC81	HS12n	1st handle axis selection code 2
Y742	Y822	Y902	Y9E2	YAC2	YBA2	YC82	HS14n	1st handle axis selection code 4
Y743	Y823	Y903	Y9E3	YAC3	YBA3	YC83	HS18n	1st handle axis selection code 8
Y744	Y824	Y904	Y9E4	YAC4	YBA4	YC84	HS116n	1st handle axis selection code 16
Y745	Y825	Y905	Y9E5	YAC5	YBA5	YC85		
Y746	Y826	Y906	Y9E6	YAC6	YBA6	YC86		
Y747	Y827	Y907	Y9E7	YAC7	YBA7	YC87	HS1Sn	1st handle valid
Y748	Y828	Y908	Y9E8	YAC8	YBA8	YC88	HS21n	2nd handle axis selection code 1
Y749	Y829	Y909	Y9E9	YAC9	YBA9	YC89	HS22n	2nd handle axis selection code 2
Y74A	Y82A	Y90A	Y9EA	YACA	YBAA	YC8A	HS24n	2nd handle axis selection code 4
Y74B	Y82B	Y90B	Y9EB	YACB	YBAB	YC8B	HS28n	2nd handle axis selection code 8
Y74C	Y82C	Y90C	Y9EC	YACC	YBAC	YC8C	HS216n	2nd handle axis selection code 16
Y74D	Y82D	Y90D	Y9ED	YACD	YBAD	YC8D		
Y74E	Y82E	Y90E	Y9EE	YACE	YBAE	YC8E		
Y74F	Y82F	Y90F	Y9EF	YACF	YBAF	YC8F	HS2Sn	2nd handle valid

$1	$2	$3	$4	$5	$6	$7	abbrev.	Signal name
+069	+083	+097	+111	+125	+139	+153	<- Sharing G	
Y750	Y830	Y910	Y9F0	YAD0	YBB0	YC90	HS31n	3rd handle axis selection code 1
Y751	Y831	Y911	Y9F1	YAD1	YBB1	YC91	HS32n	3rd handle axis selection code 2
Y752	Y832	Y912	Y9F2	YAD2	YBB2	YC92	HS34n	3rd handle axis selection code 4
Y753	Y833	Y913	Y9F3	YAD3	YBB3	YC93	HS38n	3rd handle axis selection code 8
Y754	Y834	Y914	Y9F4	YAD4	YBB4	YC94	HS316n	3rd handle axis selection code 16
Y755	Y835	Y915	Y9F5	YAD5	YBB5	YC95		
Y756	Y836	Y916	Y9F6	YAD6	YBB6	YC96		
Y757	Y837	Y917	Y9F7	YAD7	YBB7	YC97	HS3Sn	3rd handle valid
Y758	Y838	Y918	Y9F8	YAD8	YBB8	YC98	OVCn	Override cancel
Y759	Y839	Y919	Y9F9	YAD9	YBB9	YC99	OVSLn	Manual override method selection
Y75A	Y83A	Y91A	Y9FA	YADA	YBBA	YC9A	AFLn	Miscellaneous function lock
Y75B	Y83B	Y91B	Y9FB	YADB	YBBB	YC9B		
Y75C	Y83C	Y91C	Y9FC	YADC	YBBC	YC9C	TRVn	Tap retract
Y75D	Y83D	Y91D	Y9FD	YADD	YBBD	YC9D	RTNn	Reference position retract
Y75E	Y83E	Y91E	Y9FE	YADE	YBBE	YC9E		
Y75F	Y83F	Y91F	Y9FF	YADF	YBBF	YC9F	SPOFFMn	Spindle OFF mode

$1	$2	$3	$4	$5	$6	$7	abbrev.	Signal name
+070	+084	+098	+112	+126	+140	+154	<- Sharing G	
Y760	Y840	Y920	YA00	YAE0	YBC0	YCA0	*FV11n	Cutting feedrate override code 1
Y761	Y841	Y921	YA01	YAE1	YBC1	YCA1	*FV12n	Cutting feedrate override code 2
Y762	Y842	Y922	YA02	YAE2	YBC2	YCA2	*FV14n	Cutting feedrate override code 4
Y763	Y843	Y923	YA03	YAE3	YBC3	YCA3	*FV18n	Cutting feedrate override code 8
Y764	Y844	Y924	YA04	YAE4	YBC4	YCA4	*FV116n	Cutting feedrate override code 16
Y765	Y845	Y925	YA05	YAE5	YBC5	YCA5		
Y766	Y846	Y926	YA06	YAE6	YBC6	YCA6	FV2En	2nd cutting feedrate override valid
Y767	Y847	Y927	YA07	YAE7	YBC7	YCA7	FVSn	Cutting feedrate override method selection
Y768	Y848	Y928	YA08	YAE8	YBC8	YCA8	ROV1n	Rapid traverse override code 1
Y769	Y849	Y929	YA09	YAE9	YBC9	YCA9	ROV2n	Rapid traverse override code 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	ROVSn	Rapid traverse override method selection

$1	$2	$3	$4	$5	$6	$7	abbrev.	Signal name
+071	+085	+099	+113	+127	+141	+155	<- Sharing G	
Y770	Y850	Y930	YA10	YAF0	YBD0	YCB0	*JV1n	Manual feedrate code 1
Y771	Y851	Y931	YA11	YAF1	YBD1	YCB1	*JV2n	Manual feedrate code 2
Y772	Y852	Y932	YA12	YAF2	YBD2	YCB2	*JV4n	Manual feedrate code 4
Y773	Y853	Y933	YA13	YAF3	YBD3	YCB3	*JV8n	Manual feedrate code 8
Y774	Y854	Y934	YA14	YAF4	YBD4	YCB4	*JV16n	Manual feedrate code 16
Y775	Y855	Y935	YA15	YAF5	YBD5	YCB5		
Y776	Y856	Y936	YA16	YAF6	YBD6	YCB6		
Y777	Y857	Y937	YA17	YAF7	YBD7	YCB7	JVSn	Manual feedrate method selection
Y778	Y858	Y938	YA18	YAF8	YBD8	YCB8	PCF1n	Feedrate least increment code 1
Y779	Y859	Y939	YA19	YAF9	YBD9	YCB9	PCF2n	Feedrate least increment code 2
Y77A	Y85A	Y93A	YA1A	YAFA	YBDA	YCBA	JSYNn	Jog synchronous feed valid
Y77B	Y85B	Y93B	YA1B	YAFB	YBDB	YCBB	JHANn	Jog handle synchronous
Y77C	Y85C	Y93C	YA1C	YAFC	YBDC	YCBC		
Y77D	Y85D	Y93D	YA1D	YAFD	YBDD	YCBD	ILM1n	Current limit mode 1
Y77E	Y85E	Y93E	YA1E	YAFE	YBDE	YCBE	ILM2n	Current limit mode 2
Y77F	Y85F	Y93F	YA1F	YAFF	YBDF	YCBF		

$1	$2	$3	$4	$5	$6	$7	abbrev.	Signal name
+072	+086	+100	+114	+128	+142	+156	<- Sharing G	
Y780	Y860	Y940	YA20	YB00	YBE0	YCC0	MP1n	Handle/incremental feed magnification code 1
Y781	Y861	Y941	YA21	YB01	YBE1	YCC1	MP2n	Handle/incremental feed magnification code 2
Y782	Y862	Y942	YA22	YB02	YBE2	YCC2	MP4n	Handle/incremental feed magnification code 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	MPPn	Magnification valid for each handle
Y787	Y867	Y947	YA27	YB07	YBE7	YCC7	MPSn	Handle/incremental feed magnification method selection
Y788	Y868	Y948	YA28	YB08	YBE8	YCC8	TAL1n	Tool alarm 1/Tool skip 1
Y789	Y869	Y949	YA29	YB09	YBE9	YCC9	TAL2n	Tool alarm 2
Y78A	Y86A	Y94A	YA2A	YB0A	YBEA	YCCA	TCEFn	Usage data count valid
Y78B	Y86B	Y94B	YA2B	YB0B	YBEB	YCCB	TLF1n	Tool life management input
Y78C	Y86C	Y94C	YA2C	YB0C	YBEC	YCCC	TCRTn	Tool change reset
Y78D	Y86D	Y94D	YA2D	YB0D	YBED	YCCD		
Y78E	Y86E	Y94E	YA2E	YB0E	YBEE	YCCE		
Y78F	Y86F	Y94F	YA2F	YB0F	YBEF	YCCF		

$1	$2	$3	$4	$5	$6	$7	abbrev.	Signal name
+073	+087	+101	+115	+129	+143	+157	<- Sharing G	
Y790	Y870	Y950	YA30	YB10	YBF0	YCD0	CX11n	Manual arbitrary feed 1st axis selection code 1
Y791	Y871	Y951	YA31	YB11	YBF1	YCD1	CX12n	Manual arbitrary feed 1st axis selection code 2
Y792	Y872	Y952	YA32	YB12	YBF2	YCD2	CX14n	Manual arbitrary feed 1st axis selection code 4
Y793	Y873	Y953	YA33	YB13	YBF3	YCD3	CX18n	Manual arbitrary feed 1st axis selection code 8
Y794	Y874	Y954	YA34	YB14	YBF4	YCD4	CX116n	Manual arbitrary feed 1st axis selection code 16
Y795	Y875	Y955	YA35	YB15	YBF5	YCD5		
Y796	Y876	Y956	YA36	YB16	YBF6	YCD6		
Y797	Y877	Y957	YA37	YB17	YBF7	YCD7	CX1Sn	Manual arbitrary feed 1st axis valid
Y798	Y878	Y958	YA38	YB18	YBF8	YCD8	CX21n	Manual arbitrary feed 2nd axis selection code 1
Y799	Y879	Y959	YA39	YB19	YBF9	YCD9	CX22n	Manual arbitrary feed 2nd axis selection code 2
Y79A	Y87A	Y95A	YA3A	YB1A	YBFA	YCDA	CX24n	Manual arbitrary feed 2nd axis selection code 4
Y79B	Y87B	Y95B	YA3B	YB1B	YBFB	YCDB	CX28n	Manual arbitrary feed 2nd axis selection code 8
Y79C	Y87C	Y95C	YA3C	YB1C	YBFC	YCDC	CX216n	Manual arbitrary feed 2nd axis selection code 16
Y79D	Y87D	Y95D	YA3D	YB1D	YBFD	YCDD		
Y79E	Y87E	Y95E	YA3E	YB1E	YBFE	YCDE		
Y79F	Y87F	Y95F	YA3F	YB1F	YBFF	YCDF	CX2Sn	Manual arbitrary feed 2nd axis valid

$1	$2	$3	$4	$5	$6	$7	abbrev.	Signal name
+074	+088	+102	+116	+130	+144	+158	<- Sharing G	
Y7A0	Y880	Y960	YA40	YB20	YC00	YCE0	CX31n	Manual arbitrary feed 3rd axis selection code 1
Y7A1	Y881	Y961	YA41	YB21	YC01	YCE1	CX32n	Manual arbitrary feed 3rd axis selection code 2
Y7A2	Y882	Y962	YA42	YB22	YC02	YCE2	CX34n	Manual arbitrary feed 3rd axis selection code 4
Y7A3	Y883	Y963	YA43	YB23	YC03	YCE3	CX38n	Manual arbitrary feed 3rd axis selection code 8
Y7A4	Y884	Y964	YA44	YB24	YC04	YCE4	CX316n	Manual arbitrary feed 3rd axis selection code 16
Y7A5	Y885	Y965	YA45	YB25	YC05	YCE5		
Y7A6	Y886	Y966	YA46	YB26	YC06	YCE6		
Y7A7	Y887	Y967	YA47	YB27	YC07	YCE7	CX3Sn	Manual arbitrary feed 3rd axis valid
Y7A8	Y888	Y968	YA48	YB28	YC08	YCE8	CXS1n	Manual arbitrary feed smoothing off
Y7A9	Y889	Y969	YA49	YB29	YC09	YCE9	CXS2n	Manual arbitrary feed axis independent
Y7AA	Y88A	Y96A	YA4A	YB2A	YC0A	YCEA	CXS3n	Manual arbitrary feed EX.F/MODAL.F
Y7AB	Y88B	Y96B	YA4B	YB2B	YC0B	YCEB	CXS4n	Manual arbitrary feed G0/G1
Y7AC	Y88C	Y96C	YA4C	YB2C	YC0C	YCEC	CXS5n	Manual arbitrary feed MC/WK
Y7AD	Y88D	Y96D	YA4D	YB2D	YC0D	YCED	CXS6n	Manual arbitrary feed ABS/INC
Y7AE	Y88E	Y96E	YA4E	YB2E	YC0E	YCEE	*CXS7n	Manual arbitrary feed stop
Y7AF	Y88F	Y96F	YA4F	YB2F	YC0F	YCEF	CXS8n	Manual arbitrary feed strobe

$1	$2	$3	$4	$5	$6	$7	abbrev.	Signal name
+075	+089	+103	+117	+131	+145	+159	<- Sharing G	
Y7B0	Y890	Y970	YA50	YB30	YC10	YCF0	*ZRITn	2nd reference position return interlock
Y7B1	Y891	Y971	YA51	YB31	YC11	YCF1		
Y7B2	Y892	Y972	YA52	YB32	YC12	YCF2	RSSTn	Search & start
Y7B3	Y893	Y973	YA53	YB33	YC13	YCF3		
Y7B4	Y894	Y974	YA54	YB34	YC14	YCF4		
Y7B5	Y895	Y975	YA55	YB35	YC15	YCF5		
Y7B6	Y896	Y976	YA56	YB36	YC16	YCF6		Inclined axis control:no z axis compensation
Y7B7	Y897	Y977	YA57	YB37	YC17	YCF7		
Y7B8	Y898	Y978	YA58	YB38	YC18	YCF8	VAMODn	Hypothetical axis command mode
Y7B9	Y899	Y979	YA59	YB39	YC19	YCF9		Synchronous tapping command polarity reversal
Y7BA	Y89A	Y97A	YA5A	YB3A	YC1A	YCFA	CHPSn	Chopping
Y7BB	Y89B	Y97B	YA5B	YB3B	YC1B	YCFB		Chopping parameter valid
Y7BC	Y89C	Y97C	YA5C	YB3C	YC1C	YCFC		Compensation method selection
Y7BD	Y89D	Y97D	YA5D	YB3D	YC1D	YCFD		
Y7BE	Y89E	Y97E	YA5E	YB3E	YC1E	YCFE		Operation mode selection
Y7BF	Y89F	Y97F	YA5F	YB3F	YC1F	YCFF		Rapid traverse override valid

$1	$2	$3	$4	$5	$6	$7	abbrev.	Signal name
+076	+090	+104	+118	+132	+146	+160	<- Sharing G	
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		

$1	$2	$3	$4	$5	$6	$7	abbrev.	Signal name
+077	+091	+105	+119	+133	+147	+161	<- Sharing G	
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		

3.3.4 Spindle Command

1st SP	2nd SP	3rd SP	4th SP	5th SP	6th SP	7th SP	abbrev.	Signal name
+162	+165	+168	+171	+174	+177	+180	<- Sharing G	
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	GFINn	Gear shift completion
YD27	YD57	YD87	YDB7	YDE7	YE17	YE47		
YD28	YD58	YD88	YDB8	YDE8	YE18	YE48	SP1n	Spindle override code 1
YD29	YD59	YD89	YDB9	YDE9	YE19	YE49	SP2n	Spindle override code 2
YD2A	YD5A	YD8A	YDBA	YDEA	YE1A	YE4A	SP4n	Spindle override code 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	SPSn	Spindle override method selection

1st SP	2nd SP	3rd SP	4th SP	5th SP	6th SP	7th SP	abbrev.	Signal name
+163	+166	+169	+172	+175	+178	+181	<- Sharing G	
YD30	YD60	YD90	YDC0	YDF0	YE20	YE50	GI1n	Spindle gear selection code 1
YD31	YD61	YD91	YDC1	YDF1	YE21	YE51	GI2n	Spindle gear selection code 2
YD32	YD62	YD92	YDC2	YDF2	YE22	YE52		
YD33	YD63	YD93	YDC3	YDF3	YE23	YE53		
YD34	YD64	YD94	YDC4	YDF4	YE24	YE54	SSTPn	Spindle stop
YD35	YD65	YD95	YDC5	YDF5	YE25	YE55	SSFTn	Spindle gear shift
YD36	YD66	YD96	YDC6	YDF6	YE26	YE56	SORCn	Spindle orientation
YD37	YD67	YD97	YDC7	YDF7	YE27	YE57		
YD38	YD68	YD98	YDC8	YDF8	YE28	YE58	SRNn	Spindle forward run start
YD39	YD69	YD99	YDC9	YDF9	YE29	YE59	SRIn	Spindle reverse run start
YD3A	YD6A	YD9A	YDCA	YDFA	YE2A	YE5A		
YD3B	YD6B	YD9B	YDCB	YDFB	YE2B	YE5B		
YD3C	YD6C	YD9C	YDCC	YDFC	YE2C	YE5C	WRNn	Spindle forward run index
YD3D	YD6D	YD9D	YDCD	YDFD	YE2D	YE5D	WRIn	Spindle reverse run index
YD3E	YD6E	YD9E	YDCE	YDFE	YE2E	YE5E	ORCn	Spindle orientation command
YD3F	YD6F	YD9F	YDCF	YDFF	YE2F	YE5F	LRSLn	L coil selection

1st SP	2nd SP	3rd SP	4th SP	5th SP	6th SP	7th SP	abbrev.	Signal name
+164	+167	+170	+173	+176	+179	+182	<- Sharing G	
YD40	YD70	YDA0	YDD0	YE00	YE30	YE60		
YD41	YD71	YDA1	YDD1	YE01	YE31	YE61		
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	TL1n	Spindle torque limit 1
YD46	YD76	YDA6	YDD6	YE06	YE36	YE66	TL2n	Spindle torque limit 2
YD47	YD77	YDA7	YDD7	YE07	YE37	YE67	TL3n	Spindle torque limit 3
YD48	YD78	YDA8	YDD8	YE08	YE38	YE68		
YD49	YD79	YDA9	YDD9	YE09	YE39	YE69	SMSORn	Spindle multi-step monitor request
YD4A	YD7A	YDAA	YDDA	YE0A	YE3A	YE6A	SMSOMI1n	Spindle multi-step speed monitor mode input 1
YD4B	YD7B	YDAB	YDDB	YE0B	YE3B	YE6B	SMSOMI2n	Spindle multi-step speed monitor mode input 2
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	ESSCn	External axis speed clamp

3.4 Data Type Output Signals (PLC->CNC)

3.4.1 System Command

Common		abbrev.	Signal name
Sharing G	Internal		
+200	R2300		
+201	R2301		
+202	R2302		
+203	R2303		
+204	R2304		
+205	R2305		
+206	R2306		
+207	R2307		
+208	R2308		
+209	R2309	SMOD	Speed monitor mode

Common		abbrev.	Signal name
Sharing G	Internal		
+210	R2310		PLC axis droop release invalid axis
+211	R2311		
+212	R2312		KEYOUT
+213	R2313		
+214	R2314		
+215	R2315		
+216	R2316		
+217	R2317		
+218	R2318		
+219	R2319		

Common		abbrev.	Signal name
Sharing G	Internal		
+220	R2320		
+221	R2321		
+222	R2322		
+223	R2323		
+224	R2324		User macro input #1032 (PLC -> Controller)
+225	R2325		
+226	R2326		User macro input #1033 (PLC -> Controller)
+227	R2327		
+228	R2328		User macro input #1034 (PLC -> Controller)
+229	R2329		

Common		abbrev.	Signal name
Sharing G	Internal		
+230	R2330		User macro input #1035 (PLC -> Controller)
+231	R2331		
+232	R2332		PLC version code
+233	R2333		
+234	R2334		
+235	R2335		
+236	R2336		
+237	R2337		
+238	R2338		
+239	R2339		

Common		abbrev.	Signal name
Sharing G	Internal		
+240	R2340		1st axis index
+241	R2341		2nd axis index
+242	R2342		3rd axis index
+243	R2343		4th axis index
+244	R2344		5th axis index
+245	R2345		6th axis index
+246	R2346		7th axis index
+247	R2347		8th axis index
+248	R2348		9th axis index
+249	R2349		10th axis index

Common		abbrev.	Signal name
Sharing G	Internal		
+250	R2350		11th axis index
+251	R2351		12th axis index
+252	R2352		13th axis index
+253	R2353		14th axis index
+254	R2354		15th axis index
+255	R2355		16th axis index
+256	R2356		
+257	R2357		Spindle synchronization Basic spindle selection
+258	R2358		Spindle synchronization Synchronous spindle selection
+259	R2359		Spindle synchronization Phase shift amount

Common		abbrev.	Signal name
Sharing G	Internal		
+260	R2360		PLC version code (method 2)
+261	R2361		
+262	R2362		
+263	R2363		
+264	R2364		
+265	R2365		
+266	R2366		
+267	R2367		
+268	R2368		
+269	R2369		

Common		abbrev.	Signal name
Sharing G	Internal		
+270	R2370		
+271	R2371		
+272	R2372		
+273	R2373		
+274	R2374		
+275	R2375		
+276	R2376		
+277	R2377		
+278	R2378		
+279	R2379		

Common		abbrev.	Signal name
Sharing G	Internal		
+280	R2380		APLC output data 1
+281	R2381		APLC output data 2
+282	R2382		APLC output data 3
+283	R2383		APLC output data 4
+284	R2384		APLC output data 5
+285	R2385		APLC output data 6
+286	R2386		APLC output data 7
+287	R2387		APLC output data 8
+288	R2388		APLC output data 9
+289	R2389		APLC output data 10

Common		abbrev.	Signal name
Sharing G	Internal		
+290	R2390		GOT window Data changeover request
+291	R2391		
+292	R2392		
+293	R2393		
+294	R2394		
+295	R2395		
+296	R2396		
+297	R2397		
+298	R2398		
+299	R2399		

3.4.2 Part System Command

$1		$2		$3		$4		$5		$6		$7		abbrev.	Signal name
Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal		
+300	R2400	+400	R2500	+500	R2600	+600	R2700	+700	R2800	+800	R2900	+900	R3000		1st cutting feedrate override
+301	R2401	+401	R2501	+501	R2601	+601	R2701	+701	R2801	+801	R2901	+901	R3001		2nd cutting feedrate override
+302	R2402	+402	R2502	+502	R2602	+602	R2702	+702	R2802	+802	R2902	+902	R3002		Rapid traverse override
+303	R2403	+403	R2503	+503	R2603	+603	R2703	+703	R2803	+803	R2903	+903	R3003		
+304	R2404	+404	R2504	+504	R2604	+604	R2704	+704	R2804	+804	R2904	+904	R3004		Manual feedrate
+305	R2405	+405	R2505	+505	R2605	+605	R2705	+705	R2805	+805	R2905	+905	R3005		
+306	R2406	+406	R2506	+506	R2606	+606	R2706	+706	R2806	+806	R2906	+906	R3006		
+307	R2407	+407	R2507	+507	R2607	+607	R2707	+707	R2807	+807	R2907	+907	R3007		
+308	R2408	+408	R2508	+508	R2608	+608	R2708	+708	R2808	+808	R2908	+908	R3008		1st handle/incremental feed magnification
+309	R2409	+409	R2509	+509	R2609	+609	R2709	+709	R2809	+809	R2909	+909	R3009		

$1		$2		$3		$4		$5		$6		$7		abbrev.	Signal name
Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal		
+310	R2410	+410	R2510	+510	R2610	+610	R2710	+710	R2810	+810	R2910	+910	R3010		2nd handle feed magnification
+311	R2411	+411	R2511	+511	R2611	+611	R2711	+711	R2811	+811	R2911	+911	R3011		
+312	R2412	+412	R2512	+512	R2612	+612	R2712	+712	R2812	+812	R2912	+912	R3012		3rd handle feed magnification
+313	R2413	+413	R2513	+513	R2613	+613	R2713	+713	R2813	+813	R2913	+913	R3013		
+314	R2414	+414	R2514	+514	R2614	+614	R2714	+714	R2814	+814	R2914	+914	R3014		Manual arbitrary feed 1st axis travel amount
+315	R2415	+415	R2515	+515	R2615	+615	R2715	+715	R2815	+815	R2915	+915	R3015		
+316	R2416	+416	R2516	+516	R2616	+616	R2716	+716	R2816	+816	R2916	+916	R3016		Manual arbitrary feed 2nd axis travel amount
+317	R2417	+417	R2517	+517	R2617	+617	R2717	+717	R2817	+817	R2917	+917	R3017		
+318	R2418	+418	R2518	+518	R2618	+618	R2718	+718	R2818	+818	R2918	+918	R3018		Manual arbitrary feed 3rd axis travel amount
+319	R2419	+419	R2519	+519	R2619	+619	R2719	+719	R2819	+819	R2919	+919	R3019		

$1		$2		$3		$4		$5		$6		$7		abbrev.	Signal name
Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal		
+320	R2420	+420	R2520	+520	R2620	+620	R2720	+720	R2820	+820	R2920	+920	R3020		OT ignored
+321	R2421	+421	R2521	+521	R2621	+621	R2721	+721	R2821	+821	R2921	+921	R3021		Near-point dog ignored
+322	R2422	+422	R2522	+522	R2622	+622	R2722	+722	R2822	+822	R2922	+922	R3022		
+323	R2423	+423	R2523	+523	R2623	+623	R2723	+723	R2823	+823	R2923	+923	R3023		
+324	R2424	+424	R2524	+524	R2624	+624	R2724	+724	R2824	+824	R2924	+924	R3024		
+325	R2425	+425	R2525	+525	R2625	+625	R2725	+725	R2825	+825	R2925	+925	R3025		
+326	R2426	+426	R2526	+526	R2626	+626	R2726	+726	R2826	+826	R2926	+926	R3026		
+327	R2427	+427	R2527	+527	R2627	+627	R2727	+727	R2827	+827	R2927	+927	R3027		
+328	R2428	+428	R2528	+528	R2628	+628	R2728	+728	R2828	+828	R2928	+928	R3028		
+329	R2429	+429	R2529	+529	R2629	+629	R2729	+729	R2829	+829	R2929	+929	R3029		

$1		$2		$3		$4		$5		$6		$7		abbrev.	Signal name
Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal		
+330	R2430	+430	R2530	+530	R2630	+630	R2730	+730	R2830	+830	R2930	+930	R3030		Tool group No. designation
+331	R2431	+431	R2531	+531	R2631	+631	R2731	+731	R2831	+831	R2931	+931	R3031		
+332	R2432	+432	R2532	+532	R2632	+632	R2732	+732	R2832	+832	R2932	+932	R3032		Synchronization control operation method
+333	R2433	+433	R2533	+533	R2633	+633	R2733	+733	R2833	+833	R2933	+933	R3033		Droop release invalid axis
+334	R2434	+434	R2534	+534	R2634	+634	R2734	+734	R2834	+834	R2934	+934	R3034		Each axis reference position selection
+335	R2435	+435	R2535	+535	R2635	+635	R2735	+735	R2835	+835	R2935	+935	R3035		
+336	R2436	+436	R2536	+536	R2636	+636	R2736	+736	R2836	+836	R2936	+936	R3036		
+337	R2437	+437	R2537	+537	R2637	+637	R2737	+737	R2837	+837	R2937	+937	R3037		
+338	R2438	+438	R2538	+538	R2638	+638	R2738	+738	R2838	+838	R2938	+938	R3038		Search & start program No.
+339	R2439	+439	R2539	+539	R2639	+639	R2739	+739	R2839	+839	R2939	+939	R3039		

$1		$2		$3		$4		$5		$6		$7		abbrev.	Signal name
Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal		
+340	R2440	+440	R2540	+540	R2640	+640	R2740	+740	R2840	+840	R2940	+940	R3040		
+341	R2441	+441	R2541	+541	R2641	+641	R2741	+741	R2841	+841	R2941	+941	R3041		
+342	R2442	+442	R2542	+542	R2642	+642	R2742	+742	R2842	+842	R2942	+942	R3042		
+343	R2443	+443	R2543	+543	R2643	+643	R2743	+743	R2843	+843	R2943	+943	R3043		
+344	R2444	+444	R2544	+544	R2644	+644	R2744	+744	R2844	+844	R2944	+944	R3044		
+345	R2445	+445	R2545	+545	R2645	+645	R2745	+745	R2845	+845	R2945	+945	R3045		
+346	R2446	+446	R2546	+546	R2646	+646	R2746	+746	R2846	+846	R2946	+946	R3046		Workpiece coordinate offset measurement compensation No.
+347	R2447	+447	R2547	+547	R2647	+647	R2747	+747	R2847	+847	R2947	+947	R3047		
+348	R2448	+448	R2548	+548	R2648	+648	R2748	+748	R2848	+848	R2948	+948	R3048		Selected tool No.
+349	R2449	+449	R2549	+549	R2649	+649	R2749	+749	R2849	+849	R2949	+949	R3049		

$1		$2		$3		$4		$5		$6		$7		abbrev.	Signal name
Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal		
+350	R2450	+450	R2550	+550	R2650	+650	R2750	+750	R2850	+850	R2950	+950	R3050		
+351	R2451	+451	R2551	+551	R2651	+651	R2751	+751	R2851	+851	R2951	+951	R3051		
+352	R2452	+452	R2552	+552	R2652	+652	R2752	+752	R2852	+852	R2952	+952	R3052		
+353	R2453	+453	R2553	+553	R2653	+653	R2753	+753	R2853	+853	R2953	+953	R3053		
+354	R2454	+454	R2554	+554	R2654	+654	R2754	+754	R2854	+854	R2954	+954	R3054		
+355	R2455	+455	R2555	+555	R2655	+655	R2755	+755	R2855	+855	R2955	+955	R3055		
+356	R2456	+456	R2556	+556	R2656	+656	R2756	+756	R2856	+856	R2956	+956	R3056		
+357	R2457	+457	R2557	+557	R2657	+657	R2757	+757	R2857	+857	R2957	+957	R3057		
+358	R2458	+458	R2558	+558	R2658	+658	R2758	+758	R2858	+858	R2958	+958	R3058		
+359	R2459	+459	R2559	+559	R2659	+659	R2759	+759	R2859	+859	R2959	+959	R3059		

$1		$2		$3		$4		$5		$6		$7		abbrev.	Signal name
Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal		
+360	R2460	+460	R2560	+560	R2660	+660	R2760	+760	R2860	+860	R2960	+960	R3060		
+361	R2461	+461	R2561	+561	R2661	+661	R2761	+761	R2861	+861	R2961	+961	R3061		External search device No.
+362	R2462	+462	R2562	+562	R2662	+662	R2762	+762	R2862	+862	R2962	+962	R3062		External search program No.
+363	R2463	+463	R2563	+563	R2663	+663	R2763	+763	R2863	+863	R2963	+963	R3063		
+364	R2464	+464	R2564	+564	R2664	+664	R2764	+764	R2864	+864	R2964	+964	R3064		External search sequence No.
+365	R2465	+465	R2565	+565	R2665	+665	R2765	+765	R2865	+865	R2965	+965	R3065		
+366	R2466	+466	R2566	+566	R2666	+666	R2766	+766	R2866	+866	R2966	+966	R3066		External search block No.
+367	R2467	+467	R2567	+567	R2667	+667	R2767	+767	R2867	+867	R2967	+967	R3067		
+368	R2468	+468	R2568	+568	R2668	+668	R2768	+768	R2868	+868	R2968	+968	R3068		
+369	R2469	+469	R2569	+569	R2669	+669	R2769	+769	R2869	+869	R2969	+969	R3069		

$1		$2		$3		$4		$5		$6		$7		abbrev.	Signal name
Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal		
+370	R2470	+470	R2570	+570	R2670	+670	R2770	+770	R2870	+870	R2970	+970	R3070		User Macro input #1032 (PLC -> Controller)
+371	R2471	+471	R2571	+571	R2671	+671	R2771	+771	R2871	+871	R2971	+971	R3071		
+372	R2472	+472	R2572	+572	R2672	+672	R2772	+772	R2872	+872	R2972	+972	R3072		User Macro input #1033 (PLC -> Controller)
+373	R2473	+473	R2573	+573	R2673	+673	R2773	+773	R2873	+873	R2973	+973	R3073		
+374	R2474	+474	R2574	+574	R2674	+674	R2774	+774	R2874	+874	R2974	+974	R3074		User Macro input #1034 (PLC -> Controller)
+375	R2475	+475	R2575	+575	R2675	+675	R2775	+775	R2875	+875	R2975	+975	R3075		
+376	R2476	+476	R2576	+576	R2676	+676	R2776	+776	R2876	+876	R2976	+976	R3076		User Macro input #1035 (PLC -> Controller)
+377	R2477	+477	R2577	+577	R2677	+677	R2777	+777	R2877	+877	R2977	+977	R3077		
+378	R2478	+478	R2578	+578	R2678	+678	R2778	+778	R2878	+878	R2978	+978	R3078		
+379	R2479	+479	R2579	+579	R2679	+679	R2779	+779	R2879	+879	R2979	+979	R3079		

$1		$2		$3		$4		$5		$6		$7		abbrev.	Signal name
Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal		
+380	R2480	+480	R2580	+580	R2680	+680	R2780	+780	R2880	+880	R2980	+980	R3080	CHPOVn	Chopping override
+381	R2481	+481	R2581	+581	R2681	+681	R2781	+781	R2881	+881	R2981	+981	R3081		Chopping axis selection
+382	R2482	+482	R2582	+582	R2682	+682	R2782	+782	R2882	+882	R2982	+982	R3082		Upper dead point designation (L)
+383	R2483	+483	R2583	+583	R2683	+683	R2783	+783	R2883	+883	R2983	+983	R3083		Upper dead point designation (H)
+384	R2484	+484	R2584	+584	R2684	+684	R2784	+784	R2884	+884	R2984	+984	R3084		Lower dead point designation (L)
+385	R2485	+485	R2585	+585	R2685	+685	R2785	+785	R2885	+885	R2985	+985	R3085		Lower dead point designation (H)
+386	R2486	+486	R2586	+586	R2686	+686	R2786	+786	R2886	+886	R2986	+986	R3086		Number of cycles designation
+387	R2487	+487	R2587	+587	R2687	+687	R2787	+787	R2887	+887	R2987	+987	R3087		Data No.
+388	R2488	+488	R2588	+588	R2688	+688	R2788	+788	R2888	+888	R2988	+988	R3088		
+389	R2489	+489	R2589	+589	R2689	+689	R2789	+789	R2889	+889	R2989	+989	R3089		

$1		$2		$3		$4		$5		$6		$7		abbrev.	Signal name
Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal		
+390	R2490	+490	R2590	+590	R2690	+690	R2790	+790	R2890	+890	R2990	+990	R3090		
+391	R2491	+491	R2591	+591	R2691	+691	R2791	+791	R2891	+891	R2991	+991	R3091		
+392	R2492	+492	R2592	+592	R2692	+692	R2792	+792	R2892	+892	R2992	+992	R3092		
+393	R2493	+493	R2593	+593	R2693	+693	R2793	+793	R2893	+893	R2993	+993	R3093		
+394	R2494	+494	R2594	+594	R2694	+694	R2794	+794	R2894	+894	R2994	+994	R3094		
+395	R2495	+495	R2595	+595	R2695	+695	R2795	+795	R2895	+895	R2995	+995	R3095		
+396	R2496	+496	R2596	+596	R2696	+696	R2796	+796	R2896	+896	R2996	+996	R3096		
+397	R2497	+497	R2597	+597	R2697	+697	R2797	+797	R2897	+897	R2997	+997	R3097		
+398	R2498	+498	R2598	+598	R2698	+698	R2798	+798	R2898	+898	R2998	+998	R3098		
+399	R2499	+499	R2599	+599	R2699	+699	R2799	+799	R2899	+899	R2999	+999	R3099		

3.4.3 Axis Command

1st axis		2nd axis		3rd axis		4th axis		5th axis		6th axis		7th axis		8th axis		abbrev.	Signal name
Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal		
+1000	R3100	+1010	R3110	+1020	R3120	+1030	R3130	+1040	R3140	+1050	R3150	+1060	R3160	+1070	R3170		External machine coordinate system compensation data
+1001	R3101	+1011	R3111	+1021	R3121	+1031	R3131	+1041	R3141	+1051	R3151	+1061	R3161	+1071	R3171		
+1002	R3102	+1012	R3112	+1022	R3122	+1032	R3132	+1042	R3142	+1052	R3152	+1062	R3162	+1072	R3172		Thermal expansion offset compensation amount
+1003	R3103	+1013	R3113	+1023	R3123	+1033	R3133	+1043	R3143	+1053	R3153	+1063	R3163	+1073	R3173		Thermal expansion max. compensation amount
+1004	R3104	+1014	R3114	+1024	R3124	+1034	R3134	+1044	R3144	+1054	R3154	+1064	R3164	+1074	R3174		External deceleration speed selection
+1005	R3105	+1015	R3115	+1025	R3125	+1035	R3135	+1045	R3145	+1055	R3155	+1065	R3165	+1075	R3175		
+1006	R3106	+1016	R3116	+1026	R3126	+1036	R3136	+1046	R3146	+1056	R3156	+1066	R3166	+1076	R3176		
+1007	R3107	+1017	R3117	+1027	R3127	+1037	R3137	+1047	R3147	+1057	R3157	+1067	R3167	+1077	R3177		
+1008	R3108	+1018	R3118	+1028	R3128	+1038	R3138	+1048	R3148	+1058	R3158	+1068	R3168	+1078	R3178		
+1009	R3109	+1019	R3119	+1029	R3129	+1039	R3139	+1049	R3149	+1059	R3159	+1069	R3169	+1079	R3179		

9th axis		10th axis		11th axis		12th axis		13th axis		14th axis		15th axis		16th axis		abbrev.	Signal name
Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal		
+1080	R3180	+1090	R3190	+1100	R3200	+1110	R3210	+1120	R3220	+1130	R3230	+1140	R3240	+1150	R3250		External machine coordinate system compensation data
+1081	R3181	+1091	R3191	+1101	R3201	+1111	R3211	+1121	R3221	+1131	R3231	+1141	R3241	+1151	R3251		
+1082	R3182	+1092	R3192	+1102	R3202	+1112	R3212	+1122	R3222	+1132	R3232	+1142	R3242	+1152	R3252		Thermal expansion offset compensation amount
+1083	R3183	+1093	R3193	+1103	R3203	+1113	R3213	+1123	R3223	+1133	R3233	+1143	R3243	+1153	R3253		Thermal expansion max. compensation amount
+1084	R3184	+1094	R3194	+1104	R3204	+1114	R3214	+1124	R3224	+1134	R3234	+1144	R3244	+1154	R3254		External deceleration speed selection
+1085	R3185	+1095	R3195	+1105	R3205	+1115	R3215	+1125	R3225	+1135	R3235	+1145	R3245	+1155	R3255		
+1086	R3186	+1096	R3196	+1106	R3206	+1116	R3216	+1126	R3226	+1136	R3236	+1146	R3246	+1156	R3256		
+1087	R3187	+1097	R3197	+1107	R3207	+1117	R3217	+1127	R3227	+1137	R3237	+1147	R3247	+1157	R3257		
+1088	R3188	+1098	R3198	+1108	R3208	+1118	R3218	+1128	R3228	+1138	R3238	+1148	R3248	+1158	R3258		
+1089	R3189	+1099	R3199	+1109	R3209	+1119	R3219	+1129	R3229	+1139	R3239	+1149	R3249	+1159	R3259		

3.4.4 Spindle Command

1st SP		2nd SP		3rd SP		4th SP		5th SP		6th SP		7th SP		abbrev.	Signal name
Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal		
+1160	R3900	+1190	R3930	+1220	R3960	+1250	R3990	+1280	R4020	+1310	R4050	+1340	R4080	SRPMOTn	Spindle command rotation speed output
+1161	R3901	+1191	R3931	+1221	R3961	+1251	R3991	+1281	R4021	+1311	R4051	+1341	R4081		
+1162	R3902	+1192	R3932	+1222	R3962	+1252	R3992	+1282	R4022	+1312	R4052	+1342	R4082		
+1163	R3903	+1193	R3933	+1223	R3963	+1253	R3993	+1283	R4023	+1313	R4053	+1343	R4083		
+1164	R3904	+1194	R3934	+1224	R3964	+1254	R3994	+1284	R4024	+1314	R4054	+1344	R4084		
+1165	R3905	+1195	R3935	+1225	R3965	+1255	R3995	+1285	R4025	+1315	R4055	+1345	R4085		
+1166	R3906	+1196	R3936	+1226	R3966	+1256	R3996	+1286	R4026	+1316	R4056	+1346	R4086		
+1167	R3907	+1197	R3937	+1227	R3967	+1257	R3997	+1287	R4027	+1317	R4057	+1347	R4087		
+1168	R3908	+1198	R3938	+1228	R3968	+1258	R3998	+1288	R4028	+1318	R4058	+1348	R4088		
+1169	R3909	+1199	R3939	+1229	R3969	+1259	R3999	+1289	R4029	+1319	R4059	+1349	R4089		

1st SP		2nd SP		3rd SP		4th SP		5th SP		6th SP		7th SP		abbrev.	Signal name
Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal		
+1170	R3910	+1200	R3940	+1230	R3970	+1260	R4000	+1290	R4030	+1320	R4060	+1350	R4090		S command override
+1171	R3911	+1201	R3941	+1231	R3971	+1261	R4001	+1291	R4031	+1321	R4061	+1351	R4091		Multi-point orientation position data
+1172	R3912	+1202	R3942	+1232	R3972	+1262	R4002	+1292	R4032	+1322	R4062	+1352	R4092		
+1173	R3913	+1203	R3943	+1233	R3973	+1263	R4003	+1293	R4033	+1323	R4063	+1353	R4093		
+1174	R3914	+1204	R3944	+1234	R3974	+1264	R4004	+1294	R4034	+1324	R4064	+1354	R4094		
+1175	R3915	+1205	R3945	+1235	R3975	+1265	R4005	+1295	R4035	+1325	R4065	+1355	R4095		
+1176	R3916	+1206	R3946	+1236	R3976	+1266	R4006	+1296	R4036	+1326	R4066	+1356	R4096		
+1177	R3917	+1207	R3947	+1237	R3977	+1267	R4007	+1297	R4037	+1327	R4067	+1357	R4097		
+1178	R3918	+1208	R3948	+1238	R3978	+1268	R4008	+1298	R4038	+1328	R4068	+1358	R4098		
+1179	R3919	+1209	R3949	+1239	R3979	+1269	R4009	+1299	R4039	+1329	R4069	+1359	R4099		

1st SP		2nd SP		3rd SP		4th SP		5th SP		6th SP		7th SP		abbrev.	Signal name
Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal	Sharing G	Inter-nal		
+1180	R3920	+1210	R3950	+1240	R3980	+1270	R4010	+1300	R4040	+1330	R4070	+1360	R4100		
+1181	R3921	+1211	R3951	+1241	R3981	+1271	R4011	+1301	R4041	+1331	R4071	+1361	R4101		
+1182	R3922	+1212	R3952	+1242	R3982	+1272	R4012	+1302	R4042	+1332	R4072	+1362	R4102		
+1183	R3923	+1213	R3953	+1243	R3983	+1273	R4013	+1303	R4043	+1333	R4073	+1363	R4103		
+1184	R3924	+1214	R3954	+1244	R3984	+1274	R4014	+1304	R4044	+1334	R4074	+1364	R4104		
+1185	R3925	+1215	R3955	+1245	R3985	+1275	R4015	+1305	R4045	+1335	R4075	+1365	R4105		
+1186	R3926	+1216	R3956	+1246	R3986	+1276	R4016	+1306	R4046	+1336	R4076	+1366	R4106		
+1187	R3927	+1217	R3957	+1247	R3987	+1277	R4017	+1307	R4047	+1337	R4077	+1367	R4107		
+1188	R3928	+1218	R3958	+1248	R3988	+1278	R4018	+1308	R4048	+1338	R4078	+1368	R4108		
+1189	R3929	+1219	R3959	+1249	R3989	+1279	R4019	+1309	R4049	+1339	R4079	+1369	R4109		

3.5 Each Application

3.5.1 PLC Axis State

Sharing G	Internal	abbrev.	Signal details	
11370	R1900		Status	1st PLC axis
11371	R1901		Alarm details	
11372	R1902		Machine position	
11373	R1903			
11374	R1904		Remaining distance	
11375	R1905			
11376	R1906		Status 2	
11377	R1907			

Sharing G	Internal	abbrev.	Signal details	
11378	R1908		Status	2nd PLC axis
11379	R1909		Alarm details	
11380	R1910		Machine position	
11381	R1911			
11382	R1912		Remaining distance	
11383	R1913			
11384	R1914		Status 2	
11385	R1915			

Sharing G	Internal	abbrev.	Signal details	
11386	R1916		Status	3rd PLC axis
11387	R1917		Alarm details	
11388	R1918		Machine position	
11389	R1919			
11390	R1920		Remaining distance	
11391	R1921			
11392	R1922		Status 2	
11393	R1923			

Sharing G	Internal	abbrev.	Signal details	
11394	R1924		Status	4th PLC axis
11395	R1925		Alarm details	
11396	R1926		Machine position	
11397	R1927			
11398	R1928		Remaining distance	
11399	R1929			
11400	R1930		Status 2	
11401	R1931			

Sharing G	Internal	abbrev.	Signal details	
11402	R1932		Status	5th PLC axis
11403	R1933		Alarm details	
11404	R1934		Machine position	
11405	R1935			
11406	R1936		Remaining distance	
11407	R1937			
11408	R1938		Status 2	
11409	R1939			

Sharing G	Internal	abbrev.	Signal details	
11410	R1940		Status	6th PLC axis
11411	R1941		Alarm details	
11412	R1942		Machine position	
11413	R1943			
11414	R1944		Remaining distance	
11415	R1945			
11416	R1946		Status 2	
11417	R1947			

Sharing G	Internal	abbrev.	Signal details	
11418	R1948		Status	7th PLC axis
11419	R1949		Alarm details	
11420	R1950		Machine position	
11421	R1951			
11422	R1952		Remaining distance	
11423	R1953			
11424	R1954		Status 2	
11425	R1955			

Sharing G	Internal	Abbrev.	Signal details	
11426	R1956		Status	For buffering mode Data A
11427	R1957		Alarm details	
11428	R1958		Mashine position	
11429	R1959			
11430	R1960		Remaining distance	
11431	R1961			
11432	R1962			
11433	R1963			

Sharing G	Internal	Abbrev.	Signal details	
11434	R1964		Status	For buffering mode Data B
11435	R1965		Alarm details	
11436	R1966		Machine position	
11437	R1967			
11438	R1968		Remaining distance	
11439	R1969			
11440	R1970			
11441	R1971			

Sharing G	Internal	Abbrev.	Signal details	
11442	R1972		Status	For buffering mode Data C
11443	R1973		Alarm details	
11444	R1974		Machine position	
11445	R1975			
11446	R1976		Remaining distance	
11447	R1977			
11448	R1978			
11449	R1979			

Sharing G	Internal	Abbrev.	Signal details	
12660	R1980		Status	8th PLC axis
12661	R1981		Alarm detaiils	
12662	R1982		Machine position	
12663	R1983			
12664	R1984		Remaining distance	
12665	R1985			
12666	R1986		Status 2	
12667	R1987			

3.5.2 PLC Axis Control

Sharing G	Internal	abbrev.	Signal details	
+1370	R4200		Axis designation	1st PLC axis
+1371	R4201		Operation mode	
+1372	R4202		Feedrate	
+1373	R4203			
+1374	R4204		Movement data	
+1375	R4205			
+1376	R4206		Control signals	
+1377	R4207		External deceleration speed selection/Multi-step speed monitor signal input	

Sharing G	Internal	abbrev.	Signal details	
+1378	R4208		Axis designation	2nd PLC axis
+1379	R4209		Operation mode	
+1380	R4210		Feedrate	
+1381	R4211			
+1382	R4212		Movement data	
+1383	R4213			
+1384	R4214		Control signals	
+1385	R4215		External deceleration speed selection/Multi-step speed monitor signal input	

Sharing G	Internal	abbrev.	Signal details	
+1386	R4216		Axis designation	3rd PLC axis
+1387	R4217		Operation mode	
+1388	R4218		Feedrate	
+1389	R4219			
+1390	R4220		Movement data	
+1391	R4221			
+1392	R4222		Control signals	
+1393	R4223		External deceleration speed selection/Multi-step speed monitor signal input	

Sharing G	Internal	abbrev.	Signal details	
+1394	R4224		Axis designation	4th PLC axis
+1395	R4225		Operation mode	
+1396	R4226		Feedrate	
+1397	R4227			
+1398	R4228		Movement data	
+1399	R4229			
+1400	R4230		Control signals	
+1401	R4231		External deceleration speed selection/Multi-step speed monitor signal input	

Sharing G	Internal	abbrev.	Signal details	
+1402	R4232		Axis designation	5th PLC axis
+1403	R4233		Operation mode	
+1404	R4234		Feedrate	
+1405	R4235			
+1406	R4236		Movement data	
+1407	R4237			
+1408	R4238		Control signals	
+1409	R4239		External deceleration speed selection/Multi-step speed monitor signal input	

Sharing G	Internal	abbrev.	Signal details	
+1410	R4240		Axis designation	6th PLC axis
+1411	R4241		Operation mode	
+1412	R4242		Feedrate	
+1413	R4243			
+1414	R4244		Movement data	
+1415	R4245			
+1416	R4246		Control signals	
+1417	R4247		External deceleration speed selection/Multi-step speed monitor signal input	

Sharing G	Internal	abbrev.	Signal details	
+1418	R4248		Axis designation	7th PLC axis
+1419	R4249		Operation mode	
+1420	R4250		Feedrate	
+1421	R4251			
+1422	R4252		Movement data	
+1423	R4253			
+1424	R4254		Control signals	
+1425	R4255		External deceleration speed selection/Multi-step speed monitor signal input	

Sharing G	Internal	abbrev.	Signal details	
+1426	R4256		Axis designation	1st PLC axis Data A
+1427	R4257		Operation mode	
+1428	R4258		Feedrate	
+1429	R4259			
+1430	R4260		Movement data	
+1431	R4261			
+1432	R4262		Control signals	
+1433	R4263		External deceleration speed selection signal	

Sharing G	Internal	abbrev.	Signal details	
+1434	R4264		Axis designation	1st PLC axis Data B
+1435	R4265		Operation mode	
+1436	R4266		Feedrate	
+1437	R4267			
+1438	R4268		Movement data	
+1439	R4269			
+1440	R4270		Control signals	
+1441	R4271		External deceleration speed selection signal	

Sharing G	Internal	abbrev.	Signal details	
+1442	R4272		Axis designation	1st PLC axis Data C
+1443	R4273		Operation mode	
+1444	R4274		Feedrate	
+1445	R4275			
+1446	R4276		Movement data	
+1447	R4277			
+1448	R4278		Control signals	
+1449	R4279		External deceleration speed selection signal	

Sharing G	Internal	abbrev.	Signal details	
+2660	R4280		Axis designation	8th PLC axis
+2661	R4281		Operation mode	
+2662	R4282		Feedrate	
+2663	R4283			
+2664	R4284		Movement data	
+2665	R4285			
+2666	R4286		Control signals	
+2667	R4287		External deceleration speed selection signal /Multi-step speed monitor input	

3.5.3 Window Result Information

Sharing G	Internal	abbrev.	Signal name	
12270	R9000		Read result 1	
12271	R9001		Read result 2	
12272	R9002		Read result 3	
12273	R9003		Read result 4	
12274	R9004		Read result 5	
12275	R9005		Read result 6	
12276	R9006		Read result 7	
12277	R9007		Read result 8	
12278	R9008		Read result 9	
12279	R9009		Read result 10	

Sharing G	Internal	abbrev.	Signal name	
12280	R9010		Read result 11	
12281	R9011		Read result 12	
12282	R9012		Read result 13	
12283	R9013		Read result 14	
12284	R9014		Read result 15	
12285	R9015		Read result 16	
12286	R9016		Read result 17	
12287	R9017		Read result 18	
12288	R9018		Read result 19	
12289	R9019		Read result 20	

Sharing G	Internal	abbrev.	Signal name	
12290	R9020		Write result 1	
12291	R9021		Write result 2	
12292	R9022		Write result 3	
12293	R9023		Write result 4	
12294	R9024		Write result 5	
12295	R9025		Write result 6	
12296	R9026		Write result 7	
12297	R9027		Write result 8	
12298	R9028		Write result 9	
12299	R9029		Write result 10	

Sharing G	Internal	abbrev.	Signal name	
12300	R9030		Write result 11	
12301	R9031		Write result 12	
12302	R9032		Write result 13	
12303	R9033		Write result 14	
12304	R9034		Write result 15	
12305	R9035		Write result 16	
12306	R9036		Write result 17	
12307	R9037		Write result 18	
12308	R9038		Write result 19	
12309	R9039		Write result 20	

Sharing G	Internal	abbrev.	Signal name	
12310	R9040		Read window data 1	1st Read data
12311	R9041			
12312	R9042			2nd Read data
12313	R9043			
12314	R9044			3rd Read data
12315	R9045			
12316	R9046			4th Read data
12317	R9047			

Sharing G	Internal	abbrev.	Signal name	
12318	R9048		Read window data 2	1st Read data
12319	R9049			
12320	R9050			2nd Read data
12321	R9051			
12322	R9052			3rd Read data
12323	R9053			
12324	R9054			4th Read data
12325	R9055			

Sharing G	Internal	abbrev.	Signal name	
12326	R9056		Read window data 3	1st Read data
12327	R9057			
12328	R9058			2nd Read data
12329	R9059			
12330	R9060			3rd Read data
12331	R9061			
12332	R9062			4th Read data
12333	R9063			

Sharing G	Internal	abbrev.	Signal name	
12334	R9064		Read window data 4	1st Read data
12335	R9065			
12336	R9066			2nd Read data
12337	R9067			
12338	R9068			3rd Read data
12339	R9069			
12340	R9070			4th Read data
12341	R9071			

Sharing G	Internal	abbrev.	Signal name	
12342	R9072		Read window data 5	1st Read data
12343	R9073			
12344	R9074			2nd Read data
12345	R9075			
12346	R9076			3rd Read data
12347	R9077			
12348	R9078			4th Read data
12349	R9079			

Sharing G	Internal	abbrev.	Signal name	
12350	R9080		Read window data 6	1st Read data
12351	R9081			
12352	R9082			2nd Read data
12353	R9083			
12354	R9084			3rd Read data
12355	R9085			
12356	R9086			4th Read data
12357	R9087			

Sharing G	Internal	abbrev.	Signal name	
12358	R9088		Read window data 7	1st Read data
12359	R9089			
12360	R9090			2nd Read data
12361	R9091			
12362	R9092			3rd Read data
12363	R9093			
12364	R9094			4th Read data
12365	R9095			

Sharing G	Internal	abbrev.	Signal name	
12366	R9096		Read window data 8	1st Read data
12367	R9097			
12368	R9098			2nd Read data
12369	R9099			
12370	R9100			3rd Read data
12371	R9101			
12372	R9102			4th Read data
12373	R9103			

Sharing G	Internal	abbrev.	Signal name	
12374	R9104		Read window data 9	1st Read data
12375	R9105			
12376	R9106			2nd Read data
12377	R9107			
12378	R9108			3rd Read data
12379	R9109			
12380	R9110			4th Read data
12381	R9111			

Sharing G	Internal	abbrev.	Signal name	
12382	R9112		Read window data 10	1st Read data
12383	R9113			
12384	R9114			2nd Read data
12385	R9115			
12386	R9116			3rd Read data
12387	R9117			
12388	R9118			4th Read data
12389	R9119			

Sharing G	Internal	abbrev.	Signal name	
12390	R9120		Read window data 11	1st Read data
12391	R9121			
12392	R9122			2nd Read data
12393	R9123			
12394	R9124			3rd Read data
12395	R9125			
12396	R9126			4th Read data
12397	R9127			

Sharing G	Internal	abbrev.	Signal name	
12398	R9128		Read window data 12	1st Read data
12399	R9129			
12400	R9130			2nd Read data
12401	R9131			
12402	R9132			3rd Read data
12403	R9133			
12404	R9134			4th Read data
12405	R9135			

Sharing G	Internal	abbrev.	Signal name	
12406	R9136		Read window data 13	1st Read data
12407	R9137			
12408	R9138			2nd Read data
12409	R9139			
12410	R9140			3rd Read data
12411	R9141			
12412	R9142			4th Read data
12413	R9143			

Sharing G	Internal	abbrev.	Signal name	
12414	R9144		Read window data 14	1st Read data
12415	R9145			
12416	R9146			2nd Read data
12417	R9147			
12418	R9148			3rd Read data
12419	R9149			
12420	R9150			4th Read data
12421	R9151			

Sharing G	Internal	abbrev.	Signal name	
12422	R9152		Read window data 15	1st Read data
12423	R9153			
12424	R9154			2nd Read data
12425	R9155			
12426	R9156			3rd Read data
12427	R9157			
12428	R9158			4th Read data
12429	R9159			

Sharing G	Internal	abbrev.	Signal name	
12430	R9160		Read window data 16	1st Read data
12431	R9161			
12432	R9162			2nd Read data
12433	R9163			
12434	R9164			3rd Read data
12435	R9165			
12436	R9166			4th Read data
12437	R9167			

Sharing G	Internal	abbrev.	Signal name	
12438	R9168		Read window data 17	1st Read data
12439	R9169			
12440	R9170			2nd Read data
12441	R9171			
12442	R9172			3rd Read data
12443	R9173			
12444	R9174			4th Read data
12445	R9175			

Sharing G	Internal	abbrev.	Signal name	
12446	R9176		Read window data 18	1st Read data
12447	R9177			
12448	R9178			2nd Read data
12449	R9179			
12450	R9180			3rd Read data
12451	R9181			
12452	R9182			4th Read data
12453	R9183			

Sharing G	Internal	abbrev.	Signal name	
12454	R9184		Read window data 19	1st Read data
12455	R9185			
12456	R9186			2nd Read data
12457	R9187			
12458	R9188			3rd Read data
12459	R9189			
12460	R9190			4th Read data
12461	R9191			

Sharing G	Internal	abbrev.	Signal name	
12462	R9192		Read window data 20	1st Read data
12463	R9193			
12464	R9194			2nd Read data
12465	R9195			
12466	R9196			3rd Read data
12467	R9197			
12468	R9198			4th Read data
12469	R9199			

3.5.4 Window Command

Sharing G	Internal	abbrev.	Signal name	
+2100	R8500		Read control window 1	Section No.
+2101	R8501			Section sub-ID No.
+2102	R8502			Sub-section No.
+2103	R8503			Data No.
+2104	R8504			Read method
+2105	R8505			Number to be read
+2106	R8506			
+2107	R8507			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2108	R8508		Read control window 2	Section No.
+2109	R8509			Section sub-ID No.
+2110	R8510			Sub-section No.
+2111	R8511			Data No.
+2112	R8512			Read method
+2113	R8513			Number to be read
+2114	R8514			
+2115	R8515			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2116	R8516		Read control window 3	Section No.
+2117	R8517			Section sub-ID No.
+2118	R8518			Sub-section No.
+2119	R8519			Data No.
+2120	R8520			Read method
+2121	R8521			Number to be read
+2122	R8522			
+2123	R8523			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2124	R8524		Read control window 4	Section No.
+2125	R8525			Section sub-ID No.
+2126	R8526			Sub-section No.
+2127	R8527			Data No.
+2128	R8528			Read method
+2129	R8529			Number to be read
+2130	R8530			
+2131	R8531			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2132	R8532		Read control window 5	Section No.
+2133	R8533			Section sub-ID No.
+2134	R8534			Sub-section No.
+2135	R8535			Data No.
+2136	R8536			Read method
+2137	R8537			Number to be read
+2138	R8538			
+2139	R8539			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2140	R8540		Read control window 6	Section No.
+2141	R8541			Section sub-ID No.
+2142	R8542			Sub-section No.
+2143	R8543			Data No.
+2144	R8544			Read method
+2145	R8545			Number to be read
+2146	R8546			
+2147	R8547			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2148	R8548		Read control window 7	Section No.
+2149	R8549			Section sub-ID No.
+2150	R8550			Sub-section No.
+2151	R8551			Data No.
+2152	R8552			Read method
+2153	R8553			Number to be read
+2154	R8554			
+2155	R8555			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2156	R8556		Read control window 8	Section No.
+2157	R8557			Section sub-ID No.
+2158	R8558			Sub-section No.
+2159	R8559			Data No.
+2160	R8560			Read method
+2161	R8561			Number to be read
+2162	R8562			
+2163	R8563			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2164	R8564		Read control window 9	Section No.
+2165	R8565			Section sub-ID No.
+2166	R8566			Sub-section No.
+2167	R8567			Data No.
+2168	R8568			Read method
+2169	R8569			Number to be read
+2170	R8570			
+2171	R8571			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2172	R8572		Read control window 10	Section No.
+2173	R8573			Section sub-ID No.
+2174	R8574			Sub-section No.
+2175	R8575			Data No.
+2176	R8576			Read method
+2177	R8577			Number to be read
+2178	R8578			
+2179	R8579			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2180	R8580		Read control window 11	Section No.
+2181	R8581			Section sub-ID No.
+2182	R8582			Sub-section No.
+2183	R8583			Data No.
+2184	R8584			Read method
+2185	R8585			Number to be read
+2186	R8586			
+2187	R8587			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2188	R8588		Read control window 12	Section No.
+2189	R8589			Section sub-ID No.
+2190	R8590			Sub-section No.
+2191	R8591			Data No.
+2192	R8592			Read method
+2193	R8593			Number to be read
+2194	R8594			
+2195	R8595			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2196	R8596		Read control window 13	Section No.
+2197	R8597			Section sub-ID No.
+2198	R8598			Sub-section No.
+2199	R8599			Data No.
+2200	R8600			Read method
+2201	R8601			Number to be read
+2202	R8602			
+2203	R8603			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2204	R8604		Read control window 14	Section No.
+2205	R8605			Section sub-ID No.
+2206	R8606			Sub-section No.
+2207	R8607			Data No.
+2208	R8608			Read method
+2209	R8609			Number to be read
+2210	R8610			
+2211	R8611			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2212	R8612		Read control window 15	Section No.
+2213	R8613			Section sub-ID No.
+2214	R8614			Sub-section No.
+2215	R8615			Data No.
+2216	R8616			Read method
+2217	R8617			Number to be read
+2218	R8618			
+2219	R8619			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2220	R8620		Read control window 16	Section No.
+2221	R8621			Section sub-ID No.
+2222	R8622			Sub-section No.
+2223	R8623			Data No.
+2224	R8624			Read method
+2225	R8625			Number to be read
+2226	R8626			
+2227	R8627			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2228	R8628		Read control window 17	Section No.
+2229	R8629			Section sub-ID No.
+2230	R8630			Sub-section No.
+2231	R8631			Data No.
+2232	R8632			Read method
+2233	R8633			Number to be read
+2234	R8634			
+2235	R8635			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2236	R8636		Read control window 18	Section No.
+2237	R8637			Section sub-ID No.
+2238	R8638			Sub-section No.
+2239	R8639			Data No.
+2240	R8640			Read method
+2241	R8641			Number to be read
+2242	R8642			
+2243	R8643			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2244	R8644		Read control window 19	Section No.
+2245	R8645			Section sub-ID No.
+2246	R8646			Sub-section No.
+2247	R8647			Data No.
+2248	R8648			Read method
+2249	R8649			Number to be read
+2250	R8650			
+2251	R8651			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2252	R8652		Read control window 20	Section No.
+2253	R8653			Section sub-ID No.
+2254	R8654			Sub-section No.
+2255	R8655			Data No.
+2256	R8656			Read method
+2257	R8657			Number to be read
+2258	R8658			
+2259	R8659			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2260	R8660		Write data 1	1st Write data
+2261	R8661			
+2262	R8662			2nd Write data
+2263	R8663			
+2264	R8664			3rd Write data
+2265	R8665			
+2266	R8666			4th Write data
+2267	R8667			

Sharing G	Internal	abbrev.	Signal name	
+2268	R8668		Write control window 1	Section No.
+2269	R8669			Section sub-ID No.
+2270	R8670			Sub-section No.
+2271	R8671			Data No.
+2272	R8672			Write method
+2273	R8673			Number to be written
+2274	R8674			
+2275	R8675			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2276	R8676		Write data 2	1st Write data
+2277	R8677			
+2278	R8678			2nd Write data
+2279	R8679			
+2280	R8680			3rd Write data
+2281	R8681			
+2282	R8682			4th Write data
+2283	R8683			

Sharing G	Internal	abbrev.	Signal name	
+2284	R8684		Write control window 2	Section No.
+2285	R8685			Section sub-ID No.
+2286	R8686			Sub-section No.
+2287	R8687			Data No.
+2288	R8688			Write method
+2289	R8689			Number to be written
+2290	R8690			
+2291	R8691			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2292	R8692		Write data 3	1st Write data
+2293	R8693			
+2294	R8694			2nd Write data
+2295	R8695			
+2296	R8696			3rd Write data
+2297	R8697			
+2298	R8698			4th Write data
+2299	R8699			

Sharing G	Internal	abbrev.	Signal name	
+2300	R8700		Write control window 3	Section No.
+2301	R8701			Section sub-ID No.
+2302	R8702			Sub-section No.
+2303	R8703			Data No.
+2304	R8704			Write method
+2305	R8705			Number to be written
+2306	R8706			
+2307	R8707			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2308	R8708		Write data 4	1st Write data
+2309	R8709			
+2310	R8710			2nd Write data
+2311	R8711			
+2312	R8712			3rd Write data
+2313	R8713			
+2314	R8714			4th Write data
+2315	R8715			

Sharing G	Internal	abbrev.	Signal name	
+2316	R8716		Write control window 4	Section No.
+2317	R8717			Section sub-ID No.
+2318	R8718			Sub-section No.
+2319	R8719			Data No.
+2320	R8720			Write method
+2321	R8721			Number to be written
+2322	R8722			
+2323	R8723			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2324	R8724		Write data 5	1st Write data
+2325	R8725			
+2326	R8726			2nd Write data
+2327	R8727			
+2328	R8728			3rd Write data
+2329	R8729			
+2330	R8730			4th Write data
+2331	R8731			

Sharing G	Internal	abbrev.	Signal name	
+2332	R8732		Write control window 5	Section No.
+2333	R8733			Section sub-ID No.
+2334	R8734			Sub-section No.
+2335	R8735			Data No.
+2336	R8736			Write method
+2337	R8737			Number to be written
+2338	R8738			
+2339	R8739			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2340	R8740		Write data 6	1st Write data
+2341	R8741			
+2342	R8742			2nd Write data
+2343	R8743			
+2344	R8744			3rd Write data
+2345	R8745			
+2346	R8746			4th Write data
+2347	R8747			

Sharing G	Internal	abbrev.	Signal name	
+2348	R8748		Write control window 6	Section No.
+2349	R8749			Section sub-ID No.
+2350	R8750			Sub-section No.
+2351	R8751			Data No.
+2352	R8752			Write method
+2353	R8753			Number to be written
+2354	R8754			
+2355	R8755			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2356	R8756		Write data 7	1st Write data
+2357	R8757			
+2358	R8758			2nd Write data
+2359	R8759			
+2360	R8760			3rd Write data
+2361	R8761			
+2362	R8762			4th Write data
+2363	R8763			

Sharing G	Internal	abbrev.	Signal name	
+2364	R8764		Write control window 7	Section No.
+2365	R8765			Section sub-ID No.
+2366	R8766			Sub-section No.
+2367	R8767			Data No.
+2368	R8768			Write method
+2369	R8769			Number to be written
+2370	R8770			
+2371	R8771			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2372	R8772		Write data 8	1st Write data
+2373	R8773			
+2374	R8774			2nd Write data
+2375	R8775			
+2376	R8776			3rd Write data
+2377	R8777			
+2378	R8778			4th Write data
+2379	R8779			

Sharing G	Internal	abbrev.	Signal name	
+2380	R8780		Write control window 8	Section No.
+2381	R8781			Section sub-ID No.
+2382	R8782			Sub-section No.
+2383	R8783			Data No.
+2384	R8784			Write method
+2385	R8785			Number to be written
+2386	R8786			
+2387	R8787			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2388	R8788		Write data 9	1st Write data
+2389	R8789			
+2390	R8790			2nd Write data
+2391	R8791			
+2392	R8792			3rd Write data
+2393	R8793			
+2394	R8794			4th Write data
+2395	R8795			

Sharing G	Internal	abbrev.	Signal name	
+2396	R8796		Write control window 9	Section No.
+2397	R8797			Section sub-ID No.
+2398	R8798			Sub-section No.
+2399	R8799			Data No.
+2400	R8800			Write method
+2401	R8801			Number to be written
+2402	R8802			
+2403	R8803			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2404	R8804		Write data 10	1st Write data
+2405	R8805			
+2406	R8806			2nd Write data
+2407	R8807			
+2408	R8808			3rd Write data
+2409	R8809			
+2410	R8810			4th Write data
+2411	R8811			

Sharing G	Internal	abbrev.	Signal name	
+2412	R8812		Write control window 10	Section No.
+2413	R8813			Section sub-ID No.
+2414	R8814			Sub-section No.
+2415	R8815			Data No.
+2416	R8816			Write method
+2417	R8817			Number to be written
+2418	R8818			
+2419	R8819			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2420	R8820		Write data 11	1st Write data
+2421	R8821			
+2422	R8822			2nd Write data
+2423	R8823			
+2424	R8824			3rd Write data
+2425	R8825			
+2426	R8826			4th Write data
+2427	R8827			

Sharing G	Internal	abbrev.	Signal name	
+2428	R8828		Write control window 11	Section No.
+2429	R8829			Section sub-ID No.
+2430	R8830			Sub-section No.
+2431	R8831			Data No.
+2432	R8832			Write method
+2433	R8833			Number to be written
+2434	R8834			
+2435	R8835			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2436	R8836		Write data 12	1st Write data
+2437	R8837			
+2438	R8838			2nd Write data
+2439	R8839			
+2440	R8840			3rd Write data
+2441	R8841			
+2442	R8842			4th Write data
+2443	R8843			

Sharing G	Internal	abbrev.	Signal name	
+2444	R8844		Write control window 12	Section No.
+2445	R8845			Section sub-ID No.
+2446	R8846			Sub-section No.
+2447	R8847			Data No.
+2448	R8848			Write method
+2449	R8849			Number to be written
+2450	R8850			
+2451	R8851			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2452	R8852		Write data 13	1st Write data
+2453	R8853			
+2454	R8854			2nd Write data
+2455	R8855			
+2456	R8856			3rd Write data
+2457	R8857			
+2458	R8858			4th Write data
+2459	R8859			

Sharing G	Internal	abbrev.	Signal name	
+2460	R8860		Write control window 13	Section No.
+2461	R8861			Section sub-ID No.
+2462	R8862			Sub-section No.
+2463	R8863			Data No.
+2464	R8864			Write method
+2465	R8865			Number to be written
+2466	R8866			
+2467	R8867			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2468	R8868		Write data 14	1st Write data
+2469	R8869			
+2470	R8870			2nd Write data
+2471	R8871			
+2472	R8872			3rd Write data
+2473	R8873			
+2474	R8874			4th Write data
+2475	R8875			

Sharing G	Internal	abbrev.	Signal name	
+2476	R8876		Write control window 14	Section No.
+2477	R8877			Section sub-ID No.
+2478	R8878			Sub-section No.
+2479	R8879			Data No.
+2480	R8880			Write method
+2481	R8881			Number to be written
+2482	R8882			
+2483	R8883			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2484	R8884		Write data 15	1st Write data
+2485	R8885			
+2486	R8886			2nd Write data
+2487	R8887			
+2488	R8888			3rd Write data
+2489	R8889			
+2490	R8890			4th Write data
+2491	R8891			

Sharing G	Internal	abbrev.	Signal name	
+2492	R8892		Write control window 15	Section No.
+2493	R8893			Section sub-ID No.
+2494	R8894			Sub-section No.
+2495	R8895			Data No.
+2496	R8896			Write method
+2497	R8897			Number to be written
+2498	R8898			
+2499	R8899			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2500	R8900		Write data 16	1st Write data
+2501	R8901			
+2502	R8902			2nd Write data
+2503	R8903			
+2504	R8904			3rd Write data
+2505	R8905			
+2506	R8906			4th Write data
+2507	R8907			

Sharing G	Internal	abbrev.	Signal name	
+2508	R8908		Write control window 16	Section No.
+2509	R8909			Section sub-ID No.
+2510	R8910			Sub-section No.
+2511	R8911			Data No.
+2512	R8912			Write method
+2513	R8913			Number to be written
+2514	R8914			
+2515	R8915			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2516	R8916		Write data 17	1st Write data
+2517	R8917			
+2518	R8918			2nd Write data
+2519	R8919			
+2520	R8920			3rd Write data
+2521	R8921			
+2522	R8922			4th Write data
+2523	R8923			

Sharing G	Internal	abbrev.	Signal name	
+2524	R8924		Write control window 17	Section No.
+2525	R8925			Section sub-ID No.
+2526	R8926			Sub-section No.
+2527	R8927			Data No.
+2528	R8928			Write method
+2529	R8929			Number to be written
+2530	R8930			
+2531	R8931			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2532	R8932		Write data 18	1st Write data
+2533	R8933			
+2534	R8934			2nd Write data
+2535	R8935			
+2536	R8936			3rd Write data
+2537	R8937			
+2538	R8938			4th Write data
+2539	R8939			

Sharing G	Internal	abbrev.	Signal name	
+2540	R8940		Write control window 18	Section No.
+2541	R8941			Section sub-ID No.
+2542	R8942			Sub-section No.
+2543	R8943			Data No.
+2544	R8944			Write method
+2545	R8945			Number to be written
+2546	R8946			
+2547	R8947			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2548	R8948		Write data 19	1st Write data
+2549	R8949			
+2550	R8950			2nd Write data
+2551	R8951			
+2552	R8952			3rd Write data
+2553	R8953			
+2554	R8954			4th Write data
+2555	R8955			

Sharing G	Internal	abbrev.	Signal name	
+2556	R8956		Write control window 19	Section No.
+2557	R8957			Section sub-ID No.
+2558	R8958			Sub-section No.
+2559	R8959			Data No.
+2560	R8960			Write method
+2561	R8961			Number to be written
+2562	R8962			
+2563	R8963			Control signal

Sharing G	Internal	abbrev.	Signal name	
+2564	R8964		Write data 20	1st Write data
+2565	R8965			
+2566	R8966			2nd Write data
+2567	R8967			
+2568	R8968			3rd Write data
+2569	R8969			
+2570	R8970			4th Write data
+2571	R8971			

Sharing G	Internal	abbrev.	Signal name	
+2572	R8972		Write control window 20	Section No.
+2573	R8973			Section sub-ID No.
+2574	R8974			Sub-section No.
+2575	R8975			Data No.
+2576	R8976			Write method
+2577	R8977			Number to be written
+2578	R8978			
+2579	R8979			Control signal

3.5.5 Data Registered to Magazine for M System

Magazine	No.1 magazine		No.2 magazine		No.3 magazine		Remarks (data type)
T4-digit/T8-digit specifications	T4-digit	T8-digit	T4-digit	T8-digit	T4-digit	T8-digit	
ATC control parameter	G11450	←	←	←	←	←	
	R4700	←	←	←	←	←	
Number of tool parameter	G11460	←	G11461	←	G11462	←	Binary
	R4710	←	R4711	←	R4712	←	
Pointer designation	G11465	←	G11466	←	G11467	←	Binary
	R4715	←	R4716	←	R4717	←	
Spindle tool	G11470	G11470 G11471	G11480	G11480 G11481	-	-	BCD
	R4720	R4720 R4721	R4730	R4730 R4731	-	-	
Standby 1 tool	G11471	G11472 G11473	G11481	G11482 G11483	-	-	BCD
	R4721	R4722 R4723	R4731	R4732 R4733	-	-	
Standby 2 tool	G11472	G11474 G11475	G11482	G11484 G11485	-	-	BCD
	R4722	R4724 R4725	R4732	R4734 R4735	-	-	
Standby 3 tool	G11473	G11476 G11477	G11483	G11486 G11487	-	-	BCD
	R4723	R4726 R4727	R4733	R4736 R4737	-	-	
Standby 4 tool	G11474	G11478 G11479	G11484	G11488 G11489	-	-	BCD
	R4724	R4728 R4729	R4734	R4738 R4739	-	-	
AUX data	G11498	←	←	←	←	←	Binary
	R4748	←	←	←	←	←	

Magazine		No.1 magazine		No.2 magazine		No.3 magazine		Remarks (data type)
T4-digit/T8-digit specifications		T4-digit	T8-digit	T4-digit	T8-digit	T4-digit	T8-digit	
Magazine tool data	MG1	G11500	G11500 G11501	G11740	G11740 G11741	G11980	G11980 G11981	BCD
		R4750	R4750 R4751	R4990	R4990 R4991	R5230	R5230 R5231	
	MG2	G11501	G11502 G11503	G11741	G11742 G11743	G11981	G11982 G11983	BCD
		R4751	R4752 R4753	R4991	R4992 R4993	R5231	R5232 R5233	
	MG3	G11502	G11504 G11505	G11742	G11744 G11745	G11982	G11984 G11985	BCD
		R4752	R4754 R4755	R4992	R4994 R4995	R5232	R5234 R5235	
	:	:	:	:	:	:	:	:
	MG79	G11578	G11656 G11657	G11818	G11896 G11897	G12058	G12136 G12137	BCD
		R4828	R4906 R4907	R5068	R5146 R5147	R5308	R5386 R5387	
	MG80	G11579	G11658 G11659	G11819	G11898 G11899	G12059	G12138 G12139	BCD
		R4829	R4908 R4909	R5069	R5148 R5149	R5309	R5388 R5389	
Magazine tool data (Aux. D)	DN01	G11660	←	G11900	←	G12140	←	BCD
		R4910	←	R5150	←	R5390	←	
	DN02	G11661	←	G11901	←	G12141	←	BCD
		R4911	←	R5151	←	R5391	←	
	DN03	G11662	←	G11902	←	G12142	←	BCD
		R4912	←	R5152	←	R5392	←	
	:	:	:	:	:	:	:	:
	DN79	G11738	←	G11978	←	G12218	←	BCD
		R4988	←	R5228	←	R5468	←	
	DN80	G11739	←	G11979	←	G12219	←	BCD
		R4989	←	R5229	←	R5469	←	

3.5.6 Tool Life Management (M System)

Sharing G	Internal	abbrev.	Signal name	Remarks
11450	R6720		T life mgmt Spindle tool No.	PLC -> CNC
11451	R6721			
11452	R6722		T life mgmt Standby tool No.	
11453	R6723			

Sharing G	Internal	abbrev.	Signal name	Remarks
12220	R6724		Spare tool: Group No.	CNC -> PLC
12221	R6725			
12222	R6726		Spare tool: Tool No.	
12223	R6727			
12224	R6728		Spare tool: Tool data flag/status	
12225	R6729		Spare tool: Auxiliary data	
12226	R6730		Spare tool: Life data	
12227	R6731		Spare tool: Usage data	
12228	R6732		Spare tool: Length compensation amount	
12229	R6733			
12230	R6734		Spare tool: Radius compensation amount	
12231	R6735			
12232	R6736			
12233	R6737			
12234	R6738			
12235	R6739			
12236	R6740			
12237	R6741			
12238	R6742			
12239	R6743			
12240	R6744			
12241	R6745			
12242	R6746			
12243	R6747			

Sharing G	Internal	abbrev.	Signal name	Remarks
12244	R6748		Active tool: Group No.	
12245	R6749			
12246	R6750		Active tool: Tool No.	
12247	R6751			
12248	R6752		Active tool: Tool data flag/status	
12249	R6753		Active tool: Auxiliary data	
12250	R6754		Active tool: Life data	
12251	R6755		Active tool: Usage data	
12252	R6756		Active tool: Length compensation amount	
12253	R6757			
12254	R6758		Active tool: Radius compensation amount	
12255	R6759			
12256	R6760			CNC -> PLC
12257	R6761			
12258	R6762			
12259	R6763			
12260	R6764			
12261	R6765			
12262	R6766			
12263	R6767			
12264	R6768			
12265	R6769			
12266	R6770			
12267	R6771			

3.5.7 Safety Observing

CNC -> PLC			
Device		abbrev.	Signal name
Sharing G	Internal		
12470	R2150	SU_NC1	CNC side dual signal Module 1(L)
12471	R2151	SU_NC1	CNC side dual signal Module 1(H)
12472	R2152	SU_NC2	CNC side dual signal Module 2(L)
12473	R2153	SU_NC2	CNC side dual signal Module 2(H)
12474	R2154	SU_NC3	CNC side dual signal Module 3(L)
12475	R2155	SU_NC3	CNC side dual signal Module 3(H)
12476	R2156		
12477	R2157		
12478	R2158		
12479	R2159		

PLC -> CNC			
Device		abbrev.	Signal name
Sharing G	Internal		
+2580	R4450	SU_PC1	PLC side dual signal Module 1(L)
+2581	R4451	SU_PC1	PLC side dual signal Module 1(H)
+2582	R4452	SU_PC2	PLC side dual signal Module 2(L)
+2583	R4453	SU_PC2	PLC side dual signal Module 2(H)
+2584	R4454	SU_PC3	PLC side dual signal Module 3(L)
+2585	R4455	SU_PC3	PLC side dual signal Module 3(H)
+2586	R4456		
+2587	R4457		
+2588	R4458		
+2589	R4459		

Device		abbrev.	Signal name
Sharing G	Internal		
12480	R2160	SU_NER1	CNC side dual signal error Module 1(L)
12481	R2161	SU_NER1	CNC side dual signal error Module 1(H)
12482	R2162	SU_NER2	CNC side dual signal error Module 2(L)
12483	R2163	SU_NER2	CNC side dual signal error Module 2(H)
12484	R2164	SU_NER3	CNC side dual signal error Module 3(L)
12485	R2165	SU_NER3	CNC side dual signal error Module 3(H)
12486	R2166		
12487	R2167		
12488	R2168		
12489	R2169		

Device		abbrev.	Signal name
Sharing G	Internal		
+2590	R4460	SU_PER1	PLC side dual signal error Module 1(L)
+2591	R4461	SU_PER1	PLC side dual signal error Module 1(H)
+2592	R4462	SU_PER2	PLC side dual signal error Module 2(L)
+2593	R4463	SU_PER2	PLC side dual signal error Module 2(H)
+2594	R4464	SU_PER3	PLC side dual signal error Module 3(L)
+2595	R4465	SU_PER3	PLC side dual signal error Module 3(H)
+2596	R4466		
+2597	R4467		
+2598	R4468		
+2599	R4469		

Device		abbrev.	Signal name
Sharing G	Internal		
12490	R2170	SU_NO1	CNC side dual signal output Module 1
12491	R2171	SU_NO2	CNC side dual signal output Module 2
12492	R2172	SU_NO3	CNC side dual signal output Module 3
12493	R2173		
12494	R2174	SU_NOER1	CNC side dual signal output error Module 1
12495	R2175	SU_NOER1	CNC side dual signal output error Module 2
12496	R2176	SU_NOER1	CNC side dual signal output error Module 3
12497	R2177		
12498	R2178		
12499	R2179	SU_NST2	CNC side dual signal compare status 2

Device		abbrev.	Signal name
Sharing G	Internal		
+2600	R4470	SU_PO1	PLC side dual signal output Module 1
+2601	R4471	SU_PO2	PLC side dual signal output Module 2
+2602	R4472	SU_PO3	PLC side dual signal output Module 3
+2603	R4473		
+2604	R4474	SU_POER1	PLC side dual signal output error Module 1
+2605	R4475	SU_POER2	PLC side dual signal output error Module 2
+2606	R4476	SU_POER3	PLC side dual signal output error Module 3
+2607	R4477		
+2608	R4478		
+2609	R4479	SU_PST2	PLC side dual signal compare status 2

CNC -> PLC			
Device		abbrev.	Signal name
Sharing G	Internal		
12500	R2180	SU_NLT	CNC side safety compare activity check information
12501	R2181	SU_NST	CNC side dual signal compare status
12502	R2182	SU_NGDV	CNC side head G No.
12503	R2183	SU_NDLY	CNC side dual signal compare mismatch allowance time
12504	R2184	SU_NDV1	CNC side dual signal head device No. 1
12505	R2185	SU_NDV2	CNC side dual signal head device No. 2
12506	R2186	SU_NDV3	CNC side dual signal head device No. 3
12507	R2187		
12508	R2188	SU_NNUM	No. of dual signal modules on CNC side
12509	R2189		

PLC -> CNC			
Device		abbrev.	Signal name
Sharing G	Internal		
+2610	R4480	SU_PLT	PLC side safety compare activity check information
+2611	R4481	SU_PST	PLC side dual signal compare status
+2612	R4482	SU_NGDV	PLC side head G No.
+2613	R4483	SU_PDLY	PLC side dual signal compare mismatch allowance time
+2614	R4484	SU_PDV1	PLC side dual signal head device No. 1
+2615	R4485	SU_PDV2	PLC side dual signal head device No. 2
+2616	R4486	SU_PDV3	PLC side dual signal head device No. 3
+2617	R4487		
+2618	R4488	SU_PNUM	No. of dual signal modules on PLC side
+2619	R4489		

Device		abbrev.	Signal name
Sharing G	Internal		
12510	R2190		
12511	R2191		
12512	R2192		
12513	R2193		
12514	R2194		
12515	R2195		
12516	R2196		
12517	R2197		
12518	R2198		
12519	R2199		

Device		abbrev.	Signal name
Sharing G	Internal		
+2620	R4490	SU_POP	PLC side safety operation status
+2621	R4491		
+2622	R4492		
+2623	R4493		
+2624	R4494		
+2625	R4495		
+2626	R4496		
+2627	R4497		
+2628	R4498		
+2629	R4499		

3.5.8 PLC Constants

Device		abbrev.	Contents
Sharing G	Internal		
12520	R4500		#6301(Low-order side)
12521	R4501		(High-order side)
12522	R4502		#6302(Low-order side)
12523	R4503		(High-order side)
12524	R4504		#6303(Low-order side)
12525	R4505		(High-order side)
12526	R4506		#6304(Low-order side)
12527	R4507		(High-order side)
12528	R4508		#6305(Low-order side)
12529	R4509		(High-order side)

Device		abbrev.	Contents
Sharing G	Internal		
12530	R4510		#6306(Low-order side)
12531	R4511		(High-order side)
12532	R4512		#6307(Low-order side)
12533	R4513		(High-order side)
12534	R4514		#6308(Low-order side)
12535	R4515		(High-order side)
12536	R4516		#6309(Low-order side)
12537	R4517		(High-order side)
12538	R4518		#6310(Low-order side)
12539	R4519		(High-order side)

Device		abbrev.	Contents
Sharing G	Internal		
12540	R4520		#6311(Low-order side)
12541	R4521		(High-order side)
12542	R4522		#6312(Low-order side)
12543	R4523		(High-order side)
12544	R4524		#6313(Low-order side)
12545	R4525		(High-order side)
12546	R4526		#6314(Low-order side)
12547	R4527		(High-order side)
12548	R4528		#6315(Low-order side)
12549	R4529		(High-order side)

Device		abbrev.	Contents
Sharing G	Internal		
12550	R4530		#6316(Low-order side)
12551	R4531		(High-order side)
12552	R4532		#6317(Low-order side)
12553	R4533		(High-order side)
12554	R4534		#6318(Low-order side)
12555	R4535		(High-order side)
12556	R4536		#6319(Low-order side)
12557	R4537		(High-order side)
12558	R4538		#6320(Low-order side)
12559	R4539		(High-order side)

Device		abbrev.	Contents
Sharing G	Internal		
12560	R4540		#6321(Low-order side)
12561	R4541		(High-order side)
12562	R4542		#6322(Low-order side)
12563	R4543		(High-order side)
12564	R4544		#6323(Low-order side)
12565	R4545		(High-order side)
12566	R4546		#6324(Low-order side)
12567	R4547		(High-order side)
12568	R4548		#6325(Low-order side)
12569	R4549		(High-order side)

Device		abbrev.	Contents
Sharing G	Internal		
12570	R4550		#6326(Low-order side)
12571	R4551		(High-order side)
12572	R4552		#6327(Low-order side)
12573	R4553		(High-order side)
12574	R4554		#6328(Low-order side)
12575	R4555		(High-order side)
12576	R4556		#6329(Low-order side)
12577	R4557		(High-order side)
12578	R4558		#6330(Low-order side)
12579	R4559		(High-order side)

Device		abbrev.	Contents
Sharing G	Internal		
12580	R4560		#6331(Low-order side)
12581	R4561		(High-order side)
12582	R4562		#6332(Low-order side)
12583	R4563		(High-order side)
12584	R4564		#6333(Low-order side)
12585	R4565		(High-order side)
12586	R4566		#6334(Low-order side)
12587	R4567		(High-order side)
12588	R4568		#6335(Low-order side)
12589	R4569		(High-order side)

Device		abbrev.	Contents
Sharing G	Internal		
12590	R4570		#6336(Low-order side)
12591	R4571		(High-order side)
12592	R4572		#6337(Low-order side)
12593	R4573		(High-order side)
12594	R4574		#6338(Low-order side)
12595	R4575		(High-order side)
12596	R4576		#6339(Low-order side)
12597	R4577		(High-order side)
12598	R4578		#6340(Low-order side)
12599	R4579		(High-order side)

Device		abbrev.	Contents
Sharing G	Internal		
12600	R4580		#6341(Low-order side)
12601	R4581		(High-order side)
12602	R4582		#6342(Low-order side)
12603	R4583		(High-order side)
12604	R4584		#6343(Low-order side)
12605	R4585		(High-order side)
12606	R4586		#6344(Low-order side)
12607	R4587		(High-order side)
12608	R4588		#6345(Low-order side)
12609	R4589		(High-order side)

Device		abbrev.	Contents
Sharing G	Internal		
12610	R4590		#6346(Low-order side)
12611	R4591		(High-order side)
12612	R4592		#6347(Low-order side)
12613	R4593		(High-order side)
12614	R4594		#6348(Low-order side)
12615	R4595		(High-order side)

3.5.9 PLC Bit Selection

Device			abbrev.	Contents
Sharing G	Internal			
12616	R4600	(High-order side)		#6401
		(Low-order side)		#6402
12617	R4601	(High-order side)		#6403
		(Low-order side)		#6404
12618	R4602	(High-order side)		#6405
		(Low-order side)		#6406
12619	R4603	(High-order side)		#6407
		(Low-order side)		#6408
12620	R4604	(High-order side)		#6409
		(Low-order side)		#6410

Device			abbrev.	Contents
Sharing G	Internal			
12621	R4605	(High-order side)		#6411
		(Low-order side)		#6412
12622	R4606	(High-order side)		#6413
		(Low-order side)		#6414
12623	R4607	(High-order side)		#6415
		(Low-order side)		#6416
12624	R4608	(High-order side)		#6417
		(Low-order side)		#6418
1265	R4609	(High-order side)		#6419
		(Low-order side)		#6420

Device			abbrev.	Contents
Sharing G	Internal			
12626	R4610	(High-order side)		#6421
		(Low-order side)		#6422
12627	R4611	(High-order side)		#6423
		(Low-order side)		#6424
12628	R4612	(High-order side)		#6425
		(Low-order side)		#6426
12629	R4613	(High-order side)		#6427
		(Low-order side)		#6428
12630	R4614	(High-order side)		#6429
		(Low-order side)		#6430

Device			abbrev.	Contents
Sharing G	Internal			
12631	R4615	(High-order side)		#6431
		(Low-order side)		#6432
12632	R4616	(High-order side)		#6433
		(Low-order side)		#6434
12633	R4617	(High-order side)		#6435
		(Low-order side)		#6436
12634	R4618	(High-order side)		#6437
		(Low-order side)		#6438
12635	R4619	(High-order side)		#6439
		(Low-order side)		#6440

Device			abbrev.	Contents
Sharing G	Internal			
12636	R4620	(High-order side)		#6441
		(Low-order side)		#6442
12637	R4621	(High-order side)		#6443
		(Low-order side)		#6444
12638	R4622	(High-order side)		#6445
		(Low-order side)		#6446
12639	R4623	(High-order side)		#6447
		(Low-order side)		#6448

3.5.10 PLC Axis Indexing Interface

Operation command PLC CPU -> CNC CPU (R4300 to R4345)

PLC indexing axis								Abbrev.	Signal name
1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis		
G+2680	G+2686	G+2692	G+2698	G+2704	G+2710	G+2716	G+2722	AUXCM4	PLC axis indexing control command 4
R4300	R4306	R4312	R4318	R4324	R4330	R4336	R4342		
G+2681	G+2687	G+2693	G+2699	G+2705	G+2711	G+2717	G+2723	AUXCM3	PLC axis indexing control command 3
R4301	R4307	R4313	R4319	R4325	R4331	R4337	R4343		
G+2682	G+2688	G+2694	G+2700	G+2706	G+2712	G+2718	G+2724	AUXCM2	PLC axis indexing control command 2
R4302	R4308	R4314	R4320	R4326	R4332	R4338	R4344		
G+2683	G+2689	G+2695	G+2701	G+2707	G+2713	G+2719	G+2725	AUXCM1	PLC axis indexing control command 1
R4303	R4309	R4315	R4321	R4327	R4333	R4339	R4345		
G+2684	G+2690	G+2696	G+2702	G+2708	G+2714	G+2720	G+2726		PLC axis indexing control command position (L)
R4304	R4310	R4316	R4322	R4328	R4334	R4340	R4346		
G+2685	G+2691	G+2697	G+2703	G+2709	G+2715	G+2721	G+2727		PLC axis indexing control command position (H)
R4305	R4311	R4317	R4323	R4329	R4335	R4341	R4347		

Operation status signal CNC CPU -> PLC CPU (R2000 to R2045)

PLC indexing axis								Abbrev.	Signal name
1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis		
G12680	G12686	G12692	G12698	G12704	G12710	G12716	G12722	AUXST4	PLC axis indexing control status 4
R2000	R2006	R2012	R2018	R2024	R2030	R2036	R2042		
G12681	G12687	G12693	G12699	G12705	G12711	G12717	G12723	AUXST3	PLC axis indexing control status 3
R2001	R2007	R2013	R2019	R2025	R2031	R2037	R2043		
G12682	G12688	G12694	G12700	G12706	G12712	G12718	G12724	AUXST2	PLC axis indexing control status 2
R2002	R2008	R2014	R2020	R2026	R2032	R2038	R2044		
G12683	G12689	G12695	G12701	G12707	G12713	G12719	G12725	AUXST1	PLC axis indexing control status 1
R2003	R2009	R2015	R2021	R2027	R2033	R2039	R2045		
G12684	G12690	G12696	G12702	G12708	G12714	G12720	G12726		PLC axis indexing control machine position (L)
R2004	R2010	R2016	R2022	R2028	R2034	R2040	R2046		
G12685	G12691	G12697	G12703	G12709	G12715	G12721	G12727		PPLC axis indexing control machine position (H)
R2005	R2011	R2017	R2023	R2029	R2035	R2041	R2047		

3.6 Special Relay/Register Signals

3.6.1 Special Relay

Device	abbrev.	Signal name
SM0		Diagnosis error
SM1		Self-diagnosis error
SM2		
SM3		
SM4		
SM5		
SM6		
SM7		
SM8		
SM9		

Device	abbrev.	Signal name
SM10		
SM11		
SM12	CARRY	Carry flag
SM13		
SM14		
SM15		
SM16	THER	Temperature rise
SM17		
SM18		
SM19		

Device	abbrev.	Signal name
SM20		
SM21		
SM22		
SM23	QSTOP	PLC STOP
SM24		
SM25		
SM26		
SM27		
SM28		
SM29		

Device	abbrev.	Signal name
SM30		
SM31		
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		
SM48		
SM49		

Device	abbrev.	Signal name
SM50		(APLC data protect avoidance mode)
SM51		Battery low latch
SM52		Battery low
SM53		AC/DC DOWN detection
SM54		
SM55		
SM56		Calculation error
SM57		
SM58		Battery low warning latch
SM59		Battery low warning

Device	abbrev.	Signal name
SM60		
SM61		
SM62		
SM63		
SM64	DSPRQ	Tool registration and Life screen display request
SM65	LSTIN	Life management data setting prohibited
SM66		
SM67		
SM68		
SM69		(Data protect avoidance mode)

Device	abbrev.	Signal name
SM70		(APLC data protect avoidance mode)
SM71		
SM72		
SM73		
SM74		
SM75		
SM76		
SM77		
SM78		
SM79		

Device	abbrev.	Signal name
SM80		
SM81		
SM82		Model judgment code (for GOT)
SM83		Model judgment code (for GOT)
SM84		Version information (for GOT)
SM85		
SM86		
SM87		
SM88		
SM89		

Device	abbrev.	Signal name
SM90		
SM91		
SM92		
SM93		
SM94		
SM95		
SM96		
SM97		
SM98		
SM99		

Device	abbrev.	Signal name
SM100		
SM101		
SM102		
SM103		
SM104		
SM105		
SM106		
SM107		
SM108		
SM109		

Device	abbrev.	Signal name
SM110		
SM111		
SM112		CPU No. 1 reset flag
SM113		CPU No. 2 reset flag
SM114		CPU No. 3 reset flag
SM115		CPU No. 4 reset flag
SM116		CPU No. 1 error flag
SM117		CPU No. 2 error flag
SM118		CPU No. 3 error flag
SM119		CPU No. 4 error flag

Device	abbrev.	Signal name
SM120		Cyclic transmission receive error detection flag
SM121		Cyclic transmission receive error detection counter valid flag
SM122		
SM123		
SM124		
SM125		
SM126		
SM127		

Device	abbrev.	Signal name
SM240		CPU No. 1 reset flag (same as SM112)
SM241		CPU No. 2 reset flag (same as SM113)
SM242		CPU No. 3 reset flag (same as SM114)
SM243		CPU No. 4 reset flag (same as SM115)
SM244		CPU No. 1 error flag (same as SM116)
SM245		CPU No. 2 error flag (same as SM117)
SM246		CPU No. 3 error flag (same as SM118)
SM247		CPU No. 4 error flag (same as SM119)

Device	abbrev.	Signal name
SM412		1-second clock (same as SM38)

3.6.2 Special Register

Device	abbrev.	Signal name
SD0		Diagnosis error
SD1		Diagnosis error occurrence time Year/Month
SD2		Diagnosis error occurrence time Date/Hour
SD3		Diagnosis error occurrence time Minute/ Second
SD4		Error information class
SD5		Error common information
SD6		
SD7		
SD8		
SD9		

Device	abbrev.	Signal name
SD10		Error common information (continuation)
SD11		
SD12		
SD13		
SD14		
SD15		
SD16		Error individual information
SD17		
SD18		
SD19		

Device	abbrev.	Signal name
SD20		Error individual information (continuation)
SD21		
SD22		
SD23		
SD24		
SD25		
SD26		
SD27		
SD28		
SD29		

Device	abbrev.	Signal name
SD30		Writing translation error step No.
SD31		Writing translation error No.
SD32		
SD33		
SD34		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		2n-second clock set
SD41		
SD42		
SD43		
SD44		
SD45		
SD46		
SD47		
SD48		
SD49		

Device	abbrev.	Signal name
SD50		
SD51		Battery low latch
SD52		Battery low
SD53		AC/DC DOWN detection
SD54		
SD55		
SD56		
SD57		
SD58		
SD59		

Device	abbrev.	Signal name
SD60		
SD61		
SD62		Clock data Year/Month
SD63		Clock data Date/Hour
SD64		Clock data Minute/Second
SD65		Clock data Week
SD66		Multi-CPU No.
SD67		Cyclic transmission receive error threshold frequency setting
SD68		Cyclic transmission receive error detection counter for CPU No.1
SD69		Cyclic transmission receive error detection counter for CPU No.2

Device	abbrev.	Signal name
SD70		Cyclic transmission receive error detection counter for CPU No.3
SD71		Cyclic transmission receive error detection counter for CPU No.4
SD72		
SD73		
SD74		
SD75		
SD76		
SD77		
SD78		
SD79		

Device	abbrev.	Signal name
SD80		
SD81		
SD82		Model judgment code (for GOT)
SD83		Model judgment code (for GOT)
SD84		Version information (for GOT)
SD85		
SD86		
SD87		
SD88		
SD89		

Device	abbrev.	Signal name
SD90		
SD91		
SD92		
SD93		
SD94		
SD95		
SD96		
SD97		
SD98		
SD99		

Device	abbrev.	Signal name
SD100		
SD101		
SD102		
SD103		
SD104		
SD105		
SD106		
SD107		
SD108		
SD109		

Device	abbrev.	Signal name
SD110		
SD111		
SD112		
SD113		
SD114		
SD115		
SD116		
SD117		
SD118		
SD119		

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

Device	abbrev.	Signal name
SD200		Switch status (without internal device assignment)
SD201		LED status
SD203		CPU operation status
SD204		LED display color

Device	abbrev.	Signal name
SD210		Clock data Year/Month (same as SD62)
SD211		Clock data Date/Hour (same as SD63)
SD212		Clock data Minute/Second (same as SD64)
SD213		Clock data Week (same as SD65)

Device	abbrev.	Signal name
SD288		Number of points allocated for B (for extension) 1
SD289		Number of points allocated for B (for extension) 2

Device	abbrev.	Signal name
SD290		Device allocation: Number of points allocated for X
SD291		Device allocation: Number of points allocated for Y
SD292		Device allocation: Number of points allocated for M
SD293		Device allocation: Number of points allocated for L
SD294		Device allocation: Number of points allocated for B
SD295		Device allocation: Number of points allocated for F
SD296		Device allocation: Number of points allocated for SB
SD297		Device allocation: Number of points allocated for V
SD298		Device allocation: Number of points allocated for S
SD299		Device allocation: Number of points allocated for T

Device	abbrev.	Signal name
SD300		Device allocation: Number of points allocated for ST
SD301		Device allocation: Number of points allocated for C
SD302		Device allocation: Number of points allocated for D
SD303		Device allocation: Number of points allocated for W
SD304		Device allocation: Number of points allocated for SW

Device	abbrev.	Signal name
SD395		Multi-CPU No. (same as SD66)

Device	abbrev.	Signal name
SD412		1-second counter (same as SD34)
SD414		2n-second clock set (same as SD40)

Device	abbrev.	Signal name
SD420		Scan counter (same as SD35)

Device	abbrev.	Signal name
SD520		Current scan time (ms unit) (same as SD37)
SD524		Minimum scan time (ms unit) (same as SD38)
SD526		Maximum scan time (ms unit) (same as SD39)

4

Explanation of Interface Signals

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

Signal type	Explanation	Reference
Bit Type Input Signals	System State (CNC->PLC)	4.1
	Axis State (CNC->PLC)	4.2
	Part System State (CNC->PLC)	4.3
	Spindle State (CNC->PLC)	4.4
Data Type Input Signals	System State (CNC->PLC)	4.5
	Axis State (CNC->PLC)	4.6
	Part System State (CNC->PLC)	4.7
	Spindle State (CNC->PLC)	4.8
Bit Type Output Signals	System Command (PLC->CNC)	4.9
	Axis Command (PLC->CNC)	4.10
	Part System Command (PLC->CNC)	4.11
	Spindle Command (PLC->CNC)	4.12
Data Type Output Signals	System Command (PLC->CNC)	4.13
	Axis Command (PLC->CNC)	4.14
	Part System Command (PLC->CNC)	4.15
	Spindle Command (PLC->CNC)	4.16

How to read the signals

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
B	CUTTING BLOCK START INTERLOCK	*CSLn		Y714	Y7F4	Y8D4	Y9B4	YA94	YB74	YC54

The device Nos. for each part system

The table form is different depending on the signal.

(Common for part system, axis, spindle)

Types of contact

A : Signal which is valid at ON (A contact)

B : Signal which is valid at OFF (B contact)

(Note) For B contact, "*" is added to the head of the signal abbreviation.

4.1 Bit Type Input Signals : System State (CNC CPU->PLC CPU)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	24 HOURS CONTINUOUS OP-ERATION	CNOP		X310

[Function]

This signal notifies that the connector status of the drive power has been ON for over 24 hours.

[Operation]

This signal turns OFF when the contactor shutoff is confirmed by the contactor shutoff test.

Turn the "contactor shutoff test" signal ON to carry out this test.

[Caution]

There is a possibility that the contactor is welded and so your safety may not be secured when "24 hours continuous operation" signal is output. Thus, under this condition, do not input "speed monitor mode" signal to open the door.

[Related signals]

Contactor shutoff test (MCT)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	DUAL SIGNAL UNCONFIRMED AFTER COMPARE ERROR	SSUCHK		X311

[Function]

This signal notifies that ON/OFF of the previous error signal is not yet confirmed after a dual signal comparison error.

[Operation]

This signal turns ON at the power ON, after "Y20 Safety observation error 0020" (dual signal comparison error) has occurred.

When you check the ON/OFF status of the signal to which a comparison error occurred, or input a reset signal, this signal will turn OFF.

[Caution]

You can turn OFF this signal by inputting a reset signal as well as by checking the previous error signal's ON/OFF status. If you wish to use this signal after resetting, latch the signal.

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	OUTPUT OFF CHECK NOT COMPLETE	NOFFCHK		X312

[Function]

This signal notifies that the connector status of the dual signal module's output signals are not being all OFF for over 24 hours.

[Operation]

"Output OFF check not complete" signal will turn OFF when the all the output signals turned OFF is confirmed while the "output OFF check" signal is ON.

[Caution]

Create a PLC program that the operaters cannot touch the moving sections by disabling the door lock while the "output OFF check not complete" signal is OFF or dropping the power.

[Related signals]

Output OFF check (OFFCHK)

Contact	Signal name	Signal abbreviation		Common for part systems
B	POWER SHUTOFF NOTIFICATION	*PSDNTF		X313

[Function]

This signal informs that the power shutoff of the drive section is required.

[Operation]

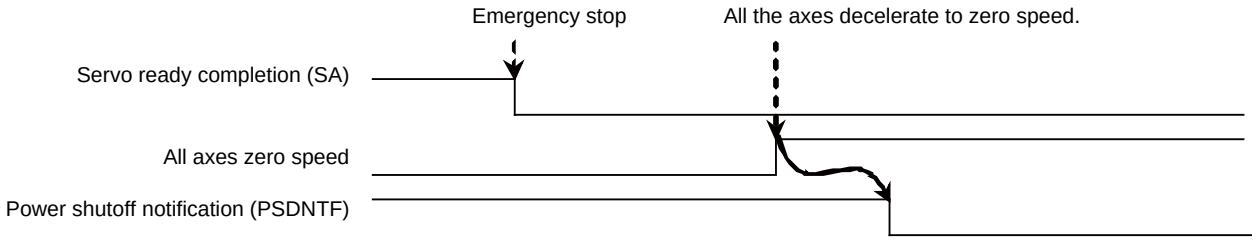
This signal turns OFF when it enters the emergency stop state so that the drive section can be shutoff.

It turns ON when the error factors are removed and there is no need to shutoff the drive section.

[Caution]

This signal is used to control a contactor at PLC side when there is no dual signal module. When it has a dual signal module, do not use this signal.

After the error factor of the emergency stop state is released, NC power needs to be turned ON again to turn this signal ON. However, it is possible to turn this signal ON by resetting if it is the safety observation error which can be removed by resetting.



Contact	Signal name	Signal abbreviation		Common for part systems
A	SKIPm INPUT SIGNAL STATE	SKIPmC		X318 - X31B

[Function]

This signal notifies that the skip signal is in input state. (m = 1 to 4)

[Operation]

It turns ON when the skip signal is input regardless of the setting of skip I/F switch parameter (#1258 set30/bit0).

The device No. will be recorded to the operation history at the rising and falling edge of this signal.

Contact	Signal name	Signal abbreviation		Common for part systems
A	CONTROLLER READY COMPLETION	MA		X320

[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.

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	SERVO READY COMPLETION	SA		X321

[Function]

This signal indicates that the servo system is ready for normal operation.

In other words, the servo system (position control) is not working when the signal is OFF.

[Operation]

The signal turns ON when:

(1) The diagnosis on the servo system is completed successfully after the control unit is turned ON.

(2) "Servo alarm", if occurs, is reset. (Resetting may not be possible depending on the servo alarm contents.)

(3) "Emergency stop" input is removed.

The signal turns OFF when:

(1) "Servo alarm" occurs.

(2) "Emergency stop" is input.

(3) The power supply of controller is turned OFF.

(4) Trouble occurs with the controller (such as failure in the CPU or memory).

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

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	DOOR OPEN ENABLE	DROPNS		X329

[Function]

This signal notifies the PLC that the drive power to all axes is turned OFF due to "Door open I, II" (DOOR1, 2) 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 I, II" (DOOR1, 2) signal turning ON.

This signal turns OFF at all axes ready ON and at all servo axes servo ON, due to "Door open I, II" (DOOR1, 2) 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 "Door open I, II" (DOOR1, 2) signals are output to the CNC after the PLC axis is stopped by the PLC. If "Door open I, II" (DOOR1, 2) signals are 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 remaining distance of PLC axis control information data.

(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 CNC. 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]

(1) Door open I (DOOR1)

(2) Door open II (DOOR2)

Contact	Signal name	Signal abbreviation		Common for part systems
A	IN SPINDLE SYNCHRONIZATION	SPSYN1		X32A

[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 synchronization control I)
- The "spindle synchronous control" (SPSY) signal turns ON. (Spindle synchronization control II)

The signal turns OFF when:

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

[Related signals]

(1) Spindle rotation speed synchronization completion (FSPRV)
(2) Spindle phase synchronization completion (FSPPH)
(3) Spindle synchronization (SPSY)
(4) Spindle phase synchronization (SPPHS)
(5) Spindle synchronization cancel (SSYNI)

Contact	Signal name	Signal abbreviation		Common for part systems
A	SPINDLE ROTATION SPEED SYNCHRONIZATION COMPLETION	FSPRV		X32B

[Function]

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

[Operation]

The signal turns ON when:

- The rotation speed difference of the primary spindle and secondary spindle reaches the value set for the spindle rotation speed attainment level in spindle synchronization mode. (Spindle synchronization I)

The signal turns OFF when:

- The actual rotation speed of the 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 signals]

(1) In spindle synchronization (SPSYN1)
(2) Spindle phase synchronization completion (FSPPH)
(3) Spindle synchronization (SPSY)
(4) Spindle phase synchronization (SPPHS)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	SPINDLE PHASE SYNCHRONI-ZATION COMPLETION	FSPPH		X32C

[Function]

This signal informs that the spindle synchronization state is entered.

[Operation]

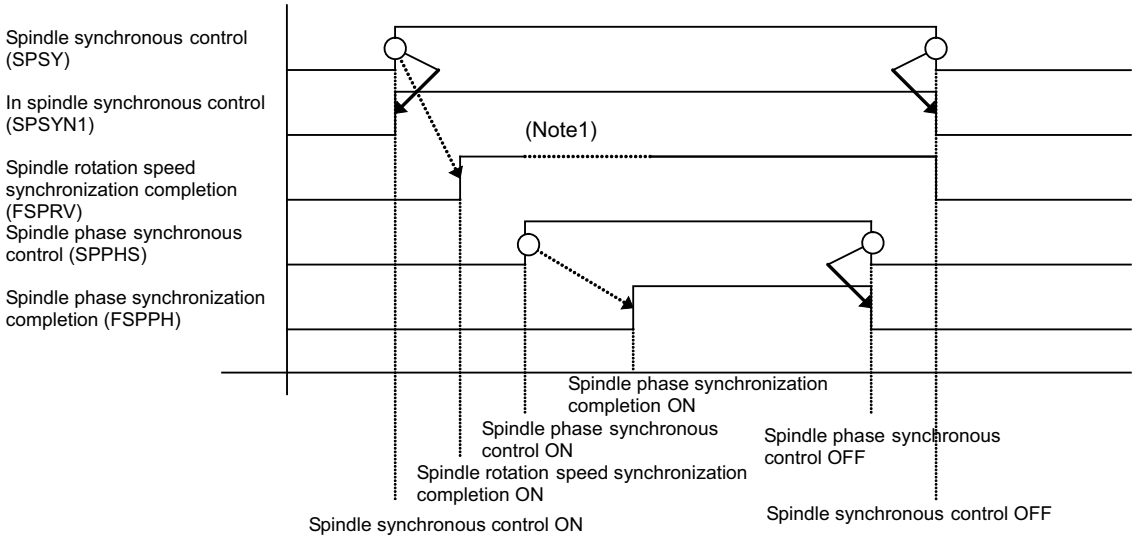
The signal turns ON when:

- 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 completion 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.**



(Note 1) Temporary turn OFF to change the rotation speed during the phase synchronization.

[Related signals]

(1) In spindle synchronization (SPSYN1)
(2) Spindle rotation speed synchronization completion (FSPRV)
(3) Spindle synchronization (SPSY)
(4) Spindle phase synchronization (SPPHS)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	CHUCK CLOSE CONFIRMA-TION	SPCMP		X32D

[Function]

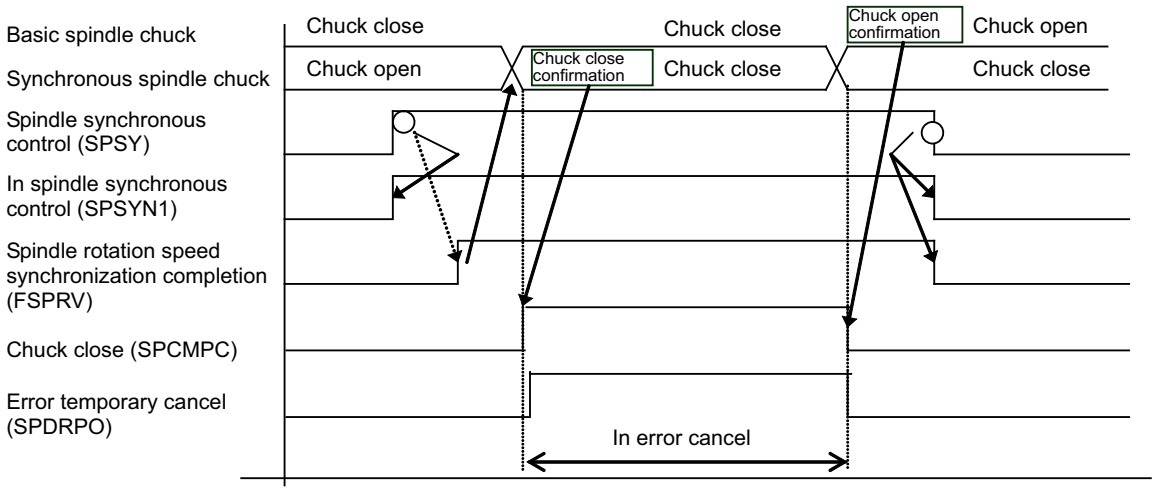
This signal informs that chuck close (SPCMPC) is input during spindle synchronous control.

[Operation]

This signal turns ON when the "Chuck close" (SPCMPC) is ON.

This signal turns OFF when the "Chuck close" (SPCMPC) 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 signals]

(1) Chuck close (SPCMPC)

(2) In spindle synchronization (SPSYN1)

(3) Spindle rotation speed synchronization completion (FSPRV)

(4) Spindle synchronization (SPSY)

(5) Error temporary cancel (SPDRPO)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	BATTERY WARNING	BATWR		X32E

[Function]

This signal notifies that the voltage of the data storage battery in the control unit or the battery supplying to the absolute position detector has dropped below the battery alarm detection level.

[Operation]

The signal turns ON when:

(1) The voltage of the data storage battery, which is checked constantly, has dropped below the battery alarm detection level (2.7V).
The alarm indicates the system alarm "Z52 BATTERY FAULT 0001" at this time.

(2) A fault is detected in the battery voltage (3.0V or less) supplied to the absolute position detector.
The alarms "Z73 ABS. WARNING 0001" and "S52 SERVO WARNING 009F" are displayed at this time.

(Note 1) Even if this signal is ON, starting the automatic operation is possible.

(Note 2) The battery alarm turns the automatic interlock ON even when the interlock has been set invalid.

The signal is turned OFF in the following way.

(1) When the alarm occurred by the cause written in (1) above, the signal is turned OFF by replacing the battery and then turning ON the "NC reset 1"signal (NRST1n).

(2) When the alarm occurred by the cause written in (2) above, the signal is turned OFF by removing the cause and then turning the power ON again.

(3) The signal is also turned OFF when the voltage of the data storage battery drops below the battery alarm detection level, and the battery alarm (BATAL) signal turns ON.
The system alarm "Z52 BATTERY FAULT 0003" is displayed at this time.

[Caution]

When this signal (BATWR) turns ON, it is recommended to replace battery as early as possible.

[Related signals]

(1) Battery alarm (BATAL)

(2) Battery drop cause

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	BATTERY ALARM	BATAL		X32F

[Function]

This signal notifies that the voltage of the data storage battery in the control unit or the battery supplying to the absolute position detector has dropped below the battery alarm detection level.

[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 battery alarm detection level (2.5V).
At this time, the alarm "Z52 BATTERY FAULT 0003" will be displayed.

(2) A fault is detected in the power voltage (battery voltage)(2.6V or less) for the speed detector in the absolute position detector.
At this time, the alarm "Z71 DETECTOR ERR 0001" will be displayed.

(3) The absolute position is lost by the drop in the backup power voltage (battery voltage) in the absolute position detector.
At this time, the alarm "Z70 Abs posn error(servo alm 25) 0101" will be displayed.

(4) A fault is detected in the battery voltage for the data storage detection circuit.
At this time, the alarm "Z52 BATTERY FAULT 0002" will be displayed.

(Note 1) Automatic starting is not possible when this signal is ON.

(Note 2) This battery alarm signal turns the automatic interlock ON even when the interlock has been set invalid.

(Note 3) The automatic interlock, validated when the battery alarm has been detected, can be set invalid with the parameter below.

#	R register	bit	Item	Details
6449	R4624	4	Automatic interlock invalid while battery alarm ON	Validates/invalidates the automatic interlock when the battery alarm is detected. This bit is always "0" (valid) when the power is turned ON. 0: Valid 1: Invalid

The signal turns OFF when:

(1) For alarms caused by ON condition (1)
The signal can be turned OFF with "NC reset 1" (NRST1n) signal after the battery is replaced with new one.

(2) For alarms caused by ON conditions (2) and (3)
The signal can be turned OFF by removing the alarm causes and then turning the power ON again.

[Caution]

(1) If simply turning the control unit power OFF upon occurrence of this battery alarm (especially in the "ON" conditions (1)), data storing machining programs, etc. will be destroyed. Replace the battery with new one before turning the power OFF and confirm that this signal is turned OFF.

(2) Make sure to backup the control unit data and keep it in case that data will be destroyed.
If this battery alarm has occurred when the control unit power is ON, take measures, assuming that the data storing machining programs may have been destroyed. (Confirm the data storing machining programs, etc.)

[Related signals]

(1) Battery warning (BATWR)

(2) Battery drop cause

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	NC ALARM 1	AL1		X330

[Function]

This signal informs that system error occurred in the controller.

[Operation]

If "watch dog error", "memory parity check error", etc. occurs on the controller side, the signal turns ON.
The system error can be reset by turning OFF.
(Note 1) "NC alarm 1" (AL1) may not be detected as signal.
(Note 2) For details of system alarms, refer to the relevant Instruction Manual or Setup Manual.

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	NC ALARM 2 (Servo alarm)	AL2		X331

[Function]

This signal informs that the controller is in servo alarm condition.
If servo alarm occurs, "Servo ready completion" (SA) signal 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, drive unit external emergency stop, etc.)
- Initial parameter error (parameter transferred to drive unit when the power is turned ON is illegal)
- Drive unit 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 or Setup Manual.

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	MACRO SINGLE VALID	MSON		X339

[Function]

This signal informs macro single is valid.
Macro single is used to stop the user macro command block by block during single block operation.

[Operation]

This signal turns ON by setting "1" in "#8101 MACRO SINGLE".

[Related signals]

(1) SINGLE BLOCK(SBKn)

Contact	Signal name	Signal abbreviation		Common for part systems
A	Power OFF required after parameter change	PARACHG		X33A

[Function]

This signal informs that the set parameter is not valid without turning the power ON again.

[Operation]

When the following operation is executed, the "Power OFF required after parameter change" signal is output, and the alarm "Z20 Power ON again" will be displayed in the alarm display area.

(1) The parameters to be valid after turning ON the power again are set from CNC monitor screen.
(2) The parameters to be valid after turning ON the power again are input via EZSocket.
(3) The parameter data (ALL.PRM) is input.
(4) The backup data (SRM.BIN) is input by the SRAM backup function.
(5) The backup data/restore data are restored.
(6) The parameters to be valid after turning ON the power again are changed with G10 L70 command.
(7) The standard parameters are set by setting "#1060 SETUP" to "1".

When the power is turned ON again, this signal will turn OFF and the message "Z20 Power ON again" will disappear.
This signal will not be cleared with NC reset.

[Caution]

A warning message and signal will be output when the parameters to be valid after turning ON the power again are changed. However, interlock, such as for operation startup, will not be executed until the power is turned ON again. Therefore, execute the interlock with PLC program.

Contact	Signal name	Signal abbreviation		Common for part systems
A	EDITIED DATA IN PROCESSING	EDITDO		X33B

[Function]

This signal informs that the compression process for the edited data is being executed.

[Operation]

Turn this signal ON when changing the machining program by editing or inputting the program.
This signal will turn OFF after the edited data compression process is completed.

[Caution]

The data being edited might corrupt if the controller's power is cutoff while this signal is ON.

[Related signals]

(1) Edited data error (EDITERR)
(2) Edited data recovery confirmation (EDITOK)

Contact	Signal name	Signal abbreviation		Common for part systems
A	EDITED DATA ERROR	EDITERR		X33C

[Function]

This signal informs that an error has occurred in the edited data.

[Operation]

This signal will turn ON if the alarm "Z99 FILE AREA ERROR" occurs
This signal will turn OFF when the alarm "Z99 FILE AREA ERROR" is all cleared.

[Caution]

Refer to the Setup manual on how to release the alarm.

[Related signals]

(1) Edited data error (EDITERR)
(2) Edited data recovery confirmation (EDITOK)

Contact	Signal name	Signal abbreviation		Common for part systems
A	NC DATA SAMPLING COMPLETED	SMPFIN		X33E

[Function]

This signal informs that the NC data sampling is completed (executed).

[Operation]

(1) This signal turns ON when "#0 sampling startup" is changed from "1" to "0" where the sampling data exists (Note). (Including when "9" is set to perform a force-quiet.)
(Note) When it entered into in sampling state even once after sampling is started.

(2) This signal turns OFF when "#0 sampling startup" is changed from "0" to "1".
The sampling data will be cleared if either the number of channels, buffering capacity or process configuration is changed. In this case, this signal will turn OFF.

Contact	Signal name	Signal abbreviation		Common for part systems
A	DOWNLOAD IN PROGRESS	DLOAD0		X350

[Function]

This signal informs that download from FTP server is started.

[Operation]

The signal turns ON when:

- Downloading a file from FTP server is normally started.

The signal turns OFF when:

- Download is completed.
- Download is interrupted as the data transfer error occurred during the download process. If it happens, the error code will be stored.

[Related signals]

(1) Download request (DLDREQ)
(2) Download completed (DLDFIN)
(3) Download error (DLDERR)

Contact	Signal name	Signal abbreviation		Common for part systems
A	DOWNLOAD COMPLETED	DLDFIN		X351

[Function]

This signal informs that a download from FTP server is successfully completed.

[Operation]

The signal turns ON when:

- Downloading a file from FTP server is started.

The signal turns OFF when:

- "Download request" (DODREQ) is turned OFF

[Related signals]

(1) Download request (DLDREQ)
(2) Download in progress (DLOAD0)
(3) Download error (DLDERR)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	DOWNLOAD ERROR	DLDERR		X352

[Function]

This signal informs that an error occurred when download is requested to FTP server.

This signal informs that an error occurred while downloading from FTP server.

[Operation]

The signal turns ON when:

- An error occurred when requesting download to FTP server but download cannot be started.
- Download is interrupted as an error occurred while downloading from FTP server.
- Download is requested when option is set as no setting. (In this case, the alarm for communication error will not occur simultaneously.)

The signal turns OFF when:

- "Download request" (DODREQ) is turned OFF.

[Related signals]

(1) Download request (DLDREQ)
(2) Download completed (DLDFIN)
(3) Download in progress (DLOAD0)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	PLC AXIS POSITION SWITCH n	PSWPn		X360 - X36F

[Function]

This is the position switch for the PLC control axis.

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

[Operation]

It operates the same as the NC axis position switch PSWmn.

[Related signals]

(1) Position switch m (PSWmn)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	APLC INPUT SIGNAL n	APLCINn		X380 - X39F

[Function] [Operation]

This signal is an interface for sending a signal from APLC C language module to PLC device.

4.2 Bit Type Input Signals : Axis State (CNC CPU->PLC CPU)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	SERVO READY	RDYn		X400	X420	X440	X460	X480	X4A0	X4C0	X4E0
				9th axis	**10th axis**	**11th axis**	**12th axis**	**13th axis**	**14th axis**	**15th axis**	**16th axis**
				X500	X520	X540	X560	X580	X5A0	X5C0	X5E0

[Function]

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

[Operation]

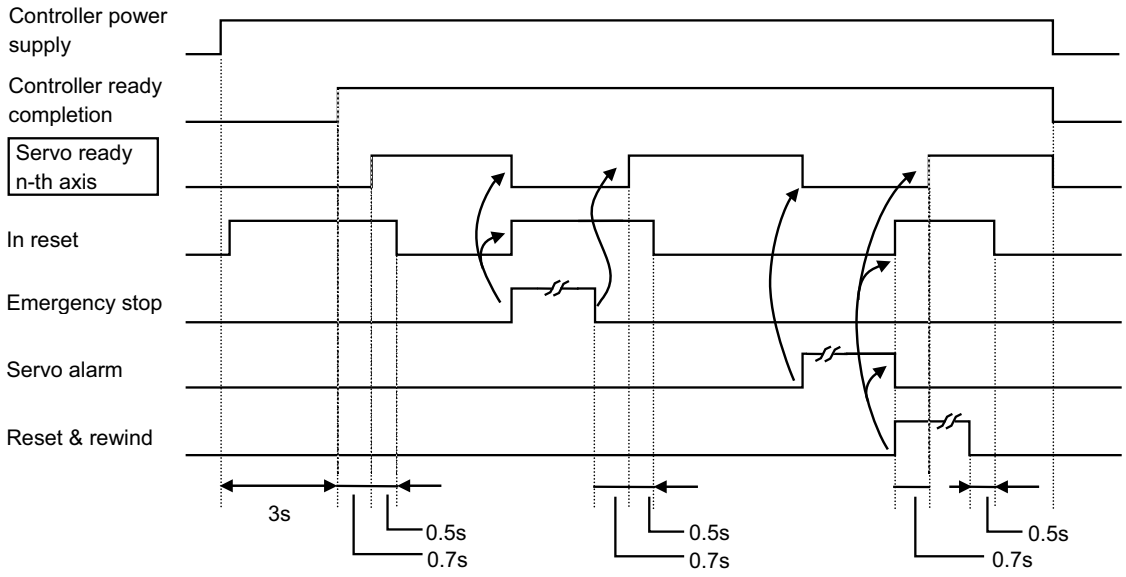
The signal turns ON when:

(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"(*SVFn) signal is reset.

The signal turns OFF when:

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

[Operation sequence]



[Related signals]

(1) Servo ready completion (SA)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	AXIS SELECTION	AXn		X401	X421	X441	X461	X481	X4A1	X4C1	X4E1
				9th axis	**10th axis**	**11th axis**	**12th axis**	**13th axis**	**14th axis**	**15th axis**	**16th axis**
				X501	X521	X541	X561	X581	X5A1	X5C1	X5E1

[Function]

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

[Operation]

This signal turns ON and OFF as follows:

(1) Automatic operation

The signal is ON while the motion command is issued to the end of movement, or to when automatic operation pause turns ON.

(2) Manual operation

(a) For JOG mode

The signal is ON while "Feed axis selection +/-" (+Jn and -Jn) signal is ON.

(b) For HANDLE mode

When "1st to 3rd handle axis selection code m" (HS1mn to HS3mn) and "Handle valid" signal (HS1Sn, HS2Sn, HS3Sn) have been selected, the "Axis selected" signal for the axis specified by the "1st to 3rd handle axis selection code m" (HS1mn to HS3mn) signal is ON.

(c) For INCREMENTAL mode

The signal turns ON when "Feed axis selection +/-" (+Jn, -Jn) signal turns ON, and turns OFF when the specified motion is completed.

(d) For MANUAL ARBITRARY FEED mode

The signal turns ON when "Manual arbitrary feed strobe" (CXS8n) signal turns ON, and turns OFF when the specified motion is completed.

(e) For REFERENCE POSITION RETURN mode

The signal is ON while "Feed axis selection +/-" (+Jn and -Jn) signal is ON. After "Reference position return near point detection" signal is detected, and the motion speed changes to approach (creeping) speed, the "Axis selected" signal remains ON until the motion stops at the reference position, even when "Feed axis selection +/-" (+Jn and -Jn) signal turns OFF.

(3) Other conditions

(a) The signal can turn ON even during machine lock (Z-axis is in cancellation). However, it does not turn ON during machine lock in manual operation mode.

(b) The signal remains on even when motion stops due to feedrate override set at 0%, manual control feedrate set at 0 mm/min, or 0 inch/min.

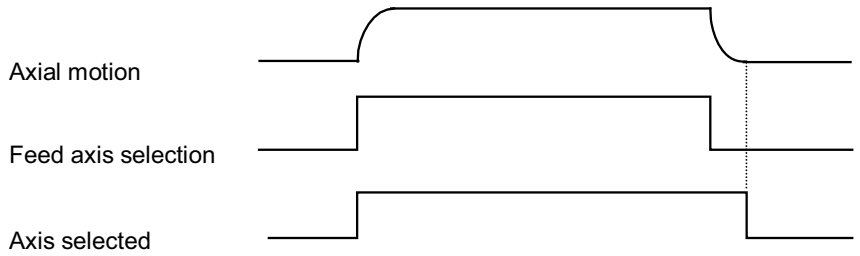
(c) Interlock does not affect status of this signal (the signal remains ON, or turns ON).

(d) "Servo off" signal does not affect status of this signal.

(e) The signal cannot be turned ON by G04 and G92.

(f) The signal turns OFF with "controller Reset & Rewind", or "Emergency stop".

(Example)



Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	IN AXIS PLUS MOTION	MVPn		X402	X422	X442	X462	X482	X4A2	X4C2	X4E2
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				X502	X522	X542	X562	X582	X5A2	X5C2	X5E2

[Function]

This signal indicates that the specified axial motion is in plus (+) direction.

This signal is available per control axis, and the last number of the signal name indicates the control axis No.

[Operation]

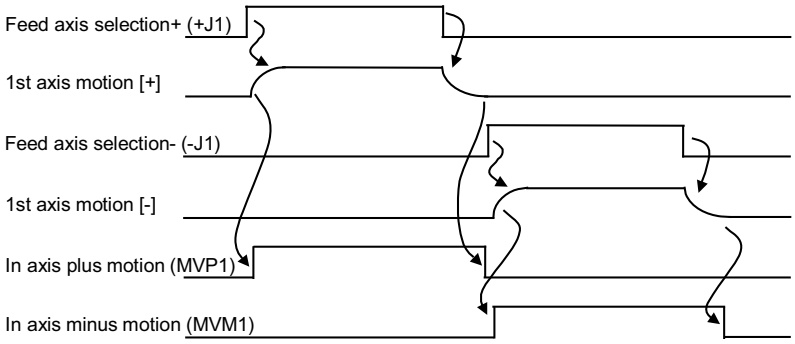
The signal turns ON when:

(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 timing chart for the jog mode is shown below.



(Note 1) This signal operates regardless of the operation mode.

(Note 2) The real movement direction is indicated.

(Note 3) The signal does not turn ON during machine lock.

[Related signals]

In axis minus motion (MVMn)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	IN AXIS MINUS MOTION	MVMn		X403	X423	X443	X463	X483	X4A3	X4C3	X4E3
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				X503	X523	X543	X563	X583	X5A3	X5C3	X5E3

[Function]

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

[Operation]

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

[Related signals]

In axis plus motion (MVPn)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	1ST REFERENCE POSITION REACHED	ZP1n		X404	X424	X444	X464	X484	X4A4	X4C4	X4E4
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				X504	X524	X544	X564	X584	X5A4	X5C4	X5E4

[Function]

This signal indicates that the axial component of the nth axis is ON the 1st reference position.

Each control axis is provided with this signal. The last number (n = 1, 2, 3...) of the signal abbreviation indicates the control axis No.

[Operation]

(1) The signal turns ON when:

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

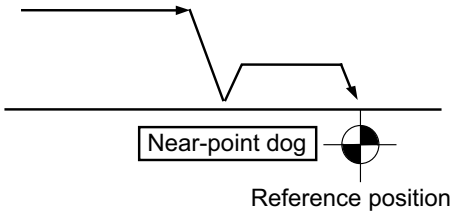
(Note 1) If "1st reference position reached" is achieved in other operation mode, or by other command, the signal does not turn ON.

(2) The signal turns OFF when:

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

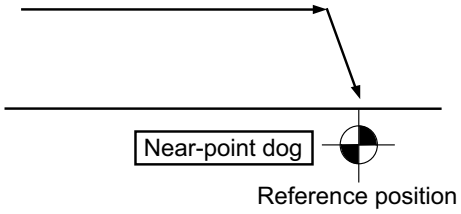
(3) Reference position return operation pattern

○ Dog-type reference position return



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

○ High-speed reference position return



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

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

[Related signals]

(1) 2nd reference position reached nth axis (ZP2n)
(2) 3rd reference position reached nth axis (ZP3n)
(3) 4th reference position reached nth axis (ZP4n)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	2ND REFERENCE POSITION REACHED	ZP2n		X405	X425	X445	X465	X485	X4A5	X4C5	X4E5
				9th axis	**10th axis**	**11th axis**	**12th axis**	**13th axis**	**14th axis**	**15th axis**	**16th axis**
				X505	X525	X545	X565	X585	X5A5	X5C5	X5E5

[Function]

This signal indicates that the axial component of the nth axis is on the 2nd reference position.
Each control axis is provided with this signal. The last number (n = 1, 2, 3...) of the signal abbreviation indicates the control axis No.

[Operation]

(1) The signal turns ON when:

- "2nd reference position reached" is attained with G30 command (G30 P2 X_ Y_ ...) in automatic operation.
- "2nd reference position reached" is attained with reference position retern mode of automatic operation (Reference position selection code 1, 2).

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

(2) The signal turns OFF when:

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

[Related signals]

(1) 1st reference position reached nth axis (ZP1n)
(2) 3rd reference position reached nth axis (ZP3n)
(3) 4th reference position reached nth axis (ZP4n)
(4) Reference position selection code m (ZSLmn)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	3RD REFERENCE POSITION REACHED	ZP3n		X406	X426	X446	X466	X486	X4A6	X4C6	X4E6
				9th axis	**10th axis**	**11th axis**	**12th axis**	**13th axis**	**14th axis**	**15th axis**	**16th axis**
				X506	X526	X546	X566	X586	X5A6	X5C6	X5E6

[Function][Operation]

This signal informs that the control axis is on the 3rd reference position.
Function and operation are the same as the 2nd reference position reached, but the reference position and G command are different.

- Reference position: 3rd reference position
- G comand: G30 P3

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	4TH REFERENCE POSITION REACHED	ZP4n		X407	X427	X447	X467	X487	X4A7	X4C7	X4E7
				9th axis	**10th axis**	**11th axis**	**12th axis**	**13th axis**	**14th axis**	**15th axis**	**16th axis**
				X507	X527	X547	X567	X587	X5A7	X5C7	X5E7

[Function][Operation]

This signal informs that the control axis is on the 4th reference position.
Function and operation are the same as the 2nd reference position reached, but the reference position and G command are different.

- Reference position: 4th reference position
- G comand: G30 P4

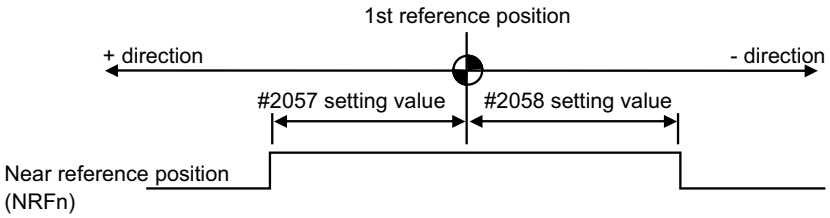
Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	NEAR REFERENCE POSITION	NRFn		X408	X428	X448	X468	X488	X4A8	X4C8	X4E8
				9th axis	**10th axis**	**11th axis**	**12th axis**	**13th axis**	**14th axis**	**15th axis**	**16th axis**
				X508	X528	X548	X568	X588	X5A8	X5C8	X5E8

[Function]

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

[Operation]

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



(Note 1) The "Near reference position" signal is output even while the axis is moving, but there may be a slight deviation with the actual machine position.
Rapid traverse: 4.8mm
Cutting feed: 2.4mm

(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.

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	NC AXIS UP-TO-SPEED	ARRFn		X409	X429	X449	X469	X489	X4A9	X4C9	X4E9
				9th axis	**10th axis**	**11th axis**	**12th axis**	**13th axis**	**14th axis**	**15th axis**	**16th axis**
				X509	X529	X549	X569	X589	X5A9	X5C9	X5E9

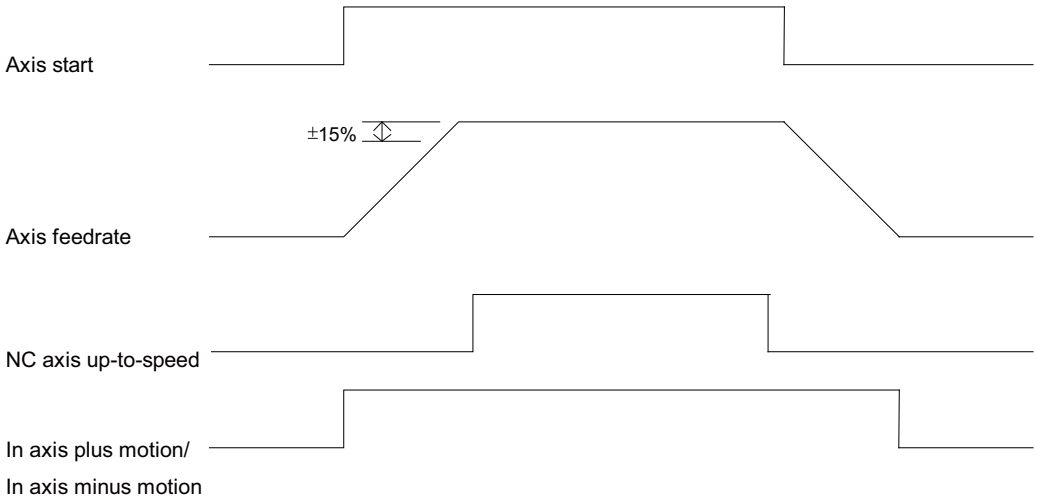
[Function]

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

[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]

(1) In axis plus motion (MVPn)

(2) In axis minus motion (MVMn)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	ZERO POINT INITIALIZATION SET COMPLETED	ZSFn		X40A	X42A	X44A	X46A	X48A	X4AA	X4CA	X4EA
				9th axis	**10th axis**	**11th axis**	**12th axis**	**13th axis**	**14th axis**	**15th axis**	**16th axis**
				X50A	X52A	X54A	X56A	X58A	X5AA	X5CA	X5EA

[Function]

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

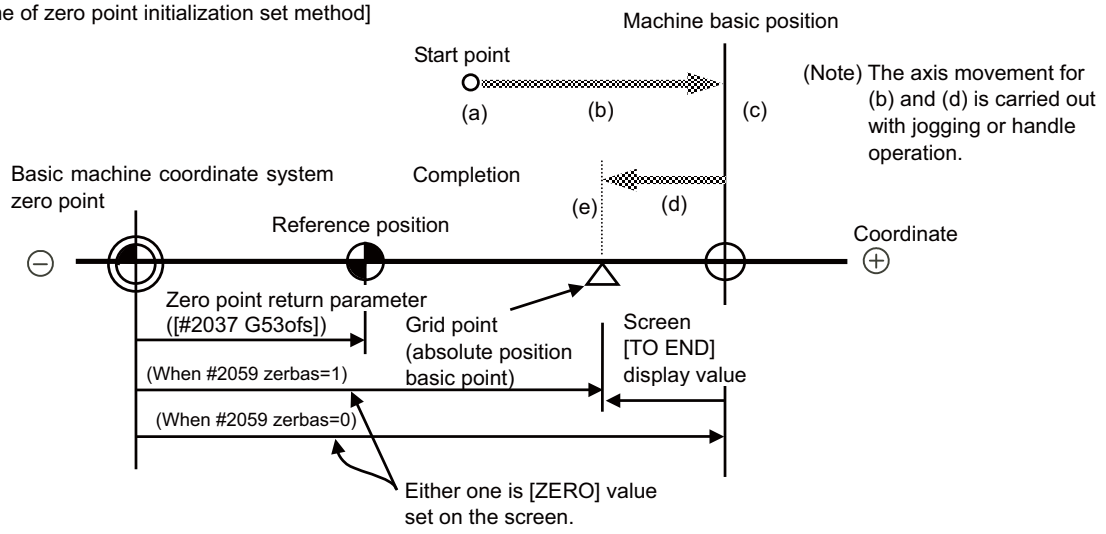
[Operation]

This signal is valid when "#2049 TYPE" on the [ABS. POSI PARAM] screen is set to "2" or "4", and turns ON when the basic machine coordinate system is set (established).

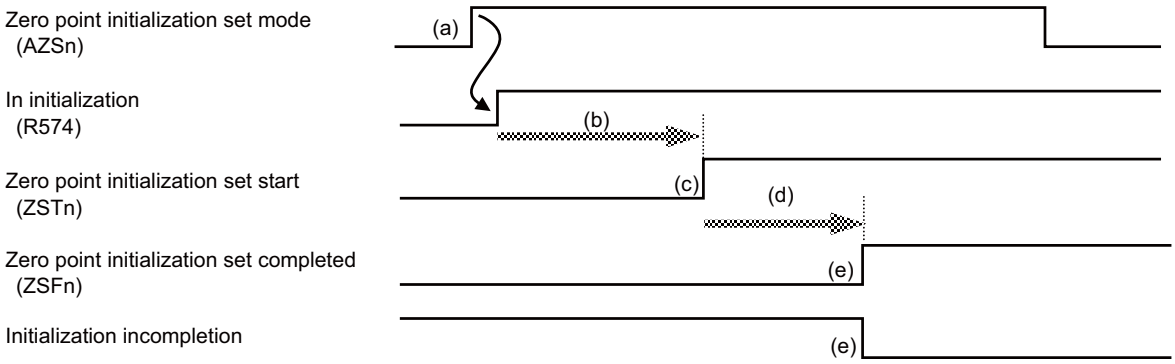
This signal will turn OFF if initializing is carried out again or if the power is turned ON again.

<Zero point initialization set method using marked point alignment method I, and timing chart>

[Outline of zero point initialization set method]

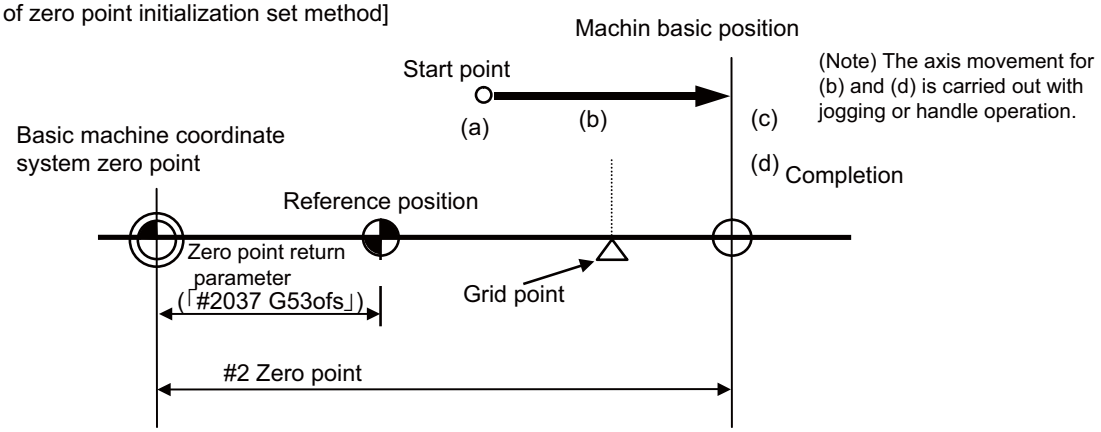


[Time chart] ((a) to (e) in the figure correspond to (a) to (e) above)



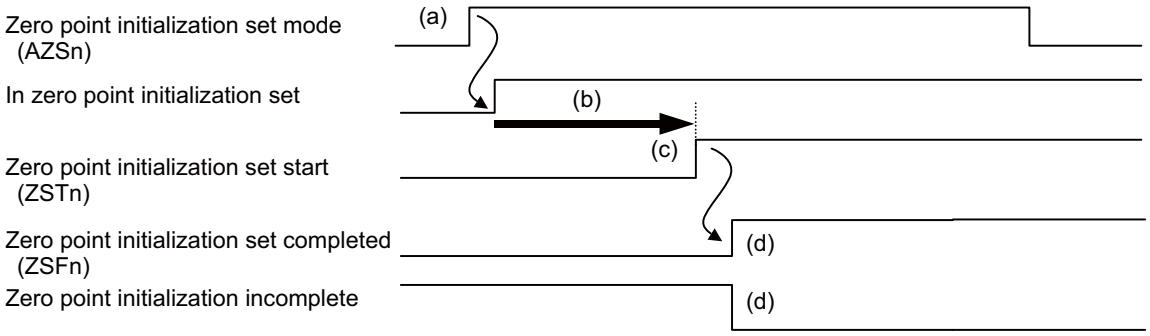
<Zero point initialization set method using marked point alignment method II, and timing chart>

[Outline of zero point initialization set method]



The parameter "#2059 zerbas" does not influence the "#2 Zero point".

[Time chart] ((a) to (d) in the figure correspond to (a) to (d) above)



[Related signals]

(1) Zero point initialization set error completed (ZSEn)
(2) In initialization
(3) Initialization incomplete
(4) Zero point initialization set mode (AZSn)
(5) Zero point initialization set start (ZSTn)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	ZERO POINT INITIALIZATION SET ERROR COMPLETED	ZSEn		X40B	X42B	X44B	X46B	X48B	X4AB	X4CB	X4EB
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				X50B	X52B	X54B	X56B	X58B	X5AB	X5CB	X5EB

[Function]

This signal is output when initializing is not possible during the marked point alignment method of the absolute position detection system I/II.

[Operation]

This signal turns ON when the initializing is not possible at the rising edge of the "Zero point initialization set start" (ZSTn) signal.

This signal is invalidated in the following cases:

- During emergency stop
- During reset
- When "Zero point initialization set start" (ZSTn) signal is turned ON before the "Zero point initialization set mode" (AZSn) signal
- When grid has not been passed even once after the power has been turned ON. (Depends on the detector type)

[Related signals]

(1) Zero point initialization set completed (ZSFn)
(2) In initialization
(3) Initialization incomplete
(4) Zero point initialization set mode (AZSn)
(5) Zero point initialization set start (ZSTn)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	IN ZERO POINT INITIALIZA-TION	ZSn		X40C	X42C	X44C	X46C	X48C	X4AC	X4CC	X4EC
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				X50C	X52C	X54C	X56C	X58C	X5AC	X5CC	X5EC

[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 (AZSn) signal is ON.

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	ZERO POINT INITIALIZATION INCOMPLETE	ZLSn		X40D	X42D	X44D	X46D	X48D	X4AD	X4CD	X4ED
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				X50D	X52D	X54D	X56D	X58D	X5AD	X5CD	X5ED

[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.

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	IN CURRENT LIMIT	ILIn		X40E	X42E	X44E	X46E	X48E	X4AE	X4CE	X4EE
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				X50E	X52E	X54E	X56E	X58E	X5AE	X5CE	X5EE

[Function][Operation]

This signal turns ON during the current limit.

[Related signals]

(1) Current limit reached (ILAn)
(2) Current limit changeover (ILCn)
(3) Droop release request (DORn)
(4) Current limit mode 1 and 2 (ILMmn)
(5) Current limit changeover

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	CURRENT LIMIT REACHED	ILAn		X40F	X42F	X44F	X46F	X48F	X4AF	X4CF	X4EF
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				X50F	X52F	X54F	X56F	X58F	X5AF	X5CF	X5EF

[Function][Operation]

This signal turns ON when the current reaches its limit during the current limit control.

[Related signals]

(1) In current limit (ILIn)
(2) Current limit changeover (ILCn)
(3) Droop release request (DORn)
(4) Current limit mode m (ILMmn)
(5) Current limit changeover

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	UNCLAMP COMMAND	UCLPn		X410	X430	X450	X470	X490	X4B0	X4D0	X4F0
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				X510	X530	X550	X570	X590	X5B0	X5D0	X5F0

[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 completion" (UCLPFn) 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]

(1) Unclamp completion (UCLPFn)

Contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	IN-POSITION	INPn		X411	X431	X451	X471	X491	X4B1	X4D1	X4F1
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				X511	X531	X551	X571	X591	X5B1	X5D1	X5F1

[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.

Contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	IN MULTI-STEP SPEED MONITOR	MSOEn		X412	X432	X452	X472	X492	X4B2	X4D2	X4F2
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				X512	X532	X552	X572	X592	X5B2	X5D2	X5F2

[Function]

This signal indicates that the axis is in multi-step speed monitor.

In multi-step monitor, when the speed of axis exceeds the monitor speed the safety observation error will occur.

[Operation]

After the "Multi-step speed monitor request" (MSORn) is turned on, the speed of axis becomes less than monitoring speed, and both NC and drive unit start executing the speed monitor function, this signal will be turned ON.

When "Multi-step speed request" (MSORn) signal is turned off, this signal too will be turned off.

[Related signals]

(1) Multi-step speed monitor request (MSORn)

(2) Multi-step speed monitor mode input (MSOMImn)

(3) Multi-step speed monitor mode output (MSOMOmn)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	MULTI-STEP SPEED MONITOR MODE OUTPUT m	MSO-MOmn		X413 - 414	X433 - 434	X453 - 454	X473 - 474	X493 - 494	X4B3 - 4B4	X4D3 - 4D4	X4F3 - 4F4
				9th axis	**10th axis**	**11th axis**	**12th axis**	**13th axis**	**14th axis**	**15th axis**	**16th axis**
				X513 - 514	X533 - 534	X553 - 554	X573 - 574	X593 - 594	X5B3 - 5B4	X5D3 - 5D4	X5F3 - 5F4

[Function]

This signal notifies which speed monitor parameter (speed monitor mode) is used for the speed monitor in the multi-step speed monitoring.

Multi-step speed monitor mode output		Speed monitor mode to be used
MSOMO2n	MSOMO1n	
0	0	1
0	1	2
1	0	3
1	1	4

[Operation]

When the monitor speed of drive unit is switched to the safety monitor speed of the mode which is designated by "Multi-step speed monitor mode input" (MSOMImn), this signal is also switched to the designated mode.

[Related signals]

(1) Multi-step speed monitor request (MSORn)

(2) In multi-step speed monitor (MSOEn)

(3) Multi-step speed monitor mode input (MSOMImn)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	AXIS SWITCHING INVALID STATUS	AXCHGISn		X416	X436	X456	X476	X496	X4B6	X4D6	X4F6
				9th axis	**10th axis**	**11th axis**	**12th axis**	**13th axis**	**14th axis**	**15th axis**	**16th axis**
				X516	X536	X556	X576	X596	X5B6	X5D6	X5F6

[Function]

This signal informs that the switching between NC axis and PLC axis cannot be executed.

[Operation]

This signal turns ON when the following conditions apply to the axis which is valid for switching between NC axis and PLC axis. When switching between NC axis and PLC axis is executed while this signal is ON, an alarm "M01 NC/PLC axis switch illegal 1250" will occur.

- While the axis is in motion
- During the Servo OFF
- While removing the axis
- While the axis is stooped with interlock
- While the axis is stopped for override
- During the current limit
- During the droop release
- The axis is stopped because of feed hold during the program command
- The axis is stopped before completing all the axes' movement even more than two axes are commanded by the program
- During the H/W OT, soft limit

[Related signals]

(1) In PLC axis control (PLCMODn)

(2) PLC axis switching (CHGPLCn)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	IN PLC AXIS CONTROL	PLCMODn		X417	X437	X457	X477	X497	X4B7	X4D7	X4F7
				9th axis	**10th axis**	**11th axis**	**12th axis**	**13th axis**	**14th axis**	**15th axis**	**16th axis**
				X517	X537	X557	X577	X597	X5B7	X5D7	X5F7

[Function]

This signal informs that the mode is PLC axis control for NC axis/PLC axis switching function.

[Operation]

This signal turns OFF during the NC axis control and turns ON during the PLC axis control.

[Related signals]

(1) Axis switching invalid status (AXCHGISn)

(2) PLC axis switching (CHGPLCn)

4.3 Bit Type Input Signals : Part System State (CNC CPU->PLC CPU)

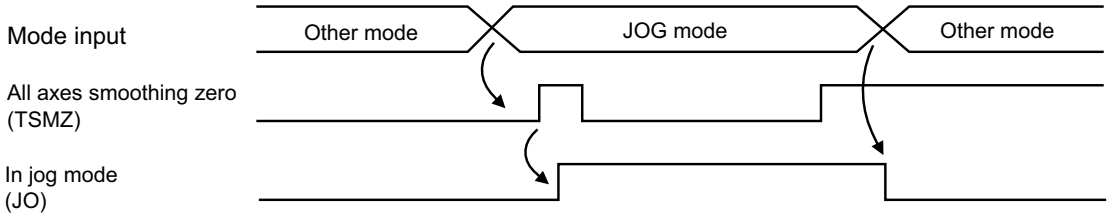
Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	IN JOG MODE	JOn		X600	X680	X700	X780	X800	X880	X900

[Function]

This signal indicates that JOG mode is selected.

[Operation]

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



[Related signals]

(1) All axes smoothing zero (TSMZn)

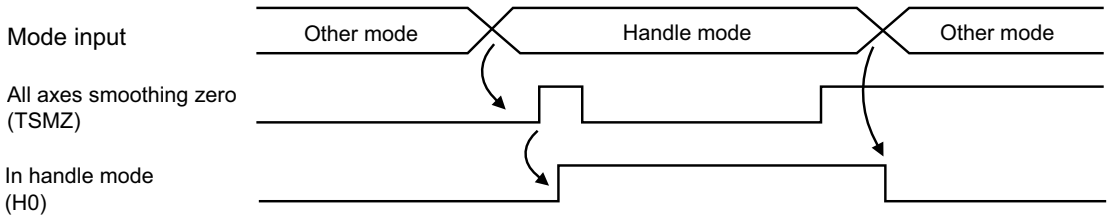
Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	IN HANDLE MODE	HOn		X601	X681	X701	X781	X801	X881	X901

[Function]

This signal indicates that HANDLE mode is selected.

[Operation]

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



[Related signals]

(1) All axes smoothing zero (TSMZn)

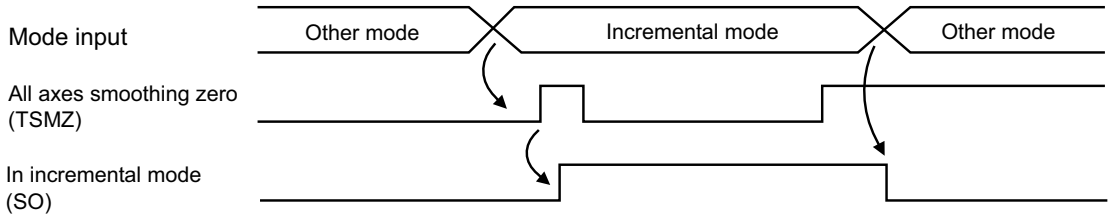
Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	IN INCREMENTAL MODE	SOn		X602	X682	X702	X782	X802	X882	X902

[Function]

This signal indicates that INCREMENTAL mode is selected.

[Operation]

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



[Related signals]

(1) All axes smoothing zero (TSMZn)

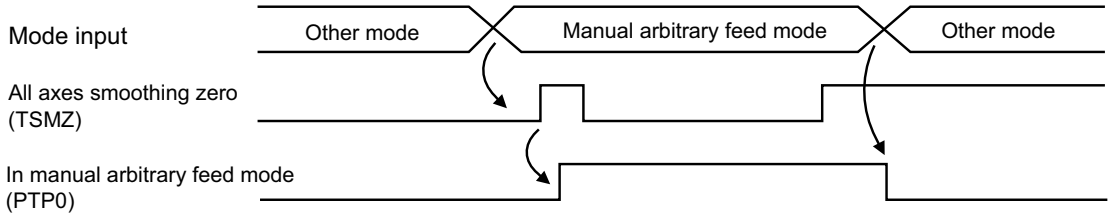
Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	IN MANUAL ARBITRARY FEED MODE	PTPOn		X603	X683	X703	X783	X803	X883	X903

[Function]

This signal indicates that MANUAL ARBITRARY FEED mode is selected.

[Operation]

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



[Related signals]

(1) All axes smoothing zero (TSMZn

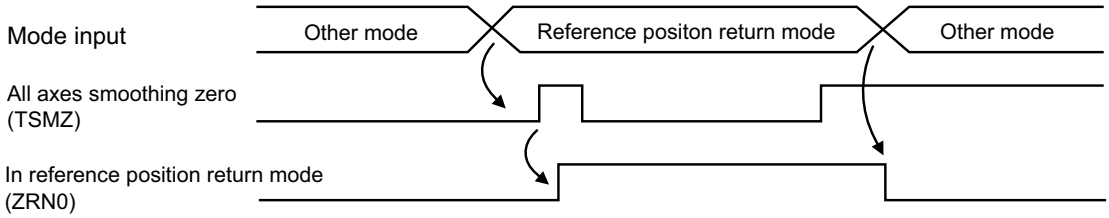
Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
A	IN REFERENCE POSITION RETURN MODE	ZRNOn		X604	X684	X704	X784	X804	X884	X904

[Function]

This signal indicates that REFERENCE POSITION RETURN mode is selected.

[Operation]

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



[Related signals]

(1) All axes smoothing zero (TSMZn)

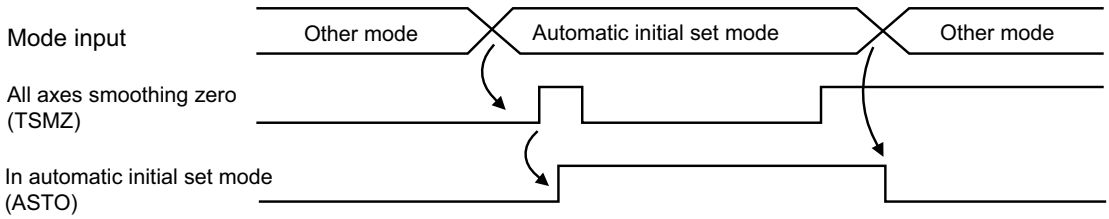
Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
A	IN AUTOMATIC INITIAL SET MODE	ASTOn		X605	X685	X705	X785	X805	X885	X905

[Function]

This signal indicates that AUTOMATIC INITIAL SET MODE is selected.

[Operation]

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



[Related signals]

(1) All axes smoothing zero (TSMZn)

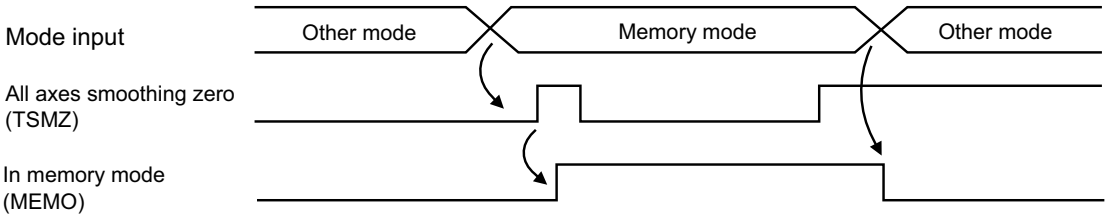
Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	IN MEMORY MODE	MEMOn		X608	X688	X708	X788	X808	X888	X908

[Function]

This signal indicates that MEMORY mode is selected.

[Operation]

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



[Related signals]

(1) All axes smoothing zero (TSMZn)

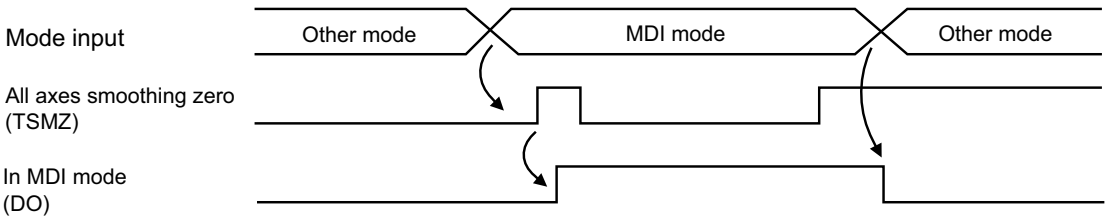
Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	IN MDI MODE	DOn		X60B	X68B	X70B	X78B	X80B	X88B	X90B

[Function]

This signal indicates that MDI mode is selected.

[Operation]

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



[Related signals]

(1) All axes smoothing zero (TSMZn)

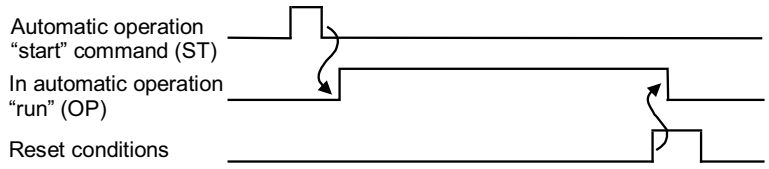
Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	IN AUTOMATIC OPERATION "RUN"	OPn		X612	X692	X712	X792	X812	X892	X912

[Function]

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

[Operation]

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



(1) Reset conditions include the followings:

- "Reset & rewind" (RRWn) is input.
- "Emergency stop" signal or "Servo alarm" signal is input.

(2) Signals that indicates status of automatic operation are "In automatic operation "start""(STLn) and "In automatic operation pause" (SPLn) besides "In atuo operation "run""(OPn).

The ON/OFF state of these signals in each state are shown below.

	In automatic operation"RUN" (OPn)	In automatic operation"START" (STLn)	In automatic operation"PAUSE" (SPLn)
Reset condition	0	0	0
Auto operation stop condition	1	0	0
Auto operation pause condition	1	0	1
Auto operation start condition	1	1	0

The outline of each condition is as follows:

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

[Related signals]

(1) In automatic operation "start" (STLn)
(2) In automatic operation "pause" (SPLn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	IN AUTOMATIC OPERATION "START"	STLn		X613	X693	X713	X793	X813	X893	X913

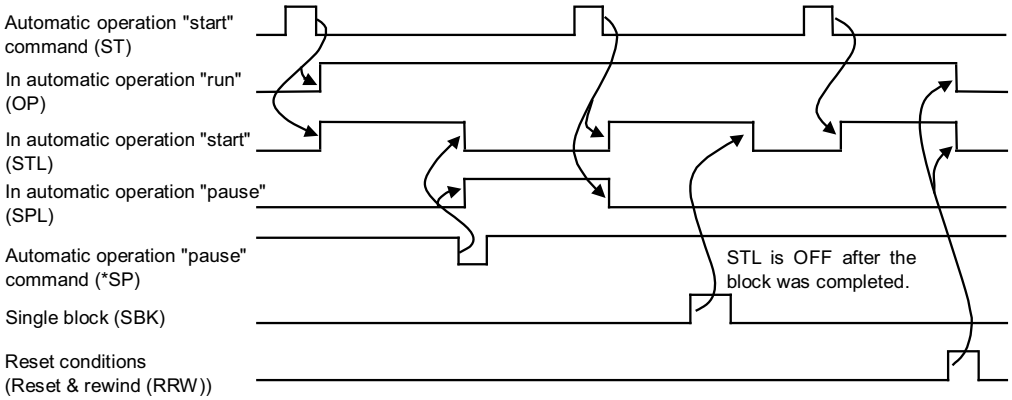
[Function]

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

[Operation]

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

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



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

[Related signals]

(1) In automatic operation "run" (OPn)

(2) In automatic operation "pause" (SPLn)

(3) Automatic operation "start" command (STn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	IN AUTOMATIC OPERATION "PAUSE"	SPLn		X614	X694	X714	X794	X814	X894	X914

[Function]

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

[Operation]

The "In automatic operation "pause"" (SPLn) signal turns ON with the following factors during automatic operation using the memory or MDI mode.

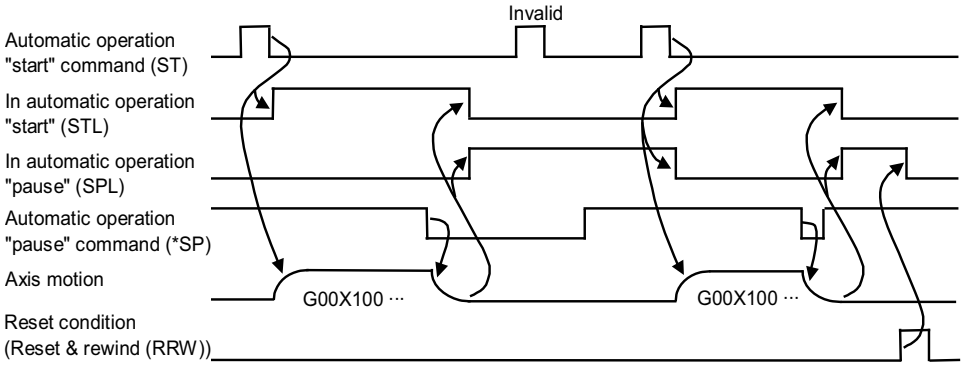
(1) When "Automatic operation "pause" command (Feed hold)" (*SPn) signal turns OFF.
(2) When mode changes to manual operation mode (jog, handle, incremental, reference position return mode, etc.).

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

This signal turns OFF in the following cases.

(1) When "Automatic operation "start" command" (STn) signal turns OFF from ON. However, this will be invalid if the "Automatic operation "pause" command (Feed hold)" (*SPn) signal 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 automatic operation "pause"" (SPLn) signal is shown below.



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

[Related signals]

(1) In automatic operation (OPn)
(2) In automatic operation "start" (STLn)
(3) Automatic operation "start" command (STn)
(4) Automatic operation "pause" command (Feed hold) (*SPn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	IN "RESET"	RSTn		X615	X695	X715	X795	X815	X895	X915

[Function]

This signal informs that the controller is in reset condition.

[Operation]

The signal turns ON:

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

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	IN MANUAL ARBITRARY FEED	CXNn		X616	X696	X716	X796	X816	X896	X916

[Function]

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

[Operation]

The signal turns ON:

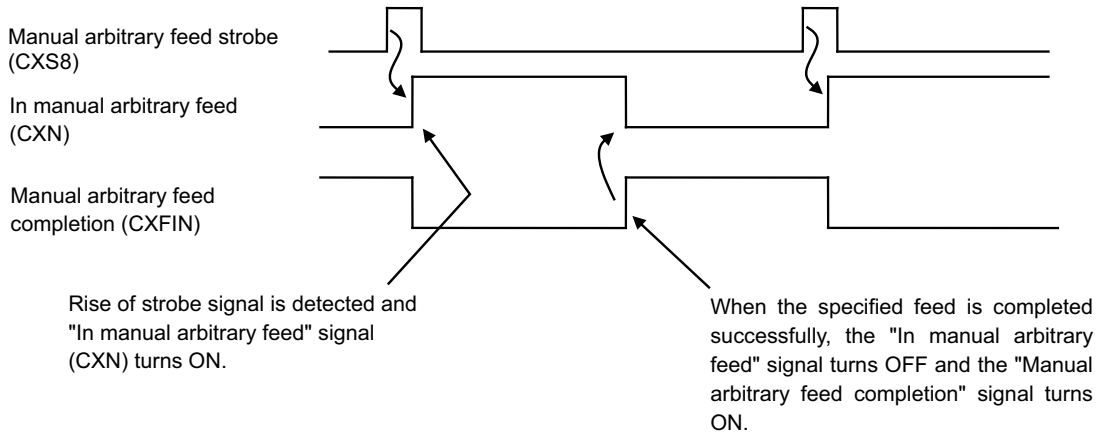
(1) "Manual arbitrary feed strobe" signal (CXS8n) turns ON during MANUAL ARBITRARY FEED mode.

The signal turns OFF:

(1) Commanded feed has been completed.

(2) When "Reset & Rewind" signal is input during execution of manual arbitrary feed command.

[Timing chart]



[Related signals]

(1) Manual arbitrary feed strobe (CXS8n)

(2) In manual arbitrary feed (CXFINn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	IN REWIND	RWDn		X617	X697	X717	X797	X817	X897	X917

[Function]

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

[Operation]

The signal turns ON when "Reset & rewind" (RRWn) signal 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]

(1) Reset & rewind (RRWn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	MOTION COMMAND COMPLE-TION	DENn		X618	X698	X718	X798	X818	X898	X918

[Function]

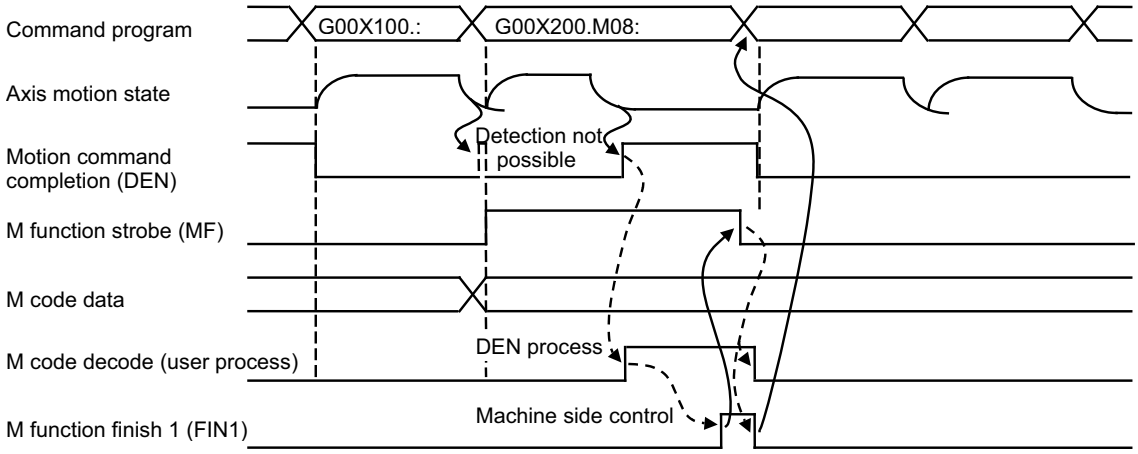
This signal notifies that the commanded motion has been completed by the controller.
In the machining program when the motion command and miscellaneous function (M, S, T, B) command are specified in the same block, this signal can be used as a synchronization signal to determine whether miscellaneous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

[Operation]

The signal turns ON when:

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

The timing chart for the "Motion command completion" (DENn) signal is shown below.



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

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	ALL AXES IN-POSITION	TIMPn		X619	X699	X719	X799	X819	X899	X919

[Function]

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

[Operation]

The signal turns ON when:

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

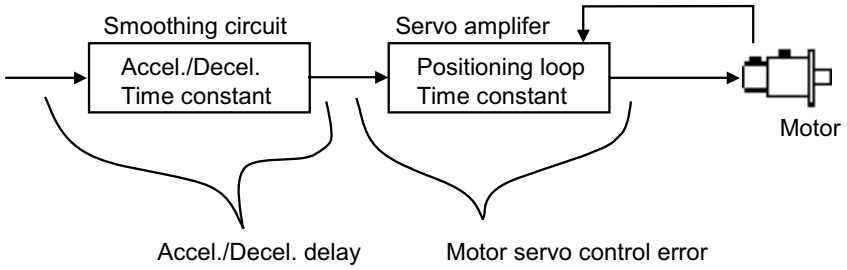
The signal turns OFF when:

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

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

(Note 1) The 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 depending on whether there is any delay in the acceleration/deceleration.



[Related signals]

(1) All axes smoothing zero (TSMZn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	ALL AXES SMOOTHING ZERO	TSMZn		X61A	X69A	X71A	X79A	X81A	X89A	X91A

[Function]

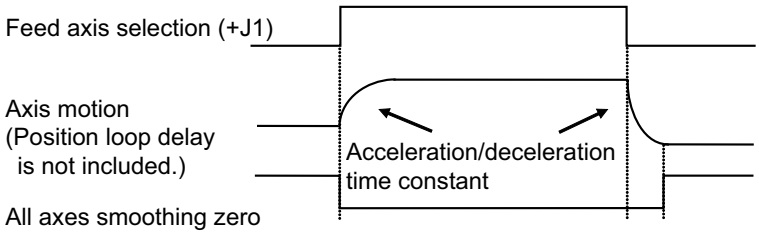
This signal informs the PLC that there is no delay (caused by the acceleration/deceleration time constants) in any of the controller control axis command system.

The PLC axis is not included in the control axis.

[Operation]

The signal turns ON when the movement amount commanded in automatic or manual operation, including delay amount of acceleration/deceleration time constant, is successfully output.

The signal turns OFF during execution of movement command, or if delay exists in acceleration/deceleration time constant.



(Note 1) The signal can turn ON even during machine lock.

(Note 2) The signal may turn ON during motion if the motion is an extremely low speed.

[Related signals]

(1) All axes in-position (TIMPn)

(2) In axis plus motion (MVPn) ... "All axes smoothing zero" signal turns ON when these signals are OFF.

(3) In axis minus motion (MVMn) ... "All axes smoothing zero" signal turns ON when these signals are OFF.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	MANUAL ARBITRARY FEED COMPLETION	CXFINn		X61C	X69C	X71C	X79C	X81C	X89C	X91C

[Function]

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

[Operation]

The signal turns ON when:

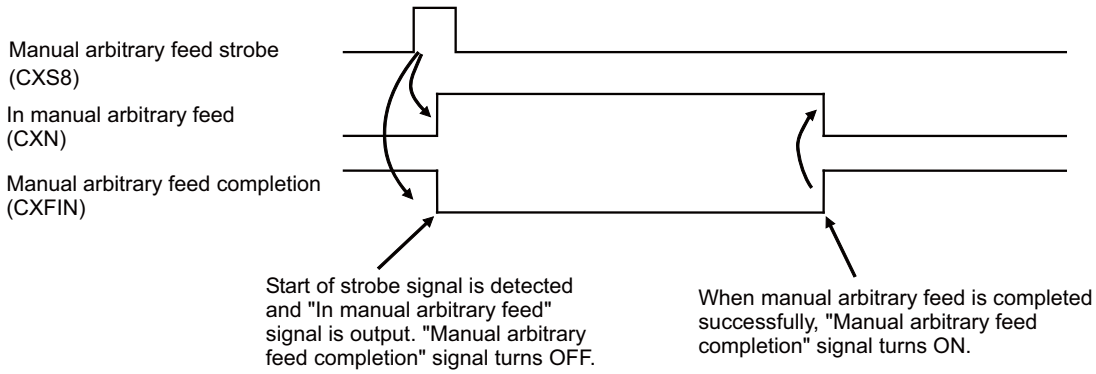
(1) The motion commanded in manual arbitrary feed mode is completed.

The signal turns OFF when:

(1) During motion in manual arbitrary feed mode.
(The signal stays OFF when motion is interrupted by a reset & rewind signal.)

(2) The power is turned ON.

[Timing chart]



[Related signals]

(1) Manual arbitrary feed strobe (CXS8n)

(2) In manual arbitrary feed (CXNn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	EXTERNAL SEARCH FINISHED	ETSEn		X61D	X69D	X71D	X79D	X81D	X89D	X91D

[Function] [Operation]

This turns ON when the external search is finished. This also turns ON when an error occurs.

This signal turns OFF when the "external search strobe" signal is turned OFF from the user PLC.

[Related signals]

(1) External search status

(2) External search device No.

(3) External search program No.

(4) External search sequence No.

(5) External search block No.

(6) External search strobe (EXTSSn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	IN RAPID TRAVERSE	RPNn		X620	X6A0	X720	X7A0	X820	X8A0	X920

[Function]

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

[Operation]

(1) The signal is ON when:

- Rapid traverse motion in automatic operation.
  Fixed cycle positioning and reference position return (G28), etc., are included in the automatic operation rapid traverse besides the motion command by the G00 command.

(2) The signal turns OFF when:

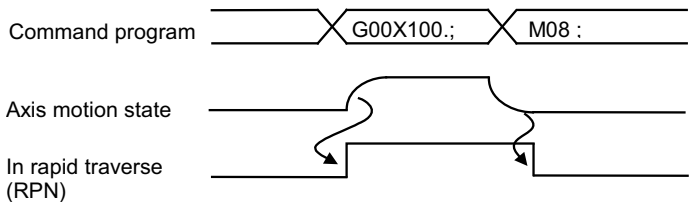
- The block in rapid traverse motion is completed during automatic operation.
- Rapid traverse motion is stopped by "Automatic operation "pause" command (Feed hold)" (*SPn) signal during automatic operation.
- Rapid traverse motion axis is stopped by interlock during automatic operation.
- The ratio of the "Cutting feedrate override code m" (*FVmn) 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" (RPNn) signal 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 automatic operation "run"" (OPn) signal.

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



Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	IN CUTTING FEED	CUTn		X621	X6A1	X721	X7A1	X821	X8A1	X921

[Function]

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

[Operation]

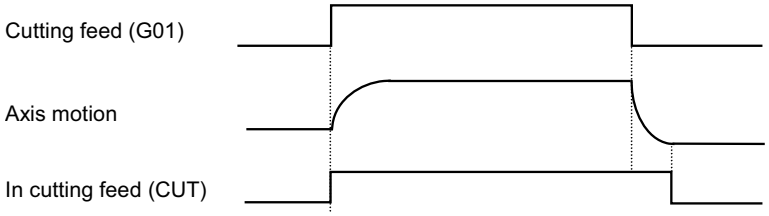
The signal turns ON when:

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

The signal turns OFF when:

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

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



Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	IN TAPPING	TAPn		X622	X6A2	X722	X7A2	X822	X8A2	X922

[Function]

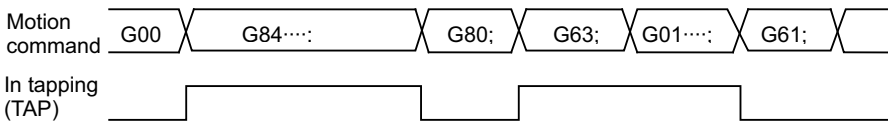
This signal informs that commanded motion in automatic operation (memory, MDI) is executed in canned tapping cycle, or tapping mode is selected for execution of commanded motion.

[Operation]

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

(2) The signal turns OFF when:
- Commanded motion is not being executed in fixed tapping cycle, nor in tapping mode.

The signal is reset by G80 or "01" group G command (G00, G01, G02, G03, G33) during canned tapping cycle, and by G61, G62 and G64 during tapping mode.



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

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	IN THREAD CUTTING	THRDn		X623	X6A3	X723	X7A3	X823	X8A3	X923

[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.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	IN SYNCHRONOUS FEED	SYNn		X624	X6A4	X724	X7A4	X824	X8A4	X924

[Function]

This signal is output during execution of synchronous feed command.

[Operation]

The signal turns ON when:

- Synchronous feed command (G94) is given.

The signal turns OFF when:

- Asynchronous feed command (G95) is given.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	IN CONSTANT SURFACE SPEED	CSSn		X625	X6A5	X725	X7A5	X825	X8A5	X925

[Function]

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

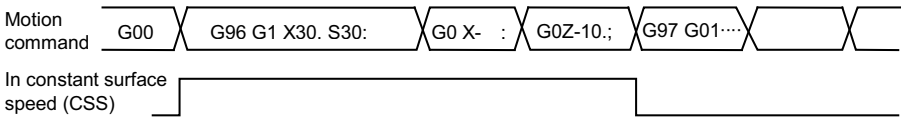
[Operation]

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 (CSSn) is output even during machine lock.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	IN SKIP	SKIPn		X626	X6A6	X726	X7A6	X826	X8A6	X926

[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.

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
A	IN REFERENCE POSITION RETURN	ZRNNn		X627	X6A7	X727	X7A7	X827	X8A7	X927

[Function]

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

[Operation]

The signal turns ON when:

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

The signal turns OFF when:

(1) All cases other than above.

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
A	IN INCH UNIT SELECTION	INCHn		X628	X6A8	X728	X7A8	X828	X8A8	X928

[Function]

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

[Operation]

This signal turns ON when inch unit is selected.
During G20 (Inch unit command) modal, "In inch unit selection" signal turns ON.
This signal will not change with machine parameter "#1041 I_inch".

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
A	F 1-DIGIT COMMANDED	F1DNn		X62A	X6AA	X72A	X7AA	X82A	X8AA	X92A

[Function]

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

[Operation]

The signal turns ON when:

(1) F1-digit command (F1 to 5) is selected for feedrate command 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 (Feed hold)" (*SPn) signal during execution of motion command by F1-digit command.
(3) Operation is stopped by "Interlock" signal during execution of motion command by F1-digit command.
(4) Reset condition occurs.
(For details of reset conditions, refer to the description about "In automatic operation "run"" (OPn) signal.)

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

[Related signals]

(1) F1-digit No. code m (F1mn)

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
A	IN TOOL LIFE MANAGEMENT	TLFOn		X62B	X6AB	X72B	X7AB	X82B	X8AB	X92B

[Function]

This signal is output during the tool life management.

[Operation]

"In tool life management" (TLFOn) signal turns ON when the tool life management (#1103 T_Life) on the parameter is ON.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	TOOL LIFE OVER	TLOVn		X62E	X6AE	X72E	X7AE	X82E	X8AE	X92E

[Function]

<For tool life management I>

This signal notifies that tool usage data (per tool) have reached to its lifetime (Usage data ≥ Life data).

<For tool life management II>

This signal notifies that all tools in the tool group have reached to their lifetimes.

[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 CNC, 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 skip (TAL1n)" 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 "T function strobe 1 (TF1n)" 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 (TRSTn)" signal is input, etc.)

[Caution]

If this signal is used for M system tool life management II, refer to this signal 30ms after the spindle tool was replaced. (This signal will not change in the same cycle in which the spindle tool was replaced.)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	NC ALARM 3 (Program error)	AL3n		X632	X6B2	X732	X7B2	X832	X8B2	X932

[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 or Setup Manual.

(1) Illegal address (address not covered by the specifications is used)

(2) Absence of F command

(3) Arc end point excessive deviation

(4) Return incomplete axis found (a motion command was issued to an axis that has not completed reference position return)

(5) Program end error (M02 or M30 command is not inserted or reset & rewind process has not been performed)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	NC ALARM 4 (Operation error)	AL4n		X633	X6B3	X733	X7B3	X833	X8B3	X933

[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 Instruction Manual or Setup 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

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	SEARCH & START ERROR	SSEn		X635	X6B5	X735	X7B5	X835	X8B5	X935

[Function]

This signal is output when the program No. to be searched with search & start is illegally designated, or search & start is executed during restart search.

[Operation]

This signal is output when the No. of the program to be searched with search & start is illegal, or search & start is executed during restart search. 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 to execute search & start again, or when the reset signal is issued.

Refer to the "Search & start" (RSSTn) signal for details.

[Related signals]

(1) Search & start (RSSTn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	SEARCH & START SEARCH	SSGn		X636	X6B6	X736	X7B6	X836	X8B6	X936

[Function]

This signal is output when searching for a program is started with search & start.

[Operation]

Informs the PLC that the CNC is searching for the program with search & start.

Hold the "search & start" signal until the "search & start (search)" signal turns ON.

If the No. of the program to be searched is illegal or search & start is executed during restart search, the "search & start (error)" (SSEn) signal will be output.

[Related signals]

(1) Search & start program No.
(2) Search & start (error) (SSEn)
(3) Search & start (RSSTn)

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
A	ILLEGAL AXIS SELECTED	ASLEn		X637	X6B7	X737	X7B7	X837	X8B7	X937

[Function]

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

[Operation]

The signal turns ON when:

(1) For handle mode

If specified "1st to 3rd handle axis selection code m" (HS1mn to HS3mn) is beyond the maximum number of control axes.

(2) For manual arbitrary feed mode

If specified manual arbitrary feed axis No. is beyond the maximum number of control axes.

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
A	F 1-DIGIT NO. CODE m	F1mn		X638 - 63A	X6B8 - 6BA	X738 - 73A	X7B8 - 7BA	X838 - 83A	X8B8 - 8BA	X938 - 93A

[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.

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
A	WAITING BETWEEN PART SYSTEMS			X63C	X6BC	X73C	X7BC	X83C	X8BC	X93C

[Function]

This signal informs that the waiting between part systems is being executed.

[Operation]

1 : This signal is output while the waiting between part systems is commanded in one part system to when the corresponding waiting between system command is commanded in the other part system (during the waiting function between part systems).

0 : When the waiting between part systems is not executed, this signal is not output.

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
A	IN HYPOTHETICAL AXIS COMMAND MODE	**VAMODOn**		X63E	X6BE	X73E	X7BE	X83E	X8BE	X93E

[Function] [Operation]

This signal indicates that the hypothetical axis command mode has been selected.

[Related signals]

(1) Hypothetical axis command mode (VAMODn)

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
A	IN HIGH-SPEED TAPPING	HSST		X63F	X6BF	X73F	X7BF	X83F	X8BF	X93F

[Function]

This signal indicates that the tapping in execution is high-sped synchronous tapping.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	M CODE INDEPENDENT OUT-PUT M00	DM00n		X640	X6C0	X740	X7C0	X840	X8C0	X940

[Function]

This signal informs that a special miscellaneous function (M00) is selected and commanded. When a special M function is specified, "Normal miscellaneous function strobe" signal and "M code data" are output.
M code independent outputs include M01, M02 and M30.

[Operation]

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

Machining program	M code independent output	Signal abbreviation	Answer back to controller
M00	M00	DM00	FIN1n or FIN2n
M01	M01	DM01	FIN1n or FIN2n
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 (SBKn) signal is turned ON and M function finish signal (FIN1n or FIN2n) 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 (RRWn) signal is sent back instead of M function finish signal. If M function finish (FIN1n, FIN2n) signal is sent back, "program error" may occur.

[Related signals]

(1) M code independent output M01 (DM01n)
(2) M code independent output M02 (DM02n)
(3) M code independent output M30 (DM30n)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	M CODE INDEPENDENT OUT-PUT M01	DM01n		X641	X6C1	X741	X7C1	X841	X8C1	X941

[Function][Operation]

Refer to "M CODE INDEPENDENT OUTPUT M00".

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
A	M CODE INDEPENDENT OUTPUT M02	DM02n		X642	X6C2	X742	X7C2	X842	X8C2	X942

[Function][Operation]

Refer to "M CODE INDEPENDENT OUTPUT M00".

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
A	M CODE INDEPENDENT OUTPUT M30	DM30n		X643	X6C3	X743	X7C3	X843	X8C3	X943

[Function][Operation]

Refer to "M CODE INDEPENDENT OUTPUT M00".

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
A	M FUNCTION STROBE m	MFmn		X644 - 647	X6C4 - 6C7	X744 - 747	X7C4 - 7C7	X844 - 847	X8C4 - 8C7	X944 - 947

[Function]

This signal informs that the 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 mode).

(2) M function (M code) is specified by manual numerical command input.

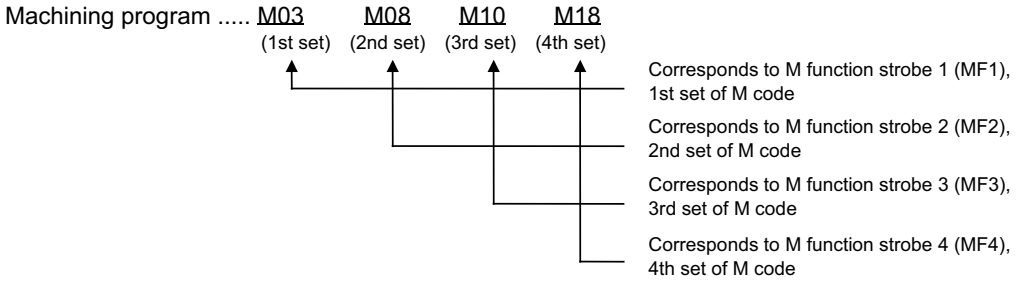
The signal turns OFF when:

(1) "M function finish 1" (FIN1n) signal or "M function finish 2" (FIN2n) signal turns ON.

(2) Reset condition occurs.

(Refer to the "In automatic operation "run"" (OPn) signal section for details on the reset conditions.)

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



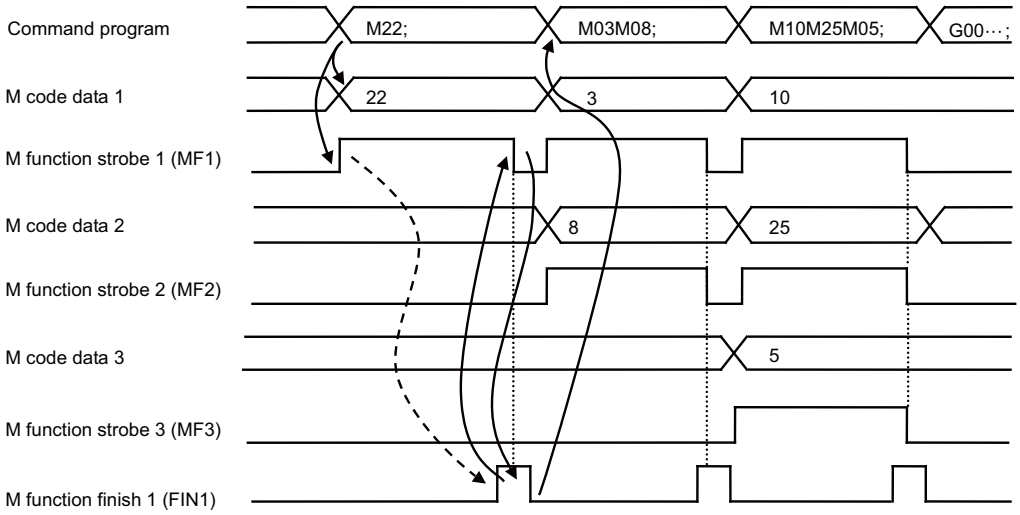
(Note 1) During operation with miscellaneous function lock (AFLn signal ON), the "M function strobe" (MFmn) will not be output. However, this signal will be output when the M code is commanded independently (M00, M01, M02, M30).

(Note 2) Since M98 (read of subprogram call), M99 (return from subprogram), etc. are handled within the controller, "M function strobe" is not output.

(Note 3) The "M function strobe" will not be output when the M function is output if the "M function finish 1" (FIN1n) signal or "M function finish 2" (FIN2n) signal is ON.

(Note 4) Outputs from manual numerical command always correspond to the "M function strobe 1" (MF1n).

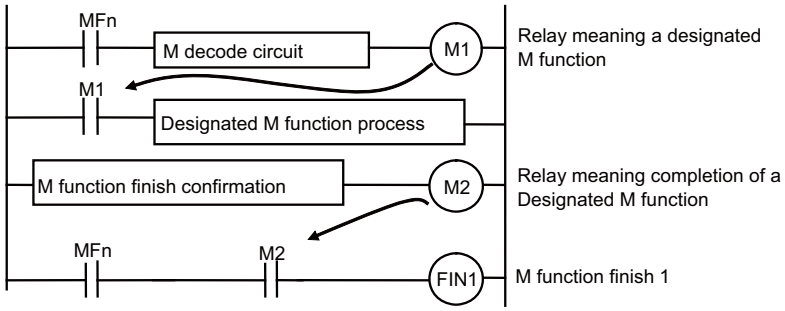
An example of the timing chart for the "M function strobe" (MF1n, MF2n, MF3n) signal is shown below.



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

(a) When the M function is commanded, the MFmn and M code data m is output.
(b) MFmn is always the trigger in the sequence process to start the M function process.
(c) When the designated M function process is completed, the "M function finish" signal (FIN1n, FIN2n) is returned to the controller.
(d) The controller waits for the rising of the "M function finish" signal (FIN1n, FIN2n) and then turns MFmn OFF.
(e) MFmn OFF is confirmed in the sequence process and then the "M function finish" signal (FIN1n, FIN2n) 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]

(1) M code data 1 to 4
(2) M function strobe 2 (MF2n)
(3) M function strobe 3 (MF3n)
(4) M function strobe 4 (MF4n)
(5) M function finish 1 (FIN1n)
(6) M function finish 2 (FIN2n)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	MANUAL NUMERICAL COM-MAND	MMSn		X649	X6C9	X749	X7C9	X849	X8C9	X949

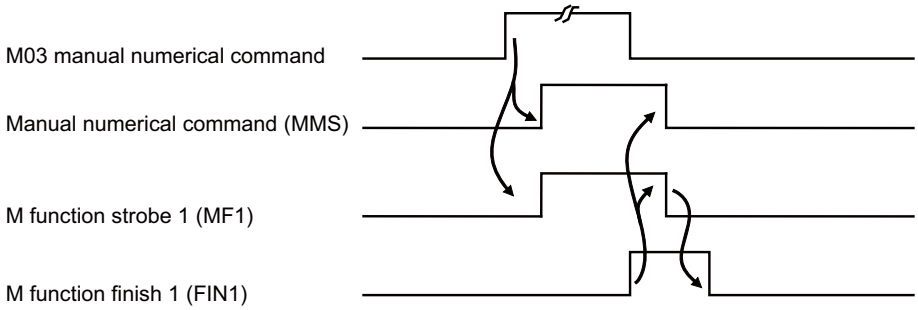
[Function]

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

[Operation]

The signal turns ON when M, S, T or B signal is specified with a specific display format in manual or automatic operation (other than auto start). Like M function strobe signal, the signal turns OFF when M function finish 1 (FIN1n) or 2 (FIN2n) signal turns ON, or in case of reset.

(Example)



[Related signals]

(1) M function strobe (MFmn)
(2) S function strobe m (SFmn)
(3) T function strobe 1 (TF1n)
(4) 2nd M function strobe 1 (BF1n)
(5) M function finish 1 (FIN1n)
(6) M function finish 2 (FIN2n)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	TOOL CHANGE POSITION RE-TURN COMPLETION	TCPn		X64B	X6CB	X74B	X7CB	X84B	X8CB	X94B

[Function]

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

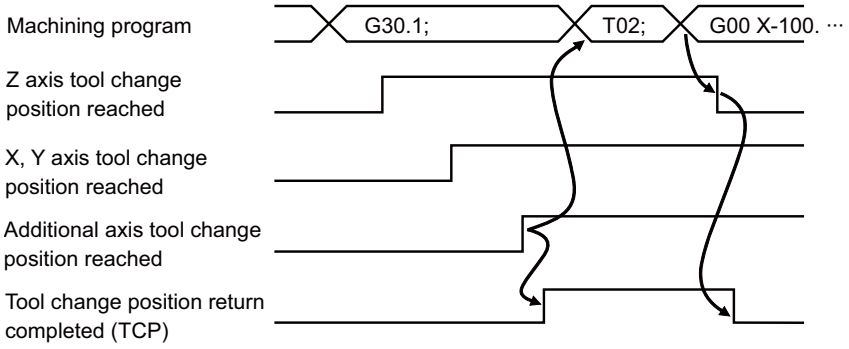
[Operation]

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.

[Timing chart]

Example: When G30.1 command, additional axis tool change position return is valid



Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	NEW TOOL CHANGE	TCRQn		X64C	X6CC	X74C	X7CC	X84C	X8CC	X94C

[Function]

This signal notifies that a new tool (unused tool) in the group is selected in the tool life management II.

[Operation]

The signal turns ON when:

(1) The tool selected by T command tool selection is unused (status 0).

The signal turns OFF when:

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

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	T FUNCTION STROBE 1	TF1n		X650	X6D0	X750	X7D0	X850	X8D0	X950

[Function]

This signal informs that the tool function (T code) is specified in automatic operation (memory, MDI mode) 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 compensation, tool nose wear compensation) Nos. are also indicated.

The user PLC receives the T code data m with this signal.

[Operation]

The signal turns ON when:

(1) The T function (T code) is specified in automatic operation (memory, MDI mode).

(2) T function (T) is specified by manual numerical command input.

The signal turns OFF when:

(1) "M function finish 1" (FIN1n) signal or "M function finish 2" (FIN2n) signal turns ON.

(2) Reset condition occurs.

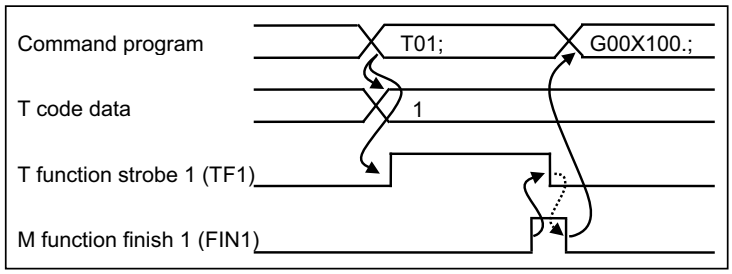
(Refer to the "In automatic operation "run"" (OPn) signal section for details on the reset conditions.)

(Note 1) One T command can be issued in one block.

(Note 2) The "T function strobe 1" (TF1n) is not output during operation with the M function lock (AFLn signal ON).

(Note 3) In the case of manual numerical command input, outputs are in accordance with "T function strobe 1" (TF1n).

An example of the timing chart for the "T function strobe 1" (TF1n) signal is shown below.



[Related signals]

(1) T code data 1

(2) M function finish 1 (FIN1n)

(3) M function finish 2 (FIN2n)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	2ND M FUNCTION STROBE 1	BF1n		X654	X6D4	X754	X7D4	X854	X8D4	X954

[Function]

This signal informs that 2nd M function is selected in automatic operation (memory, MDI) machining program or by manual numerical command input.

The 2nd M function is also called the B function.

With the signal (BF1n), user PLC receives 2nd M function data m.

[Operation]

The signal turns ON when:

(1) The 2nd M function (B code) is specified in automatic operation (memory, MDI).

(2) 2nd M function (B code) is issued by manual numerical command input.

The signal turns OFF when:

(1) "M function finish 1" (FIN1n) signal or "M function finish 2" (FIN2n) signal is turned ON.

(2) Reset condition occurs.

(Refer to the "In automatic operation "run"" (OPn) signal section for details on the reset conditions.)

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

(Note 2) The "2nd M function strobe 1" (BF1n) is not output during operation with M function lock (AFLn signal ON).

(Note 3) In the case of manual numerical command input, outputs are in accordance with "2nd M function strobe 1" (BF1n).

(Note 4) Address for 2nd M function can be selected from addresses A, B and C by using machine parameter. Set so that the address is different from the axis address.

[Related signals]

(1) 2nd M function data 1

(2) M function finish 1 (FIN1n)

(3) M function finish 2 (FIN2n)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	S FUNCTION STROBE m	SFmn		X658 - 65E	X6D8 - 6DE	X758 - 75E	X7D8X7 DE	X858 - 85E	X8D8 - 8DE	X958 - 95E

[Function]

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

The spindle function is also called the S function, and is used to command the spindle speed.

With the signal (SF1 to 4), user PLC receives S code data m respectively.

[Operation]

The signal turns ON when:

(1) S function (S code) is specified in automatic operation (memory, MDI mode).

(2) S function is specified by manual numerical command input.

The signal turns OFF when:

(1) "M function finish 1" (FIN1n) signal or "M function finish 2" (FIN2n) signal turns ON.

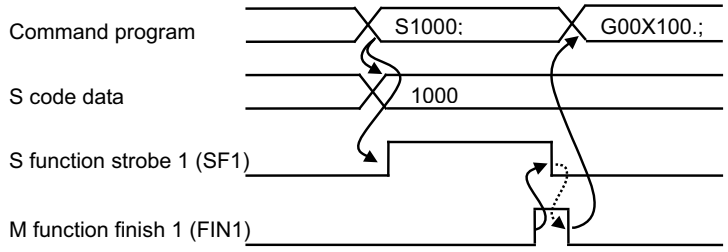
(2) Reset condition occurs.

(Refer to the "In automatic operation "run"" (OPn) signal section for details on the reset conditions.)

(Note 1) The S function strobe (SNGEn) is not output during operation with M function lock (AFLn signal ON).

(Note 2) When the S function is commanded, the "Spindle gear shift command m" (GRmn) signal and "S command no gear selected" (SNGEn) signal are output in addition to this signal (SFmn). Refer to the sections of each signal for details.

An example of the timing chart for the "S function strobe" (SF1n) signal is shown below.



[Related signals]

(1) S code data 1 to 4

(2) Spindle gear shift command m (GRmn)

(3) S command no gear selected (SNGEn)

(4) Spindle gear selection code m (GImn)

(5) Spindle gear shift completion (GFINn)

(6) M function finish 1 (FIN1n)

(7) M function finish 2 (FIN2n)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	POSITION SWITCH m	PSWmn		X660 - 667 X670 - 677	X6E0 - 6E7 X6F0 - 6F7	X760 - 767 X770 - 777	X7E0 - 7E7 X7F0 - 7F7	X860 - 867 X870 - 877	X8E0 - 8E7 X8F0 - 8F7	X960 - 967 X970 - 977

[Function]

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

[Operation]

This signal turns ON when the control axis machine position reaches the range set by the parameters, and turns OFF when the range is left. The axis name and range are set in parameters #7501 to #7573.

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

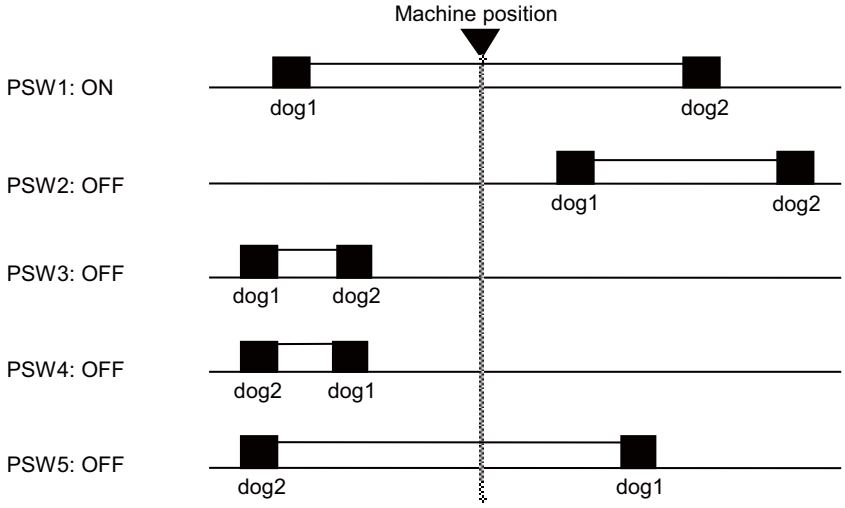
<For absolute position detection system>

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

<For incremental position detection system>

This signal is not validated until the first reference position return is completed after the power is turned ON. (PSW1n to PSW16n will all remain OFF until this signal is validated.)

Example of signal output



The setting range of the position switch uses the basic machine coordinate system as a reference.

The dog1 and dog2 setting values can be set to any size, and the area between the smaller setting and the larger setting will be used as the signal output range.

A slight delay will occur in the output signal fluctuation due to the actual machine position. This maximum delay time (tmax), which depends on the area check method parameters #7504 to #7634, is as follows. Also consider the delay by the scan time as it depends on scan time for the ladder.

When parameter is set to "0" (commanded machine position)	When parameter is set to 1 (detector FB position)
tmax = 0.004 - TP [s]	tmax = 0.004 [s]

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

PGN : Position loop gain

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	WAITING FOR DATA TO BE DOWNLOADED	DLWAITn		X66C	X6EC	X76C	X7EC	X86C	X8EC	X96C

[Function]

This signal informs that no reading data is in the buffer memory so it is idle and waiting for receiving data during FPT operation.

If the download is completed, it does not enter into idle mode and an program error (P36) will occur.

[Operation]

The signal turns ON when:

- It is idle and waiting for data to be received as the buffer memory for FTP operation is empty during the download from FTP server.

The signal turns OFF when:

- The waiting for data to be received state, as described above, is released.
- When download is completed. (If the download is completed while in the waiting for data to be received state, an program error (P36) will occur.)

[Related signals]

(1) Download completed (DLDFIN)

(2) Download in progress (DLOAD0)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	TAP RETRACT POSSIBLE	TRVEn		X66D	X6ED	X76D	X7ED	X86D	X8ED	X96D

[Function]

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

The "Tap retract" (TRVn) signal will be valid when this signal (TRVEn) is ON.

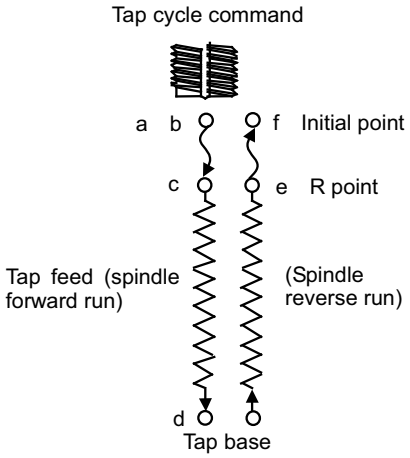
[Operation]

(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 signals]

(1) Tap retract (TRVn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	NO. OF WORK MACHINING OVER	PCNTn		X66E	X6EE	X76E	X7EE	X86E	X8EE	X96E

[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)

(2) No. of work machining (max. value)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	POWER SHUTOFF MOVEMENT OVER			X66F	X6EF	X76F	X7EF	X86F	X8EF	X96F

[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.

4.4 Bit Type Input Signals : Spindle State (CNC CPU->PLC CPU)

Contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle	4th spindle	5th spindle	6th spindle	7th spindle
A	S COMMAND GEAR NO. ILLEGAL	SIGEn		X984	X9B4	X9E4	XA14	XA44	XA74	XAA4

[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.

Contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle	4th spindle	5th spindle	6th spindle	7th spindle
A	S COMMAND MAX./MIN. COMMAND VALUE OVER	SOVEn		X985	X9B5	X9E5	XA15	XA45	XA75	XAA5

[Function]

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

[Operation]

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

Contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle	4th spindle	5th spindle	6th spindle	7th spindle
A	S COMMAND NO GEAR SELECTED	SNGEn		X986	X9B6	X9E6	XA16	XA46	XA76	XAA6

[Function]

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

[Operation]

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

This signal (SNGEn) is output simultaneously with "spindle function strobe m" (SFmn) signal.

[Related signals]

(1) Spindle function strobe m (SFmn)

(2) Spindle gear shift command m (GRmn)

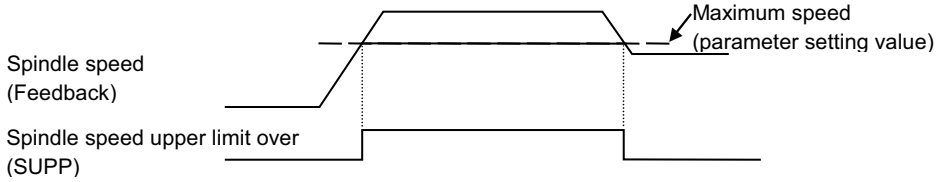
Contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle	4th spindle	5th spindle	6th spindle	7th spindle
A	SPINDLE SPEED UPPER LIMIT OVER	SUPPn		X98B	X9BB	X9EB	XA1B	XA4B	XA7B	XAAB

[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.



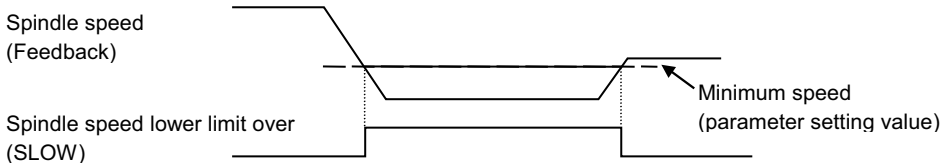
Con-tact	Signal name	Signal ab-breviation		1st spin-dle	2nd spin-dle	3rd spin-dle	4th spin-dle	5th spin-dle	6th spin-dle	7th spin-dle
A	SPINDLE SPEED LOWER LIMIT OVER	SLOWn		X98C	X9BC	X9EC	XA1C	XA4C	XA7C	XAAC

[Function]

This signal notifies that the feedback of the spindle motor is less than the minimum speed.

[Operation]

This signal turns ON when the spindle motor's feedback is less than the minimum speed regardless of the commanded speed.



Con-tact	Signal name	Signal ab-breviation		1st spin-dle	2nd spin-dle	3rd spin-dle	4th spin-dle	5th spin-dle	6th spin-dle	7th spin-dle
A	SPINDLE GEAR SHIFT COM-MAND m	GRmn		X98D - 98E	X9BD - 9BE	X9ED - 9EE	XA1D - A1E	XA4D - A4E	XA7D - A7E	XAAD - AAE

[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 (GR1n, GR2n) 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 m" (GRmn) signal output is shown below.

Gearstage	Max. spindlespeed	Spindlegear shift		
		GR2n	GR1n	
1	Smax1	0	0	← Range "S0 to S (Smax1)"
2	Smax2	0	1	← Range "S (Smax1)+1 to S (Smax2)"
3	Smax3	1	0	← Range "S (Smax2)+1 to S (Smax3)"
4	Smax4	1	1	← When range over "S (Smax3)+1" is specified.

This signal (GR1n, GR2n) is output simultaneously with the "Spindle function strobe m" (SFmn).

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

[Related signals]

(1) Spindle function strobe m (SFmn)

(2) S command no gear selected (SNGEn)

Contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle	4th spindle	5th spindle	6th spindle	7th spindle
A	CURRENT DETECTION	CDOn		X991	X9C1	X9F1	XA21	XA51	XA81	XAB1

[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 (CDOn) turns ON if motor current goes up to a level (110% output) close to the permissible maximum current (120%).

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

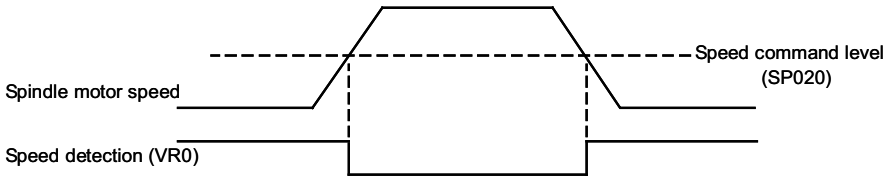
Contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle	4th spindle	5th spindle	6th spindle	7th spindle
A	SPEED DETECTION	VROn		X992	X9C2	X9F2	XA22	XA52	XA82	XAB2

[Function]

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

[Operation]

The signal (VRO) turns ON when motor speed (motor rotation speed) drops below the speed specified by the spindle parameter "#13028 Speed detection set value (SP028:SDTS)". (Related parameter "#13029 Speed detection reset width (SP029:SDTR)")



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

Contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle	4th spindle	5th spindle	6th spindle	7th spindle
A	IN SPINDLE ALARM	FLOn		X993	X9C3	X9F3	XA23	XA53	XA83	XAB3

[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 procedure, refer to the Spindle Controller specifications and maintenance manual.

(1) Overcurrent
(2) Breaker trip
(3) Motor overheat

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

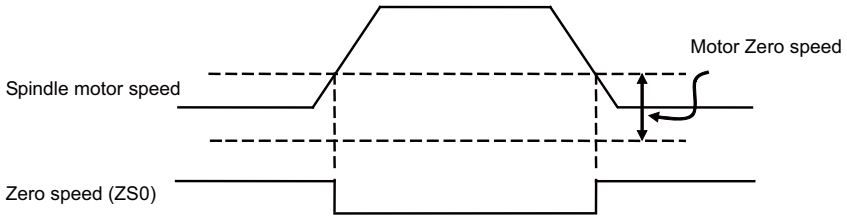
Con-tact	Signal name	Signal ab-breviation		1st spin-dle	2nd spin-dle	3rd spin-dle	4th spin-dle	5th spin-dle	6th spin-dle	7th spin-dle
A	ZERO SPEED	ZSOn		X994	X9C4	X9F4	XA24	XA54	XA84	XAB4

[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 specified by the spindle parameter "#13027 Motor zero speed (SP027:ZSP)".



(Note 1) The signal is output, no matter whether direction of rotation is "Spindle forward run start" (SRNn) or "Spindle reverse run start" (SRIn).

(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 serial connected with the controller.

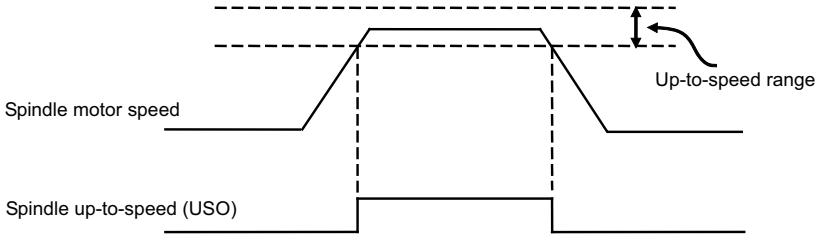
Con-tact	Signal name	Signal ab-breviation		1st spin-dle	2nd spin-dle	3rd spin-dle	4th spin-dle	5th spin-dle	6th spin-dle	7th spin-dle
A	SPINDLE UP-TO-SPEED	USOn		X995	X9C5	X9F5	XA25	XA55	XA85	XAB5

[Function]

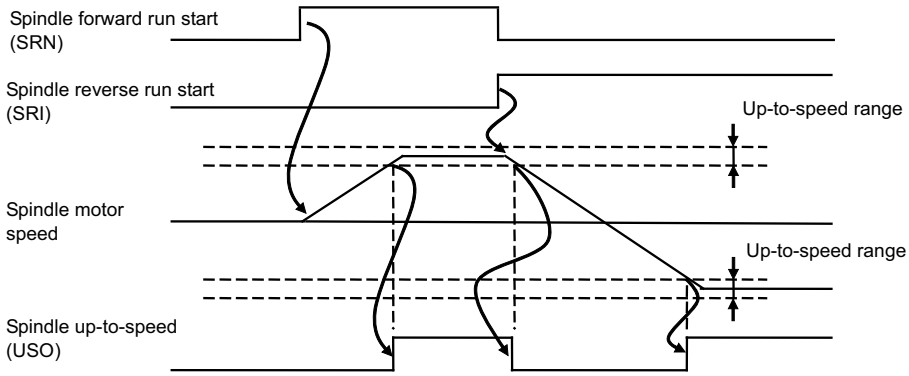
This signal is output from the high-speed serial connection specification spindle controller (spindle drive) and informs that actual spindle motor speed reaches the range designated with the parameter "#3105 sut".

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

[Operation]



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" (SRNn) signal or "spindle reverse run start" (SRIn) 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.

Con-tact	Signal name	Signal ab-breviation		1st spin-dle	2nd spin-dle	3rd spin-dle	4th spin-dle	5th spin-dle	6th spin-dle	7th spin-dle
A	SPINDLE IN-POSITION	ORAOn		X996	X9C6	X9F6	XA26	XA56	XA86	XAB6

[Function]

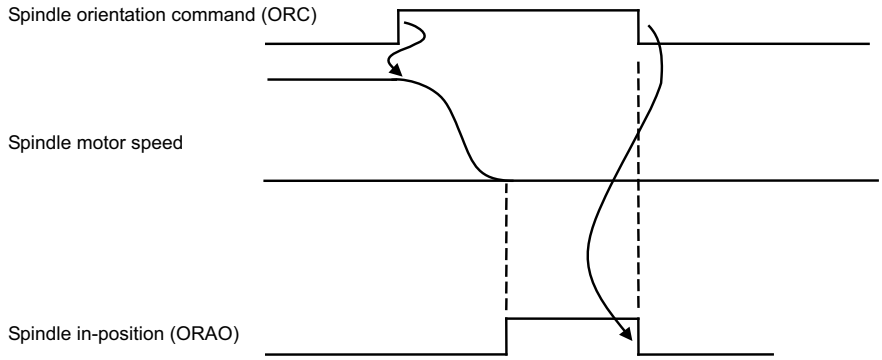
This signal is output from the high-speed serial connection specification spindle controller (spindle drive) and informs that the spindle is positioned in the set range in accordance with spindle orientation command.

[Operation]

When the spindle positioning in the set range completes, this signal will turn ON. The spindle orientation is started by "Spindle orientation command" signal (ORC).

(1) The in-position range is set with the spindle parameter "#13024 SP024 (INP) ".

(2) The signal is turned OFF when the "Spindle orientation command" (ORC) is turned OFF.



(Note 1) When spindle orientation command is given, orientation starts regardless of the "Spindle forward run start (SRNn)" or "Spindle reverse run start (SRIn)".

(Note 2) This signal is not available when an analog connection is used.

(Note 3) 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.

[Related signals]

(1) Spindle orientation command (ORCn)

Con-tact	Signal name	Signal ab-breviation		1st spin-dle	2nd spin-dle	3rd spin-dle	4th spin-dle	5th spin-dle	6th spin-dle	7th spin-dle
A	IN L COIL SELECTION	LCSAn		X997	X9C7	X9F7	XA27	XA57	XA87	XAB7

[Function]

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

[Operation]

The high-speed coil and low-speed coil are changed over only with the "L coil selection" (LRSLn) in the 2-step coil changeover specification.

(1) 2-step coil changeover

Selected coil	L coil selection (LRSLn)	In L coil selection (LCSAn)
High-speed (H)	OFF	OFF
Low-speed (L)	ON	ON

[Related signals]

(1) L coil selection (LRSLn)

Con-tact	Signal name	Signal ab-breviation		1st spin-dle	2nd spin-dle	3rd spin-dle	4th spin-dle	5th spin-dle	6th spin-dle	7th spin-dle
A	SPINDLE READY-ON	SMAn		X998	X9C8	X9F8	XA28	XA58	XA88	XAB8

[Function]

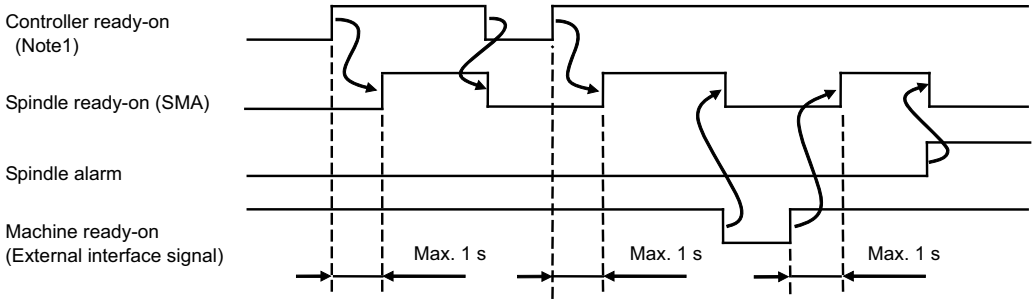
This signal is output from the high-speed serial connection specification spindle controller (spindle drive) and informs that the spindle can operate.

[Operation]

This signal (SMAn) turns ON when the spindle controller is ready for operation. The signal turns OFF (ready off) in the following conditions.

(1) A spindle alarm is generated.

(2) "Ready-on" signal (internal signal) from controller is OFF.



(Note 1) The ready on signal is output from the controller to the spindle controller.

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

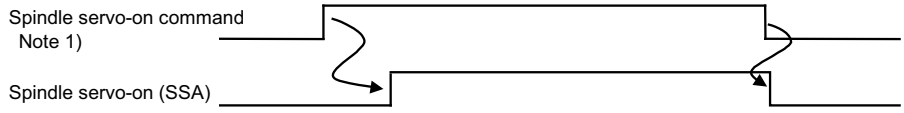
Con-tact	Signal name	Signal ab-breviation		1st spin-dle	2nd spin-dle	3rd spin-dle	4th spin-dle	5th spin-dle	6th spin-dle	7th spin-dle
A	SPINDLE SERVO-ON	SSAn		X999	X9C9	X9F9	XA29	XA59	XA89	XAB9

[Function]

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

[Operation]

The "Spindle servo-on" (SSAn) signal turns ON when the spindle is ready (SMAn 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.
Note that this signal turns OFF during rotation with "spindle forward run start"(SRNn)/"spindle reverse run start"(SRIn) (except during spindle synchronization) or spindle orientation.
This signal (SSAn) 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" (SRNn), "Spindle reverse run start" (SRIn), and "Spindle orientation command" (ORCn) are ignored.

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

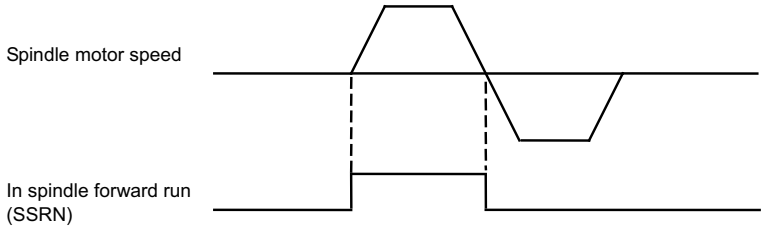
Con-tact	Signal name	Signal ab-breviation		1st spin-dle	2nd spin-dle	3rd spin-dle	4th spin-dle	5th spin-dle	6th spin-dle	7th spin-dle
A	IN SPINDLE FORWARD RUN	SSRNn		X99B	X9CB	X9FB	XA2B	XA5B	XA8B	XABB

[Function]

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

[Operation]

The "Spindle forward run" (SSRNn) signal turns ON when the spindle motor is rotating in the forward direction. This will also turn ON if the spindle motor is rotating in the forward direction during orientation or synchronous tap.



(Note 1) The "Spindle forward run" (SSRNn) signal turns ON and OFF while the spindle motor is in the stop state with servo rigidity during orientation or synchronous tap.

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

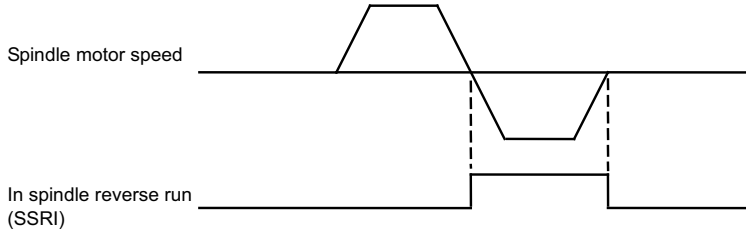
Con-tact	Signal name	Signal ab-breviation		1st spin-dle	2nd spin-dle	3rd spin-dle	4th spin-dle	5th spin-dle	6th spin-dle	7th spin-dle
A	IN SPINDLE REVERSE RUN	SSRIn		X99C	X9CC	X9FC	XA2C	XA5C	XA8C	XABC

[Function]

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

[Operation]

The "Spindle reverse run" (SSRIn) signal turns ON when the spindle motor rotates in the reverse direction. It also turns ON even during orientation or synchronous tap if the spindle motor rotates in the reverse.



(Note 1) The "Spindle reverse run" (SSRIn) signal turns ON and OFF while the spindle motor is in the stop state with servo rigidity during orientation or synchronous tap.

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

Contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle	4th spindle	5th spindle	6th spindle	7th spindle
A	Z-PHASE PASSED	SZPHn		X99D	X9CD	X9FD	XA2D	XA5D	XA8D	XABD

[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]

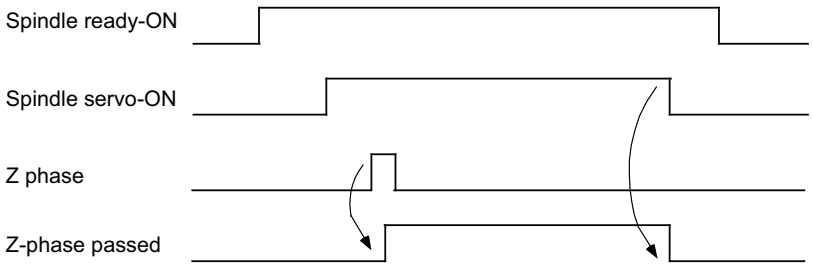
The signal turns ON when:

(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.

Contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle	4th spindle	5th spindle	6th spindle	7th spindle
A	POSITION LOOP IN-POSITION	SIMPn		X99E	X9CE	X9FE	XA2E	XA5E	XA8E	XABE

[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]

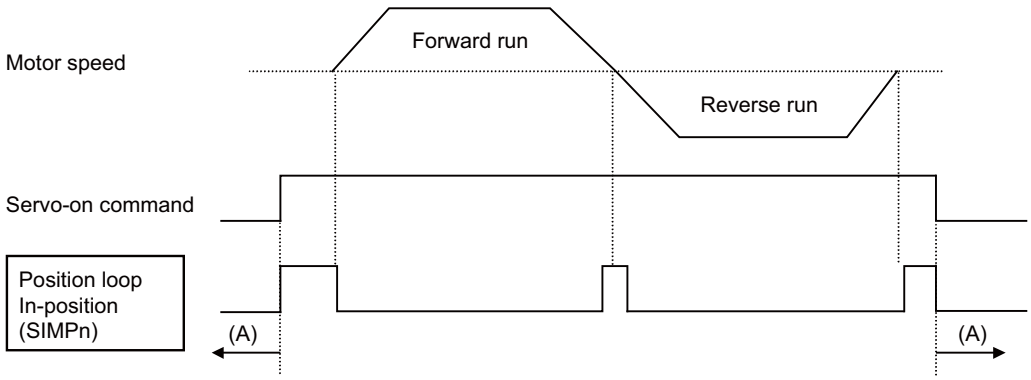
The signal will turn ON when:

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

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)

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



Contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle	4th spindle	5th spindle	6th spindle	7th spindle
A	IN SPINDLE TORQUE LIMIT	STLQn		X99F	X9CF	X9FF	XA2F	XA5F	XA8F	XABF

[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) Any of "Spindle torque limit" 1 to 3 (TL1n to TL3n) signals is ON.

The "STLQ" signal turns OFF when:

(1) All of "Spindle torque limit" 1 to 3 (TL1n to TL3n) signals are OFF.

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

[Related signals]

(1) Spindle torque limit 1 to 3 (TL1n to TL3n)

Contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis
A	IN SPINDLE MULTI-STEP SPEED MONITOR	SMSOEn		X9A9	X9D9	XA09	XA39	XA69	XA99	XAC9

[Function]

This signal indicates that the spindle is in multi-step speed monitor mode.

When the spindle speed exceeds the monitoring speed in multi-step speed monitor mode, a safety observation error will occur.

[Operation]

This signal will be turned ON after "Spindle multi-step speed monitor request" (SMSORn) is turned ON, and the spindle speed becomes less than monitoring speed, and then both NC and drive unit start executing the speed monitor function.

When "Spindle multi-step speed request" (SMSORn) signal is turned OFF, this signal will be also turned OFF.

[Related signals]

(1) Spindle multi-step speed monitor request (SMSORn)

(2) Spindle multi-step speed monitor mode input (SMSOMImn)

(3) Spindle multi-step speed monitor mode output (SMSOMOmn)

Contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis
A	SPINDLE MULTI-STEP MONITOR MODE OUTPUT m	SMSOMOmn		X9AA - 9AB	X9DA - 9DB	XA0A - A0B	XA3A - A3B	XA6A - A6B	XA9A - A9B	XACA - ACB

[Function]

This signal notifies which speed monitor parameter (speed monitor mode) is used for the speed monitor in the multi-step speed monitoring.

Spindle multi-step speed monitor mode output		Speed monitor mode being executed
SMSOMO2n	SMSOMO1n	
0	0	1
0	1	2
1	0	3
1	1	4

[Operation]

When the monitor speed of drive unit is switched to the safety monitor speed of the mode which is designated by "Spindle multi-step speed monitor mode input" (SMSOMImn), this signal is also switched to the designated mode.

[Related signals]

(1) Spindle multi-step speed monitor request (SMSORn)

(2) Spindle multi-step speed monitor mode input (SMSOMImn)

(3) In spindle multi-step speed monitor (SMSOEn)

4.5 Data Type Input Signals : System State (CNC CPU->PLC CPU)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	KEY IN			G10208
				R8

[Function]

Operator's key operation can be monitored on the PLC side.

[Operation]

While operator is using the keyboard, the corresponding data is set to "KEY IN".

Key symbol	Code (HEX)	Key symbol	Code (HEX)	Key symbol	Code (HEX)	Key symbol	Code (HEX)
MONITOR	80	↑ (⇑)	0B(F8)	- (+)	2D(2B)	O (A)	4F(41)
TOOL/PARAM	81	↓ (⇓)	0A(F7)	. (,)	2E(2C)	N (B)	4E(42)
EDIT/MDI	83	← (⇐)	08(F5)	EOB(］)	3B(5D)	G (C)	47(43)
DIAGN IN/OUT	85	→ (⇒)	09(F6)	= (#)	3D(23)	X (U)	58(55)
SFG	86	DELETE (INS)	7F(8C)	/ (*)	2F(2A)	Y (V)	59(56)
F0	87	C.B.(CAN)	8E(18)			Z (W)	5A(57)
		SHIFT	88	0 (SP)	30(20)	F (E)	46(45)
		INPUT(CALC)	0D(F4)	1	31	D (L)	44(4C)
				2	32	H (!)	48(21)
				3	33	P (I)	50(49)
Previous page	90	Window key (?HELP)	89(F9)	4	34	Q (J)	51(4A)
Next page	9A	Activ Wind (CTRL)	8A(8B)	5	35	R (K)	52(4B)
Menu 1	91			6	36	M (()	4D(28)
Menu 2	92			7	37	S ())	53(29)
Menu 3	93			8	38	T (［)	54(5B)
Menu 4	94			9 ($)	39(24)		
Menu 5	95						

(Note) The key signals and codes shown in parentheses are the shift IN side key signals.

[Related signals]

KEY OUT

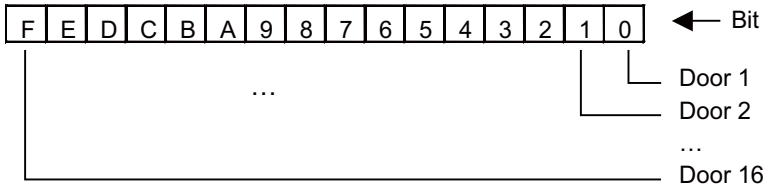
Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	SPEED MONITOR DOOR OPEN POSSIBLE	SMODEN		G10209
				R9

[Function]

This signal executes speed monitor function for the control axis for which a valid door No. is selected with parameter "#2118 S_DSI" and the spindle for which a valid door No. is selected with parameter "#3071 S_DSISp". Then the signal notifies that the selected door can be opened.

This signal is not output when "#21162 mulstepssc multi-step speed monitor value" is set to "1".

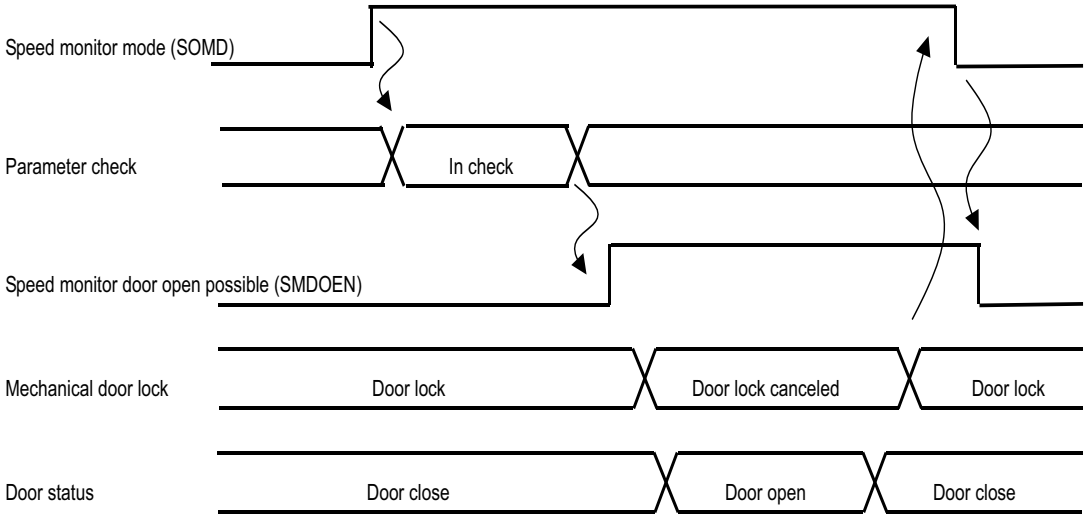
The door No. corresponds to the following bits.



[Operation]

When both CNC and drive unit start the speed monitor function with the speed monitor mode turned ON and speed monitor parameter check completed, the speed monitor door open signal will turn ON.

When the speed monitor mode is OFF, the speed monitor door open possible signal is OFF as well.



[Caution]

When using the speed monitor function, create user PLC that enables door open when the speed monitor door open possible signal is ON.

[Related signals]

Speed monitor mode (SMOD)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	HANDLE PULSE COUNTER			G10210 - G10212
				R10 - R12

[Function]

It confirms the handle pulse counter value.

[Operation]

1st to 3rd handle pulse counter values will output to R10 to R12.

Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	CRT DISPLAY INFORMATION			G10216 - G10219
				R16 - R19

[Function]

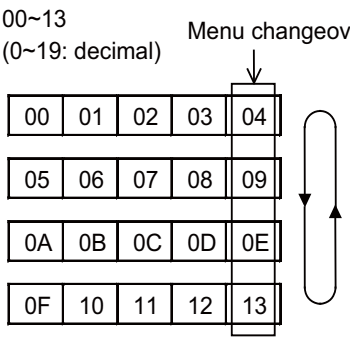
This signal notifies which screen is currently being displayed by the controller.

[Operation]

The screen information changes in the following cases. Note that the information will not change when a screen that has already been displayed is re-displayed.

(1) When a function select key is pressed.
(2) When a menu key is pressed.
(3) When a page key is pressed.

The relation of each key operated and the screen information is as follows.

File register	Operated key	Screen information		
G10217/R17 bit F to 8	**Function No.**	MONITOR		00
		TOOL-PARAM	cmdtyp is 1, 2	0C
			cmdtyp is 3, 4	12
		EDIT-MDI		0D
		DIAGN-IN/OUT		10
		SFG		08
		F0		09
G10217/R17 bit 7 to 0	Menu No.			
G10216/R16 ... bit F to 8	Page No.	01~n Change by next page key or previous page key		
G10216/R16 ... bit 7 to 0	---	Not set. The data is not set.		

(Note)File registers G10218/R18 and G10219/R19 are invalid.

Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	EMERGENCY STOP CAUSE			G10221
				R21

[Function]

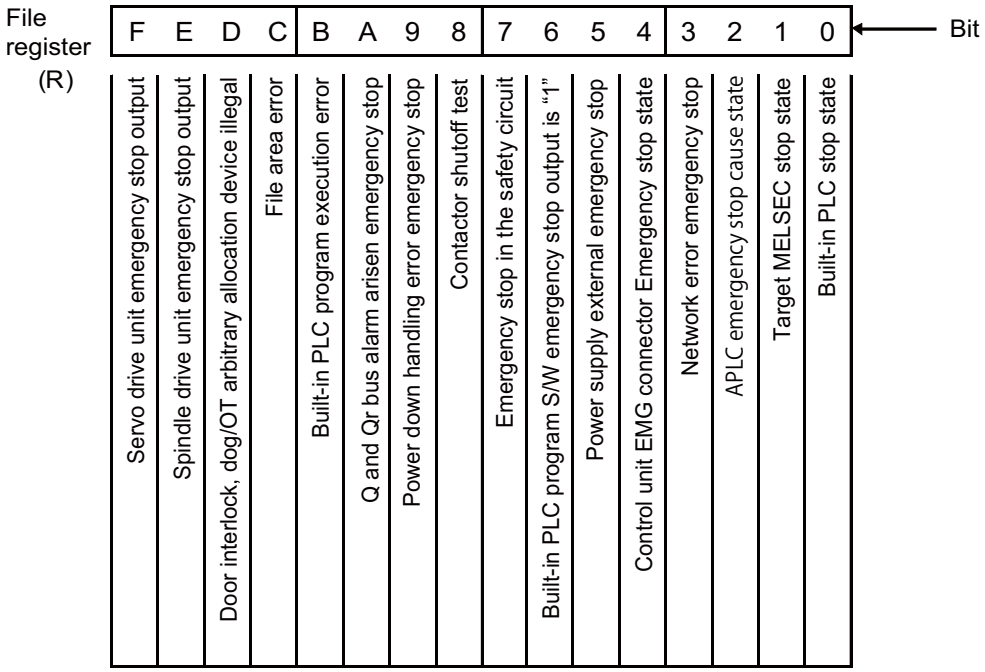
The causes of emergency stop are shown with bit correspondence.

[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.



Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	USER MACRO OUTPUT #1132 (Controller -> PLC)			G10224 - G10225
				R24 - R25

[Function]

This is interface function used to coordinate user PLC to user macro program.

[Operation]

When a value is set in the system variables #1100 to #1131 or #1132 with the user macro system, the user PLC output to the file register Rn and Rn+1 corresponding to the user PLC can be referred to with that value.

The relationship between system variable and file register is as follows:

Systemvariable	Points	Interface output signal	System variable	Points	Interface output signal
#1100	1	Register G10224/R24 bit 0	#1116	1	Register G10225/R25 bit 0
#1101	1	Register G10224/R24 bit 1	#1117	1	Register G10225/R25 bit 1
#1102	1	Register G10224/R24 bit 2	#1118	1	Register G10225/R25 bit 2
#1103	1	Register G10224/R24 bit 3	#1119	1	Register G10225/R25 bit 3
#1104	1	Register G10224/R24 bit 4	#1120	1	Register G10225/R25 bit 4
#1105	1	Register G10224/R24 bit 5	#1121	1	Register G10225/R25 bit 5
#1106	1	Register G10224/R24 bit 6	#1122	1	Register G10225/R25 bit 6
#1107	1	Register G10224/R24 bit 7	#1123	1	Register G10225/R25 bit 7
#1108	1	Register G10224/R24 bit 8	#1124	1	Register G10225/R25 bit 8
#1109	1	Register G10224/R24 bit 9	#1125	1	Register G10225/R25 bit 9
#1110	1	Register G10224/R24 bit 10	#1126	1	Register G10225/R25 bit 10
#1111	1	Register G10224/R24 bit 11	#1127	1	Register G10225/R25 bit 11
#1112	1	Register G10224/R24 bit 12	#1128	1	Register G10225/R25 bit 12
#1113	1	Register G10224/R24 bit 13	#1129	1	Register G10225/R25 bit 13
#1114	1	Register G10224/R24 bit 14	#1130	1	Register G10225/R25 bit 14
#1115	1	Register G10224/R24 bit 15	#1131	1	Register G10225/R25 bit 15

Systemvariable	Points	Interface output signal	
#1132	32	Register G10224/R24,G10225/R25	This correspondence table shows the example for file registers G10224/R24 and G10225/R25.
#1133	32	Register G10226/R26,G10227/R27	
#1134	32	Register G10228/R28,G10229/R29	
#1135	32	Register G10230/R30,G10231/R31	

File registers G10224/R24 and G10225/R25 correspond to system variables #1100 to #1131, and #1132 (32-bit data).

"User macro output #1132 to #1135 (Controller -> PLC)" and "User macro input #1032 to #1035 (PLC -> Controller)" each have both part system common signals and part system independent ones.

Setting the bit selection parameter #6454/bit0 selects part system common or part system independent.

Register Nos. when part system common/independent is selected

Bit selection parameter #6454/bit0	User macro output #1132 to #1135 (Controller -> PLC)	User macro output #1032 to #1035 (PLC -> Controller)
0: Part system common	G10224-G10231/R24-R31	G+224-G+231/R2324-R2331
1: Part system independent	G10370-G10977/R170-R777	G+370-G+977/R2470-R3077

[Related signals]

(1) User macro output #1132 to #1135 (Controller -> PLC)(Part system common)
(2) User macro output #1132 to #1135 (Controller -> PLC)(Part system independent)
(3) User macro input #1032 to #1035 (PLC -> Controller)(Part system common)
(4) User macro input #1032 to #1035 (PLC -> Controller)(Part system independent)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	USER MACRO OUTPUT #1133 (Controller -> PLC)			G10226 - G10227
				R26 - R27

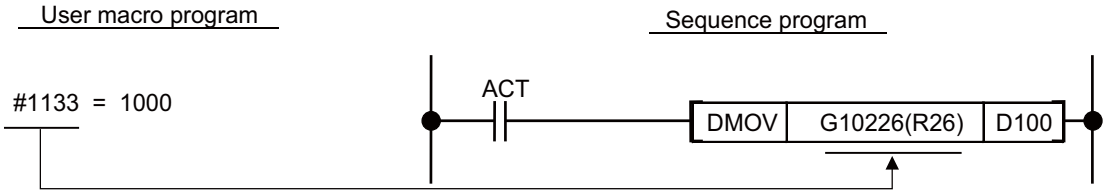
[Function]

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

[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 to #1135 (Controller -> PLC)(Part system common)
(2) User macro output #1132 to #1135 (Controller -> PLC)(Part system independent)
(3) User macro input #1032 to #1035 (PLC -> Controller)(Part system common)
(4) User macro input #1032 to #1035 (PLC -> Controller)(Part system independent)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	USER MACRO OUTPUT #1134 (Controller -> PLC)			G10228 - G10229
				R28 - R29

[Function][Operation]

The function, operation, etc. are the same as those of "USER MACRO OUTPUT #1133".

Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	USER MACRO OUTPUT #1135 (Controller -> PLC)			G10230 - G10231
				R30 - R31

[Function][Operation]

The function, operation, etc. are the same as those of "USER MACRO OUTPUT #1133".

Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	CNC SOFTWARE VERSION CODE			G10232 - G10235
				R32 - R35

[Function]

This indicates the version of the software for controller control.

[Operation]

The version of the software for controller is displayed.

```
[S/W MODULE TREE]                          ALARM/DIAGN  8.1/2

MP          BND - 377W000 - A0      SV1     BND-

OFFM
```

The file registers G10202/R32 to G10235/R35 are set to the following data.

(Example) BND - 1007W000-A0A
(1) (2) (3)

Item		File register	Type	Example
(1)	Model function No.	G10235/R35	Binary	1007=$3EF_H$
(2)	Serial No.	G10234/R34	Binary	000=0000_H
(3)	Version	Bits F to 8 of G10233/R33	ASCII code	A=41_H
		Bits 7 to 0 of G10233/R33	ASCII code	0=30_H
		Bits F to 8 of G10232/R32	ASCII code (Note1)	A=41_H
-	-	Bits 7 to 0 of G10232/R32	Always 20H (Note2)	

(Note 1) If the version is a 2-digit No., bits F to 8 of G10232/R32 are set to "20H".

(Note 2) Bits 7 to 0 on the G10232/R32 are always "20H".

Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	BATTERY DROP CAUSE			G10240
				R40

[Function]

This notifies a drop cause in the battery voltage.

[Operation]

The voltage of the data storage battery in the controller:

(1)This signal is "0" when the voltage is higher than the battery warning detection level.

(Note) If invalidating the battery alarm/warning detection (#6449 bit4=1), this signal is always "0".

(2)This signal is "1" when the voltage is higher than the battery alarm detection level and is below the battery warning detection level.

(3)This signal is "3" when the voltage is below the battery alarm detection level.

(4)This signal is "2" when error occurs in the battery detection circuit.

[Related signals]

(1) Battery warning (BATWR)

(2) Battery alarm (BATAL)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	TEMPERATURE WARNING CAUSE			G10241
				R41

[Function]

If the internal temperature of the control unit rises above 90°C, the overheat will be detected, and the following states will occur.

(1) The "Temperature rise" (SM16) is turned ON.
(2) The "Temperature warning cause" is turned ON.
(3) The alarm message (Z53) is displayed on the screen.

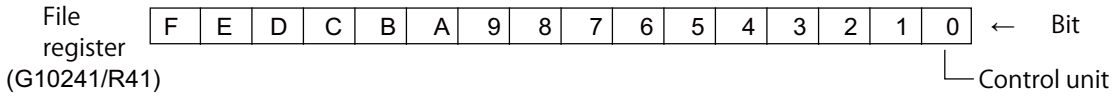
If the machine is in automatic operation, the operation will be continued, but restarting will not be possible after resetting or stopping with M02/M30. (Starting will be possible after block stop or feed hold.)

[Operation]

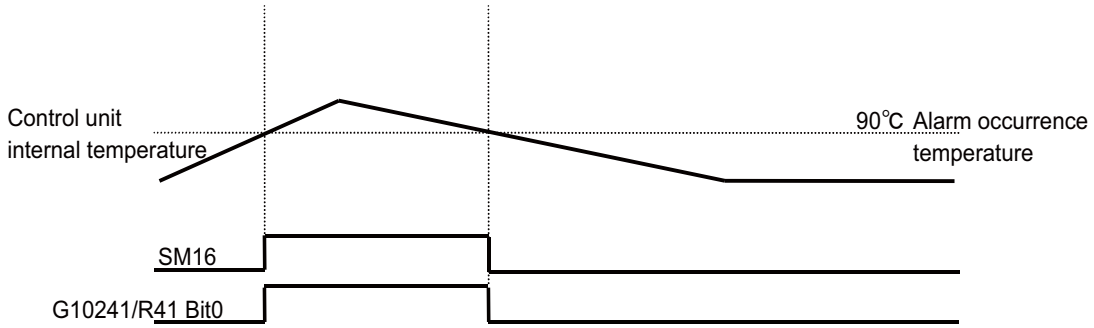
The "Temperature warning cause" is turned ON when:
- The internal temperature of the control unit rises above 90°C.

The "Temperature warning cause" is turned OFF when:
- The internal temperature of control unit drops below 90°C.

The "Temperature warning cause" is a bit unit signal. Independent bits are assigned to the control unit and setting and display unit for CNC exclusive use respectively.



<Example of operation pattern>



[Related signals]

(1) Temperature rise (SM16)

Contact	Signal name	Signal abbreviation		Common for part systems
-	SPINDLE SYNCHRONIZATION PHASE ERROR 1			G10248
				R48

[Function]

- During spindle synchronous function (G114.1)

  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 (SSPHM) is ON. The phase error is output by 1° increment.

The data has no meaning in cases other than above.

[Operation]

- During spindle synchronous function (G114.1)

  When the phase synchronization (with R command) or the "Phase shift calculation request" signal (SSPHM) 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.

[Related signals]

(1) Phase shift calculation request (SSPHM)

Contact	Signal name	Signal abbreviation		Common for part systems
-	SPINDLE SYNCHRONIZATION PHASE ERROR 2			G10249
				R49

[Function]

- During spindle synchronous function (G114.1)

  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" (SSPHM) signal is ON. The phase error is output by 1° increment.

The data has no meaning in cases other than above.

[Operation]

- During spindle synchronous function (G114.1)

  When the phase synchronization (with R command) or the "Phase shift calculation request" signal (SSPHM) 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.

[Related signals]

(1) Phase shift calculation request (SSPHM)

Contact	Signal name	Signal abbreviation		Common for part systems
-	SPINDLE SYNCHRONIZATION PHASE ERROR OUTPUT			G10255
				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 can not 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]

(1) Phase shift calculation request (SSPHM)

(2) Phase offset request (SSPHF)

(3) Spindle synchronization phase offset data

Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	SPINDLE SYNCHRONIZATION PHASE ERROR MONITOR			G10256
				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]

(1) Spindle synchronization phase error monitor (lower limit value)

(2) Spindle synchronization phase error monitor (upper limit value)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	SPINDLE SYNCHRONIZATION PHASE ERROR MONITOR (lower limit)			G10257
				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]

(1) Spindle synchronization phase error monitor

(2) Spindle synchronization phase error monitor (upper limit value)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	SPINDLE SYNCHRONIZATION PHASE ERROR MONITOR (upper limit)			G10258
				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]

(1) Spindle synchronization phase error monitor

(2) Spindle synchronization phase error monitor (lower limit value)

Contact	Signal name	Signal abbreviation		Common for part systems
-	SPINDLE SYNCHRONIZATION PHASE OFFSET DATA			G10259
				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 signal ON at executing the spindle synchronization. The synchronous spindle can be rotated with the handle during the spindle phase shift calculation, so the phase relation between two 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]

(1) Spindle phase synchronization (SPPHS)
(2) Phase shift calculation request (SSPHM)
(3) Phase offset request (SSPHF)
(4) Spindle synchronization phase error output

Contact	Signal name	Signal abbreviation		Common for part systems
-	APLC INPUT DATA n			G10260 - G10269
				R60 - R69

[Function] [Operation]

This signal is an interface for sending data from APLC C language module to PLC device.

Contact	Signal name	Signal abbreviation		Common for part systems
-	ZR DEVICE NO. AT OCCURRENCE OF NC EXCLUSIVE INSTRUCTION (DDWR/DDRD) ERROR	PCVERR		G10280 - G10281
				R80 - R81

[Function]

This signal outputs the No. of ZR device in which an error has occurred during read or write of common variables.

[Operation]

CNC sets the No. of ZR device in which an error has occurred first at the execution of the DDWR/DDRD instruction.

If no error has occurred, "0" is set.

This device value is kept until read/write of common variables is executed with the next DDWR/DDRD instruction.

Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	COMMON VARIABLE NO. AT OCCURRENCE OF ZR DEVICE ERROR	ZRECVNO		G10282
				R82

[Function]

This signal outputs the part system No. and common variable No. in which an error has occurred when the common variable is read with ZR device from GOT.

[Operation]

The thousand's digit represents the part system where the error has occurred, and the hundred's to one's digits indicate the common variable No.

(Example)

Value	Contents
520	The common variable #520 is an error.
2150	The common variable #150 of 2nd part system is an error.

If multiple errors occur when the common variable is read, one of the occurring error codes will be set. It is uncertain which error cause of common variable will be output.
The value is kept until the error cause is removed.

Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	ERROR CAUSE FOR ZR DE-VICE ERROR OCCURRENCE	ZRECVFC		G10283
				R83

[Function]

This signal outputs the error cause of the common variable No. in which an error has occurred when the common variable is read with ZR device from GOT.

[Operation]

The error codes are set by CNC. The error causes are as follows.

Error code	Error cause
0x0001	The specified common variable is empty
0x0002	The common variable value is illegal (infinity, etc.)
0x0004	The common variable value is out of the range from -214748.3648 to 214748.3647.
0x0008	The specified common variable is outside of the allowed setting range (subject to option settings).

If multiple errors occur when the common variable is read, one of the occurring error codes will be set. It is uncertain which error code of common variable will be output.
The value is kept until the error cause is removed.

Contact	Signal name	Signalab-breviation		Common for part systems
-	GOT WINDOW DATACHANGE-OVER COMPLETION			G10290 - G10291
				R90 - R91

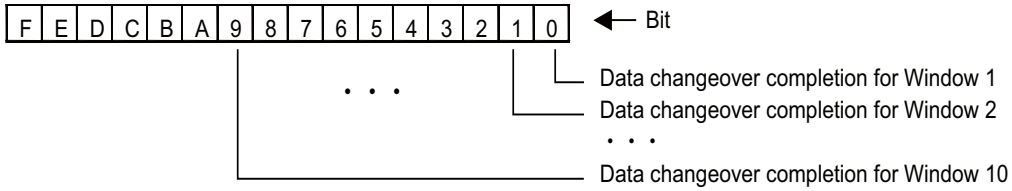
[Function]

This signal notices that data changeover is completed.

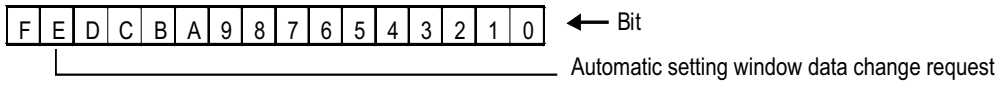
[Operation]

Turns ON when data changeover is completed.Turns OFF when Data changeover request signal is turned OFF.

<R90>



<R91>



Contact	Signal name	Signalab-breviation		Common for part systems
-	CNC SIDE DUAL SIGNAL MOD-ULE m	SU_NC m		G12470 - G12475
				R2150 - R2155

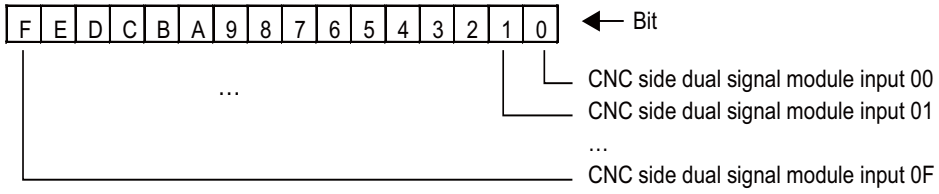
[Function

This signal informs the CNC side dual signal input status of the dual signal module.

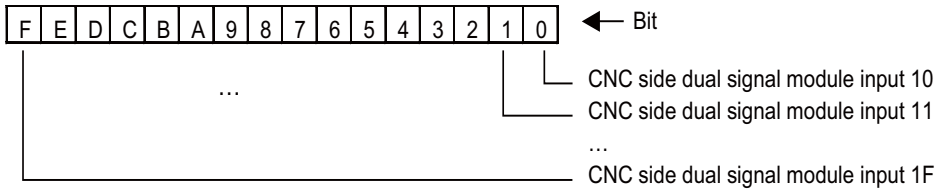
[Operation]

Each bit corresponds to the following signals. If this signal is ON, a corresponding signal bit turns ON.
These devices are the copies of the data X200 to X25F, made by CNC's internal processing.

<L side>



<H side>



[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

Contact	Signal name	Signalab-breviation		Common for part systems
-	CNC SIDE DUAL SIGNALER-ROR MODULE m	SU_NER m		G12480 - G12485
				R2160 - R2165

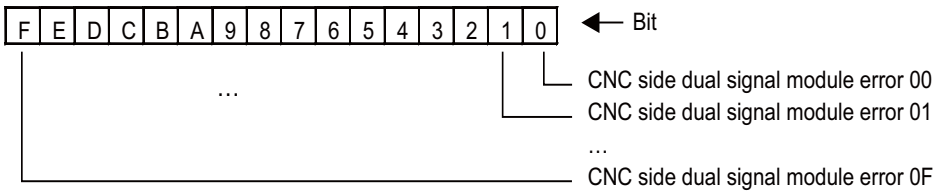
[Function]

This signal informs the comparison status of "CNC side dual signal input" in the dual signal module. The signal turned ON once holds the state until the controller power is turned ON again.

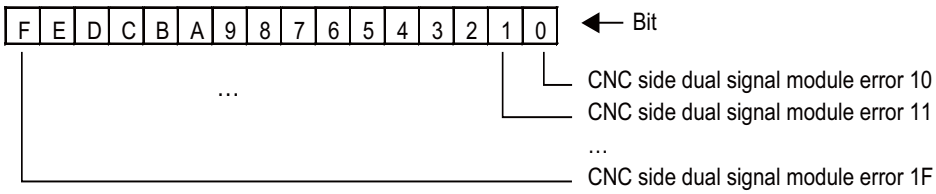
[Operation]

Each bit corresponds to the following signals. If this signal is ON, a corresponding signal bit turns ON.

<L side>



<H side>



[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

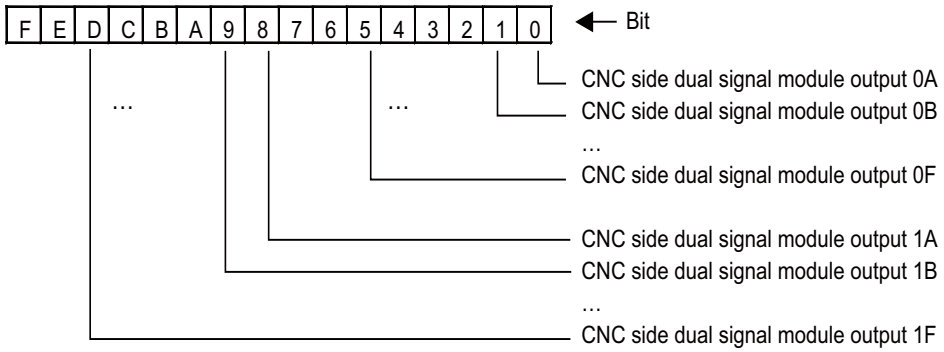
Contact	Signal name	Signalab-breviation		Common for part systems
-	CNC SIDE DUAL SIGNALOUT-PUT MODULE m	SU_NO m		G12490 - G12492
				R2170 - R2172

[Function]

This signal informs the CNC side dual signal output status of the dual signal module 1 to 3.

[Operation

Each bit corresponds to the following signals. If this signal is ON, a corresponding signal bit turns ON.
These signals are the copies of the output signals Y200 to Y25F, made by CNC's internal processing.



[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

Contact	Signal name	Signalab-breviation		Common for part systems
-	CNC SIDE DUAL SIGNALOUT-PUT ERROR MODULE m	SU_NOERm		G12494 - G12496
				R2174 - R2176

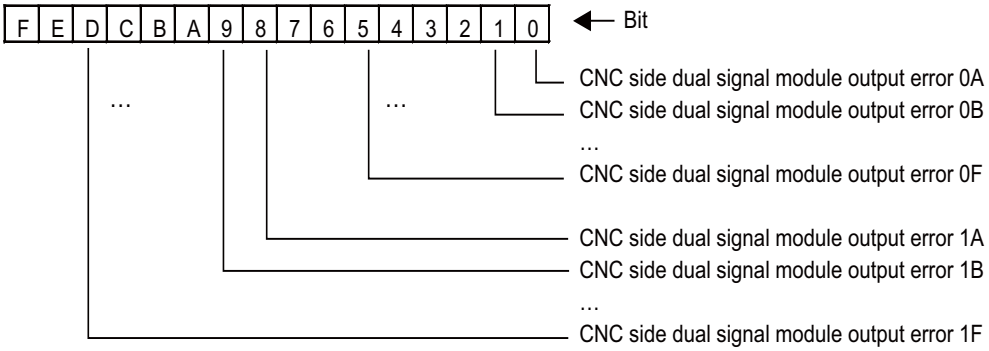
[Function]

This signal informs the comparison status between CNC side dual signal output and its input signal of the dual signal module.

The signal turned ON once holds the state until the controller power is turned ON again.

[Operation]

Each bit corresponds to the following signals. If this signal is ON, a corresponding signal bit turns ON.



[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

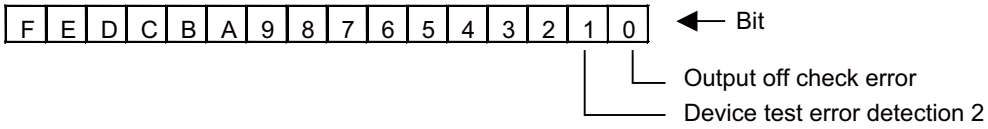
Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	CNC SIDE DUAL SIGNAL COM-PARE STATUS 2	SU_NST2		G12499
				R2179

[Function]

This signal informs CNC side dual signal compare status to the PLC.

[Operation]

Each bit corresponds to the following signals:



bit0: Output off check error

An error is detected during the output off check.

bit1: Device test error detection 2

An error is detected during the check pattern 2 for the device test.

[Caution]

This device is dedicated to the monitor. Do not change the device value with PLC program. If it is changed, the dual signal compare ladder will not be executed correctly.

Contact	Signal name	Signalab-breviation		Common for part systems
-	CNC SIDE SAFETY COMPARE ACTIVITYCHECK INFORMA-TION	SU_NLT		G12500
				R2180

[Function]

This signal informs the PLC of the CNC side dual signal comparison activity check counter.

[Operation]

To ensure that dual signal comparison is constantly done between the CNC and PLC CPUs, they perform activity check each other.

[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

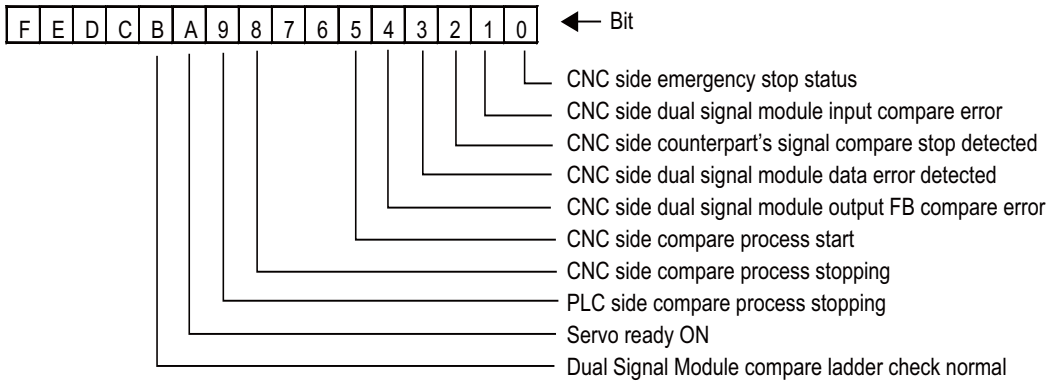
Contact	Signal name	Signalab-breviation		Common for part systems
-	CNC SIDE DUAL SIGNAL COM-PARE STATUS	SU_NST		G12501
				R2181

[Function]

This signal informs the PLC of the CNC side dual signal comparison status.

[Operation]

Each bit corresponds to the following signals.



[Caution]

This device is for monitorting only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

Contact	Signal name	Signalab-breviation		Common for part systems
-	CNC SIDE HEAD G NO.	SU_NGDV		G12502
				R2182

[Function]

This signal informs the PLC of the CNC side dual signal head G device No.

[Operation]

The value set by the parameter " #26742 G Device TOP number" is normally set.

[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

Contact	Signal name	Signalab-breviation		Common for part systems
-	CNC SIDE DUAL SIGNAL COM-PARE MISMATCH ALLOWANCE TIME	SU_NDLY		G12503
				R2183

[Function]

This signal informs the PLC of the dual signal comparison mismatch allowance time of the dual signal module.

[Operation]

The value set by the parameter "#21142 SSU_Delay " is normally set.

[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

Contact	Signal name	Signalab-breviation		Common for part systems
-	CNC SIDE DUAL SIGNALHEAD DEVICE NO. m	SU_NDV m		G12504 - G12506
				R2184 - R2186

[Function]

This signal informs the PLC of the dual signal head device No. of the dual signal module.

[Operation]

The PLC is informed of the value set by the parameters "#21143 SSU_Dev1" to "#21145 SSU_Dev3".

[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

Contact	Signal name	Signalab-breviation		Common for part systems
-	NO. OF DUAL SIGNAL MOD-ULES ON CNC SIDE	SU_NNUM		G12508
				R2188

[Function]

This signal informs the PLC of the number of dual signal modules.

[Operation]

The PLC is informed of the value set by the parameter "#21125 SSU_num".

[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

4.6 Data Type Input Signals : Axis State (CNC CPU->PLC CPU)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
-	THERMAL EXPANSION COM-PENSATION AMOUNT			G11000	G11010	G11020	G11030	G11040	G11050	G11060	G11070
				R800	R810	R820	R830	R840	R850	R860	R870
				9th axis	**10th axis**	**11th axis**	**12th axis**	**13th axis**	**14th axis**	**15th axis**	**16th axis**
				G11080	G11090	G11100	G11110	G11120	G11130	G11140	G11150
				R880	R890	R900	R910	R920	R930	R940	R950

[Function]

During ball screw thermal expansion compensation, the compensation amount calculated based on the "thermal expansion offset compensation amount" and "thermal expansion max. compensation amount" is set in this register by the CNC.

[Operation]

The "thermal expansion offset compensation amount" and the "thermal expansion max. compensation amount" is set as a set for each axis in the R register.

The current compensation amount is set by the CNC into the "thermal expansion compensate amount".

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.

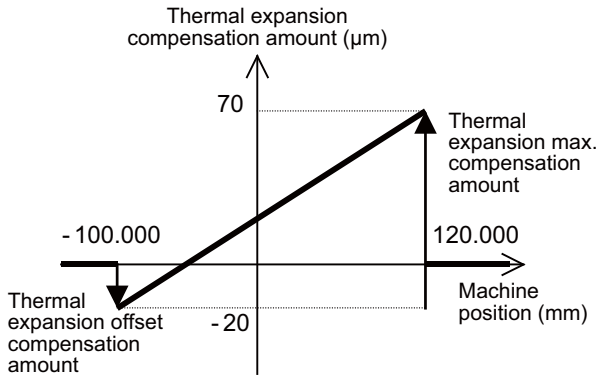
	Thermal expansion offset compensation amount (PLC R CNC) Unit: Minimum command unit/2	Thermal expansion max. compensation amount (PLC R CNC) Unit: Minimum command unit/2	Thermal expansion compensation amount (CNC R PLC) Unit: Minimum command unit/2
1st axis	G+1002/R3102	G+1003/R3103	G11000/R800
2nd axis	G+1012/R3112	G+1013/R3113	G11010/R810
3rd axis	G+1022/R3122	G+1023/R3123	G11020/R820
4th axis	G+1032/R3132	G+1033/R3133	G11030/R830
5th axis	G+1042/R3142	G+1043/R3143	G11040/R840
6th axis	G+1052/R3152	G+1053/R3153	G11050/R850
7th axis	G+1062/R3162	G+1063/R3163	G11060/R860
8th axis	G+1072/R3172	G+1073/R3173	G11070/R870
9th axis	G+1082/R3182	G+1083/R3183	G11080/R880
10th axis	G+1092/R3192	G+1093/R3193	G11090/R890
11th axis	G+1102/R3202	G+1103/R3203	G11100/R900
12th axis	G+1112/R3212	G+1113/R3213	G11110/R910
13th axis	G+1122/R3222	G+1123/R3223	G11120/R920
14th axis	G+1132/R3232	G+1133/R3233	G11130/R930
15th axis	G+1142/R3242	G+1143/R3243	G11140/R940
16th axis	G+1152/R3252	G+1153/R3253	G11150/R950

A unit half of the minimum command unit is the setting unit.

If the minimum command unit is 1 μ m and 100 is set, for example, the compensation amount will be 50 μ m.

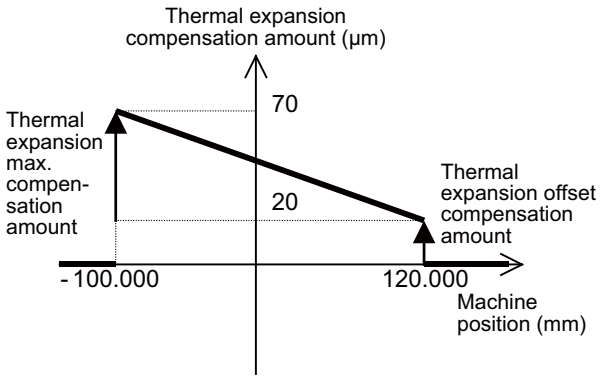
Setting example

(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
Thermal expansion offset compensation amount	-40
Thermal expansion offset compensation amount	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
Thermal expansion offset compensation amount	40
Thermal expansion offset compensation amount	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 offset compensation amount

Thermal expansion max. compensation amount

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
-	MACHINE POSITION n-TH AXIS	MPOSn		G11002-G11003	G11012-G11013	G11022-G11023	G11032-G11033	G11042-G11043	G11052-G11053	G11062-G11063	G11072-G11073
				R802-R803	R812-R813	R822-R823	R832-R833	R842-R843	R852-R853	R862-R863	R872-R873
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				G11082-G11083	G11092-G11093	G11102-G11103	G11112-G11113	G11122-G11123	G11132-G11133	G11142-G11143	G11152-G11153
				R882-R883	R892-R893	R902-R903	R912-R913	R922-R923	R932-R933	R942-R943	R952-R953

[Function]

This signal outputs the position (n-th axis) on the machine coordinate system by the PLC setting unit.

[Operation]

The base point of basic machine coordinate system is 0. Backlash compensation and machine error compensation are not included.

The unit is the input setting unit parameter "#1003 iunit".

The range of output value is shown below.

#1003 (iunit) settings	B (1μm)	C (0.1μm)
Linear axis	-2147483648 to 2147483647	-2147483648 to 2147483647
Rotation axis	0 to 359999	0 to 3599999

(Example 1) For a linear axis, the following values are output.

#1003 (iunit) settings	B (1μm)	C (0.1μm)
Output value where machine position is at 1mm (metric system)	2000	20000
Output value where machine position is at 1inch (inch system)	20000	200000

(Example 2) When diameter specification axis parameter "#1019 dia" is set to "1", the following values are output.

#1003 (iunit) settings	B (1μm)	C (0.1μm)
Output value where machine position is at 1mm (metric system)	1000	10000
Output value where machine position is at 1inch (inch system)	10000	100000

(Example 3) For a rotation axis, the following values are output.

The output values are common for inch/metric system

#1003 (iunit) settings	B (1μm)	C (0.1μm)
Output value at machine position 1°	1000	10000

Contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
-	FEEDBACK MACHINE POSITION n-TH AXIS	FBMPOSn		G11004-G11005	G11014-G11015	G11024-G11025	G11034-G11035	G11044-G11045	G11054-G11055	G11064-G11065	G11074-G11075
				R804-R805	R814-R815	R824-R825	R834-R835	R844-R845	R854-R855	R864-R865	R874-R875
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				G11084-G11085	G11094-G11095	G11104-G11105	G11114-G11115	G11124-G11125	G11134-G11135	G11144-G11145	G11154-G11155
				R884-R885	R894-R895	R904-R905	R914-R915	R924-R925	R934-R935	R944-R945	R954-R955

[Function]

This signal outputs feedback position (n-th axis) on the machine coordinate system by the PLC setting unit.

[Operation]

The base point of basic machine coordinate system is 0. Backlash compensation and machine error compensation are not included.

The unit is the input setting unit parameter "#1003 iunit".

The range of output value is shown below.

#1003 (iunit) settings	B (1μm)	C (0.1μm)
Linear axis	-2147483648 to 2147483647	-2147483648 to 2147483647
Rotation axis	0 to 359999	0 to 3599999

(Example 1) For a linear axis, the following values are output.

#1003 (iunit) settings	B (1μm)	C (0.1μm)
Output value where feedback machine position is at 1mm (metric system)	2000	20000
Output value where feedback machine position is at 1inch (inch system)	20000	200000

(Example 2) When diameter specification axis parameter "#1019 dia" is set to "1", the following values are output.

#1003 (iunit) settings	B (1μm)	C (0.1μm)
Output value where feedback machine position is at 1mm (metric system)	1000	10000
Output value where feedback machine position is at 1inch (inch system)	10000	100000

(Example 3) For a rotation axis, the following values are output.

The output values are common for inch/metric system

#1003 (iunit) settings	B (1μm)	C (0.1μm)
Output value at machine position 1°	1000	10000

4.7 Data Type Input Signals : Part System State (CNC CPU->PLC CPU)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	EXTERNAL SEARCHSTATUS			G10300	G10400	G10500	G10600	G10700	G10800	G10900
				R100	R200	R300	R400	R500	R600	R700

[Function][Operation]

The status at the end of the external search is output.

The correspondence of the external search status values and details output from the CNC CPU based on the external search is shown below.

External searchstatus value	Details	Remedy
0	Normally finished.	————
1	Operation search is being carried out.	Wait for other function’s operation search to finish before searching.
2	Search was attempted during theprogram operation.	Stop the program before searching.
3	A non-existed or disabled device was designated.	Confirm the presence of the device, and that the device is within the specifications.
4	The program file is not designated.	Designate the program No. or sequence No.
5	The block with the designated program No., sequence No. or block No. was not found. Or search was attempted during restart search.	Reset the restart search and search again.
6	No external search specifications	Check the specifications.
7	The operation search did not yet finished after three seconds since the external search had started. (Note)	Data may be being input or output. Restart the external search after finishing the operation.

(Note) Timeout monitoring is executed only when "1" is set to "#21102 add02/bit1".

[Related signals]

(1) External search finished
(2) External search device No.
(3) External search program No.
(4) External search sequence No.
(5) External search block No.
(6) External search strobe (EXTSSn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	M CODE DATA 1			G10304 - G10305	G10404 - G10405	G10504 - G10505	G10604 - G10605	G10704 - G10705	G10804 - G10805	G10904 - G10905
				R104 - R105	R204 - R205	R304 - R305	R404 - R405	R504 - R505	R604 - R605	R704 - R705

[Function]

When M function is specified, value following address "M" can be identified. The M code data output from the controller is a max. 8-digit BCD code.

[Operation]

M code data are updated when:

(1) "M**" is issued in automatic operation (memory or MDI).

(2) "M**" in fixed cycle causes motion during execution of the fixed cycle.

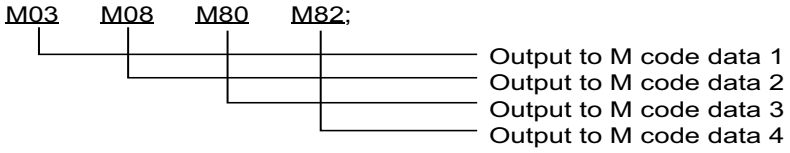
(3) "M**" is executed by manual numerical command input.

M code data is also updated when an "M code independent output" command is issued even during M function lock. The data is kept unchanged after "M function finish" (FIN1n, FIN2n) signal is sent back.

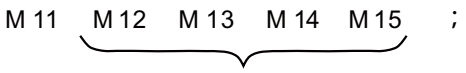
"Reset" or "Emergency stop" does not clear the data.

[Caution]

(1) Commands can be defined up to four in a block with parameters. When plural M functions are placed in one block, the signals are output in the order at programming.



A program error will not occur even if more than the maximum numbers of commands are issued. The latter commands will be valid.(Example) When five M commands are issued though only four M commands can be used.



The last four M commands are valid.

The last four M commands are valid.

(2) M98 (read of subprogram), M99 (return to main program), etc. are processed within the CNC, and not output as M code data.

[Related signals]

(1) M function strobe m (MFmn)

(2) M code data 2, 3, 4

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	M CODE DATA 2			G10306 - G10307	G10406 - G10407	G10506 - G10507	G10606 - G10607	G10706 - G10707	G10806 - G10807	G10906 - G10907
				R106 - R107	R206 - R207	R306 - R307	R406 - R407	R506 - R507	R606 - R607	R706 - R707

[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".

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	M CODE DATA 3			G10308 - G10309	G10408 - G10409	G10508 - G10509	G10608 - G10609	G10708 - G10709	G10808 - G10809	G10908 - G10909
				R108 - R109	R208 - R209	R308 - R309	R408 - R409	R508 - R509	R608 - R609	R708 - R709

[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".

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	**M CODE DATA 4**			G10310 - G10311	G10410 - G10411	G10510 - G10511	G10610 - G10611	G10710 - G10711	G10810 - G10811	G10910 - G10911
				R110 - R111	R210 - R211	R310 - R311	R410 - R411	R510 - R511	R610 - R611	R710 - R711

[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".

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	S CODE DATA 1 to 4			G10312 - G10319	G10412 - G10419	G10512 - G10519	G10612 - G10619	G10712 - G10719	G10812 - G10819	G10912 - G10919
				R112 - R119	R212 - R219	R312 - R319	R412 - R419	R512 - R519	R612 - R619	R712 - R719

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	S CODE DATA 5 to 7			G10364 - G10369	G10464 - G10469	G10564 - G10569	G10664 - G10669	G10764 - G10769	G10864 - G10869	G10964 - G10969
				R164 - R169	R264 - R269	R364 - R369	R464 - R469	R564 - R569	R664 - R669	R764 - R769

[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 (FIN1n or FIN2n) signal is sent back. "Reset" and "Emergency stop" does not cause clear to data.

The S code data is assigned in the following manner. (Refer to the table above for the 2nd and further part systems.)

Signal name	Register (1st part system)
S code data 1	G10312,10313/R112,113
S code data 2	G10314,10315/R114,115
S code data 3	G10316,10317/R116,117
S code data 4	G10318,10319/R118,119
S code data 5	G10364,10365/R164,165
S code data 6	G10366,10367/R166,167
S code data 7	G10368,10369/R168,169

[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.

(2) If two or more S codes for one spindle are issued in a block, the S code defined last will be valid.

[Related signals]

(1) S function strobe m (SFmn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	T CODE DATA 1			G10320 - G10321	G10420 - G10421	G10520 - G10521	G10620 - G10621	G10720 - G10721	G10820 - G10821	G10920 - G10921
				R120 - R121	R220 - R221	R320 - R321	R420 - R421	R520 - R521	R620 - R621	R720 - R721

[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 1 are updated when:

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

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

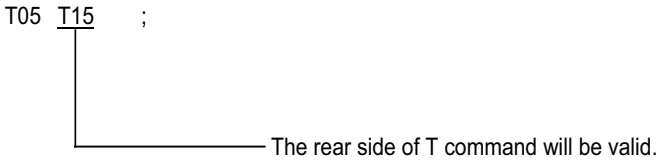
Data remain unchanged even when "M function finish" (FIN1n or FIN2n) signal is sent back. "Reset" and "Emergency stop" does not clear this data.

[Caution]

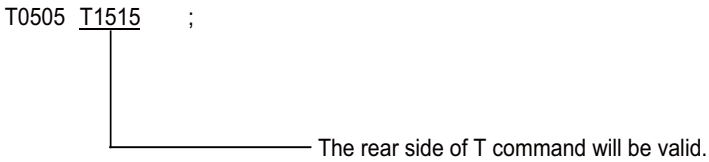
(1) Up to one T code can be commanded in one block.

The latter code will be valid if more than two codes are commanded in one block.

[M system]



[L system]



[Related signals]

(1) T function strobe 1 (TF1n)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	2ND M FUNCTION DATA 1			G10328 - G10329	G10428 - G10429	G10528 - G10529	G10628 - G10629	G10728 - G10729	G10828 - G10829	G10928 - G10929
				R128 - R129	R228 - R229	R328 - R329	R428 - R429	R528 - R529	R628 - R629	R728 - R729

[Function]

When 2nd M function is specified, value following address "B" can be identified.

The 2nd M function data output from the controller is a max. 8-digit BCD code.

(Note 1) Select an address for the 2nd M function address from the setup parameters basic specification parameter "#1170 M2name" A, B or C address that is not being used for "#1013 axname" or "#1014 incax".

[Operation]

2ND M FUNCTION DATA 1 are updated when:

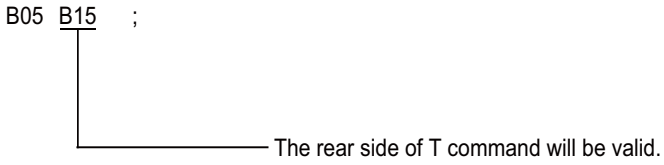
(1) "B (A, C)**" is specified in automatic operation (memory or MDI).

(2)"B (A, C)**" is executed by manual numerical command input.

Data remain unchanged even when "M function finish" (FIN1n or FIN2n) signal is sent back. "Reset" and "Emergency stop" does not clear this data.

[Caution]

(1) Only one 2nd M function can be commanded in one block. The latter code will be valid if more than two codes are commanded in one block.



[Related signals]

(1) 2nd M function strobe 1 (BF1n)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	TOOL NO.			G10336	G10436	G10536	G10636	G10736	G10836	G10936
				R136	R236	R336	R436	R536	R636	R736

[Function]

Set the compensation No. of the tool data for setting the measurement result during manual tool length measurement II. This is set in BCD code.

[Operation]

When the sensor is touched by the tool, compensation amount will be written into the tool data of the compensation No. automatically specified.

This tool No. is interpreted as the tool compensation No. by the CNC.

[Related signals]

(1) Wear compensation No.

(2) Tool length measurement 2 (TLMSn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	GROUP IN LIFE MANAGEMENT			G10338	G10438	G10538	G10638	G10738	G10838	G10938
				R138	R238	R338	R438	R538	R638	R738

[Function] [Operation]

This signal outputs group No. currently in life management with the tool life management II.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	NO. OF WORK MACHINING (CURRENT VALUE)			G10340 - G10341	G10440 - G10441	G10540 - G10541	G10640 - G10641	G10740 - G10741	G10840 - G10841	G10940 - G10941
				R140 - R141	R240 - R241	R340 - R341	R440 - R441	R540 - R541	R640 - R641	R740 - R741

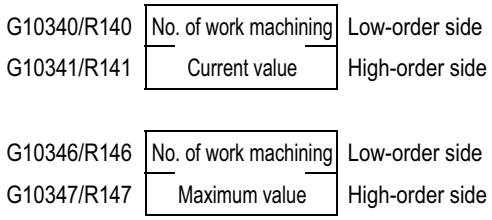
[Function]

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 the maximum No. of work machined (WRK LIMIT) of the [Process parameters], the current value or maximum value of the No. of work machining is output.

<For 1st part system>



(Note 1) If data is not set in "WRK COUNT M" and "WRK LIMIT" on the [Process Parameter] screen, data will not be output to the file register.

(Note 2) If the No. of work machining matches or exceeds maximum value, the No. of work machining over (PCNTn) signal turns ON.

<Counting of No. of work machining using user PLC>

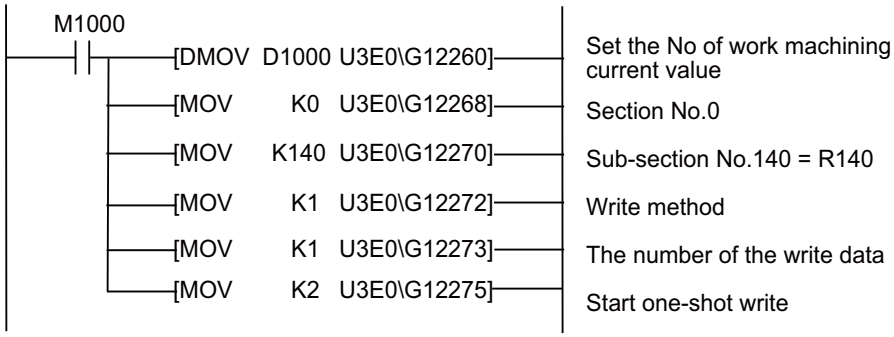
(1) Set "0" in "WRK COUNT M" on the [Process Parameter] screen. With this setting, the controller side will not count up.

(2) Add "1" to "No. of work machining (current value)" with the user PLC.

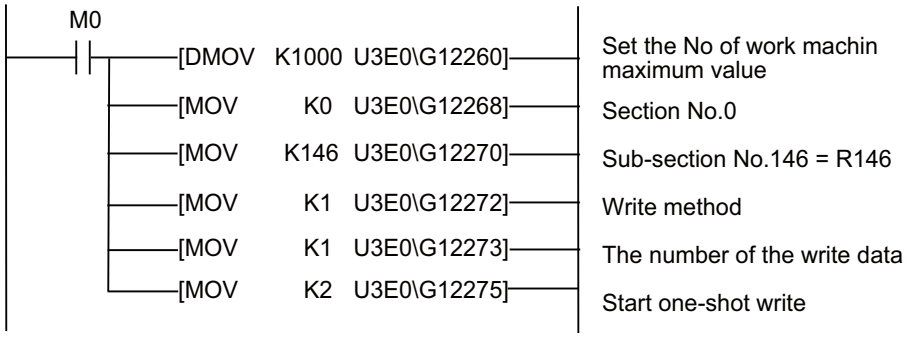
(3) The controller will display "No. of work machining (current value)" as the No. of work machining on the [COORDINATE] screen. Even in this case, if the No. of work machining matches or exceeds the work maximum value, the No. of work machining over (PCNTn) signal will turn ON.

(Note) This area allows CNC CPU to output the data to PLC CPU, while it does not allow PLC CPU to write the data in with the shared device. To write the No. of work machining current value and maximum value in this area, use the PLC window as follows.

<Writing the No. of work machining current value>



<Writing the No. of work machining maximum value>



[Related signals]

(1) No. of work machining (maximum value)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	NEAR REFERENCE POSITION (PER REFERENCE POSITION)			G10342 - G10343	G10442 - G10443	G10542 - G10543	G10642 - G10643	G10742 - G10743	G10842 - G10843	G10942 - G10943
				R142 - R143	R242 - R243	R342 - R343	R442 - R443	R542 - R543	R642 - R643	R742 - R743

[Function]

This signal indicates that the control axis is near the reference position when using the absolute position detection system.

This signal is output for the 1st reference position to the 4th reference position.

Near the 1st reference position, the time for outputting the signal is shorter than the "near reference position" (NRFn) signal (the ON/OFF timing accuracy during axis movement is improved).

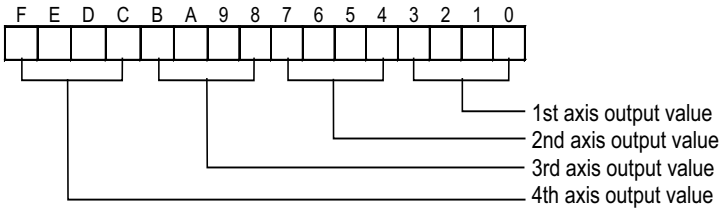
[Operation]

(1) Using the nth reference position as a reference, when the control axis is in the range set with the parameters, this signal turns ON, and turns OFF when the axis is not within the range.

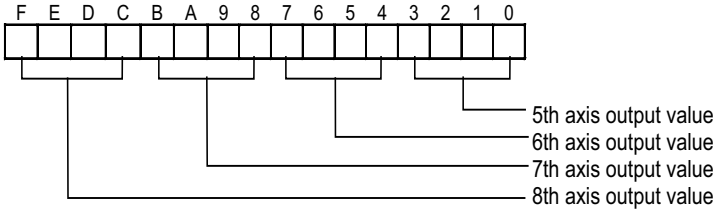
(2) The near reference position signal is output with four bits for each axis.

(a) R register and corresponding axes

G10342/R142



G10343/R143



(b) Output value and near nth reference position

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

(Note 1) The near reference position signal devices include X devices (NRFn) which output signal only for the 1st reference position, and the R registers (G10342/R142,G10343/R143) which outputs a signal for each reference position (1st reference position to 4th reference position).

(Note 2) The near reference position signal output width is set with the absolute position parameters "#2057 nrefp" and "#2058 nrefn". The near reference position signal output width is the same width for the 1st reference position to the 4th reference position.

(Note 3) Near the 1st reference position, the signals are output to the conventional X device (NRFn) and the R registers (G10342/R142,G10343/R143) which output signals to each reference position.

[Related signals]

(1) Near reference position nth axis (NRFn)

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
-	TOOL LIFE USAGE DATA			G10344 - G10345	G10444 - G10445	G10544 - G10545	G10644 - G10645	G10744 - G10745	G10844 - G10845	G10944 - G10945
				R144 - R145	R244 - R245	R344 - R345	R444 - R445	R544 - R545	R644 - R645	R744 - R745

[Function] [Operation]

This signal output usage data of tools currently being used with the tool life management II. (When multiple compensation Nos. are used, the total usage data per compensation No. is output.)

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
-	NO. OF WORK MACHINING (MAXIMUM VALUE)			G10346- G10347	G10446- G10447	G10546- G10547	G10646- G10647	G10746- G10747	G10846- G10847	G10946- G10947
				R146- R147	R246- R247	R346- R347	R446- R447	R546- R547	R646- R647	R746- R747

[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.

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
-	ERROR CODE OUTPUT			G10356 - G10358	G10456 - G10458	G10556 - G10558	G10656 - G10658	G10756 - G10758	G10856 - G10858	G10956 - G10958
				R156 - R158	R256 - R258	R356 - R358	R456 - R458	R556 - R558	R656 - R658	R756 - R758

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
-	ERROR CODE OUTPUT EXTENSION			G10360 - G10363	G10460 - G10463	G10560 - G10563	G10660 - G10663	G10760 - G10763	G10860 - G10863	G10960 - G10963
				R160 - R163	R260 - R263	R360 - R363	R460 - R463	R560 - R563	R660 - R663	R760 - R763

[Function]

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

[Operation]

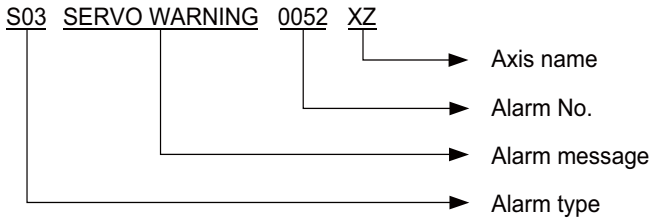
The following output will be made when an alarm occurs.

The message displayed in CNC screen is not converted.

(Example) When servo alarm S03 occurs

(Axis name is added for the messages such as some of M01, S01 to S52, and Z70 to Z73.

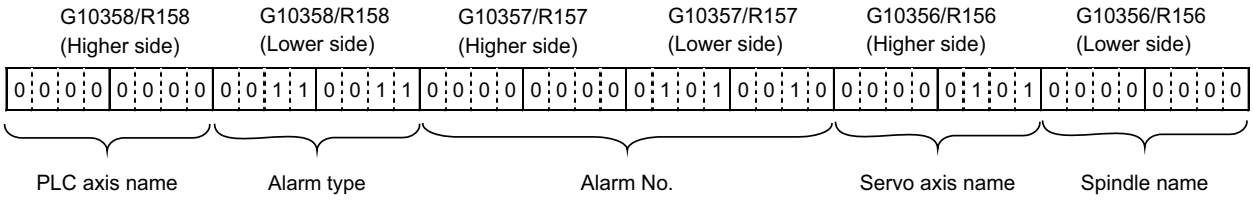
The following 48 bits are used as the output PLC I/F devices.)



The output is as shown above on the CNC 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".

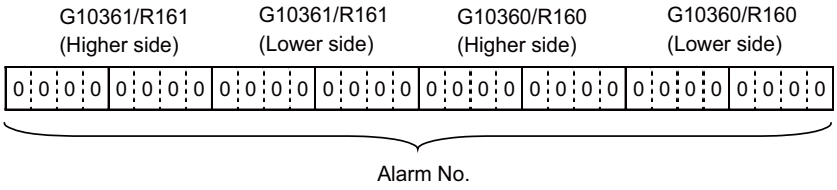
The output to PLC I/F device is as follows.
[ERROR CODE OUTPUT]

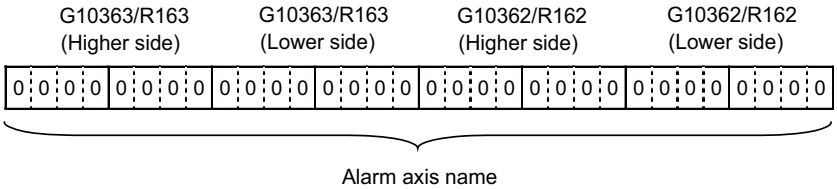


	bit							
	7	6	5	4	3	2	1	0
1st axis	0	0	0	0	0	0	0	1
2nd axis	0	0	0	0	0	0	1	0
3rd axis	0	0	0	0	0	1	0	0
4th axis	0	0	0	0	1	0	0	0
5th axis	0	0	0	1	0	0	0	0
6th axis	0	0	1	0	0	0	0	0
7th axis	0	1	0	0	0	0	0	0
8th axis	1	0	0	0	0	0	0	0

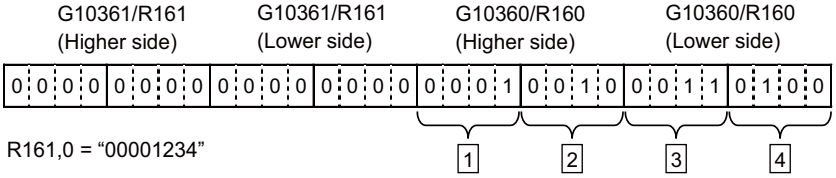
As for the servo axis name and spindle name, the bit corresponding to the No. of axis in which the alarm occurs is turned on.
The max servo axis Nos. in the 1st part system are 8, and the max spindle Nos. in the 1st part system are 7. The spindle alarm is output to the 1st part system.
The PLC axis name is output to the 1st part system.

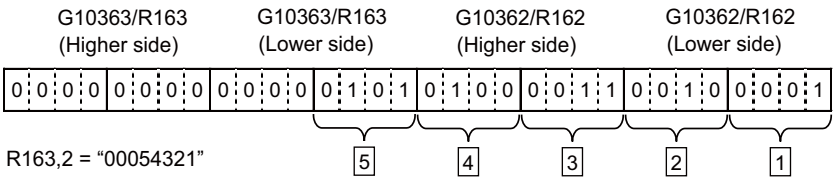
[ERROR CODE OUTPUT EXTENSION]





If the alarm No. and alarm axis name are numeric type, numeric values are output as they are. If the alarm axis name is the axis data type, it will not be output.
Ex. Y20 Safety observation error 1234 54321





Code table

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

Alarm code list

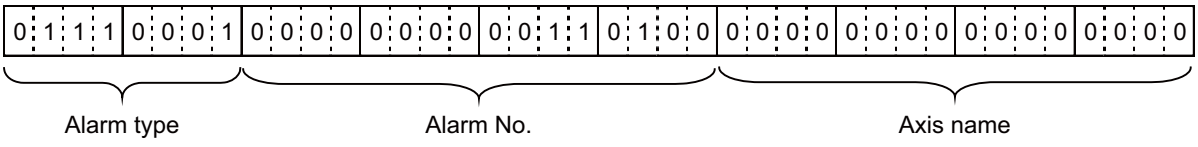
Alarm		Details	Alarm type	Axis name	Priority
Multi-CPU error	A01	MULTI CPU ERROR	A1	Not added	1
System alarm	Z70 Z71 Z72 Z73 Z89 Z99	ABS. ILLEGAL DETECTOR ERROR COMPARE ERROR ABS. WARNING APLC ERROR FILE AREA ERROR	55 56 57 58 58 5C	Some are added	2
Servo/spindle alarm	S01 S02 S03 S04	SERVO ALARM: PR INIT PARAM ERR SERVO ALARM: NR SERVO ALARM: AR	31 32 33 36	Added	3
MCP alarm	Y02 Y03 Y06 Y07 Y09 Y11 Y14 Y20	System alarm Amp. Unequipped mcp_no setting error Too many axes connected Too many axisno connected Node detect error VIR.AX AMP EQU. Safety observation error	41 42 49 43 4A 4B 4F 4C	Some are added	4
Network related alarm	L10 L11 L12 L13	DN Initialization error 1 DN Initialization error 2 DN Link error DN Message error	B1 B2 B3 B4	Not added	5
Emergency stop	EMG	EMERGENC	01	Not added	6
Program error	P ○○○ P990	(Program error) PREPRO S/W ERR	71 61	Not added	7
Servo/spindle warning	S51 S52	PARAMETER ERROR SERVO WARNING	34 35	Added	8
MCP warning	Y51 Y21 Y90	Parameter error Safety observation warning No spindle signal	45 4E 47		9
System warning	Z30 Z52 Z53 Z55 Z59 Z20	ETHERNET ERROR BATTERY FAULT TEMP_OVER RIO NOT CONNECT TIME CONSTANT Power ON again	51 52 53 54 59 5A	Not added	10
Operation error	M01 M00 M01	OPERATION ERROR AUX OPER. ALM. AUX OPER. ALM.	11 81 82	Some are added Not added Added	11
Stop code	T01 T02 T03 T10	CAN'T CYCLE ST FEED HOLD BLOCK STOP FIN WAIT	21 22 23 26	Not added	12
Illegal PLC	U10	Built-in PLC alarm	91	Not added	13

The message at emergency stop is displayed in CNC 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.
Emergency stop (EMG)	EXIN	External emergency stop	0000
	PLC	Built-in PLC emergency stop	0001
	SRV	Servo drive unit not ready	0002
	STOP	PLC not running	0003
	SPIN	Spindle drive unit not ready	0004
	DATA	File area error	0005
	PARA	Door open II fixed device setting illegal	0006
	STP2	Built-in PLC not running	0007
	LAD	Built-in PLC illegal code	0010
	MULT	Q and Qr bus alarm	0013
	IPWD	Illegal power down	0014
	CVIN	PS external emergency stop	0015
	MCT	Contactor shutoff test	0016
	SUIN	Emergency stop in the safety circuit	0017
	LINK	Network unit error	0018
	APLC	Emergency stop is set from APLC function	0019

(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.



Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	USER MACRO OUTPUT #1132 (Controller -> PLC)			G10370 - G10371	G10470 - G10471	G10570 - G10571	G10670 - G10671	G10770 - G10771	G10870 - G10871	G10970 - G10971
				R170 - R171	R270 - R271	R370 - R371	R470 - R471	R570 - R571	R670 - R671	R770 - R771

[Function]

This is interface function used to coordinate user PLC o user macro program.

[Operation]

When a value is set in the system variables #1100 to #1131 or #1132 with the user macro system, the user PLC output to the file register Rn and Rn+1 corresponding to the user PLC can be referred to with that value.

The relationship between system variable and file register is as follows:

Systemvariable	Points	Interface output signal	Systemvariable	Points	Interface output signal
#1100	1	Register G10370/R170 bit 0	#1116	1	Register G10371/R171 bit 0
#1101	1	Register G10370/R170 bit 1	#1117	1	Register G10371/R171 bit 1
#1102	1	Register G10370/R170 bit 2	#1118	1	Register G10371/R171 bit 2
#1103	1	Register G10370/R170 bit 3	#1119	1	Register G10371/R171 bit 3
#1104	1	Register G10370/R170 bit 4	#1120	1	Register G10371/R171 bit 4
#1105	1	Register G10370/R170 bit 5	#1121	1	Register G10371/R171 bit 5
#1106	1	Register G10370/R170 bit 6	#1122	1	Register G10371/R171 bit 6
#1107	1	Register G10370/R170 bit 7	#1123	1	Register G10371/R171 bit 7
#1108	1	Register G10370/R170 bit 8	#1124	1	Register G10371/R171 bit 8
#1109	1	Register G10370/R170 bit 9	#1125	1	Register G10371/R171 bit 9
#1110	1	Register G10370/R170 bit 10	#1126	1	Register G10371/R171 bit 10
#1111	1	Register G10370/R170 bit 11	#1127	1	Register G10371/R171 bit 11
#1112	1	Register G10370/R170 bit 12	#1128	1	Register G10371/R171 bit 12
#1113	1	Register G10370/R170 bit 13	#1129	1	Register G10371/R171 bit 13
#1114	1	Register G10370/R170 bit 14	#1130	1	Register G10371/R171 bit 14
#1115	1	Register G10370/R170 bit 15	#1131	1	Register G10371/R171 bit 15

Systemvariable	Points	Interface output signal	
#1132	32	Register G10370/R170,G10371/R171	This correspondence table shows the example for file registers G10370/R170 and G10371/R171.
#1133	32	Register G10372/R172,G10373/R173	
#1134	32	Register G10374/R174,G10375/R175	
#1135	32	Register G10376/R176,G10377/R177	

File registers G10370/R170 and G10371/R171 correspond to system variables #1100 to #1131, and #1132 (32-bit data).

"User macro output #1132 to #1135 (Controller -> PLC)" and "User macro input #1032 to #1035 (PLC -> Controller)" each have both part system common signals and part system independent ones.

Setting the bit selection parameter #6454/bit0 selects part system common or part system independent.

Register Nos. when part system common/independent is selected

Bit selection parameter #6454/bit0	User macro output #1132 to #1135 (Controller -> PLC)	User macro output #1032 to #1035 (PLC -> Controller)
0: Part system common	G10224-G10231/R24-R31	G+224-G+231/R2324-R2331
1: Part system independent	G10370-G10977/R170-R777	G+370-G+977/R2470-R3077

[Related signals]

(1) User macro output #1132 to #1135 (Controller -> PLC)(Part system common)
(2) User macro output #1132 to #1135 (Controller -> PLC)(Part system independent)
(3) User macro input #1032 to #1035 (PLC -> Controller)(Part system common)
(4) User macro input #1032 to #1035 (PLC -> Controller)(Part system independent)

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
-	USER MACRO OUTPUT #1133 (Controller -> PLC)			G10372 - G10373	G10472 - G10473	G10572 - G10573	G10672 - G10673	G10772 - G10773	G10872 - G10873	G10972 - G10973
				R172 - R173	R272 - R273	R372 - R373	R472 - R473	R572 - R573	R672 - R673	R772 - R773

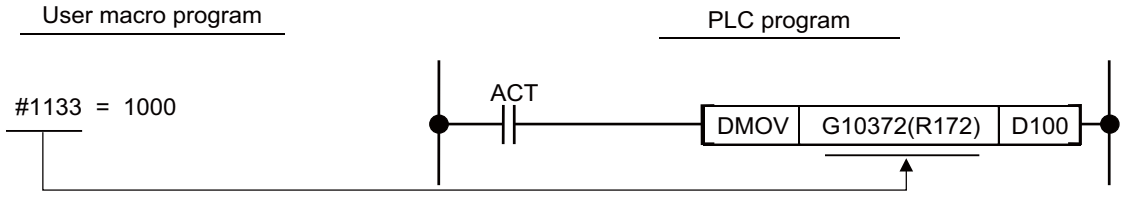
[Function]

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

[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 to #1135 (Controller -> PLC)(Part system common)
(2) User macro output #1132 to #1135 (Controller -> PLC)(Part system independent)
(3) User macro input #1032 to #1035 (PLC -> Controller)(Part system common)
(4) User macro input #1032 to #1035 (PLC -> Controller)(Part system independent)

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
-	USER MACRO OUTPUT #1134 (Controller -> PLC)			G10374 - G10375	G10474 - G10475	G10574 - G10575	G10674 - G10675	G10774 - G10775	G10874 - G10875	G10974 - G10975
				R174 - R175	R274 - R275	R374 - R375	R474 - R475	R574 - R575	R674 - R675	R774 - R775

[Function][Operation]

The function, operation, etc. are the same as those of "USER MACRO OUTPUT #1133".

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
-	USER MACRO OUTPUT #1135 (Controller -> PLC)			G10376 - G10377	G10476 - G10477	G10576 - G10577	G10676 - G10677	G10776 - G10777	G10876 - G10877	G10976 - G10977
				R176 - R177	R276 - R277	R376 - R377	R476 - R477	R576 - R577	R676 - R677	R776 - R777

[Function][Operation]

The function, operation, etc. are the same as those of "USER MACRO OUTPUT #1133".

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	CHOPPING STATUS			G10380	G10480	G10580	G10680	G10780	G10880	G10980
				R180	R280	R380	R480	R580	R680	R780

[Function] [Operation]

The state of chopping operation is output as each bit information.

BIT	Name	Description
0	In chopping start	It turns ON during the chopping operation regardless of either with chopping by the external signal or by the command from the machining program.
1	In chopping mode	It turns ON at the start of chopping command (G81.1 or chopping signal ON). After issuing the chopping complete command (G80 or chopping signal OFF) and then completing the basic position return, it turns OFF.
2	Stroke compensation completion	While the compensation operation is executed during the chopping operation, it turns ON as the difference between the position of upper dead point/bottom dead point and the feedback position has reached less than the tolerance specified with the parameter. If change, such as the movement stop, operation parameter change etc., occurs, it turns OFF.
3	Chopping designation error	Check the setting of operation parameter at the rising edge of the chopping parameter valid signal, and turn it OFF if there is any abnormality. Correct the setting detail, and check it again at the rising edge of the chipping parameter valid signal. If there is no abnormality, turn it OFF. Refer to the alarm No. for the detail of the abnormality.
4	Chopping start preparation completion	Reading the operation parameter inside the NC completes at the rising edge of the chopping parameter valid signal, and turn it ON when the operation of the designated parameter is valid. Turn the chopping parameter valid signal OFF after confirming this signal is ON. When the chopping parameter valid signal turned OFF, this signal will also turn OFF.
5	Playback mode error over	Even the compensation operation is executed using the memorized compensation amount with the playback mode of fixed compensation amount method, it turns ON if the difference between the command position and the feedback position exceeds the tolerance. If the difference is within the tolerance, it turns OFF. Set with the parameter to use the compensation value sequential update type for changing the compensation amount when the error amount exceeds the tolerance.
6	Compensation memorize complete	It turns ON when the measurement of compensation amount is completed in the record mode of fixed compensation amount method. The compensation amount is the difference between the command position and the feedback position and should be within the tolerance. It turns OFF at the completion of chopping operation of the record mode.
7	Compensation memorize incomplete	The error amount cannot be within the tolerance even chopping operation with fixed compensation method is executed 50 times succession.
8 to F	Not used	

[Related signals]

(1) Chopping (CHPS)

(2) Chopping parameter valid

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	CHOPPING ERROR NO.			G10381	G10481	G10581	G10681	G10781	G10881	G10981
				R181	R281	R381	R481	R581	R681	R781

[Function]

When the alarm occurs during the chopping operation by the external signal or at the rising edge of the chopping parameter valid signal, the alarm content will be notified to the PLC.

[Operation]

The relationship between the chopping error No. and its content is shown below.

Error No.	Description	Classification
0	No error	-
1	Number of cycles for chopping is zero. (Operates when the number of cycles is 1)	A
2	(Chopping axis feed rate) > (Cutting feed clamp speed) (Feed rate is clamped at the cutting feed clamp speed.)	A
3	(Acceleration of chopping axis) > (Cutting feed clamp speed)/(Cutting feed time constant) (Feed rate is clamped at (cutting feed clamp speed) / (cutting feed time constant))	A
4	(Number of cycles for chopping) > (1000/min) (The number of cycles for chopping is clamped at 1000/min.)	A
5	Chopping axis zero point return is not completed.	B
6	Chopping override is zero	B
7	Commanded axis is the chopping axis.	B
8	The bottom dead point position is zero.	B
9	Chopping axis is a manual feed axis.	B
10	Interlock	B
11	Stored stroke limit or stroke end	B
20	No chopping specification.	-
22	Multiple chopping axes are specified by the PLC interface.	C
23	Chopping axis is not specified by either PLC interface or parameter.	C
26	Data No. of chopping control data is out of range.	C
27	"#2081 chclsp" (chopping clamp speed) and "#2002 clamp" (cutting clamp speed) for chopping axis are both set to "0".	C
28	Chopping axis was changed during the chopping operation. (Chopping axis cannot be changed during chopping.)	C
29	The rotary axis is designated as a chopping axis.	C
31	Chopping command is executed by PLC when selecting the chopping by G command.	C

Classification A	The error is retained during chopping operation. The alarm is removed after the alarm factor is removed.
Classification B	The error is cleared after the alarm factor is removed, or when the NC is reset.
Classification C	It does not enter into the chopping mode.

[Related signals]

(1) Chopping (CHPS)

(2) Chopping parameter valid

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	CHOPPING AXIS			G10382	G10482	G10582	G10682	G10782	G10882	G10982
				R182	R282	R382	R482	R582	R682	R782

[Function]

The axis which is in the chopping operation is output.

[Operation]

The axis which is in the chopping operation turns ON regardless of either by PLC command or by machining program command.

It turns OFF when the chopping mode is removed.

bit0: 1st axis
bit1: 2nd axis
: :
bit7: 8th axis
bit8 to F: Not used (Set to "0".)

[Related signals]

(1) In chopping mode

4.8 Data Type Input Signals : Spindle State (CNC CPU->PLC CPU)

Contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle	4th spindle	5th spindle	6th spindle	7th spindle
-	SPINDLE COMMAND ROTATION SPEED INPUT	SRPMINn		G11160 - G11161	G11190 - G11191	G11220 - G11221	G11250 - G11251	G11280 - G11281	G11310 - G11311	G11340 - G11341
				R1600 - R1601	R1630 - R1631	R1660 - R1661	R1690 - R1691	R1720 - R1721	R1750 - R1751	R1780 - R1781

[Function]

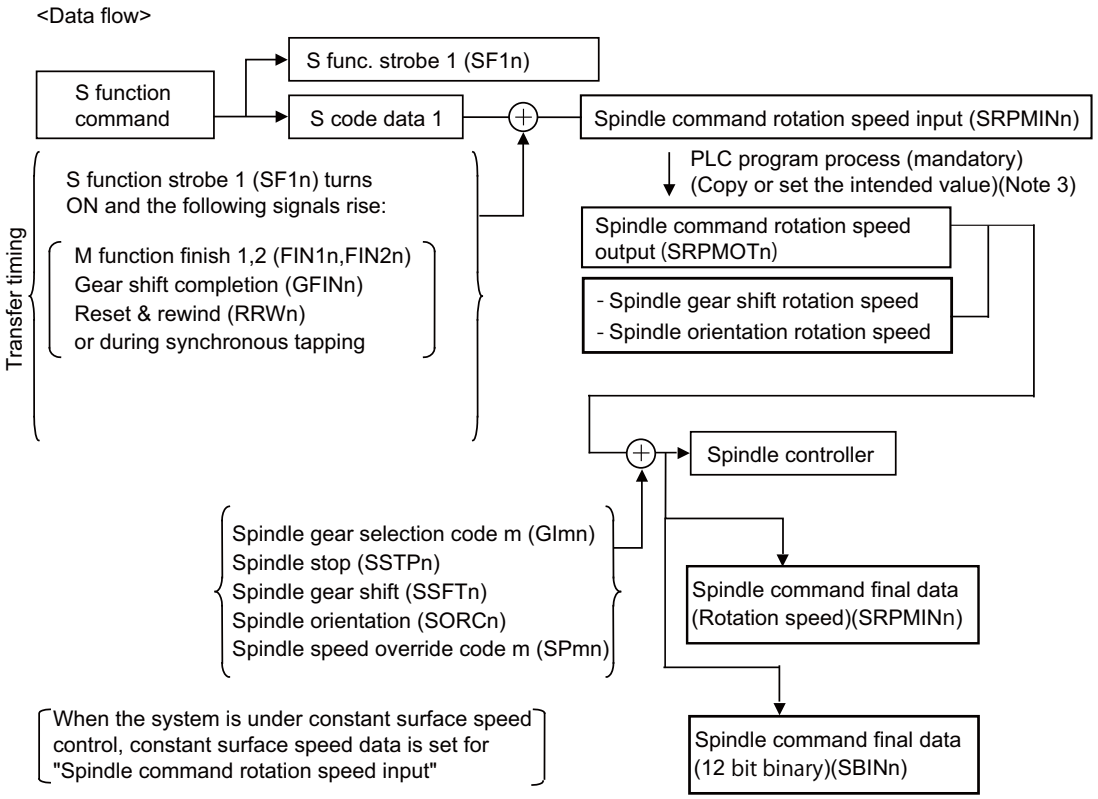
This signal informs that spindle speed reference signal (S) command specified in automatic operation (memory, MDI) or by manual numerical data input. "Spindle command rotation input" speed output from the controller is binary data. The data can be monitored in the "S display" on the command value screen.

[Operation]

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

(1) "S**" is specified in automatic operation (memory, MDI) and "M function finish 1 or 2" (FIN1n or FIN2n) signal or "Gear shift completion" (GFINn) signal is sent back to the controller.

(2) "S**" is specified by manual numerical command input and "M function finish 1 or 2" (FIN1n or FIN2n) signal or "Gear shift completion" (GFINn) signal is sent back to the controller.



(Note 1) Data cannot be cleared by "Reset" or "Emergency stop".

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

(Note 3) By setting data of desired spindle speed to this signal, the spindle can be run at that speed. PLC program for transfer needs to be created by the user to transfer the data. With the PLC program, if the spindle speed to be controlled does not need to change from the (S) command value, copy the spindle command rotation speed input value to the spindle command rotation speed output. If it is desired to be changed, set the intended value to the spindle command rotation speed output.

[Related signals]

(1) Spindle speed command rotation output (SRPMOTn)

(2) Spindle command final data (Rotation speed) (SRPMn)

Contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis
-	SPINDLE COMMAND FINAL DATA (rotation speed)	SRPMn		G11162 - G11163	G11192 - G11193	G11222 - G11223	G11252 - G11253	G11282 - G11283	G11312 - G11313	G11342 - G11343
				R1602 - R1603	R1632 - R1633	R1662 - R1663	R1692 - R1693	R1722 - R1723	R1752 - R1753	R1782 - R1783

[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 selection code 1,2"(Gl1, Gl2), "Spindle stop"(SSTP), "Spindle gear shift"(SSFT) and "Spindle orientation"(SORC) conditions have been considered.

[Related signals]

(1) Spindle command rotation speed input (SRPMINn)

(2) Spindle command rotation speed output (SRPMOTn)

Contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis
-	SPINDLE ACTUAL SPEED			G11166 - G11167	G11196 - G11197	G11226 - G11227	G11256 - G11257	G11286 - G11287	G11316 - G11317	G11346 - G11347
				R1606 - R1607	R1636 - R1637	R1666 - R1667	R1696 - R1697	R1726 - R1727	R1756 - R1757	R1786 - R1787

[Function]

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

[Operation]

True spindle speed is always set by feedback signal from spindle encoder.

Data are multiplied by 1000, and stored.

Contact	Signal name	Signal abbreviation		1stSP	2ndSP	3rdSP	4thSP	5thSP	6thSP	7thSP
-	SPINDLE MOTOR TEMPERATURE			G11171	G11201	G11231	G11261	G11291	G11321	G11351
				R1611	R1641	R1671	R1701	R1731	R1761	R1791

[Function]

It displays the thermistor temperature of the spindle motor with a thermistor.

[Operation]

It always sets the thermistor temperature of the spindle motor. The unit is "C°".

It always sets to "0" for the motor without a thermistor.

4.9 Bit Type Output Signals : System Command (PLC CPU->CNC CPU)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	CONTACTOR SHUTOFF TEST	MCT		Y310

[Function]

This signal carries out a contactor shutoff test.

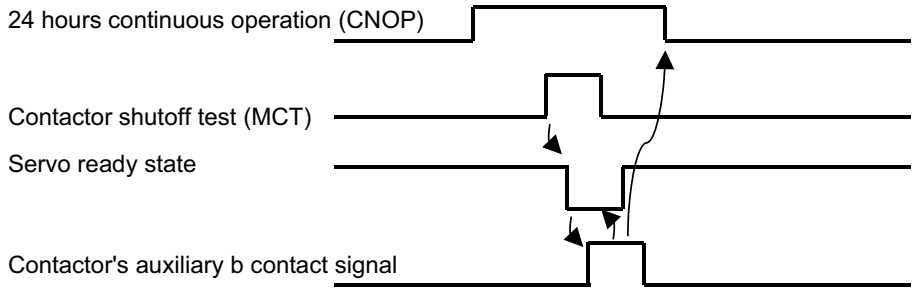
[Operation]

Send a "ready OFF" command to the drive unit at the contactor shutoff test signal's rising edge and shut the drive side contactor OFF. Then, turn the power shutdown signal of the dual signal module OFF to shut the CNC side contactor OFF.

Confirm that the contactor's status is OFF by monitoring contactor's auxiliary b contact signal, then send a "ready ON" command to the drive unit to turn the drive unit side contactor ON. Turn ON the power shutdown signal to turn ON the CNC side contactor. After that, turn the 24 hours continuous operation signal OFF.

If the contactor shutoff could not be confirmed within 5 seconds, Alarm"Y20 Safety observation error 0008" (contactor weld detection) is output and the status turns to the emergency stop.

[Timing chart]



[Caution]

Contactor shutoff test must be carried out when the drive's main power can be shut off without causing any problem.

Vertical axis requires brake circuit, etc. for a drop prevention.

[Related signals]

Emergency stop cause

24 hours continuous operation (CNOP)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	DUAL SIGNALS CHECK START	CHKTRG		Y311

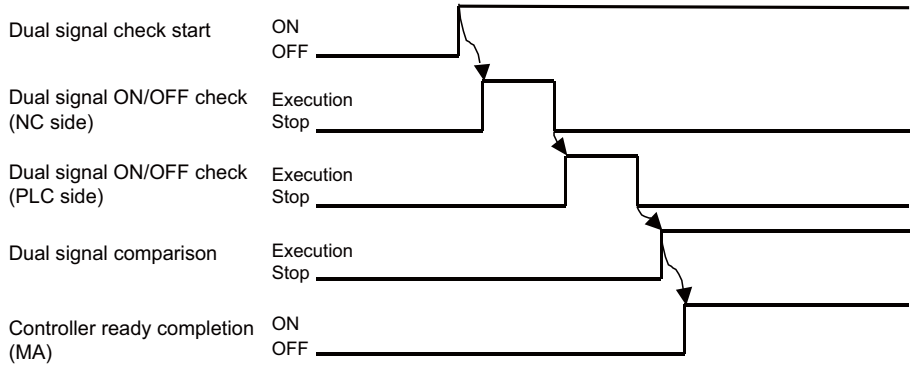
[Function]

Dual signal module's output OFF check and contactor welding detected are commenced.

[Operation]

It confirms that the contactor's auxiliary b contact is ON at the rising edge of the "dual signals check start".
When the contactor's welding is detected, "Y20 Safety observation error 0008" will occur.
At the same time, output's ON/OFF check will be commenced.
If the error is detected at the dual signal module's PLC side output, "Y20 Safety observation error 0048" will occur. If the error is detected at the NC side, "Y20 Safety observation erro 0049" will occur.
"EMG Emergency stop MCT" will be displayed until the output's ON/OFF check is completed.

"Dual signals check start" signal is valid only when "#21161 Dual signal check-time change" (SftySgnlChkTrg) is set to "1". If "#21161 Dual signal check-time change" is set to "0", the controller will automaticallly start checking. Setting "1" is allowed only when the power supply to I/Os is impossible at the controller's power ON. It starts checking when the "dual signals check start" is ON under the state of power supply.
"Dual signals check start" signal is only valid at the first rising edge of the signal.



[Caution]

Output signal state of the dual signals module will change after executing the output ON/OFF check. When creating a program, consider the state transition so as not to make the machine dangerous state even the output signals change.

[Related signals]

Emergency stop cause

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	OUTPUT OFF CHECK (OFFCHK)	OFFCHK		Y312

[Function]

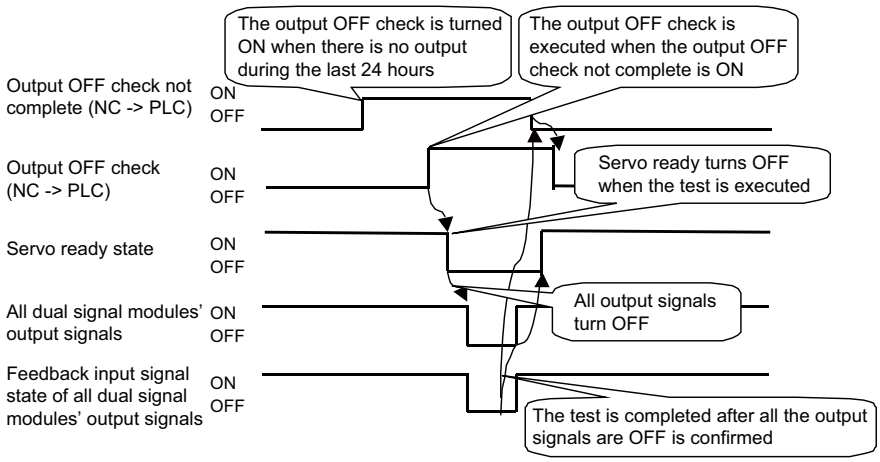
Dual signal module's output OFF check is commenced.

[Operation]

"Output OFF check" signal is ON, it enters in emergency stop state and then servo ready OFF. In the servo ready OFF state, all the output signals of the dual signals module will be OFF. Confirm that the input signal of output signal feedback is OFF. If it is not confirmed in a given amout of time, it will be considered as an error.

If the error is detected at the dual signal module's PLC side output, "Y20 Safety observation error 0050" will occur. If the error is detected at the NC side, "Y20 Safety observation erro 0051" will occur.

"EMG Emergency stop MCT" will be displayed while the output OFF check is executed.



[Caution]

All the output signals of the dual signals module will be OFF by executing the output OFF check. When creating a program, consider the state transition so as not to make the machine dangerous state even the output signals are OFF.

[Related signals]

(1) Emergency stop cause

(2) Output OFF check not complete (NOFFCHK)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	INTEGRATION TIME INPUT m	RHDm		Y314 - Y315

[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 (RHDm) has been ON is displayed in hours, minutes, and seconds.

Integrating time is displayed on "#6 EXT TIME 1" and "#7 EXT TIME 2" of "[MONITOR]-[TIME]" CNC monitor screen.

The counted (integrated) time is held even when the power is turned OFF. The integration time can be preset or reset.

Con-tact	Signal name	Signal ab-breviation		Common for part systems
B	DATA PROTECT KEY 1	*KEY1		Y318

[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]

If a setting is changed while the signal (KEY1) is OFF, DATA PROTECT appears in the message section of screen.

[Related signals]

(1) Data protect key 2 (*KEY2)
(2) Data protect key 3 (*KEY3)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
B	DATA PROTECT KEY 2	*KEY2		Y319

[Function]

Data pertinent to user parameters, common variables, CNC ladder, R register, C register and T register can be protected.

[Operation]

When this signal (KEY2) is turned OFF (0), the parameter and common variable setting operation is prohibited.

[Caution]

If a setting is changed while the signal (KEY2) is OFF (0), DATA PROTECT appears in the message section of CRT screen.

[Related signals]

(1) Data protect key 1 (*KEY1)
(2) Data protect key 3 (*KEY3)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
B	DATA PROTECT KEY 3	*KEY3		Y31A

[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.

[Caution]

If data is edited when the data protect key 3 is OFF (0), DATA PROTECT will appear in the message section.

[Related signals]

(1) Data protect key 1 (*KEY1)
(2) Data protect key 2 (*KEY2)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	CRT CHANGEOVER COMPLE-TION	CRTFN		Y31D

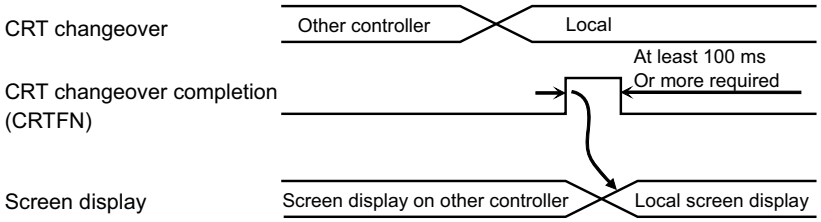
[Function]

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

[Operation]

When this signal turns ON, the currently selected screen will display at the rising edge. For the setting and display unit screen, the screen on the controller before the changeover will remain, so when this signal is input, the local screen display will be changed to.

[Timing chart]



Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	DISPLAY CHANGEOVER $m	DISP$m		Y31E - Y31F

[Function]

The displayed part system of the multiple part systems can be changed.

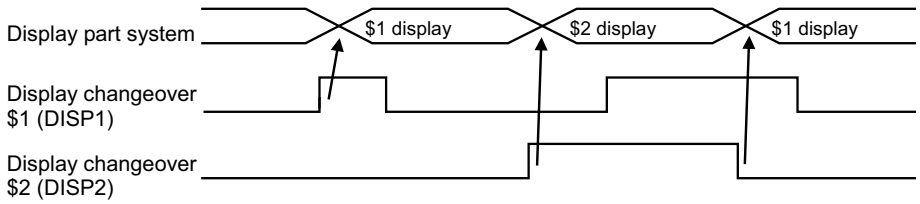
[Operation]

The displayed part system is changed at the rising edge of each display changeover signal.

The screen display for the multiple part systems 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.

[Timing chart]



Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	NC DATA SAMPLING TRIGGER	SMPTRG		Y321

[Function]

The start and end of data sampling are controlled.

[Operation]

When "#34 PLC-DEVICE" is set to "0" (or No. for this device or illegal value):

(1) When "2" is selected for "#5 Starting condition"
The sampling is started as this signal is turned ON during the trigger stand-by state.

(2) When "2" is selected for "#32 Ending condition"
The sampling is stopped as this signal is turned OFF during the sampling state.
(If a ring buffer is used for "#31 processing format", the sampling will be stopped. In other type of buffering is selected, it enters into preparing for stop state and the sampling will be stopped because the buffer is full.)

Contact	Signal name	Signal abbreviation		Common for part systems
A	SAVING OPERATION HISTORY DATA	HISAVE		Y322

[Function]

It saves the operation history information to the saving area.

[Operation]

Turn this signal ON to save the operation history information to the saving area.
It will be used for analysing the history information when the error occurs.

<Operation history information for the saving operation history data>
- Signal history
- Alarm history
- Key operation history

(Note 1) When the saving operation history data is executed, a new operation history information cannot be saved until the power is ON again.
(Note 2) Saved operation history will be retained even the power is turned OFF.

Contact	Signal name	Signal abbreviation		Common for part systems
A	EDITED DATA RECOVERY CONFIRMATION	EDITOK		Y323

[Function]

This signal instructs to release "Z99 FILE AREA ERROR 0002" and "Z99 FILE AREA ERROR 0003".

[Operation]

When this signal is turned ON, "Z99 FILE AREA ERROR 0002" and "Z99 FILE AREA ERROR 0003" are released.
Other alarms (such as 0001, 0004) will not be released.

[Caution]

Always make sure to check the details of machining program before turning this signal ON.
Refer to the Setup manual on how to release other alarms.

[Related signals]

(1) Edited data in processing (EDITDO)
(2) Edited data error (EDITERR)

Contact	Signal name	Signal abbreviation		Common for part systems
A	PLC EMERGENCY STOP	QEMG		Y327

[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 completion (SA)" is turned OFF.

(Note) Since this signal is processed in software, response is somewhat slower, as compared with external emergency stop signal. Approximate response is equal to 1 scan by user PLC plus 100ms.

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	DOOR OPEN I	DOOR1		Y328

[Function]

This signal stops all axes, and cuts OFF contactor power.

[Operation]

The CNC carries out the following operations when the "Door open I" 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 drive unit is cut OFF.
(3) The "Door open enable" signal turns ON.

The CNC carries out the following operations when the "Door open I" 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 I" signal is output to the CNC after the PLC axis is stopped by the PLC. If a "Door open I" signal is input without stopping the PLC axis, the axis will stop with a dynamic brake method due to the ready OFF state.

(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 CNC. 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]

(1) Door open enable (DROPNS)

Contact	Signal name	Signal abbreviation		Common for part systems
A	DOOR OPEN II	DOOR2		Y329

[Function]

This signal stops all axes, and cuts off contactor power.

[Operation]

The CNC 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 II" (DOOR2) signal) turns ON during axis movement, the axis will decelerate to a stop. The axis movement will resume when the door interlock ("Door open II" (DOOR2) signal) turns OFF.

The CNC 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 II" (DOOR2) signal is output to the CNC after the PLC axis is stopped by the PLC. If a "Door open II" (DOOR2) 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 PLC axis control interface.

(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 CNC. 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 (DROPNS)

Contact	Signal name	Signal abbreviation		Common for part systems
A	PLC AXIS CONTROL BUFFERING MODE VALID	PABMI		Y32B

[Function]

This signal validates the PLC axis control in buffering mode.

[Operation]

Turning this signal ON executes the PLC axis control upon the control information data in buffering mode.
If this signal has been turned OFF, the axis movement, which had been commanded in buffering mode, is canceled.

[Caution]

(1) Turning this signal ON updates the control information in single mode, such as status and machining position, even during axis control in buffering mode.
The information is updated at the same time when the axis is moved by the command in buffering mode. It is recommended to turn the PLC axis valid signal ON for the axis specified in the control information for buffering mode, and to refer to single mode for status, alarm details, machine position and remaining distance even in buffering mode.

(2) Specify the axis to command in buffering mode in the control information, axis specification, for buffering mode.

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	PLC CONTROL AXIS mTH HAN-DLE VALID	PCHm		Y32D - Y32F

[Function]

This device designate a handle when handle feed is carried out with a PLC axis.

[Operation]

When "PLC control axis mth handle valid" (PCHm) is ON, each handle changes to PLC axis dedication.

The 1st part system of "1st handle axis selection code m" (HS1mn), "1st handle valid" (HS1Sn), "2nd handle axis selection code m" (HS2mn), "2nd handle valid" (HS2Sn), "3rd handle axis selection code m" (HS3mn), "3rd handle valid" (HS3Sn), which are used with the normal control device, are used to select each handle axis.

PLC axes are differentiated from NC axes and counted from the 1st.

Turn ON "PLC axis 1st handle valid" (PCH1), "1st handle axis selection code m" (HS1mn) and "1st handle valid" (HS1Sn) to operate the 1st handle with PLC axis 1st axis.

[Caution]

The handle feed magnification is also used for CNC control axes.

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	SPINDLE SYNCHRONIZATION CANCEL	SSYNI		Y330

[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" (SPSY) is not canceled.

[Operation]

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

[Related signals]

In spindle synchronous control (SPSYN1)

Spindle rotation speed synchronization completion (FSPRV)

Spindle phase synchronization completion (FSPPH)

Spindle phase synchronous control (SPPHS)

Spindle synchronous control phase error 1 (degree)

Spindle synchronous control phase error 2 (degree)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	CHUCK CLOSE	SPCMPC		Y331

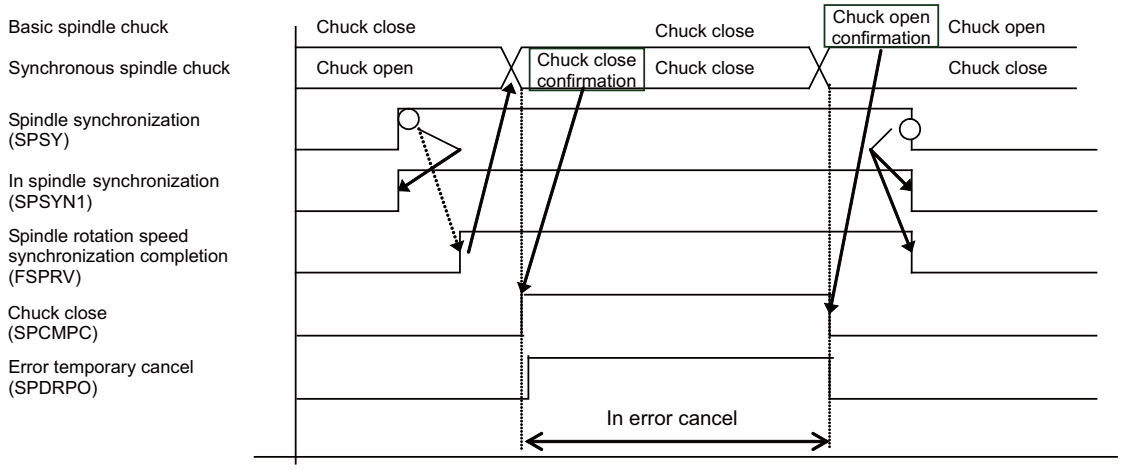
[Function]

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

[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 the "Error temporary cancel" only when the rotation error between the basic spindle and synchronous spindle occurs because of the "Chuck close" signal.

[Related signals]

(1) Chuck close confirmation (SPCMP)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	SPINDLE SYNCHRONIZATION	SPSY		Y332

[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
G+257/R2357	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, 3: 3rd spindle, 4: 4th spindle, 5: 5th spindle, 6: 6th 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.
G+258/R2358	Spindle synchronous control Synchronous spindle selection	-	Select a serially connected spindle to be controlled as the synchronous spindle. (0: 2nd spindle), 1: 1st spindle, 2: 2nd spindle, 3: 3rd spindle, 4: 4th spindle, 5: 5th spindle, 6: 6th spindle, 7: 7th spindle (Note 3) 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 4) If "0" is designated, the 2nd spindle will be controlled as the synchronous spindle.
Y334	Spindle synchronous rotation direction	-	Designate the basic spindle and synchronous spindle rotation directions for spindle synchronization 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]

(1) In spindle synchronization (SPSYN1)
(2) Spindle rotation speed synchronization completion (FSPRV)
(3) Spindle synchronous rotation direction (SPSDR)
(4) Spindle phase synchronization (SPPHS)
(5) Spindle phase synchronization completion (FSPPH)
(6) Spindle synchronous control Basic spindle selection
(7) Spindle synchronous control Synchronous spindle selection

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	SPINDLE PHASE SYNCHRONI-ZATION	SPPHS		Y333

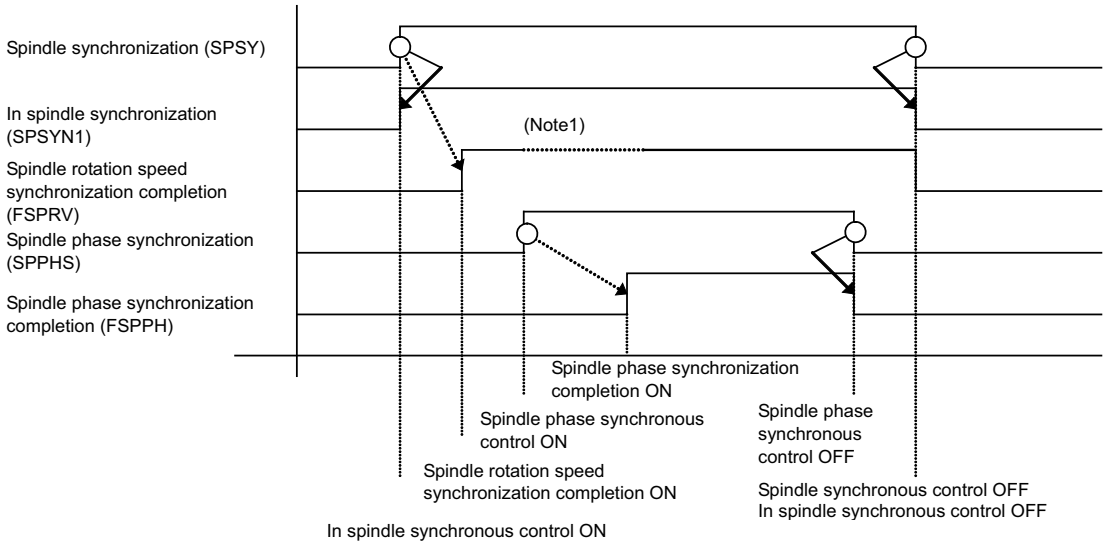
[Function]

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 completion" signal is output when the spindle phase synchronization attainment level setting value (#3051 spplv) is reached.

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



(Note 1) This is turned OFF once to change the rotation speed during phase synchronization.

[Related signals]

(1) In spindle synchronization (SPSYN1)
(2) Spindle rotation speed synchronization completion (FSPRV)
(3) Spindle synchronization (SPSY)
(4) Spindle synchronous rotation direction (SPSDR)
(5) Spindle phase synchronization completion (FSPPH)
(6) Spindle synchronization phase shift amount

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	SPINDLE SYNCHRONOUS RO-TATION DIRECTION	SPSDR		Y334

[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]

(1) In spindle synchronization (SPSYN1)
(2) Spindle rotation speed synchronization completion (FSPRV)
(3) Spindle synchronization (SPSY)
(4) Spindle phase synchronization (SPPHS)
(5) Spindle phase synchronization completion (FSPPH)
(6) Spindle synchronization phase shift amount

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	PHASE SHIFT CALCULATION REQUEST	SSPHM		Y335

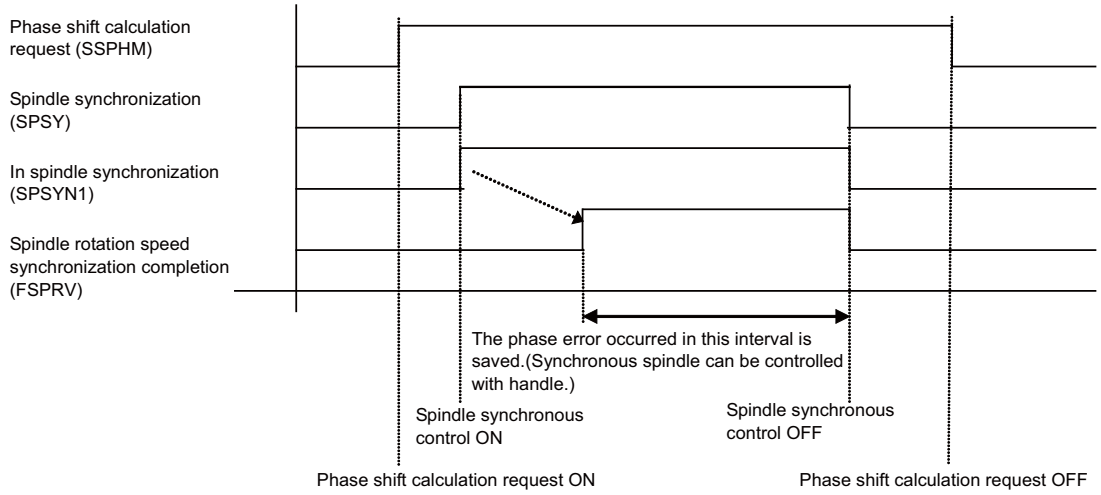
[Function]

This signal calculates the phase error of the basic spindle during rotation synchronization, and requests that it be saved in the CNC memory.

[Operation]

The phase error of the basic spindle and synchronous spindle is saved in the CNC 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 completion" 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]

(1) Phase Offset request (SSPHF)
(2) Spindle synchronization phase error output
(3) Spindle synchronization phase Offset data

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	PHASE OFFSET REQUEST	SSPHF		Y336

[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" (SSPHM) signal.

[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 CNC memory.

[Related signals]

(1) Phase shift calculation request (SSPHM)
(2) Spindle synchronization phase error output
(3) Spindle synchronization phase Offset data

Con-tact	Signal name	Signal ab-breviation		Common for part systems
A	ERROR TEMPORARY CANCEL	SPDRPO		Y337

[Function]

This signal 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" (SPCMP) signal, check that the chucks are closed.
(5) Turn the "Error temporary cancel" (SPDRPO) signal 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" (SPCMP) signal, check that the chuck is opened.
(9) Turn the "Error temporary cancel" (SPDRPO) signal OFF, and stop the error cancellation.

[Related signals]

(1) In spindle synchronization (SPSYN1)
(2) Spindle rotation speed synchronization completion (FSPRV)
(3) Spindle phase synchronization completion (FSPPHA)
(4) Chuck close confirmation (SPCMP)
(5) Chuck close (SPCMPC)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
B	PLC AXIS NEAR POINT DETEC-TION m-TH AXIS	*PCDm		Y338 - Y33F

[Function]

The near point dog signal of the PLC axis reference position return is input.

[Operation]

Set the near point dog signal of the PLC axis reference position return for the following devices in the PLC.

Signal abbreviation	Signal name
*PCD1	PLC axis near point detection 1st axis
*PCD2	PLC axis near point detection 2nd axis
*PCD3	PLC axis near point detection 3rd axis
*PCD4	PLC axis near point detection 4th axis
*PCD5	PLC axis near point detection 5th axis
*PCD6	PLC axis near point detection 6th axis
*PCD7	PLC axis near point detection 7th axis
*PCD8	PLC axis near point detection 8th axis

Contact	Signal name	Signal abbreviation		Common for part systems
A	PLC AXIS CONTROL VALID m-TH AXIS	PLCAEm		Y340 - Y347

[Function]

This signal validates the PLC axis control in single mode.

[Operation]

Turning this signal ON executes the PLC axis control upon the control information data in single mode.

Status, alarm details and machine position of each axis can be referred.

If this signal has been turned OFF, status, alarm details and machine position are not updated. The axis movement, which has been commanded in single mode, is canceled. The PLC axis control is executed upon the control information data while the PLC axis control valid signal is ON.

Contact	Signal name	Signal abbreviation		Common for part systems
A	DOWNLOAD REQUEST	DLDREQ		Y350

[Function]

This signal designates the download request to FTP server.

[Operation]

When this signal is turned ON, the file transfer is requested to FTP server.

When the designated file exists, it will be downloaded to the buffer memory.

This signal should be ON until download is finished. If this signal is turned OFF during the download, download will be interrupted and the download in progress signal will also be turned OFF.

The file transfer will not begun during the TAPE mode operation (OP). Turn this signal ON again after the operation is finished.

[Related signals]

(1) Download in progress (DLOAD0)
(2) Download completed (DLDFIN)
(3) Download error (DLDERR)

Contact	Signal name	Signal abbreviation		Common for part systems
A	APLC OUTPUT SIGNAL n	APL-COUTn		Y380 - Y39F

[Function] [Operation]

This signal is an interface for sending a signal from PLC device to APLC C language module .

Contact	Signal name	Signal abbreviation		Common for part systems
A	PLC SKIP	PSKIPm		Y3A0 - Y3BF

[Function]

This is the skip input signal from the PLC. (m = 1 to 32)

The skip condition can be created to perform skip operation.

Skipping is implemented in accordance with the logical sum of high-speed skip (hardware-fixed signals) and PLC skip conditions.

[Operation]

This can be used for the skip related functions. (G31 skip, tool length measurement, etc.)

[Caution]

When PLC skip is used, the coasting amount from the skip signal input will be slightly longer than the high speed skip.

4.10 Bit Type Output Signals : Axis Command (PLC CPU->CNC CPU)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	CONTROL AXIS DETACH	DTCHn		Y400	Y430	Y460	Y490	Y4C0	Y4F0	Y520	Y550
				9th axis	**10th axis**	**11th axis**	**12th axis**	**13th axis**	**14th axis**	**15th axis**	**16th axis**
				Y580	Y5B0	Y5E0	Y610	Y640	Y670	Y6A0	Y6D0

[Function]

Desired control axis can be specified to be exempted from control function.

Each control axis is provided with this signal. The last number (n = 1, 2, 3...) of the signal abbreviation indicates the control axis No.

[Operation]

When "Control axis detach" signal (DTCHn) turns ON, the corresponding axis is exempted from control.

(1) Specified axis is not under any positioning control (oriented spindle stop, index, etc.)
(2) "Servo alarm", "Stroke end alarm" and other alarms are not applied to specified axis.
(3) Interlock signal applied to specified axis is deemed to be ON.
(4) Specified axis is displayed by the setting and display unit.

(Note 1) The same function can be used by setting parameter on the setting and display unit. (See below)

The control axis detach is valid when the following are valid:

Basic specification parameter "#1070 axoff" (axis detach), and control axis detach n-th axis(DTCHn)

or

Basic specification parameter "#1070 axoff" (axis detach), and axis parameter of machining parameter "#8201 AX. RELEASE"

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
B	SERVO OFF	*SVFn		Y401	Y431	Y461	Y491	Y4C1	Y4F1	Y521	Y551
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				Y581	Y5B1	Y5E1	Y611	Y641	Y671	Y6A1	Y6D1

[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 number (n = 1, 2, 3...) of the signal abbreviation indicates the control axis No.

[Operation]

When "Servo OFF" signal (*SVFn) turns OFF, the corresponding control axis is set to servo OFF condition.
Whether displacement which was caused during servo OFF by external force is corrected when "Servo ON" signal is given, or not, can be determined by setting parameter. (#1064 svof Error correction)

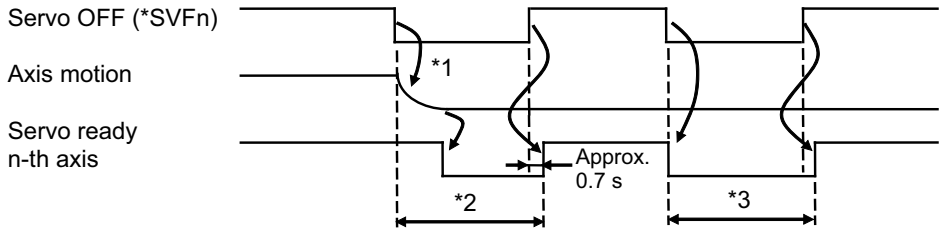
(1) When displacement is corrected (follow-up):

- 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" (ABSn) signal 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.

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	MIRROR IMAGE	MIn		Y402	Y432	Y462	Y492	Y4C2	Y4F2	Y522	Y552
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				Y582	Y5B2	Y5E2	Y612	Y642	Y672	Y6A2	Y6D2

[Function]

This signal is used to machine a symmetrical shape by reversing the sign for the movement amount per block.
Each control axis is provided with this signal. The last number (n = 1, 2, 3...) of the signal abbreviation indicates the control axis No.

[Operation]

Symmetrical cutting is enabled by reversing the sign of the value commanded for memory or MDI operation.

(1)Regardless of whether the coordinate is commanded with an incremental mode or absolute mode, the mirror image is applied ON the incremental amount to be executed for all axes that can be controlled.

(Note) The mirror image is changed after block stop.

[Related signals]

(1) In mirror image (MIRn)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
B	EXTERNAL DECELERATION +	*+EDTn		Y403	Y433	Y463	Y493	Y4C3	Y4F3	Y523	Y553
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				Y583	Y5B3	Y5E3	Y613	Y643	Y673	Y6A3	Y6D3

[Function]

The feedrate when the control axis is moving in the + direction can be controlled while this signal (*+EDTn) is OFF, at a constant speed set with the parameters.

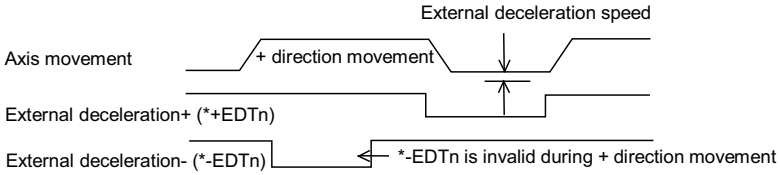
Control axis is provided with this signal. The last number (n = 1, 2, 3...) of the signal abbreviation indicates the control axis No.

"#1239 set11/bit6 External deceleration axis compliance valid" selects whether it is common setting for all axes or setting for each axis. (0: Common setting for all axes, 1: Setting for each axis)

[Operation]

During manual mode when the "External deceleration +" (*+EDTn) signal 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. (Common setting for all axes:#1216 extdcc, setting for each axis: #2086 exdcax1, #2161 exdcax2 to #2165 exdcax6)
(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.
(7) About combined speed when the external deceleration signal is multiple axes valid When the combined speed exceeds the lowest external deceleration speed among the axes that the external deceleration signal valid, it slows the combined speed to its lowest external deceleration speed.



[Caution]

(1) The unused axis must be put into invalidating an external deceleration by setting "1" with PLC program.

[Related signals]

(1) External deceleration - (*-EDTn)
(2) External deceleration speed selection

Contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
B	EXTERNAL DECELERATION -	*-EDTn		Y404	Y434	Y464	Y494	Y4C4	Y4F4	Y524	Y554
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				Y584	Y5B4	Y5E4	Y614	Y644	Y674	Y6A4	Y6D4

[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.

[Related signals]

(1)External deceleration +(*+EDTn)

(2) External deceleration speed selection

Contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
B	AUTOMATIC INTERLOCK +	*+AITn		Y405	Y435	Y465	Y495	Y4C5	Y4F5	Y525	Y555
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				Y585	Y5B5	Y5E5	Y615	Y645	Y675	Y6A5	Y6D5

[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.

Each control axis is provided with this signal. The last number (n = 1, 2, 3...) of the signal abbreviation indicates the control axis No.

[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 004" displayed.

With this signal set OFF from the beginning, the system completes calculation for axis motion but makes it remain stopped with the same operation error code displayed. In either case, setting the signal ON resumes or starts axis motion.

[Caution]

(1) All automatic interlock + (*+AITn) signals are for B contact.

(2) The unused axis must be put into an interlock cancel state by setting "1" with PLC program.

[Related signals]

(1) Automatic interlock -(*-AITn)

(2) Manual interlock +/- (*+/-MITn)

Contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
B	AUTOMATIC INTERLOCK -	*-AITn		Y406	Y436	Y466	Y496	Y4C6	Y4F6	Y526	Y556
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				Y586	Y5B6	Y5E6	Y616	Y646	Y676	Y6A6	Y6D6

[Function][Operation]

The details are the same as the "Automatic interlock +" (*+AITn) signal, except that the direction is opposite.

The "Automatic interlock +" (*+AITn) signal is valid for the axis moving in the plus direction, and this signal is valid for the axis moving in the minus direction.

Each control axis is provided with this signal. The last number (n = 1, 2, 3...) of the signal abbreviation indicates the control axis No.

[Related signals]

(1) Automatic interlock + (*+AITn)

(2) Manual interlock +/- (*+/-MITn)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
B	MANUAL INTERLOCK +	*+MITn		Y407	Y437	Y467	Y497	Y4C7	Y4F7	Y527	Y557
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				Y587	Y5B7	Y5E7	Y617	Y647	Y677	Y6A7	Y6D7

[Function]

When the corresponding axis is moving in the plus direction with manual operation (jog, manual, incremental, reference position return), only the corresponding axis can be decelerated and stopped by turning OFF this signal that corresponds to that axis.

Each control axis is provided with this signal. The last number (n = 1, 2, 3...) of the signal abbreviation indicates the control axis No.

[Operation]

When this signal turns OFF (0) for a specific axis in motion in the plus direction under manual operation mode (jog, handle, incremental, reference position return), motion of the axis decelerates and stops with NC alarm "M01 OPERATION ERROR 0004" displayed.

With this signal set OFF from the beginning, the system completes calculation for axis motion but makes it remain stopped with the same operation error code displayed. In either case, setting the signal ON (1) resumes or starts axis motion.

[Caution]

(1) All manual interlock + (*+MITn) signals are for B contact.

(2) The unused axis must be put into an interlock cancel state by setting "1" with PLC program.

[Related signals]

(1) Manual interlock - (*-MITn:)

(2) Automatic interlock +/- (*+/-AITn)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
B	MANUAL INTERLOCK -	*-MITn		Y408	Y438	Y468	Y498	Y4C8	Y4F8	Y528	Y558
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				Y588	Y5B8	Y5E8	Y618	Y648	Y678	Y6A8	Y6D8

[Function][Operation]

The details are the same as the "Manual interlock +nth axis" signal, except that the direction is opposite.

The "Manual interlock +nth axis" signal is valid for the axis moving in the plus direction, and this signal is valid for the axis moving in the minus direction.

Each control axis is provided with this signal. The last number (n = 1, 2, 3...) of the signal abbreviation indicates the control axis No.

[Related signals]

(1) Manual interlock + (*+MITn)

(2) Automatic interlock +/- (*+/-AITn)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	AUTOMATIC MACHINE LOCK	AMLKn		Y409	Y439	Y469	Y499	Y4C9	Y4F9	Y529	Y559
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				Y589	Y5B9	Y5E9	Y619	Y649	Y679	Y6A9	Y6D9

[Function]

During automatic operation, current position (counter) can be changed without actual machine motion to check program. Each control axis is provided with this signal. The last number (n = 1, 2, 3...) of the signal abbreviation indicates the control axis No.

[Operation]

In the automatic operation (memory, 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.

[Caution]

(1) If "Auto machine lock" (AMLKn) 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)

[Related signals]

(1) Manual machine lock (MMLKn)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	MANUAL MACHINE LOCK	MMLKn		Y40A	Y43A	Y46A	Y49A	Y4CA	Y4FA	Y52A	Y55A
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				Y58A	Y5BA	Y5EA	Y61A	Y64A	Y67A	Y6AA	Y6DA

[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.

Each control axis is provided with this signal. The last number (n = 1, 2, 3...) of the signal abbreviation indicates the control axis No.

[Related signals]

(1) Automatic machine lock (AMLKn)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	FEED AXIS SELECTION +	+Jn		Y40B	Y43B	Y46B	Y49B	Y4CB	Y4FB	Y52B	Y55B
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				Y58B	Y5BB	Y5EB	Y61B	Y64B	Y67B	Y6AB	Y6DB

[Function]

This signal is used to start motion (jog feed, incremental feed or reference position return mode) in plus direction during manual operation.

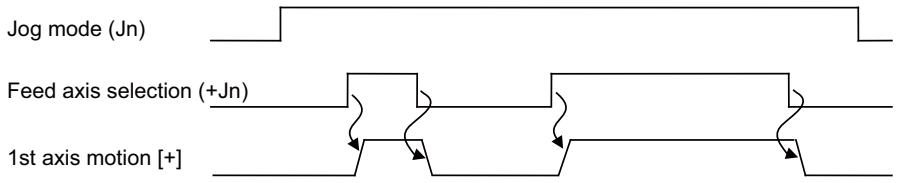
Each control axis is provided with this signal. The last number (n = 1, 2, 3...) of the signal abbreviation indicates the control axis No.

[Operation]

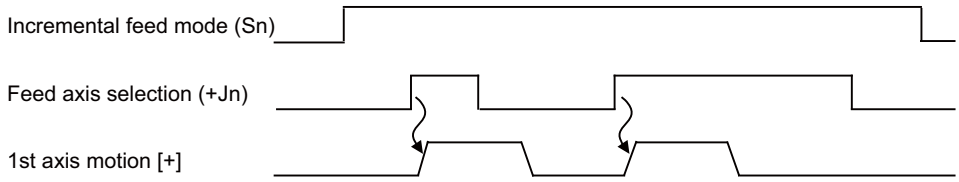
When "Feed axis select" signal (+Jn) turns ON, the following motion occurs.

(1) When jog feed, incremental feed or reference position return is possible, motion in plus direction occurs on the selected axis.

(2) In jog feed, motion continues while the signal is ON.



(3) In incremental feed, amount (length) of motion depends on setting of "Handle/Incremental feed magnification". The motion is in plus direction. Even when signal (+Jn) turns OFF during motion, the motion (feed) does not stop. To start the motion again, turn ON the signal after the preceding motion has been completed.



(4) After reference position return mode is decelerated to approach speed by the near point detect dog, the motion continues, even after the feed axis selection + (+Jn) signal is turned OFF, until motion reaches the reference position.

(Note 1) If feed axis selection +/- (+Jn, -Jn) 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 this signal turns ON before jog, incremental or reference position return mode is selected, this signal is ignored. In this case, the signal should be turned OFF and then ON.

(Note 3) If reset is exerted while this signal is ON, or " this signal turns ON during reset, the this signal is ignored even when the reset condition is canceled. In this case, this signal should be turned OFF and then ON.

(Note 4) This 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) In the 2nd part system specifications, even if this signal of 1st part system and 2nd part system turn ON in the same cycle (scan) of the sequence, the start up may not be completely simultaneous.

[Related signals]

(1) Feed axis selection - (-Jn)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	FEED AXIS SELECTION -	-Jn		Y40C	Y43C	Y46C	Y49C	Y4CC	Y4FC	Y52C	Y55C
				9th axis	**10th axis**	**11th axis**	**12th axis**	**13th axis**	**14th axis**	**15th axis**	**16th axis**
				Y58C	Y5BC	Y5EC	Y61C	Y64C	Y67C	Y6AC	Y6DC

[Function]

This signal is used to feed the axis in the minus (-) direction during jog feed, incremental feed or reference position return mode in manual operation.

Each control axis is provided with this signal. The last number (n = 1, 2, 3...) of the signal abbreviation 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 selection + (+Jn).

Use this signal to move in the minus (-) direction.

[Related signals]

(1) Feed axis selection + (+Jn)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	MANUAL/AUTOMATIC SIMUL-TANEOUS VALID	MAEn		Y40D	Y43D	Y46D	Y49D	Y4CD	Y4FD	Y52D	Y55D
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				Y58D	Y5BD	Y5ED	Y61D	Y64D	Y67D	Y6AD	Y6DD

[Function]

The automatic mode (MDI, memory) and manual mode (handle, step, jog, manual reference position return) can be simultaneously selected allowing manual operation during automatic operation. (Arbitrary feed with the PLC is also possible.)

[Operation]

The manual/auto simultaneous mode is entered when the automatic mode and manual mode are selected simultaneously. The manual operation axis is selected with this signal during the manual/auto mode. The manual operation axes (MAEn) are selected individually for each axis.

The axis selected with this signal can be operated in the manual mode during automatic operation.

(Note 1) If an axis command is issued to a manual operation axis from the automatic mode, the "M01 OPERATION ERROR 0005" will occur. The automatic operation will be interlocked until the operation error is canceled.

(Note 2) During the automatic mode (when manual is not selected and manual/auto simultaneous mode is not entered), this signal will be invalid and the interlock will not be applied.

(Note 3) If this signal turns ON in respect to an axis commanded with automatic during the manual/auto simultaneous mode, an interlock will be applied on the axis, and the axis will immediately decelerate and stop. (The "M01 OPERATION ERROR 0005" will occur.)
After decelerating and stopping, operation with the manual mode will be possible. Note that the interlock will also be applied during the tap modal.

(Note 4) During the manual/auto simultaneous mode and the automatic mode, the manual axis command for which this signal is OFF will be invalid. Note that interruption with the manual handle will be possible.

(Note 5) The feedrates for the automatic command axis and the manual command axis are different. The acceleration/deceleration mode (rapid traverse, cutting feed) are also independent.

(Note 6) The rapid traverse override, cutting feed override and 2nd cutting feedrate override are valid for both the automatic command axis and manual command axis. (Note that the cutting and 2nd cutting overrides to the manual command axis are valid when the manual cutting override is valid.) Override cancel is valid for the automatic command axis.

(Note 7) The manual interlock is valid for the manual command axis, and the automatic interlock is valid for the automatic command axis.

(Note 8) The in-cutting feed and in-rapid traverse signals will follow the automatic command axis movement mode.

(Note 9) The axis moving with manual movement will not stop with single block stop or feed hold.

(Note 10) If the G92 and G53 commands are issued in the manual mode to an axis for which this signal is ON, the G92 and G53 commands will be executed after the manual axis movement stops. (An axis command with G53 will cause an operation error after the manual axis movement stops.)

(Note 11) If a soft limit or OT is applied on the manual command axis during the manual/auto simultaneous mode, the automatic command axis will also decelerate to a stop, and will enter the feed hold state.

<Relation with manual handle interrupt>

The operation of the automatic handle interruption during the manual/auto mode is as follows.

		Axis for which manual/auto 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

Contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	CONTROL AXIS DETACH 2	DTCH2n		Y40E	Y43E	Y46E	Y49E	Y4CE	Y4FE	Y52E	Y55E
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				Y58E	Y5BE	Y5EE	Y61E	Y64E	Y67E	Y6AE	Y6DE

[Function]

A control axis can be excluded from the control targets with this function.

Each control axis is provided with this signal. The last number (n = 1, 2, 3...) of the signal abbreviation indicates the control axis No.

[Operation]

When the "Control axis detach 2" signal (DTCH2n) turns ON, the corresponding axis is excluded from the control targets.

(1) Position control cannot be carried out, but the position is not lost because the position detection is valid.
(2) The "Interlock" signal of the corresponding axis is considered turned ON.
(3) The corresponding axis also appears in the CRT position display.

[Related signals]

(1) Control axis detach (DTCHn)

Contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	CURRENT LIMIT CHANGE-OVER	ILCn		Y410	Y440	Y470	Y4A0	Y4D0	Y500	Y530	Y560
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				Y590	Y5C0	Y5F0	Y620	Y650	Y680	Y6B0	Y6E0

[Function][Operation]

This signal turns on when validating the current limit.

The current limit parameter switches from SV013 to SV014.

Release the droop and move the command value to the FB position.

(Note 1) The axis that droop release invalid axis is set does not execute the droop release.

[Related signals]

(1) In current limit (ILIn)
(2) Current limit reached (ILAn)
(3) Droop release request (DORn)
(4) Current limit mode m (ILMmn)
(5) Current limit changeover
(6) Droop release invalid axis

Contact	Signal name	Signal abbreviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	DROOP RELEASE REQUEST	DORn		Y411	Y441	Y471	Y4A1	Y4D1	Y501	Y531	Y561
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				Y591	Y5C1	Y5F1	Y621	Y651	Y681	Y6B1	Y6E1

[Function][Operation]

During the current limit control, release the droop generated by the current limit and follow the FB position.

(Note 1) The axis that the droop release invalid axis is set does not execute the droop release.

[Related signals]

(1) In current limit (ILIn)
(2) Current limit reached (ILAn)
(3) Current limit changeover (ILCn)
(4) Current limit mode m (ILMmn)
(5) Current limit changeover
(6) Droop release invalid axis

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	ZERO POINT INITIALIZATION SET MODE	AZSn		Y412	Y442	Y472	Y4A2	Y4D2	Y502	Y532	Y562
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				Y592	Y5C2	Y5F2	Y622	Y652	Y682	Y6B2	Y6E2

[Function]

This selects the zero point initialization set with the marked point alignment method I/II in the absolute position detection system.

[Operation]

The zero point initialization set is selected with this signal.

Refer to the section on "Zero point initialization set completed" (ZSFn) signal for details on the operations.

(Note 1) This signal is a function signal for zero point initialization set, 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" or "4".

[Related signals]

(1) Zero point initialization set completed (ZSFn)
(2) Zero point initialization set error completed (ZSEn)
(3) In initialization
(4) Initialization incomplete
(5) Zero point initialization set start (ZSTn)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	ZERO POINT INITIALIZATION SET START	ZSTn		Y413	Y443	Y473	Y4A3	Y4D3	Y503	Y533	Y563
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				Y593	Y5C3	Y5F3	Y623	Y653	Y683	Y6B3	Y6E3

[Function]

This is used to set a random position as the origin during zero point initialization set using the marked point alignment method in the absolute position detection system I/II.

[Operation]

This signal turns ON when a corresponding axis is moved in the zero point initialization set mode, and the position to be set as the zero point is reached.

Refer to the section on "Zero point initialization set completed" (ZSFn) signal for details on the operations.

(Note 1) This signal is a function signal for zero point initialization set, 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" or "4".

(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 completed (ZSFn)
(2) Zero point initialization set error completed (ZSEn)
(3) In initialization
(4) Initialization incomplete
(5) Zero point initialization set mode (AZSn)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	UNCLAMP COMPLETION	UCLPFn		Y415	Y445	Y475	Y4A5	Y4D5	Y505	Y535	Y565
				9th axis	**10th axis**	**11th axis**	**12th axis**	**13th axis**	**14th axis**	**15th axis**	**16th axis**
				Y595	Y5C5	Y5F5	Y625	Y655	Y685	Y6B5	Y6E5

[Function]

This signal indicates that unclamping has been completed in respect to the unclamp command from the CNC.

[Operation]

When the unclamp command (UCLPn) signal turns ON, the clamp on the corresponding axis is released by the PLC, and then this signal turns ON.

When the unclamp command (UCLPn) turns OFF, the corresponding axis is clamped by the PLC, and then this signal turns OFF.

[Related signals]

(1) Unclamp command (UCLPn)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	MULTI-STEP SPEED MONITOR REQUEST	MSORn		Y416	Y446	Y476	Y4A6	Y4D6	Y506	Y536	Y566
				9th axis	**10th axis**	**11th axis**	**12th axis**	**13th axis**	**14th axis**	**15th axis**	**16th axis**
				Y596	Y5C6	Y5F6	Y626	Y656	Y686	Y6B6	Y6E6

[Function]

This signal is used to execute the multi-step speed monitor for the control axes.

This signal can be used only when "#21162 mulstepssc Multi-step speed monitor enabled" is set to "1".

(Note) Refer to "5.1 PLC Axis Control" when using PLC axes.

[Operation]

When this signal turns ON, NC operates as follows.

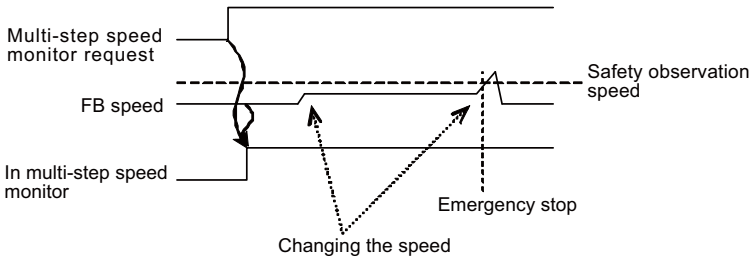
(1) Checks consistency of speed monitor parameters.
(2) Checks if NC's speed monitor parameters match with the speed monitor parameters sent to the drive unit.
(3) Notifies a speed monitor command to the drive unit.
(4) Executes the speed monitor function on NC.
(5) Turns the "Speed monitor door open possible" signal ON when receiving the "In speed monitor mode" signal from the drive unit.

The followings are monitored while the multi-step speed monitor function is executed.

Item	Details
Command speed monitoring	When a command speed that NC outputs to the drive unit exceeds a safety speed set with a parameter (Note), an emergency stop occurs.
Feedback speed monitoring	When a motor rotation speed sent from the drive unit to NC exceeds a safety rotation speed set with the parameter (Note), an emergency stop occurs.
Feedback position monitoring	When a difference between feedback position sent from the drive unit to NC and a position commanded by NC is large, an emergency stop occurs.

(Note) Use "Multi-step speed monitor input" (MSOMImn) to select which to use among the parameters from "#2181 sscfeed1 Safety observation speed 1" to "#2184 sscfeed4 Safety observation speed 4".

[Timing chart]



[Caution]

(1) Be sure to confirm the deceleration speed of the axis before turning this signal ON. Turning the signal ON without decelerating the speed will cause the safety observation warning due to the FB speed exceeding the monitoring speed. The speed monitor mode will not be entered in the mean time.
(2) Turning this signal ON while a parameter error occurs will not start the speed monitor. Set the parameter to appropriate value before turning the signal ON.

[Related signals]

(1) In multi-step speed monitor (MSOEn)
(2) Multi-step speed monitor mode input (MSOMImn)
(3) Multi-step speed monitor mode output (MSOMOmn)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	MULTI-STEP SPEED MONITOR MODE INPUT m	MSOMImn		Y417 to 418	Y447 to 448	Y477 to 478	Y4A7 to 4A8	Y4D7 to 4D8	Y507 to 508	Y537 to 538	Y567 to 568
				9th axis	**10th axis**	**11th axis**	**12th axis**	**13th axis**	**14th axis**	**15th axis**	**16th axis**
				Y597 to 598	Y5C7 to 5C8	Y5F7 to 5F8	Y627 to 628	Y657 to 658	Y687 to 688	Y6B7 to 6B8	Y6E7 to 6E8

[Function]

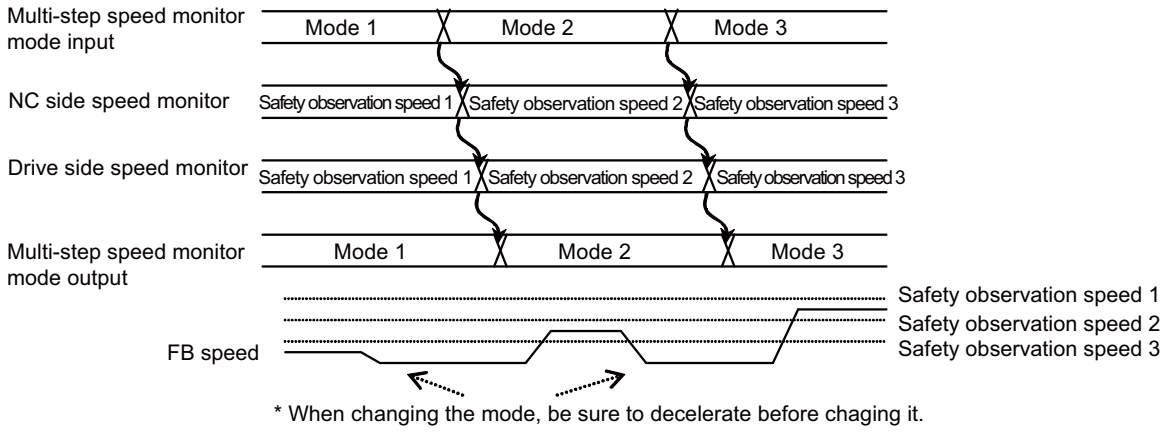
This signal designates which speed monitor parameter (speed monitor mode) is used for the speed monitor in the multi-step speed monitoring.

Multi-step speed monitor mode input m		Speed monitor mode to be selected	Corresponding safety observation speed parameter
MSOMI2n	MSOMI1n		
0	0	1	#2181 sscfeed1
0	1	2	#2182 sscfeed2
1	0	3	#2183 sscfeed3
1	1	4	#2184 sscfeed4

This signal can be used only when "#21162 mulstepssc Multi-step speed monitor enabled" is set to "1".

[Operation]

When the signals' state is changed, the safety observation speed of the designated mode will be transferred to the drive and the "Multi-step speed monitor mode output" (SMSOMOmn) signals' state will also be changed. (It will be changed even when "In multi-step speed monitor" (MSOEn) is OFF.)

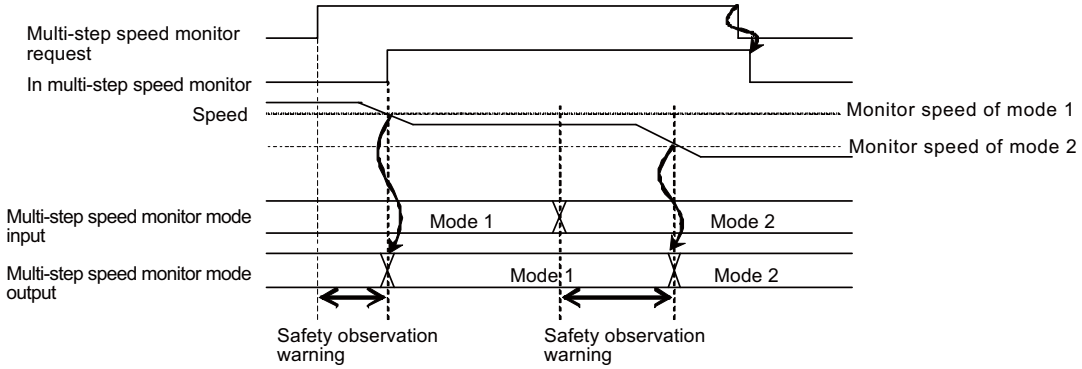


* When changing the mode, be sure to decelerate before chaging it.

[Caution]

(1) Before changing these signals' state while "In multi-step speed monitor" is ON, be sure to decelerate the axis below the monitor speed of the mode to be changed. When the signals' state has been changed before deceleration starts, the safety observation warning will be output until the speed decelerates below the monitor speed of the mode to be changed, and the speed monitor mode will not be changed in the meantime.

(2) Do not open the door before the "Multi-step speed monitor mode output" (MSOMOmn) signals for all axes in the door are changed to the desired mode, even when the "In mult-step speed monitor" (MSOEn) signals are ON for all axes in the door.



[Related signals]

(1) Multi-step speed monitor (MSORn)

(2) In multi-step speed monitor (MSOEn)

(3) Multi-step speed monitor mode output (MSOMOmn)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	COUNTER ZERO	CNT0n		Y41A	Y44A	Y47A	Y4AA	Y4DA	Y50A	Y53A	Y56A
				9th axis	**10th axis**	**11th axis**	**12th axis**	**13th axis**	**14th axis**	**15th axis**	**16th axis**
				Y59A	Y5CA	Y5FA	Y62A	Y65A	Y68A	Y6BA	Y6EA

[Function]

Set each axis's relative values displayed to "0".

[Operation]

The relative value counter of corresponding axis is set to "0" when this signal is ON.

[Caution]

- Only the relative value counter is set to "0" when this signal is ON. Workpiece coordinate value and the machine position counter will not change.
- This signal is valid during the program operation.
- The relative values of the primary axis and the secondary axis will both be set to "0" when this signals for the primary axis during the synchronous control is ON.
- This signal for the secondary axis is invalid during the synchronous control.
- The signal must be ON for at least 15ms.

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	PLC AXIS SWITCHING	CHGPLCn		Y41B	Y44B	Y47B	Y4AB	Y4DB	Y50B	Y53B	Y56B
				9th axis	10th axis	11th axis	12th axis	13th axis	14th axis	15th axis	16th axis
				Y59B	Y5CB	Y5FB	Y62B	Y65B	Y68B	Y6BB	Y6EB

[Function]

This signal can switch between NC axis and PLC axis.

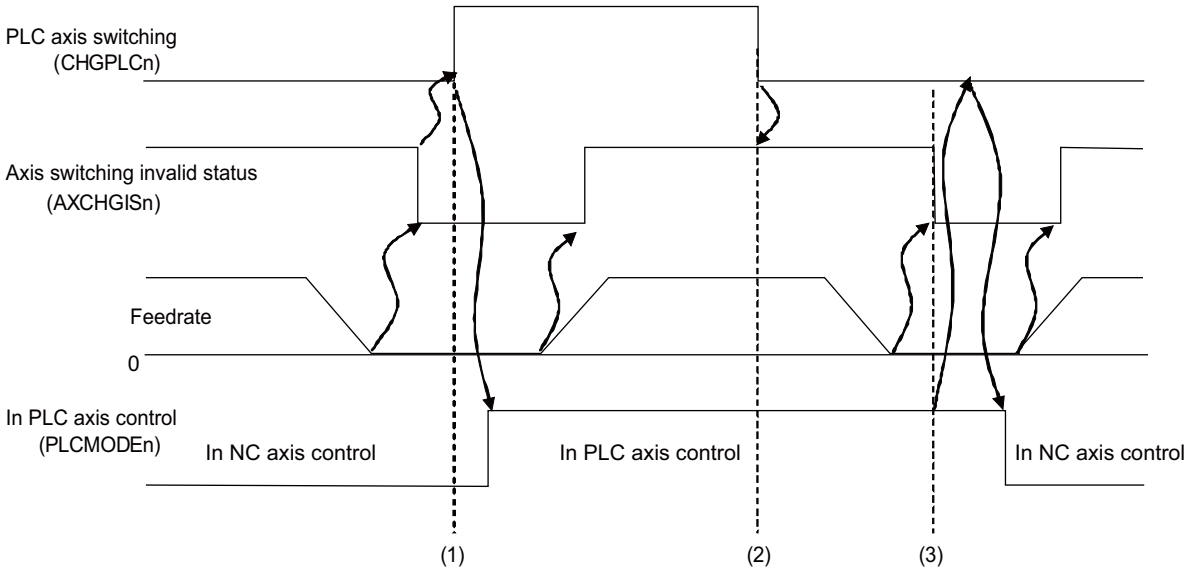
[Operation]

When this signal is turned ON, the NC axis is controlled as the PLC axis. When it is turned OFF, it is controlled as the NC axis.

Switch this signal after confirming the axis switching invalid signal is OFF.

When switching between NC axis and PLC axis is executed while axis switching invalid signal is ON, an alarm "M01 NC/PLC axis switch illegal 1250" will occur. If the axis switching invalid signal is OFF with this state, NC axis and PLC axis are switched and the alarm will be cleared.

If this signal is switched while executing the axis movement command, NC axis and PLC axis will be switched when the command is completed and the axis switching invalid signal is turned OFF.



(1) If the PLC switching signal is turned ON when the "axis switching invalid status" signal is OFF (switching is permitted), the NC axis changes over to the PLC axis control state, and the In PLC axis control signal will be turned ON.

(2) The NC axis does not change over to the NC axis control by turning OFF the "PLC axis switching" signal when the "axis switching invalid status" signal is ON (where switching is prohibited). An alarm "M01 NC/PLC axis switch illegal 1250" will occur.

(3) Axis switching invalid status signal is turned OFF when the axis movement is completed. Then the NC axis changes over to the NC axis control, and the In PLC axis control signal will be turned OFF.

[Related signals]

(1) Axis switching invalid status (AXCHGISn)

(2) In PLC axis control (PLCMODn)

4.11 Bit Type Output Signals : Part System Command (PLC CPU->CNC CPU)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	JOG MODE	Jn		Y700	Y7E0	Y8C0	Y9A0	YA80	YB60	YC40

[Function]

JOG operation mode (manual operation) is selected.

[Operation]

When JOG mode (Jn) signal turns ON, JOG operation mode is selected.

Axis motion is started by turning ON the "Feed axis selection +/-" (+Jn, -Jn) signal after turning ON the jog mode and setting the "Manual feedrate code m (*JVmn)" signal.

For rapid traverse, "Rapid traverse" (RTn) signal is turned ON together with this signal (Jn).

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)Feed axis selection +/- (+Jn, -Jn)

(2)Manual feedrate code m (*JVmn)

(3)Rapid traverse (RTn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	HANDLE MODE	Hn		Y701	Y7E1	Y8C1	Y9A1	YA81	YB61	YC41

[Function]

"Handle feed operation" mode (manual operation) is selected.

[Operation]

When HANDLE mode (Hn) signal 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 selection code (HS1mn, HS1Sn, HS2mn, HS2Sn, HS3mn, HS3mn) and this signal is turned ON. Speed of the axis motion depends on setting of feedrate magnification (Handle/Incremental feed magnification code m (MPmn)).

If the operation mode duplicates the other mode or if it is removed, the NC alarm "M01 OPERATION ERROR 0101" will occur.

The handle feed speed is clamped at the rapid traverse speed (at the external deceleration speed when the external deceleration is valid) .The speed clamping method can be selected from clamping with the feedrate by the parameter "#1281 ext17/bit4" or clamping with the handle input pulse number.

[Related signals]

(1)1st handle axis selection code m (HS1mn), 1st handle valid (HS1Sn)

(2)2nd handle axis selection code m (HS2mn), 2nd handle valid (HS2Sn) .....Valid only for handle 2-axis spec.

(3)3rd handle axis selection code m (HS3mn), 3rd handle valid (HS3Sn) .....Valid only for handle 3-axis spec.

(4)Handle/Incremental feed magnification code m (MPmn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	INCREMENTAL MODE	Sn		Y702	Y7E2	Y8C2	Y9A2	YA82	YB62	YC42

[Function]

INCREMENTAL FEED mode (manual operation) is selected.

[Operation]

When incremental mode command (Sn) signal is turned ON, INCREMENTAL FEED mode is selected.

Each time "Feed axis selection +/-" (+Jn, -Jn) signal for desired axis is turned ON, axis motion starts. Speed of the axis motion (incremental feed) depends on setting of "Handle/Incremental feed magnification code m" (MPmn).

When "Rapid traverse" signal (RTn) is ON, speed is the rapid traverse speed. When signal (RTn) is OFF, speed is equal to "Manual feedrate code m" (*JVmn).

If the signal is the same as another operation mode or if it is removed, the NC alarm "M01 OPERATION ERROR 0101" will occur.

(Note 1) The incremental mode is also called the step mode.

[Related signals]

(1)Handle/Incremental feed magnification code m (MPmn)

(2)Feed axis selection +/- (+Jn, -Jn)

(3)Manual feedrate code m (*JVmn)

(4)Rapid traverse (RTn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	MANUAL ARBITRARY FEED MODE	PTPn		Y703	Y7E3	Y8C3	Y9A3	YA83	YB63	YC43

[Function]

Manual arbitrary feed mode in manual operation is selected.

[Operation]

Manual arbitrary feed mode is selected when this signal is turned ON ("1").

[Caution]

To turn the manual arbitrary 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

$1	$2	$3	$4	$5	$6	$7	abbrev.	Signal name
+073	+087	+101	+115	+129	+143	+157	<- Sharing G	
Y790	Y870	Y950	YA30	YB10	YBF0	YCD0	CX11n	Manual arbitrary feed 1st axis selection code 1
Y791	Y871	Y951	YA31	YB11	YBF1	YCD1	CX12n	Manual arbitrary feed 1st axis selection code 2
Y792	Y872	Y952	YA32	YB12	YBF2	YCD2	CX14n	Manual arbitrary feed 1st axis selection code 4
Y793	Y873	Y953	YA33	YB13	YBF3	YCD3	CX18n	Manual arbitrary feed 1st axis selection code 8
Y794	Y874	Y954	YA34	YB14	YBF4	YCD4	CX116n	Manual arbitrary feed 1st axis selection code 16
Y795	Y875	Y955	YA35	YB15	YBF5	YCD5		
Y796	Y876	Y956	YA36	YB16	YBF6	YCD6		
Y797	Y877	Y957	YA37	YB17	YBF7	YCD7	CX1Sn	Manual arbitrary feed 1st axis valid
Y798	Y878	Y958	YA38	YB18	YBF8	YCD8	CX21n	Manual arbitrary feed 2nd axis selection code 1
Y799	Y879	Y959	YA39	YB19	YBF9	YCD9	CX22n	Manual arbitrary feed 2nd axis selection code 2
Y79A	Y87A	Y95A	YA3A	YB1A	YBFA	YCDA	CX24n	Manual arbitrary feed 2nd axis selection code 4
Y79B	Y87B	Y95B	YA3B	YB1B	YBFB	YCDB	CX28n	Manual arbitrary feed 2nd axis selection code 8
Y79C	Y87C	Y95C	YA3C	YB1C	YBFC	YCDC	CX216n	Manual arbitrary feed 2nd axis selection code 16
Y79D	Y87D	Y95D	YA3D	YB1D	YBFD	YCDD		
Y79E	Y87E	Y95E	YA3E	YB1E	YBFE	YCDE		
Y79F	Y87F	Y95F	YA3F	YB1F	YBFF	YCDF	CX2Sn	Manual arbitrary feed 2nd axis valid

$1	$2	$3	$4	$5	$6	$7	abbrev.	Signal name
+074	+088	+102	+116	+130	+144	+158	<- Sharing G	
Y7A0	Y880	Y960	YA40	YB20	YC00	YCE0	CX31n	Manual arbitrary feed 3rd axis selection code 1
Y7A1	Y881	Y961	YA41	YB21	YC01	YCE1	CX32n	Manual arbitrary feed 3rd axis selection code 2
Y7A2	Y882	Y962	YA42	YB22	YC02	YCE2	CX34n	Manual arbitrary feed 3rd axis selection code 4
Y7A3	Y883	Y963	YA43	YB23	YC03	YCE3	CX38n	Manual arbitrary feed 3rd axis selection code 8
Y7A4	Y884	Y964	YA44	YB24	YC04	YCE4	CX316n	Manual arbitrary feed 3rd axis selection code 16
Y7A5	Y885	Y965	YA45	YB25	YC05	YCE5		
Y7A6	Y886	Y966	YA46	YB26	YC06	YCE6		
Y7A7	Y887	Y967	YA47	YB27	YC07	YCE7	CX3Sn	Manual arbitrary feed 3rd axis valid
Y7A8	Y888	Y968	YA48	YB28	YC08	YCE8	CXS1n	Manual arbitrary feed smoothing off
Y7A9	Y889	Y969	YA49	YB29	YC09	YCE9	CXS2n	Manual arbitrary feed axis independent
Y7AA	Y88A	Y96A	YA4A	YB2A	YC0A	YCEA	CXS3n	Manual arbitrary feed EX.F/MODAL.F
Y7AB	Y88B	Y96B	YA4B	YB2B	YC0B	YCEB	CXS4n	Manual arbitrary feed G0/G1
Y7AC	Y88C	Y96C	YA4C	YB2C	YC0C	YCEC	CXS5n	Manual arbitrary feed MC/WK
Y7AD	Y88D	Y96D	YA4D	YB2D	YC0D	YCED	CXS6n	Manual arbitrary feed ABS/INC
Y7AE	Y88E	Y96E	YA4E	YB2E	YC0E	YCEE	*CXS7n	Manual arbitrary feed stop
Y7AF	Y88F	Y96F	YA4F	YB2F	YC0F	YCEF	CXS8n	Manual arbitrary feed strobe

$1		$2		$3		$4		$5		$6		$7		abbrev.	Signal name
Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal	Sharing G	Internal		
+308	R2408	+408	R2508	+508	R2608	+608	R2708	+708	R2808	+808	R2908	+908	R3008		1st handle/incremental feed magnification
+309	R2409	+409	R2509	+509	R2609	+609	R2709	+709	R2809	+809	R2909	+909	R3009		
+310	R2410	+410	R2510	+510	R2610	+610	R2710	+710	R2810	+810	R2910	+910	R3010		2nd handle feed magnification
+311	R2411	+411	R2511	+511	R2611	+611	R2711	+711	R2811	+811	R2911	+911	R3011		
+312	R2412	+412	R2512	+512	R2612	+612	R2712	+712	R2812	+812	R2912	+912	R3012		3rd handle feed magnification
+313	R2413	+413	R2513	+513	R2613	+613	R2713	+713	R2813	+813	R2913	+913	R3013		
+314	R2414	+414	R2514	+514	R2614	+614	R2714	+714	R2814	+814	R2914	+914	R3014		Manual arbitrary feed 1st axis travel amount
+315	R2415	+415	R2515	+515	R2615	+615	R2715	+715	R2815	+815	R2915	+915	R3015		
+316	R2416	+416	R2516	+516	R2616	+616	R2716	+716	R2816	+816	R2916	+916	R3016		Manual arbitrary feed 2st axis travel amount
+317	R2417	+417	R2517	+517	R2617	+617	R2717	+717	R2817	+817	R2917	+917	R3017		
+318	R2418	+418	R2518	+518	R2618	+618	R2718	+718	R2818	+818	R2918	+918	R3018		Manual arbitrary feed 3st axis travel amount
+319	R2419	+419	R2519	+519	R2619	+619	R2719	+719	R2819	+819	R2919	+919	R3019		

(2) Signals from controller to PLC

(a)In manual arbitrary feed mode (PTPOn)

(b)In manual arbitrary feed (CXNn)

(c)Manual arbitrary feed completion (CXFINn)

(3)Other

(a)Feedrate least increment m (PCFmn)

(b)Manual/automatic simultaneous valid (MAEn)

Con-tact	Signal name	Signal ab-breviation		1st part system	2nd part system	3rd part system	4th part system	5th part system	6th part system	7th part system
A	REFERENCE POSITION RE-TURN MODE	ZRNn		Y704	Y7E4	Y8C4	Y9A4	YA84	YB64	YC44

[Function]

The reference position return mode is selected.

"Reference position return" is that axis motion component (tool, table, etc.) is returned to the position previously determined for individual machine.

[Operation]

The reference position return mode is selected when the "Reference position return mode" signal (ZRNn) is turned ON. Select the reference position return mode, and turn ON the "Feed axis selection +/-"(+Jn,-Jn) signal of designated axis to return to the reference position.

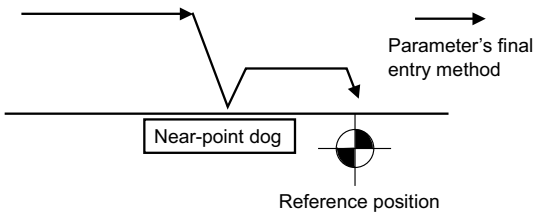
If the signal is the same as another operation mode or if it is removed, the NC alarm "M01 OPERATION ERROR 0101" will occur.

The first reference position return after the controller power is turned ON is the dog-type return (excluding when the basic machine coordinate system is established for the absolute position detection specifications). After the second manual reference position return (when basic machine coordinate system is established), the dog-type return or the high-speed return is selected with the machine parameters, basic specification parameter "#1063 mandog".

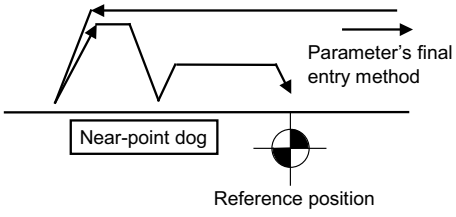
(1) Dog-type reference position return pattern

The return pattern is determined by the final entry method of the machine parameter reference position return.

(a) Operation when axis is moved in same direction as the final entry method, and dog is tripped.



(b) When axis is moved in opposite direction from final entry method, and dog is tripped.



- After the near-point dog is detected and the approach speed is applied, the axis will move to the reference position even if the Feed axis selection +/-"(+Jn,-Jn) signal is turned OFF. Thus, after the approach speed is applied, another axis can be switched to and reference position return executed.
- The entry direction (final entry direction) after the near-point dog is tripped is set with parameters.
- The feedrate before the approach speed is the reference position return feedrate if the "Rapid traverse"(RTn) signal is ON, and the "Manual feedrate code m"(*JVmn) is OFF.
- The approach speed is set with the parameters.
- When the reference position is reached, the movement will stop even if the "Feed axis selection +/-"(+Jn,-Jn) signal is ON, and the "1st reference position reached"(ZP1n) signal will turn ON.

(2) High-speed reference position return

- The axis will move toward the reference position. The motion speed will be rapid traverse if the rapid traverse signal is ON, and manual feedrate if OFF.
- When the reference position is reached, the movement will stop even if the "Feed axis selection +/-"(+Jn,-Jn)" signal is ON, and the "1st reference position reached"(ZP1n) signal will turn ON.
- "Feed axis selection +/-"(+Jn,-Jn) signal for high-speed return is enabled only in the reference position direction. If the opposite direction signal is designated, the NC alarm "M01 Operation Error 0003" will occur.

[Related signals]

(1) Feed axis selection +/- (+Jn,-Jn)
(2) Manual feedrate code m (*JVmn)
(3) Rapid traverse (RTn)
(4) 1st reference position reached (ZP1n)

Contact	Signal name	Signal abbreviation		1st part system	2nd part system	3rd part system	4th part system	5th part system	6th part system	7th part system
A	AUTOMATIC INITIALIZATION MODE	ASTn		Y705	Y7E5	Y8C5	Y9A5	YA85	YB65	YC45

[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 selection +/- "(+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 Absolute posn set" on the [ABS. POSITION SET] screen is not set to "1".
- When "#2 Zero-P" on the [ABS. POSITION SET] screen has not been set.
- When "#2055 pushf" on the [ABS. POSITION SET] screen has not been set.
- When "Z71 0005" has occurred.

Contact	Signal name	Signal abbreviation		1st part system	2nd part system	3rd part system	4th part system	5th part system	6th part system	7th part system
A	PROGRAM OPERATION MODE (MEMORY MODE)	MEMn		Y708	Y7E8	Y8C8	Y9A8	YA88	YB68	YC48

[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 "Program operation mode (Memory mode)"(MEMn) signal turns ON.
- The program is started with the "Automatic operation "start" command"(STn) signal.
- 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]

(1) Automatic operation "start" command (STn)

(2) Automatic operation "pause" command (Feed hold) (*SPn)

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
A	FTP MODE	FTPn		Y709	Y7E9	Y8C9	Y9A9	YA89	YB69	YC49

[Function]

This signal designates the FTP mode as the operation mode.

[Operation]

After starting up automatically with FTP mode, it starts executing the machining program which is downloaded to the buffer memory.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	MDI MODE	Dn		Y70B	Y7EB	Y8CB	Y9AB	YA8B	YB6B	YC4B

[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" (Dn) signal turns ON.
- The program is started with the "Automatic operation "start" command" (STn) signal.
- 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]

(1) Automatic operation "start" command (STn)

(2) Automatic operation "pause" command (Feed hold) (*SPn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	AUTOMATIC OPERATION "START" COMMAND (Cycle start)	STn		Y710	Y7F0	Y8D0	Y9B0	YA90	YB70	YC50

[Function]

This signal is used to start automatic operation in MEMORY mode, MDI mode, or to restart after automatic operation pause (halt) or block stop.

[Operation]

(1) "Automatic operation "start" command" (STn) signal arises when the pressed "auto operation start" pushbutton is released (i.e. at the time the signal turns OFF). The signal must be ON for a min. of 100msec.

(2) "In automatic operation "start"" signal (STLn) 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 (STn) is invalid when:
- Automatic operation starts.
- Automatic operation "pause" command (Feed hold) (*SPn) 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:
- Automatic operation "pause" command (Feed hold) (*SPn) 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" (SBKn) signal turns ON.
- Block in execution is completed after "Automatic machine lock" (AMKLn) signal turns ON.
- Program specified in MDI mode has been executed completely.

[Related signals]

(1) Program operation mode (Memory mode) (MEMn)

(2) MDI mode (Dn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
B	AUTOMATIC OPERATION "PAUSE" COMMAND (Feed hold)	*SPn		Y711	Y7F1	Y8D1	Y9B1	YA91	YB71	YC51

[Function]

During automatic operation, axis motion can be decelerated and stopped with this command signal. To restart, press "Automatic operation "start" command" (STn) signal pushbutton.

[Operation]

(1) When "Automatic operation "pause" command (Feed hold)" (*SPn) signal turns OFF, automatic operation stops.
- During automatic operation, the operation stops. "In automatic operation "pause"" (SPLn) occurs.
- Restart with the automatic start (STn) button. (Press after turning *SP signal.)

(2) In the following cases, automatic operation does not immediately stop.
Operation will continue to where stopping is possible, and then will 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 "Automatic operation "pause" command" (*SP) signal turns OFF, is completed. If the "Automatic operation "pause" command (Feed hold)" (*SPn) signal remains OFF, however, automatic operation stops immediately after a block (other than thread cutting) is given.
- When control variable "feed hold invalid" has been set by user macro.
  Automatic operation stops immediately after a block where the control variable "feed hold invalid" is cleared starts.

(3) "Automatic operation "pause" command (Feed hold)" (*SPn) signal is valid even during machine lock.

[Related signals]

(1)Program operation mode (Memory mode) (MEMn)
(2)MDI mode (Dn)
(3)Automatic operation "start" command (STn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	SINGLE BLOCK	SBKn		Y712	Y7F2	Y8D2	Y9B2	YA92	YB72	YC52

[Function]

Machining program can be executed block by block in automatic operation.

[Operation]

(1) When "Single block" (SBKn) signal turns ON, operation of controller is as follows:

- During automatic operation

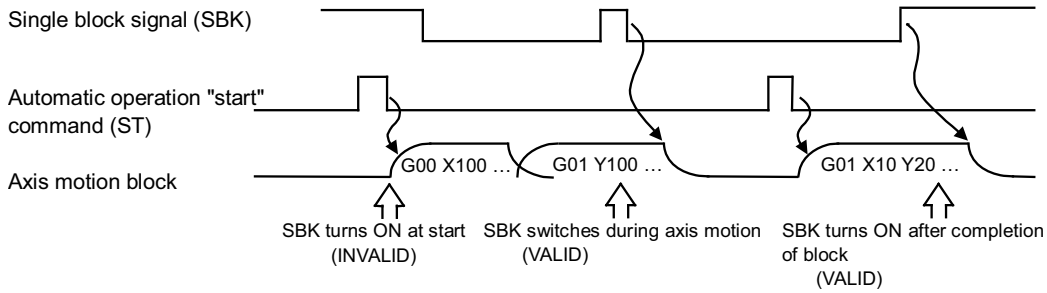
  After the block in execution has been completed, automatic operation stops. To start execution of the next block, "Automatic operation "start" command" (STn) must be turned ON to OFF.

- There will be no operation when automatic operation is not being executed but if automatic operation is started with the "Single block" (SBKn) 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 the "Single block" (SBKn) signal 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.



Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
B	BLOCK START INTERLOCK	*BSLn		Y713	Y7F3	Y8D3	Y9B3	YA93	YB73	YC53

[Function]

This signal prohibits start of the next block in automatic operation (memory, MDI).

[Operation]

While the "Block start interlock" (*BSLn) signal is OFF, execution of the next block may not be started in automatic operation. When the signal is given during execution of a block, the execution of the block continues until it is completed. Since the signal does not cause stop or suspension of automatic operation, execution of program starts when the "Block start interlock" (*BSLn) signal turns ON.

(Note 1) This signal is valid to all blocks including blocks internally generated in controller by fixed cycle, etc.

(Note 2) The unused axis must be put into an interlock cancel state by setting "1" with PLC program.

[Related signals]

(1) Cutting block start interlock (*CSLn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
B	CUTTING BLOCK START IN-TERLOCK	*CSLn		Y714	Y7F4	Y8D4	Y9B4	YA94	YB74	YC54

[Function]

This signal prohibits start of an axis motion command block other than that for positioning in automatic operation (memory, MDI).

[Operation]

While the "Cutting block start interlock" (*CSLn) signal is OFF, execution of an axis motion command block other than that for positioning may not be started in automatic operation. When the signal is given during execution of a block, the execution of the block continues until it is completed.

Since the signal does not cause stop or suspension of automatic operation, execution of program starts when the "Cutting block start interlock" (*CSLn) signal is turned ON.

(Note 1) This signal is valid to all blocks including blocks internally generated by fixed cycle, etc.

(Note 2) The unused axis must be put into an interlock cancel state by setting "1" with PLC program.

[Related signals]

(1) Block start interlock (*BSLn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	DRY RUN	DRNn		Y715	Y7F5	Y8D5	Y9B5	YA95	YB75	YC55

[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" (RTn) 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" (RTn) signal is OFF, the set "Manual feedrate code m" (*JVmn) will apply.
  Cutting feed override will also be valid if the "Manual override method selection" (OVSLn) 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" (RTn) signal is ON, the "Dry run" signal is ignored.
- When "Rapid traverse" (RTn) 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 code m (*JVmn)

(2) Rapid traverse (RTn)

(3) Manual override method selection (OVSLn)

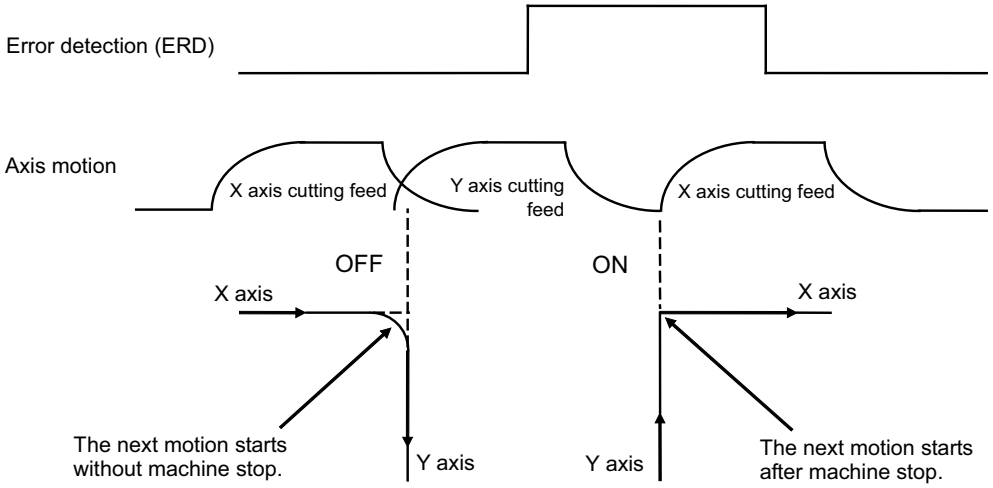
Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	ERROR DETECTION	ERDn		Y717	Y7F7	Y8D7	Y9B7	YA97	YB77	YC57

[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 detection" (ERDn) signal ON.

[Operation]

When this "Error detection" (ERDn) signal 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 (ERDn) 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.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	NC RESET 1	NRST1n		Y718	Y7F8	Y8D8	Y9B8	YA98	YB78	YC58

[Function]

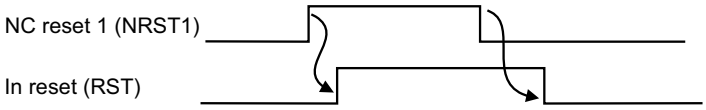
This signal is used to reset the control unit.

[Operation]

When this signal (NRST1n) is turned ON, the control unit can be reset.

Generally, the signal for the reset button of the setting and display unit for CNC exclusive use is set to "NC reset 1" (NRST1n). 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 independent output M00 to M30 (DM00n to Dm30n) will turn OFF.
(7) The axis movement will stop.
(8) The "In reset" (RSTn) signal will be output.



[Related signals]

(1) NC reset 2 (NRST2n)
(2) Reset & rewind (RRWn)
(3) In "reset" (RSTn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	NC RESET 2	NRST2n		Y719	Y7F9	Y8D9	Y9B9	YA99	YB79	YC59

[Function]

This signal is used to reset the control unit.

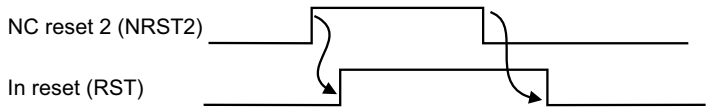
[Operation]

When this signal (NRST2n) 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" (RRWn) 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 independent output M00 to M30 (DM00n to Dm30n) will turn OFF.
(7) The axis movement will stop.
(8) The "In reset" signal (RSTn) will be output.



[Related signals]

(1) NC reset 1 (NRST1n)
(2) Reset & rewind (RRW:n)
(3) In "reset" (RSTn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	RESET & REWIND	RRWn		Y71A	Y7FA	Y8DA	Y9BA	YA9A	YB7A	YC5A

[Function]

This signal resets the controller.

During memory operation, the head of the machining program currently being run can be called out.

The reset button in the setting and display unit for CNC exclusive use may be set to "Reset & rewind" (RRWn).

According to the operation condition, it is set in either "NC reset 1" (NRST1n) or "Reset & rewind" (RRWn).

[Operation]

When this signal (RRWn) turns ON:

(1) Ongoing axis motion is decelerated and stopped.

(2) CNC is reset after axis motion stops. In about 0.5 second after CNC is reset, "In reset" (RSTn) signal turns ON.

(3) At the same time as CNC is reset, "In rewind" (RWDn) signal turns ON.

- In memory operation mode, the head of program in execution is read (memory index).

(4) While the signal (RRWn) is ON, automatic operation and manual operation are impossible.

(5) G command modal is initialized.

(6) Tool compensation (offset) data are canceled (no motion).

(7) Error/alarm is reset.

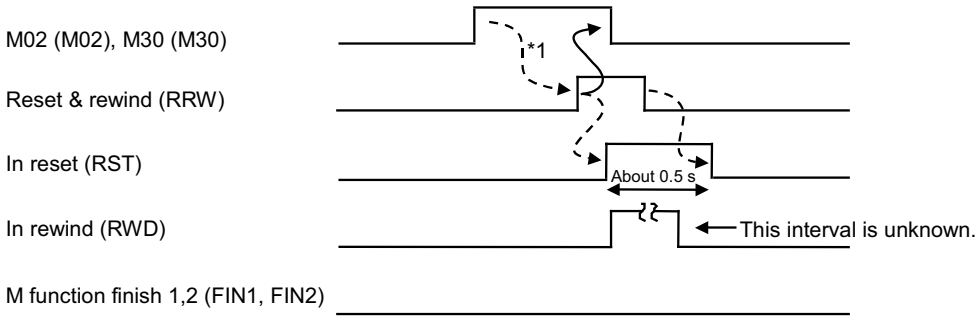
(8) M, S, T code outputs are held. (Strobe signal turns OFF.)

(9) M independent output (M00 to M30 (DM00n to DM30n)) 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 (RRWn) will be returned when the designated operation is completed. M function finish 1 (FIN1n) and M function finish 2 (FIN2n) will not be returned. (Refer to *1 in the following drawing.)



[Related signals]

(1) In reset (RSTn)

(2) In rewind (RWDn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
B	CHAMFERING	*CDZn		Y71B	Y7FB	Y8DB	Y9BB	YA9B	YB7B	YC5B

[Function]

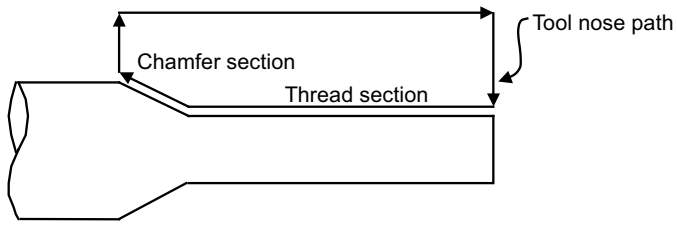
In thread cutting cycle, chamfering can be ignored.

[Operation]

Status of this signal is determined at start of thread cutting cycle.

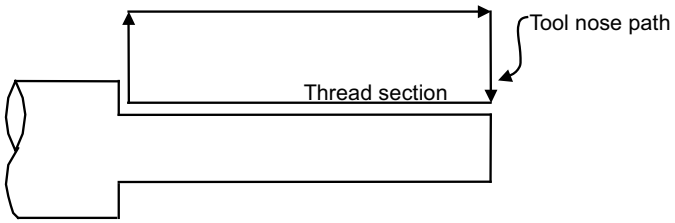
- CHAMFERING (*CDZn) is OFF.

Chamfering (at end of thread cutting) is accomplished.



- CHAMFERING (*CDZn) is ON.

Chamfering is not accomplished (signal is ignored).



Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	AUTOMATIC RESTART	ARSTn		Y71C	Y7FC	Y8DC	Y9BC	YA9C	YB7C	YC5C

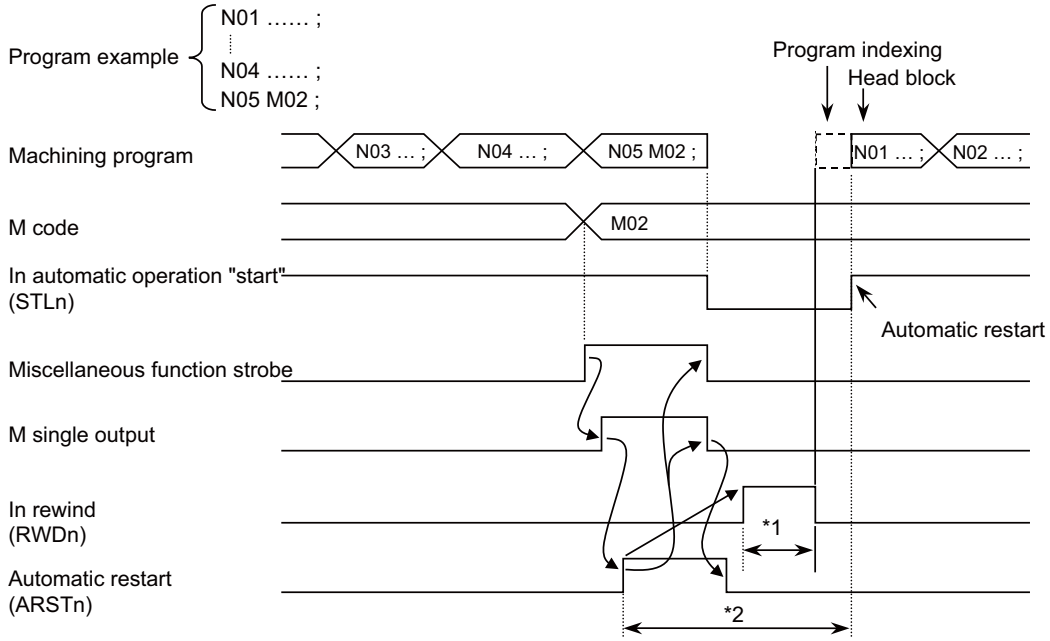
[Function]

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.

[Timing chart]



*1:Rewind time During memory operation …approx. 0.1 to 0.2
Program indexing time is a moment, so its time might not be confirmed by sequence program.

*2:Refer to Note 8.

(Note 1) The modal is initialized with this signal.

(Note 2) This signal is valid only during automatic start.

(Note 3) This signal is valid during the memory and MDI automatic operation modes.

(Note 4) Normally, "M code independent output" signal for M02 or M30 is input into this signal, but in this case, do not input the M02 or M30 completion signal (FIN1n, FIN2n).

(Note 5) If the "Automatic operation "pause" command (Feed hold)" (*SPn) signal is valid, the "Automatic 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" (RRWn) 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 "Automatic restart" signal will be invalid.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	EXTERNAL SEARCH STROBE	EXTSSn		Y71D	Y7FD	Y8DD	Y9BD	YA9D	YB7D	YC5D

[Function] [Operation]

The CNC CPU starts the external search at the rising edge of this signal.

The combinations of designation conditions and correspondence of the operation search blocks are shown below.

The designated block No. is added to the operation search block No. which is searched by operation search.

Condition		Operation search block
Program No.	Sequence No.	
Designated	Designated	Designated sequence No. for designated program
Designated	Not designated (=0)	Head of designated program
Not designated (=0)	Designated	Designated sequence No. in currently selected program
Not designated (=0)	Not designated (=0)	Error: 4 (Refer to "External search status")

(Example) If program No. 100, sequence No. 300 and block No. 2 are designated, operation search is executed for the block with(*).

```
O100()
N0100 G28 X0 Y0 Z0;
M3 S1000;
N0200 G0 Z100.;
G0 X100. Y0.;
N0300 G01 Z50. F1000;
G01 Y10.;
    G01 Z0. F100; ..... (*)
G00 Z50.
N0400 G0 Z100.;
M30;
```

(Note) The block No. is designated with the number of blocks following the last sequence No.

[Related signals]

(1) External search finished
(2) External search status
(3) External search device No.
(4) External search program No.
(5) External search sequence No.
(6) External search block No.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	M FUNCTION FINISH 1	FIN1n		Y71E	Y7FE	Y8DE	Y9BE	YA9E	YB7E	YC5E

[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 (MF1n to MF4n, SF1n to SF7n, TF1n, BF1n) will turn ON.

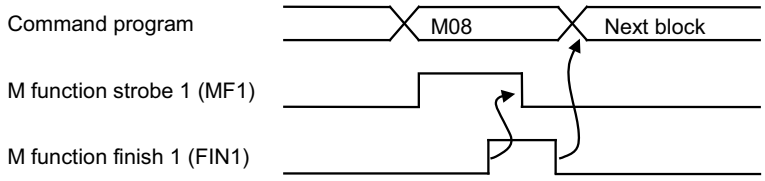
When the PLC verifies that one or more M, S, T and/or B function has been specified, it performs that function(s) and, after completion of the function(s), "M function finish 1" (FIN1n) signal turns OFF.

When the controller verifies that signal FIN1n turns ON, it turns OFF strobe signal of corresponding function.

The PLC checks that each strobe signal turns OFF, then turns OFF FIN1n.

With the signal FIN1n 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" (FIN1n) 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 command 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" (RRWn) 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 (FIN2n)

(2) M, S, T, B function strobe (MF1n to MF4n, SF1n to SF7n, TF1n, BF1n)

(3) M, S, T, B function data (output to file register R)

(4) Reset & rewind (RRWn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	M FUNCTION FINISH 2	FIN2n		Y71F	Y7FF	Y8DF	Y9BF	YA9F	YB7F	YC5F

[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]

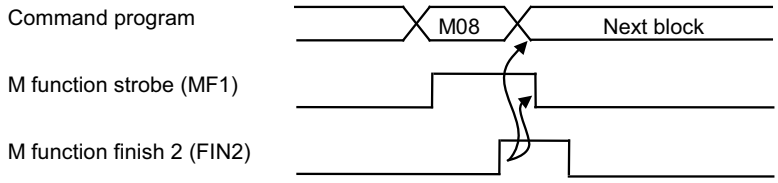
If the M, S, T or 2nd M function command is executed during automatic operation, the code and each function strobe (MF1n to MF4n, SF1n to SF7n, TF1n, BF1n) will turn ON.

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" (FIN2n) signal turns ON.

When the controller verifies that signal FIN2n turns ON, it turns OFF strobe signal of corresponding function.

When each strobe signal turns OFF, the PLC turns OFF signal FIN2n. With the signal FIN2n 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 (FIN2n)" 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 command 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 (RRWn) 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 (FIN1n)

(2) M, S, T, B function strobe (MF1n to MF4n, SF1n to SF7n, TF1n, BF1n)

(3) M, S, T, B function data (output to file register R)

(4) Reset & rewind (RRWn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	TOOL LENGTH MEASURE-MENT 1	TLMn		Y720	Y800	Y8E0	Y9C0	YAA0	YB80	YC60

[Function]

"Tool length manual measurement 1" is selected by this signal.

For M system, "Tool length manual measurement 1 and 2" functions are used by this signal.

[Operation]

When the signal (TLMn) 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 (L system)/tool compensation screen (M system) is not selected.

(2) The calculation result is read when INPUT key is pressed.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	TOOL LENGTH MEASURE-MENT 2	TLMSn		Y721	Y801	Y8E1	Y9C1	YAA1	YB81	YC61

[Function]

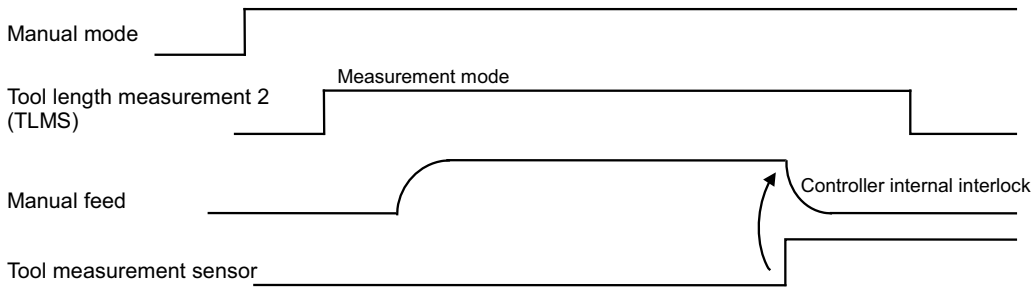
"Tool length measurement 2" is selected by this signal.

[Operation]

When the signal (TLMSn) is turned ON, calculation of tool length compensation amount is automatically started in the controller.

When skip signal is input during tool length measurement, amount of tool length to be corrected is calculated.

[Timing chart]



[Caution]

(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 "CON3" No. 24 pin ON the controller unit.

(3) The calculation result is read automatically inside the controller.

(4) With tool length measurement 2, multiple part systems cannot be measured simultaneously.

[Related signals]

(1) Tool No.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	SYNCHRONIZATION CORREC-TION MODE	SYCMn		Y722	Y802	Y8E2	Y9C2	YAA2	YB82	YC62

[Function]

When the "M01 OPERATION ERROR 0051" (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.

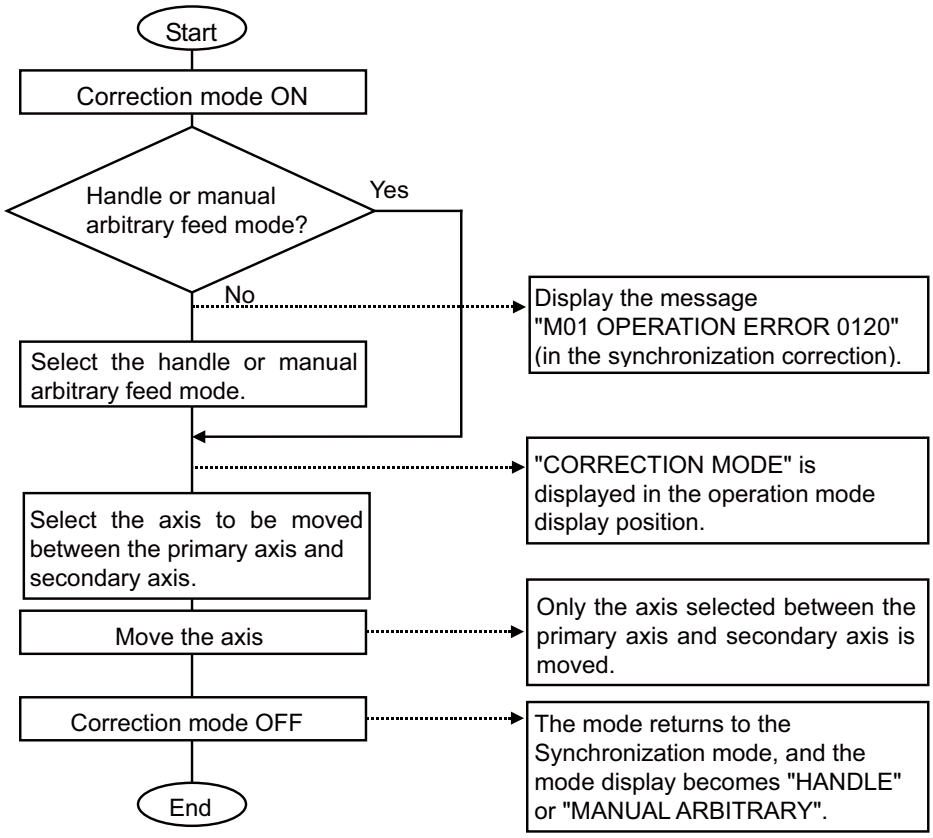
(1) The synchronous control is not carried out even in the secondary axis, and the primary axis and secondary axis are handled as independent two axes in the each control part. Thus, the primary axis and secondary axis can be moved individually.

(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 arbitrary feed mode, the "M01 OPERATION ERROR 0120" (Synchronization correction mode ON) will occur.

In the handle or manual arbitrary feed mode, if the correction mode switch 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 signals]

(1) Synchronous control operation method selection

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	PROGRAM RESTART	SRN		Y723	Y803	Y8E3	E9C3	YAA3	YB83	YC63

[Function]

With the program restart function, when the axis is returned to the restart position with the manual mode after the restart search is performed, the direction can be checked, or the axis can be stopped at the restart position.

[Operation]

If the "Program restart" signal (SRN) is turned ON after the restart search is performed and the axis is moved to the restart position direction with the manual mode, the axis is stopped at the restart position automatically. The [RESTARTR] values on the program restart screen are set to zero and "RP" appears by the side of the [RESTART-P] values. If the axis is moved in the opposite direction to the restart position, an OPERATION ERROR will occur.

[RESTART . (G54)]		[RESTART . R]	
X	-130.000 RP	X	0.000
Y	-10.000 RP	Y	0.000
Z	0.000 RP	Z	0.000

(Note) When "#1302 AutoRP (Automatic return by program restart)" is set to "1", it recovers by the automatic start to the position at the same speed as when dry run (DRN) is turned ON, and all axes start machining after the restart position recovery is completed. Therefore, the program restart signal is not necessary. Even when "#1302 AutoRP (Automatic return by program restart)" is set to "1", the restart position recovery is possible by manually turning the program restart signal (SRN) ON.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	MACRO INTERRUPT	UITn		Y725	Y805	Y8E5	Y9C5	YAA5	YB85	YC65

[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" (UITn) signal.

[Operation]

When "Macro interrupt" (UITn) 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.

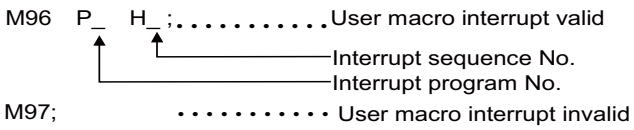
"Macro interrupt" (UITn) signal becomes valid when:

(1) Memory, tape or MDI is selected.
(2) Automatic operation is selected (signal STLn is ON).
(3) Other user macro is not being executed.

"Macro interrupt" (UITn) signal is accepted in "status trigger" method or "edge trigger" method, either one of which can be selected by parameter #1112.

(1) Status trigger method
While "Macro interrupt" (UITn) 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 (UITn) turns ON.
With the signal (UITn) kept turned ON, inserted program can be executed repeatedly.

(2) Edge trigger method
The signal (UITn) 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>



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" (UITn) 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).

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	RAPID TRAVERSE	RTn		Y726	Y806	Y8E6	Y9C6	YAA6	YB86	YC66

[Function]

Speed or feedrate of axis motion in "JOG" mode, "incremental feed" mode or "reference position return" mode can be changed to rapid traverse speed.

[Operation]

When the signal (RTn) is turned ON.

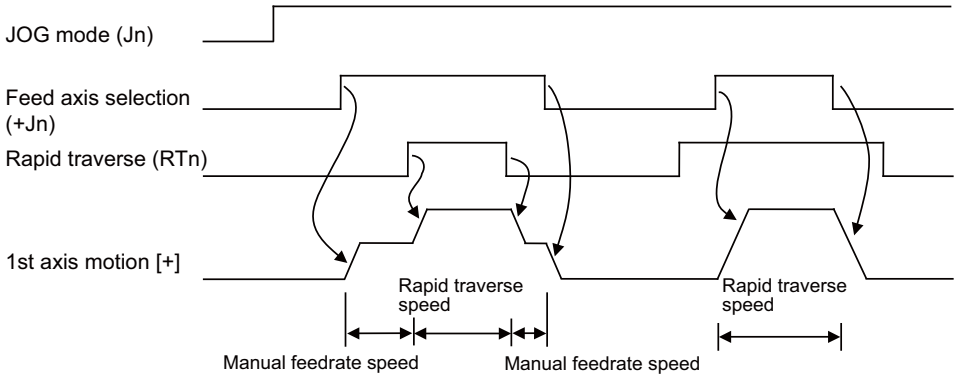
(1) The jog and incremental feedrate will be the rapid traverse feedrate set with parameters.

(2) The speed until the near-point detection dog signal is detected during dog-type reference position return will be the reference position return rapid traverse feedrate set with parameters.

(3) Speed or feedrate is changed at the same time as the signal is turned ON.When the signal (RTn) is turned OFF, rapid traverse speed changes to the previous speed or feedrate.
"Feed axis selection +/-" (+Jn, -Jn) signal may be kept turned ON.

(4) The speed will be the rapid traverse feedrate until the near point dog signal is detected during jog, incremental feed or reference position return. The rapid traverse override will also be valid.

(5) The "Rapid traverse override code m" (ROVmn) will be validated when the "Rapid traverse" signal is ON.



(Note 1) "Rapid traverse" (RTn) 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" (RTn) signal during dry run, refer to the description about dry run signal (DRNn).

[Related signals]

(1) Rapid traverse override code m (ROVmn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	MANUAL ABSOLUTE	ABSn		Y728	Y808	Y8E8	Y9C8	YAA8	YB88	YC68

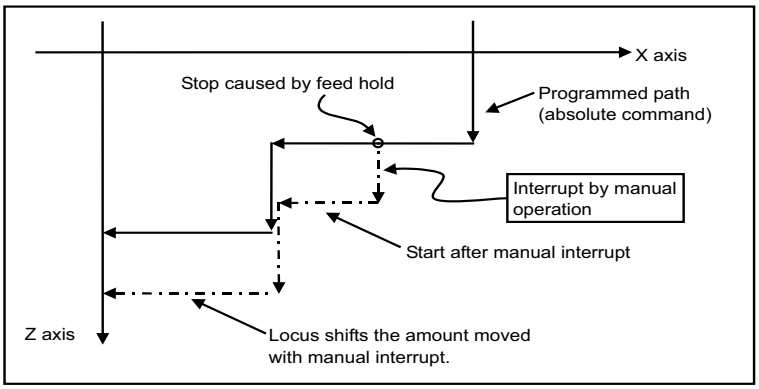
[Function]

This signal selects whether to update the program coordinate system the amount moved with manual operation (jog, handle, etc.).

[Operation]

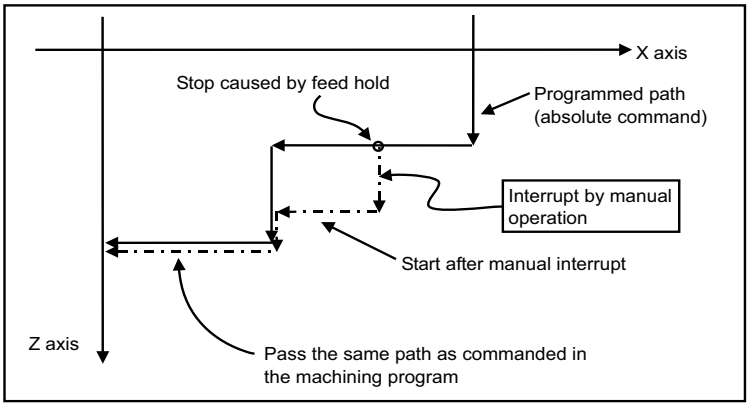
(1) When "Manual absolute" (ABSn) signal is OFF:

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/ incremental command in the machining program.)



(2) When "Manual absolute" (ABSn) 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 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 command, the axis will move in parallel the amount moved manually. (The axis will move in parallel regardless of the absolute/incremental command at the end of the inserted block.)



Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	RECALCULATION REQUEST	CRQn		Y72B	Y80B	Y8EB	Y9CB	YAAB	YB8B	YC6B

[Function]

This signal is turned ON if a calculated block (next block) is recalculated during operation of the machining program.

[Operation]

For example, to operate mirror image, etc., with the miscellaneous (M) command in the program.

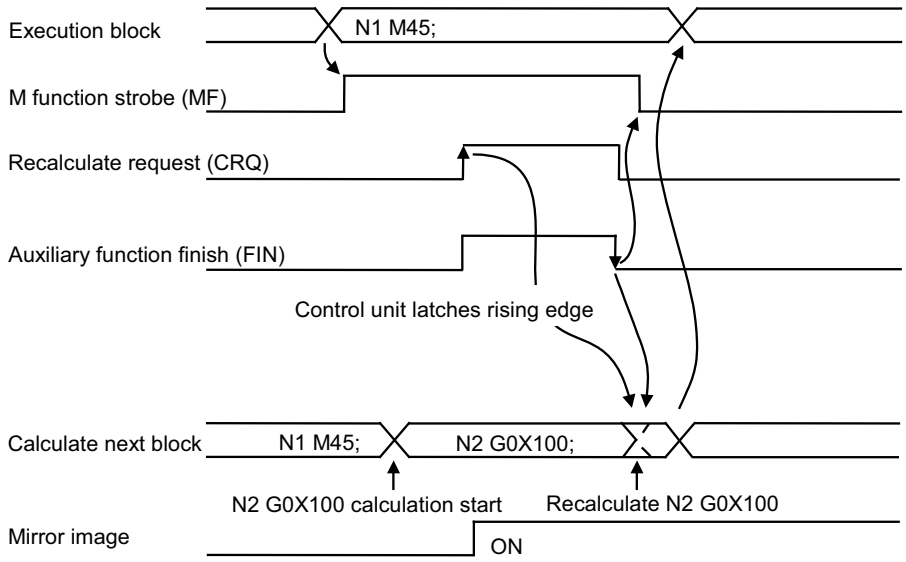
∫

N1 M45; To apply mirror image with this M command

N2 G0X100;

∫

When the N1 block is reached in the above program example, the "Recalculate request" signal will turn ON before FIN is output or simultaneously with FIN. This will validate the mirror image from the N2 block.



[Caution]

The "Recalculation request" (CRQn) signal latches the rising edge in the controller. Thus, even if the "Recalculation request" (CRQn) signal is ON (1), the "recalculation" will not take place unless at the rising edge.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	PROGRAM DISPLAY DURING OPERATION	PDISPn		Y72C	Y80C	Y8EC	Y9CC	YAAC	YB8C	YC6C

[Function]

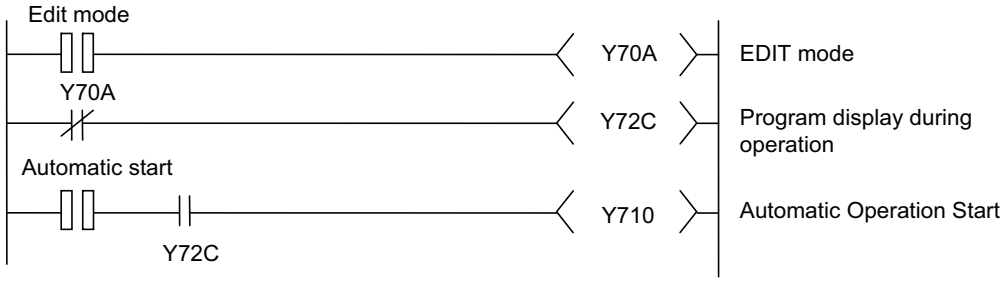
This signal is used to display a program on the Word Edit screen during operation.

[Operation]

When the "Program display during operation" signal (PDISPn) turns ON, the program being operatedwill appear in the program display of the EDIT screen.

[Caution]

Word editing function enables editing a machining program in operation in the foreground edit mode (with the Program display during operation signal (Y72C) turned OFF) even in an automatic operation as long as it is in a block stop. When the automatic start up is executed after the editing, the operation may start from an unintended location, and it may cause program errors or unintended operations. Therefore, create a sequence program in which automatic start is disabled during in the foreground edit mode (with the Program display during operation signal (Y72C) turned OFF) .



Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	OPTIONAL BLOCK SKIP m	BDTmn		Y72D Y738 - 73F	Y80D Y818 - 81F	Y8ED Y8F8 - 8FF	Y9CD Y9D8 - 9DF	YAAD YAB8 - ABF	YB8D YB98 - B9F	YC6D YC78 - C7F

[Function]

Block accompanying "/n (n: 1 to 9)" (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 "/n" (slash code) placed at the head of block is executed with "Optional block skip mn" (BDTmn) signal turned ON, the block is skipped. The block with the "/n" code in the middle instead of at the head will be executed.

When the signal is OFF, block with "/n" is executed.

(Example)If machining the two parts as illustrated below, create the following program. When machining with the "Optional block skip mn" (BDTmn) signal ON, part 1 will be provided. With the signal OFF, part 2 will be provided.

<Program>

N1 G54;

N2 G90G81X50. Z-20. R3. F100;

/1N3 X30.;

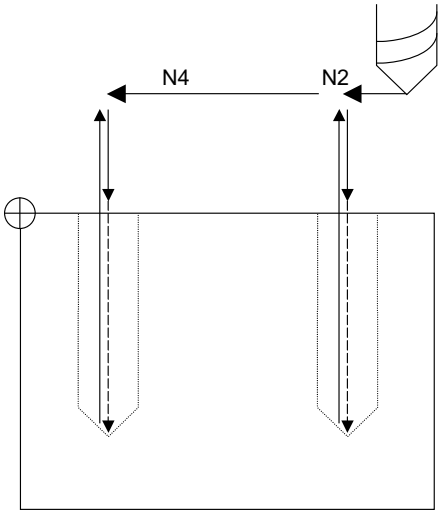
N4 X10.;

N5 G80;

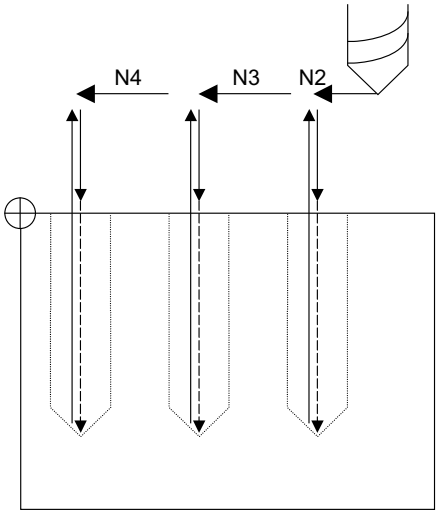
M02;

(Note) "1" of "/1N3 X30.;" can be omitted.

Part 1
Optional block skip ON



Part 2
Optional block skip OFF



Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	REFERENCE POSITION SE-LECTION CODE m	ZSLmn		Y730 - 731	Y810 - 811	Y8F0 - 8F1	Y9D0 - 9D1	YAB0 - AB1	YB90 - B91	YC70 - C71

[Function]

It is also possible to return to the nth reference position in the manual reference position return mode. This signal is used to select the number of the reference position (n) to return to. Normally both the "Reference position selection code 1, 2" (ZSL1n, ZSL2n) signals are turned OFF, and 1st point reference position return is performed.

[Operation]

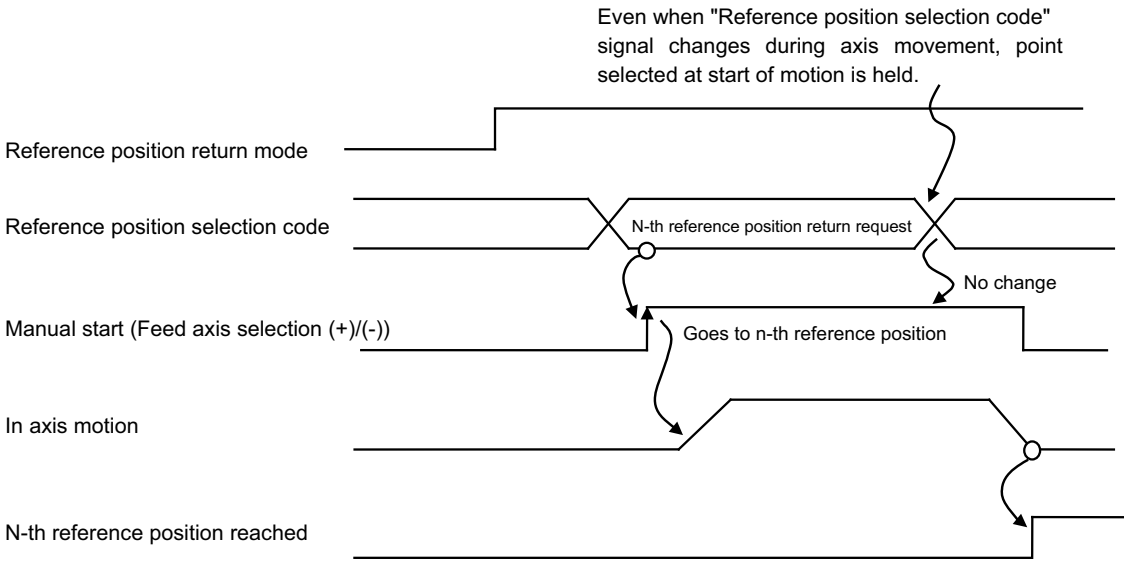
"Reference position selection code 1, 2" (ZSL1n, ZSL2n) signals are valid when:

(1) Reference position return mode is ON ("1").

(2) Manual start condition is held.

Reference position selection code 2	Reference position selection code 1	Return position
0	0	1st reference position
0	1	2nd reference position
1	0	3rd reference position
1	1	4th reference position

(Note 1) Returning to the first reference position must be performed before returning to the second, third or forth reference position.



[Related signals]

(1) Reference position return mode (ZRN)

(2) Feed axis selection +/- (+Jn, -Jn)

(3) Mth reference position reached (ZP1n to ZP4n)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	REFERENCE POSITION SE-LECTION METHOD	Mn		Y737	Y817	Y8F7	Y9D7	YAB7	YB97	YC77

[Function]

This signal selects whether the reference position selection is common for all axes or independent for each axis.

[Operation]

When this signal is OFF, the reference position selection is common for all axes, and Reference position selection code m (ZSLmn) are valid.

When this signal is ON, the reference position selection is independent for each axis, and "Each axis reference position select" is valid.

[Related signals]

(1) Reference position selection code m (ZSLmn)

(2) Each axis reference position select

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	1ST HANDLE AXIS SELECTION CODE m	HS1mn		Y740 - 744	Y820 - 824	Y900 - 904	Y9E0 - 9E4	YAC0 - AC4	YBA0 - BA4	YC80 - C84

[Function]

In HANDLE mode (handwheel is operated), axis component to be moved is selected.

In the case of 2-axis or 3-axis handle specification (two or three handles are required), axis is selected for the 1st handle.

[Operation]

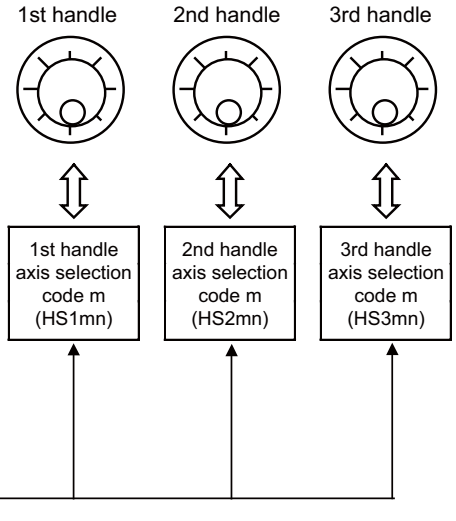
For axis motion in HANDLE mode:

(1) Select HANDLE mode.
(2) Specify axis No. for 1st handle axis selection code m (HS1mn).
(3) Turn ON "1st handle valid" (HS1Sn) 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 1Sn	-	-	HS 116n	HS 18n	HS 14n	HS 12n	HS 11n
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
#5 axis (5th axis) selected	1			0	0	1	0	1
#6 axis (6th axis) selected	1			0	0	1	1	0
#7 axis (7th axis) selected	1			0	0	1	1	1
#8 axis (8th axis) selected	1			0	1	0	0	0

"1st handle valid" signal



[Related signals]

(1) 2nd handle axis selection code m (HS2mn)
(2) 2nd handle valid (HS2Sn)
(3) 3rd handle axis selection code m (HS3mn)
(4) 3rd handle valid (HS3Sn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	1ST HANDLE VALID	HS1Sn		Y747	Y827	Y907	Y9E7	YAC7	YBA7	YC87

[Function]

In HANDLE mode, axis No. of axis motion component to be moved is set for 1st handle axis selection code m (HS1mn). 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 selection code m" (HS1mn) if this signal (HS1Sn) is not given. Although either the "1st handle axis selection code m" (HS1mn) signal or the "1st handle valid" (HS1Sn) signal can be given first, these two signals are to be given when manual axis motion is started.

[Related signals]

(1) 1st handle axis selection code m (HS1mn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	2ND HANDLE AXIS SELECTION CODE m	HS2mn		Y748 - 74C	Y828 - 82C	Y908 - 90C	Y9E8 - 9EC	YAC8 - ACC	YBA8 - BAC	YC88 - C8C

[Function]

This signal selects which handle to move with the 2nd handle when using the 2-axis or 3-axis handle specifications (two or three handles are required).

[Operation]

For axis motion controlled by the 2nd handle:

(1)Select HANDLE mode.

(2)Specify axis No. for 2nd handle axis selection code m (HS2mn).

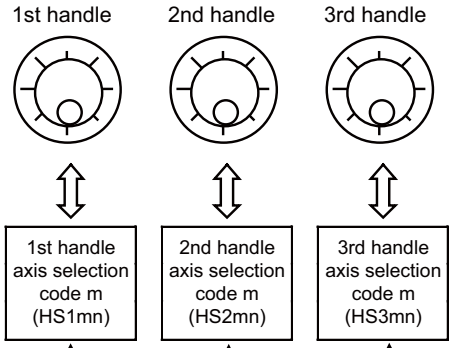
(3)Turn ON "2nd handle valid" (HS2Sn) signal (later described).

(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	HS2Sn	-	-	HS216n	HS28n	HS24n	HS22n	HS21n
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
#5 axis (5th axis) selected	1			0	0	1	0	1
#6 axis (6th axis) selected	1			0	0	1	1	0
#7 axis (7th axis) selected	1			0	0	1	1	1
#8 axis (8th axis) selected	1			0	1	0	0	0

"2nd handle valid" signal



Set the No. of the axis to be moved with the nth handle.

[Related signals]

(1) 1st handle axis selection code m (HS1mn)

(2) 1st handle valid (HS1Sn)

(3) 3rd handle axis selection code m (HS3mn)

(4) 3rd handle valid (HS3Sn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	2ND HANDLE VALID	HS2Sn		Y74F	Y82F	Y90F	Y9EF	YACF	YBAF	YC8F

[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 handle specification (two handles are required).

Refer to the above table for the relation with the "2nd handle axis selection code m" (HS2mn).

[Related signals]

(1) 2nd handle axis selection code m (HS2mn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	3RD HANDLE AXIS SELECTION CODE m	HS3mn		Y750 - 754	Y830 - 834	Y910 - 914	Y9F0 - 9F4	YAD0 - AD4	YBB0 - BB4	YC90 - C94

[Function]

This signal selects which handle to move with the 3rd handle when using the 3-axis handle specifications (three handle is required).

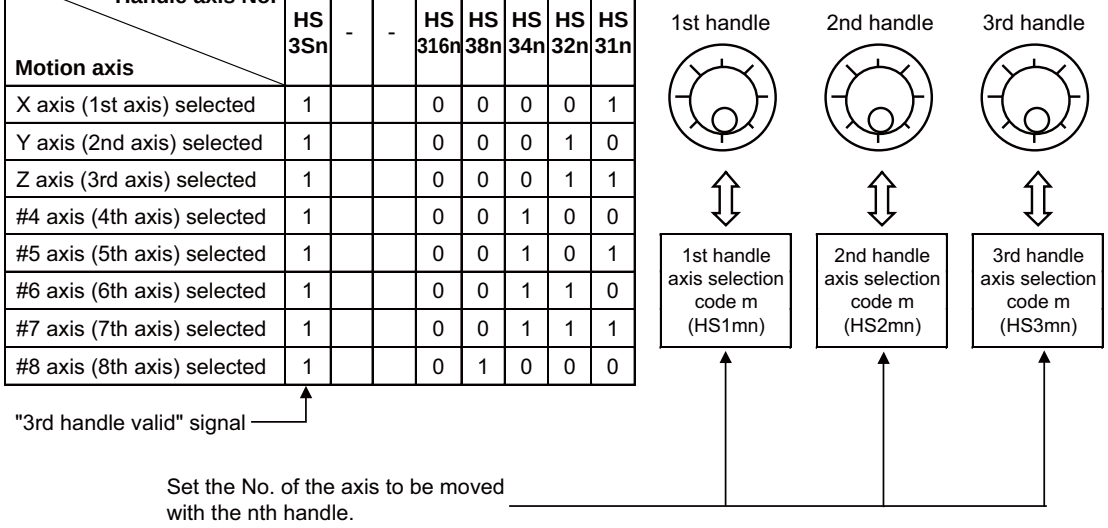
[Operation]

For axis motion in HANDLE mode:

(1) Select HANDLE mode.
(2) Specify axis No. for 3rd handle axis selection code m (HS3mn).
(3) Turn ON "3rd handle valid" (HS3Sn) 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 3Sn	-	-	HS 316n	HS 38n	HS 34n	HS 32n	HS 31n
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
#5 axis (5th axis) selected	1			0	0	1	0	1
#6 axis (6th axis) selected	1			0	0	1	1	0
#7 axis (7th axis) selected	1			0	0	1	1	1
#8 axis (8th axis) selected	1			0	1	0	0	0



[Related signals]

(1) 1st handle axis selection code m (HS1mn)
(2) 1st handle valid (HS1Sn)
(3) 2nd handle axis selection code m (HS2mn)
(4) 2nd handle valid (HS2Sn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	3RD HANDLE VALID	HS3Sn		Y757	Y837	Y917	Y9F7	YAD7	YBB7	YC97

[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 selection code m" (HS3mn).

[Related signals]

(1) 3rd handle axis selection code m (HS3mn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	OVERRIDE CANCEL	OVCn		Y758	Y838	Y918	Y9F8	YAD8	YBB8	YC98

[Function]

With this signal, override to cutting feedrate input to the controller during automatic operation is ignored.

[Operation]

When the signal (OVCn) turns ON ...

(1) Cutting feedrate override code m (*FV1mn) is ignored and feedrate specified by F command is selected.

(2) When cutting feedrate override is set at "0%", the signal (OVCn) 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]

(1) Cutting feedrate override code m (*FV1mn)

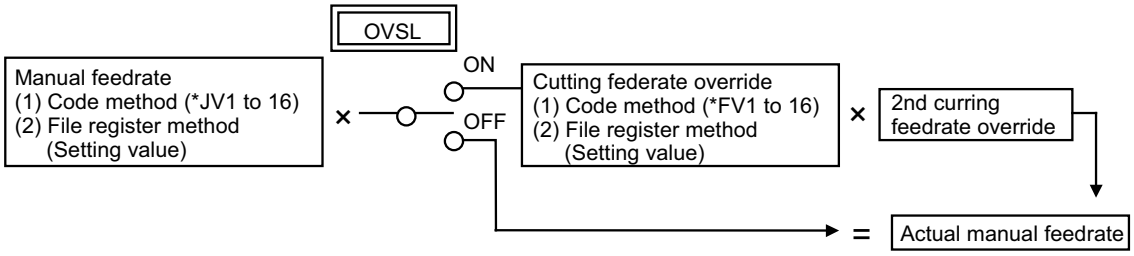
Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	MANUAL OVERRIDE METHOD SELECTION	OVSLn		Y759	Y839	Y919	Y9F9	YAD9	YBB9	YC99

[Function]

Override can be exerted on "manual feedrate" (feedrate in JOG feed, incremental feed, etc. during manual operation).

[Operation]

When this signal (OVSLn) 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 code m" (*JVmn), "Cutting feedrate override code m" (*FV1mn) and "2nd cutting feedrate override", refer to the relevant descriptions.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	MISCELLANEOUS FUNCTION LOCK	AFLn		Y75A	Y83A	Y91A	Y9FA	YADA	YBBA	YC9A

[Function]

Strobe signal for miscellaneous function (M, S, T and B) specified during automatic operation cannot be output when this signal is used. The signal (AFLn) can be used to check machining program, for example.

[Operation]

When the signal (AFLn) turns ON:

(1) Miscellaneous function (M, S, T and B) specified in automatic operation cannot be executed, i.e. output of code data and function strobe signal (MF1n to MF4n, SF1n to SF7n, TF1n, BF1n) are withheld.

(2) If the signal turns ON after code data is output, that output is accepted and the corresponding function can be completed (FIN1n or FIN2n 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 (AFLn) is ON and the decode signals, code data and "M function strobe" signal are output.

(4) Miscellaneous function which is executed within the controller and does not output its code data and "M function strobe" signal, such as M98 and M99, is executed even when the signal is ON.

(Note) As for S command data (output), the value before "Miscellaneous function lock" (AFLn) signal is turned ON will be retained even when this signal is ON. When the signal is ON at CNC power ON, S command data will be 0.

[Related signals]

(1) M function strobe m (MFmn)
(2) M code data
(3) S function strobe m (SFmn)
(4) S code data
(5) T function strobe 1 (TF1n)
(6) T code data
(7) 2nd M function strobe 1 (BF1n)
(8) 2nd M function data

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	TAP RETRACT	TRVn		Y75C	Y83C	Y91C	Y9FC	YADC	YBBC	YC9C

[Function]

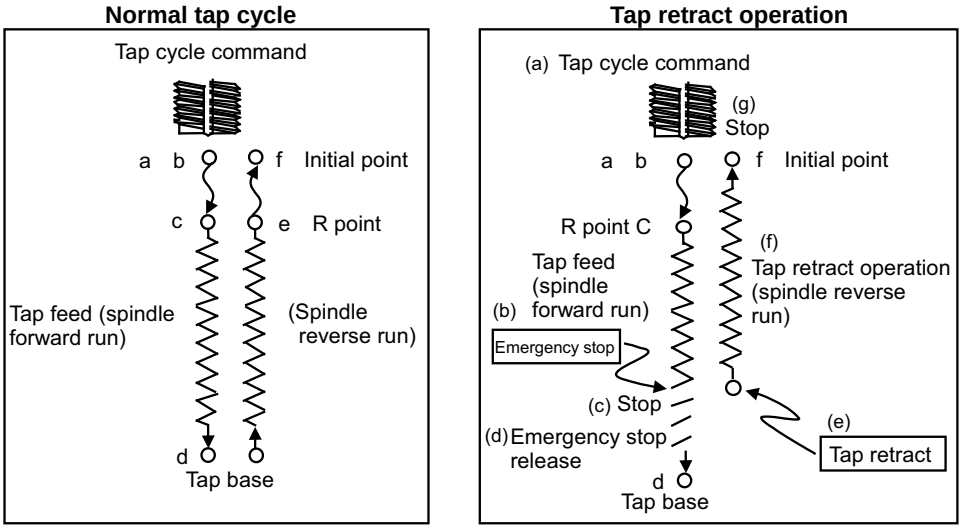
This function is used to remove the tap from the workpiece when tap cycle has been stopped due to emergency stop, etc.

[Operation]

If the "Tap retract" signal (TRVn) is turned ON while the "Tap retract possible" signal (TRVEn) is ON due to an interruption in the tap cycle, the tap retract operation can be started.

(1) The following items are conditions for tap retract. (The "Tap retract possible" signal will turn ON at this time.)
- Emergency stop during tap cycle
- Reset during tap cycle
- Power OFF during tap cycle (Only for absolute position detection system)

(2) Tap retract is executed as follows:
- Execute the synchronous tap cycle command. ---> (a)
- Stop the tap cycle with emergency stop. ---> (b)
- The "Tap retract possible" signal (TRVEn) turns ON. ---> (c)
- Release the emergency stop. (The "Servo ready completion" (SA) signal turns ON.) ---> (d)
- Turn ON the "Tap retract" signal (TRVn). ---> (e)
- The spindle will rotate in reverse, and the tap axis will move toward the tap cycle's initial point. The feedrate is the tap cycle feedrate. ---> (f)
- When the tap axis reaches the tap cycle initial point, the spindle and tap axis will stop, and tap retract will be completed. ---> (g)
- The "Tap retract possible" signal (TRVEn) will turn OFF.



(Note 1) The area between "c" and "e" above is the tap cycle. The "Tap retract possible" signal will not be output if the operation is not stopped in this area.

(Note 2) This signal is valid only during rising in the tap cycle.

(Note 3) When this signal turns ON, emergency stop and reset will not function.

(Note 4) The acceleration/deceleration method at the time of tap retract will be the time-constant method, and the time constant set for tapping will be used for tap retract.

[Related signals]

(1) Tap retract possible (TRVEn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	REFERENCE POSITION RE-TRACT	RTNn		Y75D	Y83D	Y91D	Y9FD	YADD	YBBD	YC9D

[Function]

This function returns immediately to a set reference position when the return signal is input. This function is used to return to a set position for changing the tool.

[Operation]

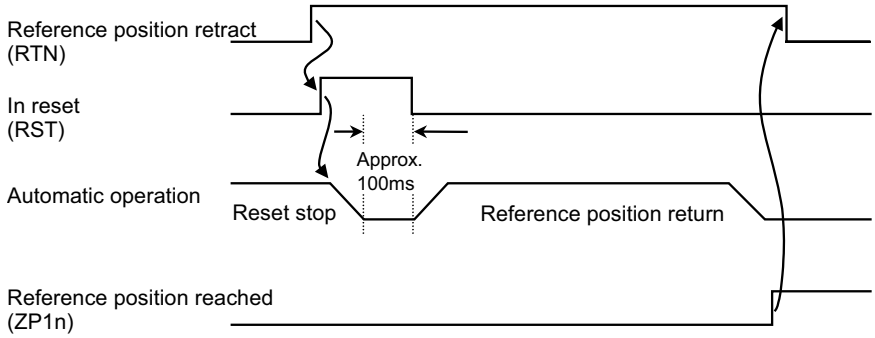
Reference position return is executed when this signal is turned ON. At the rising edge of the signal, the program is automatically reset (reset & rewind) and then reference position return is executed.

During the automatic or MDI operation, the operation is interrupted and stopped by the reset, and reference position return is executed.

If this signal is input during execution of a tap cycle in the automatic or MDI operation modes, the "Tap retract possible" signal will be output by the reset interruption, and the return operation will be the tap retract operation. The tap retract is completed at the initial point, and after that the reference position return will be carried out.

(1) If there are two or more axes, set the return order with parameter "#2019 revnum".
(2) When the reference position is reached, the corresponding "Reference position reached" (ZP1n to ZP4n) signal will be output.
(3) This signal must be held until the "Reference position reached" (ZP1n to ZP4n) signal is output. If it is turned OFF midway, the return operation will be interrupted and stop. If the signal is input again, the operation will restart from execution of resetting.
(4) The reference position return speed is handled in the same manner as the normal reference position return speed.
(5) The reference position returned to during reference position retract depends on the "Reference position selection code m".
(6) Even if the return signal is input during the thread cutting cycle, it will be invalid. However, if the return signal is executed in a block other than the thread cutting block, the return operation will be executed.
(7) The return signal is invalid if the coordinate system is not established. An operation error will occur when the return signal is input. "M01 OPERATION ERROR 0020"

[Timing chart]



[Related signals]

(1) Tap retract possible (TRVEn)
(2) Tap retract (TRVn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	SPINDLE OFF MODE	SPOFFMn		Y75F	Y83F	Y91F	Y9FF	YADF	YBBF	YC9F

[Function]

This function is used to check the program by moving the machine without rotating the spindle when the synchronous tapping command is issued. The program can advance without rotating the spindle during synchronous feed even in the asynchronous tapping mode.

[Operation]

(1) Synchronized tapping mode

When the spindle OFF mode is turned ON, the spindle will not rotate even if the servo is turned ON.

During the synchronized tapping mode, the operation up to when the synchronized tapping mode turns OFF will not change even if the spindle OFF mode is changed.

This signal should be ON from the start of operation.

When the spindle OFF mode is turned ON, the operation is executed with the command speed if the dry run signal is OFF.

When the dry run signal is ON, the operation is executed with the manual feed rate.

(2) Asynchronous tapping mode

(a) During synchronous (per revolution) feed

When the tapping cycle is executed with the spindle being not rotated, the machine will be stopped because of the “M01 Operation error 0154” (spindle stop). When the dry run signal is turned ON at this time and the spindle OFF mode is turned ON, the tapping cycle will be executed as the spindle in the stopping status (in that case, it moves at the speed of the dry run).

When the dry run signal OFF or the spindle OFF mode signal is turned OFF, the machine will be stopped because of the “M01 Operation error 0154” (spindle stop).

(b) During asynchronous feed (per minute) feed

Even when the tapping cycle is executed with the spindle being not rotated, the taping cycle will be executed. The spindle OFF mode signal is not related.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
B	CUTTING FEEDRATE OVER-RIDE CODE m	*FV1mn		Y760 - 764	Y840 - 844	Y920 - 924	YA00 - A04	YAE0 - AE4	YBC0 - BC4	YCA0 - CA4

[Function]

Override (magnification) 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" (OVCn) signal is ON.

(2) During tapping mode.

(3) During thread cutting.

These signals (*FV1 to 16) are set with the code method. The relation is shown below.

*FV16	*FV8	*FV4	*FV2	*FV1	Cutting feedrate override	
1	1	1	1	1	0%	
1	1	1	1	0	10%	
1	1	1	0	1	20%	
1	1	1	0	0	30%	
1	1	0	1	1	40%	
1	1	0	1	0	50%	
1	1	0	0	1	60%	
1	1	0	0	0	70%	
1	0	1	1	1	80%	
1	0	1	1	0	90%	
1	0	1	0	1	100%	
1	0	1	0	0	110%	
1	0	0	1	1	120%	
1	0	0	1	0	130%	**Generally, the rotary switch(5-step, 21-notch, complimentbinary code output) is connectedto 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.**
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%	

[Related signals]

(1) Override cancel (OVCn)

(2) 2nd cutting feedrate override valid (FV2En)

(3) Cutting feedrate override method selection (FVSn)

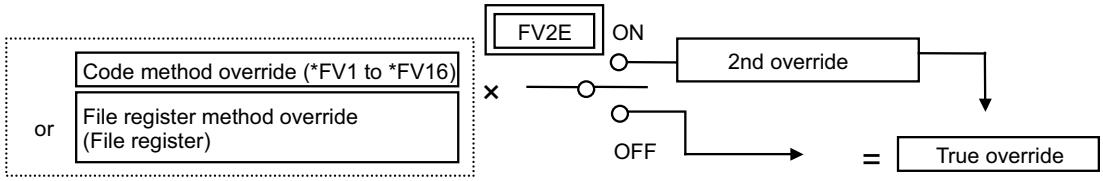
Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	2ND CUTTING FEEDRATE OVERRIDE VALID	FV2En		Y766	Y846	Y926	YA06	YAE6	YBC6	YCA6

[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 (FV2En) is ON, override can be exerted on feedrate previously overridden in code method (*FV1mn), or file register method (by setting numerals manually). Applicable range of the 2nd override is 0% to 327.6% (0.01% increment). Value (override ratio) is set to file register in binary code.



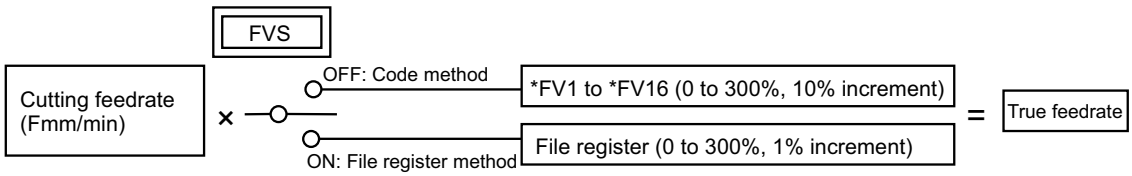
Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	CUTTING FEEDRATE OVER-RIDE METHOD SELECTION	FVSn		Y767	Y847	Y927	YA07	YAE7	YBC7	YCA7

[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 (FVSn) is OFF, code method of "Cutting feedrate override code m" (*FV1mn) is selected.
When the signal (FVSn) is ON, file register method (value is specified by manual setting) is selected.



(Note) For details of code method and file register method, refer to the relevant descriptions.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	RAPID TRAVERSE OVERRIDE CODE m	ROVmn		Y768 - 769	Y848 - 849	Y928 - 929	YA08 - A09	YAE8 - AE9	YBC8 - BC9	YCA8 - CA9

[Function]

This signal is used to exert override on rapid traverse speed set by parameter (for rapid traverse) in automatic operation (memory, 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" (RTn) signal is OFF during cutting feed during automatic operation or during manual operation.

These signals (ROVmn) are set with the code method. The relation is shown below.

ROV2n	ROV1n	Rapid traversespeed override
0	0	100%
0	1	50%
1	0	25%
1	1	1%

[Related signals]

(1) Rapid traverse speed override method selection (ROVSn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	RAPID TRAVERSE OVERRIDE METHOD SELECTION	ROVSn		Y76F	Y84F	Y92F	YA0F	YAEF	YBCF	YCAF

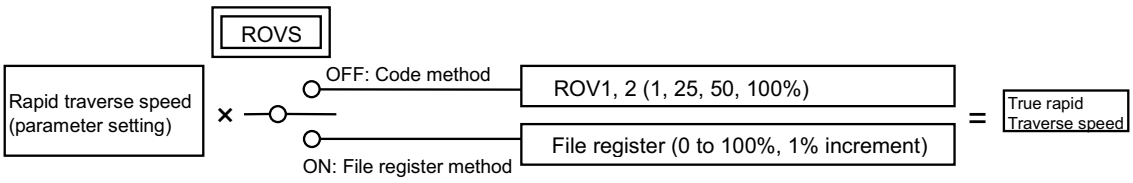
[Function]

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 (ROVSn) is OFF, code method of "Rapid traverse override code m" (ROVmn) is used.

When the signal (ROVSn) is ON, file register method is used.



(Note) For details of "code method override" and "file register method", refer to the respective description.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
B	MANUAL FEEDRATE CODE m	*JVmn		Y770 - 774	Y850 - 854	Y930 - 934	YA10 - A14	YAF0 - AF4	YBD0 - BD4	YCB0 - CB4

[Function]

Feedrate in manual operation (JOG mode, incremental feed mode, etc.) or in dry run of automatic operation (memory, MDI) is selected.

[Operation]

This signal is valid in the following cases, but will be invalid when the "Rapid traverse" (RTn) signal is ON.

(1) Jog mode, incremental mode or reference position return mode is ON.
(2) During cutting feed in automatic operation and "Dry run" (DRNn) signal is ON.
(3) Dry run signal is ON during rapid traverse in the automatic operation. Note that parameter "#1085 G00 dry run" must be ON.

These signals (*JV1 to 16) are set with the code method. The relation is shown below.

*JV16	*JV8	*JV4	*JV2	*JV1	Manual feedrate			
					Machine parameter setin meters		Machine parameter setin 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 signals]

(1) Manual feedrate method selection (JVSn)

(2) Manual override method selection (OVSLn)

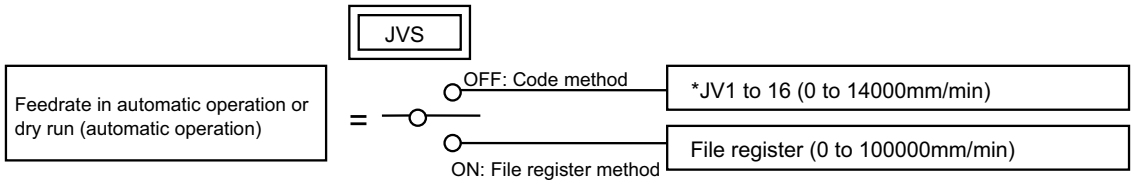
Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
A	MANUAL FEEDRATE METHOD SELECTION	JVSn		Y777	Y857	Y937	YA17	YAF7	YBD7	YCB7

[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 (JVSn) is OFF, code method of "Manual feedrate code m" (*JVmn) is selected.
When the signal (JVSn) is ON, file register method is selected.



(Note) For details of "code method feedrate" and "file register method feedrate", refer to the relevant description.

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
A	FEEDRATE LEAST INCREMENT CODE m	PCFmn		Y778 - 779	Y858 - 859	Y938 - 939	YA18 - A19	YAF8 - AF9	YBD8 - BD9	YCB8 - CB9

[Function]

When manual feedrate is specified in file register method (JVSn: "ON") or in arbitrary manual feed mode, manual feedrate of file registers R is used. In this case, least increment of the feedrate entered into the file registers is specified by this signal.

[Operation]

The relationship between PCFmn and least feed increment is as follows:

PCF2n	PCF1n	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.

[Related signals]

(1) Manual feedrate

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
A	JOG SYNCHRONOUS FEED VALID	JSYNn		Y77A	Y85A	Y93A	YA1A	YAFA	YBDA	YCBA

[Function]

This is used when the manual feedrate designation is to be per rotation feed (feed rate per spindle rotation).

[Operation]

(1) The following operation mode feedrates will immediately become per rotation feed when the "Jog synchronous feed valid" signal is turned ON.
- Jog mode
- Incremental feed mode
- Reference position return mode
- When "Manual arbitrary feed EX.F/MODAL.F" (CXS3n) is OFF and "Manual arbitrary feed G0/G1" (CXS4n) is ON in the manual random feed mode.

(2) Even if the "Jog synchronous feed valid" signal is ON, the per minute feed will be used in the following states.
- When the dry run signal is ON.
- When the "Rapid traverse" signal is ON in the jog, incremental or reference position return modes.

[Designation of feedrates]
The designation of the per rotation feedrate is the same as the per minute feed input.
The cutting override will be valid when the "Manual override method selection" (OVSLn) signal is ON.
(a) Code method (*JV1n to *JV16n)

*JV16n	*JV8n	*JV4n	*JV2n	*JV1n	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 (manual feedrate)
The feedrate when the "Manual feedrate method selection" (JVSn) is selected will be set in manual feedrate with the binary value. However, the designation unit will be as follows according to the "Feedrate least increment code m" (PCFmn).

PCF2n	PCF1n	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

[Related signals]
(1) Manual feedrate

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	JOG HANDLE SYNCHRONOUS	JHANn		Y77B	Y85B	Y93B	YA1B	YAFB	YBDB	YCBB

[Function]

Jog feed and handle feed can be carried out without changing the operation mode.

[Operation]

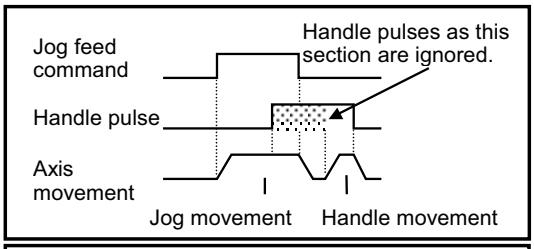
If the "Jog mode" (Jn) signal and this signal are input simultaneously, the "jog/handle synchronous mode" will be entered.

If the "Rapid traverse" (RTn) signal is turned ON during the "jog/handle synchronous mode", the jog feed will be carried out at the rapid traverse feedrate. When the "Rapid traverse" turns OFF, the jog feed will be carried out at the manual feedrate.

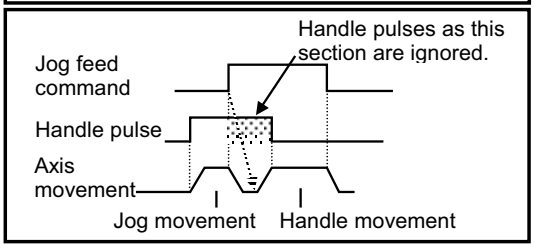
Operation mode	Jog handle synchronous signal (JHANn)	Rapid traversesignal (RTn)	Operation during jog feed	Handle feed
Jog feed	ON	ON	Rapid traverse feedrate	Possible
		OFF	Manual feedrate	Possible
	OFF	ON	Rapid traverse feedrate	Impossible
		OFF	Manual feedrate	Impossible

(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, "M01 OPERATION ERROR 0101" will occur. If the "Jog handle synchronous" signal is input simultaneously with an operation mode signal other than the jog mode, the "Jog handle synchronous" signal will be ignored.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	CURRENT LIMIT MODE m	ILMmn		Y77D - 77E	Y85D - 85E	Y93 - 93E	YA1 - A1E	YAFD - AFE	YBDD - BDE	YCBD - CBE

[Function]

This signal selects process of current limit reached.

[Operation]

When the current reaches its limit during current control, the "current limit reached" signal will be output, and the following mode will be selected and performed.

Current limit mode 2	Current limit mode 1	Mode
0	0	Normal
0	1	Interlock
1	0	Normal
1	1	Normal

(1) Normal mode

Movement command is executed in the current state.

In automatic operation, the movement command is executed to the end and moves to the next block with droops accumulated.

(2) Interlock mode

Movement command is blocked (internal interlock).

In automatic operation, the operation stops at the corresponding block and does not move to the next block.

In manual operation, the subsequent commands to the same direction will be ignored.

[Related signals]

(1) In current limit (ILIn)

(2) Current limit reached (ILAn)

(3) Current limit changeover (ILCn)

(4) Droop release request (DORn)

(5) Current limit changeover

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	HANDLE/INCREMENTAL FEED MAGNIFICATION CODE m	MPmn		Y780 - 782	Y860 - 862	Y940 - 942	YA20 - A22	YB00 - B02	YBE0 - BE2	YCC0 - CC2

[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 +/- (+Jn, -Jn) is multiplied by this signal.

[Operation]

This signal (MPmn) 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 MP1n, MP2n, MP4n.

The relationship between multiplier code (MPmn) and magnification in each feed mode is as follows.

MP4n	MP2n	MP1n	Magnification in HANDLE feed	Magnification 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 signals]

(1) Handle mode (Hn)

(2) Incremental mode (Sn)

Con-tact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
A	MAGNIFICATION VALID FOR EACH HANDLE	MPPn		Y786	Y866	Y946	YA26	YB06	YBE6	YCC6

[Function] [Operation]

This signal sets magnification per each handle when setting magnification of feed arbitrarily.

(1) When the signal is ON

When setting magnification of feed with an arbitrary value, magnification can be set per each handle.

When selecting magnification with code method, a common magnification of feed will be applied for all handles.

Handle	Magnification of feed	
	File register method	Code method
1st handle	R2408, 2409	Y780, Y781, YC782
2nd handle	R2410, 2411	
3rd handle	R2412, 2413	

(2) When the signal is OFF

When setting magnification of feed with an arbitrary value, magnification of 1st handle/incremental feed will be applied for all handles.

When selecting magnification with code method, a common magnification of feed will be applied for all handles.

[Related signals]

(1) Handle/incremental feed magnification method selection (MPSn)

(2) Handle/incremental feed magnification code m (MP1n, MP2n, MP4n)

(3) 1st handle/incremental feed magnification

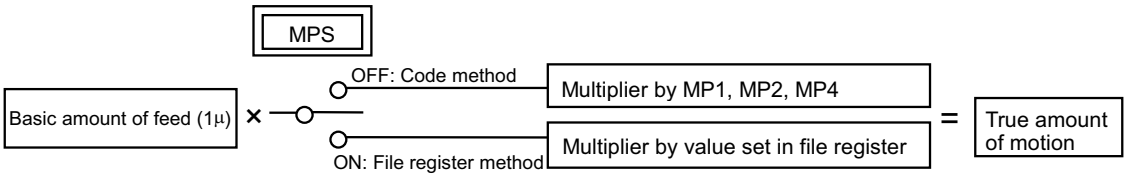
Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	HANDLE/INCREMENTAL FEED MAGNIFICATION METHOD SE-LECTION	MPSn		Y787	Y867	Y947	YA27	YB07	YBE7	YCC7

[Function]

Feed magnification method in handle feed or incremental feed is selected between "code method" and "file register method" by this signal.

[Operation]

When the signal (MPSn) is OFF, "Handle/incremental feed magnification code m" (MPmn) is selected.
When the signal (MPSn) is ON, "file register magnification method" is selected.



(Note) For details of the motion corresponding to the code method or file register method, refer to the relevant descriptions.

[Related signals]

(1) Handle/incremental feed magnification code m (MPmn)
(2) Handle/Incremental feed magnification

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	TOOL ALARM 1/TOOL SKIP 1	TAL1n		Y788	Y868	Y948	YA28	YB08	YBE8	YCC8

[Function]

This signal is used when the tool in which life has not been reached is attempted to change compulsorily.
This signal sets the tool status during tool life management to 3.

[Operation]

<M system>

By turning ON the signal in the tool life management specification, status of tool data can be changed to "3"(a tool of Tool alarm 1). This signal is validated when tool life management input (TLF1n) signal is ON.

<L system>

By turning ON the signal in the tool life management specification, status of tool data can be changed to "3" (a tool of tool skip), and the tool is handled in the same manner as life tool.

(1) The group No. to which the tool, which is attempted to change status by the sequence program, belongs is designated ("Tool group No. designation" signal) and "Tool skip 1" (TAL) signal is turned ON. When the group is selected next time, a new tool in the group is selected.
(2) When "Tool skip 1" (TAL) signal is turned ON without designating the group No. ("Tool group No. designation" signal is "0"), the group No. which has been selected at that time is considered to have been designated. When the group is selected next time, a new tool in the group is selected.

(Note) When the tool change reset or the tool skip is performed on the group currently selected, usage data count will be carried out on the tool used at the time of signal input until the next tool selection. Therefore, if a tool selected needs to be changed along with the signal input, select a group again.However, a tool may not be selected due to a preceding process if there is no movement command up to the next group selection after the signal input. In this case, contents of the preceding process can be invalidated by turning ON the "recalculation request" (CRQ) signal before selecting the group.

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
A	TOOL ALARM 2	TAL2n		Y789	Y869	Y949	YA29	YB09	YBE9	YCC9

[Function]

This signal sets the tool data status during tool life management to status 4 (a tool of Tool alarm 2).

[Operation]

By turning ON the signal in the tool life management specification, status of tool data can be changed to "4" (a tool of Tool alarm 2).

This signal is validated when tool life management input signal (TLF1n) is ON.

See "4.19.11 Interface with PLC" for details.

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
A	USAGE DATA COUNT VALID	TCEFn		Y78A	Y86A	Y94A	YA2A	YB0A	YBEA	YCCA

[Function]

This signal validates tool life count during the tool life management.

[Operation]

<M system>

The tool life count (usage time or usage count corresponding to tool) is validated in the tool life management specification.

This signal is validated when tool life management input signal (TLF1n) is ON.

<L system>

The tool life count (usage time or usage count corresponding to tool) is validated with the tool life management specification.

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
A	TOOL LIFE MANAGEMENT INPUT	TLF1n		Y78B	Y86B	Y94B	YA2B	YB0B	YBEB	YCCB

[Function]

This signal validates the tool life management.

[Operation]

By turning ON the signal in the tool life management specification, the tool life management process is executed.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	TOOL CHANGE RESET	TCRTn		Y78C	Y86C	Y94C	YA2C	YB0C	YBEC	YCCC

[Function]

This signal is used to clear all tool usage data in a group with the tool life management II.

[Operation]

Select with the tool group No. designation whether all groups that have exceeded their lifetimes or specific group to be cleared.

After this signal is input, the first tool of the group will be selected at the next group selection.

(Note) When the tool change reset or the tool skip is performed on the group currently selected, usage data count will be carried out on the tool used at the time of signal input until the next tool selection. Therefore, if a tool selected needs to be changed along with the signal input, select a group again. However, a tool may not be selected due to a preceding process if there is no movement command up to the next group selection after the signal input. In this case, contents of the preceding process can be invalidated by turning ON the "recalculation request" (CRQn) signal before selecting the group.

[Related signals]

(1) Recalculation request (CRQn:Y72B)

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
A	MANUAL ARBITRARY FEED 1ST AXIS SELECTION CODE m	CX1mn		Y790 - 4	Y870 - 4	Y950 - 4	YA30 - 4	YB10 - 4	YBF0 - 4	YCD0 - 4

[Function]

This signal specifies a number of the axis component to move in manual arbitrary feed mode.
Components of up to three axes can be moved simultaneously in manual arbitrary feed mode.
This signal is used to specify one of them.

[Operation]

(1) The "Manual arbitrary feed 1st axis selection code m" (CX1mn) must be set before "Manual arbitrary feed strobe" (CXS8n) signal is turned ON. An attempt to set it during motion shall fail.

(2) Besides this signal (CX1mn), there are two signals to specify a "Manual arbitrary feed 2nd axis selection code m" (CX2mn) and a "Manual arbitrary feed 3rd axis selection code m" (CX3mn). The axis numbers need not be specified in ascending order.

(3) The "Manual arbitrary feed 1st axis selection code m" (CX1mn) is validated by turning ON the "Manual arbitrary feed 1st axis valid" (CX1Sn) signal explained later. Similarly, the valid signals (CX2Sn, CX3Sn) are also provided for the 2nd and 3rd axis number signals.

(4) Axis numbers can be specified as follows:

n: 1 to 3

Signal / Axis specification	CXnS	—	—	CXn16	CXn8	CXn4	CXn2	CXn1
1st axis	1	—	—	0	0	0	0	1
2nd axis	1	—	—	0	0	0	1	0
3rd axis	1	—	—	0	0	0	1	1
4th axis	1	—	—	0	0	1	0	0

Validity signal — Axis number

(5) Motion of the specified axis component is as follows:

(a) The motion of the axis component specified by the "Manual arbitrary feed 1st axis selection code m" (CX1mn) signal corresponds to the contents of "Manual arbitrary feed 1st axis travel amount".

(b) The motion of the axis component specified by the "Manual arbitrary feed 2nd axis selection code m" (CX2mn) signal corresponds to the contents of "Manual arbitrary feed 2nd axis travel amount".

(c) The motion of the axis component specified by the "Manual arbitrary feed 3rd axis selection code m" (CX3mn) signal corresponds to the contents of "Manual arbitrary feed 3rd axis travel amount".

[Related signals]

For related signals, see the section "Manual arbitrary feed mode (PTPn)."

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
A	MANUAL ARBITRARY FEED 1ST AXIS VALID	CX1Sn		Y797	Y877	Y957	YA37	YB17	YBF7	YCD7

[Function]

This signal is used to validate the axis specified by the "Manual arbitrary feed 1st axis selection code m" (CX1mn) signal so that the axis component can move in manual arbitrary feed mode.

[Operation]

(1) The specification of the axis by the "Manual arbitrary feed 1st axis selection code m" (CX1mn) signal explained earlier is validated only when the "CX1S" signal is turned ON.

[Related signals]

For related signal, see the section "Manual arbitrary feed mode (PTPn)."

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	MANUAL ARBITRARY FEED 2ND AXIS SELECTION CODE m	CX2mn		Y798 - 79C	Y878 - 87C	Y958 - 95C	YA38 - A3C	YB18 - B1C	YBF8 - BFC	YCD8 - CDC

[Function][Operation]

See the descriptions on the "Manual arbitrary feed 1st axis selection code m" (CX1mn)" signal.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	MANUAL ARBITRARY FEED 2ND AXIS VALID	CX2Sn		Y79F	Y87F	Y95F	YA3F	YB1F	YBFF	YCDF

[Function][Operation]

See the descriptions on the "Manual arbitrary feed 1st axis valid" (CX1Sn) signal.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	MANUAL ARBITRARY FEED 3RD AXIS SELECTION CODE m	CX3mn		Y7A0 - 4	Y880 - 4	Y960 - 4	YA40 - 4	YB20 - 4	YC00 - 4	YCE0 - 4

[Function][Operation]

See the descriptions on the "Manual arbitrary feed 1st axis selection code m" (CX1mn) signal explained above.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	MANUAL ARBITRARY FEED 3RD AXIS VALID	CX3Sn		Y7A7	Y887	Y967	YA47	YB27	YC07	YCE7

[Function][Operation]

See the descriptions on the "Manual arbitrary feed 1st axis valid" (CX1Sn) signal.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	MANUAL ARBITRARY FEED SMOOTHING OFF	CXS1n		Y7A8	Y888	Y968	YA48	YB28	YC08	YCE8

[Function]

This signal is used to move an axis component under the condition where the acceleration/ deceleration time constant is 0 is manual arbitrary feed mode.

[Operation]

With the "Manual arbitrary feed smoothing off" (CXS1n) signal set ON, axis motion in manual arbitrary 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 signals]

For related signal, see the section "Manual arbitrary feed mode" (PTPn) mode.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	MANUAL ARBITRARY FEED AXIS INDEPENDENT	CXS2n		Y7A9	Y889	Y969	YA49	YB29	YC09	YCE9

[Function]

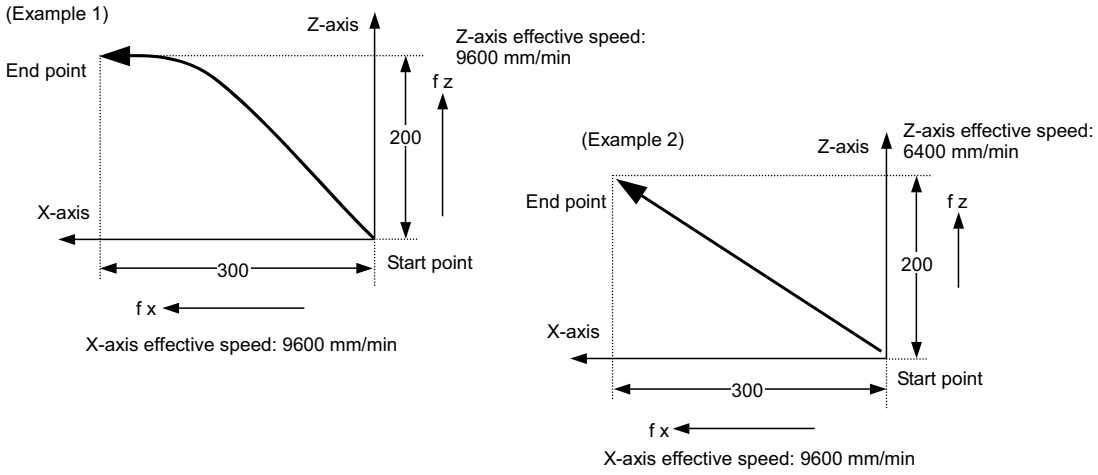
When moving two or more axis components simultaneously in "manual arbitrary feed" mode, this signal can be used to position each axis independently without performing interpolation.

[Operation]

When a manual arbitrary feed is executed for two or more axes at the same time with "Manual arbitrary feed axis independent" (CXS2n) ON, each axis is positioned independently without being subjected to interpolation.

The "Manual arbitrary feed axis independent" (CXS2n) signal is generally used when the "Manual arbitrary feed G0/G1" (CXS4n) signal explained later is OFF (G0 selected).

The following is an example where the rapid traverse speeds of X-axis and Z-axis are both set to 9,600 mm/min, and the amounts of movement of X-axis and Z-axis are set to 300mm and 200mm respectively.



[Related signals]

For related signal, see the section "Manual arbitrary feed mode (PTPn)."

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	MANUAL ARBITRARY FEED EX.F/MODAL.F	CXS3n		Y7AA	Y88A	Y96A	YA4A	YB2A	YC0A	YCEA

[Function]

This signal selects whether a manual arbitrary feed in G1 mode is done at manual feed rate or at modal speed in automatic operation.

[Operation]

When the "Manual arbitrary feed G0/G1" (CXS4n) signal explained later is ON n, the "CXS3" signal works as follows:

(1) When "Manual arbitrary feed EX.F/MODAL.F" (CXS3n) is OFF:

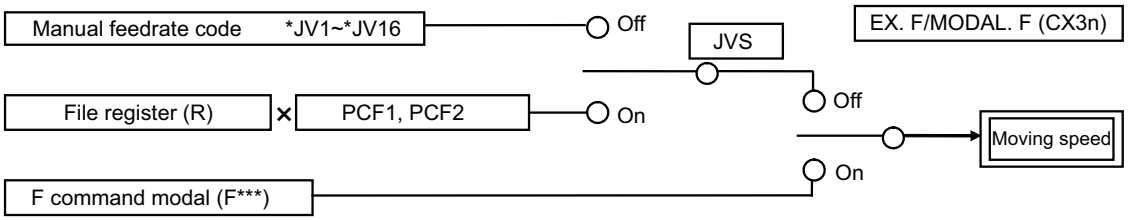
1)When the "Manual feedrate method selection" (JVSn) signal is OFF, the speed selected by the manual feed rate (*JV1 to 16) applies.

2)When the "Manual feedrate method selection" (JVSn) signal is ON, the applicable speed is determined by the relation between the contents of the corresponding file register (R) and the "Feedrate least increment code m" (PCFmn) signal.

(2) When "Manual arbitrary feed EX.F/MODAL.F" (CXS3n) is ON:

Manual arbitrary feed is operated at a modal speed (F***) set in automatic operation. However, it will not operate if no F command has been executed before.

After executing 1-digit F command when F 1-digit feed is valid (#1079 is set to "1"), it will operate with the F 1-digit feed speed (#1185 to #1189) which is registered beforehand.



[Related signals]

For related signal, see the section "Manual arbitrary feed mode (PTPn)."

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	MANUAL ARBITRARY FEED G0/G1	CXS4n		Y7AB	Y88B	Y96B	YA4B	YB2B	YC0B	YCEB

[Function]

This signal selects a manual feed speed or rapid traverse speed in manual arbitrary feed mode.

[Operation]

This signal operates as shown below depending on the status of the "Manual arbitrary feed G0/G1" (CXS4n) signal.

(1) When the "Manual arbitrary feed G0/G1" (CXS4n) 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 "Manual arbitrary feed axis independent" (CXS2n) signal. See the descriptions on the "Manual arbitrary feed axis independent" (CXS2n) signal.

(2) When the "Manual arbitrary feed G0/G1" (CXS4n) 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 "Manual arbitrary feed EX.F/MODAL.F" (CXS3n).

[Related signals]

For related signal, see the section "Manual arbitrary feed mode (PTPn)."

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	MANUAL ARBITRARY FEED MC/WK	CXS5n		Y7AC	Y88C	Y96C	YA4C	YB2C	YC0C	YCEC

[Function]

This signal selects a machine coordinate system or a modal workpiece coordinate system on which positioning is done in manual arbitrary feed mode.

[Operation]

The "Manual arbitrary feed MC/WK" (CXS5) signal becomes valid when the "Manual arbitrary feed ABS/INC" (CXS6) signal explained later is OFF in manual arbitrary feed mode.

(1) When the "Manual arbitrary feed MC/WK" (CXS5) signal is OFF:
"Manual arbitrary feed nth axis travel amount" set in a file register (R) is used for positioning on the machine coordinate system.

Amount of motion =

Manual arbitrary feed n-th travel amount - Coordinate value on machine coordinate system

(2) When the "Manual arbitrary feed MC/WK" (CXS5) signal is ON:
"Manual arbitrary feed nth axis travel amount" set in a file register (R) is used for positioning on the modal workpiece coordinate system.

Amount of motion =

Manual arbitrary feed n-th travel amount - Coordinate value on modal workpiece coordinate system

[Related signals]

For related signal, see the section "Manual arbitrary feed mode (PTPn)."

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	MANUAL ARBITRARY FEED ABS/INC	CXS6n		Y7AD	Y88D	Y96D	YA4D	YB2D	YC0D	YCED

[Function]

This signal selects whether travel amount is given in an absolute value or incremental value for manual arbitrary feed.

[Operation]

(1) When the "Manual arbitrary feed ABS/INC" (CXS6) signal is OFF:
"Manual arbitrary feed nth axis travel amount" set in a file register (R) is handled as an absolute value. For details, see the descriptions on the "Manual arbitrary feed MC/WK" (CXS5)" signal explained before.

(2) When the "Manual arbitrary feed ABS/INC" (CXS6) signal is ON:
"Manual arbitrary feed nth axis travel amount" set in a file register (R) is handled as a real movement value.

[Related signals]

For related signal, see the section "Manual arbitrary feed mode (PTPn)."

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
B	MANUAL ARBITRARY FEED STOP	*CXS7n		Y7AE	Y88E	Y96E	YA4E	YB2E	YC0E	YCEE

[Function]

This signal stops an ongoing axis component halfway in manual arbitrary feed mode.

The function of this signal is equivalent to those of the "Manual interlock +" (*+MITn) and "Manual interlock -" (*-MITn)" signals.

[Operation]

Turning the "Manual arbitrary feed stop" (*CXS7n) signal OFF (0) causes the following:

(1) Motion of axis in manual arbitrary feed mode is decelerated and stopped.

(2) The axis component which is going to move in manual arbitrary feed mode remains stopped. When the "Manual arbitrary feed stop" (*CXS7n) signal is turned ON (1) while an axis component is in the stop state, it immediately restarts the operation.

[Related signals]

For related signal, see the "Manual arbitrary feed mode (PTPn)."

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	MANUAL ARBITRARY FEED STROBE	CXS8n		Y7AF	Y88F	Y96F	YA4F	YB2F	YC0F	YCEF

[Function]

This signal is a trigger signal for moving an axis component in manual arbitrary feed mode. The axis component starts moving at the rising edge of this signal.

[Operation]

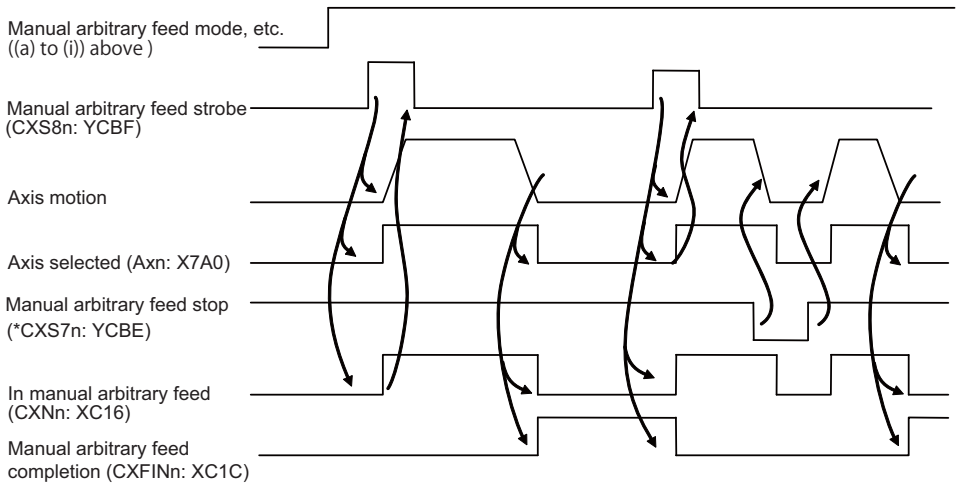
The "Manual arbitrary feed strobe" (CXS8n) signal should be turned ON after all signal values necessary for manual arbitrary feed are set appropriately.

(1) The following signals must be appropriately set before turning ON the "Manual arbitrary feed strobe" (CXS8n) signal:
- (a) Manual arbitrary feed mode (PTPn)
- (b) Manual arbitrary feed 1st axis selection code m to Manual arbitrary feed 3rd axis selection code m (CX1mn to CX3mn), Manual arbitrary feed 1st axis valid to Manual arbitrary feed 3rd axis valid (CX1Sn to CX3Sn)
- (c) Manual arbitrary feed nth axis travel amount
- (d) Manual arbitrary feed smoothing off (CXS1n)
- (e) Manual arbitrary feed axis independent (CXS2n)
- (f) Manual arbitrary feed EX.F/MODAL.F (CXS3n)
- (g) Manual arbitrary feed G0/G1 (CXS4n)
- (h) Manual arbitrary feed MC/WK (CXS5)
- (i) Manual arbitrary feed ABS/INC (CXS6)

(2) The following signals can be changed even after the "Manual arbitrary feed strobe" (CXS8n) signal is turned ON:
- (j) Manual feedrate code m (*JVmn)
- (k) Rapid traverse override for a rapid traverse speed when the "Manual arbitrary feed G0/G1" (CXS4n) signal is OFF.
- (l) "Manual arbitrary feed stop" (*CXS7n)

(Note 1) The "Manual arbitrary feed strobe" (CXS8n) signal can be accepted even when the "Manual arbitrary feed stop" (*CXS7n) signal is OFF (0).

Example of operation timing chart



(Note 2) The "Manual arbitrary feed strobe" (CXS8n) signal must be ON for at least 30ms.

[Related signals]

Signals listed in (a) to (l) above

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
B	2ND REFERENCE POSITION RETURN INTERLOCK	*ZRITn		Y7B0	Y890	Y970	YA50	YB30	YC10	YCF0

[Function]

The axis is interlocked at a designated position during manual 2nd reference position return.

[Operation]

During 2nd reference position return while this signal is valid (base specification parameter "#1505 ckref2" is "1"), if this signal turns OFF , movement of axes that have reached the designated position will stop, and an interlock will be applied. Axes that have not reached the designated position will be interlocked after reaching the designated position.
When this signal is ON, the axis movement will not stop, and the 2nd reference position return will continue.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	SEARCH & START	RSSTn		Y7B2	Y892	Y972	YA52	YB32	YC12	YCF2

[Function]

This signal is input into the controller when executing operation search in the memory mode and carrying out automatic start up.

This signal is also input into the controller when a program is downloaded from the FTP server also, the automatic startup is executed.

[Operation]

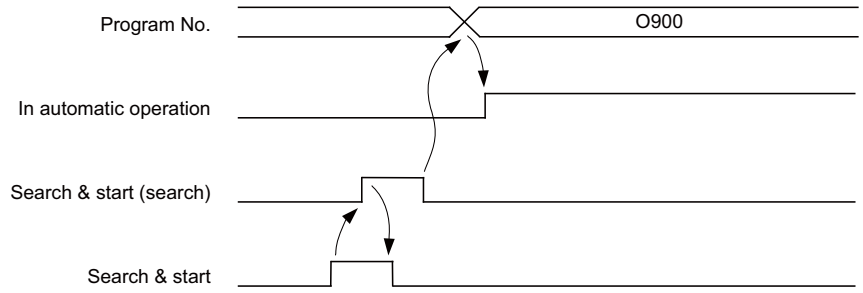
If this signal is input when the memory operation mode is selected, an operation search of the machining program designated by "Search & start program No." will be carried out. After the search, the program will be automatically started.

When the FTP mode is selected, download the program designated by "search and start program No." from FTP server and execute the automatic startup after the search is completed.

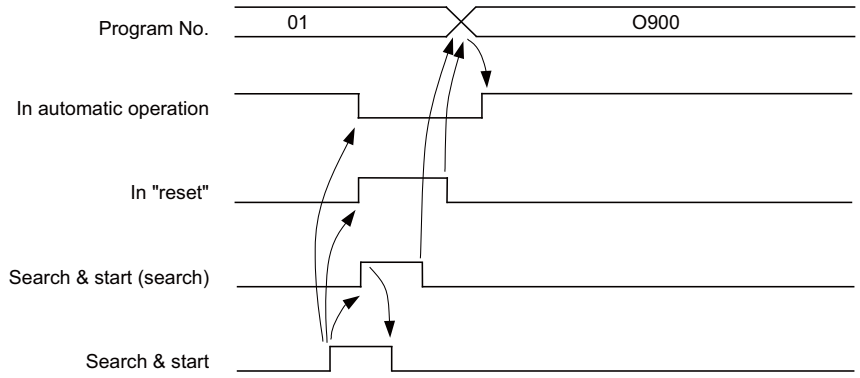
If this signal is input during automatic operation, the program will be reset before the search. After the resetting is completed, the search and automatic start operations will be executed.

Do not turn OFF this signal until the download completed signal turns ON or the download error signal turns ON. Otherwise download will be interrupted.

(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;
- the designated program No. is illegal (0 or exceeding 99999999); or
- restart search is in execution.

(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.
(2) Search & start error (SSEn)
(3) Search & start (search) (SSGn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	INCLINED AXIS CONTROL: NO Z AXIS COMPENSATION			Y7B6	Y896	Y976	YA56	YB36	YC16	YCF6

[Function]

Select whether the movement for the inclined axis in the manual operation is affected to the corresponding basic axis or not.

[Operation]

When this signal is turned ON and the manual operation for the inclined axis is executed, the corresponding basic axis is not moved.

When this signal is turned OFF and the manual operation for the inclined axis is executed, the compensation operation attending the movement of the inclined axis is executed to the corresponding basic axis.

[Caution]

Even if this signal is changed over during the axis movement, this signal will not be valid.

If this signal is changed over during the axis movement, this signal will be valid after the axis movement is stopped.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	HYPOTHETICAL AXIS COM-MAND MODE	**VAMODn**		Y7B8	Y898	Y978	YA58	YB38	YC18	YCF8

[Function]

In the hypothetical linear axis control, select whether to command the hypothetical axis in the hypothetical plane or to command the actual axis.

[Operation]

Hypothetical axis command mode can be selected by turing ON the hypothetical axis command mode (VAMODn). This mode can command the hypothetical axis out of the hypothetical plane and the actual axis.

Actual axis command mode can be selected by turing OFF the hypothetical axis command mode (VAMODn). This mode can command the actual axis.

[Related signals]

(1) In Hypothetical axis command mode (VAMODOn)

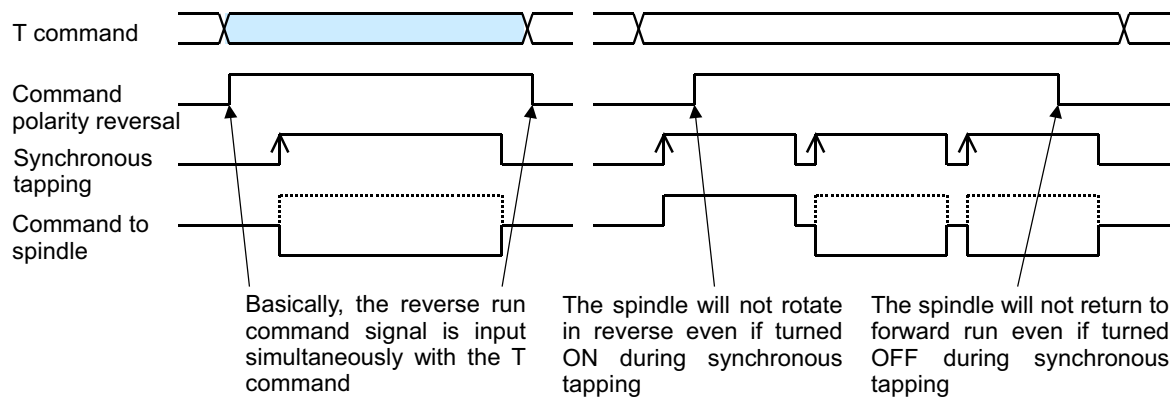
Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	SYNCHRONOUS TAPPING COMMAND POLARITY REVER-SAL			Y7B9	Y899	Y979	YA59	YB39	YC19	YCF9

[Function]

Designate whether to rotate the spindle in reverse during synchronous tapping.

[Operation]

When the "Synchronous tapping command polarity reversal" signal is ON, the spindle will rotate in reverse during synchronous tapping.



Contact	Signal name	Signal abbreviation		1st part system	2nd part system	3rd part system	4th part system	5th part system	6th part system	7th part system
A	CHOPPING	CHPSn		Y7BA	Y89A	Y97A	YA5A	YB3A	YC1A	YCFA

[Function]

This validates the chopping function by external signal.

[Operation]

The chopping operation is started at the rising edge of this signal and terminated at the falling edge of this signal.

This signal is ignored during the chopping by machining program.

Contact	Signal name	Signal abbreviation		1st part system	2nd part system	3rd part system	4th part system	5th part system	6th part system	7th part system
A	CHOPPING PARAMETER VALID			Y7BB	Y89B	Y97B	YA5B	YB3B	YC1B	YCFB

[Function]

This validates the chopping operation parameter by the external signal.

[Operation]

(1) The chopping operation parameter is valid at the rising edge of this signal.

The chopping operation parameters include the following.

(a) Compensation method selection

(b) Operation mode selection

(c) Rapid traverse override valid

(d) Chopping axis selection

(e) Upper dead point position designation (L)(H)

(f) Bottom dead point position designation (L)(H)

(g) Number of cycles designation

(h) Data No.

(2) This signal is ignored during the chopping by machining program.

(3) Chopping operation parameter can be changed with this signal during chopping operation.

[Related signals]

(1) Compensation method selection

(2) Operation mode selection

(3) Rapid traverse override valid

(4) Chopping axis selection

(5) Upper dead point position designation (L)(H)

(6) Upper dead point position designation (L)(H)

(7) Number of cycles designation

(8) Data No.

(9) Chopping status

Contact	Signal name	Signal abbreviation		1st part system	2nd part system	3rd part system	4th part system	5th part system	6th part system	7th part system
A	COMPENSATION METHOD SELECTION			Y7BC	Y89C	Y97C	YA5C	YB3C	YC1C	YCFC

[Function]

The compensation method of the chopping by external signal is selected.

[Operation]

0: The compensation amount sequential update method

1: The fixed compensation amount method

The selection with this signal is valid at the rising edge of the chopping parameter valid signal.

[Related signals]

(1) Chopping parameter valid

Con-tact	Signal name	Signal ab-breviation		1st part system	2nd part system	3rd part system	4th part system	5th part system	6th part system	7th part system
A	OPERATION MODE SELEC-TION			Y7BE	Y89E	Y97E	YA5E	YB3E	YC1E	YCFE

[Function]

The operation mode is selected when the fixed compensation amount method is selected in the compensation method of the chopping operation with eternal signal.

[Operation]

0: Playback mode

1: Record mode

This selects the operation mode, when the fixed compensation amount method from the chopping operation's compensation method by the external signal, is selected.

When the compensation value sequential update method is selected as a compensation method, this signal will be ignored.

[Related signals]

(1) Chopping parameter valid

Con-tact	Signal name	Signal ab-breviation		1st part system	2nd part system	3rd part system	4th part system	5th part system	6th part system	7th part system
A	RAPID TRAVERSE OVERRIDE VALID			Y7BF	Y89F	Y97F	YA5F	YB3F	YC1F	YCFF

[Function]

This sets the rapid traverse override valid/invalid in respect to the motion speed between basic point and the upper dead point.

[Operation]

0: Invalid

1: Valid

When this signal is OFF, the axis moves at the rapid traverse feedrate regardless of the designation of the rapid traverse override.

This signal will not be switched at the rising edge of the chopping parameter valid signal or in the the chopping operation where the G81.1 command is issued.

[Related signals]

(1) Chopping parameter valid

4.12 Bit Type Output Signals : Spindle Command (PLC CPU->CNC CPU)

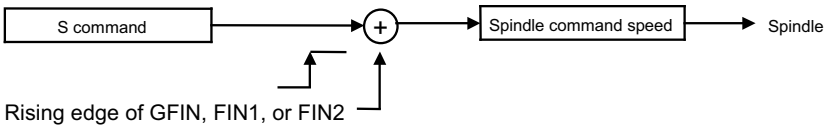
Con-tact	Signal name	Signal ab-breviation		1st spin-dle	2nd spin-dle	3rd spin-dle	4th spin-dle	5th spin-dle	6th spin-dle	7th spin-dle
A	GEAR SHIFT COMPLETION	GFINn		YD26	YD56	YD86	YDB6	YDE6	YE16	YE46

[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 command, etc.) control.

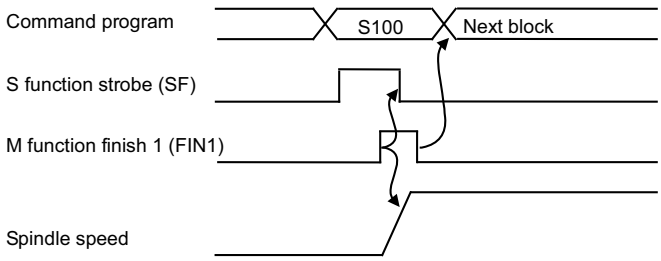
[Operation]

To change the spindle speed to the speed specified by the S command during automatic operation (memory, MDI), it is needed to turn ON the "Gear shift completion" (GFINn), or "M function finish (FIN1n, FIN2n)" signal.

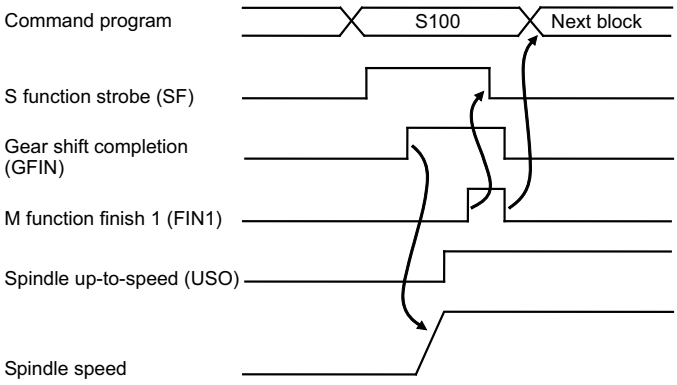


When using the "Gear shift completion" (GFINn) signal, the following two conditions should be considered:
- Whether gear shift (gear change) is applicable (whether there are two or more states of gear shift).
- Whether "Spindle up-to-speed" (USOn) signal output from the spindle controller is used for verification of spindle speed.

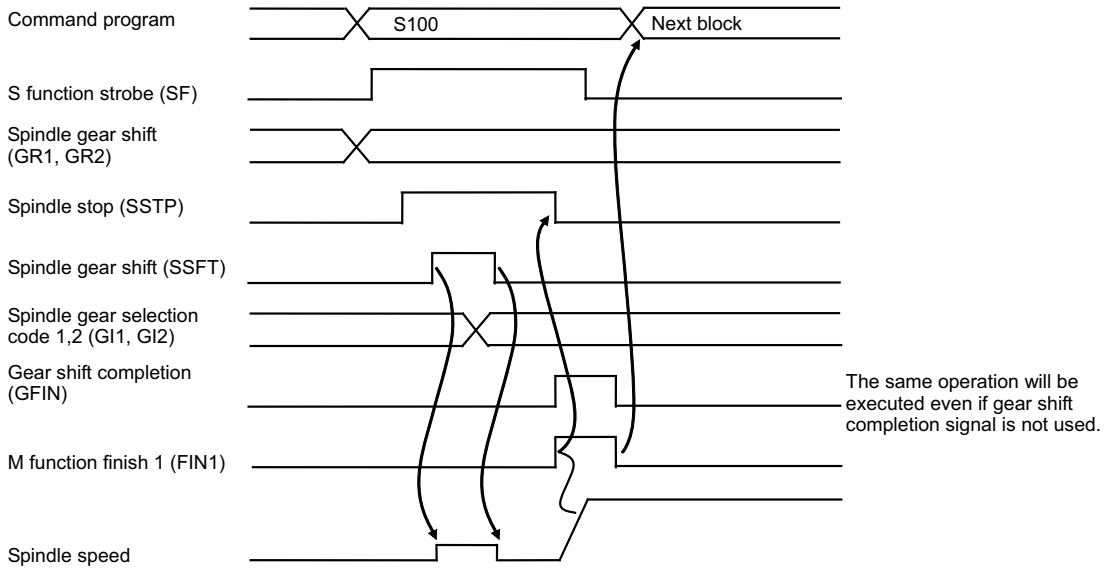
(Operation example 1) There is no gear shift and the "Spindle up-to-speed" (USOn) signal is not used.



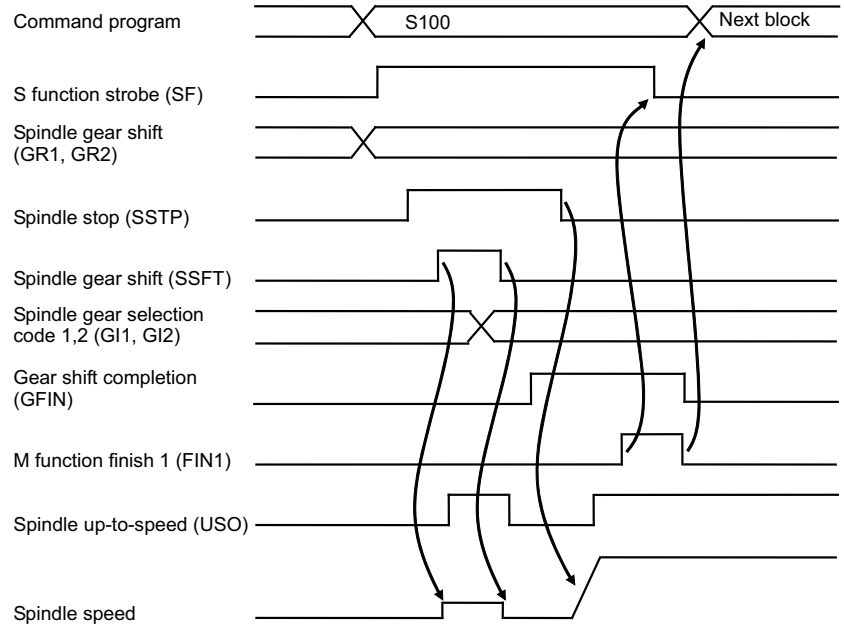
(Operation example 2) There is no gear shift, but the "Spindle up-to-speed" (USOn) signal is used.



(Operation example 3) There is gear shift, but the "Spindle up-to-speed" (USOn) signal is not used.



(Operation example 4) There is gear shift and "Spindle up-to-speed" (USOn) signal are used.



[Related signals]

(1) S function strobe m (SFmn)
(2) Spindle gear shift command m (GRmn)
(3) M function finish (FIN1n, FIN2n)
(4) Spindle gear selection input code (GImn)
(5) Spindle stop (SSTPn), Spindle gear shift (SSFTn)

Contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle	4th spindle	5th spindle	6th spindle	7th spindle
A	SPINDLE SPEED OVERRIDE CODE m	SPmn		YD28 - D2A	YD58 - D5A	YD88 - D8A	YDB8 - DBA	YDE8 - DEA	YE18 - E1A	YE48 - E4A

[Function]

This signal applies override (magnification) on the S command issued in the automatic operation (memory, MDI).

[Operation]

By selecting "Spindle speed override m" (SPmn) signal, override ratio can be selected within range from 50% to 120% (increment: 10%).

Override cannot be set when:

(1) "Spindle stop" (SSTPn) signal is ON.

(2) TAP mode is selected.

(3) Thread cutting mode is selected.

This signal (SPmn) is set with the code method. The relation is shown below.

SP4n	SP2n	SP1n	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%

(Note)The spindle override can be set either with the code method or by directly inputting the numerical value.

[Related signals]

(1) Spindle override method selection (SPSn)

Contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle	4th spindle	5th spindle	6th spindle	7th spindle
A	SPINDLE OVERRIDE METHOD SELECTION	SPSn		YD2F	YD5F	YD8F	YDBF	YDEF	YE1F	YE4F

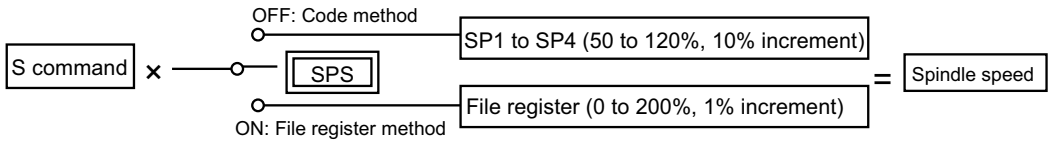
[Function]

When override is applied on the S command issued in automatic operation (memory, MDI), "code method" or "file register method" is selected for override method.

[Operation]

When the "Spindle override method selection" (SPSn) is OFF, "Spindle override code m" (SPmn) is selected.

When the "Spindle override method selection" (SPSn) is ON, register method override (value set in file register is applicable) is selected.



[Related signals]

(1) Spindle override code m (SPmn)

Con-tact	Signal name	Signal ab-breviation		1st spin-dle	2nd spin-dle	3rd spin-dle	4th spin-dle	5th spin-dle	6th spin-dle	7th spin-dle
A	SPINDLE GEAR SELECTION CODE m	GImn		YD30 - D31	YD60 - D61	YD90 - D91	YDC0 - DC1	YDF0 - DF1	YE20 - E21	YE50 - E51

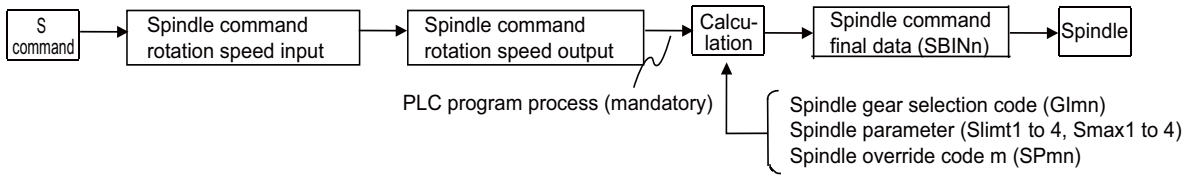
[Function]

This signal informs the controller which spindle gear has been selected on the machine side.

[Operation]

This "Spindle gear selection code" (GImn) signal is set according to the machine's spindle gear stage. The controller calculates the S command data (data is transferred when the spindle controller is the high-speed serial connection specification) based on this "Spindle gear selection" (GImn).

The flow after the spindle (S) command is executed and output to the spindle is shown below.



The relation of the gear stage to the spindle limit speed and maximum spindle speed selected with gear selection code signal (Glmn) is as shown below.

Gear stage	Spindle gear selection code		Spindle speedlimit	Maximumspindle speed
	GI2n	GI1n		
1	0	0	Slimt1	Smax1
2	0	1	Slimt2	Smax2
3	1	0	Slimt3	Smax3
4	1	1	Slimt4	Smax4

(1) Slimt1 to 4 are set with parameters. The spindle speed for when the spindle (S) command final data is the max.(the motor is run at the max. speed) is set.This setting is used for each gear stage 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 Slimt1.

(2) The controller calculates the spindle command final data as shown below.For example, if S command is issued, "Spindle gear selection code m" (GImn) is the 1st stage (GI1n=OFF, GI2n=OFF), spindle override value (%) is SOVR.

$$\text{Spindle command final data (SBINn)} = \frac{\text{S command}}{\text{Slimt1}} \times \frac{\text{SOVR}}{100} \times 4095$$

(3) If S2600 is executed when Slimt1 = "3000", Slimit2 = "6000" and spindle override "100%":

$$\text{Spindle command final data (SBINn)} = \frac{2600}{3000} \times \frac{100}{100} \times 4095 = 3549(\text{r/min})$$

During this time, the motor rotation speed is 3549/4095 * 6000 = 5200 (r/min) and the gear ratio is 1/2 therefore the spindle command final data is 2600 r/min.

(4) The S command is clamped with the Smaxn (n=1 to 4).If Smax1="2500" in the above state, the S-analog output will be:

$$\text{Spindle command final data (SBINn)} = \left(\frac{2500}{3000} \times \frac{100}{100} \times 4095\right) < 2500(\text{r/min})(\text{Smax1})$$

(Note) The spindle controller calculates the actual motor rotation speed with gear ratio as the motor max. rotation speed is 6000 r/min with the gear ratio is 2nd gear stage.

Con-tact	Signal name	Signal ab-breviation		1st spin-dle	2nd spin-dle	3rd spin-dle	4th spin-dle	5th spin-dle	6th spin-dle	7th spin-dle
A	SPINDLE STOP	SSTPn		YD34	YD64	YD94	YDC4	YDF4	YE24	YE54

[Function]

In spindle control, S command data (spindle speed) can be set to "0" by using this signal (SSTPn). Usually, the signal is not used alone, but combined with "Spindle gear shift" (SSFTn) signal explained later.

[Operation]

When the signal (SSTPn) is turned ON, S command data is set to "0". S command data is restored when the signal is turned OFF.

When "Spindle gear shift" (SSFTn) signal turns ON while the signal is ON, S command data which corresponds to speed set by the spindle speed parameter is output.

"Spindle speed override code m" (SPmn)) is ignored while the signal is ON.

Con-tact	Signal name	Signal ab-breviation		1st spin-dle	2nd spin-dle	3rd spin-dle	4th spin-dle	5th spin-dle	6th spin-dle	7th spin-dle
A	SPINDLE GEAR SHIFT	SSFTn		YD35	YD65	YD95	YDC5	YDF5	YE25	YE55

[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 (SSFTn) turns ON, the S command 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" (SSTPn) signal should be ON beforehand to use the signal (SSFTn).

Together with this signal (SSFTn), the forward run signal or the reverse run signal needs to be turned ON.

Spindle gear shift speed is selected by "Spindle gear selection code m" (GImn).The relation is as follows:

Gearstage	Spindle gearselection codesignal		Spindle speed atgear shift	Spindle speedlimit
	GI2n	GI1n		
1	0	0	Ssift1	Slimt1
2	0	1	Ssift2	Slimt2
3	1	0	Ssift3	Slimt3
4	1	1	Ssift4	Slimt4

S command data (spindle speed data) while "Spindle gear shift" (SSFTn) signal is ON can be determined from the formula shown below.

For example, if the "Spindle gear selection code m" (GImn) is the 1st stage (GI1n=OFF, GI2n=OFF), the spindle rotation speed data is as follows:

$$\text{Spindle rotation speed (Motor rotation speed)} = \frac{\text{Ssift1}}{\text{Slimt1}} \times \text{Maximum motor rotation speed}$$

Actual value is as follows:

Spindle command final data (SBINn) = Ssift1 / Slimt1 * 4095

When the spindle command final data (SBINn) is "4095", the rotation speed of the motor becomes maximum.

Con-tact	Signal name	Signal ab-breviation		1st spin-dle	2nd spin-dle	3rd spin-dle	4th spin-dle	5th spin-dle	6th spin-dle	7th spin-dle
A	SPINDLE ORIENTATION	SORCn		YD36	YD66	YD96	YDC6	YDF6	YE26	YE56

[Function]

This signal is used to run the spindle motor at low speed when executing mechanical orientation (Note) during spindle control.

<Supplement>

Since most spindle drive/control units recently marketed are equipped with spindle orientation function, and therefore this signal is rarely used for mechanical orientation. The signal (SORCn) is used for application such as rotating the spindle by constant rotation speed.

(Note) The mechanical orientation assumes to operate the orientation by performing as follows.

(1) Rotate the spindle at low speed.

(2) It detects when the spindle has reached the area where such as proximity switch is used and then stops the spindle. The spindle stops after the speed is slowed to some extent.

(3) The position (the orientation position) is decided by hitting the pin against the spindle under the status of (2).

[Operation]

When the signal (SORCn) turns ON, spindle speed is changed to the low speed previously set by parameter.
It should be noted that "Spindle stop" (SSTPn) signal must be ON to use the signal (SORCn). Together with this signal (SORCn), the forward run signal or the reverse run signal is required.

The table below shows the relationship between the oriented spindle speed and the "Spindle gear selection code m" (GImn) signal.

Gearstage	Spindle gearselection codesignal		Orientantion spindle speed	Spindle speedlimit
	GI2n	GI1n		
1	0	0	SORI	Slimt1
2	0	1		Slimt2
3	1	0		Slimt3
4	1	1		Slimt4

Spindle speed data while "Spindle orientation" (SORCn) signal is ON can be determined from the formula shown below. When "Spindle gear selection code m" (GImn)" signal combination is GI2n=0 and GI1n=1, the spindle rotation speed data is as follows:

$$\text{Orientation spindle speed data (Motor rotation speed)} = \frac{\text{SORI}}{\text{Slimt2}} \times \text{Maximum motor rotation speed}$$

Actual spindle rotation speed is as follows:

Spindle command final data (SBINn) = SORI / Slimt2 * 4095

When the spindle command final data (SBINn) is "4095", the motor becomes the maximum rotation speed.

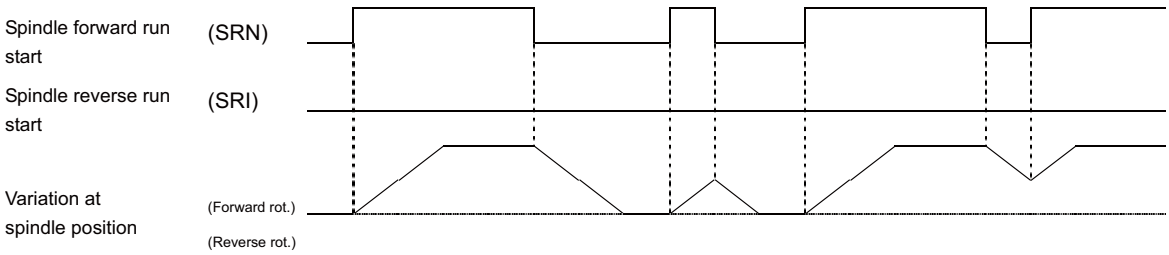
Con-tact	Signal name	Signal ab-breviation		1st spin-dle	2nd spin-dle	3rd spin-dle	4th spin-dle	5th spin-dle	6th spin-dle	7th spin-dle
A	SPINDLE FORWARD RUN START	SRNn		YD38	YD68	YD98	YDC8	YDF8	YE28	YE58

[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 starts running at speed specified by S command when the signal (SRNn) is turned ON.
When the signal is turned OFF, spindle motion decelerates and stops.
When the "Spindle forward run start" (SRNn) signal is turned OFF during acceleration of spindle forward rotation, the acceleration will be interrupted and the spindle will decelerate to stop immediately.
When the "Spindle forward run start" (SRNn) signal is turned ON during deceleration to stop of spindle forward rotation, the spindle deceleration will be interrupted and the machining will start immediately.



(1) Spindle decelerates to stop if "Spindle forward run start" (SRNn) signal and "Spindle reverse run start" (SRIn) signal are turned ON at the same time. To resume forward run, both signals OFF once and then turn the "Spindle forward run start" signal ON.
(2) The operation may stop during forward run due to emergency stop, spindle alarm or resetting. Turn the forward run signal OFF and ON once after the "Servo ready completion " (SA) signal turns ON.
(3) The motor will not run if the S command data is 0. The motor will run at the corresponding rotation speed when the S command data changes.
(4) When "Spindle orientation command" signal (ORCn) is turned ON at the same as "Spindle forward run start" signal (SRNn) is turned ON, priority is given to the former signal.
(5) Servo ON command (SRVn) of the spindle control input signal has to controlled at the CNC side so that it will turn ON when starting the spindle rotation and OFF when decelerating to stop.

[Related signals]

(1) Spindle reverse run start (SRIn)
(2) Spindle orientation command (ORCn)

Con-tact	Signal name	Signal ab-breviation		1st spin-dle	2nd spin-dle	3rd spin-dle	4th spin-dle	5th spin-dle	6th spin-dle	7th spin-dle
A	SPINDLE REVERSE RUN START	SRIn		YD39	YD69	YD99	YDC9	YDF9	YE29	YE59

[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).

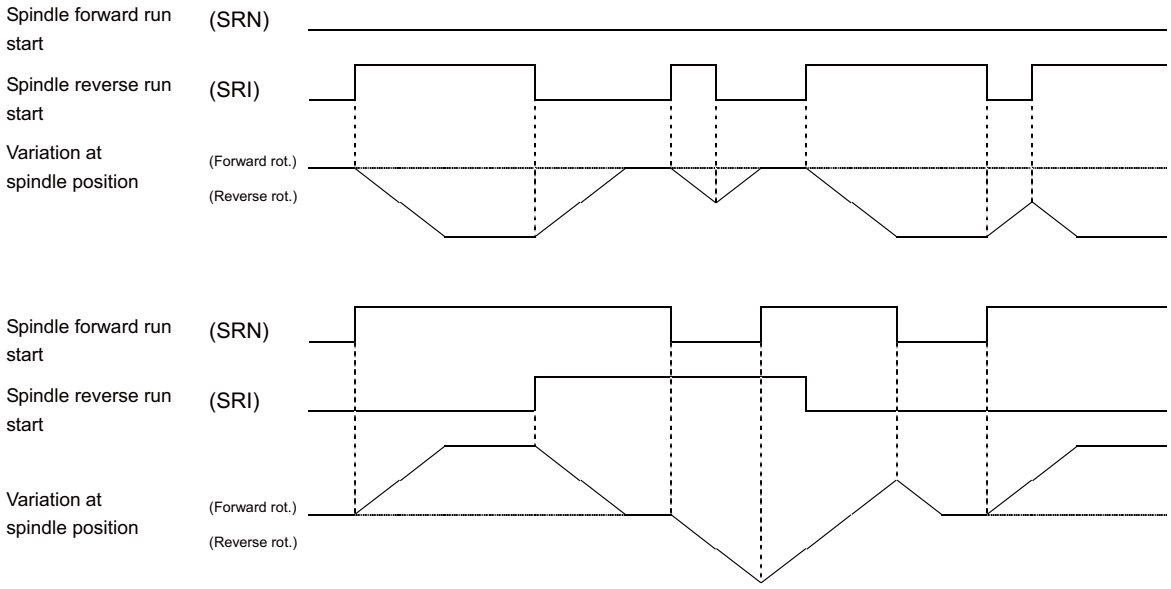
[Operation]

Spindle starts running at speed specified by S command when the signal (SRIn) is turned ON. (The operation with "Spindle reverse run start" (SRIn) signal is the same as one with "Spindle forward run start" (SRNn) except for its rotation direction.)

When the signal is turned OFF, spindle motion decelerates and stops.

When the "Spindle reverse run" (SRIn) signal is turned OFF during acceleration of spindle reverse rotation, the acceleration will be interrupted and the spindle will decelerate to stop immediately.

When the "Spindle reverse run" (SRIn) signal is turned ON during deceleration to stop of spindle reverse rotation, the spindle deceleration will be interrupted and the machining will start immediately.



(1) Spindle decelerates to stop if "Spindle reverse run start" (SRIn) signal and "Spindle forward run start" (SRNn) signal turn ON at the same time. To resume reverse run, both signals OFF once and then turn the "Spindle reverse run start" signal ON.

(2) The operation may stop during reverse run due to emergency stop, spindle alarm or resetting. Turn the reverse run signal OFF and ON once after the "Servo ready completion" (SA) signal turns ON.

(3) The motor will not run if the S command data is 0. The motor will run at the corresponding rotation speed when the S command data changes.

(4) When "Spindle orientation command" (ORCn) signal is turned ON at the same time "Spindle reverse run start" (SRIn) signal is turned ON, priority is given to the former signal.

(5) Servo ON command (SRVn) of the spindle control input signal has to controlled at the CNC side so that it will turn ON when starting the spindle rotation and OFF when decelerating to stop.

[Related signals]

(1) Spindle forward run start (SRNn)

(2) Spindle orientation command (ORCn)

Contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle	4th spindle	5th spindle	6th spindle	7th spindle
A	SPINDLE FORWARD RUN INDEX	WRNn		YD3C	YD6C	YD9C	YDCC	YDFC	YE2C	YE5C

[Function]

This signal is used for the forward run index in multi-point indexing.

[Operation]

(1) Multi-point indexing

(a) This signal turns ON after the "Spindle in-position" (ORAOn) signal is output.

(b) Continuous indexing can be carried out by turning this signal ON and OFF while the "Spindle orientation command" (ORCn) signal is ON.

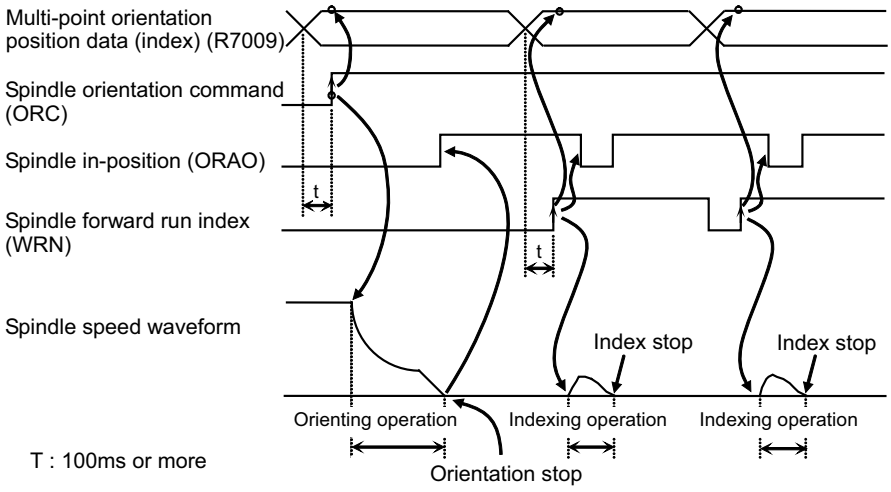
(c) If this signal is turned ON before the "Spindle orientation command" (ORCn) signal is turned ON and the "Spindle in-position" (ORAOn) signal is output, first the "Spindle orientation command" (ORCn) signal will turn ON, and the orientation will be completed at the multi-point orientation position data 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 orientation command" (ORCn) turns ON and this signal turns ON, the indexing operation will not be carried out.

(d) The index position command value is read in at the rising edge of this signal. Thus, even if the index position command value is changed after this signal is input, the stop position will not change.

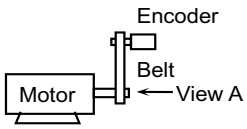
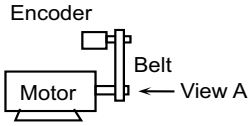
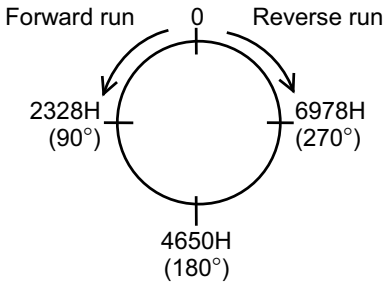
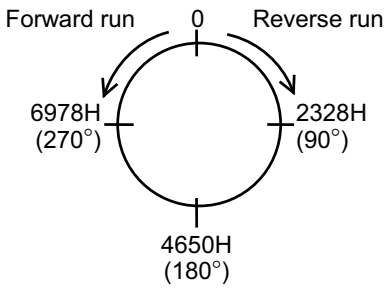
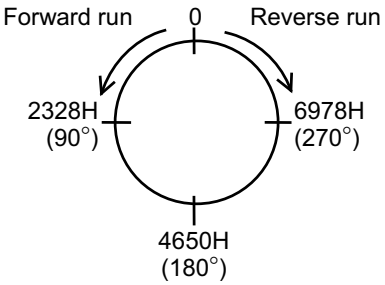
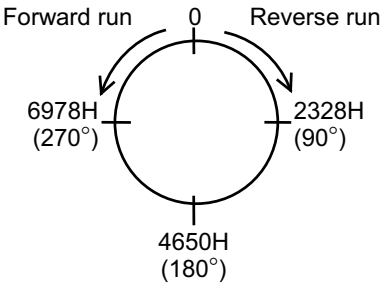
(e) Even if this signal is turned OFF while the "Spindle orientation command" (ORCn) is ON, the spindle will continue to stop at the position before this signal was turned OFF. Even if this signal is turned OFF during the indexing operation, the spindle will stop at the position command value read at the rising edge of this signal.

(f) If the stop point and index position command value are close (within the in-position range), the "Spindle in-position" (ORAOn) signal may not turn OFF and the indexing may be carried out.

(g) If the "Spindle orientation command" (ORCn) signal is turned OFF during indexing or when stopped, the servo lock will turn OFF and the motor will coast. "Spindle orientation command" (ORCn) must be carried out again when executing indexing again.



[Indexing operation according to encoder installation direction]

	Case 1	Case 2
Installation method		
Indexing		
Orientation		

(Note) Case 1 above applies when using the motor built-in encoder with Z-phase.

[Related signals]

(1) Multi-point orientation position data
(2) Spindle in-position (ORAOn)
(3) Spindle orientation command (ORCn)

Con-tact	Signal name	Signal ab-breviation		1st spin-dle	2nd spin-dle	3rd spin-dle	4th spin-dle	5th spin-dle	6th spin-dle	7th spin-dle
A	SPINDLE REVERSE RUN IN-DEX	WRIn		YD3D	YD6D	YD9D	YDCD	YDFD	YE2D	YE5D

[Function]

This signal is used for the spindle reverse run index in multi-point indexing.

[Operation]

The operation is the same as forward run indexing, except that the direction is different. Refer to the section on "Spindle forward run index".

[Related signals]

(1) Spindle forward run index (WRNn)

Contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle	4th spindle	5th spindle	6th spindle	7th spindle
A	SPINDLE ORIENTATION COMMAND	ORCn		YD3E	YD6E	YD9E	YDCE	YDFE	YE2E	YE5E

[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 orientation command" signal (ORCn) 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 (ORAOn) will be output, and orientation will stop.

During oriention spindle stop, the control system is under "servo lock" condition. Servo lock is released when the signal (ORCn) is turned OFF. When servo lock must be maintained, the signal, therefore, should be kept turned ON.

The encoder or proximity method can be used for orientation.

The orientation rotation direction is determined with the parameters.

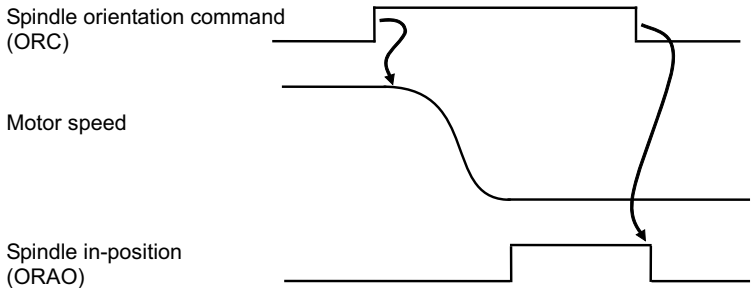
The orientation stop position is determined by the Z-phase for the encoder method, and by the sensor installation position for the proximity method. The stopping position can be changed with the following items when using the encoder method.

(1) By parameters (position shift amount)

(2) By the value of multi-point orientation position data

The value of multi-point orientation position data is added to the parameters.

The timing chart for basic orientation is shown below.



(Note 1) The "Spindle orientation command" (ORCn) takes precedence over the forward run (SRNn) and reverse run (SRIn) commands.

(Note 2) This signal is valid only for systems that are high-speed serial connected with the spindle controller.

[Related signals]

(1) Multi-point orientation position data

(2) Spindle in-position (ORAOn)

Con-tact	Signal name	Signal ab-breviation		1st spin-dle	2nd spin-dle	3rd spin-dle	4th spin-dle	5th spin-dle	6th spin-dle	7th spin-dle
A	L COIL SELECTION	LRSLn		YD3F	YD6F	YD9F	YDCF	YDFF	YE2F	YE5F

[Function]

This signal is used to select the low-speed coil in the spindle coil changeover function.

[Operation]

The high-speed coil and low-speed coil are changed over only with the "L coil selection" (LRSLn) in the 2-step coil changeover specification.

(Note) The coil is not changed over during the position loop control mode even if this signal is changed.The coil selected immediately before the position loop control mode is entered is retained.

(1) 2-step coil changeover

Selected coil	L coil selection(LRSLn)	In L coil selected(LCSAn)
High-speed (H)	OFF	OFF
Low-speed (L)	ON	ON

[Related signals]

(1) In L coil selected (LCSAn)

Con-tact	Signal name	Signal ab-breviation		1st spin-dle	2nd spin-dle	3rd spin-dle	4th spin-dle	5th spin-dle	6th spin-dle	7th spin-dle
A	SPINDLE TORQUE LIMIT m	TLmn		YD45 - D47	YD75 - D77	YDA5 - DA7	YDD5 - DD7	YE05 - E07	YE35 - E37	YE65 - E67

[Function]

This signal is issued to the high-speed serial connection specification spindle controller (spindle drive). When the signal turns ON, spindle motor torque is reduced temporarily.

The signal is used in mechanical oriented spindle stop, or gear shift.

[Operation]

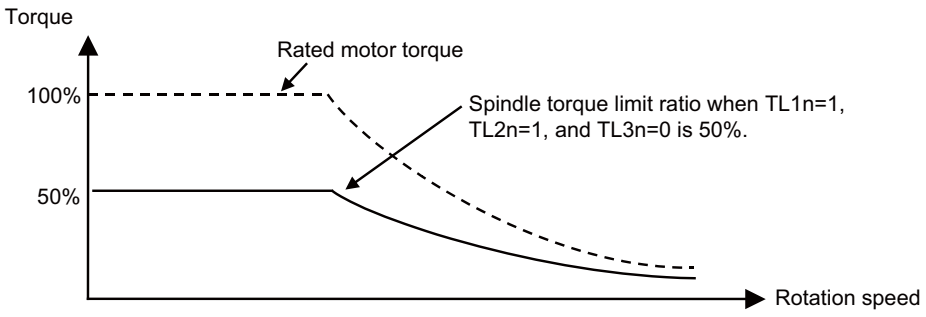
"Spindle torque limit 1 to 3" (TL1n to TL3n) are provided as spindle torque limit signals.

Spindle torque limit ratio is set by spindle parameters.

Spindle torque limit ratio is determined depending on the combination of Spindle torque limit 1 to 3 (TL1n to TL3n), and the output torque will drop accordingly.

Signal Selection	Spindle torque limit (TL1n)	Spindle torque limit (TL2n)	Spindle torque limit (TL3n)	Note
Spindle torque limit invalid	0	0	0	
Spindle torque limit level 1	1	0	0	Limits with value of the spindle parameter SP065
Spindle torque limit level 2	0	1	0	Limits with value of the spindle parameter SP066
Spindle torque limit level 3	1	1	0	Limits with value of the spindle parameter SP067
Spindle torque limit level 4	0	0	1	Limits with value of the spindle parameter SP068

(Example) When TL1n=1,TL2n=1,TL3n=0 and SP067=50



(Note 1) This signal is valid only for systems that are connected with the spindle controller via high-speed serial interface.

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis
A	SPINDLE MULTI-STEP MONI-TOR REQUEST	SMSORn		YD49	YD79	YDA9	YDD9	YE09	YE39	YE69

[Function]

This signal is used to execute the multi-step speed monitor for the control axes.

This signal can be used only when "#21162 mulstepssc Multi-step speed monitor enabled" is set to "1".

[Operation]

When this signal turns ON, NC operates as follows.

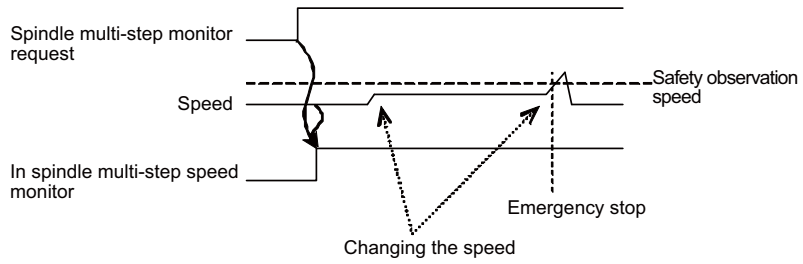
(1) Checks consistency of speed monitor parameters.
(2) Checks if NC's speed monitor parameters match with the speed monitor parameters sent to the drive unit.
(3) Notifies a speed monitor command to the drive unit.
(4) Executes the speed monitor function on NC.
(5) Turns the "Speed monitor door open possible" signal ON when receiving the "In speed monitor mode" signal from the drive unit.

The followings are monitored while the multi-step speed monitor function is executed.

Item	Details
Command speed monitoring	When a command speed that NC outputs to the drive unit exceeds a safety speed set with a parameter (Note), an emergency stop occurs.
Feedback speed monitoring	When a motor rotation speed sent from the drive unit to NC exceeds a safety rotation speed set with the parameter (Note), an emergency stop occurs.
Feedback position monitoring	When a difference between feedback position sent from the drive unit to NC and a position commanded by NC is large, an emergency stop occurs.

(Note) "Multi-step speed monitor input" (SMSOMImn) selects which parameter to use from "#3141 spsscfeed1 Safty observation speed 1" to "#3144 spsscfeed4 Safty observation speed 4".

[Timing chart]



[Caution]

(1) Always make sure to confirm deceleration speed of the spindle before turning this signal ON.Turning the signal ON without decelerating the speed will cause the safety observation warning due to the FB speed exceeding the monitoring speed. The speed monitor mode will not be entered in the mean time.
(2) Turning this signal ON while a parameter error occurs will not start the speed monitor. Set the parameter to appropriate value before turning the signal ON.

[Related signals]

(1) In spindle multi-step speed monitor (SMSOEn)
(2) Spindle multi-step speed monitor mode input (SMSOMImn)
(3) Spindle multi-step speed monitor mode output (SMSOMOmn)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis
A	SPINDLE MULTI-STEP SPEED MONITOR MODE INPUT m	SMSO-MImn		YD4A - D4B	YD7A - D7B	YDAA - DAB	YDDA - DDB	YE0A - E0B	YE3A - E3B	YE6A - E6B

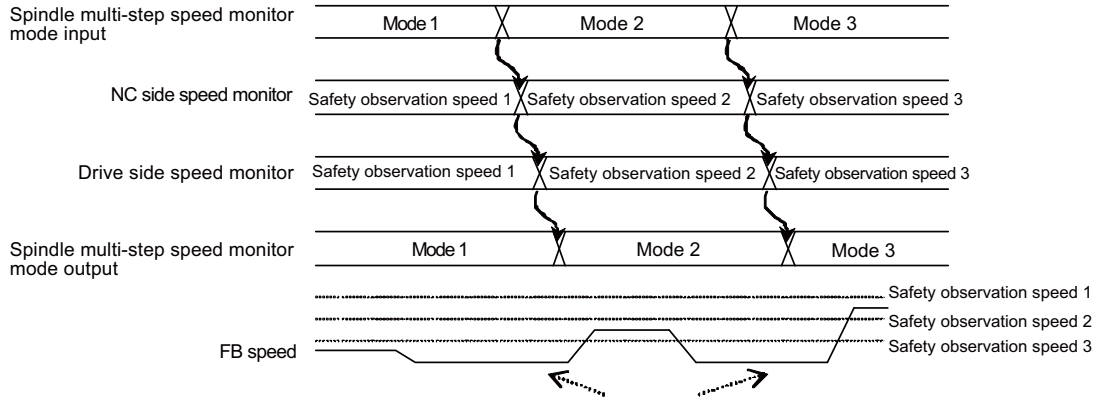
[Function]

This signal designates which speed monitor parameter (speed monitor mode) is used for the speed monitor in the multi-step speed monitoring.

Spindle multi-step speed monitor mode input		Mode to be selected	Corresponding safety observation speed parameter
SMSOMI2n	SMSOMI1n		
0	0	1	#3141 spsscfeed1
0	1	2	#3142 spsscfeed2
1	0	3	#3143 spsscfeed3
1	1	4	#3144 spsscfeed4

[Operation]

When these signals' state has been changed, the safety observation speed of the designated mode will be transferred to the drive and the "Spindle multi-step speed monitor mode output" (SMSOMOmn) signals' state will also be changed. (It will be changed even when "In spindle multi-step speed monitor" (SMSOEn) is OFF.)

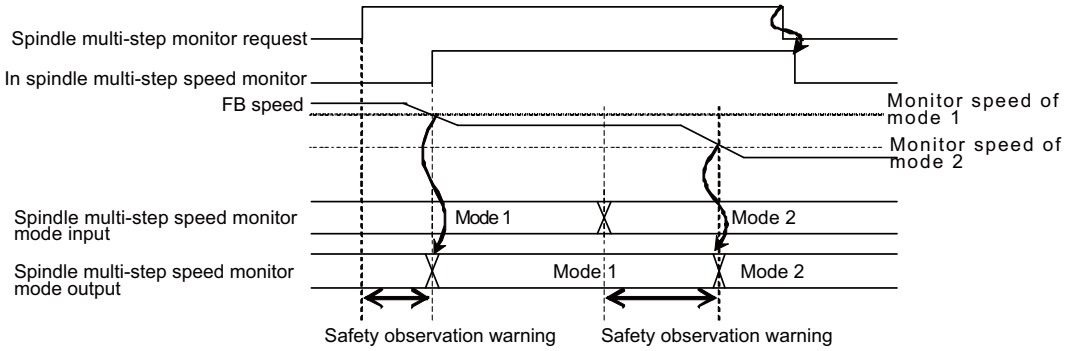


* When changing the mode, be sure to decelerate before chaging it.

[Caution]

(1) Before changing these signals' state while "In multi-step speed monitor" is ON, be sure to decelerate the spindle below the monitor speed of the mode to be changed. When the signals' state has been changed before deceleration starts, the safety observation warning will be output until the speed decelerates below the monitor speed of the mode to be changed, and the speed monitor mode will not be changed in the meantime.

(2) Do not open the door before the "Spindle multi-step speed monitor mode output" (SMSOMOmn) signals for all axes in the door are changed to the desired mode, even when the "In spindle mult-step speed monitor" (MSOEn) signals are ON for all axes in the door.



[Related signals]

(1) Spindle multi-step speed monitor request (SMSORn)

(2) In spindle multi-step speed monitor (SMSOEn)

(3) Spindle multi-step speed monitor mode output (SMSOMOmn)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis
A	EXTERNAL AXIS SPEED CLAMP	ESSCn		YD4F	YD7F	YDAF	YDDF	YE0F	YE3F	YE6F

[Function]

The spindle speed will be clamped with the speed which is designated with the parameter.

[Operation]

The rotating speed will be controlled with the smaller value of either command speed or clamp speed (the parameter setting value "#3119 ext_clp") by turning the external axis speed clamp signal ON.

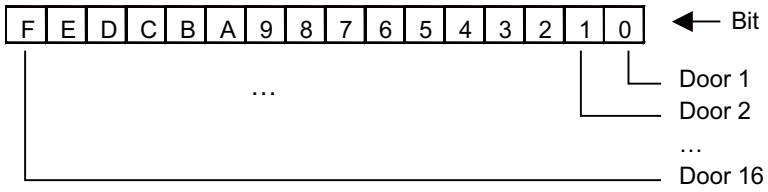
Do not switch the state of the external axis speed clamp while the spindle is in operation.

4.13 Data Type Output Signals : System Command (PLC CPU->CNC CPU)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	SPEED MONITOR MODE	SMOD		G+209
				R2309

[Function]

This signal executes speed monitor function for the control axis for which a valid door No. is selected with parameter "#2118 SscDrSel" and the spindle for which a valid door No. is selected with parameter "#3071 SscDrSelSp".
This signal is ignored when "#21162 mulstepssc Multi-step speed monitor valid" is set to "1"
The door No. corresponds to the following bits.



[Operation]

CNC performs as follows by turning the speed monitor signal ON.
(1) Checks consistency of speed monitor parameters
(2) Checks if CNC's speed monitor parameter matches with the speed monitor parameter sent to servo drive unit and spindle drive unit.
(3) Notifies speed monitor command to the drive unit
(4) Executes the speed monitor function on CNC
(5) Turns ON Speed monitor door open possible signal when CNC receives Speed monitor mode signal from the drive unit

The followings are performed while the speed monitor function is executed.

Item	Details
Monitoring command speed	When a command speed CNC outputs to the drive unit exceeds a safety speed set with parameter, an emergency stop occurs.
Monitoring feed back speed	When a motor rotation speed sent to CNC from the drive unit exceeds a safety rotation speed set with parameter, an emergency stop occurs.
Monitoring feed back position	When a difference between feedback position sent to CNC from the drive unit and a position commanded by CNC is large, an emergency stop occurs.

[Caution]

(1) Be sure to turn ON the speed monitor mode signal (SOMD) after confirming deceleration of all axes.
If the speed monitor mode signal (SOMD) is turned ON without deceleration, and the motor rotation speed exceeds the set speed, a speed monitor alarm will occur, resulting in an emergency stop state.Then, power of the drive section will be shut off.
(2) Turn OFF the speed monitor mode signal after confirming the door lock is OFF.
(3) Even if the speed monitor mode signal (SOMD) is turned ON while parameter error is output, speed monitoring is not initiated. Set the parameter with appropriate value, and then turn ON the speed monitor mode signal (SOMD).

[Related signals]

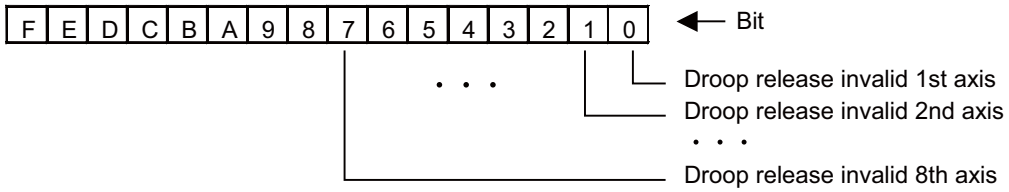
Speed monitor door open possible (SMODEN)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	PLC AXIX DROOP RELEASE IN-VALID AXIS	SMOD		G+210
				R2310

[Function] [Operation]

The PLC axis for which the droop should not be released is set when current limit changeover (ILCn) is executed.

The axis corresponds to the following bits:



DROOP RELEASE INVALID AXIS	Operation
0	Release the droop and adjust the command value to the FB position when current limit changeover is executed.
1	During the current limit changeover, the droop will not be released.

[Caution]

(1) This signal is also valid at the droop release request.

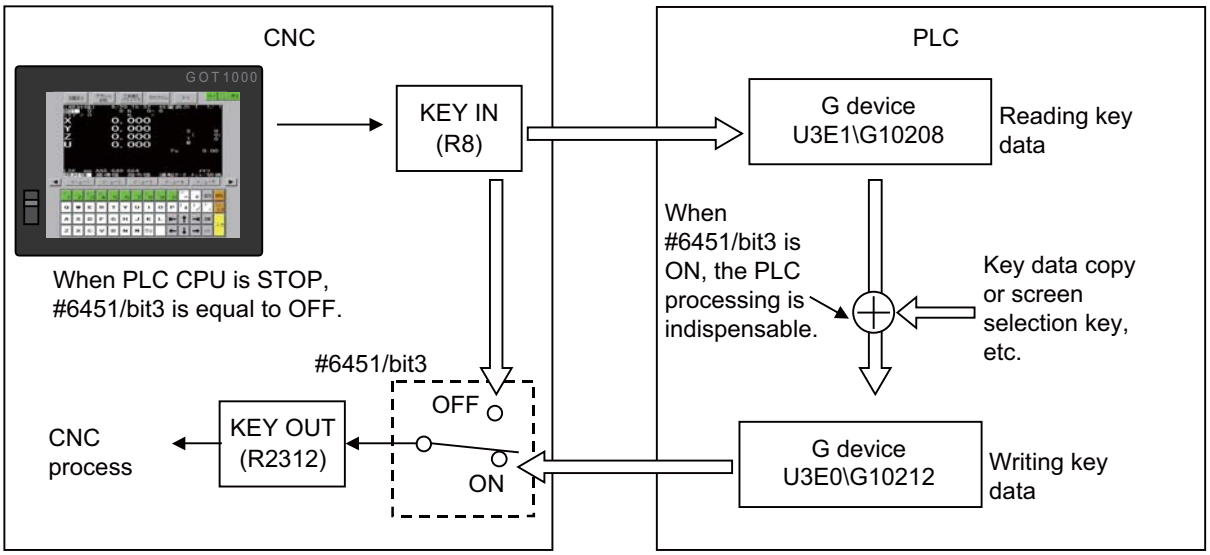
(2) This signal is invalid if the current does not reach its limit at the current limit changeover.

Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	KEY OUT			G+212
				R2312

[Function]

When this signal is used, key data can be entered on the PLC side instead of the CNC keyboard.

[Operation]



Process of the key data changing/issuing by the PLC program is as follows.

(1) Parameter "#6451/bit3" is ON.
(2) The key data is set to "KEY IN".
(3) The PLC refers to "Reading key data".
(4) Either of the following processes is carried out. (Data is written in "Writing key data".)
Usually, (a) is processed, (b) and (c) are processed if necessary.)
(a) Always copies "Reading key data" to "Writing key data" without change.
(b) Data that is rewritten according to the content of "Reading key data" is written to "Writing key data".
When deleting the key data, etc.
(c) The substitute of the operator
When the alarm is generated, the key data which selects the alarm diagnosis screen is written in "Writing key data", etc.
(5) CNC processes the valid key data according to the contents of "KEY OUT".

[Caution]

(1) When the key data is rewritten from the PLC, maintain the key data at 50ms or more.
(2) When the key data is rewritten by the PLC program, parameter "#6451/bit3" is turned ON. It is necessary to write the key data to the PLC program when turning ON.
The key data does not pass PLC program when turning OFF.

[Related signals]

KEY IN

Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	USER MACRO INPUT#1032 (PLC -> Controller)			G+224 - G+225
				R2324 - R2325

[Function]

This is interface function used to coordinate user PLC to user macro program.

[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 G+224/R2324 bit0	#1016	1	Register G+225/R2325 bit0
#1001	1	Register G+224/R2324 bit1	#1017	1	Register G+225/R2325 bit1
#1002	1	Register G+224/R2324 bit2	#1018	1	Register G+225/R2325 bit2
#1003	1	Register G+224/R2324 bit3	#1019	1	Register G+225/R2325 bit3
#1004	1	Register G+224/R2324 bit4	#1020	1	Register G+225/R2325 bit4
#1005	1	Register G+224/R2324 bit5	#1021	1	Register G+225/R2325 bit5
#1006	1	Register G+224/R2324 bit6	#1022	1	Register G+225/R2325 bit6
#1007	1	Register G+224/R2324 bit7	#1023	1	Register G+225/R2325 bit7
#1008	1	Register G+224/R2324 bit8	#1024	1	Register G+225/R2325 bit8
#1009	1	Register G+224/R2324 bit9	#1025	1	Register G+225/R2325 bit9
#1010	1	Register G+224/R2324 bit10	#1026	1	Register G+225/R2325 bit10
#1011	1	Register G+224/R2324 bit11	#1027	1	Register G+225/R2325 bit11
#1012	1	Register G+224/R2324 bit12	#1028	1	Register G+225/R2325 bit12
#1013	1	Register G+224/R2324 bit13	#1029	1	Register G+225/R2325 bit13
#1014	1	Register G+224/R2324 bit14	#1030	1	Register G+225/R2325 bit14
#1015	1	Register G+224/R2324 bit15	#1031	1	Register G+225/R2325 bit15

System variable	Points	Interface input signal	
#1032	32	Register G+224/R2324, G+225/R2325	This correspondence table shows theexample for file registers G+224/R2324and G+225/R2325.
#1033	32	Register G+226/R2326, G+227/R2327	
#1034	32	Register G+228/R2328, G+229/R2329	
#1035	32	Register G+230/R2330, G+231/R2331	

File registers G+224/R2324 and G+225/R2325 correspond to system variables #1000 to #1031, and #1032 (32-bit data).

“User macro output #1132 to #1135 (Controller -> PLC)” and “User macro input #1032 to #1035 (PLC -> Controller)” each have both part system common signals and part system independent ones.

Setting the bit selection parameter #6454/bit0 selects part system common or part system independent.

Register Nos. when part system common/independent is selected

Bit selection parameter#6454/bit0	User macro output#1132 to #1135(Controller -> PLC)	User macro output#1032 to #1035(PLC -> Controller)
0: Part system common	G10224-G10231/R24-R31	G+224-G+231/R2324-R2331
1: Part system independent	G10370-G10977/R170-R777	G+370-G+977/R2470-R3077

[Related signals]

(1) User macro output #1132 to #1135 (Controller -> PLC) (Part system common)

(2) User macro output #1132 to #1135 (Controller -> PLC) (Part system independent)

(3) User macro input #1032 to #1035 (PLC -> Controller) (Part system common)

(4) User macro input #1032 to #1035 (PLC -> Controller) (Part system independent)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	USER MACRO INPUT #1033 (PLC -> Controller)			G+226 - G+227
				R2326 - R2327

[Function]

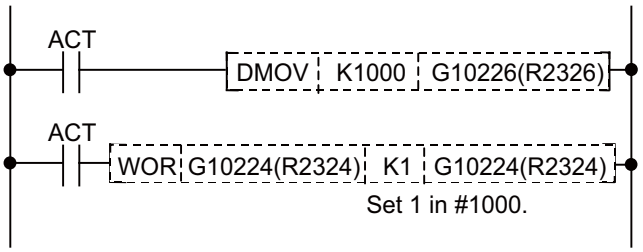
This provides interface function used to coordinate user PLC to user macro.

[Operation]

The data set in file registers Rn and Rn+1 with the user PLCs, can be referred to on the user macro side with the user macro system variables #1033.

(Example)

Sequence program



User macro program

```
IF [#1000 EQ 0] GOTO 100

#100 = #1033

N100
```

The #1033(G10226/R2326, G10227/R2327)data is read into #100 Other than when #1000 is set to 0.

[Related signals]

(1) User macro output #1132 to #1135 (Controller -> PLC)(Part system common)
(2) User macro output #1132 to #1135 (Controller -> PLC)(Part system independent)
(3) User macro input #1032 to #1035 (PLC -> Controller)(Part system common)
(4) User macro input #1032 to #1035 (PLC -> Controller)(Part system independent)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	USER MACRO INPUT #1034 (PLC -> Controller)			G+228 - G+229
				R2328 - R2329

[Function][Operation]

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

Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	USER MACRO INPUT #1035 (PLC -> Controller)			G+230 - G+231
				R2330 - R2331

[Function][Operation]

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

Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	PLC VERSION CODE			G+232 - G+235
				R2332 - R2335

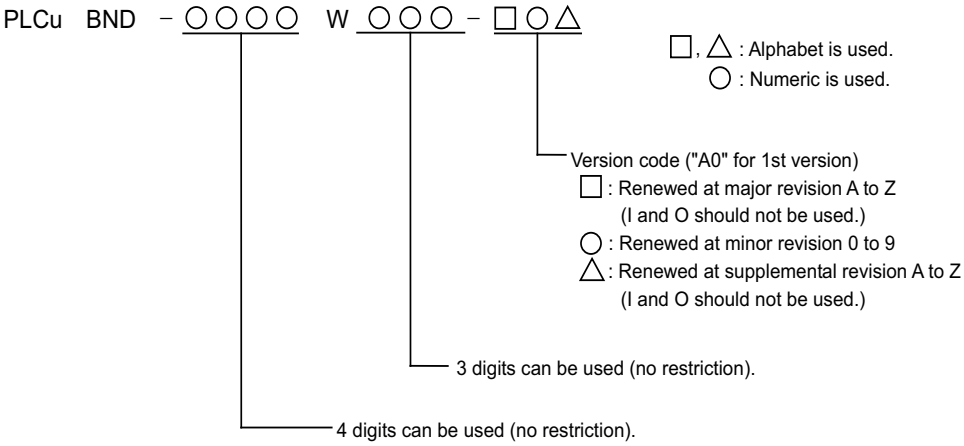
[Function]

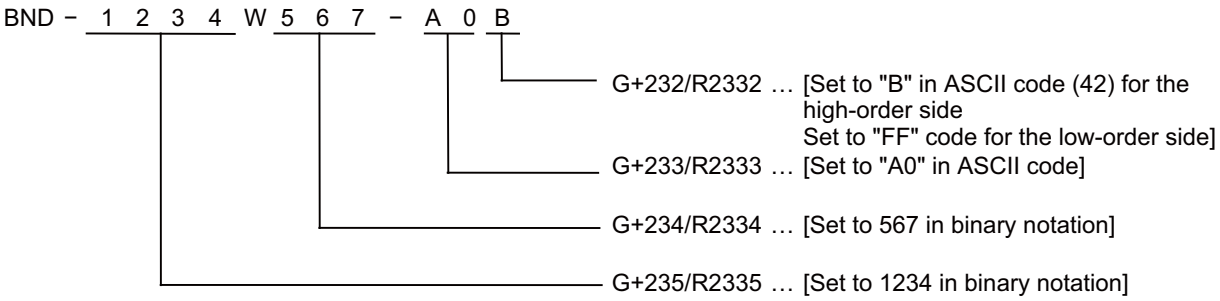
The user PLC version can be displayed with the software version that controls controller on the setting and display unit (communication terminal) DIAGNOSIS screen.

[Operation]

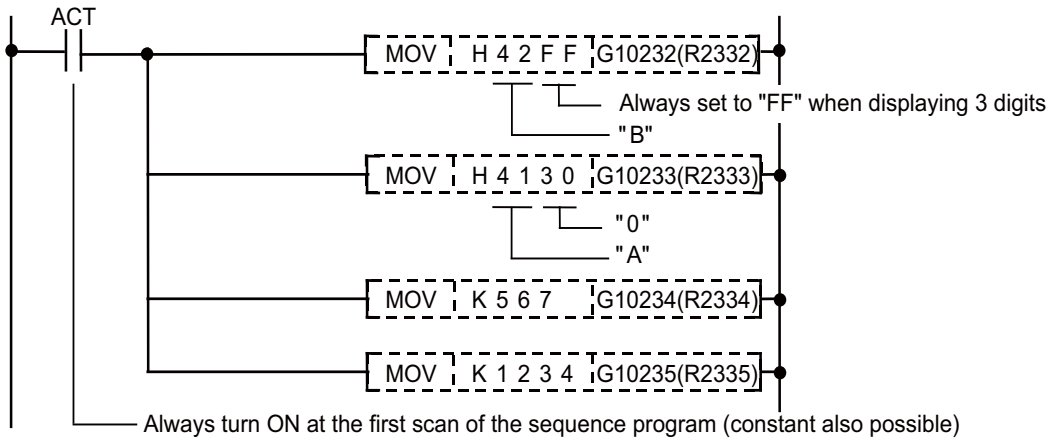
Characters to be displayed are placed in ASCII code.

<Display format>





(Program example)



Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	mTH AXIS INDEX			G+240 - G+255
				R2340 - R2355

[Function]

PLC I/F signal 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 signal corresponding to that will be changed. In that case, the PLC I/F signal's allocation of each axis is set randomly to make the PLC program in common with the I/F signal.

[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

X400 $1 1st axis	Y400 $1 1st axis
X420 $1 2nd axis	Y420 $1 2nd axis
X440 $2 1st axis	Y440 $2 1st axis

Axis index

G+240/R2340	0
G+241/R2341	0
G+242/R2342	0

1st part system 3 axes • 2nd part system 1axis

X400 $1 1st axis	Y400 $1 1st axis
X420 $1 2nd axis	Y420 $1 2nd axis
X440 $1 3rd axis	Y440 $1 3rd axis
X460 $2 1st axis	Y460 $2 1st axis

Axis index

G+240/R2340	0
G+241/R2341	0
G+242/R2342	4
G+243/R2343	3

Move 3rd axis to 4th axis.
Move 4th axis to 3rd axis.

Axis I/F after the allocation is changed with the axis index.

X400 $1 1st axis	Y400 $1 1st axis
X420 $1 2nd axis	Y420 $1 2nd axis
X440 $2 1st axis	Y440 $2 1st axis
X460 $1 3rd axis	Y460 $1 3rd axis

Contact	Signal name	Signal abbreviation		Common for part systems
-	SPINDLE SYNCHRONIZATION BASIC SPINDLE SELECTION			G+257
				R2357

[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, 3: 3rd spindle, 4: 4th spindle, 5: 5th spindle, 6: 6th 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.

Contact	Signal name	Signal abbreviation		Common for part systems
-	SPINDLE SYNCHRONIZATION SYNCHRONOUS SPINDLE SELECTION			G+258
				R2358

[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, 3: 3rd spindle, 4: 4th spindle, 5: 5th spindle, 6: 6th 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.

Contact	Signal name	Signal abbreviation		Common for part systems
-	SPINDLE SYNCHRONIZATION PHASE SHIFT AMOUNT			G+259
				R2359

[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]

(1) In spindle synchronization (SPSYN1)
(2) Spindle rotation speed synchronization completion (FSPRV)
(3) Spindle phase synchronization completion (FSPPH)
(4) Spindle synchronization (SPSY)
(5) Spindle phase synchronization (SPPHS)
(6) Spindle synchronous rotation direction (SPSDR)

Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	PLC VERSION CODE (METHOD 2)			G+260 - G+266
				R2360 - R2366

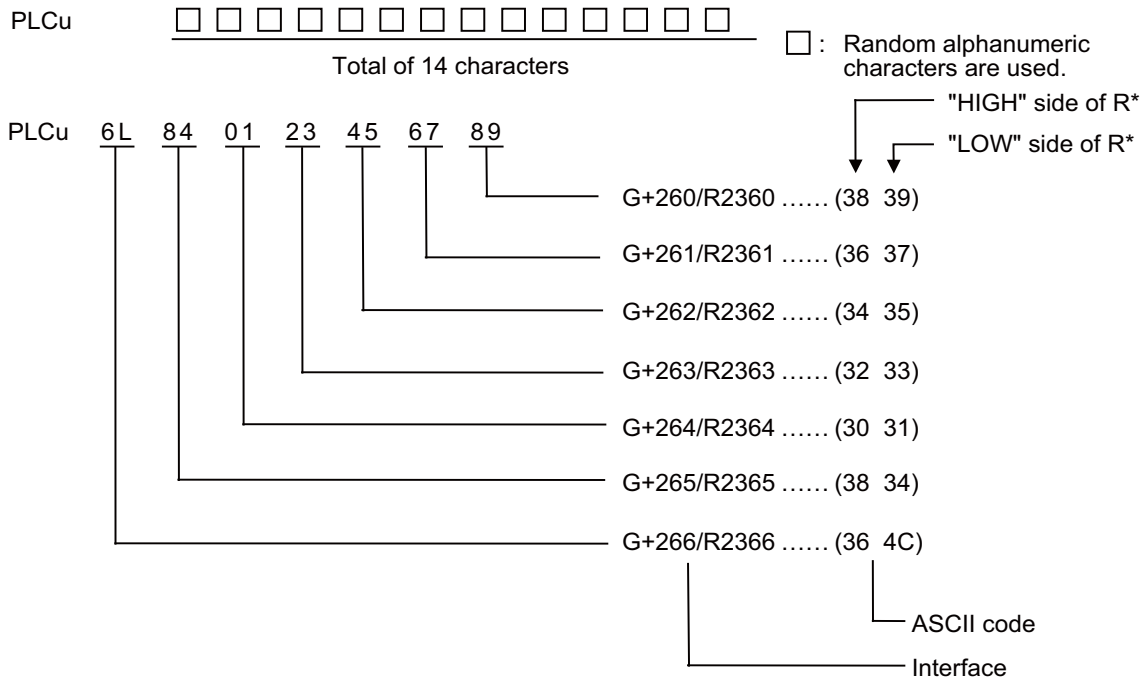
[Function]

This signal enables the user PLC version to be displayed, together with the software version controlling control unit, in the DIAGNOSIS screen of the setting display unit (communication terminal).

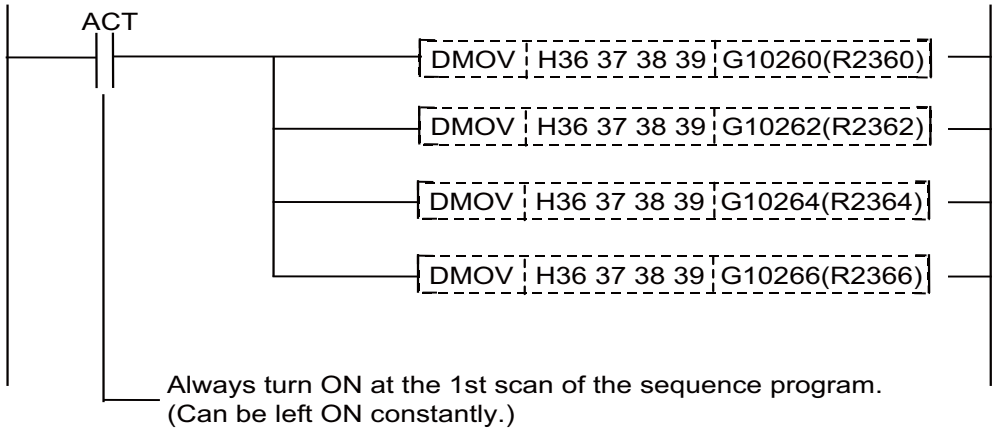
[Operation]

The ASCII code that corresponds to the character to be displayed in the version display interface is set.

<Display format and usage example>



(Program example)



Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	APLC OUTPUT DATA n			G+280 - G+289
				R2380 - R2389

[Function] [Operation]

This signal is an interface for sending data from PLC device to APLC C language module.

Contact	Signal name	Signalab-breviation		Common for part systems
-	GOT WINDOW DATACHANGE-OVER REQUEST			G+290 - G+291
				R2390 - R2391

[Function]

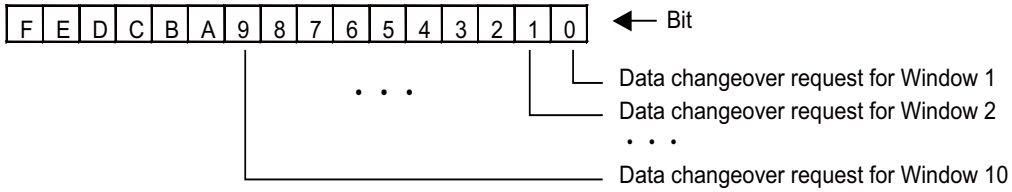
This signal notices that necessary command is set in command area.

[Operation]

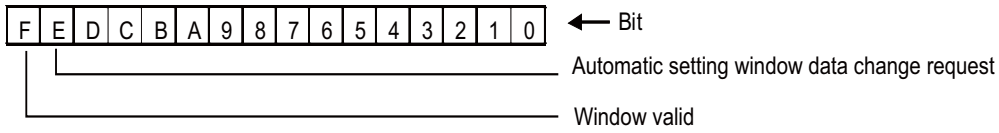
Turns ON when command data is changed.

(R2391/bitF is handled as window valid signal.)

<R2390>



<R2391>



Contact	Signal name	Signalab-breviation		Common for part systems
-	PLC SIDE DUAL SIGNAL MOD-ULE m	SU_PC m		G+2580 - G+2585
				R4450 - R4455

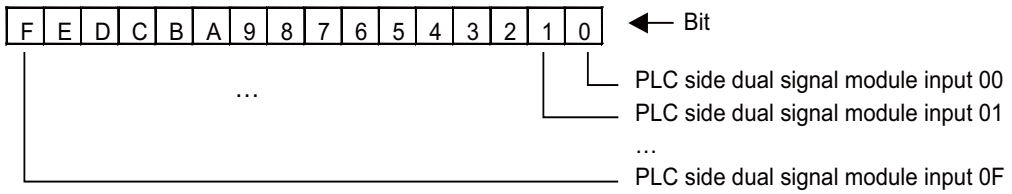
[Function]

This signal informs the CNC of the PLC side dual signal input status of the dual signal modules.

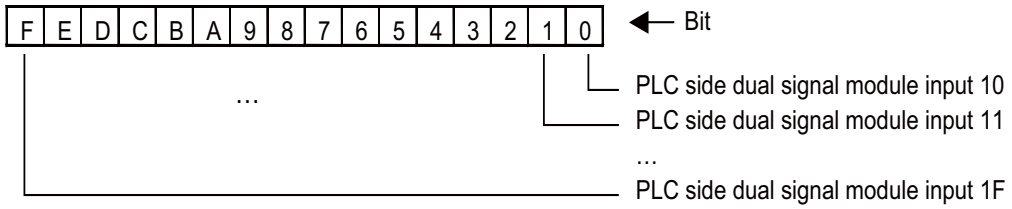
[Operation]

Each bit corresponds to the following signals. If this signal is ON, a corresponding signal bit turns ON.

<L side>



<H side>



[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

Contact	Signal name	Signalab-breviation		Common for part systems
-	PLC SIDE DUAL SIGNALER-ROR MODULE m	SU_PER m		G+2590 - G+2595
				R4460 - R4465

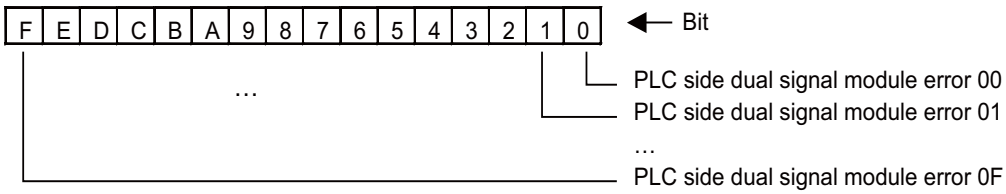
[Function]

This signal informs the comparison status of "PLC side dual signal input" in the dual signal module.The signal turned ON once holds the state until the controller power is turned ON again.

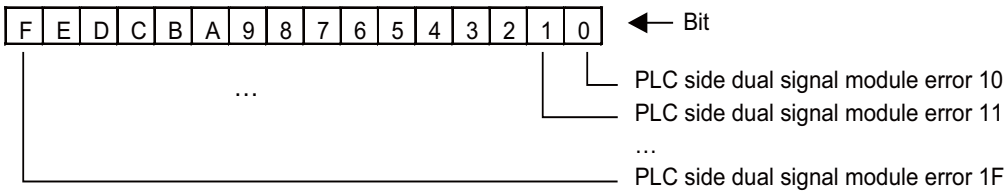
[Operation]

Each bit corresponds to the following signals. If this signal is ON, a corresponding signal bit turns ON.

<L side>



<H side>



[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

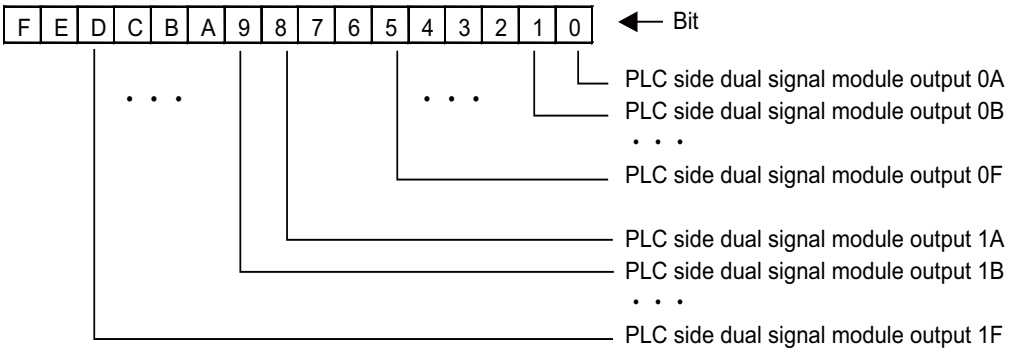
Contact	Signal name	Signalab-breviation		Common for part systems
-	PLC SIDE DUAL SIGNALOUT-PUT MODULE m	SU_PO m		G+2600 - G+2602
				R4470 - R4472

[Function]

This signal informs the PLC side dual signal output status of the dual signal module.

[Operation

Each bit corresponds to the following signals. If this signal is ON, a corresponding signal bit turns ON.



[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

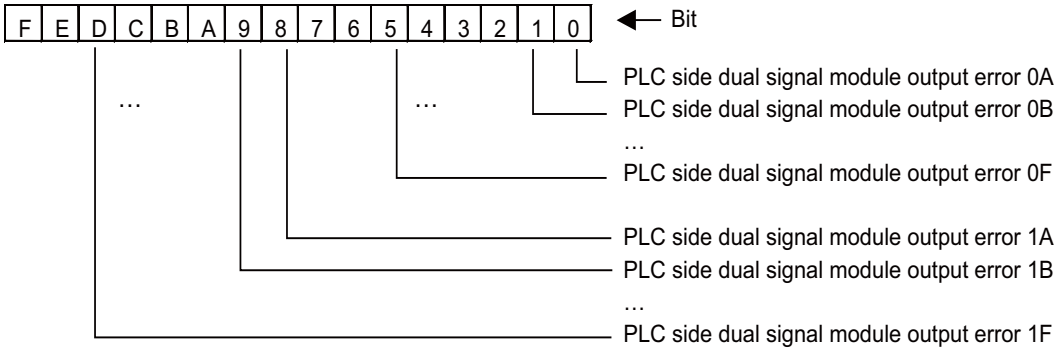
Contact	Signal name	Signalab-breviation		Common for part systems
-	PLC SIDE DUAL SIGNALOUT-PUT ERROR MODULE m	SU_POERm		G+2604 - G+2606
				R4474 - R4476

[Function]

This signal informs the comparison status between PLC side dual signal output and its input signal of the dual signal module. The signal turned ON once holds the state until the controller power is turned ON again.

[Operation]

Each bit corresponds to the following signals. If this signal is ON, a corresponding signal bit turns ON.



[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

Con-tact	Signal name	Signal ab-breviation		Common for part systems
-	PLC SIDE DUAL SIGNAL COM-PARE STATUS 2	SU_PST2		G+2609
				R4479

[Function]

This signal informs PLC side dual signal compare status to the CNC.

[Operation]

Each bit corresponds to the following signals:

bit0: Output off check error

An error is detected during the output off check.

bit1: Device test error detection 2

An error is detected during the check pattern 2 for the device test.

[Caution]

This device is dedicated to the monitor. Do not change the device value with PLC program. If it is changed, the dual signal compare ladder will not be executed correctly.

Contact	Signal name	Signalab-breviation		Common for part systems
-	PLC SIDE SAFETYCOMPARE ACTIVITYCHECK INFORMA-TION	SU_PLT		G+2610
				R4480

[Function]

This signal informs the CNC of the PLC side dual signal comparison activity check counter.

[Operation

To ensure that dual signal comparison is constantly done between the CNC and PLC CPUs, they perform activity check each other.

[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

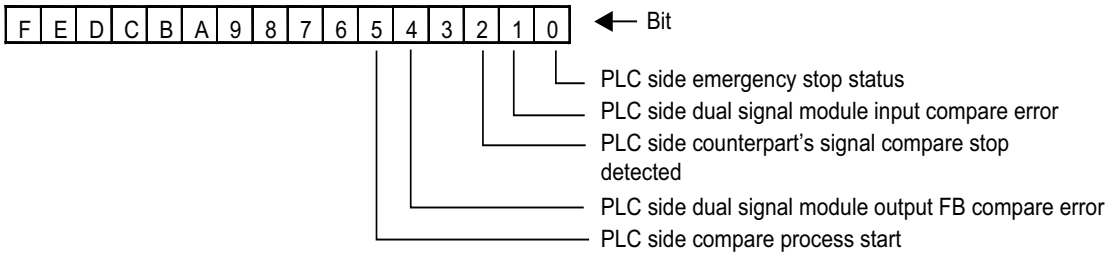
Contact	Signal name	Signalab-breviation		Common for part systems
-	PLC SIDE DUAL SIGNAL COM-PARE STATUS	SU_PST		G+2611
				R4481

[Function]

This signal informs the CNC of the PLC side dual signal comparison status.

[Operation]

Each bit corresponds to the following signals.



[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

Contact	Signal name	Signalab-breviation		Common for part systems
-	PLC SIDE HEAD G NO.	SU_NGDV		G+2612
				R4482

[Function]

This signal informs the CNC of the dual signal head G device No. that has been transmitted to the PLC.
This is for confirming that data has been correctly transmitted to the PLC.

[Operation]

The value set by the parameter " #26742 G Device TOP number" is normally set.

[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

Contact	Signal name	Signalab-breviation		Common for part systems
-	PLC SIDE DUAL SIGNAL COM-PARE MISMATCH ALLOWANCE TIME	SU_PDLY		G+2613
				R4483

[Function

This signal informs the CNC of the dual signal comparison mismatch allowance time of the dual signal module, which has been transmitted to the PLC. This is for confirming that data has been correctly transmitted to the PLC.

[Operation]

The value set by the parameter "#21142 SSU_Delay " is normally set.

[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

Contact	Signal name	Signalab-breviation		Common for part systems
-	PLC SIDE DUAL SIGNALHEAD DEVICE NO. m	SU_PDV m		G+2614 - G+2616
				R4484 - R4486

[Function]

This signal informs the CNC of the dual signal head device No. of the dual signal module, which has been transmitted to the PLC. This is for confirming that data has been correctly transmitted to the PLC.

[Operation]

The PLC is informed of the value set by the parameters "#21143 SSU_Dev1" to “#21145 SSU_Dev3”.

[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

Contact	Signal name	Signalab-breviation		Common for part systems
-	NO. OF DUAL SIGNALMOD-ULES ON PLC SIDE	SU_PNUM		G+2618
				R4488

[Function]

This signal informs the CNC of the number of dual signal modules, which has been transmitted to the PLC.This is for confirming that data has been correctly transmitted to the PLC.

[Operation]

The CNC is informed of the value set by the parameter "#21125 SSU_num”.

[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

Contact	Signal name	Signalab-breviation		Common for part systems
-	PLC SIDE SAFETYOPERATION STATUS	SU_POP		G+2620
				R4490

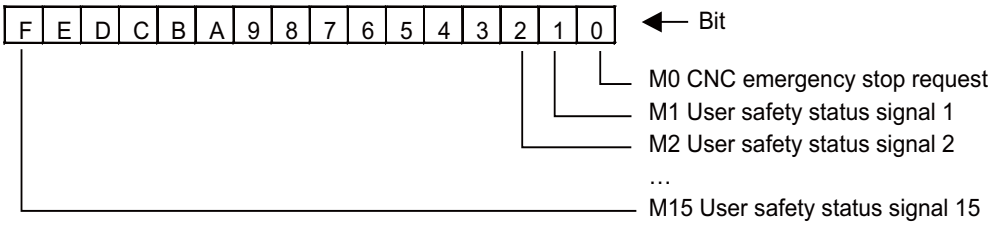
[Function]

This signal informs the CNC of the safety-related operation status that has been set by PLC side user ladder when dual signal comparison function is valid.

[Operation]

The CNC is informed of the safety-related operation status devices (M0 to M15) that have been set by PLCside user ladder.

Each bit corresponds to the following signals.



[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

4.14 Data Type Output Signals : Axis Command (PLC CPU->CNC CPU)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
-	EXTERNAL MACHINE COORDI-NATE SYSTEM COMPENSA-TION DATA			G+1000	G+1010	G+1020	G+1030	G+1040	G+1050	G+1060	G+1070
				R3100	R3110	R3120	R3130	R3140	R3150	R3160	R3170
				9th axis	**10th axis**	**11th axis**	**12th axis**	**13th axis**	**14th axis**	**15th axis**	**16th axis**
				G+1080	G+1090	G+1100	G+1110	G+1120	G+1130	G+1140	G+1150
				R3180	R3190	R3200	R3210	R3220	R3230	R3240	R3250

[Function] [Operation]

External machine coordinate system compensation is executed by setting compensation data (absolute amount) in the G device for each axis.

Thus, the compensation timing is when PLC CPU rewrites G device compensation data. Necessary condition, timing, etc., are set by PLC CPU.

The interface between PLC CPU and CNC is shown below.

G device File register	Details	G device File register	Details
G+1000	Compensation data 1st axis	G+1080	Compensation data 9th axis
R3100		R3180	
G+1010	Compensation data 2nd axis	G+1090	Compensation data 10th axis
R3110		R3190	
G+1020	Compensation data 3rd axis	G+1100	Compensation data 11th axis
R3120		R3200	
G+1030	Compensation data 4th axis	G+1110	Compensation data 12th axis
R3130		R3210	
G+1040	Compensation data 5th axis	G+1120	Compensation data 13th axis
R3140		R3220	
G+1050	Compensation data 6th axis	G+1130	Compensation data 14th axis
R3150		R3230	
G+1060	Compensation data 7th axis	G+1140	Compensation data 15th axis
R3160		R3240	
G+1070	Compensation data 8th axis	G+1150	Compensation data 16th axis
R3170		R3250	

(Note 1) File register Nos. correspond to CNC.

(Note 2) The delay to compensation is about (one PLC program scan + 15ms). However, smoothing time constant and servo follow delay are not contained.

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
-	THERMAL EXPANSION OFF-SET COMPENSATION AMOUNT			G+1002	G+1012	G+1022	G+1032	G+1042	G+1052	G+1062	G+1072
				R3102	R3112	R3122	R3132	R3142	R3152	R3162	R3172
				9th axis	**10th axis**	**11th axis**	**12th axis**	**13th axis**	**14th axis**	**15th axis**	**16th axis**
				G+1082	G+1092	G+1102	G+1112	G+1122	G+1132	G+1142	G+1152
				R3182	R3192	R3202	R3212	R3222	R3232	R3242	R3252

[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 expansion compensation amount" for details.

[Related signals]

Thermal expansion max. compensation amount

Thermal expansion compensation amount

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
-	THERMAL EXPANSION MAX. COMPENSATION AMOUNT			G+1003	G+1013	G+1023	G+1033	G+1043	G+1053	G+1063	G+1073
				R3103	R3113	R3123	R3133	R3143	R3153	R3163	R3173
				9th axis	**10th axis**	**11th axis**	**12th axis**	**13th axis**	**14th axis**	**15th axis**	**16th axis**
				G+1083	G+1093	G+1103	G+1113	G+1123	G+1133	G+1143	G+1153
				R3183	R3193	R3203	R3213	R3223	R3233	R3243	R3253

[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 "thermal expansion compensation amount" for details.

[Related signals]

Thermal expansion offset compensation amount
Thermal expansion compensation amount

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
-	EXTERNAL DECELERATION SPEED SELECTION			G+1004	G+1014	G+1024	G+1034	G+1044	G+1054	G+1064	G+1074
				R3104	R3114	R3124	R3134	R3144	R3154	R3164	R3174
				9th axis	**10th axis**	**11th axis**	**12th axis**	**13th axis**	**14th axis**	**15th axis**	**16th axis**
				G+1084	G+1094	G+1104	G+1114	G+1124	G+1134	G+1144	G+1154
				R3184	R3194	R3204	R3214	R3224	R3234	R3244	R3254

[Function]

When the external deceleration signal is valid, the external deceleration parameter for each axis is selected. This R register is valid when "1" is set to "#1239 set11/bit6 External deceleration axis compliance valid".

[Operation]

When external deceleration +(*EDTn) or external deceleration-(*EDTn) is valid, it is decelerated to the speed, which is set in "#2086 exdcax1 External deceleration speed 1", "#2161 exdcax2 External deceleration speed 2" to "#2165 exdcax6 External deceleration speed 6". The relationship between parameter and the setting value is as follows.

The external deceleration speed selection value	External deceleration speed (for each axis)
0	External deceleration speed 1 (#2086 exdcax1)
1	External deceleration speed 2 (#2161 exdcax2)
2	External deceleration speed 3 (#2162 exdcax3)
3	External deceleration speed 4 (#2163 exdcax4)
4	External deceleration speed 5 (#2164 exdcax5)
5	External deceleration speed 6 (#2165 exdcax6)
Other than the above.	External deceleration speed 1 (#2086 exdcax1)

[Related signals]

(1)External deceleration +(*+EDTn)
(2)External deceleration -(*-EDTn)

4.15 Data Type Output Signals : Part System Command (PLC CPU->CNC CPU)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	1ST CUTTING FEEDRATE OVERRIDE			G+300	G+400	G+500	G+600	G+700	G+800	G+900
				R2400	R2500	R2600	R2700	R2800	R2900	R3000

[Function]

When "Cutting feedrate override method selection method" (FVSn) is set to "file register method", override (0 to 300%, 1% increment) can be exerted on the cutting feedrate. Desired value is set to file register (R) in binary code.

[Operation]

When override is exerted to the preset feedrate, the true feedrate is the product obtained by multiplying the preset feedrate by the specified override ratio (provided that "2nd cutting feedrate override" is not valid).

The override ratio is fixed to 100%, irrespective of "1st feedrate override" setting, under the following condition:

(1) "Override cancel" (OVCn) 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 feedrate override is set to 0% during automatic operation. When override setting is 0%, "M01 OPERATION ERROR" appears in the alarm display section of setting and display unit, and "M01 OPERATION ERROR 0102" in the ALARM DIAGNOSIS display.

[Related signals]

(1) Cutting feedrate override code m (*FV1mn)
(2) Cutting feedrate override method selection method (FVSn)
(3) 2nd cutting feedrate override valid (FV2En)
(4) 2nd cutting feedrate override

(Note) For relationship among these signals, refer to the description the cutting federate override.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	2ND CUTTING FEEDRATE OVERRIDE			G+301	G+401	G+501	G+601	G+701	G+801	G+901
				R2401	R2501	R2601	R2701	R2801	R2901	R3001

[Function]

When the "2nd cutting feedrate override valid" function (FV2En) is used, another override can be exerted on cutting feedrate overrided by "Cutting feedrate override code m" (*FV1mn) in code method, or by "1st cutting feedrate override" when the "Cutting feedrate override method selection" (FVSn) is set to file register method. The 2nd feedrate override can be set within range from 0% to 327.67% with 0.01% increment. The value is set in the file register (R) in binary.

[Operation]

When this override function is used, the true feedrate is the product obtained by multiplying commanded feedrate (F) by "1st cutting feedrate override" ratio and "2nd cutting feedrate override" ratio.

Since the least increment of 2nd feedrate override is 0.01%, override setting "10000" corresponds to 100%.

The override ratio is fixed to 100%, irrespective of "1st cutting feedrate override" or "2nd cutting feedrate override" setting, under the following condition:

(1) "Override cancel" (OVCn) signal is ON.
(2) During tapping in fixed cycle.
(3) During TAPPING mode.
(4) During thread cutting.

(Note) Only when the 1st cutting feedrate override or 2nd cutting feedrate override is 0% or both of them are 0%, override is exerted even on rapid traverse speed in automatic operation. That is, cutting feed as well as rapid traverse stop if the 1st override feedrate is set to 0% during automatic operation. When override setting is 0%, "M01 OPERATION ERROR" appears in the alarm display section of setting and display unit, and "M01 OPERATION ERROR 0102" in the ALARM DIAGNOSIS display.

[Related signals]

(1) Cutting feedrate override code m (*FV1mn)
(2) Cutting feedrate override method selection method (FVSn)
(3) 2nd cutting feedrate override valid (FV2En)
(4) 1st cutting feedrate override
(Note) For relationship among these signals, refer to the description about the cutting feedrate override.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	RAPID TRAVERSE OVERRIDE			G+302	G+402	G+502	G+602	G+702	G+802	G+902
				R2402	R2502	R2602	R2702	R2802	R2902	R3002

[Function]

The rapid traverse override specified with values (ROVSn) provides the override control within the range of 0% to 100% by 1% increments in addition to the normal override specified with codes (ROVmn).

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 overridecode m (ROVmn)
(2) Rapid traverse override method selection (ROVSn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	MANUAL FEEDRATE			G+304 - G+305	G+404 - G+405	G+504 - G+505	G+604 - G+605	G+704 - G+705	G+804 - G+805	G+904 - G+905
				R2404 - R2405	R2504 - R2505	R2604 - R2605	R2704 - R2705	R2804 - R2805	R2904 - R2905	R3004 - R3005

[Function]

When "Manual feedrate method selection" (JVSn) signal is set to "file register method", feedrate can be specified, besides code method (*JVmn) setting, by setting desired feedrate ratio manually. The value is set in the file register (R) in binary.

[Operation]

This mode of feedrate setting can be used in JOG feed, incremental feed, reference position return feed and manual arbitrary feed mode. For JOG, incremental and reference position return mode, "Rapid traverse speed" (RTn) signal should be OFF. For manual arbitrary feed mode, "Manual arbitrary feed EX.F/MODAL.F" (CXS3n) signal should be OFF. Feedrate specified in this mode can be applied to feed motion in dry run (automatic operation).

The use of this signal is conditioned as follows:

(1) When "Manual feedrate override valid" (OVSLn) signal is OFF, the originally set feedrate is applied.

(2) When "Manual feedrate override valid" (OVSLn) signal is ON, the actual feedrate can be obtained by multiplying the feedrate specified by the 1st/2nd cutting feed override value.

(3) Manual feedrate is set to file registers Rn and Rn+1. The feedrate depends on "Feedrate least increment code m" (PCFmn) as listed below.

PCF2n	PCF1n	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" (RTn) signal is OFF.

(Note 1) During incremental feed mode, the true feedrate does not change even when the manual feedrate setting is changed while feed motion is going on.

(Note 2) As for file registers (Rn and Rn+1), Rn is of lower order.Of the file registers Rn and Rn+1 to designate the feedrate, if the value is 2-bytes (one word), the high-order side does not need to do anything.

[Related signals]

(1) Manual feedrate code m (*JVmn)

(2) Manual feedrate method selection (JVSn)

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
-	1ST HANDLE/INCREMENTAL FEED MAGNIFICATION			G+308 - G+309	G+408 - G+409	G+508 - G+509	G+608 - G+609	G+708 - G+709	G+808 - G+809	G+908 - G+909
				R2408 - R2409	R2508 - R2509	R2608 - R2609	R2708 - R2709	R2808 - R2809	R2908 - R2909	R3008 - R3009

[Function]

By selecting the handle/incremental feed magnification method (MPSn), an arbitrary magnification can be designated separately from magnification set by regular code method. Magnification value (multiplier) is set in file register (R) in binary.

When the "handle/incremental feed magnification method selection" (MPSn) signal is ON, this magnification factor is applied for the hand pulse from handy terminal.

[Operation]

Magnification 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 +/- (+Jn, -Jn).

When multiplier is "500" and one pulse is given in handle feed mode, for example, 500 μ m 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 magnification setting during feed motion is ignored.

(Note 2) Since considerably large magnification can be used, the signal should be used carefully.

[Related signals]

(1) Handle/Incremental feed magnification +/- (MPmn)

(2) Handle/Incremental feed magnification method selection (MPSn)

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
-	2ND HANDLE FEED MAGNIFICATION			G+310 - G+311	G+410 - G+411	G+510 - G+511	G+610 - G+611	G+710 - G+711	G+810 - G+811	G+910 - G+911
				R2410 - R2411	R2510 - R2511	R2610 - R2611	R2710 - R2711	R2810 - R2811	R2910 - R2911	R3010 - R3011

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
-	3RD HANDLE FEED MAGNIFICATION			G+312 - G+313	G+412 - G+413	G+512 - G+513	G+612 - G+613	G+712 - G+713	G+812 - G+813	G+912 - G+913
				R2412 - R2413	R2512 - R2513	R2612 - R2613	R2712 - R2713	R2812 - R2813	R2912 - R2913	R3012 - R3013

[Function]

By selecting the handle/incremental feed magnification method (MPSn), an arbitrary magnification can be designated separately from magnification set by regular code method. Magnification value (multiplier) is set in file register (R) in binary.

Arbitrary magnification, when using 2nd and 3rd handles, is designated here.

[Operation]

When 1 pulse is sent by 2nd or 3rd handle, its feed amount conforms to this feed magnification.

For example, when 1 pulse is sent in handle mode with magnification set at "500", its feed amount will be 500 μ m.

(Note 1) Changing magnification during feed motion is invalid.

(Note 2) Considerably large magnification can be set in the handle/incremental feed magnification method. Pay extra attention when setting magnification.

[Related signals]

(1) Handle/incremental feed magnification code m (MPmn)

(2) Handle/incremental feed magnification

(3) Handle/incremental feed magnification method selection (MPSn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	MANUAL ARBITRARY FEED 1ST AXIS TRAVEL AMOUNT			G+314 - G+315	G+414 - G+415	G+514 - G+515	G+614 - G+615	G+714 - G+715	G+814 - G+815	G+914 - G+915
				R2414 - R2415	R2514 - R2515	R2614 - R2615	R2714 - R2715	R2814 - R2815	R2914 - R2915	R3014 - R3015

[Function]

This data specifies the travel amount or positioning point in manual arbitrary feed mode.

[Operation]

"Manual arbitrary feed 1st axis travel amount" is for the axis whose number is specified by "Manual arbitrary feed 1st axis selection code m" (CXmn).

"Manual arbitrary feed 1st axis travel amount" means differently depending on the statuses of the "Manual arbitrary feed MC/WK" (CXS5n) and "Manual arbitrary feed ABS/INC" (CXS6n) signals.

(1) When the "Manual arbitrary feed ABS/INC" (CXS6n) signal is ON:
"Manual arbitrary feed 1st axis travel amount" specifies the travel amount (increment).

(2) When the "Manual arbitrary feed ABS/INC" (CXS6n) signal is OFF, it depends on the status of the "Manual arbitrary feed MC/WK" (CXS5n) signal as follows:

(a) When the "Manual arbitrary feed MC/WK" (CXS5n) signal is OFF:
"Manual arbitrary feed 1st axis travel amount" specifies a coordinate position (positioning point) of the machine coordinate system.

(b) When the "Manual arbitrary feed MC/WK" (CXS5n) signal is ON:
"Manual arbitrary feed 1st axis travel amount" specifies a coordinate position (positioning point) of the modal workpiece coordinate system.

"Manual arbitrary feed 1st axis travel amount" is written in binary notation with a sign. The unit of the specified value matches that of data entered.

(Example)When micrometer system specifies "Manual arbitrary feed 1st axis travel amount" to 1, axis motion is set to 1 μ m (at incremental specification).

[Caution]

"Manual arbitrary feed 1st axis travel amount" forms a data item by G+314/R2414 and G+315/R2415 (for 1st part system). Handle negative data carefully.

[Related signals]

For related signals, see the descriptions on "Manual arbitrary feed mode" (PTPn).

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	MANUAL ARBITRARY FEED 2ND AXIS TRAVEL AMOUNT			G+316 - G+317	G+416 - G+417	G+516 - G+517	G+616 - G+617	G+716 - G+717	G+816 - G+817	G+916 - G+917
				R2416 - R2417	R2516 - R2517	R2616 - R2617	R2716 - R2717	R2816 - R2817	R2916 - R2917	R3016 - R3017

[Function][Operation]

"Manual arbitrary feed 2nd axis travel amount" is for the axis whose number is specified by "Manual arbitrary feed 2nd axis selection code m" (CX2mn).

The other conditions are the same as for "Manual arbitrary feed 1st axis travel amount" explained in the previous section.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	MANUAL ARBITRARY FEED 3ND AXIS TRAVEL AMOUNT			G+318 - G+319	G+418 - G+419	G+518 - G+519	G+618 - G+619	G+718 - G+719	G+818 - G+819	G+918 - G+919
				R2418 - R2419	R2518 - R2519	R2618 - R2619	R2718 - R2719	R2818 - R2819	R2918 - R2919	R3018 - R3019

[Function][Operation]

"Manual arbitrary feed 3rd axis travel amount" is for the axis whose number is specified by "Manual arbitrary feed 3rd axis selection code m" (CX3mn).

The other conditions are the same as for "Manual arbitrary feed 1st axis travel amount" explained in the previous section.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	OT IGNORED			G+320	G+420	G+520	G+620	G+720	G+820	G+920
				R2420	R2520	R2620	R2720	R2820	R2920	R3020

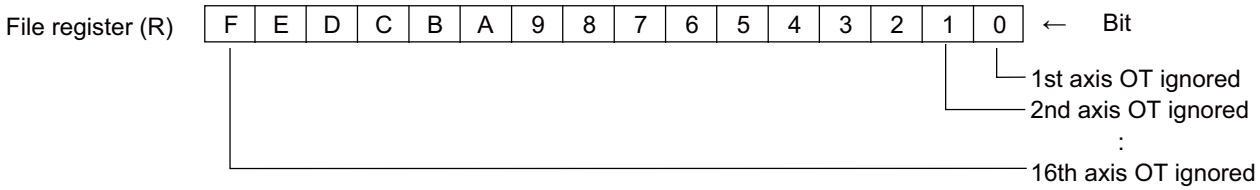
[Function]

When this signal is used, stroke end error can be avoided without eternal wiring for stroke end signal (a device which is set in 2074 H/W_OT+ or #2075 HW_HT-) 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".

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	NEAR-POINT DOG IGNORED			G+321	G+421	G+521	G+621	G+721	G+821	G+921
				R2421	R2521	R2621	R2721	R2821	R2921	R3021

[Function]

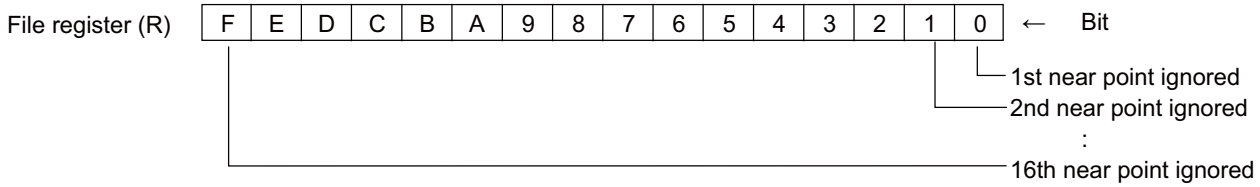
When this signal is used, "Near-point detected" signal which is used for dog type reference position return can be ignored (tripping of near switch can be ignored).

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:



Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	TOOL GROUP NO. DESIGNA-TION			G+330	G+430	G+530	G+630	G+730	G+830	G+930
				R2430	R2530	R2630	R2730	R2830	R2930	R3030

[Function]

The group No. is designated when clearing usage data of a group in which the tool life has been exceeded with the tool life management II or when forcibly changing the tool currently in use.

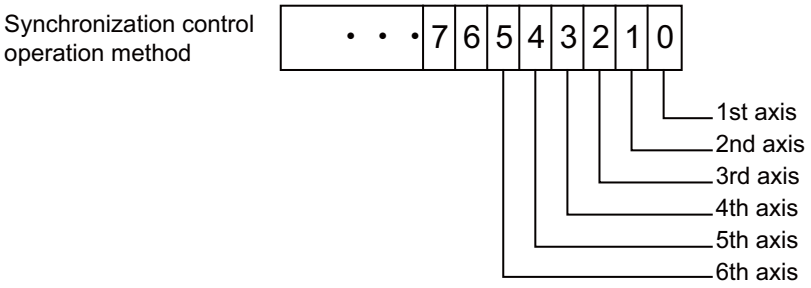
[Operation]

The group designation range is as follows.For group designation: 1 to 9999 of group No.For all groups: 65535 (all 1)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	SYNCHRONIZATION CON-TROL OPERATION METHOD			G+332	G+432	G+532	G+632	G+732	G+832	G+932
				R2432	R2532	R2632	R2732	R2832	R2932	R3032

[Function]

The synchronization control's ON/OFF can be changed over by operating the bit corresponding to each axis of this signal. CNC changes over the operation at the point when all axes enter in-position state.



[Operation]

In case of synchronous control

(1) Designation of the synchronization operation method

Turn ON both the bits corresponding to the primary axis and secondary axis with the base specifications parameter "#1068 slavno".

(Example) When the 2nd axis (primary axis) and 3rd axis (secondary axis) are operated by the synchronous operation

	7	6	5	4	3	2	1	0	HEX
Synchronization control operation method	0	0	0	0	0	0	0	0	00
	0	0	0	0	0	1	1	0	06

(2) Designation of the independent operation method

Turn ON the bit corresponding to only one of the axes to be moved with the primary axis command.

(Example) When only the 3rd axis (secondary axis) is moved

	7	6	5	4	3	2	1	0	HEX
Synchronization control operation method	0	0	0	0	0	0	0	0	00
	0	0	0	0	0	1	0	0	04

For the machine structure reasons, if the synchronous state must always be kept from immediately after the power is turned ON, set the synchronization control operation method when the ladder power is turned ON at the first time.

In case of multi-secondary-axis synchronous control

(1) Designation of the synchronization operation method

Turn ON both the bits corresponding to the primary axis and secondary axis with the base specifications parameter "#22014 mastno".

(Example) When the 2nd axis (primary axis), the 3rd axis (secondary axis), and the 4th axis (secondary axis) are operated by the synchronous operation

	7	6	5	4	3	2	1	0	HEX
Synchronization control operation method	0	0	0	0	0	0	0	0	00
	0	0	0	0	1	1	1	0	0E

(2) Designation of the independent operation method

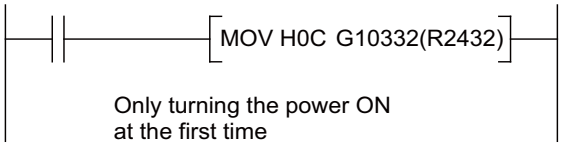
Turn ON the bit corresponding to only one of the axes to be moved with the primary axis command.

(Example) When the 2nd axis (primary axis) and the 3rd axis (secondary axis) are moved in synchronization, and the 4th axis is operated independently.

	7	6	5	4	3	2	1	0	HEX
Synchronization control operation method	0	0	0	0	0	0	0	0	00
	0	0	0	0	0	1	1	0	06

For the machine structure reasons, if the synchronous state must always be kept from immediately after the power is turned ON, set the synchronization control operation method when the ladder power is turned ON at the first time.

<Example of ladder creation>



When changing the operation with the synchronization control operation method during automatic operation, calculate the coordinates again.

After secondary axis independent operation is carried out, the end point coordinates of the secondary axis are substituted in the program end point coordinates for the primary axis. Thus, if the coordinates are not recalculated, the primary axis' movement command will not be created properly.

Request recalculation immediately after the synchronization control operation method is changed.

<Example of ladder creation>

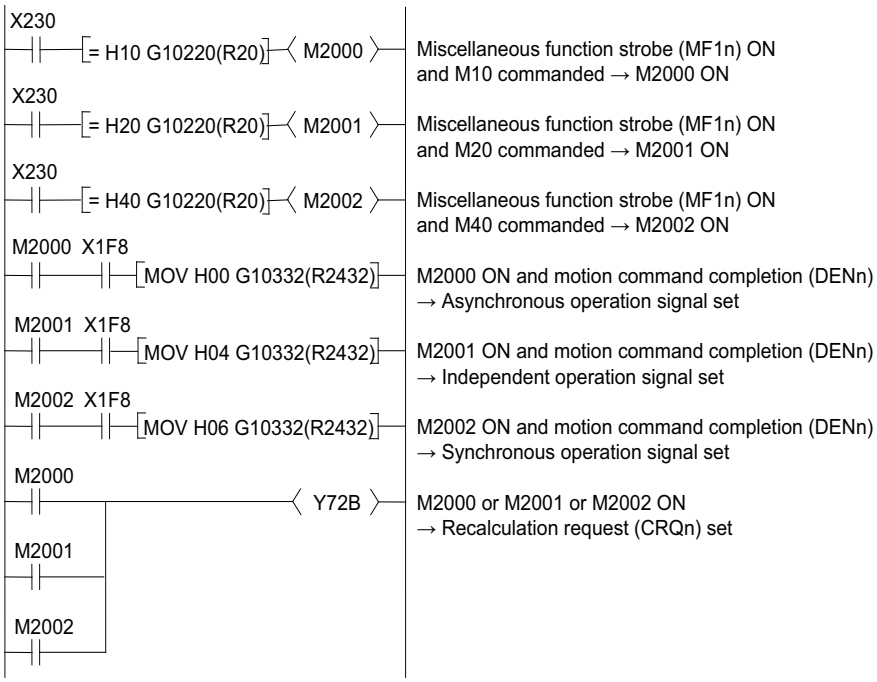
Primary axis: 2nd axis Secondary axis: 3rd axis

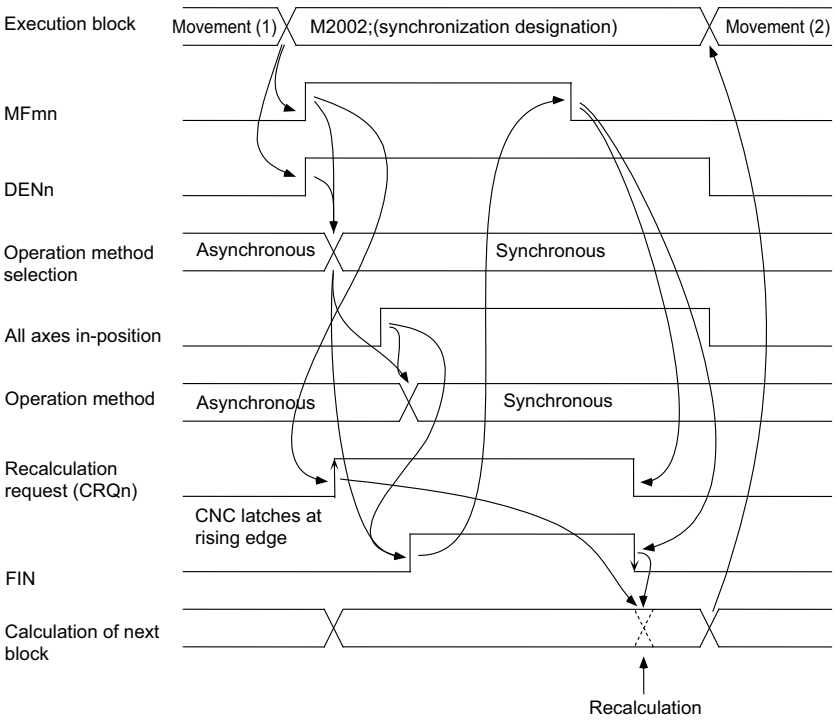
When M code is assigned to each:

M10: Asynchronous operation

M20: Independent operation

M40: Synchronous operation





[Caution]

(1) During synchronous operation or independent operation, the primary axis signals are valid for the "Interlock" and "Machine lock" signals, etc.

(2) The secondary axis will return to the reference position in synchronization with the primary axis if G27, G28 or G30 is commanded during synchronous operation. If the secondary axis is at the reference position when the primary axis completes reference position return, the reference position return will be completed. If the secondary axis is not at the reference position when the primary axis completes reference position return, the "Reference position reached" (ZP1n to ZP4n) signal for the primary axis will not be output.

(3) The position switches are processed independently for the primary axis and secondary axis.

(4) Input the same OT signal for the primary axis and secondary axis.
Set the same soft limit value for the primary axis and secondary 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 secondary axis, and the primary axis will not stop.
  Thus, make sure that the primary axis alarm turns ON before the secondary axis.
- OT during the manual operation mode will cause the secondary axis to stop when the OT signal for only the primary axis turns ON. The primary axis is stopped by the position controller, and the secondary axis is stopped by the CNC 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 primary axis independent operation is handled as asynchronous, so the PLC input/output signal is not reflected on the secondary axis.

(6) A command error and feedback error are confirmed on a synchronous error screen.

[Related signals]

Synchronized correction mode (SYCMn)
Recalculation request (CRQn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	DROOP RELEASE INVALID AXIS			G+333	G+433	G+533	G+633	G+733	G+833	G+933
				R2433	R2533	R2633	R2733	R2833	R2933	R3033

[Function]

The axis which does not release droop is set when current limit changeover (ILCn) is executed.

[Operation]

Droop release invalid axis	Operation
0	Release the droop and move the command value to the FB position when current limit changeover is executed.
1	During the current limit changeover, the droop will not be released.

(Note 1) This signal is also valid at the droop release request.

(Note 2) This signal is invalid if the current does not reach its limit at the current limit changeover.

[Related signals]

(1) Current limit changeover (ILCn)

(2) Droop release request (DORn)

(3) In current limit (ILIn)

(4) Current limit reached (ILAn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	EACH AXIS REFERENCE POSI-TION SELECTION			G+334	G+434	G+534	G+634	G+734	G+834	G+934
				R2434	R2534	R2634	R2734	R2834	R2934	R3034

[Function]

Select the each axis reference position return position for manual reference position return.

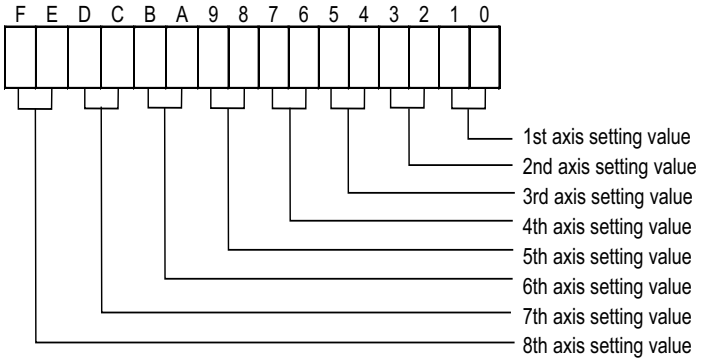
[Operation]

(1) This signal is valid when the reference position select method is ON.

(2) Two bits are used for each axis to select the reference position.

(a) R register and corresponding axis

Each axis reference position select



(b) Setting value and reference position No.

High-order bit	Low-order bit	Return position
0	0	1st reference position
0	1	2nd reference position
1	0	3rd reference position
1	1	4th reference position

[Related signals]

(1) Reference position select method (Mn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	SEARCH & START PROGRAM NO			G+338 - G+339	G+438 - G+439	G+538 - G+539	G+638 - G+639	G+738 - G+739	G+838 - G+839	G+938 - G+939
				R2438 - R2439	R2538 - R2539	R2638 - R2639	R2738 - R2739	R2838 - R2839	R2938 - R2939	R3038 - R3039

[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 (RSSTn)

(2) Search & start (error) (SSEn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	WORKPIECE COORDINATE OFFSET MEASUREMENT COMPENSATION NO.			G+346 - G+347	G+446 - G+447	G+546 - G+547	G+646 - G+647	G+746 - G+747	G+846 - G+847	G+946 - G+947
				R2446 - R2447	R2546 - R2547	R2646 - R2647	R2746 - R2747	R2846 - R2847	R2946 - R2947	R3046 - R3047

[Function]

(1) External workpiece coordinate offset measurement function
Set the tool No. (Selected tool No.) and the tool compensation No. (Workpiece coordinate offset measurement compensation No.) used for workpiece coordinate offset measurement in a BCD code.

(2) Chuck barrier check
Set the tool No. (Selected tool No.) and the compensation No. (Workpiece coordinate offset measurement compensation No.) selected for the chuck barrier check.

[Operation]

(1) External workpiece coordinate offset measurement function
Set the tool No. and the tool compensation No. used for workpiece coordinate offset measurement in a BCD code. This is set with the user PLC.
This tool No. (Selected tool No.) is interpreted as the tool offset No. by the CNC.

(2) Chuck barrier check
The file register used differs according to the parameter (#1098 Tlno.)

#1098 Tlno.	Workpiece coordinate offset measurement compensation No.	Selected tool No.
0	Tool length, tool nose wear offset No.	Tool No.
1	Tool nose wear offset No.	Tool No., tool length compensation No.

If the tool length compensation No. is not designated (if the contents are 0), the tool length and tool nose wear offset will both follow the T command modal.

The T command modal will also be followed if the designated offset No. is not within the specified range.

If the T command modal value is 0, the compensation amount will be interpreted as 0.

[Related signals]

(1) Selected tool No.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	SELECTED TOOL NO.			G+348 - G+349	G+448 - G+449	G+548 - G+549	G+648 - G+649	G+748 - G+749	G+848 - G+849	G+948 - G+949
				R2448 - R2449	R2548 - R2549	R2648 - R2649	R2748 - R2749	R2848 - R2849	R2948 - R2949	R3048 - R3049

[Function][Operation]

Refer to the explanation of "workpiece coordinate offset measurement compensation No." for details.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	EXTERNAL SEARCH DEVICE NO.			G+361	G+461	G+561	G+661	G+761	G+861	G+961
				R2461	R2561	R2661	R2761	R2861	R2961	R3061

[Function] [Operation]

The device storing the machining program to be searched is designated with a No. Be sure to set 0 for this CNC.
An error occurs if any No. except "0" is set. (Status: 3)

Device No.	Device
0	Memory

[Related signals]

(1) External search finished
(2) External search status
(3) External search program No.
(4) External search sequence No.
(5) External search block No.
(6) External search strobe (EXTSSn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	EXTERNAL SEARCH PRO-GRAM NO.			G+362 - G+363	G+462 - G+463	G+562 - G+563	G+662 - G+663	G+762 - G+763	G+862 - G+863	G+962 - G+963
				R2462 - R2463	R2562 - R2563	R2662 - R2663	R2762 - R2763	R2862 - R2863	R2962 - R2963	R3062 - R3063

[Function] [Operation]

Designate the program No. of the machining program to be searched as a binary.
The setting range is 1 to 99999999 (8 digits).

[Related signals]

(1) External search finished
(2) External search status
(3) External search device No.
(4) External search sequence No.
(5) External search block No.
(6) External search strobe (EXTSSn)

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
-	EXTERNAL SEARCHSEQUENCE NO.			G+364 - G+365	G+464 - G+465	G+564 - G+565	G+664 - G+665	G+764 - G+765	G+864 - G+865	G+964 - G+965
				R2464 - R2465	R2564 - R2565	R2664 - R2665	R2764 - R2765	R2864 - R2865	R2964 - R2965	R3064 - R3065

[[Function] [Operation]

Designate the sequence No. of the machining program to be searched as a binary.
The setting range is 1 to 99999 (5 digits).

[Related signals]

(1) External search finished
(2) External search status
(3) External search device No.
(4) External search program No.
(5) External search block No.
(6) External search strobe (EXTSSn)

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
-	EXTERNAL SEARCH BLOCK NO.			G+366 - G+367	G+466 - G+467	G+566 - G+567	G+666 - G+667	G+766 - G+767	G+866 - G+867	G+966 - G+967
				R2466 - R2467	R2566 - R2567	R2666 - R2667	R2766 - R2767	R2866 - R2867	R2966 - R2967	R3066 - R3067

[[Function] [Operation]

Designate the block No. as a binary.
The setting range is 0 to 99 (2 digits).

[Related signals]

(1) External search finished
(2) External search status
(3) External search device No.
(4) External search program No.
(5) External search sequence No.
(6) External search strobe (EXTSSn)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	USER MACRO INPUT #1032 (PLC -> Controller)			G+370 - G+371	G+470 - G+471	G+570 - G+571	G+670 - G+671	G+770 - G+771	G+870 - G+871	G+970 - G+971
				R2470 - R2471	R2570 - R2571	R2670 - R2671	R2770 - R2771	R2870 - R2871	R2970 - R2971	R3070 - R3071

[Function]

This is interface function used to coordinate user PLC to user macro program.

[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:

Systemvariable	Points	Interface input signal	Systemvariable	Points	Interface input signal
#1000	1	Register G+370/R2470 bit 0	#1016	1	Register G+371/R2471 bit 0
#1001	1	Register G+370/R2470 bit 1	#1017	1	Register G+371/R2471 bit 1
#1002	1	Register G+370/R2470 bit 2	#1018	1	Register G+371/R2471 bit 2
#1003	1	Register G+370/R2470 bit 3	#1019	1	Register G+371/R2471 bit 3
#1004	1	Register G+370/R2470 bit 4	#1020	1	Register G+371/R2471 bit 4
#1005	1	Register G+370/R2470 bit 5	#1021	1	Register G+371/R2471 bit 5
#1006	1	Register G+370/R2470 bit 6	#1022	1	Register G+371/R2471 bit 6
#1007	1	Register G+370/R2470 bit 7	#1023	1	Register G+371/R2471 bit 7
#1008	1	Register G+370/R2470 bit 8	#1024	1	Register G+371/R2471 bit 8
#1009	1	Register G+370/R2470 bit 9	#1025	1	Register G+371/R2471 bit 9
#1010	1	Register G+370/R2470 bit 10	#1026	1	Register G+371/R2471 bit 10
#1011	1	Register G+370/R2470 bit 11	#1027	1	Register G+371/R2471 bit 11
#1012	1	Register G+370/R2470 bit 12	#1028	1	Register G+371/R2471 bit 12
#1013	1	Register G+370/R2470 bit 13	#1029	1	Register G+371/R2471 bit 13
#1014	1	Register G+370/R2470 bit 14	#1030	1	Register G+371/R2471 bit 14
#1015	1	Register G+370/R2470 bit 15	#1031	1	Register G+371/R2471 bit 15

Systemvariable	Points	Interface input signal	
#1032	32	Register G+370/R2470, G+371/R2471	This correspondence table shows the example for file registers G+370/R2470 and G+371/R2471.
#1033	32	Register G+372/R2472, G+373/R2473	
#1034	32	Register G+374/R2474, G+375/R2475	
#1035	32	Register G+376/R2476, G+377/R2477	

File registers G+370/R2470 and G+371/R2471 correspond to system variables #1000 to #1031, and #1032 (32-bit data).

"User macro output #1132 to #1135 (Controller -> PLC)" and "User macro input #1032 to #1035 (PLC -> Controller)" each have both part system common signals and part system independent ones.

Setting the bit selection parameter #6454/bit0 selects part system common or part system independent.

Register Nos. when part system common/independent is selected

Bit selection parameter #6454/bit0	User macro output #1132 to #1135 (Controller -> PLC)	User macro output #1032 to #1035 (PLC -> Controller)
0: Part system common	G10224-G10231/R24-R31	G+224-G+231/R2324-R2331
1: Part system independent	G10370-G10977/R170-R777	G+370-G+977/R2470-R3077

[Related signals]

(1) User macro output #1132 to #1135 (Controller -> PLC)(Part system common)
(2) User macro output #1132 to #1135 (Controller -> PLC)(Part system independent)
(3) User macro input #1032 to #1035 (PLC -> Controller)(Part system common)
(4) User macro input #1032 to #1035 (PLC -> Controller)(Part system independent)

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
-	USER MACRO INPUT #1033 (PLC -> Controller)			G+372 - G+373	G+472 - G+473	G+572 - G+573	G+672 - G+673	G+772 - G+773	G+872 - G+873	G+972 - G+973
				R2472 - R2473	R2572 - R2573	R2672 - R2673	R2772 - R2773	R2872 - R2873	R2972 - R2973	R3072 - R3073

[Function]

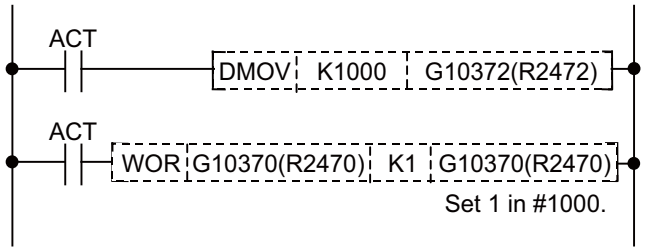
This provides interface function used to coordinate user PLC to user macro.

[Operation]

The data set in file registers Rn and Rn+1 with the user PLCs, can be referred to on the user macro side with the user macro system variables #1033.

(Example)

Sequence program



User macro program

```
IF [#1000 EQ 0] GOTO 100

#100 = #1033

N100
```

The #1033(G10372/R2472, G10373/R2473)data is read into #100 Other than when #1000 is set to 0.

[Related signals]

(1) User macro output #1132 to #1135 (Controller -> PLC)(Part system common)
(2) User macro output #1132 to #1135 (Controller -> PLC)(Part system independent)
(3) User macro input #1032 to #1035 (PLC -> Controller)(Part system common)
(4) User macro input #1032 to #1035 (PLC -> Controller)(Part system independent)

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
-	USER MACRO INPUT #1034 (PLC -> Controller)			G+374 - G+375	G+474 - G+475	G+574 - G+575	G+674 - G+675	G+774 - G+775	G+874 - G+875	G+974 - G+975
				R2474 - R2475	R2574 - R2575	R2674 - R2675	R2774 - R2775	R2874 - R2875	R2974 - R2975	R3074 - R3075

[Function][Operation]

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

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
-	USER MACRO INPUT #1035 (PLC -> Controller)			G+376 - G+377	G+476 - G+477	G+576 - G+577	G+676 - G+677	G+776 - G+777	G+876 - G+877	G+976 - G+977
				R2476 - R2477	R2576 - R2577	R2676 - R2677	R2776 - R2777	R2876 - R2877	R2976 - R2977	R3076 - R3077

[Function][Operation]

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

Con-tact	Signal name	Signal ab-breviation		1st part system	2nd part system	3rd part system	4th part system	5th part system	6th part system	7th part system
-	CHOPPING OVERRIDE	CHPOVn		G+380	G+480	G+580	G+680	G+780	G+880	G+980
				R2480	R2580	R2680	R2780	R2880	R2980	R3080

[Function]

The chopping override can be set in the range between 0 and 100% (1% increment).

[Operation]

(1) Only the chopping override is valid for the chopping operation. However, valid or invalid of the rapid traverse override can be selected for the rapid traverse between the basic position and the upper dead point.

(2) The chopping override is set between 0 and 100% in a 1% increment. If a value outside the range from 0 to 100% is set, the override will be clamped at 100%.

(3) If the "Chopping override" signal is set to "0", "M01 OPERATION ERROR 0150" will occur.

(4) The value is set in binary.

[Related signals]

(1) Chopping parameter valid

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	CHOPPING AXIS SELECTION			G+381	G+481	G+581	G+681	G+781	G+881	G+981
				R2481	R2581	R2681	R2781	R2881	R2981	R3081

[Function]

The axis to operate chopping is set when the chopping is commanded by the external signal.

[Operation]

When chopping is commanded by the external signal, "1" is set to a corresponding bit of the axis to operate chopping.

bit0: 1st axis
bit1: 2nd axis
: :
bit7: 8th axis
bit8 to F: Not used (Set to "0".)

If two or more bit are designated, the lowest number axis will be selected.
The axis designation with this signal is valid in the record mode of the compensation value sequential update method and the fixed compensation amount method.
The designation is invalid with the playback mode of the fixed compensation amount method.
This signal is valid at the rising edge of the chopping parameter valid signal.

[Related signals]

(1) Chopping parameter valid

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	UPPER DEAD POINT DESIGNA-TION (L)			G+382	G+482	G+582	G+682	G+782	G+882	G+982
				R2482	R2582	R2682	R2782	R2882	R2982	R3082
-	UPPER DEAD POINT DESIGNA-TION (H)			G+383	G+483	G+583	G+683	G+783	G+883	G+983
				R2483	R2583	R2683	R2783	R2883	R2983	R3083

[Function]

The upper dead point is set when chopping is commanded by external signal.

[Operation]

The designation by this signal is valid with the record mode of the compensation value sequential update method and the fixed compensation amount method.
The designation is invalid with the playback mode of the fixed compensation amount method.
This signal is valid at the rising edge of the chopping parameter valid signal.

[Related signals]

(1) Chopping parameter valid

Contact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
-	LOWER DEAD POINT DESIGNATION (L)			G+384	G+484	G+584	G+684	G+784	G+884	G+984
				R2484	R2584	R2684	R2784	R2884	R2984	R3084
-	LOWER DEAD POINT DESIGNATION (H)			G+385	G+485	G+585	G+685	G+785	G+885	G+985
				R2485	R2585	R2685	R2785	R2885	R2985	R3085

[Function]

The bottom dead point of when chopping is commanded by the external signal is set with the increment amount from the upper dead point.

[Operation]

The designation by this signal is valid with the record mode of the compensation value sequential update method and the fixed compensation amount method.

The designation is invalid with the playback mode of the fixed compensation amount method.

This signal is valid at the rising edge of the chopping parameter valid signal.

[Related signals]

(1) Chopping parameter valid

Contact	Signal name	Signal abbreviation		1st part system	2nd part system	3rd part system	4th part system	5th part system	6th part system	7th part system
-	NUMBER OF CYCLES DESIGNATION			G+386	G+486	G+586	G+686	G+786	G+886	G+986
				R2486	R2586	R2686	R2786	R2886	R2986	R3086

[Function]

The speed when chopping is commanded by external signal is set with the number of cycles in one minute. [Number of cycles/min]

[Operation]

The designation by this signal is valid with the record mode of the compensation value sequential update method and the fixed compensation amount method.

The designation is invalid with the playback mode of the fixed compensation amount method.

This signal is valid at the rising edge of the chopping parameter valid signal.

[Related signals]

(1) Chopping parameter valid

Contact	Signal name	Signal abbreviation		1st part system	2nd part system	3rd part system	4th part system	5th part system	6th part system	7th part system
-	DATA NO.			G+387	G+487	G+587	G+687	G+787	G+887	G+987
				R2487	R2587	R2687	R2787	R2887	R2987	R3087

[Function]

When the compensation method is the fixed compensation amount method, the number of the data to be recorded or played back is designated.

[Operation]

(When operating in the record mode, the measured amount of compensation is recorded in the area of the designated number. In the playback mode, operation parameter is read from the area of the designated number.

This signal is valid at the rising edge of the chopping parameter valid signal.

[Related signals]

(1) Chopping parameter valid

4.16 Data Type Output Signals : Spindle Command (PLC CPU->CNC CPU)

Con-tact	Signal name	Signal ab-breviation		1st spin-dle	2nd spin-dle	3rd spin-dle	4th spin-dle	5th spin-dle	6th spin-dle	7th spin-dle
-	SPINDLE COMMAND ROTA-TION SPEED OUTPUT	SRPMOTn		G+1160 - G+1161	G+1190 - G+1191	G+1220 - G+1221	G+1250 - G+1251	G+1280 - G+1281	G+1310 - G+1311	G+1340 - G+1341
				R3900 - R3901	R3930 - R3931	R3960 - R3961	R3990 - R3991	R4020 - R4021	R4050 - R4051	R4080 - R4081

[Function]

By setting data of desired spindle speed to this signal, the spindle can be run at that speed.

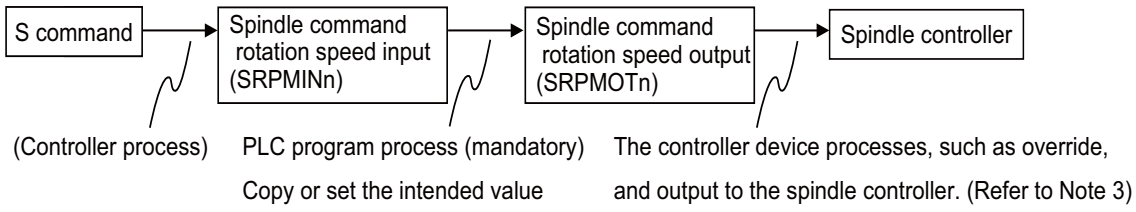
Even when the data does not need to be changed, the process of copying the spindle command rotation speed input to the spindle command rotation speed input is required.

[Operation]

(1) When the spindle function (S) command is issued, the control device set the commanded value to the spindle command rotation speed input.

(2) The spindle command rotation speed value will be copied to the spindle command rotation speed output each time if the spindle speed if the spindle speed to be controlled does not need to change from the (S) command for the PLC program. If it is desired to be changed, set the intended value to the spindle command rotation speed output each time.

(3) The control device processes the value of the spindle command rotation speed output and output the rotation speed command to the spindle controller.



(Note 1) Prepare the PLC program by the user.

(Note 2) When the data is set to the spindle command rotation speed output with PLC program, it will be written each time.

(Note 3) The conditions of the spindle override code m(SPmn), spindle gear selection code m(GImn), spindle stop (SSSTPn), spindle gear shift (SSFTn) and spindle orientation (SORCn) are evaluated to the spindle command rotation speed output, and then transferred to the spindle controller.

(Note 4) Refer to the spindle command rotation speed input section for the flow of spindle function (S) command and the timing of updating the data.

[Related signals]

(1) Spindle command rotation speed input

(2) Spindle command final data(rotation speed)

Contact	Signal name	Signal abbreviation		1st spindle	2nd spindle	3rd spindle	4th spindle	5th spindle	6th spindle	7th spindle
-	S COMMAND OVERRIDE			G+1170	G+1200	G+1230	G+1260	G+1290	G+1320	G+1350
				R3910	R3940	R3970	R4000	R4030	R4060	R4090

[Function]

When "Spindle override method selection" (SPSn) signal is set to "file register method", override can be exerted on the spindle rotation speed besides the code method override (Spindle override code m (SPmn)).

Override can be exerted within range of 0% to 200% (1% increment).

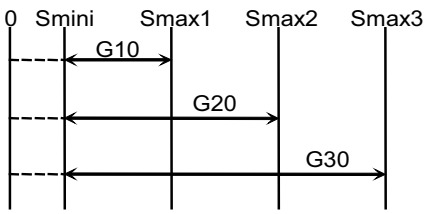
The value is set in the file register (R) in binary.

[Operation]

When this function is used, the true spindle speed is obtained by multiplying the originally set spindle speed by override ratio set with this signal.

Clamp spindle speed is the maximum or minimum speed set with parameters, which depends on "Spindle gear selection code m" (GImn) signal.

Even when spindle speed exceeds the maximum or minimum speed at the currently selected gear stage, due to change of override setting, "Spindle gear shift command m" (GRmn) signal 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" (SSTPn) signal is ON.
(2)During tapping mode.
(3)During thread cutting.

[Related signals]

(1) Spindle override code m (SPmn)
(2) Spindle override method selection (SPSn)
(3) Spindle gear selection code m (GImn)
(4) Spindle stop (SSTPn)
(5) Spindle gear shift (SSFTn)
(6) Spindle orientation (SORCn)

Con-tact	Signal name	Signal ab-breviation		1st spin-dle	2nd spin-dle	3rd spin-dle	4th spin-dle	5th spin-dle	6th spin-dle	7th spin-dle
-	MULTI-POINT ORIENTATION POSITION DATA			G+1171	G+1201	G+1231	G+1261	G+1291	G+1321	G+1351
				R3911	R3941	R3971	R4001	R4031	R4061	R4091

[Function]

This signal, having the following two functions, is issued in respect to the high-speed serial connection specification spindle controller (spindle drive).

(1) Notification of orientation position to control unit (spindle controller) at orientation command.
Position data where the "Spindle orientation command" (ORCn) is turned ON.

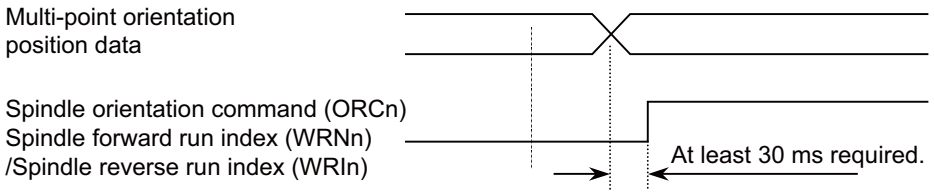
(2) During multi-point indexing, notification of indexing position during forward run indexing or reverse run indexing to control unit (spindle controller).
Position data where the "Spindle forward run index" (WRNn), the "Spindle reverse run index" (WRIn) is turned ON.

[Operation]

(1) Orientation command
The orientation position at when the "Spindle orientation command" (ORCn) turns ON is input.
The values designated with the spindle parameter (SP007 OPST: in-position shift amount for orientation) and with "Multi-point orientation position data" signal are totaled to determine the orientation position.

(2) Multi-point indexing
Each time the "Spindle forward run index" (WRNn) and "Spindle reverse run index" (WRIn) turn ON, the axis rotates by the amount designated with the multi-point orientation position data.

When using MDS-D series drive unit, command value is handled as 16-bit binary data and its increment is as follows.
Command increment = 360/36000 [0.01°]
This signal must be validated before the "Spindle orientation command" signal turns ON (at least 30 ms before).



[Related signals]

(1) Spindle orientation command (ORCn)
(2) Spindle forward run index (WRNn)
(3) Spindle reverse run index (WRIn)

5

Explanation for Each Application

5.1 PLC Axis Control

This function allows an independent axis to be controlled with commands from the user PLC, separately from the CNC control axis.

5.1.1 Specifications

Item	Details
No. of control axes	Max. 8 axes
Simultaneous control axes	The PLC control axis is controlled independently of the CNC control axis. Simultaneous start of multiple PLC axes is possible.
Command unit	Min. command unit (Note 1) 0.001mm (0.0001 inch) 0.0001mm (0.00001 inch)
Feedrate	0 to 1000000mm/min (0 to 100000inch/min) (The feedrate is fixed regardless of the unit system.)
Movement commands	Incremental value commands from the current position. Absolute value commands of the machine coordinate system. 0 to ± 99999999 (Note 1)
Operation modes	Rapid traverse, cutting feed Jog feed (+), (-) Reference position return feed (+), (-) Handle feed
Backlash compensation	Provided
Stroke end	Not provided
Soft limit	Provided
Rotation axis commands	Provided Absolute value commands.....Rotation amount within one rotation. (Rotates the remainder divided by rotational axis division count.) The axis rotates in shortcut direction according to "#8213 Rotation axis type" setting. Incremental commands.....Rotates the commanded rotation amount.
Inch/mm changeover	Not provided Command to match the feedback unit.

(Note 1) Screen displays as follows according to the setting of the parameter "#1003 iunit".

Setting value	Unit	Display
B	0.001mm (0.0001inch)	Displays up to three digits after the decimal point.
C	0.0001mm (0.00001inch)	Displays up to four digits after the decimal point.

(Note 2) Commands can be issued by inch if "#1042 pcinch (PLC axis command)" is set to "1" (inch system).

Other restrictions

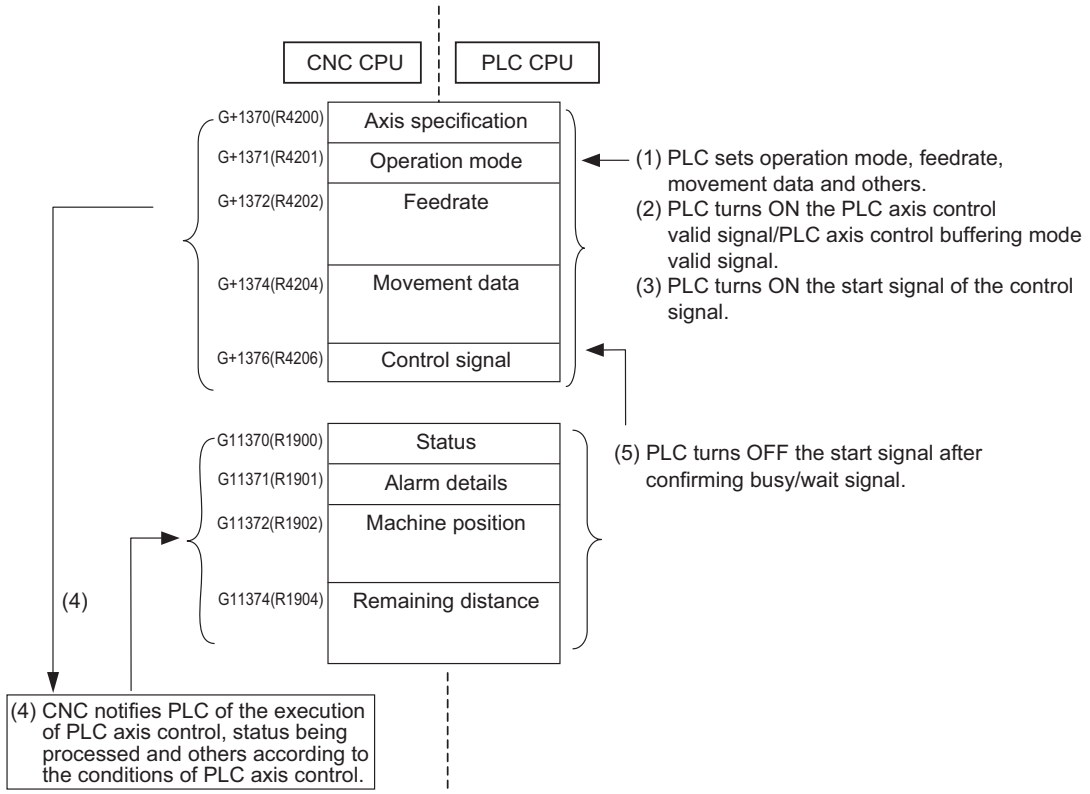
(1) There is no mirror image or machine lock function.
(2) Rapid traverse override, cutting override and dry run control are not possible.
(3) Automatic operation start, automatic operation stop, reset and interlock CNC controls are invalid for PLC control axes.
The same control can be realized using an interface dedicated for PLC control axes.
(4) There is no dedicated emergency stop. The emergency stop is valid in the same manner as the CNC control axis.
(5) PLC axis external deceleration is valid only when external deceleration ("#1239 set11/bit6 External deceleration axis compliance valid" is set to "1") is set by axis.

5.1.2 Detailed Explanation

The flow of the process during PLC axis control execution is shown below.

(1) PLC sets operation mode, feedrate, movement data and others.
(2) PLC turns ON the PLC axis control valid signal/PLC axis control buffering mode valid signal.
(3) PLC turns ON the start signal of the control signal.
(4) CNC notifies PLC of the execution of PLC axis control, status being processed and others according to the conditions of PLC axis control.
(5) PLC turns OFF the start signal after confirming busy/wait signal.

Flow of PLC axis control for 1st PLC axis



(Note 1) The specification of axis is valid only in buffering mode.
(Note 2) Refer to "5.1.6 Timing Chart" for the exact timing.

5.1.3 Interface with PLC

To perform interface between PLC and CNC, PLC carries out the following steps.
-Sets the control information data to the shared device (G).
-Turns ON either the PLC axis control valid signal or the PLC axis control buffering mode valid signal.
-Turns ON the start signal of control signal.
The operation is executed in single mode if the PLC axis control valid signal is ON, executed in buffering mode if the PLC axis control buffering mode valid signal is ON.
Single mode and buffering mode can be operated simultaneously. However, a movement command to the same axis can only be issued in either mode.
Alarm doesn't occur when either mode is operating an axis and valid signal of the other mode is turned ON for the same axis. Instead, the mode commanded later is ignored.
In this case, process in the first mode is not canceled.

(Note 1) Refer to "5.1.9 Buffering Mode" for details of buffering mode.
(Note 2) Refer to "5.1.4 (2) Alarm details" for alarms.

PLC CPU -> CNC CPU interface signal

Contact	Signal name	Signal abbreviation		Common for part systems
A	PLC AXIS CONTROL VALID m-TH AXIS	PLCAEm		Y340 - Y347

[Function]
This signal validates the PLC axis control in single mode.
[Operation]
Turning this signal ON executes the PLC axis control upon the control information data in single mode.
Status, alarm details and machine position of each axis can be referred.
If this signal has been turned OFF, status, alarm details and machine position are not updated. The axis movement, which has been commanded in single mode, is canceled. The PLC axis control is executed upon the control information data while the PLC axis control valid signal is ON.

Contact	Signal name	Signal abbreviation		Common for part systems
A	PLC AXIS CONTROL BUFFERING MODE VALID	PABMI		Y32B

[Function]
This signal validates the PLC axis control in buffering mode.
[Operation]
Turning this signal ON executes the PLC axis control upon the control information data in buffering mode.
If this signal has been turned OFF, the axis movement, which had been commanded in buffering mode, is canceled.
[Caution]
(1) Turning this signal ON updates the control information in single mode, such as status and machining position, even during axis control in buffering mode.
The information is updated at the same time when the axis is moved by the command in buffering mode. It is recommended to turn the PLC axis valid signal ON for the axis specified in the control information for buffering mode, and to refer to single mode for status, alarm details, machine position and remaining distance even in buffering mode.
(2) Specify the axis to command in buffering mode in the control information, axis specification, for buffering mode.

PLC axis control information data

Store the control information data in the R registers indicated in the table below before executing the PLC axis control. The control information data is arranged as table below.

(Note) Devices are written with each shared memory device (G) Nos. in upper line and each internal register Nos. in bottom line.

<PLC axis state: CNC PC>

Signal name	PLC axis No.								For buffering mode		
	1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis	Data A	Data B	Data C
Status	G11370	G11378	G11386	G11394	G11402	G11410	G11418	G12660	G11426	G11434	G11442
	R1900	R1908	R1916	R1924	R1932	R1940	R1948	R1980	R1956	R1964	R1972
Alarm details	G11371	G11379	G11387	G11395	G11403	G11411	G11419	G12661	G11427	G11435	G11443
	R1901	R1909	R1917	R1925	R1933	R1941	R1949	R1981	R1957	R1965	R1973
Machine position	G11372	G11380	G11388	G11396	G11404	G11412	G11420	G12662	G11428	G11436	G11444
	R1902	R1910	R1918	R1926	R1934	R1942	R1950	R1982	R1958	R1966	R1974
	G11373	G11381	G11389	G11397	G11405	G11413	G11421	G12663	G11429	G11437	G11445
	R1903	R1911	R1919	R1927	R1935	R1943	R1951	R1983	R1959	R1967	R1975
Remaining distance	G11374	G11382	G11390	G11398	G11406	G11414	G11422	G12664	G11430	G11438	G11446
	R1904	R1912	R1920	R1928	R1936	R1944	R1952	R1984	R1960	R1968	R1976
	G11375	G11383	G11391	G11399	G11407	G11415	G11423	G12665	G11431	G11439	G11447
	R1905	R1913	R1921	R1929	R1937	R1945	R1953	R1985	R1961	R1969	R1977
Status 2	G11376	G11384	G11392	G11400	G11408	G11416	G11424	G12666	(Not used)	(Not used)	(Not used)
	R1906	R1914	R1922	R1930	R1938	R1946	R1954	R1986			

<PLC axis command: PC CNC>

Signal name	PLC axis No.								For buffering mode		
	1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis	Data A	Data B	Data C
Axis specification (Note 1)	(Not used)	(Not used)	(Not used)	(Not used)	(Not used)	(Not used)	(Not used)	(Not used)	+1426	+1434	+1442
									R4256	R4264	R4272
Operation mode	+1371	+1379	+1387	+1395	+1403	+1411	+1419	+2661	+1427	+1435	+1443
	R4201	R4209	R4217	R4225	R4233	R4241	R4249	R4281	R4257	R4265	R4273
Feedrate	+1372	+1380	+1388	+1396	+1404	+1412	+1420	+2662	+1428	+1436	+1444
	R4202	R4210	R4218	R4226	R4234	R4242	R4250	R4282	R4258	R4266	R4274
	+1373	+1381	+1389	+1397	+1405	+1413	+1421	+2663	+1429	+1437	+1445
	R4203	R4211	R4219	R4227	R4235	R4243	R4251	R4283	R4259	R4267	R4275
Movement data	+1374	+1382	+1390	+1398	+1406	+1414	+1422	+2664	+1430	+1438	+1446
	R4204	R4212	R4220	R4228	R4236	R4244	R4252	R4284	R4260	R4268	R4276
	+1375	+1383	+1391	+1399	+1407	+1415	+1423	+2665	+1431	+1439	+1447
	R4205	R4213	R4221	R4229	R4237	R4245	R4253	R4285	R4261	R4269	R4277
Control signal	+1376	+1384	+1392	+1400	+1408	+1416	+1424	+2666	+1432	+1440	+1448
	R4206	R4214	R4222	R4230	R4238	R4246	R4254	R4286	R4262	R4270	R4278
External deceleration speed selection/ Multi-step speed monitor signal input (Note 2)	+1377	+1385	+1393	+1401	+1409	+1417	+1425	+2667	+1433	+1441	+1449
	R4207	R4215	R4223	R4231	R4239	R4247	R4255	R4287	R4263	R4271	R4279

(Note 1) Axis specification is valid only for buffering mode.

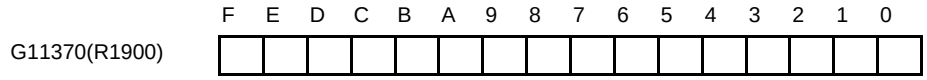
(Note 2) The buffering mode area is invalid for multi-step speed monitor signal input.

(Note 3) Pay attention when programming as the device No. of PLC axis 8th axis is not close to that of 1st to 7th axis.

5.1.4 Details of PLC Axis Control Information Data

(1) Status

The status is set by the CNC to indicate the execution status of PLC axis control and the status of the axis being controlled.



bit0:busy	Command processing	bit8:oper	Option error
1:den	Axis movement completed	9:ILI	In current limit
2:move	Axis moving	A:ILA	Current limit reached
3:SA	Servo ready	B:	
4:svon	Servo ON	C:	
5:ZP	Reference position reached	D:ALM3	Feedrate zero alarm
6:IMP	During in-position	E:ALM2	Axis in control alarm
7:WAIT	Axis movement wait	F:ALM1	Control information data designation alarm

bit 0: busy Command processing

This turns ON when the command is being processed.
The next command is not received while this bit is ON.
The next command to be issued is received while this bit is OFF.

bit 1: den Axis movement completed

This bit turns ON when the initialization and commanded movement are completed.
This bit stays OFF during movement, even when an interlock is applied.
This bit turns ON at reset or servo OFF, or when PLC axis control valid is "0".

bit 2: move Axis moving

This bit turns ON when the machine is moving, and turns OFF when the machine is stopped.
When movement distance is microscopically small, PLC may be unable to detect having turned ON.

bit 3: SA Servo ready

This bit turns ON when the servo is ready.
It turns OFF during emergency stops and servo alarms.

bit 4: svon Servo ON

This bit turns OFF when a servo OFF signal is output.
It also turns OFF during emergency stops and servo alarms.
Machine movement is possible when this signal is ON.

bit5: ZP Reference position reached

This bit turns ON when the reference position is reached after completion of a reference position return.
It turns OFF when the machine moves.

bit6: IMP During in-position

This bit turns ON when the PLC axis moves upon in-position, turns OFF when out of in-position.

bit7: WAIT Axis movement wait

This bit turns ON in the buffering mode when the axis movement of the previous block has been completed, and the machine is in a WAIT status.
It turns OFF when the previous block movement is completed and the movement of the next block begins.

bit 8: oper Option error

This bit turns ON when an attempt is made to execute PLC axis control when there is no PLC axis control option.

bit9 : ILI In Current Limit

This bit turns ON when a current limit changeover signal turns ON and entering in current limit state. It turns OFF by turning the current limit changeover signal OFF.

(Note 1) In current limit of the axis, which is selected by axis designation, will be output in a buffering mode.

bitA :ILA Current limit reached

This bit turns ON when a current value reaches to the current limit. It turns OFF when a current value falls below the current limit.

(Note 1) A current limit reached of the axis, which is selected by axis designation, will be output in a buffering mode.

bitD: ALM3 Feedrate zero alarm

It turns ON when the feedrate is zero during the execution of axix control.

It turns OFF by setting the feedrate, and starts moving immediately.

bit E: ALM2 Axis in control alarm

This bit turns ON when an alarm occurs (such as a servo alarm) during execution of axis control. Axis control cannot be executed while this bit is ON.

After the cause of the alarm has been removed, turn the bit OFF by turning ON a reset signal of PLC axis, setting PLC axis control valid signal to 0, or turning the power OFF then ON again.

(Note) When alarms occur during axis control, the same alarms appear in the CNC screen as for CNC control axes. Set the 1st PLC axis to "1", and the 2nd PLC axis to "2".

Example: When a servo alarm occurs for the 1st PLC axis

S03 Servo alarm 52 1

PLC axis

bit F: ALM:1 Control information data designation alarm

This bit turns ON when the designated details of the control information data are illegal.

When an alarm occurs for the simultaneous operation of buffering mode and single mode, the mode designated later is not executed and the mode designated first continues processing.

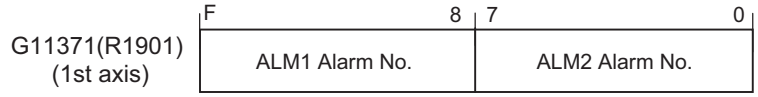
PLC axis control is not executed when any other alarm occurs.

Turn the bit OFF by correcting the data, turning ON a reset signal of PLC axis, or setting PLC axis control valid signal to 0.

(Note) When the PLC axis control valid signal is turned ON for an axis, status of the same axis is automatically updated.

(2) Alarm details

The alarm Nos. of status ALM1 and ALM2 are set.



The details of each alarm No. are shown below.

ALM1 (Control information data designation alarm)

Alarm No.	Details
01	Control signal illegal (A signal other than a registered control signal has been commanded.)
02	Axis No. illegal
03	Operation mode illegal (0 to 6)
04	Movement data range exceeded -99999999 to +99999999
05	
06	
07	
10	Reference position return not complete (absolute value command not possible)
11	
12	

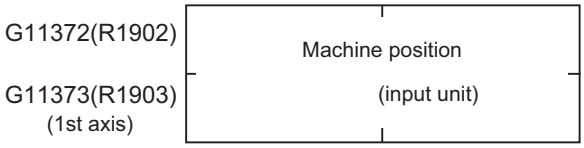
ALM2 (Axis in control alarm)

Alarm No.	Details
0	Servo alarm (Alarm No. is displayed in the PLC axis monitor screen. Refer to the Drive Unit Maintenance Manual for details.)
1	Z-phase not passed
2	Soft limit (+)
3	Soft limit (-)

(Note) When the PLC axis control valid signal is turned ON for an axis alarm details for the same axis is automatically updated.

(3) Machine Position

The machine position output to the machine system is expressed. The machine position becomes the Rfp (reference position) when the reference position is reached.

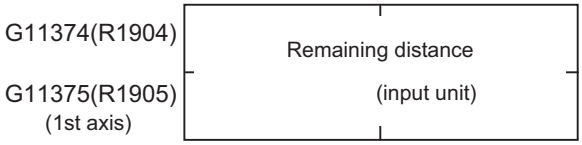


(Note 1) Refer to the explanation of "#1003 iunit" in "5.1.1 Specifications" for measure unit.

(Note 2) When the PLC axis control valid signal turned is ON for an axis, machine position for the same axis is automatically updated.

(4) Remaining Distance

The remaining distance of the movement data output to the machine system is expressed.

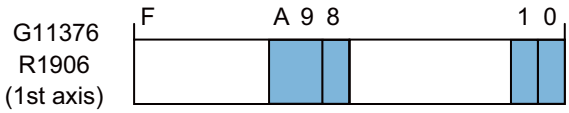


(Note 1) Refer to the explanation of "#1003 iunit" in "5.1.1 Specifications" for measure unit.

(Note 2) When the PLC axis control valid signal is turned ON, remaining distance for the same axis is automatically updated.

(5) Status 2

Multi-step speed monitor related signals for each axis are output. It is valid wether PLC axis control valid signal is ON or OFF. This signal outputs only when “#21162 mulstepssc Multi-step speed monitor enabled” is set to “1”.



Bit 0: ZLS Zero point initialization incomplete

This signal is output when the absolute position is not established in the absolute position detection system.

Bit 1: Power shutoff movement over

This signal turns ON when the difference of the machine position at power OFF and at power ON exceeds the tolerable value (parameter "#2051 check" setting value) when using the absolute position detection system.

Bit 8: In multi-step speed monitor

This signal turns ON when the muti-step speed monitor request is ON and PLC axis is in multi-step speed monitor.

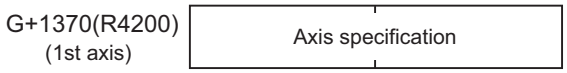
Bit 9, A: Multi-step speed monitor output

This signal outputs the mode is currently used to monitor the speed for multi-step speed monitor.

(Numerical data)
0: Speed monitor mode 1
1: Speed monitor mode 2
2: Speed monitor mode 3
3: Speed monitor mode 4

(6) Axis specification

PLC axis No. is designated.

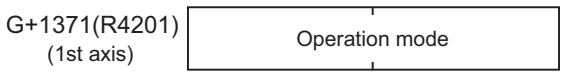


0: 1st axis
1: 2nd axis
2: 3rd axis
3: 4th axis
4: 5th axis
5: 6th axis
6: 7th axis
7: 8th axis

Only buffering mode allows the axis specification upon this data.
Single mode, which provides the PLC axis control valid signal for each axis, does not allow the axis specification upon this data.

(7) Operation Mode

The operation mode for the PLC axis is designated.
For example, in the handle mode, R1n+5=6 (DATA) is set.



(Numeric value data)
0: Rapid traverse (G0)
1: Cutting feed (G1)
2: Jog feed (+)
3: Jog feed (-)
4: Reference position return (+)
5: Reference position return (-)
6: Handle feed
7: Automatic initial set

The axis movement will not be affected by changing the operation mode, even while the axis is moving. The new operation mode is validated at the next start.

(8) Feedrate

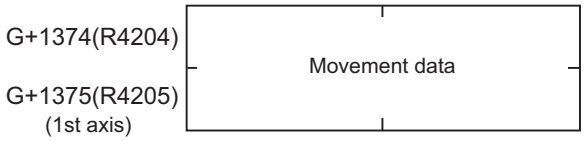
When the operation mode is cutting feed or jog feed (operation mode, register = 1 to 3), the PLC axis feedrate is designated with a binary code.

Command range : 1 to 1000000 mm/min. (0.1 to 100000 inch/min.)

(Note 1) The measure unit of feedrate is fixed regardless of the unit system set as command unit.
(Note 2) The feedrate designated in the parameters is used for the rapid traverse mode and reference position return mode.
(Note 3) The feedrate can be changed during axis movement by directly changing the feedrate data (R1n + 6, 7).

(9)Movement Data

When the operation mode is rapid traverse or cutting feed, the movement data is designated with a binary code.



Command range : -99999999 to +99999999

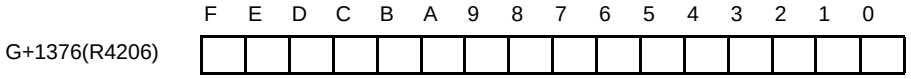
(Note 1) Refer to the explanation of "#1003 iunit" in "5.1.1 Specifications" for measure unit.

(Note 2) The movement data is classified as follows by the absolute value command flag (bit 8) of the command signal.
Absolute value command flag = 0: Incremental value from the current position
Absolute value command flag = 1: Absolute value of the machine coordinate system

(Note 3) If the movement amount is changed during axis movement, the new movement amount will be validated at the next start.

(10) Control Signals

Control signals such as start, interlock, reset, axis removal and axis removal 2 are designated for the PLC axis.



bit 0: Start	bit 8: Absolute value command
1: Interlock	9:Current limit changeover
2: Reset	A:Droop release request
3: Servo OFF	B:
4: Axis removal	C:
5: Axis removal 2	D:
6: External deceleration +	E:
7: External deceleration -	F:

bit 0: Start

Starting begins at the rising edge (OFF -> ON) of the start signal, based on the control information data.
Turn ON a start signal after turning ON the PLC axis control valid signal.
The axis does not move during interlock, servo OFF, axis removal and axis removal 2.
Movement starts after interlock, servo OFF, axis removal and axis removal 2 are canceled.
Start is invalid during resetting.

bit 1: Interlock

The moving PLC axis executes a deceleration stop when the interlock signal turns ON.
The stopped PLC axis will resume movement when the interlock signal turns OFF (is canceled).

bit 2: Reset

The PLC axis is reset when the reset signal turns ON.
Moving PLC axes will execute a deceleration stop.
Commands and controls are invalid during resetting.
If the reset signal turns ON during an alarm occurrence, the alarm will be cleared.

bit 3: Servo OFF

bit4: Axis removal

The axis will execute a deceleration stop, and a servo OFF status will result, when the axis removal signal turns ON.

A servo ON status will result and the stopped PLC axis will resume movement when the axis removal signal turns OFF (is canceled).

Axis removal is validated when either this signal or machining parameter and axis parameter "#8201 Axis Removal" is validated.

The reference position return will become incomplete when the axis is removed. Therefore, a dog-type reference position return must be completed again when starting with an absolute value command.

bit 5: Axis removal 2

The axis will execute a deceleration stop, and a servo OFF/ready OFF status will result, when the axis removal 2 signal turns ON.

A servo ON/ready ON status will result for the stopped PLC axis when the axis removal 2 signal turns OFF (is canceled).

A restart must be executed to start the movement again.

Position control cannot be carried out while the axis removal 2 signal is ON. However, position detection is possible so the position will not be lost.

bit6: External deceleration +

When the external deceleration + signal has been turning ON while the PLC axis is moving towards + direction, the feedrate can be set to constant speed set by parameter. Turning this signal ON does not affect it when it is moving at the speed less than the external deceleration. The external deceleration speed can be randomly set with "#2086 exdcax1 External deceleration speed 1", "#2161 exdcax2 External deceleration speed 2" to "#2165 exdcax6 External deceleration speed 6" and the external deceleration speed selection signal.

This signal is valid only when "#1239 set11/bit6 External deceleration axis compliance valid" is set to "1".

bit7 : External deceleration -

The performance is the same as the External deceleration +. The condition of deceleration is to turn the external deceleration signal - ON while the PLC axis is moving towards "-" direction.

bit 8: Absolute value command

Turn this bit ON when the movement data is commanded in absolute values.

When this bit is OFF, the commands will be processed as incremental value commands.

bit9 : Current limit changeover

Turn this bit ON when validating the current limit. A current limit parameter will switch from SV013 to SV014.

If this signal is turned OFF, the droop generated by the current limit will be released and the command value will move to the FB position during the current limit reached.

(Note 1) If “#1236 set08/bit2 Current limit droop cancel invalid” is selected for current limit changeover or for the axis designated as a droop release invalid axis, the droop will not be released.

(Note 2) Use the current limit changeover signal in single mode even during the buffering mode. (The PLC axis control valid signal needs to be ON.) The current limit changeover signal for a buffering mode is invalid.

(Note 3) If the current limit changeover signal is turned ON while the movement command remains, do not release the droop at once. After turning OFF the signal, make sure no movement command remains and then release the droop.

bitA : Droop release request

Release the droop generated by the current limit and move the command value to the FB position if it is during the current limit reached.

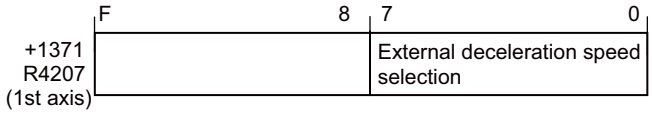
(Note 1) This signal is invalid for the axis that is set as the droop release invalid axis.

(Note 2) Use the droop release request signal in the single mode even during the buffering mode. (The PLC axis control valid signal needs to be ON.) The current limit changeover signal for a buffering mode is invalid.

(Note 3) If the current limit changeover signal is turned ON while the movement command is still effective, do not release the droop at once. After turning OFF the signal, make sure no movement command is still effective and then release the droop.

(11) External deceleration speed selection

This signal selects which external deceleration parameter to use when the PLC axis external deceleration signal is valid. It is valid only when “#1239 set11/bit6 External deceleration axis compliance valid” is set to “1”.



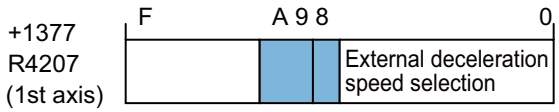
Setting range:0~5

(Numerical value data)
0: External deceleration speed 1(#2086 exdcax1)
1: External deceleration speed 2 (#2161 exdcax2）
2: External deceleration speed 3(#2162 exdcax3)
3: External deceleration speed 4(#2163 exdcax4)
4: External deceleration speed 5(#2164 exdcax5)
5: External deceleration speed 6(#2165 exdcax6)
Other than above: External deceleration speed 1(#2086 exdcax1)

(12) Multi-step speed monitor input

This signal is used to input the multi-step speed monitor related signal for each axis. It is always valid wether the PLC axis control valid signal is ON or OFF.

This signal is ignored when "#21162 mulstepssc Multi-step speed monitor enabled" is set to "0".



bit8 : Multi-step speed monitor request

PLC axis executes to monitor the multi-step speed while the speed monitor request signal is ON.

bit9,A :Multi-step speed monitor mode input

This signal selects which speed monitor parameter to use when the speed monitor request signal for PLC axis becomes valid.

(Numerical data)
0 : Speed monitor mode 1 (#2181 sscfeed1)
1 : Speed monitor mode 2 (#2182 sscfeed2)
2 : Speed monitor mode 3 (#2183 sscfeed3)
3 : Speed monitor mode 4 (#2184 sscfeed4)

5.1.5 Precautions

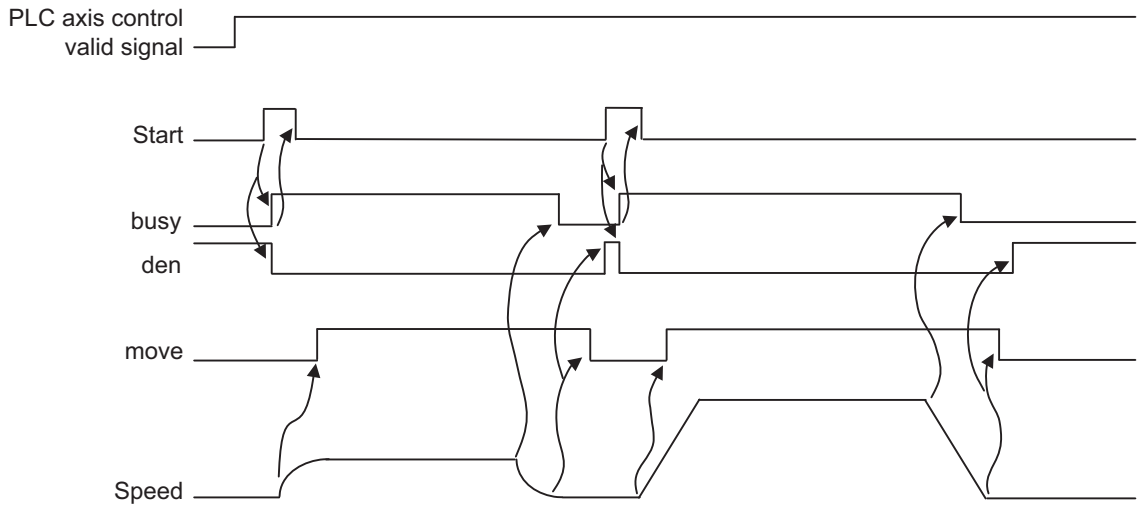
(1) Updates of signals are not synchronized. Set the control information data, such as feedrate and movement data before setting the start signal of control signal/bit 0.

(2) PLC control valid signal is valid at all times for as many PLC axes as used.
PLC axis control buffering mode valid signal is also valid at all times during the axis is used.
Therefore, the PLC axis control valid signal and the PLC axis control buffering mode valid signal must be turned ON until the movement of the axis specified is completed.
If these signals are turned OFF, the axis is reset and the command is canceled.

(3) Always transfer 32bit data via 32bit regardless of the setting value.

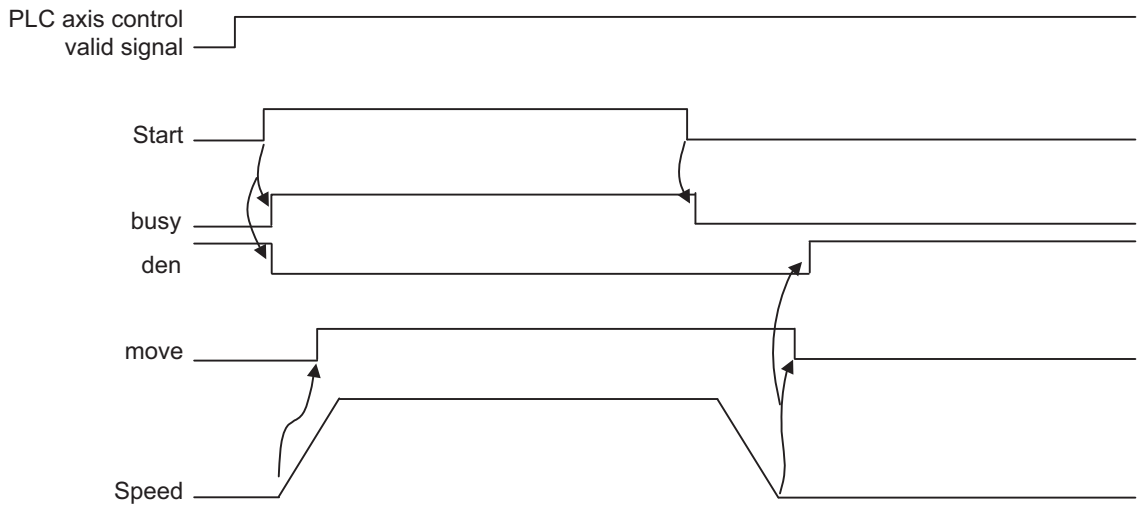
5.1.6 Timing Chart

(1) For rapid traverse and cutting feed mode



(Note) Make sure the busy signal has been turned ON before turning OFF the start signal.
As long as the start signal is ON, the busy signal is kept ON even after the movement has ended.

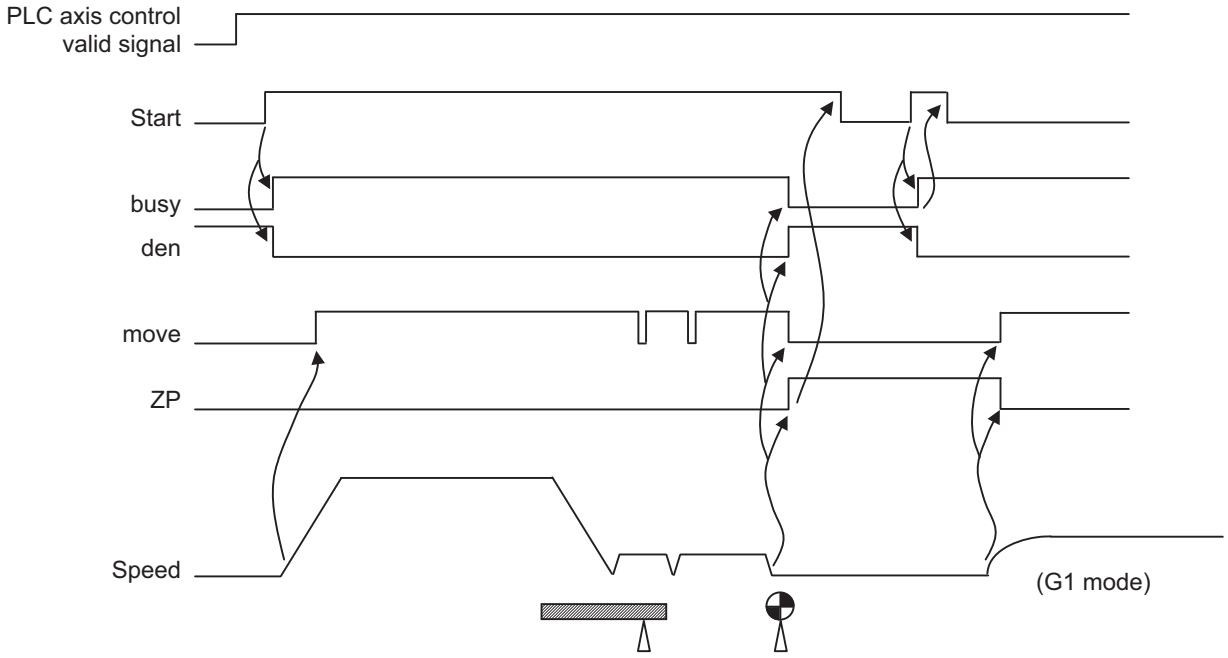
(2) For jog feed mode



(Note) The axis moves by jog feed only during start ON.

(3) For reference position return feed mode

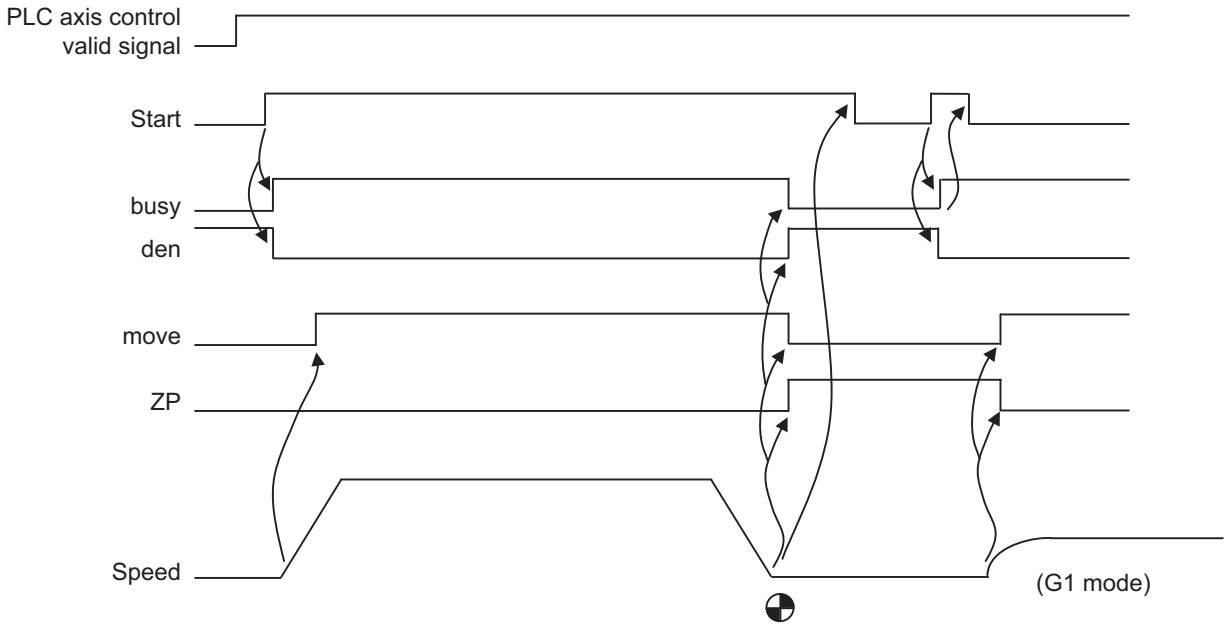
(a) Dog-type reference position return



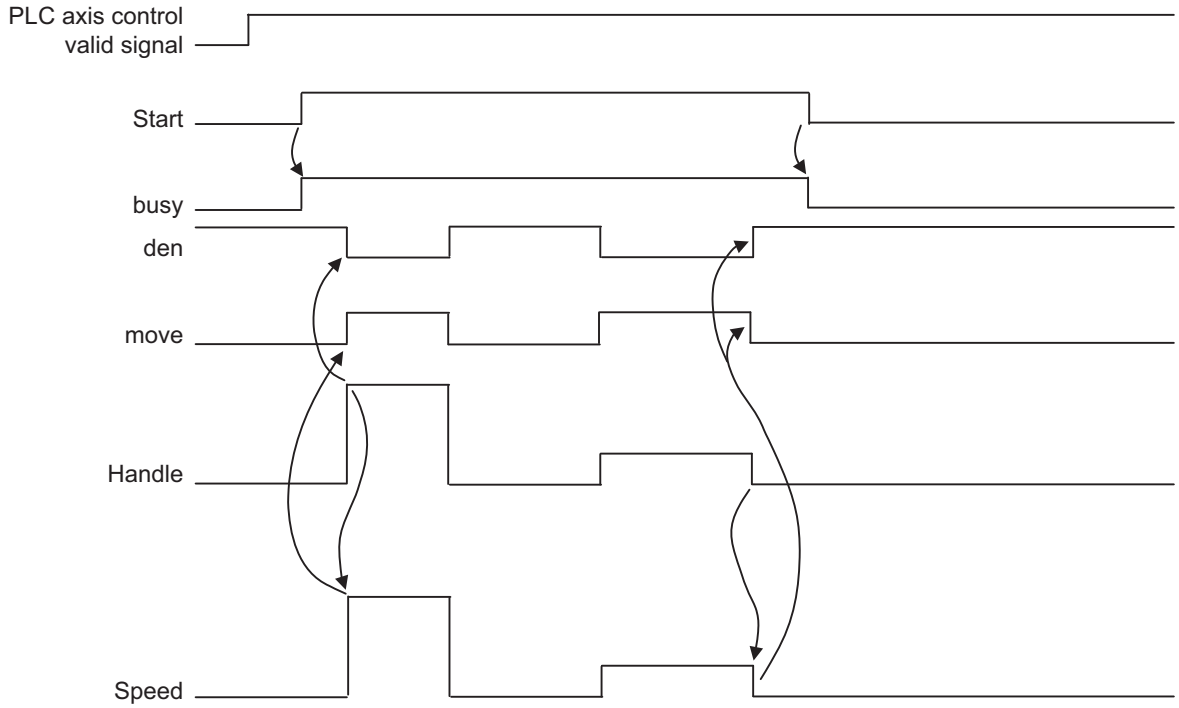
(Note 1) The axis moves by reference position return feed only during start ON.
Turn the start OFF after confirming that the reference position has been reached.

(Note 2) The first reference position return after the power is turned ON is always dog-type.
All returns after that are high-speed reference position returns.

(b) High-speed reference position return

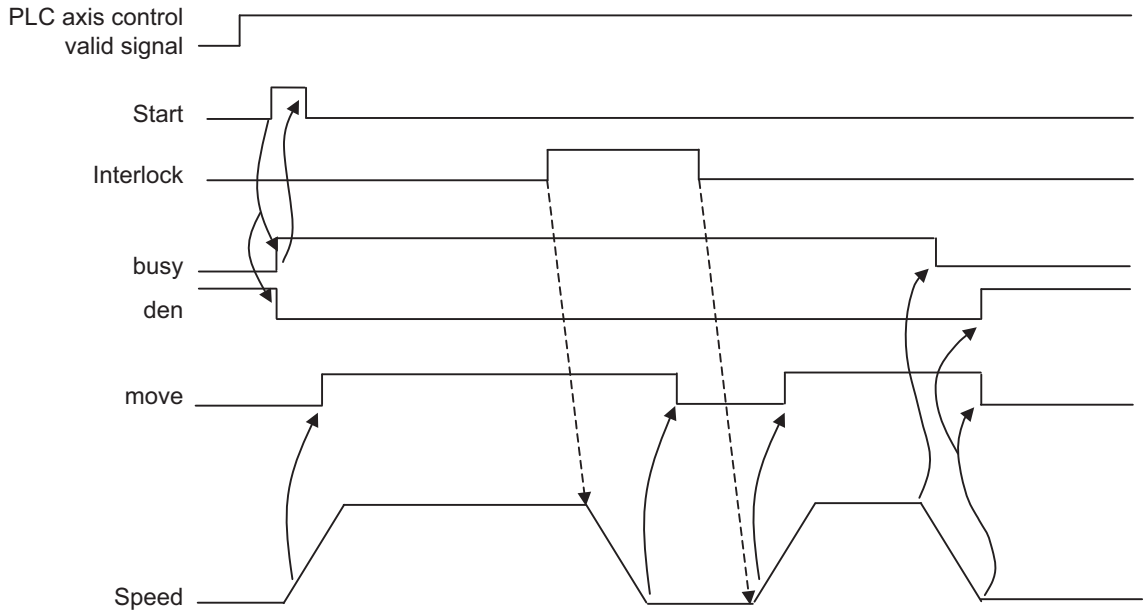


(4) For handle feed mode



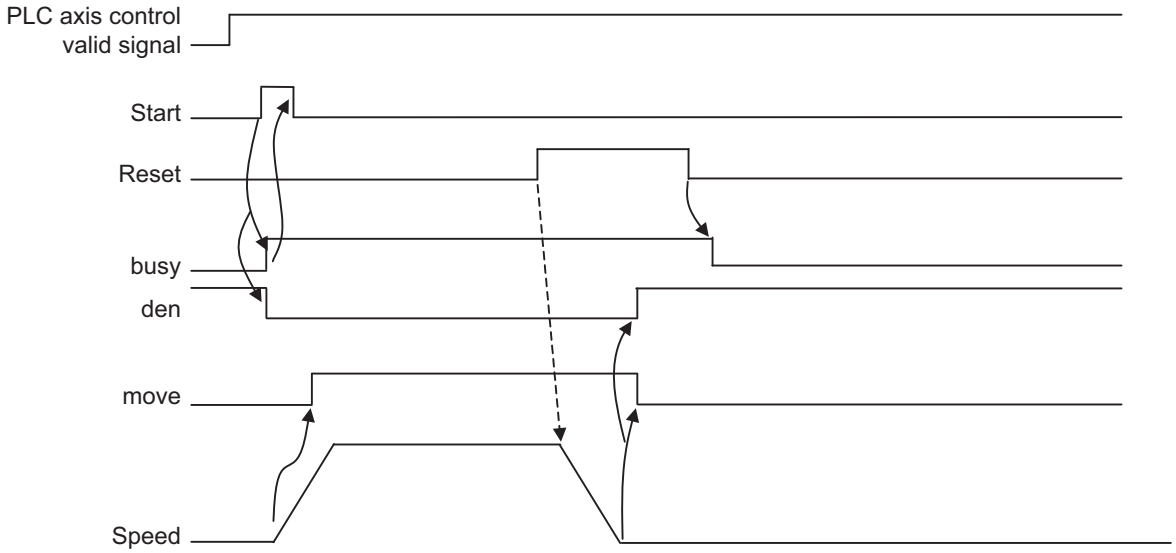
(Note) Handle feed is possible only during start ON.

(5) When the interlock signal is ON (= 1)



(Note) Make sure the busy signal has been turned ON before turning OFF the start signal.
As long as the start signal is ON, the busy signal is kept ON even after the movement has ended.

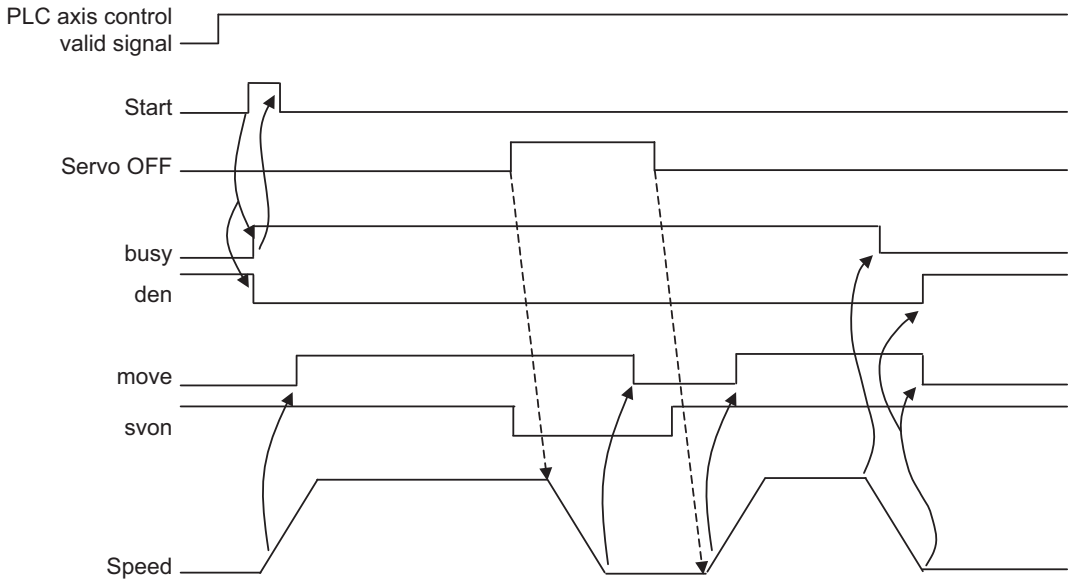
(6) When the reset signal is ON (= 1)



(Note 1) Make sure that the busy signal has been turned ON before turning OFF the start signal.
As long as the start signal is ON, the busy signal is kept ON even after the movement has ended.

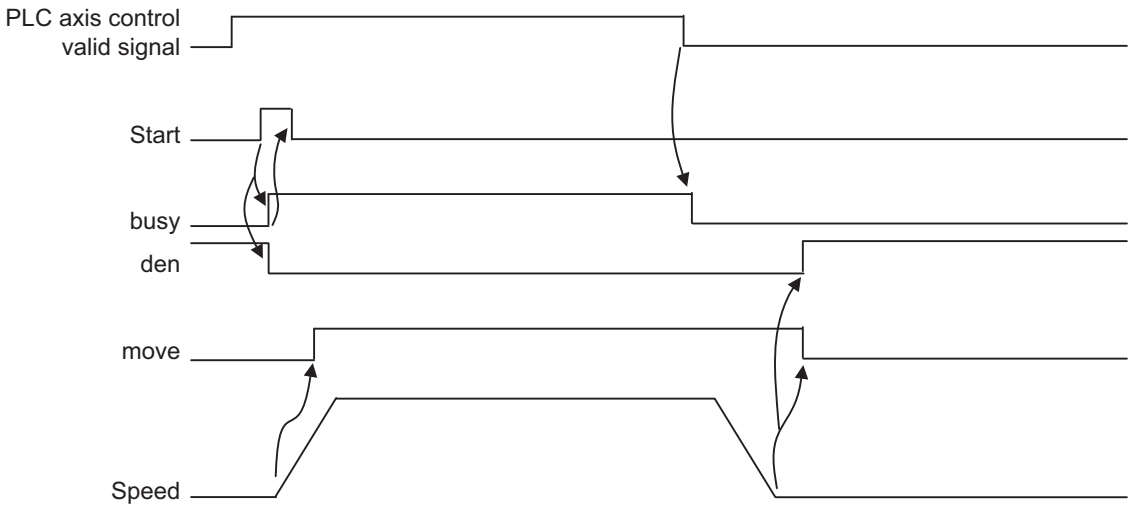
(Note 2) The busy signal will be reset at the falling edge of the reset signal. The start signal has to start up again to make the mode valid if the mode is used with the start signal ON for handle mode, JOG mode, or reference position return mode.
When the reset command is issued with this mode and the start up signal is turned OFF, it will be a busy state as the reset is cancelled and the start signal is turned ON again. Then the handle mode becomes valid.

(7) When the servo OFF signal is ON (= 1)



(Note) Make sure the busy signal has been turned ON before turning OFF the start signal.
As long as the start signal is ON, the busy signal is kept ON even after the movement has ended.

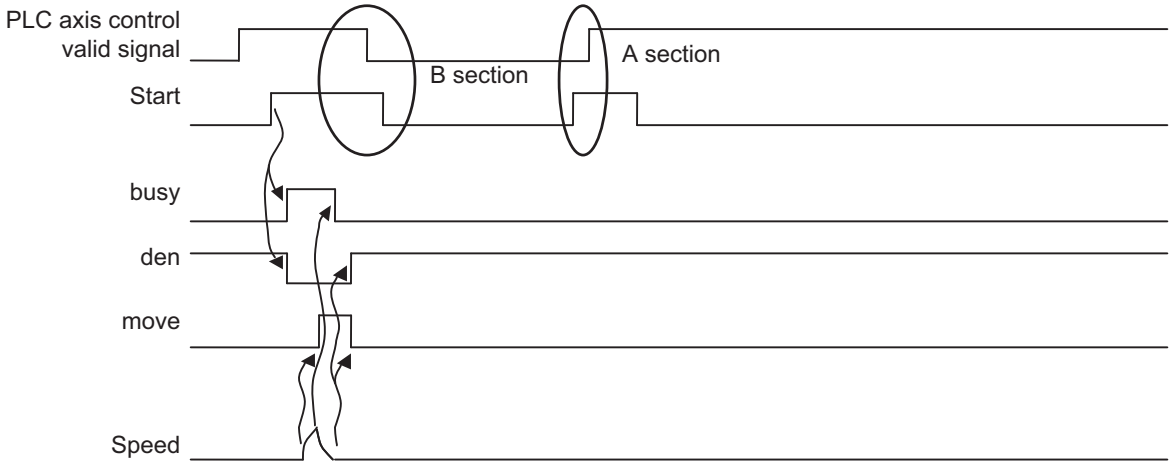
(8) When the PLC axis control valid signal is OFF (= 0)



(Note) Make sure the busy signal has been turned ON before turning OFF the start signal.
As long as the start signal is ON, the busy signal is kept ON even after the movement has ended.

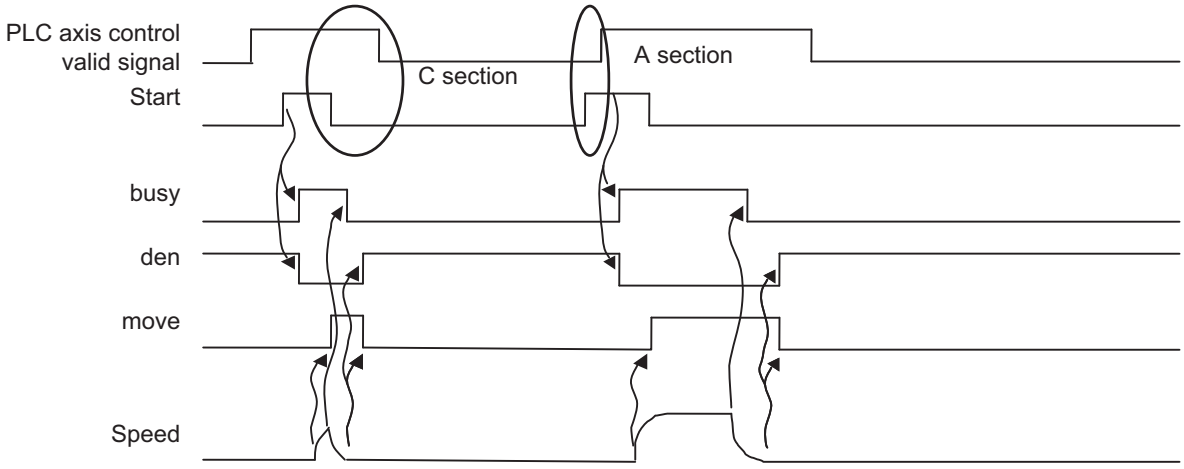
(9) When the start signal ON (=1) is earlier than the PLC axis control valid signal ON (=1) (A section)

(a) When OFF the last PLC axis control valid signal OFF is earlier than a start signal OFF (B section)



When PLC axis control valid signal is turned OFF at the 1st time, a start signal continues being ON, and since the start signal is turned ON previously when PLC axis control valid signal is turned ON at the 2nd time, CNC cannot detect the standup of a start signal.
Therefore, a PLC axis does not operate by the 2nd start signal.

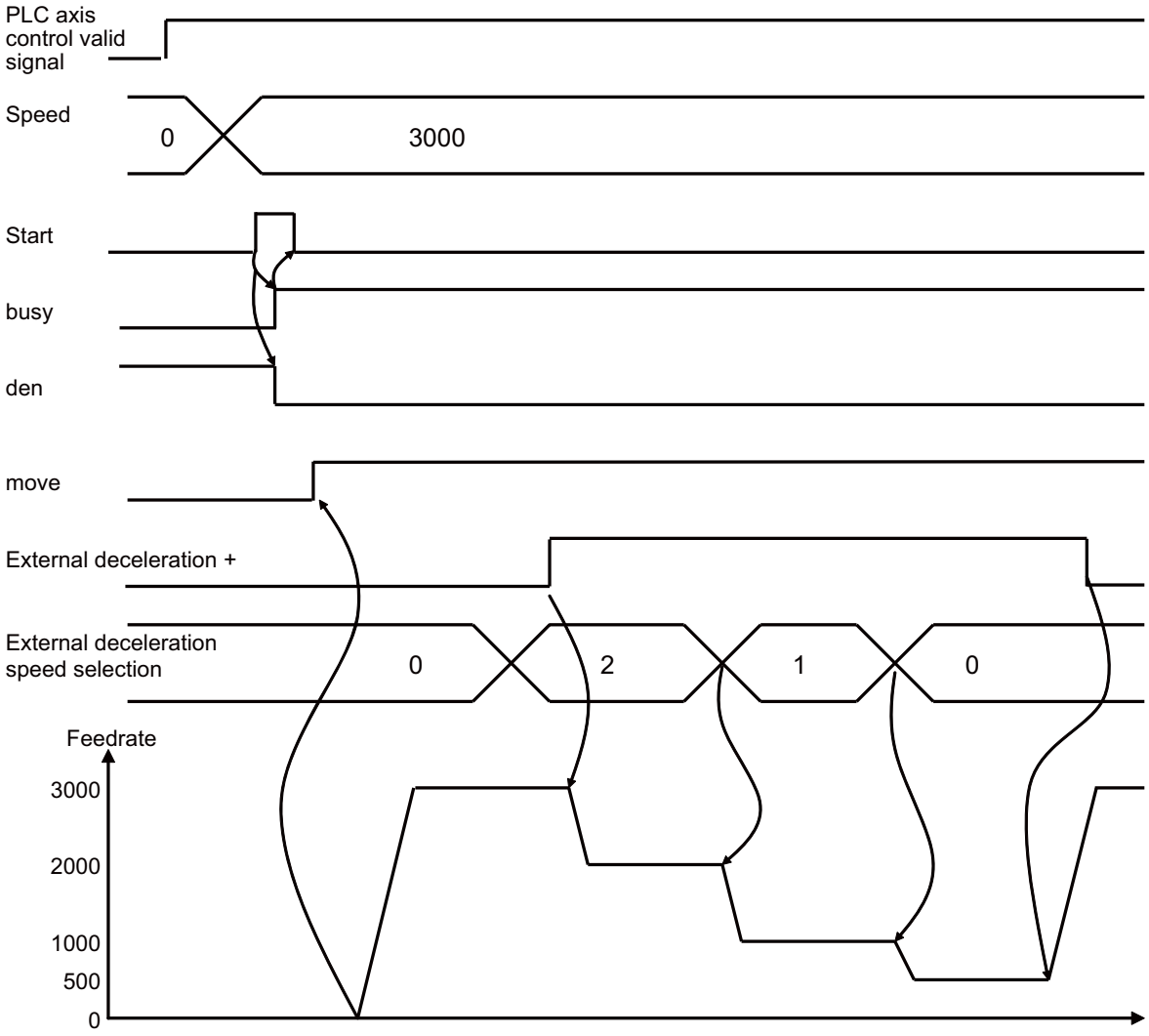
(b) When the PLC axis control valid signal OFF is later than the start signal OFF (C section)



When PLC axis control valid signal is turned OFF at the 1st time, a start signal is turned OFF, CNC can detect the standup of a start signal when PLC axis control valid signal is turned ON at the 2nd time.
Therefore, a PLC axis operates by the 2nd start signal.

When the start signal ON (=1) is earlier than the PLC axis control valid signal ON (=1), a PLC axis does not operate according to the state of the last start signal.
In order to avoid such a situation, please turn ON PLC axis control valid signal after a start signal or turn OFF PLC axis control valid signal after a start signal.

(10) When the external deceleration speed signal is set to ON (="1") during the G0/G1 mode



Make sure the busy signal has been turned ON before turning OFF the start signal.
As long as the start signal is ON, the busy signal is kept ON even after the movement has ended.

5.1.7 Reference Position Return Near Point Detection

Set the near point dog signal of the PLC axis reference position return for the following devices in the PLC.

Device No.		Signal name
Y338	*PCD1	PLC axis near point detection 1st axis
Y339	*PCD2	PLC axis near point detection 2nd axis
Y33A	*PCD3	PLC axis near point detection 3rd axis
Y33B	*PCD4	PLC axis near point detection 4th axis
Y33C	*PCD5	PLC axis near point detection 5th axis
Y33D	*PCD6	PLC axis near point detection 6th axis
Y33E	*PCD7	PLC axis near point detection 7th axis
Y33F	*PCD8	PLC axis near point detection 8th axis

5.1.8 Handle Feed Axis Selection

The axis is designated for the following devices when handle feed is carried out with a PLC axis.

Device No.		Signal name
Y32D	PCH1	PLC axis 1st handle valid
Y32E	PCH2	PLC axis 2nd handle valid
Y32F	PCH3	PLC axis 3rd handle valid

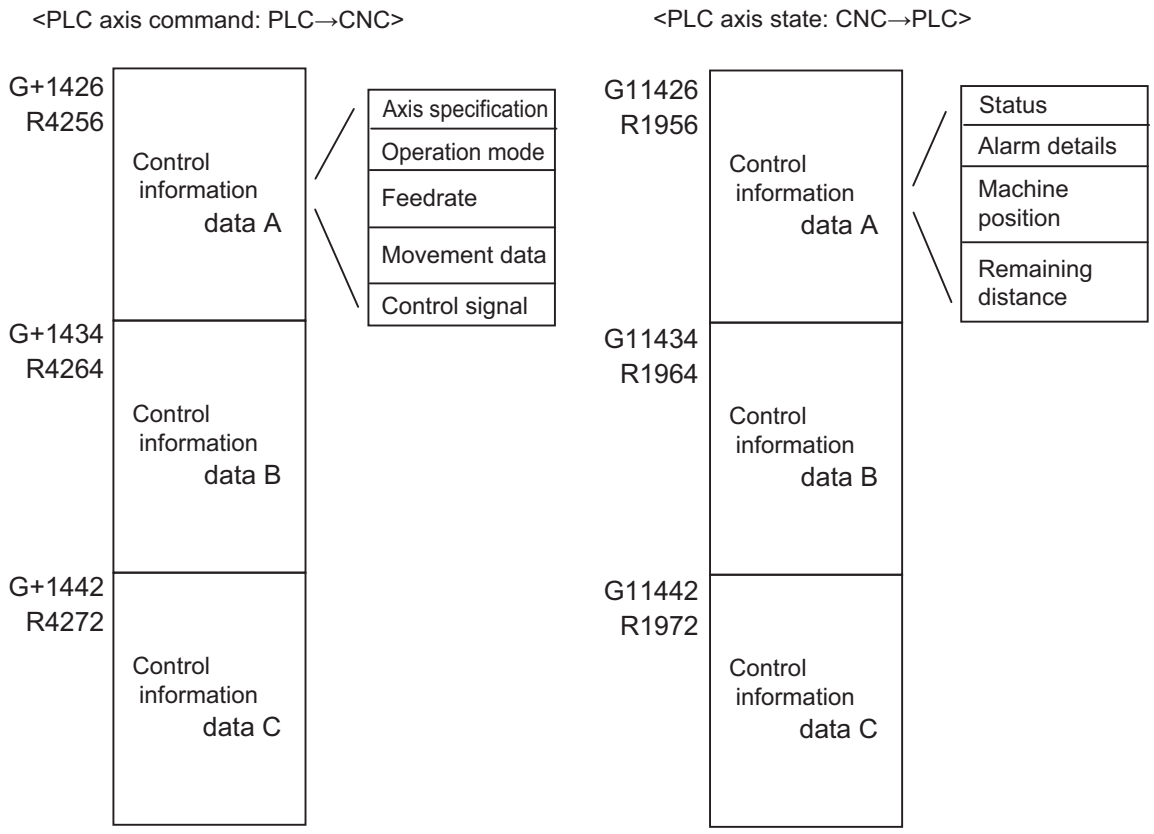
When Y32D, Y32E, Y32F are ON, each handle changes to PLC axis dedication.
Y740-Y744, Y747, Y748-Y74C, Y74F, Y750-Y754, Y757 used with the normal control device are used to select each handle axis.
PLC axes are differentiated from NC axes and counted from the 1st.
Therefore, if you will operate the first handle in the 1st PLC axis, turn ON Y32D, Y740-Y744 and Y747.

(Note) The handle feed magnification is also used for CNC control axes.

5.1.9 Buffering Mode

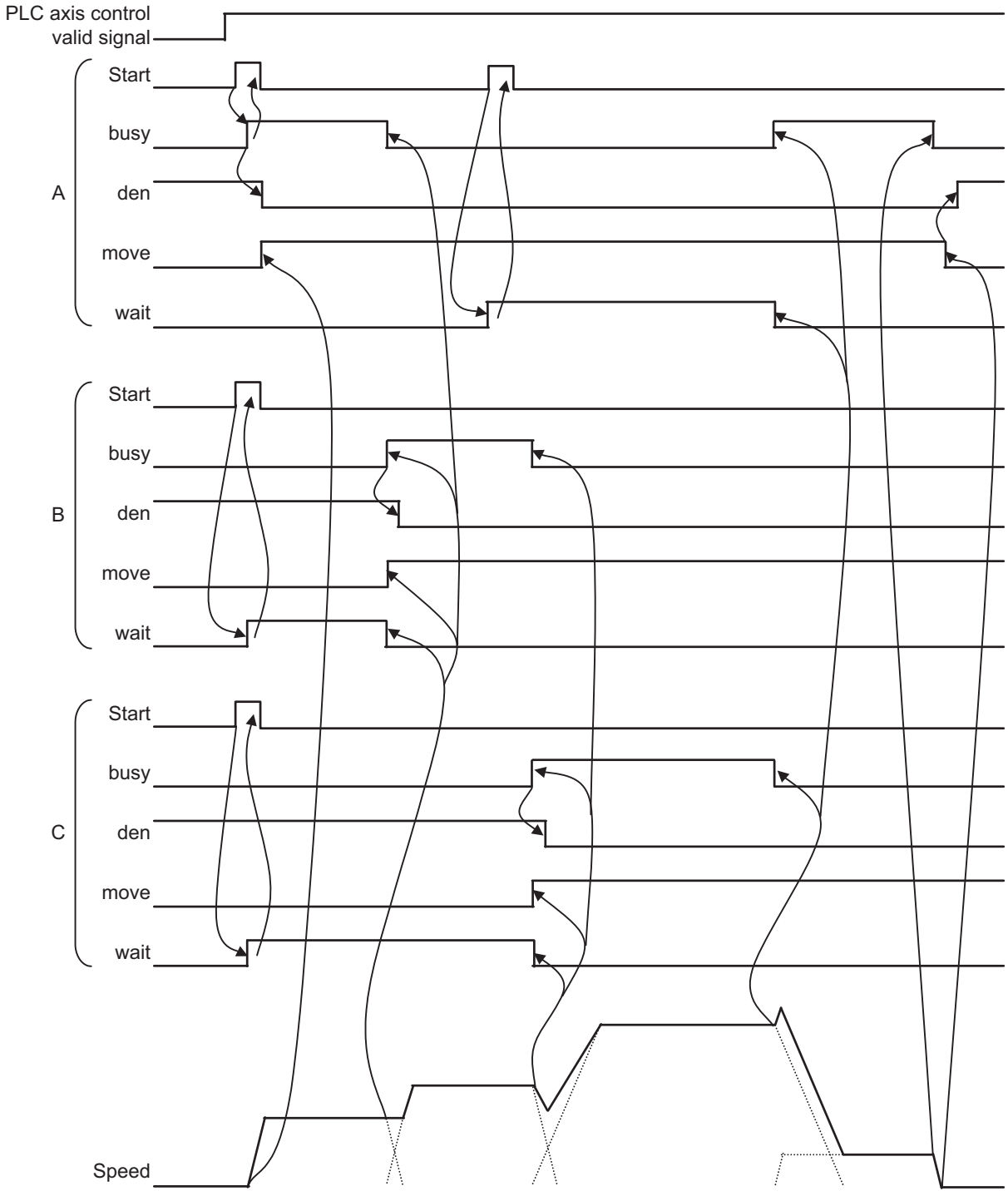
In the buffering mode, the PLC axis command (control information data) is commanded to several blocks. This enables smooth changeover of commands.
Axis specifications can be set to each control information data. Up to three axes can be controlled in sequence. (See the figure in "(1) Control information data".)

(1) Control information data
The control data for the buffering mode is set in three blocks, the control information data A, B and C.
The contents of each control information data have the same configuration as the normal control information data.
When executing, the axis moves in the order that each control information data has been started. When the movement is completed, it will move to the next block.
(If the start signals are turned ON simultaneously, it will be performed in the order of A, B, and C.)



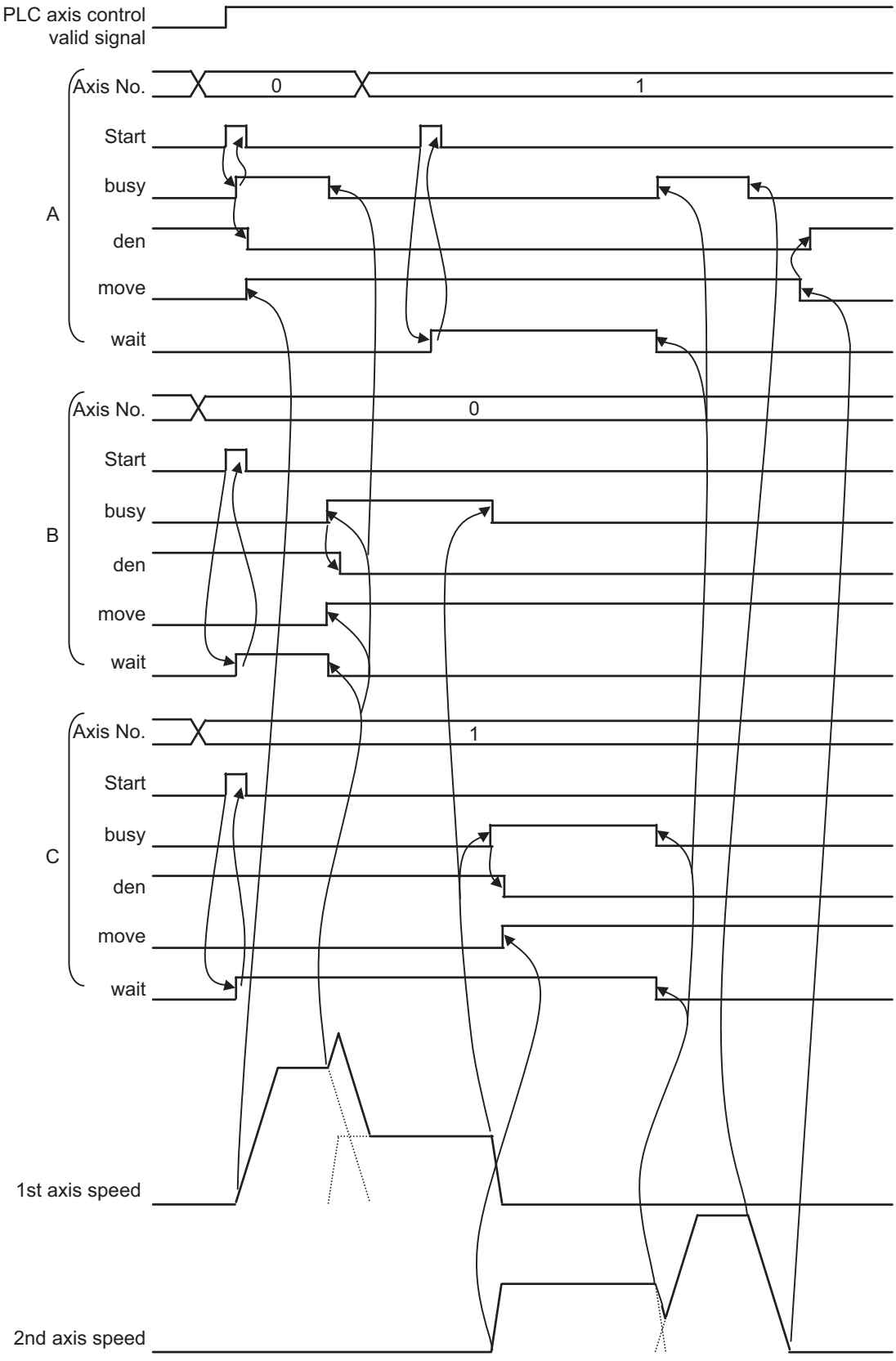
(Note 1) Only one set of the buffering mode can be commanded.
(Note 2) Turning ON the PLC axis control valid signal updates the control information in single mode, such as status and machining position, even during axis control in buffering mode. The information is updated at the same time when the axis is moved by the command in buffering mode. It is recommended to turn the PLC axis valid signal ON for the axis specified in the control information for buffering mode, and to refer to single mode for status, alarm details, machine position and remaining distance even in buffering mode.

(2) Timing chart
G1→G1→G0→G1 (same axis)



(Note) Change and start the data after the busy signal or wait signal turns OFF.
Starting while the busy signal or wait signal is ON will be ignored.
As long as the start signal is ON, the busy signal or wait signal is kept ON even after the movement has ended.

G1→G1→G0→G1 (two axes)



5.1.10 Parameters

Set the parameters according to the Operation Manual. Servo parameters to set are same as parameters for CNC axis. The table below shows the axis parameters, the basic parameters and the axis specification parameters, which are related to PLC axis control.

Correspondence of Parameters to PLC axis

○: Supported ×: Not supported

#	Name	Supported	#	Name	Supported	#	Name	Supported
[Axis parameters]			1065	JOG_H	×	1106	Tcount	×
8201	AX. RELEASE	○	1066	JOG_HP	×	1107	Tllfsc	×
8202	OT-CHECK	×	1067	JOG_HN	×	1108	TlrectM	×
	OFF		1068	slvno	×	1109	Subs_M	×
8203	OT-CHECK-	×	1069	no_dsp	×	1110	M96_M	×
	CANCEL		1070	axoff	○	1111	M97_M	×
8204	OT-CHECK-N	×	1071	JOG_D	×	1112	S_TRG	×
8205	OT-CHECK-P	×	1073	I_Absm	×	1113	INT_2	×
8206	TOOL CHG. P	×	1074	I_Sync	×	1114	mcrint	×
8207	G76/87 IGNR	×	1075	I_G00	×	1115	thwait	×
8208	(-)G76/87 (-)	×	1076	AbsInc	×	1116	G30SLM	×
8209	G60 SHIFT	×	1077	radius	×	1117	H_sens	○
8210	OT INSIDE	×	1078	Decpt2	×	1118	mirr_A	×
			1079	F1digt	×			
8213	Rotation axis type	○						
[Basic parameters]			1080	Dril_Z	×			
1001	SYS_ON	○	1081	Gmac_P	×			
1002	axisno	○	1082	Geomet	×			
1003	iunit	○	1084	RadErr	×			
1013	axname	○	1085	G00Drn	×			
1014	incax	×	1086	G0intp	×			
1015	cunit	×	1087	G96_G0	×			
1016	iout	○	1088	G30SL	×			
1017	rot	○	1089	Cut_RT	×			
1018	ccw	○	1090	Lin_RT	×			
1019	dia	×	1091	Mpoint	×			
1020	sp_ax	×	1092	Tchg_A	×			
1037	cmdtyp	×	1093	Wmvfin	×			
1038	plccel	×	1094	Tl_SBK	×			
1039	spinno	×	1095	T0tfof	×			
1040	M_inch	○	1096	T_Ltyp	×			
1041	I_inch	×	1097	T1digt	×			
1042	pcinch	○	1098	Tlno.	×			
1043	lang	×	1099	Treset	×			
1044	auxno	×	1100	Tmove	×			
1060	SETUP	×	1101	Tabsmv	×			
1061	intabs	×	1102	tlm	×			
1062	T_cmp	×	1103	T_life	×			
1063	mandog	×	1104	T_Com2	×			
1064	svof	○	1105	T_Sel2	×			

#	Name	Supported	#	Name	Supported
[Axis specification parameters]			2055	pushf	×
2001	rapid	○	2056	aproch	×
2002	clamp	○	2057	nrefp	×
2003	smgst	○	2058	nrefn	×
2004	G0tL	○	2059	zerbas	○
2005	G0t1	○	2061	OT_1B-	×
2006	G0t2	○	2062	OT_1B+	×
2007	G1t+	○	2063	OT_1Btype	×
2008	G1t1	○	2068	G0fwdg	×
2009	G1t2	○	2069	Rcoeff	×
2010	fwd_g	×	2070	div_RT	○
2011	G0back	○			
2012	G1back	○			
2013	OT-	○			
2014	OT+	○			
2015	tlml-	×			
2016	tlml+	×			
2017	tap_g	×			
2018	no_srv	○			
2019	revnum	×			
2020	o_chkp	×			
2021	out_f	×			
2022	G30SLX	×			
2023	ozfmin	×			
2024	synerr	×			
2025	G28rap	○			
2026	G28crp	○			
2027	G28sft	○			
2028	grmask	○			
2029	grspc	○			
2030	dir(-)	○			
2031	noref	○			
2032	nochk	×			
2033	zp_no	×			
2037	G53ofs	○			
2038	#2_rfp	×			
2039	#3_rfp	×			
2040	#4_rfp	×			
2049	type	○			
2050	absdir	○			
2051	check	○			
2052	absg28	×			
2053	absm02	×			
2054	clpush	×			

5.1.11 PLC Axis Monitor

The PLC axis operation status (machine position and remaining distance) can be confirmed by checking the section of the PLC axis on the servo monitor.

5.1.12 Absolute Position Detection

The absolute position of the PLC axis can be detected in the same manner as the CNC control axis.
The initial setting operations are the same as the CNC control axis. However, the following restrictions apply to the absolute position detection with the PLC axis.

(1) The near zero-point signal cannot be output.

(2) About the automatic initialization set start trigger
PLC axis automatic initialization set starts by starting the axis that the initialization is to be performed. (For NC axis, the initialization is started when the automatic initialization mode is selected, and the "Feed axis selection" (+Jn, -Jn) signal in the direction of the machine end of the axis to be initialized is turned ON.

5.1.13 Rotary axis

In PLC axis, the axis which is designated “1" by “#1017 rot rotary axis” is controlled with the rotary axis' coordinate system in the same manner as the CNC control axis.
The rotating type (short-cut valid/invalid) is set with the parameter "#8213 rotation axis type".
The setting range for “#8213 rotation axis type” is 0 to 2. "Workpiece coordinate linear type” is applied when "2" is set for NC axis, but for PLC axis it performs as same as “0” (disable shot-cut) is set.

5.1.14 Position switch

Position switch function can be used for PLC axis in the same manner as NC axis. The following devices turn ON within the area set by parameter.

The relationship of PLC axis position switch and output signal (CNC -> PLC)

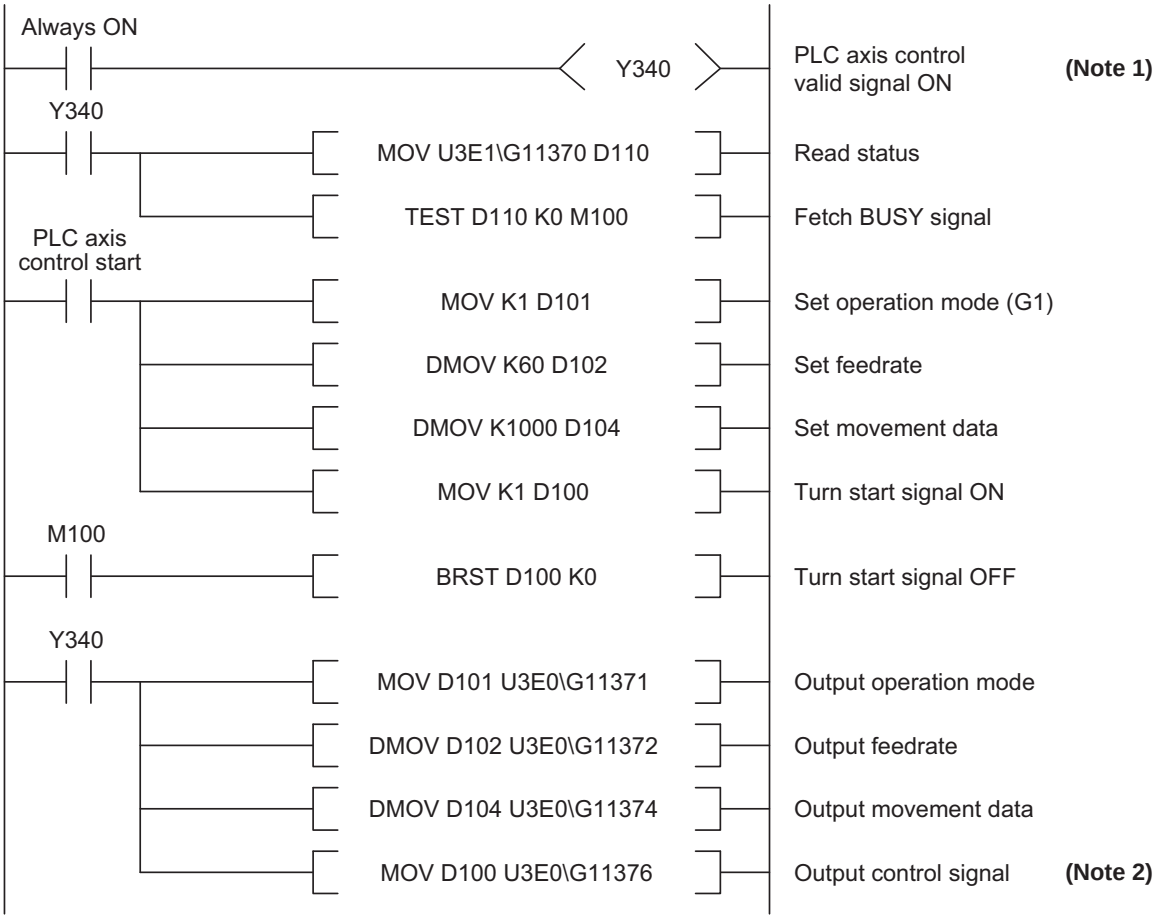
PWS No.	PSW1	PSW2	PSW3	PSW4	PSW5	PSW6	PSW7	PSW8
Shared device	G10006.0	G10006.1	G10006.2	G10006.3	G10006.4	G10006.5	G10006.6	G10006.7
Internal device	X360	X361	X362	X363	X364	X365	X366	X367

PWS No.	PSW9	PSW10	PSW11	PSW12	PSW13	PSW14	PSW15	PSW16
Shared device	G10006.8	G10006.9	G10006.A	G10006.B	G10006.C	G10006.D	G10006.E	G10006.F
Internal device	X368	X369	X36A	X36B	X36C	X36D	X36E	X36F

5.1.15 Usage Example

An example of the PLC axis control ladder in single mode for the 1st PLC axis is shown below.

Mode: cutting feed, speed: 60mm/min, movement amount: 1.000mm (iunit: B)



(Note 1) Program example of bit-type interface was made on the premise that the interface is transferred corresponding to the device Nos. of NC interface.
Assignment of device Nos. may change the details of the program.

(Note 2) Set all kinds of control information data before outputting control signal.

5.2 PLC Window

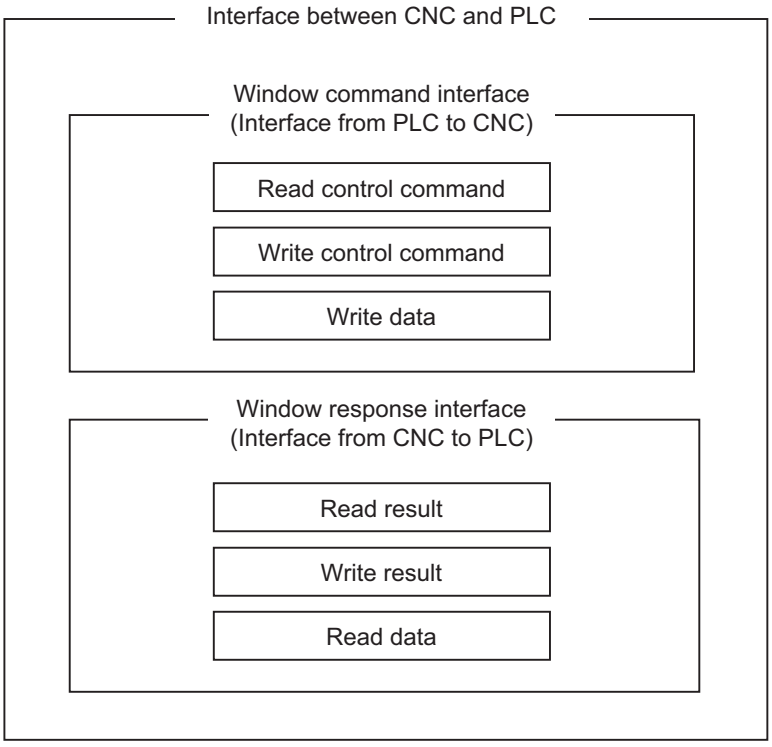
PLC window is used to read/write the operation state, axis information, parameters and tool data through a cyclic transmission area in CPU shared memory.

5.2.1 Details

PLC window has two interfaces, "window command interface" and "window response interface", which are used between PLC and CNC.
"Window command interface", an interface for control signals (from PLC to CNC), requests CNC for the data of "read control command", "write control command" and "write data".
"Window response interface", an interface for state signals (from CNC to PLC), outputs data of "read result", "write result" and "read data" to PLC.

If PLC sets the required command to the window command interface, data can be written to or read from CNC.

<Outline of interfaces between CNC and PLC>

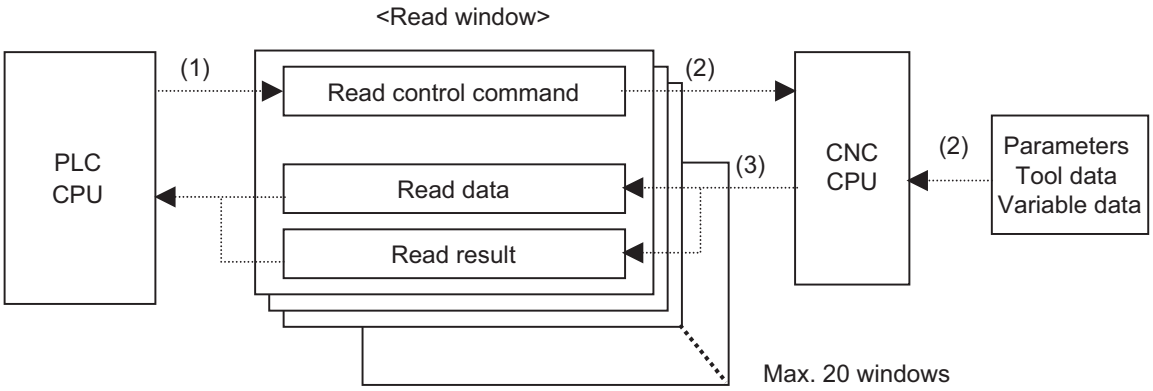


"Read control command", "read data" and "read result" in the chart above are all called "read window". "Write control command", "write data" and "write result" are all called "write window".
These windows are used for the read and write operations. 40 units of windows, 20 units for each, are provided for "read window" and "write window".

Note that the device Nos. assigned to the windows are not continuous through each unit of read/write window. Refer to "5.2.2 Read Window" and "5.2.3 Write Window" when using the windows. Take care not to set wrong device Nos.

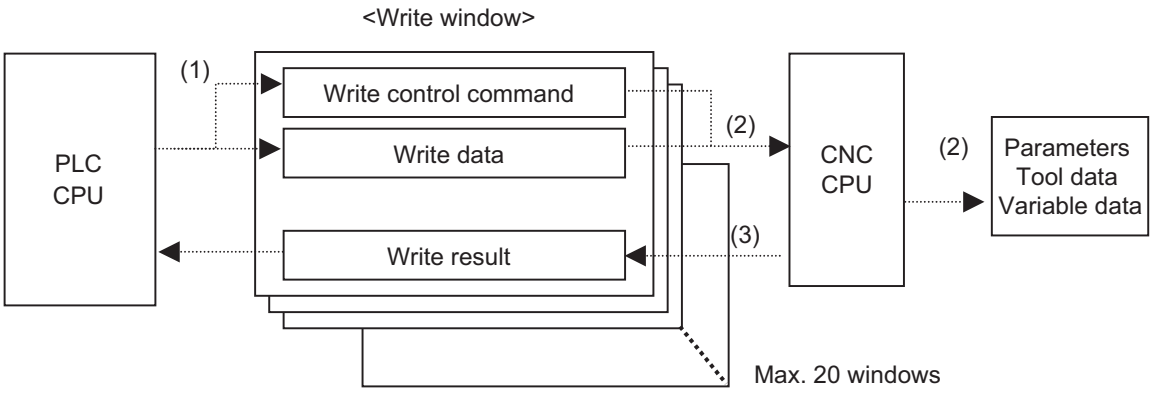
Outlines of read and write processes are shown below.

<Read process>



(1) PLC sets the “read control command” with the information on the CNC internal data to be read, and then turn the read control signal ON.
(2) CNC receives the control signal, and reads the data designated in the “read control command”.
(3) CNC sets the read data to “read data”.
CNC also sets the read status and results, such as errors, to the “read result”.

<Write process>



(1) PLC sets the “write control command” with the information of the CNC internal data where the data is written into, and sets the data to be written to the “write data”. After setting, turns the write control signal ON.
(2) CNC receives the control signal, and writes the data designated in the “writedata” into the CNC internal data designated in the “write control command”.
(3) CNC sets the write status and errors to the "write result"

Data is transmitted between PLC CPU and CNC CPU through a cyclic transmission area in the memory shared among CPU. The cyclic transmission area is allocated to G device, from G10000.
Interfaces for PLC window are allocated to the cyclic transmission area. This area is used to read out or write into the CNC internal data.
The lists of device Nos. are shown below. The device Nos. in the lists are offset Nos. from a head device in a cyclic transmission area.

List of device Nos. of read window

Signal name	Shared device	Reference
Read control command	G+2100 to G+2259	5.2.2 Read window
Read data	G12310 to G12469	
Read result	G12270 to G12289	

List of device Nos. of write window

Signal name	Shared device	Reference
Write control command	G+2260 to G+2579	5.2.3 Write window
Write data		
Write result	G12290 to G12309	

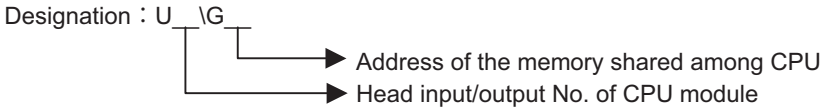
Note that when a system is configured with multiple CNC-CPUs, which divide a cyclic transmission area to use, head device Nos. are changed as follows.

Relation of CNC configuration to head device No.

Configuration		Head device No.	Parameter (#26742)	Remark
1 unit of CNC	1st unit	G10000	10000	Set with a parameter for CNC CPU (#26742)
2 units of CNC	1st unit	G10000	10000	Set with a parameter for CNC CPU (#26742)
	2nd unit *	G13072 G14000	13072 14000	Set with a parameter for CNC CPU (#26742)

* The head device of 2nd unit changes depending on the parameter "26742.

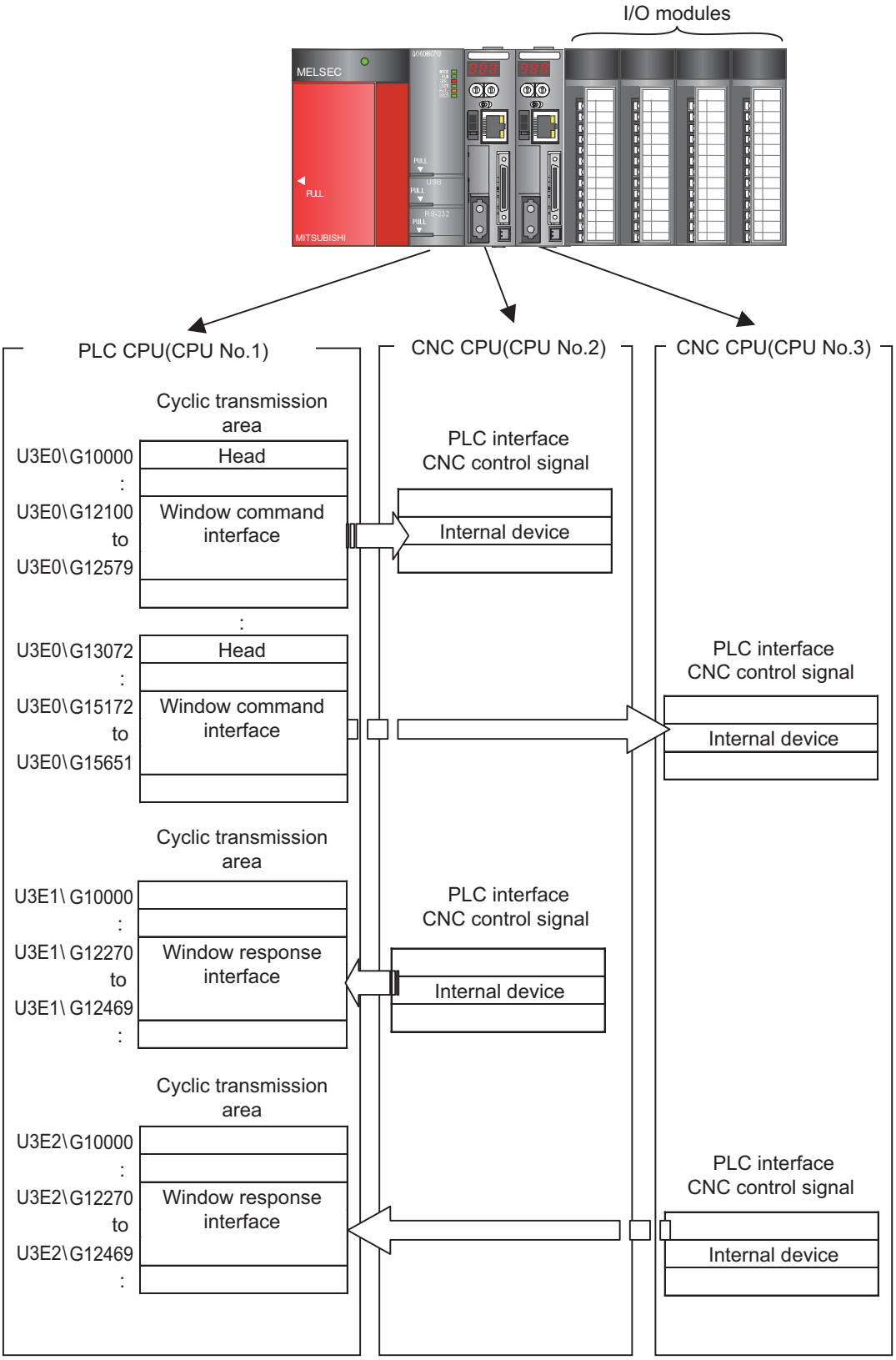
Sequence programs need the designation of CPU No. in addition to device No.
Designate as follows to access the cyclic transmission area.



Relation of CPU No. to head input/output No.

CPU No.	1	2	3	4
Head I/O No.	3E0	3E1	3E2	3E3

The following chart shows the interfaces when a system is configured with a PLC CPU and 2 CNC CPUs.



* When the head address of 2nd unit is U3E\G1400, the window status is U3E0\G16100 to U3E0\G16579.

5.2.2 Read window

Read control command

Read control command is used to designate the CNC internal data to read. For shared device Nos., refer to "Read window interface" written later in this section. For setting values such as section Nos., refer to "Appendix 1. List of PLC Window Data".

Shared device	Item	Details
Gn	Section No.	Designate the type of the CNC internal data.
Gn+1	Section sub-ID No. (Note 1)	Designate the part system No. (0:1st part system 1 - 7:Designated part system 100:PLC axis)
Gn+2	Sub-section No.	Designate the type of the CNC internal data.
Gn+3	Data No.	Designate the axis No. used in the part system. The axis No. can be designated up to 8 axes for each part system. (Each part system: 1 to 8, PLC axis: 1 to 8. "0" will be converted to designate the 1st axis. *if the part system is unused, designate the available axis No.
Gn+4	Read method (Note 2)	0: Reads up to 4 consecutive data from the designated "data No.". 1: Reads up to 4 consecutive data from the designated "sub-section No.". 2: Reads up to 4 consecutive data from the designated "section sub-ID No.".
Gn+5	Number to be read	Designate the number of data to be read. Maximum number to be read is 4. If 5 or more is designated, the number of data is regarded as 4.
Gn+6	Blank	—
Gn+7	Control signal (Note 3)	bit0: - ON/ Start continuous read - OFF/ Stop continuous read bit1: - ON/ Start one-shot read - OFF/ Stop one shot read bit2: Not used bit3: - ON/ Decimal point is valid - OFF/ Decimal point is invalid Bit4: - ON/ Divide the reading result into halves - OFF/ Not to divide the reading result into halves When 2 of the control signals are ON, continuous read is adapted. Set all the other data in this table before turning the control signal ON.

(Note 1) As well as the usual part system, PLC axis can be designated. Set "100" for designating the PLC axis.

(Note 2) Designating the sub-section No. is only available when the sub-section Nos. are consecutive as 1, 2, 3 (such as R register, tool offset).

(Note 3) When decimal point is valid, last 4 digits of the value to be read are placed after decimal point.
(Example) The value "1234567" is read as:
"123.4567" when decimal point is valid.
"1234567" when decimal point is invalid.

Read data

"Read data" is an area that stores data read by CNC. "Read data" can store up to 4 consecutive data.
Data read by CNC is stored in the data storage area as follows.
1 or 2 byte read data is stored as 4 byte with sign extension.

(Example 1)
Read data: 100000(0x186A0)
When the device No. of the 1st read data window is G12310/G12311,
G12310: 0x86A0 G12311: 0x0001
(Example 2)
Read data: -2(0xFFFE)
When the device No. of the 1st read data window is G12310/G12311,
G12310: 0xFFFE G12311: 0xFFFF

Shared device	Item	Details
Gn	1st read data	Stores the read data
Gn+1		
Gn+2	2nd read data	Stores the read data
Gn+3		
Gn+4	3rd read data	Stores the read data
Gn+5		
Gn+6	4th read data	Stores the read data
Gn+7		

Read result

Read result stores the number of the read data in high 8 bit and the read status in low 8 bit.
As for read status, bit0 is turned ON when the read operation is completed, while bit1 to 7 are combined to show error status. Refer to the following table for details. Read result is cleared by turning the control signal OFF.

Shared device	Item	Details
Gn	Read result bit0 to bit7: Status bit8 to bitF: Results	<Status> bit0: Read finished (this bit is turned ON when the read operation finished, regardless of whether the operation succeeded or not.) bit1 to 7: bit1 to 7: Error status 0x01: Normally finished 0x11: Read variable is empty 0x21: Read variable overflowed 0x41: Part system designation illegal 0x45: Section No. illegal 0x5D: Data type illegal 0xFF: No option
		<Results>: Number of data read

Read window interface

Window No.	Read control window	Read data window				Read result
		1	2	3	4	
1	G+2100-G+2107	G12310-G12311	G12312-G12313	G12314-G12315	G12316-G12317	G12270
	R8500-R8507	R9040-R9041	R9042-R9043	R9044-R9045	R9046-R9047	R9000
2	G+2108-G+2115	G12318-G12319	G12320-G12321	G12322-G12323	G12324-G12325	G12271
	R8508-R8515	R9048-R9049	R9050-R9051	R9052-R9053	R9054-R9055	R9001
3	G+2116-G+2123	G12326-G12327	G12328-G12329	G12330-G12331	G12332-G12333	G12272
	R8516-R8523	R9056-R9057	R9058-R9059	R9060-R9061	R9062-R9063	R9002
4	G+2124-G+2131	G12334-G12335	G12336-G12337	G12338-G12339	G12340-G12341	G12273
	R8524-R8531	R9064-R9065	R9066-R9067	R9068-R9069	R9070-R9071	R9003
5	G+2132-G+2139	G12342-G12343	G12344-G12345	G12346-G12347	G12348-G12349	G12274
	R8532-R8539	R9072-R9073	R9074-R9075	R9076-R9077	R9078-R9079	R9004
6	G+2140-G+2147	G12350-G12351	G12352-G12353	G12354-G12355	G12356-G12357	G12275
	R8540-R8547	R9080-R9081	R9082-R9083	R9084-R9085	R9086-R9087	R9005
7	G+2148-G+2155	G12358-G12359	G12360-G12361	G12362-G12363	G12364-G12365	G12276
	R8548-R8555	R9088-R9089	R9090-R9091	R9092-R9093	R9094-R9095	R9006
8	G+2156-G+2163	G12366-G12367	G12368-G12369	G12370-G12371	G12372-G12373	G12277
	R8556-R8563	R9096-R9097	R9098-R9099	R9100-R9101	R9102-R9103	R9007
9	G+2164-G+2171	G12374-G12375	G12376-G12377	G12378-G12379	G12380-G12381	G12278
	R8564-R8571	R9104-R9105	R9106-R9107	R9108-R9109	R9110-R9111	R9008
10	G+2172-G+2179	G12382-G12383	G12384-G12385	G12386-G12387	G12388-G12389	G12279
	R8572-R8579	R9112-R9113	R9114-R9115	R9116-R9117	R9118-R9119	R9009
11	G+2180-G+2187	G12390-G12391	G12392-G12393	G12394-G12395	G12396-G12397	G12280
	R8580-R8587	R9120-R9121	R9122-R9123	R9124-R9125	R9126-R9127	R9010
12	G+2188-G+2195	G12398-G12399	G12400-G12401	G12402-G12403	G12404-G12405	G12281
	R8588-R8595	R9128-R9129	R9130-R9131	R9132-R9133	R9134-R9135	R9011
13	G+2196-G+2203	G12406-G12407	G12408-G12409	G12410-G12411	G12412-G12413	G12282
	R8596-R8603	R9136-R9137	R9138-R9139	R9140-R9141	R9142-R9143	R9012
14	G+2204-G+2211	G12414-G12415	G12416-G12417	G12418-G12419	G12420-G12421	G12283
	R8604-R8611	R9144-R9145	R9146-R9147	R9148-R9149	R9150-R9151	R9013
15	G+2212-G+2219	G12422-G12423	G12424-G12425	G12426-G12427	G12428-G12429	G12284
	R8612-R8619	R9152-R9153	R9154-R9155	R9156-R9157	R9158-R9159	R9014
16	G+2220-G+2227	G12430-G12431	G12432-G12433	G12434-G12435	G12436-G12437	G12285
	R8620-R8627	R9160-R9161	R9162-R9163	R9164-R9165	R9166-R9167	R9015
17	G+2228-G+2235	G12438-G12439	G12440-G12441	G12442-G12443	G12444-G12445	G12286
	R8628-R8635	R9168-R9169	R9170-R9171	R9172-R9173	R9174-R9175	R9016
18	G+2236-G+2243	G12446-G12447	G12448-G12449	G12450-G12451	G12452-G12453	G12287
	R8636-R8643	R9176-R9177	R9178-R9179	R9180-R9181	R9182-R9183	R9017
19	G+2244-G+2251	G12454-G12455	G12456-G12457	G12458-G12459	G12460-G12461	G12288
	R8644-R8651	R9184-R9185	R9186-R9187	R9188-R9189	R9190-R9191	R9018
20	G+2252-G+2259	G12462-G12463	G12464-G12465	G12466-G12467	G12468-G12469	G12289
	R8652-R8659	R9192-R9193	R9194-R9195	R9196-R9197	R9198-R9199	R9019

Read control window is written by PLC, while read data window and read result are written by CNC.

5.2.3 Write window

Write control command

Write control command is used to designate the CNC data to write in.

For shared device Nos., refer to "Write window interface" written later in this section.

For setting values such as section Nos., refer to "Appendix 1. List of PLC Window Data".

Shared device	Item	Details
Gn	Section No.	Designate the type of the CNC internal data.
Gn+1	Section sub-ID No. (Note 1)	Designate the part system No. (0:1st part system 1 to 7:Designated part system 100:PLC axis)
Gn+2	Sub-section No.	Designate the type of the CNC internal data.
Gn+3	Data No.	Designate the axis No. used in the part system. The axis No. can be designated maximum of 8 axes for each part system. (Each part system: 1 to 8, PLC axis: 1 to 8. "0" will be converted to designate the 1st axis. *if the part system is unused, designate the available axis No.
Gn+4	Write method (Note 2)	0: Writes up to 4 consecutive data from the designated "Data No.". 1: Writes up to 4 consecutive data from the designated "Sub-section No.". 2: Writes up to 4 consecutive data from the designated "Section sub-ID No.".
Gn+5	Number to be written	Designate number of data to be written. Maximum number to be written is 4. If 5 or more is designated, the number of data is regarded as 4.
Gn+6	Blank	—
Gn+7	Control signal (Note 3)	bit0: - ON/ Start continuous write - OFF/ Stop continuous write bit1: - ON/ Start one-shot write - OFF/ Stop one-shot write bit2: - ON/ Addition input - OFF/ Direct input bit3: - ON/ Decimal point is valid - OFF/ Decimal point is invalid When 2 of the control signals are ON, continuous read is adapted. Set all the other data in this table before turning the control signal ON.

(Note 1) As well as the usual part system, PLC axis can be designated. Set "100" for designating the PLC axis.

(Note 2) Designating the sub-section No. is only available when the sub-section Nos. are consecutive as 1, 2, 3 (such as R register, tool offset).

(Note 3) When decimal point is valid, last 4 digits of the value to be written are placed after decimal point.
(Example) The value "1234567" is written as:
"123.4567" when decimal point is valid.
"1234567" when decimal point is invalid.

Write data

"Write data" is an area that stores data to be written in CNC. "Write data" can store up to 4 consecutive data.
Data to be written in CNC should be stored in the data storage area as follows.

(Example)

Write data: 100000(0x186A4)
When the device No. of the 1st write data window is G12260/G12261,
G12260: 0x86A0 G12261: 0x0001

(Note) The value of data which is written to CNC using PLC window function should be within the range shown in the Appendix 1. If the value is set over the range, the performance is not guaranteed.

Shared device	Item	Details
Gn	1st write data	Stores data to be written
Gn+1		
Gn+2	2nd write data	Stores data to be written
Gn+3		
Gn+4	3rd write data	Stores data to be written
Gn+5		
Gn+6	4th write data	Stores data to be written
Gn+7		

Write result

"Write result" stores the number of written data in high 8 bit and the write status in low 8 bit.
As for write status, bit0 is turned ON when the write operation is completed, while bit1 to 7 are combined to show error status. Refer to the following table for details. "Write result" is cleared by turning the control signal OFF.

Shared device	Item	Details
Gn	Write result bit0 to bit7: Status bit8 to bitF: Results	<Status> bit0: Write finished (this bit is turned ON when the write operation finished, regardless of whether the operation succeeded or not.)) bit1 to 7: bit1 to 7: Error status 0x01: Normally finished 0x21: Write variable overflowed 0x41: Part system designation illegal 0x45: Section No. illegal 0x5D: Data type illegal 0x6D: Written in read-only data 0xFF: No option
		<Results>: Number of data written

Write window interface

Window No.	Write control window	Write data window ("write data")				Write result
		1	2	3	4	
1	G+2268-G+2275	G+2260-G+2261	G+2262-G+2263	G+2264-G+2265	G+2266-G+2267	G12290
	R8668-R8675	R8660-R8661	R8662-R8663	R8664-R8665	R8666-R8667	R9020
2	G+2284-G+2291	G+2276-G+2277	G+2278-G+2279	G+2280-G+2281	G+2282-G+2283	G12291
	R8684-R8691	R8676-R8677	R8678-R8679	R8680-R8681	R8682-R8683	R9021
3	G+2300-G+2307	G+2292-G+2293	G+2294-G+2295	G+2296-G+2297	G+2298-G+2299	G12292
	R8700-R8707	R8692-R8693	R8694-R8695	R8696-R8697	R8698-R8699	R9022
4	G+2316-G+2323	G+2308-G+2309	G+2310-G+2311	G+2312-G+2313	G+2314-G+2315	G12293
	R8716-R8723	R8708-R8709	R8710-R8711	R8712-R8713	R8714-R8715	R9023
5	G+2332-G+2339	G+2324-G+2325	G+2326-G+2327	G+2328-G+2329	G+2330-G+2331	G12294
	R8732-R8739	R8724-R8725	R8726-R8727	R8728-R8729	R8730-R8731	R9024
6	G+2348-G+2355	G+2340-G+2341	G+2342-G+2343	G+2344-G+2345	G+2346-G+2347	G12295
	R8748-R8755	R8740-R8741	R8742-R8743	R8744-R8745	R8746-R8747	R9025
7	G+2364-G+2371	G+2356-G+2357	G+2358-G+2359	G+2360-G+2361	G+2362-G+2363	G12296
	R8764-R8771	R8756-R8757	R8758-R8759	R8760-R8761	R8762-R8763	R9026
8	G+2380-G+2387	G+2372-G+2373	G+2374-G+2375	G+2376-G+2377	G+2378-G+2379	G12297
	R8780-R8787	R8772-R8773	R8774-R8775	R8776-R8777	R8778-R8779	R9027
9	G+2396-G+2403	G+2388-G+2389	G+2390-G+2391	G+2392-G+2393	G+2394-G+2395	G12298
	R8796-R8803	R8788-R8789	R8790-R8791	R8792-R8793	R8794-R8795	R9028
10	G+2412-G+2419	G+2404-G+2405	G+2406-G+2407	G+2408-G+2409	G+2410-G+2411	G12299
	R8812-R8819	R8804-R8805	R8806-R8807	R8808-R8809	R8810-R8811	R9029
11	G+2428-G+2435	G+2420-G+2421	G+2422-G+2423	G+2424-G+2425	G+2426-G+2427	G12300
	R8828-R8835	R8820-R8821	R8822-R8823	R8824-R8825	R8826-R8827	R9030
12	G+2444-G+2451	G+2436-G+2437	G+2438-G+2439	G+2440-G+2441	G+2442-G+2443	G12301
	R8844-R8851	R8836-R8837	R8838-R8839	R8840-R8841	R8842-R8843	R9031
13	G+2460-G+2467	G+2452-G+2453	G+2454-G+2455	G+2456-G+2457	G+2458-G+2459	G12302
	R8860-R8867	R8852-R8853	R8854-R8855	R8856-R8857	R8858-R8859	R9032
14	G+2476-G+2483	G+2468-G+2469	G+2470-G+2471	G+2472-G+2473	G+2474-G+2475	G12303
	R8876-R8883	R8868-R8869	R8870-R8871	R8872-R8873	R8874-R8875	R9033
15	G+2492-G+2499	G+2484-G+2485	G+2486-G+2487	G+2488-G+2489	G+2490-G+2491	G12304
	R8892-R8899	R8884-R8885	R8886-R8887	R8888-R8889	R8890-R8891	R9034
16	G+2508-G+2515	G+2500-G+2501	G+2502-G+2503	G+2504-G+2505	G+2506-G+2507	G12305
	R8908-R8915	R8900-R8901	R8902-R8903	R8904-R8905	R8906-R8907	R9035
17	G+2524-G+2531	G+2516-G+2517	G+2518-G+2519	G+2520-G+2521	G+2522-G+2523	G12306
	R8924-R8931	R8916-R8917	R8918-R8919	R8920-R8921	R8922-R8923	R9036
18	G+2540-G+2547	G+2532-G+2533	G+2534-G+2535	G+2536-G+2537	G+2538-G+2539	G12307
	R8940-R8947	R8932-R8933	R8934-R8935	R8936-R8937	R8938-R8939	R9037
19	G+2556-G+2563	G+2548-G+2549	G+2550-G+2551	G+2552-G+2553	G+2554-G+2555	G12308
	R8956-R8963	R8948-R8949	R8950-R8951	R8952-R8953	R8954-R8955	R9038
20	G+2572-G+2579	G+2564-G+2565	G+2566-G+2567	G+2568-G+2569	G+2570-G+2571	G12309
	R8972-R8979	R8964-R8965	R8966-R8967	R8968-R8969	R8970-R8971	R9039

Write control window and write data window are written by PLC, while write result is written by CNC.

5.2.4 Operation Details

Read operation

Procedure to read data is as follows.

(1) Designate the data to read by setting "section No.", "section sub-ID No.", "sub-section No.", "data No.", and "data size" to the "read control command".

(2) Designate "number to be read" (max. 4 data) and "read method" to the same "read control command".

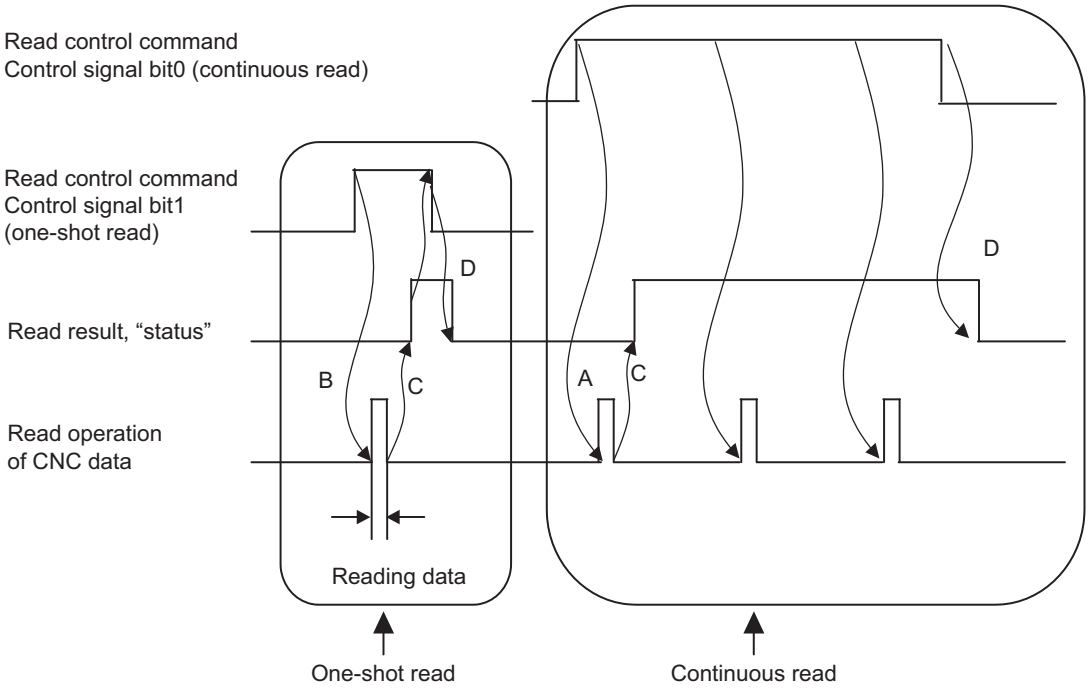
(3) If bit0 of "control signal" is turned ON, the read operation starts ("A" in the chart below). The read operation continues as long as bit0 is ON.
If bit1 of "control signal" is turned ON, one-shot read operation starts ("B" in the chart below).

(4) After the read operation is completed, CNC sets the "status" in "read result" ("C" in the chart below).
If "status" is set while one-shot read is ON, data is not read.

(5) If the control signal of "read control command" is turned OFF, "status (bit0)" in "read result" is also turned OFF. The operation is the same for both one-shot and continuous read. ("D" in the chart below)

(6) "Read data window" stores the read data. Check the "status" and "result" in "read result" before using the read data.

<Timing chart of read operation>

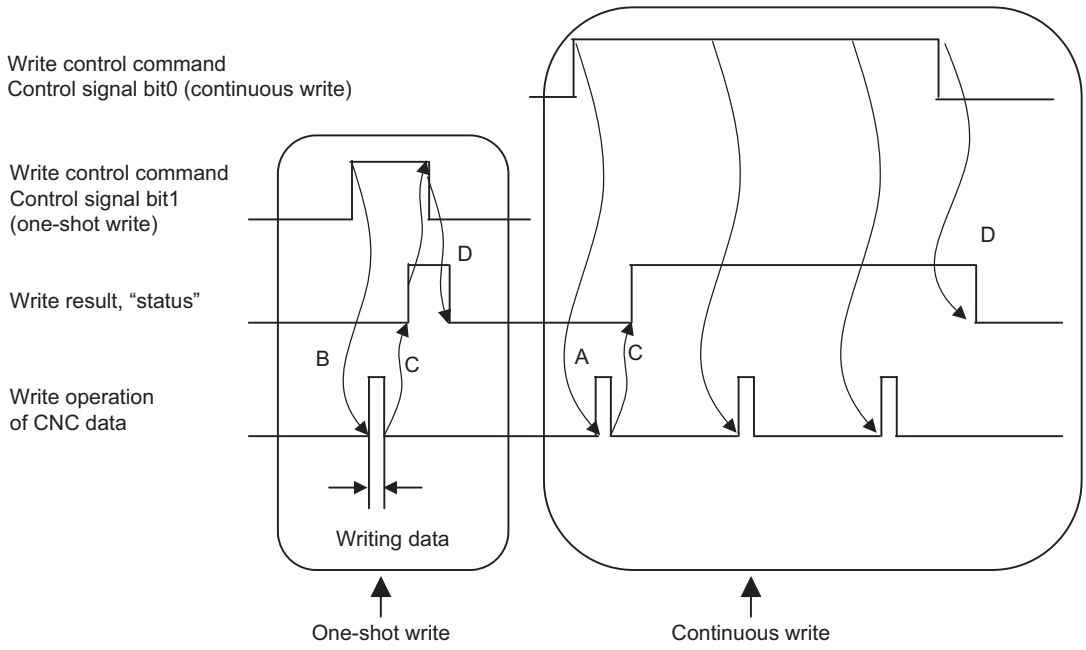


Write operation

Procedure to write data is as follows.

(1) Designate the data to write by setting "section No.", "section sub-ID No.", "sub-section No.", "data No.", and "data size" to the "write control command".
(2) Designate "number to be written" (max. 4 data) and "write method" to the same "write control command".
(3) If bit0 of "control signal" is turned ON, the write operation starts ("A" in the chart below).
The write operation continues as long as bit0 is ON.
If bit1 of "control signal" is turned ON, one-shot write operation starts ("B" in the chart below).
(4) After the write operation is completed, CNC sets the "status" in "write result" ("C" in the chart below).
If "status" is set while one-shot write is ON, CNC does not write data.
(5) If the control signal of "write control command" is turned OFF, "status(bit0)" in "write result" is also turned OFF.
The operation is the same for both one-shot and continuous read. ("D" in the chart below)
(6) Check the "status" and "result" in "write result" before executing other operations to the written data.

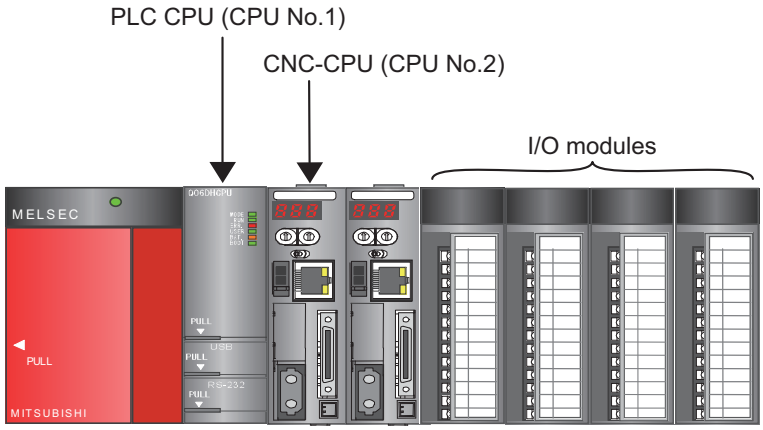
<Timing chart of write operation>



5.2.5 Usage Examples

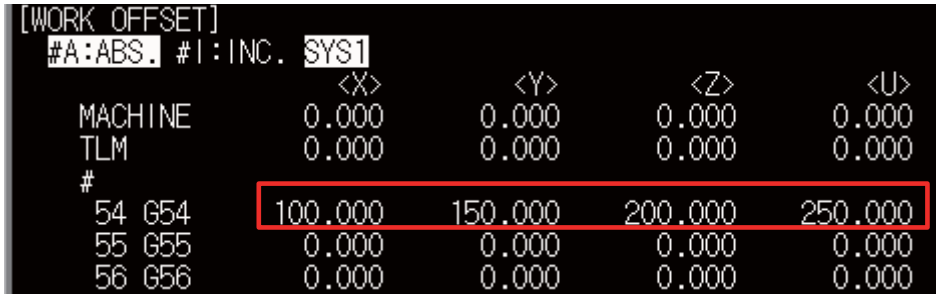
This section shows the usage examples with the system configured as follows.

<System configuration>



Example 1 (Reading out the G54 workpiece coordinate offset values of each 1st to 4th axes in the1st part system)

(1) Set the data to be read as follows.
[TOOL OFFSET] - [WORK OFFSET] screen



(2) Set the following data to the read control command.

Device No.	Item	Setting value	Details
G12100	Section No.	0x0004	Designate workpiece coordinate offset
G12101	Section sub-ID No.	0x0001	Designate the part system No.
G12102	Sub-section No.	0x0000	Designate G54 workpiece coordinate offset
G12103	Data No.	0x0001	Designate the axis No. used in the part system
G12104	Read method	0x0000	Set the method to read the designated number of data consecutively from the designated data No.
G12105	Number to be read	0x0004	Designate the number to be read

(3) Turn ON the control signal (G12107/bit0) of the read control command.

(4) Check the read result (G12270) in the read control window.

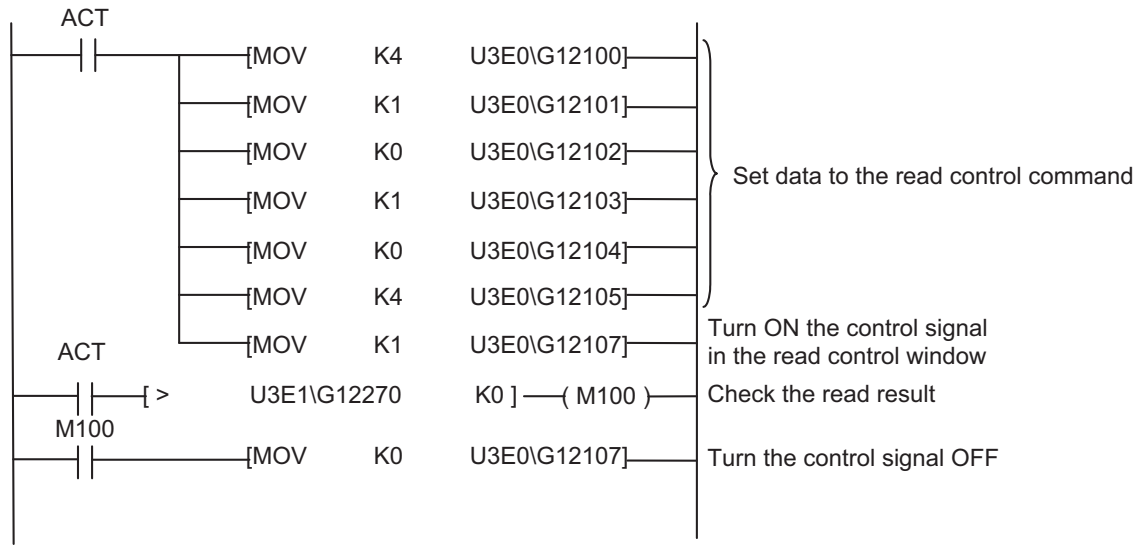
Device No.	Device value	Details
G12270	0x0401	High 8 bit (number of data read): 4 Low 8 bit (read status): Completed

(5) After the read result (G12270/bit0) is turned ON, turn OFF the control signal (G12107/bit0) of the read control command.

(6) Check the read data in the read data window.

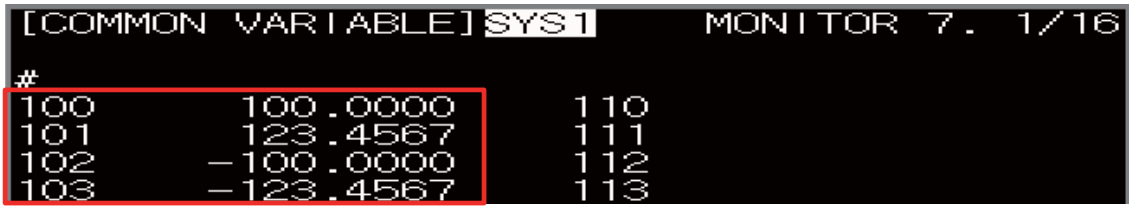
Device No.	Device value	Details
G12310	0x86A0	G54 workpiece coordinate offset value of the 1st axis is "100.000"
G12311	0x0001	
G12312	0x49F0	G54 workpiece coordinate offset value of the 2nd axis is "150.000"
G12313	0x0002	
G12314	0x0D40	G54 workpiece coordinate offset value of the 3rd axis is "200.000"
G12315	0x0003	
G12316	0xD090	G54 workpiece coordinate offset value of the 4th axis is "250.000"
G12317	0x0003	

The sequence program of example 1 is written as follows.



Example 2 (Reading out the values of each common variable #100 to #103 in the 1st part system)

(1) Set the values to be read as follows.
[POSITION] - [COMMON VARIABLE] screen



(2) Set the following values to the read control command.

Device No.	Item	Setting value	Details
G12100	Section No.	0x0020	Designate common variable
G12101	Section sub-ID No.	0x0001	Designate the part system No.
G12102	Sub-section No.	0x0064	Designate common variable No.
G12103	Data No.	0x0000	Designate the axis No. used in the part system
G12104	Read method	0x0001	Set the method to read the designated number of data consecutively from the designated sub-section No.
G12105	Number to be read	0x0004	Designate the number to be read

(3) Turn ON the control signal (G12107/bit0 and bit3) of the read control command.

(4) Check the read result (G12270) in the read control window.

Device No.	Device value	Details
G12270	0x0401	High 8 bit (number of data read): 4 Low 8 bit (read status): Completed

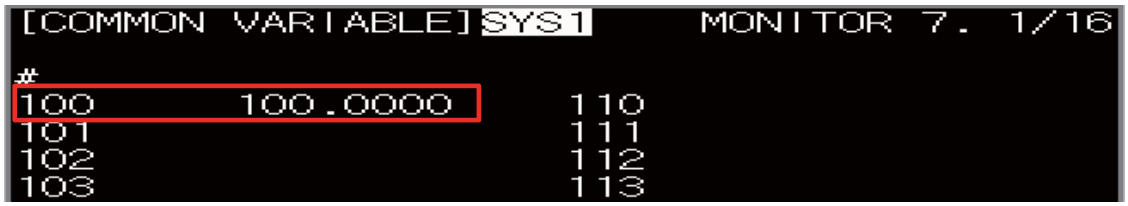
(5) After the read result (G12270/bit0) is turned ON, turn OFF the control signal (G12107/bit0 and bit3) of the read control command.

(6) Check the read data in the read data window.

Device No.	Device value	Details
G12310	0x4240	The value of common variable #100 for the 1st part system is "100.0000"
G12311	0x000F	
G12312	0xD687	The value of common variable #101 for the 1st part system is "123.4567"
G12313	0x0012	
G12314	0xBDC0	The value of common variable #102 for the 1st part system is "-100.0000"
G12315	0xFFF0	
G12316	0x2979	The value of common variable #103 for the 1st part system is "-123.4567"
G12317	0xFFED	

Example 3 (Reading out the value of common variable #100 for each part system)

(1) Set the values to be read as follows.
(The following screen shows the value set for the 1st part system. Change the part systems and set the value for each 1st to 4th part system.)
Set "150.0000" for 2nd part system #100, "200.0000" for 3rd part system #100, 250.0000 for 4th part system #100.
[POSITION] - [COMMON VARIABLE] screen



(2) Set the following values to the read control command.
Change the setting value of "read method" in the example 2 from "1" to "2". (The other setting values are the same as those in example 2.)

Device No.	Item	Setting value	Details
G12104	Read method	0x0002	Set the method to read the designated number of data consecutively from the designated section sub-ID No.

(3) Turn ON the control signal (G12107/bit0) of the read control command.

(4) Check the read result (G12270) in the read control window.

Device No.	Device value	Details
G12270	0x0401	High 8 bit (number of data read): 4 Low 8 bit (read status): Completed

(5) After the read result (G12270/bit0) is turned ON, turn OFF the control signal (G12107/bit0) of the read control command. Turn bit3 ON for the same signal.

(6) Check the read data in the read data window.

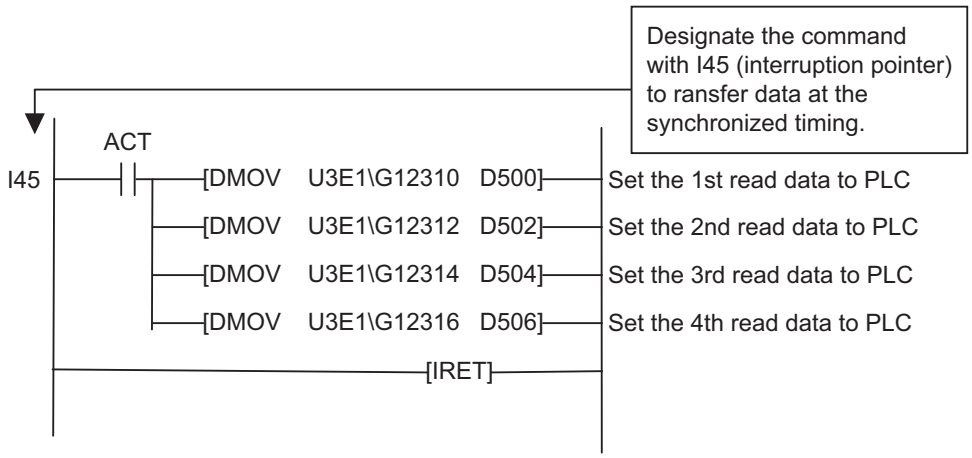
Device No.	Device value	Details
G12310	0x0064	The value of common variable #100 for the 1st part system is "100"
G12311	0x0000	
G12312	0x0096	The value of common variable #100 for the 2nd part system is "150"
G12313	0x0000	
G12314	0x00C8	The value of common variable #100 for the 3rd part system is "200"
G12315	0x0000	
G12316	0x00FA	The value of common variable #100 for the 4th part system is "250"
G12317	0x0000	

5.2.6 Precautions

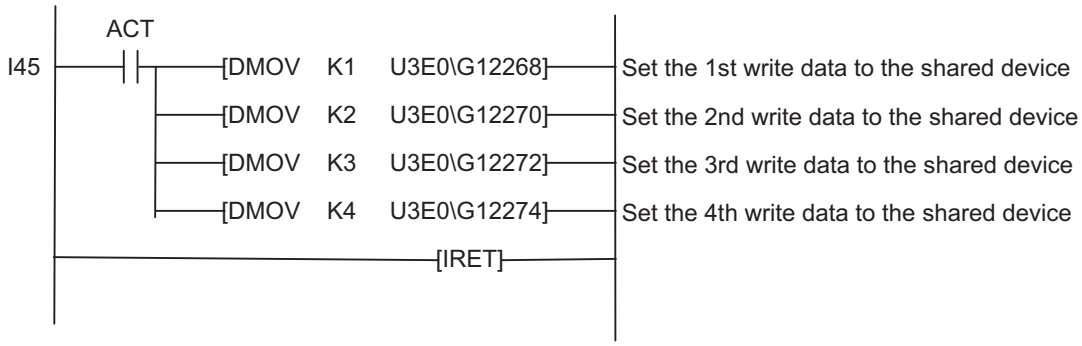
(1) PLC window operates even while PLC stops. If read/write control signal is ON, read/write function operates during the PLC stop.

(2) When multiple data is read/written while continuous read/write is set, some data may not be updated due to the time of execution.
To read/write all the multiple data at the same time, synchronize the data transfer timing of each CPU by designating the target command with I45(interruption pointer) and terminating the command with IRET command. The following sequence program is the example when the system is configured with PLC CPU for CPU No.1 and CNC CPU for No.2.

<For reading>



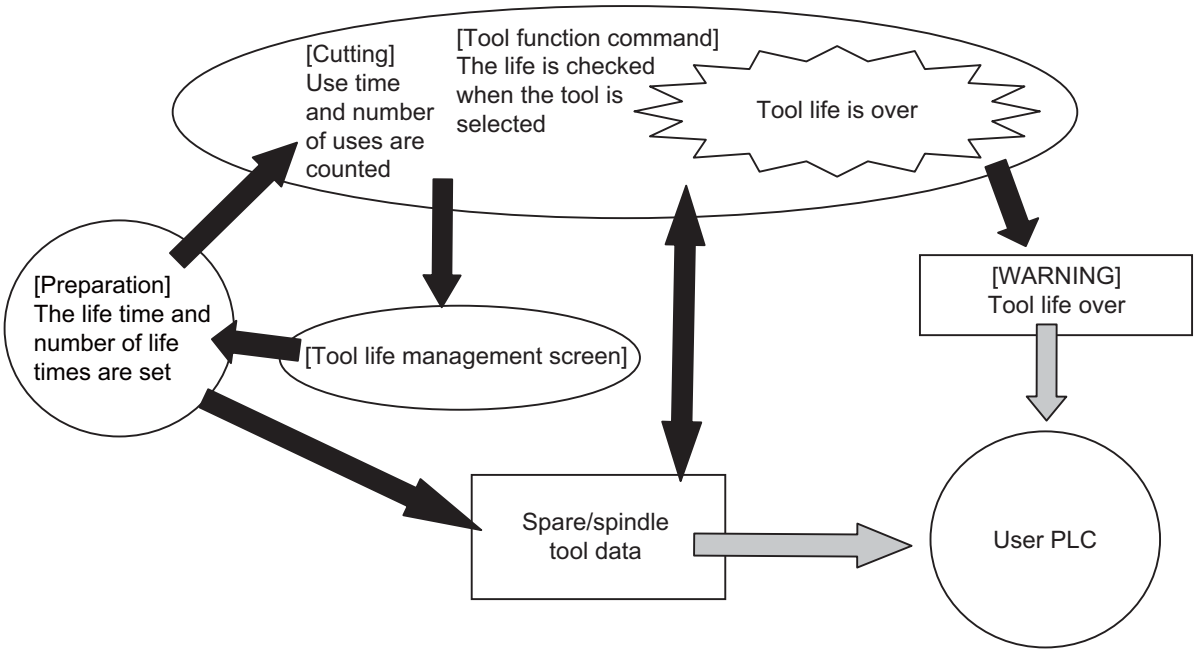
<For writing>



5.3 Tool Life Management (M System)

5.3.1 Outline of Tool Life Management Function

-When the tool is commanded, a tool is selected from the tool group.(Only for tool life management II.)
-The tool status is monitored by counting the tool usage time and number of uses.
-When the tool being used reaches its life, the tool life over signal is output.



[TOOL LIFE] TOOL 4.2/2

GROUP 10000000

#TOOL	NO.ST	FROM	L-CMP	R-CMP	AUX	LIFE	USED
1	12345678	4 220	-345.678	100.000	12345	1234	234(min)
2	1234567	3 120	112.340	30.000	11111	123	45(min)
3	123456	2 111	122.220	20.000	44444	100	50(set)
4	12345	1 002	11.234	100.123	100	50	15(cyc)
5							
6							
7							
8							
9							
10							

#( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )

OFFSET | REGIST | | LIFE | MENU

5.3.2 Tool Life Management Methods

The following two management methods are available.

(1) Tool life management I (When Base common parameter "#1096 T-Ltyp" is set to 1.)
The use time or use count of the spindle tool specified from user PLC (G11450-G11451/R6720-R6721) is integrated and the tool use state is monitored.
Tool data corresponding to the spindle tool is also output. (G12244-G12255/R6748-R6759)

(2) Tool life management II (When Base common parameter "#1096 T-Ltyp" is set to 2.)
A function to select a spare tool has been added to the tool management I. The spare tool is selected from the group by the spare tool selection processes executed by the CNC when the tool is commanded, etc. The tool data for that spare tool is output (G12220-G12231/R6724-R6735).
Tool data corresponding to the spindle tool specified from user PLC (G11450-G1145/R6720-R6721) is output (G12244-G12255/R6748-R6759) and tool compensation corresponding to the spindle tool is made.

(Note) Tool life management can be executed only for the 1st part system.

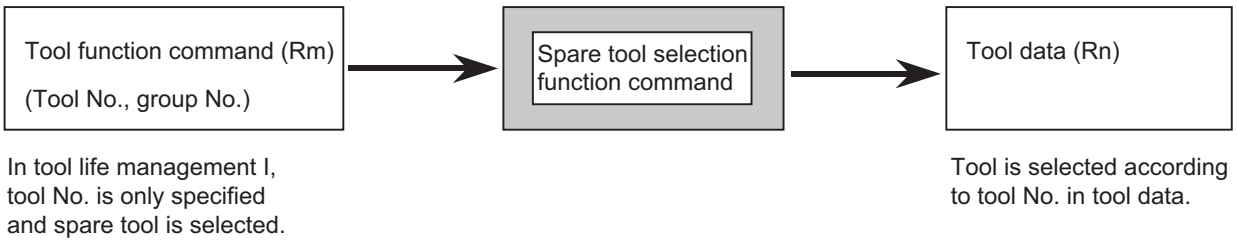
5.3.3 Procedure when Tool Function Command is Executed

(1) Tool life management I
  (a) When the tool function command (T command) is commanded, the CNC outputs the T code data (BCD) and the tool function strobe signal.
  (b) The CNC checks the tool function command, and executes the tool selection process if the life management is valid ("#1103 T_life" is set to "1").
  (c) The tool selection process outputs the tool data for the tool corresponding to the designated tool No. (G12220-G12231/R6724-R6735)
  (d) The user PLC decides whether or not the tool can be used according to the status in the output tool data after the confirmation of the tool function strobe signal, and selects command tool or performs alarm processing.

(2) Tool life management II
  (a) When the tool function command (T command) is commanded, the CNC outputs the T code data (BCD) and the tool function strobe signal.
  (b) The CNC checks the tool function command, and executes the spare tool selection process if the life management is required as is valid ("#1103 T_life" is set to "1").
  (c) The spare tool selection process selects the spare tool corresponding to the specified No. (group No., tool No.) and outputs the tool data of the spare tool. (G12220-G12231/R6724-R6735)
  The T command value, after the subtraction of the tool life management standard number (#1312 T_base), is used as group No. and tool No.
  If the commanded value is smaller than the tool life management standard number, the spare tool selection is not processed.
  (d) The user PLC decides whether or not the tool can be used according to the status in the output tool data after the confirmation of the tool function strobe signal, and selects command tool or performs alarm processing.

(Note) If -1 is set in the group No. in the output tool data, the tool data is invalid. At the time, the specified tool No. is output to the tool No. in the output tool data as it is.

<When tool function command is executed>



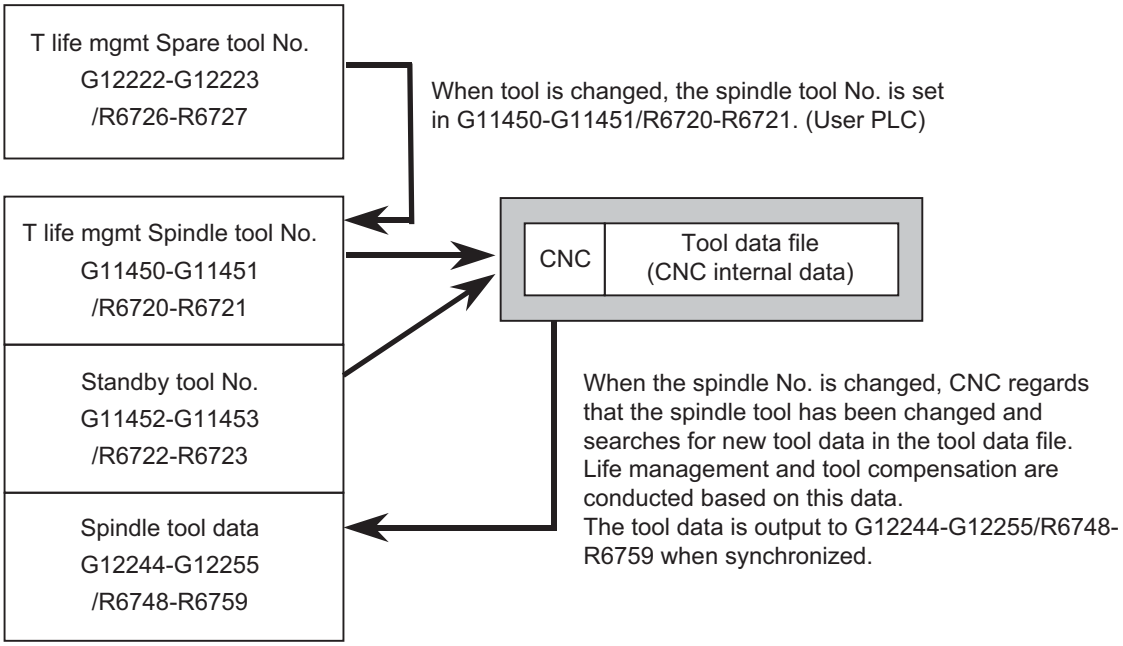
5.3.4 Procedure when Spindle Tool is Changed

(1) When spindle tool is changed during the spindle tool change command (M06), etc., the user PLC specifies the tool No. of the spindle tool (G11450-G11451/R6720-R6721).
CNC always outputs the spindle tool data corresponding to the tool No. of the spindle (G12244 -G12255/R6748-R6759).

(2) CNC integrates the use time or use count of the spindle tool based on the spindle tool data in the tool data file.
In tool life management II, it also executes tool compensation corresponding to the spindle tool.

(Note) If -1 is set in the group No. in the output spindle tool data, the spindle tool data is invalid. At the time, the specified tool No. (G11450-G11451 (R6720-R6721)) is output to the tool No. in the output spindle tool data as it is. CNC does not integrate the usage time or usage count of the spindle tool or make tool compensation.

<When tool is changed>



5.3.5 Tool Life Management II Method

(1) Tool function command method
One of the following two can be selected by using a parameter for command tool No. (Rm contents) input to the spare tool selection process in tool life management II:

(a) Group No. command method (When Base common parameter "#1104 T-Com2" is set to 0.)
The command tool No. (Rm contents) input to the spare tool selection process is handled as group No. Spare tool is selected among the tools corresponding to the group No. in tool data.

(b) Tool No. command method (When BASE SPEC parameter "#1104 T-Com2" is set to 1.)
The command tool No. (Rm contents) input to the spare tool selection process is handled as a tool No. The group No. containing the command tool No. is found and spare tool is selected among the group.

(2) Spare tool selection method
One of the following two can be selected by using a parameter for the spare tool selection method of the spare tool selection process in tool life management II:

(a) Selection in tool registration order (When Base common parameter "#1105 T-Sel2" is set to 0.)
This selects the tool from the tools in use in the same group, following the registration No. order.
If there are no "Tools in use", the tools are selected in order of "Tools not in use", "Normal life tools" and "Abnormal tools", following the registration No. order.

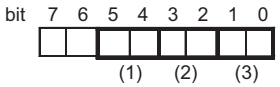
(b) Life equality selection (When Base common parameter "#1105 T-Sel2" is set to 1.)
This selects the tool with the maximum remaining life from the tools in use and not in use in the same group. When several tools have the same remaining life, the tools are selected in order of registration No. If there are no "Tools in use" or "Tools not in use", the tools are selected in order of "Tools not in use", "Normal life tools" and "Abnormal tools", following the registration No. order.

5.3.6 Maximum Number of Registerable Tools

Maximum number of registerable tools is 100.

5.3.7 Tool Data

The tool data is tool management data such as the group No., tool No., and tool status.

Tool data name	Explanation	Data range
Group No.	No. to manage tools of the same type (form and dimensions) in a group is set. The tools assigned the same group No. are assumed to be spare tools.	1 to 99999999
Tool No.	No. unique to each tool actually output during tool function command execution	1 to 99999999
Tool data flag	Set the parameter for tool life management method, length compensation method, radius compensation method, etc.	 (1) Tool life management method 0-2 (2) Tool radius compensation method 0-2 (3) Tool length compensation method 0-2
Tool status	The tool state is indicated.	0 to 4 0 to 4 
Auxiliary data	May differ according to the machine tool builder specifications.	0 to 65535
Tool life data	Life time or life count for each tool is set. (If 0 is set, infinity is assumed to be specified.)	0 to 4000 (minutes) 0 to 65000 (times)
Tool usage data	Usage time or usage count for each tool. (Refer to the following "Usage time, usage count" section for details on the count method.)	0 to 4000 (minutes) 0 to 65000 (times)
Tool length compensation data	The tool length compensation data is set with the format designated with the tool data flag.	Compensation No. 1 to 200 Direct offset amount ± 99999.999 Addition offset amount ± 99999.999
Tool radius compensation data	The tool radius compensation data is set with the format designated with the tool data flag.	Compensation No. 1 to 200 Direct offset amount ± 99999.999 Addition offset amount ± 99999.999

(Note) Refer to tool data after the output tool No. coincided with the number set to the spindle tool No.

(1) Tool data flag

Parameter	Details	Value	Explanation
Tool life management method (bit4/5)	Usage time	0	Manages the cutting feed with the execution time.
	Mount count	1	Manages the number of times the tool becomes the spindle tool at tool change, etc.
	Work count	2	Manages with the number of times the cutting feed command is issued.
Tool length compensation method (bit0/1) Tool radius compensation method (bit2/3)	Compensation number method	0	Handles the compensation data in the tool data as the compensation No., and compensates by replacing the compensation No. commanded in the machining program with this value.
	Addition compensation method	1	Handles the compensation data in the tool data as the addition compensation amount. Compensates by adding the amount to the compensation amount indicated by the compensation No. commanded in the machining program.
	Direct compensation method	2	Handles the compensation data in the tool data as the direct compensation amount. Compensates by replacing the amount to the compensation amount indicated by the compensation No. commanded in the machining program with this value.

(2) Tool status

Details	Value	Explanation
Unused tool	0	Set to 0 when replacing the tool with a new tool.
Tool in use	1	This state is activated when cutting is actually started.
Normal life tool	2	This state is activated when the usage data exceeds the life data.
Error tool 1	3	This state is activated when the CNC receives tool error 1 signal.
Error tool 2	4	This state is activated when the CNC receives tool error 2 signal.

-Values of tool status, 3 and 4 may differ according to the machine tool builder specifications.
-The unused tool and tool in use are usable spare tools.

(3) Tool life data, tool usage data
The setting range and unit differ according to the tool data flag's tool life management method.

Tool life management method	Setting range	Unit
0 : Usage time	0 to 4000	Minute
1 : Mount count	0 to 65000	Times
2 : Work count	0 to 65000	Times

(Note) When usage time is selected for the tool life management method, the data is output to user ladder on a 1/16 minute basis.

(4) Tool length compensation data, tool radius compensation data
The tool corresponding to the spindle tool can be compensated with tool life management II.
The setting details and range differ according to the tool data flag's tool length compensation method and tool radius compensation method.

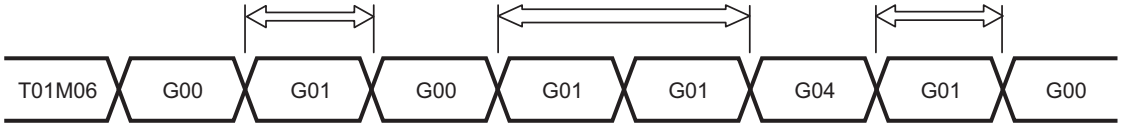
Tool compensation data	Setting details	Setting range
0 : Compensation number method	Compensation No.	1 to 200
1 : Addition compensation method	Compensation amount	± 99999.999
2 : Direct compensation method	Compensation amount	± 99999.999

5.3.8 Usage Time, Work Count

The usage data is counted with the life system (usage time, work count, mount count) set for each tool.

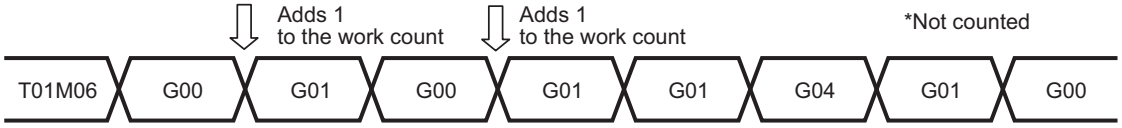
Usage time count

Counts the time duration of cutting feed movement (G01/02/03, etc.). (The duration indicated with <=> in the following chart is counted.)



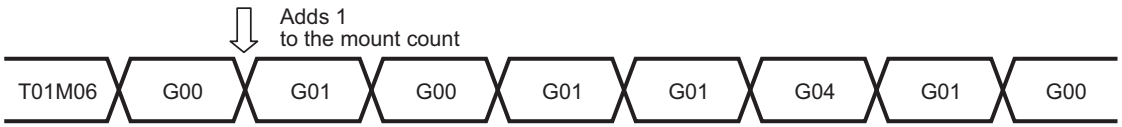
Work count

Counts the number of times at which the rapid traverse command (G00) has been changed to the cutting feed command. However, if a command other than the rapid traverse has been issued while the cutting feed is commanded, the data is not counted.



Mount count

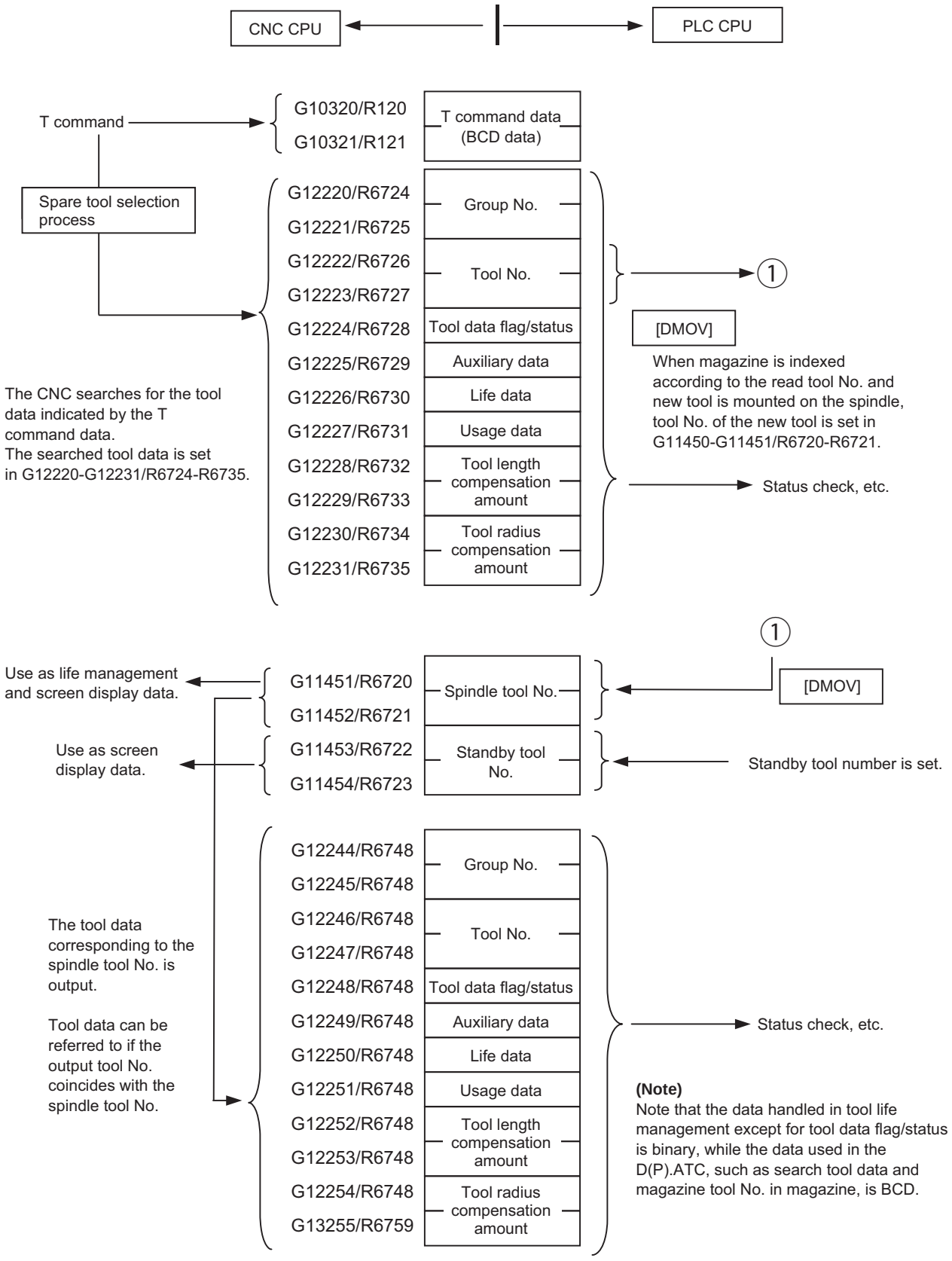
Counts the number of times at which the cutting feed has started after the tool change.
This is not counted unless the cutting feed is commanded after the tool change.



Precautions

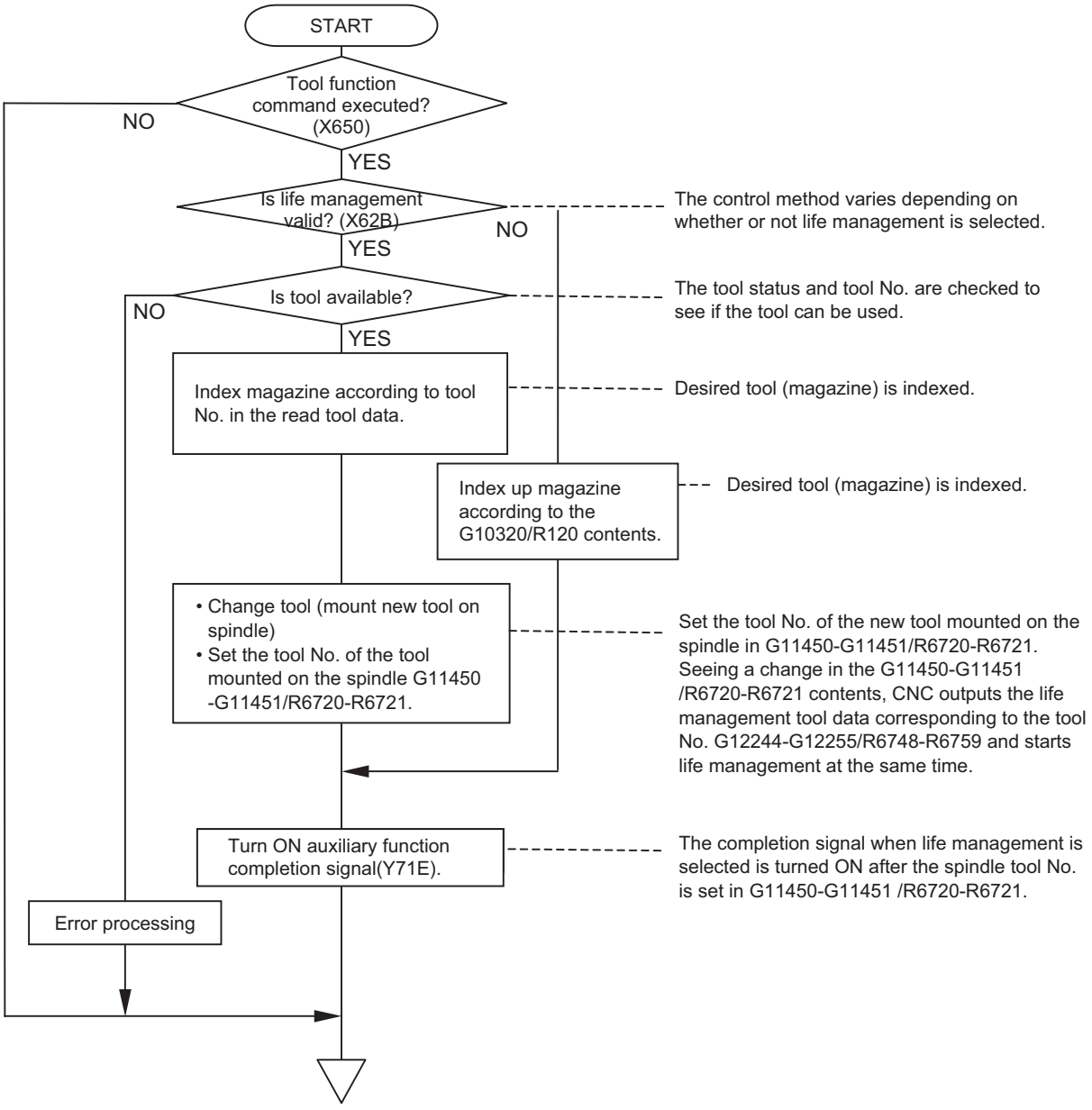
(1) Tool life management is executed even when the operation mode is MDI.
(2) Linear interporation, arc interporation and threading are regarded as cutting feed.
However, the data is not counted unless any movement has been made in the block.
(3) The data is not counted if the automatic machine lock is executed to any one of the axes.
(4) These counts are available when the parameter "#1103 T_Life (Validate life management)" is set to "1" and "Usage data count valid" signal (Y78A) is ON. The data is not counted when either the parameter or the signal is set to "0" or OFF.
(5) None of the "0" tool life data, tools whose life is over, and abnormal tools (status: 3 or 4) are counted.
(6) The data is not counted during miscellaneous function lock or dry run.
(7) The data is not counted during the operation with a single block.
(8) The movement by the skip command (G31) is not counted.

5.3.9 Tool Data Flow (R Register)



5.3.10 User PLC Processing

A PLC processing example when tool change is made by the T command is given below:



5.3.11 Interface with PLC

CNC -> PLC interface signal

Con-tact	Signal name	Signal abbreviation		$1
A	IN TOOL LIFE MANAGEMENT	TLFOn		X62B

[Function]

This signal is output during the tool life management.

[Operation]

"In tool life management" (TLFOn) signal turns ON when the tool life management (#1103 T_Life) on the parameter is ON.

Con-tact	Signal name	Signal abbreviation		$1
A	TOOL LIFE OVER	TLOVn		X62E

[Function]

<For tool life management I>

This signal notifies that tool usage data (per tool) have reached to its lifetime (Usage data ≥ Life data).

<For tool life management II>

This signal notifies that all tools in the tool group have reached to their lifetimes.

[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 CNC, 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 skip (TAL1n)" 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 "T function strobe 1 (TF1n)" 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 (TRSTn)" signal is input, etc.)

[Caution]

If this signal is used for M system tool life management II, refer to this signal 30ms after the spindle tool was replaced. (This signal will not change in the same cycle in which the spindle tool was replaced.)

Standby tool data

1st part system	Name	Details
G12220/R6724	SPARE TOOL: GROUP NO.	This is the SPARE TOOL spare tool's group No.
G12221/R6725		
G12222/R6726	SPARE TOOL: TOOL NO.	This is the spare tool's tool No.
G12223/R6727		
G12224/R6728	SPARE TOOL: TOOL DATA FLAG/STATUS	This is the spare tool's flag/status.
G12225/R6729	SPARE TOOL: AUXILIARY DATA	This is the spare tool's auxiliary data.
G12226/R6730	SPARE TOOL: LIFE DATA	This is the spare tool's life data.
G12227/R6731	SPARE TOOL: USAGE DATA	This is the spare tool's usage data.
G12228/R6732	SPARE TOOL: LENGTH COMPENSATION AMOUNT	This is the spare tool's tool length compensation amount.
G12229/R6733		
G12230/R6734	SPARE TOOL: RADIUS COMPENSATION AMOUNT	This is the spare tool's tool radius compensation amount.
G12231/R6735		

Active tool data

1st part system	Name	Details
G12244/R6748	ACTIVE TOOL: GROUP NO.	This is the active tool's group No.
G12245/R6748		
G12246/R6748	ACTIVE TOOL: TOOL NO.	This is the active tool's tool No.
G12247/R6748		
G12248/R6748	ACTIVE TOOL: TOOL DATA FLAG/STATUS	This is the active tool's flag/status.
G12249/R6748	ACTIVE TOOL: AUXILIARY DATA	This is the active tool's auxiliary data.
G12250/R6748	ACTIVE TOOL: LIFE DATA	This is the active tool's life data.
G12251/R6748	ACTIVE TOOL: USAGE DATA	This is the active tool's usage data.
G12252/R6748	ACTIVE TOOL: LENGTH COMPENSATION AMOUNT	This is the active tool's tool length compensation amount.
G12253/R6748		
G12254/R6748	ACTIVE TOOL: RADIUS COMPENSATION AMOUNT	This is the active tool's tool radius compensation amount.
G12255/R6759		

Spindle/Standby tool Nos.

1st part system	Name	Details
G11450/R6720	T LIFE MGMT SPINDLE TOOL NO.	This is the active spindle tool No.
G11451/R6721		
G11452/R6722	T LIFE MGMT STANDBY TOOL NO.	This is the standby tool No.
G11453/R6723		

PLC -> CNC interface signal

Con-tact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
A	TOOL ALARM 1	TAL1n		Y788	Y868	Y948	YA28	YB08	YBE8	YCC8

[Function]

This signal is used when the tool in which life has not been reached is attempted to change compulsorily.
This signal sets the tool status during tool life management to 3.

[Operation]

<M system>

By turning ON the signal in the tool life management specification, status of tool data can be changed to "3"(a tool of Tool alarm 1). This signal is validated when tool life management input (TLF1n) signal is ON.

<L system>

By turning ON the signal in the tool life management specification, status of tool data can be changed to "3" (a tool of tool skip), and the tool is handled in the same manner as life tool.

(1) The group No. to which the tool, which is attempted to change status by the sequence program, belongs is designated ("Tool group No. designation" signal) and "Tool skip 1" (TAL) signal is turned ON. When the group is selected next time, a new tool in the group is selected.

(2) When "Tool skip 1" (TAL) signal is turned ON without designating the group No. ("Tool group No. designation" signal is "0"), the group No. which has been selected at that time is considered to have been designated. When the group is selected next time, a new tool in the group is selected.

(Note) When the tool change reset or the tool skip is performed on the group currently selected, usage data count will be carried out on the tool used at the time of signal input until the next tool selection. Therefore, if a tool selected needs to be changed along with the signal input, select a group again.However, a tool may not be selected due to a preceding process if there is no movement command up to the next group selection after the signal input. In this case, contents of the preceding process can be invalidated by turning ON the "recalculation request" (CRQ) signal before selecting the group.

Con-tact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
A	TOOL ALARM 2	TAL2n		Y789	Y869	Y949	YA29	YB09	YBE9	YCC9

[Function]

This signal sets the tool data status during tool life management to status 4 (a tool of Tool alarm 2).

[Operation]

By turning ON the signal in the tool life management specification, status of tool data can be changed to "4" (a tool of Tool alarm 2).
This signal is validated when tool life management input signal (TLF1n) is ON.
See "4.19.11 Interface with PLC" for details.

Con-tact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
A	USAGE DATA COUNT VALID	TCEFn		Y78A	Y86A	Y94A	YA2A	YB0A	YBEA	YCCA

[Function]

This signal validates tool life count during the tool life management.

[Operation]

<M system>

The tool life count (usage time or usage count corresponding to tool) is validated in the tool life management specification.

This signal is validated when tool life management input signal (TLF1n) is ON.

<L system>

The tool life count (usage time or usage count corresponding to tool) is validated with the tool life management specification.

B Con-	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
-	TOOL LIFE MANAGEMENT IN-PUT	TLF1n		Y78B	Y86B	Y94B	YA2B	YB0B	YBEB	YCCB

[Function]

This signal validates the tool life management.

[Operation]

By turning ON the signal in the tool life management specification, the tool life management process is executed.

Con-tact	Signal name	Signal abbreviation		$1	$2	$3	$4	$5	$6	$7
-	TOOL GROUP NO. DESIGNA-TION			G+330	G+430	G+530	G+630	G+730	G+830	G+930
				R2430	R2530	R2630	R2730	R2830	R2930	R3030

[Function]

The group No. is designated when clearing usage data of a group in which the tool life has been exceeded with the tool life management II or when forcibly changing the tool currently in use.

[Operation]

The group designation range is as follows.For group designation: 1 to 9999 of group No.For all groups: 65535 (all 1)
Y (Axis)

PLC -> CNC interface signal

1st part system	Signal abbreviation	Name	Details
Y409	AMLK1	Automatic machine lock 1st axis	While this signal is being received, the tool life management is not performed.
Y439	AMLK2	Automatic machine lock 2nd axis	
Y469	AMLK3	Automatic machine lock 3rd axis	
Y499	AMLK4	Automatic machine lock 4th axis	
Y4C9	AMLK5	Automatic machine lock 5th axis	
Y4F9	AMLK6	Automatic machine lock 6th axis	
Y529	AMLK7	Automatic machine lock 7th axis	
Y559	AMLK8	Automatic machine lock 8th axis	

Y (Part system)

1st part system	Signal abbreviation	Name	Details
Y712	SBKn	Single block	While this signal is being received, the tool life management is not performed.
Y715	DRNn	Dry run	
Y75A	AFLn	Miscellaneous function lock	

5.4 Tool Life Management (L System)

The tool life is managed based on usage time and usage count of tools.

5.4.1 Interface with PLC

CNC -> PLC interface signal

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	IN TOOL LIFE MANAGEMENT	TLFOn		X62B	X6AB	X72B	X7AB	X82B	X8AB	X92B

[Function]

This signal is output during the tool life management.

[Operation]

"In tool life management" (TLFOn) signal turns ON when the tool life management (#1103 T_Life) on the parameter is ON.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	TOOL LIFE OVER	TLOVn		X62E	X6AE	X72E	X7AE	X82E	X8AE	X92E

[Function]

<For tool life management I>

This signal notifies that tool usage data (per tool) have reached to its lifetime (Usage data ≥ Life data).

<For tool life management II>

This signal notifies that all tools in the tool group have reached to their lifetimes.

[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 CNC, 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 skip (TAL1n)" 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 "T function strobe 1 (TF1n)" 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 (TRSTn)" signal is input, etc.)

[Caution]

If this signal is used for M system tool life management II, refer to this signal 30ms after the spindle tool was replaced. (This signal will not change in the same cycle in which the spindle tool was replaced.)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	NEW TOOL CHANGE	TCRQn		X64C	X6CC	X74C	X7CC	X84C	X8CC	X94C

[Function]

This signal notifies that a new tool (unused tool) in the group is selected in the tool life management II.

[Operation]

The signal turns ON when:

(1) The tool selected by T command tool selection is unused (status 0).

The signal turns OFF when:

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

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	**GROUP IN LIFE MANAGEMENT**			G10338	G10438	G10538	G10638	G10738	G10838	G10938
				R138	R238	R338	R438	R538	R638	R738

[Function] [Operation]

This signal outputs group No. currently in life management with the tool life management II.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	TOOL LIFE USAGE DATA			G10344 - G10345	G10444 - G10445	G10544 - G10545	G10644 - G10645	G10744 - G10745	G10844 - G10845	G10944 - G10945
				R144 - R145	R244 - R245	R344 - R345	R444 - R445	R544 - R545	R644 - R645	R744 - R745

[Function] [Operation]

This signal output usage data of tools currently being used with the tool life management II. (When multiple compensation Nos. are used, the total usage data per compensation No. is output.)

PLC -> CNC interface signal

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	TOOL ALARM 1/TOOL SKIP 1	TAL1n		Y788	Y868	Y948	YA28	YB08	YBE8	YCC8

[Function]

This signal is used when the tool in which life has not been reached is attempted to change compulsorily.
This signal sets the tool status during tool life management to 3.

[Operation]

<M system>

By turning ON the signal in the tool life management specification, status of tool data can be changed to "3"(a tool of Tool alarm 1). This signal is validated when tool life management input (TLF1n) signal is ON.

<L system>

By turning ON the signal in the tool life management specification, status of tool data can be changed to "3" (a tool of tool skip), and the tool is handled in the same manner as life tool.

(1) The group No. to which the tool, which is attempted to change status by the sequence program, belongs is designated ("Tool group No. designation" signal) and "Tool skip 1" (TAL) signal is turned ON. When the group is selected next time, a new tool in the group is selected.

(2) When "Tool skip 1" (TAL) signal is turned ON without designating the group No. ("Tool group No. designation" signal is "0"), the group No. which has been selected at that time is considered to have been designated. When the group is selected next time, a new tool in the group is selected.

(Note) When the tool change reset or the tool skip is performed on the group currently selected, usage data count will be carried out on the tool used at the time of signal input until the next tool selection. Therefore, if a tool selected needs to be changed along with the signal input, select a group again.However, a tool may not be selected due to a preceding process if there is no movement command up to the next group selection after the signal input. In this case, contents of the preceding process can be invalidated by turning ON the "recalculation request" (CRQ) signal before selecting the group.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	USAGE DATA COUNT VALID	TCEFn		Y78A	Y86A	Y94A	YA2A	YB0A	YBEA	YCCA

[Function]

This signal validates tool life count during the tool life management.

[Operation]

<M system>

The tool life count (usage time or usage count corresponding to tool) is validated in the tool life management specification.
This signal is validated when tool life management input signal (TLF1n) is ON.

<L system>

The tool life count (usage time or usage count corresponding to tool) is validated with the tool life management specification.

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
A	TOOL CHANGE RESET	TCRTn		Y78C	Y86C	Y94C	YA2C	YB0C	YBEC	YCCC

[Function]

This signal is used to clear all tool usage data in a group with the tool life management II.

[Operation]

Select with the tool group No. designation whether all groups that have exceeded their lifetimes or specific group to be cleared.

After this signal is input, the first tool of the group will be selected at the next group selection.

(Note) When the tool change reset or the tool skip is performed on the group currently selected, usage data count will be carried out on the tool used at the time of signal input until the next tool selection. Therefore, if a tool selected needs to be changed along with the signal input, select a group again. However, a tool may not be selected due to a preceding process if there is no movement command up to the next group selection after the signal input. In this case, contents of the preceding process can be invalidated by turning ON the "recalculation request" (CRQn) signal before selecting the group.

[Related signals]

(1) Recalculation request (CRQn:Y72B)

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	TOOL GROUP NO. DESIGNA-TION			G+330	G+430	G+530	G+630	G+730	G+830	G+930
				R2430	R2530	R2630	R2730	R2830	R2930	R3030

[Function]

The group No. is designated when clearing usage data of a group in which the tool life has been exceeded with the tool life management II or when forcibly changing the tool currently in use.

[Operation]

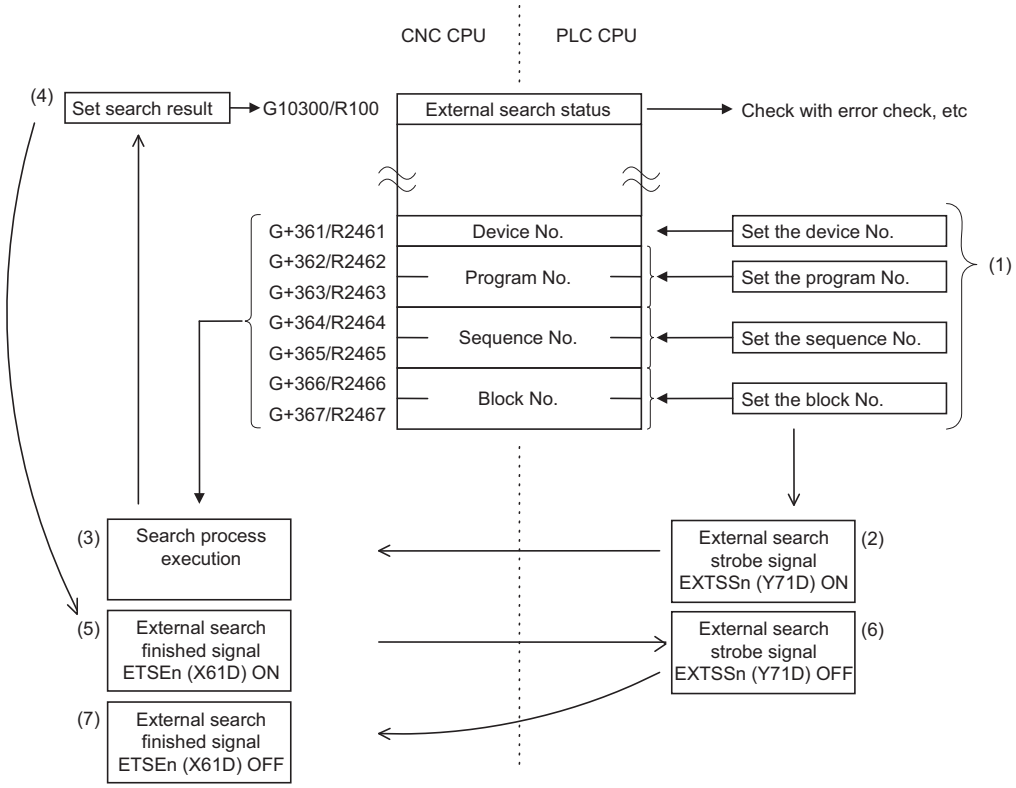
The group designation range is as follows.For group designation: 1 to 9999 of group No.For all groups: 65535 (all 1)

5.5 External Search

External search is a function that searches the machining program according to the machining program storage device, program No., sequence No., block No. designated from the PLC CPU.

Details

Flow of process for the external search (the 1st part system) is shown below.



[Operation]

(1) The PLC CPU sets the device, program No., sequence No., and block No.
(2) The PLC CPU sets the external search strobe signal ON.
(3) The CNC CPU searches for the target machining program from the designated device, program No., sequence No., and block No.
(4) The CNC CPU sets the search results as the external search status.
(5) The CNC CPU turns the external search finished signal ON.
(6) The PLC CPU turns the external search strobe signal OFF.
(7) The CNC CPU turns the external search finished signal OFF.

CNC CPU → PLC CPU Interface signals

Signal name	Part system No.						
	$1	$2	$3	$4	$5	$6	$7
EXTERNAL SEARCH FINISHED	X61D	X69D	X71D	X79D	X81D	X89D	X91D
EXTERNAL SEARCH STATUS	G10300	G10400	G10500	G10600	G10700	G10800	G10900
	R100	R200	R300	R400	R500	R600	R700

(1) External search finished (ETSFn:X61D)
This turns ON when the external search is finished. This also turns ON when an error occurs.
This signal turns OFF when the "external search strobe" signal is turned OFF from the PLC CPU.

(2) External search status (G10300/R100)
The status at the end of the external search is output.
Refer to "External search status" for the details on status value.

PLC CPU → CNC CPU Interface signals

Signal name	Part system No.						
	$1	$2	$3	$4	$5	$6	$7
EXTERNAL SEARCH DEVICE NO.	G+361	G+461	G+561	G+661	G+761	G+861	G+961
	R2461	R2561	R2661	R2761	R2861	R2961	R3061
EXTERNAL SEARCH PROGRAM NO.	G+362 - G+363	G+462 - G+463	G+562 - G+563	G+662 - G+663	G+762 - G+763	G+862 - G+863	G+962 - G+963
	R2462 - R2463	R2562 - R2563	R2662 - R2663	R2762 - R2763	R2862 - R2863	R2962 - R2963	R3062 - R3063
EXTERNAL SEARCH SEQUENCE NO.	G+364 - G+365	G+464 - G+465	G+564 - G+565	G+664 - G+665	G+764 - G+765	G+864 - G+865	G+964 - G+965
	R2464 - R2465	R2564 - R2565	R2664 - R2665	R2764 - R2765	R2864 - R2865	R2964 - R2965	R3064 - R3065
EXTERNAL SEARCH BLOCK NO.	G+366 - G+367	G+466 - G+467	G+566 - G+567	G+666 - G+667	G+766 - G+767	G+866 - G+867	G+966 - G+967
	R2466 - R2467	R2566 - R2567	R2666 - R2667	R2766 - R2767	R2866 - R2867	R2966 - R2967	R3066 - R3067
EXTERNAL SEARCH STROBE	Y71D	Y7FD	Y8DD	Y9BD	YA9D	YB7D	YC5D

(1) External search device No. (G+361/R2461)
The device storing the machining program to be searched is designated with a No. Be sure to set 0 for this CNC.
An error occurs if any No. except "0" is set. (Status: 3)

Device No.	Device
0	Memory

(2) External search program No. (G+362/R2462, G+363/R2463)
Designate the program No. of the machining program to be searched as a binary.
The setting range is 1 to 99999999 (8 digits).

(3) External search sequence No. (G+364/R2464, G+365/R2465)
Designate the sequence No. of the machining program to be searched as a binary.
The setting range is 1 to 99999 (5 digits).

(4) External search block No. (G+366/R2466, G+367/R2467)
Designate the block No. as a binary.
The setting range is 0 to 99 (2 digits).

(5) External search strobe (EXTSSn:Y71D)
The CNC CPU starts the external search at the rising edge of this signal.

The combinations of designation conditions and correspondence of the operation search blocks are shown below.
The designated block No. is added to the operation search block No. which is searched by operation search.

Condition		Operation search block
Program No.	Sequence No.	
Designated	Designated	Designated sequence No. for designated program
Designated	Not designated (=0)	Head of designated program
Not designated (=0)	Designated	Designated sequence No. in currently selected program
Not designated (=0)	Not designated (=0)	Error: 4 (Refer to "External search status")

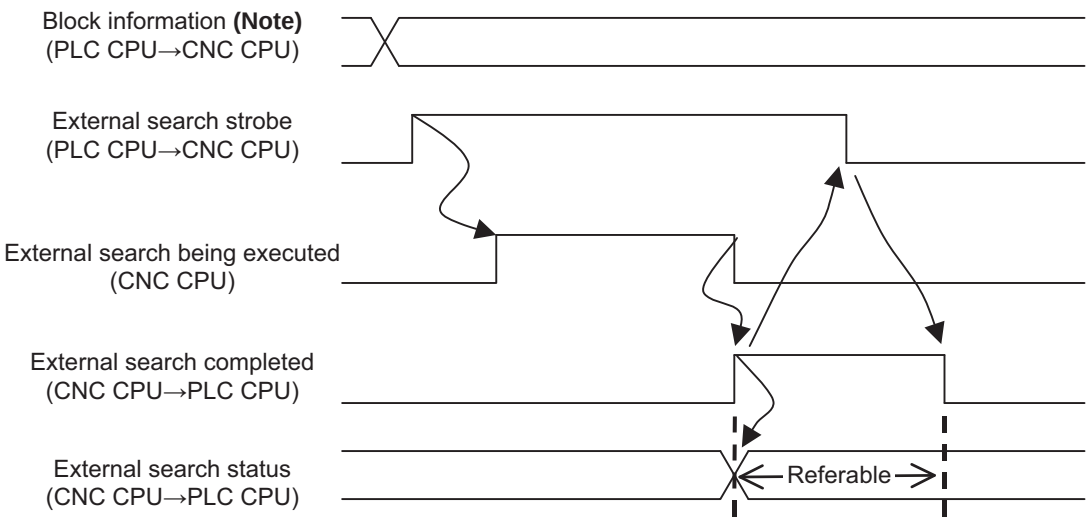
(Example)If program No. 100, sequence No. 300 and block No. 2 are designated, operation search is executed for the block underlined.

```
O100()
N0100 G28 X0 Y0 Z0;
M3 S1000;
N0200 G0 Z100.;
G0 X100. Y0.;
N0300 G01 Z50. F1000;
G01 Y10.;
    G01 Z0. F100; ..... (*)
G00 Z50.
N0400 G0 Z100.;
M30;
```

(Note) The block No. is designated with the number of blocks following the last sequence No.

Timing chart

The timing chart for the external search is shown below.



(Note) Block information includes program No., sequence No. and block No.

(Note 1) Retain the external search strobe until external search finished signal is turned ON.
(Note 2) Refer to external search status to confirm that the operation search has successfully completed.

External search status

The correspondence of the external search status values and details output from the CNC CPU based on the external search is shown below.

External search status value	Details	Remedy
0	Normally finished.	————
1	Operation search is being carried out.	Wait for other function's operation search to finish before searching.
2	Search was attempted during the program operation.	Stop the program before searching.
3	A non-existed or disabled device was designated.	Confirm the presence of the device, and that the device is within the specifications.
4	The program file is not designated.	Designate the program No. or sequence No.
5	The block with the designated program No., sequence No. or block No. was not found.	————
6	No external search specifications	Check the specifications.
7	The operation search did not yet finished after three seconds since the external search had started. (Note)	Data may be being input or output. Restart the external search after finishing the operation.

(Note) Timeout monitoring is executed only when "1" is set to "#21102 add02/bit1".

Precautions

(1) If the external search strobe is OFF at the time when CNC CPU completes the external search, the external search finished signal ON may not be confirmed by PLC CPU.
Do not turn OFF the external search strobe signal until the external search finished signal is turned ON.

(2) Set program No., sequence No. and block No. before turning ON the external search strobe signal.
Do not change the Nos. until the external search finished signal is turned ON.

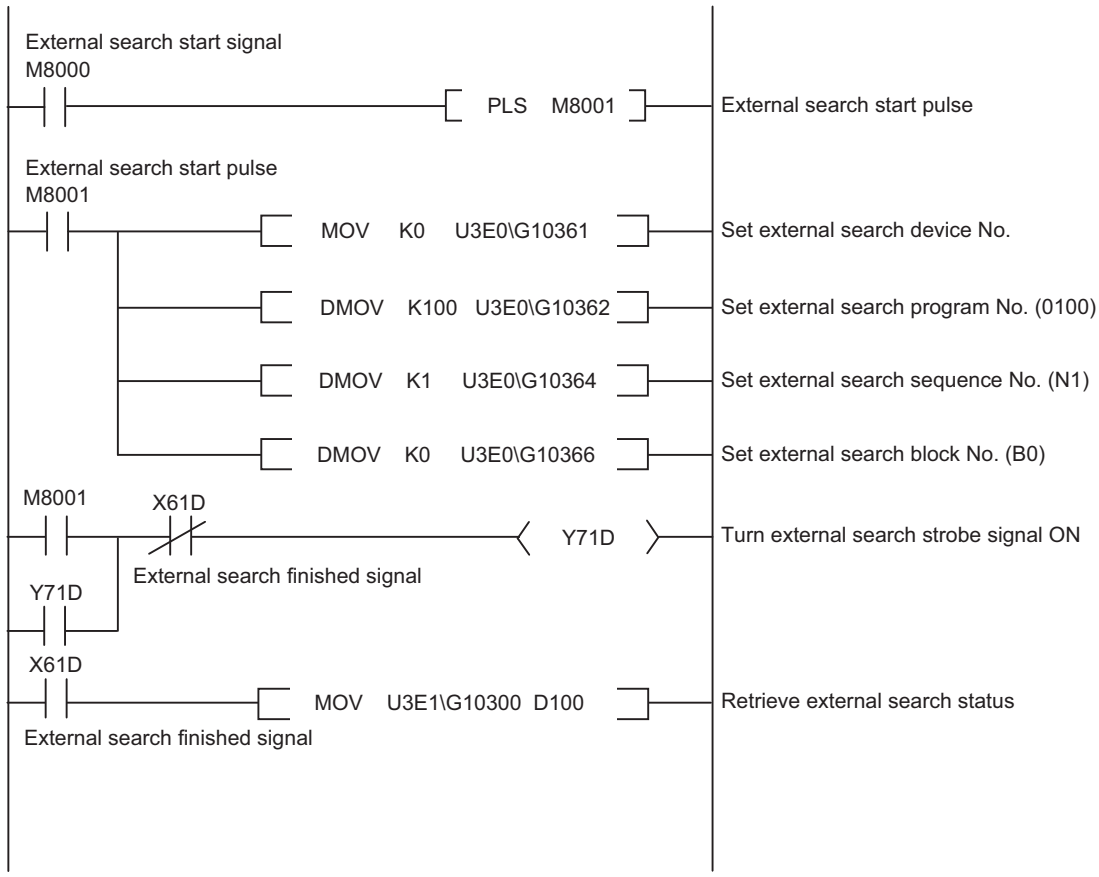
(3) External search status can only be referred when the external search finished signal is ON.

(4) Execution of external search during resetting is possible.

Usage example

An example of the external search ladder for the 1st part system is shown below.

(Example) Executes the operation search for the block O100 N1 B0 in CNC CPU mounted in slot 0.



(Note) Bit devices (Y71D/X61D) in the program example are set on the premise that the transfer corresponds to the device Nos. of CNC interface.
Assignment of device Nos. may change the details of the program.

5.6 External Machine Coordinate System Compensation

External machine coordinate system compensation is executed by setting compensation data (absolute amount) in the G device for each axis.
Thus, the compensation timing is when PLC CPU rewrites G device compensation data. Necessary condition, timing, etc., are set by PLC CPU.
The interface between PLC CPU and CNC is shown below.

G device File register	Details	G device File register	Details
G+1000	Compensation data 1st axis	G+1080	Compensation data 9th axis
R3100		R3180	
G+1010	Compensation data 2nd axis	G+1090	Compensation data 10th axis
R3110		R3190	
G+1020	Compensation data 3rd axis	G+1100	Compensation data 11th axis
R3120		R3200	
G+1030	Compensation data 4th axis	G+1110	Compensation data 12th axis
R3130		R3210	
G+1040	Compensation data 5th axis	G+1120	Compensation data 13th axis
R3140		R3220	
G+1050	Compensation data 6th axis	G+1130	Compensation data 14th axis
R3150		R3230	
G+1060	Compensation data 7th axis	G+1140	Compensation data 15th axis
R3160		R3240	
G+1070	Compensation data 8th axis	G+1150	Compensation data 16th axis
R3170		R3250	

(Note 1) File register Nos. correspond to CNC.
(Note 2) The delay to compensation is about (one PLC program scan + 15ms). However, smoothing time constant and servo follow delay are not contained.

5.7 Safety Observing

5.7.1 CNC CPU -> PLC CPU Interface signals

CNC CPU -> PLC CPU Interface signals

Con-tact	Signal name	Signal abbreviation		Common for part systems
-	CNC SIDE DUAL SIGNAL MODULE m	SU_NC m		G12470 - G12475
				R2150 - R2155

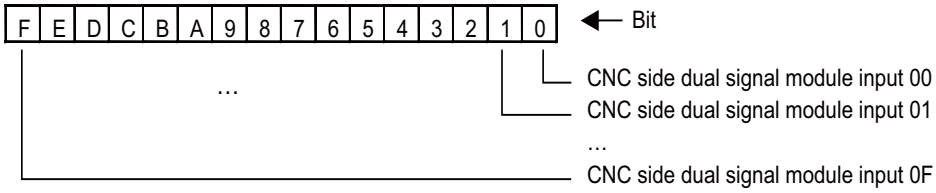
[Function

This signal informs the CNC side dual signal input status of the dual signal module.

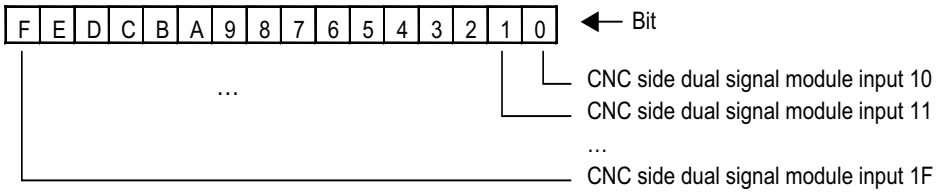
[Operation]

Each bit corresponds to the following signals. If this signal is ON, a corresponding signal bit turns ON.
These devices are the copies of the data X200 to X25F, made by CNC's internal processing.

<L side>



<H side>



[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

Con-tact	Signal name	Signal abbreviation		Common for part systems
-	CNC SIDE DUAL SIGNAL ERROR MODULE m	SU_NER m		G12480 - G12485
				R2160 - R2165

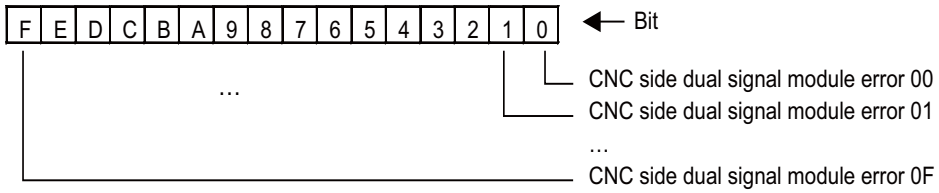
[Function]

This signal informs the comparison status of "CNC side dual signal input" in the dual signal module. The signal turned ON once holds the state until the controller power is turned ON again.

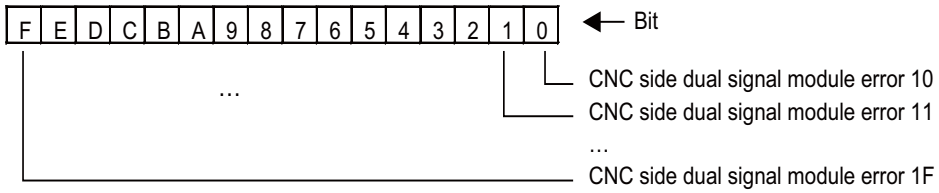
[Operation]

Each bit corresponds to the following signals. If this signal is ON, a corresponding signal bit turns ON.

<L side>



<H side>



[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

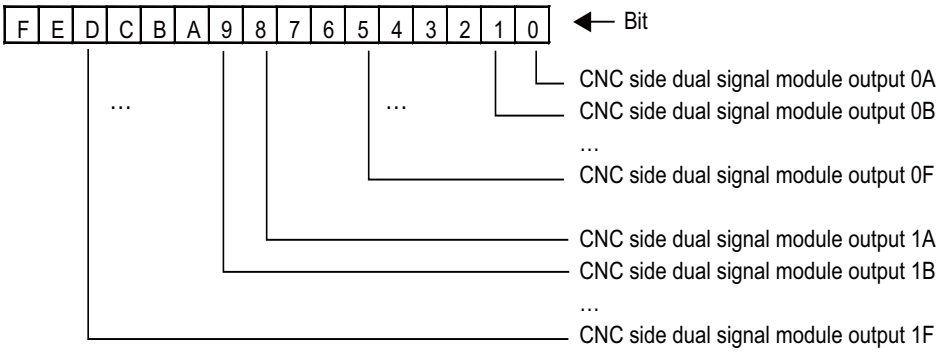
Con-tact	Signal name	Signal abbreviation		Common for part systems
-	CNC SIDE DUAL SIGNAL OUTPUT MODULE m	SU_NO m		G12490 - G12492
				R2170 - R2172

[Function]

This signal informs the CNC side dual signal output status of the dual signal module 1 to 3.

[Operation

Each bit corresponds to the following signals. If this signal is ON, a corresponding signal bit turns ON.
These signals are the copies of the output signals Y200 to Y25F, made by CNC's internal processing.



[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

Con-tact	Signal name	Signal abbreviation		Common for part systems
-	CNC SIDE DUAL SIGNAL OUTPUT ERROR MODULE m	SU_NOER m		G12494 - G12496
				R2174- - R2176

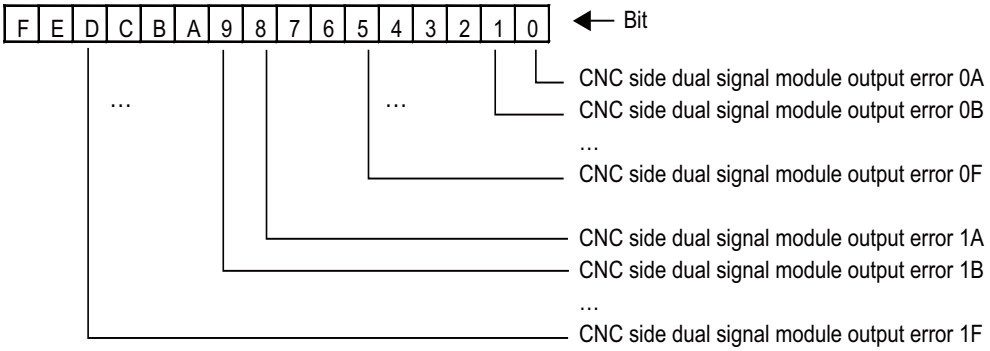
[Function]

This signal informs the comparison status between CNC side dual signal output and its input signal of the dual signal module.

The signal turned ON once holds the state until the controller power is turned ON again.

[Operation]

Each bit corresponds to the following signals. If this signal is ON, a corresponding signal bit turns ON.



[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

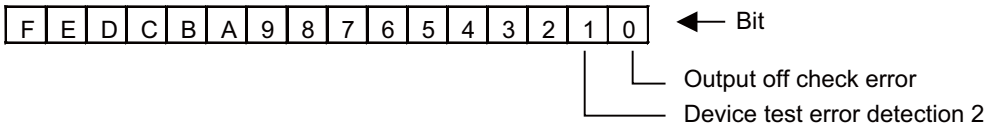
Contact	Signal name	Signal abbreviation		Common for part systems
-	CNC SIDE DUAL SIGNAL COMPARE STATUS 2	SU_NST2		G12499
				R2179

[Function]

This signal informs CNC side dual signal compare status to the PLC.

[Operation]

Each bit corresponds to the following signals:



bit0: Output off check error

An error is detected during the output off check.

bit1: Device test error detection 2

An error is detected during the check pattern 2 for the device test.

[Caution]

This device is dedicated to the monitor. Do not change the device value with PLC program. If it is changed, the dual signal compare ladder will not be executed correctly.

Contact	Signal name	Signal abbreviation		Common for part systems
-	CNC SIDE SAFETY COMPARE ACTIVITY CHECK INFORMA-	SU_NLT		G12500
				R2180

[Function]

This signal informs the PLC of the CNC side dual signal comparison activity check counter.

[Operation]

To ensure that dual signal comparison is constantly done between the CNC and PLC CPUs, they perform activity check each other.

[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

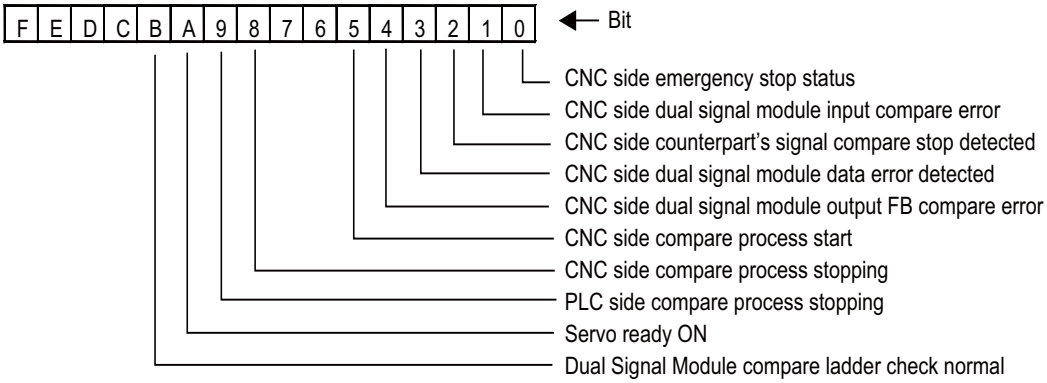
Con-tact	Signal name	Signal abbreviation		Common for part systems
-	CNC SIDE DUAL SIGNAL COMPARE STATUS	SU_NST		G12501
				R2181

[Function]

This signal informs the PLC of the CNC side dual signal comparison status.

[Operation]

Each bit corresponds to the following signals.



[Caution]

This device is for monitorting only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

Con-tact	Signal name	Signal abbreviation		Common for part systems
-	CNC SIDE HEAD G NO.	SU_NGDV		G12502
				R2182

[Function]

This signal informs the PLC of the CNC side dual signal head G device No.

[Operation]

The value set by the parameter " #26742 G Device TOP number" is normally set.

[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

Con-tact	Signal name	Signal abbreviation		Common for part systems
-	CNC SIDE DUAL SIGNAL COMPARE MISMATCH ALLOW-ANCE TIME	SU_NDLY		G12503
				R2183

[Function]

This signal informs the PLC of the dual signal comparison mismatch allowance time of the dual signal module.

[Operation]

The value set by the parameter "#21142 SSU_Delay " is normally set.

[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

Con-tact	Signal name	Signal abbreviation		Common for part systems
-	CNC SIDE DUAL SIGNAL HEAD DEVICE NO. m	SU_NDV m		G12504 - G12506
				R2184 - R2186

[Function]

This signal informs the PLC of the dual signal head device No. of the dual signal module.

[Operation]

The PLC is informed of the value set by the parameters "#21143 SSU_Dev1" to "#21145 SSU_Dev3".

[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

Con-tact	Signal name	Signal abbreviation		Common for part systems
-	NO. OF DUAL SIGNAL UNITS ON CNC SIDE	SU_NNUM		G12508
				R2188

[Function]

This signal informs the PLC of the number of dual signal modules.

[Operation]

The PLC is informed of the value set by the parameter "#21125 SSU_num".

[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

PLC CPU -> CNC CPU Interface signals

Con-tact	Signal name	Signal abbreviation		Common for part systems
-	PLC SIDE DUAL SIGNAL MODULE m	SU_PC m		G+2580 - G+2585
				R4450 - R4455

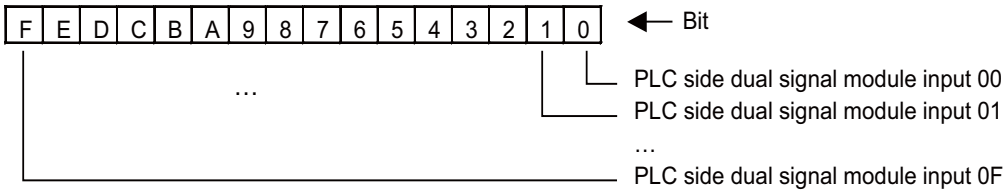
[Function]

This signal informs the CNC of the PLC side dual signal input status of the dual signal modules.

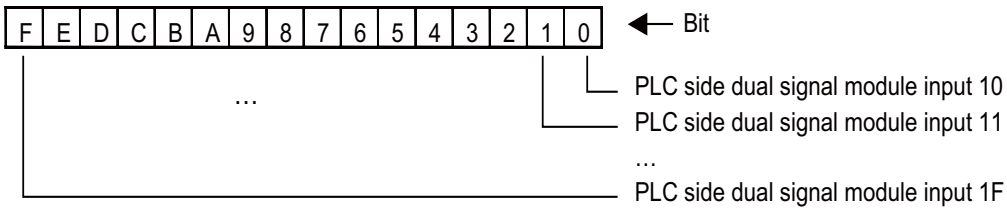
[Operation]

Each bit corresponds to the following signals. If this signal is ON, a corresponding signal bit turns ON.

<L side>



<H side>



[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

Con-tact	Signal name	Signal abbreviation		Common for part systems
-	PLC SIDE DUAL SIGNAL ERROR MODULE m	SU_PER m		G+2590 - G+2595
				R4460 - R4465

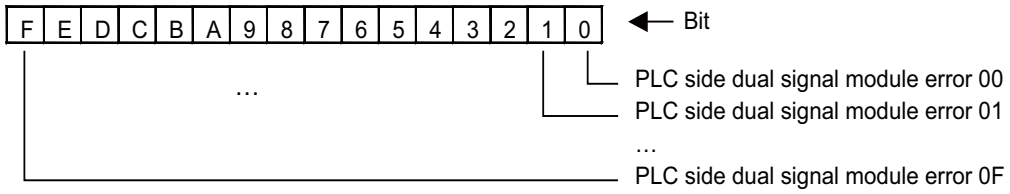
[Function]

This signal informs the comparison status of "PLC side dual signal input" in the dual signal module.The signal turned ON once holds the state until the controller power is turned ON again.

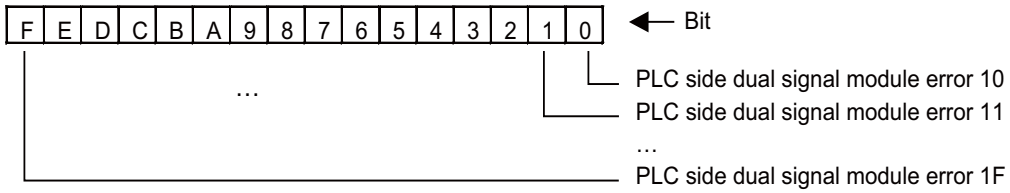
[Operation]

Each bit corresponds to the following signals. If this signal is ON, a corresponding signal bit turns ON.

<L side>



<H side>



[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

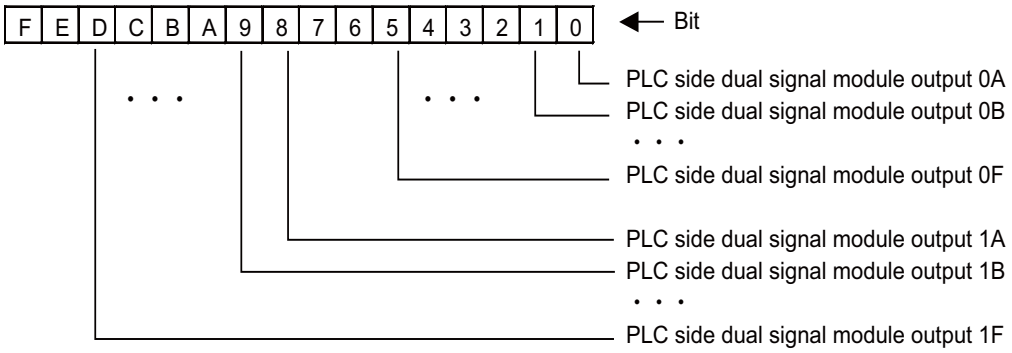
Con-tact	Signal name	Signal abbreviation		Common for part systems
-	PLC SIDE DUAL SIGNAL OUTPUT MODULE m	SU_PO m		G+2600 - G+2602
				R4470 - R4472

[Function]

This signal informs the PLC side dual signal output status of the dual signal module.

[Operation

Each bit corresponds to the following signals. If this signal is ON, a corresponding signal bit turns ON.



[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

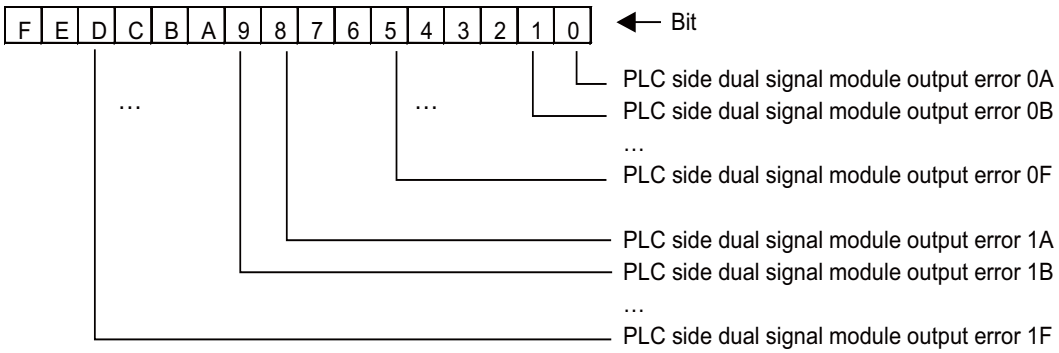
Con-tact	Signal name	Signal abbreviation		Common for part systems
-	PLC SIDE DUAL SIGNAL OUTPUT ERROR MODULE m	SU_POER m		G+2604 - G+2606
				R4474 - R4476

[Function]

This signal informs the comparison status between PLC side dual signal output and its input signal of the dual signal module. The signal turned ON once holds the state until the controller power is turned ON again.

[Operation]

Each bit corresponds to the following signals. If this signal is ON, a corresponding signal bit turns ON.



[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

Contact	Signal name	Signal abbreviation		Common for part systems
-	PLC SIDE DUAL SIGNAL COMPARE STATUS 2	SU_PST2		G+2609
				R4479

[Function]

This signal informs PLC side dual signal compare status to the CNC.

[Operation]

Each bit corresponds to the following signals:

bit0: Output off check error

An error is detected during the output off check.

bit1: Device test error detection 2

An error is detected during the check pattern 2 for the device test.

[Caution]

This device is dedicated to the monitor. Do not change the device value with PLC program. If it is changed, the dual signal compare ladder will not be executed correctly.

Contact	Signal name	Signal abbreviation		Common for part systems
-	PLC SIDE SAFETY COMPARE ACTIVITY CHECK INFORMATION	SU_PLT		G+2610
				R4480

[Function]

This signal informs the CNC of the PLC side dual signal comparison activity check counter.

[Operation

To ensure that dual signal comparison is constantly done between the CNC and PLC CPUs, they perform activity check each other.

[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

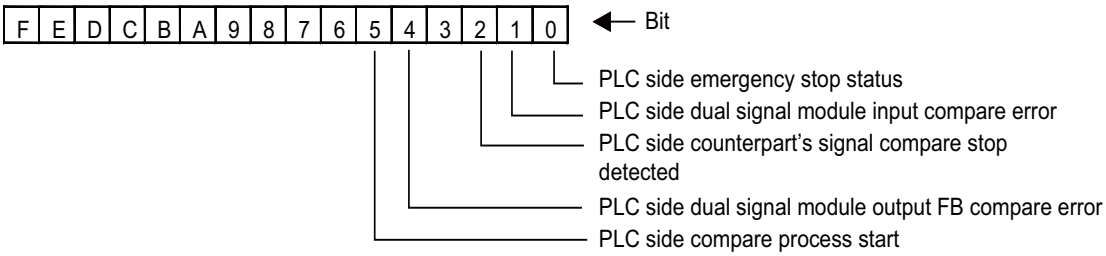
Contact	Signal name	Signal abbreviation		Common for part systems
-	PLC SIDE DUAL SIGNAL COMPARE STATUS	SU_PST		G+2611
				R4481

[Function]

This signal informs the CNC of the PLC side dual signal comparison status.

[Operation]

Each bit corresponds to the following signals.



[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

Con-tact	Signal name	Signal abbreviation		Common for part systems
-	PLC SIDE HEAD G NO.	SU_NGDV		G+2612
				R4482

[Function]

This signal informs the CNC of the dual signal head G device No. that has been transmitted to the PLC.
This is for confirming that data has been correctly transmitted to the PLC.

[Operation]

The value set by the parameter " #26742 G Device TOP number" is normally set.

[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

Con-tact	Signal name	Signal abbreviation		Common for part systems
-	PLC SIDE DUAL SIGNAL COM-PARE MISMATCH ALLOWANCE	SU_PDLY		G+2613
				R4483

[Function

This signal informs the CNC of the dual signal comparison mismatch allowance time of the dual signal module, which has been transmitted to the PLC. This is for confirming that data has been correctly transmitted to the PLC.

[Operation]

The value set by the parameter "#21142 SSU_Delay " is normally set.

[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

Con-tact	Signal name	Signal abbreviation		Common for part systems
-	PLC SIDE DUAL SIGNAL HEAD DEVICE NO. m	SU_PDV m		G+2614 - G+2616
				R4484- - R4486

[Function]

This signal informs the CNC of the dual signal head device No. of the dual signal module, which has been transmitted to the PLC. This is for confirming that data has been correctly transmitted to the PLC.

[Operation]

The PLC is informed of the value set by the parameters "#21143 SSU_Dev1" to "#21145 SSU_Dev3".

[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

Con-tact	Signal name	Signal abbreviation		Common for part systems
-	NO. OF DUAL SIGNAL MODULE ON PLC SIDE	SU_PNUM		G+2618
				R4488

[Function]

This signal informs the CNC of the number of dual signal modules, which has been transmitted to the PLC.This is for confirming that data has been correctly transmitted to the PLC.

[Operation]

The CNC is informed of the value set by the parameter "#21125 SSU_num".

[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

Con-tact	Signal name	Signal abbreviation		Common for part systems
-	PLC SIDE SAFETY OPERATION STATUS	SU_POP		G+2620
				R4490

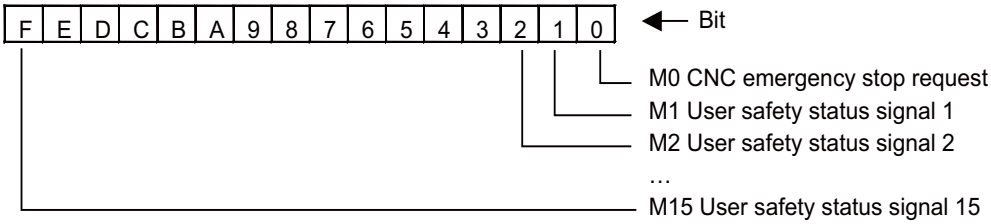
[Function]

This signal informs the CNC of the safety-related operation status that has been set by PLC side user ladder when dual signal comparison function is valid.

[Operation]

The CNC is informed of the safety-related operation status devices (M0 to M15) that have been set by PLCside user ladder.

Each bit corresponds to the following signals.



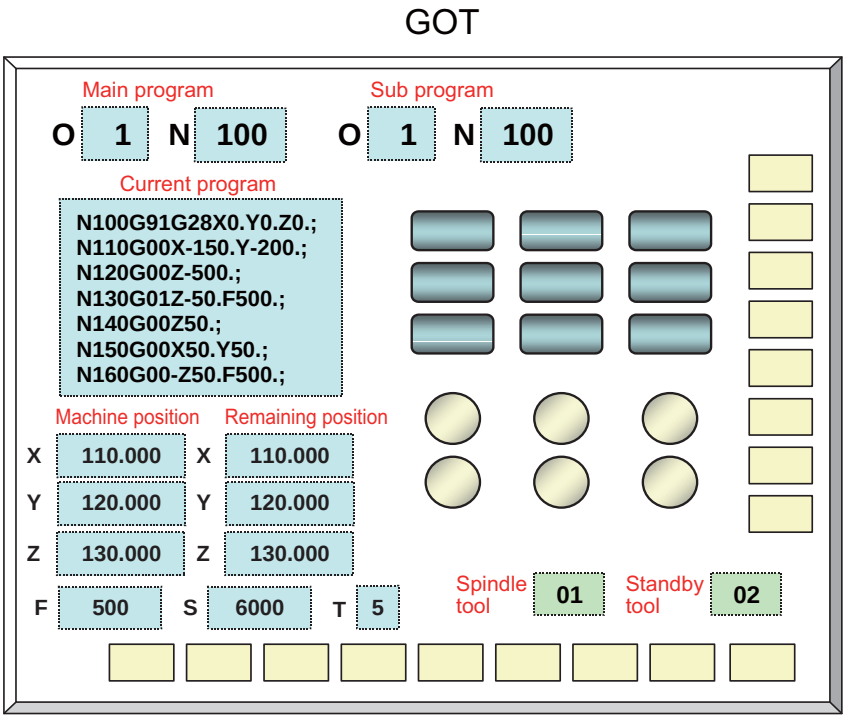
[Caution]

This device is for monitoring only. Do not change the device by user ladder. The comparison ladder is not correctly executed when changing.

5.8 GOT Window

GOT window interface is for displaying various NC data on GOT1000 that is connected to CNC CPU.
By commanding device read instruction, GOT can read data such as current machining program No., current machining program and coordinate value.
Set a command to CNC CPU using GOT or PLC I/F command. Also create data that corresponds to the command on CNC CPU side.
As the area of up to ten commands is available, up to ten commands can be designated at a same time.
The group of commands which are frequently used can be automatically set at the power ON, and it is available to refer to the CNC data without programming. (Automatic setup window)

<Sample screen shot and command examples>

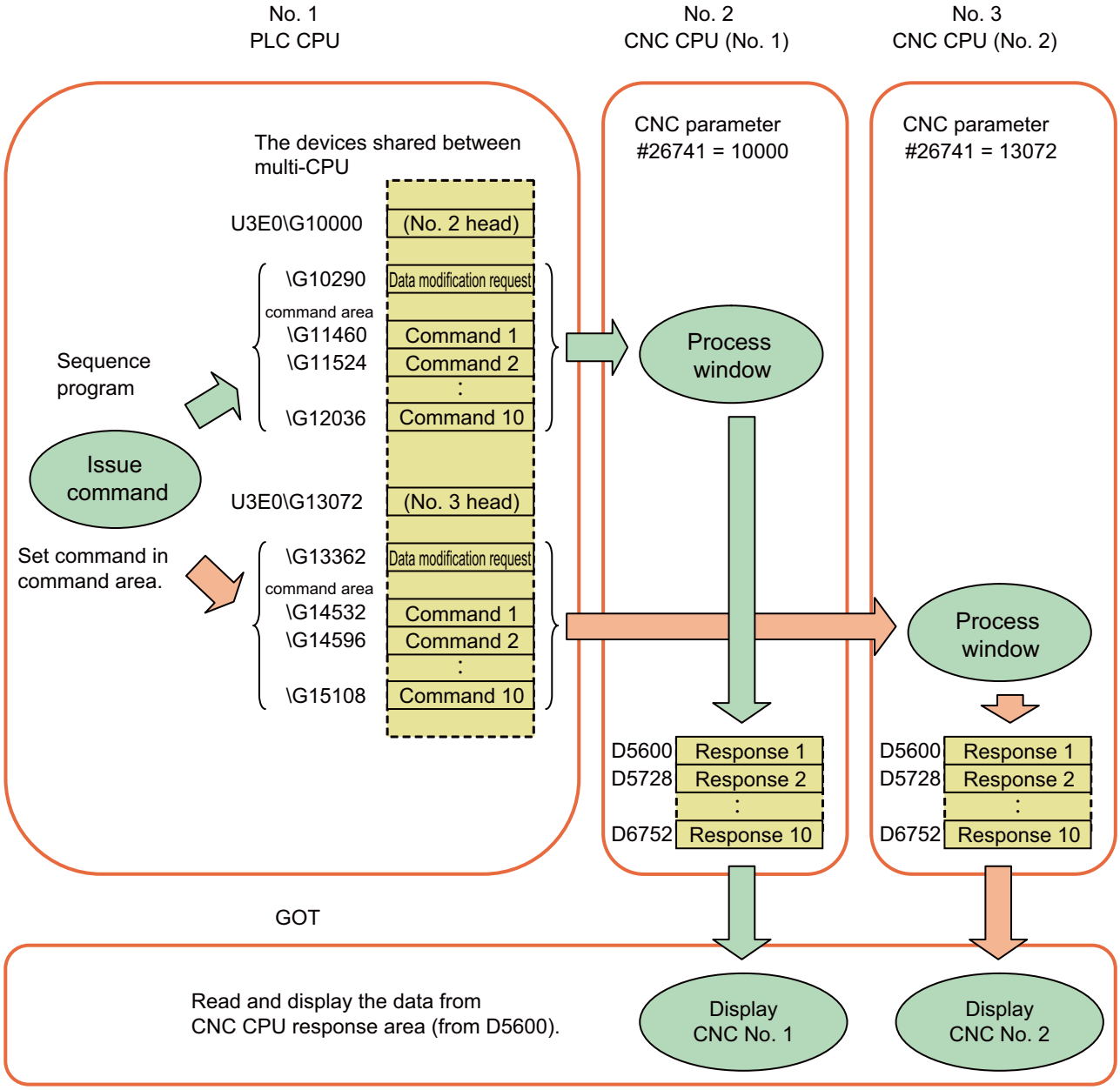


Data displayed	How to obtain these data
Current program	Using command code: 0xF01
Main/Sub/O/N number	Using command code: 0xF02
F command (modal)	Using command code: 0xF02
S command (modal)	Using command code: 0xF02
T command (modal)	Using command code: 0xF02
Machine position	Using command code: 0xF03
Remaining distance	Using command code: 0xF03

5.8.1 GOT Window Interface

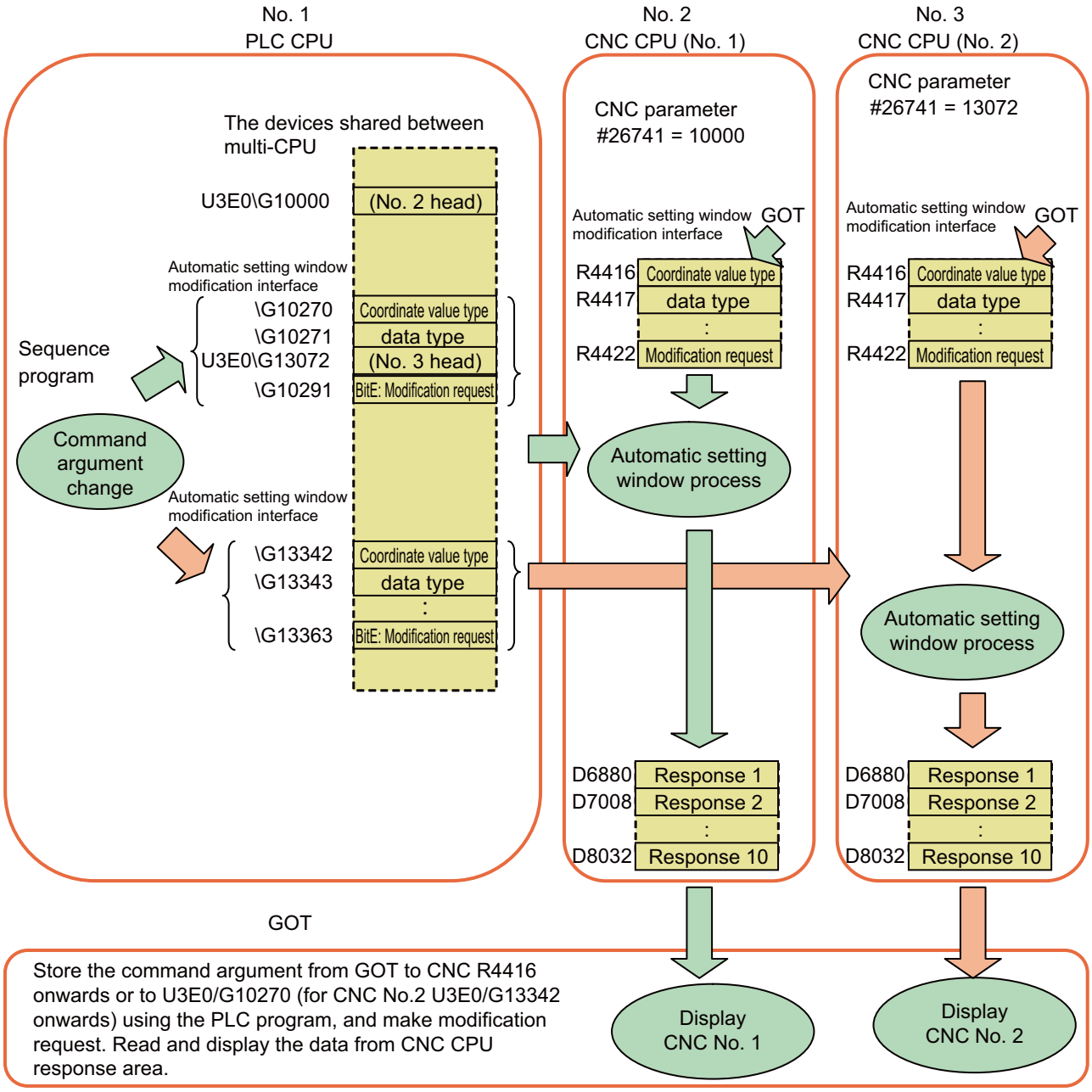
Outline

Assign command area to the devices from U3En\G11460 (the CNC No. 2 is from U3En\G14532) and response area to the devices from D5600 to D6879 (devices in CNC). Designated data is set in command area, using PLC I/F command. And then, CNC will store the designated data in response area, and this data can be read and displayed on GOT as needed.
Maximum of ten sets of window areas have been assigned. So, up to ten types of command can be designated at a time.



(Note 1) The head address for CNC CPU No.3 changes depending on the value set for "#26742". Refer to the table in "Command area and response area" for the relationship between the parameter and the address.

Automatic setting window is a GOT window that can automatically set frequently-used command group when the power is turned ON and the CNC data can be referred without programming.
The response data will be stored in the window response area accodance with the command that is automatically set.
Some of the commands can change the acquiring data by changing the argument. The command's argument can be changed by both GOT and PLC program.
As the automatic setting window is assigned to the different area from the 10 sets of window previously mentioned, GOT window and automatic setting window can be used in combination.
Refer to "Automatic setting window" section about the automatic setting window.



(Note 1) The head address for CNC CPU No.3 changes depending on the value set for "#26742".
Refer to the table in "Command area and response area" for the relationship between the parameter and the address.

Command area and response area

There are ten sets each of command areas and response areas.
64 words are used for one command in the command area, and 128 words are used for one response in the response area.
Command area is assigned to the devices shared between multi-CPU (G device). Writing command to the command area is done by PLC program.
The response area is assigned to the D device in the CNC CPU. The response area (CNC CPU device) is monitored by GOT.

Command area					Response	
Item	CPU No.1	CPU No.2			Items	Devise
Setting value for parameter "#26742"	10000	When "13072" is set	When "14000" is set			
Head device	U3E0\ G10000	U3E0\ G13072	U3E0\ G14000			
Window command 1	G11460	G14532	G15460		Window response 1	D5600
Window command 2	G11524	G14596	G15524		Window response 2	D5728
Window command 3	G11588	G14660	G15588		Window response 3	D5856
Window command 4	G11652	G14724	G15652		Window response 4	D5984
Window command 5	G11716	G14788	G15716		Window response 5	D6112
Window command 6	G11780	G14852	G15780		Window response 6	D6240
Window command 7	G11844	G14916	G15844		Window response 7	D6368
Window command 8	G11908	G14980	G15908		Window response 8	D6496
Window command 9	G11972	G15044	G15972		Window response 9	D6624
Window command 10	G12036	G15108	G16036		Window response 10	D6752

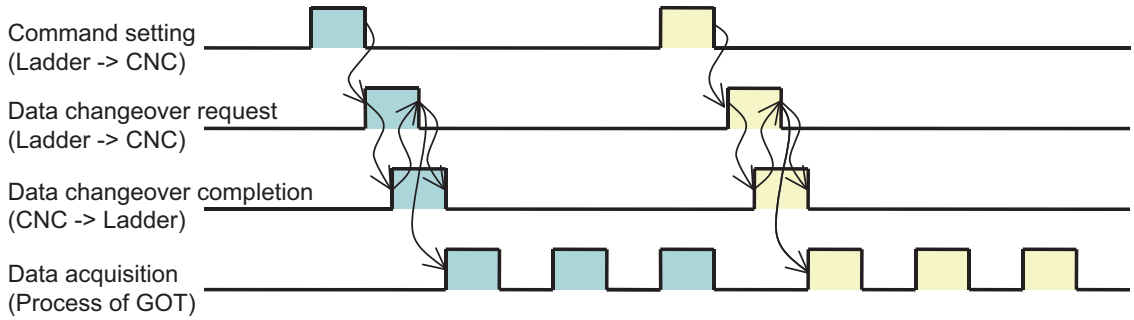
*G11460 is the top of command area for the first CNC CPU.
If there are two CNC CPUs, the command area for the second CPU will change depending on the value set for "#26742".

* When referring the response area (CNC CPU's device) from GOT drawing data, make sure to designate the CNC No. (2 to 4) to refer to in the CNC No. setting field. If "0" (host CNC) is designated, it may monitor the CNC which is not intended to do so depending on the connection state of GOT.

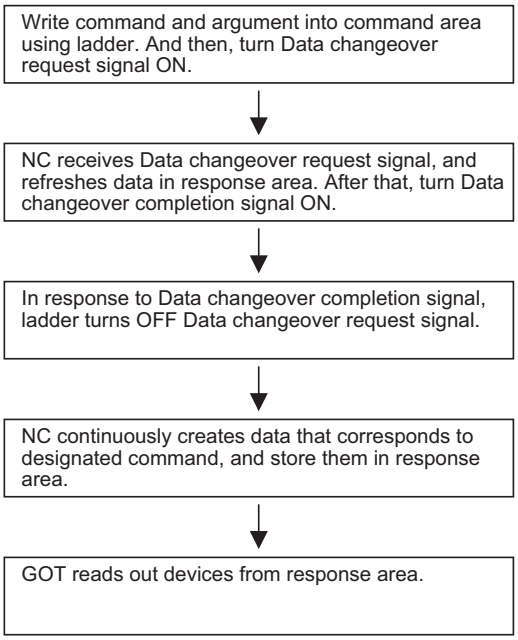
5.8.2 How to Obtain Window Data

Procedure

In order for GOT to obtain NC data, firstly set necessary command in command area. And then, turn Data changeover request signal ON.
When NC has received Data changeover request signal and finished the data changeover, Data changeover completion signal will be turned ON.
Once Data changeover request signal is turned ON, NC will continuously create data until Data changeover request signal is turned ON next time.
There are ten Data changeover request signals, which correspond to Window 1 through 10.



- When the command is changed, GOT cannot obtain the response data for modified command until the data changeover completion signal is turned ON.
- When the command is not changed, turn ON the data changeover request signal only once with PLC program. Subsequent response area will be constantly updated.



PLC CPU -> CNC CPU Interface signals

Contact	Signal name	Signalab-breviation		Common for part systems
-	GOT WINDOW DATACHANGE-OVER REQUEST			G+290 - G+291
				R2390 - R2391

[Function]

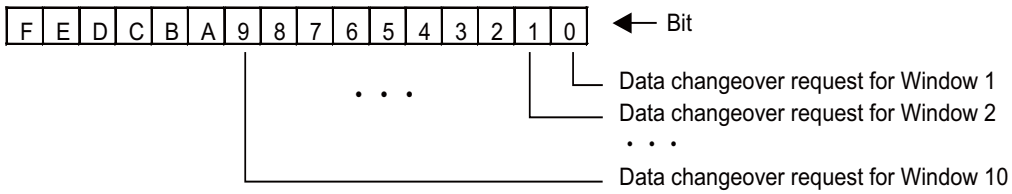
This signal notices that necessary command is set in command area.

[Operation]

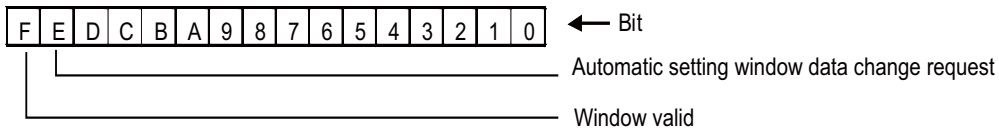
Turns ON when command data is changed.

(R2391/bitF is handled as window valid signal.)

<R2390>



<R2391>



CNC CPU -> PLC CPU Interface signals

Contact	Signal name	Signalab-breviation		Common for part systems
-	GOT WINDOW DATACHANGE-OVER COMPLETION			G10290 - G10291
				R90 - R91

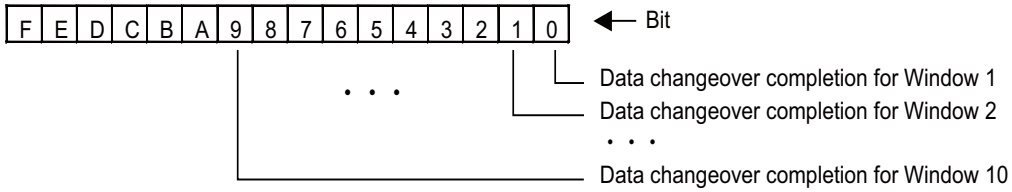
[Function]

This signal notices that data changeover is completed.

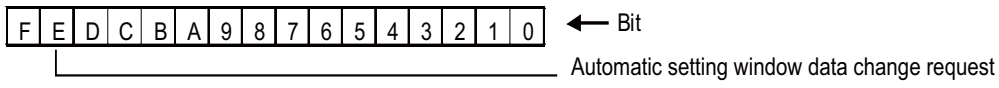
[Operation]

Turns ON when data changeover is completed.Turns OFF when Data changeover request signal is turned OFF.

<R90>



<R91>



Window command

Ten fixed sets of window command areas are used.

<Command area>

	Offset	Description	Note
Window 1	+0	Data size	The number of bytes from the command code to the end of the argument
	+1	Reserve	
	+2	Command code	Command code to use
	+3	Reserve	
	+4 to +63	Argument 1 to Argument 30	Configuration of the argument is different depending on the function
Window 2	+64	Data size	The number of bytes from the command code to the end of the argument
	+65	Reserve	
	+66	Command code	Command code to use
	+67	Reserve	
	+68 to +125	Argument 1 to Argument 30	Configuration of the argument is different depending on the function
:	:	:	:

(Note 1) Offset is described in the word unit.

<Command code list>

Command code	Description
0xF01	Get the current program with designating the format
0xF02	Get all modal information
0xF03	Get all axes' coordinate values
0xF04	Get the alarm message currently occurring
0xF05	Get the alarm history information

Window response

Ten fixed sets of window response areas are used.

<Response area>

	Offset	Description	Note
Window 1	+0	Data size	The number of bytes from the command code to the end of the argument
	+1	Reserve	
	+2	Command code	Command code to use
	+3	Reserve	
	+4 , +5	Error code	0: No error Other than 0: Error
	+6 to +127	Response (122 words)	Configuration of the response is different depending on the function
Window 2	+128	Data size	The number of bytes from the command code to the end of the argument
	+129	Reserve	
	+130	Command code	Command code to use
	+131	Reserve	
	+132 , +133	Error code	0: No error Other than 0: Error
	+134 to +255	Response (122 words)	Configuration of the response is different depending on the function
:	:	:	:

(Note 1) Offset is described in the word unit.

5.8.3 Details of Command

Command code 0x0F01

Get the current program.

Example type 1:(Not to line-wrap the current program)

<Command>

Offset	Description	Setting example	Note
0	Data size	16	
1	Reserve	0	
2	Command code	0x0F01	Designate melGetCurrentPrgPack
3	Reserve	0	
4, 5	Argument 1: Designate the part system No.	1	1: 1st part system Setting range: 1 to 7 (When “0” is set, it is handled as 1st part system.)
6, 7	Argument 2: Designate the number of lines in a program to get.(Note 5)	5	Setting range: 1 to 10
8, 9	Argument 3: Designate the number of characters per line.(Note 5)	16	Setting range: 1 to 240

<Response>

Offset	Description	Setting example	Note
0	Data size	92	The number of bytes
1	Reserve	0	
2	Command code	0x0F01	Used function code
3	Reserve	0	
4, 5	Error code	0	0: No error Other than 0: Error
6, 7	Status	1	0: Not in operation 1: In operation
8 to 15	Data in 1st line	N01G90G28X0.Y0.Z	(Note 4)
16 to 23	Data in 2nd line	N02G00X-123.456Y	
24 to 31	Data in 3rd line	N03M03S1000;	
32 to 39	Data in 4th line	N04G01Z-234.567F	
40 to 47	Data in 5th line	M30;	

(Note 1) Offset is described in word unit.

(Note 2) Make sure the total number of characters ("the number of lines in program to be obtained" * "the number of characters in one line") is within 240.

(Note 3) The block currently executed is always output from the 2nd line. A space (0x20) will be output for a blank block. Thus, if not in operation, a space (0x20) will be output for the 1st and 2nd lines.

(Note 4) The number of characters which is designated with the argument 3 are output for one block before the currently executed block (the 1st line). It is output from the head of the block. It does not line-wrap.

(Note 5) The values for the argument 2 "the number of lines in a program to get" and the argument 3 "the number of characters in one line" should fit the actual GOT display area. Otherwise it will not be displayed correctly.

Example type 2:(Line-wrap the current program)

<Command>

Offset	Description	Setting example	Note
0	Data size	20	
1	Reserve	0	
2	Command code	0x0F01	Designate melGetCurrentPrgPack
3	Reserve	0	
4, 5	Argument 1: Designate the part system No.	1	1: $1 (1st part system) 1 to 7: 1st to 7th part system
6, 7	Argument 2: Designate the number of lines in a program to get. (Note 5)	5	Setting range: 1 to 10
8, 9	Argument 3: Designate the number of characters in a line.(Note 5)	16	Setting range: 1 to 240
10, 11	Argument 4: Designate the validation of line-wrapping.(Note 5)	1	0:Invalid 1:Valid

<Response>

Offset	Description	Setting example	Note
0	Data size	92	The number of bytes
1	Reserve	0	
2	Command code	0x0F01	Used function code
3	Reserve	0	
4, 5	Error code	0	0: No error Other than 0: Error
6, 7	Status	0x0006	0: Not in operation 1: In operation It displays the operation status of each line for each bit. (Note 7)
8 to 15	Data in 1st line	N01G90G28X0.Y0.Z	(Note 4)
16 to 23	Data in 2nd line	N02G00X-123.456Y	(Note 6)
24 to 31	Data in 3rd line	-123.456;	
32 to 39	Data in 4th line	N03M03S1000;	
40 to 47	Data in 5th line	N04G01Z-234.567F	(Note 6)

(Note 1) Offset is described in word unit.

(Note 2) Make sure the total number of characters (“the number of lines in program to be obtained” * “the number of characters in one line”) is within 240.

(Note 3) The block currently executed is always output to the second line. A space (0x20) will be output for a blank block. Thus, if not in operation, a space (0x20) will be output for the 1st and 2nd lines.

(Note 4) The number of characters which is designated with the argument 3 are output for one block before the currently executed block (the 1st line). It is output from the head of the block. It does not line-wrap.

(Note 5) The values for the argument 2 "the number of lines in a program to get" and the argument 3 "the number of characters in one line" should fit the actual GOT display area. Otherwise it will not be displayed correctly.

(Note 6) When the argument 4 is set to "1", from the program block currently executed is output with line-wrap. But it might not be display till the end of the block (;).

(Note 7) For example, if the block currently executed is line-wrapped and displayed in 2 lines, the status will be output as follows. The status can be used to differentiate the block currently executed by changing the display color.

BIT	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
Data	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
Line position							10	9	8	7	6	5	4	3	2	1

The status output example described in the above shows that the program which is output in line 2 and 3 are being executed.

Command code 0x0F02

Get all modal information.

Example

<Command>

Offset	Description	Setting example	Note
0	Data size	8	
1	Reserve	0	
2	Command code	0x0F02	Designate melGetCurrentPrgPack
3	Reserve	0	
4, 5	Argument 1: Designate the part system No.	1	1: 1st part system Setting range: 1 to 7 (When “0” is set, it is handled as 1st part system.)

Offset is described in the word unit.

<Response>

Offset	Description	Setting example	Note
0	Data size	190	The number of bytes
1	Reserve	0	
2	Command code	0x0F02	Used function code
3	Reserve	0	
4, 5	Error code	0	0: No error Other than 0: Error
6 to 9	S1 modal	"1200 "	S1 modal in 8 digits (ASCII) S1 is output regardless of part system
10 to 13	T modal	"13 "	T modal in 8 digits (ASCII)
14 to 18	F modal	"1200.00 "	FA modal in 10 digits (ASCII)
19 to 48	G modal	"01 17 91 94 " "21 40 49 80 " "98 54 64 67 " "97 50.1 43.1 "	G modal of each group (ASCII) One group is output in 4 characters
49	NC status 1	0	0: No alarm message 1: Alarm message
50 to 68	NC status 2	"LSK mm INC G40 G54"	When there isn't alarm message: ST1 to ST8 will be output in ASCII When there is alarm message: Message will be output in up to 33 characters
69 to 72	Main program No.	"100 "	Main program No. in 8 digits (ASCII)
73 to 76	Main sequence No.	"110 "	Main program sequence No. in 8 digits (ASCII)
77 to 80	Sub program No.	"9990 "	Sub program No. in 8 digits (ASCII)
81 to 84	Sub sequence No.	"200 "	Sub program sequence No. in 8 digits (ASCII)
85 to 88	S2 modal	"2000 "	S2 modal in 8 digits (ASCII) S2 is output regardless of part system
89 to 92	Current program No.	"9990 "	Current program No. in 8 digits (ASCII)
93 to 96	Sequence No. of the program currently executed	"200 "	Sequence No. of the program currently executed in 8 digits (ASCII)

Offset is described in the word unit.

The F modal value will be without override.

NC alarm message language is set by the NC parameter "#1043 lang".

(Note) If the "#1043 lang" is Simplified Chinese, the messages are displayed in English.

Command code 0x0F03

Get all axes' coordinate values.

The part system No. and the axis No. of NC axis that the coordinate value is to be get can be designated. After getting the coordinate value of NC axis, the coordinate values of all mounted PLC axes will be obtained. Designating the type of coordinate value is valid for NC axis and PLC axis.

There are three types of response store methods - binary type, character string type, and extended character string type. In binary type, the coordinate value can be obtained with two words signed numerical value. The unit is interpolation unit (Note).

In character string type, it can be obtained with six words character string.

In extended character string type, it can be obtained with seven words character string. The axis state information, such as the zero point arrival, is added to the character string.

There is no need to convert the unit for character string type and extended character string type. Select the type of response with command "Argument4: Data type". See below for a store method of each data type.

(Note) Binary type is stored with interpolation unit.
When command unit is "1μm", the interpolation unit is "0.5μm". The value of response divided by 2 is the coordinate value [μm].
When command unit is "0.1μm", the interpolation unit is "0.05μm". The value of response divided by 2 is the coordinate value[0.1μm].

Example of getting the machine value(Getting in binary)

<Command>

Designate "0:Binary type" to "Argument4: Data type".

Offset	Description	Setting example	Note
0	Data size	20	
1	Reserve	0	
2	Command code	0x0F03	Designate melGetAxisPosition
3	Reserve	0	
4, 5	Argument 1: Designate the part system No.	1	1: 1st part system Setting range: 1 to 7 (When “0” is set, it is handled as 1st part system.)
6, 7	Argument 2: Designate the axis to get	7	BIT0: 1st axis BIT1: 2nd axis … If no axis is designated, all axes will be got.
8, 9	Argument 3: Designate the type of coordinate value	0	0: NC axis: Machine value / PLC axis: Machine value 1: NC axis: Current value / PLC axis: No data obtained 2: NC axis: Workpiece coordinate value / PLC axis: No data obtained 3: NC axis: Remaining commands / PLC axis: Remaining commands 4: NC axis: Next command / PLC axis: No data obtained
10, 11	Argument 4: Data type	0	0 : Binary type 1 : Character string type (ASCII) 2 : Extended character string type(ASCII)

Offset is described in the word unit

<Response>

Designate "0:Binary type" to "Argument4: Data type".

Offset	Description	Setting example	Note
0	Data size	68	The number of bytes
1	Reserve	0	
2	Command code	0x0F03	Used function code
3	Reserve	0	
4, 5	Error code	0	0: No error Other than 0: Error
6, 7	Coordinate value of 1st axis	20000 (0x4E20)	Up to 11 ASCII characters. Aligned to right, and if not all the prepared digits are used, spaces will fill the blank digits. The last character will always be space.
8, 9	Coordinate value of 2nd axis	-24690 (0xFFFF9F8E)	
10, 11	Coordinate value of 3rd axis	1000 (0x3E8)	
12, 13	Coordinate value of 4th axis	0	
14, 15	Coordinate value of 5th axis	0	
16, 17	Coordinate value of 6th axis	0	
18, 19	Coordinate value of 7th axis	0	
20, 21	Coordinate value of 8th axis	0	
22, 23	PLC axis 1st axis coordinate value	6000 (0xBB8)	Response example when there are five PLC axes.
24, 25	PLC axis 2nd axis coordinate value	1000 (0x3E8)	
26, 27	PLC axis 3rd axis coordinate value	20000 (0x4E20)	
28, 29	PLC axis 4th axis coordinate value	150000 (0x249F0)	
30, 31	PLC axis 5th axis coordinate value	4000 (0xFA0)	
32, 33	PLC axis 6th axis coordinate value	0	
34, 35	PLC axis 7th axis coordinate value	0	
36, 37	PLC axis 8th axis coordinate value	0	

Offset is described in the word unit.

Example of how to store in the register (0xFFFF9F8E (-024690))

+0	9F8E
+1	FFFF

(Note) Binary type is store with interpolation unit.
When command unit is "1μm", the interpolation unit is "0.5μm". The value of response devided by 2 is the coordinate value [μm].
When command unit is "0.1μm", the interpolation unit is "0.05μm". The value of response devided by 2 is the coordinate value [0.1μm].

<Note>

- If the number of axes to get exceeds the number of axes actually connected to the NC, an error will be returned. No coordinate values will be stored. (Including the data for axes actually connected.)
- Offset of response area which stores the coordinate value for each axis is fixed. The coordinate value of PLC axis is stored in later than offset 22. (Offset unit is word)
- The blank digits will be stored for the response area of an unset axis and an axis which is not eligible to acquire.

Example of getting the machine value (Getting in the character string type)

<Command>

Designate "1:Character string type (ASCII) to "Argument4: Data type".

Offset	Description	Setting example	Note
0	Data size	20	
1	Reserve	0	
2	Command code	0x0F03	Designate melGetAxisPosition
3	Reserve	0	
4, 5	Argument 1: Designate the part system No.	1	1: 1st part system Setting range: 1 to 7 (When “0” is set, it is handled as 1st part system.)
6, 7	Argument 2: Designate the axis to get	3	BIT0: 1st axis BIT1: 2nd axis … If no axis is designated, all axes will be got.
8, 9	Argument 3: Designate the type of coordinate value	0	0: Machine value / Machine value 1: Current value / No data obtained 2: Workpiece coordinate value / No data obtained 3: Remaining commands / Remaining commands 4: Next command / No data obtained (NC axis / PLC axis)
10, 11	Argument 4: Data type	1	0 : Binary type 1 : Character string type (ASCII) 2 : 2:Extended character string type(ASCII)

Offset is described in the word unit

<Response>

Designate "1:Character string type (ASCII) to "Argument4: Data type".

Offset	Description	Setting example	Note
0	Data size	188	The number of bytes
1	Reserve	0	
2	Command code	0x0F08	Used function code
3	Reserve	0	
4, 5	Error code	0	0: No error Other than 0: Error
6 to 11	Coordinate value of 1st axis	" -12345.678 "	Up to 11 ASCII characters. Aligned to right, and if not all the prepared digits are used, spaces will fill the blank digits. The last character will always be space.
12 to 17	Coordinate value of 2nd axis	" -12345.678 "	
18 to 23	Coordinate value of 3rd axis	" "	
24 to 29	Coordinate value of 4th axis	" "	
30 to 35	Coordinate value of 5th axis	" "	
36 to 41	Coordinate value of 6th axis	" "	
42 to 47	Coordinate value of 7th axis	" "	
48 to 53	Coordinate value of 8th axis	" "	
54 to 59	PLC axis 1st axis coordinate value	" -12345.678 "	Response example when there are five PLC axes.
60 to 65	PLC axis 2nd axis coordinate value	" -12345.678 "	
66 to 71	PLC axis 3rd axis coordinate value	" -12345.678 "	
72 to 77	PLC axis 4th axis coordinate value	" -12345.678 "	
78 to 83	PLC axis 5th axis coordinate value	" -12345.678 "	
84 to 89	PLC axis 6th axis coordinate value	" "	
90 to 95	PLC axis 7th axis coordinate value	" "	
96 to 101	PLC axis 8th axis coordinate value	" "	

Offset is described in the word unit.

Example of how to store in the register (-123.456)

	bit15 ---------- bit8	bit7 ---------- bit0
+0	" "	" "
+1	"-"	" "
+2	"2"	"1"
+3	"."	"3"
+4	"5"	"4"
+5	" "	"6"

<Note>

- When the data type is character string type, the diameter value will be displayed for the diameter specification axis.
- When the data type is character string type, "*" will be displayed if the coordinate value exceeds 8 digits. (e.g.) *****.***
- When the data type is character string, unit conversion is not required.
- If the number of axes to get exceeds the number of axes actually connected to the NC, an error will be returned. No coordinate values will be stored. (Including the data for axes actually connected.)
- Offset of response area which stores the coordinate value for each axis is fixed. The coordinate value of PLC axis is stored in later than offset 54.(Offset unit is word)
- The blank digits will be stored for the response area of an unset axis and an axis which is not eligible to acquire.

Example of getting the machine value (Getting in the extended character string type)

<Command>

Designate "2: Extended character string type (ASCII)" to "Argument 4

Offset	Description	Setting example	Note
0	Data size	20	
1	Reserve	0	
2	Command code	0x0F03	Designate melGetAxisPosition
3	Reserve	0	
4, 5	Argument 1: Designate the part system No.	1	1: 1st part system Setting range: 1 to 7 (When “0” is set, it is handled as 1st part system.)
6, 7	Argument 2: Designate the axis to get	3	BIT0: 1st axis BIT1: 2nd axis … If no axis is designated, all axes will be got.
8, 9	Argument 3: Designate the type of coordinate value	0	0 Machine value / Machine value 1 Current value / No data obtained 2 Workpiece coordinate value / No data obtained 3 Remaining commands / Remaining commands 4 Next command / No data obtained
10, 11	Argument 4: Data type	2	0 : Binary type 1 : Character string type (ASCII) 2 : Extended character string type(ASCII)

Offset is described in the word unit

<Response>

Designate "2: Extended character string type (ASCII)" to "Argument 4: Data type"

Offset	Description	Setting example	Note
0	Data size	248	The number of bytes
1	Reserve	0	
2	Command code	0x0F03	Used function code
3	Reserve	0	
4, 5	Error code	0	0: No error Other than 0: Error
6 to 13	Coordinate value of 1st axis	"-12345.678 #1"	Maximum of 13 characters of ASCII Stored by right alignment and spaces will be inserted if there are not enough digits.
14 to 21	Coordinate value of 2nd axis	"-12345.678 #2"	
22 to 29	Coordinate value of 3rd axis	" "	
30 to 37	Coordinate value of 4th axis	" "	
38 to 45	Coordinate value of 5th axis	" "	
46 to 53	Coordinate value of 6th axis	" "	
54 to 61	Coordinate value of 7th axis	" "	
62 to 69	Coordinate value of 8th axis	" "	
70 to 77	PLC axis 1st axis coordinate value	"-12345.678]["	This is a response example when the PLC axes have 5 axes.
78 to 85	PLC axis 2nd axis coordinate value	"-12345.678 "	
86 to 93	PLC axis 3rd axis coordinate value	"-12345.678 "	
94 to 101	PLC axis 4th axis coordinate value	"-12345.678 "	
102 to 109	PLC axis 5th axis coordinate value	"-12345.678 "	
110 to 117	PLC axis 6th axis coordinate value	" "	
118 to 125	PLC axis 7th axis coordinate value	" "	

Offset is described in the word unit.

Example of how to store in the register(-123.456 #1)

	bit15 ---------- bit8	bit7 ---------- bit0
+0	" "	" "
+1	"-"	" "
+2	"2"	"1"
+3	"."	"3"
+4	"5"	"4"
+5	" "	"6"
+6	"1"	"#"
+7	" "	" "

Axis state when "2: Extended character string type (ASCII)" is designated as a data type is as follows:

1) Zero point arrival: #1, #2, #3, #4 (# is a zero point arrival No.)
2) Axis detachment: ><
3) Servo OFF:][
4) Mirror image: MR
5) Others: (Space)

<Precautions>

- When the data type is character string type, the diameter value will be displayed for the diameter specification axis.
- When the data type is character string type, "*" will be displayed if the coordinate value exceeds 8 digits. (e.g.) *****.***
- When the data type is character string, unit conversion is not required.
- If the number of axes to get exceeds the number of axes actually connected to the NC, an error will be returned. No coordinate values will be stored. (Including the data for axes actually connected.)
- Offset of response area which stores the coordinate value for each axis is fixed. The coordinate value of PLC axis is stored in later than offset 70. (Offset unit is word)
- Space will be stored for theresponse area of an unset axis and an axis which is not eligible to acquire.
- The axis state which is eligible to acquire from PLC axis is only servo OFF.
- When the data type is extended character string type, the coordinate values for the PLC axis 8th axis cannot be obtained.

Command code 0x0F04

Get the currently occurring alarm messages. It is possible to designate how many messages to get (up to five). The messages will be got in priority order.
The language of NC alarm/stop code will follow the NC parameter #1043 lang.
(Note) If the ""#1043 lang" is Simplified Chinese, the messages are displayed in English.

Example

<Command>

Offset	Description	Setting example	Note
0	Data size	16	
1	Reserve	0	
2	Command code	0x0F04	Designate melGetCurrentAlarmMsg2
3	Reserve	0	
4, 5	Argument 1: Designate the part system No.	1	0: All part systems 1: 1st part system 2: 2nd part system Setting range: 0 to 7
6, 7	Argument 2: Designate the number of messages to get	5	Setting range: 1 to 5
8, 9	Argument 3: Alarm type to get	0x7	bit0: NC alarm bit1: Stop code Bit2 :Macro alarm message Alarm message to which corresponding bit is ON is acquired.

Offset is described in the word unit.

<Response>

Offset	Description	Setting example	Note
0	Data size	252	The number of bytes
1	Reserve	0	
2	Command code	0x0F04	Used function code
3	Reserve	0	
4, 5	Error code	0	0: No error Other than 0: Error
6 to 7	The number of messages got	2	The number of messages there were got. (The number of alarms currently occurring.)
8 to 10	Alarm code (1)	0x003300520700	Refer to the code list.
11 to 31	Alarm message (1)	"S03 Servo alarm:PR 0052 XYZ $1"	Aligned to left. In the blank area, spaces (0x20) will go in.
32 to 34	Alarm code (2)	0x000100000000	
35 to 55	Alarm message (2)	"EMG EXIN $1"	
56 to 58	Alarm code (3)	0x000000000000	If there is no alarm, it will be 0.
59 to 79	Alarm message (3)	NULL	If there is no alarm, it will be NULL (0).
80 to 82	Alarm code (4)	0x000000000000	
83 to 103	Alarm message (4)	NULL	
104 to 106	Alarm code (5)	0x000000000000	
107 to 127	Alarm message (5)	NULL	

Offset is described in the word unit.

(1) Message format

NC alarm and stop codes will be in the following format.

Length of each message is fixed to 21 words (42 characters).

- NC alarm/Stop code

  [When the error No.1 is 4 characters]

  Message (20 characters)+sp+Error No. 1 (4 characters)+sp+ Error No. 2 (8 characters)+sp+$1 (2 characters)+sp (5 characters)

  [When the error No.1 is 5 characters]

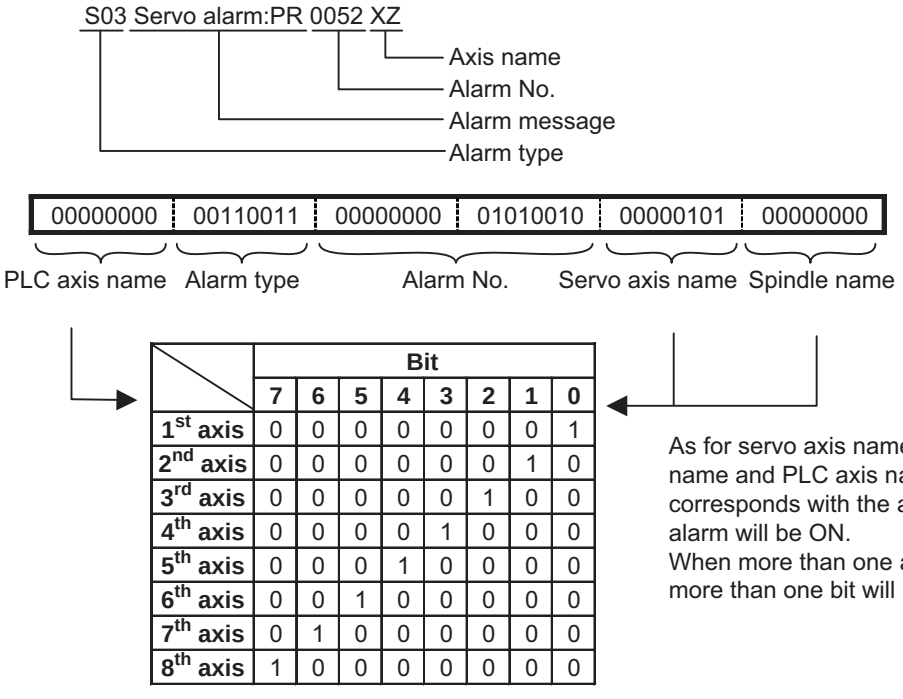
  Message (20 characters)+sp+Error No.1(5 characters)+sp+Error No.2(7 characters)+sp+$1(2 characters)+sp(5 characters)

- Macro alarm message

  Message (30 characters) + sp (2 characters) + No. (4 characters) + sp (6 characters)

(2) Alarm code

NC alarm and stop code that is displayed on the NC screen will be coded in three words.



	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 servo axis name, spindle name and PLC axis name, bit that corresponds with the axis with the alarm will be ON.
When more than one axis has alarm, more than one bit will be ON.

(Note 1) The alarm message will not be changed into code.

(Note 2) When the alarm number is 5-digits, "10xxx" - "15xxx" are set in the alarm No. area as "Axxx" - "Fxxx", but it will not be set correctly if the alarm No. is bigger than "16xxx".

(Note 3) If the alarm with no alarm No. occurs, the alarm No. area is set to "0".

(Note 4) If the alarm with no axis name occurs, the axis name area is set to "0".

(Note 5) The alarm not in the alarm code table occurs, it will not be set in the alarm code.

(Note 6) "xxx" of a program error "Pxxx" will be set in the alarm No. area.

(3) List of alarm code

Alarm types and alarm Nos. are as follows.

Alarm		Details	Alarm type	Axis name	Priority
Multi-CPU error	A01	MULTI CPU ERROR	A1	Not added	1
System alarm	Z70 Z71 Z72 Z73 Z89 Z99	ABS. ILLEGAL DETECTOR ERROR COMPARE ERROR ABS. WARNING APLC ERROR FILE AREA ERROR	55 56 57 58 58 5C	Some are added	2
Servo/spindle alarm	S01 S02 S03 S04	SERVO ALARM: PR INIT PARAM ERR SERVO ALARM: NR SERVO ALARM: AR	31 32 33 36	Added	3
MCP alarm	Y02 Y03 Y06 Y07 Y09 Y11 Y14 Y20	System alarm Amp. Unequipped mcp_no setting error Too many axes connected Too many axisno connected Node detect error VIR.AX AMP EQU. Safety observation error	41 42 49 43 4A 4B 4F 4C	Some are added	4
Network related alarm	L10 L11 L12 L13	DN Initialization error 1 DN Initialization error 2 DN Link error DN Message error	B1 B2 B3 B4	Not added	5
Emergency stop	EMG	EMERGENC	01	Not added	6
Program error	P ○○○ P990	(Program error) PREPRO S/W ERR	71 61	Not added	7
Servo/spindle warning	S51 S52	PARAMETER ERROR SERVO WARNING	34 35	Added	8
MCP warning	Y51 Y21 Y90	Parameter error Safety observation warning No spindle signal	45 4E 47		9
System warning	Z30 Z52 Z53 Z55 Z59 Z20	ETHERNET ERROR BATTERY FAULT TEMP_OVER RIO NOT CONNECT TIME CONSTANT Power ON again	51 52 53 54 59 5A	Not added	10
Operation error	M01 M00 M01	OPERATION ERROR AUX OPER. ALM. AUX OPER. ALM.	11 81 82	Some are added Not added Added	11
Stop code	T01 T02 T03 T10	CAN'T CYCLE ST FEED HOLD BLOCK STOP FIN WAIT	21 22 23 26	Not added	12
Illegal PLC	U10	Built-in PLC alarm	91	Not added	13

The highest priority is on the alarm with the priority number 1.

Emergency stop messages are changed into codes as follows.

Error message		Details	Alarm No.
Emergency stop (EMG)	EXIN	External emergency stop	0000
	PLC	Built-in PLC emergency stop	0001
	SRV	Servo drive unit not ready	0002
	STOP	PLC not running	0003
	SPIN	Spindle drive unit not ready	0004
	DATA	File area error	0005
	PARA	Door open II fixed device setting illegal	0006
	STP2	Built-in PLC not running	0007
	LAD	Built-in PLC illegal code	0010
	MULT	Q and Qr bus alarm	0013
	IPWD	Illegal power down	0014
	CVIN	PS external emergency stop	0015
	MCT	Contactor shutoff test	0016
	SUIN	Emergency stop in the safety circuit	0017
	LINK	Network unit error	0018
	APLC	Emergency stop is set from APLC function	0019

Command code 0x0F05

Get the current program with designating the format.

(1) Content of alarm history

- Get the alarm history information in the NC
- From among the history data that is displayed on the NC's "Operation history" screen, get the NC alarm history.
- In getting, history data is sorted in reverse chronological order
- In the NC, up to 168 alarms can be stored. If more alarms occur, older alarms will be deleted
- Stop code isn't stored in the operation history
- Of NC alarms, following alarms aren't stored in the operation history
  - M01 OPERATION ERROR 0004 (External interlock axis exists)
  - M01 OPERATION ERROR 0005 (Internal interlock axis exists)
  - M01 OPERATION ERROR 0109 (Block start interlock)
  - M01 OPERATION ERROR 0110 (Cutting block start interlock)

(2) Message format of alarm history

Length of each message is fixed to 60 characters.
Blanks in the message will be filled with space code.

Part system No. ($1, $2, etc) will be at the 38th and 39th characters in the message.
In the case of the system with one part system, part system No. will be sp+sp.
NC alarm message language is set by the NC parameter "#1043 lang".
(Note) If the ""#1043 lang" is Simplified Chinese, the messages are displayed in English.

(3) How to use

Get M history items from the Nth item from the latest item. (M= The number of items to get.) However, due to the size limitation of the response area, how may items to get at a time is also limited.
Up to four items can be got at a time.
Thus, in order to get all the alarm history in the NC, it is necessary to get by up to 42 times.

Example

<Command>

Offset	Description	Setting example	Note
0	Data size	12	
1	Reserve	0	
2	Command code	0x0F05	Designate melGetAlarmHistory
3	Reserve	0	
4, 5	Argument 1:Head item No. of history items to get	10	0: Start with the latest item 1: Start with the second item from the latest one 2: Start with the third item from the latest one …
6, 7	Argument 2:The number of items to get	4	Setting range: 1 to 4

Offset is described in the word unit. <Response>

<Response>

Offset	Description	Setting example	Note
0	Data size	252	The number of bytes
1	Reserve	0	
2	Command code	0x0F05	Used function code
3	Reserve	0	
4, 5	Error code	0	0: No error Other than 0: Error
6 , 7	The number of history items got	3	The number of history items there were got.
8 to 37	Alarm history (1)	"03/01/01 15:20:26 EMG EXIN $3 "	
38 to 67	Alarm history (2)	"03/01/01 15:20:26 EMG EXIN $3 "	
68 to 97	Alarm history (3)	"03/01/01 15:20:26 EMG EXIN $3 "	
98 to 127	Alarm history (4)	" "	If there is no alarm history, it will be space.

Offset is described in the word unit.

5.8.4 Automatic setting window

Description of automatic setting window

Automatic setting window, which has ten sets of area as shown below, sets pre-establised command automatically when the power is turned ON.

2-part system's window (window No. 6 to 10) is not valid for 1-part system. (Null is entered in all the response area.)

No.	Command description		Part system	Details
1	Machine coordinate value package acquisition (all axes within the 1-part system)	0xF03	1-part system	Designate ASCII output
2	Remaining distance package acquisition (all axes within the 1-part system)			
3	Modal information package acquisition	0xF02		
4	Acquisition of currently running program	0xF01		Designate 48 words × 5 rows
5	Acquisition of alarm message which is occurring	0xF04		The number of messages = 5
6	Machine coordinate value package acquisition (all axes within the 2-part system)	0xF03	2-part system	Same as above
7	Remaining distance package acquisition (all axes within the 2-part system)			
8	Modal information package acquisition	0xF02		
9	Acquisition of currently running program	0xF01		
10	Acquisition of alarm message which is occurring	0xF04		

Window response area

The window response area is assigned in NC as shown below.Direct reference from GOT is possible.

No.	Response area' s device
1	D6880
2	D7008
3	D7136
4	D7264
5	D7392
6	D7520
7	D7648
8	D7776
9	D7904
10	D8032

Automatic setting window's command change

Fixed value is set for automatic setting windows command details, however it is possible to change a part of the value after it was set.

The followings explain the contens which can be changed.

Command details	Changeable argument	Setting details		Default value
Package acquisition of Machine coordinate values	Type of output coordinate	1	Machine value	1: Machine value
		2	Current value	
		3	Work coordinate value	
		4	Remaining command	
		5	Next command	
		-	-	
	Data type	1	Interpolation unit	3: Extended character string
		2	Character string (AXCII)	
		3	Extended character string (AXCII)	
Acquisition of running program	Number of blocks	5	1 to 10	5 blocks
	Number of characters inside the block	48	1 to 240	48 characters
Obtaining the message during the alarm	Number of messages	5	1 to 5	5 Messages
	Type of message	1	Bit0: NC alarm bit1: Stop code *When "3" is set, both of them are obtained.	Bit0: NC alarm only

The range of changeable setting value depends on the setting range of arguments of each command.

The value is changed for both 1st and 2nd part systems.

When one of the value is changed all the setting values needs to be set. When "0" is set, it does not need to be changed.

Keep in mind that the arguments of machine coordinate value packet acquisition do not mach with the data in the actual command.

When changing the machine coordinate value packeage acquision, data type of the remaining distance packeage acquisition's window is also changed.

When the value outside the specification range is set, the error occurs for the response area window. Normal response is output by changing the value and removing the error.

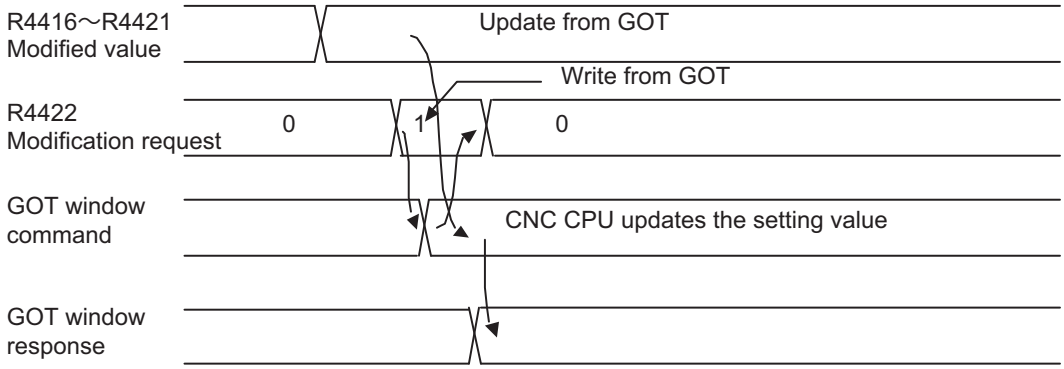
(Note) Acquiring the currently executed program in the automatic setting window does not line-wrap and is fixed type. If the line-wrap is required, use the standard GOT window.

Changing the command from GOT

Write a value to change directory to the device in NC to change the command detail from GOT.
Interfaces for change are shown below.

Device in NC	Details of interface
R4416	Type of output coordinate value
R4417	Data type of output coordinate value
R4418	Number of output blocks of running program
R4419	Number of characters in the block of running program
R4420	Number of messages output
R4421	Type of message output
R4422	Change request (write “1” when required)

Timing chart of changing details of command from GOT is shown below.
Follow the order of this timing chart and make sure that the change request is written at the end.

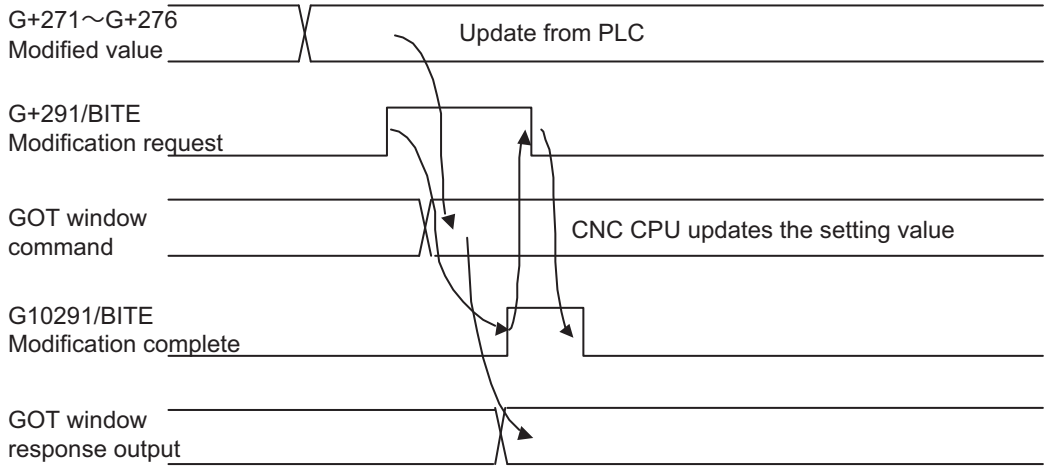


Changing the command from PLC

Write a value to change via shared device to change the command detail from PLC.
Interfaces for change are shown in the table below.
These interfaces of the NC internal device is same as the NC internal device that is written directory from GOT (refer to "Changing the command from GOT").
Updating during the first scan (such as the condition of SM402) from PLC, control for updating because of the change request is not required. In this case, the command details can be changed by writing the details of changing in G+270 to G+275. (When detals of G+270 to G+275 are all zero, command changing is not executed.)

Shared device	Details of interface
G+270	Type of output coordinate value
G+271	Data type of output coordinate value
G+272	Number of output blocks of running program
G+273	Number of characters in the block of running program
G+274	Number of messages output
G+275	Type of message output
G+291	bite: Change request

Timing chart of changing details of command from PLC is shown below.
Follow the order of this timing chart and make sure that the change request is turned ON at the end.



5.8.5 Error code for each command code

Command code	Error No.	Error description
0x0F01	0x80050C93	The number of characters of No. of block x 1 block are over 240.
0x0F02	0x80040190	Part system is out of range.
0x0F03	0x80040190	Either part system or axis is out of range. The coordinate value type is out of range. The data type is out of range.
0x0F04	0x80040190	Part system is out of range. The alarm type is out of range.
0x0F05	0x80040190	The head number of history data acquired is out of range (other than 0 to 167). The number of history data acquired is out of range (1 to 4).

5.9 PLC Constants

The parameters #6301 to #6348 can be used as PLC constants.
The setting range is ±8 digits (-99999999 to 99999999)
When the data is set while the parameters #6301 to #6348 are displayed, the set data is set in the file register and backed up.
If the data is set at R register from the PLC side, the screen display will not change. To change the display, move to another screen and then select the PLC constants screen.

#	Sharing G device		Internal R register	
	(HIGH side)	(LOW side)	(HIGH side)	(LOW side)
6301	G12521	G12520	R4501	R4500
6302	G12523	G12522	R4503	R4502
6303	G12525	G12524	R4505	R4504
: : :	: : :	: : :	: : :	: : :
6347	G12613	G12612	R4593	R4592
6348	G12615	G12614	R4595	R4594

(1) Parameter input/output

The PLC constant data can be input and output with the CNC data.
PLC constants are output with N6301 to N6348.

5.10 PLC bit selection

There are 96 parameters, #6401 to #6469, that can be used for PLC bit selection.
#6401 to #6448 (48 parameters) are for user open area and their interfaces are as follows.
Only reference is possible from the PLC.
#6449 to #6496 are interlocked with the NC system and applications are fixed. CNC performance is changed by setting the value.
They are set by turning ON/OFF of each bit.

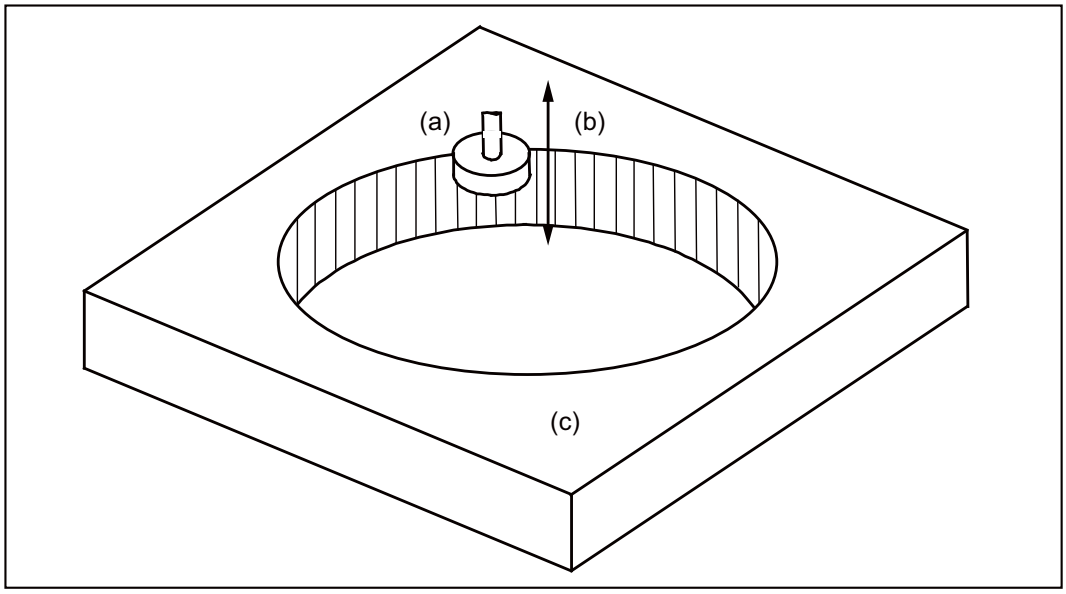
#	Sharing G device		Internal R register	
6401 6402	G12616	(Low order side) (High order side)	R4600	(Low order side) (High order side)
6403 6404	G12617	(Low order side) (High order side)	R4601	(Low order side) (High order side)
6405 6406	G12618	(Low order side) (High order side)	R4602	(Low order side) (High order side)
: : :	: : :	: : :	: : :	: : :
6447 6448	G12663	(Low order side) (High order side)	R4623	(Low order side) (High order side)

(1) Parameter input/output

The PLC bit selection data can be input and output with the CNC data input/output operation.
The PLC bit selection data can be input and output with N64011 to N6496.

5.11 Chopping

This function continuously raises and lowers the chopping axis independently of the program operation when workpiece contours are to be cut.
There are two types of command for the chopping function: a command by the machining program and a command by a signal from the PLC. Use "#1323 chopsel (chopping command method)" to select which command to choose for the chopping function.



(a) Grindstone
(b) Chopping operation
(c) Workpiece

5.11.1 Interface with PLC

CNC CPU -> PLC CPU interface signal

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	CHOPPING STATUS			G10380	G10480	G10580	G10680	G10780	G10880	G10980
				R180	R280	R380	R480	R580	R680	R780

[Function] [Operation]

The state of chopping operation is output as each bit information.

BIT	Name	Description
0	In chopping start	It turns ON during the chopping operation regardless of either with chopping by the external signal or by the command from the machining program.
1	In chopping mode	It turns ON at the start of chopping command (G81.1 or chopping signal ON). After issuing the chopping complete command (G80 or chopping signal OFF) and then completing the basic position return, it turns OFF.
2	Stroke compensation completion	While the compensation operation is executed during the chopping operation, it turns ON as the difference between the position of upper dead point/bottom dead point and the feedback position has reached less than the tolerance specified with the parameter. If change, such as the movement stop, operation parameter change etc., occurs, it turns OFF.
3	Chopping designation error	Check the setting of operation parameter at the rising edge of the chopping parameter valid signal, and turn it OFF if there is any abnormality. Correct the setting detail, and check it again at the rising edge of the chipping parameter valid signal. If there is no abnormality, turn it OFF. Refer to the alarm No. for the detail of the abnormality.
4	Chopping start preparation completion	Reading the operation parameter inside the NC completes at the rising edge of the chopping parameter valid signal, and turn it ON when the operation of the designated parameter is valid. Turn the chopping parameter valid signal OFF after confirming this signal is ON. When the chopping parameter valid signal turned OFF, this signal will also turn OFF.
5	Playback mode error over	Even the compensation operation is executed using the memorized compensation amount with the playback mode of fixed compensation amount method, it turns ON if the difference between the command position and the feedback position exceeds the tolerance. If the difference is within the tolerance, it turns OFF. Set with the parameter to use the compensation value sequential update type for changing the compensation amount when the error amount exceeds the tolerance.
6	Compensation memorize complete	It turns ON when the measurement of compensation amount is completed in the record mode of fixed compensation amount method. The compensation amount is the difference between the command position and the feedback position and should be within the tolerance. It turns OFF at the completion of chopping operation of the record mode.
7	Compensation memorize incomplete	The error amount cannot be within the tolerance even chopping operation with fixed compensation method is executed 50 times succession.
8 to F	Not used	

[Related signals]

(1) Chopping (CHPS)

(2) Chopping parameter valid

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	CHOPPING ERROR NO.			G10381	G10481	G10581	G10681	G10781	G10881	G10981
				R181	R281	R381	R481	R581	R681	R781

[Function]

When the alarm occurs during the chopping operation by the external signal or at the rising edge of the chopping parameter valid signal, the alarm content will be notified to the PLC.

[Operation]

The relationship between the chopping error No. and its content is shown below.

Error No.	Description	Classification
0	No error	-
1	Number of cycles for chopping is zero. (Operates when the number of cycles is 1)	A
2	(Chopping axis feed rate) > (Cutting feed clamp speed) (Feed rate is clamped at the cutting feed clamp speed.)	A
3	(Acceleration of chopping axis) > (Cutting feed clamp speed)/(Cutting feed time constant) (Feed rate is clamped at (cutting feed clamp speed) / (cutting feed time constant))	A
4	(Number of cycles for chopping) > (1000/min) (The number of cycles for chopping is clamped at 1000/min.)	A
5	Chopping axis zero point return is not completed.	B
6	Chopping override is zero	B
7	Commanded axis is the chopping axis.	B
8	The bottom dead point position is zero.	B
9	Chopping axis is a manual feed axis.	B
10	Interlock	B
11	Stored stroke limit or stroke end	B
20	No chopping specification.	-
22	Multiple chopping axes are specified by the PLC interface.	C
23	Chopping axis is not specified by either PLC interface or parameter.	C
26	Data No. of chopping control data is out of range.	C
27	"#2081 chclsp" (chopping clamp speed) and "#2002 clamp" (cutting clamp speed) for chopping axis are both set to "0".	C
28	Chopping axis was changed during the chopping operation. (Chopping axis cannot be changed during chopping.)	C
29	The rotary axis is designated as a chopping axis.	C
31	Chopping command is executed by PLC when selecting the chopping by G command.	C

Classification A	The error is retained during chopping operation. The alarm is removed after the alarm factor is removed.
Classification B	The error is cleared after the alarm factor is removed, or when the NC is reset.
Classification C	It does not enter into the chopping mode.

[Related signals]

(1) Chopping (CHPS)

(2) Chopping parameter valid

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	CHOPPING AXIS			G10382	G10482	G10582	G10682	G10782	G10882	G10982
				R182	R282	R382	R482	R582	R682	R782

[Function]

The axis which is in the chopping operation is output.

[Operation]

The axis which is in the chopping operation turns ON regardless of either by PLC command or by machining program command.

It turns OFF when the chopping mode is removed.

bit0: 1st axis
bit1: 2nd axis
: :
bit7: 8th axis
bit8 to F: Not used (Set to "0".)

[Related signals]

(1) In chopping mode

PLC CPU -> CNC CPU interface signal

Contact	Signal name	Signal abbreviation		1st part system	2nd part system	3rd part system	4th part system	5th part system	6th part system	7th part system
A	CHOPPING	CHPSn		Y7BA	Y89A	Y97A	YA5A	YB3A	YC1A	YCFA

[Function]

This validates the chopping function by external signal.

[Operation]

The chopping operation is started at the rising edge of this signal and terminated at the falling edge of this signal.
This signal is ignored during the chopping by machining program.

Contact	Signal name	Signal abbreviation		1st part system	2nd part system	3rd part system	4th part system	5th part system	6th part system	7th part system
A	CHOPPING PARAMETER VALID			Y7BB	Y89B	Y97B	YA5B	YB3B	YC1B	YCFB

[Function]

This validates the chopping operation parameter by the external signal.

[Operation]

(1) The chopping operation parameter is valid at the rising edge of this signal.
The chopping operation parameters include the following.
(a) Compensation method selection
(b) Operation mode selection
(c) Rapid traverse override valid
(d) Chopping axis selection
(e) Upper dead point position designation (L)(H)
(f) Bottom dead point position designation (L)(H)
(g) Number of cycles designation
(h) Data No.
(2) This signal is ignored during the chopping by machining program.
(3) Chopping operation parameter can be changed with this signal during chopping operation.

[Related signals]

(1) Compensation method selection
(2) Operation mode selection
(3) Rapid traverse override valid
(4) Chopping axis selection
(5) Upper dead point position designation (L)(H)
(6) Upper dead point position designation (L)(H)
(7) Number of cycles designation
(8) Data No.
(9) Chopping status

Contact	Signal name	Signal abbreviation		1st part system	2nd part system	3rd part system	4th part system	5th part system	6th part system	7th part system
A	COMPENSATION METHOD SELECTION			Y7BC	Y89C	Y97C	YA5C	YB3C	YC1C	YCFC

[Function]

The compensation method of the chopping by external signal is selected.

[Operation]

0: The compensation amount sequential update method
1: The fixed compensation amount method
The selection with this signal is valid at the rising edge of the chopping parameter valid signal.

[Related signals]

(1) Chopping parameter valid

Contact	Signal name	Signal abbreviation		1st part system	2nd part system	3rd part system	4th part system	5th part system	6th part system	7th part system
A	OPERATION MODE SELECTION			Y7BE	Y89E	Y97E	YA5E	YB3E	YC1E	YCFE

[Function]

The operation mode is selected when the fixed compensation amount method is selected in the compensation method of the chopping operation with eternal signal.

[Operation]

0: Playback mode

1: Record mode

This selects the operation mode, when the fixed compensation amount method from the chopping operation's compensation method by the external signal, is selected.

When the compensation value sequential update method is selected as a compensation method, this signal will be ignored.

[Related signals]

(1) Chopping parameter valid

Contact	Signal name	Signal abbreviation		1st part system	2nd part system	3rd part system	4th part system	5th part system	6th part system	7th part system
A	RAPID TRAVERSE OVERRIDE VALID			Y7BF	Y89F	Y97F	YA5F	YB3F	YC1F	YCFF

[Function]

This sets the rapid traverse override valid/invalid in respect to the motion speed between basic point and the upper dead point.

[Operation]

0: Invalid

1: Valid

When this signal is OFF, the axis moves at the rapid traverse feedrate regardless of the designation of the rapid traverse override.

This signal will not be switched at the rising edge of the chopping parameter valid signal or in the the chopping operation where the G81.1 command is issued.

[Related signals]

(1) Chopping parameter valid

Contact	Signal name	Signal abbreviation		1st part system	2nd part system	3rd part system	4th part system	5th part system	6th part system	7th part system
-	CHOPPING OVERRIDE	**CHPOVn**		G+380	G+480	G+580	G+680	G+780	G+880	G+980
				R2480	R2580	R2680	R2780	R2880	R2980	R3080

[Function]

The chopping override can be set in the range between 0 and 100% (1% increment).

[Operation]

(1) Only the chopping override is valid for the chopping operation. However, valid or invalid of the rapid traverse override can be selected for the rapid traverse between the basic position and the upper dead point.

(2) The chopping override is set between 0 and 100% in a 1% increment. If a value outside the range from 0 to 100% is set, the override will be clamped at 100%.

(3) If the "Chopping override" signal is set to "0", "M01 OPERATION ERROR 0150" will occur.

(4) The value is set in binary.

[Related signals]

(1) Chopping parameter valid

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	CHOPPING AXIS SELECTION			G+381	G+481	G+581	G+681	G+781	G+881	G+981
				R2481	R2581	R2681	R2781	R2881	R2981	R3081

[Function]

The axis to operate chopping is set when the chopping is commanded by the external signal.

[Operation]

When chopping is commanded by the external signal, "1" is set to a corresponding bit of the axis to operate chopping.

bit0: 1st axis
bit1: 2nd axis
: :
bit7: 8th axis
bit8 to F: Not used (Set to "0".)

If two or more bit are designated, the lowest number axis will be selected.
The axis designation with this signal is valid in the record mode of the compensation value sequential update method and the fixed compensation amount method.
The designation is invalid with the playback mode of the fixed compensation amount method.
This signal is valid at the rising edge of the chopping parameter valid signal.

[Related signals]

(1) Chopping parameter valid

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	UPPER DEAD POINT DESIGNA-TION (L)			G+382	G+482	G+582	G+682	G+782	G+882	G+982
				R2482	R2582	R2682	R2782	R2882	R2982	R3082
-	UPPER DEAD POINT DESIGNA-TION (H)			G+383	G+483	G+583	G+683	G+783	G+883	G+983
				R2483	R2583	R2683	R2783	R2883	R2983	R3083

[Function]

The upper dead point is set when chopping is commanded by external signal.

[Operation]

The designation by this signal is valid with the record mode of the compensation value sequential update method and the fixed compensation amount method.
The designation is invalid with the playback mode of the fixed compensation amount method.
This signal is valid at the rising edge of the chopping parameter valid signal.

[Related signals]

(1) Chopping parameter valid

Con-tact	Signal name	Signal ab-breviation		$1	$2	$3	$4	$5	$6	$7
-	LOWER DEAD POINT DESIG-NATION (L)			G+384	G+484	G+584	G+684	G+784	G+884	G+984
				R2484	R2584	R2684	R2784	R2884	R2984	R3084
-	LOWER DEAD POINT DESIG-NATION (H)			G+385	G+485	G+585	G+685	G+785	G+885	G+985
				R2485	R2585	R2685	R2785	R2885	R2985	R3085

[Function]

The bottom dead point of when chopping is commanded by the external signal is set with the increment amount from the upper dead point.

[Operation]

The designation by this signal is valid with the record mode of the compensation value sequential update method and the fixed compensation amount method.
The designation is invalid with the playback mode of the fixed compensation amount method.
This signal is valid at the rising edge of the chopping parameter valid signal.

[Related signals]

(1) Chopping parameter valid

Contact	Signal name	Signal abbreviation		1st part system	2nd part system	3rd part system	4th part system	5th part system	6th part system	7th part system
-	NUMBER OF CYCLES DESIGNATION			G+386	G+486	G+586	G+686	G+786	G+886	G+986
				R2486	R2586	R2686	R2786	R2886	R2986	R3086

[Function]

The speed when chopping is commanded by external signal is set with the number of cycles in one minute. [Number of cycles/min]

[Operation]

The designation by this signal is valid with the record mode of the compensation value sequential update method and the fixed compensation amount method.

The designation is invalid with the playback mode of the fixed compensation amount method.

This signal is valid at the rising edge of the chopping parameter valid signal.

[Related signals]

(1) Chopping parameter valid

Contact	Signal name	Signal abbreviation		1st part system	2nd part system	3rd part system	4th part system	5th part system	6th part system	7th part system
-	DATA NO.			G+387	G+487	G+587	G+687	G+787	G+887	G+987
				R2487	R2587	R2687	R2787	R2887	R2987	R3087

[Function]

When the compensation method is the fixed compensation amount method, the number of the data to be recorded or played back is designated.

[Operation]

(When operating in the record mode, the measured amount of compensation is recorded in the area of the designated number. In the playback mode, operation parameter is read from the area of the designated number.

This signal is valid at the rising edge of the chopping parameter valid signal.

[Related signals]

(1) Chopping parameter valid

5.11.2 Chopping command from PLC

Chopping command by the signalf from PLC is as follows.

(1) The chopping performance parameter setting
Set the information that is required for chopping performance to the PLC interface.
- Rapid traverse override valid/invalid
- Chopping axis selection
- Upper dead point (increment amount from the basic position)
- Lower dead point (increment amount from the upper dead point)
- Number of cycles (number of cycles/min)

(2) Turn the chopping performance parameter valid signal ON
Turn the chopping parameter valid signal ON, and make the chopping performance parameters which are mentioned in “(1)”valid.
Turn the chopping parameter valid signal OFF after confirming the chopping start ready completion signal is turned ON.

(3) Starting the chopping operation
The chopping operation starts after turning ON the chopping signal.
When the chopping signal is turned OFF during the operation, the chopping operation ends after returing to the basic position.

(Note 1) The basic position is the point where the chopping signal is turned ON.

(Note 2) When “1” is set to “#1323 chopsel Chopping command method”, the chopping does not start up from the PLC. Turning the chopping operation parameter valid signal ON outputs the error No. 31 on the chopping error No.

(Note 3) Operation depends on whether automatic mode or manual mode is selected when the chopping signal is turned ON during the chopping designated axis is moving with other mode.

< Automatic operation mode >
When a movement command is issued for chopping axis, the chopping operation starts after completing the movement block.

< Manual operation mode >
When the movement is executed for the chopping axis, the chopping operation does not start and “M01 Operation error 0154” occurs.

(Note 4) When the movement command is executed for the chopping axis during the chopping operation, the chopping operation continues without executing the movement because of the “M01 Operation error 0151”.

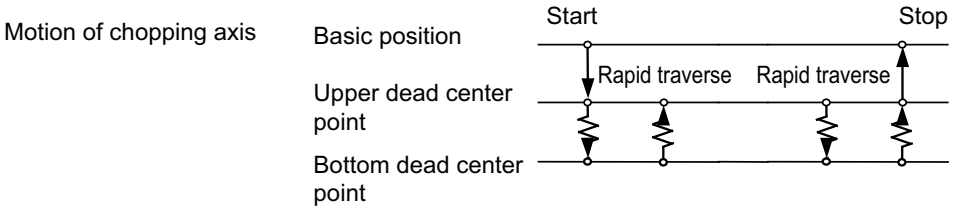
(Note 5) Always make sure to set chopping operation parameter before the chopping starts.
When the chopping operation is executed again after completing the chopping operation, the chopping operation parameter valid signal needs to be turned ON.
If the chopping operation is executed without setting the parameters, it executes with previous parameter settings.

(Note 6) The chopping operation parameter can be changed during the chopping operation.
The parameters after changing the operation parameters are validated when the chopping parameter valid signal ON after changing the operation parameter setting value.

(Note 7) Do not execute the chopping command to an axis in synchronous control (tandem).

(Note 8) Do not execute the coordinate preset (G92) to an axis in chopping operation.

5.11.3 Chopping operation



(1) Starting the chopping operation
The chopping mode is entered at the rising edge of the chopping signal and the chopping operation will be initiated using the current position as a bisic position. Chopping is operated after travelling from the base position to the upper dead point with rapid traverse.
Acceleration/deceleration will be performed by linear acceleration/deceleration for travelling from the basic point to the upper dead point.

(2) During the chopping operation
The axis travels repeatedly between the upper dead point and the lower dead point by designated number of cycles or the feedrate.
During the chopping operation, the compensation amount is calculated from the machinery operation (feedback position of the motor end) to compensate so that the machine can move to the upper dead point/lower dead point.
Travelling during the chopping operation will be performed by soft acceleration/deceleration.

(3) Terminating the chopping operation
The chopping operation is terminated at the falling edge of the chopping signal.
After the chopping operation is performed to get to the upper dead point, the chopping axis will travel to the base point with rapid traverse.
When the chopping axis is travelling from the upper dead point to tthe lower dead point, it will travel to the lower dead point before terminating.
Acceleration/deceleration will be performed by linear acceleration/deceleration for travelling from the basic point to the upper dead point.

5.11.4 Interrupt operation during chopping

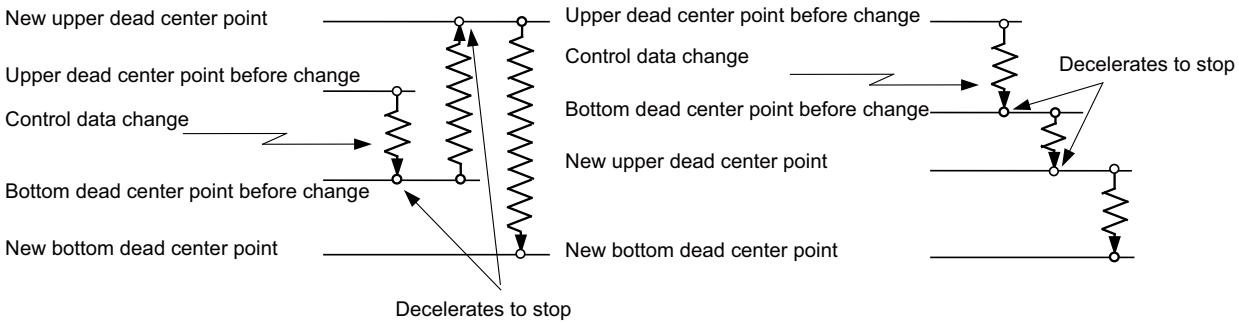
If an interruption (such as resetting) that affects the chopping axis occurs during the chopping operation, the chopping axis will perform as follows.

<table>
<tr><th>Interrupt operation</th><th>Chopping operation</th><th>Chopping mode</th></tr>
<tr><td>Reset</td><td>Travel to the basic position with rapid traverse after travelling to the upper dead point immediately.</td><td>Cancel</td></tr>
<tr><td>Feed hold</td><td rowspan="2">Peformance can be continued witout stopping.</td><td rowspan="4">Hold</td></tr>
<tr><td>Block stop</td></tr>
<tr><td>Axis interlock</td><td rowspan="2">Decelerates to stop.
The chopping operation starts again after cancelling the interruption.</td></tr>
<tr><td>Door interlock II</td></tr>
<tr><td>Door interlock I</td><td rowspan="4">Decelerates to stop.</td><td rowspan="5">Cancel</td></tr>
<tr><td>Servo OFF</td></tr>
<tr><td>Axis detachment</td></tr>
<tr><td>Stroke end</td></tr>
<tr><td>Emergency stop</td><td>Stop immediately.</td></tr>
<tr><td>Program error</td><td>Travel to the basic position with rapid traverse after travelling to the upper dead point immediately.</td><td>Hold</td></tr>
</table>

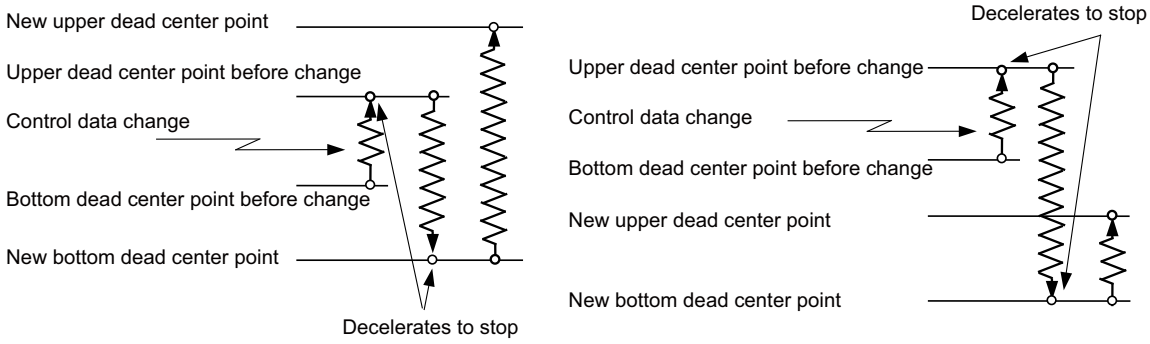
5.11.5 Changing the peformance parameter during the chopping start state

Chopping performance parameter can be changed during the chopping operation.
When the chopping parameter valid signal is turned ON after changing the performance parameter, the chopping axis decelerates to stop once at the upper or bottom dead center point at before the parameter was changed.
As soon as decelerating to stop, chopping operation is carried out immediately with the changed parameter.

(1) Switching the upper dead point and the lower dead point, during the travel from the upper dead point to the lower dead point



(2) Switching the upper dead point and the lower dead point, during the travel from the lower dead point to the upper dead point



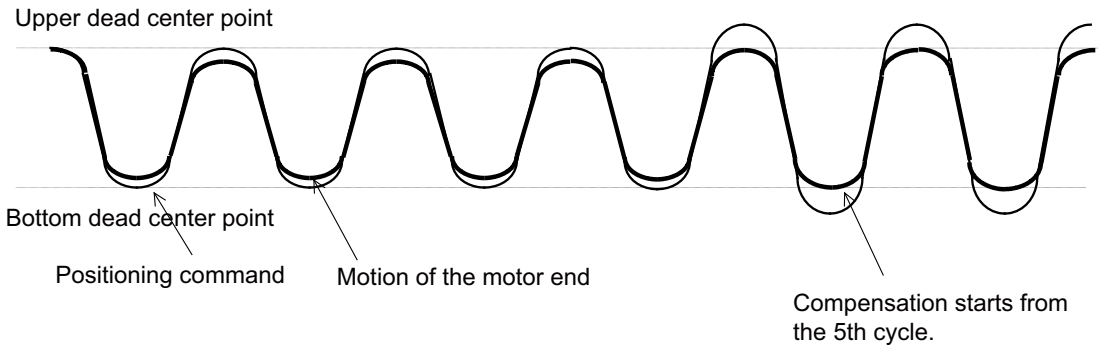
(Note) Chopping axis cannot be changed during the chopping operation.

5.11.6 Chopping compensation operation

As this function involes high-speed repetitive motions, the positioning method allowing compensation based on the calculation from the machinery operation (feedback position of the motor end) is adapted, rather than the method using in-position check.
There are two types of compensation method, the compensation value sequential update method and the fixed compensation amount method.

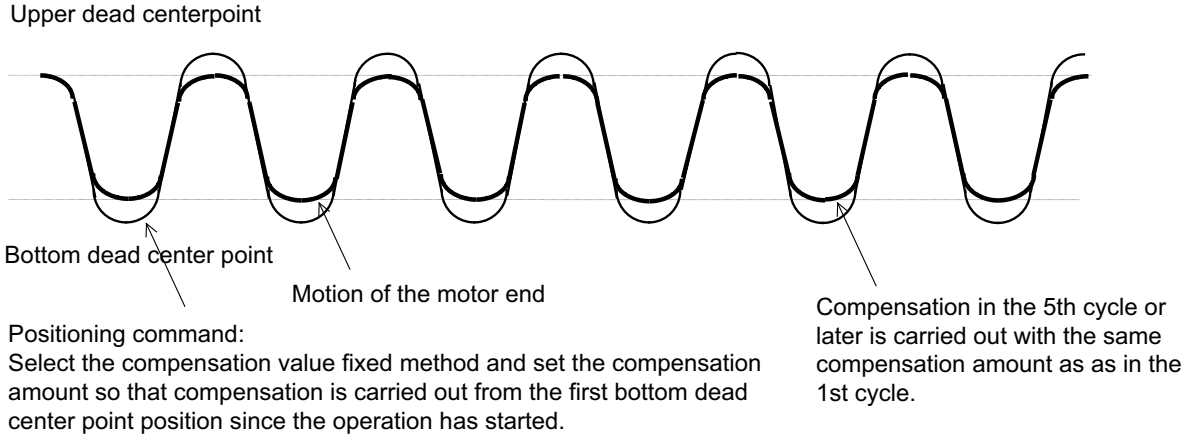
Compensation value sequential update method

The compensation amount for assigning the position can be calculated from the difference between command position and feedback position for every four cycyle after the chopping operation started. Then the compensation amount is added on the positioning command for the next cycle to eliminate the difference between command position and feedback position.
Compare the commanded stroke and the actual stroke. When the difference between them has become less than the tolerance which is designated with the parameter (#2080 chwid), output the stroke compensation completion signal.



Fixed compensation amount fixed method

If the grindstone contacts with the workpiece immediately after the chopping operation has started, the chopping width before and after compensation may be differed, and which may affect the machining surface. In this case, the compensation value fixed method is appropriate.
With the compensation amount fixed method, compensation amount based on a dry run operation is recorded in advance so that, in the real operation, compensation is carried out from the first positioning to the bottom dead point using the compensation amount recorded earlier.
Set with "#1235 set07/bit2: Fixed type chopping compensation valid only at start" whether to compensate with the same compensation amount or to update every four cycyle like the compensation value sequential update method.



The stroke compensation completion signal is output when the difference between the commanded stroke and the actual stroke has reached the tolerance specified with the parameter (#2080 chwid).

Compensation amount fixed method includes the record mode and the playback mode.

< Record mode >

This mode records the compensation amount with the following procedures.

(1) Setting the chopping operation parameter
Set the necessity information for chopping operation to the PLC interface by turning the compensation method selection ON (the compensation amount fixed method) and the operation mode selection signal ON (the record mode).
- Rapid traverse override valid/invalid
- Chopping axis selection
- Upper dead point position (increment amount from the upper dead point)
- Lower dead point position (increment amount from the lower dead point)
- Number of cycles (cycle/min)
- Data No. (0 to 3)

(2) Validating Chopping parameter
Turn the chopping parameter valid signal ON to validate the parameters mentioned in (1).
This signal must be turned OFF after confirming the chopping start ready completion signal (chopping status bit4) is turned ON.

(3) Starting chopping operation
After turning the chopping signal ON, the chopping operation will start.
If the chopping signal is turned OFF during the chopping operation, the chopping operation will be terminated after returning to the base point.

(4) Recording the compensation amount
From the start of chopping operation, the chopping operation will be carried out with the compensation value sequential update method.
The compensation is carried out with the compensation value sequential update method. The compensation value will be recorded when the difference amount between the command position and feedback position has become within the tolerance, and the compensation recording completion signal (chopping status bit6) will be output.

(5) Terminating the chopping operation
The compensation amount recording is completed when the compensation amount recording completion signal is turned ON. Turn the chopping signal OFF.
The chopping operation will be terminated after returning to the base point.

< Playback mode >

Command the playback mode with the following procedures.

(1) Setting the chopping operation parameter
Set the data No. for playback by turning the compensation method selection ON (the compensation amount fixed method) and the operation mode selection signal OFF (the playback mode).
Setting for the chopping axis, the upper dead point position, the lower dead point position and the number of cycles are invalid with the playback mode.

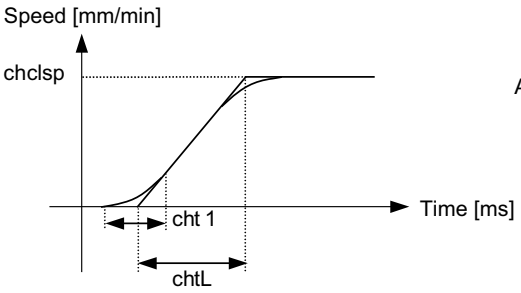
(2) Validating Chopping parameter
The recorded information will be read by turninig ON the chopping parameter valid signal.
The information which is read is the chopping axis, the upper dead point poisition, the lower dead point position, the number of cycyles and the compensation amount.
This signal must be turned OFF after confirming the chopping start ready completion signal (chopping status bit4) is turned ON.

(3) Starting chopping operation
After turning the chopping signal ON, the chopping operation will start.
If the chopping signal is turned OFF during the chopping operation, the chopping operation will be terminated after returning to the base point.
The compansation will be carried out with the recorded compensation amount for four cycles after starting the chopping opearation.
Set with "#1235 set07/bit2: Fixed type chopping compensation valid only at start" whether to compensate with the same compensation amount from 5th cycle onwards or to modify the compensation amount based on the previous four cycle's error amount.

(4) Terminating the chopping operation
When the chopping signal is turned OFF, the chopping operation will be terminated after returning to the base point.

5.11.7 Chopping feedrate

The chopping axis feedrate is clamped at the chopping axis clamp speed (#2081 chclsp). When "0" is set to the chopping clamp speed, the chopping axis feedrate is clamped at the G1 clamp speed (#2002 clamp). The acceleration/deceleration time constant is set with chopping axis acceleration/deceleration time constant (#2141 chtL). When "0" is set to the chopping axis acceleration/deceleration time constant, the chopping axis linear acceleration/deceleration time constant (#2007 G1tL) is used.

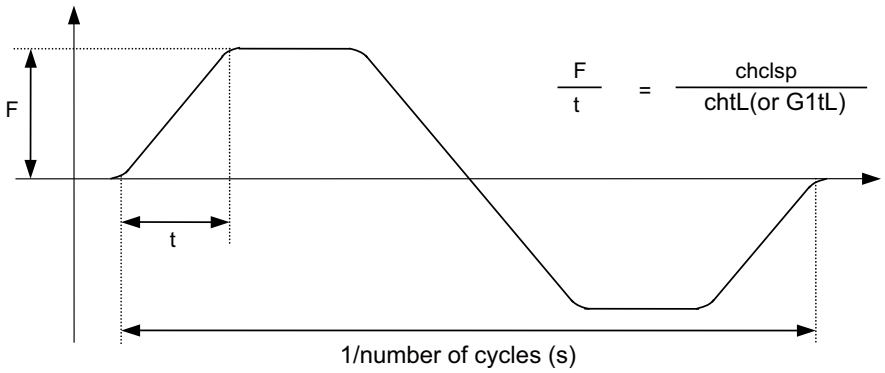


$$\text{Acceleration } \alpha = \frac{\text{chclsp}}{\text{chtL(or G1tL)}}$$

Feedrate conversion by designating with cycle

When the chopping is executed by the command from PLC, designate the feedrate with the number of cycles (cycle/min).

When the upper dead point, the lower dead point and the number of cycles are set with the chopping control data, the speed pattern in which the acceleration speed will be "the clamp speed/time constant" is commanded to the servo drive unit.

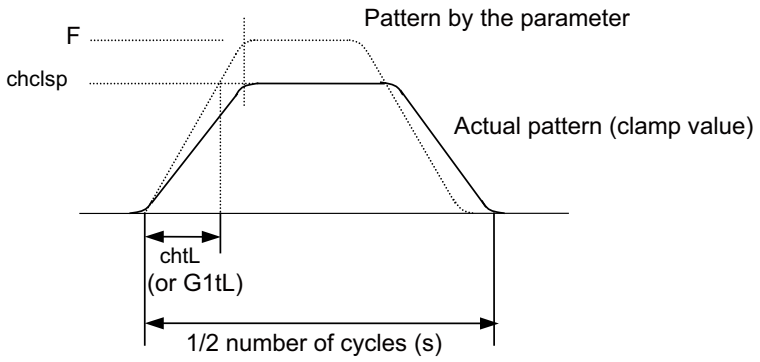


$$\frac{F}{t} = \frac{\text{chclsp}}{\text{chtL(or G1tL)}}$$

When the chopping operation parameter is illegal, the chopping designate error signal will be turned ON and the contents will be notified to the chopping error No.
In the following cases, the number of cycles or feedrate is converted into the value controllable with NC (clamp value) upon occurrence of the alarm.

(1) When number of cycles is "0"
Number of cycles is 1/min.

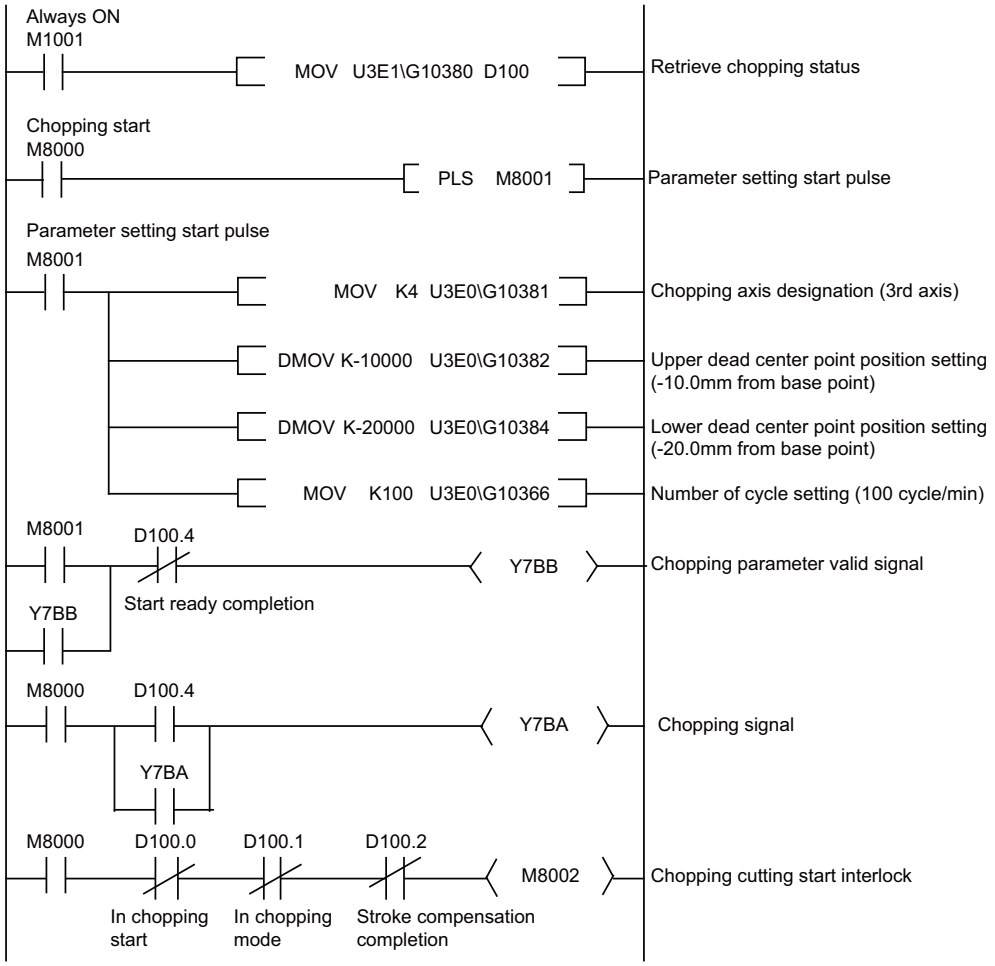
(2) When converted feedrate F exceeds chclsp
The following indicates that F exceeds chclsp when the speed pattern is calculated based on the acceleration of chclsp/chtL. (The number of cycles becomes smaller than that of specified.)



(3) When number of cycles is 1000/min or more
The number of cycles is clamped at 1000/min.

5.11.8 Usage example

The circuit example is shown below.



(Note) Bit devices in the program example are set on the premise that the transfer corresponds to the device Nos. of CNC interface.
Depending on the device No. to assign, the details of the program may differ.

5.12 PLC Axis Indexing

5.12.1 Functions

PLC axis indexing is used to move the PLC axis to the positioning destination or an arbitrary coordinate position.
This function is applied to tool exchange and magazine control.

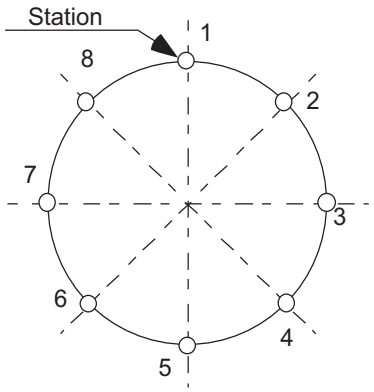
[Positioning command methods]

(1) Station method

The axis will be positioned to the destination (station) that has been decided.
There are two assigning methods: Uniform assignment and arbitrary coordinate assignment.

・Uniform assignment

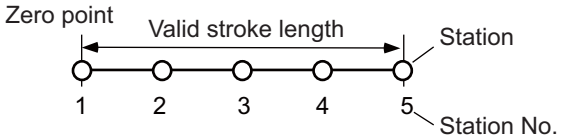
One rotation (360°) of the rotary axis will be equally divided to determine the stations.
(Maximum number of divisions: 360)



[Setting 8 stations (8 divisions)]

[For linear axis]

A valid stroke will be equally divided to determine the station. (Maximum number of divisions: 359)



[Setting 5 stations]

・Arbitrary coordinate assignment

A station will be assigned to an arbitrary coordinate set in each table

(2) Arbitrary coordinate designation method

An arbitrary coordinate will be directly designated in PLC program for positioning.

[Operation functions]

- Automatic mode
  Stations will be determined automatically.
- Manual mode
  Stations will be determined manually.
  While the start signal is ON, the axis will be rotated at a constant speed. When the start signal is OFF, the axis will be positioned at the nearest station.
- JOG mode
  The axis will be rotated at constant speed.
- Incremental feed
  The axis will be moved by the designed amount.
- Manual handle feed
  The axis will be moved by the manual pulse generator.
- Reference position return
  The axis will be positioned at the reference position.
  Reference position return is not possible by a dog switch.

[Feed functions]

- Feed rate selection
  Automatic mode and manual mode can have each four different feed rates to be designated in the PLC program.
- Acceleration/deceleration method
  Four different combination can be set from the acceleration/deceleration patterns (linear or S-pattern acceleration/deceleration) and the acceleration/deceleration time constants. The combination will be selected in the PLC program.
  Select acceleration/deceleration type with parameter: the acceleration/deceleration with constant time or the one with a constant angle of inclination.
- Short-cut control
  A least movement distance is automatically judged when a rotary axis is rotated.

5.12.2 PLC Axis Indexing Interface

List of signals

Operation command PLC CPU -> CNC CPU (R4300 to R4345)

PLC indexing axis								Abbrev.	Signal name
1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis		
G+2680	G+2686	G+2692	G+2698	G+2704	G+2710	G+2716	G+2722	AUXCM4	PLC axis indexing control command 4
R4300	R4306	R4312	R4318	R4324	R4330	R4336	R4342		
G+2681	G+2687	G+2693	G+2699	G+2705	G+2711	G+2717	G+2723	AUXCM3	PLC axis indexing control command 3
R4301	R4307	R4313	R4319	R4325	R4331	R4337	R4343		
G+2682	G+2688	G+2694	G+2700	G+2706	G+2712	G+2718	G+2724	AUXCM2	PLC axis indexing control command 2
R4302	R4308	R4314	R4320	R4326	R4332	R4338	R4344		
G+2683	G+2689	G+2695	G+2701	G+2707	G+2713	G+2719	G+2725	AUXCM1	PLC axis indexing control command 1
R4303	R4309	R4315	R4321	R4327	R4333	R4339	R4345		
G+2684	G+2690	G+2696	G+2702	G+2708	G+2714	G+2720	G+2726		PLC axis indexing control command position (L)
R4304	R4310	R4316	R4322	R4328	R4334	R4340	R4346		
G+2685	G+2691	G+2697	G+2703	G+2709	G+2715	G+2721	G+2727		PLC axis indexing control command position (H)
R4305	R4311	R4317	R4323	R4329	R4335	R4341	R4347		

PLC axis indexing control command 4 (R4300: AUXCM4)		
bit	Abbrev.	Name
bit0	OV1	Speed override 1
bit1	OV2	Speed override 2
bit2	OV4	Speed override 4
bit3	OV8	Speed override 8
bit4	OV16	Speed override 16
bit5	OV32	Speed override 32
bit6	OV64	Speed override 64
bit7	OVR	Speed override valid
bit8		Spare
bit9		Spare
bitA		Spare
bitB		Spare
bitC		Spare
bitD		Spare
bitE		Spare
bitF		Spare

PLC axis indexing control command 3 (R4301: AUXCM3)		
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
bitA		Spare
bitB		Spare
bitC		Spare
bitD		Spare
bitE		Spare
bitF		Spare

PLC axis indexing control command 2 (R4302: AUXCM2)				PLC axis indexing control command 1 (R4303: AUXCM1)		
bit	**Abbrev.**	**Name**		**bit**	**Abbrev.**	**Name**
bit0	ST	Operation start		bit0	*SVF	Servo OFF
bit1	DIR	Rotation direction		bit1		
bit2	STS	Arbitrary point feed command valid		bit2		
bit3				bit3	MRST	Master reset
bit4	MP1	Incremental feed magnification 1		bit4	*IT+	Interlock+
bit5	MP2	Incremental feed magnification 2		bit5	*IT-	Interlock-
bit6	PR1	Operation parameter selection 1		bit6	RDF	Ready OFF
bit7	PR2	Operation parameter selection 2		bit7	H	Handle feed operation mode selection
bit8	EDT+	External deceleration+		bit8	AUT	Automatic operation mode
bit9	EDT-	External deceleration-		bit9	MAN	Manual operation mode
bitA		Spare		bitA	J	JOG operation mode
bitB		Spare		bitB	ZRN	Reference position return mode
bitC		Spare		bitC		
bitD		Spare		bitD	AZS	Basic point initialization setting mode
bitE		Spare		bitE	ZST	Basic point setting
bitF		Spare		bitF	S	Incremental feed operation mode selection

Operation status signal CNC CPU -> PLC CPU (R2000 to R2045)

PLC indexing axis								Abbrev.	Signal name
1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis		
G12680	G12686	G12692	G12698	G12704	G12710	G12716	G12722	AUXST4	PLC axis indexing control status 4
R2000	R2006	R2012	R2018	R2024	R2030	R2036	R2042		
G12681	G12687	G12693	G12699	G12705	G12711	G12717	G12723	AUXST3	PLC axis indexing control status 3
R2001	R2007	R2013	R2019	R2025	R2031	R2037	R2043		
G12682	G12688	G12694	G12700	G12706	G12712	G12718	G12724	AUXST2	PLC axis indexing control status 2
R2002	R2008	R2014	R2020	R2026	R2032	R2038	R2044		
G12683	G12689	G12695	G12701	G12707	G12713	G12719	G12725	AUXST1	PLC axis indexing control status 1
R2003	R2009	R2015	R2021	R2027	R2033	R2039	R2045		
G12684	G12690	G12696	G12702	G12708	G12714	G12720	G12726		PLC axis indexing control machine position (L)
R2004	R2010	R2016	R2022	R2028	R2034	R2040	R2046		
G12685	G12691	G12697	G12703	G12709	G12715	G12721	G12727		PPLC axis indexing control machine position (H)
R2005	R2011	R2017	R2023	R2029	R2035	R2041	R2047		

PLC axis indexing control status 4 (R2000: AUXST4)		
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		Spare
bit9		Spare
bitA		Spare
bitB	NST	Start not possible
bitC		Spare
bitD		Spare
bitE		Spare
bitF		Spare

PLC axis indexing control status 3 (R2001: AUXST3)		
bit	Abbrev.	Name
bit0	STO1	Station position 1
bit1	STO2	Station position 2
bit2	STO4	Station position 4
bit3	STO8	Station position 8
bit4	STO16	Station position 16
bit5	STO32	Station position 32
bit6	STO64	Station position 64
bit7	STO128	Station position 128
bit8	STO256	Station position 256
bit9	PSW9	Position switch 9
bitA	PSW10	Position switch 10
bitB	PSW11	Position switch 11
bitC	PSW12	Position switch 12
bitD	PSW13	Position switch 13
bitE	PSW14	Position switch 14
bitF	PSW15	Position switch 15

PLC axis indexing control status 2 (R2002: AUXST2)		
bit	**Abbrev.**	**Name**
bit0	AUTO	In automatic operation mode
bit1	MANO	In manual operation mode
bit2	JO	In JOG operation mode
bit3		
bit4	ZRNO	In reference position return mode
bit5		
bit6	AZSO	In basic point initialization setting mode
bit7	SO	In incremental mode
bit8	AL1	Alarm 1
bit9	AL2	Alarm 2
bitA	AL4	Alarm 4
bitB	BAT	Battery drop
bitC	ABS	Absolute position power shutoff movement over
bitD	ZSN	Absolute position data loss
bitE	ZSF	Initialization setting completed
bitF	ZSE	Initialization setting error completed

PLC axis indexing control status 1 (R2003: AUXST1)		
bit	**Abbrev.**	**Name**
bit0	RDY	Servo ready
bit1	INP	In-position
bit2	SMZ	Smoothing zero
bit3	AX1	Axis selection output
bit4	MVP	In axis plus motion
bit5	MVM	In axis minus motion
bit6	TLQ	In torque limit
bit7		
bit8	ZP	Reference position reached
bit9	RST	In reset
bitA	HO	In handle feed operation mode
bitB	MA	Controller ready completion
bitC	SA	Servo ready completion
bitD	JSTA	Automatic set position reached
bitE	JST	Set position reached
bitF	NEAR	Near set position

Details of operation command signals (PLC → NC)

Signal name	Signal abbreviation	1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
PLC AXIS INDEXING CONTROL COMMAND 1	AUXCM1	G+2683	G+2689	G+2695	G+2701	G+2707	G+2713	G+2719	G+2725
		R4303	R4309	R4315	R4321	R4327	R4333	R4339	R4345

Contact	Signal name	Signal abbreviation	bit
B	Servo OFF	*SVF	AUXCM1/bit0

[Function][Operation]

When the Servo OFF signal is set to "0" (B contact), the control axis enters the servo OFF status. No matter which operation mode the servo is in and turned OFF, the axis movement will stop, and the servo will turn OFF. The axis movement restarts when the servo is turned ON again.

If the axis moves for any reason while the servo is OFF, it can be selected whether to compensate that movement amount when the servo turns ON the next time. Select with parameter "#1064 svof".

(1) When carrying out movement amount compensation (#1064 svof = 1)

When the servo is OFF, the coordinates are always updated by the amount the axis has moved. When the servo is OFF, the coordinates show the machine position.

(2) When not carrying out movement amount compensation (#1064 svof = 0)

When the servo is OFF, the coordinates are not updated even when the axis moves. When the servo is OFF, the coordinates show the machine position when the servo is OFF.

When the servo is turned ON, the axis is moved to the position where the servo was turned OFF.

When the servo is OFF and the axis movement exceeds the excessive error width (designated with parameter "#2226 SV026"), a servo alarm occurs.

[Caution]

(1) The actual servo OFF operation is validated after In-position (INP) is completed. When using a mechanical clamp, carry out the clamp operation after confirming the in-position status.

(2) When the power is turned ON, the Servo OFF signal turns OFF ("0") and the servo OFF function becomes valid. It is necessary before operation to turn the Servo OFF signal ON ("1") in the PLC program to release the servo OFF.

Contact	Signal name	Signal abbreviation	bit
A	Master reset	MRST	AUXCM1/bit3

[Function]

This signal resets the PLC indexing axis.

[Operation]

When this signal is ON, the following reset operations are carried out.

(1) The axis movement decelerates to a stop.

(2) Alarms that can be released by the reset are released.

(3) The In reset (RST) signal is output.

(4) The operation alarm is released while resetting.

[Related signals]

(1) In reset (RST: AUXST1/bit9)

Contact	Signal name	Signal abbreviation	bit
A	Interlock+	*IT+	AUXCM1/bit4

[Function][Operation]

When the control axis is moving in the (+) direction, this signal decelerates and stops the axis movement immediately. When this signal is OFF from before movement, the motion is stopped in the same manner as without starting. In any case the movement is started or restarted by turning this signal ON.

Con-tact	Signal name	Signal ab-breviation	bit
A	Interlock-	*IT-	AUXCM1/bit5

[Function][Operation]

This is the same as the Interlock + (IT+) signal, the only difference being the direction.

Con-tact	Signal name	Signal ab-breviation	bit
A	Ready OFF	RDF	AUXCM1/bit6

[Function]

This is a signal to turn OFF the READY status.

[Operation]

When put into a READY OFF status, the power supply to the servomotor is shut off, and the contactor control output is simultaneously turned OFF. If the motor is in operation, it will stop by a dynamic brake stop or a deceleration control stop. Servo ready completion (SA) and Servo ready (RDY) are also turned OFF, but an alarm does not occur. When this signal is turned OFF, the machine immediately returns to the original state.

[Related signals]

(1) Servo ready completion (SA: AUXST1/bitC)
(2) Servo ready (RDY: AUXST1/bit0)

Con-tact	Signal name	Signal ab-breviation	bit
A	Handle feed operation mode	H	AUXCM1/bit7

[Function]

This signal selects the handle feed operation mode.

[Operation]

The axis will move for the amount determined by input pulse multiplied by feed magnification after this signal is turned ON, each signal [Operation parameter selection (PR1, PR2) and Incremental feed magnification (MP1, MP2)] is determined, and the handle pulse is input.

[Caution]

(1) Turning this signal ON when other operation modes are ON will result in the operation alarm "M00 AUX OPER. ALM. 0101".
(2) The handle mode acceleration/deceleration time is the acceleration/deceleration time constant 2 linear acceleration/deceleration of the selected operation parameter group.

[Related signals]

(1) Operation parameter selection 1, 2 (PR1, PR2: AUXCM2/bit6,7)
(2) Incremental feed magnification 1, 2 (MP1, MP2: AUXCM2/bit4,5)

Con-tact	Signal name	Signal ab-breviation	bit
A	Automatic operation mode	AUT	AUXCM1/bit8

[Function]

This signal selects the automatic operation mode.

[Operation]

Turn this signal ON, set Station selection 1 to 256 (ST1 to ST256) and then turn Operation start (ST) ON to move the axis to the designated station. The shortcut control or the rotation direction can be selected with parameters.

[Caution]

Turning this signal ON when other operation modes are ON will result in the operation alarm "M00 AUX OPER. ALM. 0101".

[Related signals]

(1) Rotation direction (DIR: AUXCM2/bit1)
(2) Operation parameter selection 1, 2 (PR1, PR2: AUXCM2/bit6,7)
(3) Station selection 1 to 256 (ST1 to ST256: AUXCM3/bit0 to 8)

Contact	Signal name	Signal abbreviation	bit
A	Manual operation mode	MAN	AUXCM1/bit9

[Function]

This signal selects the manual operation mode.

[Operation]

When the rotation direction is designated and Operation start (ST) is turned ON, the axis will begin moving, and the rotation will continue in the designated direction until Operation start is turned OFF. When Operation start turns OFF, the axis will be positioned to the nearest station.

[Caution]

Turning this signal ON when other operation modes are ON will result in the operation alarm "M00 AUX OPER. ALM. 0101".

[Related signals]

(1) Rotation direction (DIR: AUXCM2/bit1)

(2) Operation parameter selection 1, 2 (PR1, PR2: AUXCM2/bit6,7)

Contact	Signal name	Signal abbreviation	bit
A	JOG operation mode	J	AUXCM1/bitA

[Function]

This signal selects the JOG operation mode.

[Operation]

When the rotation direction is designated and Operation start (ST) is turned ON, the axis will begin moving, and the rotation will continue in the designated direction until Operation start is turned OFF. Unlike the manual operation mode, when Operation start is turned OFF, the axis immediately decelerate to a stop.

[Caution]

Turning this signal ON when other operation modes are ON will result in the operation alarm "M00 AUX OPER. ALM. 0101".

[Related signals]

(1) Rotation direction (DIR: AUXCM2/bit1)

(2) Operation parameter selection 1, 2 (PR1, PR2: AUXCM2/bit6,7)

Contact	Signal name	Signal abbreviation	bit
A	Reference position return mode	ZRN	AUXCM1/bitB

[Function]

This signal selects the reference position return mode.

[Operation]

When this signal (ZRN) is turned ON, the reference position return mode is designated. To start the reference position return, turn this signal ON, select the operation parameter group, then turn ON the Operation start (ST) signal.

When the absolute position coordinate system has been established in the absolute position specifications, the high-speed return will be applied in every operation.

[Related signals]

(1) Operation parameter selection 1, 2 (PR1, PR2: AUXCM2/bit6,7)

Contact	Signal name	Signal abbreviation	bit
A	Basic point initialization setting mode	AZS	AUXCM1/bitD

[Function]

This signal selects the mode that initializes the basic point for the absolute position detection system.

[Operation]

When this signal is turned ON, the basic point initialization setting mode is held until the NC power is turned OFF. (Cannot be canceled)

When the stopper method is selected by setting "1" to "#2049 type", the torque limit value and the excessive error detection width in the operation parameter group 4 are automatically selected.

Con-tact	Signal name	Signal ab-breviation	bit
A	Basic point setting	ZST	AUXCM1/bitE

[Function]

This signal turns ON when designating the basic point with the basic point initialization in the absolute position detection system.

[Operation]

When this signal is turned ON in the basic point initialization setting mode, the designated position is set as the absolute position basic point.

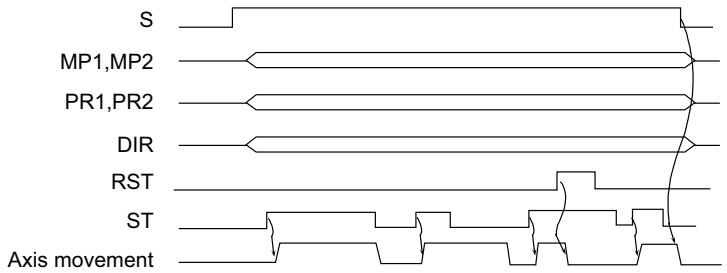
Con-tact	Signal name	Signal ab-breviation	bit
A	Incremental feed operation mode selection	S	AUXCM1/bitF

[Function]

This signal selects the incremental feed operation mode selection.

[Operation]

After turning ON this signal, designate the operation parameter group (with PR1 and PR2), the incremental feed magnification (with MP1 and MP2) and the rotation direction (with DIR). Then turn ON the Operation start (ST) signal to move the axis.



[Caution]

(1) Turning this signal ON when other operation modes are ON will result in the operation alarm "M00 AUX OPER. ALM. 0101".

(2) In the incremental mode, the axis travel will be maintained at a constant amount, even if the Operation start signal is OFF.

[Related signals]

(1) Operation parameter selection 1, 2 (PR1, PR2: AUXCM2/bit6,7)

Signal name	Signal abbreviation	1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
PLC AXIS INDEXING CONTROL COMMAND 2	AUXCM2	G+2682	G+2688	G+2694	G+2700	G+2706	G+2712	G+2718	G+2724
		R4302	R4308	R4314	R4320	R4326	R4332	R4338	R4344

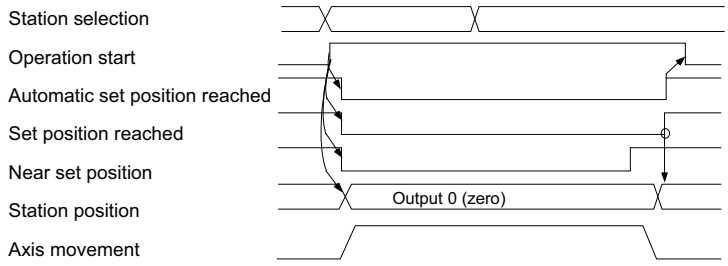
Contact	Signal name	Signal abbreviation	bit
A	Operation start	ST	AUXCM2/bit0

[Function][Operation]

When this signal is turned ON in an operation mode, the operation will start. The Operation start signal is handled as a status, so the ON status must be maintained until the operation is finished.

Operation movement in each operation mode

(1) Automatic operation mode



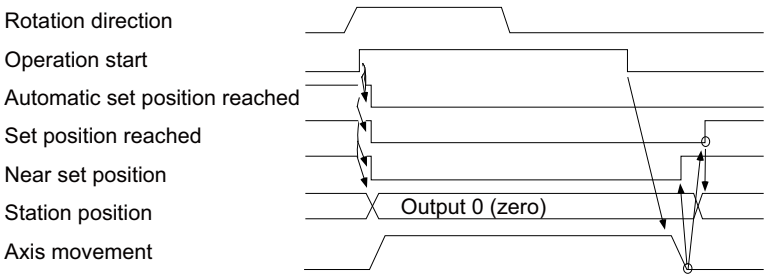
Station selection (ST1 to ST256) and Operation parameter selection (PR1, PR2) are established before inputting the Operation start signal. These two signals are read in by the startup of the Operation start signal, so they are held even if they are changed after the startup.

When the Operation start signal is input, the output signals related to the set position all turn OFF. Station position will be output as "0". When the positioning is completed, Automatic set position reached (JSTA) and Set position reached (JST) is output. Then turn the Operation start signal OFF.

When the Operation start signal is turned OFF during axis movement, the axis will stop at the nearest station. Note that for a linear axis, if there is not a nearest point in the movement direction, the commanded station becomes the nearest point.

(Note) When the shortcut function is OFF for the rotating axis, the positioning direction can be designated with Rotation direction (DIR).

(2) Manual operation mode



Rotation direction (DIR) and Operation parameter selection (PR1, PR2) are established before inputting the Operation start signal. These two signals are read in by the startup of the Operation start signal, so they are held even if they are changed after the startup.

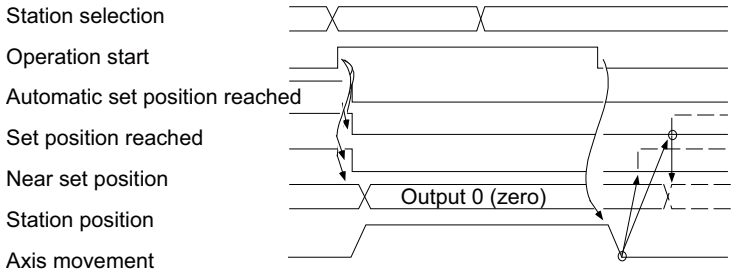
When the Operation start signal is input, the output signals related to the set position all turn OFF. Station position will be output as "0".

While the Operation start signal is ON, the rotation continues in the designated direction. When the Operation start signal is turned OFF, a positioning is carried out to the nearest station where the axis can stop in the rotation direction. Note that for a linear axis, if there is no nearest point in the movement direction, the axis will immediately decelerate to a stop.

When the positioning is completed, Set position reached (JST) is output.

(Note) Automatic set position reached (JSTA) will not be output.

(3) JOG operation mode



Rotation direction (DIR) and Operation parameter selection (PR1, PR2) are established before inputting the Operation start signal. These two signals are read in by the startup of the Operation start signal, so they are held even if they are changed after the startup.

When the Operation start signal is input, the output signals related to the set position all turn OFF. Station position will be output as "0". While the Operation start signal is ON, the rotation continues in the designated direction. When the Operation start signal is turned OFF, the axis decelerates to a stop. Set position reached (JST) and Near set position (NEAR) are output if the axis is stopped within each tolerable width from the station position.

Con-tact	Signal name	Signal ab-breviation	bit
A	Rotation direction	DIR	AUXCM2/bit1

[Function]

This signal designates the rotation direction of the operation in each operation mode.

[Operation]

Turn this signal ON to designate the rotation direction before inputting the Operation start (ST) signal.

This signal is invalid in the automatic operation mode when the shortcut control is set and selected by the parameter. When the shortcut control is not selected, a positioning is carried out in the direction designated by this signal.

This signal is read in at the startup of Operation start (ST). The signal changes are ignored after the startup.

DIR	Axis rotation direction	Station movement direction
0	Forward run	Direction of increasing station No.
1	Reverse run	Direction of decreasing station No.

The actual motor rotation direction is reversed by changing the setting of parameter "#1018 ccw".

[Related signals]

(1) Operation start (ST: AUXCM2/bit0)

Con-tact	Signal name	Signal ab-breviation	bit
A	Arbitrary point feed command val-id	STS	AUXCM2/bit2

[Function][Operation]

This signal selects the mode that executes the positioning, with the command unit specified by "#1003 iunit", to the arbitrary position (coordinate) transferred from the NC. Automatic operation mode (AUT) must be turned ON simultaneously with Arbitrary point feed command valid.

[Related signals]

(1) Automatic operation mode (AUT: AUXCM1/bit8)

Con-tact	Signal name	Signal ab-breviation	bit
A	Incremental feed magnification 1, 2	MP1,MP2	AUXCM2/bit4,5

[Function][Operation]

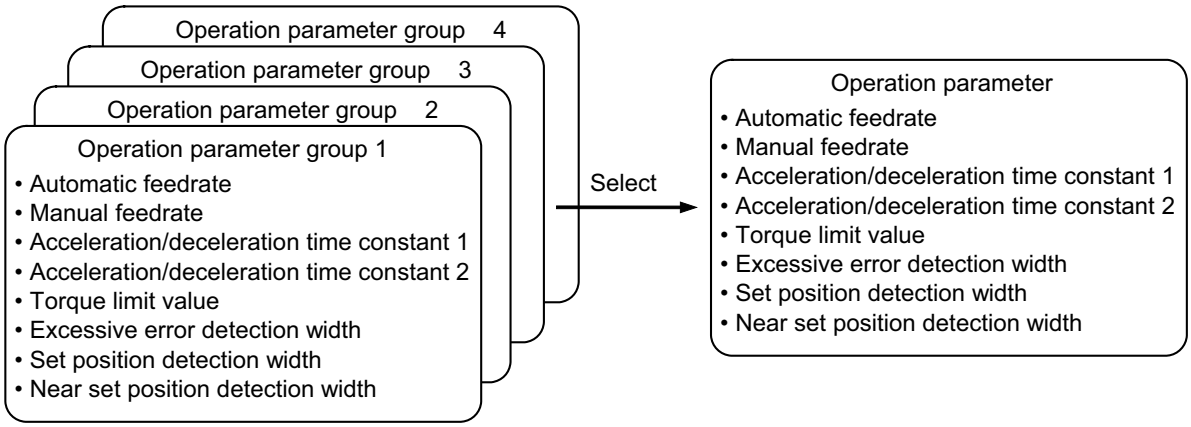
This signal selects the incremental feed amount and the handle feed magnification. In the handle feed, the movement amount per handle pulse is selected.

MP2	MP1	Feed amount
0	0	0.001˚
0	1	0.01˚
1	0	0.1˚
1	1	1˚

Con-tact	Signal name	Signal ab-breviation	bit
A	Operation parameter selection 1, 2	PR1,PR2	AUXCM2/bit6,7

[Function][Operation]

This signal selects one parameter group to be actually used from four parameter groups that designate the axis feed operation. The parameter group cannot be changed while Operation start (ST) is ON. (The group is held in NC.)
If Smoothing zero is confirmed for the target axis, the operation parameter group can be changed with the Operation start. Changing the parameter setting values of the time constant, torque limit value and excessive error detection width, however, is not possible unless Smoothing zero is confirmed for all the NC axes. The parameter values, if changed during the NC axis movement, are valid after the smoothing zero is confirmed.



PR2	PR1	Selected operation parameter group
0	0	1
0	1	2
1	0	3
1	1	4

Con-tact	Signal name	Signal ab-breviation	bit
B	External deceleration+	*EDT+	AUXCM2.bit8

[Function]

The feed speed towards positive direction is controlled by the external deceleration speed while this signal is OFF.

[Operation]

The external deceleration speed is set with the axis parameter.
The external deceleration speed can be set in 6 steps and can be selected with the external deceleration speed selection signal.
The external deceleration speed selection signal uses the PLC axis interface.

Contact	Signal name	Signal abbreviation	bit
B	External deceleration-	*EDT-	AUXCM2.bit9

[Function]

The feed speed towards negative direction is controlled by the external deceleration speed while this signal is OFF.

[Operation]

Same as the External deceleration(*EDT+).

Signal name	Signal abbreviation	1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
PLC AXIS INDEXING CONTROL COMMAND 3	AUXCM3	G+2681	G+2687	G+2693	G+2699	G+2705	G+2711	G+2717	G+2723
		R4301	R4307	R4313	R4319	R4325	R4331	R4337	R4343

Contact	Signal name	Signal abbreviation	bit
A	Station selection 1 to 256	ST1 to ST256	AUXCM3/bit0 to 8

[Function]

This signal designates an index station No. in the automatic operation mode.

[Operation]

Set an index station No. before inputting Operation start (ST) in the automatic operation mode.

Input a 9-digit binary number. An input "000000001" corresponds to station No.1.

This signal is read in at the startup of Operation start (ST). The signal changes are ignored after the startup.

When this signal is set to "000000000" and the automatic operation is started, a one station rotation special command will result. (Note that this cannot be used when the station positions are determined in non-uniform assignments.)

Signal name	Signal abbreviation	1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
PLC AXIS INDEXING CONTROL COMMAND 4	AUXCM4	G+2680	G+2686	G+2692	G+2698	G+2704	G+2710	G+2716	G+2722
		R4300	R4306	R4312	R4318	R4324	R4330	R4336	R4342

Contact	Signal name	Signal abbreviation	bit
A	Speed override 1 to 64	OV1 to OV64	AUXCM4/bit0 to 6

[Function][Operation]

This signal designates the override value added to the selected feedrate. Set a binary value for the override. Values over 100% are regarded as 100%.

Effective feedrate = (Selected speed * Speed override) / 100

Contact	Signal name	Signal abbreviation	bit
A	Speed override valid	OVR	AUXCM4/bit7

[Function][Operation]

This is a signal to validate the speed override. When this signal is turned OFF, the set feedrate becomes the operation speed without calculating the override.

Details of operation status signals (NC → PLC)

Signal name	Signal abbreviation	1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
PLC AXIS INDEXING CONTROL STATUS 1	AUXST1	G12683	G12689	G12695	G12701	G12707	G12713	G12719	G12725
		R2003	R2009	R2015	R2021	R2027	R2033	R2039	R2045

Contact	Signal name	Signal abbreviation	bit
A	Servo ready	RDY	AUXST1/bit0

[Function]

This signal indicates that the servo system is in an operable status.

[Operation]

This signal turns ON when:

(1) The servo system diagnosis is normally completed after turning the power ON.

(2) The servo alarm, which had occurred, has been released by Master reset (MRST).

(3) The emergency stop has been released.

(4) Ready OFF (RDF) or Servo OFF (*SVF) has been released.

This signal turns OFF when:

(1) Servo ready completion (SA) is turned OFF.

(2) The Servo OFF signal is input and the drive unit is in a servo OFF state.

[Related signals]

(1) Master reset (MRST: AUXCM1/bit3)

(2) Ready OFF (RDF: AUXCM1/bit6)

(3) Servo OFF (*SVF: AUXCM1/bit0)

(4) Servo ready completion (SA: AUXST1/bitC)

Contact	Signal name	Signal abbreviation	bit
A	In-position	INP	AUXST1/bit1

[Function]

This signal notifies that the control axis is in-position.

[Operation]

This signal turns ON when:

(1) Smoothing zero (SMZ) is turned ON and the droop is within the range set in the parameters.

This signal turns OFF when:

(1) Smoothing zero (SMZ) is turned OFF. (When there is a movement command.)

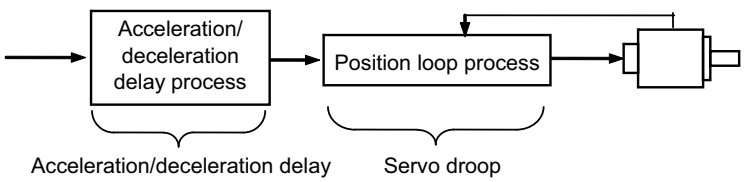
(2) The droop exceeds the range set in the parameters.

[Caution]

(1) In-position (INP) may turn ON, even during movement, when the axis is moving at extremely low speeds.

(2) The in-position detection range is set in the parameter "#2224 SV024 In-position detection width".

(3) In the servo ready OFF state, Smoothing zero (SMZ) turns OFF when the travel amount of servomotor is detected. Therefore, In-position (INP) also turns OFF. In axis plus motion (MVP) or In axis minus motion (MVN) turns ON depending on the detected movement direction. Note that Smoothing zero (SMZ), In axis plus motion (MVP) and In axis minus motion (MVN) will not change in the servo OFF state without error correction, because detected servomotor travel amount becomes a droop amount.



[Related signals]

(1) Smoothing zero (SMZ: AUXST1/bit2)

Con-tact	Signal name	Signal ab-breviation	bit
A	Smoothing zero	SMZ	AUXST1/bit2

[Function][Operation]

This signal indicates that the acceleration/deceleration process in the built-in controller is finished, and that no command to the control section remains.

Con-tact	Signal name	Signal ab-breviation	bit
A	Axis selection output	AX1	AUXST1/bit3

[Function]

This signal indicates that the control axis has received the movement command.

[Operation]

This signal turns ON in the following cases, and turns OFF after Smoothing zero (SMZ) is detected.

(1) In automatic operation mode

This signal turns ON while Operation start (ST) is ON and the axis is moving.

(2) In manual operation mode

This signal turns ON while Operation start (ST) is ON and the axis is moving.

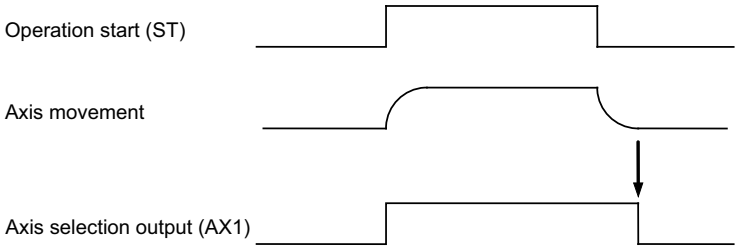
(3) In JOG operation mode

This signal turns ON while Operation start (ST) is ON and the axis is moving.

(4) In reference poisition return mode

This signal turns ON while Operation start (ST) is ON and the axis is moving.

When an interlock is applied, this signal remains ON even when the servo is OFF. This signal turns OFF atthe emergency stop.



[Related signals]

(1) Operation start (ST: AUXCM2/bit0)

Con-tact	Signal name	Signal ab-breviation	bit
A	In axis plus motion	MVP	AUXST1/bit4

[Function]

This signal indicates that the axis is moving in the (+) direction.

[Operation]

This signal turns ON when the axis starts moving in the (+) direction, turns OFF after Smoothing zero (SMZ) is detected or the axis starts moving in the (-) direction.

[Related signals]

(1) Smoothing zero (SMZ: AUXST1/bit2)

Con-tact	Signal name	Signal ab-breviation	bit
A	In axis minus motion	MVM	AUXST1/bit5

[Function]

This signal indicates that the axis is moving in the (-) direction.

[Operation]

This signal turns ON when the axis starts moving in the (-) direction, turns OFF after Smoothing zero (SMZ) is detected or the axis starts moving in the (+) direction.

[Related signals]

(1) Smoothing zero (SMZ: AUXST1/bit2)

Contact	Signal name	Signal abbreviation	bit
A	In torque limit	TLQ	AUXST1/bit6

[Function][Operation]

This signal indicates that the control axis is at the current limit value. This signal turns ON when the motor output torque (motor current) is limited at the torque limit value of the selected operation parameter group.

Contact	Signal name	Signal abbreviation	bit
A	Reference position reached	ZP	AUXST1/bit8

[Function]

Thsi signal indicates that the control axis is on the reference position.

[Operation]

This signal turns ON when the reference position is reached in the reference position return mode.

If the reference position is reached in other operation modes or by other commands, the signal will not turn ON.

This signal turns OFF when:

(1) The axis is moved by a travel command, etc.

(2) An emergency stop has been activated due to an emergency stop input or a servo alarm occurrence, etc.

(3) The axis has moved in the servo OFF state.

[Related signals]

(1) Reference position return mode (ZRN: AUXCM1/bitB)

Contact	Signal name	Signal abbreviation	bit
A	In reset	RST	AUXST1/bit9

[Function]

This signal indicates that the built-in controller is being reset.

[Operation]

The signal turns ON when:

(1) Master reset (MRST) is turned ON.

(2) Master reset (MRST) is turned ON and the built-in controller is being reset.

(3) In an emergency stop status.

[Related signals]

(1) Master reset (MRST: AUXCM1/bit3)

Contact	Signal name	Signal abbreviation	bit
A	In handle feed operation mode	HO	AUXST1/bitA

[Function][Operation]

This signal indicates that handle feed operation mode is selected.

Contact	Signal name	Signal abbreviation	bit
A	Controller ready completion	MA	AUXST1/bitB

[Function]

This signal indicates that the controller is in a status to carry out normal operation.

[Operation]

This signal turns ON when:

(1) Normal operation has begun after the power ON.

This signal turns OFF when:

(1) The power is turned OFF.

(2) An error with the controller, such as CPU error or memory error, has been detected.

(3) A servo error, which cannot be released unless the controller is first turned OFF, has occurred.

Con-tact	Signal name	Signal ab-breviation	bit
A	Servo ready completion	SA	AUXST1/bitC

[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 servo system diagnosis is normally completed after the power ON.

(2) The servo alarm, which had occurred, has been released by Master reset (MRST).

(3) The emergency stop has been released.

(4) Ready OFF (RDF) is turned OFF.

This signal turns OFF when:

(1) Controller ready completion (MA) is turned OFF.

(2) A servo alarm has occurred.

(3) Emergency stop is issued.

(4) Ready OFF (RDF) is turned OFF.

[Caution]

With Servo OFF (*SVF), Servo ready completion (SA) will not turn OFF as long as there are no separate conditions for turning the SA OFF.

[Related signals]

(1) Master reset (MRST: AUXCM1/bit3)

(2) Ready OFF (RDF: AUXCM1/bit6)

(3) Controller ready completion (MA: AUXST1/bitB)

Con-tact	Signal name	Signal ab-breviation	bit
A	Automatic set position reached	JSTA	AUXST1/bitD

[Function]

In the automatic operation, this signal notifies that the positioning to the commanded station No. is completed. The tolerable ON width is as same as that of Set position reached (JST).

[Operation]

The signal turns ON when:

(1) The positioning to the designated station No. is completed in the automatic operation mode. The signal actually turns ON before the positioning is completed, when the tolerable width is entered.

The signal turns OFF when:

(1) When the Operation start signal is input in any of the operation modes.

(2) When the axis deviates outside the tolerable width.

[Caution]

(1) In automatic operation, this signal does not turn ON when positioning to the nearest station is carried out by the Operation start signal OFF.

(2) When this signal is ON, it does not turn OFF if the same station No. index is started.

(3) When the positioning to the station is completed in manual mode and the same station No. index is started, this signal turns ON. However, there is no movement.

(4) Once turned OFF, this signal does not turn ON again even if the axis returns within the tolerable width.

(5) During the emergency stop or the servo OFF, the axis movement, once deviated outside the output width of Set position reached, returns within the tolerable width, turns this signal ON again if "#12802 aux_Cont1/bit4" is OFF; does not turn it ON if "#12802 aux_Cont1/bit4" is ON.

Contact	Signal name	Signal abbreviation	bit
A	Set position reached	JST	AUXST1/bitE

[Function]

This signal notifies that the positioning to the station position has been completed. It is ON when the machine position is at any of the station positions. The tolerable ON width is set with a parameter.

[Operation]

The signal turns OFF when:

(1) The positioning to the station is completed in automatic or manual operation. The signal actually turns ON before the positioning is completed, when the tolerable width is entered.

(2) The stop position after JOG operation is the station position or within the tolerable width.

(3) The reference position return position corresponds to those of the stop position in (2).

Other than the above conditions, this signal normally monitors the machine position, and carries out comparisons between stations. Therefore, this signal is output even when the machine moves to a station position outside the operation.

The signal turns OFF when:

(1) The Operation start signal is input in any of the operation modes. When the operation is started by the Operation start signal, this signal will not turn ON, even when a station position is passed during operation.

(2) The axis deviates outside the tolerable width.

Contact	Signal name	Signal abbreviation	bit
A	Near set position	NEAR	AUXST1/bitF

[Function]

This signal notifies that the machine position is near the station.

[Operation]

It operates in the same manner as the Set position reached (JST), but the tolerable width is set with a different parameter. The tolerable width is generally set larger than that of Set position reached. This signal is generally used at the mechanical clamp or the like just before the completion of the positioning.

Signal name	Signal abbreviation	1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
PLC AXIS INDEXING CONTROL STATUS 2	AUXST2	G12682	G12688	G12694	G12700	G12706	G12712	G12718	G12724
		R2002	R2008	R2014	R2020	R2026	R2032	R2038	R2044

Contact	Signal name	Signal abbreviation	bit
A	In automatic operation mode	AUTO	AUXST2/bit0

[Function][Operation]

This signal indicates that the automatic operation mode has been selected.

Contact	Signal name	Signal abbreviation	bit
A	In manual operation mode	MANO	AUXST2/bit1

[Function][Operation]

This signal indicates that the manual operation mode has been selected.

Contact	Signal name	Signal abbreviation	bit
A	In JOG operation mode	JO	AUXST2/bit2

[Function][Operation]

This signal indicates that the JOG operation mode has been selected.

Contact	Signal name	Signal abbreviation	bit
A	In reference position return mode	ZRNO	AUXST2/bit4

[Function][Operation]

This signal indicates that the reference position return mode has been selected.

Contact	Signal name	Signal abbreviation	bit
A	In basic point initialization setting mode	AZSO	AUXST2/bit6

[Function][Operation]

This signal indicates that the basic point initialization setting mode has been selected.

Contact	Signal name	Signal abbreviation	bit
A	In incremental mode	SO	AUXST2/bit7

[Function][Operation]

This signal indicates that the incremental mode has been selected.

Contact	Signal name	Signal abbreviation	bit
A	Alarm 1	AL1	AUXST2/bit8

[Function][Operation]

This signal indicates that an alarm has occurred requiring the power to be turned ON again after the cause is removed.

Contact	Signal name	Signal abbreviation	bit
A	Alarm 2	AL2	AUXST2/bit9

[Function][Operation]

This signal indicates that an alarm has occurred which can be released by the Master reset (MRST) signal after the cause is removed.

Contact	Signal name	Signal abbreviation	bit
A	Alarm 4	AL4	AUXST2/bitA

[Function][Operation]

This signal indicates that an operation alarm or absolute position alarm has occurred.

Contact	Signal name	Signal abbreviation	bit
A	Absolute position power shutoff movement over	ABS	AUXST2/bitC

[Function][Operation]

This signal indicates that the axis moved beyond the tolerable amount while the control power was OFF in the absolute position system.

Contact	Signal name	Signal abbreviation	bit
A	Battery voltage dropping	BAT	AUXST2.bitB

[Function][Operation]

This signal informs that the battery voltage is dropping.

Contact	Signal name	Signal abbreviation	bit
A	Absolute position data loss	ZSN	AUXST2/bitD

[Function][Operation]

This signal indicates that the absolute position data has been lost in the absolute position system.

Contact	Signal name	Signal abbreviation	bit
A	Initialization setting completed	ZSF	AUXST2/bitE

[Function][Operation]

This signal indicates that in the absolute position system the basic point initialization setting has completed normally, and that the absolute position coordinates have been established.

Contact	Signal name	Signal abbreviation	bit
A	Initialization setting error completed	ZSE	AUXST2/bitF

[Function][Operation]

This signal indicates that the basic point initialization setting has not finished normally in the absolute position system.

Signal name	Signal abbreviation	1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
PLC AXIS INDEXING CONTROL STATUS 3	AUXST3	G12681	G12687	G12693	G12699	G12705	G12711	G12717	G12723
		R2001	R2007	R2013	R2019	R2025	R2031	R2037	R2043

Contact	Signal name	Signal abbreviation	bit
A	Station position 1 to 256	STO1 to STO256	AUXST3/bit0 to 8

[Function][Operation]

This signal shows a 9-digit binary No. of the present station.

This signal outputs the station position when Set position reached (JST) is ON, "0" when Set position reached is OFF.

Signal name	Signal abbreviation	1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
PLC AXIS INDEXING CONTROL STATUS 4	AUXST4	G12680	G12686	G12692	G12698	G12704	G12710	G12716	G12722
		R2000	R2006	R2012	R2018	R2024	R2030	R2036	R2042

Contact	Signal name	Signal abbreviation	bit
A	Position switch 1 to 15	PSW1 to PSW15	AUXST4/bit0 to 7 AUXST3/bit9 to F

[Function][Operation]

This signal turns ON when the axis is within the setting range of the respective position switches.

Contact	Signal name	Signal abbreviation	bit
A	Start not possible	NST	AUXST4/bitB

[Function][Operation]

This signal turns ON when the Operation start signal is turned ON for non PLC indexing axis.

5.13 Switching between NC Axis / PLC Axis

5.13.1 Outline

This is the function which dynamically switches the drive unit control method between the control from NC and the control from PLC. In addition, switching between the NC axis control and the indexing axis control is possible when a PLC axis is set as the indexing axis.

5.13.2 Specification

Switching

The PLC switching signal (CHGPLCn) preforms switching between the NC axis control and PLC axis control. When it is turned OFF, an axis is controlled as the NC axis. When this signal is turned ON, the NC axis is controlled as the PLC axis. In addition, the current control mode is output to the In PLC axis control signal (PLCMODn) as OFF during the NC axis control, and as ON state during the PLC axis control.

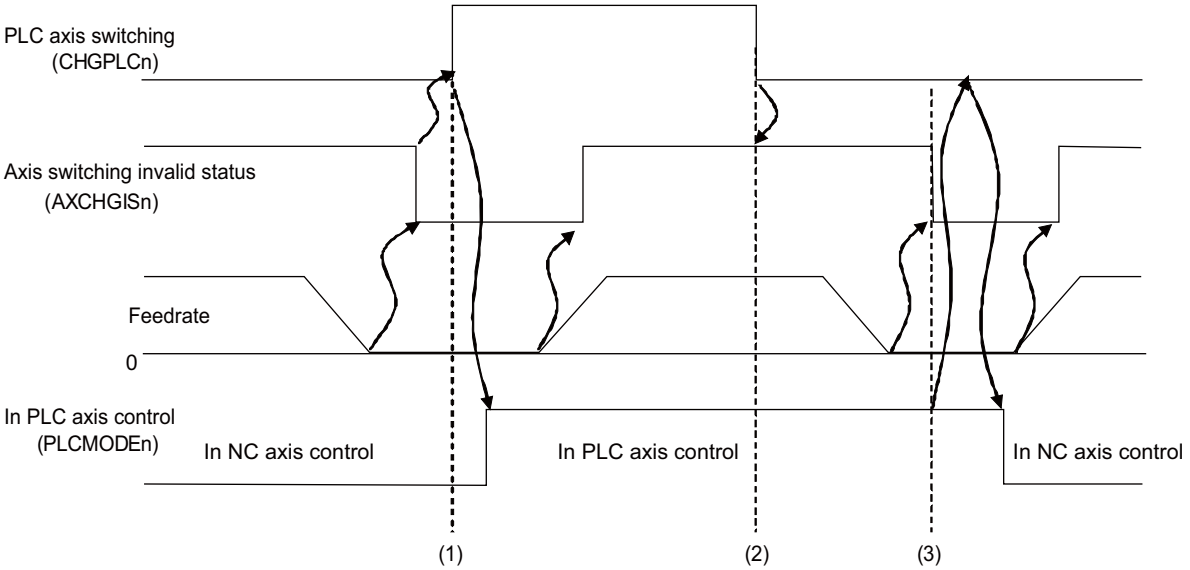
Switching requirements

The axis switching invalid signal (AXCHGISn) informs of the state that the NC axis control and PLC axis control cannot be switched. Confirm this signal is OFF, and then switch the PLC axis switching signal ON/OFF.
When switching the PLC switching signal ON/OFF while the axis switching invalid signal is ON, the alarm "M01 NC/PLC axis switch illegal 1250" will occur (*). After that, when axis switching invalid signal is turned OFF, the control will be switched and the alarm will be released. Returning the state of the PLC axis switching signal also releases the alarm.
If the axis control is switched during motion, the switching will be realized after the command has completed and the axis switching invalid status has been turned OFF.

The axis switching invalid signal will be turned ON when the valid axis of the NC/PLC axis switching is in the following conditions.
- While the axis is in motion
- During the Servo OFF
- While removing the axis
- While the axis is stopped with override zero
- While the axis is stopped with interlock
- During the current limit
- During the droop release
- The axis is stopped because of feed hold during the program command
- The axis is stopped before completing all the axes' movement even more than two axes are commanded by the program
- During the H/W OT, or soft limit

(*) When an alarm "M01 NC/PLC axis switch illegal 1250" occurs, the NC axis name is displayed regardless of its control mode.

Timing of axis switching



(1) The switching signal is turned OFF to ON, and the axis switching invalid signal is OFF (switching is permitted). Therefore the axis changes over to the PLC axis control state and the In PLC axis control signal will be turned ON.

(2) The PLC axis switching signal is turned OFF, but the axis switching invalid signal is ON (switching is prohibited). Therefore the axis does not change over to the NC axis control. An alarm "M01 NC/PLC axis switch illegal 1250" will occur.

(3) The axis switching invalid signal is turned OFF when the axis movement is completed. And then it will be switched to the PLC axis control, and the In PLC axis control signal will be turned ON.

Commands

Commands can be issued only from the mode in control.

When a command is issued from PLC during the NC axis control, the command from PLC is ignored and the NC axis command execution continues. Moreover, when the command is issued by the buffering mode, the subsequent buffer commands are all ignored. The command from a PLC axis does not cause an alarm. Make sure the signal is in the PLC axis control by the ladder, and then activate the switching.

When manual feed command is issued from NC during the PLC axis control, an error "M01 Operation error 0005" (*) will occur. Then the command from NC is ignored, and the PLC axis command execution continues. Also, if the command from NC is a program command, an error "P32 Address. Error" occurs, and the program is stopped. However, motion commands to the other NC axes and parameter input by program do not cause any alarms.

(*) When the alarm "M01 Operation error 0005" occurs, the NC axis No. is displayed.

Control unit

The command unit which is switched to the PLC axis control is the minimum command unit (#1003 iunit) of the NC axis. Similarly, the command unit system for the inch/mm uses the unit system of the NC axis (#1040 M_inch and #1041 I_inch).

To change the command unit system with G20/G21 is invalid in the PLC axis control.

However, the command position on PLC axis I/F, machine position, remaining distance, command federate, and machine /command position on indexing axis I/F are based on the unit of "#1042 pcinh". Therefore, the command position and command federate are converted from the unit system, "pcinh" to "I_inch" due to the "#1041 I_inch" and "#1042 pcinch" settings. On the contrary, the unit system for the machine position and remaining distance are converted from "I_inch" to "pcinch". The machine position on I/F may not match with the command position because the position of the actual NC axis is converted for output.

(Example 1) If 1000 is set to the command position for PLC axis I/F when "#1041 I_inch = 0" and "#1042 pcinh = 1";
The value on I/F is based on inch unit, and on the NC control is based on millimeter unit, so the positioning will be at 2.540 mm, the result of inch -> millimeter conversion of the command position, which is 1000 (0.1000 inches). The machine position on I/F will be at 1000 (0.1000 inches), the result of millimeter -> inch conversion of the current NC axis position, which is 2.540 mm.

(Example 2) If 1000 is set to the command position for OLC axis I/F when" #1041 I_inch = 1 "and "#1042 pcinh = 0";
The value on I/F is based on millimeter unit, and on NC control is based on inch unit, so the positioning will be at 0.0393 inch 0.0393 inches, the result of millimeter -> inch conversion of the command position, which is 1000 (1.000 mm). The machine position on I/F will be at 999 (0.999 mm), the result of millimeter -> inch conversion of the current NC axis position, which is 0.0393 inches.

Speed display

When the PLC axis is moved, the movement speed (Fc) for relative screen, etc., is not displayed. When the other axes are simultaneously moving, the composite speed of the axes currently in NC axis control only is displayed.

The movement speed in the PLC axis is displayed as the feedrate in the PLC monitor screen.

Coordinate system

Command during the PLC axis control is issued using positions on the machine coordinate of the NC axis.

When the axis is moved by PLC axis, the machine values, workpiece coordinates and relative values of the NC axis are updated. Also, the NC axis workpiece coordinates are updated when workpiece coordinates are changed by G54, etc., while in the PLC axis control.

Tool compensation

If the axis is switched to the PLC axis as keeping the tool compensation amount, including the length and radius compensation valid in the NC axis control, the compensation amount is retained. However, when the axis in the PLC control is moved by the compensation amount, the program error "P32 ADDRESS. ERROR" will occur.

When the axis in the PLC axis control is returned to zero point, the compensation amount will be cleared.

PLC axis monitor screen

The PLC axis which is switched to the NC axis is also displayed on the PLC axis monitor screen. However, only the machine position is updated in the NC axis control, and other data except it will not be updated. For the switching axis, "NC" appears on the axis type column for the switching axis.

5.13.3 Combined Functions

Function list

Function name	Summary
Reset	The signal of each control mode is valid.
Servo OFF	The signal of each control mode is valid.
Axis detach	The signal of each control mode is validated, so is the axis detachment by parameters. During switching the indexing axis, only axis detachment by parameters is valid.
Interlock	The signal of each control mode is valid.
Current limit changeover	The signal of each control mode is valid.
Droop release request	The signal of each control mode is valid.
External deceleration	The signal of each control mode is validated. However, external deceleration in the PLC axis control is valid only for the each axis external deceleration ("#1239 set11/bit6" is set to 1).
Speed monitor	When individual axis speed is monitored, speed monitor is performed with the NC axis signal even if the axis is currently in the PLC axis control. Turning the PLC axis signal ON does not activate the speed monitor.
Absolute value initialization setting	Absolute value initialization can be set with the zero point initialization setting mode (AZSn) of the NC axis and the zero point initialization start (ZSTn) signal in the PLC axis control. Absolute initialization can be set with the same signal which is available in the indexing axis I/F during the indexing axis control. The PLC axis (indexing axis) signal is used to start the axis in the PLC axis control.
High accuracy control	The axis in the PLC axis control is invalided.
Synchronization control	When this function is set to the primary axis / secondary axis of the synchronization control, the parameter error "Y05 Initial parameter error #2187" will occur when the power is turned ON.
Spindle C axis	When this function is set to the axis designated as the spindle C axis, the parameter error "Y05 Initial parameter error #2187" will occur when the power is turned ON.
Ready OFF	The ready OFF signal of each axis on the PLC indexing axis is always invalid.
Machine lock	The machine lock signal of NC axis enables to update the current position without moving the axis through the PLC axis command in the PLC axis control. The machine lock status does not switch while the axis is moving. However, the automatic machine lock signal is invalid.
Machine error compensation (backlash error compensation, pitch error compensation, thermal expansion compensation, external machine error compensation)	Compensation amount is set for the NC axis. The set amount is valid even when the control mode is switched, and it can be set in either mode regardless of the control mode. The backlash error compensation during the indexing axis control will be always G0 backlash compensation regardless of the command mode. It is switched to the G0 or G1 backlash compensation during the NC axis control depending on the command mode.
Stroke end (over travel)	The axis is stopped by the OT signal of the NC axis even during the PLC control. It is impossible to switch the axis during stroke end, so release the alarm to execute the switching. If the axis switched to the PLC axis causes the alarm of H/W or soft limit, an alarm"T01 Cycle start prohibit 106"will occur, and it prevents automatic operation start. If the axis which is switched to the PLC axis causes a limit alarm at the time of automatic start, an alarm "T02 Feed hold 202"occurs and the program will be stopped.
Soft limit	Parameters are shared by the NC axis control and PLC axis control. The axis control can not be switched when soft limit is occurring, so release the alarm and execute switching. Resetting NC axis releases the alarms during the NC axis control, and resetting PLC axis releases the alarms during the PLC axis control. However, regardless of the control mode, the soft limit IB and IIB can be released by resetting the NC axis. When the axis which is switched to the PLC axis causes the soft limit alarm, "T01 Cycle start prohibit 106"will occur, and it prevents automatic start. When the axis which is switched to the PLC axis causes the limit alarm, an alarm"T02 Feed hold 202"occurs, and the program will be stopped. When the range is moved to the outside of the limit to the inside during PLC control, the clamp with "#2021 out_f"is not executed, and the axis is operated at the commanded speed.

Function name	Summary
Position switch (PSW)	The NC axis PSW and PLC axis PSW are both valid any time, and the signal turns ON/OFF in their own PSW ranges. The PLC axis No. after being switched is set on the PLC axis PSW. The PLC axis PSW can be switched to the indexing axis. However, the indexing axis PSW is valid only while the indexing axis is being switched, and the signal is not output during the NC axis control even the axis is in the range of the PSW.
PLC window	Data can be read and write by specifying the NC axis No. regardless of its control modes. When the PLC axis No. is specified, the alarm of illegal data type will occur.
Programmable parameter input	Specifying the desired NC axis No. can set programmable parameter input regardless of its control modes.
Manual absolute	The command from the PLC axis is counted as the manual interrupt amount. When the manual ABC signal is ON, execution of the absolute value command from NC after being moved by the PLC axis updates the program coordinate.
Acceleration/deceleration with a constant angle of inclination	The requirements for the acceleration/deceleration with a constant angle of inclination are different between NC axes and PLC axes. The acceleration/deceleration with a constant angle of inclination for a NC axis can be performed in "#1200 G0_acc (rapid traverse)", "#1201 G1_acc(cutting feed)", "#1205 G0bdcc(before G0 interpolation)" or high accuracy control (G61.1). The acceleration/deceleration with a constant angle of inclination for a PLC axis is can be performed in "#21101 add01/bit0 (rapid traverse)" or "#21101 add01/bit1 (cutting feed)", and in "#1361 aux_add (automatic operation mode)" for a PLC indexing axis.
Origin zero	The axis on the PLC axis control can be selected; however, the absolute value and workpiece coordinate will not be zero value even if the origin zero function is applied. When the origin zero is applied to the axis in the PLC axis control, the axis name will be no longer highlighted. To perform the origin zero, set as the NC axis control.
Counter zero	The counter zero function can be applied during the PLC axis control. The counter zero for a NC axis signal is also valid.

Signal list

All the PLC axis and indexing axis signal are invalid in the NC axis control.

The validity of control signals which are available for each NC axis in the PLC axis (indexing axis) control is as follows.

Signal name	Abbreviation	Valid/Invalid
Control axis detach	DTCH n	×
Servo OFF	*SVFn	×
Mirror image	MI n	×
External deceleration +	*+EDTn	×
External deceleration -	*-EDTn	×
Automatic interlock +	*+AITn	×
Automatic interlock -	*-AITn	×
Manual interlock +	*+MITn	×
Manual interlock -	*-MITn	×
Automatic machine lock	AMLK n	×
Manual machine lock	MMLKn	○
Feed axis selection +	+Jn	×
Feed axis selection -	-Jn	×
Manual/Automatic simultaneous valid	MAEn	×
Control axis detach 2	DTCH2n	×
Current limit	ILCn	×
Droop release request	DORn	×
Zero point initialization set mode	AZSn	○
Zero point initialization set start	ZSTn	○
Unclamp completion	UCLPFn	×
Multi-step speed monitor request	MSORn	×
Multi-step speed monitor mode input 1	MSOMI1n	×
Multi-step speed monitor mode input 2	MSOMI2n	×
Counter zero	CNT0n	○
External machine coordinate system compensation data	-	○
Each axis reference position selection	-	×
Thermal expansion offset compensation amount	-	○
Thermal expansion max. compensation amount	-	○
External deceleration speed selection	-	×

The validity of status signals which are available for each NC axis in the PLC axis (indexing axis) control is as follows.

Signal name	Abbreviation	Valid/Invalid
Servo ready	RDYn	○
Axis selection	AXn	○
In axis plus motion	MVPn	○
In axis minus motion	MVMn	○
1st reference position reached	ZP1n	×
2nd reference position reached	ZP2n	×
3rd reference position reached	ZP3n	×
4th reference position reached	ZP4n	×
Near reference position	NRFn	○
NC axis up-to-speed	ARRFn	○
Zero point initialization set completed	ZSFn	○
Zero point initialization set error completed	ZSEn	○
In zero point initialization	ZSn	×
Zero point initialization incomplete	ZLSn	○
In current limit	ILIn	×
Current limit reached	ILAn	×
Unclamp command	UCLPn	×
In-position	INPn	○
In multi-step speed monitor	MSOEn	×
Multi-step speed monitor mode output 1	MSOMO1n	×
Multi-step speed monitor mode output 2	MSOMO2n	×
Thermal expansion compensation amount	-	○
Servo motor temperature	-	○

5.13.4 Parameter settings

This NC axis / PLC axis switching function sets the PLC No. to be switched to a NC axis. The I/F No. of a vacant PLC axis will be used. If this function is not used, set to 0.
When a PLC axis I/F No. is designated twice or more, the parameter error "Y05 Initial parameter error 2187" will occur.

No.	Item		Details	Setting range
2187(PR)	chgPLCax	PLC axis switching axis No.	When the NC/PLC axis switching is used, this sets the I/F No. of the PLC axis to be switched. The I/F No. of a vacant PLC axis will be used. When it is not used, set to 0.	0 to 8

Switching between NC axis and PLC axis

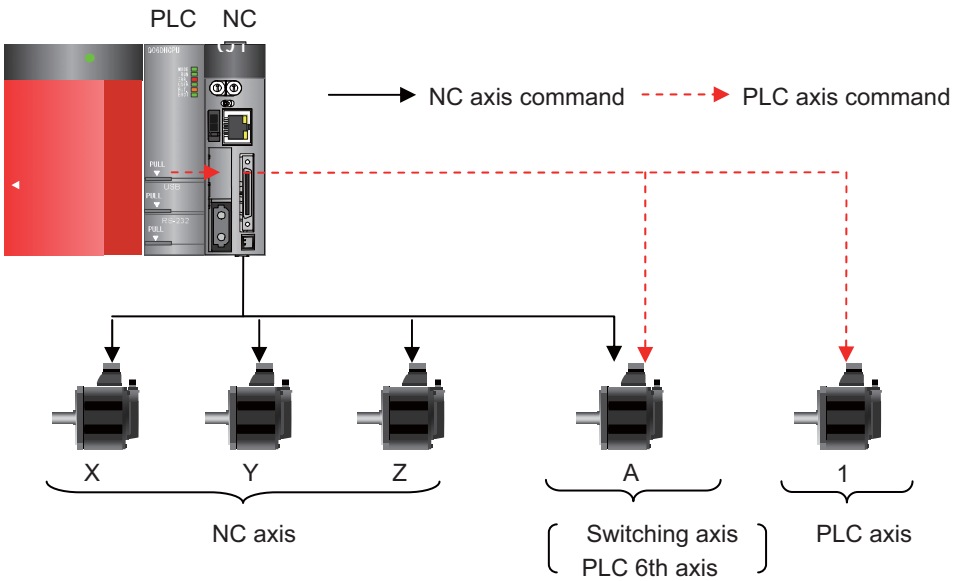
Assuming there are 3 NC-exclusive axes, 1 PLC-exclusive axis and 1 switching axis, and if the 4th NC axis is switched to the 6th PLC axis, set the PLC axis No. "6" which is switched to the A axis side as the following. For this example, when "1" is set to "#2187 chgPLCax", a parameter error "Y05 Initial parameter error 2187" will occur when the power is turned ON. When the axis is changed to the PLC axis, the command will be issued using the 6th I/F of the PLC axis.

	$1	PLC
#1001 syson	1	1
#1002 axisno	4	1

	1	2	3	4	5
#1013 axname	X	Y	Z	A	1
#1021 mcp_no	1001	1002	1003	1004	1005
#2187 chgPLCax	0	0	0	6	0
#12800 chgauxno	0	0	0	0	0

PLC axis I/F

1st axis	G1137 R1900	+1370 R4200
	:	
6th axis	G11410 R1940	+1410 R4240



Switching between NC axis and PLC indexing axis

Assuming there are 3 NC-exclusive axes, 2 PLC-exclusive axis and 1 switching axis, and if the A axis is switched to the 8th PLC axis, and the 8th PLC axis is used as the 2nd indexing axis, set the PLC axis No. "8" and indexing axis No. "2" which are switched to the A side as the following. In this example, if axis Nos. "1" to "3" are set to "#2187 chgPLCax", a parameter error "Y05 Initial parameter error 2187" will occur when the power is turned ON. After the axis is changed to the PLC indexing axis, the command is issued using the 8th PLC axis and 2nd indexing axis's I/F.

	$1	PLC
#1001 syson	1	1
#1002 axisno	4	3

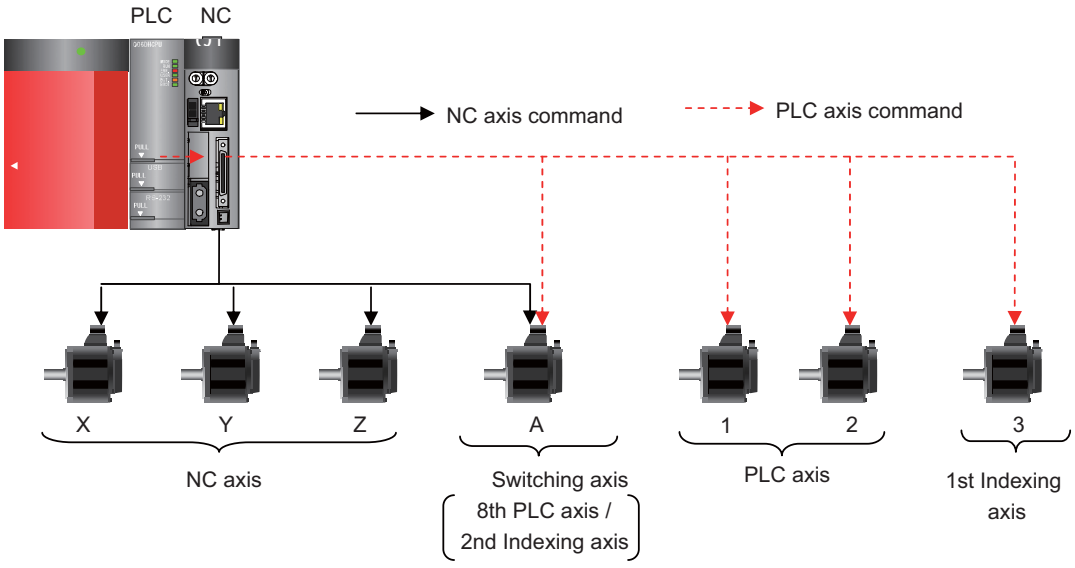
	1	2	3	4	5	6	7
#1013 axname	X	Y	Z	A	1	2	3
#1021 mcp_no	1001	1002	1003	1004	1005	1006	1007
#2187 chgPLCax	0	0	0	8	0	0	0
#12800 chgauxno	0	0	0	2	0	0	1

PLC axis I/F

1st axis	G11370 R1900	+1370 R4200
2nd axis	G11378 R1908	+1378 R4208
3rd axis	G11386 R1916	+1386 R4216
	:	
8th axis	G12660 R1980	+2660 R4280

PLC Indexing axis I/F

1st axis	G12680 R2000	+2680 R4300
2nd axis	G12686 R2006	2686 R4306



Operation parameter

When switching between the NC axis and PLC axis, the parameters in the following chart are valid only in either NC or PLC axis mode. The parameters except the following are common to both the NC axis control and the PLC axis control.

Parameters which turn valid only when the axis is controlled as the NC axis:

Parameter No.	Operations
#1200 G0_acc	Select acceleration/deceletion mode of rapid traverse when the axis is set to NC axis to be with constant time or constant angle of inclination.
#1201 G1_acc	Select acceleration/deceleration mode of cutting feed when the axis is set to NC axis to be with constant time or constant angle of inclination.
#1205 G0bdcc	Set the G0 command to be acceleration and deceleration before interporation regardless of validity/invalidity of high accuracy control when the axis is set to NC axis.

Parameters which turn valid only when the axis is controlled as the PLC axis (common to non-switching PLC axes including PLC indexing axes):

Parameter No.	Operations
#21101 add01/bit0	Select acceleration/deceleration mode of rapid traverse when the axis is set to PLC axis to be with constant time or constant angle of inclination.
#21101 add01/bit1	Select acceleration/deceletion mode of cutting feed when the axis is set to PLC axis to be with constant time or constant angle of inclination.
#1361 aux_add	Select acceleration/deceletion mode of automatic operation mode when the axis is set to PLC indexing axis to be with constant time or constant angle of inclination.

5.13.5 Interface with PLC

CNC CPU -> PLC CPU interface signal

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	AXIS SWITCHING INVALID STATUS	AXCHGISn		X416	X436	X456	X476	X496	X4B6	X4D6	X4F6
				9th axis	**10th axis**	**11th axis**	**12th axis**	**13th axis**	**14th axis**	**15th axis**	**16th axis**
				X516	X536	X556	X576	X596	X5B6	X5D6	X5F6

[Function]

This signal informs that the switching between NC axis and PLC axis cannot be executed.

[Operation]

This signal turns ON when the following conditions apply to the axis which is valid for switching between NC axis and PLC axis. When switching between NC axis and PLC axis is executed while this signal is ON, an alarm "M01 NC/PLC axis switch illegal 1250 will occur.

- While the axis is in motion
- During the Servo OFF
- While removing the axis
- While the axis is stopped for interlock
- While the axis is stopped for override
- During the current limit
- During the droop release
- The axis is stopped because of feed hold during the program command
- The axis is stopped before completing all the axes' movement even more than two axes are commanded by the program
- During the H/W OT, soft limit

[Related signals]

(1) In PLC axis control (PLCMODn)
(2) PLC axis switching (CHGPLCn)

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	IN PLC AXIS CONTROL	PLCMODn		X417	X437	X457	X477	X497	X4B7	X4D7	X4F7
				9th axis	**10th axis**	**11th axis**	**12th axis**	**13th axis**	**14th axis**	**15th axis**	**16th axis**
				X517	X537	X557	X577	X597	X5B7	X5D7	X5F7

[Function]

This signal informs that the mode is PLC axis control for NC axis/PLC axis switching function.

[Operation]

This signal turns OFF during the NC axis control and turns ON during the PLC axis control.

[Related signals]

(1) Axis switching invalid status (AXCHGISn)
(2) PLC axis switching (CHGPLCn)

PLC CPU -> CNC CPU interface signal

Con-tact	Signal name	Signal ab-breviation		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis	7th axis	8th axis
A	PLC AXIS SWITCHING	CHGPLCn		Y41B	Y44B	Y47B	Y4AB	Y4DB	Y50B	Y53B	Y56B
				9th axis	**10th axis**	**11th axis**	**12tha axis**	**13th axis**	**14th axis**	**15th axis**	**16th axis**
				Y59B	Y5CB	Y5FB	Y62B	Y65B	Y68B	Y6BB	Y6EB

[Function]

This signal can switch between NC axis and PLC axis.

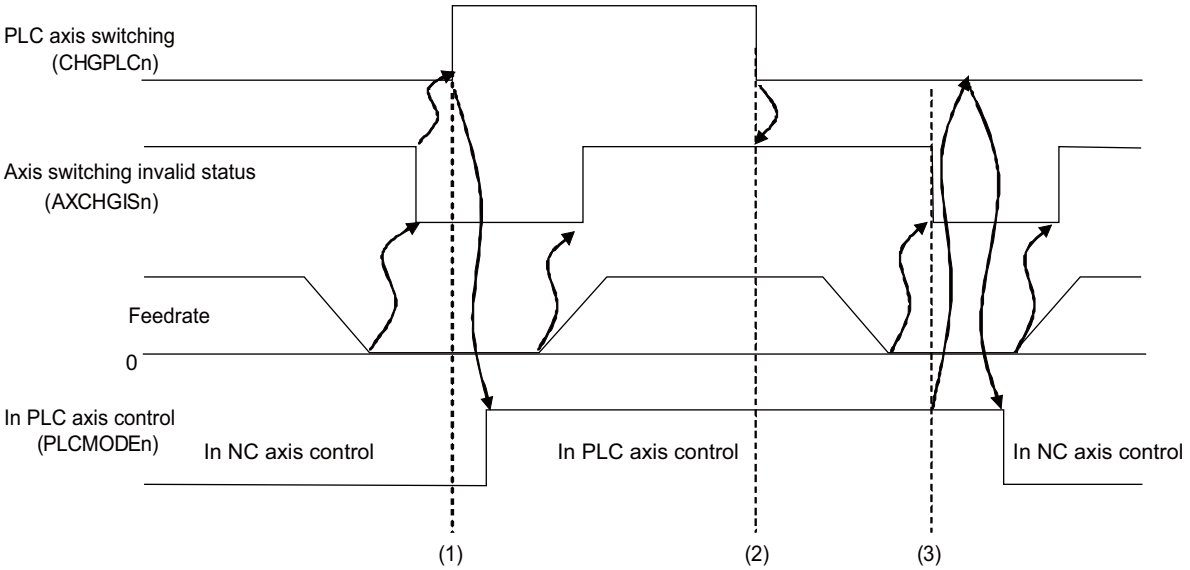
[Operation]

When this signal is turned ON, the NC axis is controlled as the PLC axis. When it is turned OFF, it is controlled as the NC axis.

Switch this signal after confirming the axis switching invalid signal is OFF.

When switching between NC axis and PLC axis is executed while axis switching invalid signal is ON, an alarm "M01 NC/PLC axis switch illegal 1250" will occur. If the axis switching invalid signal is OFF with this state, NC axis and PLC axis are switched and the alarm will be cleared.

If this signal is switched while executing the axis movement command, NC axis and PLC axis will be switched when the command is completed and the axis switching invalid signal is turned OFF.



(1) If the PLC switching signal is turned ON when the "axis switching invalid status" signal is OFF (switching is permitted), the NC axis changes over to the PLC axis control state, and the In PLC axis control signal will be turned ON.

(2) The NC axis does not change over to the NC axis control by turning OFF the "PLC axis switching" signal when the "axis switching invalid status" signal is ON (where switching is prohibited). An alarm "M01 NC/PLC axis switch illegal 1250" will occur.

(3) Axis switching invalid status signal is turned OFF when the axis movement is completed. Then the NC axis changes over to the NC axis control, and the In PLC axis control signal will be turned OFF.

[Related signals]

(1) Axis switching invalid status (AXCHGISn)

(2) In PLC axis control (PLCMODn)

6

Spindle Control

Spindle speed can be directly controlled by an 8-digit S code command.
The controller selects an appropriate spindle gear stage corresponding to the 8-digit command following the S code and outputs (spindle gear shift command) it to the machine side (PLC CPU). The controller also outputs S command data (serial connection data) corresponding to the gear input (spindle gear select input) and spindle speed specified by the machine side (PLC CPU).

6.1 Related Parameters

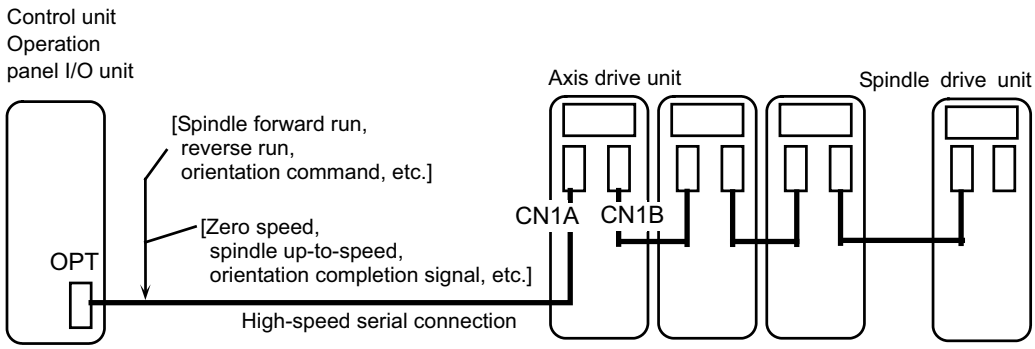
The PLC can have up to four gear stages.
The table below lists the four gear stages and the corresponding parameters.

	Parameters									
Parameter name	Spindle limit speed	Maximum spindle speed	Spindle shift speed	Tap cycle maximum speed	Oriented speed	Minimum speed	Output signal		Input signal	
Gear stage							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 #3008	Ssift4 #3012	Stap4 #3016			1	1	1	1

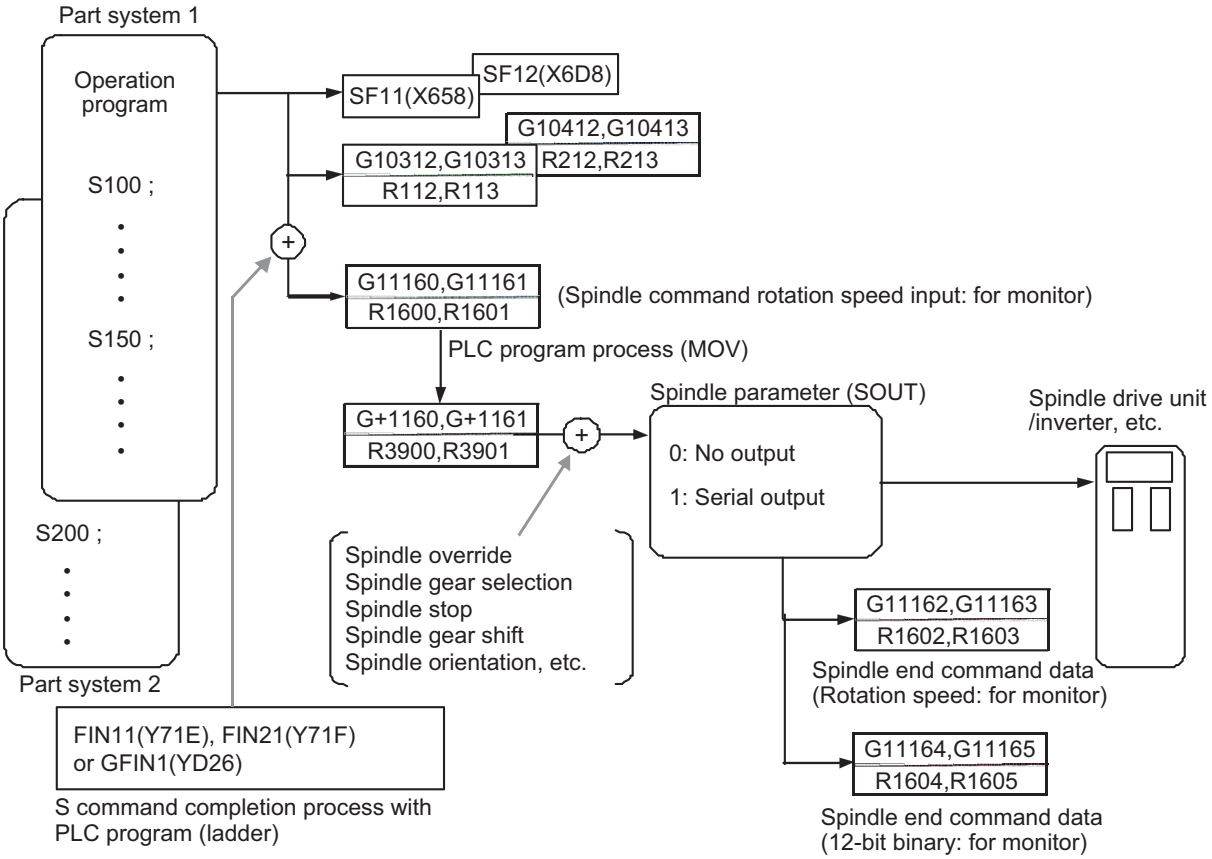
(Note 1) The upper line shows the parameter name, and the bottom line shows the parameter No.
(Note 2) Set the parameter for the gear stage not being used to 0.

6.2 Connection Method

To serially connect the controller and spindle controller



6.3 Flow of Spindle (S) Data



Outline explanation

(1) The "S function strobe 1" (SF1n) signal is output when the spindle (S) command is issued.
(2) After the designated processes is executed by SF1n with the sequence program, the M function finish or gear shift completion signal is returned to the controller.
(3) Data (rotation speed) corresponding to the S command is output to Spindle rotation speed input (G11160/R1600 and G11161/R1601) with the completion signal.
(4) The values of spindle rotation speed input are transferred to spindle command rotation speed output(G+1160/R3900 and G+1161/R3901) with PLC process. (By setting data to the spindle command rotation speed output, the spindle can be rotated with that value. PLC program for transfer needs to be created by the user.)
(5) Spindle command rotation speed output data is transferred to the spindle drive unit with serial communication according to the spindle parameter SOUT value.

(Note) If spindle commands from multiple part systems are issued to a spindle, the command issued later will be applied.

7

Handling of M, S, T, B Functions

The following abbreviations are used in the subsequent explanations.

- Miscellaneous function (command) : M function (command)
- Spindle function (command) : S function (command)
- Tool function (command) : T function (command)
- 2nd miscellaneous function (command) : B function (command)
- Miscellaneous function strobe 1 to 4 : MF (MF1, 2, 3, 4)
- Spindle function strobe 1 to 7 : SF (SF1, 2, 3, 4, 5, 6, 7)
- Tool function strobe 1 : TF (TF1)
- 2nd miscellaneous function strobe 1 : BF (BF1)
- Miscellaneous function finish 1, 2 : FIN1, FIN2

7.1 Command Format

(1) The maximum number of commands that can be issued in one block are shown below.

Function	Maximum number of commands (when released to user)
M function	4 commands
S function	7 commands (Form : Sn = xxxx)
T function	1 command
B function	1 command

(2) The command can have up to eight digits.

(3) A program error will not occur even if more commands than the maximum number are issued. The latter commands will be valid.
(Example) When five M commands are issued though only four M commands can be used.

M 11 M 12 M 13 M 14 M 15 ;

The last four M commands are valid.

7.2 Miscellaneous Function Finish

After the PLC CPU (machine) finished the specified operations for the M, S, T, B commands output with automatic operation (memory, MDI) or manual numerical commands from the CNC, the finish signal will be returned to the CNC. However, there are two types of finish signals as shown below. Use these accordingly in one sequence.

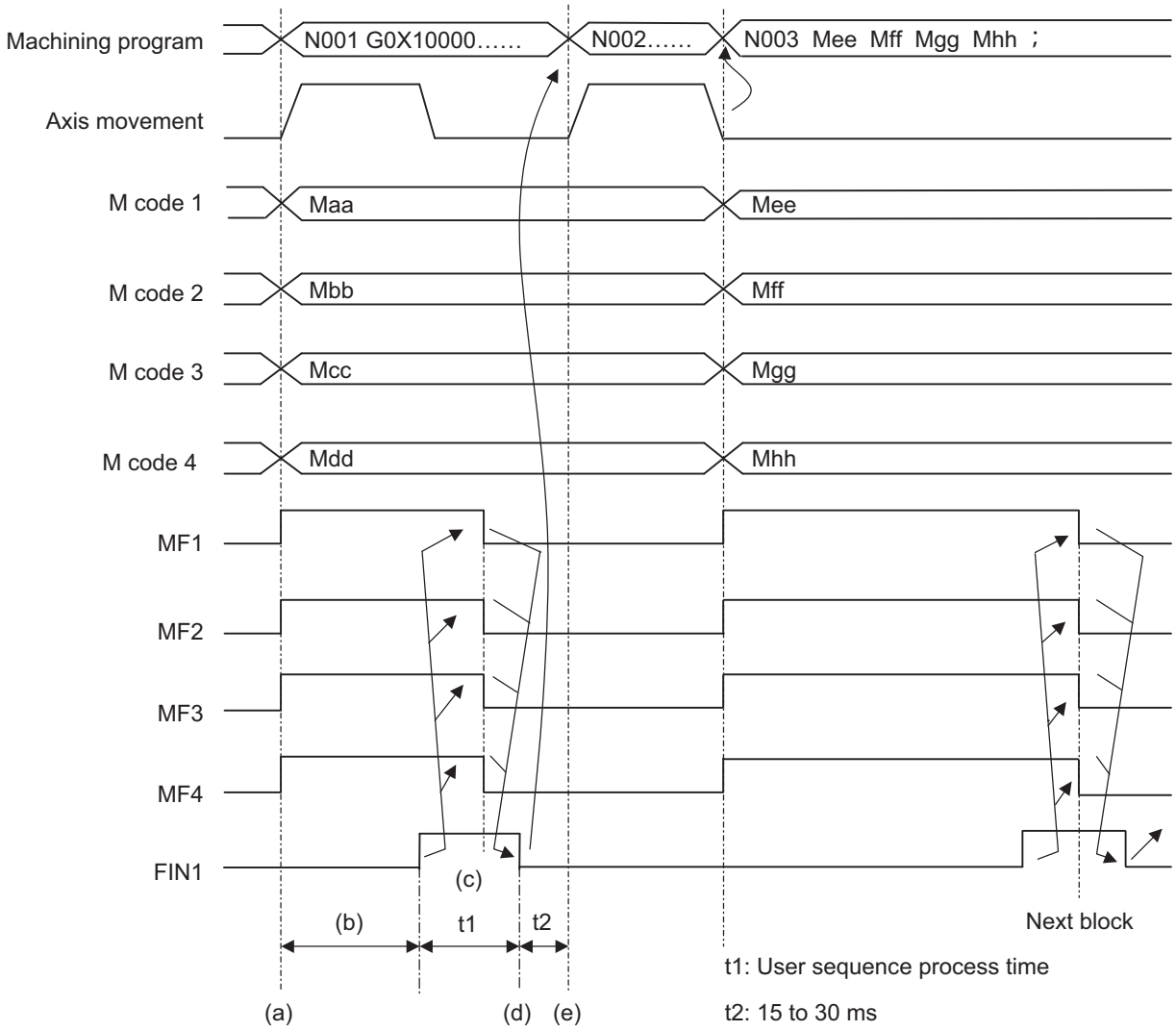
(1) FIN1 ... CNC proceeds to next block at falling edge of finish (FIN1n) signal.
(2) FIN2 ... CNC proceeds to next block at rising edge of finish (FIN2n) signal.

The details for FIN1 and FIN2 are also described in the section "4. Explanation of Interface Signals".
Examples of the M function are given in the following section.

7.2.1 Operation Sequence 1 (Using FIN1 with M Command)

[Example of machining program]

```
N001  G0X10000  Maa  Mbb  Mcc  Mdd ;
N002  G0Z-2000;
N003  Mee  Mff  Mgg  Mhh ;
```



[Explanation of operation]

(a) The CNC outputs the M code data m (BCD) and MFm to the PLC CPU (machine).
Refer to the section "7.5 Precautions Related to M, S, T, B Functions" for details on the M code data and MF output timing.

(b) The PLC CPU (machine) confirms that the MF signal has turned ON, reads the M code data, and executes the specified operation. Then, it turns FIN1 ON.

(c) The CNC confirms that FIN1 has turned ON, and then turns MF OFF.

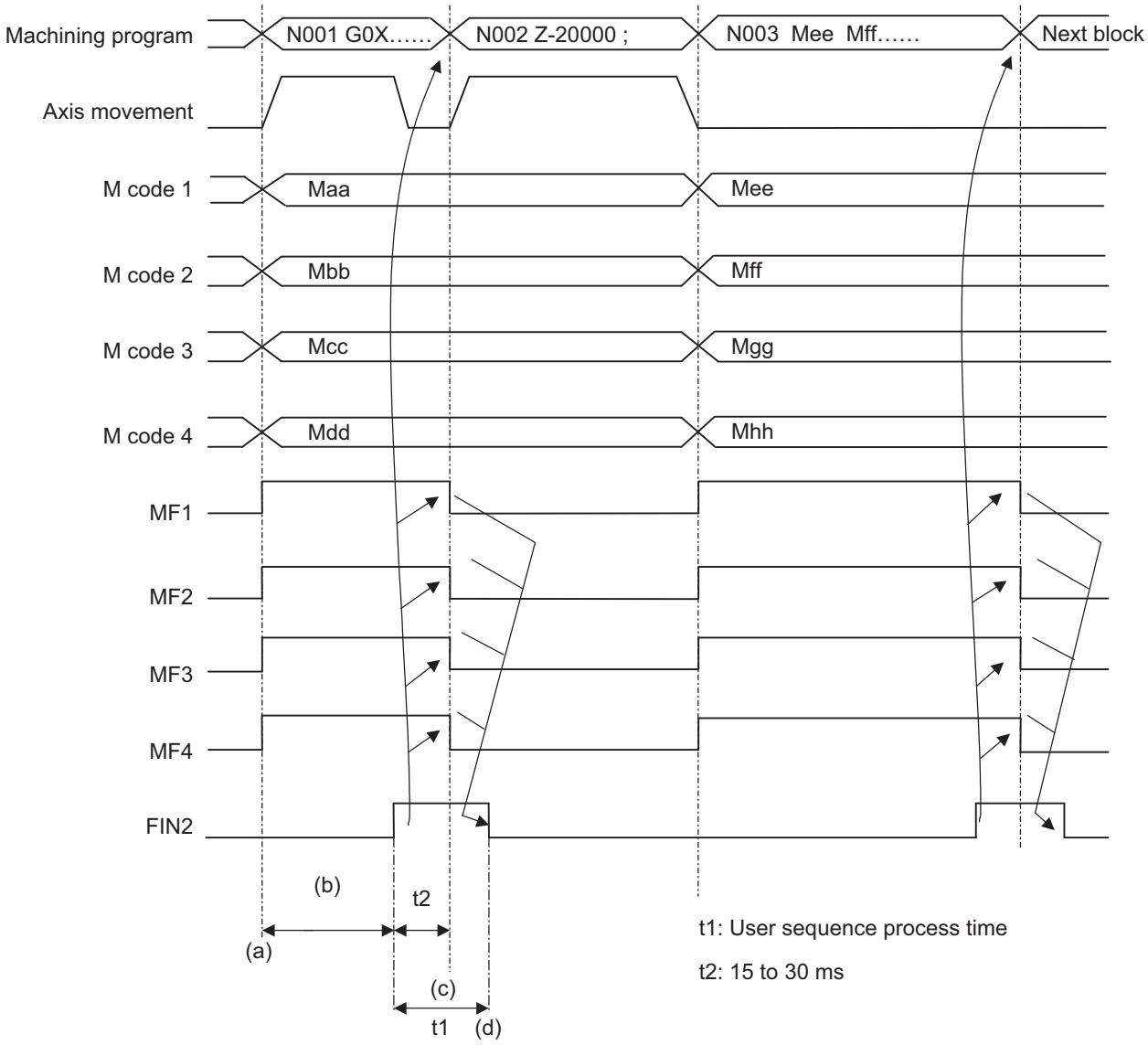
(d) The PLC CPU (machine) confirms that MF has turned OFF, and then turns FIN1 OFF.

(e) The CNC confirms that FIN1 has turned OFF, and then proceeds to the next block.

7.2.2 Operation Sequence 2 (Using FIN2 with M Command)

[Example of machining program]

```
N001  G0X10000  Maa  Mbb  Mcc  Mdd ;
N002  G0Z-20000;
N003  Mee  Mff  Mgg  Mhh ;
```



[Explanation of operation]

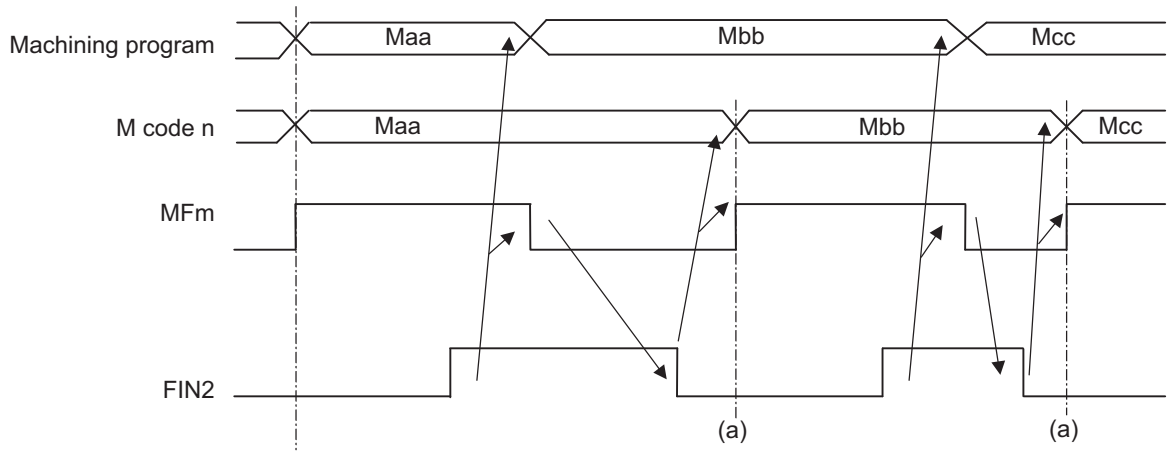
(a) The CNC outputs the M code data m (BCD) and MFm to the PLC CPU (machine).
Refer to the section "7.5 Precautions Related to M, S, T, B Functions" for details on the M code data and MF output timing.

(b) The PLC CPU (machine) confirms that the MF signal has turned ON, reads the M code data, and executes the specified operation. Then, it turns FIN2 ON.

(c) The CNC confirms that FIN2 has turned ON, and proceeds to the next block simultaneously with the turning OFF of MF.

(d) The PLC CPU (machine) confirms that MF has turned OFF, and then turns FIN2 OFF.

7.2.3 When M Commands Continue (Using FIN2 with M Command)



[Explanation of operation]

The general operation is the same as "6.2.2 Operation sequence 2" on the previous page.

(a) The CNC confirms that FIN2 has turned OFF, and then output the next code signal and MF.

7.3 M Code Independent Output

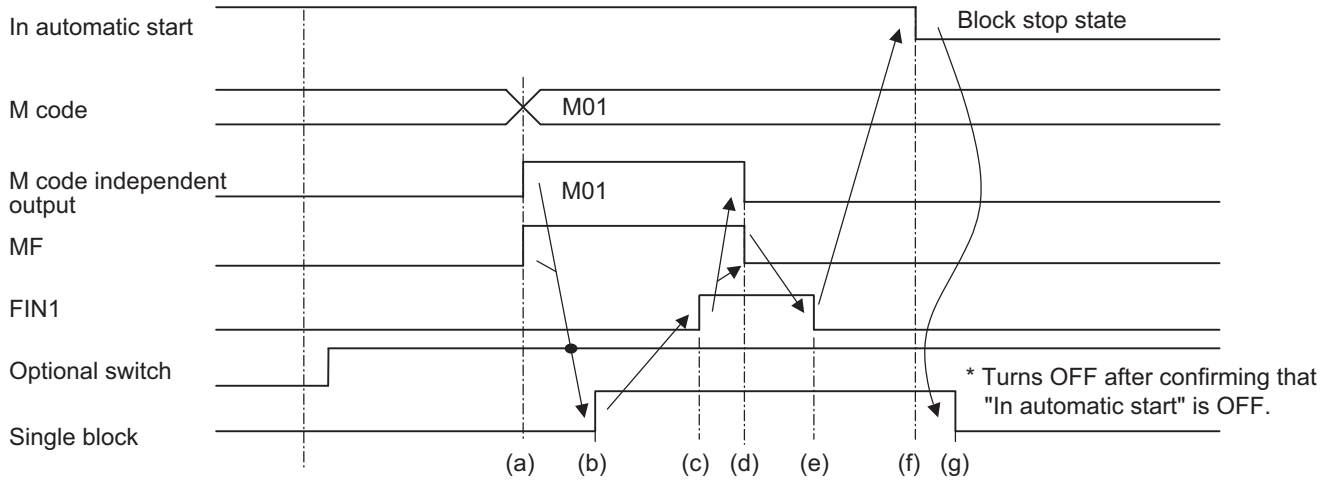
The following four types of M codes output "M code independent output" signal (decode signals) separately from their code signals and MF.The M code independent output is generally used with the following details, but the CNC outputs only the decode signal, and the operation and finish signal processes, etc., are carried out by the PLC CPU (machine).

M00	:	Program stop <Example of process>The block stop state is entered when M00 is commanded.
M01	:	Optional stop <Example of process>The block stop state is entered when M01 is commanded and the optional stop selection switch is selected.
M02, M30	:	Program end <Example of process>When M02 or M30 is commanded, "Reset" or "Reset & rewind" is returned to the CNC, and the reset state is entered.

7.3.1 Operation Sequence

The "M code independent output" signal turns ON when M00, M01, M02 or M30 is commanded during automatic operation (memory, MDI) or by the manual numerical command, and turns OFF with the "FIN1", "FIN2", "Reset 1", "Reset 2" or "Reset & rewind" signal.

Example of M01 process (stopping the block with the M01 command)



[Explanation of operation]

(a) The CNC outputs the M code data and MF to the PLC CPU (machine).
Refer to the section "7.5 Precautions Related to M, S, T, B Functions" for details on the M code data and MF output timing.

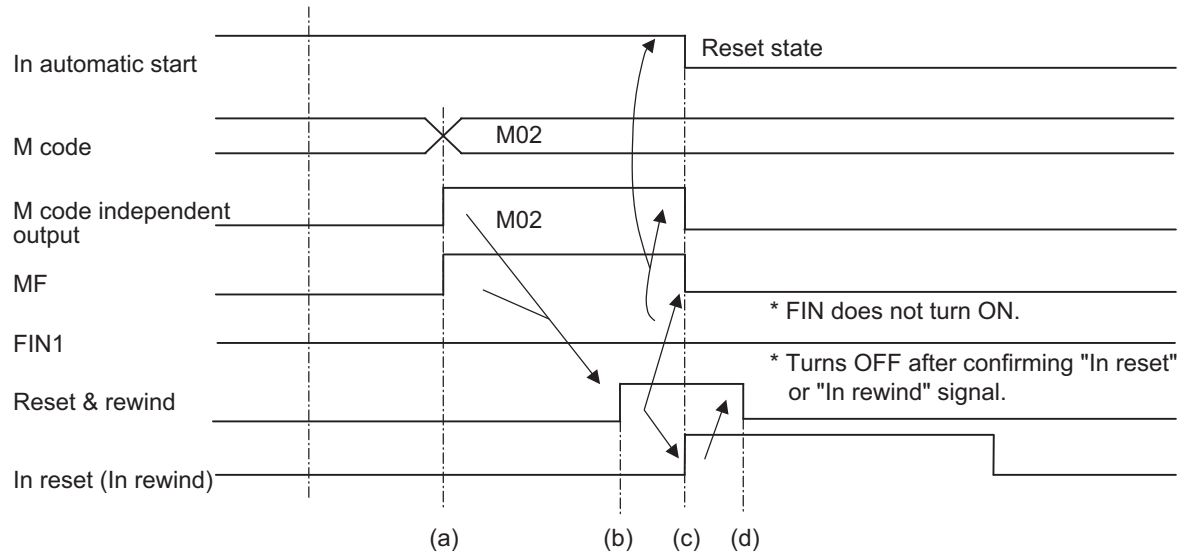
(b) (c) The PLC CPU (machine) confirms that the MF signal has turned ON, and then carries out the specified operation. It then confirms that the "Optional switch" is ON, and then turns "Single block" and "FIN1" ON.

(d) (e) The CNC confirms that FIN1 has turned ON, and then turns the MF and "M code independent output" signal OFF. The PLC CPU (machine) confirms that MF has turned OFF, and then turns FIN1 OFF.

(f) The CNC confirms that FIN1 has turned OFF, and then turns "In automatic start" signal OFF.

(g) The PLC CPU (machine) confirms that "In automatic start" signal has turned OFF, and then turns the "Single block" OFF at the next automatic start.

Example of M02 process (carrying out "Reset & rewind" with M02 command)



[Explanation of operation]

(a) The CNC outputs the M code data and MF to the PLC CPU (machine).
Refer to the section "7.5 Precautions Related to M, S, T, B Functions" for details on the M code data and MF output timing.

(b) The PLC CPU (machine) confirms that the MF signal has turned ON, and then carries out the specified operation. It then turns "Reset & rewind" ON.

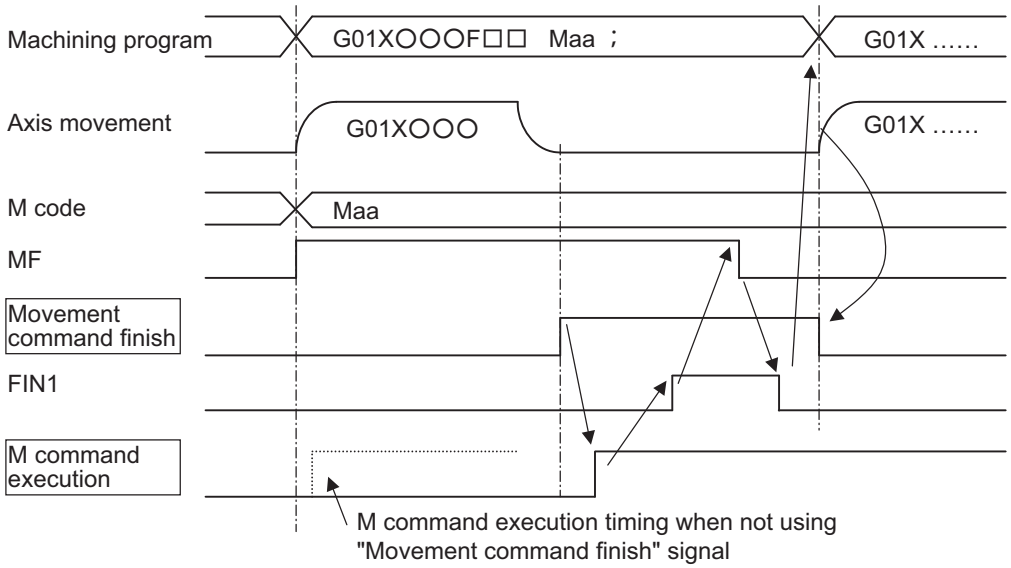
(c) The CNC confirms that "Reset & rewind" has turned ON, then turns MF, "M code independent output" and "In automatic start" OFF, and then starts the rewinding operation.

(d) The PLC CPU (machine) confirms the "In reset" or "In rewind" signals, and then turns the "Reset & rewind" signal OFF.

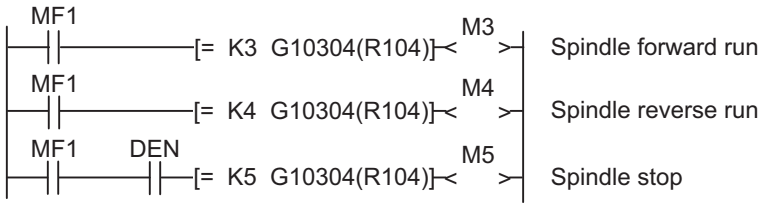
7.4 Axis Movement and M Commands

If an M command is issued in the same block as a movement command, whether to process the M command simultaneously with the movement command or to process it after the movement is finished, depends on the "Movement command finish (DEN)" signal output from the CNC. When processing M command after the movement is finished, the "Movement command finish" (DEN) signal is inserted in the startup condition of M function.

Axis movement and general M command (To execute M command after movement command is finished)



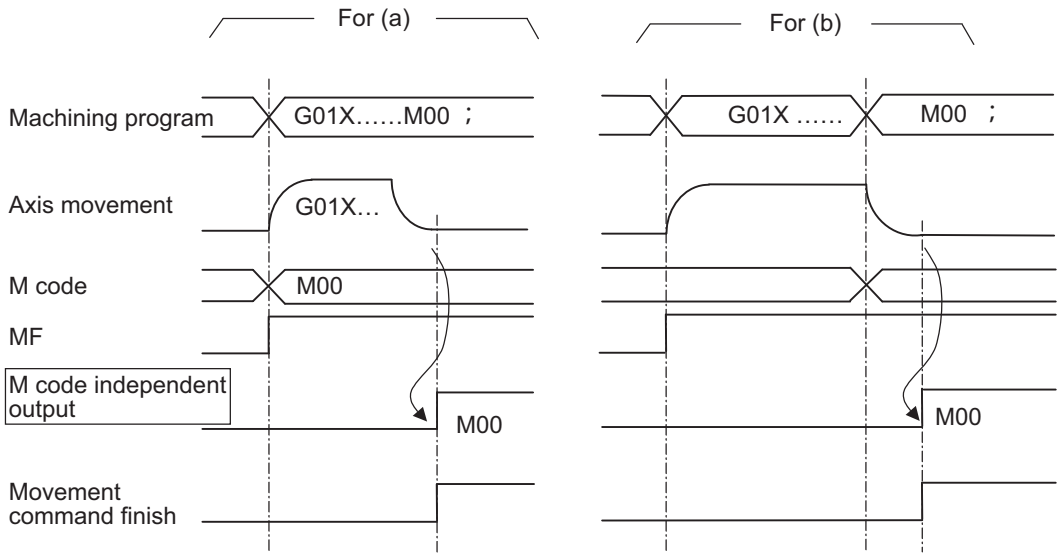
Example: Processing the spindle forward rotation and reverse rotation simultaneously without DEN, while processing the spindle stop with DEN.



Axis movement and M code independent output command

(a) When the M code independent output command is issued in the same block as a movement command, the M code independent output will be output after the movement command is finished.

(b) Even when the M code independent output command is issued without movement command, it will be output after the axis movement in the previous command block is finished.



(Note 1) Refer to the section "7.3 M Code Independent Output" for details on the PLC CPU (machine) process for the M code independent output.

7.5 Precautions

(1) M code data and MF output timing (Also applies to S, T, B signal)
The M code data m and MFm are output simultaneously to the PLC CPU.

(2) The finish signals (FIN1, FIN2) are commonly used for the M, S, T, B functions, so turn them ON under the conditions where all function operations have been finished.

(3) When the "M function lock" (AFLn) signal is turned ON, the M, S, T, B functions (including M commands in fixed cycle) issued during automatic operation (memory, MDI) and manual numerical command, will not be executed. In other words, the code signal, MF, SF, TF and BF signals will not be output (updated). However, when the M code independent output (M00, M01, M02, M30) is commanded, the "M code independent output", "M code data" and MF will be output as usual.

(4) The 2nd miscellaneous (B) function can be selected from address A, B or C using the setup parameters. The "B function" refers to when address "B" is selected.

8

Exclusive Instructions

NC exclusive instruction is limited to its application for the processes which may be difficult to perform only with basic instruction or function instruction.

NC exclusive instructions include:

(1) ATC exclusive instruction (ATC)

With this instruction, ATC, such as magazine index control, tool change by arm, etc. is performed.

ATC exclusive instructions include:

- Tool No. search
- Tool change
- Tool table forward/reverse run
- Pointer (which displays magazine index position) forward/reverse run
- Tool data read/write, etc.

(2) Rotary body control instruction (ROT)

With this instruction, the rotary body's target position and rotation direction are determined, as well as the function as a ring counter is realized.

This is used when calculating the rotation direction or number of index steps of the magazine and turret, etc. based on the output data figured with tool No. search of ATC dedicated instruction, or used when controlling the rotary body position.

(3) Another CPU module's device write instruction (DDWR)

An instruction to write data from the PLC CPU to another CPU module's device

(4) Another CPU module's device read instruction (DDRD)

An instruction to read the data of another CPU module's device to the PLC CPU.

8.1 ATC Exclusive Instruction

8.1.1 Outline of ATC Control

The ATC (Automatic Tool Change) control, also called magazine control, is executed in the following two ways:

(1) Mechanical random control

With the information of magazine position from the machine, and T command, the control method determines the direction of magazine rotation, number of steps, etc. for index of the magazine, according to the given command.

Each tool and magazine tool pot (socket) has a one-on-one corresponding relation.

Usually, the "intermediate pot" that supports the transfer of the tool is provided between the spindle and the magazine.

This control is possible by not using ATC instruction, but ROT instruction only.

(2) Memory random control

With the information of magazine rotation, or magazine position from the machine, the control method controls tool No. stored in the memory.

For index of the magazine, the direction of magazine rotation and number of steps, etc. are determined by the given T command and tool No. stored in the memory.

Each tool and magazine tool pot (socket) does not always have a one-on-one corresponding relation.

Usually, the "intermediate pot" is not provided.

8.1.2 ATC Operation

The motions related to ATC operation can be largely divided into the following four motions:

(1) Index of magazine ..... (ATC-Function No.1, Function No.2, Function No.5, Function No.6, Function No.7, Function No.8)

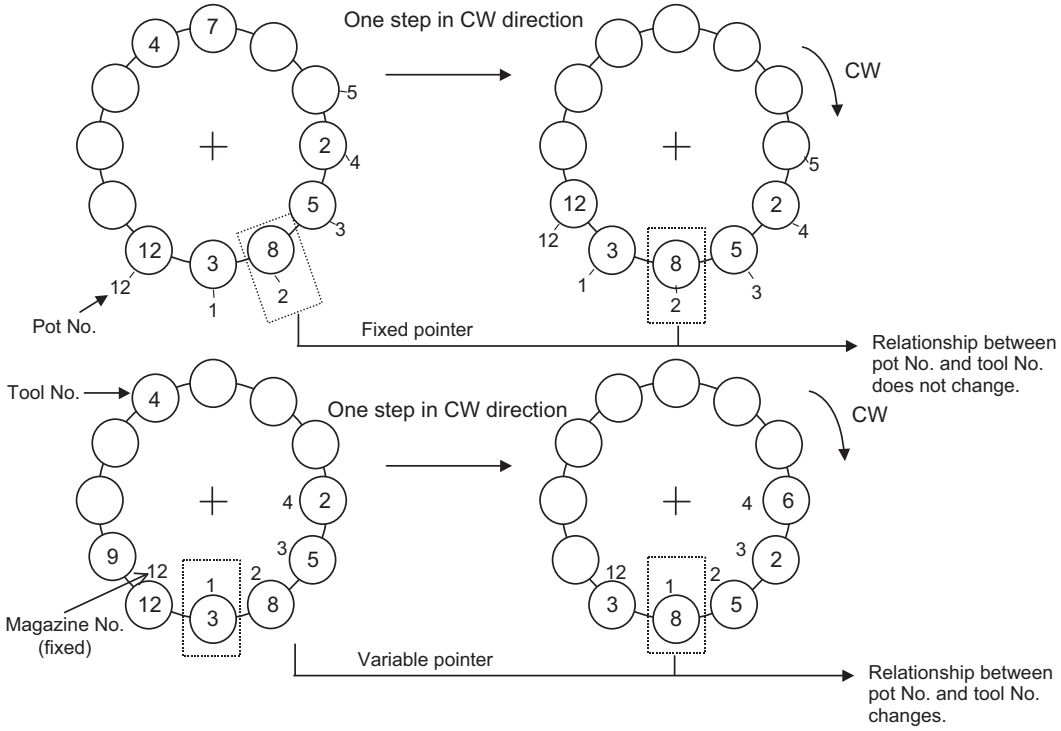
(2) Tool change (arm, or the like is used) ..... (ATC-Function No.3, Function No.4)

(3) Transfer of tool to intermediate pot or arm ..... (Normal function instructions such as MOV, XCH are used)

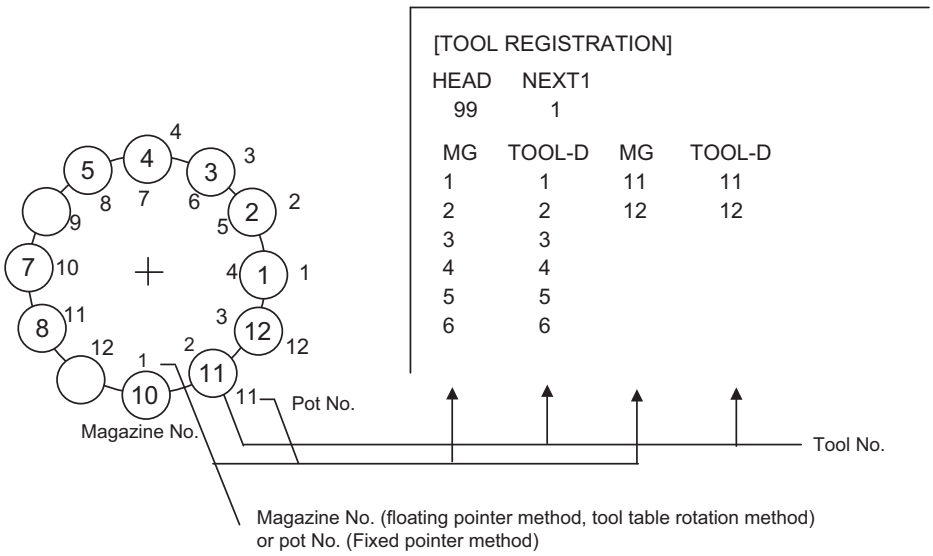
(4) Others ..... (ATC-Function No.9, Function No.10, Function No.11)

8.1.3 Explanation of Terminology

(1)	Pointer:	Points out the position where the magazine is indexed. When a tool table in which tool No. are previously recorded is used, the tool table does not rotate with rotation of the magazine and the pointer serves as "ring counter" for control of magazine position.
(2)	Fixed pointer method:	This is the type with tool pots numbered and the relationship between tool pot and tool No. is fixed if the magazine is rotated. When the tool table is rotated, fixed pointer does not functionally differ from variable pointer method.
(3)	Variable pointer method:	This is the type with numbered fixed position on magazine and the relationship between magazine No. and tool No. changes when the magazine rotates.



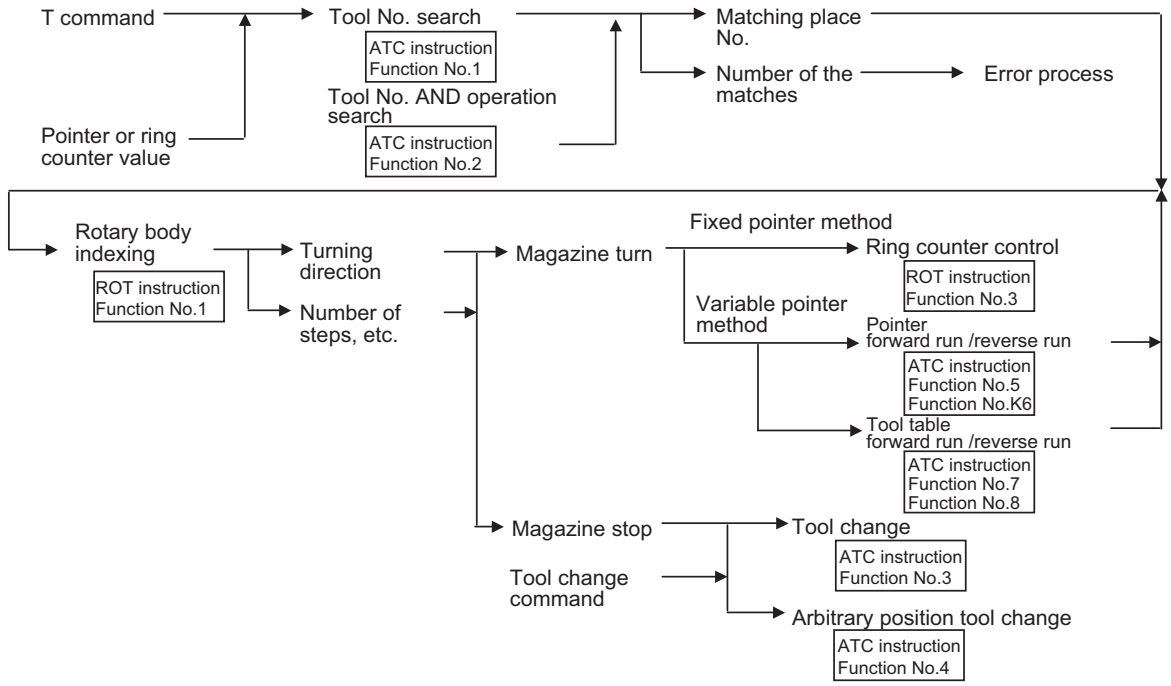
8.1.4 Relationship between Tool Registration Screen and Magazines



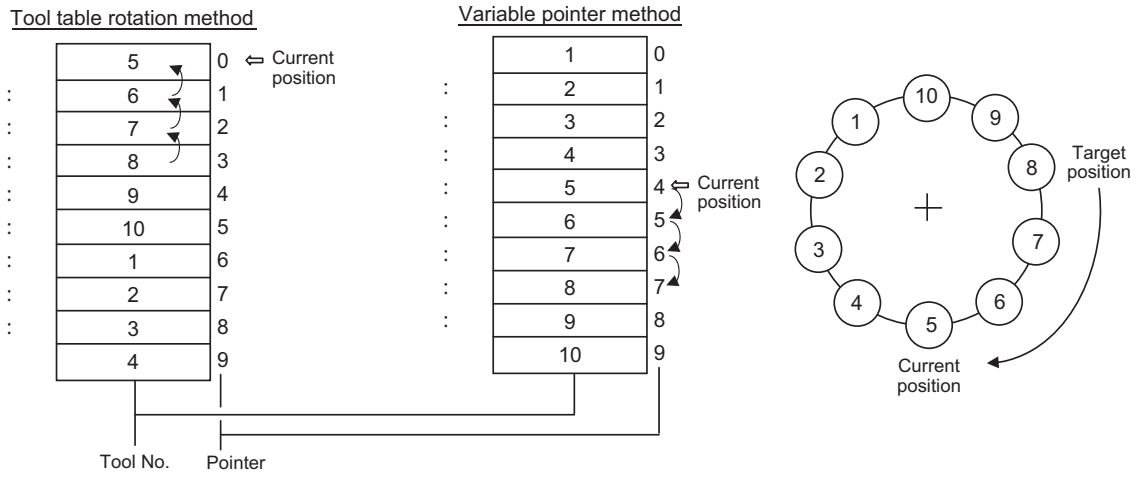
When the floating pointer method or tool table rotation method is selected on the tool registration screen, correspondence display between the magazines and tools changes each time the magazine rotates; when the fixed pointer method is selected, it does not change.

8.1.5 Use of ATC and ROT Instructions

The use order of the ATC and ROT instructions during the T command or tool change command is shown below:



The relationship between the tool number search instruction and rotary body indexing instruction when the tool table rotation method or variable pointer method is used is explained below.



(1) When indexing tool number 8 in the situation given in the above chart,
  (a) In the tool table rotation method, the tool number search instruction outputs 3.
  (b) In the variable pointer method, the tool number search instruction outputs 7.

(2) The tool number search instruction output result is used by the rotary body indexing instruction to find the rotation direction, the number of steps, etc.
  (a) In the tool table rotation system, rotation direction CW and number of steps 3 are found from the relationship between current value 0 (pointer 0) and tool number search output result 3.
  (b) In the variable pointer method, rotation direction CW and number of steps 3 are found from the relationship between current value 4 (pointer 4) and tool number search output result 7, as in (a) above.
  In the fixed pointer system, the pointer is fixed to 0 and the ring counter of 0 to n-1 (n is the number of magazines), separate from the pointer, is controlled. The counter value is used as the current position.

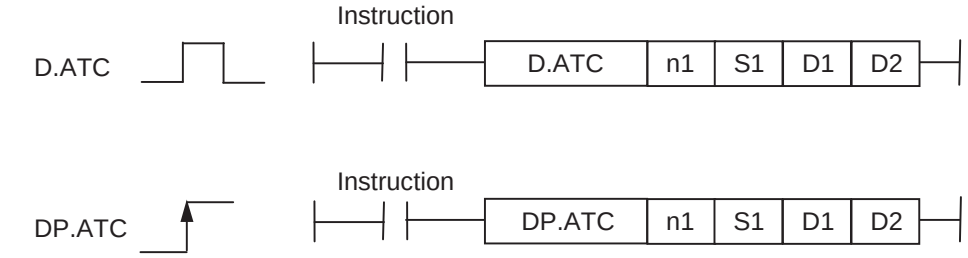
8.1.6 Format of ATC Exclusive Instruction

(1) Available devices

Setting data	Available devices															
	Internal user device/ Internal system device				File register		Indirect designation	Link direct device (J \ )			Unit access device (U \G)		Index register (Z)	Constant		Others
	Bit	Word			Bit	Word		Bit	Word		Bit	Word		Decimal, hexadecimal (K,H)	Real number string	
			Digit designation A	Digit designation B						Digit designation						
n1	–	○	○	○	–	○	○	–	–	–	–	–	–	○	–	–
S1	–	○	–	–	–	○	○	–	–	–	–	–	–	–	–	–
D1	–	△ (Note)	–	–	–	△ (Note)	–	–	–	–	–	–	–	–	–	–
D2	△ (Note)	–	–	–	△ (Note)	–	–	–	–	–	–	–	–	–	–	–

(Note) Local devices are not available.

[Instruction symbol] [Execution condition]



(2) Setting data

Setting data	Setting details	Setting range	Setting side	Data type
n1	Head I/O No. of target CPU divided by 16 For CPU No. 2 to 4: H3E1 to H3E3	3E1h to 3E3h	User	BIN16 Bit
S1	Head device that stores the control data for request data	–	User	Word
D1	Head device that stores the control data for response data	–	System	Word
D2	Completion device that goes ON for 1 scan when an instruction is completed.	–	System	Bit

(3) (S1) Control data for request data

Device	Item	Setting data	Setting range	Setting side
S1+0	Size of request data	Set the size (number of words) of data to store in the control data for request data.	3 to 6	User
S1+1	Function No.	Designate the No. of function to command.	1 to 11	User
S1+2	R No. to store the number of tools in magazine	Designate the No. of file that stores the number of tools in magazine.	0 to 8191	User
S1+3 to S1+6	Argument 1, 2	Stores the arguments that correspond to the designated function No. Refer to "(1) Control data for request data" in "8.1.7 Functions".	–	User

(4) (D1) Control data for response data

Device	Item	Setting data	Setting range	Setting side
D1+0	Completion status	Stores the status when an instruction has been completed. 0: No error (Successfully completed) Others: Error codes (Note)	–	System
D1+1	Size of response data	Set the size (number of words) of data to store in the control data for response data.	0 to 2	System
D1+2	Response 1	Stores the response data that corresponds to the designated function No. Refer to "(2) Control data for response data" in "8.1.7 Functions".	–	System
D1+3	Response 2			

(Note) For error codes other than "0", see "8.3.3 Completion Status Information".

(5) (D2) Completion device

Device	Item	Setting data	Setting range	Setting side
D2+0	Completion device	Goes ON for 1 scan when an instruction has been completed.	0/1	System
D2+1		Goes ON with D2+0 upon abnormal completion.	0/1	System

(6) Availability of instruction execution for each type

No.	Type of execution	Availability
1	Initial program	Available
2	Scan program	Available
3	Fixed-interval program	Available (Note)
4	Interrupt program	Available (Note)

(Note) Completion device, which is ON only for 1 scan, is not recognized in the sequence program (execution type) with long cycle time. The device is basically programmed in a scan.

8.1.7 Functions

This section explains the functions to execute ATC (Automatic Tool Change) control for the target CPU. D(P).ATC instruction has 11 functions. Operations of the instruction are decided by the function No. stored in (S1+1).
Size of the request data stored in (S1+0) is also decided by the function No. stored in (S1+1).

Contents and numbers of data, stored in the control data for request data, differ according to the function No. in (S1+1). Contents and numbers of responses, stored in control data for response data, also differ.
The following tables show the contents of the control data for request data, which are set according to the function No., and the contents of responses, which are stored in the control data for response data.

(1) Control data for request data

<For T4-digit specification>

(S1+0) Size of data	(S1+1)		(S1+2)	(S1+3)	(S1+4)
	Function No.	Type of instruction			
3	1	Tool No. search	R No. to store the number of tools in magazine	Tool No. to be searched (BCD)	-
4	2	Tool No. AND operation search			AND data
3	3	Tool change		R No. to specify the position of tool change	-
4	4	Arbitrary position tool change			Magazine No. to be changed
3	5	Forward run of pointer		R No. to specify pointer in magazine	-
3	6	Reverse run of pointer			-
3	7	Forward run of tool table		R No. to specify the number of tools in magazine	-
3	8	Reverse run of tool table			-
3	9	Tool data read		Magazine No. to be read	-
4	10	Tool data write		Magazine No. to which data is written	Data to be written
3	11	Automatic tool data write		Default value	-

<For T8-digit specification>

(S1+0) Size of data	(S1+1)		(S1+2)	(S1+3)	(S1+4)	(S1+5)	(S1+6)
	Function No.	Type of instruction					
4	1	Tool No. search	R No. to store the number of tools in magazine	Tool No. to be searched (BCD)		-	-
6	2	Tool No. AND operation search				AND data	
3	3	Tool change		R No. to specify the position of tool change	-	-	-
4	4	Arbitrary position tool change			Magazine No. to be changed	-	-
3	5	Forward run of pointer		R No. to specify pointer in magazine	-	-	-
3	6	Reverse run of pointer			-	-	-
3	7	Forward run of tool table		R No. to specify the number of tools in magazine	-	-	-
3	8	Reverse run of tool table			-	-	-
3	9	Tool data read		Magazine No. to be read	-	-	-
5	10	Tool data write		Magazine No. to which data is written	Data to be written		-
4	11	Automatic tool data write		Default value		-	-

(2) Control data for response data

<For T4-digit specification>

Function No.	Type of instruction	(D1+0)	(D1+1)	(D1+2)	(D1+3)
1	Tool No. search	Completion status	Size of response data; 2	Search result	Number of the matches
2	Tool No. AND operation search		Size of response data; 2	Search result	Number of the matches
3	Tool change		Size of response data; 0	-	-
4	Arbitrary position tool change		Size of response data; 0	-	-
5	Forward run of pointer		Size of response data; 0	-	-
6	Reverse run of pointer		Size of response data; 0	-	-
7	Forward run of tool table		Size of response data; 0	-	-
8	Reverse run of tool table		Size of response data; 0	-	-
9	Tool data read		Size of response data; 1	Read data	-
10	Tool data write		Size of response data; 0	-	-
11	Automatic tool data write		Size of response data; 0	-	-

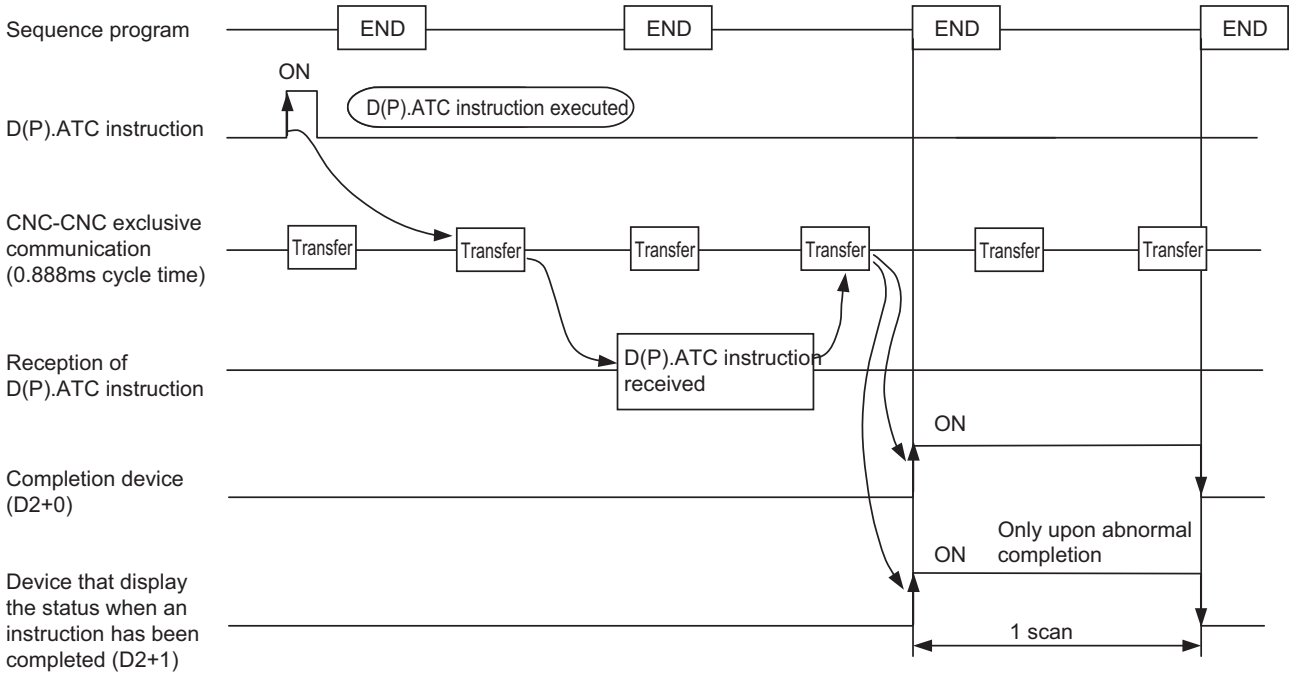
<For T8-digit specification>

Function No.	Type of instruction	(D1+0)	(D1+1)	(D1+2)	(D1+3)
1	Tool No. search	Completion status	Size of response data; 2	Search result	Number of the matches
2	Tool No. AND operation search		Size of response data; 2	Search result	Number of the matches
3	Tool change		Size of response data; 0	-	-
4	Arbitrary position tool change		Size of response data; 0	-	-
5	Forward run of pointer		Size of response data; 0	-	-
6	Reverse run of pointer		Size of response data; 0	-	-
7	Forward run of tool table		Size of response data; 0	-	-
8	Reverse run of tool table		Size of response data; 0	-	-
9	Tool data read		Size of response data; 2	Read data	
10	Tool data write		Size of response data; 0	-	-
11	Automatic tool data write		Size of response data; 0	-	-

8.1.8 Operation Outline

The following chart shows the outline of operation between CPUs when D(P).ATC instruction is executed.
If (D2+1) has been turned ON, the instruction is abnormally completed. Then the data is stored in completion status (D1+0). For the values stored, see "8.3.3 Completion Status Information".

<Operation outline when an instruction is executed>



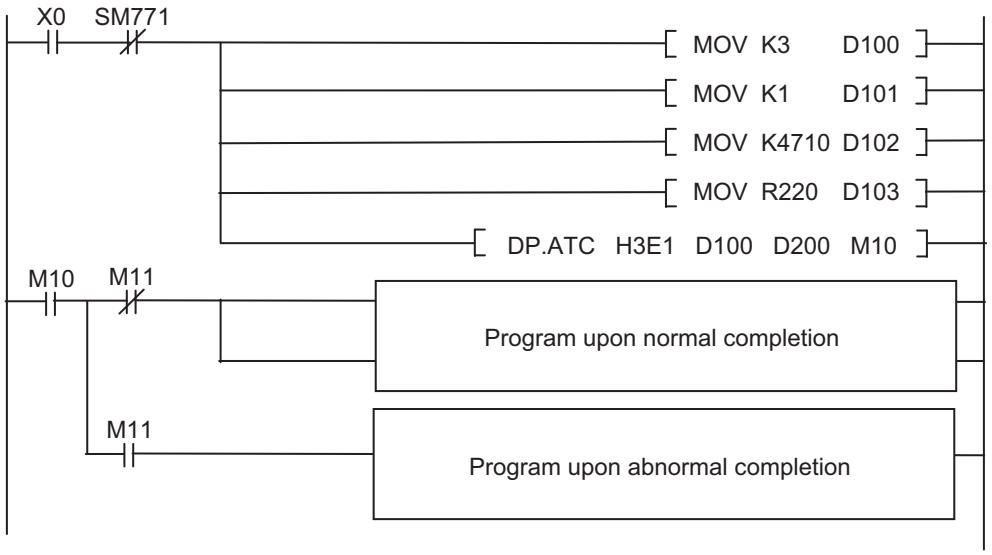
8.1.9 Errors

SM0 is turned ON and the error code is stored in SD0 when:
- "Head I/O No. of target CPU divided by 16" (n1) specified the CPU that has already been reserved or has not been mounted.
(Error code: 2110<SP. UNIT ERROR>)
- "Head I/O No. of target CPU divided by 16" (n1) specified the host CPU itself.
(Error code: 2114<SP. UNIT ERROR>)
- "Head I/O No. of target CPU divided by 16" (n1) specified the CPU that does not correspond to the exclusive instructions in this section.
(Error code: 2117<SP. UNIT ERROR>)
- "Head I/O No. of target CPU divided by 16" (n1) specified the invalid value (not within 3E0H to 3E3H).
(Error code: 4100<OPERATION ERROR>)

CNC CPU outputs the following error codes to the completion status when:
- An invalid function No. (out of the range 0 to 11) was specified. (Error code: 3200)
- An invalid R No. to store the number of tools in magazine (out of the range 4710 to 4714) was specified. (Error code: 3201)
- An invalid tool No. (negative value or over the number of tools) is specified.(Error code: 3202)
- An invalid magazine No. was specified. (Error code: 3203)
- An invalid number of arguments was specified. (Error code: 3207)

8.1.10 Program Example

(1) Executes an ATC instruction (tool No. search) to CPU No.2 (Q17nNCCPU) when X0 is turned ON.



8.1.11 File Register Allocation and Parameters for ATC Control

(1) File registers for ATC control

File registers used for ATC control are as shown below.

The number enclosed with brackets "( )" is a relative address of the shared device.

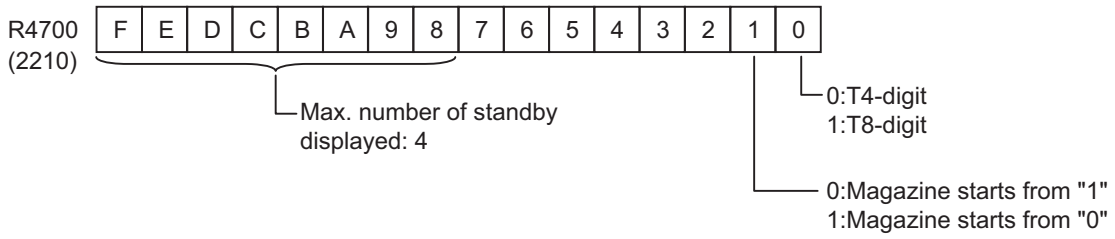
	R register for corresponding file						Remarks (data type)
Magazine	**No.1 magazine**		**No.2 magazine**		**No.3 magazine**		
Specification T4-digit/T8-digit	**T4-digit**	**T8-digit**	**T4-digit**	**T8-digit**	**T8-digit**	**T8-digit**	
ATC control parameters	R4700 (2210)	←	←	←	←	←	
Number of magazine designation	R4710 (2220)	←	R4711 (2221)	←	R4712 (2222)	←	Binary
Pointer designation	R4715 (2225)	←	R4716 (2226)	←	R4717 (2227)	←	Binary
Spindle tool	R4720 (2230)	R4720 R4721 (2230) (2231)	R4730 (2240)	R4730 R4731 (2240) (2241)	-	-	BCD
Standby 1 tool	R4721 (2231)	R4722 R4723 (2232) (2233)	R4731 (2241)	R4732 R4733 (2242) (2243)	-	-	BCD
Standby 2 tool	R4722 (2232)	R4724 R4725 (2234) (2235)	R4732 (2242)	R4734 R4735 (2244) (2245)	-	-	BCD
Standby 3 tool	R4723 (2233)	R4726 R4727 (2236) (2237)	R4733 (2243)	R4736 R4737 (2246) (2247)	-	-	BCD
Standby 4 tool	R4724 (2234)	R4728 R4729 (2238) (2239)	R4734 (2244)	R4738 R4739 (2248) (2249)	-	-	BCD
AUX data	R4748	←	←	←	←	←	Binary (0 to 99)

Magazine		R register for corresponding file						Remarks (data type)
		No.1 magazine		No.2 magazine		No.3 magazine		
Specification T4-digit/T8-digit		T4-digit	T8-digit	T4-digit	T8-digit	T4-digit	T8-digit	
Magazine tool data	MG1	R4750 (2260)	R4750 R4751 (2260) (2261)	R4990 (2500)	R4990 R4991 (2500) (2501)	R5230 (2740)	R5230 R5231 (2740) (2741)	BCD
	MG2	R4751 (2261)	R4752 R4753 (2262) (2263)	R4991 (2501)	R4992 R4993 (2502) (2503)	R5231 (2741)	R5232 R5233 (2742) (2743)	BCD
	MG3	R4752 (2262)	R4754 R4755 (2230) (2231)	R4992 (2502)	R4994 R4995 (2504) (2505)	R5232 (2742)	R5234 R5235 (2744) (2745)	BCD
	:	:	:	:	:	:	:	:
	MG79	R4828 (2338)	R4906 R4907 (2416) (2417)	R5068 (2578)	R5146 R5147 (2656) (2657)	R5308 (2818)	R5386 R5387 (2896) (2897)	BCD
	MG80	R4829 (2339)	R4908 R4909 (2418) (2419)	R5069 (2579)	R5148 R5149 (2658) (2659)	R5309 (2819)	R5388 R5389 (2898) (2899)	BCD

(Note 1) The maximum number of tools to be set is 80 per magazine.

(Note 2) Tool registration screen is provided only for No.1 magazine.

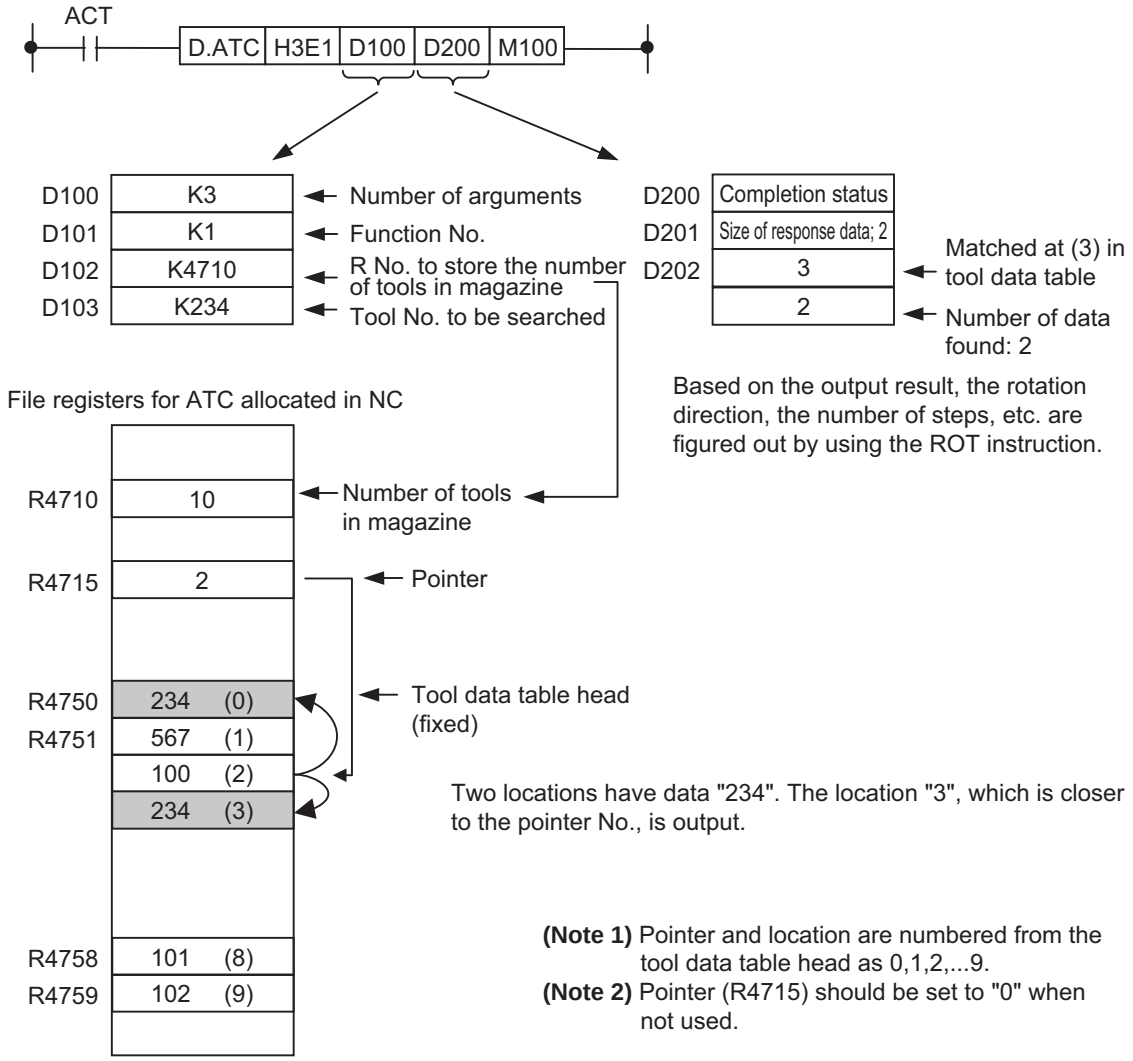
(2) Contents of control parameter



8.1.12 Details of Each Instruction

Tool No. search

Searches for the tool No. stored in the magazine (tool data table) and outputs the number of the matches as well as their location in the tool data table. If two or more tool Nos. are found, the location of tool No. closest to the pointer is output.

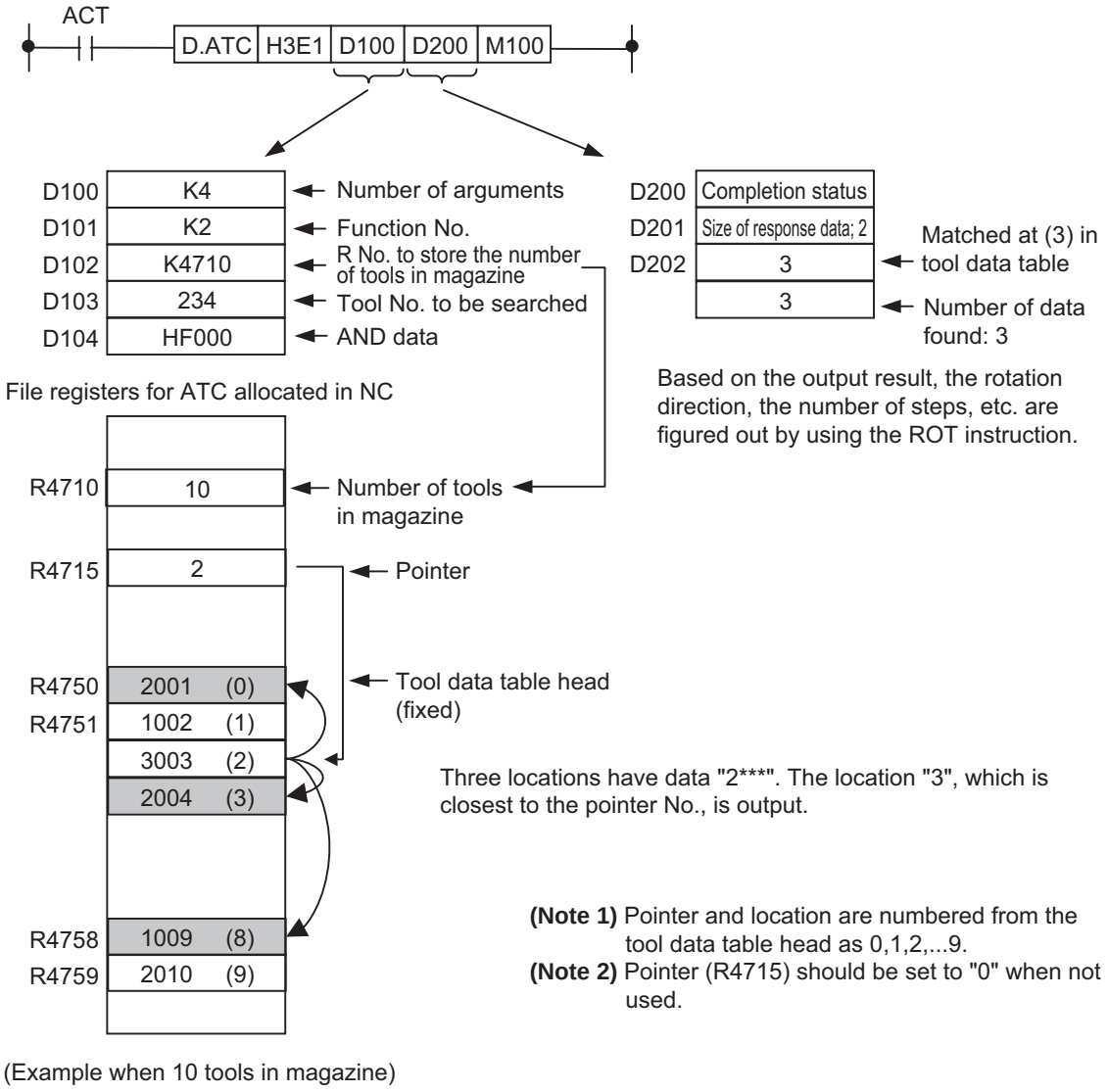


(Example when 10 tools in magazine)

(Note 1) Pointer and location are numbered from the tool data table head as 0,1,2,...9.
(Note 2) Pointer (R4715) should be set to "0" when not used.

Tool No. AND operation search

The function of this instruction is as same as that of the tool number search instruction (ATC K1). Search data and in-magazine tool number and AND data are ANDed together for a search.

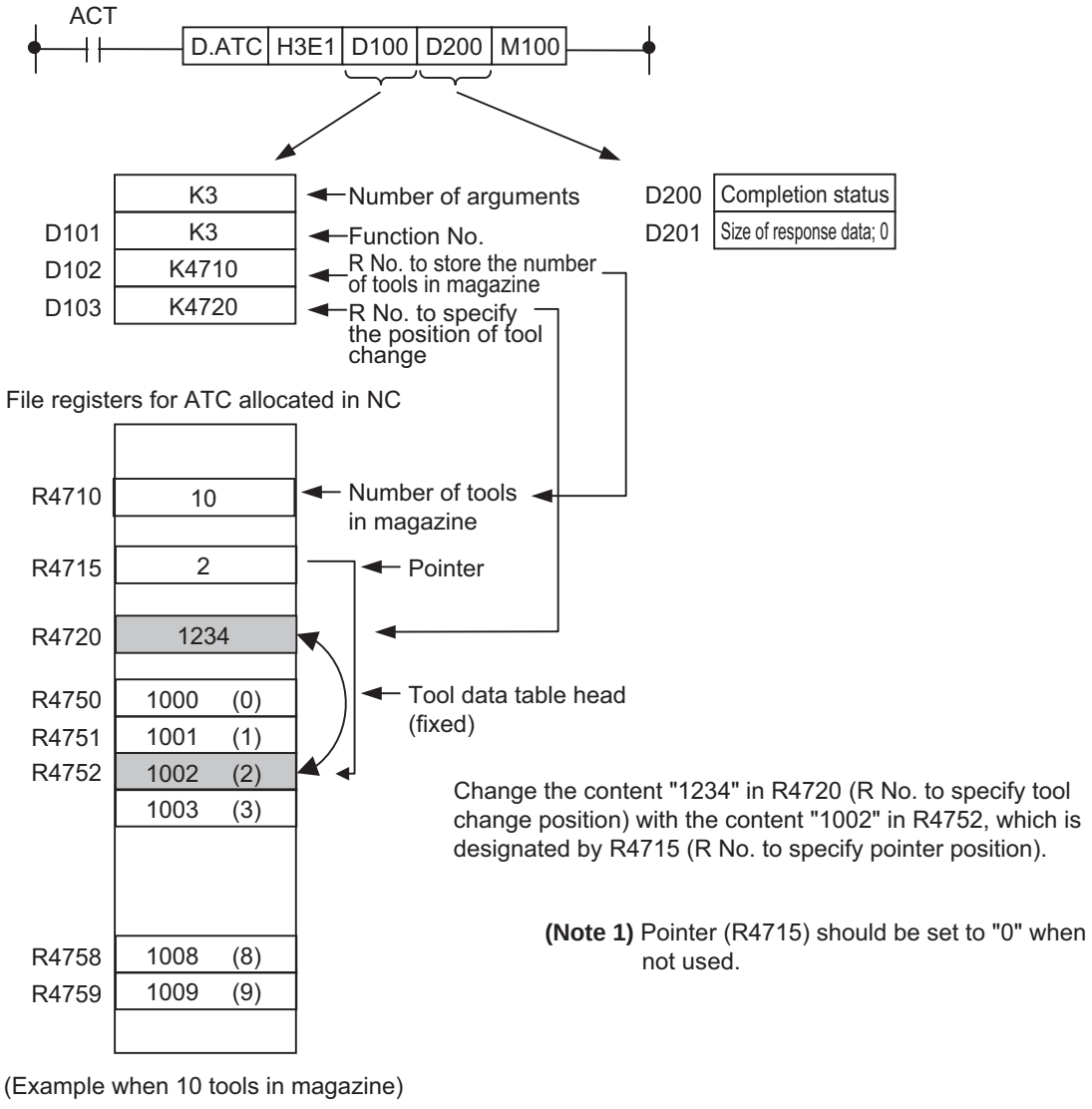


(Example when 10 tools in magazine)

(Note 1) Pointer and location are numbered from the tool data table head as 0,1,2,...9.
(Note 2) Pointer (R4715) should be set to "0" when not used.

Tool change

This instruction is used to update the contents in the memory (R register) after a spindle tool and a magazine index tool have been exchanged by the ATC arm, etc.



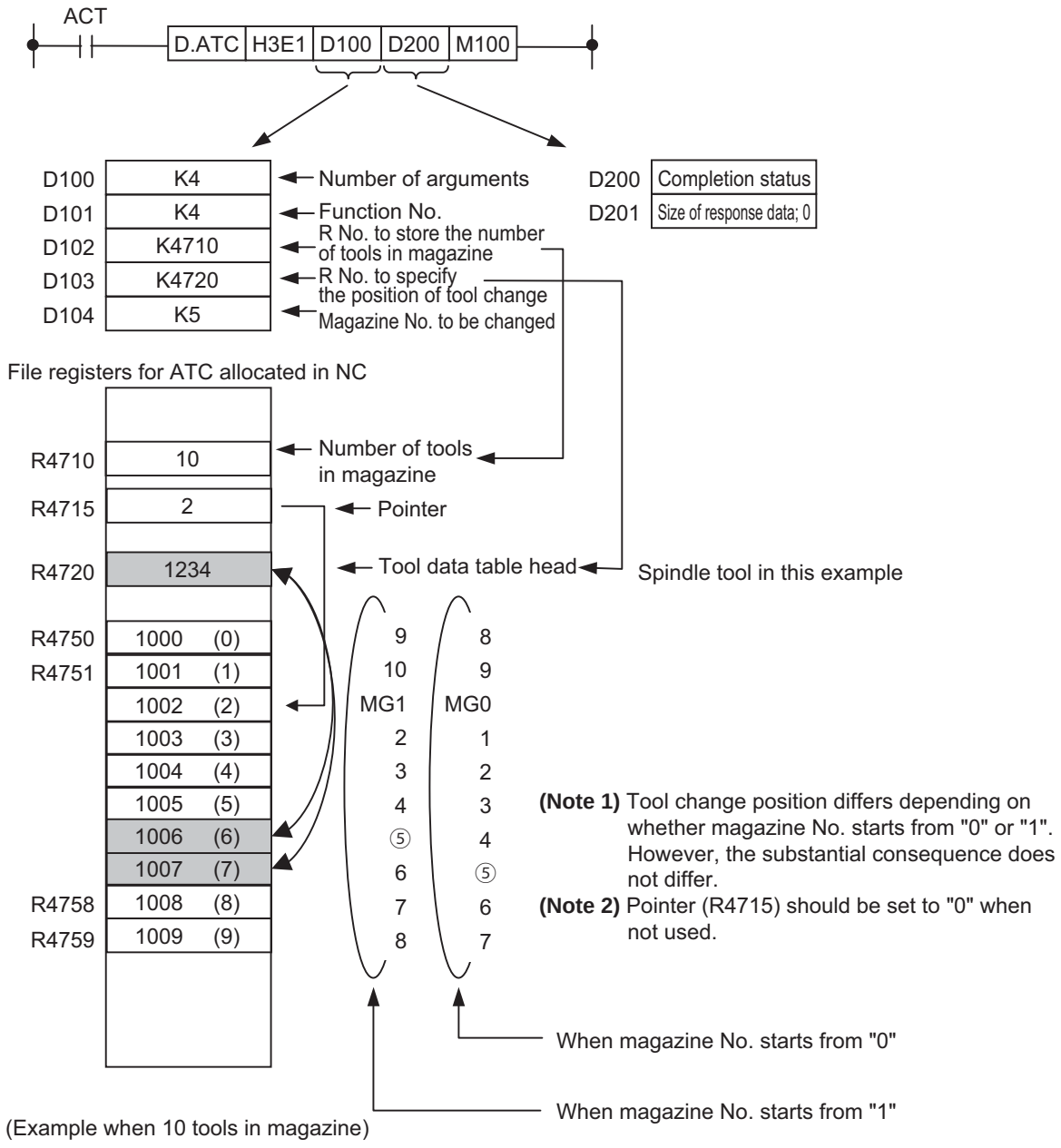
(Example when 10 tools in magazine)

Change the content "1234" in R4720 (R No. to specify tool change position) with the content "1002" in R4752, which is designated by R4715 (R No. to specify pointer position).

(Note 1) Pointer (R4715) should be set to "0" when not used.

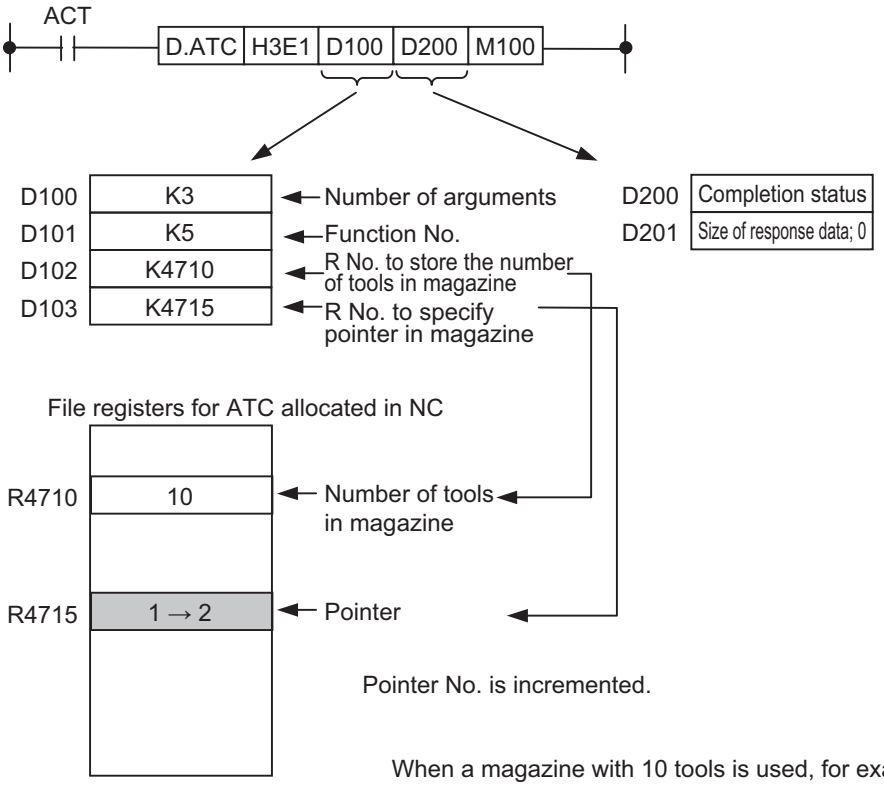
Arbitrary position tool change

In tool change, a spindle tool is usually exchanged with a magazine index tool. It may often occur, however, that tool change is required at other stations (tool change at spare tool change position, for example). This instruction is used in such a case.



Forward run of pointer

In the ATC control with variable pointer, pointer count is controlled so that it coincides with actual magazine position when the magazine rotates in forward direction.



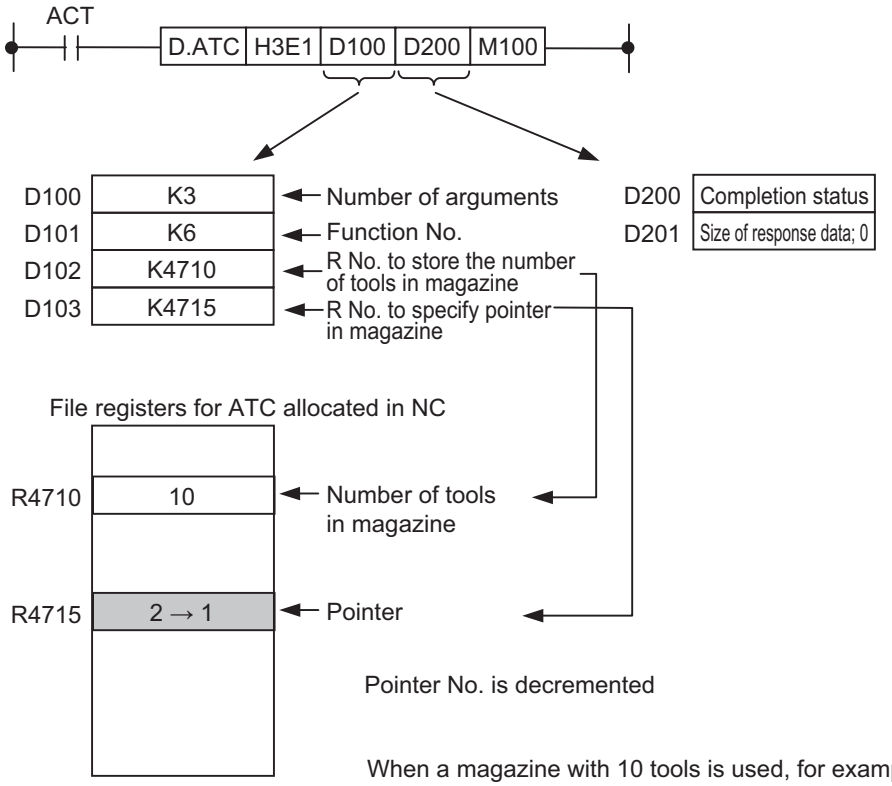
Pointer No. is incremented.

When a magazine with 10 tools is used, for example, the control sequence is as follows:
0,1,2,3,...9,0,1,2,...8,9,0,1,...

(Note 1) This instruction changes the relation between magazine No. and tool No. on the tool registration screen.

Reverse run of pointer

In the ATC control with variable pointer, pointer count is controlled so that it coincides with actual magazine position when the magazine rotates in reverse direction.



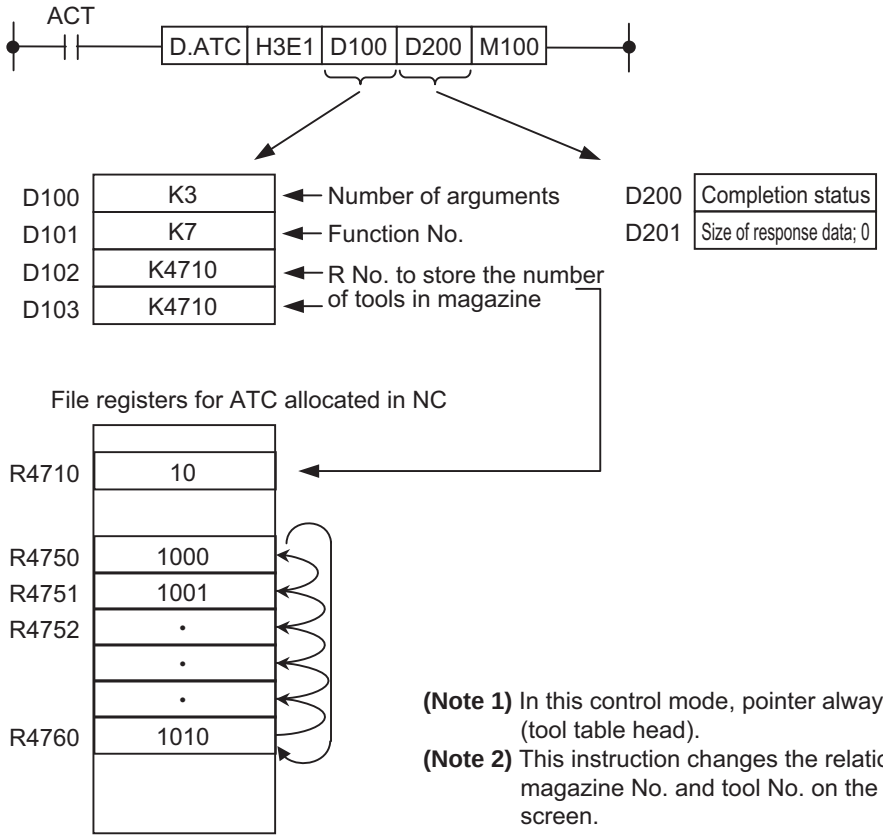
Pointer No. is decremented

When a magazine with 10 tools is used, for example, the control sequence is as follows:
2,1,0,9...2,1,0,9,8,...1,0,9...

(Note 1) This instruction changes the relation between magazine No. and tool No. on the tool registration screen.

Forward run of tool table

This instruction is used to rotate the tool table in accordance with the magazine rotation.

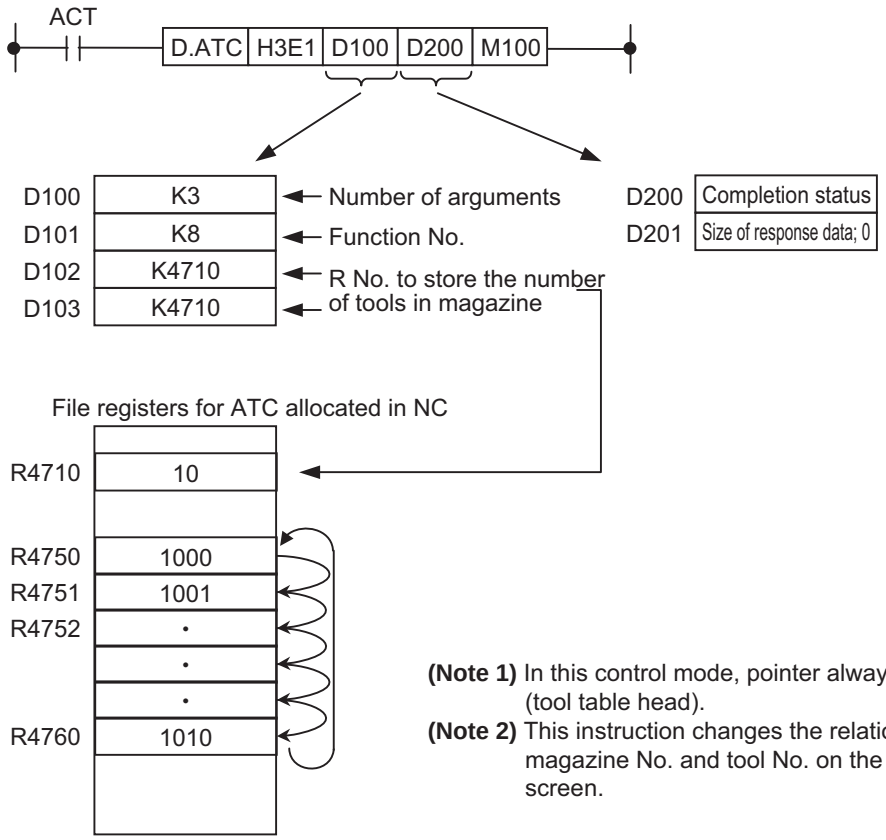


(Note 1) In this control mode, pointer always indicates "0" (tool table head).

(Note 2) This instruction changes the relation between magazine No. and tool No. on the tool registration screen.

Reverse run of tool table

This instruction is used to rotate the tool table in accordance with the magazine rotation.

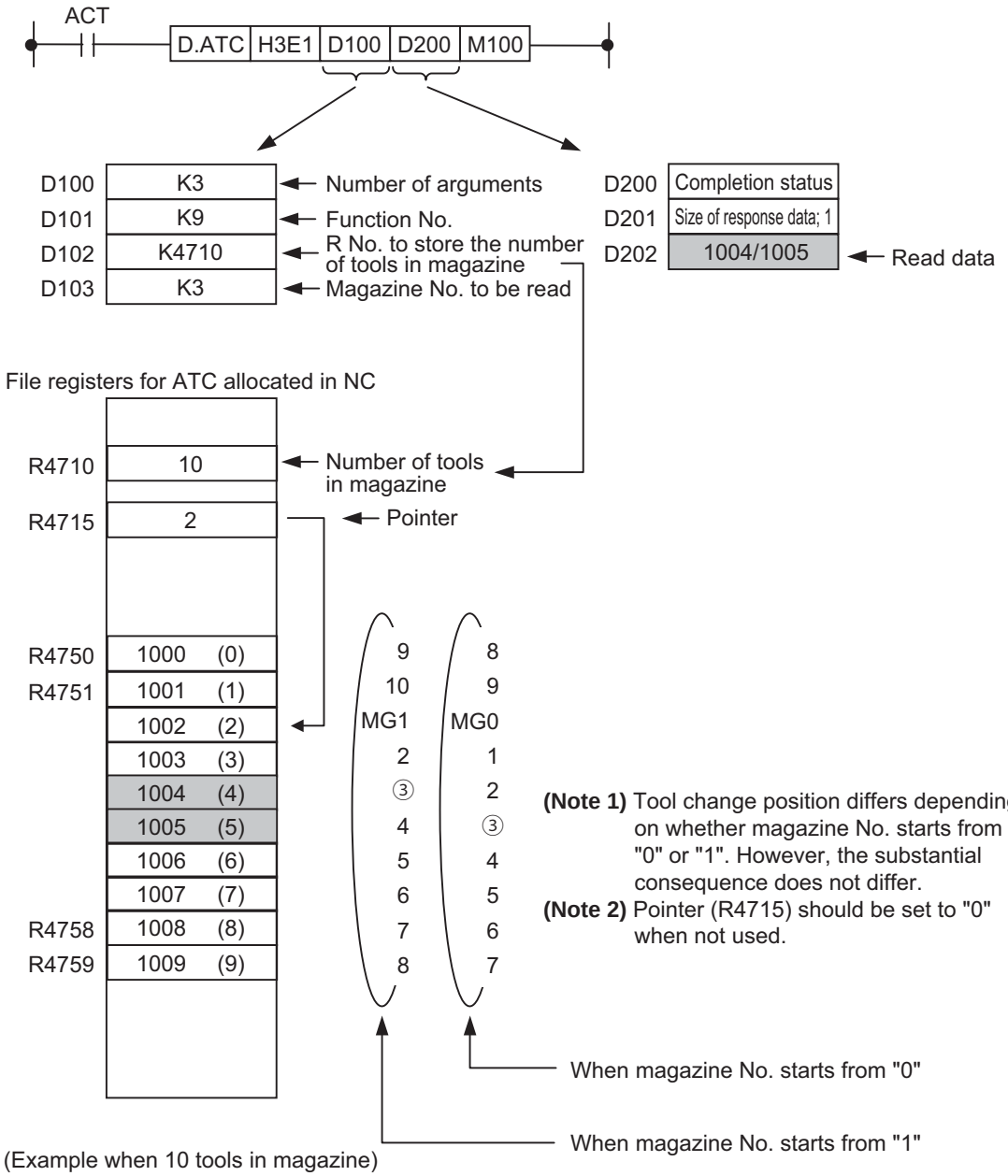


(Note 1) In this control mode, pointer always indicates "0" (tool table head).

(Note 2) This instruction changes the relation between magazine No. and tool No. on the tool registration screen.

Tool data read

This instruction is used to read out a specific tool No. in the magazine.

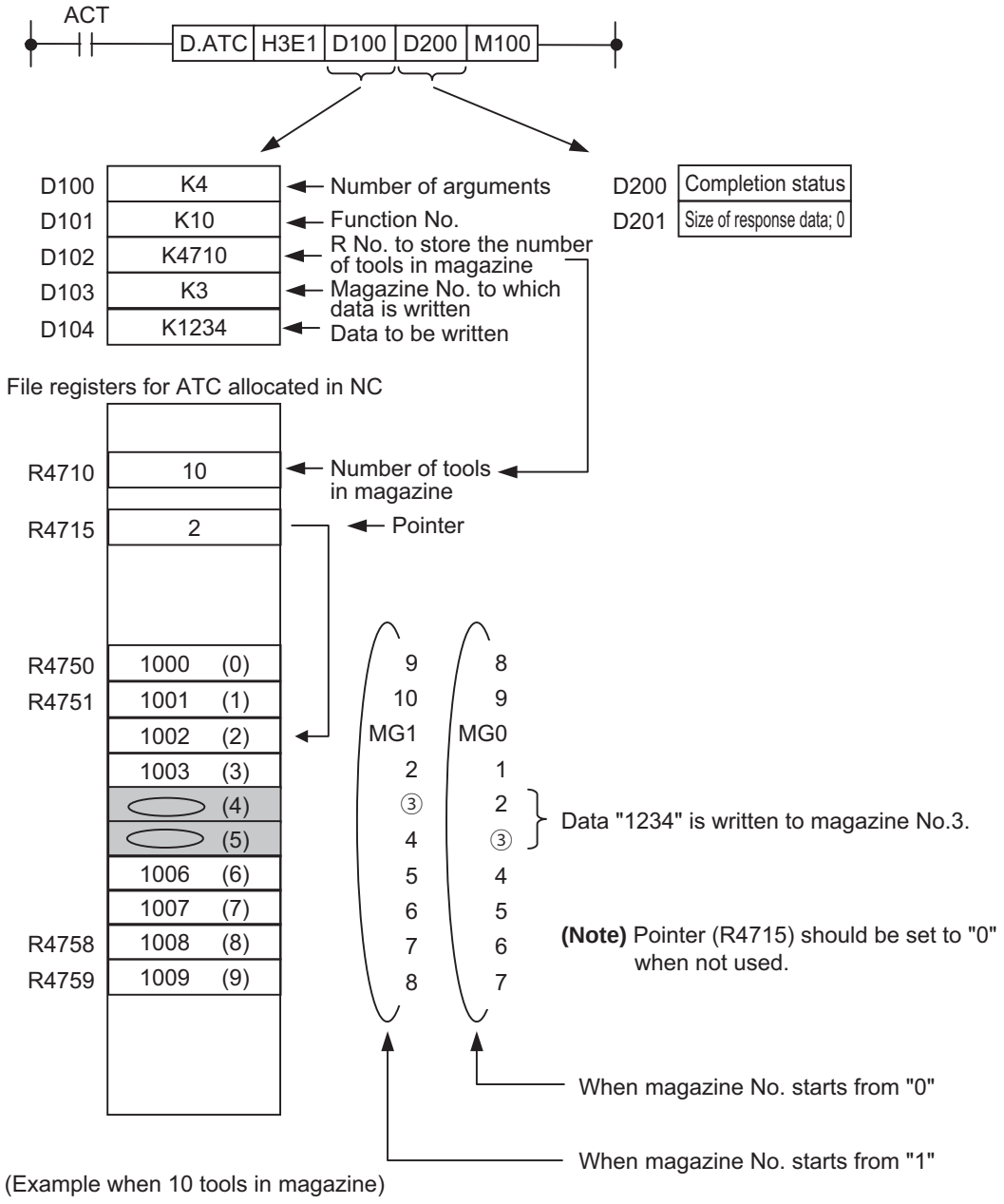


(Note 1) Tool change position differs depending on whether magazine No. starts from "0" or "1". However, the substantial consequence does not differ.

(Note 2) Pointer (R4715) should be set to "0" when not used.

Tool data write

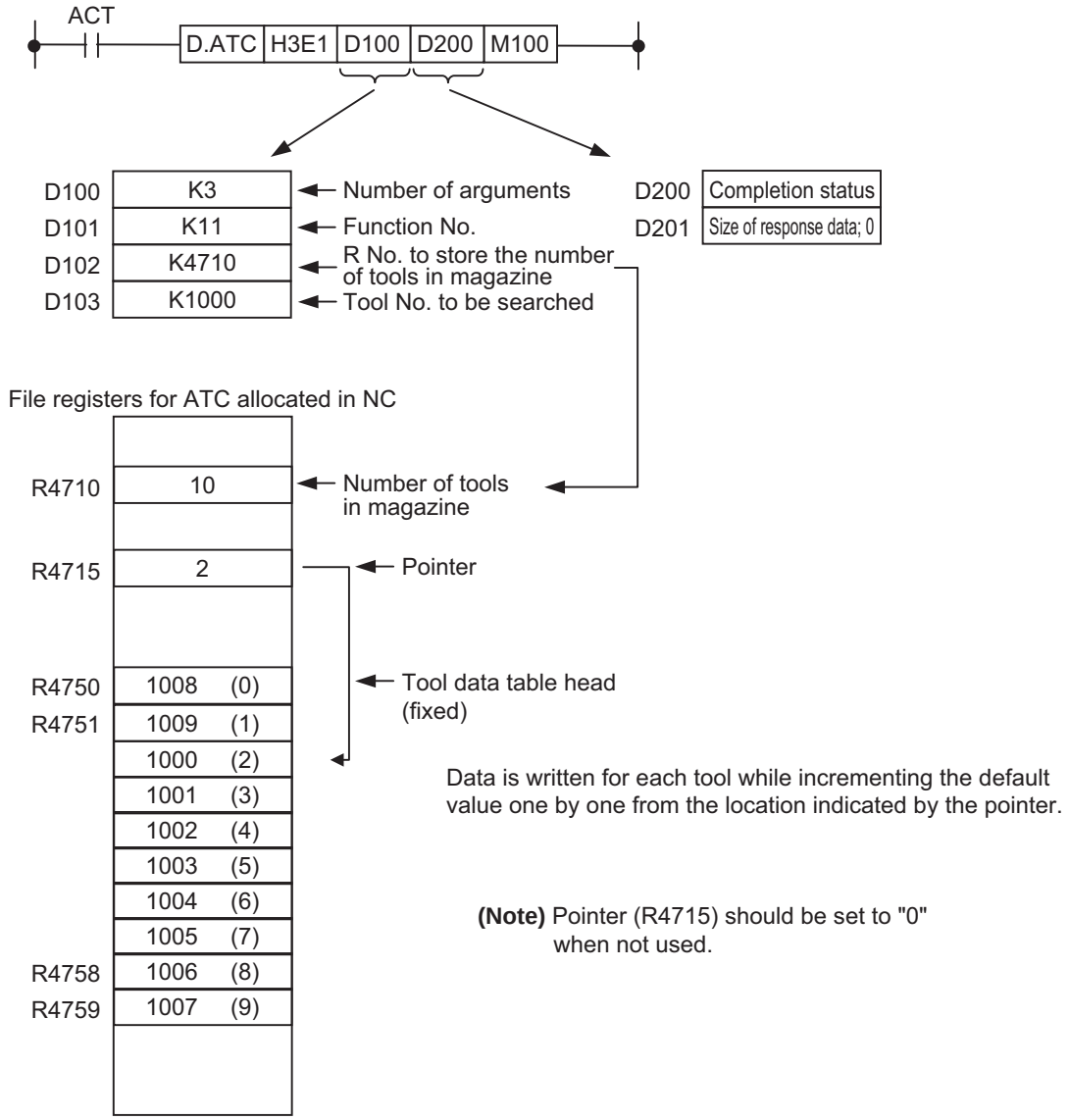
This instruction is used to write a tool No. to each magazine No. through PLC program, instead of using the setting and display unit.



(Example when 10 tools in magazine)

Automatic tool data write

All tool Nos. are written in batch. This instruction is used for initialization and so on.
Data is written for each tool while incrementing the default value one by one.



(Example when 10 tools in magazine)

8.2 ROT Instruction

With this instruction, the rotary body's target position and rotation direction are determined, as well as the function as a is realized.

This is used when calculating the rotation direction or number of index steps of the magazine and turret, etc. based on the output data figured with tool No. search of ATC instruction, or used when controlling the rotary body position.

8.2.1 Instruction List

Instruction	Description
D.ROT S1 D1 D2n	Rotary body indexing/ring counter

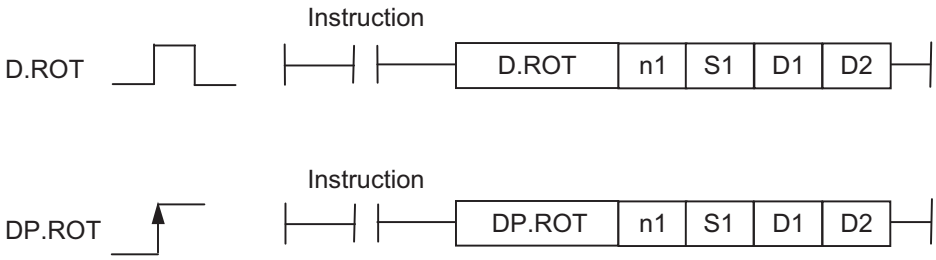
8.2.2 Format of ROT Instruction

(1) Available devices

Setting data	Available devices															
	Internal user device/ Internal system device				File register		In-direct desig-nation	Link direct device (J □ \ □)			Unit access device (U □ \G □)		Index register (Z □)	Constant		Others
	Bit	Word			Bit	Word		Bit	Word		Bit	Word		Decimal, hexa-decimal (K,H)	Real number string	
			Digit desig-nation A	Digit desig-nation B						Digit desig-nation						
n1	—	○	○	○	—	○	○	—	—	—	—	—	—	○	—	—
S1	—	○	—	—	—	○	○	—	—	—	—	—	—	—	—	—
D1	—	△ (Note)	—	—	—	△ (Note)	—	—	—	—	—	—	—	—	—	—
D2	△ (Note)	—	—	—	△ (Note)	—	—	—	—	—	—	—	—	—	—	—

(Note) Local devices are not available.

[Instruction symbol] [Execution condition]



(2) Setting data

Setting data	Details	Setting range	Setting side	Data type
n1	Head I/O No. of target CPU divided by 16 For CPU No. 2 to 4: H3E1 to H3E3	3E1h to 3E3h	User	BIN16 Bit
S1	Head device that stores the control data for request data	—	User	Word
D1	Head device that stores the control data for response data	—	System	Word
D2	Completion device that goes ON for 1 scan when an instruction is completed.	—	System	Bit

(3) (S1) Control data for request data

Device	Item	Setting data	Setting range	Setting side
S1+0	Number of arguments	Set the number of words of arguments to store in the control for the request data.	4、5	User
S1+1	Function No.	Designate the No. of function to command.	1、3	User
S1+2	Parameter	Set the parameter that designates the specifications of rotary body to control.	—	User
S1+3 to S1+5	Argument 1 to 3	Stores the arguments corresponding to the designated function No. Refer to "(1) Control data for request data" in "8.2.3 Functions".	—	User

(4) (D1) Control data for response data

Device	Item	Setting data	Setting range	Setting side
D1+0	Completion status	Stores the status when an instruction has been completed. 0: No error (Successfully completed) Others: Error codes (Note)	—	System
D1+1	Size of response data	Set the size (number of words) of data to store in the control data for response data.	0 to 2	System
D1+2	Response 1	Stores the response data corresponding to the designated function No. Refer to "(2) Control data for response data" in "8.2.3 Functions".	—	System
D1+3	Response 2			

(Note) For error codes other than "0", see "8.3.3 Completion Status Information".

(5) (D2) Completion device

Device	Item	Setting data	Setting range	Setting side
D2+0	Completion device	Goes ON for 1 scan when an instruction is completed.	0/1	System
D2+1		Goes ON with D2+0 upon abnormal completion.	0/1	System

(6) Availability of instruction execution for each type

No.	Type of execution	Availability
1	Initial program	Available
2	Scan program	Available
3	Fixed-interval program	Available (Note)
4	Interrupt program	Available (Note)

(Note) Completion device, which is ON only for 1 scan, is not recognized in the sequence program (execution type) with long cycle time. The device is basically programmed in a scan.

8.2.3 Functions

This instruction is used to determine the rotary body's target position, rotation direction, etc. in the target CPU.
D(P).ROT instruction has 2 functions. Operations of the instruction are decided by the function No. stored in (S1+1). The number of arguments stored in (S1+0) is also decided according to the function No. stored in (S1+1).

Contents and number of data, stored in the control data for request data, differ according to the function No. in (S1+1). Contents and number of responses, stored in control data for response data, also differ.
The following tables show the contents of the control data for request data, which are set according to the function No., and the contents of responses, which are stored in the control data for response data.

(1) Control data for request data

S1+0) Number of arguments	(S1+1)		(S1+2)	(S1+3)	(S1+4)	(S1+5)
	Function No.	Type of instruction				
5	1	Rotary body indexing	Parameter	Current position	Target position	Number of rotary body indexing cycles
4	3	Ring counter	Parameter	R No. to specify ring counter	Number of rotary body indexing cycles	—

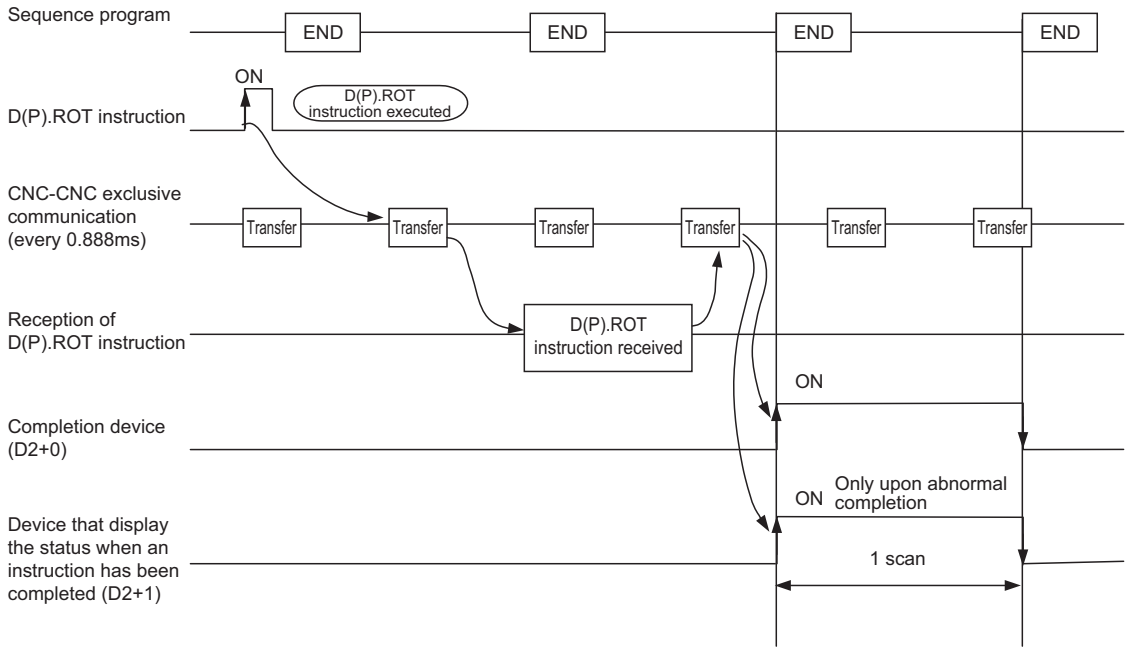
(2) Control data for response data

Function No.	Type of instruction	(D1+0)	(D1+1)	(D1+2)	(D1+3)
1	Rotary body indexing	Completion status	Size of response data; 2	Number of output steps	Rotary direction 0:CW 1:CCW
3	Ring counter	Completion status	Size of response data; 0	—	—

8.2.4 Operation Outline

The following chart shows the outline of operation between CPUs when D(P).ROT instruction is executed.
If (D2+1) has been turned ON, the instruction is abnormally completed. Then the data is stored in completion status (D1+0).For the values stored, see "8.3.3 Completion Status Information".

<Operation outline when an instruction is executed>



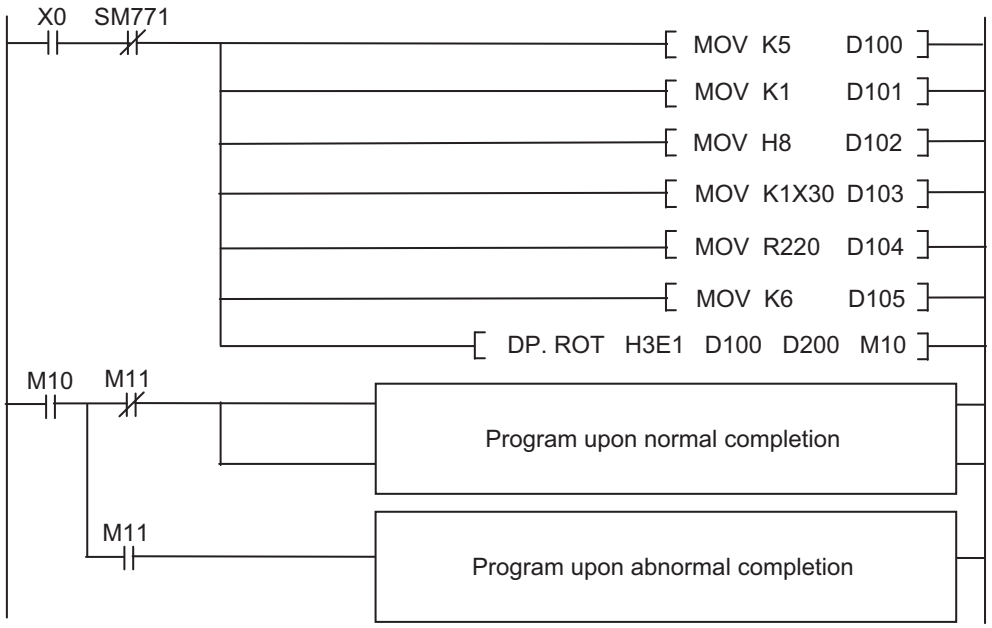
8.2.5 Errors

SM0 is turned ON and the error code is stored in SD0 when:
- “Head I/O No. of target CPU divided by 16” (n1) specified the CPU already been reserved or has not been mounted.
(Error code: 2110<SP. UNIT ERROR>)
- "Head I/O No. of target CPU divided by 16" (n1) specified the operating CPU itself.
(Error code: 2114<SP. UNIT ERROR>)
- "Head I/O No. of target CPU divided by 16" (n1) specified the CPU that does not correspond to the exclusive instructions in this section.
(Error code: 2117<SP. UNIT ERROR>)
- "Head I/O No. of target CPU divided by 16" (n1) specified the invalid value (not within 3E0H to 3E3H).
(Error code: 4100<OPERATION ERROR>)

CNC CPU outputs the following error codes to the completion status when:
- An invalid function No. (other than 0 and 3) was specified. (Error code: 3200)
- An invalid number of rotary body indexing cycles (negative) was specified. (Error code: 3204)
- An invalid current position was set. (Error code: 3205)
- An invalid parameter was specified (calculation does not result to 11). (Error code: 3206)
- An invalid number of arguments was specified. (Error code: 3207)

8.2.6 Program Example

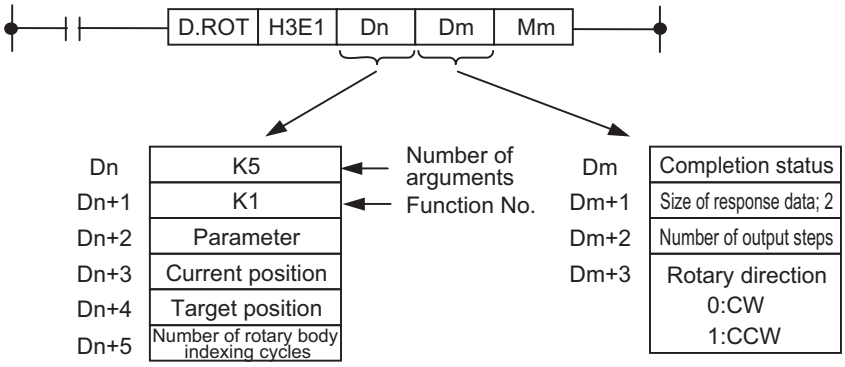
(1) Executes an ROT instruction (tool No. search) on CPU No.2 (Q17nNCCPU) when X0 is turned ON.



8.2.7 Details of Each Instruction

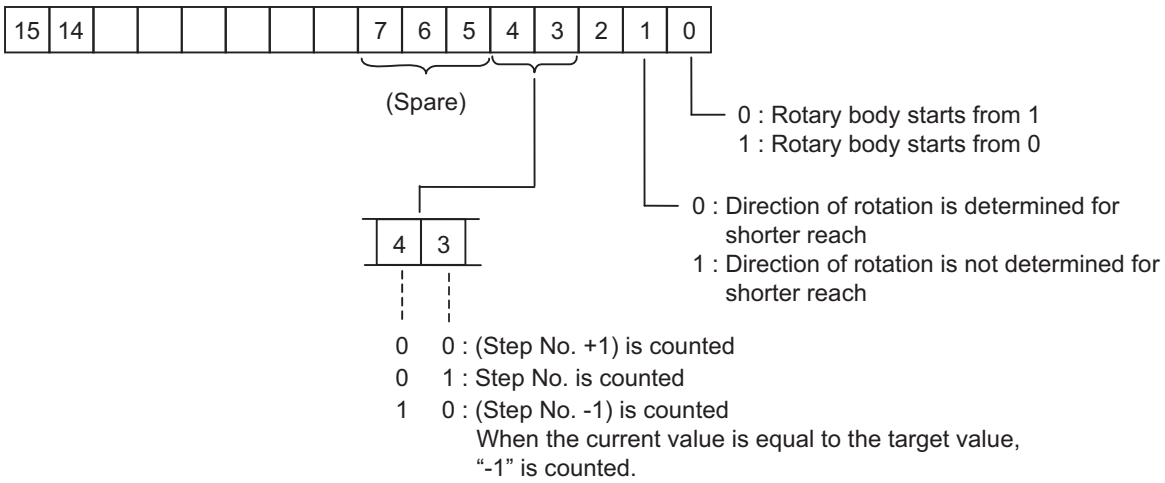
Rotary body indexing

Direction of rotation and number of steps of ATC magazine (or turret) are determined.



(Note) CW or CCW output is controlled so that it takes a short circuit regardless of parameter specification.

Contents of Rp(parameter)

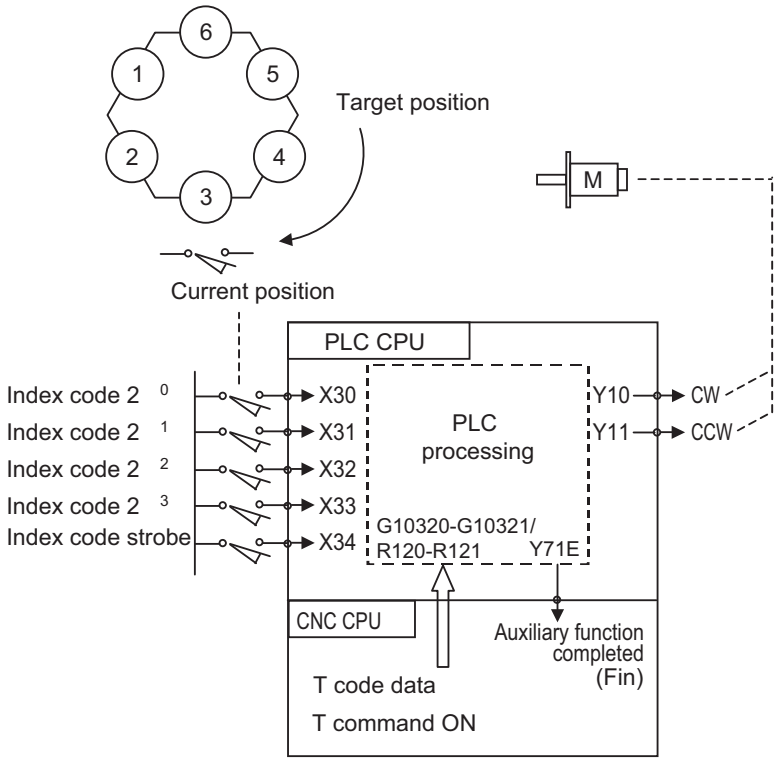


(Example) Rotary body index by ROT-Function No.1 instruction

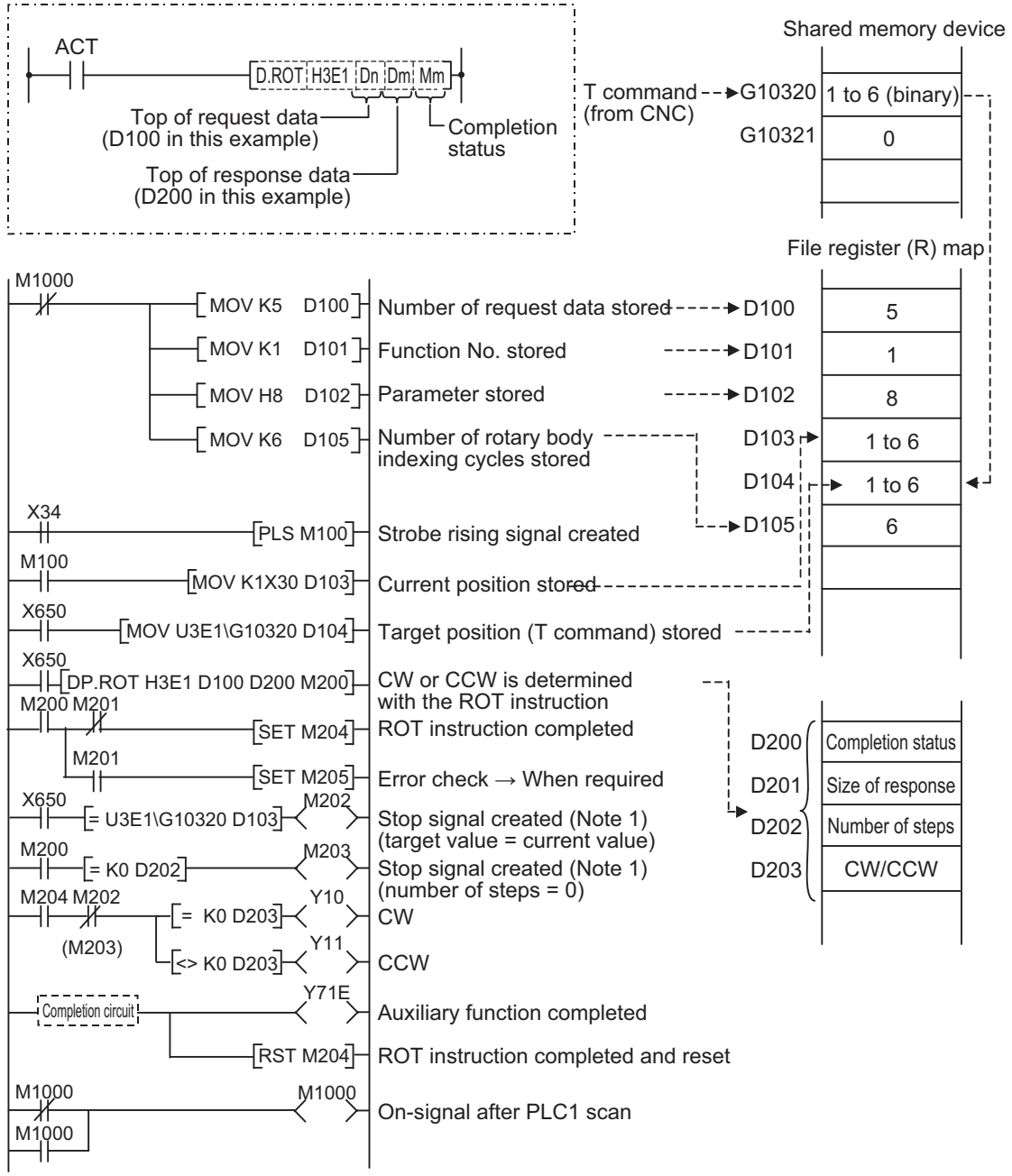
Conditions

(i) The number of rotary body index is 6.

(ii) The target position is set with the T command. The T command is set with the parameters so that it outputs to the PLC with a binary. (Set base specification parameter Tbin to 1.)



In the example of ladder circuit shown below, the rotation direction is determined by the T command and current position data given by the machine, and the rotary body is rotated in that direction until the target position reaches the current position. When indexing is completed, the auxiliary command completion signal is turned ON.



(Note 1) Either M202 or M203 can be used for a stop signal.

(Note 2) The X and Y devices used above are set on the premise that the data is transferred to the device that coincides with the CNC internal device.

(Note 3) The D devices are used in this example for no special purpose. Use any device within the available range.

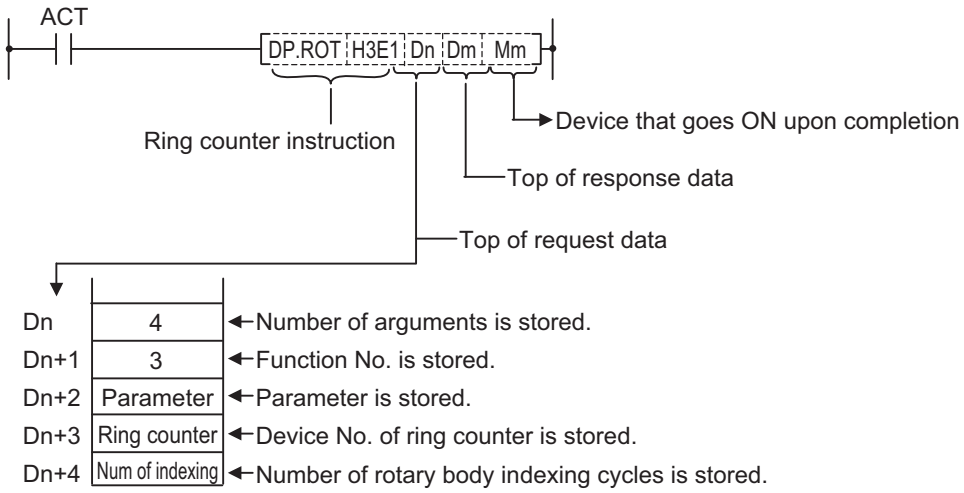
(Note 4) If a value from 1 to 6 has not been set for current position data (D103) before the ROT instruction is issued, an error will occur.

(Note 5) The contents of the control parameter (D102) is as follow:

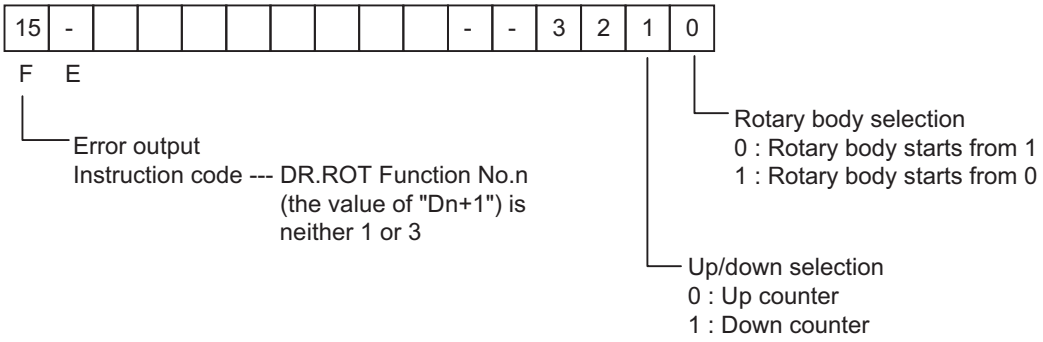
- Rotary body starts from 1
- Take a short cut.
- Calculate the number of steps.

Ring counter (Up/down counter)

This instruction is used to control position of rotary body.



The ring counter is a binary counter; it is used as an up/down counter of "start from 0" or "start from 1" according to the parameter rotary body selection.
For ring counter, specify the device No. of CNC internal device on which up/down operation is executed.



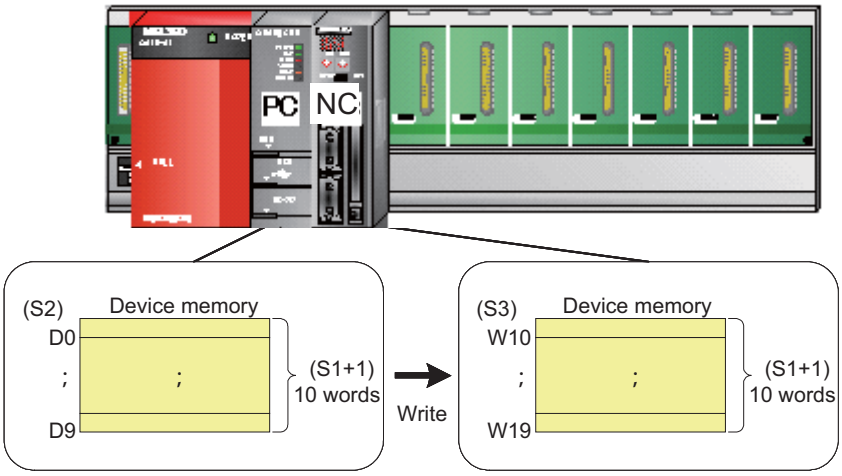
(Note 1) The ring counter instruction is executed after setting R No. to Rn to Rn+1 and specifying data for the parameter.

(Note 2) The error completion (Mm) of the ring counter instruction and the error output in bit F of the parameter (Rp) are cleared when the activating signal (ACT) goes OFF. The activating signal (ACT) of the ring counter instruction is generally pulsed. This makes it hard for the interface diagnostic and ladder monitor programs to detect an error signal. For debugging, therefore, an error hold circuit is provided after the ring count instruction to ease error detection.

8.3 D (P).DDWR Instruction

This instruction is to execute a batch data write from PLC CPU to a device in another CPU.

DDWR instruction image figure



8.3.1 Format of DDWR Instruction

(1) Available devices

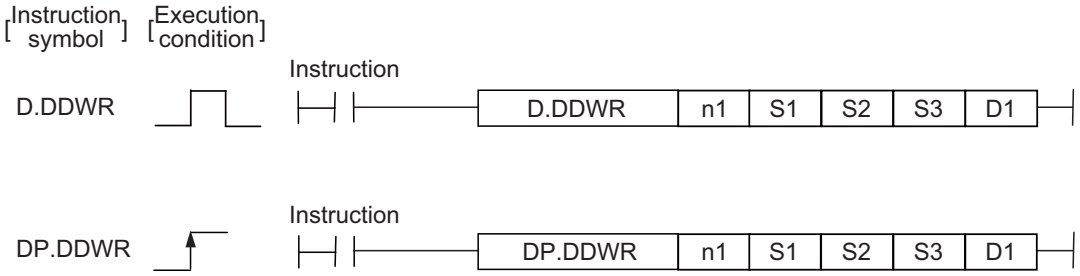
Setting data Note 1	Usable device															
	Internal user device/ Internal system device				File register		In-direct design ation	Link direct device (J □ \ □)			Unit access device (U □ \G □)		Index register (Z □)	Constant		Others
	Bit	Word			Bit	Word		Bit	Word		Bit	Word		Decimal, hexa-decimal (K,H)	Real Num-ber String	
			Digit designation A	Digit designation B						Digit designation						
n1	—	○	○	○	—	○	○	—	—	—	—	—	—	○	—	—
S1	—	△ Note 2	—	—	—	△ Note 3	○	—	—	—	—	—	—	—	—	—
S2	—	○	○	—	—	○	○	—	—	—	—	—	—	—	—	—
S3	—	○	—	—	—	○	○	—	—	—	—	—	—	—	○	—
D1	△ Note 2	—	—	—	△ Note 3	—	—	—	—	—	—	—	—	—	—	—

○ : Available to designate △ : Partially available to designate

(Note 1): Index qualification can be used for setting data (n1) to (D1).

(Note 2): Local devices cannot be used.

(Note 3): Each program's file register cannot be used.



(2) Setting data

Setting data	Settings	Setting side	Data type
n1	Head I/O No. of target CPU divided by 16 The followings are the values actually assigned. No. 2: H3E1 No. 3: H3E2 No. 4: H3E3 (Note) NC CPU cannot be No.1 with multi-CPU configuration.	User	BIN16 Bit
S1	The host CPU's head device which stores control data.	User	Word
S2	The host CPU's head device which stores the write data.	User	Word
S3	The target CPU unit's head device which stores the write data.	User	Word
D1	Completion device (D1+0): Completion device that goes ON for 1 scan at the completion of the instruction. (D1+): Device that goes ON for 1 scan at the abnormal completion of the instruction. (D1+0 will also be turned ON at the abnormal completion)	System	Bit

(3) Control data

Device	Item	Setting data	Setting range	Setting side
S1+0	Completion status	Stores the status when an instruction has been completed. 0: No error (Successfully completed) Other than 0: Error code	—	System
S1+1	Number of write data	Set the number of write data with word unit.	1 to 100	User

Details of control

In multi-CPU configuration, the data stored in each of the host CPU's devices starting from the one specified with (S2) by the number specified with (S1+1) are copied. The copied data are stored in each of the devices starting from the one specified with (S3) of the target CPU (n1).
Bit device digit designation is available for (S2) and (S3). However, it is 4-digit designation and only a multiple of 16 is available for the start bit device No. If the value other than that is designated, MULTI-COM.ERROR [4353] will occur.
D(P).DDWR instruction being accepted and normal/abnormal completion can be confirmed with the status display device (D1+1) at the completion of completion device (D1).

(a) Completion device
It turns ON for the scan END process at the instruction completion, and turns OFF for the next END process.

(b) State display device at completion
It turns ON/OFF depending on the condition at the instruction completion.
- Successfully completed: It stays OFF.
- Abnormal completion: It turns ON for the scan END process at the instruction completion, and turns OFF for the next END process.
(Error code will be stored in the control data (S1+0: completion status) at the abnormal completion.)

NC devices that can write with DDWR instruction are shown below.

Usable NC devices

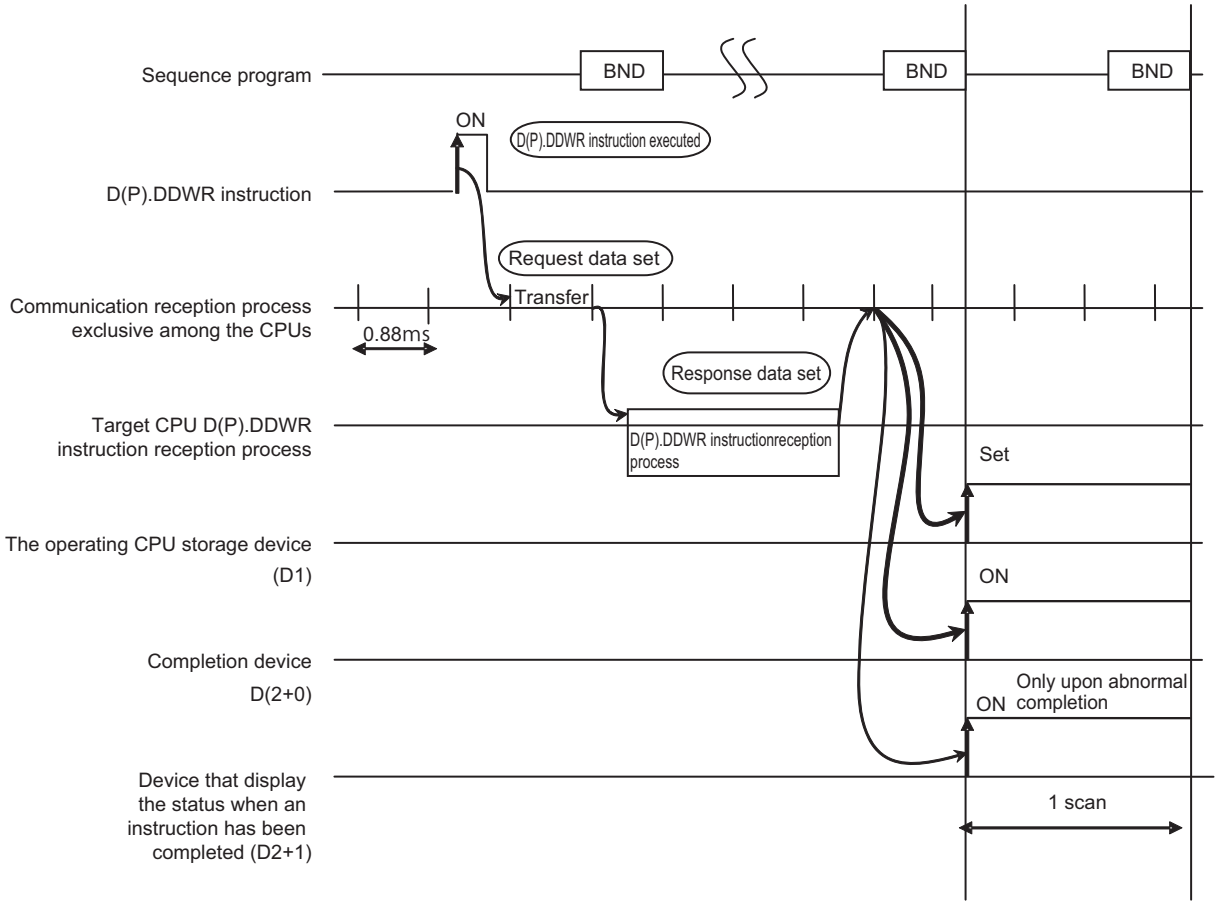
Device	Usable device range	Representation
W	0 to 1FFF	Hexadecimal
ZR	0 to 4184063 (Note 1)(Note 2)	Decimal

(Note 1) If a specified device is write-disabled, an error occurs (error code: 3001(HEX)).
(Note 2) The ZR devices ZR60000 to ZR67999 are used for reading and writing common variables.
For details, refer to "8.5 Read/Write of Common Variables".

8.3.2 Operation when executing the DDWR instruction

The following chart shows the outline of operation between CPUs when D(P).DDWR instruction is executed.

<The outline of operation between CPUs>



Precautions

- Execute this instruction when the target NC CPU has started up. It cannot be executed without starting up the target CPU. (No process will occur.)
- After executed this instruction, do not change the device range etc. which is designated in the setting data until the completion device is turned ON. If the change is made, data (the completion status and completion device) to be stored in the system cannot be stored correctly.
- When executing this instruction without empty block for the exclusive instruction transmission area, it will be abnormal completion. Abnormal completion because of not having the empty block for the exclusive instruction transmission area can be avoided by using a flag for with/without the exclusive instruction transmission area empty block (SM796 to 799) as the instruction interlock.

8.3.3 Error contents

Abnormal completion occurs in the following cases, and the error code will be stored in the device which is designated by the completion status storage device (S1+0).

Completion status error code	Error factors	Remedy
0010 (HEX) (16)	The instruction request from PLC CPU to NC CPU exceeds the tolerance. (No empty block for the exclusive instruction transmission area.)	Decrease the number of instructions to execute at a time and adjust them to be within the tolerance.
3001 (HEX) (12289)	The device which is designated by the program cannot be used with NC CPU. Or outside the device range.	Refer to "Device" of "(3) Control data" and designate the usable device with NC CPU.
3080 (HEX) (12416)	The number of write data which is set with D(P).DDWR instruction is illegal.	Set the number of read data 1 to 100.
3209 (HEX) (12809)	The common variable control data is not set correctly in the D(P).DDWR instruction.	Set the common variable control data correctly.

(Note) The error code is written in hexadecimal and base-10.

8.3.4 Calculation error

In the following cases, the calculation error occurs, the diagnosis error flag (SM0) turns ON, and an error code will be stored in the diagnosis error register (SD0).

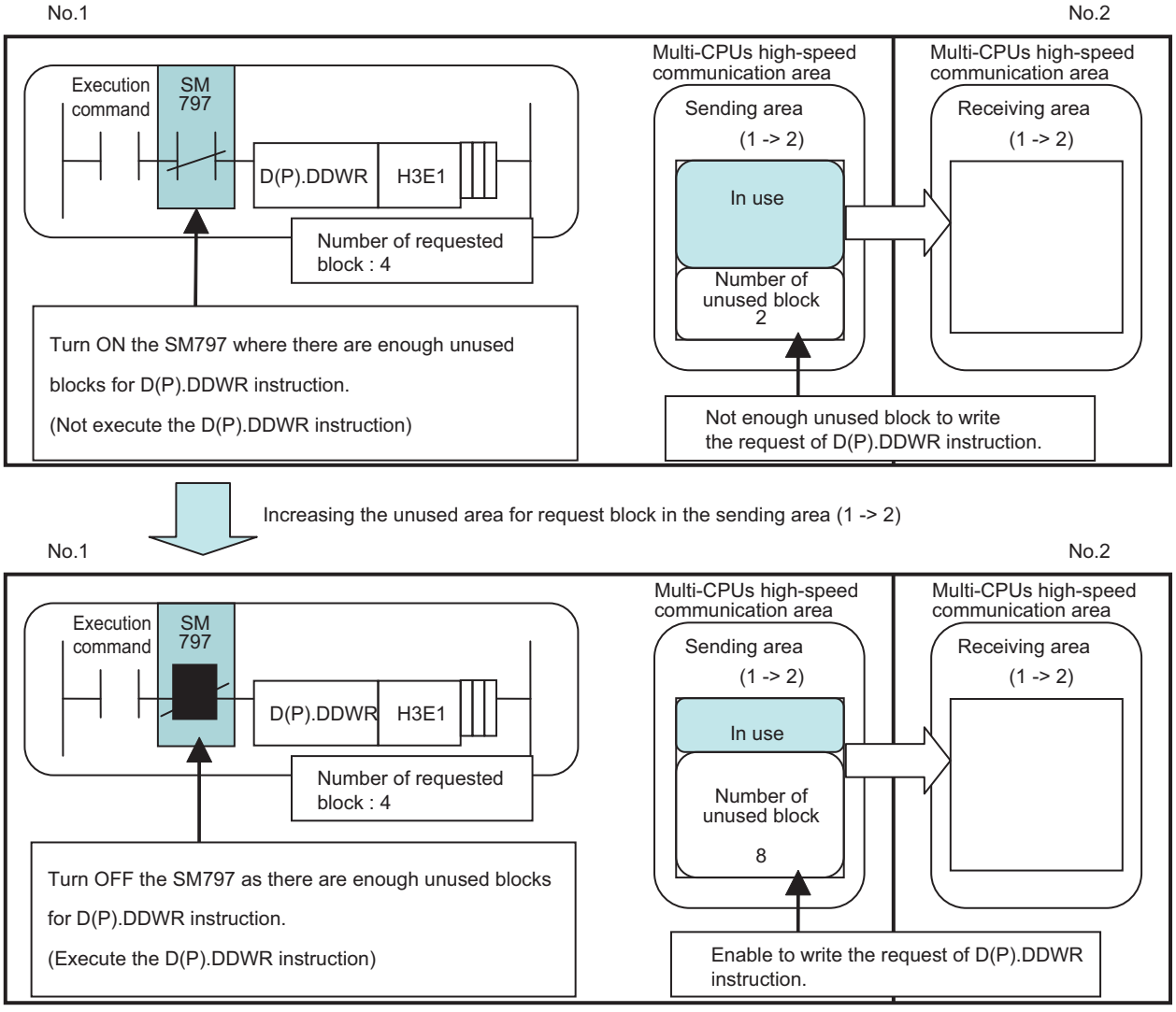
Error code	Error factors	Remedy
10FE (HEX) (4350)	An incorrect target CPU unit was selected by the instruction set in the program. (1) The designated unit has already been reserved. (2) CPU which is not mounted is designated. (3) Head I/O No. of target CPU unit divided by 16 (n1) is not within 3E0H to 3E3H.	Read the common information of the error using a programming tool, check error step corresponding to its numerical value (program error location), and correct the problem.
10FF (HEX) (4351)	The designated target CPU cannot be executed. (1) The instruction name is incorrect. (2) The instruction which is not supported by the target CPU is executed.	
1100 (HEX) (4352)	An incorrect number of devices are designated in the program.	
1101 (HEX) (4353)	An unusable device is designated in the program.	
1102 (HEX) (4354)	An unusable character string is designated in the program.	
1104 (HEX) (4355)	The number of write data is outside the range of 1 to 100.	
1005 (HEX) (4101)	The number of write data is outside the range of the write data's storage device.	

(Note) The error code is written in hexadecimal and base-10.

8.3.5 Interlock using the PLC instruction exclusive for NC

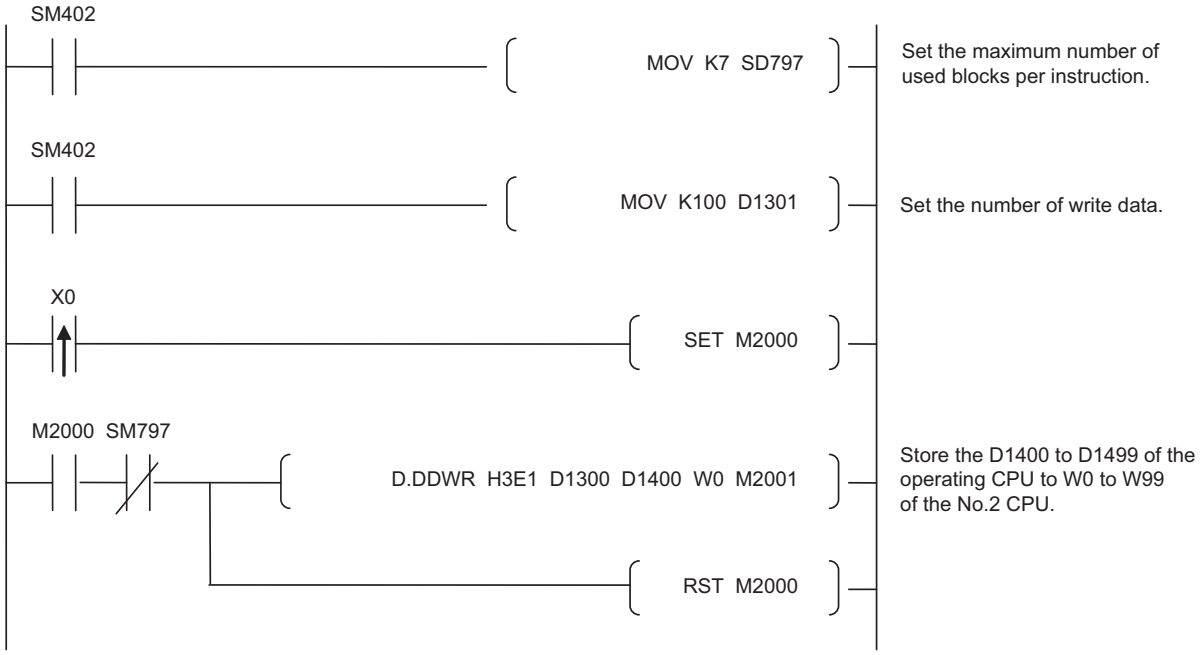
Special relay SM796 to SM799 (block information used for instruction exclusive for Multi CPU high speed transmission) can be used as an interlock when using the PLC instruction exclusive for NC.
When a number of Multi CPU high speed transmission instructions are executed at once, use SM796 to SM799 as an interlock for Multi CPU high speed transmission instructions.

When using special relay SM796 to SM799, set the maximum number of blocks used for special register SD796 to SD799 of each CPU. (Maximum number of blocks that DDWR instruction uses is 7 and a DDRD instruction uses is 1.)
When the Multi CPU high speed transmission area becomes less than the number of blocks set in the SD796 to SD799, corresponding special relay (SM796 to 799) will be turned ON.



8.3.6 Program example

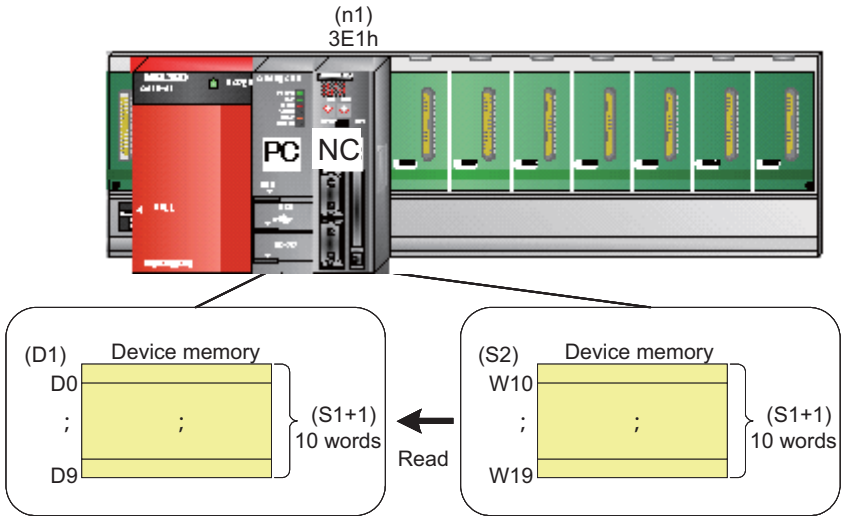
(Example) A program which executes the D.DDWR instruction to the CPU No.2 when SM796 to 799 is used as an interlock and X0 has started up.



8.4 D(P).DDRD Instruction

This instruction is to read the device data in the other CPUs to the PLC CPU.

DDRD instruction image figure



8.4.1 Format of DDRD Instruction

(1) Usable devices

Setting data *1	Usable device															
	Internal user device/internal system device				File register		Indirect designation	Link direct device (J □ \ □)			Unit access device (U □ \G □)		Index register (Z □)	Constant		Others
	Bit	Word			Bit	Word		Bit	Word		Bit	Word		Decimal, hexa-decima (K,H)	Real character string	
			Digit designation A	Digit designation B						Digit designation						
n1	–	○	○	○	–	○	○	–	–	–	–	–	–	○	–	–
S1	–	△ Note 2	–	–	–	△ Note 3	○	–	–	–	–	–	–	–	–	–
S2	–	○	○	–	–	○	○	–	–	–	–	–	–	–	○	–
D1	–	△ Note 2	△ Note 2	–	–	△ Note 3	○	–	–	–	–	–	–	–	–	–
D2	△ Note 1	–	–	–	△ Note 3	–	–	–	–	–	–	–	–	–	–	–

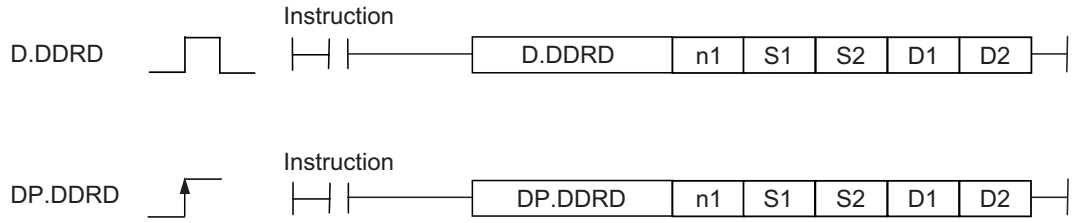
○ : Available to designate △ : Partially available to designate

(Note 1) Index qualification can be used for setting data (n1) to (D1).

(Note 2) Local devices are not available.

(Note 3) Each program's file register cannot be used.

[Instruction symbol] [Execution condition]



(2) Setting data

Setting data	Settings	Setting side	Data type
n1	Head I/O No. of target CPU divided by 16 The followings are the values actually assigned. No. 2: H3E1 No. 3: H3E2 No. 4: H3E3 (Note) Motion CPU cannot be No.1 with multi-CPU configuration.	User	BIN16 Bit
S1	The host CPU's head device which stores control data.	User	Word
S2	The target CUP unit's head device that the data to be read is stored.	User	Word
D1	The host CPU's head device that stores the read data.	User	Word
D2	Completion device (D1+0): Completion device that goes ON for 1 scan at the completion of the instruction. (D1+1): Device that goes ON for 1 scan at the abnormal completion of the instruction. (D1+0 will also be turned ON at the abnormal completion)	System	Bit

(3) Control data

Device	Item	Setting	Setting range	Setting side
S1+0	Completion status	Stores the status when an instruction has been completed. 0: No error (Successfully completed) Other than 0: Error code	–	System
S1+1	Number of read data	Set the number of read data with word unit.	1 to100	User

Details of control

In multi-CPU configuration, the data stored in each of the devices starting from the one specified with (S2) of the target CPU (n1) by the number specified with (S1+1) are copied. The copied data are stored in each of the host CPU's devices starting from the one specified with (D1).
Bit device digit designation is available for "S2" and "D1". However, it is 4-digit designation and only a multiple of 16 is available for the start bit device No. If the value other than that is designated, MULTI-COM.ERROR [4353] will occur.
D(P).DDRD instruction being accepted and normal/abnormal completion can be confirmed with the status display device (D2+1) at the completion of completion device (D2).

(a) Completion device
It turns ON for the scan END process at the instruction completion, and turns OFF for the next END process.

(b) State display device at completion
It turns ON/OFF depending on the condition at the instruction completion.
- Successfully completed: It stays OFF.
- Abnormal completion: It turns ON for the scan END process at the instruction completion, and turns OFF for the next END process.
(Error code will be stored in the control data (S1+0: completion status) at the abnormal completion.)

NC devices that can write with DDRD instruction are shown below.

Usable NC devices

Device	Usable device range	Representation
W	0 to 1FFF	Hexadecimal
ZR	0 to 4184063 (Note 1)(Note 2)	Decimal

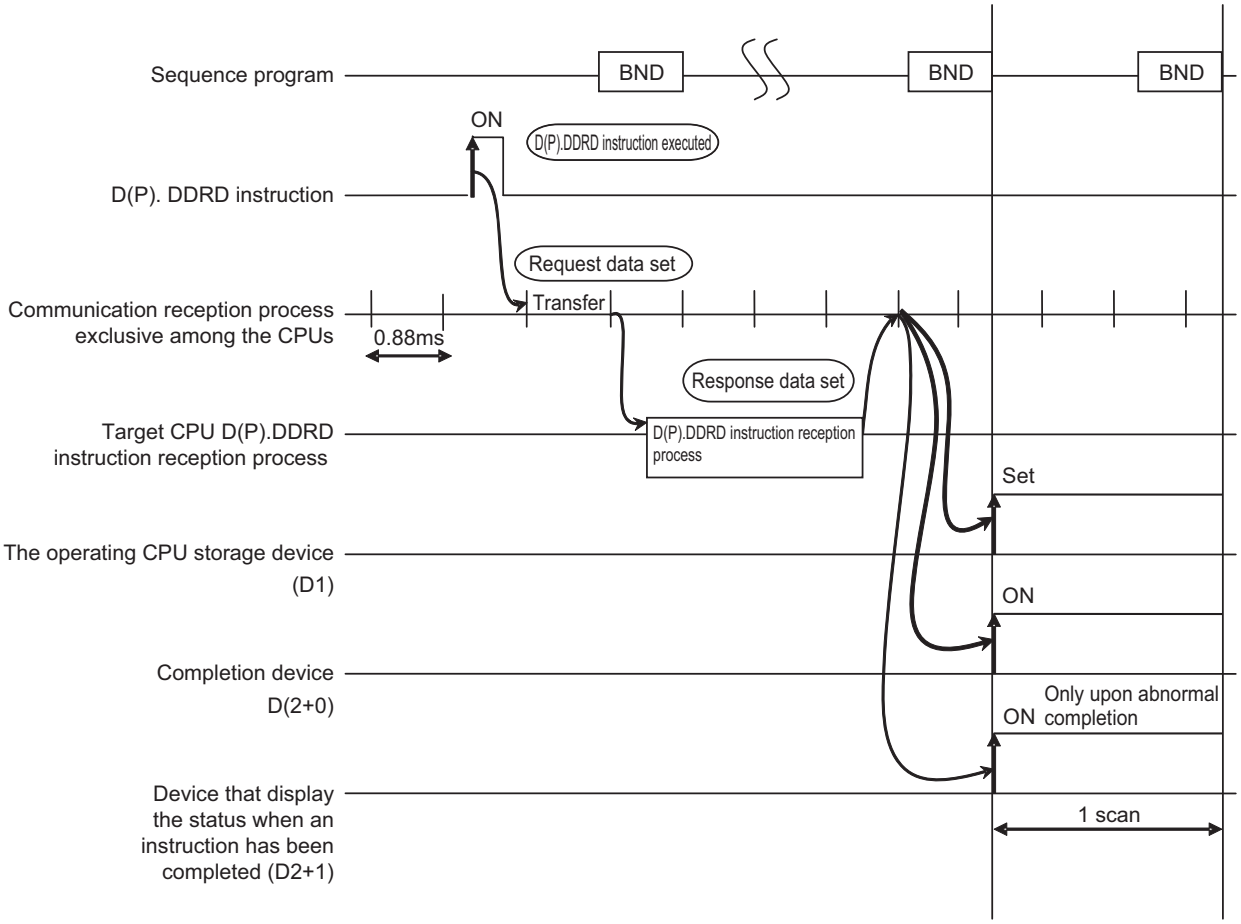
(Note 1) If a specified device is write-disabled, an error occurs (error code: 3001(HEX)).

(Note 2) The ZR devices from ZR60000 to ZR67999 are used for reading and writing common variables.
For details, refer to "8.5 Read/Write of Common Variables".

8.4.2 Operation when executing the DDRD instruction

The following chart shows the outline of operation between CPUs when D(P).DDRD instruction is executed.

The outline of operation between CPUs



Precautions

- Execute this instruction when the target NC CPU has started up. It cannot be executed without starting up the target CPU. (No process will occur.)
- After executed this instruction, do not change the device range etc. which is set in the setting data until the completion device is turned ON. If the change is made, data (the completion status and completion device) to be stored in the system cannot be stored correctly.
- When executing this instruction without empty block for the exclusive instruction transmission area, it will be abnormal completion. Abnormal completion because of not having the empty block for the exclusive instruction transmission area can be avoided by using a flag for with/without the exclusive instruction transmission area empty block (SM796 to 799) as the instruction interlock.

8.4.3 Error contents

Abnormal completion occurs in the following cases, and the error code will be stored in the device which is designated by the completion status storage device (S1+0).

Completion status error code	Error factors	Remedy
0010 (HEX) (16)	The instruction request from PLC CPU to Motion CPU exceeds the tolerance. (No empty block for the exclusive instruction transmission area.)	Decrease the number of instructions to execute at a time and adjust them to be within the tolerance.
3001 (HEX) (12289)	The device which is designated by the program cannot be used with NC CPU. Or outside the device range.	Refer to "Device" of "8.4.1 Format of DDRD Instruction" and designate the usable device with NC CPU.
3081 (HEX) (12417)	The number of write data which is set with D(P).DDRD instruction is illegal.	Set the number of read data 1 to 100.
3208 (HEX) (12808)	Any of the data specified in the D(P).DDRD instruction is overflowed.	This error may occur when a common variable value is got using the D(P).DDRD instruction. Change the setting so as not to get the common variable. Or change the setting of the common variable control data.

(Note) The error code is written in hexadecimal and base-10.

8.4.4 Calculation error

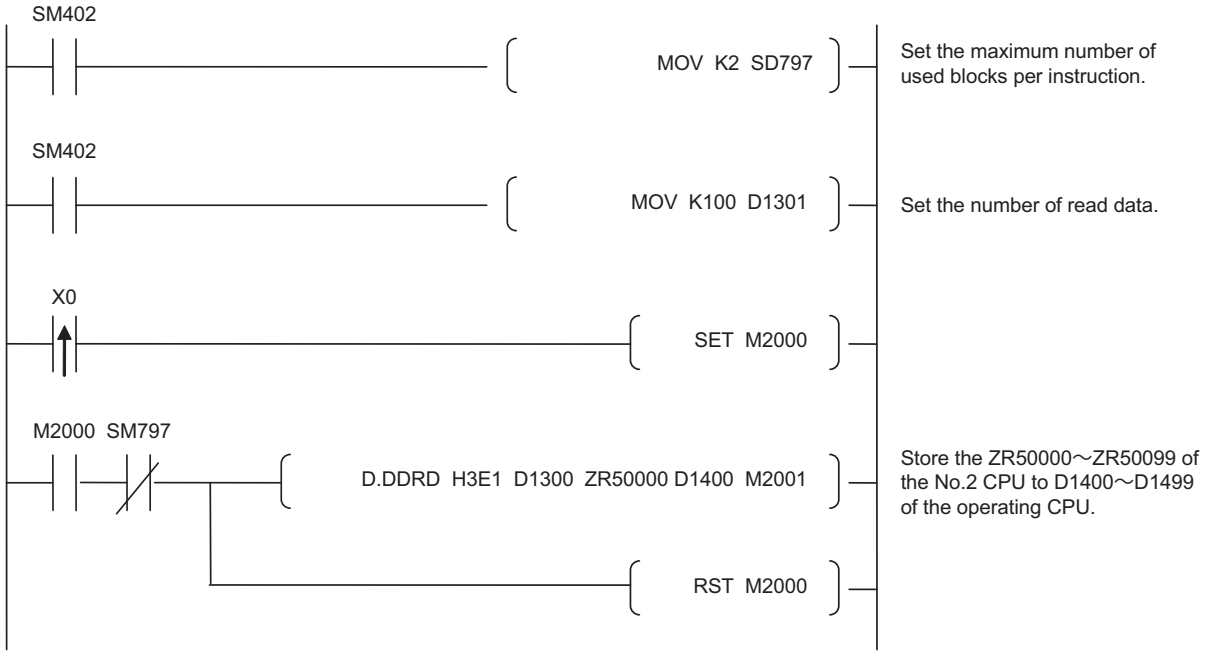
In the following cases, the calculation error occurs, the diagnosis error flag (SM0) turns ON, and an error code will be stored in the diagnosis error register (SD0).

Error code	Error factors	Remedy
10FE (HEX) (4350)	An incorrect target CPU unit was selected by the instruction set in the program. (1) The designated unit has already been reserved. (2) CPU which is not mounted is designated. (3) "Head I/O No. of target CPU unit divided by 16' (n1) is not within 3E0H to 3E3H.	Read the common information of the error using a programming tool, check error step corresponding to its numerical value (program error location), and correct the problem.
10FF (HEX) (4351)	The designated target CPU cannot be executed. (1) The instruction name is incorrect. (2) The instruction which is not supported by the target CPU is executed.	
1100 (HEX) (4352)	An incorrect number of devices is designated in the program.	
1101 (HEX) (4353)	An unusable device is designated in the program.	
1102 (HEX) (4354)	An unusable character string is designated in the program.	
1103 (HEX) (4355)	The number of write data is outside the range of 1 to 100.	
1105 (HEX) (4101)	The number of read data is outside the range of the reading data's storage device.	

(Note) The error code is written in hexadecimal and base-10.

8.4.5 Program example

(Example 1) A program which stores 100 words data from D400 of CPU No.2 in later than X0 of the host CPU when X0 turns ON.



8.5 Read/Write of Common Variables

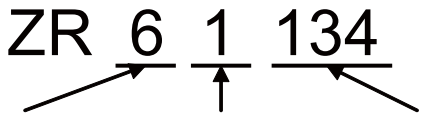
This section explains how to read and write common variables using the DDWR/DDRD instructions from the PLC.
To read and write common variables using the DDWR/DDRD instructions, specify the CNC side devices from between ZR60000 and ZR67199
The setting of common variable read/write can be changed by executing the common variable control data, which is described later, by using the DDWR instruction.
(Note 1) It is not possible to write "empty" data to a common variable using the DDWR instruction.
(Note 2) When an "empty" common variable is read using the DDRD instruction, "0" is loaded.

8.5.1 Instruction Format

The format of DDWR instruction for writing common variables is the same as of "8.3.1 Format of DDWR Instruction". However, the CNC side devices are within the range between ZR60000 and ZR67199.
In the same way, the DDRD instruction format for reading common variables is the same as of "8.4.1 Format of DDRD Instruction", but the CNC side devices are within the range between ZR60000 and ZR67199.

8.5.2 CNC Side Devices to be Specified

The assignment of S3 (the target CPU's head device which stores the write data) in DDWR instruction and S2 (the host CPU's head device which stores the read data) in DDRD instruction is as shown below.



The devices from ZR60000 are used for common variables

Part system No. (1 to 7) "0" for the common variable 1

Corresponding common variable No.

[How to assign CNC side devices]

The following CNC side devices are specified.

Type		Devices used on the CNC side
Common variable control data		ZR60000
Common variable 1 (#500 to #999)		ZR60500 to ZR60999
Common variable 2 (#100 to #199)	**1st part system**	ZR61100 to ZR61199
	2nd part system	ZR62100 to ZR62199
	3rd part system	ZR63100 to ZR63199
	4th part system	ZR64100 to ZR64199
	5th part system	ZR65100 to ZR65199
	6th part system	ZR66100 to ZR66199
	7th part system	ZR67100 to ZR67199

[Correspondence table between common variables and ZR devices]

8.5.3 Common Variable Control Data

The following items are set to the common variable control data:
- The type of data to be read and written in common variables
- The decimal point position
- The overflow error notification selection

The following default settings are applied at the CNC power ON for reading and writing common variables.
- Two-word data
- With decimal point, and four effective decimal digits
- Error code is returned when overflowed

The settings of common variable control data are listed in the table below.

Device	Item	Setting data	Setting range	Setting side
ZR60000	Control data for common variables	Set the type of data to read and write, and the decimal point position. [0 to the 3rd bits: Data type] 0: Two-word data 1: Word data 2: Double-precision floating-point data 3: Single-precision floating-point data [4th to 7th bits: Decimal point position in the data] 0: With decimal point/Four effective decimal digits 1: With decimal point/According to #1003(iunit) and #1041 (I_inch) 2: No decimal point (Note) Refer to "8.5.3.2 Decimal Point Position in the Data". [8th bit: Error notification selection] 0: Error code is returned 1: Error is ignored (Note) Refer to "8.5.3.3 Error Notification Selection".	-	User

If a value other than 0 to 3 is selected for the data type, or if a value other than 0 to 2 for the decimal point position, an error (error code: 3209(HEX)) is returned.
The settings of the common variable control data are held until the control data is changed next time.
In order to set the common variable control data, select "1" for the number of write data for the DDWR control data.
For program examples, refer to "8.5.5 Program Examples".

8.5.3.1 Data Type

The numbers of read and write data specified by the DDWR and DDRD instructions vary according to the data type setting.
The table below shows the numbers of read and write data required for read and write of one data.

Data type set in the control data	Number of read/write data required for read and write of one data	When five common variablesare read and written
Two-word data	2	10
Word data	1	5
Double-precision floating-point data	4	20
Single-precision floating-point data	2	10

The values listed in "When five common variables are read and written" are the numbers of read/write data required for reading and writing five common variables with the selected data type.

8.5.3.2 Decimal Point Position in the Data

When two-word data or word data is selected for the data type, the numbers of effective decimal digits are as in the table below.

Setting value	Decimal point position setting			Number of effective decimal digits	Common variable value after execution of DDWR instruction (Note 1)	Value read with DDRD instruction
0	Four effective decimal digits			4	1234.5678	456789
1	Determined with #1003(iunit) and #1041(I_inch)	I_inch=0	Iunit=B	3	12345.678 (12345.6780)	45679
			Iunit=C	4	1234.5678	456789
		I_inch=1	Iunit=B	4	1234.5678	456789
			Iunit=C	5	123.45678 (123.4568)	4567891
2	No decimal point			0	12345678 (1.2346 E 7)	46

The values listed in "Common variable value after execution of DDWR instruction" are the ones when the write data "12345678" is executed using the DDWR instruction.
The values listed in "Value read with DDRD instruction" are the ones when the common variable value "45.678912" is read using the DDRD instruction.

(Note 1) Values enclosed with brackets "( )" are the ones when the common variable is displayed using the remote monitor tool.
(Note 2) When the common variable 1 is read and written with the decimal point position set to "1", the decimal point position is determined by the combination of #1003(iunit) and #1041(I_inch) set for the 1st part system.
(Note 3) If the value read with the DDRD instruction is smaller than the effective decimal digit, the value is rounded off.

8.5.3.3 Error Notification Selection

Select how to respond to an overflow error that occurs during execution of the DDRD instruction.

Operation when "0: Error code is returned" is selected

The processing ends at the point of the overflow error occurrence, and the completion status error code is returned.
In this case, no common variables can be retrieved.

Operation when "1: Error is ignored" is selected

When an overflow error occurs while a common variable is being read, the retrieved data of the variable is handled as "0", and reading the subsequent common variables is continued. After the completion of the processing, the normal completion status is returned.
In this case, it is possible to read out the common variable data by the specified number of variables.

8.5.4 Error Contents

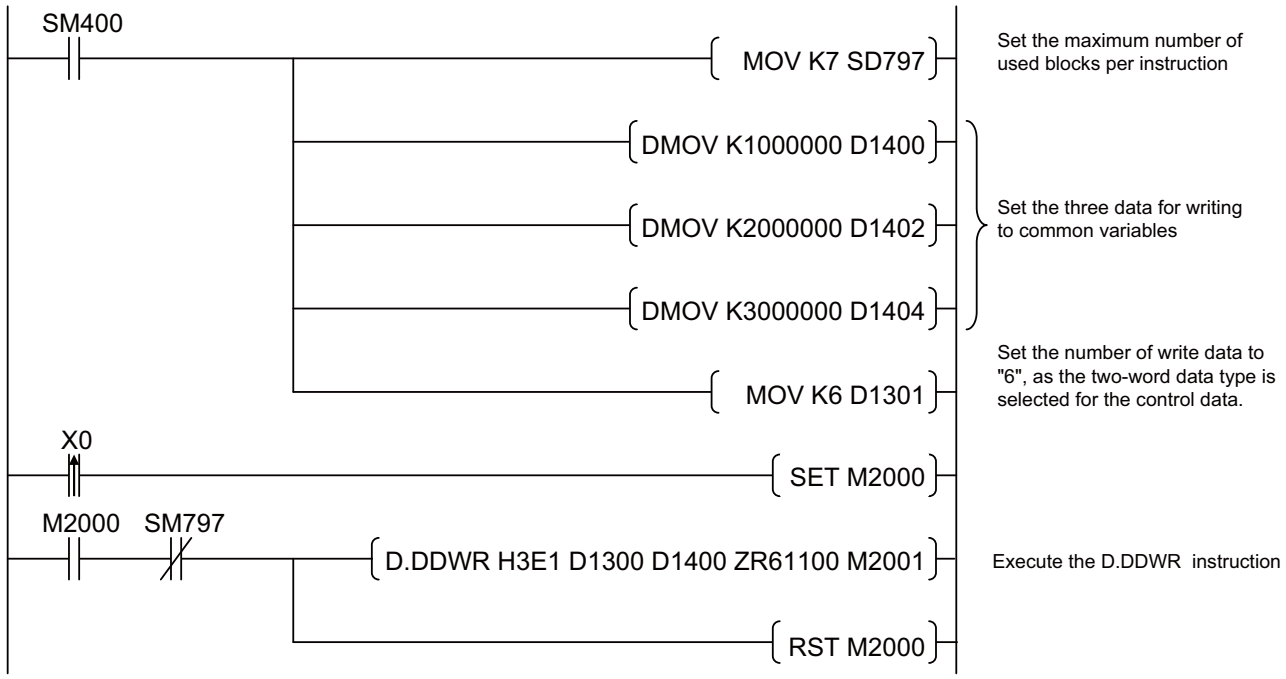
For the DDWR instruction completion status error codes, refer to "8.3.3. Error Contents", and "8.4.3 Error Contents" for the DDRD completion status error codes.

The No. of ZR device, in which an error has occurred during read/write of common variables with DDWR/DDRD instruction, is written to "H3E1\G10280" (by two words).
The No. of ZR device, where an error has occurred first, is written to "H3E1\G10280" (by two words).
The contents of "H3E1\G10280" (by two words) are held until the next execution of the DDWR and DDRD instructions for reading and writing common variables.
If there is no error occurring, "0" is written to "H3E1\G10280" (by two words).

8.5.5 Program Examples

8.5.5.1 Write Data to Common Variables

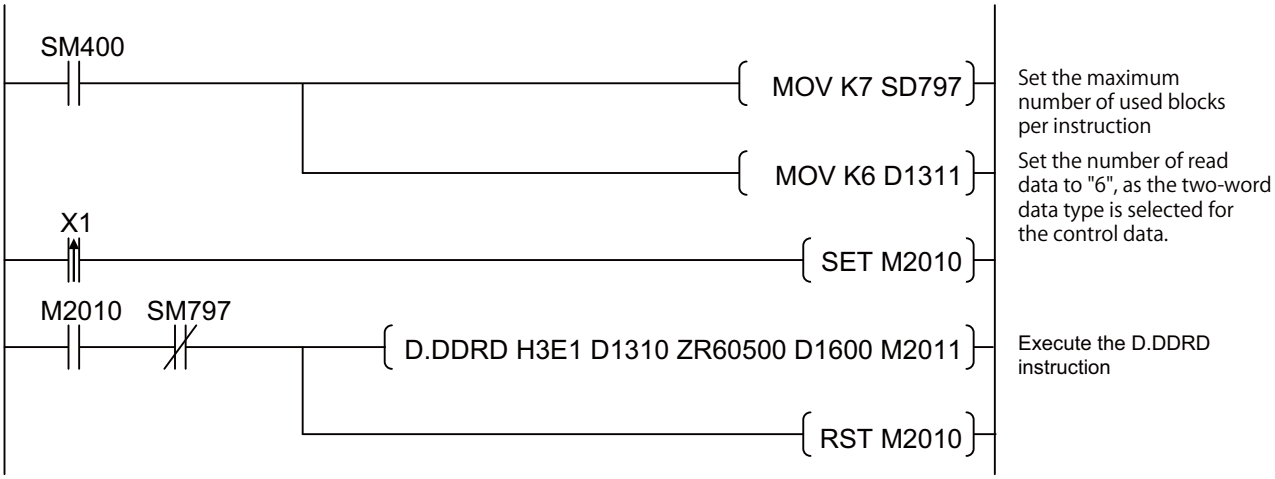
<EX> A program which executes the D.DDWR instruction to the CPU No. 2 at the rising edge of X0, in order to write three data to the 1st part system's common variables starting from #100.
(The default setting at the CNC power ON is applied to the control data)



[Example of executing write of common variables]

8.5.5.2 Read Common Variable Data

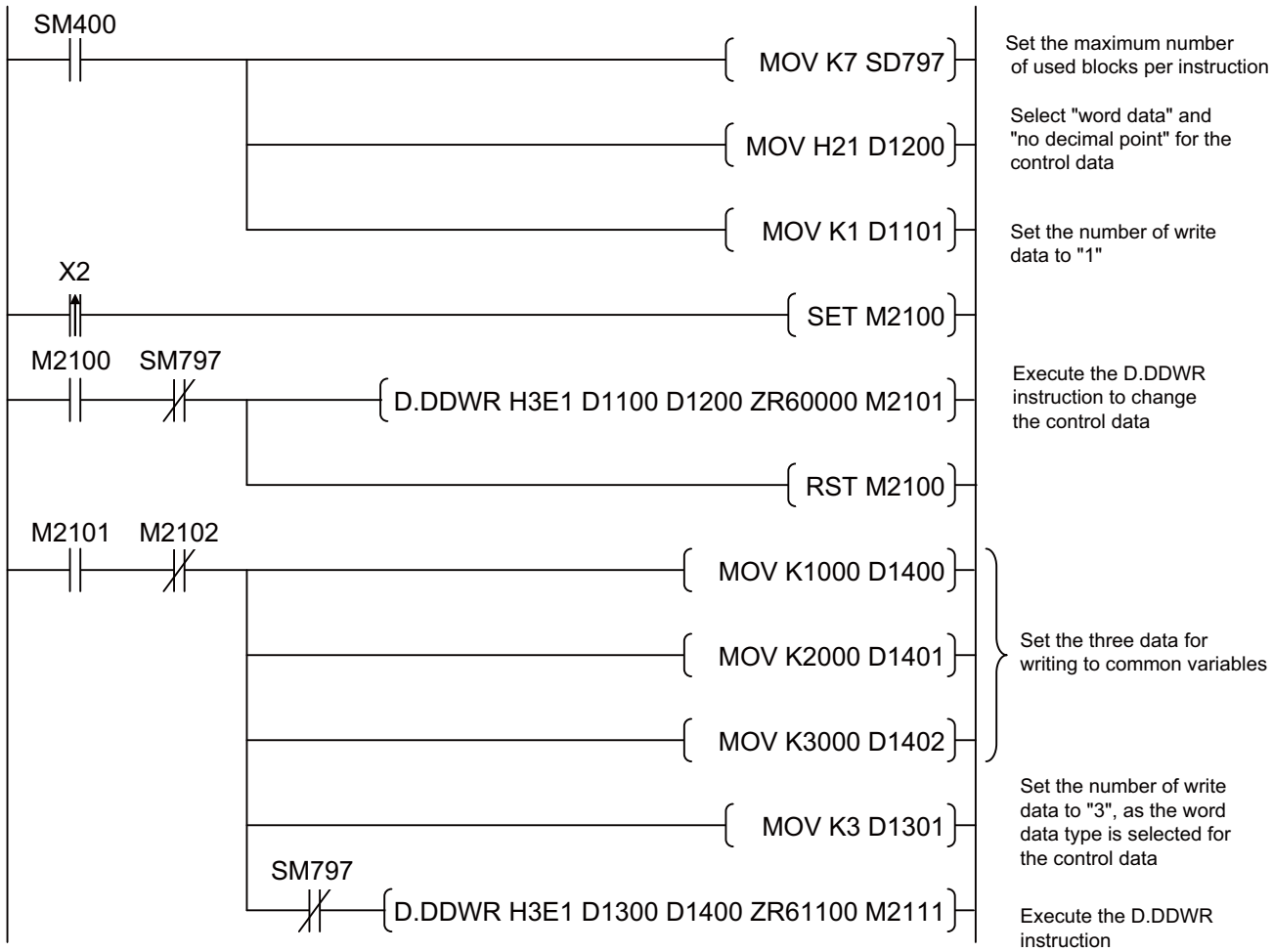
<EX> A program which executes the D.DDRD instruction to the CPU No. 2 at the rising edge of X0, in order to retrieve three common variable data starting from #500.
(The default setting at the CNC power ON is applied to the control data)



[Example of executing read of common variables]

8.5.5.3 Change the Common Variable Control Data

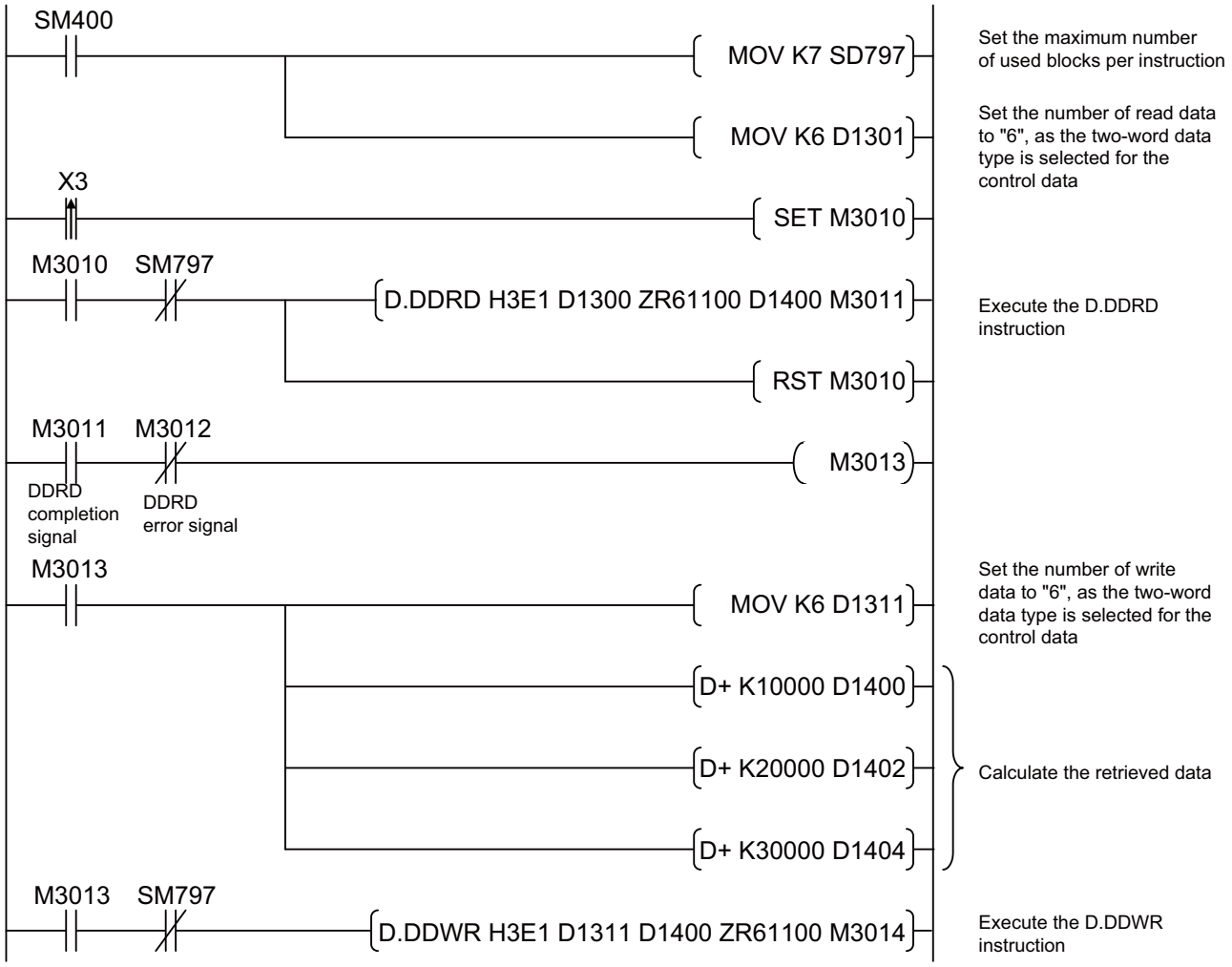
<EX> A program which executes the D.DDWR instruction to the CPU No. 2 at the rising edge of X2, in order to change the control data settings to "word data" and "no decimal point".
After this, the D.DDWR instruction is executed again to write the 1st part system's three common variable data starting from #100.



[Example of executing change of common variable control data]

8.5.5.4 Read Common Variable Data, Calculate and then Write the Data to Common Variables

<EX> A program which executes the D.DDRD instruction to the CPU No. 2 at the rising edge of X3. In this program, the 1st part system's three common variable data starting from #100 are read out, calculation is performed, and then the data are written to the common variables
(The default setting at the CNC power ON is applied to the control data)



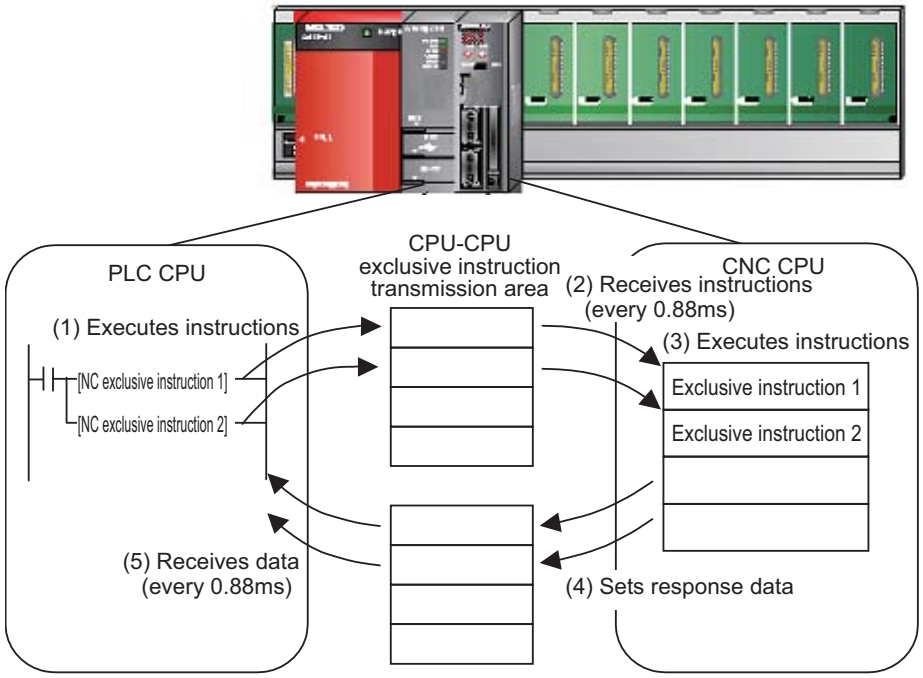
[Example of executing read of common variable data, calculation and write of the data to common variables]

8.6 Precautions

8.6.1 Transmitting Exclusive Instructions between CPUs

Operation concept of NC exclusive instructions

NC exclusive instructions are transmitted through the CPU-CPU exclusive instruction transmission area, which is provided to the system area in the shared memory for cyclic transmissions. The following chart shows the operation concept of NC exclusive instructions.



CPU-CPU exclusive instruction transmission area is allocated as follows when CNC CPU has standard settings (system area size: 1K points).

<Table 1 Size of CPU-CPU exclusive instruction transmission area>

Number of multi-CPUs	Size of CPU-CPU exclusive instruction transmission area per instruction target CPU
2 CPUs	47 blocks
3 CPUs	23 blocks
4 CPUs	15 blocks

Table 2 shows the numbers of blocks of CPU-CPU exclusive instruction transmission area used from the execution of a NC exclusive instruction by PLC CPU until the completion device's ON.

<Table 2 Numbers of blocks used for a NC exclusive instruction>

Instruction		Number of blocks used
D(P).ATC		1
D(P).ROT		1
D(P).DDWR D(P).DDRD	Numbers of data	-
	1 to 4	1
	5 to 20	2
	21 to 36	3
	37 to 52	4
	53 to 68	5
	69 to 84	6
	85 to 100	7

If the number of blocks used for the instructions is larger than the size of CPU-CPU exclusive instruction transmission area in table 1, the instructions cannot be executed at the same time. Instruction executions after the CPU-CPU exclusive instruction transmission area has been occupied are not successfully completed. Execute either the interlock with the special register for "Command FULL", explained in "Special register for "Command FULL"" column later, or the adjustment of system area size, explained in "CPU-CPU exclusive transmission area" column, as required.

Special register for "Command FULL"

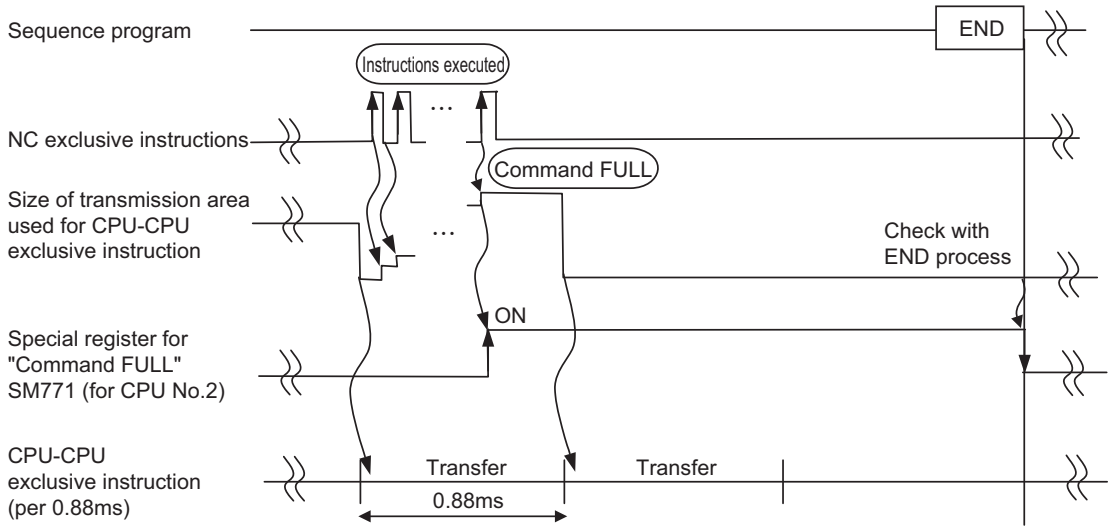
When the CPU-CPU exclusive instruction transmission area is occupied, the target CPU cannot receive NC exclusive instructions, which is "Command FULL" state.
Then, the special register for "Command FULL" (special relay in PLC CPU) goes ON and operates to the target CPU. If the "Command FULL" state has been cleared with END process, the special relay goes OFF.

To prepare for the anticipated "Command FULL" state, execute an interlock with the special register for "Command FULL" in the target CPU. Unless the interlock is executed, the error code "4C90" is set to the completion status when an instruction is executed in "Command FULL" state. Note that no process is executed when the completion device is omitted.

Special relay in PLC CPU	Name	Details
SM770	Exclusive instructions for multi-CPUs high-speed communication at "Command FULL" of CPU No.1	Operates to multi-CPUs high-speed communication with target CPU. Goes ON when the CPU-CPU transmission area is occupied, which is "Command FULL" state. Goes OFF if the "Command FULL" state has been cleared with END process.
SM771	Exclusive instructions for multi-CPUs high-speed communication at "Command FULL" CPU No.2	
SM772	Exclusive instructions for multi-CPUs high-speed communication at "Command FULL" CPU No.3	
SM773	Exclusive instructions for multi-CPUs high-speed communication at "Command FULL" CPU No.4	

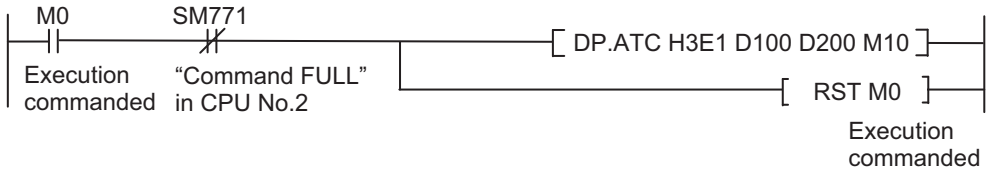
Operation of the special register for "Command FULL"

The following chart shows the operation outline when "Command FULL" state has occurred after the execution of NC exclusive instructions.



Program example

A program to execute an ATC instruction to CNC CPU No.2 after MO is ON.
(With the completion device and completion status omitted)



CPU-CPU exclusive instruction transmission area

The size of CPU-CPU exclusive instruction transmission area (number of blocks; 16 words per block) can be enlarged by changing the system area size. The number of the CPUs used and the size of the selected system area decide the size of the transmission area as follows.

When 2 multi-CPUs are used

Size of selected system area	Size of CPU-CPU exclusive instruction transmission area per target CPU
1.0kw	48 blocks
2.0kw	112 blocks

When 3 multi-CPUs are used

Size of selected system area	Size of CPU-CPU exclusive instruction transmission area per target CPU
1.0kw	24 blocks
2.0kw	56 blocks

8.6.2 Executing NC Exclusive Instructions

(1) NC exclusive instructions are available in both fixed-interval programs and interrupt programs. If a completion device is designated, make sure to execute the program during the scan after the completion of instruction. Otherwise, the completion device, which is ON only for 1 scan, will not be recognized.

(2) File registers for each local device and each program are written into devices with END process. The following devices are not available:

Completion devices and completion status of instructions

8.6.3 Completion Status Information

The following table shows the codes stored in completion status when a NC exclusive instruction has been completed. (Error codes with "*" are detected on CNC CPU.)

Note that omitting a completion status storage device makes no error detection and null processing.

Completion status (Error code)(H)	Error factors
0	Successfully completed
4C20*	The designated device is not available on CNC CPU or out of the range.
4C21*	The executed multi-CPU instruction is not supported by CNC CPU.
4C2A*	The designated command cannot be read by CNC CPU.
4C30*	An invalid function No. was specified by the ATC or ROT instruction.
4C31*	An invalid No. to store the number of magazines was specified by the ATC instruction.
4C32*	An invalid tool No. was specified by the ATC instruction.
4C33*	An invalid magazine No. was specified by the ATC instruction.
4C34*	An invalid number of rotary body indexing cycles was specified by the ROT instruction.
4C35*	An invalid current position was specified by the ROT instruction.
4C36*	An invalid parameter was set by the ROT instruction.
0010	The number of instructions from PLC CPU to CNC CPU exceeds the tolerance. * The tolerance amount differs for each CPU and the number of the CPUs mounted on.

Appendix 1

List of PLC Window Data

Appendix 1 List of PLC Window Data

Section No.	Details for each section No.	Sub ID (system designation)	Significance of data No.	Sub-section No.	Details for each sub-section No.		Spindle, NC axis R/W	PLC axis R/W	Data range when writing	Remarks
0	R register	Not used	Not used	0	R register R0		R/W	-	0 to 65535	Unsigned integer
				:	:		R/W			
				9214	R register R0		R/W	-	0 to 65535	Unsigned integer
1	Parameters common to each axis	Not used	Axis No.	8960	Maximum spindle speed (Gear 1st step)		R/W	-	0 to 99999 [r/min]	
				8964	Maximum spindle speed (Gear 2nd step)		R/W	-	0 to 99999 [r/min]	
				8968	Maximum spindle speed (Gear 3rd step)		R/W	-	0 to 99999 [r/min]	
				8972	Maximum spindle speed (Gear 4th step)		R/W	-	0 to 99999 [r/min]	
		Not used	Axis No.	8976	Spindle limit speed (Gear 1st step)		R/W	-	0 to 99999 [r/min]	
				8980	Spindle limit speed (Gear 2nd step)		R/W	-	0 to 99999 [r/min]	
				8984	Spindle limit speed (Gear 3rd step)		R/W	-	0 to 99999 [r/min]	
				8988	Spindle limit speed (Gear 4th step)		R/W	-	0 to 99999 [r/min]	
		Not used	Axis No.	9008	Spindle shift speed (Gear 1st step)		R/W	-	0 to 99999 [r/min]	
				9010	Spindle shift speed (Gear 2nd step)		R/W	-	0 to 99999 [r/min]	
				9012	Spindle shift speed (Gear 3rdstep)		R/W	-	0 to 99999 [r/min]	
				9014	Spindle shift speed (Gear 4thstep)		R/W	-	0 to 99999 [r/min]	
		Not used	Axis No.	9024	Spindle orientation speed		R/W	-	0 to 99999 [r/min]	
		Not used	Axis No.	9026	Minimum spindle speed		R/W	-	0 to 99999 [r/min]	
		Not used	Axis No.	8192	Spindle parameter SP001		R/W	-	1 to 200 [1/s]	
				8194	Spindle parameter SP002		R/W	-	1 to 200 [1/s]	
				:	:					
				8670	Spindle parameter SP240		R/W	-	Refer to the manual	
		Not used	Axis No.	195	Method selection parameter (1)		R	-	-	
		Not used	Axis No.	130	Method selection parameter (3)		R/W	-	Refer to the manual	
		Not used	Axis No.	194	Method selection parameter (4)		R/W	-	Refer to the manual	
		Part system No.	Not used	11984	Position switch [1]	axis	R/W	R/W	Input the name of the designated axis with ASCII code.	
				11968		dog1	R/W	R/W	± 199999998 [0.5 μm]	
				11972		dog2	R/W	R/W	± 199999998 [0.5 μm]	
		Part system No.	Not used	12004	Position switch [2]	axis	R/W	R/W	Input the name of the designated axis with ASCII code.	
				11988		dog1	R/W	R/W	± 199999998 [0.5 μm]	
				11992		dog2	R/W	R/W	± 199999998 [0.5 μm]	
		Part system No.	Not used	12024	Position switch [3]	axis	R/W	R/W	Input the name of the designated axis with ASCII code.	
				12008		dog1	R/W	R/W	± 199999998 [0.5 μm]	
				12012		dog2	R/W	R/W	± 199999998 [0.5 μm]	
		Part system No.	Not used	12044	Position switch [4]	axis	R/W	R/W	Input the name of the designated axis with ASCII code.	
				12028		dog1	R/W	R/W	± 199999998 [0.5 μm]	
				12032		dog2	R/W	R/W	± 199999998 [0.5 μm]	
		Part system No	Not used	12064	Position switch [5]	axis	R/W	R/W	Input the name of the designated axis with ASCII code.	
				12048		dog1	R/W	R/W	± 199999998 [0.5 μm]	
				12052		dog2	R/W	R/W	± 199999998 [0.5 μm]	

Section No.	Details for each section No.	Sub ID (system designation)	Significance of data No.	Sub-section No.	Details for each sub-section No.		Spindle, NC axis R/W	PLC axis R/W	Data range when writing	Remarks
1	Parameters common to each axis	Part system	Not used	12084	Position switch [6]	axis	R/W	R/W	Input the name of the designated axis with ASCII code.	
				12068		dog1	R/W	R/W	± 199999998 [0.5 μm]	
				12072		dog2	R/W	R/W	± 199999998 [0.5 μm]	
		Part systemPart system	Not used	12104	Position switch [7]	axis	R/W	R/W	Input the name of the designated axis with ASCII code.	
				12088		dog1	R/W	R/W	± 199999998 [0.5 μm]	
				12092		dog2	R/W	R/W	± 199999998 [0.5 μm]	
		Part system	Not used	12124	Position switch [8]	axis	R/W	R/W	Input the name of the designated axis with ASCII code.	
				12108		dog1	R/W	R/W	± 199999998 [0.5 μm]	
				12112		dog2	R/W	R/W	± 199999998 [0.5 μm]	
		Part system	Not used	14128	Position switch [9]	axis	R/W	R/W	Input the name of the designated axis with ASCII code.	
				14112		dog1	R/W	R/W	± 199999998 [0.5 μm]	
				14116		dog2	R/W	R/W	± 199999998 [0.5 μm]	
		Part system	Not used	14148	Position switch [10]	axis	R/W	R/W	Input the name of the designated axis with ASCII code.	
				14132		dog1	R/W	R/W	± 199999998 [0.5 μm]	
				14136		dog2	R/W	R/W	± 199999998 [0.5 μm]	
		Part system	Not used	14168	Position switch [11]	axis	R/W	R/W	Input the name of the designated axis with ASCII code.	
				14152		dog1	R/W	R/W	± 199999998 [0.5 μm]	
				14156		dog2	R/W	R/W	± 199999998 [0.5 μm]	
		Part system	Not used	14188	Position switch [12]	axis	R/W	R/W	Input the name of the designated axis with ASCII code.	
				14172		dog1	R/W	R/W	± 199999998 [0.5 μm]	
				14176		dog2	R/W	R/W	± 199999998 [0.5 μm]	
		Part system	Not used	14208	Position switch [13]	axis	R/W	R/W	Input the name of the designated axis with ASCII code.	
				14192		dog1	R/W	R/W	± 199999998 [0.5 μm]	
				14196		dog2	R/W	R/W	± 199999998 [0.5 μm]	
		Part system	Not used	14228	Position switch [14]	axis	R/W	R/W	Input the name of the designated axis with ASCII code.	
				14212		dog1	R/W	R/W	± 199999998 [0.5 μm]	
				14216		dog2	R/W	R/W	± 199999998 [0.5 μm]	
		Part system	Not used	14248	Position switch [15]	axis	R/W	R/W	Input the name of the designated axis with ASCII code.	
				14232		dog1	R/W	R/W	± 199999998 [0.5 μm]	
				14236		dog2	R/W	R/W	± 199999998 [0.5 μm]	
		Part system	Not used	14268	Position switch [16]	axis	R/W	R/W	Input the name of the designated axis with ASCII code.	
				14252		dog1	R/W	R/W	± 199999998 [0.5 μm]	
				14256		dog2	R/W	R/W	± 199999998 [0.5 μm]	

Appendix 1 List of PLC Window Data

Section No.	Details for each section No.	Sub ID (system designation)	Significance of data No.	Sub-section No.	Details for each sub-section No.	Spindle, NC axis R/W	PLC axis R/W	Data range when writing	Remarks
2	Axis independent parameters	Part system	Axis No.	272	1st reference position coordinate	R/W	R/W	± 199999998 [0.5 μm]	
				276	2nd reference position coordinate	R/W	-	± 199999998 [0.5 μm]	
				280	3rd reference position coordinate	R/W	-	± 199999998 [0.5 μm]	
				284	4th reference position coordinate	R/W	-	± 199999998 [0.5 μm]	
		Part system	Axis No.	288	Stored stroke limit (+)	R/W	R/W	± 199999998 [0.5 μm]	#2014
		Part system	Axis No.	292	Stored stroke limit (-)	R/W	R/W	± 199999998 [0.5 μm]	#2013
		Part system	Axis No.	20	Movement control parameter	R	R	Refer to the manual	R/W is not valid for the diameter specification axis of PLC axis.
		Part system	Axis No.	38	Reference position return approach speed	R/W	R/W	1 to 60000 [mm/min]	Unsigned integer
		Part system	Axis No.	44	Reference position return shift amount	R/W	R/W	0 to 65535 [μm]	Unsigned integer
		Part system	Axis No.	46	Rapid traverse backlash amount	R/W	R/W	± 9999	
		Part system	Axis No.	48	Cutting feed backlash amount	R/W	R/W	± 9999	
		Part system	Axis No.	640	Axis parameter	R/W	-	Refer to the manual	
		Part system	Axis No.	656	Stored stroke limit II (+)	R/W	-	± 199999998 [0.5 μm]	#8205
		Part system	Axis No.	660	Stored stroke limit II (+)	R/W	-	± 199999998 [0.5 μm]	#8204
		Part system	Axis No.	24	Rapid traverse time constant G0tL	R/W	R/W	1 to 4000 [ms]	#2004
		Part system	Axis No.	26	Cutting feed time constant G1tL	R/W	R/W	1 to 5000 [ms]	#2007
		Part system	Axis No.	28	Rapid traverse time constant G0t1	R/W	R/W	1 to 4000 [ms]	#2005
		Part system	Axis No.	32	Cutting feed time constant G1t	R/W	R/W	1 to 5000 [ms]	#2008
		Part system	Axis No.	122	Current limit value 2 (SV014)	R/W	R/W	0 to 999	
		Part system	Axis No.	0	Axis name (axname)	R/W	R/W	X,Y,Z,U,V,W,A,B,C	#1013
		Part system	Axis No.	264	Cutting feed clamp speed	R/W	R/W	1 to 1000000	#2002
		Part system	Axis No.	768	Soft limit IB+	R/W	-	± 199999998 [0.5 μm]	#2062
		Part system	Axis No.	772	Soft limit IB-	R/W	-	± 199999998 [0.5 μm]	#2061
		Part system	Axis No.	376	Soft limit IB type	R/W	-	0 to 2	
3	Machine error compensation information	Not used	Not used	2	Compensation basic axis No.	R	-	-	
		Not used	Not used	6	Compensation direction axis No.	R	-	-	
		Not used	Not used	10	Division point No. at reference position	R	-	-	
		Not used	Not used	14	Division point No. at the most negative side	R	-	-	
		Not used	Not used	18	Division point No. at the most positive side	R	-	-	
		Not used	Not used	20	Compensation scale factor	R/W	-	0 to 99	
		Not used	Not used	28	Division interval	R/W	-	2 to 19999998 [0.5unit]	

Section No.	Details for each section No.	Sub ID (system designation)	Significance of data No.	Sub-section No.	Details for each sub-section No.		Spindle, NC axis R/W	PLC axis R/W	Data range when writing	Remarks
4	Workpiece coordinate system offset, external workpiece coordinate system offset	Part system	Axis No.	0	G54 workpiece coordinate system offset		R/W	-	± 199999998 [0.5 μm]	
		Part system	Axis No.	4	G55 workpiece coordinate system offset		R/W	-	± 199999998 [0.5 μm]	
		Part system	Axis No.	8	G56 workpiece coordinate system offset		R/W	-	± 199999998 [0.5 μm]	
		Part system	Axis No.	12	G57 workpiece coordinate system offset		R/W	-	± 199999998 [0.5 μm]	
		Part system	Axis No.	16	G58 workpiece coordinate system offset		R/W	-	± 199999998 [0.5 μm]	
		Part system	Axis No.	20	G59 workpiece coordinate system offset		R/W	-	± 199999998 [0.5 μm]	
		Part system	Axis No.	24	External workpiece coordinate system offset		R/W	-	± 199999998 [0.5 μm]	
5	Alarm information	Part system	Not used	16	Servo alarm No.	Main	R	-	-	
				18		Attribute (bit F)	R	-	-	
				20		Sub 1	R	-	-	
				22		Sub 2	R	-	-	
		Part system	Not used	64	Servo warning No.	Main	R	-	-	
				66		Attribute (bit F)	R	-	-	
				68		Sub 1	R	-	-	
				70		Sub 2	R	-	-	
		Part system	Not used	96	Operation error No.	Main	R	-	-	
				98		Attribute (bit F)	R	-	-	
				100		Sub 1	R	-	-	
				102		Sub 2	R	-	-	
		Part system	Not used	104	Automatic stop code	Main	R	-	-	
				106		Attribute (bit F)	R	-	-	
				108		Sub 1	R	-	-	
				110		Sub 2	R	-	-	
11	Axis common non-modal information in block being executed	Part system	Not used	172	Interporation vector length		R	-	-	
		Part system	Not used	71	Movement mode		R	-	-	
12	Axis independent non-modal information in block being executed	Part system	Axis No.	4	Axis direction movement amount		R	-	-	

Appendix 1 List of PLC Window Data

Section No.	Details for each section No.	Sub ID (system designation)	Significance of data No.	Sub-section No.	Details for each sub-section No.	Spindle, NC axis R/W	PLC axis R/W	Data range when writing	Remarks
13	Axis common modal information in block being executed	Part system	Not used	0	G code (group 1)	R	-	-	
				1	G code (group 2)	R	-	-	
				2	G code (group 5)	R	-	-	
				3	G code (group 7)	R	-	-	
				4	G code (group 9)	R	-	-	
				5	G code (group 12)	R	-	-	
				6	G code (group 13)	R	-	-	
				7	G code	R	-	-	
				15	Block No.	R	-	-	
				64	G code (group 15)	R	-	-	
				76	Shape compensation No.	R	-	-	
				78	Wear compensation No.	R	-	-	
				208	Miscellaneous function code	R	-	-	
				212	Spindle function code	R	-	-	
				216	Tool function code	R	-	-	
				220	2nd miscellaneous function code	R	-	-	
				240	Program No.	R	-	-	
				244	Sequence No.	R	-	-	
14	Axis independent modal information in block being executed			112	Tool length compensation No.	R	-	-	
15	Axis common non-modal information in next block	Same as the section No. 11							
16	Axis independent non-modal information in next block	Same as the section No. 12							
17	Axis common modal information in next block	Same as the section No. 13							
18	Axis independent modal information in next block	Same as the section No. 14							
19									
20	Axis common machine control information 1	Part system	Not used	84	Automatic effective feedrate	R	-	-	
		Part system	Not used	88	Manual effective feedrate	R	-	-	
		Part system	Not used	4	In-position	R	-	-	

Section No.	Details for each section No.	Sub ID (system designation)	Significance of data No.	Sub-section No.	Details for each sub-section No.	Spindle, NC axis R/W	PLC axis R/W	Data range when writing	Remarks
21	Axis independent machine control information 1	Part system	Axis No.	0	Current position in machine coordinate system	R	R	-	
		Part system	Axis No.	8	Manual interrupt amount (1)	R	-	-	
		Part system	Axis No.	12	Manual interrupt amount (2)	R	-	-	
		Part system	Axis No.	36	Current position in workpiece coordinate system	R	-	-	
		Part system	Axis No.	112	Current position in workpiece coordinate system during skip ON	R	-	-	
		Part system	Axis No.	116	Current position in machine coordinate system during skip ON	R	-	-	
		Part system	Axis No.	120	Remaining distance during skip ON	R	-	-	
		Part system	Axis No.	124	Current position in machine coordinate system during manual skip ON	R	-	-	
		Part system	Axis No.	64	Current position of the program command	R	-	-	
		Part system	Axis No.	400	Remaining command	R	-	-	
22	Information input from PLC to controller	Part system	Not used	0	Emergency stop cause	R	-	-	
23	Information output from controller to PLC	Axis No.	Not used	48	Spindle command speed (effective value)	R	-	-	
24	Cumulative time data	Not used	Not used	0	Power ON time	R/W	-	Refer to the manual	
		Not used	Not used	4	Automatic operation time	R/W	-	Refer to the manual	
		Not used	Not used	8	Automatic start up time	R/W	-	Refer to the manual	
		Not used	Not used	12	External cumulative time 1	R/W	-	Refer to the manual	
		Not used	Not used	16	External cumulative time 2	R/W	-	Refer to the manual	
25									
26	Axis common machine control information 2	Not used	Axis No.	8992	Spindle motor real speed	R	-	-	
		Not used	Axis No.	8988	Spindle motor load	R	-	-	
		Not used	Axis No.	9176	Spindle position within one rotation (Z-phase standard)	R	-	-	
27	Axis independent machine control information 2	Part system	Axis No.	74	Smoothing status, servo status	R	R	-	
		Part system	Axis No.	308	Servo delay amount	R	R	-	
		Part system	Axis No.	328	Feed axis motor load A (%)	R	R	-	
		Part system	Axis No.	330	Feed axis motor load B (%)	R	R	-	
		Part system	Axis No.	60	Grid amount	R	R	-	
		Part system	Axis No.	1720	Overload (%)	R	R	-	
		Part system	Axis No.	1704	Estimated disturbance torque (%)	R	R	-	
		Part system	Axis No.	2540	Feed axis motor speed (0.01r/min)	R	R	-	
28									

Section No.	Details for each section No.	Sub ID (system designation)	Significance of data No.	Sub-section No.	Details for each sub-section No.	Spindle, NC axis R/W	PLC axis R/W	Data range when writing	Remarks
29	Common variables (common for all part systems, from #500)	Not used	Not used	x	(Common for all part systems, #500 to #999) (x=500 to 999)	R/W	-	Refer to the manual	Input/Output with decimal point is available Addition input and absolute value input are available
30	Local variable value	Part system	Not used	x	Local variables (level 0) (x=1 to 32)	R/W	-	Refer to the manual	Addition input and absolute value input are availableAddition input and absolute value input are available
		Part system	Not used	100+x	Local variables (level 1)(x=1 to 32)	R/W	-	Refer to the manual	Addition input and absolute value input are available
		Part system	Not used	200+x	Local variables (level 2)(x=1 to 32)	R/W	-	Refer to the manual	Addition input and absolute value input are available
		Part system	Not used	300+x	Local variables (level 3)(x=1 to 32)	R/W	-	Refer to the manual	Addition input and absolute value input are available
		Part system	Not used	400+x	Local variables (level 4)(x=1 to 32)	R/W	-	Refer to the manual	Addition input and absolute value input are available

Section No.	Details for each section No.	Sub ID (system designation)	Significance of data No.	Sub-section No.	Details for each sub-section No.	Spindle, NC axis R/W	PLC axis R/W	Data range when writing	Remarks
31	Tool compensation amount	Part system	Not used	1 to 400	Tool compensation amount 1 (M system)	R/W	-	± 99999999	Addition input and absolute value input are available
		Part system	Not used	1001 to 1400	Tool compensation amount 2 (M system)	R/W	-	± 99999	Addition input and absolute value input are available
		Part system	Not used	6001 to 6400	Tool compensation amount 3 (M system)	R/W	-	± 99999999	Addition input and absolute value input are available
		Part system	Not used	7001 to 7400	Tool compensation amount 4 (M system)	R/W	-	± 99999	Addition input and absolute value input are available
		Part system	Not used	1 to 80	1st axis tool length compensation amount (L system)	R/W	-	± 99999999	Addition input and absolute value input are available
		Part system	Not used	1001 to 1080	1st axis wear compensation amount (L system)	R/W	-	0 to 99999	Addition input and absolute value input are available
		Part system	Not used	2001 to 2080	3rd axis tool length compensation amount (L system)	R/W	-	0 to 99999	Addition input and absolute value input are available
		Part system	Not used	3001 to 3080	3rd axis wear compensation amount (L system)	R/W	-	0 to 99999	Addition input and absolute value input are available
		Part system	Not used	4001 to 4080	2nd axis tool length compensation amount (L system)	R/W	-	0 to 99999	Addition input and absolute value input are available
		Part system	Not used	5001 to 5080	2nd axis wear compensation amount (L system)	R/W	-	0 to 99999	Addition input and absolute value input are available
		Part system	Not used	6001 to 6080	Nose R compensation amount (L system)	R/W	-	0 to 99999	Addition input and absolute value input are available
		Part system	Not used	7001 to 7080	Nose R wear compensation amount (L system)	R/W	-	0 to 99999	Addition input and absolute value input are available
		Part system	Not used	8001 to 8080	Hypothetical nose No. (L system)	R/W	-	Refer to the manual	Addition input and absolute value input are available
32	Common variables (from #100)	Part system	Not used	x	#100 to #199 (x=100 to 199)	R/W	-	Refer to the manual	Input/Output with decimal point is available Addition input and absolute value input are available
62	Synchronous error monitor	Not used	Not used	101	Command error (1st set)	R	R	-	
		Not used	Not used	201	Command error (2nd set)	R	R	-	
		Not used	Not used	301	Command error (3rd set)	R	R	-	
		Not used	Not used	102	FB error (1st set)	R	R	-	
		Not used	Not used	202	FB error (2nd set)	R	R	-	
		Not used	Not used	302	FB error (3rd set)	R	R	-	
		Not used	Not used	103	Machine position (1st set)	R	R	-	
		Not used	Not used	203	Machine position (2nd set)	R	R	-	
		Not used	Not used	303	Machine position (3rd set)	R	R	-	

Appendix 1.1 Section No. List

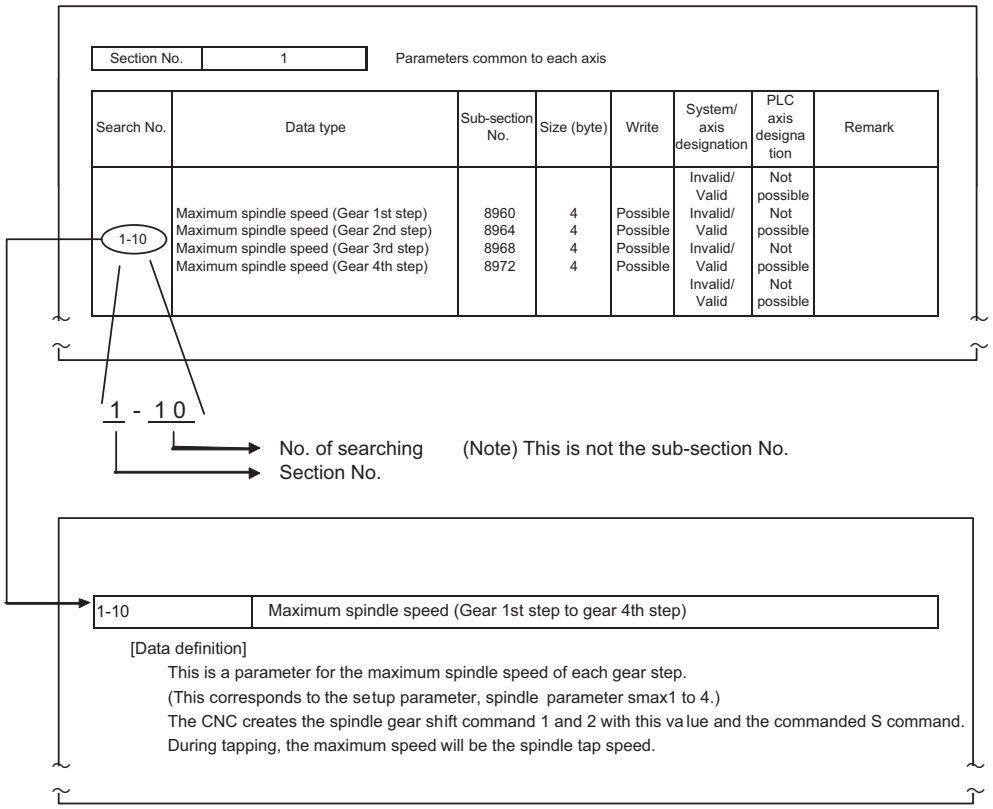
Section No.	Details	Write	Axis specifcation	Sub ID (system designation)	PLC axis designation	Remark
0	R register	Possible (partially not possible)	Invalid	Invalid	Not possible	
1	Parameters common to each axis	Possible (partially not possible)	Partially valid	Partially valid	Possible (partially not possible)	
2	Axis independent parameters	Possible	Invalid	Valid	Possible (partially not possible)	
3	Machine error compensation information	Not possible (partially possible)	Invalid	Invalid	Not possible	
4	Workpiece coordinate system offset, External workpiece coordinate system offset	Possible	Valid	Valid	Not possible	
5	Alarm information	Not possibleNot possible	Invalid	Valid	Not possible	
6						
7						
8						
9						
10						
11	Axis common non-modal information in block being executed	Not possible	Invalid	Valid	Not possible	
12	Axis independent non-modal information in block being executed	Not possible	Valid	Valid	Not possible	
13	Axis common modal information in block being executed	Not possible	Invalid	Valid	Not possible	
14	Axis independent modal information in block being executed	Not possible	Valid	Valid	Not possible	
15	Axis common non-modal information in next block	Not possible	Invalid	Valid	Not possible	
16	Axis independent non-modal information in next block	Not possible	Valid	Valid	Not possible	
17	Axis independent non-modal information in next block	Not possible	Invalid	Valid	Not possible	
18	Axis independent modal information in next block	Not possible	Valid	Valid	Not possible	
19						
20	Axis common machine control information 1	Not possible	Invalid	Valid	Not possible	
21	Axis independent machine control information 1	Not possible	Valid	Valid	Possible (partially not possible)	
22	Information input from PLC to controller	Not possible	Invalid	Valid	Not possible	
23	Information output from controller to PLC	Not possible	Invalid	Valid	Not possible	
24	Cumulative time data	Possible	Invalid	Invalid	Not possible	
25						
26	Axis common machine control information 2	Not possible	Invalid	Valid	Not possible	
27	Axis independent machine control information 1	Not possible	Valid	Valid	Possible	
28						
29	Common variable value 1	Possible	Invalid	Invalid	Not possible	From #500

Section No	Details	Write	Axis specifcation	Sub ID (system designation)	PLC axis designation	Remark
30	Local variable value	Possible	Invali	Valid	Not possible	
31	Tool compensation amount	Possible	Invalid	Valid	Not possible	
32	Common variable value 2	Possible	Invalid	Valid	Not possible	From #100
33 - 61						
62	Synchronous error monitor	Not possible	Invalid	Invalid	Not possible	

Appendix 1.2 Sub-section No. List

The sub-section No. list shows the sub-section No. of each data in correspondence with the section No.
Each data has a search No. To refer to the contents of the data, search for the corresponding data in "Explanation of Read/Write Data" using this search No.

Search No.



Section No.	0

R resister

Search No.	Data type	Sub-section No.	Size (byte)	Write	System/axis designation	PLC axis designation	Remark
0-10	R register R0	0	2	Possible	Invalid	Not possible	
	R register R1	1	2	Possible	Invalid	Not possible	
	:	:	:	:	:	:	
	R register R9214	9214	2	Possible	Invalid	Not possible	

Section No.	1

Parameters common to each axis

Search No.	Data type	Sub-section No.	Size (byte)	Write	System/axis designation	PLC axis designation	Remark
1-10	Maximum spindle speed (Gear 1st step)	8960	4	Possible	Invalid/ Valid	Not Possible	
	Maximum spindle speed (Gear 1st step)	8964	4	Possible	Invalid/ Valid	Not Possible	
	Maximum spindle speed (Gear 3rd step)	8968	4	Possible	Invalid/ Valid	Not possible	
	Maximum spindle speed (Gear 4th step)	8972	4	Possible	Invalid/ Valid	Not possible	
1-11	Spindle limit speed (Gear 1st step)	8976	4	Possible	Invalid/ Valid	Not possible	
	Spindle limit speed (Gear 2nd step)	8980	4	Possible	Invalid/ Valid	Not possible	
	Spindle limit speed (Gear 3rd step)	8984	4	Possible	Invalid/ Valid	Not possible	
	Spindle limit speed (Gear 4th step)	8988	4	Possible	Invalid/ Valid	Not possible	
1-13	Spindle shift speed (Gear 1st step)	9008	2	Possible	Invalid/ Valid	Not possible	
	Spindle shift speed (Gear 2nd step)	9010	2	Possible	Invalid/ Valid	Not possible	
	Spindle shift speed (Gear 3rd step)	9012	2	Possible	Invalid/ Valid	Not possible	
	Spindle shift speed (Gear 4th step)	9014	2	Possible	Invalid/ Valid	Not possible	
1-20	Spindle orientation speed	9024	2	Possible	Invalid/Valid	Not possible	
1-21	Minimum spindle speed	9026	2	Possible	Invalid/Valid	Not possible	
1-30	Spindle parameter SP001	8192	2	Possible	Invalid/Valid	Not possible	
	Spindle parameter SP002	8194	2	Possible	Invalid/Valid	Not possible	
	:	:	:	:	:	:	
	Spindle parameter SP240	8670	2	Possible	Invalid/Valid	Not possible	

Search No.	Data type	Sub-section No.	Size (byte)	Write	System/axis designation	PLC axis designation	Remark
1-50	Method selection parameter (1) Bit0: Bit1: Bit2: Bit3: Bit4: Bit5: Bit6: Synchronous tapping Bit7:	195	1	Not possible	Invalid/Valid	Not possible	
1-70	Method selection parameter (3) Bit0: Bit1: Tool compensation method (Tabsmv) Bit2: Bit3: Bit4: Bit5: Bit6: Bit7:	130	1	Possible	Invalid/Valid	Not possible	
1-80	Method selection parameter (4) Bit0: Bit1: Bit2: Bit3: Bit4: Bit5: Reference point middle point ignore Bit6: Bit7:	194	1	Possible	Invalid/Valid	Not possible	

Section No.	1

Parameters common to each axis (position switch)

Search No.	Data type		Sub-section No.	Size (byte)	Write	System/axis designation	PLC axis designation	Remark
1-100	Position switch [1]	axis	11984	1	Possible	Valid/Invalid	Possible	Designate ASCII code with a decimal
		dog1	11968	4	Possible	Valid/Invalid	Possible	
		dog2	11972	4	Possible	Valid/Invalid	Possible	
1-100	Position switch [2]	axis	12004	1	Possible	Valid/Invalid	Possible	Designate ASCII code with a decimal
		dog1	11988	4	Possible	Valid/Invalid	Possible	
		dog2	11992	4	Possible	Valid/Invalid	Possible	
1-100	Position switch [3]	axis	12024	1	Possible	Valid/Invalid	Possible	Designate ASCII code with a decimal
		dog1	12008	4	Possible	Valid/Invalid	Possible	
		dog2	12012	4	Possible	Valid/Invalid	Possible	
1-100	Position switch [4]	axis	12044	1	Possible	Valid/Invalid	Possible	Designate ASCII code with a decimal
		dog1	12028	4	Possible	Valid/Invalid	Possible	
		dog2	12032	4	Possible	Valid/Invalid	Possible	
1-100	Position switch [5]	axis	12064	1	Possible	Valid/Invalid	Possible	Designate ASCII code with a decimal
		dog1	12048	4	Possible	Valid/Invalid	Possible	
		dog2	12052	4	Possible	Valid/Invalid	Possible	
1-100	Position switch [6]	axis	12084	1	Possible	Valid/Invalid	Possible	Designate ASCII code with a decimal
		dog1	12068	4	Possible	Valid/Invalid	Possible	
		dog2	12072	4	Possible	Valid/Invalid	Possible	
1-100	Position switch [7]	axis	12104	1	Possible	Valid/Invalid	Possible	Designate ASCII code with a decimal
		dog1	12088	4	Possible	Valid/Invalid	Possible	
		dog2	12092	4	Possible	Valid/Invalid	Possible	
1-100	Position switch [8]	axis	12124	1	Possible	Valid/Invalid	Possible	Designate ASCII code with a decimal
		dog1	12108	4	Possible	Valid/Invalid	Possible	
		dog2	12112	4	Possible	Valid/Invalid	Possible	

Section No.	1

Parameters common to each axis (position switch)

Search No.	Data type		Sub-section No.	Size (byte)	Write	System/axis designation	PLC axis designation	Remark
1-100	Position switch [9]	axis	14128	1	Possible	Valid/Invalid	Possible	Designate ASCII code with a decimal
		dog1	14112	4	Possible	Valid/Invalid	Possible	
		dog2	14116	4	Possible	Valid/Invalid	Possible	
1-100	Position switch [10]	axis	14148	1	Possible	Valid/Invalid	Possible	Designate ASCII code with a decimal
		dog1	14132	4	Possible	Valid/Invalid	Possible	
		dog2	14136	4	Possible	Valid/Invalid	Possible	
1-100	Position switch [11]	axis	14168	1	Possible	Valid/Invalid	Possible	Designate ASCII code with a decimal
		dog1	14152	4	Possible	Valid/Invalid	Possible	
		dog2	14156	4	Possible	Valid/Invalid	Possible	
1-100	Position switch [12]	axis	14188	1	Possible	Valid/Invalid	Possible	Designate ASCII code with a decimal
		dog1	14172	4	Possible	Valid/Invalid	Possible	
		dog2	14176	4	Possible	Valid/Invalid	Possible	
1-100	Position switch [13]	axis	14208	1	Possible	Valid/Invalid	Possible	Designate ASCII code with a decimal
		dog1	14192	4	Possible	Valid/Invalid	Possible	
		dog2	14196	4	Possible	Valid/Invalid	Possible	
1-100	Position switch [14]	axis	14228	1	Possible	Valid/Invalid	Possible	Designate ASCII code with a decimal
		dog1	14212	4	Possible	Valid/Invalid	Possible	
		dog2	14216	4	Possible	Valid/Invalid	Possible	
1-100	Position switch [15]	axis	14248	1	Possible	Valid/Invalid	Possible	Designate ASCII code with a decimal
		dog1	14232	4	Possible	Valid/Invalid	Possible	
		dog2	14236	4	Possible	Valid/Invalid	Possible	
1-100	Position switch [16]	axis	14268	1	Possible	Valid/Invalid	Possible	Designate ASCII code with a decimal
		dog1	14252	4	Possible	Valid/Invalid	Possible	
		dog2	14256	4	Possible	Valid/Invalid	Possible	

Section No.	2	Axis independent parameters

Search No.	Data type	Sub-section No.	Size (byte)	Write	System/axis designation	PLC axis designation	Remark
2-10	1st reference position coordinate 2nd reference position coordinate 3rd reference position coordinate 4th reference position coordinate	272 276 280 284	4 4 4 4	Possible Possible Possible Possible	Valid/Valid Valid/Valid Valid/Valid Valid/Valid	Possible Not possible Not possible Not possible	
2-11	Stored stroke limit (+) Stored stroke limit (-)	288 292	4 4	Possible Possible	Valid/Valid Valid/Valid	Possible Possible	For machine tool builder For machine tool builder
2-20	Movement control parameter Bit0: Bit1: Inch input Bit2: Reference point return direction (-) Bit3: Servo OFF error compensation Bit4: Rotary axis Bit5: Motor CCW Bit6: Bit7: Bit8: Bit9: BitA: No reference point axis BitB: BitC: BitD: Diameter designated axis BitE: BitF:	20	2	Not possible	Valid/Valid	Possible	R/W is not valid for the diameter specification axis of PLC axis.
2-30	Reference position return approach speed	38	2	Possible	Valid/Valid	Possible	
2-35	Reference position return shift amount	44	2	Possible	Valid/Valid	Possible	
2-36	Rapid traverse backlash amount	46	2	Possible	Valid/Valid	Possible	
2-37	Cutting feed backlash amount	48	2	Possible	Valid/Valid	Possible	
2-39	Axis parameter Bit0: Bit1:(System reserve) Bit2: Bit3: Bit4: Bit5: Bit6: (System reserve) Bit7: Bit8: Bit9: BitA: Soft limit invalid #8202 BitB: (System reserve) BitC: (System reserve) BitD:(System reserve) BitE: BitF:	640	2	Possible	Valid/Valid	Not possible	
2-40	Stored stroke limit II (+) Stored stroke limit II (-)	656 660	4 4	Possible Possible	Valid/Valid Valid/Valid	Not possible Not possible	For user For user
2-50	Rapid traverse time constant G0tL	24	2	Possible	Valid/Valid	Possible	
2-51	Cutting feed time constant G1tL	26	2	Possible	Valid/Valid	Possible	
2-52	Rapid traverse time constant G0t1	28	2	Possible	Valid/Valid	Possible	
2-53	Cutting feed time constant G1t1	32	2	Possible	Valid/Valid	Possible	
2-54	Current limit value 2 (SV014)	122	2	Possible	Valid/Valid	Possible	
2-55	Axis name (axname)	0	1	Possible	Valid/Valid	Possible	
2-56	Cutting feed clamp speed	264	4	Possible	Valid/Valid	Possible	
2-57	Soft limit IB+	768	4	Possible	Valid/Valid	Not possible	
2-58	Soft limit IB-	772	4	Possible	Valid/Valid	Not possible	
2-59	Soft limit IB type	376	1	Possible	Valid/Valid	Not possible	

Section No.	3

Machine error compensation information

Search No.	Data type	Sub-section No.	Size (byte)	Write	System/axis designation	PLC axis designation	Remark
3-10	Compensation basic axis No.	2	1	Not possible	Invalid/ Invalid	Not possible	
3-11	Compensation direction axis No.	6	1	Not possible	Invalid/ Invalid	Not possible	
3-12	Division point No. at reference position	10	2	Not possible	Invalid/ Invalid	Not possible	
3-13	Division point No. at the most negative side	14	2	Not possible	Invalid/ Invalid	Not possible	
3-14	Division point No. at the most positive side	18	2	Not possible	Invalid/ Invalid	Not possible	
3-15	Compensation scale factor	20	2	Possible	Invalid/ Invalid	Not possible	
3-16	Division interval	28	4	Possible	Invalid/ Invalid	Not possible	

Section No.	4

Workpiece coordinate system offset, external workpiece coordinate system offset

Search No.	Data type	Sub-section No.	Size (byte)	Write	System/axis designation	PLC axis designation	Remark
4-10	G54 workpiece coordinate system offset	0	4	Possible	Valid/Valid	Not possible	
4-11	G55 workpiece coordinate system offset	4	4	Possible	Valid/Valid	Not possible	
4-12	G56 workpiece coordinate system offset	8	4	Possible	Valid/Valid	Not possible	
4-13	G57 workpiece coordinate system offset	12	4	Possible	Valid/Valid	Not possible	
4-14	G58 workpiece coordinate system offset	16	4	Possible	Valid/Valid	Not possible	
4-15	G59 workpiece coordinate system offset	20	4	Possible	Valid/Valid	Not possible	
4-16	External workpiece coordinate system offset	24	4	Possible	Valid/Valid	Not possible	

Section No.	5	Alarm information

Search No.	Data type		Sub-section No.	Size (byte)	Write	System/axis designation	PLC axis designation	Remark
5-30	Servo alarm No.	Main	16	2	Not possible	Valid/Invalid	Not possible	
		Attribute (bit F)	18	2	Not possible	Valid/Invalid	Not possible	(0-Invalid,1-Valid)
		Sub 1	20	2	Not possible	Valid/Invalid	Not possible	
		Sub 2	22	2	Not possible	Valid/Invalid	Not possible	
5-90	Servo warning No.	Main	64	2	Not possible	Valid/Invalid	Not possible	
		Attribute (bit F)	66	2	Not possible	Valid/Invalid	Not possible	(0-Invalid,1-Valid)
		Sub 1	68	2	Not possible	Valid/Invalid	Not possible	
		Sub 2	70	2	Not possible	Valid/Invalid	Not possible	
5-130	Operation error No.	Main	96	2	Not possible	Valid/Invalid	Not possible	
		Attribute (bit F)	98	2	Not possible	Valid/Invalid	Not possible	(0-Invalid,1-Valid)
		Sub 1	100	2	Not possible	Valid/Invalid	Not possible	
		Sub 2	102	2	Not possible	Valid/Invalid	Not possible	
5-140	Automatic stop code	Main	104	2	Not possible	Valid/Invalid	Not possible	
		Attribute (bit F)	106	2	Not possible	Valid/Invalid	Not possible	(0-Invalid,1-Valid)
		Sub 1	108	2	Not possible	Valid/Invalid	Not possible	
		Sub 2	110	2	Not possible	Valid/Invalid	Not possible	

Section No.	
	11
	15

11 Axis common non-modal information in block being executed

15 Axis common non-modal information in the next block

Search No.	Data type	Sub-section No.	Size (byte)	Write	System/axis designation	PLC axis designation	Remark
11/15-10	Interporation vector length	172	4	Not possible	Valid/Invalid	Not possible	
11/15-20	Movement mode gmov Binary data 0: Positionoing (each axis independent) 1: Positionoing (linear) 2: Linear interpolation 3: Circular interpolation (CW) 4: Circular interpolation (CCW) 5: Helical interpolation (CW) 6: Helical interpolation (CCW) 7: 8: 9: 10: 11: Time designated dwell 12: 13: 1st reference position valification 14: 2nd reference position valification 15: 3rd reference position valification 16: 4th reference position valification 17: Automatic referene point return 18: Return from automatic referene point 19: 2nd reference point return 20: 3rd reference point return 21: 4th reference point return 22: Skip function 23: Multi-step skip function 24: Multi-step skip function 2 25: Multi-step skip function 3 26: Thread cutting 27: 28: 29: Coordinate system setting	71	1	Not possible	Valid/Invalid	Not possible	

Section No.	
	12
	16

12 Axis independent non-modal information in block being executed

16 Axis independent non-modal information in the next block

Search No.	Data type	Sub-section No.	Size (byte)	Write	System/axis designation	PLC axis designation	Remark
12/16-10	Axis direction movement amount	4	4	Not possible	Valid/Valid	Not possible	

Section No.	13	Axis common modal information in block being executed
	17	Axis common modal information in the next block

Search No.	Data type	Sub-section No.	Size (byte)	Write	System/axis designation	PLC axis designation	Remark
13/17-10	G code (Group 1)	0	1	Not possible	Valid/Invalid	Not possible	Interpolation mode
13/17-11	G code (Group 2)	1	1	Not possible	Valid/Invalid	Not possible	Plane selection
13/17-12	G code (Group 5)	2	1	Not possible	Valid/Invalid	Not possible	Feed mode
13/17-13	G code (Group 7)	3	1	Not possible	Valid/Invalid	Not possible	Radius compensation modal
13/17-14	G code (Group 9)	4	1	Not possible	Valid/Invalid	Not possible	Fixed cycle modal
13/17-15	G code (Group 12)	5	1	Not possible	Valid/Invalid	Not possible	Workpiece coordinate system modal
13/17-16	G code (Group 13)	6	1	Not possible	Valid/Invalid	Not possible	Cutting mode
13/17-17	G code (Group 3, 4, 6, 10, 17, 18) Bit0: Absolute/incremental mode Bit1 : Barrier check Bit2 : Inch/metric mode Bit3 : Fixed cycle R point return Bit4 : Bit5 : Constant surface speed control Bit6 : Balance cut Bit7 :	7	1	Not possible	Valid/Invalid	Not possible	
13/17-20	Block No.	15	1	Not possible	Valid/Invalid	Not possible	0 to 99
13/17-25	G code (Group 15) BitB : In normal line control BitC : The right side is in normal line control	64	2	Not possible	Valid/Invalid	Not possible	Normal line control modal
13/17-30	Shape compensation No.	76	2	Not possible	Valid/Invalid	Not possible	
13/17-31	Wear compensation No.	78	2	Not possible	Valid/Invalid	Not possible	
13/17-40	Miscellaneous function No.	208	4	Not possible	Valid/Invalid	Not possible	M code (binary)
13/17-41	Spindle function code	212	4	Not possible	Valid/Invalid	Not possible	S code (binary)
13/17-42	Tool function code	216	4	Not possible	Valid/Invalid	Not possible	T code (binary)
13/17-43	2nd miscellaneous function code	220	4	Not possible	Valid/Invalid	Not possible	B code (binary)
13/17-44	Program No.	240	4	Not possible	Valid/Invalid	Not possible	O1 to 99999999
13/17-45	Sequence No.	244	4	Not possible	Valid/Invalid	Not possible	N1 to 99999

Section No.	14	Axis independent modal information in block being executed
	18	Axis independent modal information in the next block

Search No.	Data type	Sub-section No.	Size (byte)	Write	System/axis designation	PLC axis designation	Remark
14/18-10	Tool length compensation No.	112	2	Not possible	Valid/Valid	Not possible	Machininig center system only

Section No.	20	Axis common machine control information

Search No.	Data type	Sub-section No.	Size (byte)	Write	System/axis designation	PLC axis designation	Remark
20-10	Automatic effective feedrate	84	4	Not possible	Valid/Invalid	Not possible	Effective speed of feed direction
20-11	Manual effective feedrate	88	4	Not possible	Valid/Invalid	Not possible	Effective speed of axis direction
20-20	In-position	4	2	Not possible	Valid/Invalid	Not possible	

Section No.	21	Axis independent machine control information

Search No.	Data type	Sub-section No.	Size (byte)	Write	System/axis designation	PLC axis designation	Remark
21-10	Current position in machine coordinate system	0	4	Not possible	Valid/Valid	Possible	
21-12	Manual interrupt amount (1)	8	4	Not possible	Valid/Valid	Not possible	Manual ABS switch is OFF
21-13	Manual interrupt amount (2)	12	4	Not possible	Valid/Valid	Not possible	Manual ABS switch is ON
21-20	Current position in workpiece coordinate system	36	4	Not possible	Valid/Valid	Not possible	
21-30	Current position in workpiece coordinate system during skip ON	112	4	Not possible	Valid/Valid	Not possible	
21-31	Current position in machine coordinate system during skip ON	116	4	Not possible	Valid/Valid	Not possible	
21-32	Remaining distance during skip ON	120	4	Not possible	Valid/Valid	Not possible	
21-33	Current position in machine coordinate system during manual skip ON	124	4	Not possible	Valid/Valid	Not possible	
21-34	Current position of the program command	64	4	Not possible	Valid/Valid	Not possible	
21-35	Remaining command	400	4	Not possible	Valid/Valid	Not possible	

Section No.	22

Information input from PLC to controller

Search No.	Data type	Sub-section No.	Size (byte)	Write	System/axis designation	PLC axis designation	Remark
22-10	Emergency stop cause Bit0: CNC side PLC Software stop state Bit1 : Bit2 : Bit3 : Bit4 :External emergency stop Bit5 : Bit6 : PLC Emergency stop output device Y327 is "1" Bit7 : Bit8 : Bit9 : BitA : BitB : BitC : BitD : Door interlock, dog/OT arbitrary allocation device illegal BitE : Spindle drive unit emergency stop output BitF : Servo drive unit emergency stop output	0	2	Not possible	Valid/Invalid	Not possible	

Section No.	23

Information output from controller to PLC

Search No.	Data type	Sub-section No.	Size (byte)	Write	System/axis designation	PLC axis designation	Remark
23-10	Spindle command speed (effective value)	48	4	Not possible	Valid* / Invalid	Not possible	Including the override

* Use Section sub-ID No. to designate the axis No.
When no Axis No. is designated (Section sub-ID No. is set to "0"), the 1st spindle will be selected.
1: 1st spindle
2: 2nd spindle
::
7: 7th spindle

Section No.	24

Cumulative time data

Search No.	Data type	Sub-section No.	Size (byte)	Write	System/axis designation	PLC axis designation	Remark
24-1	Power ON time	0	4	Possible	Invalid/ Invalid	Not possible	
24-2	Automatic operation time	4	4	Possible	Invalid/ Invalid	Not possible	
24-3	Automatic start up time	8	4	Possible	Invalid/ Invalid	Not possible	
24-4	External cumulative time 1	12	4	Possible	Invalid/ Invalid	Not possible	
24-5	External cumulative time 2	16	4	Possible	Invalid/ Invalid	Not possible	

Section No.	26

Axis common machine control information

Search No.	Data type	Sub-section No.	Size (byte)	Write	System/axis designation	PLC axis designation	Remark
26-10	Spindle motor real speed	8992	4	Not possible	Invalid/Valid	Not possible	Including the override
26-20	Spindle motor load	8988	2	Not possible	Invalid/Valid	Not possible	
26-30	Spindle position within one rotation (Z-phase standard)	9176	4	Not possible	Invalid/Valid	Not possible	

Section No.	27

Axis independent machine control information 2

Search No.	Data type	Sub-section No.	Size (byte)	Write	System/axis designation	PLC axis designation	Remark
27-10	Smoothing status, servo status Bit0: READY ON Bit1: servo ON Bit2: Bit3: In alarm Bit4: Absolute position established Bit5: Z phase passed Bit6: In-position Bit7: Torque limit Bit8: Smoothing 0 Bit9: Smoothing + BitA: Smoothing - BitB: BitC: H/W OT+ BitD: H/W OT- BitE: Near-point dog ON BitF:	74	2	Not possible	Valid/Valid	Possible	
27-20	Servo delay amount	308	4	Not possible	Valid/Valid	Possible	
27-30	Feed axis motor load A (%)	328	2	Not possible	Valid/Valid	Possible	
27-31	Feed axis motor load B (%)	330	2	Not possible	Valid/Valid	Possible	
27-33	Feed axis motor speed (0.01r/min)	2540	2	Not possible	Valid/Valid	Possible	
27-34	Machine end FB	2192	4	Not possible	Valid/Valid	Possible	
27-35	Feed axis motor speed (0.01r/min)	2540	2	Not possible	Valid/Valid	Possible	
27-36	Grid amount	60	4	Not possible	Valid/Valid	Possible	
27-37	Overload (%)	1720	2	Not possible	Valid/Valid	Possible	
27-38	Estimated disturbance torque (%)	1704	2	Not possible	Valid/Valid	Possible	
27-39	#2 ZERO	20502		Possible	Valid/Valid	Possible	-99999.999 to 99999.999

Section No.	29

Common variable value 1

Search No.	Data type	Sub-section No.	Size (byte)	Write	System/axis designation	PLC axis designation	Remark
	50 sets #500 ~ #549	500 to 549	4	Possible	Invalid/ Invalid	Not possible	Part system common variable
	100 sets #500 ~ #599	500 to 599	4	Possible	Invalid/ Invalid	Not possible	
	200 sets #500 ~ #699	500 to 699	4	Possible	Invalid/ Invalid	Not possible	
	500 sets #500 ~ #999	500 to 999	4	Possible	Invalid/ Invalid	Not possible	

Section No.	30

Local variable value

Search No.	Data type	Sub-section No.	Size (byte)	Write	System/axis designation	PLC axis designation	Remark
30-10	Local variables (Level 0)	1 to 32	4	Possible	Valid/Invalid	Not possible	
30-11	Local variables (Level 1)	101 to 132	4	Possible	Valid/Invalid	Not possible	
30-12	Local variables (Level 2)	201 to 232	4	Possible	Valid/Invalid	Not possible	
30-13	Local variables (Level 3)	301 to 332	4	Possible	Valid/Invalid	Not possible	
30-14	Local variables (Level 4)	401 to 432	4	Possible	Valid/Invalid	Not possible	

Section No.	31

Tool compensation amount

Search No.	Data type	Sub-section No.	Size (byte)	Write	System/axis designation	PLC axis designation	Remark
31-10	Tool compensation amount 1	1 to 400	4	Possible	Valid/Invalid	Not possible	The contents will differ depending on the type of tool offset memory.
31-20	Tool compensation amount 2	1001 to 1400	4	Possible	Valid/Invalid	Not possible	
31-30	Tool compensation amount 3	6001 to 6400	4	Possible	Valid/Invalid	Not possible	
31-40	Tool compensation amount 4	7001 to 7400	4	Possible	Valid/Invalid	Not possible	
31-100	1st axis tool length compensation amount	1 to 80	4	Possible	Valid/Invalid	Not possible	The contents will differ depending on the type of tool offset memory.
31-110	1st axis wear compensation amount	1001 to 1080	4	Possible	Valid/Invalid	Not possible	
31-120	3rd axis tool length compensation amount	2001 to 2080	4	Possible	Valid/Invalid	Not possible	
31-130	3rd axis wear compensation amount	3001 to 3080	4	Possible	Valid/Invalid	Not possible	
31-140	2nd axis tool length compensation amount	4001 to 4080	4	Possible	Valid/Invalid	Not possible	
31-150	2nd axis wear compensation amount	5001 to 5080	4	Possible	Valid/Invalid	Not possible	
31-160	Nose R compensation amount	6001 to 6080	4	Possible	Valid/Invalid	Not possible	
31-170	Nose R wear compensation amount	7001 to 7080	4	Possible	Valid/Invalid	Not possible	
31-180	Hypothetical nose No.	8001 to 8080	1	Possible	Valid/Invalid	Not possible	

Section No.	32	Common variable value 2

Search No.	Data type	Sub-section No.	Size (byte)	Write	System/axis designation	PLC axis designation	Remark
32-10	50 sets * No. of part systems: #100 to #149	100 to 149	4	Possible	Valid/Invalid	Not possible	Variables per part system
	100 sets * No. of part systems: #100 to #199	100 to 199	4	Possible	Valid/Invalid	Not possible	

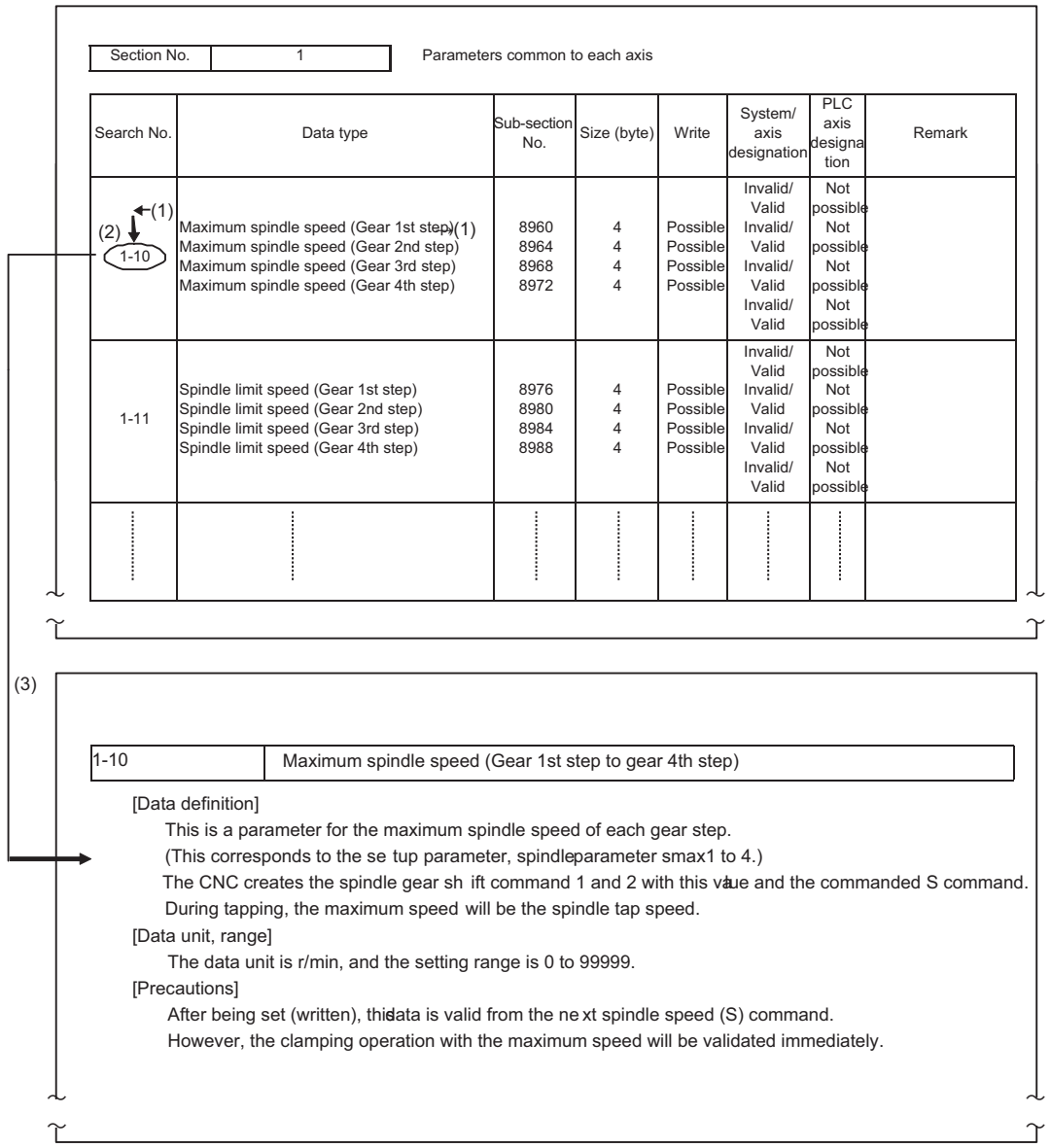
Section No.	62	Synchronous error monitor

Search No.	Data type	Sub-section No.	Size (byte)	Write	System/axis designation	PLC axis designation	Remark
62-1	Command error (1st set)	101	4	Not possible	Invalid/ Invalid	Not possible	
	Command error (2nd set)	201	4	Not possible	Invalid/ Invalid	Not possible	
	Command error (3rd set)	301	4	Not possible	Invalid/ Invalid	Not possible	
62-2	FB error (1st set)	102	4	Not possible	Invalid/ Invalid	Not possible	
	FB error (2nd set)	202	4	Not possible	Invalid/ Invalid	Not possible	
	FB error (3rd set)	302	4	Not possible	Invalid/ Invalid	Not possible	
62-3	Machine position (1st set)	103	4	Not possible	Invalid/ Invalid	Not possible	
	Machine position (2nd set)	203	4	Not possible	Invalid/ Invalid	Not possible	
	Machine position (3rd set)	303	4	Not possible	Invalid/ Invalid	Not possible	

Appendix 1.3 Explanation of Read/Write Data

Appendix 1.3.1 How to refer to the data

The explanation of read and write data is common for all machine type. The method for referring to the data is shown below.



(1) Search for the data to be read or written from the type of data givenin the "Sub-section No. List".
(2) Confirm the search No. corresponding to the searched data.
(3) Search for the reference data from the "Appendix 1.3.3 Detailed Explanation of Data" based on the confirmed search No.

(Note 1) Note that the first value of the search No. (for example, 1-10) is the section No., but the second value is not the sub-section No.
(Note 2)The expression "1-50-6" in the read/write data explanation indicates section No.: 1, search No.: 50 and bit: 6.
(Note 3)The search No. expressed as "11/15-10" in the read/write data explanation indicates that the contens are common to the data in section No.: 11, search No.: 10, and the data in section No.: 15 and search No.: 10.

Appendix 1.3.2 Data unit system

The unit system in this manual is explained below.

Uni systemt		B (1 μm system)	C (0.1 μm system)	Selection parameter
Input unit	Mm	0.001	0.0001	Setup parameter Basic specification parameter #1041 I_inch = 0
	Inch	0.0001	0.00001	Setup parameter Basic specification parameter #1041 I_inch = 1
Output unit (Detection unit)	Mm	0.0005	0.00005	Setup parameter Basic specification parameter #1016 iout = 0
	Inch	0.00005	0.000005	Setup parameter Basic specification parameter #1016 iout = 1
Machine constant input unit	Mm	0.001	0.001	Setup parameter Basic specification parameter #1040 M_inch = 0
	Inch	0.0001	0.00001	Setup parameter Basic specification parameter #1040 M_inch = 1

(Note 1)The unit systems B and C are settings for the setup parameters (basic specification parameters: #1003 iunit). This may differ depending on the machine type.

(Note 2)The unit system C (0.1 μm system) is an option specification.

(Note 3)Of the selection parameters, #1041 I_inch and #1040 M_inch are common for each axis, and #1061 iout is for the independent axis.

(Note 4)The data is read and written in the internal unit.

Appendix 1.3.3 Explanation of data details

The details of the data that are read or written with the PLC window are explained below.

0-10	R resister (R0 to R9214)

[Data definition]

This is CNC R register. (This corresponds to the I/F diagnosis screen.)

Refer to "Chapter4 Explanation of Interface Signals" for contents of each register.

[Data unit, range]

The data unit and range may differ depending on the register. Refer to "Chapter4 Explanation of Interface Signals" for details.

[Precautions]

Data cannot be written in the R register that the shared device is assigned.

Write the data using the PLC program.

1-10	Maximum spindle speed (Gear 1st step to gear 4th step)

[Data definition]

This is a parameter for the maximum spindle speed of each gear step.

(This corresponds to the setup parameter, spindle parameter smax1 to 4.)

The CNC creates the spindle gear shift command 1 and 2 with this value and the commanded S command.

During tapping, the maximum speed will be the spindle tap speed.

[Data unit, range]

The data unit is r/min, and the setting range is 0 to 99999.

[Precautions]

After being set (written), this data is valid from the next spindle speed (S) command.

However, the clamping operation with the maximum speed will be validated immediately.

1-11	Spindle limit speed (Gear 1st step to gear 4th step)

[Data definition]

This parameter is used to calculate the spindle speed (S-analog) data for each gear step.

(This corresponds to the setup parameter, spindle parameter slimt1 to 4.)

The CNC determines the corresponding spindle limit speed with the spindle gear selection input (Y...) that is output from the PLC, and calculates the spindle speed (S-analog) data.

$$\text{Spindle speed data} = \frac{Sd_1d_2d_3d_4}{\text{slimt n}} \times \frac{\text{SOVR}}{100}$$

slimt n : Spindle limit speed of corresponding gear step detemined with spindle gear selection input. (n: 1 to 4)

$Sd_1d_2d_3d_4$: Spindle speed (S) command

SOVR : Spindle override

[Data unit, range]

The data unit is r/min, and the setting range is 0 to 99999.

[Precautions]

Writing is possible during the automatic operation, but it will be validated after the NC axis movement is finished.

1-13	Spindle shift speed (Gear 1st step to gear 4th step)

[Data definition]

When changing the spindle gears, the spindle motor is run slowly at a constant speed to make the changeover operation smoothly. This parameter is used to designate the speed for it.
(This corresponds to the setup parameter, spindle parameter ssift to 4.)
The CNC determines the corresponding spindle shift speed with the spindle gear selection input (Y...) output from the PLC.

Spindle speed data for gear shift = ssift n / slimt n

slimt n : Spindle limit speed of corresponding gear step detemined with spindle gear selection input. (n: 1 to 4)
ssiftn : Spindle shift speed of corresponding gear step detemined with spindle gear selection input. (n: 1 to 4)

[Data unit, range]

The data unit is r/min, and the setting range is 0 to 32767.

[Precautions]

Writing is possible during the automatic operation, but it will be validated after the NC axis movement is finished

1-20	Spindle orientation speed

[Data definition]

This parameter is used to rotate the spindle at a slow constant speed when carrying out spindle orientation (stopping at set position).
(This corresponds to the setup parameter, spindle parameter sori.)

Spindle speed data for orientation = sori / slimt n

sori : Spindle orientation speed
slimtn : Spindle limit speed of corresponding gear step detemined with spindle gear selection input. (n: 1 to 4)

[Data unit, range]

The data unit is r/min, and the setting range is 0 to 32767.

[Precautions]

If the writing is executed during the manual operation, it will be validated after the axis movement is stopped.

[Supplement]

The orientation function is provided for most of the recent spindle controllers, so this parameter is not used often for the spindle orientation.

1-21	Minimum spindle speed

[Data definition]

This parameter specifies the minimum spindle speed value.
If the S command issued is a spindle speed lower than this parameter value or if the results of the spindle override are lower than this parameter value, the spindl will be rotated at this minimum spindle speed.
(This corresponds to the setup parameter, spindle parameter smini.)

[Data unit, range]

The data unit is r/min, and the setting range is 0 to 32767.

[Precautions]

Writing is possible during the automatic operation, but it will be validated after the NC axis movement is finished.

1-30	Spindle parameter (SP001 to SP240)

[Data definition]

These parameters are used to control the spindles.

(This corresponds to the setup parameter, spindle parameter "#13001 (SP001)" to "#13240 (SP240)".)

Refer to Setup manual for details of each parameter.

[Data unit, range]

The data unit and range may differ depending on the parameters. Refer to the Setup manual for details.

[Precautions]

Setting of some parameters will become valid after turning the NC power ON. Please turn the NC power ON after setting the data using the PLC window.

1-50	Method selection parameter (1)

[Data definition]

The following parameters are set in bit units.

1-50-6) Synchronous tapping

This parameter is used when executing the machining program's tapping cycle (G84, G74) with the synchronous method.

0: Asynchronous method

1: Synchronous method

(This corresponds to the setup parameter, basic specification parameter set01.)

1-70	Method selection parameter (3)

[Data definition]

The following parameters are set in bit units.

[Data unit, range]

The setting range is 0 to 255.

The set data could affect the other bits, so take care when setting.

1-70-1) Tool compensation method --- Valid only for lathe (L) system

Designate the type of movement command, when the tool compensation operation (Tmove) is set to "1".

0: Compensation is carried out regardless of the movement command type.

1: Compensation is carried out only for a movement command issued with an absolute value.

(This corresponds to the setup parameter, basic specification parameter Tabsmv.)

1-80	Method selection parameter (4)

[Data definition]

The following parameters are set in bit units.

[Data unit, range]

The setting range is 0 to 255.

The set data could affect the other bits, so take care when setting.

1-80-5) Reference point middle point ignore

This parameter designates how to handle the middle point during G28 and G30 reference point return.

0: Move to the reference point via the middle point designated in the program.

1: Ignore the middle point designated in the program, and move directly to the reference point.

(This corresponds to the setup parameter, basic specification parameter Mpoint.)

1-100	Position switch [1] to [16]

[Data definition]

A software dog switch is established at an arbitrary point of the axis on the machine, and the output signal from this switch is output to the PLC interface when the axis is passing over this switch. A maximum of sixteen switches can be set per part system, also another 16 axes can be set for PLC axes (a maximum of 128 axes).
This switch can be used after the zero point is established.
(This corresponds to the setup parameter, position switches axis, dog1 and dog2.)

The position switch uses the axis, dog1, dog2 as one set.

axis: Name of axis for which the switch is established.
dog1: Distance 1 from basic machine coordinate system zero point
dog2: Distance 2 from basic machine coordinate system zero point

The difference of distance between dog1 and dog2 becomes the position switch width.

[Data unit, range]

The data unit is 1/2 of the machine constant input unit, and the setting range is -99999.999 mm to +99999.999 mm.

[Precautions]

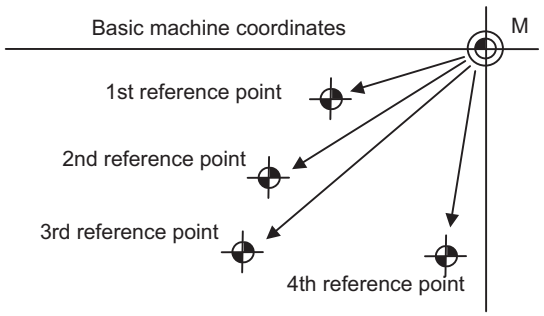
A slight delay will occur in the output signal fluctuation due to the actual machine position. This maximum delay time (tmax), which depends on the area check method parameters #7504 to #7634, is as follows. Also consider the delay by the scan time as it depends on scan time for the ladder.

When parameter is set to "0" (commanded machine position)	When parameter is set to 1 (detector FB position)
tmax = 0.004 - TP [s]	tmax = 0.004 [s]
TP : Position loop time constant $\left(\frac{1}{PGN}\ [s]\right)$	
PGN : Position loop gain	

2-10	Axis n 1st to 4th reference point coordinate

[Data definition]

The 1st reference point, 2nd reference point, 3rd reference point and 4th reference point using 0 of the basic machine coordinates as the base point can be set for each axis with these parameters.
(This corresponds to the setup parameter, reference point return parameters G53ofs to #4_rfp.)



[Data unit, range]

The data unit is 1/2 of the machine constant input unit, and the setting range is -99999.999 mm to +99999.999 mm.

[Precautions]

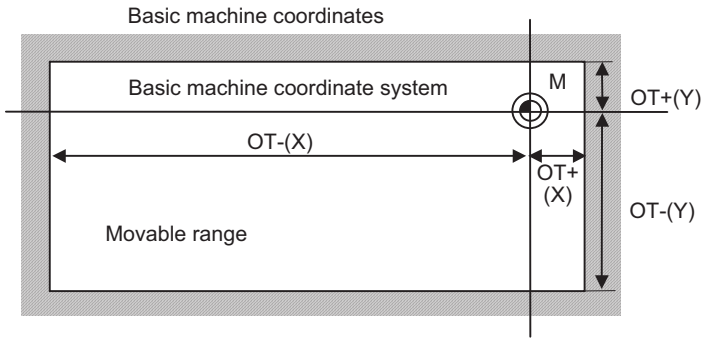
This setting is validated from the next reference point return after setting (writing).

2-11	Axis n Stored stroke limit II (+), (-) ----- For machine tool builder

[Data definition]

These parameters set the movable range in the (+) or (-) limit using 0 of the basic machine coordinates as the base point.

(This corresponds to the setup parameter, axis specification parameters OT+ and OT-.)



[Data unit, range]

The data unit is 1/2 of the machine constant input unit, and the setting range is -99999.999 mm to +99999.999 mm.

[Precautions]

Writing is possible during the automatic operation, but it will be validated after the NC axis movement is finished.

2-20	Axis n Movement control parameter

[Data definition]

The following parameters are indicated in bit units.

2-20-1) Inch output

This parameter indicates whether the output unit is a metric or inch.

(This corresponds to the setup parameter, basic specification parameter iout.)

0: When the machine side detectors (ball screw and detectors) are metric specifications.

1: When the machine side detectors (ball screw and detectors) are inch specifications.

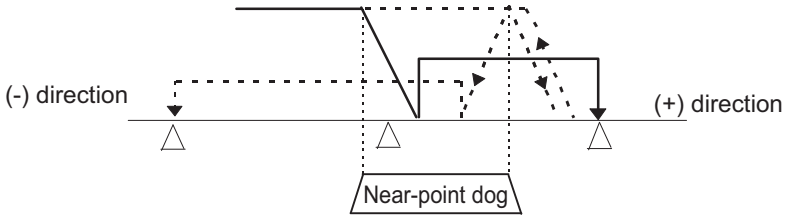
2-20-2) Reference point return direction (-)

This parameter indicates whether the reference point position is to the (-) direction or (+) direction from the reference point return near-point detection (near-point dog).

(This corresponds to the setup parameter, reference point return parameter dir(-).)

0: (+) direction

1: (-) direction



2-20-3) Servo OFF error compensation

The servo system will enter the servo OFF state when the servo OFF n th axis (*SVFn) signal is input from the PLC to the CNC. This parameter indicates for each axis whether the amount that the motor rotated during servo OFF is to be returned to the original state when the servo is turned ON again.

(This corresponds to the setup parameter, basic specification parameter svof.)

0: Compensate the error (Do not return to the original state.)

1: Do not compensate the error

2-20-4) Rotary axis

This parameter indicates whether the target control axis is a linear axis or rotary axis.

0: Linear axis

1: Rotary axis

(This corresponds to the setup parameter, basic specification parameter rot.)

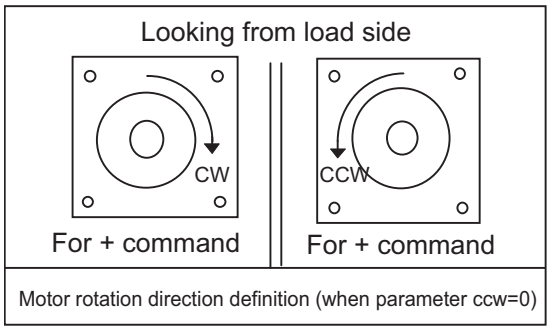
2-20-5) Motor CCW

This parameter indicates the motor rotation direction when commanded in the + direction.

0: CW direction looking from motor load side

1: CCW direction looking from motor load side

(This corresponds to the setup parameter, basic specification parameter ccw.)



2-20-A) No reference point axis

This parameter indicates that the control axis is one that does not have a reference point or that reference point return is not required.

0: G28, G29, G30, manual reference point return is carried out.

1: G28, G29, G30, manual reference point return is ignored.

(This corresponds to the setup parameter, zero point return parameter noref.)

2-20-D) Diameter disgnated axis (valid only for lathe system)

This parameter indicates the movement amount (commanded by U) in the X axis direction to half of the command value.

The command in address X will always be a diameter command.

0: Addresses X and U command movement amounts are the same.

1: The address U command movement amount is half of the address X movement amount.

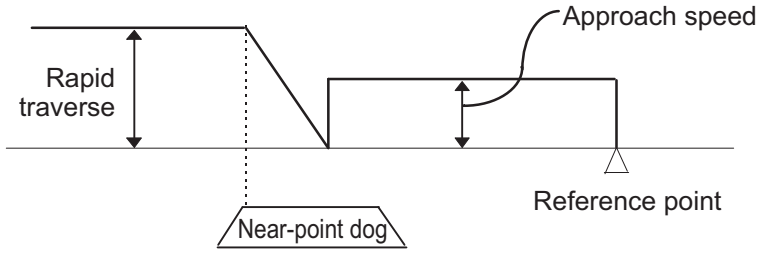
(This corresponds to the setup parameter, basic specification parameter dia.)

2-30	Axis n Reference position return approach speed

[Data definition]

This parameter indicates the movement speed when moving toward the reference point after detecting the near-point dog and then decelerating to stop during the reference point return command. This parameter can be set for each axis.

(This corresponds to the setup parameter, reference point return parameter G28crp.)



[Data unit, range]

The data unit is mm/min, °/min or inch/min and the setting range is 0 to 60000.

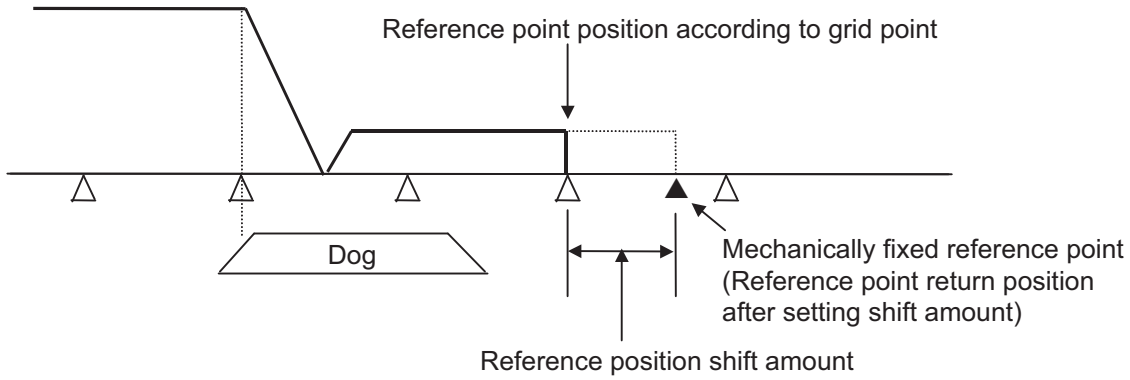
[Precautions]

Writing is possible during the automatic operation, but it will be validated after the NC axis movement is finished.

2-35	Axis n Reference position return shift amount

[Data definition]

This parameter defines the distance from the electrical reference point (grid) to the actual machine reference point during the reference point return command. This can be set for each axis.
(This corresponds to the setup parameter, reference point return parameter G28sft.)



[Data unit, range]

The data unit is 1/2 of the machine constant input unit, and the setting range is 0 to 65535 (μm).

[Precautions]

Writing is possible during the automatic operation, but it will be validated after the NC axis movement is finished.

2-36	Axis n Rapid traverse backlash amount

[Data definition]

This parameter indicates the backlash amount to be compensated when the movement direction is reversed with the movement command in the rapid traverse mode or with the manual operation (excluding handle feed). This can be set for each axis.
(This corresponds to the setup parameter, axis specification parameter G0back.)

[Data unit, range]

The data unit is 1/2 of the machine constant input unit, and the setting range is -9999 to +9999 pulses.

[Precautions]

If the writing is executed during the manual operation, it will be validated after the axis movement is stopped.

2-37	Axis n Cutting feed backlash amount

[Data definition]

This parameter indicates the backlash amount to be compensated when the movement direction is reversed with the movement command in the cutting feed mode or with the handle feed mode of the manual operation. This can be set for each axis.
(This corresponds to the setup parameter, axis specification parameter G1back.)

[Data unit, range]

The data unit is 1/2 of the machine constant input unit, and the setting range is -9999 to +9999 pulses.

[Precautions]

Writing is possible during the automatic operation, but it will be validated after the NC axis movement is finished.

2-39	Axis n Axis parameter

[Data definition]

The following parameters are indicated in bit units.

2-39-A)

Select the soft limit function (stored stroke limit II or IIB) set in the parameter #8204 and #8205.

0: Soft limit valid

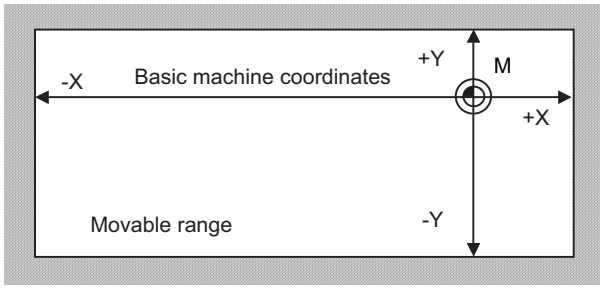
1: Soft limit invalid

2-40	Axis n Stored stroke limit II (+), (-) ----- For user

[Data definition]

These parameters set the movable range in the (+) or (-) limit using 0 of the basic machine coordinates as the base point for each axis.

(This corresponds to the setup parameter, axis specification parameter's soft limit (+) and soft limit (-))



[Data unit, range]

The data unit is 1/2 of the machine constant input unit, and the setting range is -99999.999 mm to +99999.999 mm.

[Precautions]

Writing is possible during the automatic operation, but it will be validated after the NC axis movement is finished.

2-50	Axis n Rapid traverse time constant G0tL

[Data definition]

Set up the liner control time constant for the acceleration and deceleration in the rapid traverse mode. This can be set for each axis with the parameter. (This corresponds to the setup parameter and axis specification parameter G0tL.)

[Data unit, range]

The data unit is ms, and the setting range is 1 to 4000 (ms).

[Precautions]

Writing is possible during the automatic operation, but it will be validated after the NC axis movement is finished.

2-51	Axis n Cutting feed time constant G1tL

[Data definition]

Set up the liner control time constant for the acceleration and deceleration in the cutting feed mode. This can be set for each axis with the parameter. (This corresponds to the setup parameter and axis specification parameter G1tL.)

[Data unit, range]

The data unit is ms, and the setting range is 1 to 4000 (ms).

[Precautions]

Writing is possible during the automatic operation, but it will be validated after the NC axis movement is finished.

2-52	Axis n Rapid traverse time constant G0t1

[Data definition]

Set up the primary-delay time constant for the acceleration and deceleration in the cutting feed mode. This can be set for each axis with the parameter. (This corresponds to the setup parameter and axis specification parameter G0t1. When acceleration or deceleration by software is selected, the second stage time constant is used in G0t1.)

[Data unit, range]

The data unit is ms, and the setting range is 1 to 5000 (ms).

[Precautions]

Writing is possible during the automatic operation, but it will be validated after the NC axis movement is finished.

2-53	Axis n Cutting feed time constant G1t1

[Data definition]

Set up the primary-delay time constant for the acceleration and deceleration in the cutting feed mode. This can be set for each axis with the parameter.

(This corresponds to the setup parameter, axis specification parameter G1t1. When acceleration or deceleration by software is selected, the second stage time constant is used in G1t1.)

[Data unit, range]

The data unit is ms, and the setting range is 1 to 5000 (ms).

[Precautions]

Writing is possible during the automatic operation, but it will be validated after the NC axis movement is finished.

2-54	Axis n Current limit value 2

[Data definition]

Set the rate (%) in respect to the stall current for special operations (absolute position initialization, stopper operation, etc). (This is the limit value for both + and - direction.) For making the maximum driver torque level available, set "800". This can be set for each axis with the parameter.

(This corresponds to the setup parameter, servo parameter SV014.)

[Data unit, range]

The data unit is the stall rated current %, and the setting range is 0 to 999 (%).

[Precautions]

Writing is possible during the automatic operation, but it will be validated after the NC axis movement is finished.

2-55	Axis n Axis name

[Data definition]

Specify the axis name of each axis with alphabet. Spcify it from X, Y, Z, U, V, W, A, B, and C.

(This corresponds to the setup parameter and basic parameter "axname".)

[Data unit, range]

Input and output with ASCII code.

2-56	Axis n Cutting feed clamp speed

[Data definition]

Set the maximum cutting feedrate for each axis.

It will be clamped with this feedrate even if the feedrate with G01 is over this value.

(This corresponds to the setup parameter and basic parameter "clamp".)

[Data unit, range]

Data unit is ms, and the setting range is 1 to 1000000 (ms).

2-57	Axis n Axis n Soft limit IB+

[Data definition]

Set the coordinate of the upper limit of the area where the stored stroke limit IB is prohibited.
Set a value from zero point in the basic machine coordinate system.
(This corresponds to the setup parameter and axis specification parameter OT_1B+.)
Stored stroke limit IB function will be invalid if the values set for the sign and value (other than 0) are the same as soft limit IB-.

[Data unit, range]

Data unit is half of machine constant input unit, and the setting range is -99999.999 mm to +99999.999 mm

2-58	Axis n Soft limit IB-

[Data definition]

Set the coordinate of the lower limit of the area where the stored stroke limit IB is prohibited.
Set a value from zero point in the basic machine coordinate system.
(This corresponds to the setup parameter and axis specification parameter OT_1B-.)
Stored stroke limit IB function will be invalid if the values set for the sign and value (other than 0) are the same as soft limit IB-.

[Data unit, range]

Data unit is half of machine constant input unit, and the setting range is -99999.999 mm to +99999.999 mm

2-59	Axis n Soft limit IB type

[Data definition]

Select the type that applies the settings of "#2062 OT_IB+" and "#2061 OT_IB-" in stored stroke limit I. (This corresonds to the axis specification parameter OT_1Byte.)
0: Soft limit IB is valid
1: Both soft limit IB and soft limit IC are invalid
2: Soft limit IC is valid

[Data unit, range]

The setting range is 0, 1 and 2.

3-10	Compensation basic axis No.

[Data definition]

Specify the basic axis address for machine error compensation.
For pitch error compensation, set the name of the axis to be compensated.
For relative position compensation, set the name of the axis to be the base axis.
In the multi-part system, set "part system No. + axis name".
(This corresponds to the setup parameter, machine compensation parameter cmpax.)

[Data unit, range]

Output the axis No. of designated axis.

[Precautions]

Write disabled.

3-11	Compensation direction axis No.

[Data definition]

Specify the compensation axis address for machine error compensation.
For pitch error compensation, set the same axis name as #4001 cmpax.
For relative position compensation, set the name of the axis to be actually compensated.
In the multi-part system, set "part system No. + axis name".
(This corresponds to the setup parameter, machine compensation parameter drcax.)

[Data unit, range]

Output the axis No. of designated axis.

[Precautions]

Write disabled.

3-12	**Division point No. at reference position**

[Data definition]

Set the compensation data No. corresponding to the reference point position. The reference point is actually the base, so there is no compensation No. Set the number that is decremented by 1.
(This corresponds to the setup parameter, machine compensation parameter rdvno.)

[Data unit, range]

The setting range is 4101 to 5124.

[Precautions]

Write disabled.

3-13	**Division point No. at the most negative side**

[Data definition]

Set the compensation data No. that is on the farthest negative side.
(This corresponds to the setup parameter, machine compensation parameter mdvno.)

[Data unit, range]

The setting range is 4101 to 5124.

[Precautions]

Write disabled.

3-14	**Division point No. at the most positive side**

[Data definition]

Set the compensation data No. that is on the farthest positive side.
(This corresponds to the setup parameter, machine compensation parameter pdvno.)

[Data unit, range]

The setting range is 4101 to 5124.

[Precautions]

Write disabled.

3-15	**Compensation scale factor**

[Data definition]

Set the compensation amount's scale.
(This corresponds to the setup parameter, machine compensation parameter sc.)

[Data unit, range]

The setting range is 0 to 99.

[Precautions]

If the writing is executed during the manual operation, it will be validated after the axis movement is stopped.

3-16	Division interval

[Data definition]

Set the interval to divide the basic axis. Each compensation data will be the compensation amount for each of these intervals.

(This corresponds to the setup parameter, machine compensation parameter spcdy.)

[Data unit, range]

The setting range is 1 to 9999999.

[Precautions]

Writing is possible during the automatic operation, but it will be validated after the NC axis movement is finished.

4-10	Axis n G54 workpiece coordinate system offset
4-11	Axis n G55 workpiece coordinate system offset
4-12	Axis n G56 workpiece coordinate system offset
4-13	Axis n G57 workpiece coordinate system offset
4-14	Axis n G58 workpiece coordinate system offset
4-15	Axis n G59 workpiece coordinate system offset

[Data definition]

These are the G54 to G59 workpiece offset amount of the nth axis (n: 1 to No. of control axes.).

(This corresponds to the tool/compensation amount workpiece coordinate offset G54 to G59.)

[Data unit, range]

Unit

Input unit (iunit)	Linear axis		Rotary axis
	Input unit (metric)	Input unit (inch)	
B	0.0005mm	0.00005inch	0.0005°
C	0.00005 mm	0.000005 inch	0.00005 °

Range: -199999998 to +199999998

[Precautions]

This setting is valid after the data is rewritten and the next workpiece coordinate changeover is commanded.

4-16	Axis n External workpiece coordinate system offset

[Data definition]

These are the external workpiece coordinate system offset amount of the nth axis (n: 1 to No. of control axes).

(This corresponds to the tool/compensation amount workpiece coordinate offset EXT.)

[Data unit, range]

Unit

Input unit (iunit)	Linear axis		Rotary axis
	Input unit (metric)	Input unit (inch)	
B	0.0005mm	0.00005inch	0.0005°
C	0.00005 mm	0.000005 inch	0.00005 °

Range: -199999998 to +199999998

[Precautions]

This setting is valid after the data is rewritten and the next workpiece coordinate changeover is commanded.

5-30	Servo alarm No.

[Data definition]

This indicates that an error has occurred in the servo system.

When an error occurs, the NC alarm 2 (AL2:X331) will turn ON.

(1) Data configuration

Sub-section No.	Details
16	Alarm No. main (2-byte)
18	Alarm attribute (2-byte) bit F 0: No alarm 1: Alarm has occurred (hexadecimal)
20	Alarm No. sub 1 (2-byte)
22	Alarm No. sub 2 (2-byte)

(2) Alarm contents

Alarm No. Main	Alarm No. Sub 1	Alarm No. Sub 2	Alarm contents
1	10	Alarm axis	Insufficient voltage
1	11	-	Axis selection error
1	12	Alarm axis	Memory error 1
1	13	-	Software processing error 1
1	16	Alarm axis	Magnetic pole detection error
1	17	Alarm axis	A/D converter error
1	18	Alarm axis	Mortor side detector - Initial communication error
1	1A	Alarm axis	Machine side detector - Initial communication error
1	1B	Alarm axis	Machine side detector - CPU error 1
1	1C	Alarm axis	Machine side detector - EEPROM/LED error
1	1D	Alarm axis	Machine side detector - Data error
1	1E	Alarm axis	Machine side detector - Memory error
1	1F	Alarm axis	Machine side detector - Communication error
1	20	Alarm axis	Mortor side detector - No signal
1	21	Alarm axis	Machine side detector - No signal
1	22	Alarm axis	LSI error
1	23	Alarm axis	Excessive speed error 1
1	25	Alarm axis	Absolute position data lost
1	26	-	Unused axis error
1	27	Alarm axis	Machine side detector - CPU error 2
1	28	Alarm axis	Machine side detector - Overspeed
1	29	Alarm axis	Machine side detector - Absolute position data error
1	2A	Alarm axis	Machine side detector - Relative position data error
1	2B	Alarm axis	Motor side detector - CPU error 1
1	2C	Alarm axis	Motor side detector - EEPROM/LED error
1	2D	Alarm axis	Mortor side detector - Data error
1	2F	Alarm axis	Mortor side detector - Communication error
1	30	Alarm axis	Over regeneration
1	31	Alarm axis	Overspeed
1	32	Alarm axis	Power module overcurrent
1	33	Alarm axis	Overvoltage
1	34	-	NC-DRV communication - CRC error
1	35	Alarm axis	NC command error

Alarm No. Main	Alarm No. Sub 1	Alarm No. Sub 2	Alarm contents
1	36	-	NC-DRV communication - Communication error
1	37	Alarm axis	Initial parameter error
1	38	-	NC-DRV communication - Protocol Error 1
1	39	Alarm axis	NC-DRV communication - Protocol Error 2
1	3A	Alarm axis	Overcurrent
1	3B	Alarm axis	Power module overheat
1	3C	Alarm axis	Regeneration circuit error
1	40	Alarm axis	Detector selection unit switching error
1	41	Alarm axis	Detector selection unit communication error
1	42	Alarm axis	Feedback error 1
1	43	Alarm axis	Feedback error 2
1	46	Alarm axis	Motor overheat
1	50	Alarm axis	Overload 1
1	51	Alarm axis	Overload 2
1	52	Alarm axis	Excessive error 1
1	53	Alarm axis	Excessive error 2
1	54	Alarm axis	Excessive error 3
1	55	-	External emergency stop
1	58	Alarm axis	Collision detection 1 : G0
1	59	Alarm axis	Collision detection 1 : G1
1	5A	Alarm axis	Collision detection 2
1	5C	Alarm axis	Orientation feedback error
1	5F	-	External contactor error
1	61	-	Power module overcurrent
1	63	-	Supplementary regeneration error
1	65	-	Rush relay error
1	67	-	Phase interruption
1	68	-	Watchdog
1	69	-	Grounding
1	6A	-	External contactor welding
1	6B	-	Rush relay welding
1	6C	-	Main circuit error
1	6D	-	Parameter error
1	6E	-	Memory error
1	6F	-	Power supply error
1	71	-	Instantaneous power interruption
1	73	-	Over regeneration
1	74	-	Regenerative resistor overheat
1	75	-	Overvoltage
1	76	-	External emergency stop setting error
1	77	-	Power module overheat
1	88	-	Watchdog

(Note 1) Depending on the driver type and power supply type, there may be some alarms that might not occur.
(Note 2) Refer to the alarm No. when the alarm attribute bit F is set to 1.

5-90	Servo warning No.

[Data definition]

This indicates that a warining alarm has occurred in the servo system.

(1) Data configuration

Sub-section No.	Details
64	Alarm No. main (2-byte)
66	Alarm attribute (2-byte) bit F 0: No alarm 1: Alarm has occurred (hexadecimal)
68	Alarm No. sub 1 (2-byte)
70	Alarm No. sub 2 (2-byte)

(2) Alarm contents

Alarm No. Main	Alarm No. Sub 1	Alarm No. Sub 2	Alarm contens
2	90	Alarm axis	Detector - Initial communication error
2	91	Alarm axis	Detector - Communication error
2	92	Alarm axis	Detector - Protocol error
2	93	Alarm axis	Initial absolute position fluctuation
2	96	Alarm axis	Scale feedback error
2	97	Alarm axis	Scale offset error
2	9E	Alarm axis	Absolute position detector - Revolution counter error
2	9F	-	Battery voltage drop
2	A8	Alarm axis	Turret indexing error warning
2	E0	Alarm axis	Over regeneration warning
2	E1	Alarm axis	Overload warning
2	E3	Alarm axis	Absolute position counter warning
2	E4	Alarm axis	Parameter error warning
2	E6	Alarm axis	Control axis detachment warning
2	E7	-	In NC emergency stop state
2	E8	-	Excessive supplementary regeneration frequency
2	E9	-	Instantaneous power interruption warning
2	EA	-	In external emergency stop state
2	EB	-	Over regeneration warning

(Note 1) E7 of the alarm No. sub 1 cannot be viewed as the servo warning No.

(Note 2) Refer to the alarm No. when the alarm attribute bit F is set to 1.

5-130	Operation error No.

[Data definition]

This indicates that the axis cannot move, etc., due to the operation or machine side conditions.
When an error occurs, the NC alarm 4 (AL4) will turn ON.

AL4	$1	$2	$3	$4	$5	$6	$7
	X633	X6B3	X733	X7B3	X833	X8B3	X933

(1) Data configuration

Sub-section No.	Details
96	Alarm No. main (2-byte)
98	Alarm attribute (2-byte) bit F 0: No alarm 1: Alarm has occurred (hexadecimal)
100	Alarm No. sub 1 (2-byte)
102	Alarm No. sub 2 (2-byte)

(2) Alarm contents

Alarm No. Main	Alarm No. Sub 1	Alarm No. Sub 2	Alarm contents
1	1	Alarm axis	Dog overrun
1	2	Alarm axis	Z-axis not cross
1	3	Alarm axis	Invalid return
1	4	Alarm axis	External interlock
1	5	Alarm axis	Internal interlock
1	6	Alarm axis	H/W stroke end
1	7	Alarm axis	S/W stroke end
1	8	-	Chuck/tail-stock barrier stroke end axis found
1	9	-	Reference point return number illegal
1	20	-	Reference point return illegal
1	24	-	Reference point return disabled during absolute position detection alarm
1	25	-	Reference point return disabled during zero point initialization
1	51	-	Synchronization error too large
1	101	-	Not operation mode
1	102	-	Override zero
1	103	-	External feedrate zero
1	104	-	F1-digit speed zero
1	105	-	Spindle stop
1	106	-	Handle feed axis No. illegal
1	107	-	Spindle speed excessive
1	108	-	Fixed point mode feed axis No. illegal
1	109	-	Block start interlock
1	110	-	Cutting block start interlock
1	112	-	Program check mode
1	115	-	Resetting
1	117	-	Play back not possible
1	120	-	Synchronization correction mode ON
1	121	-	No synchronous control option
1	124	Alarm axis	Simultaneous axes movement prohibition when the incline axis control is valid.
1	160	Alarm axis	Axis with no maximum speed set for the outside of the soft limit range
1	1005	-	Execution of G114.* during G114.*
1	1106	-	Spindle synchronization phase calculation illegal

(Note 1) Refer to the alarm No. when the alarm attribute bit F is set to 1.

5-140	Automatic stop code

[Data definition]

This indicates the cause of automatic stop or block stop.

(1) Data configuration

Sub-section No.	Contents
104	Alarm attribute main (2-byte)
106	Alarm attribute (2-byte) bit F 0: No alarm 1: Alarm has occurred (hexadecimal)
108	Alarm attribute sub 1 (2-byte)
110	Alarm attribute sub 2 (2-byte)

(2) Alarm contents

Alarm No. Main	Alarm No. Sub 1	Alarm No. Sub 2	Alarm contents
1	101	-	Automatic start is not performed as one of the axes is moving.
1	102	-	Automatic start is not performed as the NC is not ready.
1	103	-	Automatic start is not performed as the "reset" signal has been input.
1	104	-	Automatic start is not perfomed as the feed hold signal is turned ON.
1	105	-	Automatic start is not performed as one of the axes is at the stroke end.
1	106	-	Automatic start is not performed as one of the axes is at the stored stroke limit.
1	107	-	Automatic start is not performed as there is no operation mode.
1	108	-	Automatic start is not performed as two or more automatic operation modes have been selected.
1	109	-	Automatic start is not performed as the automatic operaton mode has changed to another automatic operation mode.
1	110	-	Automatic start is not performed as the buffer correction is executed.
1	113	-	Automatic start is not possible because a thermal alarm (Z53 CNC overheat) has occurred.
1	116	-	Automatic start is not possible because the voltage of the battery in the NC control unit has dropped.
1	138	-	A start signal was input during an absolute position detection alarm.
1	139	-	A start signal was input during zero point initialization in the absolute position detection system.
1	141	-	A start signal was input for MDI mode while the MDI operation was being carried out in another part system.
1	190	-	Automatic start is not performed as the setting of setup parameters is enabled.
1	191	-	Automatic start was attempted while a file was being deleted/written.
2	201	-	Automatic operation pause was perfomed as an axis is at the stroke end.
2	202	-	Automatic operation pause was performed as an axis is at the stored stroke limit.
2	203	-	Automatic operation pause was perfomed as the reset signal is detected.
2	204	-	Automatic operation pause was perfomed as the feed hold switch is ON.
2	205	-	Automatic operation pause was perfomed as the operation mode has changed to another mode during automatic operation.
2	206	-	The acceleration and deceleration time constants are too large.
2	215	-	An absolute position detection alarm occurred.
3	301	-	Block stop was performed as the SINGLE BLOCK switch turned ON.
3	302	-	Block stop was performed due to the user macro stop.
3	303	-	Block stop was performed as the automatic mode changed to another automatic mode.

Alarm No. Main	Alarm No. Sub 1	Alarm No. Sub 2	Alarm contents
3	304	-	MDI last block was completed.
3	305	-	The interlock signal, which locks the block start, is ON.
3	306	-	The interlock signal, which locks the block cutting start, is ON.
3	310	-	The "inclined axis control: No Z axis compensation" signal has turned ON or OFF during the program operation.
10	(Note 2)	-	The Nos. in the table are shown during the operation of the corresponding completion wait factor. The numbers will disappear when the operation is completed.

(Note 1) Refer to the alarm No. when the alarm attribute bit F is set to 1.

(Note 2) 0□□□

Alarm No.	Waiting for unclamp signal (Note 3)			Dwelling
0				
1				×
8	×			
9	×			×

Alarm No.	Door open (Note 4)			Waiting for spindle position to be looped
0				
1				×
8	×			
9	×			×

Alarm No.	Waiting for spindle orientation to complete	Waiting for cutting speed deceleration	Waiting for rapid traverse deceleration	Waiting for MSTB completion
0				
1				×
2			×	
3			×	×
4		×		
5		×		×
6		×	×	
7		×	×	×
8	×			
9	×			×
A	×		×	
B	×		×	×
C	×	×		
D	×	×		×
E	×	×	×	
F	×	×	×	×

(Note 3) Waiting for unclamp when "#2076 index_x"=1.

(Note 4) Door open mode is enable d by the door interlock function.

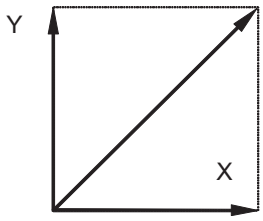
11/15-10	Interporation vector length

[Data definition]

The remaining movement distance of the block being executed is indicated.

$$\sqrt{\Sigma(\text{Remaining movement distance of each axis})^2}$$

[Interpolation vector length]



[Data unit, range]

The unit is 1/2 of the input unit.
(Either 0.5μm, or 0.05μm)

[Precautions]

The data is not set when G0 non-interpolation (G0Intp=1). The data will be updated with the interpolation cycle.

11/15-20	Movement mode

[Data definition]

Data (binary)	Contents
0	G00 Positionoing (each axis independent)
1	G00 Positionoing (linear)
2	G01 Linear interpolation
3	G02 Circular interpolation (CW)
4	G03 Circular interpolation (CCW)
5	G02 X_Y_Z Helical interpolation (CW)
6	G03 X_Y_Z Helical interpolation (CW)
7	
8	
9	
10	
11	G04 Time designated dwell
12	
13	G27_P1 1st reference position valification
14	G27_P2 2nd reference position valification
15	G27_P3 3rd reference position valification
16	G27_P4 4th reference position valification
17	G28 Automatic referene point return
18	G29 Return from automatic referene point
19	G30_P2 2nd reference point return
20	G30_P3 3rd reference point return
21	G30_P4 4th reference point return
22	G31 Skip function
23	G31.1 Multi-step skip function 1
24	G31.2 Multi-step skip function 2
25	G31.3 Multi-step skip function 3
26	G33 Thread cutting (G32 for lathe G code series 2.)
27	G34 Variable lead thread cutting (lathe only)
28	
29	G92 Coordinate system setting
30	

12/16-10	Axis direction movement amount

[Data definition]

The remaining movement distance of each axis in the block being executed is indicated.

(Machine position at movement end point) - (Machine position at movement start or current position)

For block being executed

For block before execution

[Data unit, range]

The unit is 1/2 of the input unit.

(Either 0.5μm, or 0.05μm)

[Precautions]

(1) If the movement mode is skip or multi-step skip, the movement end point will not be the skip stop point, but instead will be a value calculated from the commanded value.

(2)If the movement mode is counter preset, the counter preset value will be set instead of the remaining movement distance of each axis. The value will be cleared immediately after the counter preset is executed.

(3) If the movement mode is reference point return, the remaining movement distance to the middle point will be set.

(4) If the movement mode is start position return, the remaining movement distance from the middle point will be set.

13/17-10	Interpolation mode (G code group 1)

[Data definition]

The current movement modal (group 1) is indicated.

Data	Machininig center system	Lathe system	
		Series 2	Series 3
0	G00	G00	G00
1	G01	G01	G01
2	G02	G02	G02
3	G03	G03	G03
4	-	-	-
5	-	-	-
6	G33	G32	G33
7	-	-	-
8	-	G34	G34

13/17-11	Plane selection (G code group 2)

[Data definition]

The current plane selection modal (group 2) is indicated.

Data	Machininig center system	Lathe system	
		Series 2	Series 3
0	G17	G17	G17
1	G18	G18	G18
2	G19	G19	G19

13/17-12	Feed mode (G code group 5)

[Data definition]

The current feed modal (group 5) is indicated.

Data	Machininig center system	Lathe system	
		Series 2	Series 3
0	-	-	-
1	G94	G98	G94
2	G95	G99	G95

13/17-13	Radius compensation modal (G code group 7)

[Data definition]

The current radius compensation modal (group 7) is indicated.

Data	Machininig center system	Lathe system	
		Series 2	Series 3
0	G40	G40	G40
1	G41	G41	G41
2	G42	G42	G42
3	-	G46	G46

13/17-14	Fixed cycle modal (G code group 9)

[Data definition]

The current fixed cycle modal (group 9) is indicated.

Data	Machininig center system	Lathe system	
		Series 2	Series 3
0	-	G72	G72
1	-	G73	G73
2	-	G74	G74
3	-	G75	G75
4	-	G76	G76
5	-	G90	G77
6	-	G92	G78
7	-	G94	G79
8	G80	G80	G80
9	G81	-	-
10	G82	-	-
11	G83	G83	G83
12	G84	G84	G84
13	G85	G85	G85
14	G86	-	-
15	G87	G87	G87
16	G88	G88	G88
17	G89	G89	G89
18	-	-	-
19	-	G70	G70
20	-	G71	G71
21	G73	-	-
22	G74	-	-
23	G76	G79	G83.2

13/17-15	Workpiece coordinate system modal (G code group 12)

[Data definition]

The current workpiece coordinate system modal (group 12) is indicated.

Data	Machininig center system	Lathe system	
		Series 2	Series 3
0	G54	G54	G54
1	G55	G55	G55
2	G56	G56	G56
3	G57	G57	G57
4	G58	G58	G58
5	G59	G59	G59

13/17-16	Cutting mode (G code group 13)

[Data definition]

The current cutting modal (group 13) is indicated.

Data	Machininig center system	Lathe system	
		Series 2	Series 3
0	G61	G61	G61
1	G62	G62	G62
2	G63	G63	G63
3	G64	G64	G64
4	G61.1	-	-

13/17-17	Other G modals (G code group 3, 4, 6, 10, 17, 18)

[Data definition]

The current G modal (group 3, 4, 6, 17, 18) is indicated.

	bit7	*bit6	bit5	bit4	bit3	bit2	bit1	bit0
		Group 18	Group 17		Group 10	Group 6	Group 4	Group 3
1		G15	G96		G99	G20	G22	G90
0		G14	G97		G98	G21	G23	G91

* Lathe system

13/17-20	Block No.

[Data definition]

The current block No. is indicated.

[Data unit, range]

The setting range is 0 to 99.

13/17-25	Normal line control modal (G code group 15)

[Data definition]

The current normal line control modal (G code group 15) is indicated.

	bitF	bitE	bitD	bitC	bitB	bitA	bit9	bit8
				Group 15	Group 15			
1				G42.1	G41.1/ G42.1			
0				G41.1	G40.1			

* The bitB is turned ON by either G41.1 or G42.1. The bit C determines which of G41.1 or G42.1 turns the bit B ON.

13/17-30	Shape compensation No.

[Data definition]

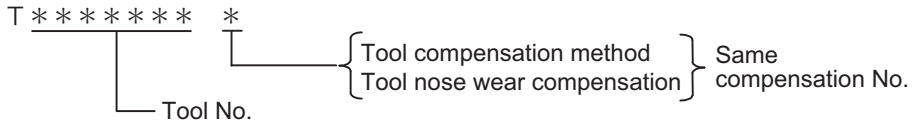
(1)Machininig center system

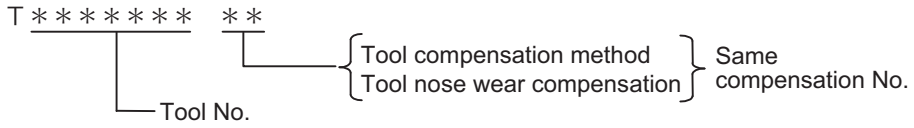
The tool compensation No. commanded by address D in the nose radius compensation (G41, G42) or position compensation (G45 to G48) block is indicated.

(2)Lathe system

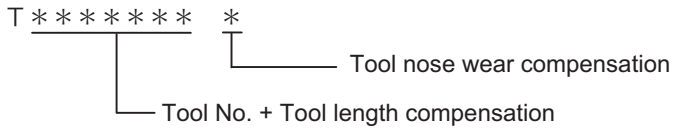
The tool length compensation No. the tool function code T is indicated.

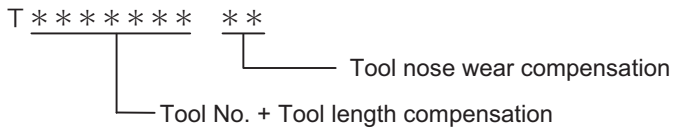
(a) When designating the tool length and tool nose wear compensation No. with the low-order 1digit or 2 digits of the T command.





(b) When designating the tool length compensation No. and tool nose wear compensation No. independently.





In this case, the tool length compensation No. is the last two digits of the high-order digit.

13/17-31	Wear compensation No.

[Data definition]

(1) Machininig center system

This is the same as the shape compensation No.

(2) Lathe system

The tool nose wear No. commanded by the tool function code (T) is indicated.

13/17-40	Miscellaneous function (M) code (BCD)

[Data definition]

The miscellaneous function No. commanded by the miscellaneous function code (M) is indicated.

13/17-41	Spindle function (S) code (BIN)

[Data definition]

The spindle speed commanded by the spindle function code (S) is indicated.

13/17-42	Tool function (T) code (BCD)

[Data definition]

The tool No. commanded by the tool function code (T) is indicated.

13/17-43	2nd miscellaneous function (B) code (BCD)

[Data definition]

The data commanded by the 2nd miscellaneous function code (B, A or C) is indicated.

13/17-44	Program No.

[Data definition]

The current program No. (modal) is indicated.

[Data unit, range]

The setting range is 1 to 99999999 (binary).

13/17-45	Sequence No.

[Data definition]

The current sequence No. is indicated.

[Data unit, range]

The setting range is 1 to 99999 (binary).

14/18-10	Tool length compensation No.

[Data definition]

The tool length compensation No. of the axis is indicated

[Data unit, range]

The setting range is 0 to 99999999 (binary).

(Note) This is valid only for the machining center system.

20-10	Automatic effective feedrate

[Data definition]

The actual feedrate in the automatic mode is indicated.

(This includes the speed change conditions such as override.)

(1) For G0, G1, G2, G3, G27

The composite speed of all commanded axes is indicated.

(2) For G28, G29, G30

The speed of the fastest axis among the axes moving simultaneously is indicated.

[Data unit]

Input unit system (iunit)	Input unit (metric)	Input unit (inch)
B	1×2^{-10} mm/min	0.1×2^{-10} inch/min
C	0.1×2^{-10} mm/min	0.01×2^{-10} inch/min

20-11	Manual effective feedrate

[Data definition]

The actual feedrate in the manual mode is indicated.
(This includes the speed change conditions such as override.)
The speed of the fastest axis among the axes moving simultaneously is indicated.

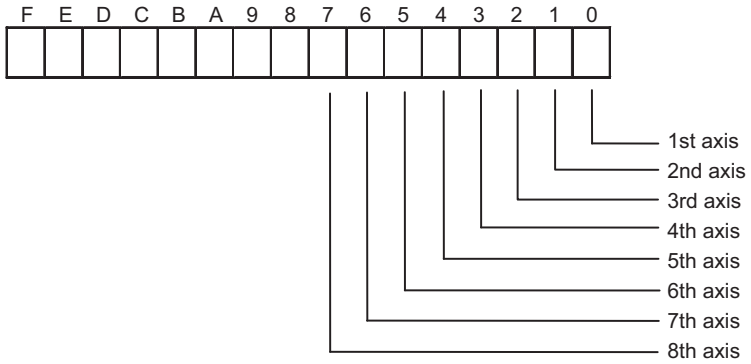
[Data unit]

Input unit system (iunit)	Input unit (metric)	Input unit (inch)
B	1×2^{-10} mm/min	0.1×2^{-10} inch/min
C	0.1×2^{-10} mm/min	0.01×2^{-10} inch/min

20-20	In-position

[Data definition]

This indicates that the control axes which belong to each part system are in teh state of in-position. (Up to 8 axes are available in the part system)



21-10	Current position in machine coordinate system

[Data definition]

The current position of the axis in the machine coordinate system is indicated.

[Data unit]

Input unit system (iunit)	Linear axis		Rotary axis
	Input unit (metric)	sInput unit (inch)	
B	0.0005mm	0.00005inch	0.0005˚
C	0.00005 mm	0.000005 inch	0.00005 ˚

21-12	Manual interrupt amount (1) (Manual absolute switch OFF)

[Data definition]

The total of the movement amount in the manual mode with the manual absolute switch OFF is indicated.
The program coordinate system is shifted by the distance corresponding to this data.

[Data unit]

Input unit system (iunit)	Linear axis		Rotary axis
	Input unit (metric)	Input unit (inch)	
B	0.0005mm	0.00005inch	0.0005˚
C	0.00005 mm	0.000005 inch	0.00005 ˚

21-13	Manual interrupt amount (2) (Manual absolute switch OFF)

[Data definition]

The total of the movement amount in the manual mode with the manual absolute switch ON is indicated.
This data is cleared in the following cases:

(1) When calculation of the buffer is started during automatic starting, or when automatic start up is executed.
(2) When the reset signal is input.

[Data unit]

Input unit system (iunit)	Linear axis		Rotary axis
	Input unit (metric)	Input unit (inch)	
B	0.0005mm	0.00005inch	0.0005°
C	0.00005 mm	0.000005 inch	0.00005 °

21-20	Current position in workpiece coordinate system

[Data definition]

The current position in the currently selected workpiece coordinate system is indicated.

[Data unit]

Input unit system (iunit)	Linear axis		Rotary axis
	Input unit (metric)	Input unit (inch)	
B	0.0005mm	0.00005inch	0.0005°
C	0.00005 mm	0.000005 inch	0.00005 °

21-30	Current position in workpiece coordinate system during skip ON

[Data definition]

The current position in the workpiece coordinate system when the skip signal is input during the G31 command is indicated.
This corresponds to the macro variable #5061, 5062 .....

[Data unit]

Input unit system (iunit)	Linear axis		Rotary axis
	Input unit (metric)	Input unit (inch)	
B	0.0005mm	0.00005inch	0.0005°
C	0.00005 mm	0.000005 inch	0.00005 °

21-31	Current position in machine coordinate system during skip ON

[Data definition]

The current position in the machine coordinate system when the skip signal is input during the G31 command is indicated.

[Data unit]

Input unit system (iunit)	Linear axis		Rotary axis
	Input unit (metric)	Input unit (inch)	
B	0.0005mm	0.00005inch	0.0005°
C	0.00005 mm	0.000005 inch	0.00005 °

21-32	Remaining distance during skip ON

[Data definition]

The remaining commanded distance when the skip signal is input during the G31 command is indicated.

[Data unit]

Input unit system (iunit)	Linear axis		Rotary axis
	Input unit (metric)	Input unit (inch)	
B	0.0005mm	0.00005inch	0.0005°
C	0.00005 mm	0.000005 inch	0.00005 °

21-33	Current position in machine coordinate system during manual skip ON

[Data definition]

The current position in the machine coordinate system when the skip signal is ON during the manual skip command is indicated.

[Data unit]

Input unit system (iunit)	Linear axis		Rotary axis
	Input unit (metric)	Input unit (inch)	
B	0.0005mm	0.00005inch	0.0005°
C	0.00005 mm	0.000005 inch	0.00005 °

21-34	Current position of program command

[Data definition]

This indicates the program position of machine coordinate system. (The same value as the current value 2 of the servo monitor screen will be displayed.)

This data does not include the work offset amount, tool compensation amount and radius compensation amount. Counter operation is artificially carried out by adding the remaining movement amount to the end position coordinate which is designated by the machining program. So it informs the command position of the machining program when it reaches the end point of each block, but it does not show the correct path of the machining program when the axis is in motion.

[Data unit]

The double of the counter value is stored.

Input unit system (iunit)	Linear axis		Rotary axis
	Input unit (metric)	Input unit (inch)	
B	0.0005mm	0.00005inch	0.0005°
C	0.00005 mm	0.000005 inch	0.00005 °

21-35	Remaining command

[Data definition]

It displays the remaining distance of the movement command currently executed. (The remaining distance is the incremental distance from the current position to the end point of that block).

[Data unit]

Input unit system (iunit)	Linear axis		Rotary axis
	Input unit (metric)	Input unit (inch)	
B	0.0005mm	0.00005inch	0.0005°
C	0.00005 mm	0.000005 inch	0.00005 °

22-10	Emergency stop cause

[Data definition]

The cause of why the CNC entered the emergency stop state is indicated.
This data can also be referred to with the file register R21 (G10221) in the PLC interface.
The correspondence of each bit is explained below. Here, the signal is normally "1", and is set to "0" when an emergency stop occurs.

22-10-0) CNC side PLC Software stop state

This indicates that the emergency stop state was entered because the CNC side PLS is in the stop state. Switching RUN/STOP for CNC side PLC is made by using the CNC unit rotary switch 2 (right side). (Normal: 0, at STOP: 1)

22-10-4) Emergency stop output

This indicates that the 24V is not being supplied to the emergency stop input because the emergency stop switch has been pressed.

22-10-6) PLC Emergency stop output device Y327 is "1"

This indicates that the user PLC has entered the emergency stop state.
The PLC device "Y427" is the PLC emergency stop interface.

22-10-D) Door interlock, dog/OT arbitrary allocation device illegal

The device No. of door interlock dogO/T arbitrary allocation overlaps another signal, or that is specified with and illegal No.

22-10-E) Spindle drive unit emergency stop output

This indicates that the spindle controller is in the emergency stop state.

22-10-F) Servo drive unit emergency stop output

This indicates that the servo controller is in the emergency stop state.

23-10	Spindle command speed (effective value)

[Data definition]

This is not the spindle function (S) command value, but instead is the commanded speed that is obtained by adding the conditions such as spindle override, spindle stop and spindle gear shift to the S command. Designate the axis No. with section sub-ID No.
(1: 1st spindle, 2: 2nd spindle, ...7: 7th spindle)
* When "0" is set, the 1st spindle data will be output.

[Data unit and range]

The data unit is r/min. The setting range is 0 to 32767.

24-1	Power ON time

[Data definition]

This is the total cumulative time from when the controller power is turned ON to when it is turned OFF.

[Data unit and range]

The read data is a binary, and is not a time unit.
The following calculation is performed to change the data to time (unit: second).

$$\text{Time [s]} = \boxed{\text{Read data}} \times \frac{64}{9000}$$

The reverse calculation is perfomed to write the data.

$$\boxed{\text{Write data}} = \frac{9000}{64} \times \text{time}$$

24-2	Automatic operation time

[Data definition]*256

This is the total cumulative time per machining time from when the automatic start button is pressed in the memory (tape) mode to when the M02/M30 command is issued, or to when the reset process is carried out by pressing the reset button.

[Data unit and range]

The read data is a binary, and is not a time unit.

The following calculation is performed to change the data to time (unit: second).

$$\text{Time [s]} = \boxed{\text{Read data}} \times \frac{64}{9000}$$

The reverse calculation is perfomed to write the data.

$$\boxed{\text{Write data}} = \frac{9000}{64} \times \text{time}$$

24-3	Automatic start up time

[Data definition]

This is the total cumulative time of automatic starting from when the automatic start button is pressed in the memory (tape) mode or MDI mode to when the feedhold stop, block stop or reset button is pressed.

[Data unit and range]

The read data is a binary, and is not a time unit.

The following calculation is performed to change the data to time (unit: second).

$$\text{Time [s]} = \boxed{\text{Read data}} \times \frac{64}{9000}$$

The reverse calculation is perfomed to write the data.

$$\boxed{\text{Write data}} = \frac{9000}{64} \times \text{time}$$

24-4	External cumulative time 1
24-5	External cumulative time 2

[Data definition]

This counts and displays the total cumulative time that the designated signal (Y414, Y415) is ON with the PLC program. The signals are assigned in the following manner.

24-4 External cumulative time 1: Y314

24-5 External cumulative time 2: Y315

[Data unit and range]

The read data is a binary, and is not a time unit.

The following calculation is performed to change the data to time (unit: second).

$$\text{Time [s]} = \boxed{\text{Read data}} \times \frac{64}{9000}$$

The reverse calculation is perfomed to write the data.

$$\boxed{\text{Write data}} = \frac{9000}{64} \times \text{time}$$

26-10	Spindle Motor real speed

[Data definition]

This is the real speed of the spindle motor detected by the encoder built into the motor.

[Data unit, range]

The data unit is r/min.

26-20	Spindle Motor load

[Data definition]

This is the load (torque current) of the spindle motor.

The rated load for 30 minutes is regarded as 100%.

Spindle motor load (%) = | Read data | (An absolute value is retrieved.)

26-30	Spindle Position within one rotation (Z-phase standard)

[Data definition]

This is the Z-phase position within one rotation of the spindle motor.

The same value (rounded with 360°) as the machine value in the spindle monitor (3) screen of the CNC monitor will be output.

[Data unit]

If the output unit setting ("#3025") is B, it is 0.0005 degree, and if it is C, it is 0.00005 dgree.

27-10	Smoothing status, servo status

[Data definition]

The various servo related information is expressed in bit units.

27-10-0) Ready ON

If the drive unit can be entered the ready ON state, including the ready ON request signal from the CNC, the main circuit can be turned on. While the main circuit is ON, the ready ON signal will turn ON as the answer signal to the CNC.

The conditions for turning OFF is as follows:

(1) When the ready ON request signal from the CNC turns OFF.
(2) When the CNC enters the emergency stop state.
(3) When a servo alarm occurs.

27-10-1) Servo ON

If the conditions, where the above ready ON signal is ON and the servo ON request signal is received from the CNC, are met, turn ON the servo ON signal (structure a position loop). While the position loop is structured, the servo ON signal will remain ON as the answer signal to the CNC.

The conditions for turning OFF is as follows:

(1) When the condition for turning OFF the the ready OFF signal is met and the servo ON request signal from the CNC turns OFF.

27-10-3) In alarm

This notifies that the drive unit is in the servo OFF state.

27-10-4) Absolute position established

This turns ON when the absolute position has been established.

27-10-5) Z phase passed

This means that the datum point (Z phase) has been passed by the axis movement after the power was turned ON. The servo parameter "SPEC" value in the setup parameters determines which datum point (Z phase) is valid among the points output by detector.

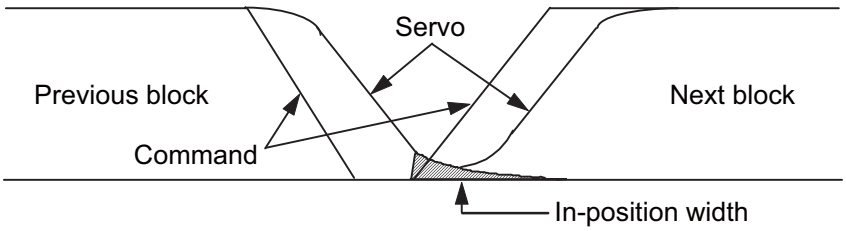
The CNC will determine the reference point return position, etc., based on this signal.

Once turned ON, this signal remains ON until it is turned OFF.

27-10-6) In-position

This indicates that the difference of the command and the feedback from the detector, or in other words, the position deflection (position loop droop) is within the range designated by the servo parameter "SV024" (in-position width) in the setup parameters.

How the CNC operates upon receiving this signal depends on the basic specification parameter "inpos" (in-position check valid) in the setup parameters.



27-10-7) Torque limit

This notifies that the motor drive current has been limited.

The current limit parameter will follow the ILMT (limit values for both + and - directions) in the servo parameters of the setup parameters.

27-10-8) Smoothing 0

The acceleration/deceleration time constant to make the machine movement smooth is applied to the issued step-state command. The circuit onto which the acceleration/deceleration time constant is applied is called the smoothing circuit.

Smoothing 0 means that there is no droop amount in that smoothing circuit.

(Note 1) This may turn ON when the machine is moving at an extremely low speed.

(Note 2) This state is equivalent to when the plus motion (+) signal (MVPn) and the minus motion (-) signal (MVMn) sent from the CNC to the PLC are both OFF.

27-10-9) Smoothing (+)

This indicates that there is a (+) droop amount (movement in the + direction) in the smoothing circuit described in section 27-10-8.

(Note 1) This may turn OFF when the machine is moving at an extremely low speed.

(Note 2) This state is equivalent to when the plus motion (+) signal (MVPn) sent from the CNC to the PLC.

27-10-A) Smoothing (-)

This indicates that there is a (-) droop amount (movement in the - direction) in the smoothing circuit described in section 27-10-8.

(Note 1) This may turn OFF when the machine is moving at an extremely low speed.

(Note 2) This state is equivalent to when the minus motion (-) signal (MVPn) sent from the CNC to the PLC.

27-10-C) Hardware OT+ (hardware overtravel)

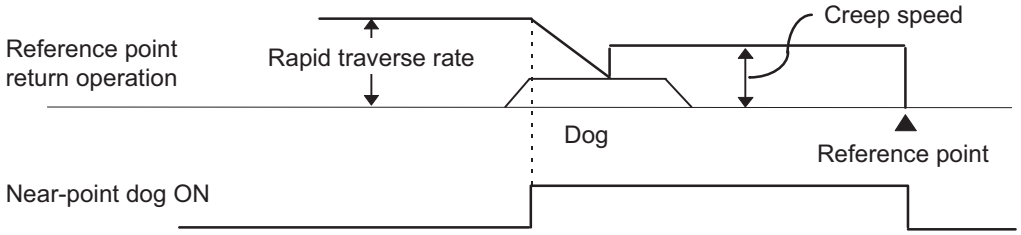
This indicates that the stroke end (+) signal was input for an axis moving in the (+) direction. Once the conditions are met, the signal will turn ON and the axis will move in the (+) direction. And when the stroke end (-) signal is no longer input, this signal will turn OFF.

27-10-D) Hardware OT- (hardware overtravel)

This indicates that the stroke end (-) signal was input for an axis moving in the (-) direction. Once the conditions are met, the signal will turn ON and the axis will move in the (-) direction. And when the stroke end (-) signal is no longer input, this signal will turn OFF.

27-10-E) Near-point dog ON

This turns ON when the reference point return near-point detection signal (dog) for the axis is detected while executing the dog-type reference point return. This turns OFF when the reference point is reached.



27-20	Servo delay amount

[Data definition]

This is an amount that indicates the difference of the actual machine position from the commanded position. (With code (+) ir (-))

The servo delay amount will be the same as the droop on the diagnosis screen's servo monitor, according to the following equation.

$$\text{Droop [command unit]} = \left| \boxed{\text{Read data}} \right| \times \frac{1}{2}$$

27-30	Feed axis motor load A (%)

[Data definition]

This is the load of the feed axis monitor.
The data read with the PLC window has a code (+ or -).

[Precautions]

The motor data is data that considers the motor type. Thus, conversion may not be required depending on the motor type.

27-31	Feed axis motor load B (%)

[Data definition]

This is the load (current) of the feed axis monitor.

(Note) The same contents as the feed axis motor load A (27-30) are obtained for the feed axis motor load B.
To read the feed axis motor load, use the feed axis motor load A (27-30).

27-32	Motor end FB

[Data definition]

This is the feedback value of the speed detector.
The data read with the PLC window has a code.

[Data unit]

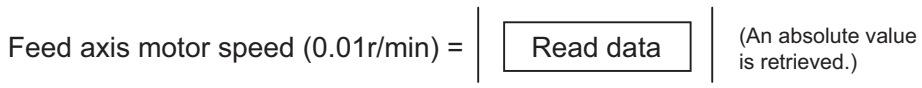
Input unit system (iunit)	Linear axis		Rotary axis
	Input unit (metric)	Input unit (inch)	
B	0.0005mm	0.00005inch	0.0005°
C	0.00005 mm	0.000005 inch	0.00005 °

When detecting the relative position, the base (zero) is where the power is turned ON.
When detecting the absolute position, the base (zero) is where the absolute position initialization set is made.
The distance from the base (not rounded to 360°) is displayed as the FB value of the rotary axis unlike the machine value.

27-33	Feed axis motor speed (0.01r/min)

[Data definition]

This is the speed of the feed axis monitor.
The data read with the PLC window has a code (+ or -).



27-34	Machine end FB

[Data definition]

In case of full-closed control, it is the feedback value of machine end position detector.
In case of the semi-closed control, the value is the same as the motor end FB value.
The data read with the PLC window has a code.

[Data unit]

Input unit system (iunit)	Linear axis		Rotary axis
	Input unit (metric)	Input unit (inch)	
B	0.0005mm	0.00005inch	0.0005°
C	0.00005 mm	0.000005 inch	0.00005 °

When detecting the relative position, the base (zero) is where the power is turned ON.
When detecting the absolute position, the base (zero) is where the absolute position initialization set is made.
The distance from the base (not rounded to 360°) is displayed as the FB value of the rotary axis unlike the machine value.

27-35	**Feed axis motor speed (0.01r/min)**

[Data definition]

This is the speed of the feed axis motor.
The data read with the PLC window has a code.

Feed axis motor speed (0.01r/min) = | Read data | (An absolute value is retrieved.)

27-36	Grid amount

[Data definition]

The grid amount is the distance from where the near-point detection limit switch leaves the near-point dog to the grid point (electrical zero point) as the dog-type reference position return is executed.
The grid amount can be confirmed on the DRIVE MONITOR screen.
After setting the grid mask, the grid amount shows the value designated by the parameter #1229 set01/bit6:
0: Distance between dog ON and basic point (including a grid mask amount)
1: A value given by deducting a grid mask amount from the distance between dog ON and basic point.
The grid amount is cleared by power shutoff of NC, and therefore 0 will be obtained if it is read after the NC restart.

[Data unit]

Input unit (iunit)	Linear axis		Rotary axis
	Input unit (metric)	Input unit (inch)	
B	0.0005mm	0.00005inch	0.0005°
C	0.00005 mm	0.000005 inch	0.00005 °

27-37	Overload (%)

[Data definition]

This indicates the overload status (%) of the motor.

27-38	Estimated disturbance torque (%)

[Data definition]

This indicates the estimated disturbance torque (%) of the motor. The same value as the estimated disturbance torque in the servo monitor is output.

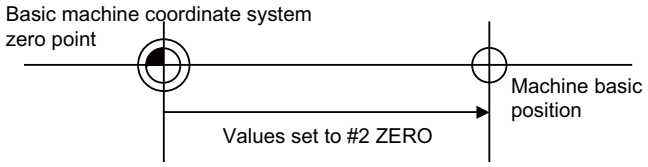
27-39	#2 ZERO

[Data definition]

This parameter is used to determine the basic machine coordinate system.

Specify the coordinates of the machine basic position seen from the zero point of basic machine coordinate system or absolute position basic point.

(Whether the machine basic position or absolute position basic point is used is determined by data specified for #2059 "zerbas" of the setup parameter.)



[Data unit]

Unit: mm

Range: -99999.999 to 99999.999

29-10	**Variable command (common variable value 1)**

[Data definition]

These are comon variables used by the variable commands and user macros.

The sub-section No. of the PLC window uses the same value as the variable No. to be read or written.

The common variable 1 can be used common for all the part systems.

Common variables	Function	
	Sub-section No.	Remark
50 sets: #500 to #549	500 to 549	These can be used in the main program, sub program and each macro program.
100 sets: #500 to #599	500 to 599	
200 sets: #500 to #699	500 to 699	
500 sets: #500 to #999	500 to 999	

[Precautions]

(1) When data is changed during operation:

(a) The data will not be effective on a block that has already been calculated.

(2) The substitute command is executed when the command block is ACT.

(3) When handling decimal place with the PLC window, the last four digits of the data read or written correspond to the decimal place when the control signal bit 3 is set to "1".

When the control signal bit 3 is set to "0", only the integer is read or written.

30-10	**Local variables (Level 0)**

[Data definition]

These are the local variables for the main program (macro level 0).

The sub-section No. of the PLC window uses the same value as the local No. to be read or written.

[Precautions]

(1) When data is changed during operation:

(a) The data will not be effective on a block that has already been calculated.

(b) The variable is cleared to a blank when the macro is called.

(2) The substitute command is executed when the command block is ACT.

(3) When handling decimal place with the PLC window, the last four digits of the data read or written correspond to the decimal place when the control signal bit 3 is set to "1".

30-11	Local variables (Level 2)

[Data definition]

These are the same as the local variables (level 0), and are the local variables in macro level 1.
However, the sub-section No. of the PLC window uses the value which 200 has been added to the local variable No.

30-12	Local variables (Level 2)

[Data definition]

These are the same as the local variables (level 1), and are the local variables in macro level 2.
However, the sub-section No. of the PLC window uses the value which 200 has been added to the local variable No.

30-13	Local variables (Level 3)

[Data definition]

These are the same as the local variables (level 2), and are the local variables in macro level 3.
However, the sub-section No. of the PLC window uses the value which 300 has been added to the local variable No.

30-14	Local variables (Level 4)

[Data definition]

These are the same as the local variables (level 3), and are the local variables in macro level 4.
However, the sub-section No. of the PLC window uses the value which 400 has been added to the local variable No.

31-10	Tool compensation amount 1

[Data definition]

This is the tool offset and differs according to the distinction of shape and wear.
Without shpae/wear distinction : Tool compensation amount
With shpae/wear distinction : Tool length shape compensation amount
The sub-section No. used by the PLC window corresponds to the tool offset No.

[Data unit, range]

Unit : 1/2 of the input unit (Either 0.5 μm, or 0.05 μm)
Data range : -99999999 to +99999999 (binary)

[Precautions]

Even if this data is changed during the operation, it will not be effective on a block that has already been calculated.

31-20	Tool compensation amount 2

[Data definition]

This is the tool length wear compensation amount.
(This is valid only when there is a shape/wear distinction in the tool offset.)
The sub-section No. of the PLC window uses the value which 1000 has been added to the local variable No.

[Data unit, range]

Unit : 1/2 of the input unit (Either 0.5 μm, or 0.05 μm)
Data range : -99999 to +99999 (binary)

[Precautions]

Even if this data is changed during the operation, it will not be effective on a block that has already been calculated.

31-30	Tool compensation amount 3

[Data definition]

This is the tool radius shape compensation amount.
(This is valid only when there is a shape/wear distinction in the tool offset.)
The sub-section No. of the PLC window uses the value which 6000 has been added to the offset No.
Data unit, data range and precautions are same as the "Tool compensation amount 1".

31-40	Tool compensation amount 4

[Data definition]

This is the tool radius wear compensation amount.
(This is valid only when there is a shape/wear distinction in the tool offset.)
The sub-section No. of the PLC window uses the value which 7000 has been added to the local variable No.
Data unit, data range and precautions are same as the "Tool compensation amount 2".

31-100	1st axis tool length compensation amount

[Data definition]

This is the 1st axis tool length compensation amount.
The sub-section No. used by the PLC window corresponds to the tool offset No.

[Data unit, range]

Unit : 1/2 of the input unit (Either 0.5 μm, or 0.05 μm)
Data range : -99999999 to +99999999 (binary)

[Precautions]

Even if this data is changed during the operation, it will not be effective on a block that has already been calculated.

31-110	1st axis wear compensation amount

[Data definition]

This is the 1st axis wear compensation amount.
The sub-section No. of the PLC window uses the value which 1000 has been added to the local variable No.

[Data unit, range]

Unit : 1/2 of the input unit (Either 0.5 μm, or 0.05 μm)
Data range : 0 to 99999 (binary)

[Precautions]

Even if this data is changed during the operation, it will not be effective on a block that has already been calculated.

31-120	3rd axis tool length compensation amount

[Data definition]

This is the 3rd axis tool length compensation amount.
The sub-section No. of the PLC window uses the value which 2000 has been added to the local variable No.
Data unit, data range and precautions are same as the "1st axis tool length compensation amount".

31-130	3rd axis wear compensation amount

[Data definition]

This is the 3rd axis wear compensation amount.
The sub-section No. of the PLC window uses the value which 3000 has been added to the local variable No.
Data unit, data range and precautions are same as the "1st axis wear compensation amount".

31-140	2nd axis tool length compensation amount

[Data definition]

This is the 2nd axis tool length compensation amount.
The sub-section No. of the PLC window uses the value which 4000 has been added to the local variable No.
Data unit, data range and precautions are same as the "1st axis tool length compensation amount".

31-150	2nd axis wear compensation amount

[Data definition]

This is the 2nd axis wear compensation amount.
The sub-section No. of the PLC window uses the value which 5000 has been added to the local variable No.
Data unit, data range and precautions are same as the "1st axis wear compensation amount".

31-160	Nose R compensation amount

[Data definition]

This is the nose R compensation amount.
The sub-section No. of the PLC window uses the value which 6000 has been added to the local variable No.
Data unit, data range and precautions are same as the "X axis tool length compensation amount".

31-170	Nose R wear compensation amount

[Data definition]

This is the nose R wear compensation amount.
The sub-section No. of the PLC window uses the value which 7000 has been added to the local variable No.
Data unit, data range and precautions are same as the "X axis wear compensation amount".

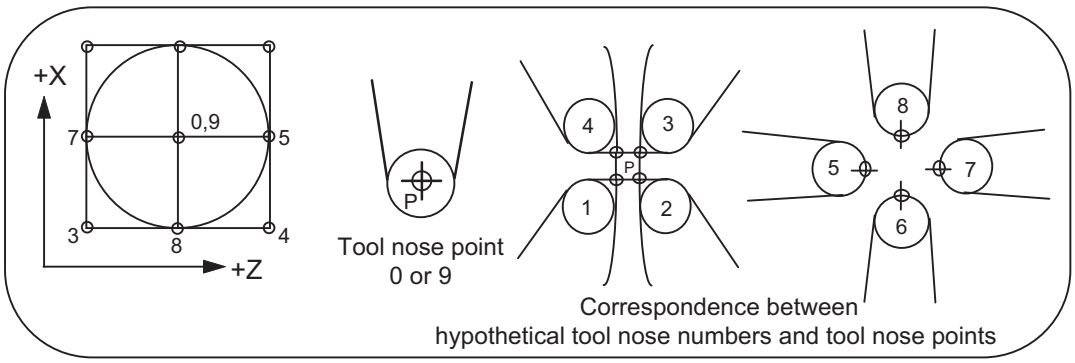
31-180	Hypothetical nose No.

[Data definition]

This is the hypothetical nose No.

(1) Nose point

Generally, the tool nose is rounded, so the nose position in the program is aligned to point P as shown in the following example.
With nose R compensation, select one point from the points shown below for each tool No., and preset this position relation.
(Select from 1 to 8 for G46 mode, and from 0 to 9 for G41/G42 mode.)



The sub-section No. of the PLC window uses the value which 8000 has been added to the local variable No.

32-10	Variable command (common variable value 2)

[Data definition]

These are comon variables used by the variable commands and user macros.
The sub-section No. of the PLC window uses the same value as the variable No. to be read or written.
The common variable 2 is prepared per part system. Designate the part system No. on the part system No. designation bit.

Common variables	Function	
	Sub-section No.	Remark
50 sets * No. of part systems: #100 to #149	100 to 149	These can be used in the main program, sub program and each macro program.
100 sets * No. of part systems: #100 to #199	100 to 199	

[Precautions]

(1) When data is changed during operation:
  (a) The data will not be effective on a block that has already been calculated.
(2) The substitute command is executed when the command block is ACT.
(3) When handling decimal place with the PLC window, the last four digits of the data read or written correspond to the decimal place when the control signal bit 3 is set to "1".
  When the control signal bit 3 is set to "0", only the integer is read or written.

62-1	Command error

[Data definition]

This is the deviation of the secondary axis machine position in respect to the primary axis. This displays the error of the command value to the servo control section before compensating the pitch error, incremental position, or backlash. If this error occurs, the parameters that should be the same for the secondary axes are different. Check the setting value.
This data is valid only during the synchronous operation. When in independent or asynchronous operation, or for axis set(s) that are not being synchronous-operated (e.g., the 3rd set in case where only 2 sets are designated for synchronous operation), the value "0" will be displayed.
Command error = Command "s" - command "m" - Δ
Command "s": Seconady axis command value
Command "m": Primary axis command value
Δ: Command "s" - command "m" at start of synchronous control

[Data unit]

The data units, depending on the input unit of the part system to which the primary/secondary axis belongs, are as follows.

Input unit (iunit)	Linear axis		Rotary axis
	Input unit (metric)	Input unit (inch)	
B	0.0005 mm	0.00005 inch	0.0005°
C	0.00005 mm	0.000005 inch	0.00005 °

62-2	FB error

[Data definition]

This is the deviation of the secondary axis feedback value in respect to the feedback value from the primary axis servomotor. This displays the error of the actual machine position. The synchronous error check is carried out on this error.

This data is valid only during the synchronous operation. When in independent or asynchronous operation, or for axis set(s) that are not being synchronous-operated (e.g., the 3rd set in case where only 2 sets are designated for synchronous operation), the value "0" will be displayed.

FB error = FBs - FBm - Δ

FBs : Secondary axis feedback value

FBm: Primary axis feedback value

Δ: FBs . FBm at start of synchronous control

[Data unit]

Same as "Command error".

62-3	Machine position

[Data definition]

This displays the machine position of the master axis.

This data is valid only during the synchronous operation. When in independent or asynchronous operation, or for axis set(s) that are not being synchronous-operated (e.g., the 3rd set in case where only 2 sets are designated for synchronous operation), the value "0" will be displayed.

[Data unit]

Same as "Command error".

Page No. INDEX

Numbers

A

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

R

S

T

U

W

Z

Device No. INDEX

Numbers

A

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

R

S

T

U

W

Z

Revision History

Date of revision	Manual No.	Revision details
Dec. 2006	IB-1500263(ENG)-A	First edition created.
Jan. 2007	IB-1500263(ENG)-B	- "Device No. Index" was added. - The following sections were added. 4.23 Each Application: Safety Observation 7. Exclusive Instructions - The following explanations of signals were added. 4.1 Bit Type Input Signals: System State (CNC->PLC) - 24 hours continuous operation X310 - Safety signal unconfirmed after compare error X311 4.5 Data Type Input Signals: System State (CNC->PLC) - Speed monitor door open possible R9 4.9 Bit Type Output Signals: System Command (PLC->CNC) - Contactor shutoff test Y310 4.13 Data Type Output Signals: System Command (PLC->CNC) - Speed monitor mode R2309 - The device No. of "No. of work machining (maximum value) was changed to R146. - The shared G device Nos. of safety observation signals were changed. - Mistakes were corrected.
May 2007	IB-1500263(ENG)-C	- The following sections were added. 2.1.3 Shared Device CNC Internal Device Correspondence Table 4.24 Each Application : GOT Window - Mistakes were corrected.
Jun. 2007	IB-150263(ENG)-D	- The following sections were added. 3.3.5 Precautions 3.5.8 PLC Constants 3.5.9 PLC Bit Selection 3.6 Special Relay/Register Signals 4.25 Each Application : PLC Constants - The following explanations of signals were added. 4.2 Bit Type Input Signals : Axis State (CNC->PLC) - In current limit X40E 4.3 Bit Type Input Signals : Part System State (CNC->PLC) - In inch unit selection X628 - Waiting between part systems X63C 4.5 Data Type Input Signals: System State (CNC->PLC) - KEY IN R8 4.11 Bit Type Output Signals : Part System Command (PLC->CNC) - Program display during operation Y72C - Inclined axis control: no Z axis compensation Y7B6 4.13 Data Type Output Signals: System Command (PLC->CNC) - KEY OUT R2312 - Mistakes were corrected.
Mar. 2010	IB-1500263(ENG)-F	- Corrections are made corresponding to C70 S/W version B2. - The following sections were added. 2.1.3 Data update program with NC 4.26 Each application : PLC bit selection 4.27 Each application :Chopping 7.3 D(P).DDWR command 7.4 D(P).DDRD command Appendix 1.1 Section No. List Appendix 1.2 Sub-section No. List Appendix 1.3 Explanation of Read/Write Data - Following chapter is revised. 4.17 Each Application: PLC Axis Control - Mistakes were corrected.

Date of revision	Manual No.	Revision details
Dec. 2010	IB-1500263(ENG)-G	Corrections are made corresponding to C70 S/W version C5. - Following chapters are added 4.28 Each Application : PLC Axis Indexing - Type to line-wrap the currently executed program is added to "4.24.3 Details of Command" - Following signal explanations are added. X33E SMPFIN(NC data sampling completed) X33A PARACHG(Power OFF required after parameter change) X33B EDITDO(Edited data processing) X33C EDITERR(Edited data error) Y323 EDITOK(Edited data recovery confirmation) Y41B to Y6EB CHGPLCn(PLC axis switching) X416 to Y5F6 AXCHGISn(Axis switching invalid status) X417 to X5F7 PLCMODn(In PLC axis control) X313 PSDNTF(Power shutoff notification) YD4F to YE6F ESSCn(External axis speed clamp) R2310 PLC axis droop release invalid axis R60 to R69 APLC input data 1 to 10 R2380 to R2389 APLC output data 1 to 10 R2000 to R2047 PLC axis indexing control status 1 to 4 R4300 to R4347 PLC axis indexing control command 1 to 4 R2179 CNC side dual signal compare status 2(SU_NST2) R4479 PLC side dual signal compare status 2(SU_PST2) R160 to R163/R260 to R263/R360 to R363/R460 to R463/R560 to R563/R660 to R663/R760 to R763 Error code output extension, Parameter 1, 2 output area - Following signal names are changed X66F to X96F: Absolute position warning is changed to Power shutoff movement over R1906/R1914/R1922/R1930/R1938/R1946/R1954/R1986: Multi-step speed monitor signal output is changed to Status 2 - Followings are added to "Appendix 1.3 Explanation of Read/Write Data" 2-50：Rapid traverse time constant G0tL 2-52：Rapid traverse time constant G0t1 2-55：Axis name 2-56：Cutting feed clamp speed 2-57：Soft limit IB+ 2-58：Soft limit IB- 2-59: Soft limit IB type 21-34: Current position of program command 21-35: Remaining command 26-36：Spindle Position within one rotation (Z-phase standard) - Following signals are deleted. R98 Insulation degradation monitor: warning R99 Insulation degradation monitor: limitation value alarm output - Mistakes are corrected.
Feb. 2012	IB-1500263(ENG)-H	- Added "Handling of our product" - Mistakes are corrected.
Sep. 2012	IB-1500263(ENG)-J	Corrections were made corresponding to C70 S/W version D5. - The following chapter was added. 5.13 Switching between NC Axis / PLC Axis - The following signal explanations were added. X63F to X93F HSST (In high-speed synchronous tapping) R82 ZRECVNO (Common variable No. at occurrence of ZR device error) R83 ZRECVFC (Error cause at occurrence of ZR device error) R802/R803 to R952/R953 (Machine position n-th axis) R804/R805 to R954/R955 (Feedback machine position n-th axis) Y3A0 to Y3BF PSKIPn (PLC skip 1 to 32) Y723 to YC63 SRN (Program restart) Y75F to YC9F SPOFFMn (Spindle OFF mode) Y7B9 to YCF9 (Synchronous tapping command polarity reversal) - The following signal descriptions were deleted. R801 to R951 Servo motor temperature (Continued on the following page)

Date of revision	Manual No.	Revision details
Sep. 2012	IB-1500263(ENG)-J	(Continued from the previous page) - The followings were updated to the latest version. "Appendix 1 List of PLC Window Data" "Appendix 1.1 Section No. List" "Appendix 1.2 Sub-section No. List" "Appendix 1.3.3 Explanation of data details" - Mistakes were corrected.

Global Service Network

AMERICA

MITSUBISHI ELECTRIC AUTOMATION INC. (AMERICA FA CENTER)

Central Region Service Center
500 CORPORATE WOODS PARKWAY, VERNON HILLS, ILLINOIS 60061, U.S.A.
TEL: +1-847-478-2500 / FAX: +1-847-478-2650

Michigan Service Satellite
ALLEGAN, MICHIGAN 49010, U.S.A.
TEL: +1-847-478-2500 / FAX: +1-269-673-4092

Ohio Service Satellite
LIMA, OHIO 45801, U.S.A.
TEL: +1-847-478-2500 / FAX: +1-847-478-2650
CLEVELAND, OHIO 44114, U.S.A.
TEL: +1-847-478-2500 / FAX: +1-847-478-2650

Minnesota Service Satellite
ROGERS, MINNESOTA 55374, U.S.A.
TEL: +1-847-478-2500 / FAX: +1-847-478-2650

West Region Service Center
16900 VALLEY VIEW AVE., LAMIRADA, CALIFORNIA 90638, U.S.A.
TEL: +1-714-699-2625 / FAX: +1-847-478-2650

Northern CA Satellite
SARATOGA, CALIFORNIA 95070, U.S.A.
TEL: +1-714-699-2625 / FAX: +1-847-478-2650

East Region Service Center
200 COTTONTAIL LANE SOMERSET, NEW JERSEY 08873, U.S.A.
TEL: +1-732-560-4500 / FAX: +1-732-560-4531

Pennsylvania Service Satellite
ERIE, PENNSYLVANIA 16510, U.S.A.
TEL: +1-814-897-7820 / FAX: +1-814-987-7820

South Region Service Center
1845 SATTELITE BOULEVARD STE. 450, DULUTH, GEORGIA 30097, U.S.A.
TEL +1-678-985-4529 / FAX +1-678-258-4519

Texas Service Satellites
GRAPEVINE, TEXAS 76051, U.S.A.
TEL: +1-817-251-7468 / FAX: +1-817-416-5000
HOUSTON, TEXAS 77001, U.S.A.
TEL: +1-678-258-4529 / FAX: +1-678-258-4519

Florida Service Satellite
WEST MELBOURNE, FLORIDA 32904, U.S.A.
TEL: +1-321-610-4436 / FAX: +1-321-610-4437

Canada Region Service Center
4299 14TH AVENUE MARKHAM, ONTARIO L3R OJ2, CANADA
TEL: +1-905-475-7728 / FAX: +1-905-475-7935

Canada Service Satellite
EDMONTON, ALBERTA T5A 0A1, CANADA
TEL: +1-905-475-7728 / FAX: +1-905-475-7935

Mexico City Service Center
MARIANO ESCOBEDO 69 TLALNEPANTLA, 54030 EDO. DE MEXICO
TEL: +52-55-9171-7662 / FAX: +52-55-9171-7649

Monterrey Service Satellite
MONTERREY, N.L., 64720, MEXICO
TEL: +52-81-8365-4171 / FAX: +52-81-8365-4171

BRAZIL

MELCO CNC do Brasil Comércio e Serviços S.A

Brazil Region Service Center
ACESSO JOSE SARTORELLI, KM 2.1 CEP 18550-000, BOITUVA-SP, BRAZIL
TEL: +55-15-3363-9900 / FAX: +55-15-3363-9911

EUROPE

MITSUBISHI ELECTRIC EUROPE B.V. (EUROPE FA CENTER)
GOTHAER STRASSE 10, 40880 RATINGEN, GERMANY
TEL: +49-2102-486-0 / FAX: +49-2102-486-5910

Germany Service Center
KURZE STRASSE. 40, 70794 FILDERSTADT-BONLANDEN, GERMANY
TEL: + 49-711-770598-121 / FAX: +49-711-770598-141

France Service Center
25, BOULEVARD DES BOUVETS, 92741 NANTERRE CEDEX FRANCE
TEL: +33-1-41-02-83-13 / FAX: +33-1-49-01-07-25

France (Lyon) Service Satellite
120, ALLEE JACQUES MONOD 69800 SAINT PRIEST FRANCE
TEL: +33-1-41-02-83-13 / FAX: +33-1-49-01-07-25

Italy Service Center
VIALE COLLEONI 7-PALAZZO SIRIO CENTRO DIREZIONALE COLLEONI,
20864 AGRATE BRIANZA MILANO ITALY
TEL: +39-039-6053-342 / FAX: +39-039-6053-206

Italy (Padova) Service Satellite
VIA SAVELLI 24 - 35129 PADOVA ITALY
TEL: +39-039-6053-342 / FAX: +39-039-6053-206

U.K. Service Center
TRAVELLERS LANE, HATFIELD, HERTFORDSHIRE, AL10 8XB, U.K.
TEL: +44-1707-282-846 / FAX: +44-1707-27-8992

Spain Service Center
CTRA. DE RUBI, 76-80-APDO. 420
08190 SAINT CUGAT DEL VALLES, BARCELONA SPAIN
TEL: +34-935-65-2236 / FAX: +34-935-89-1579

Poland Service Center
UL.KRAKOWSKA 50, 32-083 BALICE, POLAND
TEL: +48-12-630-4700 / FAX: +48-12-630-4701

Turkey Service Center
ŞERIFALI MAH. NUTUK SOK. NO.5 34775
ÜMRANIYE / ISTANBUL, TURKEY
TEL: +90-216-526-3990 / FAX: +90-216-526-3995

Czech Republic Service Center
TECHNOLOGICKA 374/6,708 00 OSTRAVA-PUSTKOVEC, CZECH REPUBLIC
TEL: +420-59-5691-185 / FAX: +420-59-5691-199

Russia Service Center
213, B.NOVODMITROVSKAYA STR., 14/2, 127015 MOSCOW, RUSSIA
TEL: +7-495-748-0191 / FAX: +7-495-748-0192

Sweden Service Center
STRANDKULLEN, 718 91 FRÖVI , SWEDEN
TEL: +46-581-700-20 / FAX: +46-581-700-75

Bulgaria Service Center
4 ANDREJ LJAPCHEV BLVD. POB 21, BG-1756 SOFIA, BULGARIA
TEL: +359-2-8176009 / FAX: +359-2-9744061

Ukraine (Kharkov) Service Center
APTEKARSKIY LANE 9-A, OFFICE 3, 61001 KHARKOV, UKRAINE
TEL: +380-57-732-7774 / FAX: +380-57-731-8721

Ukraine (Kiev) Service Center
4-B, M. RASKOVOYI STR., 02660 KIEV, UKRAINE
TEL: +380-44-494-3355 / FAX: +380-44-494-3366

Belarus Service Center
Nezavisimosti pr.177, 220125 Minsk, Belarus
TEL: +375-17-393-1177 / FAX: +375-17-393-0081

South Africa Service Center
P.O. BOX 9234, EDLEEN, KEMPTON PARK GAUTENG, 1625 SOUTH AFRICA
TEL: +27-11-394-8512 / FAX: +27-11-394-8513

ASEAN

MITSUBISHI ELECTRIC ASIA PTE. LTD. (ASEAN FA CENTER)

Singapore Service Center
307 ALEXANDRA ROAD #05-01/02 MITSUBISHI ELECTRIC BUILDING SINGAPORE 159943
TEL: +65-6473-2308 / FAX: +65-6476-7439

Indonesia Service Center
THE PLAZZA OFFICE TOWER, 28TH FLOOR JL.M.H. THAMRIN KAV.28-30, JAKARTA, INDONESIA
TEL: +62-21-2992-2333 / FAX: +62-21-2992-2555

Malaysia (KL) Service Center
60, JALAN USJ 10 /1B 47620 UEP SUBANG JAYA SELANGOR DARUL EHSAN, MALAYSIA
TEL: +60-3-5631-7605 / FAX: +60-3-5631-7636

Malaysia (Johor Baru) Service Center
NO. 16, JALAN SHAH BANDAR 1, TAMAN UNGKU TUN AMINAH, 81300 SKUDAI, JOHOR MALAYSIA
TEL: +60-7-557-8218 / FAX: +60-7-557-3404

Vietnam (Ho Chi Minh) Service Center
UNIT 2408~11, 24TH FLOOR, SAIGON TRADE CENTER, 37 TON DUC THANG STREET,
DISTRICT 1, HO CHI MINH CITY, VIETNAM
TEL: +84-8-3910 5945 / FAX: +84-8-3910 5947

Vietnam (Hanoi) Service Center
SUITE 9-05, 9TH FLOOR, HANOI CENTRAL OFFICE BUILDING, 44B LY THUONG KIET STREET,
HOAN KIEM DISTRICT, HANOI CITY, VIETNAM
TEL: +84-4-3937-8075 / FAX: +84-4-3937-8076

Philippines Service Center
UNIT NO.411, ALABAMG CORPORATE CENTER KM 25. WEST SERVICE ROAD
SOUTH SUPERHIGHWAY, ALABAMG MUNTINLUPA METRO MANILA, PHILIPPINES 1771
TEL: +63-2-807-2416 / FAX: +63-2-807-2417

MITSUBISHI ELECTRIC AUTOMATION (THAILAND) CO., LTD. (THAILAND FA CENTER)

BANG-CHAN INDUSTRIAL ESTATE NO.111 SOI SERITHAI 54
T.KANNAYAO, A.KANNAYAO, BANGKOK 10230, THAILAND
TEL: +66-2906-8255 / FAX: +66-2906-3239

Thailand Service Center
898/19,20,21,22 S.V. CITY BUILDING OFFICE TOWER 1, FLOOR 7
RAMA III RD., BANGPONGPANG, YANNAWA, BANGKOK 10120, THAILAND
TEL: +66-2-682-6522 / FAX: +66-2-682-9750

INDIA

MITSUBISHI ELECTRIC INDIA PVT. LTD.

India Service Center
2nd FLOOR, TOWER A & B, DLF CYBER GREENS, DLF CYBER CITY,
DLF PHASE-III, GURGAON 122 002, HARYANA, INDIA
TEL: +91-124-4630 300 / FAX: +91-124-4630 399
Ludhiana satellite office
Jamshedpur satellite office

India (Pune) Service Center
EMERALD HOUSE, EL-3, J-BLOCK, MIDC BHOSARI. PUNE – 411 026, MAHARASHTRA, INDIA
TEL: +91-20-2710 2000 / FAX: +91-20-2710 2100
Baroda satellite office
Mumbai satellite office

India (Bangalore) Service Center
PRESTIGE EMERALD, 6TH FLOOR, MUNICIPAL NO. 2,
LAVELLE ROAD, BANGALORE - 560 043, KAMATAKA, INDIA
TEL: +91-80-4020-1600 / FAX: +91-80-4020-1699
Chennai satellite office
Coimbatore satellite office

OCEANIA

MITSUBISHI ELECTRIC AUSTRALIA LTD.

Australia Service Center
348 VICTORIA ROAD, RYDALMERE, N.S.W. 2116 AUSTRALIA
TEL: +61-2-9684-7269 / FAX: +61-2-9684-7245

CHINA

MITSUBISHI ELECTRIC AUTOMATION (CHINA) LTD. (CHINA FA CENTER)

China (Shanghai) Service Center
1-3,5-10,18-23/F, NO.1386 HONG QIAO ROAD, CHANG NING QU,
SHANGHAI 200336, CHINA
TEL: +86-21-2322-3030 / FAX: +86-21-2308-2830
China (Ningbo) Service Dealer
China (Wuxi) Service Dealer
China (Jinan) Service Dealer
China (Hangzhou) Service Dealer
China (Wuhan) Service Satellite

China (Beijing) Service Center
9/F, OFFICE TOWER 1, HENDERSON CENTER, 18 JIANGUOMENNEI DAJIE,
DONGCHENG DISTRICT, BEIJING 100005, CHINA
TEL: +86-10-6518-8830 / FAX: +86-10-6518-3907
China (Beijing) Service Dealer

China (Tianjin) Service Center
B-2 801/802, YOUYI BUILDING, NO.50 YOUYI ROAD, HEXI DISTRICT,
TIANJIN 300061, CHINA
TEL: +86-22-2813-1015 / FAX: +86-22-2813-1017
China (Shenyang) Service Satellite
China (Changchun) Service Satellite

China (Chengdu) Service Center
ROOM 407-408, OFFICE TOWER AT SHANGRI-LA CENTER, NO. 9 BINJIANG DONG ROAD,
JINJIANG DISTRICT, CHENGDU, SICHUAN 610021, CHINA
TEL: +86-28-8446-8030 / FAX: +86-28-8446-8630

China (Shenzhen) Service Center
ROOM 2512-2516, 25/F., GREAT CHINA INTERNATIONAL EXCHANGE SQUARE, JINTIAN RD.S.,
FUTIAN DISTRICT, SHENZHEN 518034, CHINA
TEL: +86-755-2399-8272 / FAX: +86-755-8218-4776
China (Xiamen) Service Dealer
China (Dongguan) Service Dealer

KOREA

MITSUBISHI ELECTRIC AUTOMATION KOREA CO., LTD. (KOREA FA CENTER)

Korea Service Center
1480-6, GAYANG-DONG, GANGSEO-GU, SEOUL 157-200, KOREA
TEL: +82-2-3660-9602 / FAX: +82-2-3664-8668

Korea Taegu Service Satellite
4F KT BUILDING, 1630 SANGYEOK-DONG, BUK-KU, DAEGU 702-835, KOREA
TEL: +82-53-382-7400 / FAX: +82-53-382-7411

TAIWAN

MITSUBISHI ELECTRIC TAIWAN CO., LTD. (TAIWAN FA CENTER)

Taiwan (Taichung) Service Center
NO.8-1, GONG YEH 16TH RD., TAICHUNG INDUSTRIAL PARK, SITUN DIST.,
TAICHUNG CITY 407, TAIWAN R.O.C.
TEL: +886-4-2359-0688 / FAX: +886-4-2359-0689

Taiwan (Taipei) Service Center
10F, NO.88, SEC.6, CHUNG-SHAN N. RD., SHI LIN DIST., TAIPEI CITY 111, TAIWAN R.O.C.
TEL: +886-2-2833-5430 / FAX: +886-2-2833-5433

Taiwan (Tainan) Service Center
11F-1., NO.30, ZHONGZHENG S. ROAD, YONGKANG DISTRICT, TAINAN CITY 710, TAIWAN, R.O.C.
TEL: +886-6-252-5030 / FAX: +886-6-252-5031

Notice

Every effort has been made to keep up with software and hardware revisions in the contents described in this manual. However, please understand that in some unavoidable cases simultaneous revision is not possible.
Please contact your Mitsubishi Electric dealer with any questions or comments regarding the use of this product.

Duplication Prohibited

MITSUBISHI CNC

MITSUBISHI ELECTRIC CORPORATION
HEAD OFFICE : TOKYO BUILDING,2-7-3 MARUNOUCHI,CHIYODA-KU,TOKYO 100-8310,JAPAN

MODEL	C70
MODEL CODE	100-013
Manual No.	IB-1500263

IB(NA)1500263(ENG)-J(1209)MEE
Made in JAPAN