



**W1000Xd1 Series / S300Xd1 Series / S500Xd1 Series
S700Xd1 Series / R450Xd1 Series / R650Xd1 Series
U500Xd1 Series**

COMPACT MACHINING CENTER SPEEDIO

**CNC-D00
OPERATION MANUAL II
(For Installers & Machine Setup Specialists)**

Please read this manual carefully before operating the machine.
Be careful not to lose the manuals, and keep them handy at all times.

OPERATION MANUAL II

Read this manual before performing work.

brother

Attention

- When you purchase the Product, we guide you through “OPERATION MANUAL (FOR GENERAL OPERATORS)”, “INSTALLATION MANUAL”, “OPERATION MANUAL (OPERATION)”, and other explanatory documents related to this Product as needed. In addition, we usually issue a letter of warranty together with various explanatory documents. Please keep these documents in a designated place so that you can read them whenever needed. The letter of warranty (hereinafter referred to as the “**letter**”) is a significant document that states the warranty period of this Product. Please note that the warranty conditions may not apply if you do not keep and show us the letter even if the letter has been issued.
- The content described here is common to the “OPERATION MANUAL (FOR GENERAL OPERATORS)”, “INSTALLATION MANUAL” and “OPERATION MANUAL (OPERATION)”. Please note that if there is a discrepancy between the content described here and that of the letter, the latter shall prevail regarding the warranty period, while the former shall prevail regarding any other contents in the Manuals.
- We warrant to you that this Product will correspond with any relevant specifications of the Product (hereinafter referred to as “**Specifications**”) described in the “OPERATION MANUAL (FOR GENERAL OPERATORS)”, “INSTALLATION MANUAL”, “OPERATION MANUAL (OPERATION)” and other explanatory documents or product catalogs issued by us (hereinafter collectively referred to as “**Manuals**”) and that this Product will operate in accordance with the Specifications.
- We make every effort to ensure that this Product does not impair the quality and reliability of the Specifications. However, if we fail to meet the Specifications (if modified, the latest version shall apply) of unused Products purchased from us or our designated distributor/dealer within **one (1) year** from the purchase of the Product (provided, however, that if a letter of warranty is issued separately by us and you provide us with such letter, the warranty period specified in the letter shall prevail in case of any discrepancy), we will, at our discretion, repair this Product or take any other measures that we consider necessary (hereinafter referred to as the “**Warranty**”); provided, however, that the Warranty shall not apply if the non-conformance of Specifications is due to any of the followings (hereinafter referred to as “**No-Warranty Conditions**”):

<No-Warranty Conditions>

- (1) you use, transport, relocate or store the Product in a way that is not in accordance with the method and environment (including specifications, standards, etc.) and purpose of use of the Product specified in the Manuals, any other documents attached to this Product, our website, and other documents provided by us in a timely manner (including the case where we know your method, environment and purpose of use in advance);
- (2) you modify, alter or make any other change to the Product without our prior consent;
- (3) you connect or link this Product to other equipment or make any other settings for such purpose under any methods or procedures prohibited or not described in the Specification without our prior consent;
- (4) we confirm that you could have prevented the non-conformance if you were to replace, install, use or maintain the consumables of the Product, in a timely manner, in accordance with the contents described in the Manuals, any other documents attached to the Product, our website, and/or other documents provided by us (including the case where you do not understand the relevant contents in the Manuals but use this Product without making inquiries to us);
- (5) the user of this Product is lack of basic knowledge and/or operation skills about machine tools (including possession of necessary training and qualifications), or fails to meet the minimum health requirements necessary for the operation of this Product (including having normal five senses, and not being influenced by alcohol and/or drug);
- (6) the non-conformance is caused by circumstance that is impossible or difficult to foresee based on general scientific and technology level of the industry at the time when the customer purchased this Product from us or our designated distributor/dealer;
- (7) the non-conformance is caused by natural disasters (including earthquakes, fires, floods, lightning strikes), abnormal voltages, wars, civil wars, terrorism, labor disputes, government policies, infectious diseases, pollution, salt damage, invasion of foreign substances/pests or any other force majeure events;
- (8) the non-conformance is due to your change of the installation location of this Product without our prior consent, or any environmental factors related to the installation location (including polluted air, water quality, toxic gas, electromagnetic waves, radiation or other harm or pollution, or devices or products not connected to this Product);
- (9) the non-conformance is related to be sensual features (including sound, vibration or oozing of oil) that is objectively recognized as having no effect on the functioning and accuracy of the Product;
- (10) the non-conformance is caused by damage, wear or deterioration due to aging (including natural fading of painted surface, plated surface, rust, etc.);
- (11) we consider that the non-conformance of this Specification is minor and does not affect the basic operation of this Product;
- (12) we consider that you can take necessary measures for the non-conformance by yourself based on the explanation of work procedures in the Manuals;
- (13) the non-conformance is related to non-standard Specifications separately designated by you; or
- (14) the non-conformance is caused by any other factors not attributable to us.

- * In addition to the above, any damage, wear or deterioration of any consumables of this Product are not covered by this Warranty, and if replacement of consumables is required, we will charge an additional fee.
- At your sole cost and responsibility, you shall comply with and take any actions to meet any requirements, including the laws, guidelines, standards or qualifications, government approval/licenses, and any other regulations that apply to the use of this Product, except for those that are related to the development or manufacture of this Product itself.
- We do not make any warranty that this Product is suitable for your business use. Please verify and confirm whether this Product is suitable for your business use by yourself.
- **To the maximum extent permitted under applicable laws, other than normal and direct damages caused by non-conformance of the Specification of this Product as provided in this Warranty, we hereby disclaim and exclude any other liability or loss for any damages, including but not limited to any damages or malfunctions of any other equipment/devices, any indirect damages, special damages, damages arising from interruption of business, loss of profits, punitive damages, or any other similar damages. Even if we are required to bear any such liability or loss, the maximum total amount of our liability shall be limited to the purchase price of this Product (including any attached options, software and paid replacement parts). In addition, we shall not be liable for any damages caused by any of your intentional acts or negligence, nor any damage arising from your use of the software included in this Product to create any program. To the maximum extent permitted under applicable laws, the above exclusion and limitation of liability shall apply even if we have known or could have foreseen the possibility and/or results of these damages or loss in advance.**
- Although we attempt to explain the cases and circumstances where you should not use this Product due to certain Specification, applicable laws and regulations or other reasons, it is difficult to specify all such cases due to the wide variety of such cases. Therefore, you shall not use the Product for any purpose or usage that is not specifically described in the Manuals without our prior consent.
- This Product is a target equipment of our loading system (which includes a set of accessories such as loader body, mount, side door, hand valve, piping and wiring, hereinafter collectively referred to as the “**System**”). If you and us separately agree that you will use the System, we will deliver this Product with the System connected. In that case, there are the following conditions in addition to the No-Warranty Conditions under which our Warranty will not apply (hereinafter referred to as “**Additional No-Warranty Conditions**”); provided further, that in the event of any inconsistency between the content of the following Additional No-Warranty Conditions and that of the No-Warranty Conditions, the former shall prevail:

<Additional No-Warranty Conditions>

- (1) the non-conformance is due to (a) you use the Product with the System, remove the Product from or reconnect to the System, or modify, alter or make any change to the Product in a way that is contrary to the method or purpose of use described in the "OPERATION MANUAL (FOR GENERAL OPERATORS)", "INSTALLATION MANUAL", "OPERATION MANUAL (OPERATION)" and other explanatory documents or product catalog of the System(hereinafter collectively referred to as "**Loading Manuals.**"), attachments, our website and/or any other documents provided by us in a timely manner (including the case where we know your method and environment for use and purpose of use in advance); or (b) you modify, alter or make any change to this Product in relation to the System without our prior consent (including the case our company knows your method and environment for use and purpose of use in advance);
 - (2) the non-conformance is due to you connect the System to the Product after its warranty period has expired;
 - (3) the non-conformance is due to you connect this System to a Product that is not a suitable model to be connected;
 - (4) the non-conformance is due to you have not completed user registration or connect the System to a Product with incorrect registration information; or
 - (5) the non-conformance is caused by any non-compliance with the contents of the Loading Manuals, attachments, our website, and/or other documents provided by us in a timely manner.
- If there is any non-conformance occurs in the System caused by this Product, please refer to the warranty condition of the Loading Manual.
 - This Warranty covers software provided together with this Product, but if there are any other contractual conditions separately agreed between you and us regarding the software, the terms and conditions of such contractual conditions shall prevail.
 - We reserve the right, with or without notification to you, to add, delete, modify, enhance, update or upgrade any functions to the Product (including the software) at our own discretion for the purpose of modifying, maintaining or enhancing technology, provided however, that we do not have any obligation to carry out any of such actions.
 - This Warranty describes our conditions. If our designated distributor/dealer or anyone who sells this Product has its own warranty, the additional warranty is provided at their sole cost and responsibility and, therefore, please contact them if you have any questions regarding such additional warranty.
 - **If there is a change of the Specifications, an update or modification to the explanatory content regarding this Product, or any other appropriate reasons, we may amend the content of the Manuals at our discretion after we publicly disclose the content on our website or through other similar methods; provided that the content of the amendment shall take effect from the effective date described in the disclosure and if you continue to use this Product after such effective date, you are deemed to agree to such amendment of the Manuals. Please note that due to this change, there may be slight differences between the functions described in the amended Manuals and that of this Product.**

<The following applies to Products destined FOR JAPAN>

- This Warranty is based on the assumption that the warranty services will be carried out during our normal working hours (9:00 to 17:00 Japan time) excluding Saturdays, Sundays, national holidays and our holidays. However, if it is unavoidable to work outside those hours (including the case that we need to work in Hokkaido, Okinawa or other remote islands), you shall bear the actual expenses for travel and transportation.
- If you purchase this Product (that is a second-hand product) from us or a third party other than our designated distributors/dealers, please promptly make the procedures for changing the user registration (including paying the prescribed change of registration fee). If you complete the procedures, you can receive our support (with charges) based on the conditions specified separately. However, please note that you may not be eligible for our support (with charges) if any of the following applies.
 - (1) (1) before you purchase this Product (that is a second-hand product), if the third party who you purchase the products from, or if there are multiple owners in the past any of the owners (hereinafter collectively referred to as "**Third Party, etc.**") falls into any of the cases of the "**No-Warranty Conditions**";
 - (2) the non-conformance is caused by a specification separately designated by the Third Party, etc.
 - (3) the non-conformance is caused by a change to the external environment due to change of user (impact caused by removal at the relocation source, transportation to the relocation destination, or re-installation at the relocation destination) and environmental factors in the relocation process or relocation destination (including polluted air, water quality, toxic gas, electromagnetic waves, radiation or other pollution or natural environment, or equipment or products that are not connected to this Product), or due to any differences in the external environment between the relocation source and the relocation destination.
 - (4) the non-conformance is caused by any issue between you and the Third Party, etc. that is not attributable to us.
- It is assumed that you or the Third Party etc. will not export and/or use this Product outside Japan. In the unlikely event that the Product will be exported and/or used outside Japan (including the case where you permit the use by the Third Party etc.), you have to obtain our prior written consent and import/export at your own expense and responsibility. Please comply with the applicable laws and regulations such as import/export control laws and regulations. Please note that this Warranty does not cover any Product used or exported outside Japan, even if you have obtained our prior written consent and have complied with such import/export control laws and regulations.
- Regarding the Warranty, a translated version in other language may be created for reference. If there is any discrepancy between the Japanese version and that of other language, the Japanese version shall prevail.
- This Warranty shall be governed by and construed in accordance with the laws of Japan.

<The following applies to Products destined OUTSIDE JAPAN>

- When you or the Third Party etc. use this Product (including the case where you resell the Product, permit their use and re-exports the Product to any other countries), please comply with any relevant procedures specified in the Manual, import/export control laws and regulations and other relevant laws and regulations which are applicable in relevant countries or regions at your own expense and responsibility. Please note that this Warranty will not apply if you fail to comply with such procedures, the applicable import/export control laws and regulations and other relevant laws and regulations.
- This Product is designed and manufactured for the purpose of manufacturing general products for general industrial use. Therefore, this Product is not intended to be used to manufacture any products that require an extremely high level of safety and may pose serious risk to human life or health or result in serious threat to the peace and order of the society, including but not limited to products for nuclear-related purpose or military-related purpose (excluding the manufacture of non-military products used in military facilities) (hereinafter referred to as "**Purpose**"). If you use this Product for the Purpose or if you use this Product to manufacture any other products (including parts) for the Purpose, this Warranty will not apply and we shall not be liable for any damages or loss incurred by you or the Third Party resulting from or in connection with such use.
- Regarding the Warranty, a translated version in other language may be created for reference. If there is any discrepancy between the English version and that of other language, the English version shall prevail; provided, however, that regarding the Warranty for the Product destined for the People's Republic of China (excluding Hong Kong, Macau and Taiwan), the Chinese version shall prevail.
- To the extent that the Warranty or any part thereof is inconsistent with applicable laws, the Warranty or the corresponding part shall be deemed modified to be consistent with such applicable laws. Except to the extent lawfully permitted, this Warranty do not exclude, restrict, or modify but are in addition to the mandatory statutory consumer rights applicable to the sale of this Product to you.
- If you are a company incorporated and operating in the country or region in which the Product purchase from our designated dealer to you took place (hereinafter referred to as "**Purchase Country**"), this Warranty shall be governed by and construed in accordance with the laws of the Purchase Country or otherwise the laws of England and Wales shall govern this Warranty. Please note that the United Nations Convention on Contracts for the International Sale of Goods does not apply to this Warranty.

Introduction

Thank you for purchasing the SPEEDIO (hereafter referred to as “machine”) made by Brother. Always be sure to read this manual carefully first, in order to use the machine functions properly and safely.

This machine manual is divided into the following sections.

- **Operation Manual**
This manual describes the operation procedure for the machine.
- **Installation Manual**
This manual describes the machine’s installation procedure and inspections.
- **Programming Manual**
This manual provides a program description.

Attach this manual to the machine if it is resold.

Contact the nearest Brother sales office or Brother approved service dealer if this manual or the safety labels are damaged, lost or missing. (Charges apply)

The re-exporting and resale of this machine is regulated by Japan’s export laws and regulations in accordance with international export management.
When exporting, permission from the exporting country’s government and/or from the Japanese government may be required.
Contact a Brother Industries dealer in advance before re-transferring, reselling or re-exporting this machine.

Copying and reprinting all or part of the content in this manual without permission is illegal.

The content of this manual may be changed without prior notice.

Brother has taken steps to ensure this manual is accurate and complete. However, if you notice or suspect that there is an error, please contact the nearest Brother sales office or Brother approved service dealer.

We provide source code to customers who wish to use GPL or LGPL software.

Contact Brother for further details. (A separate fee and service charge applies.)

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This product uses the following toolkit.

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———— How to Read This Manual ——

This manual is divided into the following sections.

(1) Overview ----- A summary of the content is provided for the corresponding section.

(2) Warning ----- A warning is provided for any hazards that could potentially cause serious bodily injury, death or damage to the machine.

The hazards are described in the following order.

(2-1) Hazard level

(2-2) Type of hazard

(2-3) Potential damage

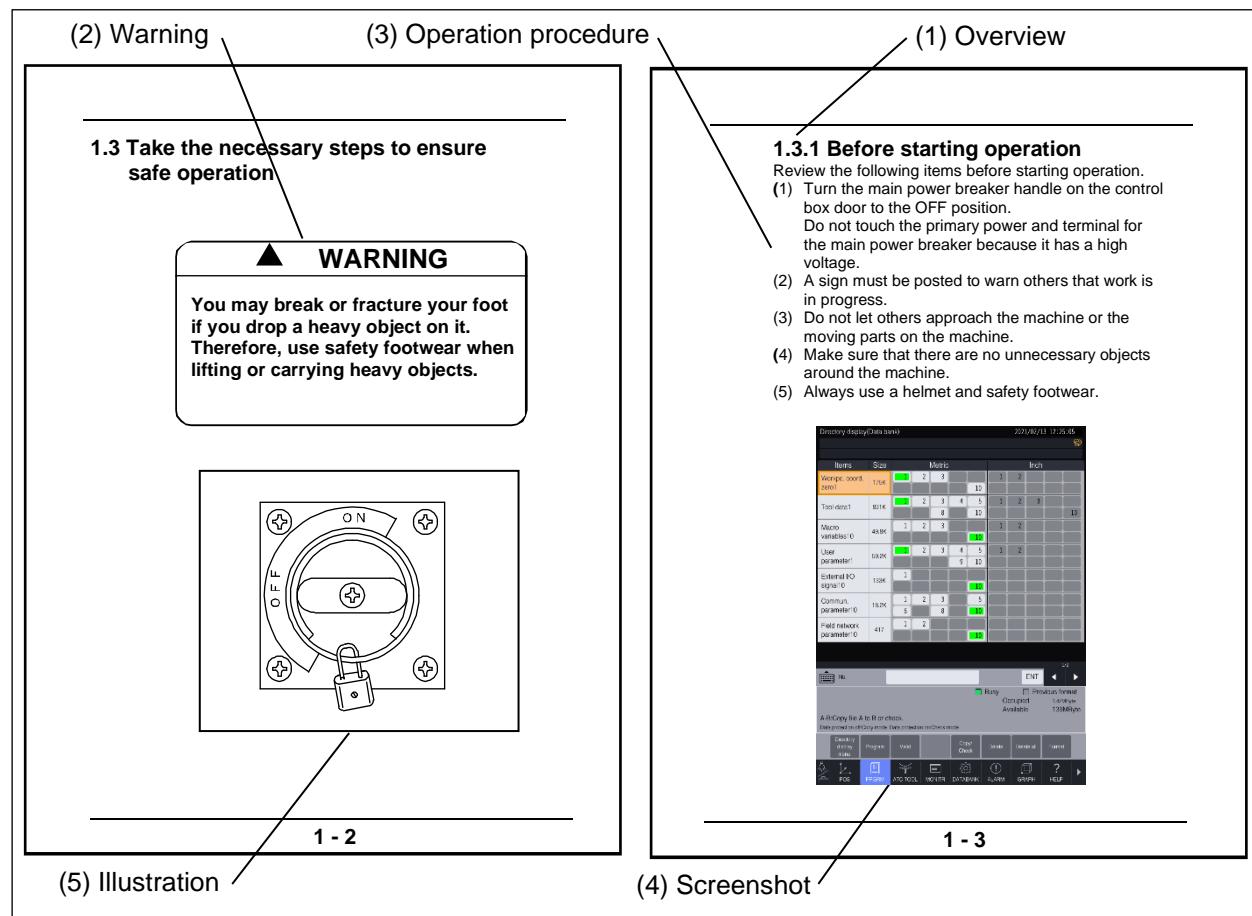
(2-4) Safety directions to avoid danger

(3) Operation procedure --- The procedure describes how to operate each function.

(4) Screenshot --- A screenshot is inserted into places to highlight certain points in the operation procedure.

The screenshot messages are shown at an approximate position and may differ slightly from the actual position of the line or column. The same applies to the font.

(5) Illustration ----- Illustrations, such as explanatory drawings, diagrams that show the dimensions, positioning, ranges, figures or configurations, are used in certain places where a written explanation alone may be hard to understand.



In this manual, the following symbols are used to differentiate between keys, switches, text displayed on screens and alarm messages.

- [] : Keys
- [] : Switches
- < > : Text displayed on screens
- << >> : Alarm messages

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CHAPTER 1

PROGRAM EDIT

- 1.1 **Outline**
- 1.2 **Program Edit (NC)**
- 1.3 **Program Edit (Conversation)**
- 1.4 **Directory Display**
- 1.5 **Folder Operations**
- 1.6 **How to Convert G Codes**

1.1 Outline

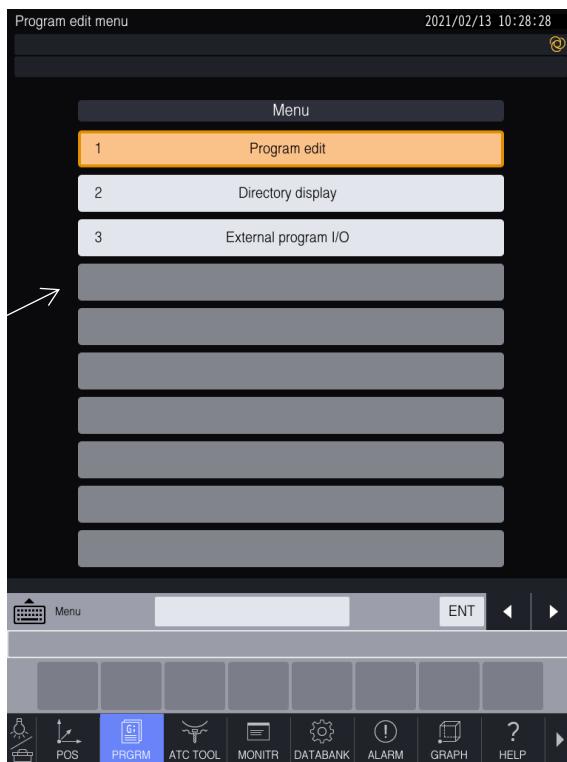
The following four functions are available in program edit mode.

1. Creation and modification of NC type program
2. Creation and modification of conversation type programs
3. Display, delete, copy and check registered programs
4. I/O of programs and data to/from an external unit

1.1.1 Program Edit Menu Screen (NC Language Mode)

Press the [EDIT] key to display the <Program edit menu> screen.

<Program edit menu> screen (NC language mode)



1.1.1.1 Description of screen display

Position	Name	Description
1	Program edit menu	Displays the program edit menu.

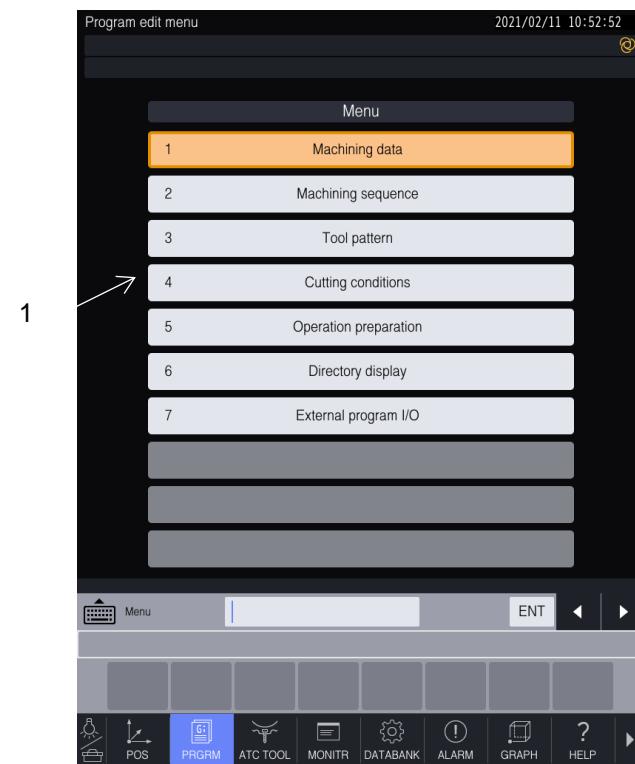
1.1.1.2 Description of screen operation

- Tap on an item to change to the screen for that item.
- Press the [ENT] key to change to the screen for an item selected with the cursor.
- An item can be selected with the [CURSOR] keys (up, down, left and right).
- After entering a number for an item, press the [ENT] key to change to the screen for that number.

1.1.2 Program Edit Menu Screen (Conversation Language Mode)

Press the [EDIT] key to display the <Program edit menu> screen.

<Program edit menu> screen (conversation language mode)



1

1.1.2.1 Description of screen display

Position	Name	Description
1	Program edit menu	Displays the program edit menu.

1.1.2.2 Description of screen operation

- Tap on an item to change to the screen for that item.
- Press the [ENT] key to change to the screen for an item selected with the cursor.
- An item can be selected with the [CURSOR] keys (up, down, left and right).
- After entering a number for an item, press the [ENT] key to change to the screen for that number.

1.1.3 Edit During Memory Operation

When the [EDIT] key is pressed while in memory operation, the operation temporarily stops or pauses (block stop). To edit or reference a program without stopping operation, press the [EDIT] key while pressing the [MEM] key.

1.2 Program Edit (NC)

1.2.1 Program Edit

This function is available only for the NC language mode.

Creation and modification of NC program are available.

In addition, you can move a program to a folder or create a folder.

1

- * For creation, correction, or storage of a program and creation of a folder, there are following capacity limits:
 - Total capacity of usable memory is about 512M bytes.
 - The total number of usable files and folders including NC programs, conversational programs, databanks, and folders is 4096 files.

1.2.2 Program File Names

1.2.2.1 Naming rules

After pressing the [EDIT] key on the <Program edit menu> screen, the program list screen is displayed.

1. Program number

Programs are managed by assigning 4 digit numbers from 0001 to 8999.

The program number for an NC program has the capital letter “O” at the beginning of the assigned number and the file is saved with the file name “Opppp” (pppp refers to the program number).

2. Program name

The user can save an NC program using a file name that is less than 32 characters.

Alphanumeric (does not distinguish between uppercase and lowercase) characters and the symbols “+”, “-” and “_” can be used in the file name.

The following names cannot be used when assigning a program name.

- A combination of integers that is not 4 digits long and that starts with the capital letter “O”.
- 0000 and 9000 to 9999 in the integer combinations that are 4 digits long and that start with the capital letter “O”.
- Integers only
- Same names as data bank files or service data files (Refer to “3.6.1 List of data names”)
- File name where the first character is a symbol
- 4 digit integer combination that starts with “QI”, “QM”, “KI”, “KM”, “GI”, “GM” and “J”
- 4 digit integer combination that starts with “SD”

“Programs” noted in this manual refer to the above program numbers or the above program names. To specify a program, enter the 4 digit number for the program number, and enter the file name for the program name.

1.2.2.2 List display

The program number and program name are mixed together when displaying the list of programs. When a file with a program number is displayed, the capital letter “O” is not displayed at the beginning of the file name, and only the number is displayed.

When using the sort function on the list display screen, the order is displayed as follows.

Ascending order:

When there are folders, they are displayed in alphabetical order from A to Z. When sorting by the program number, it displays starting from the smallest number. When sorting by the program names, it displays in alphabetical order.

Descending order:

When there are folders, they are displayed in reverse alphabetical order from Z to A. When sorting by the program names, it also displays in reverse alphabetical order. When sorting by the program number, it displays starting from the largest number.

1.2.3 Program Edit Screen

The maximum size of a program that can be edited is 40 MB.

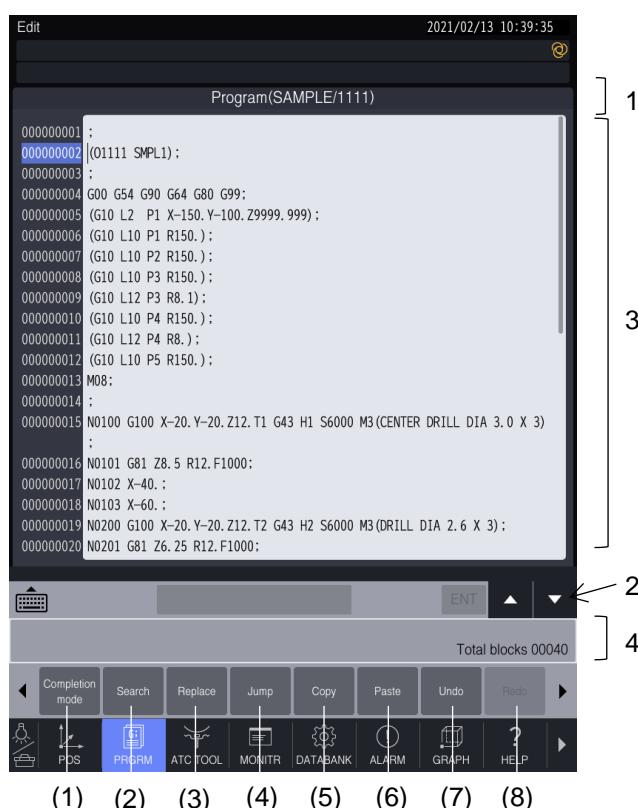
- When a block is completely filled with characters and it is converted based on “127 characters + EOB”, it will be divided into 327,680 blocks.
- When only an EOB is inserted into all of the blocks and then they are converted, it will be divided into 41,943,038 blocks.

If an attempt is made to edit a program that is bigger than 40 MB, the alarm <>Memory overflow>> appears and editing is not possible.

Or, if the 40 MB maximum is exceeded while editing, the alarm <>Editing area exceeded>> appears and the user cannot add any more characters. In this situation, divide the program up.

When the program size exceeds 32 MB, or when the program size including all sub programs being called exceeds 32 MB, the program runs in extended memory operation mode during operation.

<Edit> screen



1.2.3.1 Description of screen display

Position	Name	Description
1	Edit program	Displays the number or name of the program to be edited.
2	<▼><▲> keys	<ul style="list-style-type: none"> Change the screen to the previous page or the next page. After the page is changed, the cursor moves to first line of the new page that is displayed. When changing to the next page, the last line from the previous page is displayed at the top. When changing to the previous page, the first line from the last page is displayed at the bottom.
3	Edit area	Displays the program.
4	Operations area	<p>This area is for performing user operations such as search or replace operations.</p> <p>When the user is not performing an operation, the area displays the number of blocks in the program that is being edited.</p>

1.2.3.2 Description of screen operation

1. Description of function key operations

Column	Position	Label	Description
1	(1)	<Completion mode>	Ends and exits editing.
	(2)	<Search>	Changes to the <Search> screen.
	(3)	<Replace>	Changes to the <Replace> screen.
	(4)	<Jump>	Changes to the <Jump> screen.
	(5)	<Copy>	Changes to the <Copy> screen.
	(6)	<Paste>	Pastes the copied character string.
	(7)	<Undo>	Undoes the edit operation.
	(8)	<Redo>	Re-executes the previous operation (before <Undo>).
2	(1)	<Completion mode>	Ends and exits editing.
	(2)	<Search for block>	Jumps to the block position currently being executed when operation is in progress.
	(3)	<Menu programming>	Changes to the <Menu programming> screen.
	(4)	<Start auto sequence insertion>	Turns the automatic input for the sequence number ON and OFF.
	(5)		
	(6)		
	(7)		
	(8)		

2. Description of edit area operations

- The user can swipe up and down to scroll through the edit area.

1.2.3.3 Basic Operations

1. Deletion of character

Press the **[DEL]** key.

The character pointed by the cursor is deleted by one character. The remaining of the block after the cursor is moved to the left by one character.

If the cursor is positioned on the end of block (EOB) code “;”, then that block and the next one merge and become one block. The entire next block shifts to the cursor position.

However, if the number of characters after merging the blocks exceeds 127, then the alarm <<Too many characters>> is triggered and deletion is not possible.

Push the **[BACKSPACE]** key.

One character right before the cursor position is deleted. All content for that block including the cursor shifts 1 character space to the left.

If the cursor is at the head of a block, the block and the next block are connected into one block and the entire next block moves to the end of the before block.

However, if the number of characters after merging the blocks exceeds 127, then the alarm <<Too many characters>> is triggered and deletion is not possible.

2. Insertion of character

Insertion is available as long as the **[INS]** LED is lit on.

When any of the alphabetical keys, numerical keys or symbol keys is pressed at this time, the character specified by the keys is inserted before the character pointed by the cursor. The cursor and the rest of the characters are moved to the right by one character.

* The insertion input mode is the prompt when a program edit starts.

3. Overwriting of character

Press the [INS] key and turn off the LED. The overwriting mode is valid as long as the LED is lit off.

When any of the alphabetical keys, numerical keys or symbol keys is pressed, the character pointed by the cursor is replaced by a new character.

When the cursor is at ";" the characters specified by the pressed key are inserted before this symbol as in the insertion mode.

After overwriting is finished, press the [INS] key again. The LED is lit on and the insertion mode becomes valid.

4. Cursor shift

The cursor is shifted by pressing the [↑], [↓], [←] and [→] keys.

The cursor cannot move where there is no character. When the [←] key is pressed at the beginning of a block, the cursor moves over the ";" of the precedent block.

When the cursor is at the bottom line of the screen, pressing the [↓] key scrolls the screen and moves the cursor to the next line or the next block.

If the [↑] key is pressed at the top of a line, the screen scrolls down.

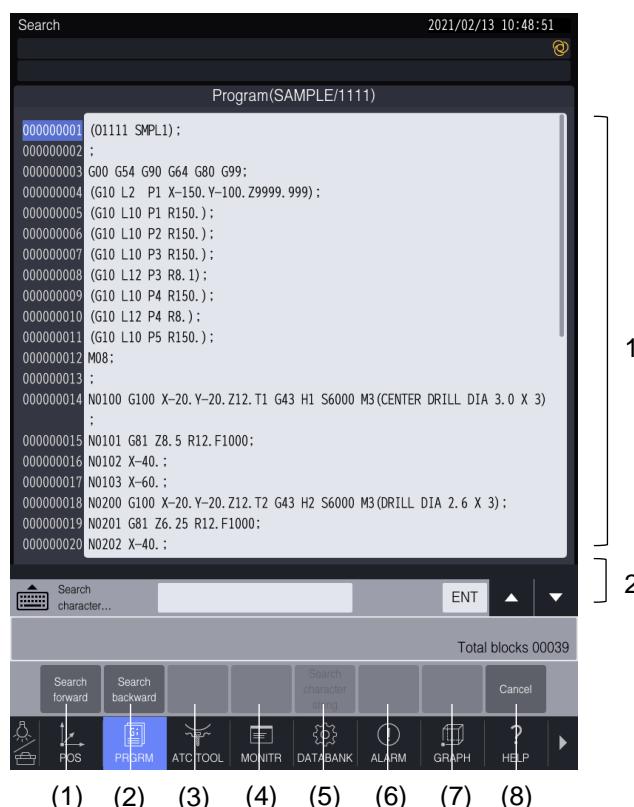
If the [←] key is pressed while pressing the [SHIFT] key, the cursor moves to the head character of the line.

If the [→] key is pressed while pressing the [SHIFT] key, the cursor moves to the last character of the line (or ";" of the line).

1.2.3.4 Search screen

After pressing the <Search> key, the <Search> screen is displayed.

Character string of maximum 12 characters can be searched from the cursor position.



Description of screen display

Position	Name	Description
1	Edit area	Displays the program.
2	Search area	Enter and search for a character string.

- The user cannot perform input operations in the edit and search areas at the same time.
- The user can either tap on the area directly or can press a key (<Search character string>, <Search forward> or <Search backward>) to use the desired area.
- After the <Search> screen displays, the user can use the search area but the edit area becomes unavailable.

1

Description of screen operation

Description of function key operations

Column	Position	Label	Description
1	(1)	<Search forward>	Conducts a search going down from the cursor position.
	(2)	<Search backward>	Conducts a search going up from the cursor position.
	(3)		
	(4)		
	(5)	<Search character string>	Enables the search area so the user can enter characters for a search.
	(6)		
	(7)		
	(8)	<Cancel>	Changes to the <Edit> screen.

1. Description of edit area operations

The user can tap on the edit area or can press a key (<Search forward> or <Search backward>) to use the edit area. When the user can use the edit area, the search area becomes unavailable.

2. Description of search area operations

The user can tap on the search area or can press the <Search character string> key to use the search area. When the user can use the search area, the edit area becomes unavailable.

(Operation procedure)

Enter characters in the search area to conduct a search. The character string cannot include “;” (EOB).

Press the <Search forward> key and <Search backward> key to execute a search.

The cursor moves to the head of the searched character string.

If no designated character string is found, the operator message <<Data not found>> appears but the cursor does not move.

After pressing the <Search forward> key or <Search backward> key, the edit area becomes available and the user can move the cursor or edit the program.

After performing a character string search, the specified character string is saved until the search content is changed or until machine power is turned OFF.

To keep searching for the same character string, press the <Search forward> key or <Search backward> key.

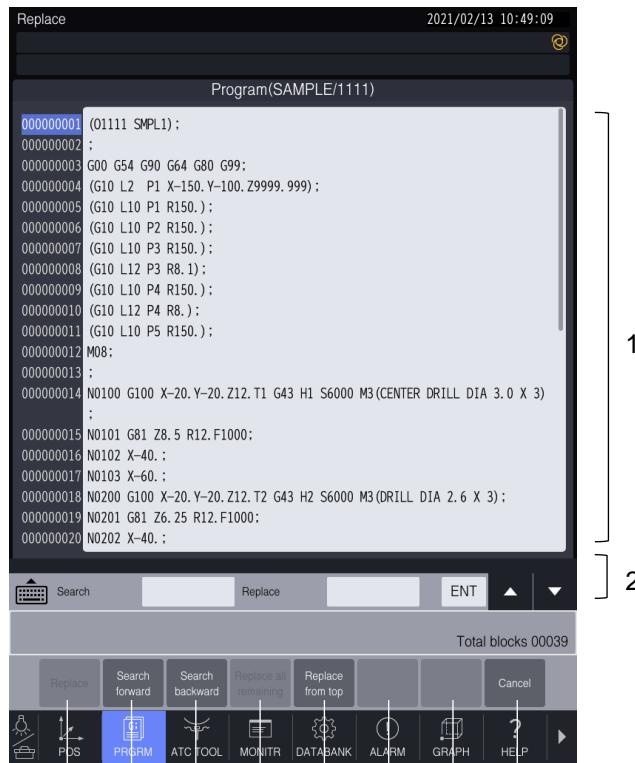
To change the search content, the user must either press the <Search character string> key or tap on the search area to change the search content.

If the <Cancel> key is pressed, it closes and exits the search screen and returns to the <Edit> screen.

1.2.3.5 Replace screen

After pressing the <Replace> key, the <Replace> screen is displayed.

Replace a character string that is 12 characters or less with another character string that is 12 characters or less.



(1) (2) (3) (4) (5) (6) (7) (8)

Description of screen display

Position	Name	Description
1	Edit area	Displays the program.
2	Character replacement area	Enter the character strings for searching and replacing.

The user cannot input into the edit area when the <Replace> screen is displayed.

Description of screen operation

Description of function key operations

Column	Position	Label	Description
1	(1)	<Replace>	Replaces the designated character string.
	(2)	<Search forward>	Conducts a search for replacing characters going down from the cursor position.
	(3)	<Search backward>	Conducts a search for replacing characters going up from the cursor position.
	(4)	<Replace all remaining>	Replaces all remaining designated character strings from the cursor position.
	(5)	<Replace from top>	Replace all designated character strings from the beginning of the program.
	(6)		
	(7)		
	(8)	<Cancel>	Changes to the <Edit> screen.

1. Description of character replacement area operations
 - When the user taps on the data input field for <Search>, the cursor moves to that data input field.
 - When the user taps on the data input field for <Replace>, the cursor moves to that data input field.

1

(Operation procedure)

- (1) Input a character string to be replaced and a new string character.

When entering a character string for a <Search>, after pressing the [ENT] key, the cursor moves to the data input field to enter data to <Replace>.

After entering the character string to <Replace> and pressing the [ENT] key, the cursor moves to the data input field for a <Search>.

- (2) When the <Search forward> key or <Search backward> key is pressed, it searches for the specified character string by going forward or backward in the content relative to the cursor's position. When the <Replace from top> key is pressed, it searches starting from the beginning of the program. The cursor moves to the beginning of the searched character string. If there is no character string to be replaced, the operator message <<Data not found>> appears to return to the <Edit> screen.

- (3) When the <Replace> key is pressed, the character string found in the search is replaced with the character string in the <Replace> field.

When the <Search forward> key is pressed, the character string at the cursor position is not replaced and the cursor moves forward to the next hit in the search. If there is no character string to be replaced, the operator message <<Data not found>> appears to return to the <Edit> screen.

When the <Search backward> key is pressed, the character string at the cursor position is not replaced and the cursor moves backward to the next hit in the search. If there is no character string to be replaced, the operator message <<Data not found>> appears to return to the <Edit> screen.

When the <Replace all remaining> key is pressed, all hits found from the cursor's position (right before pressing search forward) going forward or (right before pressing search backward) going backward are replaced at once without confirmation.

However, if replacement frequency exceeds 1000 times, the operator message <<Replacement performed too many times>> appears and the replacement finishes to return to the <Edit> screen.

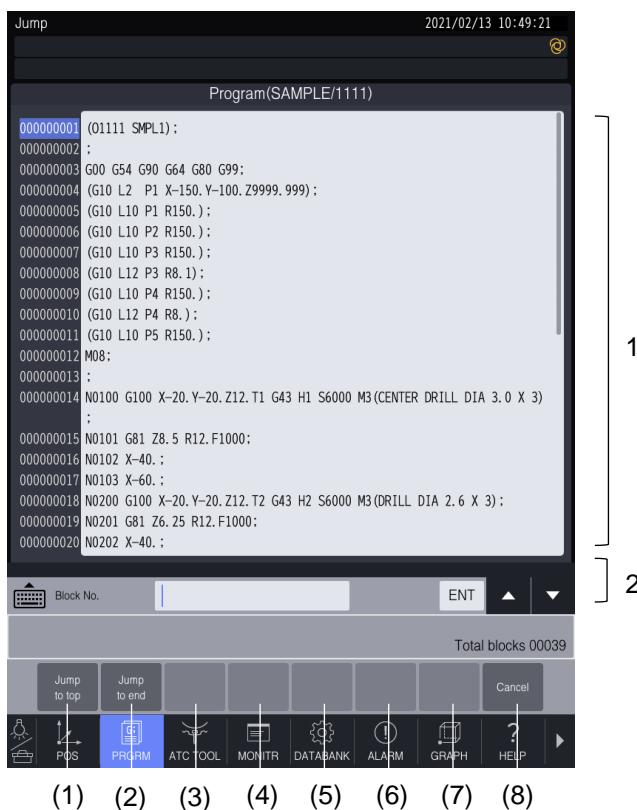
If the <Cancel> key is pressed, it closes and exits the <Replace> screen and returns to the <Edit> screen.

The current character string (character string to be replaced) and the new character string are saved until these are changed or turning off the power.

If the size exceeds 40 MB after replacement, or if the number of characters in the block exceeds 127, then the alarm <<Editing area exceeded>> or <<Too many characters>> is displayed. At this time, the replacement operation is cancelled and the screen goes back to the <Edit> screen.

1.2.3.6 Jump Screen

After pressing the <Jump> key, the <Jump> screen is displayed.



Description of screen display

Position	Name	Description
1	Edit area	Displays the program.
2	Area to specify jump location	Enter the block number to jump to.

The user cannot input into the edit area when the <Jump> screen is displayed.

Description of screen operation

Description of function key operations

Column	Position	Label	Description
1	(1)	<Jump to top>	Moves the cursor to the top or beginning of the program.
	(2)	<Jump to end>	Moves the cursor to the end of the program.
	(3)		
	(4)		
	(5)		
	(6)		
	(7)		
	(8)	<Cancel>	Changes to the <Edit> screen.

(Operation procedure)

Press the <Jump to top> or <Jump to end> key to move the cursor.

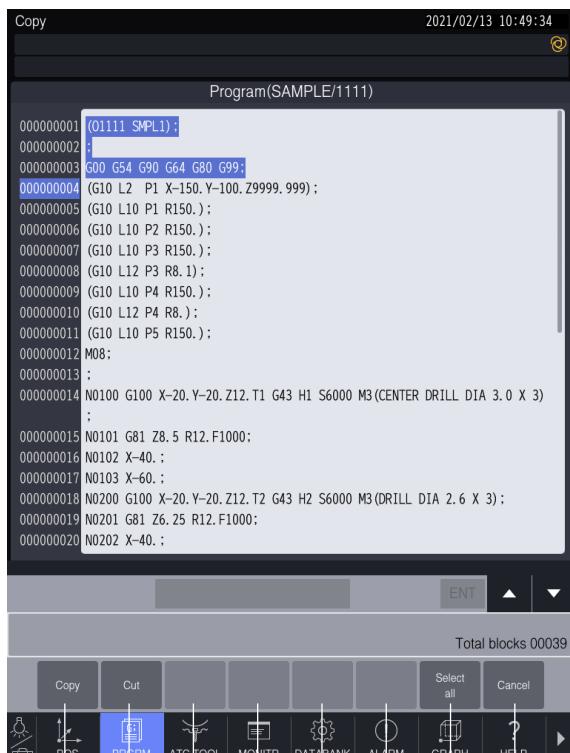
Or, enter a block number and press the [ENT] key to jump to the first character for the specified block number. If a block number is entered that is greater than the total number of blocks, it jumps to the end of the program.

1.2.3.7 Copy screen

The user can display the <Copy> screen by pressing the <Copy> key or by pressing and holding down your finger on the edit area (on the <Edit> screen). If the <Cancel> key is pressed, it closes and exits the <Copy> screen and returns to the <Edit> screen.

The maximum amount of data that can be copied or recorded is 20 MB. If the maximum is exceeded, the message <<Copy range exceeded>> appears.

1



(1) (2) (3) (4) (5) (6) (7) (8)

Description of screen display

Position	Name	Description
1	Edit area	Displays the program.

The user cannot input into the edit area when the <Copy> screen is displayed.

Description of screen operation

Description of function key operations

Column	Position	Label	Description
1	(1)	<Copy>	Refer to “Copy” for further details about copying.
	(2)	<Cut>	Refer to “Cut (data)” for further details about cutting data.
	(3)		
	(4)		
	(5)		
	(6)		
	(7)	<Select all>	Refer to “Select all” for further details about selecting all the data.
	(8)	<Cancel>	Changes to the <Edit> screen.

Copy

This function copies one part (characters) of the program to another location.

(Operation procedure)

1. Move the cursor to the start position for copying.
2. Press the <Copy> key to display the <Copy> screen. Use the tap operation to change the start position for copying.
3. Move the cursor to the end position for copying. At this time, the copy segment is highlighted. To copy data by lines, tap on the desired block number or tap three times on the desired line. Or, tap two times to select and copy data by words.
4. Press the <Copy> key. The highlighted part is saved or recorded, and then it goes back to the <Edit> screen.
5. Point the cursor at the part you want to copy.
6. Press the <Paste> key. The copied character is inserted before the cursor position.

Cut (data)

This function cuts one part (characters) of the program. Note that the characters that are cut are saved and can be pasted to a different location.

(Operation procedure)

Steps 1 to 3 are for setting the start and end positions to cut data.

They are the same as steps 1 to 3 in the “Copy” procedure.

4. Press the <Cut> key. The highlighted part is cut and saved. Thereafter, the screen goes back to the <Edit> screen.
5. When pasting the cut character to another place, move the cursor to the place to be pasted.
6. Press the <Paste> key. The cut character is inserted before the cursor position.

Select all

Press the <Select all> key to select and highlight all of the displayed program for copying or cutting data. Thereafter, press the <Copy> or <Cut> key to perform the desired operation.

1.2.3.8 Paste

The character string that is selected for copy or cut operations is saved. That content is saved until a new copy or cut operation is performed or until the power to the machine is turned OFF.

The <Paste> key can be pressed to paste the content any number of times and insert it at the letter before the cursor position.

This function is used in the following cases:

- Restoration after cutting
- Move a character string to another location.
- Copy a character string to multiple locations.
- Copying or moving a specified part of a program to another program

1.2.3.9 Undo

The edit operations are recorded. As a result, the user can undo an operation and change it back to the previous state. Every time the <Undo> key is pressed, it cancels and undoes the previous operation.

(NOTE 1) The <Undo> key can be pressed and used a maximum of 100 times. As characters are entered and recorded as operations, the maximum for undo operations decreases accordingly.

(NOTE 2) The undo operation can be used for up to 100 blocks of characters. If an edit operation is carried out and it exceeds this number of characters, the <Undo> key will not work.

(NOTE 3) All of the following operations are recorded and counted as one operation: selecting a range to delete, cut, or paste, inserting a character string with menu programming, automatically inserting a sequence number and replacing with the <Replace all remaining> key.

(NOTE 4) After pressing the <Save and end> key or <Cancel w/o saving changes> key, the screen changes from the program edit screen and any records of the edit operations are deleted.

1.2.3.10 Redo

A cancelled operation (using <Undo>) can be re-executed. Every time the <Redo> key is pressed, it re-executes an operation.

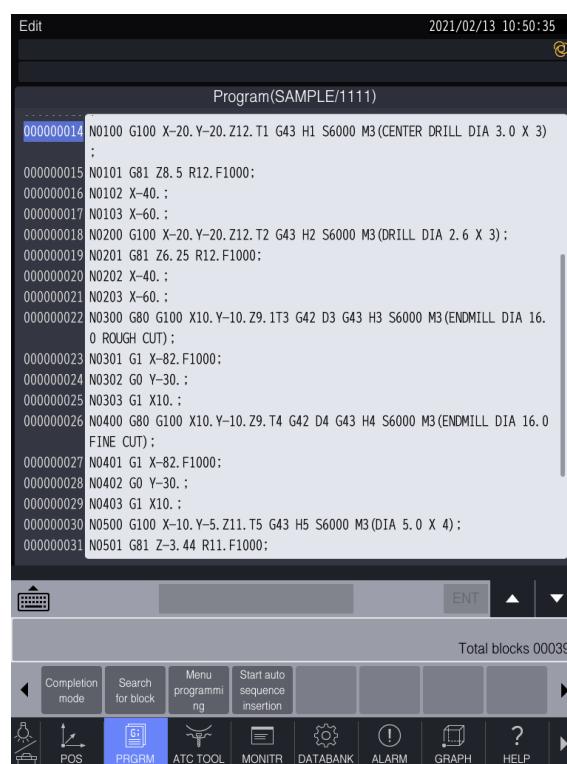
(NOTE) After pressing the <Save and end> key or <Cancel w/o saving changes> key, the screen changes from the program edit screen and any operation that was cancelled with <Undo> cannot be re-executed.

1.2.3.11 Search for Block

If the program being edited on the <Edit> screen in program edit mode is also currently running, when the <Search for block> key is pressed, the cursor will jump to the block position that is currently executing.

If the program in editing differs from the program in operation or is not in operation, the operator message <<Data not found>> appears and the cursor does not move.

If there is no “Search for block” in the function display, change the functions by pressing <Next function> key.



The block number pointed by the operation pointer is indicated in a black background.

1.2.3.12 Menu Programming

Menu programming is the function enable to make NC program by inputting numerical values according to the menu. You don't need to remember G/M codes.

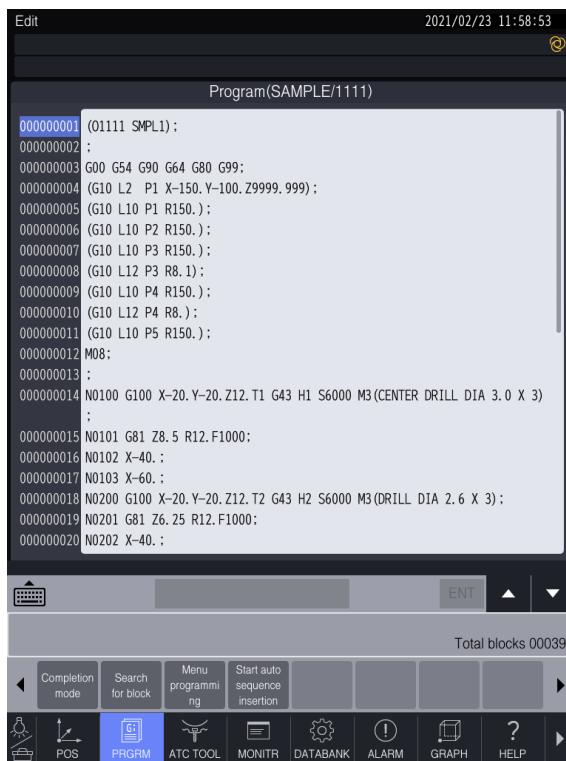
For details, refer to “1.2.6 Menu programming”.

1.2.3.13 Insertion of Automatic Sequence Number

If EOB is input, the sequence number is automatically inserted.

The value of the sequence number is set with the sequence number of the block, where EOB is input, added with the user parameter <Automatic sequence insertion increment>. When the block where EOB is input does not have a sequence number, the value of the sequence number is set with the user parameter <Automatic sequence insertion increment>.

The display for the <Start auto sequence insertion / End auto sequence insertion> key changes back and forth.



1

1.2.3.14 Edit Finish

When the <Completion mode> key is pressed on the program edit screen, it changes to edit completion check mode and the screen allows the user to select the completion conditions.

You can save a program for finishing or continue editing.

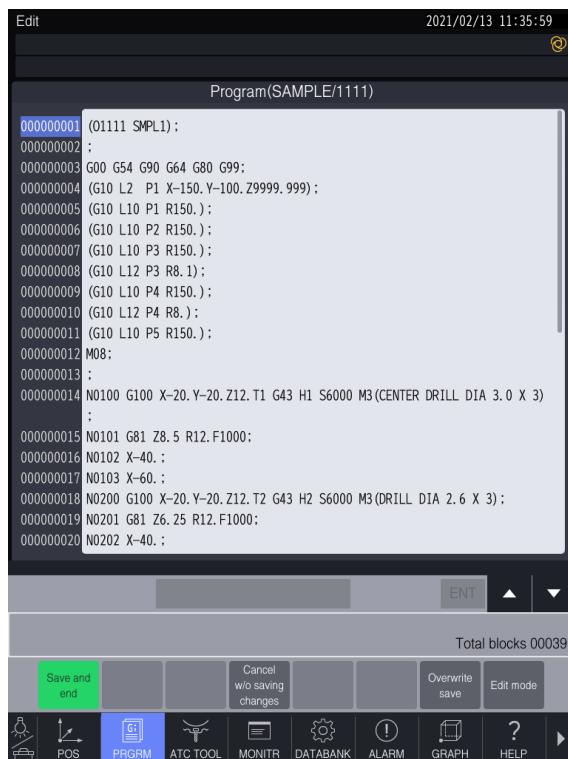
If an edited program is in operation, the message <A program is currently running. Are you sure you want to change?> appears.

(NOTE) When edited programs are currently running and the program which is running takes up 32 MB or more so that extension memory operation is required, the message <End editing after operation is completed.> is displayed, and the save and exit operation or overwriting operation is not possible.

In addition, when edited programs are currently drawing and the program which is drawing takes up 32 MB or more, the message <Quit editing after drawing is completed.> is displayed, and the save and exit operation or overwriting operation is not possible.

Screen to check editing of a program during operation is finished

1



1. <Save and end> key

Editing finishes when the edited content is saved.

The screen returns to the <Program list> screen.

However, when editing a program that is running in extended memory operation, or when editing a program that takes up 32 MB or more during a drawing operation, the <Save and end> key cannot be pressed.

2. <Cancel w/o saving changes> key

Edited contents are invalidated.

The screen returns to the <Program list> screen.

3. <Overwrite save> key

The contents ever edited are overwritten in a file and the screen returns to the edit status.

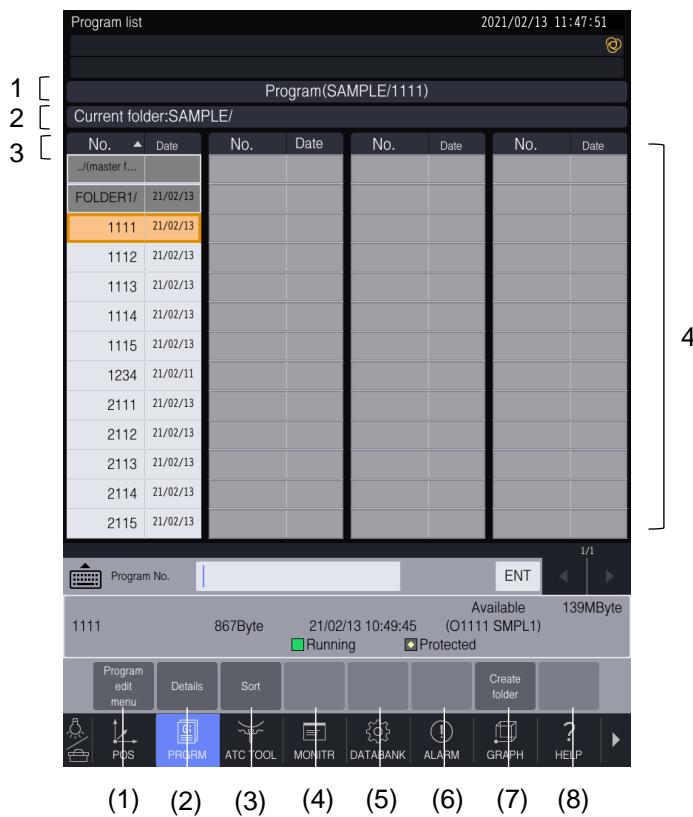
However, when editing a program that is running in extended memory operation, or when editing a program that takes up 32 MB or more during a drawing operation, the <Overwrite save> key cannot be pressed.

4. <Edit mode> key

Returns to the editing status.

1.2.4 Program List Screen

After pressing the [Program edit] key on the <Program edit menu> screen, the program list screen is displayed.



1.2.4.1 Description of screen display

Position	Name	Description
1	Program	Displays the number or name of the program that was previously edited.
2	Current folder	Displays the folder name being currently displayed.
3	Program information	<ul style="list-style-type: none"> Program Displays the program and folder. Size Displays the amount of memory used by a program. Date Displays the date and time the last time the program was saved in the NC.
4	Program list	Displays a list of folders and programs in the current folder.

During memory operation, the program that is running is highlighted in green.

If a program is protected and cannot be edited, that program is highlighted in gray.

* Refer to the “1.4 Directory display” for further details on currently running programs and protected programs that cannot be edited.

The edit programs and memory operation programs are independent of each other, but they can be matched to each other (including the folders) by setting the user parameter <Set the same program for edit/memory operation programs> to <1:Yes>.

For example, when using memory operation mode and the edit program number is 1000, the memory operation program number also becomes 1000. In addition, when using edit mode and the memory operation program number is 2000, the edit program number also becomes 2000.

- (NOTE) A description of block 1 in the program is displayed on the <Detailed program list> screen. The user can insert comments using the control-out and control-in codes (“,” “”). This makes the overview helpful because the user does not have to look inside the program to check the description.
Note, there is a 60 character limit for the description that is displayed in the <Detailed program list> screen.

1

1.2.4.2 Description of screen operation

1. Description of function key operations

Column	Position	Label	Description
1	(1)	<Program edit menu>	Changes to the <Program edit menu> screen.
	(2)	<Details>/<List>	Changes the display. <Details>: Displays comments or the time of the last update. <List>: Displays many programs on one screen.
	(3)	<Sort>	Sorts the programs according to the date, the program number or the comments (sorts folders in alphabetical order A – Z). Data can be sorted in ascending and descending order.
	(4)		
	(5)		
	(6)		
	(7)	<Create folder>	Creates a new folder in the current folder.
	(8)		

2. Description of program information and operations

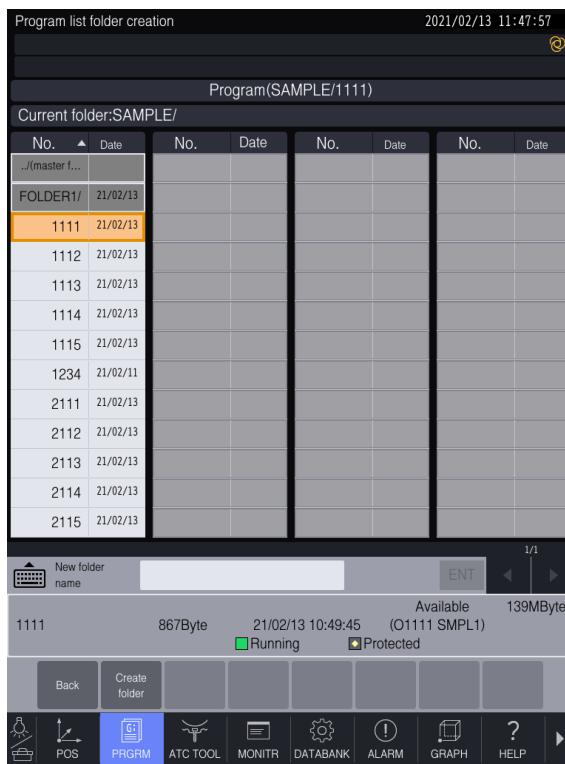
- The user can tap on a program to sort the programs or folders. Each time the user taps, the order switches back and forth between ascending and descending order.
- The user can tap on the size to sort according to the program size. Each time the user taps, the order switches back and forth between ascending and descending order.
- The user can tap on the date to sort according to the dates of the programs. Each time the user taps, the order switches back and forth between ascending and descending order.

3. Description of program list operations

- Tap on a program to change to the edit screen for that program.
- Tap on a folder to move and go inside that folder.
- An item can be selected with the [CURSOR] keys (up and down).
- After a program is selected and the [ENT] key is pressed, the screen changes to the edit screen for that program.
- After a program number or name is entered and the [ENT] key is pressed, the screen changes to the edit screen for that program.
When a program that was input does not exist in the NC, a new program is created and the screen changes to the edit screen.
- Even if a folder name is entered and the [ENT] key is pressed, the screen cannot change to the folder screen.
- After a folder is selected and the [ENT] key is pressed, the focus moves to inside that folder.

1.2.4.3 Create folder

After pressing the <Create folder> key, the <Create folder> screen is displayed.



Enter a new folder name and press the <Create folder> key. A new folder is created and the screen goes back to the previous screen.

Press the <Back> key to return to the previous screen without creating a folder.

Up to 16 characters (alphanumeric characters and period) can be used for the folder name.

In addition, the folders that can be created in the machine directory can extend to 3 levels including the root folder.

For example, when creating folder AAA inside the root folder and then folder BBB inside folder AAA, beyond that, another folder cannot be created inside folder BBB.

In the above situation, when moving the focus to inside folder BBB, the current folder is displayed as "AAA/BBB/".

When a folder name cannot be specified (because the folder name, the name used inside the NC program (O+Numerical value) or the name used inside the conversation program already exists inside the same folder), then the alarm <<This is an unusable folder name.>> appears and a folder cannot be created.

1.2.5 Program Edit in Memory Operation (Edit During Operation)

Programs are editable during a memory operation without stopping the operation.

1.2.5.1 To Edit a Program not in Operation or a New Program

1. Press the [EDIT] key while pressing the [MEM] key.
The LEDs of the [MEM] and [EDIT] keys go lit.
2. When a program that is not an executing program is set, the user can create a new program or edit another program.

(NOTE) Unless the [MEM] key is pressed in 1 above, the mode becomes the program edit mode and the memory operation stops.

1.2.5.2 To Edit a Program in Execution

1. Press the [EDIT] key while pressing the [MEM] key. The LEDs of the [MEM] and [EDIT] keys go lit.
2. When an executing program is set, the user can edit the program while it is executing. At this time, the alarm <<Running program>> appears.

If the user parameter <Program edit start position during operation > is set as <1: Pointer>, the cursor moves to the operation pointer position when the editing started.

The block number of the operation pointer is displayed in a black background.

If the user parameter <Save when mode of current program is changed> is set <1: Overwrite save>, the message <Perform overwrite save by mode switching.> appears in the teaching area.

3. When the <Completion mode> key is pressed after editing a program, the message <A program is currently running. Are you sure you want to change?> appears.
4. When the <Save and end> key is pressed, the edited content is saved.

(NOTE) Unless the [MEM] key is pressed in 1 above, the mode becomes the program edit mode and the memory operation stops.

The saved program in operation is reflected in memory operation after the operation finishes.

If any of the [MANU], [MDI], [MEM], and [EDIT] keys is pressed while a program in operation is being edited and the modes are changed, the user parameter <Save when mode of current program is changed> is set <1: Overwrite save>, the edited content is overwritten and saved in a file.

1.2.6 Menu Programming

Menu programming is the function enable to make NC program by inputting numerical values according to the menu. You don't need to remember G/M codes.

1.2.6.1 Menu programming input menu screen

There are two screen types for the programming input menu, one for G code and one for M code. When the <Menu programming> key is selected from the program edit screen or from the MDI operation screen, the menu programming input menu screen is displayed.

Menu programming input menu (G code) screen

1

2

1/8

ENT

Total blocks 000039

(1) (2) (3) (4) (5) (6) (7) (8)

1

Menu programming input menu (M code) screen

1

2

1/9

ENT

Total blocks 000039

(1) (2) (3) (4) (5) (6) (7) (8)

Description of screen display

Menu programming input menu (G code) screen

Position	Name	Description
1	Program being edited	Displays the name of the program being edited.
2	G code list	Displays the G code list screen.

Menu programming input menu (M code) screen

Position	Name	Description
1	Program being edited	Displays the name of the program being edited.
2	M code list	Displays the M code list screen.

Description of screen operation

1. Description of function key operations

The function keys are the same for both the <Menu programming input menu (G code)> and the <Menu programming input menu (M code)> screens.

Column	Position	Label	Description
1	(1)	<Back>	Goes back to the program edit screen.
	(2)	<G code>	Displays the <Menu programming input menu (G code)> screen.
	(3)	<M code>	Displays the <Menu programming input menu (M code)> screen.
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

2. Description of G code and M code list operations

G code list operations

- After entering a G code number and pressing the [ENT] key, the cursor moves to that G code number.
- After pressing the [ENT] key, the G code setting screen is displayed for the G code where the cursor is.
- Tap on a G code to display the G code setting screen for that G code.
- An item that cannot be executed in the current mode is grayed out.
Any item that is grayed out cannot be selected. Even if the [ENT] key is pressed, the G code setting screen will not display.

M code list operations

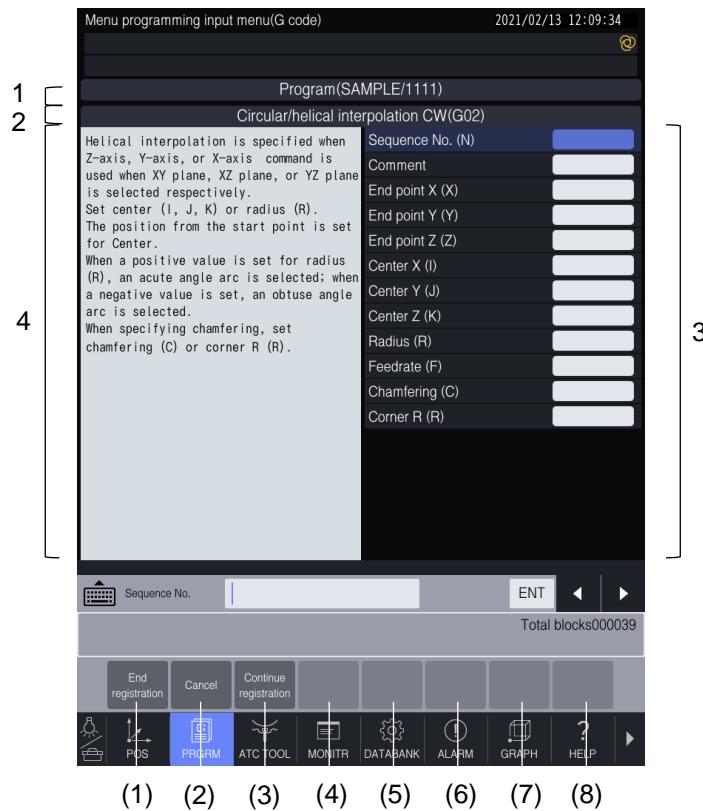
The operations are the same as the G code list.

1.2.6.2 Menu programming setting screen

There are two types of menu programming setting screens, one for programming using G code and one for programming using M code.

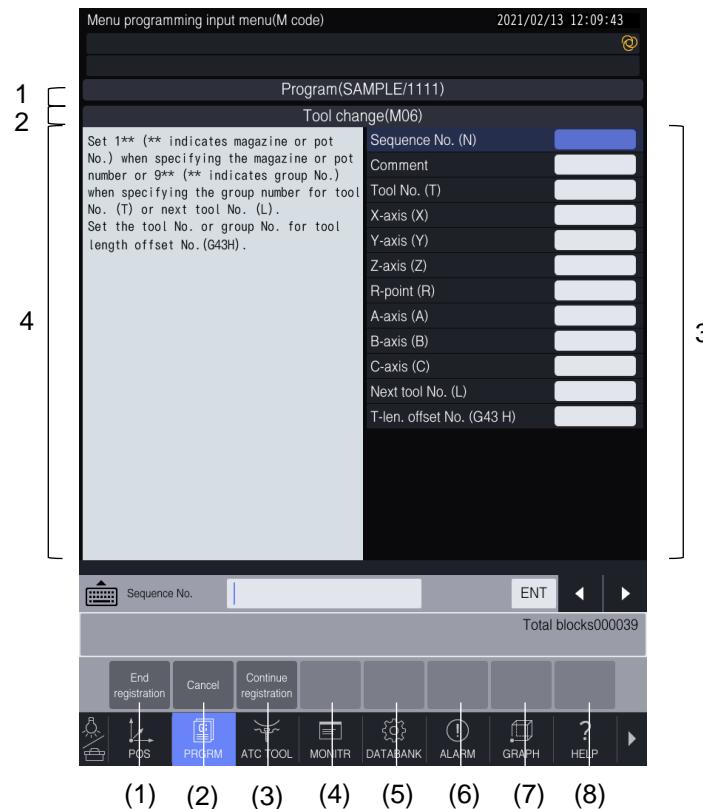
After selecting G code or M code from the menu programming input menu screen, the corresponding menu programming setting screen is displayed.

Menu programming setting (G code) screen



1

Menu programming setting (M code) screen



1

Description of screen display

Menu programming setting (G code) screen

Position	Name	Description
1	Program being edited	Displays the name of the program being edited.
2	G code number	Displays the G code number being used.
3	List of setting items	Displays the setting items required for using the G code. These items vary depending on the G code number.
4	Procedure guide	Displays a procedure guide for the setting items.

Menu programming setting (M code) screen

Position	Name	Description
1	Program being edited	Displays the name of the program being edited.
2	M code number	Displays the M code number being used.
3	List of setting items	Displays the setting items required for using the M code. These items vary depending on the M code number.
4	Guidance	Displays a procedure guide for the setting items.

Description of screen operation

1. Description of function key operations

The function keys are the same for both the <Menu programming input menu(G code)> and the <Menu programming input menu(M code) > setting screens.

Column	Position	Label	Description
1	(1)	<End registration>	Adds the setting data to the program being edited and goes back to the program edit screen.
	(2)	<Cancel>	Discards setting content and goes back to the program edit screen.
	(3)	<Continue registration>	Registers setting content and goes back to the menu programming input menu screen.
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

2. Description of setting list operations

The following shows examples of G code settings. The operations are also the same for the M code settings.

- Use the cursor to select a setting item.
- Move the cursor by using the [CURSOR] keys or by tapping on a setting item.
- When a value is entered and the [ENT] key is pressed, the value is set to the item where the cursor is.
- Press the [DEL] key to delete the set value (for the item where the cursor is).

(NOTE) The G code or M code that is registered as a <G/M code macro> in the data bank carries out the corresponding G code or M code macro call operation.

1.3 Program Edit (Conversation)

For creation of a conversational program, refer to the “Programming Manual (Conversation).”

1.4 Directory Display

1.4.1 Outline

The directory display is to display the amount of memory used by a program or data bank.

Usable amount amount is as follows:

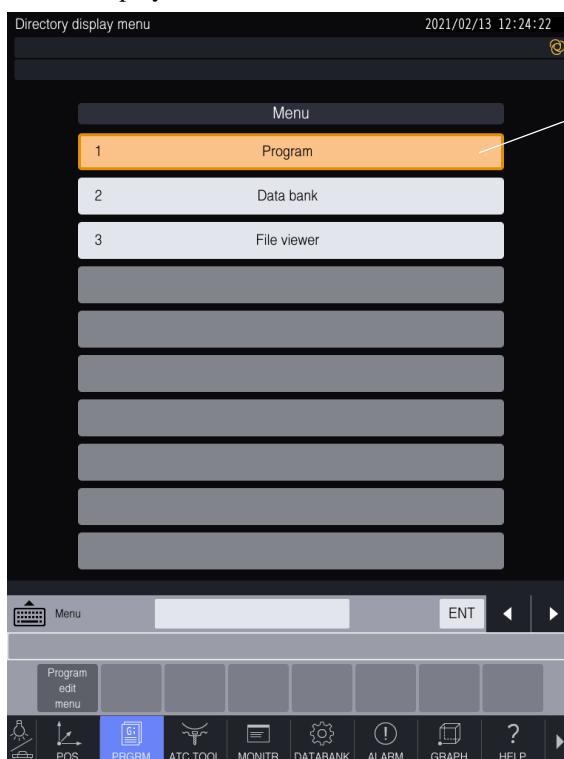
- Total amount of usable memory is about 512 M bytes.
- The total number of usable files and folders including NC programs, conversational programs, databanks, and folders is 4096 files.

1

1.4.2 Screens

1.4.2.1 Directory display menu

1. Display the <Program edit menu> screen.
Press the [EDIT] key.
2. Display the <Directory display> screen.
Press the <Directory display> key.
3. Select the data to display.

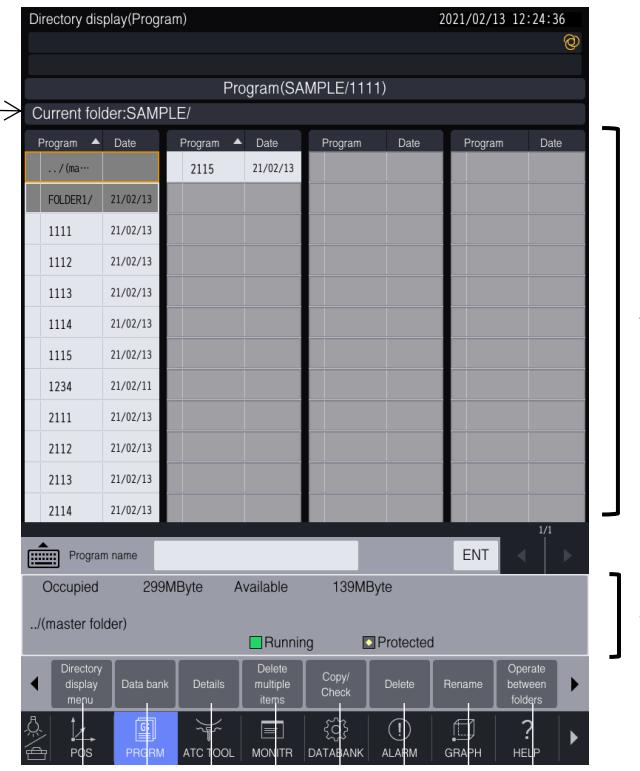


Description of directory display menu screen

Position	Name	Description
1	Menu list	<p>This list shows the directory display menu.</p> <p><Program> The user can perform program or sub folder file operations.</p> <p><Data bank> The user can perform data bank file operations.</p> <p><File viewer> The user can perform document and image file operations.</p>

1.4.2.2 Directory Display (Program)

1



(1) (2) (3) (4) (5) (6) (7) (8)

Description of screen display

Position	Name	Description
1	Current folder	Displays the name of the folder being currently displayed.
2	Program	<p>Displays a list of folders and programs in the current folder.</p> <ul style="list-style-type: none"> Program Displays the program and folder. Size Displays the amount of memory used by a program. Comment Displays the first block of the program in a details display. Date Displays the date and time the last time the program was saved in the NC.
3	Selected program information	Displays the program name, size, updated timing and comments for the program selected with the cursor.

If a program is in memory operation (in operation / in block stop / in temporary stop), it is displayed in a green background.

NC language

- Main program
- Sub program called from a main program
- Sub program called from a sub program

Conversational language

- Main program
- Schedule program
- Program registered in a schedule program

When a program is protected and cannot be edited, it is grayed out.

With respect to the program number in the conversational language:

- The program created in the unit system (metric system or inch system) opposite to the one displayed on the screen is displayed with “M” or “I” in front of the program number.

Description of screen operation

1. Description of function key operations

For NC language

Column	Position	Label	Description
1	(1)	<Program edit menu>	Changes to the <Program edit menu> screen.
	(2)	<Data bank>	Changes to the <Directory display (Data bank)> screen.
	(3)	<Details>/<List>	Changes the display. <Details>: Displays comments or the time of the last update. <List>: Displays many programs on one screen.
	(4)	<Delete multiple programs>	Selects multiple programs or folders to delete.
	(5)	<Copy/Check>	When data protection is disabled <ul style="list-style-type: none"> • Copies the selected program or folder. When data protection is enabled <ul style="list-style-type: none"> • Checks the selected program or folder. • Checks the programs in the folder when a folder is specified.
	(6)	<Delete>	Deletes the selected program or folder.
	(7)	<Rename>	Renames the selected program or folder.
	(8)	<Operate between folders>	Copies, checks and/or moves programs between folders as well as copies and checks the folder itself.
2	(1)	<Program edit menu>	Changes to the <Program edit menu> screen.
	(2)	<Create folder>	Creates a new folder. This key cannot be selected when a third level directory folder (including the root folder) is being displayed. It grays out.
	(3)	<Sort>	Sorts the programs according to the time of the last update, the program number or the comments (sorts folders in alphabetical order A – Z). Data can be sorted in ascending and descending order.
	(4)		
	(5)		
	(6)		
	(7)	<Protect ON>	Disables program editing.
	(8)	<Format>	Formats a program or the data bank.

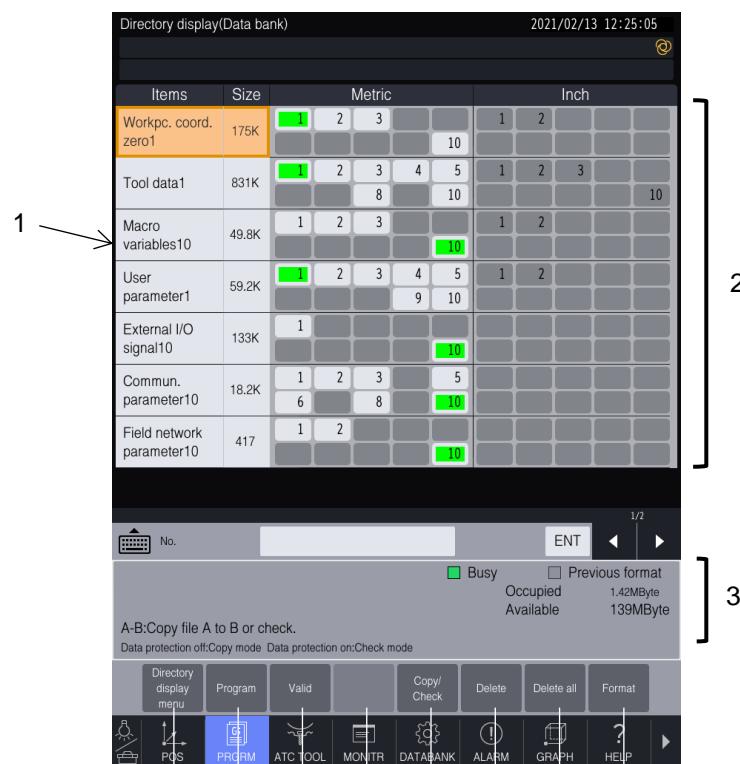
For conversation language

Column	Position	Label	Description
1	(1)	<Program edit menu>	Same operation as the NC language mode.
	(2)	<Data bank>	Same operation as the NC language mode.
	(3)	<Details>/<List>	Same operation as the NC language mode.
	(4)	<Delete multiple programs>	Same operation as the NC language mode.
	(5)	<Copy/Check>	Same operation as the NC language mode.
	(6)	<Delete>	Same operation as the NC language mode.
	(7)	<Rename>	Same operation as the NC language mode.
	(8)	<Operate between folders>	Same operation as the NC language mode.
2	(1)	<Program edit menu>	Same operation as the NC language mode.
	(2)	<Convert G code>	Converts a conversation program to an NC program.
	(3)	<Create folder>	Same operation as the NC language mode.
	(4)	<Sort>	Same operation as the NC language mode.
	(5)		
	(6)		
	(7)	<Protect ON>	Same operation as the NC language mode.
	(8)	<Format>	Same operation as the NC language mode.

2. Description of program area

- The user can tap on the program name, size or data in the title section to change back and forth between ascending and descending order.
- The user can tap on a program to select it.
- Tap on a folder to move and go inside that folder.
- An item can be selected with the [CURSOR] keys (up and down).
- After a folder is selected and the [ENT] key is pressed, the focus moves to inside that folder.

1.4.2.3 Directory display data bank



(1) (2) (3) (4) (5) (6) (7) (8)

Description of screen display

Position	Name	Description
1	Items	<p>Displays each item for the data bank.</p> <ul style="list-style-type: none"> The items vary depending on the NC or conversation language mode. The numbers on the right of the data name are the data numbers that are valid. Items <p>Displays each item name for the data bank.</p> <ul style="list-style-type: none"> Size <p>Displays the amount of memory used by each item.</p>
2	Data number	<p>Displays the data number for the data that is registered for each item.</p> <ul style="list-style-type: none"> The user can register up to 10 files for the metric data and the inch data under each item in the data bank. Any data number that is highlighted in green means that the data bank is currently using it. Any data number that is highlighted in dark gray and displayed in parentheses means that the corresponding data bank has an error, like the formatting is old or there is a parity error.
3	Data bank information	Displays the amount of memory used by the data bank.

Data bank items

(NC language)

File	Notes
Workpiece coordinate zero	Metric/Inch
Tool data	Metric/Inch
Macro variable	Metric/Inch
G/M code macro	
User parameter	Metric/Inch Same for NC and conversation languages
External I/O signal	Same for NC and conversation languages
Communication parameter	Same for NC and conversation languages
Field network parameter	Same for NC and conversation languages
Machine parameter	Only one file that is the same for NC and conversation languages
Special settings	Same for NC and conversation languages
Load monitor	Same for NC and conversation languages

(Conversation)

File	Notes
Tool list	Metric/Inch
Tool pattern	
Tapping drill diameter	Metric/Inch
Cutting conditions	Metric/Inch
User parameter	Metric/Inch Same for NC and conversation languages
External I/O signal	Same for NC and conversation languages
Communication parameter	Same for NC and conversation languages
Field network parameter	Same for NC and conversation languages
Machine parameter	Only one file that is the same for NC and conversation languages
Special settings	Same for NC and conversation languages
Load monitor	Same for NC and conversation languages

Description of screen operation

1. Description of function key operations

Column	Position	Label	Description
1	(1)	<Program edit menu>	Changes to the <Program edit menu> screen.
	(2)	<Program>	Changes to the <Directory display (Program)> screen.
	(3)	<Valid>	Enables (uses) the currently selected data.
	(4)		
	(5)	<Copy/Check>	When data protection is disabled • Copies the selected data. When data protection is enabled • Checks the selected data for both.
	(6)	<Delete>	Deletes the selected data.
	(7)	<Delete all>	Deletes the data for all the items.
	(8)	<Format>	Formats a program or the data bank.

2. Item operations

- The user can scroll through the items with the **[CURSOR]** keys (up and down).
- When the user taps to select a data number, the cursor moves to that item.

3. Data number operations

- The user can tap on a data number to select it.

1.4.2.4 Directory display file viewer



Description of screen display

Position	Name	Description
1	Current folder	Displays the name of the folder being currently displayed.
2	Documents/Images	<p>Displays a list of folders and document/image files in the current folder.</p> <ul style="list-style-type: none"> • File name Displays the file name and folder. • Size Displays the amount of memory used by a file. • Date Displays the date and time the last time the file was saved in the NC.
3	File viewer information	Displays the amount of memory used by the file viewer.

Description of screen operation

1. Description of function key operations

Column	Position	Label	Description
1	(1)	<Directory display menu>	Changes to the <Directory display menu> screen.
	(2)		
	(3)		
	(4)	<Delete multiple items>	Selects multiple files or folders to delete.
	(5)		
	(6)	<Delete>	Deletes the selected file or folder.
	(7)	<Rename>	Renames the selected file or folder.
	(8)		
2	(1)	<Directory display menu>	Changes to the <Directory display menu> screen.
	(2)	<Create folder>	<p>Creates a new folder.</p> <p>This key cannot be selected when a third level directory folder (including the root folder) is being displayed. It grays out.</p>
	(3)	<Sort>	<p>Sorts the programs according to the time of the last update or the file.</p> <p>Data can be sorted in ascending and descending order.</p>
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

2. Description of file fields

- The user can tap on the file, size or data in the title section to change back and forth between ascending and descending order.
- The user can tap on a file to select it.
- Tap on a folder to move and go inside that folder.
- An item can be selected with the [CURSOR] keys (up and down).
- After a folder is selected and the [ENT] key is pressed, the focus moves to inside that folder.

1.4.3 Directory Display Program Operations

1.4.3.1 Copy operation

The user can copy a specified program or folder.

For this operation, the current folder is both the copy source and the copy destination. To copy to another folder, use the “Operate between folders” key.

Before performing an operation, set the [DATA PROTECTION] switch to “O” (disable).

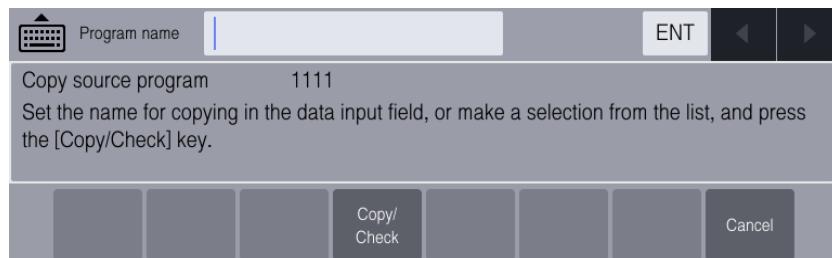
1

In the following situations, an operator message appears and the copy operation cannot be carried out.

Conditions	Operator messages
When a program where editing is disabled is specified as the program for the copy destination	<<Program is write-protected.>>
When a program specified for the copy destination exists and that program is running in extended memory operation	<<Extended memory operation mode>>
When a program specified as the copy source or copy destination is communicating (input/output in progress)	<<Communicating>>
When a program specified as the copy source does not exist	<<No copy source data>>
When a file name at the copy destination is not permitted or valid in the NC directory (Refer to “1.2.2 Program file names” for details about file names that cannot be used.)	<<Input data error>>

How to copy a program or folder

- Use the following operations to select the copy source.
 - Use the cursor or tap on a program or folder to select it, and then press the <Copy/Check> key.
- A message appears indicating how to specify the copy destination.



- Set the name for copying in the data input field, or make a selection from the list, and press the <Copy/Check> key to copy the data.

If the name of the copy destination already exists, a message will appear to confirm whether to overwrite the data or not. Press the <Yes> key to overwrite, and press the <No> key to cancel overwriting.

When multiple programs are copied in a folder copy operation, after pressing the <Overwrite all remaining> key, all remaining programs are overwritten. Press the <Cancel> key to cancel the operation.

- (NOTE 1) If the folder contains files that are different from the current language mode (NC language/conversation language), those files are also copied.
- (NOTE 2) When the copy source is specified in the data input field, that program (specified in the data input field) is used for copying and not the program specified using the operation in step (1).

How to use the data input field to copy

The user can enter data into the data input field and press the <Copy/Check> key to copy the specified program.

Input example	Copy operation	
	Copy source	Copy destination
1234-5678	1234	→ 5678

(NOTE) A folder cannot be copied with this operation.

If the copy destination is not specified, a message appears indicating how to specify the copy destination.

Input example	Copy operation		Notes
	Copy source	Copy destination	
1234	1234	→	• A message appears indicating how to specify the copy destination.
PROG001	PROG001	→	

When [-] is used to specify the copy destination, it can only be used with numerical values.

- When a character string other than numbers is used
- When more than one [-] is used

In the two aforementioned cases, the copy source and copy destination (that is separated by the [-] symbol) cannot be identified correctly. Therefore, all the data in the data input field is processed as the copy source and a message appears indicating how to specify the copy destination.

Input example	Copy operation		Notes
	Copy source	Copy destination	
1234-5678	1234-5678	→	
PROG001-1234	PROG001-1234	→	
1234-PROG001	1234-PROG001	→	• A message appears indicating how to specify the copy destination.

1.4.3.2 Check operation

Programs can be verified and checked. The operation procedure is the same as the copy operation when the copy destination is verified and checked.

Before performing an operation, set the [DATA PROTECTION] switch to “|” (enable).

In the conversation language, a check cannot be carried out between a scheduled program and a program.

If the programs are checked and both have the same content, the expression <Check OK> is displayed in the instructions area.

When there is a program that does not match while multiple programs are being checked, the message <Check error> appears in the instructions area and the verification check is cancelled during the checking process.

In the following situation, an operator message appears and the check cannot be carried out.

Condition	Operator message
When the program number for the check source or check destination does not exist	<<Required data not found>>

1.4.3.3 Delete operation

The user can delete the specified program or folder.

Before performing an operation, set the [DATA PROTECTION] switch to “O” (disable).

In the following situations, an operator message appears and the deletion cannot be carried out.

Conditions	Operator messages
When a program where editing is disabled is specified	<<Program is write-protected.>>
When the program to be deleted is running in memory operation mode	<<Running program>>
When the program to be deleted is communicating	<<Communicating>>
When data protection is enabled	<<Data is write-protected.>>

How to delete a program or folder

- (1) Use the following operations to select a program or folder to delete.
- Use the cursor or tap on a program or folder to select it, and then press the [Delete] key.

- (2) A delete confirmation message is displayed.

Press the <Yes> key to delete, and press the <No> key to cancel deleting.

When multiple programs are deleted in a folder deletion operation, after pressing the <Delete all remaining> key, all remaining programs are deleted. Press the <Cancel> key to cancel the operation.

If there is a file that cannot be deleted in the folder, or if the <No> key is pressed after the confirmation message, the selected folder is not deleted.

(NOTE) The folder may contain files that are different from current language mode (NC language/conversation language). When items are deleted consecutively, be careful because all of the files in the folder will be deleted.

How to use the data input field to delete

The user can enter data into the data input field and press the [Delete] key to delete the specified program.

A folder cannot be deleted with this operation.

Input example	Deletion operation
1234	Deletes 1234.
PRG01	Deletes PRG01.
1234 PRG01	Deletes 1234 and PRG01.
10/7999	<p>Deletes all programs from program No. 10 to No. 7999.</p> <p>(NOTE 1) When the first program number (“10” in this example) in the range is omitted, all the programs starting from No. 1 are deleted.</p> <p>(NOTE 2) When the last program number (“7999” in this example) in the range is omitted, all the programs up to No. 8999 are deleted. Scheduled programs from 9900 to 9999 are also included when using conversation language.</p> <p>(NOTE 3) Only numerical values can be used.</p> <p>Invalid example: PROG001/PROG003</p> <p>If an entry like above (“PROG001/PROG003”) is entered, it is processed as a program with an invalid name and an input error is triggered.</p>

1.4.3.4 Delete multiple programs/folders

When the <Delete multiple programs> key is pressed, the screen below is displayed. Then, the user can select multiple programs and folders and delete them. Tick the checkboxes for the programs or folders you wish to delete.

Before performing an operation, set the [DATA PROTECTION] switch to “O” (disable).



(1) (2) (3) (4) (5) (6) (7) (8)

Description of function key operations

Column	Position	Label	Description
1	(1)	<Back>	Goes back to the <Directory display (Program)> screen.
	(2)	<Start selection>	Specifies a range to select multiple programs or folders. Move the cursor to the start position for selecting the program or folder range and press the set key. Then, move the cursor to the last program or folder in the range, and press the set key again.
	(3)	<Select all>	Selects all of the programs and folders.
	(4)	<Deselect all>	Deselects all of the programs or folders.
	(5)		
	(6)	<Delete>	Same as the <Directory display (Program)> screen.
	(7)		
	(8)		

How to delete a program or folder

Tick the checkbox to select and delete a program or folder.

The procedure hereafter is the same as the delete operation above.

1.4.3.5 Rename operation

The user can rename a program and folder.

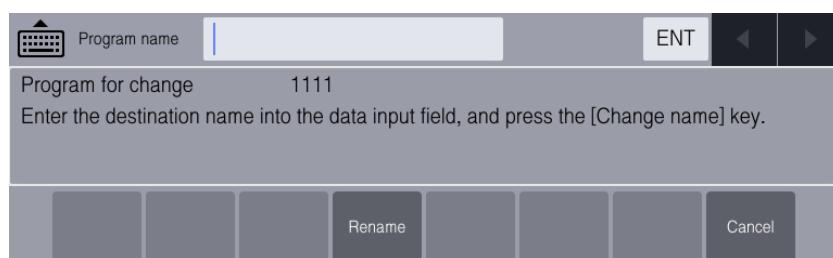
Before performing an operation, set the [DATA PROTECTION] switch to “O” (disable).

In the following situations, an operator message appears and the rename operation cannot be carried out.

Conditions	Operator messages
When data protection is enabled	<<Data is write-protected.>>
When editing is disabled on a program to be renamed	<<Program is write-protected.>>
When the renamed program already exists	<<A program is already existing.>>
When the renamed folder already exists	<<This is an unusable folder name.>>
When the specified program is running	<<Running program>>
When the specified program is communicating	<<Communicating>>
When the renamed file is not permitted or valid in the NC directory (Refer to “1.2.2 Program file names” for details about file names that cannot be used.)	<<Input data error>>

How to delete a program or folder

- (1) Use the following operations to select a program or folder to delete.
 - Use the cursor or tap on a program or folder to select it, and then press the <Rename> key.
- (2) A message appears indicating how to rename a program or folder.



- (3) Enter the new name into the data input field. After pressing the <Rename> key, the name is changed.

Press the <Cancel> key to cancel the operation.

(NOTE) When the name change is specified in the data input field, that program (specified in the data input field) is renamed and not the program specified using the operation in step (1).

How to use the data input field to rename

Enter a number like the following into the data input field. Then, press the <Rename> key to change the name.

Input example	Rename		
	Before change	→	After change
1234-5678	1234	→	5678

(NOTE) A folder cannot be renamed with this operation.

If a new name (after change) is not specified, a message appears indicating how to specify a new name.

Input example	Rename			Notes
	Before change	→	After change	
1234	1234	→		• A message appears indicating how to specify a new name.
PROG001	PROG001	→		

When [-] is used to specify a new name (after change), it can only be used with numerical values.

- When a character string other than numbers is used
- When more than one [-] is used

In the two aforementioned cases, the name before the change and the name after the change (that is separated by the [-] symbol) cannot be identified correctly. Therefore, all the data in the data input field is processed as one name (before the change) and a message appears indicating how to specify a new name (after change).

Input example	Rename		Notes
	Before change	After change	
1234--5678	1234--5678	→	
PROG001-1234	PROG001-1234	→	
1234-PROG001	1234-PROG001	→	• A message appears indicating how to specify a new name.

1.4.3.6 Operations between folders

The user can copy (check) and/or move a folder or program(s) between folders.

Refer to “1.5 Folder operations” for further details.

1.4.3.7 Create folder

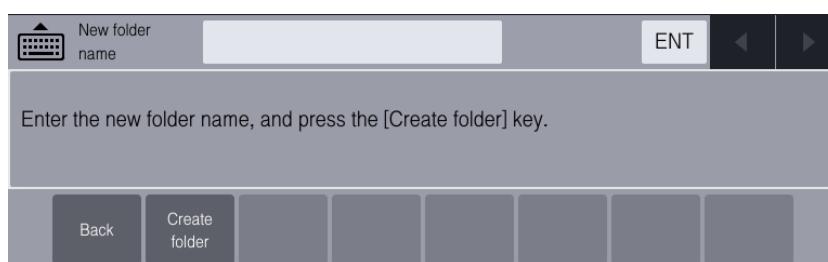
The user can create a new folder.

Before performing an operation, set the [DATA PROTECTION] switch to “O” (disable).

In the following situation, an operator message appears and a new folder cannot be created.

Condition	Operator message
When a folder name cannot be specified because the folder name, the name used inside the NC program (O0000 to O9999) or the name used inside the conversation program already exists inside an existing folder	<<This is an unusable folder name.>>

- (1) After pressing the <Create folder> key, the screen changes to a screen to enter a new folder name.
- (2) A message appears indicating how to name a new folder.



- (3) Enter the new name into the data input field. After pressing the <Create folder> key, a new folder is created.

Press the <Cancel> key to cancel the operation.

- Up to 16 characters (alphanumeric characters and period) can be used for the folder name.
- A new folder can be created for up to 3 levels in the directory, including the root folder.

1.4.3.8 Data protection operation

The programs from 8000 to 8999 can be set “uneditable.”

The programs set uneditable are the programs from 8000 to 8999 not only in a current folder but also in different folders.

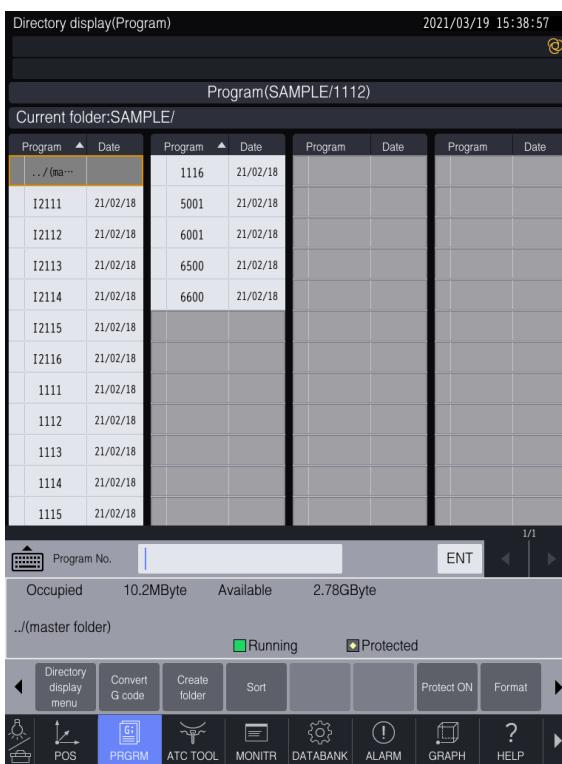
ON: Changes are prohibited.

OFF: Changes are permitted.

1.4.3.9 G-code conversion

This function is only valid in the conversation language.
The conversational program is converted into an NC program.
Programs in other folders can also be converted.

1



Before performing an operation, set the **[DATA PROTECTION]** switch to “O” (disable).

- (1) Press the <Next function> key to have the function display the G code conversion.
- (2) Press the <Convert G code> key

* For details, refer to “1.6 How to convert G codes”.

1.4.4 Directory Display Data Bank Operations

1.4.4.1 Change valid data number

The user can change the data number that is currently valid.

In the following situations, an operator message appears and the valid data number cannot be changed.

Conditions	Operator messages
When an attempt is made to change a number during memory operation	<<Operating>>
When the data before the number change is being edited in the data bank or when it is being input or output (communicating)	<<Editing>> or <<Communicating>>
When the data after the number change is being input or output (communicating)	<<Communicating>>

Restrictions when changing valid data numbers

The machine parameters cannot be changed.

How to change valid data bank numbers

- (1) Use the following operations to select a number.
 - Select the desired data bank number by tapping it, and press the <Valid> key or **[ENT]** key.
- (2) The number will change.

How to use the data input field to change a valid data number

Move the cursor to the desired item, and then enter the data number to be changed.

For example, after inputting [2] and pressing [ENT] (or inputting [2] and pressing [Valid]), the data for No. 2 becomes valid.

1.4.4.2 Copy operation

The user can copy a data bank that is already registered to another bank number.

Before performing an operation, set the [DATA PROTECTION] switch to “O” (disable).

In the following situations, an operator message appears and the copy operation cannot be carried out.

Conditions	Operator messages
When an attempt is made to copy during memory operation	<<Operating>>
When a program specified as the copy source does not exist	<<No copy source data>>

Restrictions when copying

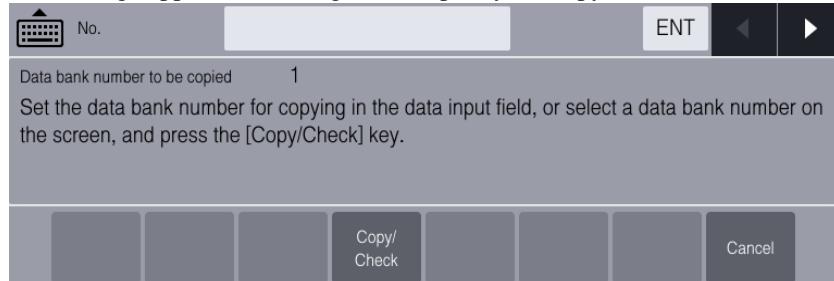
The copy operation is not possible for a number that is currently valid.

How to copy a data bank

(1) Use the following operations to select a number.

- Select the desired data bank number by tapping it, and press the <Copy> key.

(2) A message appears indicating how to specify the copy destination.



(3) Set the data bank number for copying in the data input field, or select a data bank number on the screen. After pressing the <Copy> key, the data bank number is copied.

If the data bank number already exists, a message will appear to confirm whether to overwrite the data or not.

Press the <Yes> key to overwrite, and press the <No> key to cancel overwriting.

Press the <Cancel> key to cancel the operation.

(NOTE) When the copy source is specified in the data input field, that number (specified in the data input field) is used for copying and not the number specified using the operation in step (1).

How to use the data input field to copy

The user can enter data into the data input field and press the <Copy/Check> key to copy the specified number.

Input example	Copy operation		
	Copy source	→	Copy destination
1-3	1	→	3

1.4.4.3 Check operation

The user can check and verify the content for two data numbers. The operation procedure is the same as the copy operation when the copy destination is verified and checked.

Before performing an operation, set the [DATA PROTECTION] switch to “|” (enable).

If the content for both is the same, the expression <Check OK> is displayed in the instructions area.

1.4.4.4 Delete operation

The user can delete a specified data number.

Before performing an operation, set the [DATA PROTECTION] switch to “O” (disable).

In the following situations, an operator message appears and the deletion cannot be carried out.

Conditions	Operator messages
When an attempt is made to delete during memory operation	<<Operating>>
When attempting to delete a machine parameter and <Parameter change> is set to <0:Write-protected>	<<*Machine parameter was not deleted.>>

How to delete

- (1) Use the following operations to select a data number for deletion.
 - Select the desired number by tapping it, and then press the [Delete] key.
- (2) A deletion confirmation message is displayed.
Press the <Yes> key to delete, and press the <No> key to cancel deleting.

How to use the data input field to delete

Enter data into the data input field and press the [Delete] key to delete the specified number.

Input example	Deletion operation
1	Deletes No. 1.

1.4.4.5 Delete all

The user can delete all data banks.

Before performing an operation, set the [DATA PROTECTION] switch to “O” (disable).

After pressing the <Delete all> key on the <Directory display (Data bank)> screen, a message appears to confirm the deletion of all data banks. Press the <Yes> key to delete all data banks, and press the <No> key to cancel the deletion.

1.4.5 Directory Display File Viewer Operations

1.4.5.1 Delete operation

The user can delete document files, image files or folders that are specified.

Before performing an operation, set the [DATA PROTECTION] switch to “Disable”.

An operator message appears and the deletion cannot be carried out in the following situations.

Conditions	Operator messages
When the file for deletion is being viewed	<<Currently being viewed>>
When communication is in progress with the file for deletion	<<Communicating>>
When data protection is enabled	<<Data is write-protected.>>

How to delete a document/image file or folder

- (1) Use the following operations to select a file or folder to delete.
 - Use the cursor or tap on a file or folder to select it, and then press the [Delete] key.
- (2) A delete confirmation message is displayed.
Press the <Yes> key to delete, and press the <No> key to cancel deleting.
When multiple files are deleted in a folder deletion operation, after pressing the <Delete all remaining> key, all remaining programs are deleted. Press the <Cancel> key to cancel the operation.

If there is a file that cannot be deleted in the folder, or if the <No> key is pressed after the confirmation message, the selected folder is not deleted.

How to use the data input field to delete

Enter data into the data input field and press the [Delete] key to delete the specified file.

A folder cannot be deleted with this operation.

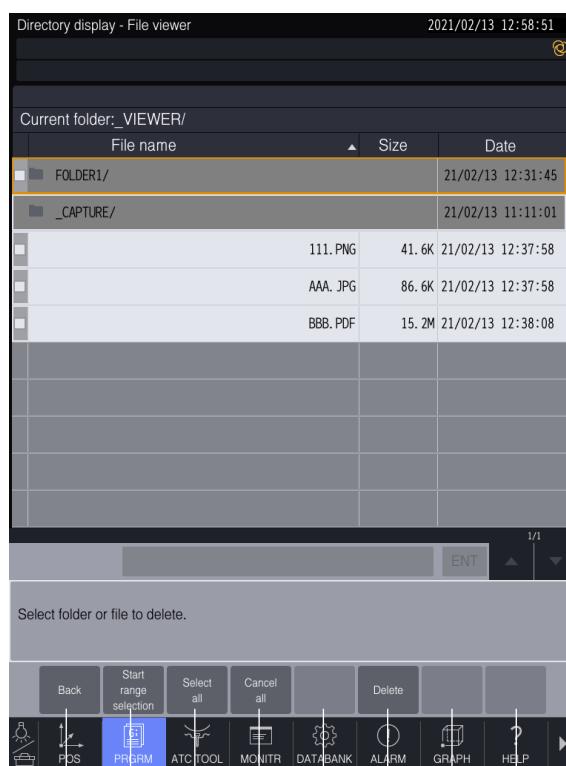
Enter a file name with the extension.

Input example	Deletion operation
1234.PNG	Deletes 1234.PNG.
1234.JPG	Deletes 1234.JPG.
PRG01.PNG	Deletes PRG01.PNG.
1234.PNG PRG01.PNG	Deletes 1234.PNG and PRG01.PNG.

1.4.5.2 Delete multiple items

When the <Delete multiple items> key is pressed, the screen below is displayed. Then, the user can select multiple documents/image files and folders and delete them. Tick the checkboxes for the files or folders you wish to delete.

Before performing an operation, set the **[DATA PROTECTION]** switch to “Disable”.



(1) (2) (3) (4) (5) (6) (7) (8)

Description of function key operations

Column	Position	Label	Description
1	(1)	<Back>	Goes back to the <Directory display (File viewer)> screen.
	(2)	<Start range selection>	Specifies a range to select multiple files or folders. Move the cursor to the start position for selecting the file or folder range and press the set key. Then, move the cursor to the last file or folder in the range, and press the set key again.
	(3)	<Select all>	Selects all of the files and folders.
	(4)	<Cancel all>	Deselects all of the files and folders.
	(5)		
	(6)	<Delete>	Same as on the <Directory display (File viewer)> screen.
	(7)		
	(8)		

How to delete a document/image file or folder

Tick the checkbox to select and delete a file or folder.

The procedure hereafter is the same as the delete operation above.

1.4.5.3 Rename operation

The user can rename a document/image file or folder.

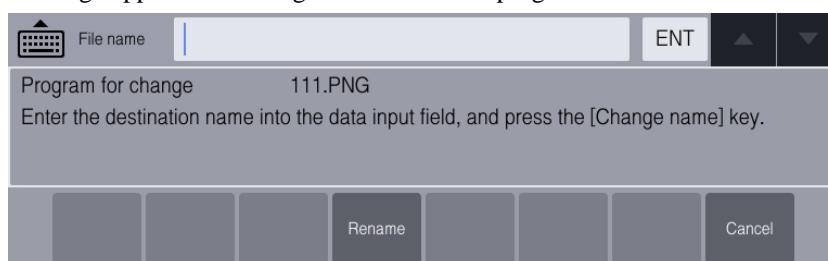
Before performing an operation, set the [DATA PROTECTION] switch to “Disable”.

An operator message appears and the rename operation cannot be carried out in the following situations.

Conditions	Operator messages
When data protection is enabled	<<Data is write-protected.>>
When the renamed file already exists	<<The file already exists>>
When the renamed folder already exists	<<This is an unusable folder name.>>
When the specified file is currently being viewed	<<Currently being viewed>>
When the specified file is communicating	<<Communicating>>

How to rename a document/image file or folder

- (1) Use the following operations to select a file or folder to rename.
 - Use the cursor or tap on a file or folder to select it, and then press the <Rename> key.
- (2) A message appears indicating how to rename a program or folder.



- (3) Enter the new name into the data input field. After pressing the <Rename> key, the name is changed.

Press the <Cancel> key to cancel the operation.

(NOTE) When the copy source is specified in the data input field, that number (specified in the data input field) is used for copying and not the number specified using the operation in step (1).

How to use the data input field to rename

A name cannot be changed using the data input field in the directory display file viewer.

1.4.5.4 Create folder

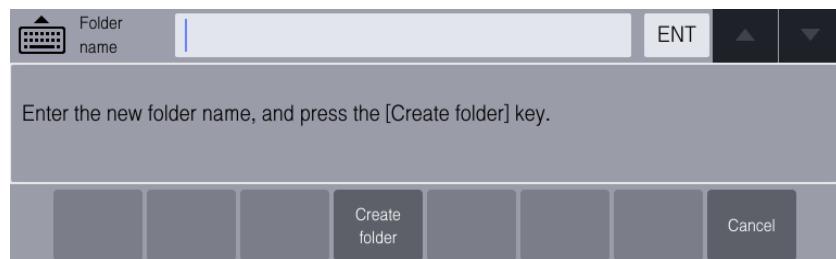
The user can create a new folder.

Before performing an operation, set the [DATA PROTECTION] switch to “Disable”.

An operator message appears and a new folder cannot be created in the following situation.

Conditions	Operator messages
When a folder name cannot be specified (i.e. because that folder name already exists)	<<This is an unusable folder name.>>

- (1) After pressing the <Create folder> key, the screen changes to a screen to enter a new folder name.
- (2) A message appears indicating how to name a new folder.



- (3) Enter the new name into the data input field. After pressing the <Create folder> key, a new folder is created.
 Press the <Cancel> key to cancel the operation.
- Up to 16 characters (alphanumeric characters and period) can be used for the folder name.
 - A new folder can be created for up to 2 levels in the directory, inside or under the _VIEWER folder.
 (Ex: _VIEWER/_CAPTURE/FOLDER1/)
- The _VIEWER folder's location is fixed and stores documents/images that are used by the file viewer.

1.4.6 Format

After formatting the memory, the following data is deleted and cleared.

Programs, data banks in NC language, data banks in conversation language, file viewer, notebooks, automatic centering history, ATC tool registration data, MDI operation history, production monitoring, measurement results, machine status history, graph parameters, maintenance notifications and waveform displays

Before performing an operation, set the [DATA PROTECTION] switch to “O” (disable).

How to format

- Set the <Parameter change> to <1: Writable> on the <I/O (extension I/O maintenance)> screen.
- Enter “FMT” on the <Directory display(Program)> screen or the <Directory display(Data bank)> screen, and then press the <Format> key.
- A format confirmation message is displayed.
 Press the <Yes> key to format, and press the <No> key to cancel formatting.

An operator message appears and the format cannot be carried out in the following situations.

Conditions	Operator messages
When an attempt is made to format during memory operation	<<Operating>>
When a data bank or program is being edited or when either is being input/output in communication	<<Editing>> or <<Communicating>>
When the <Parameter change> is set to <0:Write-protected>.	<<Machine param. change disabled>>
When the inside of a sub folder is displayed on the following screen <ul style="list-style-type: none"> List of programs for tool path simulation graph setting List of memory operation programs (When changing to editing mode during operation while the sub folder is displayed) 	<<Sub folder is being displayed>>

1.4.6.1 Delete All Conversation Files

When the following operations are performed, all the conversation files (data banks and machining programs) are deleted.

- Directory display program screen:
 Enter [T], [C], [F], [M] and [T], and then press the [Format] key.
- Directory display data bank screen:
 Enter [T], [C], [F], [M] and [T], and then press the [Format] key.

Conversation files that are deleted

- Tool list
- Tool pattern
- Tapping drill diameter
- Cutting conditions
- Machining data
- Schedule program

(NOTE) This operation is only valid when the “Conversation/NC language change” is set to “NC”.

1.5 Folder Operations

1.5.1 Overview

The user can copy or move a program or folder in the current folder to another folder. Folder operations are only possible for directory display programs. Folder operations are not possible using the directory display file viewer.

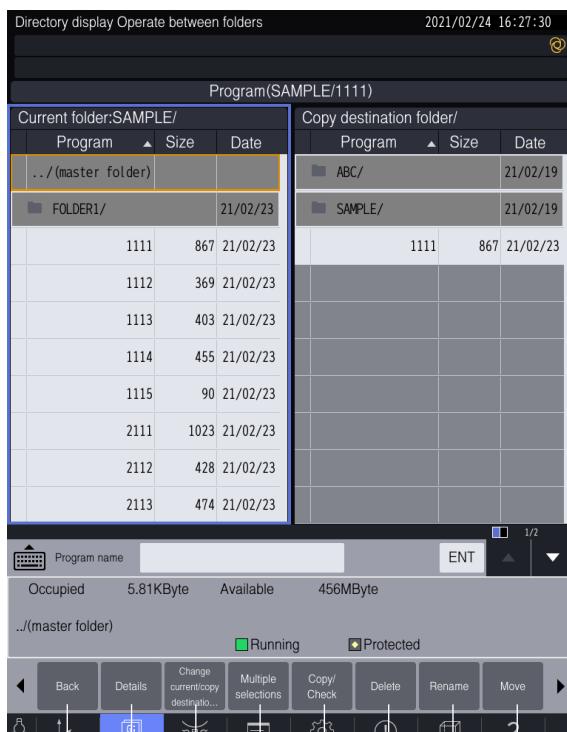
1

1.5.2 Folder Operations Screen

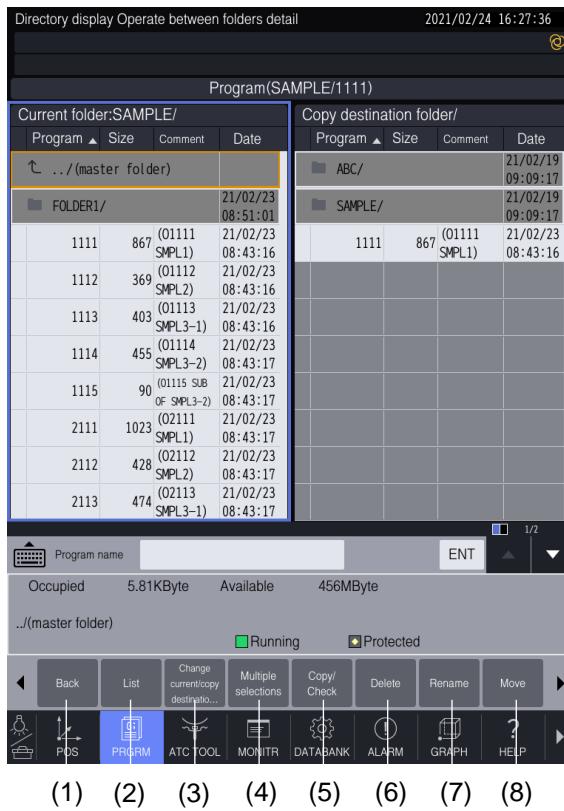
After pressing the <Operate between folders> key on the <Directory display (Program)> screen, the <Directory display Operate between folders> screen is displayed.

When displaying from the <Directory display (Program)> screen, the <Directory display Operate between folders> screen is displayed. When displaying from <Directory display (Program details)> screen, the <Directory display Operate between folders detail> screen is displayed.

<Directory display Operate between folders> screen...when the <List> key is pressed



<Directory display Operate between folders detail> screen...when the <Details> key is pressed



(1) (2) (3) (4) (5) (6) (7) (8)

1.5.2.1 Description of screen display

The current folder is displayed on the left side of the screen, and the copy destination folder is displayed on the right side of the screen.

The display content is the same as on the <Directory display(Program)> screen.

1.5.2.2 Description of screen operation

1. Description of function key operations

Column	Position	Label	Description
1	(1)	<Back>	Goes back to the <Directory display (Program)> screen or <Directory display (Program details)> screen.
	(2)	<Details>/<List>	Changes the display. <Details>: Displays comments or the time of the last update. <List>: Displays many programs on one screen. It displays in the format (details/list) that was being used, when changing screens from the <Directory display (Program)> screen.
	(3)	<Change current/ copy destination folder>	Switches between the current folder and the copy destination folder. The copy destination folder is displayed for the current folder, and then the key display switches, and the current folder is displayed for the copy destination folder.
	(4)	<Multiple selections>	Selects multiple programs or folders to execute an operation like copying.
	(5)	<Copy/Check>	When data protection is disabled <ul style="list-style-type: none"> Copies the program or folder selected in the current folder to the copy destination folder. When data protection is enabled <ul style="list-style-type: none"> Checks the program or folder selected in the current folder with the copy destination folder. Checks the programs in the folder when a folder is specified.
	(6)	<Delete>	Deletes the selected program or folder in the current folder.

Column	Position	Label	Description
	(7)	<Rename>	Renames the selected program or folder in the current folder.
	(8)	<Move>	Moves the program or folder selected in the current folder to the copy destination folder.
2	(1)	<Back>	Goes back to the <Directory display(Program)> screen or <Directory display(Program details)> screen.
	(2)	<Create folder>	Creates a new folder in the current folder or in the copy source folder. This key cannot be selected when a third level directory folder (including the root folder) is being displayed. It grays out.
	(3)	<Sort>	Sorts the programs according to the time of the last update, the program name or the comments (sorts folders in alphabetical order A – Z). Data can be sorted in ascending and descending order. The display order changes for both the current folder side and the copy destination folder side.
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

2. Description of program area

The current folder operations are the same as on the <Directory display(Program)> screen.
The cursor does not display for the copy destination folder. The user can move folders by tapping on them.

However, the cursor is displayed for a copy or move operation (described later) when specifying a name in the copy destination folder.

1.5.3 Folder Operations

1.5.3.1 Copy operation

The user can copy a program or folder specified in the current folder to the copy destination folder. Before performing an operation, set the [DATA PROTECTION] switch to “O” (disable).

When a program or folder is copied in the following conditions on the <Directory display (Program)> screen, an alarm is displayed and the copy operation cannot be executed.

Conditions	Alarm
When a folder is copied and the destination folder is the third level in the directory (including the root folder)	<<A folder cannot be created when the folder is multiple levels inside the directory>>
When a folder is copied and there is a sub folder inside the source folder and the sub folder in the destination exceeds the third level in the directory (including the root folder) (NOTE) The copy operation is carried out when the destination sub folder does not exceed the third level in the directory.	<<There is a subfolder where data cannot be created>>
When the same program is selected for both the current folder and the copy destination folder	<<The same program cannot be copied.>>
When the same folder is selected in the current folder and the copy destination folder	<<Copy to and check of same folder not available.>>

How to copy a program or folder

The operation procedure is the same as the <Directory display program> screen.

How to use the data input field to copy

When using the data input field to perform an operation on the <Directory display program> screen, multiple file names can be specified with a space, and consecutive programs can be specified using a slash (/).

Input example	Copy operation		
	Current folder	→	Copy destination folder
1234 PROG001	1234, PROG001	→	1234, PROG001
1000/1999	All programs from 1000 to 1999	→	All programs from 1000 to 1999

1.5.3.2 Check operation

The user can check and verify the program or folder specified in the current folder with the copy destination folder. The operation procedure is the same as the copy operation when the copy destination folder is verified and checked.

Before performing an operation, set the [DATA PROTECTION] switch to “|” (enable).

When a program or folder is checked in the following conditions, an alarm is displayed and the check operation cannot be executed.

Conditions	Alarm
When the same program is selected for both the current folder and the copy destination folder	<<The same program cannot be checked.>>
When the same folder is selected in the current folder and the copy destination folder	<<Copy to and check of same folder not available.>>

1.5.3.3 Delete operation

The user can delete a program or folder specified in the current folder.

The operation procedure is the same as the <Directory display program> screen.

1.5.3.4 Move operation

The user can move a program or folder specified in the current folder to the destination folder.

Before performing an operation, set the [DATA PROTECTION] switch to “O” (disable).

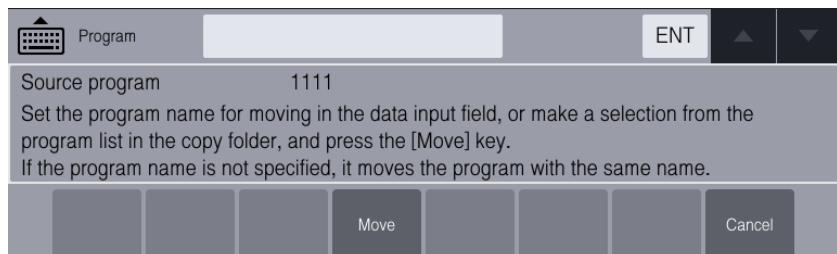
In a situation like the following, an alarm is displayed and the move operation cannot be executed.

Conditions	Alarm
When the current folder and the destination folder are the same folder	<<Transfer to the same folder is unavailable.>>
When an attempt is made to move a program with editing disabled	<<Program is write-protected.>>
When an attempt is made to move a program that is running	<<Running program>>
When a name is specified for the destination and that program cannot be edited	<<Program is write-protected.>>
When a program before or after being moved is communicating	<<Communicating>>
When a folder is moved and the destination folder is the third level in the directory (including the root folder)	<<A folder cannot be created when the folder is multiple levels inside the directory>>
When a folder is moved and there is a sub folder inside the source folder and the sub folder in the destination exceeds the third level in the directory (including the root folder) (NOTE) The move operation is carried out when the destination sub folder does not exceed the third level in the directory.	<<There is a subfolder where data cannot be created>>

Procedure to move a program

- (1) Tap on the copy destination folder side and then select the move destination folder (where program moves to).
- (2) Tap on the current folder side and then select the program source folder (where program is moving from).
- (3) Use the cursor or tap on a program to select it, and then press the <Move> key.

1



- (4) Enter the destination name into the data input field, or select the destination folder, and press the <Move> key to move the data.
If you do not want to change the name, then just press the <Move> key.

If the name already exists in the destination folder, a message will appear to confirm whether to overwrite the data or not. Press the <Yes> key to overwrite, and press the <No> key to cancel overwriting.

Procedure to move a folder

- (1) Tap on the copy destination folder side and then select the move destination folder.
- (2) Tap on the current folder side and then select the master folder (of the folder being moved).
- (3) Press the <Move> key with the cursor positioned on the folder to move.
 - When tapping on the folder, the focus changes to inside the folder. Therefore, select <../(Master folder)> and return to the master folder.
- (4) Enter the destination name into the data input field and press the <Move> key to move it.
If you do not want to change the name, then just press the <Move> key.

When the same folder name exists at the (move) destination and there is the same file name inside the folder, the user is prompted with a confirmation to overwrite. Press the <Yes> key to overwrite, and press the <No> key to cancel overwriting.

When moving multiple programs with the same name, after pressing the <Overwrite all remaining> key, all remaining programs are overwritten. Press the <Cancel> key to cancel the operation.

How to use the data input field to move

The user can enter data into the data input field and press the <Move> key to move the specified program.

Input example	Move operation		Notes
	Current folder	Destination folder	
1234-5678	1234	→ 5678	

(NOTE) A folder cannot be moved with this operation.

If you do not wish to change the name, then input without specifying the name of the destination.

Input example	Move operation		Notes
	Current folder	Destination folder	
1234	1234	1234	
PROG001	PROG001	PROG001	

When [-] is used to specify a name change, it can only be used with numerical values.

- When a character string other than numbers is used
- When more than one [-] is used

In the two aforementioned cases, the name of the current folder and the name of the destination folder (separated by the [-] symbol) cannot be identified correctly. Therefore, all the data in the data input field is processed as the current folder name and that name is input.

Input example	Move operation		Notes
	Current folder	Destination folder	
1234--5678	1234-5678	→ 1234--5678	
PROG001-1234	PROG001-1234	PROG001-1234	
1234-PROG001	1234-PROG001	1234-PROG001	

As shown below, multiple file names can be specified with a space, and consecutive programs can be specified using a slash (/).

Input example	Move operation		Notes
	Current folder	Destination folder	
1234 PROG001	1234, PROG001	→ 1234, PROG001	
1000/1999	All programs from 1000 to 1999	All programs from 1000 to 1999	

1.5.3.5 Rename

The user can rename a program or folder specified in the current folder.

The operation procedure is the same as the <Directory display program> screen.

1.5.3.6 Create folder

The user can create a new folder.

The operation is the same as the <Directory display program> screen.

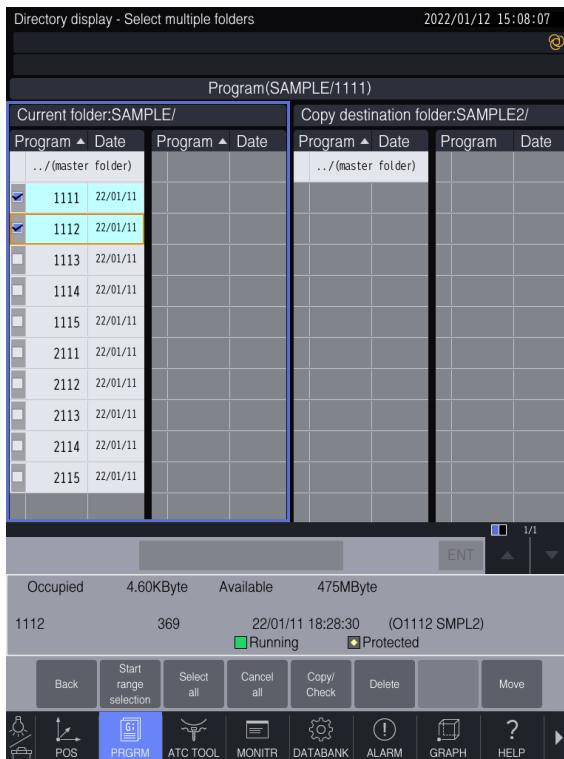
The function keys <Create new folder in current folder> and <Create new folder in copy destination folder> can be used to create new folders.

1.5.3.7 Multiple selections

When the <Multiple selections> key is pressed, the screen below is displayed. Then, the user can select multiple programs or folders in the current folder.

Procedure for multiple selections

- (1) Tap on the copy destination folder side and then select the move destination folder.
- (2) Tap on the current folder side and then select the source folder or the program folder (where program is moving from).
- (3) Press the <Multiple selections> key and then tick the checkbox for the program and/or folder to move in the current folder.
- (4) After ticking and making selections, press the <Copy/Check> key, <Delete> key and <Move> key to execute the corresponding operation.



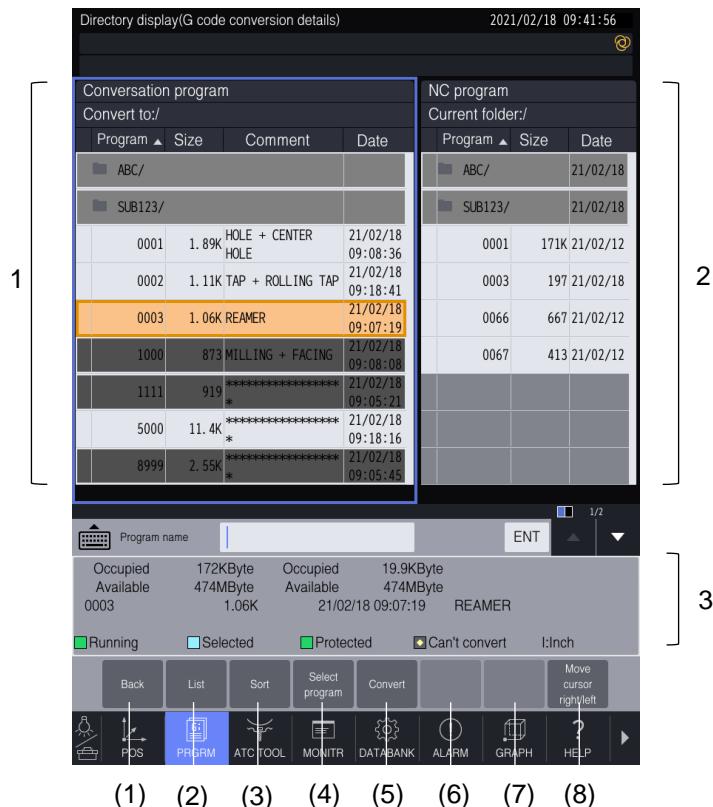
Description of function key operations

Column	Position	Label	Description
1	(1)	<Back>	Goes back to the <Directory display Operate between folders> screen.
	(2)	<Start selection>	Specifies a range to select multiple programs or folders. Move the cursor to the start position for selecting the program or folder range and press the set key. Then, move the cursor to the last program or folder in the range, and press the set key again.
	(3)	<Select all>	Selects all of the program and folders.
	(4)	<Deselect all>	Deselects all of the programs or folders.
	(5)	<Copy/Check>	Same as on the <Directory display Operate between folders> screen.
	(6)	<Delete>	Same as on the <Directory display Operate between folders> screen.
	(7)	<Rename>	Same as on the <Directory display Operate between folders> screen. When multiple programs or folders are selected, this key cannot be selected.
	(8)	<Move>	Same as on the <Directory display Operate between folders> screen.

When the current folder and the copy destination are the same folder and a copy or check operation is performed, the alarm <<Copy to and check of same folder not available.>> is triggered.

1.6 How to Convert G Codes

1.6.1 Directory Display (G Code Conversion Details) Screen



1.6.1.1 Description of screen display

Position	Name	Description
1	Conversation program list	Displays the program list that is saved in the selected folder. When the <Directory display(G code conversion details)> screen is displayed, the content in the current folder is shown in the <Directory display> screen for both the conversation program and NC program directories.
2	NC program list	
3	Data input field/Instructions area	Displays the data input field for selecting a program number to be converted. Or, the area displays various information for the NC and conversation programs, such as the corresponding memory being used, remaining memory, size of the selected program and date.

1.6.1.2 Description of screen operation

1. Description of function key operations

Column	Position	Label	Description
1	(1)	<Back>	Goes back to the previous screen.
	(2)	<List> <Details>	Switches back and forth between the list display and detailed display. <List>: Displays 28 conversation programs and 28 NC programs on one screen. <Details>: Displays 14 conversation programs and 14 NC programs on one screen. It displays comments or the time of the last update.
	(3)	<Sort>	Sort instructions are displayed in the function display area. The user can sort and change the order of the programs. Refer to “1.2.3.2 Description of screen operation” for further details about sorting.
	(4)	<Select program>	Instructions are displayed to select a program number for conversion in the function display area. The user can select a program number. Or, checkboxes are displayed to the left of each item in the conversation program list.
	(5)	<Convert>	Converts the conversation program to an NC program. The programs that can be converted in G code include programs that use the current unit system (meters/inches) and those programs that can run with tools assigned to it. A conversion confirmation message appears in the function display area. Press <Yes> to execute the conversion and press <No> to cancel the conversion.
	(6)		
	(7)		
	(8)		

When the <Select program> key is pressed.

Column	Position	Label	Description
1	(1)	<Back>	Goes back to the previous screen.
	(2)	<Start selection>	Specifies a range to select multiple files or folders. Move the cursor to the start position for selecting the file or folder range and press the set key. Then, move the cursor to the last file or folder in the range, and press the [ENT] key again.
	(3)	<Select all>	Selects all programs.
	(4)	<Deselect all>	Deselects all programs that are selected.
	(5)		
	(6)	<Convert>	Converts the conversation program to an NC program. The programs that can be converted in G code include programs that use the current unit system (meters/inches) and those programs that can run with tools assigned to it. A conversion confirmation message appears in the function display area. Press <Yes> to execute the conversion and press <No> to cancel the conversion.
	(7)		
	(8)		

(NOTE) Folders and programs that cannot be converted cannot be selected.

2. Description of operations for the directory display (G code conversion details)
- The user can use the [CURSOR] key or tap operation to select a folder in the same way as the <Directory display> screen. The user can press the [ENT] key to move to that folder. The user can also move folders in the NC directory in the same way.
 - (NOTE) When a folder name is entered into the data input field, even if the [ENT] key is pressed, the folder cannot be moved.
 - When a number key is pressed, the data input field displays and a program number can be input for conversion. When the same NC program number already exists, the message <The same program number already exists.> appears.

Input example	Conversion operation		
1234	Conversation program 1234	→	NC program 1234
1234-5678 (Separate with a minus sign: “-”)	Conversation program 1234	→	NC program 5678
1000/1999 (Separate with a slash sign: “/”)	Conversation program Programs that can be converted: 1000 to 1999	→	NC program Programs that can be converted: 1000 to 1999

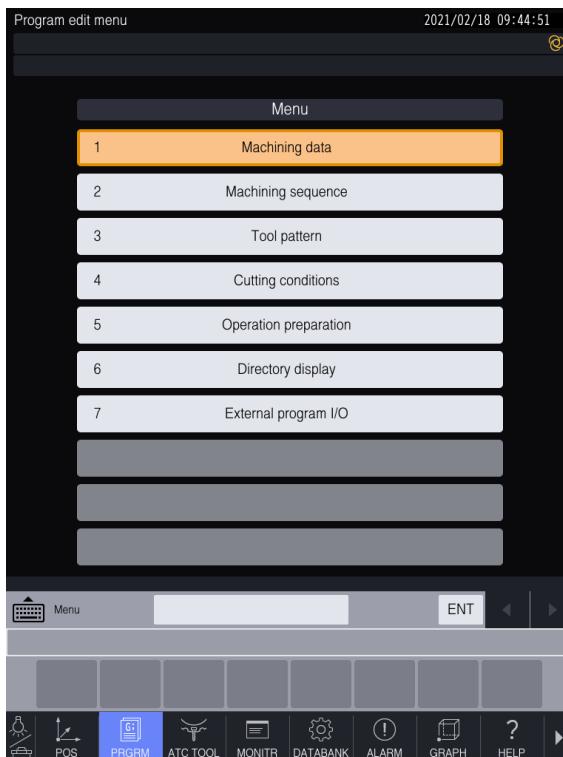
(NOTE) When making a selection on the screen, the operator message appears indicating that there is a program number that is input.

- After pressing the <Select program> key, the user can tick a checkbox to select a program for conversion.

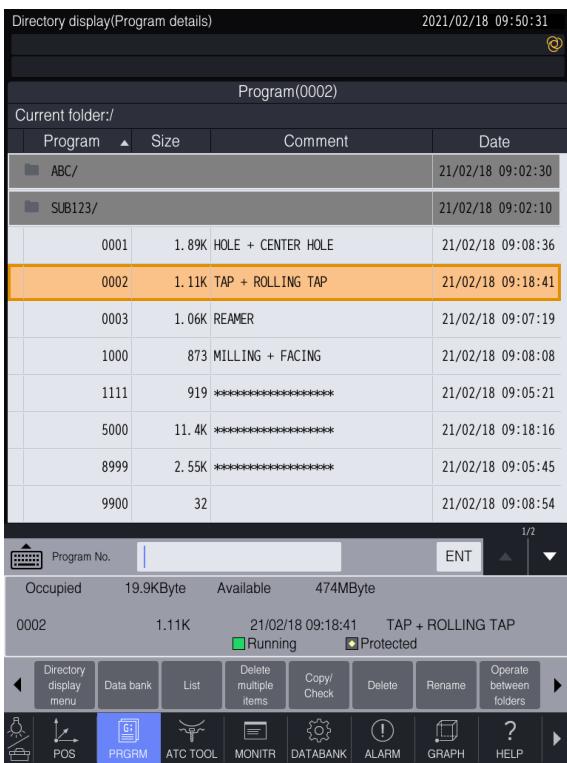
1.6.2 Operational Procedure

- Set the [DATA PROTECTION] switch to the [OFF] position.
- Push the [EDIT] key.

The <Program edit menu> screen appears.



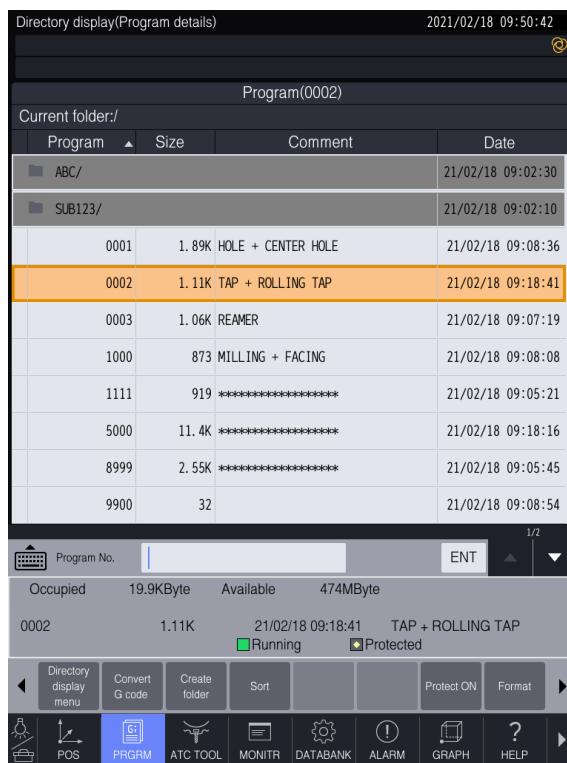
3. Push the [6] key and then push the [ENT] key.
The <Directory display> screen appears.



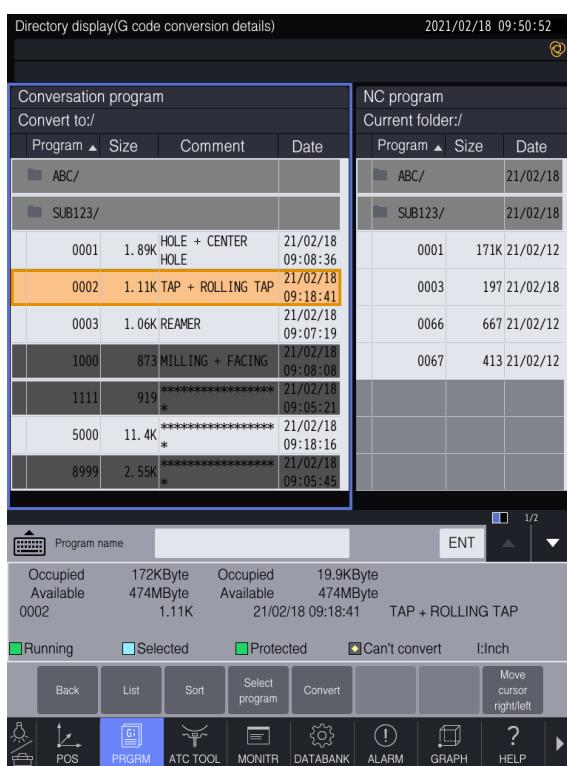
When the <Directory display(Data bank)> screen is displayed, press the <Program> key.

- * The following methods can be used to select the desired menu on the <Program edit> screen.
 - Use the [CURSOR] key to select <6. Directory display>, and press the [ENT] key.
 - Tap on <6. Directory display> to select it.
 - Press the <Directory display> key.

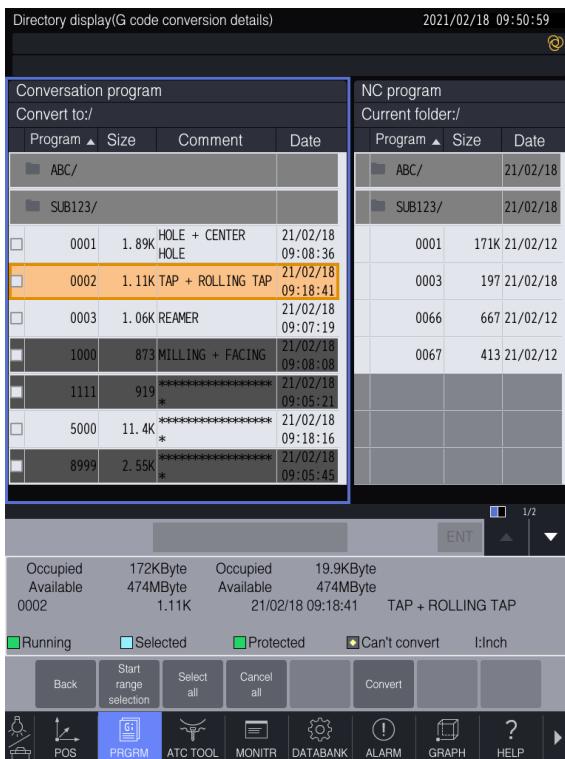
4. Press the <Next function> key.
The display changes for the function display area.



5. Press the <Convert G code> key.
The <Directory display (G code conversion details)> screen appears.



- To change between List and Detail
Press the <Details/List> key.
Each press of the <Details/List> key alternates the screen between List and Detail.
- Sorting
Conversational programs or NC programs are sorted.
Programs in the current window are sorted.
 1. Press the <Sort> key.
 2. Select the sort criteria.
 3. Programs are sorted and the screen returns to the previous screen.
- To select a program
Select the program to be converted.
 1. Press the <Select program> key.
 2. Select the program.



- Conversion
 1. Press the <Select program> key to select a program for conversion.
Or, enter a program number into the data input field for conversion.
 2. Press the <Convert> key.
 3. When selections appear in the function display area to confirm conversion execution, press the <Yes> key. (Press the <No> key to cancel the conversion.)

(NOTE) An alarm occurs when the measurement results are used although no measurement command is in the program. The link with the conversational program is disconnected once the program is converted.

Conversational Parameters

As a supplementary note, the parameters noted below may impact the conversion.

- User parameter - Switch 1 <Workpiece zero conversion code>
You can select which workpiece coordinates should be used when performing external conversion.
- User parameter - Switch 1 <Convert tool data>
You can select whether the G10 should be added to the program when performing external conversion.
- User parameter - Switch 1 <Tap step return position>
You can select whether the tapping cycle (synchronous mode) (G77 or G78) should be used for tapping operation or the deep hole tapping cycle (synchronous mode) (G277 or G278) should be used for tapping operation.

1.6.3 Conversion Results

Basically, one operation in a conversational operation is converted to one block in an NC program.

1.6.3.1 Tool List Conversion

The tool list used in a conversational program can be reflected to the tool list in an NC program by G10 (programmable data input).

(NOTE) The tool numbers in the list data in the conversational mode are overwritten in the same tool numbers in the tool list data in the NC mode.

The tool length offset amount setting command is output to the head of a program.

The tool diameter offset amount setting command is output to the position where G41 or G42 code (tool diameter offset command) is commanded.

“0” is commanded for both the tool length wear offset and tool diameter wear offset.

No tool life setting command is output.

(No tool life is reflected, so change it if necessary.)

The extension information (tool wash/CTS) setting command of tool information is output to the head of a program.

If the user parameter <Convert tool data> is set <0: No>, the above tool list data setting command (G10) is output as a comment.

1.6.3.2 Conversion of Coordinate System Settings

Coordinate system setting commands are converted into G54-G59 (Workpiece coordinate system selection) according to the setting of the user parameter <Workpiece zero conversion code>.

The setting for each axis is output by G10 (programmable data input).

(NOTE) The workpiece coordinate zero point data set by the parameter is changed.

1.6.3.3 Comment Output

Comments set by a conversational program are output to the head of a program.

The number and name are output each time the job or tool is changed.

1.6.3.4 Notes

1. If a measurement number in a coordinate system setting job is set with other than “?” and no measurement motion is set in a motion call job before the coordinate system setting job, an error occurs and conversion becomes unavailable.

2. About a command position of additional axis (A- or B-axis) in the absolute mode:
(There is no problem in the incremental mode.)

Positioning (G0) command:

When strokes are controlled, the additional axis command position is regarded as the same point each time the axis rotates 360 degrees in the conversational mode. However, there is only one point in the NC language mode.

(This does not occur when the strokes are not controlled.)

Ex) If a stroke is between -360.000 and 720.000, 50.000 is at three positions (-310.000, 50.000, 410.000) in the conversational mode but is at only one position (50.000) in the NC language mode.

Cutting movement (G1) command:

Movement direction can be specified in the conversational mode, but it cannot be specified in the NC language mode, so the shortest path is always applied.

When specifying the movement direction, it is necessary to correct the program (e.g. using the incremental mode (G91)).

3. When the Z-axis is lowered in the incremental mode after the Z-axis has returned to the zero point, it lowers from the zero point by the specified value in the conversational mode (accordingly, the tool tip lowers by the tool length). In the NC language mode, however, the tool length offset is enabled, so the tool tip moves to the specified position. Therefore, set the Z-axis to the position offset by the tool length for the Z-axis to operate the same way as in the conversational mode.

4. Cutter compensation

When cutter compensation is used in jobs that don't include motion calls (for example, contouring jobs), or when the current position is the same as the program command position after cutter compensation, for example:

G0 X0.000 Y0.000;
G41 D1 X0.000 Y0.000;

Cutter compensation is used according to the position of the next operation and the XY axes do travel in conversation language mode. However, they do not travel when in NC language mode. (Note that the axes do not travel for jobs that include motion calls, even when using conversation language mode.)

In NC language mode, G40 is used to cancel cutter compensation. However, an error is triggered when the next GM code is executed with an offset amount still remaining. Use G0 or G1 to add an XY command before the command that triggers the error in order to cancel the offset.

GM code that triggers an error

G28
G30
G121~G129
M410~M411
G133 • G134

When the tool change position is set for the XY axes while in offset mode, an error is triggered and the tool change is not possible.

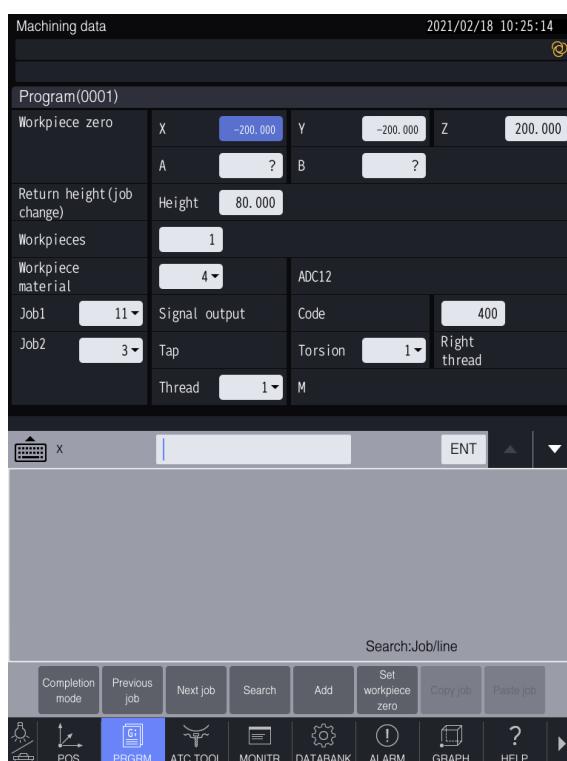
Cancel the offset mode before the operation for the tool change positioning.

When using the conversation language, if there are 14 or more commands issued that do not include XY travel while in offset mode, the offset is applied at the travel end point in the vertical direction relative to the travel direction. However, in NC language mode, the offset is applied in the vertical direction when 3 or more motion commands (3 blocks) are issued.

5. Travel to tool change position during rotational transformation
When the tool change position is set for the XY axes while in rotational transformation mode, an error is triggered and the tool change is not possible. Therefore, cancel the rotational transformation before traveling to the tool change position.
6. Automatic workpiece measurement
An error is triggered when the automatic workpiece measurement is performed during rotational transformation in NC language mode.
Therefore, cancel the rotational transformation before performing the automatic workpiece measurement.
7. Spindle orientation to specified position
An error occurs when M19R* (* indicates an orientation angle) is used in arc modal state or during a canned cycle in the NC language mode. Cancel the arc modal state or the canned cycle.
8. To move 2nd/3rd zero return commands
When G-code conversion is performed, the 2nd and 3rd zero point return commands are converted to 2nd and 3rd reference point return commands. Set the same coordinate values as the 2nd and 3rd zero point return positions for the 2nd and 3rd reference point return position parameters after the mode has been changed to the NC language mode.
An error occurs when the 2nd or 3rd reference point return command is used during rotational transformation in the NC language mode. Cancel the rotational transformation before performing the 2nd or 3rd reference point return.
9. Amount of pallet shift
In NC language mode, there is no function to set the amount of shift for pallet 2. Therefore, set the workpiece coordinates for pallet 1 and 2 separately.
10. Z-axis stroke check
The Z-axis stroke is checked at the spindle end in the conversational mode but it is checked at the tool tip in the NC language mode.

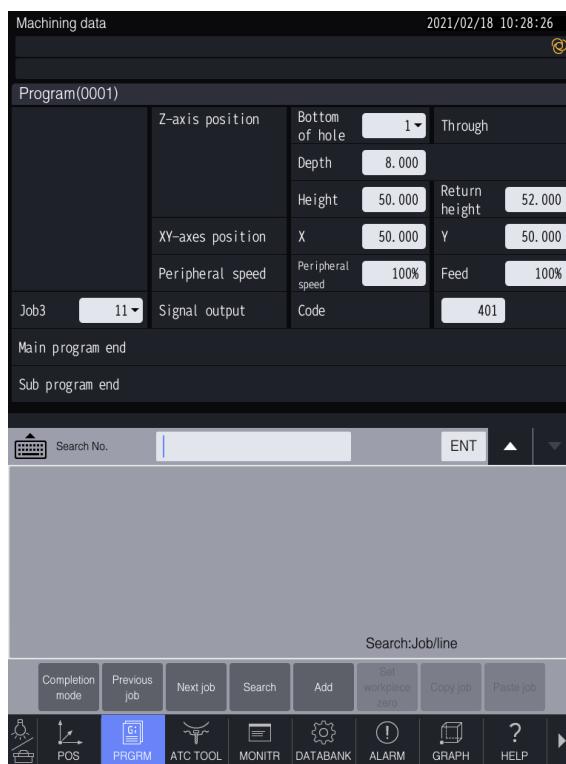
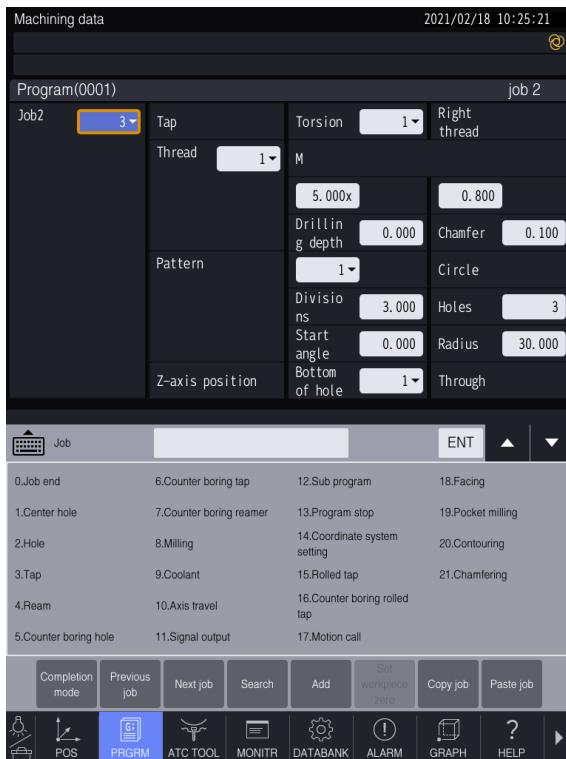
1.6.3.5 Conversion Example

Conversational program example
“Conversational program”

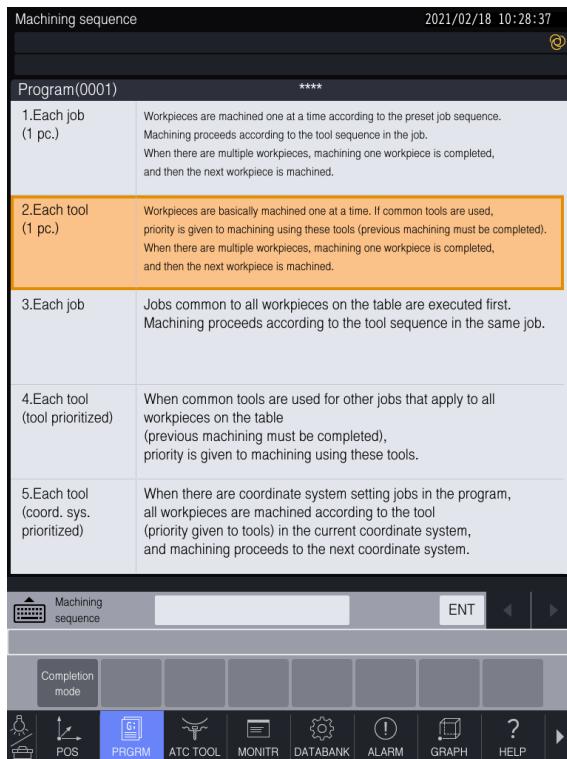


Chapter 1 Program Edit

1



“Machining order”



“Tool pattern”



Chapter 1 Program Edit

1

“Cutting conditions”

Cutting condition 1(boring tool) 2021/02/18 10:28:59

Program(0001)		****	m/min	mm/rev.
Material ADC12				
Center drill	Center drill	Lengthwise	30.0	0.10
Drill	Drill	Crosswise		
Carbide drill	Carbide drill	- 2.999	50.0	0.10
Tap (Blind)	Spiral tap	3.000 -	50.0	0.20
Tap (Through)	Point tap	- 2.999	100.0	0.10
Rolled tap	Rolled tap	3.000 -	100.0	0.20
Chamfering tool	Chamfer tool	- 2.999	30.0	—
		3.000 -	40.0	—
		- 2.999	40.0	—
		3.000 -	50.0	—
		-	35.0	0.30

1/2

Tool ENT

1.Center drill 6.Hand tap 11.Stepped drill
2.Drill 7.Rolled tap 12.Drill tap
3.Carbide drill 8.Chamfer tool 13.Reamer
4.Spiral tap 9.CBR tool 14.Drill reamer
5.Point tap 10.Chamfer drill

Completion mode Cutting condition 1 (boring tool) Cutting condition 2 Milling tool Previous tool Next tool

POS PRGRM ATC-TOOL MONITR DATABANK ALARM GRAPH HELP

“Tool assignment”

Tool assignment 2021/02/18 10:29:10

Program(0001)		****	????	
Job02	1. Center hole	Tool No.	01	Center drill
Tap...		Tool length offset		Cutter compensation
		Misc. func. bef ore cutting		Misc. func. aft er cutting
		Dwell time		
	2. Hole	Tool No.	02	Drill 4.300
		Tool length offset		Cutter compensation
		Misc. func. bef ore cutting		Misc. func. aft er cutting
		Dwell time		
	3. Chamfering	Tool No.	04	Chamfer tool 10.000
		Tool length offset		Cutter compensation

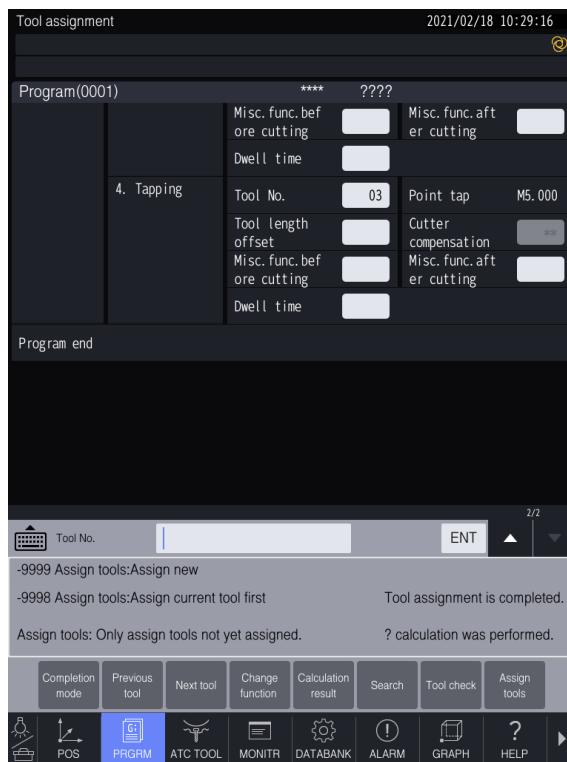
1/2

Tool No. ENT

-9998 Assign tools:Assign current tool first Tool assignment is completed.
-9999 Assign tools:Assign new
Assign tools: Only assign tools not yet assigned. ? calculation was performed.

Completion mode Previous tool Next tool Change function Calculation result Search Tool check Assign tools

POS PRGRM ATC-TOOL MONITR DATABANK ALARM GRAPH HELP



“Tool list”

Tool list

2021/02/18 10:29:29

Tool No.	01	02	03	04
Tool	Center drill	Drill	Point tap	Chamfer tool
Point angle	0.000	118.000	*	*
Minor diameter	0.000	*	*	0.000
Minor dia. length	0.000	*	*	*
Center angle	90.000	*	*	90.000
Invalid section	*	*	1.000	1.000
Major/Nominal D	5.000	4.300	M5.000	10.000
Pitch/Threads	*	*	0.800	*
Length of teeth	*	50.000	30.000	*
Torsion	* * *	* * *	Right thread	* * *
Number of teeth	*	*	*	*
Tool length	120.000	130.000	140.000	150.000
Initial life	5000 (H)	1000 (H)	5000 (H)	**
Life warning	100 (H)	100 (H)	100 (H)	**
Tool life	5000 (H)	1000 (H)	5000 (H)	**

1/25

Tool

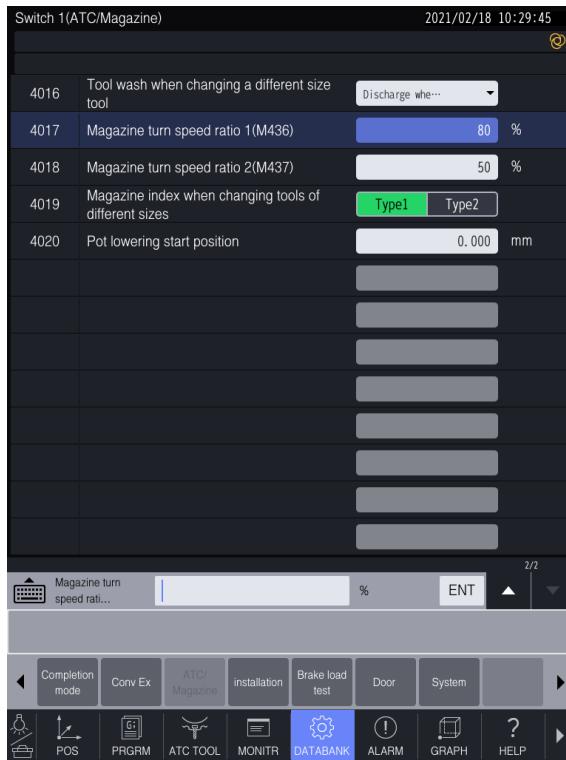
設定

Completion mode, Search, Tool length setting, Add, Copy, Paste, Tool data Delete, POS, PRGRM (highlighted), ATC TOOL, MONITR, DATABANK (highlighted), ALARM, GRAPH, HELP.

Chapter 1 Program Edit

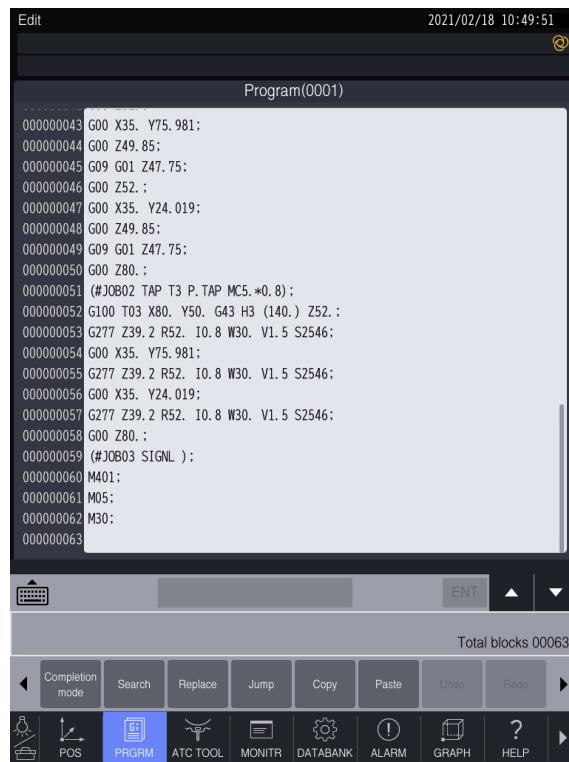
1

“User parameter settings”



NC program output results
“NC program”





Program(0001)

```
00000043 G00 X35. Y75.981;
00000044 G00 Z49.85;
00000045 G00 G01 Z47.75;
00000046 G00 Z52. ;
00000047 G00 X35. Y24.019;
00000048 G00 Z49.85;
00000049 G00 G01 Z47.75;
00000050 G00 Z80. ;
00000051 (#JOB02 TAP T3 P.TAP MC5.*0.8);
00000052 G100 T03 X80. Y50. G43 H3 (140.) Z52. ;
00000053 G277 Z39.2 R52. I0.8 W30. V1.5 S2546;
00000054 G00 X35. Y75.981;
00000055 G277 Z39.2 R52. I0.8 W30. V1.5 S2546;
00000056 G00 X35. Y24.019;
00000057 G277 Z39.2 R52. I0.8 W30. V1.5 S2546;
00000058 G00 Z80. ;
00000059 (#JOB03 SIGNAL );
00000060 M401;
00000061 M05;
00000062 M30;
00000063
```

Total blocks 00063

Completion mode Search Replace Jump Copy Paste Undo Redo

POS PRGRM ATC TOOL MONITR DATABANK ALARM GRAPH HELP

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CHAPTER 2

GRAPHIC

- 2.1 **Outline**
- 2.2 **Graphic Mode and Drawing**

2.1 Outline

2.1.1 Outline

This graphic function draws the tool path for programs that are set to the NC and shows a graphic or illustration of the program on the screen. The path that is drawn shows the path of the tool.

There are 2 modes for this graphic function: “Operation drawing” and “Tool path simulation”.

“Operation drawing” is also divided into “Drawing before operation” and “Drawing during operation”.

Outline	
Operation drawing	<p>Drawing during operation</p> <ul style="list-style-type: none"> - Draws a rough motion path when the machine is operating. This path refers to the motion path during memory operation and the motion during manual operation or MDI operation. <p>Drawing before operation</p> <ul style="list-style-type: none"> - Draws a rough motion path of the program that is saved in memory operation while in memory operation mode. Drawing is only possible in memory operation mode.
Tool path simulation	Draws the motion path of a specified program. Since any program number can be specified and executed, the graphic of the next memory operation program can be checked during the current memory operation.

There are two graphic display modes: 2D (two-dimensional) and 3D (three-dimensional).

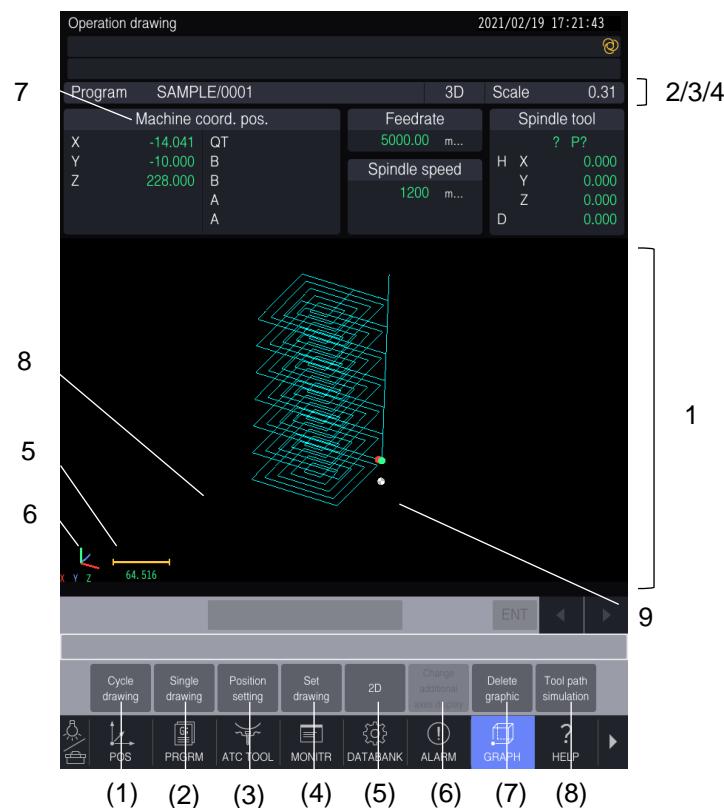
Outline	
2D	Displays a graphic in two dimensions that is specified in the drawing setting parameter <2D drawing plane>. When [3-plane drawing] is selected, the screen is divided into four segments, and a view from one of three directions is displayed in three of these segments.
3D	Displays a graphic that can rotate the spatial coordinate system horizontally and vertically, which is specified in the drawing setting parameter <3D drawing plane>. Refer to “2.2.6 Change graphic display” for further details on the graphic display.

Graphic drawing is subject to the following display restrictions:

Restrictions	
Operation drawing	<p>When the path of the program run at high speed is drawn, the displayed path may become rough.</p> <p>When operating for a long time, the message <<Too many drawing points (drawing before oper./drawing during oper.)>> appears on the bottom when drawing during or before operation. In addition, the old points or plots may disappear.</p>
Tool path simulation	When operating tool path simulation for a long time, the message <<Too many drawing points (tool path simulation)>> appears on the bottom. In addition, the old points or plots may disappear.

2.1.2 Description of Screen Display

When the <GRAPH> key is pressed, a screen appears in graphic function mode.



Position	Name	Description
1	Graphic drawing area	This area is used to draw the path of the program for operation drawing or tool path simulation.
2	Program	Displays the number or name of the program that is drawn.
3	Graph mode	Shows whether a 2D or 3D display has been selected.
4	Scale	Displays the display ratio of the current graphic.
5	Reduced scale mark	This refers to the yellow line on the bottom-left corner of the screen and to the green numbers. The green numbers refer to the actual length of the yellow line and indicate what size it will be.
6	Reference coordinate system	Displays the coordinate axes that are the reference for the graph.
7	Coordinate display	Displays the current graph information on the screen. Refer to “2.1.4 Drawing Size and Coordinate Display” for further details.
8	Machine zero point	Displays the machine zero point on the screen with a yellow colored circle ●. (When the <Display machine zero> is set to <1: Yes> in the drawing settings.)
9	Workpiece zero point	Displays the current workpiece coordinate zero point on the screen with a white colored circle ●. (When the <Display workpiece zero> is set to <1: Yes> in the drawing settings.)

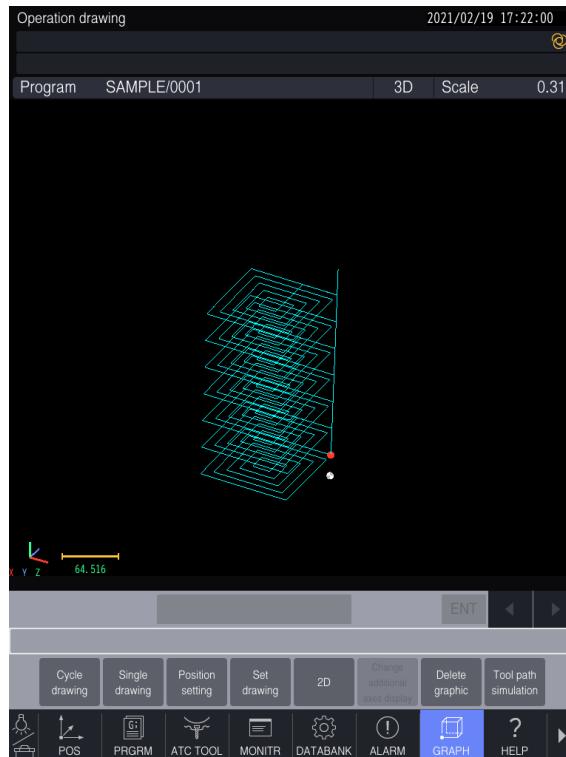
2.1.3 Description of Function Key Operations

When the drawing is stopped:

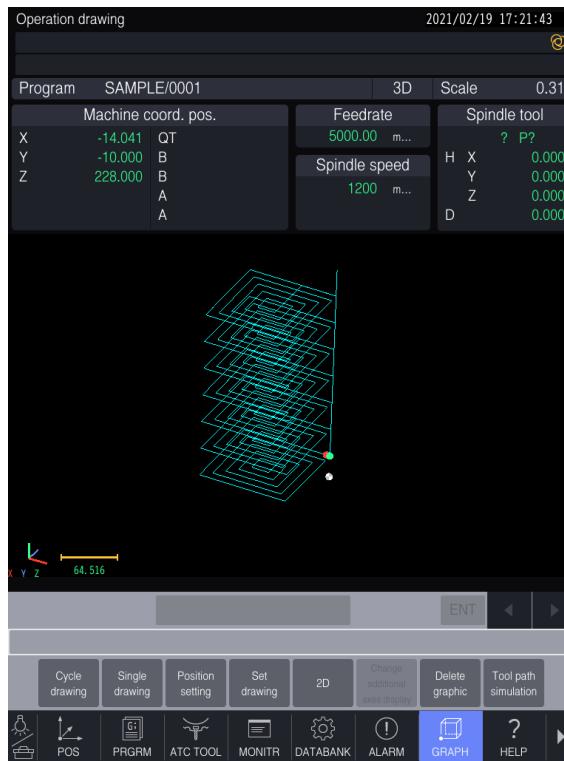
Column	Position	Label	Description
1	(1)	<Cycle drawing>	Starts the cycle drawing. Refer to the chapter “2.2.4 Cycle drawing” for further details.
	(2)	<Single drawing>	Starts the single drawing. Refer to the chapter “2.2.5 Single drawing” for further details.
	(3)	<Position setting>	Changes to the <Position setting> screen. Refer to “2.2.6 Change graphic display” for further details.
	(4)	<Set drawing>	Changes to the <Set drawing> screen. Refer to “2.2.7 Drawing setting” for further details.
	(5)	<2D> / <3D>	Switches back and forth between the 2D and 3D display.
	(6)	<Change additional axes display>	Changes the additional axis display for the machine coordinate position between the following axes: QT-axis and 5th-axis to 8th-axis (A-, B- and C-axes) and the PLC-axes (P1- to P4-axes). When the PLC axis does not exist, the key grays out.
	(7)	<Delete graphic>	Deletes the graphic that is drawn. Refer to “2.2.11 Delete drawing” for further details.
	(8)	<Tool path simulation/ Operation drawing>	Switches between the <Operation drawing> and <Tool path simulation> screens.

2.1.4 Drawing Size and Coordinate Display

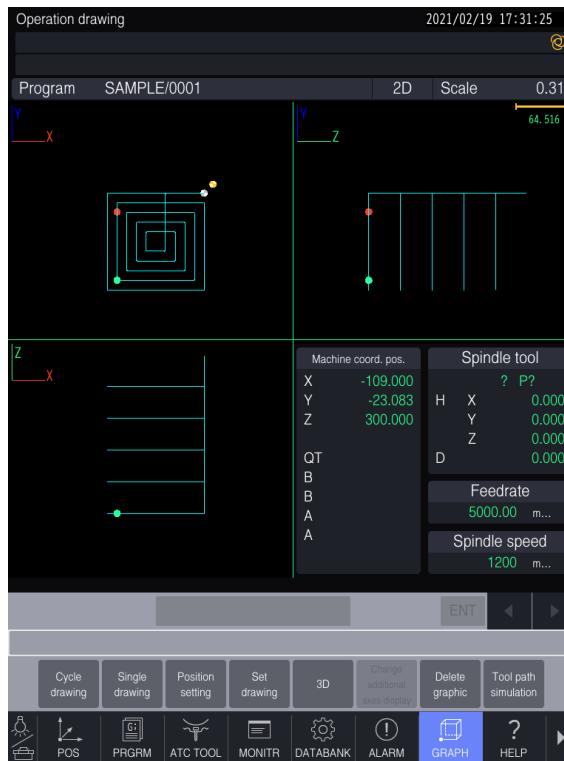
The user can switch the <Coordinate display> settings on the <Set drawing> screen for both the operation graph and tool trajectory and display the current graph information on the screen. When the <Coord. display> is set to <0>No>, the graphic is displayed on the full screen.



When the <Coord. display> is set to <1:Machine coord. / 2:Absolute coord. / 3:Relative coord.>, drawing information is displayed above the graphic.



For 3-plane drawings, the drawing data is displayed at the bottom right of the screen.



The display for the absolute coordinate position when <2: Absolute coord.> is selected is the same as the <Current position> screen.

Every time the <Change additional axes display> key is pressed, the additional axis display switches between showing the axes set in the user parameter (switch 1: common) <4th to 8th row display axis> and the axes set in <9 to 12th row display axis>.

	Actual operation information display (NOTE 1)	Simulation information display (NOTE 1)
Coordinates (X-, Y- and Z-axes) (NOTE 2)	Displays the current coordinates in the specified coordinate system. If using the NC language, when adding the tool length/tool position offset to the absolute coordinate position, the (H) display is added to the X-, Y- and Z-axes coordinates and the tool number is displayed under the Z-axis. (NOTE 3)	Displays the current simulation coordinates in the specified coordinate system. If using the NC language, when adding the tool length/tool position compensation while the absolute coordinates are displayed, the (H) display is added to the X-, Y- and Z-axes coordinates and the tool number is displayed under the Z-axis. (NOTE 3)
Coordinates (4-8 axes, PLC axis)	The additional axes (QT-axis, 5th to 8th axes and PLC-axis) are set in the user parameters (switch 1: common) <4th row display axis> to the <8th row display axis> and the <9th row display axis> to the <12th row display axis>. Press the <Change additional axes display> key to change which axes are displayed.	The additional axes (QT-axis, 5th to 8th axes and PLC-axis) are set in the user parameters (switch 1: common) <4th row display axis> to the <8th row display axis> and the <9th row display axis> to the <12th row display axis>. Press the <Change additional axes display> key to change which axes are displayed. However, the values for the PLC axes do not display.
Feedrate	Displays the machine's actual feed rate.	Displays the feed rate of a simulation program.
Spindle speed	Displays the machine's actual spindle speed.	Displays the spindle speed of a simulation program.
Spindle tool	Displays the name of the tool currently attached to the spindle.	Displays the name of the tool regarded as the spindle tool in simulation.
H (Tool length)	Displays the tool length/tool position compensation during actual operation.	Displays the tool length/tool position compensation in the simulation.
D (Tool diameter/ nose R)	Displays the cutter/nose R compensation during actual operation.	Displays the cutter/nose R compensation in the simulation.

(NOTE 1) The <Operation drawing> screen displays the simulation data when drawing before operation is on and the actual operation data when it is off.

The <Tool path simulation> screen always displays the simulation data.

(NOTE 2) If absolute coordinates are displayed and the <Display coordinates during rotational transformation> user parameter has been set to <1: Before>, a "(R)" will be displayed together with the coordinate values before turning while coordinate turning is in progress.

(Example: 123.456(R)) If <0: After> has been set, the values after coordinate turning has been applied will be displayed. (The "R" will not be displayed.)

(NOTE 3) If the absolute coordinates are displayed in the NC language, when adding the tool length/tool position offset to the position of the absolute coordinates and when the <XYZ-axis absolute coord. Display> setting in the user parameter is configured to "1: Display 2" or "2: Display 3," that tool number is displayed under the Z-axis. The tool number is displayed similar to "(H099)".

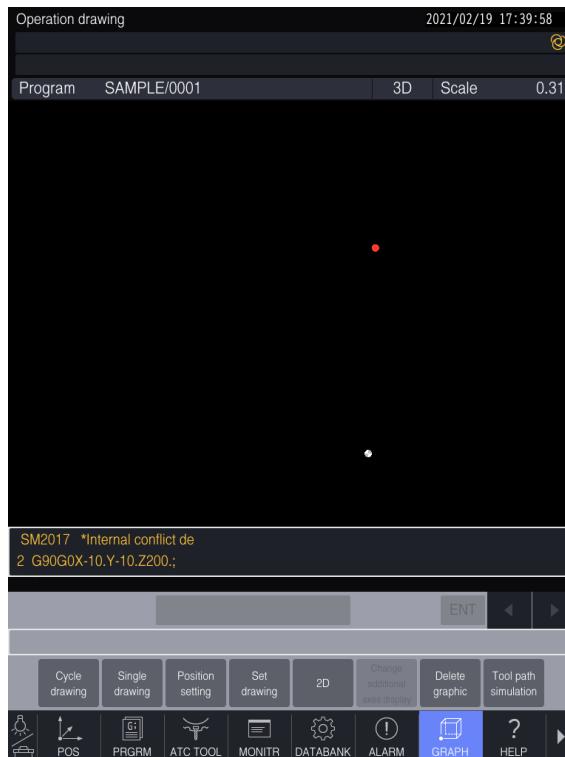
2.1.5 Display of Drawing Alarm

When an alarm in the drawing program is triggered while drawing is being executed, an alarm message and information related to the alarm location are displayed on the screen. In addition, when there is a coordinate display on the tool path simulation screen, the alarm information is shown in the coordinate value and tool information display area.

Such information is displayed until new drawing starts or drawing programs are changed (during tool path drawing).

- For NC language

Any alarm message is displayed on the bottom of the screen. If that alarm is triggered inside the program, the block number in alarm and that block are displayed under the alarm message.

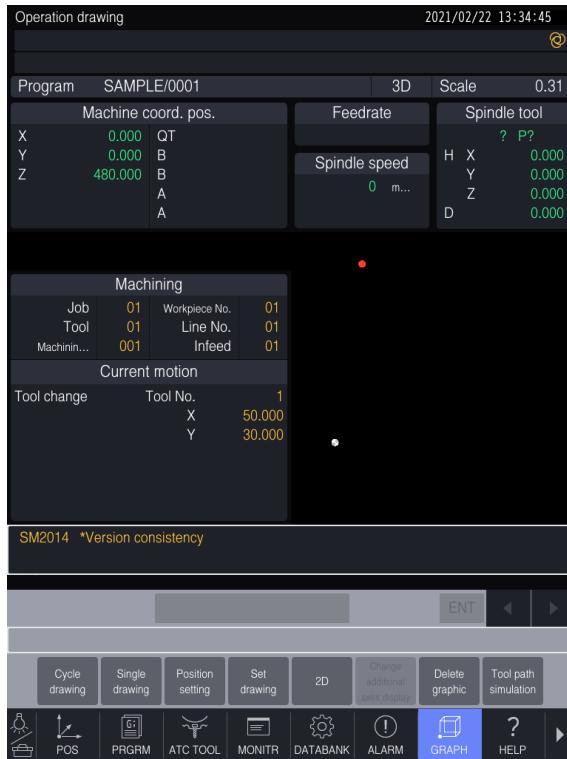


Chapter 2 Graphic

- For conversational language

Any alarm message is displayed on the bottom of the screen. If that alarm is triggered inside the program, the operation information and machining information at the time of the alarm are displayed above the alarm message.

2



2.2 Graphic Mode and Drawing

2.2.1 Overview

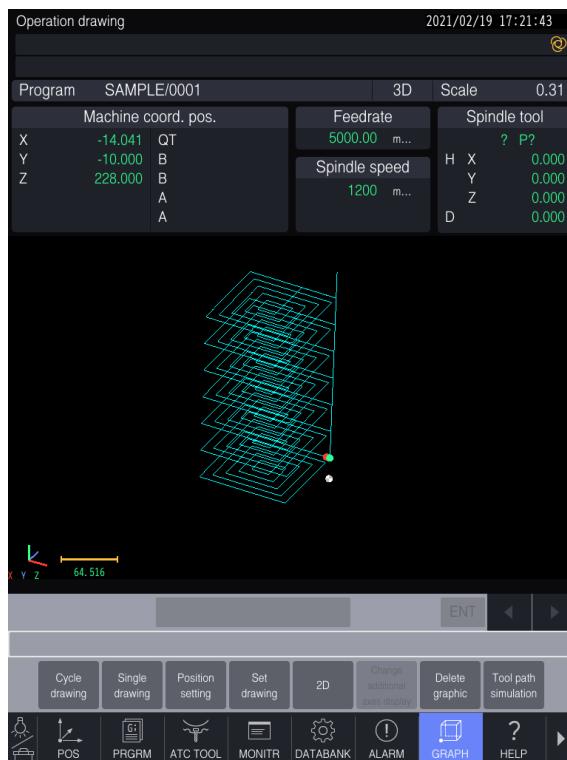
This section provides a detailed description on the “Operation drawing” and “Tool path simulation” that make up the graphic function.

2.2.2 Operation Drawing

Operation drawing mode features drawing during operation and drawing before operation.

Drawing during operation draws the motion path while the machine is operating, such as during memory operation. Drawing before operation draws a motion path of a program that is set or scheduled in memory operation.

2.2.2.1 Drawing before operation



1. Press the [MEM] key to switch to memory operation mode.
2. Press the <GRAPH> key to switch to the <Operation drawing> screen.
Make sure that the title on the top-left of the screen reads <Operation drawing>. If it reads <Tool path simulation>, press <Operation drawing> key.
3. Check the program name that is displayed on the top of the screen.
When a program set in memory operation is saved in the root directory or folder, only the program name is displayed. In all other situations, the “Folder name/Program name” is displayed.
4. (To execute a drawing before operation)
Press <Cycle drawing> or <Single drawing> to start drawing.
(To execute a drawing during operation)
Press the [START] switch to execute memory operation, and the motion path during operation will be drawn.

2.2.2.2 Drawing During Operation

In the drawing during operation, the motion path is not just drawn during memory operation but in manual and MDI operation as well.

The tool path is drawn with the specified colors. The colors can be specified on the <ATC tool> screen. Refer to “4.4 ATC tools” in Operation Manual I for further details.

A red dot ● is displayed to indicate the current position of the tool.

A blue dot ● is displayed to indicate the next position of the tool when memory operation is executing.

2

- (NOTE 1) The motion path is not drawn in the following operations.
- Motion path when <Drawing during operation> is set to <0:No>
 - Motion path for manual and MDI operations when <Drawing during operation> is set to <1:Memory mode only>
 - Memory operation block (in NC language) that is outside of the range defined by <Start/End sequence No.>
 - Job (in conversation language) that is outside of the range defined by <Start/End job number>
- (NOTE 2) The drawn path is plotted at fixed intervals that are based on the NC program. As a result, the actual path and the drawn path may vary slightly, such as in the corner sections. In addition, the smooth path override in high accuracy mode is not reflected in the drawn path.

2.2.3 Tool Path Simulation

The user can check the tool path by displaying a large graphic of a program specified by the user. Drawing is not limited to memory operation mode and can be executed in all modes.

1. Press the <GRAPH> key to switch to the <Operation drawing> screen.
2. Change to the <Tool path simulation> screen.
Make sure that the title on the top-left of the screen reads <Tool path simulation>. Press <Tool path simulation> if it reads <Operation drawing>.
3. Press <Set drawing> to specify a program from the settings screen.
Refer to “2.2.7 Drawing setting” for details on how to set a program.
4. Check the program name that is displayed on the top of the screen.
When a specified program is saved in the root directory or folder, only the program name is displayed. In all other situations, the “Folder name/Program name” is displayed.
5. Press <Cycle drawing> or <Single drawing> to start drawing.

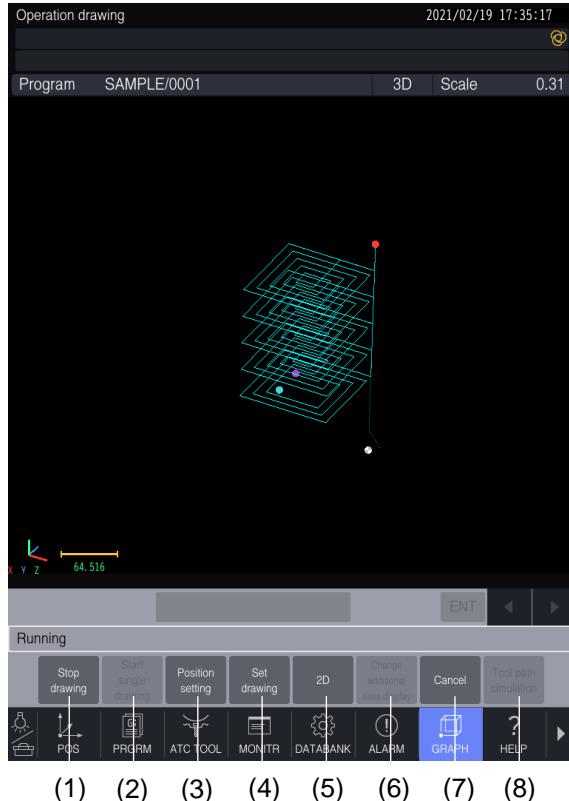
2.2.4 Cycle Drawing

The user can press <Cycle drawing> to start drawing a set program.

When using operation drawing mode, the motion path is drawn for a program that is scheduled in memory operation. When using tool path simulation mode, the motion path is drawn for a specified program.

A purple dot ● indicates the current position of the simulation tool while drawing during operation. In addition, a light blue dot ● indicates the next position of the simulation tool.

Cycle drawing in progress



(1) (2) (3) (4) (5) (6) (7) (8)

2.2.4.1 Description of screen display

Refer to “2.1.2 Screen display” for further details.

2.2.4.2 Description of screen operation

Column	Position	Label	Description
1	(1)	<Stop drawing>	Stops the drawing operation. Refer to “2.2.9 Stop drawing” for further details.
	(2)	<Single drawing>	The key is grayed out.
	(3)	<Position setting>	Changes to the <Position setting> screen. Refer to “2.2.6 Change graphic display” for further details.
	(4)	<Set drawing>	Changes to the <Set drawing> screen. Refer to “2.2.7 Drawing setting” for further details.
	(5)	<2D> / <3D>	Switches back and forth between the 2D and 3D display.
	(6)	<Change additional axes display>	Changes the additional axis display for the machine coordinate position between the following axes: QT-axis and 5th-axis to 8th-axis (A-, B- and C-axes) and the PLC-axes (P1- to P4-axes). When the PLC-axes do not exist, the key grays out.
	(7)	<Cancel>	Cancels the drawing operation. Refer to “2.2.10 Cancel drawing” for further details.
	(8)	<Tool path simulation> / <Operation drawing>	The key is grayed out. The user can switch the operation when the drawing block is stopped.

- (NOTE 1) This can only be executed in memory operation mode.
- (NOTE 2) This does not execute in tape operation.
- (NOTE 3) The drawing start position is set under <Drawing start position> on the drawing setting screen.
- (NOTE 4) Drawing is stopped at an M00 block. Press <Start cycle drawing> again.
- (NOTE 5) The drawn path is created based on the NC program. As a result, the actual path and the drawn path may vary slightly, such as in the corner sections. In addition, the smooth path override in high accuracy mode is not reflected in the drawn path.

2.2.5 Single Drawing

After pressing <Start single drawing>, the path of a program that is saved in memory operation is drawn one block at a time. When using operation drawing mode, the motion path is drawn for a program that is scheduled in memory operation. When using tool path simulation mode, the motion path is drawn for a specified program.

2.2.5.1 Description of screen display

Refer to “2.1.2 Screen display” for further details.

2.2.5.2 Description of screen operation

The screen operations are the same as “2.2.4 Cycle drawing”.

- (NOTE 1) This can only be executed in memory operation mode.
- (NOTE 2) This does not execute in tape operation.
- (NOTE 3) The drawing start position is set under <Drawing start position> on the drawing setting screen.
- (NOTE 4) During a single block stop while drawing before operation, if the user changes to another program on the memory operation screen and then returns to the <Operation drawing> screen, the program number is displayed for the program where the user changed to on the <Memory operation> screen.
In this situation, press <Start single drawing> to open the graph again. The program number is displayed on the screen for the program that was stopped. However, if the user stops the newly opened program, it goes back to the previous program number on the memory operation screen.

2.2.6 Change Graphic Display

The user can change the viewing direction of the graphic or the position with a tap operation or function key.

2.2.6.1 Change display using tap operation

The user can use a tap operation in the graphic drawing area to change the display of the graphic.

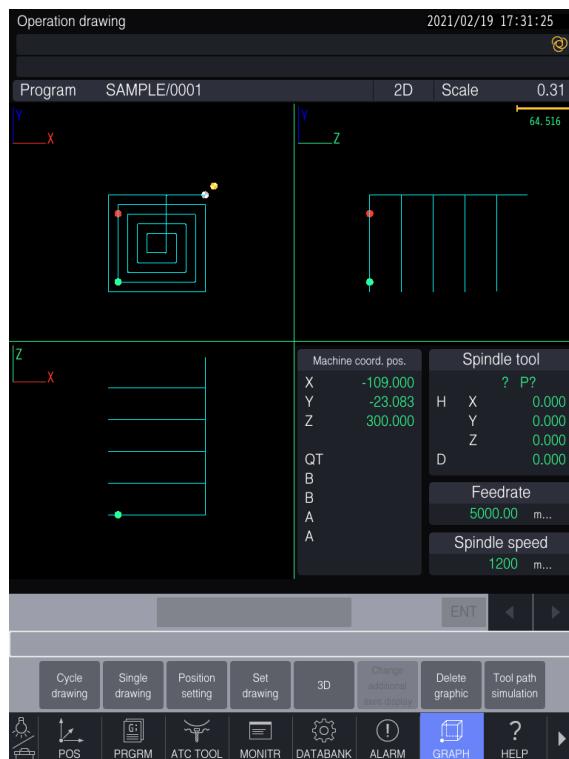
Zoom: Changes the display magnification. Pinch-out and pinch-in (using your fingers) operations can be used to zoom in and zoom out.

Move: Multi-touch operations can be used to swipe in a direction to move the center position of the display. When using 3D, the user can tap on a plane to change the motion direction.

Rotate: Rotates the graphic in the swipe direction. This function is only enabled when drawing in 3D.

(Example of 3D operation)

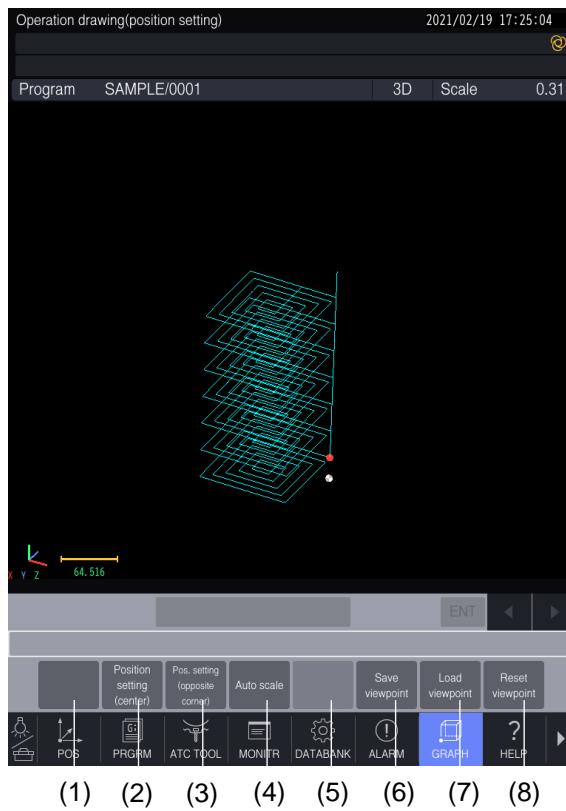
- When the user uses a multi-touch operation to swipe the XY plane to the right, the graphic moves in a positive direction along the X-axis (to the right on the XY plane and to the right on the XZ plane).
- When the user uses a multi-touch operation to swipe the XZ plane downward, the graphic moves in a negative direction along the Z-axis (downward on the XZ plane and to the left on the ZY plane).



2.2.6.2 Change display using function keys

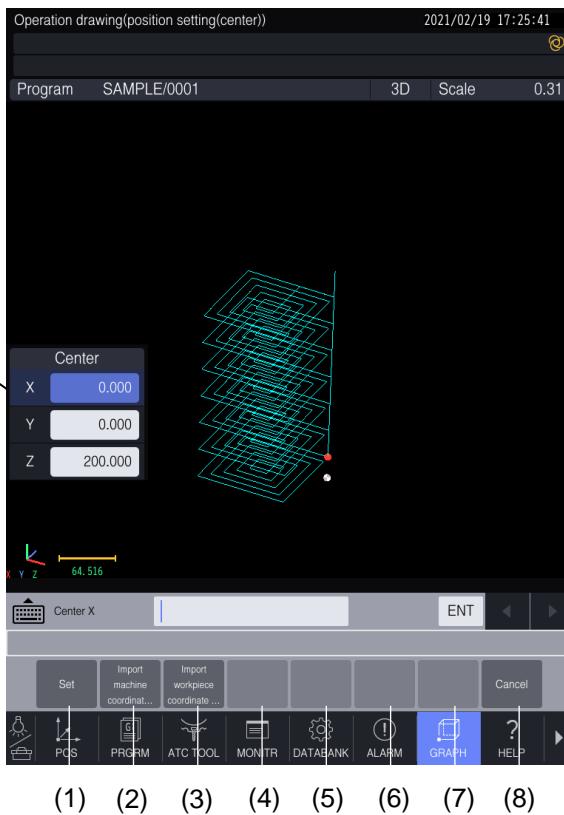
The user can set the coordinates to display in the center of the screen.

Press <Position setting> to display the position setting screen. The function keys on the position setting screen can be used to set to the center display position and to execute the automatic scaling.



Position setting screen operations

Column	Position	Label	Description
1	(1)	<Back>	Goes back to the previous screen.
	(2)	<Position setting (center)>	The user can set the center position coordinate for the screen display. The details will be discussed later in this chapter.
	(3)	<Pos. setting (opposite corner)>	The user can set the center position coordinate for the screen display so that the 2 entered points are displayed. The details will be discussed later in this chapter.
	(4)	<Auto scale>	Automatically calculates the center position coordinate in the graphic and the scale setting. The details will be discussed later in this chapter.
	(5)	-	-
	(6)	<Save viewpoint>	Saves the current viewpoint information. The user can load the saved information by pressing the <Load viewpoint> key. The details will be discussed later in this chapter.
	(7)	<Load viewpoint>	Loads the viewpoint information (that is saved with the <Save viewpoint> key) onto the screen. The details will be discussed later in this chapter.
	(8)	<Reset viewpoint>	Resets the viewpoint of the graphic. The details will be discussed later in this chapter.

Position setting (center)

(1) (2) (3) (4) (5) (6) (7) (8)

<Position setting(center)> screen display

Position	Name	Description
1	Center	The user can set the center position of the graphic with the X, Y and Z coordinate values.

Position setting (center) screen operations

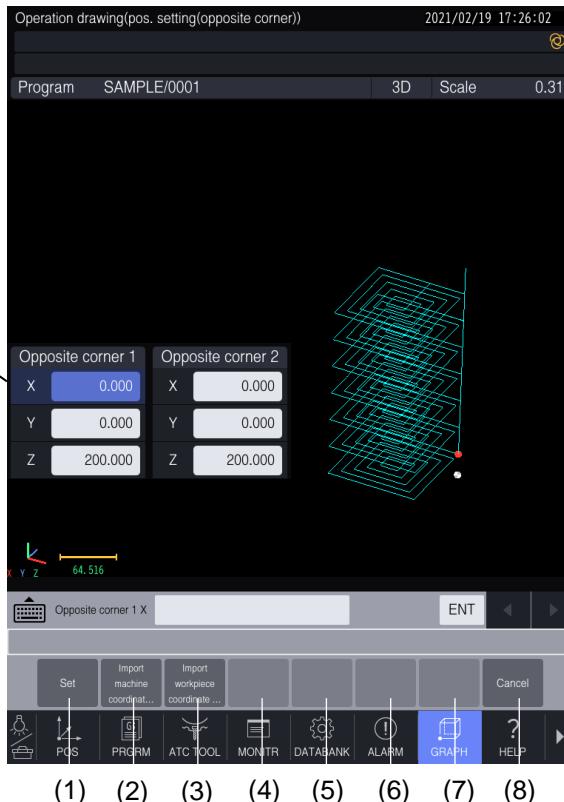
Column	Position	Label	Description
1	(1)	<Set>	Sets the position.
	(2)	<Import machine coordinate position>	The user can import the current machine coordinates and set the center position.
	(3)	<Import workpiece coordinate zero position>	(NC language only) The user can import the current workpiece coordinate zero position and set the center position.
	(4)	-	-
	(5)	-	-
	(6)	-	-
	(7)	-	-
	(8)	<Cancel>	Cancels the position setting.

The operation procedure is shown below.

1. Change to the <Position setting> screen.
2. Press <Position setting (center)>.
3. The data input field becomes active and the input coordinate display area appears.
4. Set a new <Center> position.
At this time, the user can import and set the corresponding coordinate as the <Center> by pressing <Import current coordinate position> / <Import workpiece coordinate zero position>.
5. Press <Set>.
The screen goes back to the previous screen, and the graphic is drawn according to the set value for the <Center>.

2

Position setting (opposite corner)



<Position setting (opposite corner)> screen display

Position	Name	Description
1	Opposite corner	The user can set 2 points with the X, Y and Z coordinates. The scale changes so that the set coordinates are displayed on the screen. The center coordinates between the 2 points that are entered become the center of the screen.

<Position setting (opposite corner)> screen operations

Column	Position	Label	Description
1	(1)	<Set>	Sets the position.
	(2)	<Import machine coordinate position>	The user can import the current machine coordinates and set the opposite corner.
	(3)	<Import workpiece coordinate zero position>	(NC language only) The user can import the current workpiece coordinate zero position and set the opposite corner position.
	(4)	-	-
	(5)	-	-
	(6)	-	-
	(7)	-	-
	(8)	<Cancel>	Cancels the position setting.

The operation procedure is shown below.

1. Change to the <Position setting> screen.
 2. Press the <Pos. setting (opposite corner)> key.
 3. The data input field becomes active and the input coordinate display area appears.
 4. Enter 2 points to display.
- At this time, the user can import and set the corresponding coordinate as the opposite point by pressing <Import machine coordinate position> / <Import workpiece coordinate zero position>.

5. Press <Set>.

The screen goes back to the previous screen, and the graphic is drawn with the <Center> at the center position between the two opposite corners.

Automatic scaling

Automatic scaling calculates the center position in the graph and the drawing scale setting.

1. Press <Auto scale> on the position setting screen.
2. The center position and the scale setting are automatically calculated.
The new <Drawing scale> and the center are automatically set, and the graphic is drawn.

(NOTE) The processing does not end in a program with an infinite recursion statement. Press <Cancel>.

Save and load viewpoint

Press the <Save viewpoint> key on the <Position setting> screen to save the current viewpoint information. The user can load the saved information by pressing the <Load viewpoint> key. The information is also loaded when the power is turned ON.

The viewpoint information that is saved is shown below.

- <Drawing scale>
- <Center> set with the <Position setting (center)> or <Pos. setting (opposite corner)>
- Travel amount using the multi-touch swipe operation
- Rotation amount at the viewpoint using the swipe operation

(NOTE 1) If there is a change in the <3D drawing plane> value in the drawing settings when saving or loading the viewpoint information, then the viewpoint that is loaded will change.

(NOTE 2) When the <Drawing method> in the drawing settings is set to <Method 3>, the viewpoint that is saved may be different from the viewpoint that is loaded, because the coordinates of the rotation axis/tilt axis are not added in.

Reset viewpoint

Press the <Reset viewpoint> key on the <Position setting> screen to initialize or reset the viewpoint according to the current drawing settings as shown below.

- Screen center : The position set in with the <Position setting (center)> or <Pos. setting (opposite corner)> is displayed as the center of the screen.
- Drawing scale : The value set in <Drawing scale when viewpoint is reset> is applied.
- Angle (3D drawing only) : Based on the coordinate system specified in the <3D drawing plane>, the viewpoint rotates in a horizontal direction per the setting: <Angle (horizontal) when viewpoint is reset>, and it also rotates in a vertical direction per the setting: <Angle (vertical) when viewpoint is reset>.

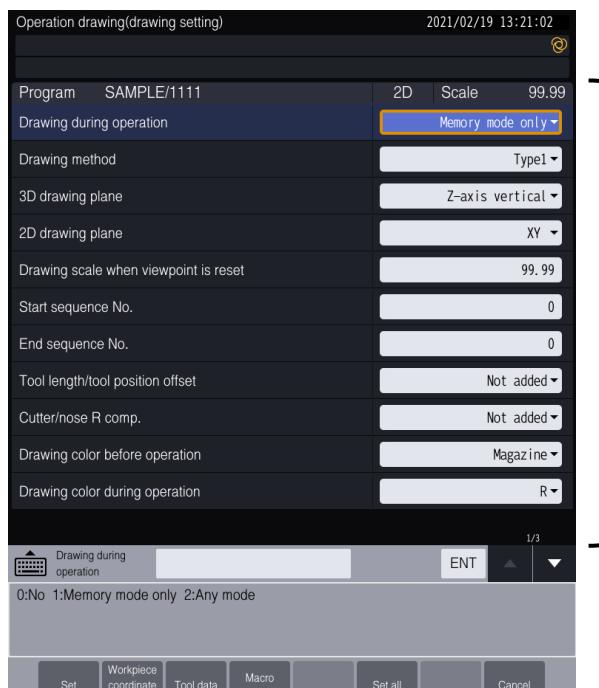
Ex: When <3D drawing plane> is set to <Z-axis vertical>, <Angle (horizontal) when viewpoint is reset> is set to 0 and <Angle (vertical) when viewpoint is reset> is set to 90, the viewpoint rotates 90 degrees vertically (when looking at the XZ plane from the front). Therefore, the XY plane is displayed on the screen as if the user is looking down on the machine from above.

2.2.7 Drawing Setting

The user can press <Set drawing> to open the <Set drawing> screen. The items that can be set vary depending on the mode.

Workpiece coordinates, tool data and macro variables used in the drawing setting are different from the data used in memory operation. When the values at power ON are set as the default values, use the <Set all> to apply changes to those values (at power ON) and use them in the drawing setting.

2



(1) (2) (3) (4) (5) (6) (7) (8)

Drawing setting screen display

Position	Name	Description
1	Drawing parameter list	The user can set the drawing conditions.

Drawing setting screen operations

Column	Position	Label	Description
1	(1)	<Set>	Sets the drawing setting and goes back to the operation drawing screen.
	(2)	<Workpiece coordinate zero>	Changes to the workpiece coordinate zero screen.
	(3)	<Tool data>	Changes to the <Tool data> screen.
	(4)	<Macro variables>	Changes to the macro variables screen.
	(5)	-	-
	(6)	<Set all>	The user can set all the drawing parameters together with the same conditions as the current memory operation that is running. Workpiece coordinates, tool data, macro variables are the same values as in memory operation.
	(7)	<Program list>	-
	(8)	<Cancel>	Cancels the drawing setting.

Description of drawing parameter list operations

- Tap on an item to edit it.
- Press the [ENT] key to edit the corresponding item.
- An item can be selected with the cursor keys (up/down).
- Press the page arrow keys next to the data input field to change the page.

2.2.7.1 Drawing parameter

Set the parameters related to the operation drawing mode and the tool path simulation mode. The same parameters are saved in both modes (excluding some parameters).

Operation drawing parameters

Name	Setting range	Overview
Drawing during operation	0: No 1: Memory mode only 2: Any mode	<p>Set whether or not to perform drawing in operation during machine operation.</p> <p><0: No>: Hides the display for the machine's motion path.</p> <p><1: Memory mode only>: Shows the display only during memory operation.</p> <p><2: Any mode>: Displays the motion path in all modes including manual and MDI modes.</p>
Drawing method	0: Method 1 1: Method 2 2: Method 3	<p>Set the drawing method when the additional axis travels.</p> <p><0: Method 1>: Draws the position of the X-, Y- and Z-axes without adding the additional axis motion.</p> <p><1: Method 2>: Draws the position adding the additional axis motion. When the additional axis travels, a path is drawn that shows the tool motion relative to the workpiece.</p> <p><2: Method 3>: Draws the position adding the additional axis motion. The drawn graphic rotates with the additional axis motion, and the position is drawn so that the actual workpiece and tool motion match.</p> <p>(NOTE 1) When this parameter is set to <Method 2> or <Method 3>, set the following parameters to match the machine configuration.</p> <ul style="list-style-type: none"> - User parameter (rotation axis/tilt axis setting) - Machine parameter (system 2: common) <Rotation center X/Y/Z coordinate for tilt axis 1/2> and <Rotation center X/Y/Z coordinate for rotation axis 1/2> <p>(NOTE 2) In the drawing before operation, the rotation of the lathe spindle is not added.</p> <p>(NOTE 3) When this parameter is changed, the graphic is cleared.</p>
3D drawing plane	0:Z-axis vertical 1:Z-axis horizontal	<p>Set the reference direction when displaying the graphic in 3D mode.</p> <p><0: Z-axis vertical>: Sets the display to the Z-axis vertical plane (XZ plane).</p> <p><1: Z-axis horizontal>: Sets the display to the Z-axis horizontal plane (ZY plane).</p>
2D drawing plane	0: XY 1: XZ 2: YZ 3: ZX 4: ZY 5: 3-plane drawing	<p>Sets the graphic display in 2D.</p> <p><0: XY> : Displays the XY plane.</p> <p><1: XZ> : Displays the XZ plane.</p> <p><2: YZ> : Displays the YZ plane.</p> <p><3: ZX> : Displays the ZX plane.</p> <p><4: ZY> : Displays the ZY plane.</p> <p><5: 3-plane drawing> : Displays the XY plane, YZ plane and ZX plane.</p>
Drawing scale when viewpoint is reset	0.01 to 99.99	Set the graphic scale displayed on the screen when <Reset viewpoint> is pressed.
Start sequence No. (Start job number)	0 to 99999	<p>Start the drawing operation from the block that includes this sequence number when the value (NC language) is not zero. If the value is zero, it starts the drawing operation from the beginning of the program.</p> <p>Start the drawing operation from the specified job number when the value (Conversation language) is not zero. If the value is zero, it starts the drawing operation from the beginning of the program.</p>
End sequence No. (End job number)	0 to 99999	<p>Stop or end the drawing operation after reaching the block that includes this sequence number when the value (NC language) is not zero. If the value is zero, it stops or ends the drawing operation after reaching the end of the program.</p> <p>Stop or end the drawing operation after reaching the specified job number when the value (Conversation language) is not zero. If the value is zero, it stops or ends the drawing operation after reaching the end of the program.</p>

Chapter 2 Graphic

2

Name	Setting range	Overview									
Tool length/tool position offset (Tool length offset)	0: Not added 1: Added	<p>(NC language)</p> <p>Set the drawing positions of the X-, Y- and Z-axes with the tool length/tool position offset applied. This function is valid only for drawing before operation.</p> <p>To not add the offset, a “0” is used for the tool length/tool position compensation. To add the offset, a value for the tool length/tool position compensation in the tool list is used to offset the positions of the X-, Y- and Z-axes.</p> <table border="1"> <thead> <tr> <th></th><th>During tool length offset (G43/G44)</th><th>During tool position offset (G143/G144)</th></tr> </thead> <tbody> <tr> <td>0: Not added</td><td>Ignores the <Tool length offset> and plots the graph using the spindle tip position.</td><td>Ignores the <Tool length offset> and <Tool position offset> and plots the graph using the spindle tip position.</td></tr> <tr> <td>1: Added</td><td>Uses the <Tool length offset> to offset the Z-axis position and plots the graph using the tool tip position.</td><td>Uses the <Tool length offset> and <Tool position offset> to offset the positions for the X-, Y- and Z-axes and plots the graph using the tool tip position.</td></tr> </tbody> </table> <p>(Conversation language)</p> <p>Set the drawing position of the Z-axis with the tool length offset applied. This function is valid only for drawing before operation.</p> <p>To not add the offset, a “0” is used for the tool length offset. To add the offset, a value for the tool length position in the tool list is used to offset the Z-axis position.</p> <p><0: Not added>: Ignores the <Tool length offset> and plots the graph using the spindle tip position.</p> <p><1: Added>: Uses the <Tool length offset> to offset the Z-axis position and plots the graph using the tool tip position.</p>		During tool length offset (G43/G44)	During tool position offset (G143/G144)	0: Not added	Ignores the <Tool length offset> and plots the graph using the spindle tip position.	Ignores the <Tool length offset> and <Tool position offset> and plots the graph using the spindle tip position.	1: Added	Uses the <Tool length offset> to offset the Z-axis position and plots the graph using the tool tip position.	Uses the <Tool length offset> and <Tool position offset> to offset the positions for the X-, Y- and Z-axes and plots the graph using the tool tip position.
	During tool length offset (G43/G44)	During tool position offset (G143/G144)									
0: Not added	Ignores the <Tool length offset> and plots the graph using the spindle tip position.	Ignores the <Tool length offset> and <Tool position offset> and plots the graph using the spindle tip position.									
1: Added	Uses the <Tool length offset> to offset the Z-axis position and plots the graph using the tool tip position.	Uses the <Tool length offset> and <Tool position offset> to offset the positions for the X-, Y- and Z-axes and plots the graph using the tool tip position.									
Cutter/nose R compensation (Cutter compensation)	0: Not added 1: Added	<p>(NC language)</p> <p>Set the drawing position of the axis with the cutter/nose R compensation applied. This function is valid only for drawing before operation.</p> <table border="1"> <thead> <tr> <th></th><th>During cutter compensation (G41/G42)</th><th>During nose R compensation (G141/G142)</th></tr> </thead> <tbody> <tr> <td>0: Not added</td><td>Program path is displayed.</td><td>Program path is displayed.</td></tr> <tr> <td>1: Added</td><td>Tool center path is displayed.</td><td>A path which is offset by nose R from the program path is displayed.</td></tr> </tbody> </table> <p>(Conversation language)</p> <p>Set the XY axes drawing position with cutter compensation applied. This function is valid only for drawing before operation.</p> <p><0: Not added>: Displays the program path.</p> <p><1: Added>: Displays the tool center path.</p>		During cutter compensation (G41/G42)	During nose R compensation (G141/G142)	0: Not added	Program path is displayed.	Program path is displayed.	1: Added	Tool center path is displayed.	A path which is offset by nose R from the program path is displayed.
	During cutter compensation (G41/G42)	During nose R compensation (G141/G142)									
0: Not added	Program path is displayed.	Program path is displayed.									
1: Added	Tool center path is displayed.	A path which is offset by nose R from the program path is displayed.									
Drawing color before operation	0: MGZN 1: BLU 2: R 3: PP 4: GRN 5: LBLU 6: Y 7: W	<p>Set the color for the paths drawn during drawing before operation.</p> <p>When <0: MGZN> is set, each tool is displayed in a different color using the colors registered for the ATC tools.</p>									
Drawing color during operation	0: MGZN 1: BLU 2: R 3: PP 4: GRN 5: LBLU 6: Y 7: W	<p>Set the color for the paths drawn during drawing during operation.</p> <p>When <0: MGZN> is set, each tool is displayed in a different color using the colors registered for the ATC tools.</p>									

Name	Setting range	Overview
Rapid traverse drawing	0: No 1: Yes	Specify whether to draw a G0 block or not for drawing before operation. When set to <0: No>, the G0 block is not drawn. When set to <1: Yes>, the G0 block is drawn with a dotted line.
Canned cycle mark	0: No 1: Yes	Set whether to add the dot ● mark to the sections where the canned cycle drilling is executed.
Drawing speed	0: High speed 1: Medium speed 2: Low speed	Set the drawing speed when drawing before operation. <0: High speed, 1: Medium speed 2: Low speed>: Draws at the speed of the set value.
Line drawing method	0: Method 1 1: Method 2	Set the drawing method for drawing a line when drawing before operation. <0: Method 1>: Draws a line in increments. <1: Method 2>: Draws a line all at once. (NOTE 1) The alarm <<Too many drawing points>> may trigger and the older points may be cleared because the plotted points increase when using method 1. (NOTE 2) The drawing time will take longer in method 1 than in method 2.
Coordinate display	0: No 1: Machine coord. 2: Absolute coord. 3: Relative coord.	Set the display to show or hide the coordinates and spindle tool information. <0: No>: Hides the display of the coordinates and tool information. <1: Machine coord. / 2: Absolute coord. / 3: Relative coord.>: Shows the display of the specified coordinates and tool information.
Workpiece zero point	0: No 1: Yes	Set whether to display the current workpiece coordinate zero position with a circle ●. <0: No>: Hides the display. <1: Yes>: Displays the position.
Machine zero point	0: No 1: Yes	Set whether to display the machine zero position with a circle ●. <0: No>: Hides the display. <1: Yes>: Displays the position.
Clear screen when changing tool	0: No 1: Yes	Set whether to clear the graphic when the tool has been changed.
Clear screen when rotating additional axis	0: No 1: Yes	Set whether to clear the graphic when the additional axis has been rotated.
Angle (horizontal) when viewpoint is reset	-180 to 180 deg.	Set the rotation angle for the viewpoint horizontally when <Reset viewpoint> is pressed (only valid with 3D drawing).
Angle (vertical) when viewpoint is reset	-180 to 180 deg.	Set the rotation angle for the viewpoint vertically when <Reset viewpoint> is pressed (only valid with 3D drawing).
Drawing start position X	-9999.999 to 9999.999 mm	Set the machine coordinate position X to indicate where to start the drawing before operation.
Drawing start position Y	-9999.999 to 9999.999 mm	Set the machine coordinate position Y to indicate where to start the drawing before operation.
Drawing start position Z	-9999.999 to 9999.999 mm	Set the machine coordinate position Z to indicate where to start the drawing before operation.
Drawing start position tilt axis	-9999.999 to 9999.999 deg.	Set the machine coordinate position on the tilt axis where the drawing before operation starts. This parameter is used when <Drawing method> is set to <Method 2/3>.
Drawing start position rotation axis	-9999.999 to 9999.999 deg.	Set the machine coordinate position on the rotation axis where the drawing before operation starts. This parameter is used when <Drawing method> is set to <Method 2/3>.
Machining pallet	1: Pallet 1 2: Pallet 2	This parameter is valid only for machines with a quick table. The parameter specifies the machining pallet to which additional axis settings for user and machine parameters are applied.

Parameters for tool path simulation

Name		Overview
Drawing program folder	Alphanumeric characters including periods and slashes that can be entered from the panel	Set the folder for the drawing program. Do not specify a folder in order to set a program to the root folder.
Drawing program	1 to 8999 or a character string using no more than 32 characters	Specify the drawing program. The program can be selected from the program list.
Drawing method	0: Method 1 1: Method 2 2: Method 3	<p>Set the drawing method when the additional axis travels.</p> <p><0: Method 1>: Draws the position of the X-, Y- and Z-axes without adding the additional axis motion.</p> <p><1: Method 2>: Draws the position adding the additional axis motion. When the additional axis travels, a path is drawn that shows the tool motion relative to the workpiece.</p> <p><2: Method 3>: Draws the position adding the additional axis motion. The drawn graphic rotates with the additional axis motion, and the position is drawn so that the actual workpiece and tool motion match.</p> <p>(NOTE 1) When this parameter is set to <Method 2> or <Method 3>, set the following parameters to match the machine configuration.</p> <ul style="list-style-type: none"> - User parameter (rotation axis/tilt axis setting) - Machine parameter (system 2: common) <Rotation center X/Y/Z coordinate for tilt axis 1/2> and <Rotation center X/Y/Z coordinate for rotation axis 1/2> <p>(NOTE 2) The rotation of the lathe spindle is not added.</p> <p>(NOTE 3) When this parameter is changed, the graphic is cleared.</p>
3D drawing plane	0: Z-axis vertical 1: Z-axis horizontal	<p>Set the reference direction when displaying the graphic in 3D mode.</p> <p><0: Z-axis vertical> : Sets the display to the Z-axis vertical plane (XZ plane).</p> <p><1: Z-axis horizontal> : Sets the display to the Z-axis horizontal plane (ZY plane).</p>
2D drawing plane	0: XY 1: XZ 2: YZ 3: ZX 4: ZY 5: 3-plane drawing	<p>Sets the graphic display in 2D.</p> <p><0: XY> : Displays the XY plane.</p> <p><1: XZ> : Displays the XZ plane.</p> <p><2: YZ> : Displays the YZ plane.</p> <p><3: ZX> : Displays the ZX plane.</p> <p><4: ZY> : Displays the ZY plane.</p> <p><5: 3-plane drawing> : Displays the XY plane, YZ plane and ZX plane.</p>
Drawing scale when viewpoint is reset	0.01 to 99.99	Set the graphic scale displayed on the screen when <Reset viewpoint> is pressed.
Start sequence No. (Start job number)	0 to 99999	<p>Start the drawing operation from the block that includes this sequence number when the value (NC language) is not zero. If the value is zero, it starts the drawing operation from the beginning of the program.</p> <p>Start the drawing operation from the specified job number when the value (conversation language) is not zero. If the value is zero, it starts the drawing operation from the beginning of the program.</p>

Name		Overview									
End sequence No. (End job number)	0 to 99999	<p>Stop or end the drawing operation after reaching the block that includes this sequence number when the value (NC language) is not zero. If the value is zero, it stops or ends the drawing operation after reaching the end of the program.</p> <p>Stop or end the drawing operation after reaching the specified job number when the value (conversation language) is not zero. If the value is zero, it stops or ends the drawing operation after reaching the end of the program.</p>									
Tool length/tool position offset (Tool length offset)	0: Not added 1: Added	<p>(NC language)</p> <p>Set the drawing positions of the X-, Y- and Z-axes with tool length/tool position offset applied.</p> <p>To not add the offset, a “0” is used for the tool length/tool position compensation. To add the offset, a value for the tool length/tool position compensation in the tool list is used to offset the positions of the X-, Y- and Z-axes.</p> <table border="1"> <thead> <tr> <th></th> <th>During tool length offset (G43/G44)</th> <th>During tool position compensation (G143/G144)</th> </tr> </thead> <tbody> <tr> <td>0: Not added</td> <td>Ignores the <Tool length offset> and plots the graph using the spindle tip position.</td> <td>Ignores the <Tool length offset> and <Tool position offset> and plots the graph using the spindle tip position.</td> </tr> <tr> <td>1: Added</td> <td>Uses the <Tool length offset> to offset the Z-axis position and plots the graph using the tool tip position.</td> <td>Uses the <Tool length offset> and <Tool position offset> to offset the positions for the X-, Y- and Z-axes and plots the graph using the tool tip position.</td> </tr> </tbody> </table> <p>(Conversation language)</p> <p>Set the drawing position of the Z-axis with the tool length offset applied.</p> <p>To not add the offset, a “0” is used for the tool length offset. To add the offset, a value for the tool length position in the tool list is used to offset the Z-axis position.</p> <p><0: Not added>: Ignores the <Tool length offset> and plots the graph using the spindle tip position.</p> <p><1: Added>: Uses the <Tool length offset> to offset the Z-axis position and plots the graph using the tool tip position.</p>		During tool length offset (G43/G44)	During tool position compensation (G143/G144)	0: Not added	Ignores the <Tool length offset> and plots the graph using the spindle tip position.	Ignores the <Tool length offset> and <Tool position offset> and plots the graph using the spindle tip position.	1: Added	Uses the <Tool length offset> to offset the Z-axis position and plots the graph using the tool tip position.	Uses the <Tool length offset> and <Tool position offset> to offset the positions for the X-, Y- and Z-axes and plots the graph using the tool tip position.
	During tool length offset (G43/G44)	During tool position compensation (G143/G144)									
0: Not added	Ignores the <Tool length offset> and plots the graph using the spindle tip position.	Ignores the <Tool length offset> and <Tool position offset> and plots the graph using the spindle tip position.									
1: Added	Uses the <Tool length offset> to offset the Z-axis position and plots the graph using the tool tip position.	Uses the <Tool length offset> and <Tool position offset> to offset the positions for the X-, Y- and Z-axes and plots the graph using the tool tip position.									
Cutter compensation	0: Not added 1: Added	<p>(NC language)</p> <p>Set the drawing position of the X- and Y-axes with the cutter compensation applied.</p> <table border="1"> <thead> <tr> <th></th> <th>During cutter compensation (G41/G42)</th> <th>During nose R compensation (G141/G142)</th> </tr> </thead> <tbody> <tr> <td>0: Not added</td> <td>Program path is displayed.</td> <td>Program path is displayed.</td> </tr> <tr> <td>1: Added</td> <td>Tool center path is displayed.</td> <td>A path which is offset by nose R from the program path is displayed.</td> </tr> </tbody> </table> <p>(Conversation language)</p> <p>Set the XY axes drawing position with cutter compensation applied.</p> <p><0: Not added>: Displays the program path.</p> <p><1: Added>: Displays the tool center path.</p>		During cutter compensation (G41/G42)	During nose R compensation (G141/G142)	0: Not added	Program path is displayed.	Program path is displayed.	1: Added	Tool center path is displayed.	A path which is offset by nose R from the program path is displayed.
	During cutter compensation (G41/G42)	During nose R compensation (G141/G142)									
0: Not added	Program path is displayed.	Program path is displayed.									
1: Added	Tool center path is displayed.	A path which is offset by nose R from the program path is displayed.									
Drawing color	0: Each tool change 1: BLU 2: R 3: PP 4: GRN 5: LBLU 6: Y 7: W	<p>Set the drawing color.</p> <p>When <0: Each tool change> is set, each time a tool change occurs, the color changes and is displayed.</p>									

Chapter 2 Graphic

2

Name		Overview
Rapid traverse drawing	0: No 1: Yes	Specify whether to draw a G0 block or not. If the value is <0>, the G0 block is not drawn. If the value is <1>, the G0 block is drawn with a dotted line.
Canned cycle mark	0: No 1: Yes	Set whether to add the dot • mark to the sections where the canned cycle drilling is executed.
Drawing speed	0: High speed 1: Medium speed 2: Low speed	Sets the drawing speed. The drawing speed is divided into ten levels (drawing speed 1 to drawing speed 2). Set the desired level. If drawing speed 1 is less than drawing speed 2, the former is automatically applied regardless of this parameter setting.
Line drawing method	0: Method 1 1: Method 2	Set the drawing method when drawing a line. <0: Method 1>: Draws a line in increments. <1: Method 2>: Draws a line all at once. (NOTE 1) The alarm <<Too many drawing points>> may trigger and the older points may be cleared because the plotted points increase when using method 1. (NOTE 2) The drawing time will take longer in method 1 than in method 2.
Coordinate display	0: No 1: Machine coord. 2: Absolute coord. 3: Relative coord.	Set the display to show or hide the coordinates and spindle tool information. <0: No>: Hides the display of the coordinates and tool information. <1:Machine coord. / 2:Absolute coord. / 3:Relative coord.>: Shows the display of the specified coordinates and tool information.
Workpiece zero point	0: No 1: Yes	Set whether to display the current workpiece coordinate zero position with a circle •. <0: No>: Hides the display. <1: Yes>: Displays the position.
Machine zero point	0: No 1: Yes	Set whether to display the machine zero position with a circle •. <0: No>: Hides the display. <1: Yes>: Displays the position.
Clear screen when changing tool	0: No 1: Yes	Set whether to clear the drawn graphic when the tool has been changed.
Clear screen when rotating additional axis	0: No 1: Yes	Set whether to clear the drawn graphic when the additional axis has been rotated.
Angle (horizontal) when viewpoint is reset	-180 to 180 deg.	Set the rotation angle for the viewpoint horizontally when <Reset viewpoint> is pressed (only valid with 3D drawing).
Angle (vertical) when viewpoint is reset	-180 to 180 deg.	Set the rotation angle for the viewpoint vertically when <Reset viewpoint> is pressed (only valid with 3D drawing).
Drawing start position X	-9999.999 to 9999.999 mm	Set the machine coordinate position X to indicate where to start drawing.
Drawing start position Y	-9999.999 to 9999.999 mm	Set the machine coordinate position Y to indicate where to start drawing.
Drawing start position Z	-9999.999 to 9999.999 mm	Set the machine coordinate position Z to indicate where to start drawing.
Drawing start position tilt axis	-9999.999 to 9999.999 deg.	Set the machine coordinate position on the tilt axis where the drawing starts. This parameter is used when <Drawing method> is set to <Method 2/3>.
Drawing start position rotation axis	-9999.999 to 9999.999 deg.	Set the machine coordinate position on the rotation axis where the drawing starts. This parameter is used when <Drawing method> is set to <Method 2/3>.
Machining pallet	1: Pallet 1 2: Pallet 2	This parameter is valid only for machines with a quick table. The parameter specifies the machining pallet to which additional axis settings for user and machine parameters are applied.

2.2.7.2 Reference workpiece coordinates

The user can reference the workpiece coordinate zero, the extended coordinates and the reference rotary fixture offset.

These values are used for drawing before operation in operation drawing mode and tool path simulation.

This reference is only available when using the NC language.

Operation drawing(Workpc. coord. zero) 2021/02/19 13:21:32

	G54	G55	G56	G57
X	-200.000	-200.500	-117.936	-370.000
Y	-200.000	-200.000	-52.454	-180.000
Z	400.000	400.000	150.000	100.000
A	0.000	0.000	0.000	0.000
B	0.000	0.000	0.000	0.000
C	0.000	0.000	0.000	0.000
	G58	G59	External	
X	0.000	0.000	0.000	
Y	0.000	0.000	0.000	
Z	0.000	0.000	0.000	
A	0.000	0.000	0.000	
B	0.000	0.000	0.000	
C	0.000	0.000	0.000	

1

(1) (2) (3) (4) (5) (6) (7) (8)

2

Workpiece coordinate zero display

Position	Name	Description
1	Coordinate data	The user can use the function keys to reference the workpiece coordinate zero, the extended coordinates and the reference rotary fixture offset.

Workpiece coordinate zero display operations

Column	Position	Label	Description
1	(1)	<Back>	Goes back to the drawing setting screen.
	(2)	<Standard Coordinates>	Displays the workpiece coordinate zero.
	(3)	<Extended coordinates>	Displays the extended workpiece coordinate zero.
	(4)	<Rotary fixture offset>	Displays the reference rotary fixture offset.
	(5)	-	-
	(6)	-	-
	(7)	-	-
	(8)	-	-

2.2.7.3 Reference tool data

The user can reference the tool data that is used for drawing before operation in operation drawing mode and tool path simulation.

This reference is only available when using the NC language.

Operation drawing(tool data) 2021/02/19 13:21:54

Tool No.	001	002	003	004
Tool name	AAA	BBB	CCC	DDD
Tool length offset	130.000	100.000	200.000	200.000
T length wear offset	0.000	0.000	0.000	0.000
Cutter comp.	2.000	8.000	0.000	0.000
Cutter wear offset	0.000	0.000	0.000	0.000
Life unit	*****	*****	*****	*****
Initial life	*****	*****	*****	*****
Life warning	*****	*****	*****	*****
Tool No.	005	006	007	008
Tool name	EEE	FFF	GGG	HHH
Tool length offset	200.000	200.000	200.000	200.000
T length wear offset	0.000	0.000	0.000	0.000
Cutter comp.	0.000	0.000	0.000	0.000
Cutter wear offset	0.000	0.000	0.000	0.000
Life unit	*****	*****	*****	*****
Initial life	*****	*****	*****	*****
Life warning	*****	*****	*****	*****

1/25

(1) (2) (3) (4) (5) (6) (7) (8)

Tool data display

Position	Name	Description
1	Tool data	The user can use the function keys to reference the tool list, tool extension 1 and tool extension 2.

Tool data display operations

Column	Position	Label	Description
1	(1)	<Back>	Goes back to the drawing setting screen.
	(2)	<List>	Displays tool data for 8 tools.
	(3)	<Expansion 1>	Displays a screen for items that can be set for the peripheral speed and the feed per rotation.
	(4)	<Expansion 2>	Displays a screen that includes the setting items for the lathe tool.
	(5)	-	-
	(6)	-	-
	(7)	-	-
	(8)	-	-

2.2.7.4 Reference macro variables

The user can reference the macro variables that are used for drawing before operation in operation drawing mode and tool path simulation.

This reference is only available when using the NC language.

Operation drawing(macro variables) 2021/02/19 13:22:18

Var.	Value								
#500	123.000	#520	229.000	#540	232.000	#560	236.000	#580	239.000
#501	226.000	#521	229.000	#541	232.000	#561	236.000	#581	239.000
#502	226.000	#522	229.000	#542	233.000	#562	236.000	#582	239.000
#503	226.000	#523	229.000	#543	233.000	#563	236.000	#583	239.000
#504	226.000	#524	230.000	#544	233.000	#564	236.000	#584	240.000
#505	226.000	#525	230.000	#545	233.000	#565	236.000	#585	240.000
#506	227.000	#526	230.000	#546	233.000	#566	237.000	#586	240.000
#507	227.000	#527	230.000	#547	233.000	#567	237.000	#587	240.000
#508	227.000	#528	230.000	#548	234.000	#568	237.000	#588	240.000
#509	227.000	#529	230.000	#549	234.000	#569	237.000	#589	240.000
#510	227.000	#530	231.000	#550	234.000	#570	237.000	#590	241.000
#511	227.000	#531	231.000	#551	234.000	#571	237.000	#591	241.000
#512	228.000	#532	231.000	#552	234.000	#572	238.000	#592	241.000
#513	228.000	#533	231.000	#553	234.000	#573	238.000	#593	241.000
#514	228.000	#534	231.000	#554	235.000	#574	238.000	#594	241.000
#515	228.000	#535	231.000	#555	235.000	#575	238.000	#595	241.000
#516	228.000	#536	232.000	#556	235.000	#576	238.000	#596	242.000
#517	228.000	#537	232.000	#557	235.000	#577	238.000	#597	242.000
#518	229.000	#538	232.000	#558	235.000	#578	239.000	#598	242.000
#519	229.000	#539	232.000	#559	235.000	#579	239.000	#599	242.000

(1) (2) (3) (4) (5) (6) (7) (8)

2

Macro variable display

Position	Name	Description
1	<Macro variables>	The user can use the functions keys to reference the local variables from No. 100 to No. 900 (in lists of 100).

Macro variable display operations

Column	Position	Label	Description
1	(1)	<Back>	Goes back to the drawing setting screen.
	(2)	<Local variables>	Displays the local variables from #001 to #033.
	(3)	<#100 - 199>	Displays the macro variables from #100 to #199.
	(4)	<#500 - 599>	Displays the macro variables from #500 to #599.
	(5)	<#600 - 699>	Displays the macro variables from #600 to #699.
	(6)	<#700 - 799>	Displays the macro variables from #700 to #799.
	(7)	<#800 - 899>	Displays the macro variables from #800 to #899.
	(8)	<#900 - 999>	Displays the macro variables from #900 to #999.

2.2.7.5 Program list

The program list is used for tool path simulation mode.

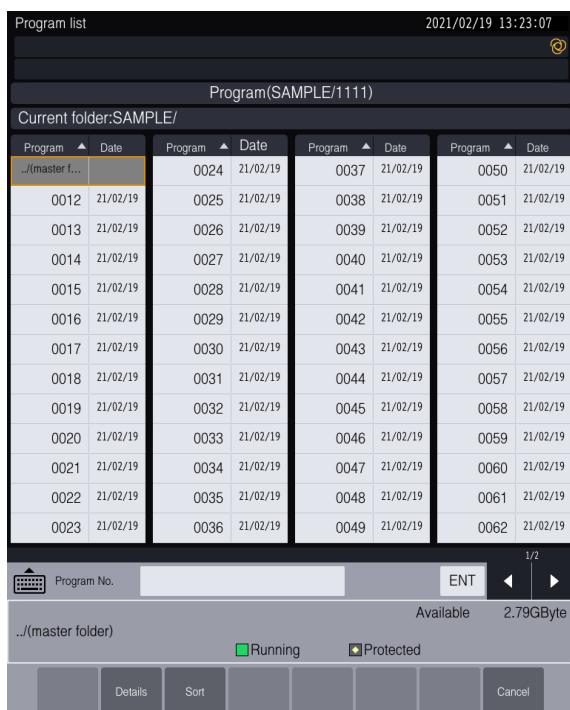
The user can access the program list to set a program to be drawn in tool path simulation mode.

The user can select a <Drawing program> from the drawing parameter list. After pressing the <Program list> key, a list of programs currently registered is displayed. The programs can be sorted according to the date, program or comment.

When a program is selected, the drawing program folder can also be set.

However, when a program in the root folder is selected, the drawing program folder becomes unset.

2



(1) (2) (3) (4) (5) (6) (7) (8)

Program list display

Position	Name	Description
1	Program list	The user can display the program list screen and the detailed program list screen. <Details/List> can be used to switch between the screens.

Program list operations

Column	Position	Label	Description
1	(1)	-	-
	(2)	<Details>/<List>	Switches between the program list screen and the detailed program list screen. <Details> is displayed on the program list screen, and <List> is displayed on the detailed program list screen.
	(3)	<Sort>	The user can use the function keys to switch between the sorting options and change how to sort the programs.
	(4)	-	-
	(5)	-	-
	(6)	-	-
	(7)	-	-
	(8)	<Cancel>	Cancels the program list operation.

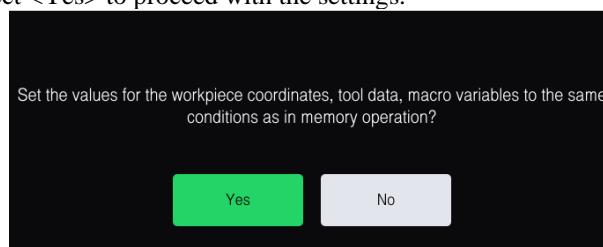
Sort operations

Column	Position	Label	Description
1	(1)	<Date (ascending)>	Displays starting from the data with the oldest date.
	(2)	<Date (descending)>	Displays starting from the data with the most recent date.
	(3)	<Program (ascending)>	Displays the programs in ascending order. The folder names are displayed in alphabetical order for the folders.
	(4)	<Program (descending)>	Displays the programs in descending order. The folder names are displayed in reverse alphabetical order (Z to A) for the folders.
	(5)	<Comment (ascending)>	Displays in alphabetical order using the comment character string. The folder names are displayed in alphabetical order for the folders.
	(6)	<Comment (descending)>	Displays in reverse alphabetical order using the comment character string. The folder names are displayed in reverse alphabetical order (Z to A) for the folders.
	(7)		
	(8)	<Cancel>	Cancels the sort operation. Goes back to the previous function key display.

2.2.7.6 Set all

The user can set all the drawing parameters together with the same conditions as the current memory operation that is running.

Workpiece coordinates, tool data, macro variables are the same values as in memory operation. When <Set all> is pressed on the drawing settings screen, the popup message below is displayed. Select <Yes> to proceed with the settings.



(NOTE) When only the data bank is changed, the workpiece coordinates, tool data, macro variables in the drawing parameters do not become the same conditions as in memory operation values. The user must execute the set all operation.

2.2.8 Additional Axis Settings

The parameters below related to the additional axis must be set when the drawing parameter <Drawing method> is set to <1: Method 2> or <2: Method 3>. If the parameter is not set correctly, the graphic will not draw correctly.

2.2.8.1 Machine parameter

Set the machine parameters (system 2: common) below. Refer to “Chapter 7 Machine parameter” in the Installation Manual for further details.

- <Rotation center X/Y/Z coordinate for tilt axis 1/2>
- <Rotation center X/Y/Z coordinate for rotation axis 1/2>

2.2.8.2 User parameter

Set the user parameters (rotation axis/tilt axis settings). Refer to “1.5 User parameters” in the Data Bank & Alarm Manual for further details.

(NOTE) The alarm <<Rotation axis/Tilt axis setting error>> is triggered in the following situations.

- When the axis used for the <Tilt axis*> or <Rotation axis*> is set to another <Tilt axis*> or <Rotation axis*>.
- When the <*axis install. position> is different than the additional axis specified for the pair: <Tilt axis*> and <Rotation axis*>.
- When the <Forward direction for the coordinate system on the tilt axis*> and <Forward direction for the coordinate system on the rotation axis*> are set on the same plane.

2.2.9 Stop Drawing

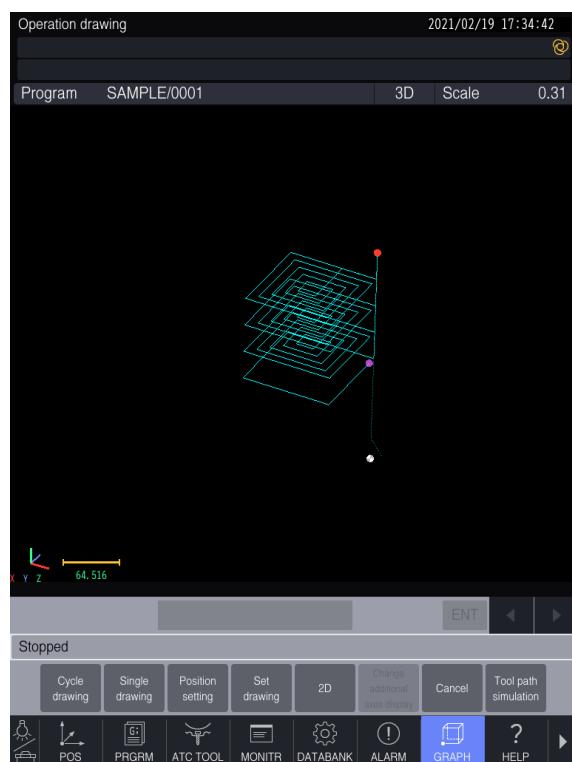
The user can stop the cycle drawing at a block.

1. Press <Stop drawing> during a drawing operation.
2. After finishing drawing at the end of the block that is currently drawing, it stops at the block.

(NOTE 1) If the user switches modes while drawing before operation, the operation and behavior is the same as when stopping the drawing operation.

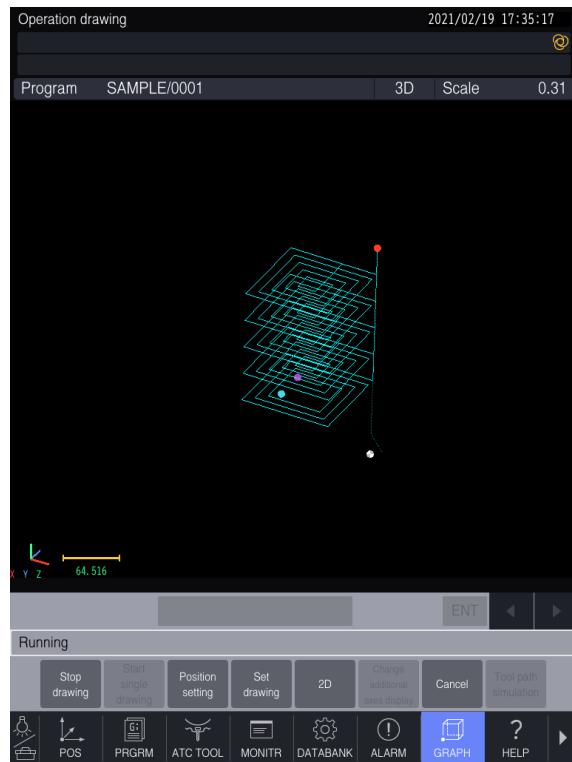
(NOTE 2) When stopped while drawing before operation, if the user changes to another program on the memory operation screen and then returns to the operation drawing screen, the program number is displayed for the program where the user changed to on the memory operation screen.

When starting and opening the graph drawing again in this situation, the program number is displayed for the program that was stopped. However, if the user stops the newly opened program, it goes back to the previous program number on the memory operation screen.



2.2.10 Cancel Drawing

The user can cancel a cycle drawing or single drawing.
Press <Cancel> during a drawing operation.



2.2.11 Delete Drawing

The user can delete the graphic that has been drawn.

1. Press <Delete graphic> when not executing a cycle drawing or single drawing.
If the drawing operation is in progress, stop the drawing before deleting it.
2. The entire graphic that is displayed on the screen is deleted.

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CHAPTER 3

3

COMMUNICATION

- 3.1 Outline**
- 3.2 Master Station Communication**
- 3.3 Slave Station Communication**
- 3.4 Maintenance Communication**
- 3.5 Communication Protocol**
- 3.6 Details of Communication Data**

3.1 Outline

3.1.1 Special Notes Before Using Communication Function

This product has communication functions, such as Ethernet. However, it is not possible to connect directly to a telecommunication line (including public wireless LAN) for telecommunication carriers (such as mobile communication carriers, fixed-line communication carriers, Internet providers, etc.). When connecting this product to the Internet, always be sure to connect it using a router or similar device.

To avoid inadvertently losing important data, we recommend regularly backing up the data in this product. If there is an accident, such as data being deleted due to a mistaken operation, data being corrupted due to a failure, or data being deleted and/or falsified via remote operation from an external program on the network, the customer can shorten the recovery time and minimize the impact on work by using backup data.

A description of how to back up the internal data on this product is described later on.

In addition, we recommend for the customer to save any data in a separate data storage device at the appropriate time, for example, when creating or making changes to data, such as data found in NC programs, conversation-language programs, internal PLC programs or in data banks.

To customers using the FTP master station communication function:

The FTP master station communication function allows customers to use this product to access an FTP server that is prepared separately by the customer. When using an FTP server, be sure to limit access to files used by this product, for example, by minimizing the range of access that is granted under the login name used on this product.

Procedure to back up internal data for this product

Items needed: Formatted memory card (USB memory)

1. Turn the machine breaker ON, and then turn the power ON.
2. Insert the memory card into the memory card interface, which is under the machine's operation panel.
3. Change to maintenance mode.
 - 3-1. Change to <Program edit menu> screen.
Press the [EDIT] key.
 - 3-2. Change to <External program I/O menu> screen.
Select <External program I/O> on the menu, and press the [ENT] key.
 - 3-3. Change to <Maintenance menu> screen.
Select <Maintenance> on the menu, and press the [ENT] key.
 - 3-4. Make sure that <Connected> on the bottom-right corner of the screen reads <Memory card>.
If the connecting location is different, select <Change connection device> and change it to <Memory card>.
4. Output the internal machine data to the memory card.
 - 4-1. Change to <Maintenance(Output all data)> screen.
Press the <Output all data> key.
 - 4-2. Output data to memory card.
Press the <Output> key.
After output is complete, it goes back to the screen before outputting.
5. Remove memory card.

Copy the internal machine data saved in the memory card to the computer or other device to store it. If data is corrupted, this procedure can be used to restore the data by transferring and inputting the backup data.

3.1.2 Master station and slave station communication

The user can input and output programs, data banks, file viewer data, notebook data and maintenance data between the NC and an external I/O device.

Master station communication: External program I/O menu and the subsequent screens of NC are used to start data input/ output. External equipment is the responding equipment (server). Memory card is also the subject of master station communication.

Slave station communication: External equipment initiates communication with the NC, which is the responding equipment (server). Slave station communication is limited when NC is displaying the external program I/O menu or the subsequent screens.

Maintenance communication: Special inputs/outputs necessary for maintenance are performed (board exchange, etc.).

Connecting lines	Communication type	Master/ Slave	Mainte nance	Description
Serial	General communication device	(Master)	×	Reader/ puncher protocol communication.
	NC communication device (Type 1)	Master	×	External I/O equipment must be compatible with NC communication device protocol type 1.
	NC communication device (Type 2)	Master/ slave	×	External I/O equipment must be compatible with NC communication device protocol type 2. Input/output between NCs is available.
Ethernet	NC communication device (Type 2)	Slave	○	External I/O equipment must be compatible with NC communication device protocol type 2. Input/output between NCs is available.
	FTP(S)	Master	○	External I/O equipment must have the FTP(S) server function.
	FTP(S)	Slave	○	External I/O equipment must have the FTP(S) client function.
Memory card		Master	○	Inputs/outputs files, etc. with a memory card connected to the USB port of the operation panel.

This product cannot connect directly to a telecommunication line (including public wireless LAN) for telecommunication carriers (such as mobile communication carriers, fixed-line communication carriers, Internet providers, etc.). When connecting this product to the Internet, always be sure to connect it using a router or similar device.

3.1.3 File Name

The programs, data banks output from NC are normally stored in the I/O equipment under the following file name: In addition, the folder for saving data varies depending on the file type. Refer to “3.6.1 List of data names” for further details.

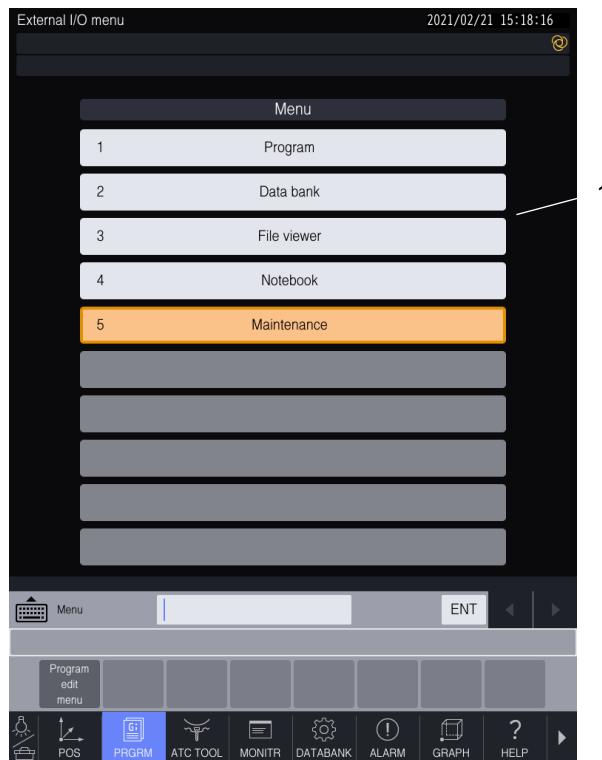
Type	Folder	File name
NC program		O****.NC (NC language) O****.TC (conversation) ****: 4 digits fixed or OXXXX.NC (NC language) OXXXX.TC (conversation language) XXXX: Character string
Conversation program		QM****.NC (NC language) QM****.TC (conversation) ****: 4 digits fixed
NC data	/_DAT	*****.NC (NC language)
Production data	/_PRD	*****.TC (conversation)
Machine status monitor	/_MCM	*****: by file
System configuration data	/_SYS	
PLC program	/_PLC	*****.ldr *****: by file
Sampling and log data	/_LOG	*****.NC (NC language) *****.TC (conversation)
Request code	/_RQC	*****: by file
File viewer	/_ACCESSORY/_VIEWER	XXXX.PNG XXXX: Character string (Extension varies depending on the input file)
Screenshots	/_ACCESSORY/_VIEWER /_CAPTURE	yyyymmdd_nnnn.PNG yyyy: Year, mm: Month, dd: Day nnnn: Sequence number (0000 to 9999)
Notebook	/_ACCESSORY/_MEMO	MEMOn.PNG n: Numerical value

3.2 Master Station Communication

3.2.1 Screen

3.2.1.1 External program I/O menu

1. Display <Program edit menu> screen.
Press [EDIT] key.
2. Display <External program I/O menu> screen.
Press the <External I/O> key.
3. Select input/output data.



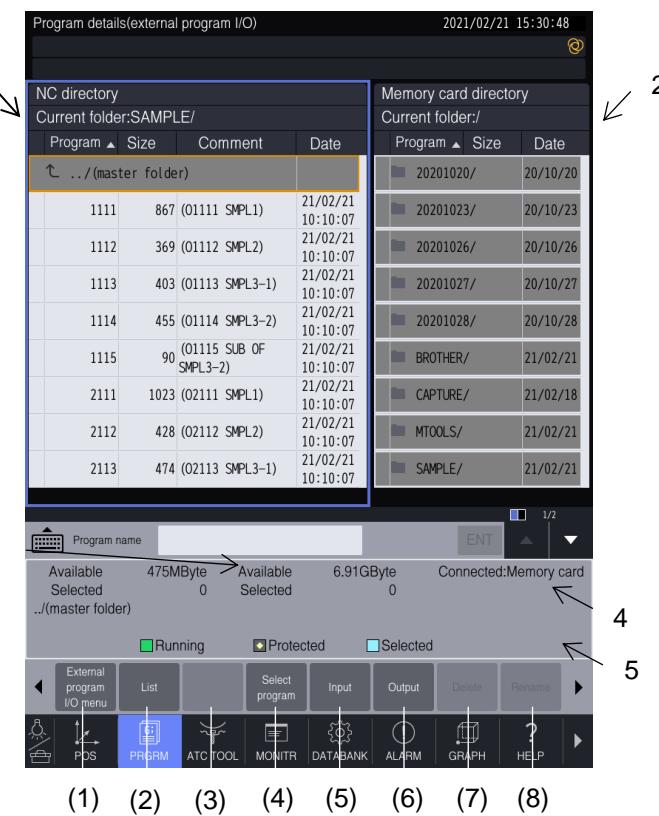
3

Description of external I/O menu screen

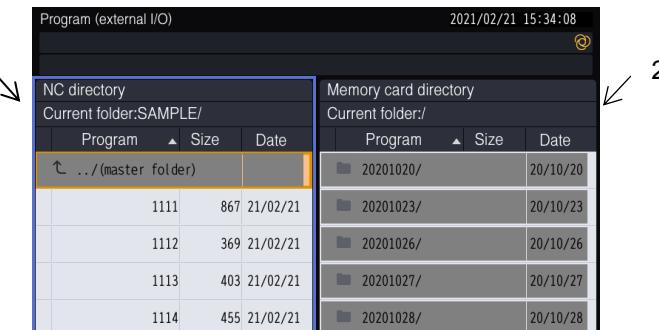
Position	Name	Description
1	Menu list	<p>This screen shows the external I/O menu.</p> <p><Program></p> <p>The user can input, output and delete programs and sub folders between the NC and the connecting devices.</p> <p><Data bank></p> <p>The user can input, output and delete data banks between the NC and the connecting devices.</p> <p><File viewer></p> <p>The user can input, output and delete files between the NC and the connecting devices with the file viewer.</p> <p><Notebook></p> <p>The user can output and delete files between the NC and the connecting devices with the notebook.</p> <p><Maintenance></p> <p>The user can maintain and transfer data. Refer to “3.4 Maintenance communication” for further details.</p>

3.2.1.2 Program (External program I/O)

<Program details (external program I/O)> screen...when the <Details> key is pressed



<Program (external I/O)> screen...when the <List> key is pressed



1. Description of screen display

Position	Name	Description
1	NC directory	Displays a list of the programs and sub folders in this machine. The location of the current folder in the directory is displayed.
2	Connecting directory	<p>Displays information about the connecting directory.</p> <p><Memory card directory></p> <p>Displays a list of programs and sub folders.</p> <p>The size that is displayed even for the same program varies because the saving format for data in the NC directory is different.</p> <p>When the sub folder name is long, it is abbreviated.</p> <p>The current folder's location in the directory for the connecting device is shown in the lower half.</p> <p><Gen. COMM dir.></p> <p>Information for the connecting directory cannot be displayed.</p> <p><NC COMM directory></p> <p>Displays only the program list. In the NC language, the programs without the data name "Opppp" ("pppp" is the program number) do not display.</p> <p><FTP(S) server side></p> <p>Displays a list of programs and sub folders.</p> <p>The size that is displayed even for the same program varies because the saving format for data in the NC directory is different.</p> <p>When the sub folder name is long, it is abbreviated.</p> <p>The current folder's location in the directory for the connecting device is shown in the lower half.</p>
3	Available memory and selections	Displays the amount of system memory available (bytes) and the total number of programs selected from the program list. The left side shows the NC directory data and the right side shows the connecting directory data. However, the amount of system memory available in the connecting directory is only displayed when the connecting device is a <Memory card>.
4	Connected	Displays the currently connected device (directory).
5	Program unit	Indicates a program with a different unit system than the unit system for the current selection. This is only displayed in conversation language mode. I: Program using inches when the unit system is in meters M: Program using meters when the unit system is in inches

2. Description of screen operation

(1) Operations when connected to a general communication device

Column	Position	Label	Description
1	(1)	<External program I/O menu>	Goes back to the external program I/O menu screen.
	(2)	<Details>/<List>	Changes the display. <Details>: Displays comments or the time of the last update. <List>: Displays many programs on a screen.
	(3)		
	(4)	<Select program>	The user can select multiple programs or folders to perform an operation.
	(5)	<Input>	Inputs the program into the NC from the connecting device. When the [DATA PROTECTION] switch is set to " " (enable) to perform an operation, the program is checked and verified.
	(6)	<Output>	Outputs the program to the connecting device from the NC.
	(7)	<Input all programs>	Use this key to input all the programs (that were output using the 'Output all programs' operation).

Column	Position	Label	Description
2	(8)	<Output all programs>	Outputs all the programs from the current folder in the NC directory. Folders cannot be output.
	(1)	<External program I/O menu>	Goes back to the external program I/O menu screen.
	(2)	<Create folder>	Creates a new folder in the NC directory.
	(3)	<Change connection device>	Selects the connecting destination.
	(4)	<Parameter>	Changes the communication parameter.
	(5)	<Input all>	Takes the program file from the connecting directory and identifies each program in the file and inputs each accordingly.
	(6)		
	(7)		
	(8)	<Sort>	Sorts the programs according to the time of the last update, the program or the comments. Data can be sorted in ascending and descending order. When the programs or the comments are selected for sorting, the folders are sorted in alphabetical order (A – Z).

(2) Operations when connected to an NC device, memory card or FTP(S) server

Column	Position	Label	Description
1	(1)	<External program I/O menu>	Goes back to the external program I/O menu screen.
	(2)	<Details>/<List>	Changes the program display. <Details>: Displays comments or the time of the last update. <List>: Displays many programs on one screen.
	(3)		
	(4)	<Select program>	The user can select multiple programs or folders to perform an operation.
	(5)	<Input>	Inputs the folder or program into the NC directory from the connecting directory. When the [DATA PROTECTION] switch is set to “ ” (enable) to perform an operation, the program is checked and verified.
	(6)	<Output>	Outputs the folder or program to the connecting directory from the NC directory.
	(7)	<Delete>	Deletes the folder or program specified in the connecting directory.
	(8)	<Rename>	Renames the folder or the program specified in the connecting directory. When the connection is set to an NC device, this key cannot be selected.
2	(1)	<External program I/O menu>	Goes back to the external program I/O menu screen.
	(2)	<Create folder>	Creates a new folder.
	(3)	<Change connection device>	Selects the connecting destination.
	(4)	<Parameter>	Changes the communication parameter.
	(5)	<Input all>	Takes the program file from the connecting directory, identifies each program in the file and inputs each accordingly.

Column	Position	Label	Description
	(6)	<Display all files / Display NC exclusive file>	This key is valid when the connecting destination is set to <Memory card> / <FTP(S) server>. Display all files: Displays all files for the connecting destination. Display NC exclusive file: Displays only the files for the program specified in the connecting destination. When the file name is long, the display is abbreviated and an underscore symbol “_” is inserted in the middle of the name.
	(7)	<Latest directory>	Updates the list of programs and folders in the connecting directory.
	(8)	<Sort>	Sorts the programs according to the time of the last update, the program or the comments. Data can be sorted in ascending and descending order. When the programs or the comments are selected for sorting, the folders are sorted in alphabetical order (A – Z).

(NOTE 1) The operations <Input all> and <Display all files / Display NC exclusive file> are only valid when using NC language.

(NOTE 2) Use the “latest directory” operation when displaying the program list from a connecting device. However, this is not valid when connected to a <General COMM device>.

(NOTE 3) If the cursor is positioned at a folder on the <Program (external program I/O)> screen, the folder changes when the [ENT] key is pressed. (NC directory, memory card directory and FTP(S) server directory)

(NOTE 4) The program list on a connecting directory can display up to 4096 items (sub folders and programs), and anything that exceeds that maximum will not display.

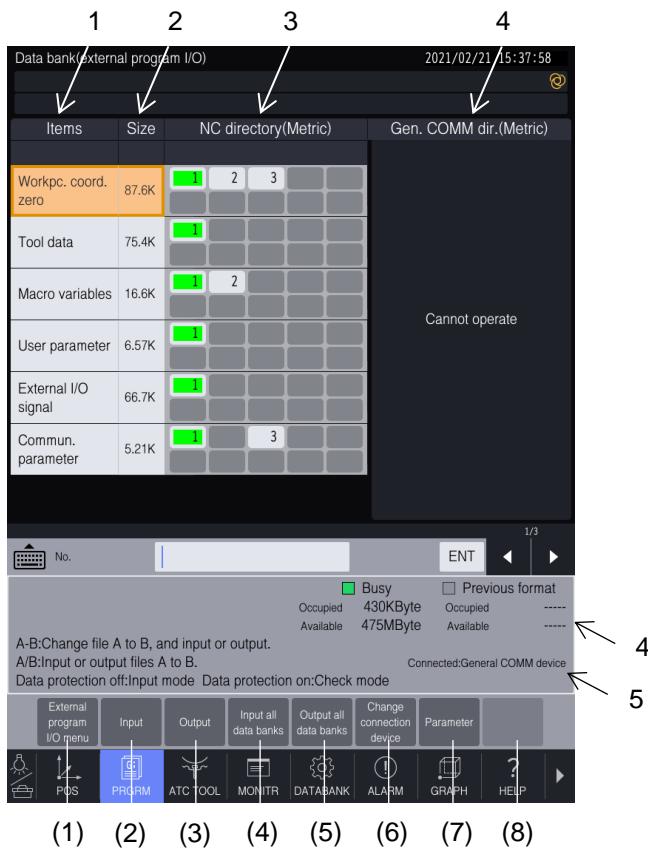
(3) Description of NC directory and connecting directories

- The user can tap on the program name, size or data in the title section to change back and forth between ascending and descending order.
- The user can tap on a program to select it.
- Tap on a folder to move and go inside that folder.
- An item can be selected with the [CURSOR] keys (up and down).
- After a folder is selected and the [ENT] key is pressed, the focus moves to inside that folder.

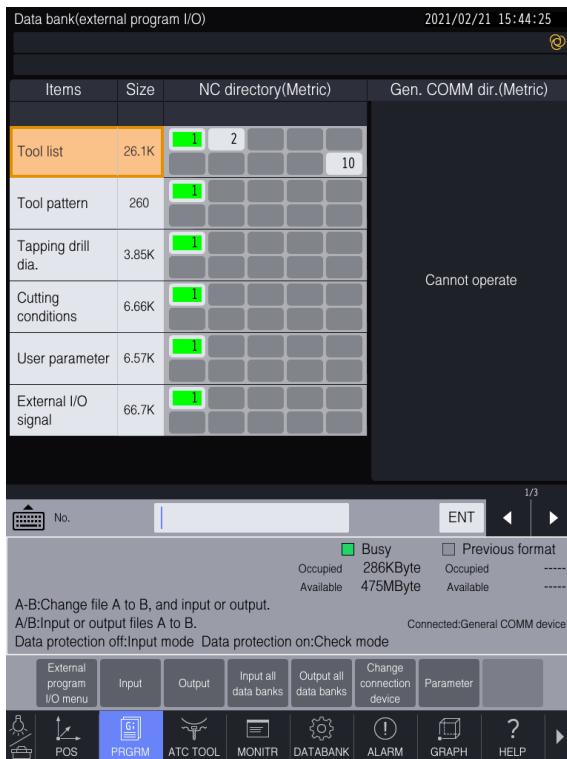
3.2.1.3 Data bank (external program I/O)

NC language mode

3



Conversation mode



1. Description of screen display

Position	Name	Description
1	Item	Displays the type of data bank. The items that can be input and output change depending on the connecting directory.
2	Size	Displays the total capacity (bytes) of each data bank in the NC directory.
3	NC directory	Displays the registration status of each data bank in the NC directory. The data bank number being used is displayed in green. Data banks in an old format are displayed in gray.
4	Connecting directory	Displays information about the connecting directory. <Memory card directory> Displays a list of data banks in the connected media's directory (memory card). The current folder's location in the directory for the connecting device is shown in the lower half. Numbers for data banks using an old format or a different minimum unit setting are displayed in gray. <Gen. COMM dir.> Information for the connecting directory cannot be displayed. <NC COMM directory> Displays a list of data banks in the connected media's directory (NC communication device). Numbers for data banks using an old format or a different minimum unit setting are displayed in gray. <FTP(S) server side> Displays a list of data banks in the connected media's directory (FTP(S) server). The current folder's location in the directory for the connecting device is shown in the lower half. Numbers for data banks using an old format or a different minimum unit setting are displayed in gray.
5	Total used and available memory	Displays the total capacity of all the data banks (bytes) and the available system memory (bytes). The left side shows the NC directory data and the right side shows the connecting directory data. However, the amount of system memory available in the connecting directory is only displayed when the connecting device is a <Memory card>.
6	Connected	Displays the currently connected device (directory). Refer to "3.2.5 Change connection device" for details on how to change settings.

Data bank items

NC language mode

Item (Input/Output file)	Notes
Workpiece coordinate zero	Meter/Inch
Tool data	Meter/Inch
Macro variables	Meter/Inch
G/M code macro	
User parameter	Meter/Inch
External I/O signal	
Commun. parameter	
Field network parameter	
Machine parameter	Only one
Special setting	
Load monitor	
ATC tool data	Only one
PLC program	Only one
Auto thermal distortion compensation (Not displayed when connected to <General COMM device>)	Only one Meter/Inch for output only

Conversation mode

Item (Input/Output file)	Notes
Tool list	Meter/Inch
Tool pattern	Meter/Inch
Tapping drill dia.	Meter/Inch
Cutting conditions	Meter/Inch
User parameter	Meter/Inch
External I/O signal	
Commun. parameter	
Field network parameter	
Machine parameter	Only one
Special setting	
ATC tool data	Only one
PLC program	Only one
Auto thermal distortion compensation (Not displayed when connected to <General COMM device>)	Only one Meter/Inch for output only

Up to 10 data bank files can be displayed for the data banks that correspond to the current unit system. However, there is 1 file for the auto thermal distortion compensation. There is 1 file for the machine parameters and the ATC tool data for both meters and inches. The PLC programs are registered to 1 project.

In addition, the PLC program cannot be transmitted when connected to a <General COMM device> or an <NC COMM device>. (Items and data numbers are displayed, but the input and output functions are not shown.)

2. Description of screen operation

(1) Operations when connected to a general communication device

Column	Position	Label	Description
1	(1)	<External program I/O menu>	Goes back to the external program I/O menu screen.
	(2)	<Input>	Inputs data banks into the NC directory (internally in the machine) from the connecting directory. When the [DATA PROTECTION] switch is set to “ ” (enable) to perform an operation, the data bank is checked and verified.
	(3)	<Output>	Outputs the data banks to the connecting directory from the NC directory (internally in the machine).
	(4)	<Input all data banks>	Inputs all the data banks into the NC directory (internally in the machine) from the current folder in the connecting directory.
	(5)	<Output all data banks>	Outputs all data banks to the connecting directory.
	(6)	<Change connection device>	Selects the connecting device or directory for communication. Refer to “3.2.5 Change connection device” for further details.
	(7)	<Parameter>	Changes the communication parameter.
	(8)		

(2) Operations when connected to an NC device, memory card or FTP(S) server

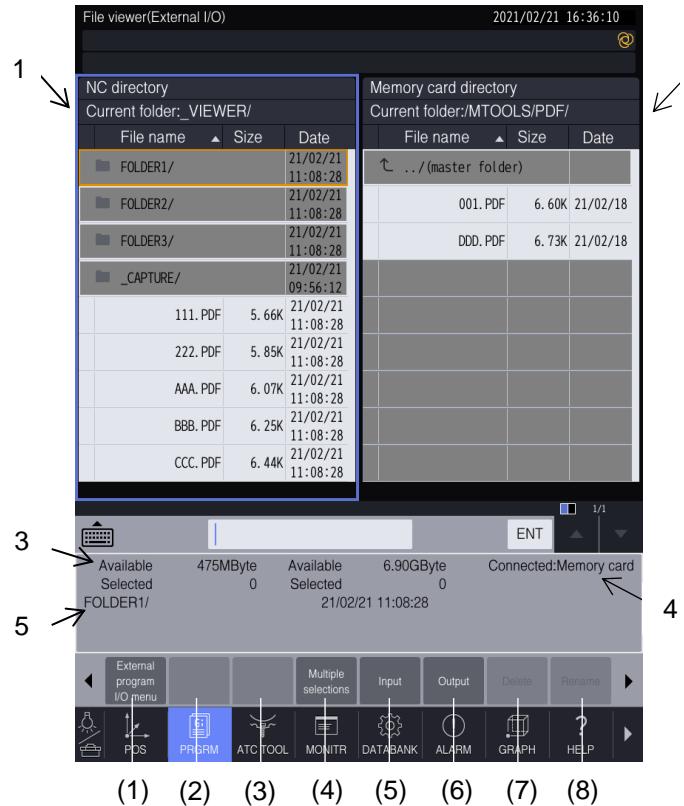
Column	Position	Label	Description
1	(1)	<External program I/O menu>	Goes back to the external program I/O menu screen.
	(2)	<Input>	Inputs data banks into the NC directory (internally in the machine) from the connecting directory. When the [DATA PROTECTION] switch is set to “ ” (enable) to perform an operation, the data bank is checked and verified.
	(3)	<Output>	Outputs the data banks to the connecting directory from the NC directory (internally in the machine).
	(4)	<Input all data banks>	Inputs all the data banks into the NC directory (internally in the machine) from the current folder in the connecting directory.
	(5)	<Output all data banks>	Outputs all data banks to the connecting directory.
	(6)	<Folder operation>	The user can perform folder operations where data banks are saved in the connecting directory. <Latest directory> is displayed at this key location when connected to an NC device.
	(7)	<Delete>	Deletes data banks in the current folder of the connecting directory.
	(8)	<Delete all data banks>	Deletes all data banks for the current unit system and language that are in the current folder of the connecting directory.
2	(1)	<External program I/O menu>	Goes back to the external program I/O menu screen.
	(2)	<Change connection device>	Selects the connecting destination. Refer to “3.2.5 Change connection device” for further details.
	(3)	<Parameter>	Changes the communication parameter.
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

(NOTE) Press the function key <Latest directory> or <Folder operation> to request the latest directory information when displaying a list of data banks from the connecting directory. However, these are not valid when the connected to a <General COMM device>.

(3) Description of NC directory and connecting directories

- The user can tap on a data number to select it.

3.2.1.4 File viewer (External I/O)



Description of screen display

Position	Name	Description
1	NC directory	Displays a list of document/image files and sub folders in this machine. The location of the current folder in the directory is displayed. All files are displayed with their extensions.
2	Connecting directory	Displays information about the connecting directory. <Memory card directory>/<FTP(S) server directory> Displays a list of files and sub folders. The size that is displayed even for the same file varies because the saving format for data in the NC directory is different. When the sub folder or file name is long, it is abbreviated. The current folder's location in the directory for the connecting device is shown in the lower half.
3	Available memory and selections	Displays the amount of system memory available (bytes) and the total number of files selected from the file list. The left side shows the NC directory data and the right side shows the connecting directory data. However, the amount of system memory available in the connecting directory is only displayed when the connecting device is a <Memory card>.
4	Connected	Displays the currently connected device (directory).
5	File information	Displays the file name, the size and the date. When the file name is long, the file format is kept and the display is abbreviated.

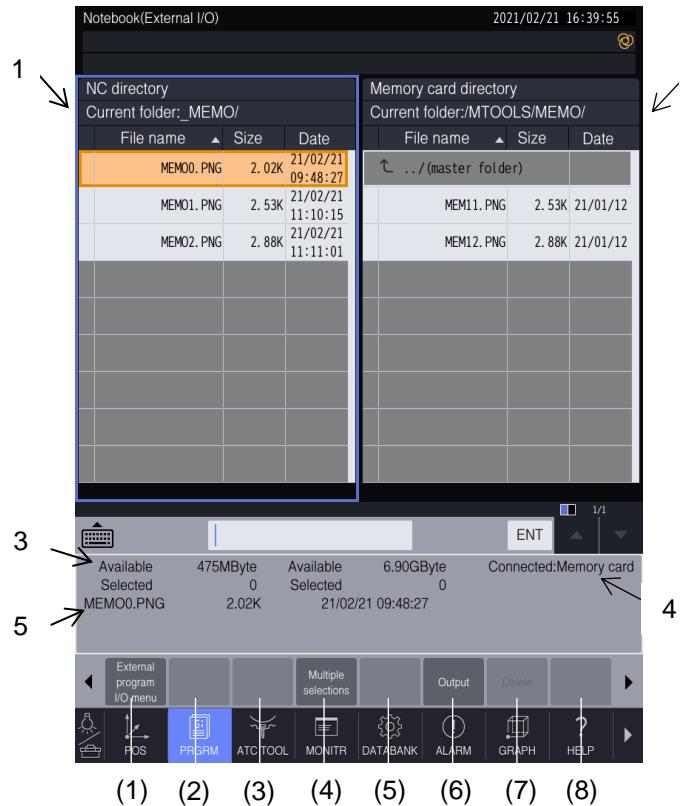
Description of screen operation

Column	Position	Label	Description
1	(1)	<External I/O menu>	Goes back to the external I/O menu screen.
	(2)		
	(3)		
	(4)	<Multiple selections>	The user can select multiple files or folders to perform an operation.
	(5)	<Input>	Inputs the folder or file into the NC directory from the <u>connecting directory</u> .
	(6)	<Output>	Outputs the file or folder to the connecting directory from the NC directory.
	(7)	<Delete>	Deletes the file or folder specified in the connecting directory.
	(8)	<Rename>	Renames the file or folder specified in the connecting directory.
2	(1)	<External I/O menu>	Goes back to the external I/O menu screen.
	(2)	<Create folder>	Creates a new folder.
	(3)	<Change connection device>	Selects the connecting destination. Refer to “3.2.5 Change connection device” for further details.
	(4)	<Parameter>	Changes the communication parameter.
	(5)		
	(6)		
	(7)	<Latest directory>	Updates the list of files and folders in the connecting directory.
	(8)	<Sort>	Sorts the files according to the time of the last update or by the file name. Data can be sorted in ascending and descending order. When the file name is selected for sorting, the folders are sorted in alphabetical order (A to Z).

- (NOTE 1) The connecting directory cannot be set to a general communications device or NC communication device. Only the <Change connection device> and the <External I/O menu> keys can be selected when changing to this screen while connected to a general communications device (or an NC communication device).
- (NOTE 2) Use the “latest directory” operation when displaying the file list from a connecting device.
- (NOTE 3) If the cursor is positioned at a folder on the <File viewer (External input/output)> screen, the folder changes when the [ENT] key is pressed. (NC directory, memory card directory and FTP(S) server directory)
- (NOTE 4) The file list on a connecting directory can display up to 4096 items (sub folders and files), and anything that exceeds that maximum will not display.

3.2.1.5 Notebook (External input/output)

3



Description of screen display

Position	Name	Description
1	NC directory	Displays a list of notebook files and sub folders in this machine. The location of the current folder in the directory is displayed. All files are displayed with their extensions.
2	Connecting directory	Displays information about the connecting directory. <Memory card directory>/<FTP(S) server directory> Displays a list of files and sub folders. The size that is displayed even for the same file varies because the saving format for data in the NC directory is different. When the sub folder or file name is long, it is abbreviated. The current folder's location in the directory for the connecting device is shown in the lower half.
3	Available memory and selections	Displays the amount of system memory available (bytes) and the total number of files selected from the file list. The left side shows the NC directory data and the right side shows the connecting directory data. However, the amount of system memory available in the connecting directory is only displayed when the connecting device is a <Memory card>.
4	Connected	Displays the currently connected device (directory).
5	File information	Displays the file name, the size and the date. When the file name is long, the file format is kept and the display is abbreviated.

Description of screen operation

Column	Position	Label	Description
1	(1)	<External I/O menu>	Goes back to the external I/O menu screen.
	(2)		
	(3)		
	(4)	<Multiple selections>	The user can select multiple files to perform an operation.
	(5)		
	(6)	<Output>	Outputs the file or folder to the connecting directory from the NC directory.
	(7)	<Delete>	Deletes the file or folder specified in the connecting directory.
	(8)		
2	(1)	<External I/O menu>	Goes back to the external I/O menu screen.
	(2)		
	(3)	<Change connection device>	Selects the connecting destination. Refer to “3.2.5 Change connection device” for further details.
	(4)	<Parameter>	Changes the communication parameter.
	(5)		
	(6)		
	(7)	<Latest directory>	Updates the list of files and folders in the connecting directory.
	(8)	<Sort>	Sorts according to the file name and date. Data can be sorted in ascending and descending order.

- (NOTE 1) The connecting directory cannot be set to a general communications device or NC communication device. Only the <Change connection device> and the <External I/O menu> keys can be selected when changing to this screen while connected to a general communications device (or an NC communication device).
- (NOTE 2) Use the “latest directory” operation when displaying the file list from a connecting device.
- (NOTE 3) If the cursor is positioned at a folder on the <Notebook (External input/output)> screen, the folder changes when the [ENT] key is pressed. (NC directory, memory card directory and FTP(S) server directory)
- (NOTE 4) The file list on a connecting directory can display up to 4096 items (sub folders and files), and anything that exceeds that maximum will not display.

3.2.2 Program Operations

3.2.2.1 Input operation

The user can take a folder or program selected in the connecting directory and input it into the NC directory (in this machine).

Before performing an operation, set the [DATA PROTECTION] switch to “O” (disable).

In the following situations, an operator message appears and the input cannot be carried out.

Conditions	Operator messages
When a folder is input and the folder name is not permitted or valid in the NC directory.	<<This is a folder name that cannot be input.>>
When a folder is input and the current folder in the NC directory is the third level in the directory (counting from the root folder).	<<No folder can enter the current folder position.>>
When a folder is input into the NC directory and the folder selected in the connecting directory becomes a sub folder beyond the third level in the directory (counting from the root folder). The input operation is carried out when the sub folder does not exceed the third level in the directory.	<<There was a subfolder unable to input.>>
When a folder is input from the connecting directory and the selected folder has a sub folder with a name that is not permitted or valid in the NC directory. The input operation is carried out when the sub folder name is permitted or valid.	<<This is a folder name that cannot be input.>>

Conditions	Operator messages
When a file is input and the file name is not permitted or valid in the NC directory (Refer to “1.2.2 Program file names” for details about file names that cannot be used.)	<<Input data error>>

How to input a program or folder

When not connected to a <General COMM device>, the user can input a program or folder using the following procedure.

When connected to a <General COMM device>, follow the instructions in “How to use the data input field to input”.

Use the tap operation or cursor to select a program and/or folder in the connecting directory, and then press the <Input> key.

3

If the name that is set already exists in the NC directory, a message will appear to confirm whether to overwrite the data or not. Press the <Yes> key to overwrite, and press the <No> key to cancel overwriting.

When multiple programs are input, after pressing the <Input all remaining> key, all remaining programs are overwritten. Press the <Cancel> key to cancel the operation.

(NOTE) When the input source is specified in the data input field, that program (specified in the data input field) becomes the input source and not the program specified by the tap operation or with the cursor.

How to use the data input field to input

The user can enter data into the data input field and press the <Input> key to input the specified program.

Input example	Input operation			Notes
	Connecting directory	→	NC directory	
1234-5678	1234	→	5678	

If you do not want to change the name, then input without specifying the input destination.

Input example	Input operation			Notes
	Connecting directory	→	NC directory	
1234	1234	→	1234	
PROG001	PROG001	→	PROG001	

When [-] is used to specify a name change, it can only be used with numerical values.

- When a character string other than numbers is used
- When more than one [-] is used

In the two aforementioned cases, the input source and input destination (that is separated by the [-] symbol) cannot be identified correctly. Therefore, all the data in the data input field is processed as the input source and the name of the input source is input.

Input example	Input operation			Notes
	Connecting directory	→	NC directory	
1234--5678	1234--5678	→	1234--5678	
PROG001-1234	PROG001-1234	→	PROG001-1234	
1234-PROG001	1234-PROG001	→	1234-PROG001	

When not connected to a <General COMM device>, multiple file names can be specified with a space, and consecutive programs can be specified using a slash (/).

Input example	Input operation		Notes
	Connecting directory	NC directory	
1234 PROG001	1234, PROG001	→	1234, PROG001
1000/1999	All programs from 1000 to 1999	→	All programs from 1000 to 1999

(NOTE 1) When using the NC language and connected to a <General COMM device>, the user can start input without having to specify the program number for inputting. When the <Input> key is pressed without entering a number, then the first block number in the program becomes the program number for input. If there is no program number for the first block, then the user will be prompted to enter a program number or program name.

(NOTE 2) When using the NC language, the user can input a program file from the connecting directory, which will then identify each program and input each accordingly.

- General communication device
When the <Input all> key is pressed, a tape program is separated into multiple programs.
- Other devices (not a general communication device)
When an input file is selected and the <Input all> key is pressed, the programs included in the file are separated into multiple programs. When using the input all function, only one file can be specified.

The method used when separating between programs depends on the communication parameter setting <Program batch input system>.

Setting for <Program batch input system>	Separating method
Type 1	Programs are separated using M02, M30 and M99. Programs with data after the M02, M30 and M99 blocks or programs without M02, M30 or M99 commands will not be identified and separated properly.
Type 2	Programs are separated using the program number (O****). If there is no program number at the beginning of each block for the programs you wish to separate, the programs will not be identified and separated properly.

(NOTE 3) When using the NC language and connected to a <Memory card> or the <FTP(S) server>, the user can also input other programs (besides programs (*.NC) that are output from this machine).

Press the <Display all files> key. All files in the connected media's directory are displayed with their extensions.

Select the displayed file and press the <Input> key, or enter a name into the data input field, as shown below, and press the <Input> key.

Ex: “1234.TXT” and “1234.TXT--5678”

When a file name is specified that is not permitted or valid on this machine, if the program name for the input destination (1234.TXT--5678) is not specified, then the user will be prompted to enter a program file name. Use the data input field on the bottom of the screen to enter a program number or name, and then press the <Input> key.

The program is saved in the NC directory under the specified program number or name.

The user can use the communication parameter <Add comment of file name> in order to add the source file name as a comment in block 1.

(NOTE 4) In the NC language, a program that includes character strings that are not numerical values cannot be input when connected to a <General COMM device> or an <NC COMM device>.

3.2.2.2 Check operation

Programs and folders can be verified and checked. The operation procedure is the same as the input operation when the input destination is verified and checked.

Before performing an operation, set the [DATA PROTECTION] switch to “|” (enable).

In the conversation language, a check cannot be carried out between a scheduled program and a program.

If the programs are checked and both have the same content, the expression <Check OK> is displayed in the instructions area.

When there is a program that does not match while multiple programs are being checked, the message <Check error> appears in the instructions area and the verification check is cancelled during the checking process.

3

In the following situations, an operator message appears and the check cannot be carried out.

Conditions	Operator messages
When a folder is checked and the folder name from the connecting directory is not permitted or valid in the NC directory	<<This is a folder name that cannot be checked.>>
When a folder is checked and the sub folder in the connecting directory does not exist in the NC directory	<<Required data not found>>

(NOTE) In the NC language, a program that includes character strings that are not numerical values cannot be checked when connected to a <General COMM device> or an <NC COMM device>.

3.2.2.3 Output operation

The user can output the specified folder or program to a connecting directory from the NC directory (internally in this machine).

How to output a program or folder

Use the tap operation or cursor to select a program and/or folder in the NC directory, and then press the <Output> key.

If the name that is set already exists in the connecting directory, a message will appear to confirm whether to overwrite the data or not.

Press the <Yes> key to overwrite, and press the <No> key to cancel overwriting.

When multiple programs are output, after pressing the <Delete all remaining> key, all remaining programs are overwritten. Press the <Cancel> key to cancel the operation.

(NOTE 1) When the output source is specified in the data input field, that program (specified in the data input field) becomes the output source and not the program specified by the tap operation or with the cursor.

(NOTE 2) In the NC language, a program that includes character strings that are not numerical values cannot be output when connected to a <General COMM device> or an <NC COMM device>.

How to use the data input field to output

The user can enter data into the data input field and press the <Output> key to output the specified program.

Input example	Output operation			Notes
	NC directory	→	Connecting directory	
1234-5678	1234	→	5678	

If you do not want to change the name, then output without specifying the output destination.

Input example	Output operation			Notes
	NC directory	→	Connecting directory	
1234	1234	→	1234	
PROG001	PROG001	→	PROG001	

When [-] is used to specify a name change, it can only be used with numerical values.

- When a character string other than numbers is used
- When more than one [-] is used

In the two aforementioned cases, the output source and output destination (that is separated by the [-] symbol) cannot be identified correctly. Therefore, all the data in the data input field is processed as the output source and the name of the output source is output.

Input example	Output operation		Notes
	NC directory	Connecting directory	
1234--5678	1234--5678	→ 1234--5678	
PROG001-1234	PROG001-1234	→ PROG001-1234	
1234-PROG001	1234-PROG001	→ 1234-PROG001	

Multiple file names can be specified with a space, and consecutive programs can be specified using a slash (/). (When connected to a <General COMM device>, an all output operation is carried out)

Input example	Output operation		Notes
	NC directory	Connecting directory	
1234 PROG001	1234,PROG001	→ 1234,PROG001	
1000/1999	All programs from 1000 to 1999	→ All programs from 1000 to 1999	(When not connected to a <General COMM device>)

(NOTE) In the NC language, a program that includes character strings that are not numerical values cannot be output when connected to a <General COMM device> or an <NC COMM device>.

3.2.2.4 Delete operation

The user can delete the folder and/or program specified in the connecting directory.

The user cannot delete when connected to a <General COMM device>.

Select a program or folder in the connecting directory and delete it. The operation procedure is the same as the directory display screen. Refer to “1.4.3.3 Delete operation” for further details.

(NOTE 1) When using the NC language and connected to a <Memory card> or the <FTP(S) server>, the user can also delete other programs (besides programs (*.NC) that are output from this machine).

Press the <Display all files> key.

All files in the connected media’s directory are displayed with their extensions.

Select the a program to delete and press the [Delete] key, or enter a name into the data input field, as shown below, and press the [Delete] key.

Ex: “ABC.TXT”

(NOTE 2) In the NC language, a program that includes character strings that are not numerical values cannot be deleted when connected to an <NC COMM device>.

3.2.2.5 Rename

The user can rename a folder or program in the connecting directory.

A name cannot be changed when connected to a <General COMM device> or an <NC COMM device>.

Select a program or folder in the connecting directory and rename it. The operation procedure is the same as the directory display screen. Refer to “1.4.3.5 Rename operation” for further details.

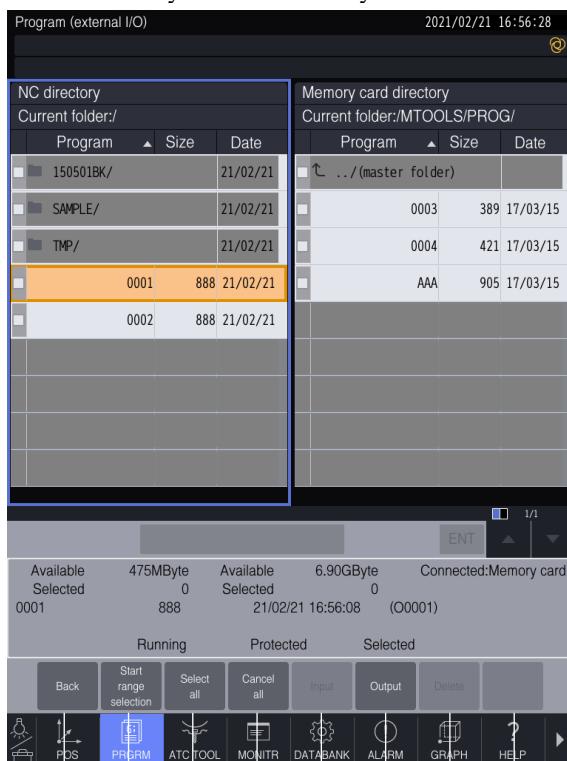
3.2.2.6 Program selection

When the <Select program> key is pressed on the <Program(external program I/O)> screen, the screen below is displayed. Then, the user can select multiple programs and folders and perform an operation.

The user can tick checkboxes in the NC directory or connecting directory to select multiple programs or folders.

The user cannot select from both the NC directory and a connecting directory at the same time. When programs or folders are selected in the either the NC directory or a connecting directory, the selections in the other directory are automatically deselected.

3



(1) (2) (3) (4) (5) (6) (7) (8)

Description of function key operations

Column	Position	Label	Description
1	(1)	<Back>	Goes back to the <Program (external I/O)> screen.
	(2)	<Start / End selection>	Specifies a range to select multiple programs or folders. Move the cursor to the start position for selecting the program or folder range and press the set key. Then, move the cursor to the last program or folder in the range, and press the set key again.
	(3)	<Select all>	Selects all the programs and folders.
	(4)	<Deselect all>	Deselects all the programs or folders.
	(5)	<Input>	Same as the <Program (external I/O)> screen.
	(6)	<Output>	Same as the <Program (external I/O)> screen.
	(7)	<Delete>	Same as the <Program (external I/O)> screen.
	(8)		

3.2.3 Data Bank Operation

3.2.3.1 Input operation

The user can input a data bank into the NC directory (internally in the machine) from a connecting directory. The data is input into the NC directory from the current folder of the connecting directory.

Before performing an operation, set the [DATA PROTECTION] switch to “O” (disable).

To input all data banks from a connecting directory, press the <Input all data banks> key. All data banks for the current unit system and language that are in the current folder of the connecting directory are input into the NC directory (into this machine).

How to input a data bank

Select a data bank number in the connecting directory by tapping it, and then press the <Input> key.

If the data bank number that is selected already exists in the NC directory, a message will appear to confirm whether to overwrite the data or not. Press the <Yes> key to overwrite, and press the <No> key to cancel overwriting.

When multiple data bank numbers are input, after pressing the <Input all remaining> key, all remaining data bank numbers are overwritten. Press the <Cancel> key to cancel the operation.

(NOTE) When the input source is specified in the data input field, that number (specified in the data input field) becomes the input source and not the number specified by the tap operation.

How to use the data input field to input

The user can enter data into the data input field and press the <Input> key to input the specified data bank number.

Input example	Input operation	
	Connecting directory	NC directory
1	1	→ 1
1-5	1	→ 5
1/10	All data banks from 1 to 10	→ All data banks from 1 to 10
1 3 5	1, 3 and 5	→ 1, 3 and 5

(NOTE 1) The auto thermal distortion compensation cannot be input.

(NOTE 2) Only one machine parameter file can be saved in the NC directory (in this machine).

(NOTE 3) Data bank No. 1 can only be used with the ATC tool data and PLC programs.

(NOTE 4) All control programs are input including the project for the connecting directory when the PLC program is input.

(NOTE 5) After the user performs a data input operation for the PLC system, the data is transferred the next time the [RST] key is pressed or the next time the power is turned ON.

Refer to “Chapter 3 Built-in PLC” in the PLC System Manual for details about alarms that may trigger during data input.

(NOTE 6) When an attempt is made to input a PLC program after a version update but before the power is turned OFF, the alarm <<PLC program is being input>> is triggered and the input operation is not possible.

3.2.3.2 Check operation

The check and verification is carried out for data banks. The operation procedure is the same as the input operation when the input destination is verified and checked.

Before performing an operation, set the [DATA PROTECTION] switch to “|” (enable).

(NOTE) Even if the <DATA PROTECTION> key is enabled for a PLC program, the alarm <<Data is write-protected.>> is triggered and the verification check is not carried out. Note that there is no alarm and the verification check is skipped when inputting all data banks.

3.2.3.3 Output operation

The user can output the data banks to the connecting directory from the NC directory (internally in the machine).

The data is output to the current folder in the connecting directory from the NC directory.

To output all data banks from the NC directory, press the <Output all data banks> key. All data banks for the current unit system and language that are in the NC directory (in this machine) are output into the current folder of the connecting directory.

How to output a data bank

Select a data bank number in the NC directory by tapping it, and then press the <Output> key. If the data bank number that is selected already exists in the connecting directory, a message will appear to confirm whether to overwrite the data or not.

Press the <Yes> key to overwrite, and press the <No> key to cancel overwriting.

When multiple data bank numbers are output, after pressing the <Delete all remaining> key, all remaining data bank numbers are overwritten. Press the <Cancel> key to cancel the operation.

3

(NOTE) When the output source is specified in the data input field, that number (specified in the data input field) becomes the output source and not the number specified by the tap operation.

How to use the data input field to output

The user can enter data into the data input field and press the <Output> key to output the specified data bank number.

Input example	Output operation	
	NC directory	Connecting directory
1	1	→ 1
1-5	1	→ 5
1/10	All data banks from 1 to 10	→ All data banks from 1 to 10
1 3 5	1, 3 and 5	→ 1, 3 and 5

(NOTE) The user can output the workpiece coordinate zero, tool data and macro variables in a type 1 format on a machine that uses the type 2 for the minimum unit setting.

Specify the data bank number and insert “B” before the number.

Ex: When outputting No. 1 for the workpiece coordinate zero in a type 1 format...

Move the cursor to the workpiece coordinate zero, enter “B1” into the data input field and press the <Output> key.

(NOTE 1) The data bank number does not need to be specified for the auto thermal distortion compensation.

(NOTE 2) Data bank No. 1 can only be used with the ATC tool data and PLC programs.

(NOTE 3) Multiple control programs are output as 1 project for the PLC program output. Refer to “3.2.3.5 Input/Output of records (User parameters, machine parameters and PLC programs)” when specifying each control program to output.

3.2.3.4 Delete operation

The user can delete a data bank in the connecting directory. The data banks in the current folder of the connecting directory are deleted.

The user cannot delete when connected to a <General COMM device>.

To delete all data banks from a connecting directory, press the <Delete all data banks> key. All data banks for the current unit system and language that are in the current folder of the connecting directory are deleted.

How to delete

- (1) Perform one of the following operations in the connecting directory to select a data bank number for deletion.
 - Select a data bank number by tapping it, and then press the **[Delete]** key.
- (2) A delete confirmation message is displayed.
Press the <Yes> key to delete, and press the <No> key to cancel deleting.

How to use the data input field to delete

Enter data into the data input field and press the **[Delete]** key to delete the specified number.

Input example	Deletion operation
1	Deletes No. 1.
1/10	Deletes all data banks from No. 1 to No. 10.
1 3 5	Deletes No. 1, No. 3 and No. 5.

3.2.3.5 Input/Output of records (User parameters, machine parameters and PLC programs)

The user can select user parameters and machine parameters and input or output them as records. In addition, the user can select POU (program organization units) and certain data in the PLC program to be output. Input is not possible.

1. Display the <Data bank (external program I/O)> screen.
2. Connect a device to the machine, and check <Connected> on the bottom-right corner of the screen.
Refer to “3.2.5 Change connection device” for details on how to change the connected device.
3. Display the directory list for the connected device. (*When not connected to a <General COMM device>)
 - NC COMM device
Press the <Latest directory> key.
 - Memory card and FTP(S) server
Press the <Operate folder> key, and then press the <Latest directory> key.
4. Specify the data bank for input and output.
Move the cursor to the data bank for the input/output.
5. Specify the data bank number and record number for input or output.
Enter the data bank number in the data input field on the bottom of the screen.

Input example	Communication operation
1.1	Inputs the 1st record for data bank number 1.
1.1/3	Inputs the 1st through 3rd records for data bank number 1.
1.1 3 5 (Space inserted as delimiter)	Inputs the 1st, 3rd and 5th records for data bank number 1.

- * If a record is specified using “.” and multiple data bank numbers are specified (“-”) and then deleted with (<Delete>), an alarm is triggered.

Record	User parameter	Machine parameter
1	Switch 1	System 1
2	Switch 2	System 2
3	Switch 3	System 3
4	Reference position/Conversation zero point	Pitch error compensation
5	User registered miscellaneous functions	Servo controller
6	Tool breakage detection	Auto. thermal distortion comp.
7	Automatic workpiece measurement / Automatic centering	High accuracy
8	Auto. thermal distortion comp.	PLC
9	Quick table	Special setting
10	High accuracy	
11	PLC	
12	Rotary fixture offset	
13	Rotation axis/tilt axis setting	
14	Power consumption	

Record	PLC program
1	High speed control program No.1
2	High speed control program No.2
~	
10	High speed control program No.10
11	Standard control program No.1
~	
20	Standard control program No.10
21	User defined function
22	System defined function
23	Global OM comment
24	Program execution settings
25	Global variable

When specifying 1 to 20, communication is not carried out if the specified control program is not found.

6. Start the data transfer.
Press the <Input> key or <Output> key.
 - When inputting, only the specified record inputs. All other records are part of the internal data of the machine.
 - When outputting, only the specified record outputs.
7. After the data transfer is complete, it returns to the previous screen.

3.2.3.6 Folder operation

The user can change a folder where data banks are saved in the connecting directory. In addition, the user can <Create>, <Delete> and <Rename> a folder in the connecting directory.
The user cannot perform a folder operation in the connecting directory from the connecting device.

1. Press the <Folder operation> key from the functions listed.
2. After the folder operation is complete, press the <Back> key to go back to the previous screen.



3

(1) Description of screen display

Position	Name	Description
1	NC directory	The user cannot perform an operation here.
2	Connecting directory	<p>Displays information about the connecting directory. <Memory card directory></p> <p>Displays a list of files and folders in the current folder for the connected media's directory (memory card). All files are displayed with their extensions regardless if the directory has been selected or not for communication. For folders, a slash “/” is inserted and displayed at the tail end of the name.</p> <p>When the file or sub folder name is long, it is abbreviated.</p> <p>The current folder's location in the directory for the connecting device is shown in the lower half.</p> <p><Gen. COMM dir.></p> <p>Information for the connecting directory cannot be displayed.</p> <p><NC COMM directory></p> <p>Displays a list of programs in the connected media's directory (NC communication device). No file extension is displayed.</p> <p><FTP(S) server side></p> <p>Displays a list of programs and sub folders in the current folder for the connected media's directory (FTP(S) server). All files are displayed with their extensions regardless if the directory has been selected or not for communication. For folders, a slash “/” is inserted and displayed at the tail end of the name.</p> <p>When the file or sub folder name is long, it is abbreviated.</p> <p>The current folder's location in the directory for the connecting device is shown in the lower half.</p>
3	Connected	Displays the connected media (general communication device, NC communication device, memory card or FTP(S) server) that is currently set. Refer to “3.2.5 Change connection device” for details on how to change settings.

(2) Description of screen operation

Column	Position	Label	Description
1	(1)	<Back>	Goes back to the program (external I/O signal) screen.
	(2)	<Move>	Moves a folder where data banks are saved in the connecting directory.
	(3)	<Create folder>	The user can create a new folder.
	(4)	<Delete>	Deletes the selected folder.
	(5)	<Rename>	Renames the selected folder.
	(6)	<Latest directory>	Updates the list of programs and sub folders. The list of programs is updated when connected to an <NC COMM device>. This key is not valid when connected to a <General COMM device>.
	(7)	<Sort>	Displays the sort screen. The user can select to sort by the date or name (in either ascending or descending order).
	(8)		

3.2.4 File Viewer & Notebook Operations

3.2.4.1 Input operation

The user can take a file selected from the connecting directory and input into the NC directory (internally in the machine).

Before performing an operation, set the [DATA PROTECTION] switch to “O” (disable).

- (NOTE 1) Only for files with the following extensions (PNG/PDF/BMP/JPG /JPEG) can be input and displayed to the connected directory on the <File viewer (External input/output)> screen.
- (NOTE 2) The input operation is not available on the <Notebook (External input/output)> screens.

An operator message appears and the input cannot be carried out in the following situations.

Conditions	Operator message
When a folder is input and the folder name is not permitted or valid in the NC directory.	<<This is a folder name that cannot be input.>>
When a folder is input and the current folder in the NC directory is the third level in the directory (counting from the _VIEWER folder).	<<No folder can enter the current folder position.>>
When a folder is input into the NC directory and the folder selected in the connecting directory becomes a sub folder beyond the third level in the directory (counting from the _VIEWER folder). The input operation is carried out when the sub folder does not exceed the third level in the directory.	<<There was a subfolder unable to input.>>
When a folder is input from the connecting directory and the selected folder has a sub folder with a name that is not permitted or valid in the NC directory. The input operation is carried out when the sub folder name is permitted or valid.	<<This is a folder name that cannot be input.>>
When the input operation is carried out and the file extension is changed at the same time.	<<Input data error>>
When the input destination file is being viewed	<<Data is currently being accessed>>

How to input a file or folder

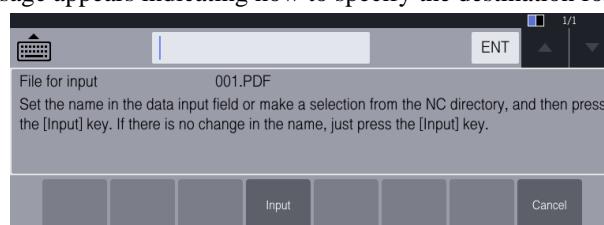
- Use the operation below to input from the connecting directory.
Use the cursor or tap on a file to select it, and then press the <Input> key.

When a folder is selected in (1):

- The folder name used in the connecting device is automatically input.
In order to change the folder name, go to the <Directory display - File viewer> screen to rename it.

When a file is selected in (1):

- A message appears indicating how to specify the destination for inputting.



- Set the name for inputting into the data input field, or make a selection from the NC directory, and press the <Input> key to input the data. If you do not want to change the name, then just press the <Input> key.

If the name that is set already exists in the NC directory, a message will appear to confirm whether to overwrite the data or not. Press the <Yes> key to overwrite, and press the <No> key to cancel overwriting.

When inputting multiple files, after pressing the <Input all remaining> key, all remaining files are overwritten. Press the <Cancel> key to cancel the operation.

(NOTE) When the input source is specified in the data input field, that file (specified in the data input field) becomes the input source and not the file specified using the operation in step (1).

How to use the data input field to input

When using the data input field in the file viewer (external I/O) for input, the rename operation cannot be used at the same time as an input that uses the symbol [-].

Ex: 1234.PNG-5678.PNG

3

The user can enter data into the data input field and press the <Input> key to input the specified file without changing the name.

Input example	Input operation			Notes
	Connecting directory	→	NC directory	
1234.PNG	1234.PNG	→	1234.PNG	
1234.JPG	1234.JPG	→	1234.JPG	
DOC001.PNG	DOC001.PNG	→	DOC001.PNG	

(NOTE) If a file name is specified that is not permitted or valid on this machine, a message appears indicating how to specify the input destination.

3.2.4.2 Check operation

Files can be verified and checked. The operation procedure is the same as the input operation when the input destination is verified and checked.

Before performing an operation, set the [DATA PROTECTION] switch to "Enable".

An operator message appears and the check cannot be carried out in the following situations.

Conditions	Operator message
When a folder is checked and the folder name from the connecting directory is not permitted or valid in the NC directory.	<<This is a folder name that cannot be checked.>>
When a folder is checked and the sub folder in the connecting directory does not exist in the NC directory.	<<Required data not found>>
When the check destination file is being viewed	<<Data is currently being accessed>>

3.2.4.3 Output operation

The user can output the specified file from the NC directory (internally in this machine) to a connecting directory.

An operator message appears and the output cannot be carried out in the following situation.

Conditions	Operator message
When the output operation is carried out and the file extension is changed at the same time.	<<Input data error>>
When the file for output is being viewed	<<Data is currently being accessed>>

How to output a file or folder

(1) Use the operation below to output from the NC directory.

Use the cursor or tap on a file or folder to select it, and then press the <Output> key.

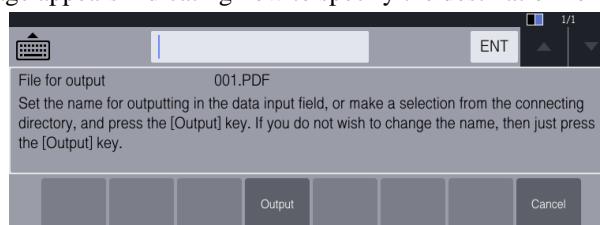
When a folder is selected in (1):

(2) The folder name used in the NC is automatically output.

In order to change the folder name, press the <Rename> key to rename it.

When a file is selected in (1):

(2) A message appears indicating how to specify the destination for outputting.



(3) Set the name for outputting in the data input field, or make a selection from the connecting directory, and press the <Output> key to output the data. If you do not want to change the name, then just press the <Output> key.

If the name that is set already exists in the connecting directory, a message will appear to confirm whether to overwrite the data or not. Press the <Yes> key to overwrite, and press the <No> key to cancel overwriting.

When outputting multiple files, after pressing the <Delete all remaining> key, all remaining files are overwritten. Press the <Cancel> key to cancel the operation.

(NOTE) When the output source is specified in the data input field, that file (specified in the data input field) becomes the output source and not the file specified using the operation in step (1).

How to use the data input field to output

When using the data input field in the file viewer (external I/O) for output, the rename operation cannot be used at the same time as an input that uses the symbol [-].

Ex: 1234.PNG-5678.PNG

The user can enter data into the data input field and press the <Output> key to output the specified file without changing the name.

Input example	Input operation		Notes
	NC directory	Connecting directory	
1234.PNG	1234.PNG	→	1234.PNG
1234.JPG	1234.JPG	→	1234.JPG
DOC001.PNG	DOC001.PNG	→	DOC001.PNG

3.2.4.4 Delete operation

The user can delete the data and/or folder specified in the connecting directory.

Select the file to delete and press the [Delete] key, or enter a name into the data input field, as shown below, and press the [Delete] key.

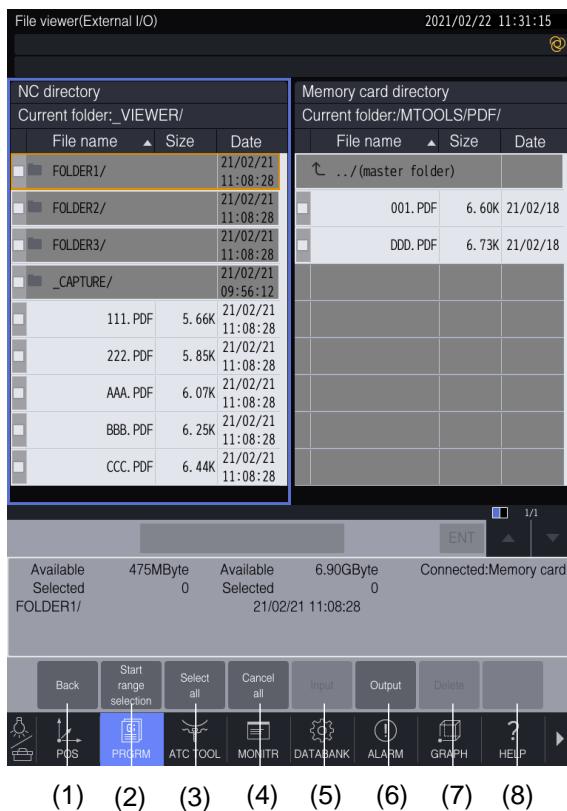
Ex: "ABC.PNG"

3.2.4.5 Multiple selections

When the <Multiple selections> key is pressed on the <File viewer (External input/output)> or <Notebook (External input/output)> screen, the screen below is displayed. Then, the user can select multiple files.

The user can tick checkboxes in the NC directory or connecting directory to select multiple files.

The user cannot select from both the NC directory and a connecting directory at the same time. When files are selected in the either the NC directory or a connecting directory, the selections in the other directory are automatically deselected.



Description of function key operations

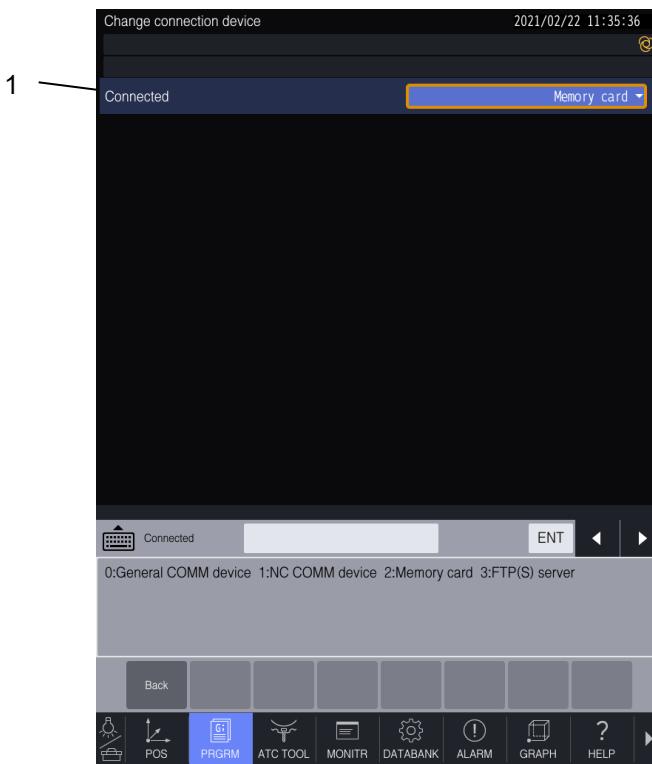
Column	Position	Label	Description
1	(1)	<Back>	Goes back to the <File viewer (External input/output)> or <Notebook (External input/output)> screen.
	(2)	<Start / End selection>	Specifies a range to select multiple files. Move the cursor to the start position for selecting the file or folder range and press the set key. Then, move the cursor to the last file or folder in the range, and press the set key again.
	(3)	<Select all>	Selects all of the files and folders.
	(4)	<Deselect all>	Deselects all of the files and folders.
	(5)	<Input>	Same as the <File viewer (External input/output)> screen. (NOTE) The input operation is not available on the <Notebook (External input/output)> screen.
	(6)	<Output>	Same as the <File viewer (External input/output)> and <Notebook (External input/output)> screens.
	(7)	<Delete>	Same as the <File viewer (External input/output)> and <Notebook (External input/output)> screens.
	(8)		

3.2.5 Change connection device

3.2.5.1 Connection device changing procedure

Specify the connected device correctly before starting master station communication.

1. Press the <Change connection device> key from the functions listed.
2. Specify the device to communicate.



Position	Name	Description
1	Connected	Selects the connecting destination when using master station communication.

Connected	Target device
General COMM device	PTP/PTR communication. Connect to the serial port.
NC COMM device	Communication with FACIT (Protocol type 1) Communication with devices available for command-response type communication (Protocol type 1, 2) Connect to the serial port. <NC COMM device> uses the Brother original communication system. The user must prepare software for the <NC COMM device> side when using communication device other than FACIT.
Memory card	Communication with a memory card. See “3.2.2.2 Memory card” for details.

Connected	Target device
FTP(S) server	<p>Communicates with the FTP(S) server. The NC becomes the FTP client or the FTPS client.</p> <p>Connect the NC to the network, and make arrangements for a network FTP(S) server.</p> <p>Follow the instructions to set the communication parameters: <FTP(S) server name(IP address)>, <FTP(S) server port number>, <User name as client>, <Password as client> and <Security communication for client>, and then connect to the FTP(S) server on the network.</p> <p>Set the <Security communication for client> so it matches the encryption function on the FTP(S) server. If there is no encryption on the FTP(S) server, set the <Security communication for client> to <Disable>. If the FTP(S) server is encrypted in explicit mode, set the <Security communication for client> to <Type 1>. If the FTP(S) server is encrypted in implicit mode, set the <Security communication for client> to <Type 2>.</p>

(NOTE 1) List of programs and data banks of the connected device cannot be displayed and folder operation for the connected device is not available depending on the connected device.

Connected device	Display of lists of connected device	Folder operation for connected device
General COMM device	Display is not available.	Folder operation is not available
NC COMM device	Display is available	Folder operation is not available
Memory card	Display is available.	Folder operation is available
FTP(S) server	Display is available.	Folder operation is available

(NOTE 2) You cannot change the setting during tape operation (including pauses); the alarm <<Tape Operating mode>> occurs.

(NOTE 3) Files and folders existing in the FTP(S) server may not be correctly displayed in the list if the name includes characters other than one-byte alphanumerals. When there is a file on the FTP(S) server that has the same name as the input or output file but the file names differ only in letter case, then the file may not input or output correctly due to the FTP(S) server configuration.

(NOTE 4) A general communication device and NC communication device cannot be selected for the connecting media on the <File viewer (External input/output)> screen and the <Notebook (External input/output)> screen.

(NOTE 5) When logging onto the FTPS server, if there is an error or mismatch in the data for the FTPS server certificate, the alarm <<Connecting server certificate error>> may trigger or the operator message <<Connecting server certificate warning>> may appear depending on the communication parameter (security) <Connecting server certificate warning level>.

3.2.5.2 Memory card

NC has a USB interface for connecting memory cards. By inserting a USB memory or other adapter for USB-based recording media into the USB interface, these devices can be used as an external storage for NC.

Memory card for NC is a generic term for all these external storage devices including USB memory sticks.

- (NOTE 1) The memory card file formats FAT16, FAT32 and exFAT are supported. (number of files to be created, etc. depends on format).
- (NOTE 2) If write protect switch of a memory card is ON, input from the memory card to the machine is possible but output from the machine is impossible.
- (NOTE 3) Security function of memory card must be “released”. The machine may not recognize the memory card.
- (NOTE 4) Removing the memory card while the machine is accessing it may cause the machine to fail to recognize the memory card until the power is turned on again.
- (NOTE 5) The alarm <<Multiple memory cards cannot be connected>> occurs if you connect more than one memory card.
- (NOTE 6) The data cannot be read correctly if you use commercial memory cards without first logically formatting. Use them after logical formatting with the disc format of the machine.

3.2.6 Parameters

Communication parameters are changed.

Settings and parameters of the connected device must be adjusted before starting master station communication.

Refer to “1.7 Communication parameters” in the Data Bank & Alarm Manual for further details on this setting.

1. Press the <Parameter> key from the functions listed.



2. Select the connected device with the function keys.
3. Adjust settings to the communication device.

3.3 Slave Station Communication

3.3.1 Outline

There is various software available, such as communication software (with <NC communication device protocol>), FTP(S) client software, browser software and OPC UA client software, which allows this machine to be used as a slave station in communication. Communication is possible even when the machine is running, subject to some restrictions depending on the type of communication.

- File operation for programs, data banks, etc.
- Operation of the machine

3.3.1.1 Slave station communication from “NC COMM software”

3

Serial port or Ethernet is used.

Software for the master station must be created because a communication system unique to Brother is used.

<Type2> is used in the slave station communication regardless of the <NC communication device protocol (master)> setting. Slave station communication is impossible with <Type1>.

In addition to file operation, operation of the machine can be controlled using commands.

When using Ethernet, commands are transmitted as TCP/IP packet data.

The machine becomes the server, waiting for connection establishment request from the client at the port specified by the communication parameter <Port No.>.

When the communication parameter <Restrict Ethernet access> is set to <1: Yes>, the access becomes restricted. Use a temporary access command.

Even if <Restrict Ethernet access> is set to <1: Yes> when using the serial port, the access does not become restricted.

Refer to the “3.5 Communication protocol” for further details.

3.3.1.2 Slave station communication from FTP(S) client

Ethernet is used. NC is the FTP(S) server.

The master station need not create special software because FTP protocols are used. Use any desired FTP(S) client software.

For FTP connection, use the user name and password that are set to <Server user name> and <Password as server> of communication parameters.

FTP allows file operation but cannot operate the machine by commands.

(NOTE 1) When creating a new folder for the NC (FTP(S) server side), sometimes a character string (Ex: “New folder” (2 byte character or more than 17 characters), etc.) that is not allowed by the NC may be used to create the folder depending on the FTP(S) client that is used.

In this situation, an error in the FTP protocol is triggered and the folder cannot be created.

When creating a new folder for the NC (FTP(S) server side) using the slave station’s communication from the FTP(S) client, create a folder on the FTP(S) client side based on the rules (See below) for the folder level and name that are permitted by the NC. Then, copy the folder.

- Up to 16 characters (alphabetic characters and period) can be used for the folder name.
- Up to 3 levels, including the root folder, can be created.
- A folder name cannot be used or created if the folder or program name already exists or if the name is being used inside an NC program (O+Numerical value) or inside a conversation program.

- (NOTE 2) Special response for delete (DELE) command
When inputting (STOR) data that does not follow the file format, the NC returns an error response. However, depending on the FTP client being used, a delete (DELE) response may be issued as a second reply to the error response. If a response is issued for this delete (DELE) command, the existing data in the NC may be deleted accidentally. Therefore, the following special response is used.
A normal response is issued back to the delete (DELE) command for the same file that receives from the error response in less than 1 second, in order to avoid deleting the existing data in the NC.
- (NOTE 3) Set the number of simultaneous connections on the FTP(S) client software to “1”. If the number of simultaneous connections on the FTP(S) client software is set to “2” or greater, then the NC (FTP(S) server side) may reject the connection and not transfer data properly.
- (NOTE 4) If a certificate warning is displayed when accessing the FTPS server, this machine’s server certificate, or a certificate for the certificate authority who issued this machine’s server certificate must be registered as a trusted certificate. Follow the instructions on each client to register the certificate.

3.3.1.3 Slave station communication from browser

Ethernet is used. NC is the web server.

The master station need not create special software because HTTP protocols are used. Use any desired browser software.

Use <Host name> or <IP address> of communication parameters to specify URL for HTTP connection.

http://host name (or IP address)

or

https://host name (or IP address)

The machine's workpiece counter, operation time and alarm status can be checked using a browser.

Refer to “4.1 HTTP (Hyper Text Transfer Protocol)” for further details.

3.3.1.4 Slave station communication from OPC UA client software

This software uses the Ethernet. The NC becomes the OPC UA server.

Software on the master station side needs to be created using the OPC UA client.

In addition to file operations, this machine can be operated by issuing commands.

The URL for connecting is specified in the communication parameters: <Host name> and <IP address>.

opc.tcp:// host name (or IP address) :4840/

Refer to “4.2 OPC UA” for further details.

3.3.2 Restrictions

Slave station communication is not available according to the setting or condition of the machine.

Setting/Condition	Serial port	Ethernet	FTP	Browser	OPC UA
Connected device: <Memory card> or <FTP server> In the master station mode	○	○	○	○	○
Connected device: <General COMM device> or <NC COMM device> In the master station mode	×	○	○	○	○
Connected device: <General COMM device> Not in the master station mode	×	○	○	○	○
Connected device: Other than <General COMM device> Not in the master station mode	○	○	○	○	○
In maintain and transfer mode	×	×	×	×	×
Same data is being transmitted through a certain port	×	×	×	×	×
Input of data existing in the machine is instructed when <Data overwrite (slave)> = <0: No>	×	×	×	×	×
A command in the operation control group is instructed when <Remote operation> = <0: Invalid>	×	×	-	-	×
Operation level or data input or deletion currently prohibited by data protection function of the machine is instructed	×	×	×	×	×
When issuing a command that is restricted from <Restrict Ethernet access> being set to <1: Yes>	○	×	-	-	×
Communication parameter <External output - Output destination> is set to <3: General COMM device>	×	○	○	○	○
When there is no valid server certificate for this machine	-	-	Δ (NOTE 5)	Δ (NOTE 5)	×

(NOTE 1) Master station mode: When the screen is under the directory of <External program I/O menu> screen.

(NOTE 2) Maintain and transfer mode: Time while using the sub-screens under the <Maintenance menu> screen

(NOTE 3) Data protection function: See “Chapter 5 - Data Protection” for details.

(NOTE 4) Restrict Ethernet access: Refer to “3.5 Communication protocol” for details on commands and functions that are restricted.

(NOTE 5) If there is no valid server certificate and the communication parameter (Ethernet/FTP) <FTPS server function> and <HTTPS server function> are set to <1: Enable>, then the alarm <<Security communication error>> is triggered and the FTPS server and HTTPS server will not be enabled. The FTP server and HTTP server are not impacted by the certificate status.

(NOTE 6) If there is no valid server certificate and the communication parameter (Ethernet/FTP) <OPC UA security communication> is set to <0: None>, then the alarm <<Security communication error>> is triggered and the OPC UA server will not be enabled.

When pressing the [RST] key during slave station communication, slave station communication stops according to the setting of <Reset (slave)>. When <1: Valid> is selected slave station communication stops, when <0: Invalid> it doesn't stop.

When slave station communication ends normally, an end of communication alarm appears on the screen if the <Display slave command alarm> is set to <1: Yes>. It does not appear when <0: No> is set. An alarm is shown regardless of the setting if the communication ends abnormally.

3.4 Maintenance Communication

3.4.1 What is maintenance communication?

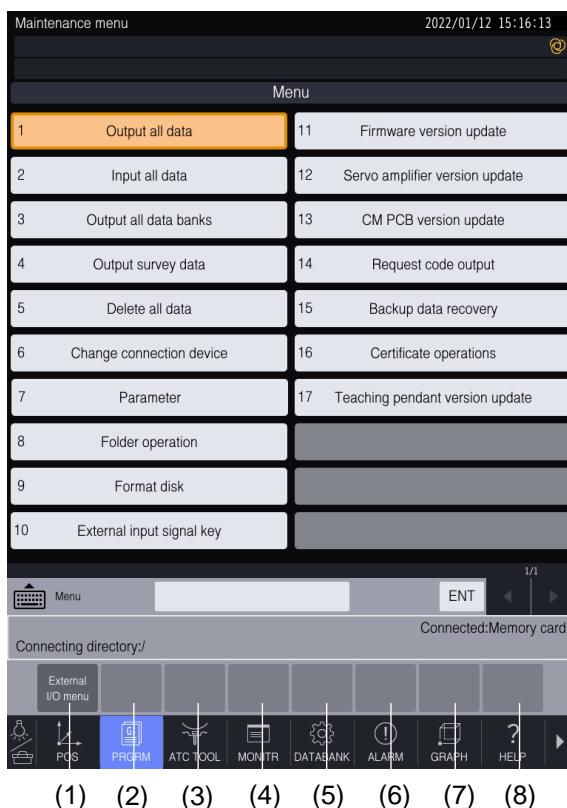
Machine data may be cleared or lost if a control component becomes damaged or if the user performs a wrong or accidental operation. By backing up the internal data on the machine, the user can restore operation faster in the event that data is lost or cleared.

In addition, the user can regularly back up the data to ensure the machine's internal data is maintained.

(NOTE) You cannot select <General COMM device> and <NC COMM device> as the connected device in the maintenance communication.

3.4.1.1 Maintenance menu

1. Display <Program edit menu> screen.
Press [EDIT] key.
2. Display <External program I/O menu> screen.
Press <External program I/O> key from the function keys.
3. Display <Maintenance menu> screen.
Press the <Maintenance> key.
4. Select a function.



3

1

Description of maintenance menu screen

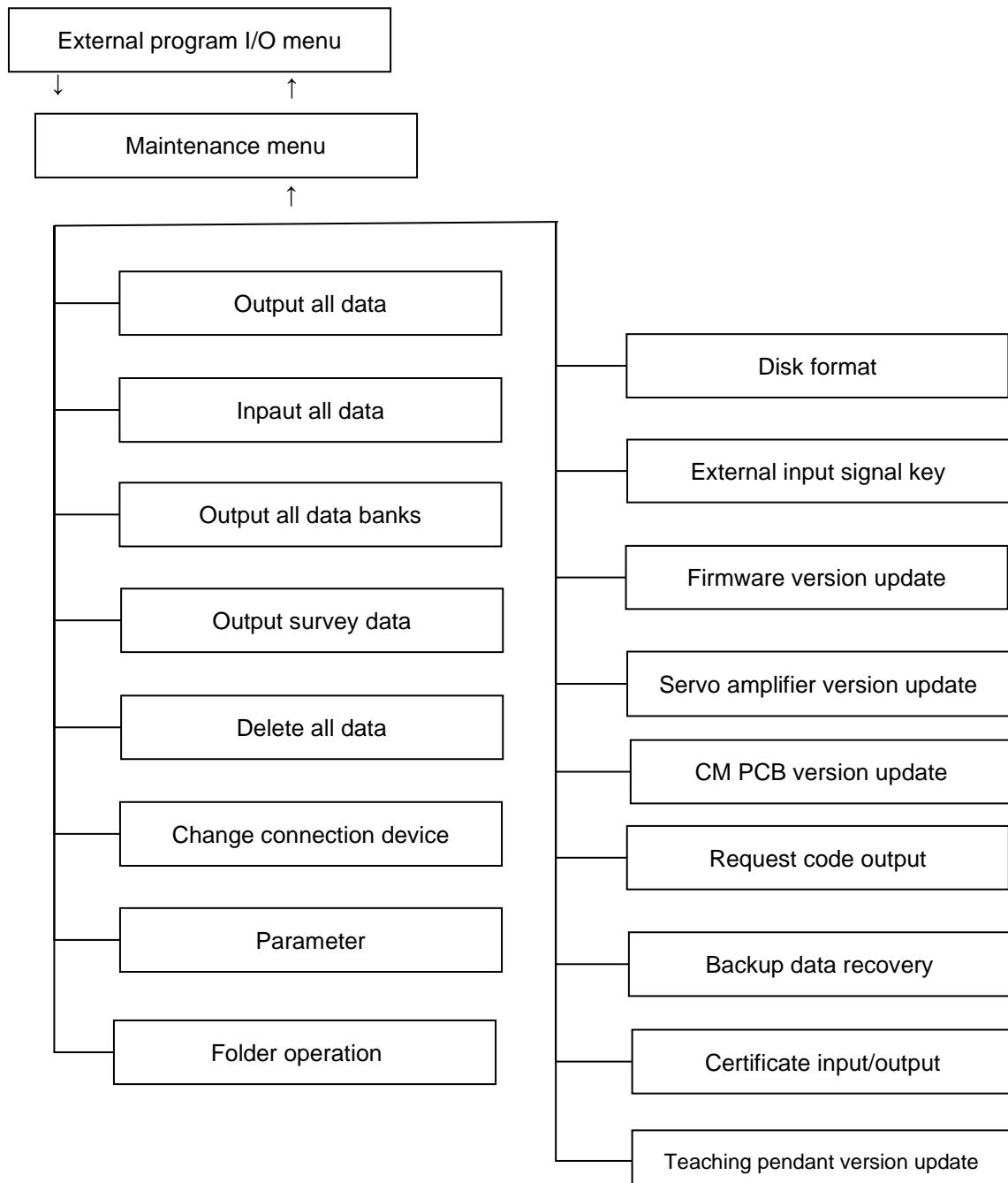
Position	Name	Description
1	Maintenance menu list	<p>This screen shows the maintenance function menu.</p> <p>Tap on a menu item to open that screen.</p> <p><Output all data></p> <p> Backs up all the data in the machine using the connecting directory.</p> <p><Input all data></p> <p> Restores the machine's internal data using the backup data from the connecting directory.</p> <p><Output all data banks></p> <p> Backs up all the data bank files in the machine using the connecting directory.</p> <p><Output survey data></p> <p> Outputs all other data and the survey data. (This is normally not used.)</p> <p><Delete all data></p> <p> Deletes all the backup data from the connecting directory.</p> <p><Change connection device></p> <p> Refer to "3.2 Master station communication".</p> <p><Parameter></p> <p> Refer to "3.2 Master station communication".</p> <p><Format disk></p> <p> Formats the memory card using a logical format.</p> <p><Folder operation></p> <p> Refer to "3.2 Master station communication".</p> <p><External input signal key></p> <p> Uses a special format to format the memory card and creates an external input signal key.</p> <p><Firmware version update></p> <p> Updates the version of the system firmware.</p> <p><Servo amplifier version update></p> <p> Updates the version of the servo amplifier firmware.</p> <p><CM PCB version update></p> <p> Updates the version of the CM PCB firmware.</p> <p><Request code output></p> <p> Outputs the request code for resetting the relocation detection status on the connecting device.</p> <p><Backup data recovery></p> <p> Restores using backup data.</p> <p><Certificate input/output></p> <p> Refer to "3.4.10 Certificate input/output" for further details.</p> <p><Teaching pendant version update></p> <p> Updates the version of the teaching pendant firmware.</p>

Description of function key operations

Column	Position	Label	Description
1	(1)	<External program I/O menu>	Goes back to the external program I/O menu screen.
	(2)		
	(3)		
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

- (NOTE 1) The menu varies depending on the connected device.
 (NOTE 2) Only the <External program I/O menu> and the <Change connection device> selections are available when connected to a <General COMM device> and an <NC COMM device>.
 (NOTE 3) While waveform data is being measured, even if the <Input all data> key is pressed, the alarm <<The waveform data is being measured.>> is triggered and the screen will not change.

3.4.1.2 Screen flow



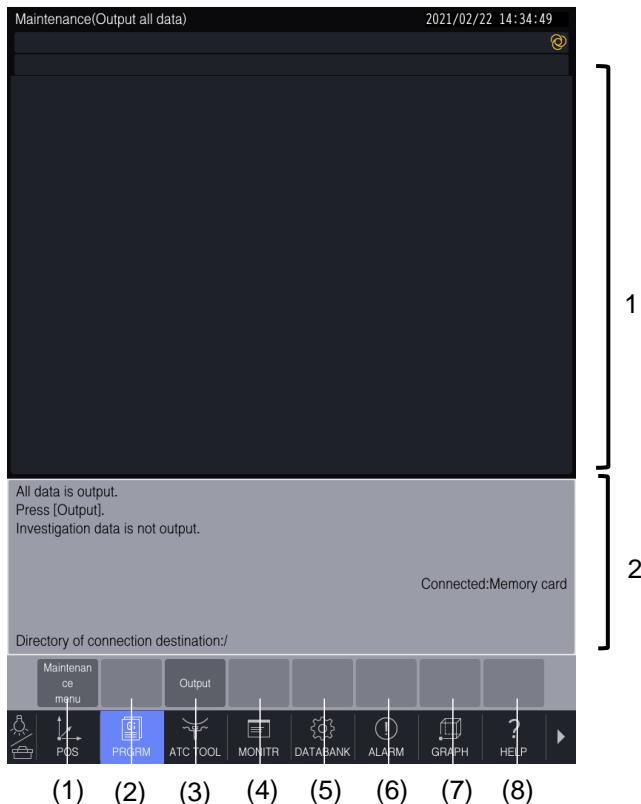
3.4.2 Output all data

The user can output and back up all the data banks, programs and documents/images in the machine. The folder structure of the machine is created on the current folder and below of the connected device. Refer to “3.4.2.1 Folder configuration inside NC” for details on the folder structure in the NC directory.

Refer to “3.6 Communication data details” for further details on outputting data.

1. Display <Maintenance menu> screen.
2. Connect the target device to the machine and check the display of <Connected> on the lower right corner of the screen.
See “3.2 Master station communication” for the connection changing procedure.
3. Display <Output all data> screen.
Press the <Output all data> key.

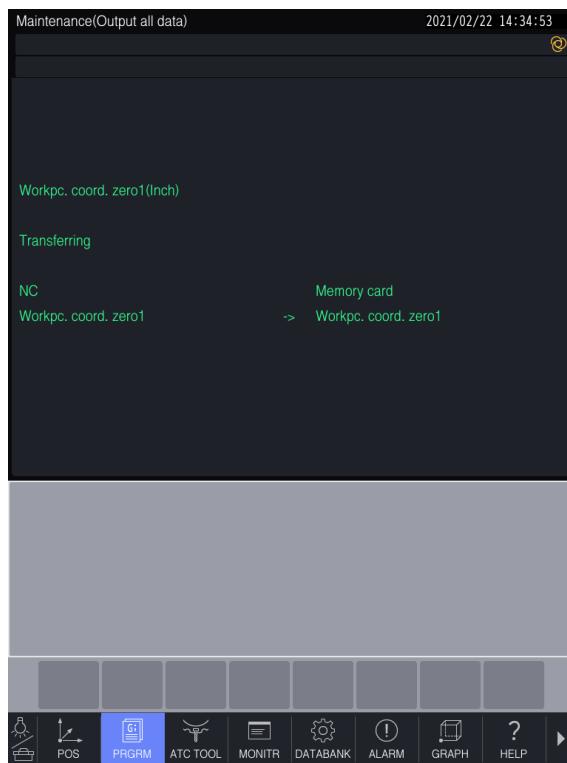
3



4. Start communication.

Press the <Output> key.

5. When communication completes, the screen returns to the former screen.
 (NOTE) This operation is not available in the memory operation edit mode.



Display description of all data output screen

Position	Name	Description
1	Status display	Displays the data being output for the output all data operation.
2	Operation instructions	Displays the operation procedure, the connecting device and the connecting directory for the output all data operation.

Display description of all data output screen

Column	Position	Label	Description
1	(1)	<Maintenance menu>	Goes back to the maintenance menu screen.
	(2)		
	(3)	<Output>	Outputs all the data.
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

3.4.2.1 Folder configuration inside NC

Data	Folder
NC program	/
Conversation program	/
NC data	/_DAT
Production data	/_PRD
Machine status monitoring	/_MCM
System configuration data	/_SYS
PLC program	/_PLC
Test and log data	/_LOG
Request code	/_RQC
File viewer	/_ACCESSORY/_VIEWER
Screenshots	/_ACCESSORY/_VIEWER/_CAPTURE
Notebook	/_ACCESSORY/_MEMO
Waveform data	/_WAVE

3.4.3 Input all data

The user can take all the data banks, programs and documents/images in the connecting directory and input (restore) them into this machine. The folder inside the current folder for the connecting directory is created under the root folder for the NC directory.

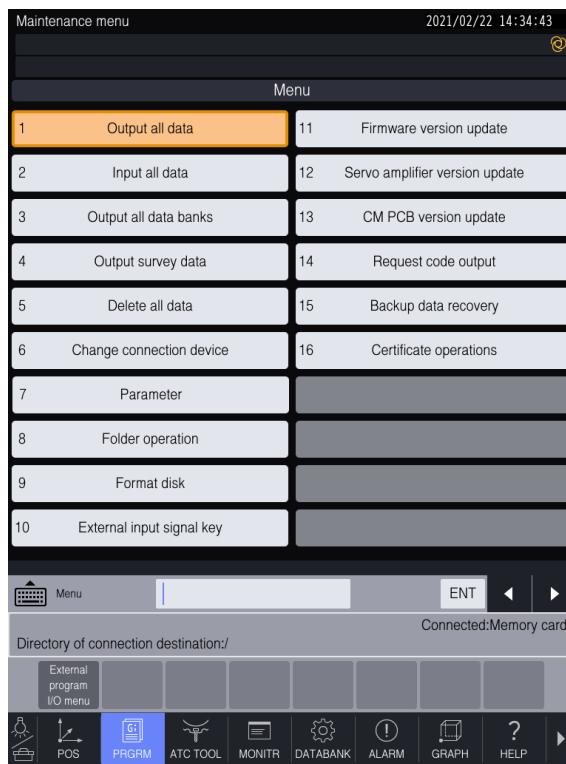
- Each file is input following the folder configuration in the NC. Refer to “3.4.2.1 Folder configuration inside NC” for details on the folder structure in the NC directory.
- The folders in the NC directory can be created up to 3 levels including the root directory. Any folder that is located at the fourth level or beyond is ignored. (The operator message <<There was a subfolder unable to input.>> is triggered.)
- If the folder name is not allowed in the NC directory, the operator message <<This is a folder name that cannot be input.>> is triggered, and that folder is ignored.

Refer to “3.6 Details of communication data” for further details on inputting data.

1. Check **[DATA PROTECTION]** switch and the operation level of the current data protection.
Data protection off: input
Data protection on: check mode (compares files)
2. When entering the machine parameter: high speed control program 10 and standard control program 10, set <Parameter change> to <1: Writable>.
 - (1) Display the <I/O menu> screen.
Press the <I/O> key.
 - (2) Select <Extension maintenance>
 - (3) Set the <Parameter change> to <1: Writable>.
Enter 1 into the data input field, and press the **[ENT]** key.
 - (4) The screen returns to the <Program> screen.
Press the <PRGRM> key.
3. Display <Maintenance menu> screen.

4. Connect the target device to the machine and check the display of <Connected> on the lower right corner of the screen.

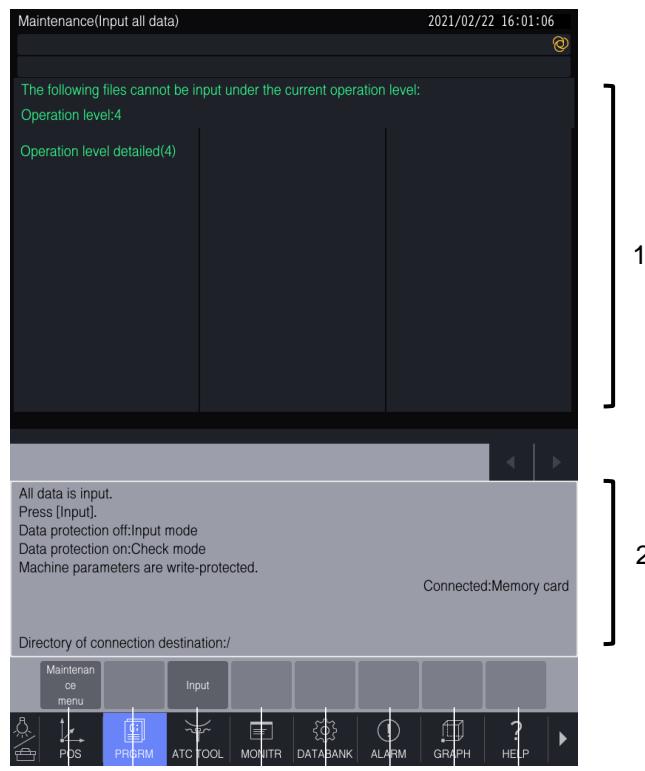
See “3.2 Master station communication” for the connection changing procedure.



3

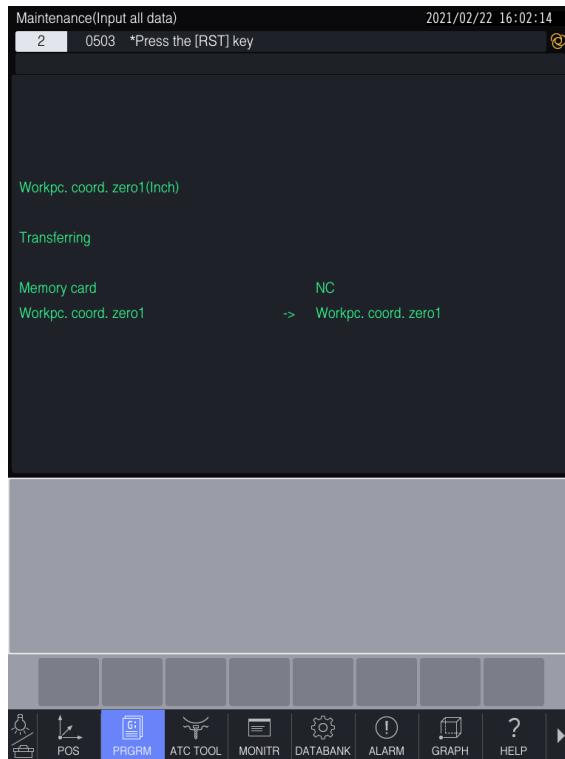
5. Display <Input all data> screen.

Press the <Input all data> key.



(1) (2) (3) (4) (5) (6) (7) (8)

6. Start communication.
Press the <Input> key.



3

7. Select among the followings when <Overwrite check> screen is displayed.
<Yes> : Overwrite
<No> : Input of the relevant data is skipped
<Input all remaining> : All data is input hereafter without confirmation

8. When machine data 1 is included in the data to be input, this operation selects whether to skip the input of start point data (adjusted absolute values).

<Yes> : Skip the input of the start point data.

<No> : Overwrite the start point data.

Normally, select <Yes>. When <No> is selected, the machine zero point may shift. Select <No> only when carrying out a work task, such as a PCB replacement, that causes the start point data to be lost.

When <No> is selected, the alarm <<The machine coordinates may be out of position.>> may trigger after turning ON the power again. Check the machine status by following the recovery procedure for the alarm <<The machine coordinates may be out of position.>>.



9. When communication completes, the screen returns to the former screen.

10. Restart the power.

(NOTE 1) This operation is not available in the memory operation edit mode.

(NOTE 2) The files that support the current language mode (NC/conversation) are input.

- The files with an “.NC” extension are input when in NC language mode.
- The files with a “.TC” extension are input when in conversation language mode.

However, if there is not files found in the current language mode, then the other files are input.

(NOTE 3) PLC program data and other data, where the extension does not matter in a given language mode, are input regardless if it is in NC or conversation mode. Refer to “3.6 Communication data details” for further details.

(NOTE 4) After inputting all data, do not operate the built-in PLC until you turn power off and then on again.

Display description of all data input screen

Position	Name	Description
1	Status display	<ul style="list-style-type: none"> • Displays the progress of the data being output for the output all data operation. • Displays the data that is write-protected for the current operation level.
2	Operation instructions	Displays the operation procedure, the connecting device and the connecting directory for the input all data operation.

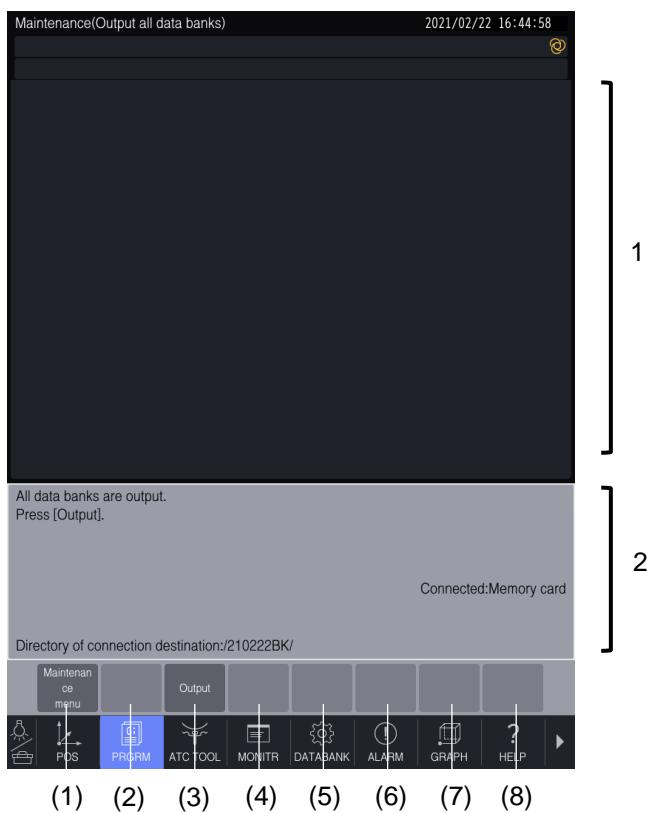
Description of operations on all data input screen

Column	Position	Label	Description
1	(1)	<Maintenance menu>	Goes back to the maintenance menu screen.
	(2)		
	(3)	<Input>	Inputs all the data.
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

3.4.4 Output all data banks

All data banks in the machine are output to the connected device for backup.
See “3.6 Details of communication data” for the data to be output.

3



(1) (2) (3) (4) (5) (6) (7) (8)

Display description of the all data bank output screen

Position	Name	Description
1	Status display	Displays the data being output for the output all data banks operation.
2	Operation instructions	Displays the operation procedure, the connecting device and the connecting directory for the output all data banks operation.

Display description of the all data bank output screen

Column	Position	Label	Description
1	(1)	<Maintenance menu>	Goes back to the maintenance menu screen.
	(2)		
	(3)	<Output>	Outputs all the data banks.
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

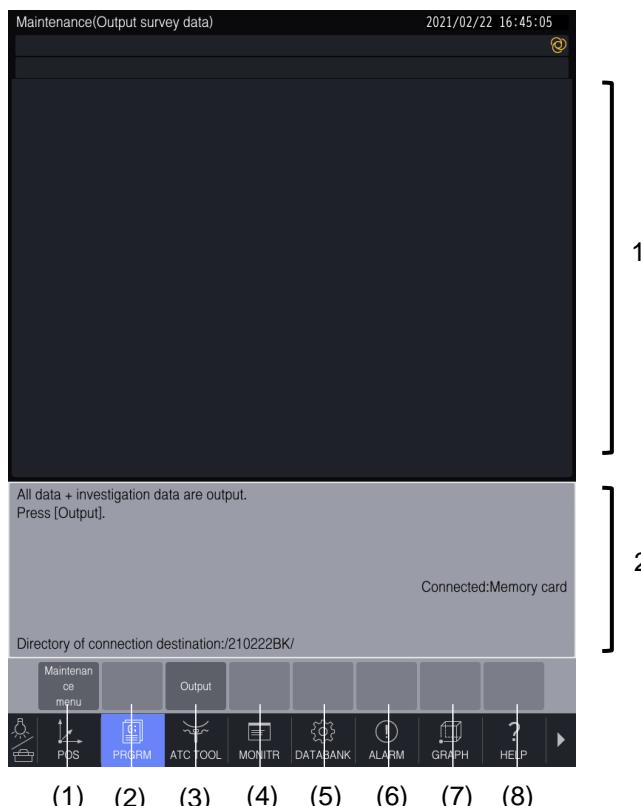
1. Display <Maintenance menu> screen.
2. Connect the target device to the machine and check the display of <Connected> on the lower right corner of the screen.
See “3.2 Master station communication” for the connection changing procedure.
3. Display <Output all data banks> screen.
Press the <Output all data banks> key.
4. Start communication.
Press the <Output> key.
5. When communication completes, the screen returns to the former screen.

3.4.5 Output survey data

All data in the machine (data output by <Output all data> plus survey data) are output to the connected device for backup. The folder structure of the machine is created on the current folder and below of the connected device.

Survey data cannot be input.

Refer to “3.6 Communication data” for further details on outputting data.



Display description of survey data output screen

Position	Name	Description
1	Status display	Displays the data being output for the survey data output operation.
2	Operation instructions	Displays the operation procedure, the connecting device and the connecting directory for the survey data output operation.

Display description of survey data output screen

Column	Position	Label	Description
1	(1)	<Maintenance menu>	Goes back to the maintenance menu screen.
	(2)		
	(3)	<Output>	Outputs the survey data.
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

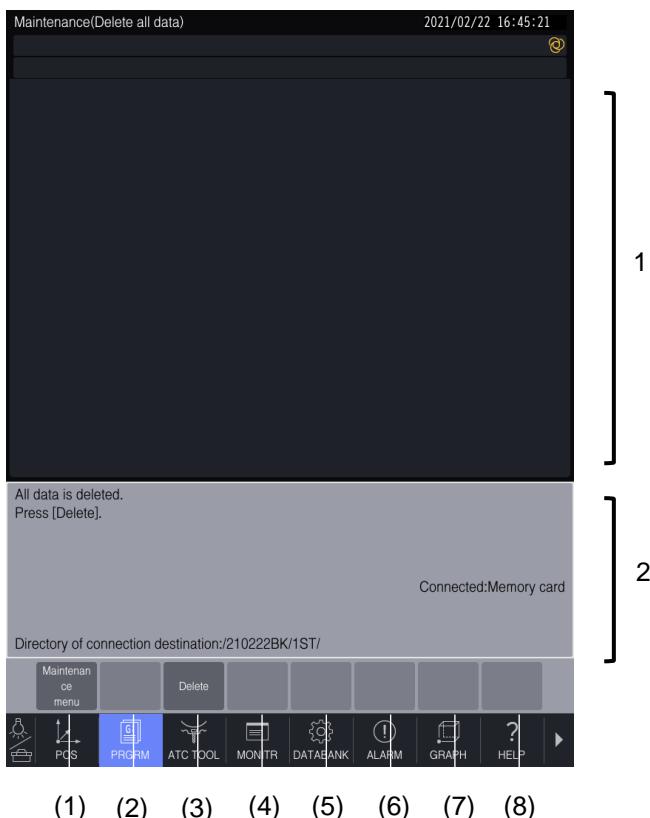
1. Display <Maintenance menu> screen.
2. Connect the target device to the machine and check the display of <Connected> on the lower right corner of the screen.
See “3.2 Master station communication” for the connection changing procedure.
3. Display <Output survey data> screen.
Press the <Output survey data> key.
4. Start communication.
Press the <Output> key.
5. When communication completes, the screen returns to the former screen.

3.4.6 Delete all data

All data stored on the connected device is deleted. All files in the current folder and below of the connected device are deleted together with the folders. Note that the files and folders other than those output from the machine are also deleted altogether.

See “3.6 Details of communication data” for the data to be deleted.

3



(1) (2) (3) (4) (5) (6) (7) (8)

Display description of all data deletion screen

Position	Name	Description
1	Status display	Displays the data being deleted when deleting all the data.
2	Operation instructions	Displays the operation procedure, the connecting device and the connecting directory when deleting all the data.

Display description of the all data deletion screen

Column	Position	Label	Description
1	(1)	<Maintenance menu>	Goes back to the maintenance menu screen.
	(2)		
	(3)	<Delete>	Deletes all the data.
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

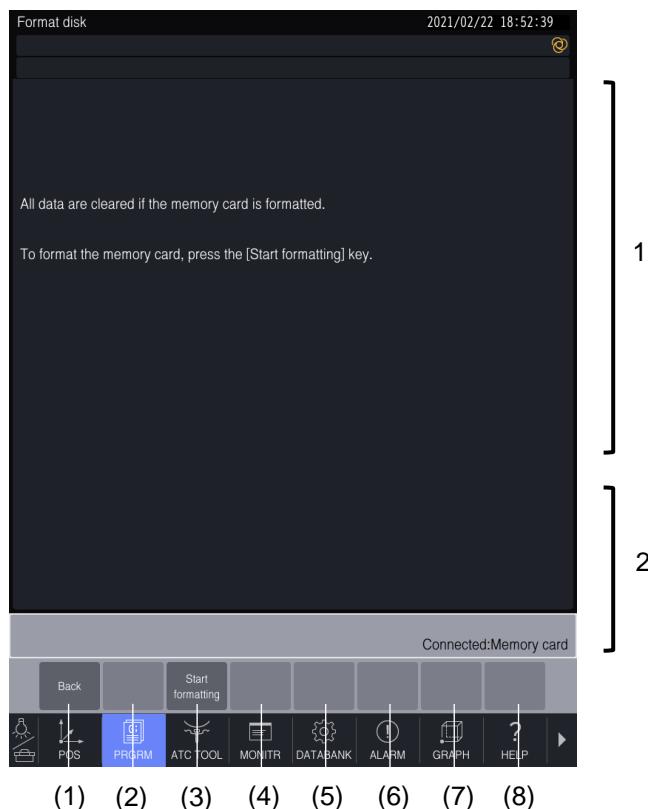
1. Display <Maintenance menu> screen.
2. Connect the target device to the machine and check the display of <Connected> on the lower right corner of the screen.
See “3.2 Master station communication” for the connection changing procedure.
3. Display <Delete all data> screen.
Press the <Delete all data> key.
4. Start communication.
Press the <Delete> key.
5. When communication completes, the screen returns to the former screen.

3.4.7 Disk format

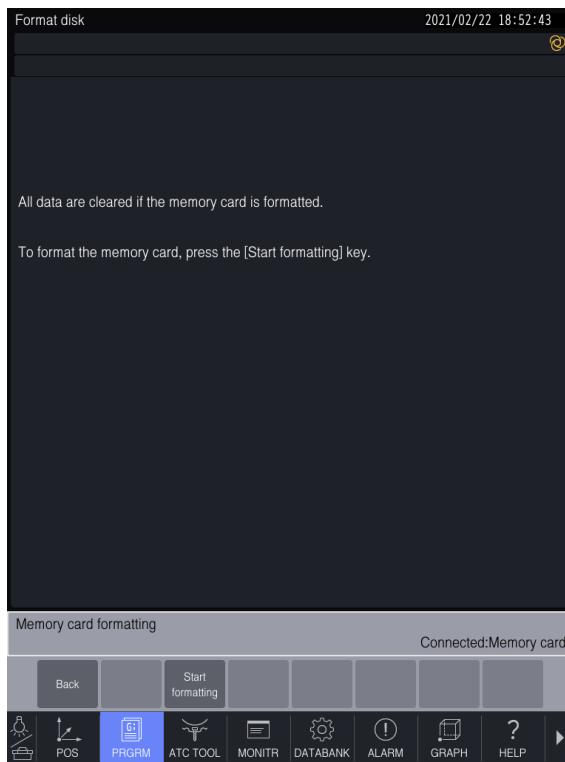
A memory card is logically formatted (physical formatting is not performed).

(NOTE) You cannot use memory cards that are not physically formatted.

1. Display <Maintenance menu> screen.
2. Connect the memory card to the USB port and check the display of <Connected> on the lower right corner of the screen.
See “3.2 Master station communication” for the connection changing procedure.
3. Display <Format disk> screen.
Press the <Format disk> key.



4. Start formatting.
Press the <Start formatting> key.



3

5. When formatting completes, the screen returns to the former screen.

Display description of the disk format screen

Position	Name	Description
1	Operation instructions	Displays the operation procedure for disk formatting.
2	Status display	Displays the progress of the formatting operation when formatting a disk.

Description of the disk format screen operations

Column	Position	Label	Description
1	(1)	<Back>	Goes back to the maintenance menu screen.
	(2)		
	(3)	<Start formatting>	Starts the disk formatting.
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

3.4.8 External input signal key

Memory cards are specially formatted to create external input signal keys. The designated external input signal is turned ON as you insert the memory card into the USB port. External input signals can be turned on without adding switches, etc.

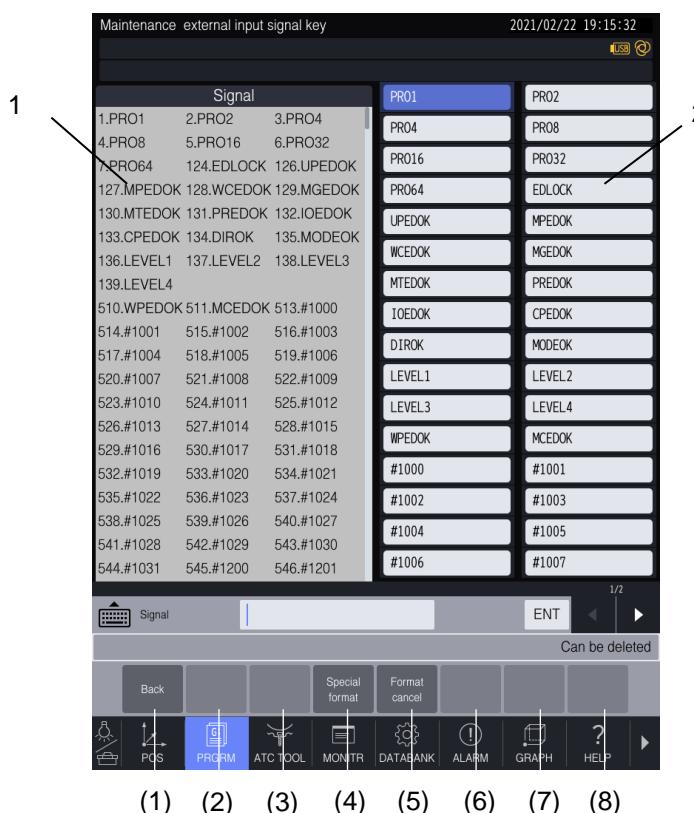
- (NOTE 1) External input signals of the machine are turned on if one of the following external signal controls is selected to ON:
- Actual external input signal input from the terminal
 - External input signal control by slave station commands
 - External input signal key
- (NOTE 2) The external input signal key cannot be differentiated from an ordinary memory card if inserted into a PC. Handle with care.

3.4.8.1 External input signal key screen

(NOTE) To display this screen, set the data protection operation level to <Level 5> beforehand.

3

1. Display <Maintenance menu> screen.
2. Connect the memory card to the USB port and check the display of <Connected> on the lower right corner of the screen.
See “3.2 Master station communication” for the connection changing procedure.
3. Display <Maintenance external input signal key> screen.
Change the function key display, and press the <External input signal key> key.



(1) (2) (3) (4) (5) (6) (7) (8)

Display description of external I/O signal key screen

Position	Name	Description
1	List of setting signal	Displays a list of signals that can be set.
2	List of key settings for external I/O signals	Displays the external I/O signals that have been set.

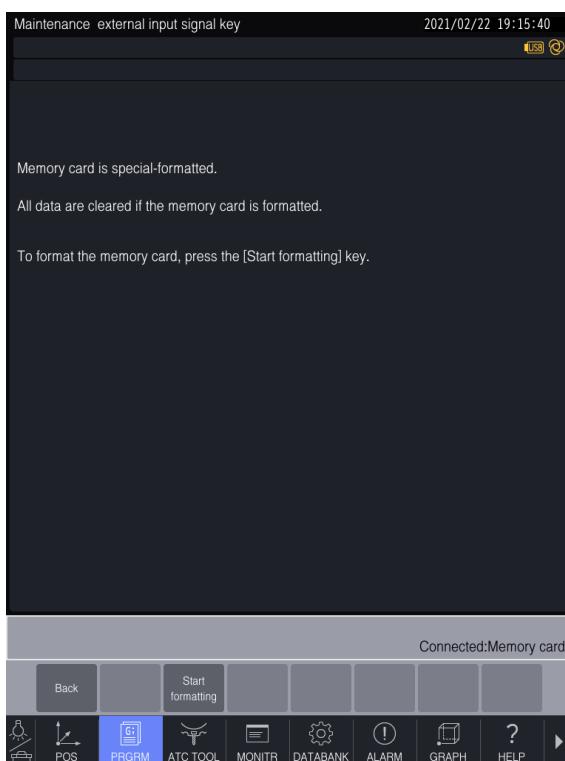
Description of operations on external I/O signal key screen

Column	Position	Label	Description
1	(1)	<Back>	Goes back to the maintenance menu screen.
	(2)		
	(3)		
	(4)	<Special format>	Starts the special formatting so that the memory card can support external input signal keys. Refer to “3.4.8.2 Creation of external input signal key”.
	(5)	<Format cancel>	Cancels the special formatting. Refer to “3.4.8.2 Creation of external input signal key”.
	(6)		
	(7)		
	(8)		

3

3.4.8.2 Creation of external input signal key

1. Memory cards are specially formatted to use them as an external input signal key.
Insert a memory card and press the <Special format> key.



2. Confirm formatting.
Press the <Start formatting> key.

3. When formatting completes, the screen returns to the former screen.

(NOTE 1) The memory card is physically formatted when specially formatted.

(NOTE 2) The memory card that is specially formatted as an external input signal key can also be used as a connection device for external I/O.

3.4.8.3 Adding external input signals

Signals are set to the external input signal key.

1. Select an area to set from the external input signal key list.
2. Reference the setting signal list, enter the desired signal name into the data input field, and then press the [ENT] key.

The user can set signals by entering numbers into the data input field. In this situation, the user can set the PLC input signals according to "X" and the "No." If there is an empty field before the cursor position, then that empty field is used and filled in for the setting.

Example: Typing PLC input "X03FF"

[X] [3] [F] [F] [ENT]

(NOTE 1) Up to 64 types of signals can be set.

(NOTE 2) Some signals cannot be set.

(NOTE 3) The signal is immediately turned on when set.

(NOTE 4) Multiple signals can be set to a single external input signal key. In this case, all signals on the key are turned on when the key is inserted.

(NOTE 5) If there are external input signal keys created on a machine model equipped with a CNC-C00, some of the signal assignments may be restricted. Special formatting is required on the machine.

(NOTE 6) Due to the compatibility with CNC-C00 machine models, PLCX400 to PLCX7FF are added after PLCX3FF.

3

3.4.8.4 Deleting external input signals

1. Signals are deleted from the external input signal key.

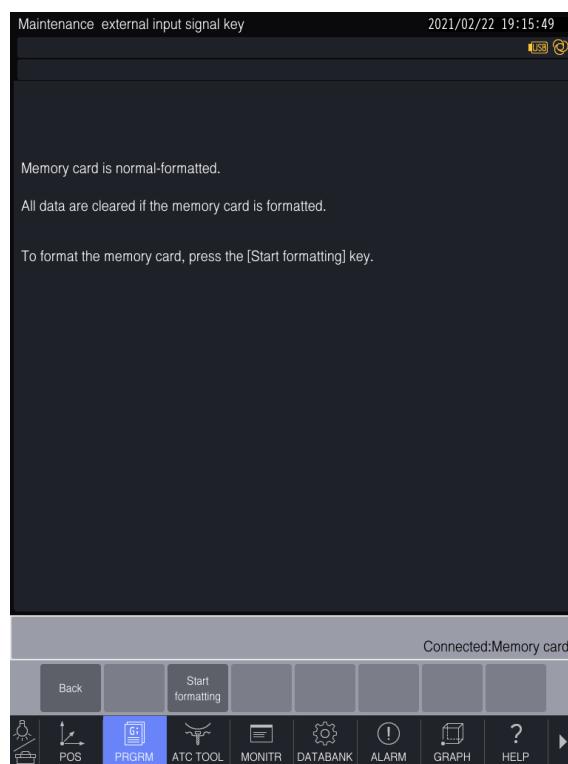
Move the cursor to the signal you wish to delete and press [Delete] key.

(NOTE) The signal is immediately turned off when it is deleted.

3.4.8.5 Cancellation of external input signal key

1. The memory card that has been used as an external input signal key is reformatted to ordinary card without the function of signal key.

Insert a memory card and press the <Format cancel> key.



2. Confirm formatting.
Press the <Start formatting> key.
3. When formatting completes, the screen returns to the former screen.

(NOTE) The memory card is physically formatted when the special formatting is canceled.

3.4.9 Request code output

There are some machine models that do not require request code output. In this situation, the operator message <<There is no corresponding function.>> is triggered and the screen does not change to the request code output menu.

Refer to “Chapter 14 Relocation Detection Device” in the Installation Manual for further details on request code output.

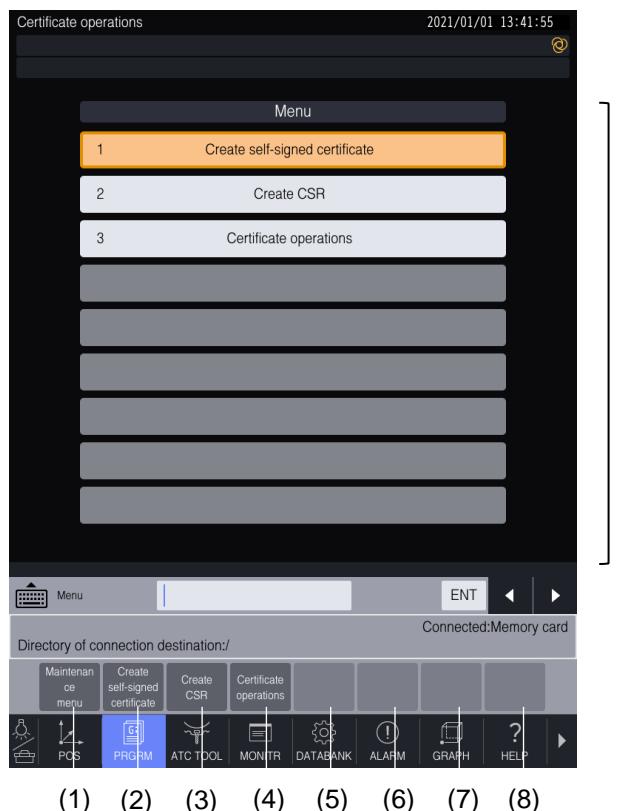
3

3.4.10 Certificate input/output

3.4.10.1 Screen

Certificate input/output

1. Display the <Program edit menu> screen.
Press the <External I/O> key.
Press the <Maintenance> key.
2. The <Maintenance menu> screen is displayed.
Press the <Certificate I/O> key.
3. Select the data operation.



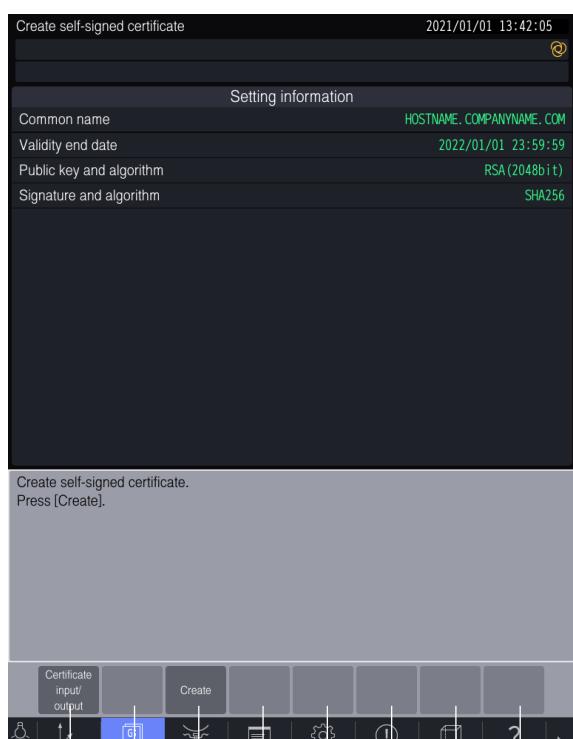
Display description of certificate input/output screen

Position	Name	Description
1	Menu list	<p>This screen shows the certificate input/output menu.</p> <p><Create self-signed certificate> Creates a self-signed server certificate for this machine.</p> <p><Create CSR> Creates a CSR file required when requesting a certificate authority to issue a server certificate for this machine.</p> <p><Certificate operations> The user can input, output and delete certificates used between the NC and the connecting devices.</p>

Description of function key operations

Column	Position	Label	Description
1	(1)	<Maintenance menu>	Goes back to the <Maintenance menu> screen.
	(2)	<Create self-signed certificate>	Changes to the <Create self-signed certificate> screen.
	(3)	<Create CSR>	Changes to the <Create CSR> screen.
	(4)	<Certificate operations>	Changes to the <Certificate operations> screen.
	(5)		
	(6)		
	(7)		
	(8)		

Create self-signed certificate



(1) (2) (3) (4) (5) (6) (7) (8)

Description of screen display

Position	Name	Description
1	Setting information	<p>Displays the self-signed certificate information. The following items are displayed.</p> <ul style="list-style-type: none"> • Common name When the communication parameter (security) <Domain name> is set, the host name and <Domain name> set values are displayed in sequence and connected with a period. When that name is not set, the communication parameter (Ethernet/FTP) <IP address> set value is displayed. • Validity end date Adds the communication parameter (security) <Valid period (days)> to the current date and displays the validity end date. The end time in the valid period is fixed at 23:59:59. • Public key and algorithm • Signature and algorithm Displays the set value for the communication parameter.

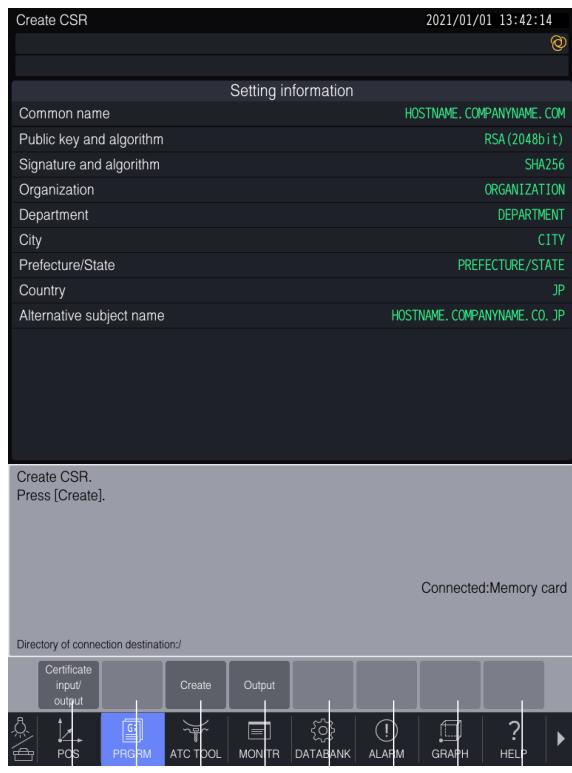
Chapter 3 Communication

Description of screen operation

Column	Position	Label	Description
1	(1)	<Certificate I/O>	Goes back to the <Certificate input/output> screen.
	(2)		
	(3)	<Create>	Creates a self-signed certificate.
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

Create CSR

3



(1) (2) (3) (4) (5) (6) (7) (8)

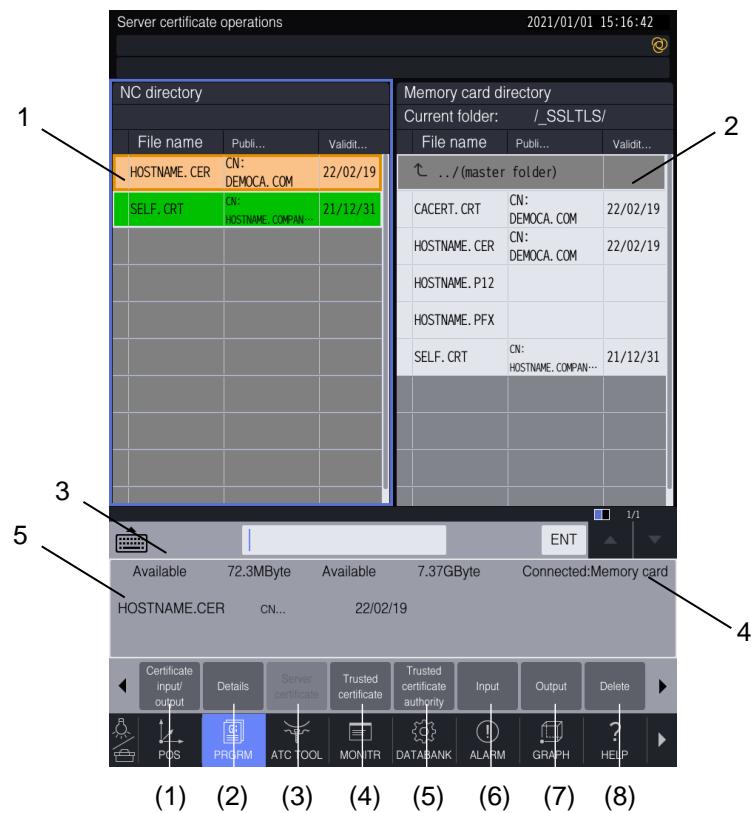
Description of screen display

Position	Name	Description
1	Setting information	<p>Displays CSR information. The following items are displayed.</p> <ul style="list-style-type: none"> • Common name When the communication parameter (security) <Domain name> is set, the host name and <Domain name> set values are displayed in sequence and connected with a period. When that name is not set, the communication parameter (Ethernet/FTP) <IP address> set value is displayed. • Public key and algorithm • Signature and algorithm • Organization • Department • City • Prefecture/State • Country <p>Displays the set value for the communication parameter.</p> <ul style="list-style-type: none"> • Alternative subject name When the communication parameter (security) <Alternative domain name> is set, the set values for the host name and <Alternative domain name> are displayed in sequence and connected with a period. If a name is not set, the alternative subject name is not displayed.

Description of screen operation

Column	Position	Label	Description
1	(1)	<Certificate I/O>	Goes back to the <Certificate input/output> screen.
	(2)		
	(3)	<Create>	Creates a CSR file.
	(4)	<Output>	Outputs the CSR file to the connected device. If a CSR file is not created, this key is grayed out.
	(5)		
	(6)		
	(7)		
	(8)		

Certificate operations



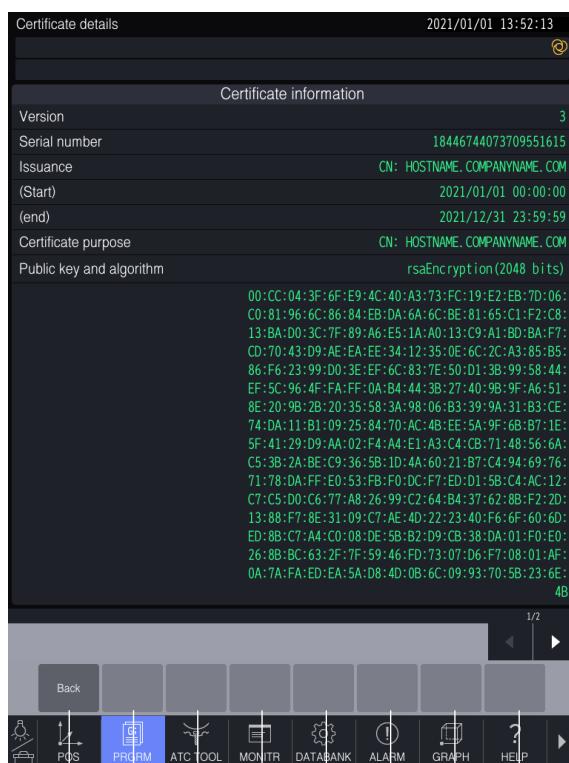
Description of screen display

Position	Name	Description
1	NC directory	Displays a list of certificates for this machine. When there are server certificates displayed, the server certificate that is currently being used is highlighted in green.
2	Connecting directory	Displays information about the connecting directory. <Memory card directory> Displays a list of certificates and sub folders. When the sub folder or file name is long, it is abbreviated. The current folder's location in the directory for the connecting device is shown in the lower half. <FTP server side> Displays a list of certificates and sub folders. The publisher and validity end date are not displayed. When the sub folder or file name is long, it is abbreviated. The current folder's location in the directory for the connecting device is shown in the lower half.
3	Available memory and selections	Displays the available system memory (bytes). The left side shows the NC directory data and the right side shows the connecting directory data. However, the amount of system memory available in the connecting directory is only displayed when the connecting device is a <Memory card>.
4	Connected	Displays the currently connected device (directory).
5	File information	Displays the file name, publisher and the validity end date. When the file name is long, the file format is kept and the display is abbreviated.

Description of screen operation

Column	Position	Label	Description
1	(1)	<Certificate I/O>	Goes back to the <Certificate input/output> screen.
	(2)	<Details>	Displays detailed information about the certificate that is specified in the NC directory.
	(3)	<Server certificate>	Displays a list of server certificates.
	(4)	<Trusted certificate>	Displays a list of trusted certificates.
	(5)	<Trusted certificate authority>	Displays a list of trusted certificate authorities.
	(6)	<Input>	Inputs the certificate into the NC directory from the connecting directory.
	(7)	<Output>	Outputs the certificate to the connecting directory from the NC directory.
	(8)	<Delete>	Deletes the certificate that is specified in the NC directory.
2	(1)	<Certificate I/O>	Goes back to the <Certificate input/output> screen.
	(2)	<Details>	Displays detailed information about the certificate that is specified in the NC directory.
	(3)	<OPC UA client certificate>	Displays a list of OPC UA client certificates.
	(4)		
	(5)		
	(6)	<Input>	Inputs the certificate into the NC directory from the connecting directory.
	(7)	<Output>	Outputs the certificate to the connecting directory from the NC directory.
	(8)	<Delete>	Deletes the certificate that is specified in the NC directory.

Certificate details



(1) (2) (3) (4) (5) (6) (7) (8)

Description of screen display

Position	Name	Description
1	Certificate information	<p>Displays information about the certificate that is specified on the <Certificate operations> screen.</p> <p>The following items are displayed.</p> <ul style="list-style-type: none"> • Version • Serial number • Issuance • Validity start date • Validity end date • Certificate purpose • Public key and algorithm • Exponent • Signature and algorithm

3

Description of screen operation

Column	Position	Label	Description
1	(1)	<Back>	Goes back to the <Certificate operations> screen.
	(2)		
	(3)		
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

3.4.10.2 Create self-signed certificate

Create certificate operation

This operation creates a self-signed server certificate for this machine.

A server certificate is created in this machine under the file name: SELF.CRT

Before performing an operation, set the [DATA PROTECTION] switch to “Disable”.

If the certificate is created successfully, the message <CSR file created> appears in the instructions area. If the certificate could not be created, the message <Failed to create CSR file> appears.

(NOTE) When the SELF.CRT file is a server certificate that is currently being used and the <Create> key is pressed, the operator message <<Press the [RST] key.>> appears.

3.4.10.3 Create CSR

Create CSR operation

This operation creates a CSR file required when requesting a certificate authority to issue a server certificate for this machine.

A CSR file is created in this machine under the file name: HOSTNAME.CSR

Before performing an operation, set the [DATA PROTECTION] switch to “Disable”.

If the certificate is created successfully, the message <Self-signed certificate created> appears in the instructions area. If the certificate could not be created, the message <Failed to create self-signed certificate> appears.

(NOTE) The host name is the value displayed in the <Ethernet information> on the <Communication monitor> screen.

If the <Create> key is pressed when a CSR file already exists, the following popup message is displayed. Select <Yes> to overwrite the CSR file, or select <No> to cancel the operation.



Output operation

The user can output the CSR file (that is created) from this machine to a connecting directory.

3.4.10.4 Certificate Operations

Input operation

The user can take a certificate selected from the connecting directory and input it into the NC directory (internally in the machine).

Before performing an operation, set the **[DATA PROTECTION]** switch to “Disable”.

The types of certificates that can be input vary depending on the function key that is selected.

Function key	Extension					
	CRT	CER	PEM	DER	P12	PFX
<Server certificate>	○	○	○	○	○	○
<Trusted certificate>	○	○	○	○	×	×
<Trusted certificate authority>	○	○	○	○	×	×
<OPC UA client certificate>	×	×	×	○	×	×

In addition, an operator message appears and the input cannot be carried out in the following situations.

Conditions	Operator messages
When the <Server certificate> key is selected and the input server certificate file (extension is CRT, CER, PEM or DER) is not a certificate that is compatible with a CSR file.	<<Certificate cannot be input>>
When the <Server certificate> key is selected and the private-key password for the input server certificate file (extension is P12 or PFX) does not match the communication parameter (security) <Private-key password>.	<<Certificate cannot be input>>
When the file format of the input server certificate is invalid, regardless of the function key that is selected.	<<Certificate cannot be input>>

- How to input a certificate

Use the operation below to input from the connecting directory.

- Use the cursor or tap on a file to select it, and then press the <Input> key.

When inputting a file, if another file with the same name already exists in the NC directory, a message will appear to confirm whether to overwrite the data or not. Press the <Yes> key to overwrite, and press the <No> key to cancel overwriting.

(NOTE) When the server certificate that is currently being used is overwritten, the operator message <<Press the **[RST]** key.>> appears.

Output operation

The user can output the specified certificate from the NC directory (internally in this machine) to a connecting directory.

- How to output a certificate

Use the operation below to output from the NC directory.

- Use the cursor or tap on a file or folder to select it, and then press the <Output> key.

When outputting a file, if another file with the same name already exists in the connecting directory, a message will appear to confirm whether to overwrite the data or not. Press the <Yes> key to overwrite, and press the <No> key to cancel overwriting.

Delete operation

The user can delete the specified certificate from the NC directory (internally in this machine).

- How to delete a certificate

Use the operation below to delete it from the NC directory.

- Use the cursor or tap on a file or folder to select it, and then press the **[Delete]** key.

A delete confirmation message is displayed. Press the <Yes> key to delete, and press the <No> key to cancel deleting.

(NOTE) When the server certificate that is currently being used is deleted, the operator message <<Press the **[RST]** key.>> appears.

3

3.4.10.5 Change connection device

Refer to “3.2 Master station communication” for details on how to change the connected device.

3.5 Communication Protocol

3.5.1 Character code table (NC language mode)

Character	ASCII								Character	ISO								Character	EIA								Processing	Meaning
	8	7	6	5	4	3	2	1		8	7	6	5	4	3	2	1		8	7	6	5	4	3	2	1		
0			○	○					0			○	○				0			○								Number0
1			○	○			○		1	○		○	○				○	1					○				Number1	
2			○	○			○		2	○		○	○			○	2					○				Number2		
3			○	○			○	○	3			○	○			○	3			○		○	○				Number3	
4			○	○	○				4	○		○	○	○			4				○							Number4
5			○	○	○	○	○		5			○	○	○	○	○	5			○	○	○	○				Number5	
6			○	○	○	○	○		6			○	○	○	○	○	6			○	○	○	○				Number6	
7			○	○	○	○	○	○	7	○		○	○	○	○	○	7				○	○	○	○			Number7	
8			○	○	○				8	○		○	○	○			8			○								Number8
9			○	○	○			○	9			○	○	○		○	9			○	○		○				Number9	
A	○					○	A			○						○	A	○	○			○					AddressA	
B	○				○		B			○					○	○	B	○	○			○					AddressB	
C	○				○	○	C	○	○						○	○	C	○	○	○		○	○			AddressC		
D	○			○			D	○				○				○	D	○	○		○						AddressD	
E	○			○		○	E	○	○			○			○	○	E	○	○	○	○	○	○			AddressE		
F	○			○	○		F	○	○			○	○			○	F	○	○	○	○	○	○			AddressF		
G	○			○	○	○	G	○				○	○	○	○	○	G	○	○		○	○	○			AddressG		
H	○		○				H	○			○					○	H	○	○	○	○						AddressH	
I	○		○			○	I	○	○		○				○	○	I	○	○	○	○	○					AddressI	
J	○		○		○		J	○	○			○	○			○	J	○	○			○					AddressJ	
K	○		○		○	○	K	○			○	○	○	○	○	○	K	○	○			○					AddressK	
L	○		○	○			L	○	○			○	○			○	L	○				○	○				AddressL	
M	○		○	○		○	M	○			○	○	○	○	○	○	M	○	○	○	○						AddressM	
N	○		○	○	○		N	○			○	○	○	○	○	○	N	○			○	○	○				AddressN	
O	○		○	○	○	○	O	○	○		○	○	○	○	○	○	O	○			○	○	○			AddressO		
P	○	○					P	○	○	○						○	P	○	○	○	○	○	○				AddressP	
Q	○	○				○	Q	○	○	○	○					○	Q	○	○	○	○						AddressQ	

Character	ASCII								Character	ISO								Character	EIA								Processing	Meaning
	8	7	6	5	4	3	2	1		8	7	6	5	4	3	2	1		8	7	6	5	4	3	2	1		
R	o	o				o			R	o	o		o		o		R	o		o		o		o			AddressR	
S	o	o			o	o			S	o		o		o		o		S		o	o		o		o			AddressS
T	o	o	o				T	o	o		o	o					T	o		o		o	o				AddressT	
U	o	o	o	o			U	o		o	o	o		o		U		o	o	o						AddressU		
V	o	o	o	o	o		V	o		o	o	o	o			V		o		o	o	o				AddressV		
W	o	o	o	o	o	o	W	o	o		o	o	o	o		W		o		o	o					AddressW		
X	o	o	o				X	o	o		o	o				X		o	o	o	o	o	o			AddressX		
Y	o	o	o				Y	o		o	o					Y		o	o	o						AddressY		
Z	o	o	o		o		Z	o		o	o		o			Z		o	o		o					AddressZ		
DEL	o	o	o	o	o	o	DEL	o	o	o	o	o	o	o		DEL	o	o	o	o	o	o	o		(1)	Delete		
NUL							NUL									BLA NK										(1)	No punched	
BS		o					BS	o			o					BS		o	o	o	o						(1)	Back space
HT		o			o		HT				o			o		TAB		o	o	o	o	o					(5)	Tabulator
LF /NL		o		o			LF /NL				o	o				EOB /CR	o											End of block
CR		o	o		o		CR	o			o	o		o			X	X	X	X	X	X	X	X		(7)	Carriage return	
SP	o						SP	o	o							SP			o									Space
%	o		o		o		%	o	o		o		o			ER			o	o	o						(6)	End of record
(o	o					(o	o						C/O (2+4+5)			o	o	o							Control Out
)	o	o			o)	o	o	o		o				C/I (2+4+7)	o		o	o	o						Control In	
+	o	o		o	o	o	+		o		o	o	o	o		+		o	o	o							Plus sign	
-	o	o	o		o		-		o		o	o	o	o		-	o										Minus sign	
:	o	o	o			o	:		o	o	o		o			X	X	X	X	X	X	X	X		(4)	Colon		
/	o	o	o	o	o	o	/	o		o	o	o	o	o		/		o	o		o						Optional block skip	
.	o	o	o	o	o		.		o		o	o	o			.		o	o	o	o	o					Period (decimal point)	
#	o			o	o		#	o	o				o	o		X	X	X	X	X	X	X	X		(3)	Sharp		
\$	o		o				\$		o		o					X	X	X	X	X	X	X	X		(1)	Dollar mark		
&	o		o	o			&	o	o		o	o				&			o	o	o						(2)	Ampersand
'	o		o	o	o		'		o		o	o	o	o		X	X	X	X	X	X	X	X		(1)	Apostrophe		
*	o		o	o	o	o	*	o	o	o	o	o	o	o		X	X	X	X	X	X	X	X		(3)	Asterisk		

Character	ASCII								Character	ISO								Character	EIA								Processing	Meaning
	8	7	6	5	4	3	2	1		8	7	6	5	4	3	2	1		8	7	6	5	4	3	2	1		
,			○	○	○				,	○		○	○	○	○		,		○	○	○	○	○	○		(2)	Comma	
;			○	○	○		○	○	;	○		○	○	○	○	○										(1)	Semicolon	
▼			○	○	○	○			◀			○	○	○	○											(8)	Left angle bracket	
=			○	○	○	○			=	○		○	○	○	○	○										(3)	Equal sign	
Λ			○	○	○	○	○		Λ	○		○	○	○	○	○										(8)	Right angle bracket	
?		○					○	?			○					○										(2)	Question mark	
@	○								@	○	○															(1)	At mark	
"		○				○			"			○			○											(1)	Quotation mark	
[○	○	○	○	○	○	○		[○	○	○	○	○	○	○										(3)	Left square bracket	
]	○	○	○	○	○	○	○]	○	○	○	○	○	○	○										(3)	Right square bracket		
-	○	○	○	○	○	○	○	○	-		○		○	○	○	○	○									(8)	Underline	

- (NOTE 1) Blanks in "Processing" indicate that the data is read normally.
- (NOTE 2) Characters noted (1) in "Processing" and the codes not listed in this table, excluding label skip section, etc. (see NOTE 12) are processed as follows according to the setting of communication parameter <Invalid data>:
 <0: Convert> Read after converted into "?" (question mark).
 <1: Error> When inputted, the communication is stopped as an error.
 <2: Ignore> When inputted, it is ignored.
- (NOTE 3) Characters noted (2) in "Processing" are read normally but will cause an error in operation if they are located in the significant section.
- (NOTE 4) Characters noted (3) in "Processing" are converted into the values set to communication parameters <EIA character codes # through]> when inputted in EIA.
- (NOTE 5) Processing for (4) is converted to "O" (Address O) for ISO / ASCII input. However, the communication parameter <Extended comment input> is set to "1: Yes", the NC program content enclosed in parentheses () between (control out) and (control in) and the data bank or data to be maintained enclosed in apostrophes ' is not converted.
- (NOTE 6) Characters noted (5) in "Processing" are converted into "SP" (space) when inputted in ISO, EIA, and ASCII.
- (NOTE 7) Characters noted (6) in "Processing" may not be used other than tape start and tape end code in ISO, EIA, and ASCII. They may not be used even between "(" (control out) and ")" (control in) of an NC program.
- (NOTE 8) Characters noted (7) in "Processing" are always ignored when inputted in ISO or ASCII.
- (NOTE 9) When communication parameter <Character length> is set to <0: 7 bits> in the ISO code, the 8th bit of the ISO code is always treated as mask (not punched) (same as ASCII).
- (NOTE 10) Switching among ISO, EIA, and ASCII at inputting is automatically judged by "LF" / "EOB" / "CR" at the head of the tape.
- (NOTE 11) "'' (apostrophe) as used in outputting a data capable of setting a character string such as <<External alarm 10 message>> of external I/O signal is processed as follows:
 • Same as the character code table in ISO and ASCII.
 • Converted into "&" (ampersand) in EIA.
 "'' (apostrophe) indicates the start and the end of a character string.

- (NOTE 12) When communication parameter <Extended comment input> is set to <1:Yes> and communication is performed by other than serial port, characters between “(” (control out) and “)” (control in) in NC programs and those between two “” (apostrophes) in data banks or maintenance data can be input if they are compatible with the following character codes:
 Supported code display:
 When the <Display language> setting is Japanese → Shift-JIS
 Supported code display:
 When the <Display language> setting is English, German, French, Portuguese, Italian or Spanish → ISO8859-1
 Supported code display:
 When the <Display language> setting is Chinese → GB18030
 Supported code display:
 When the <Display language> setting is Polish or Czech → ISO8859-2
 Supported code display:
 When the <Display language> setting is Korean → EUC-KR
 Codes other than the above cannot be input.
 However, lower case English alphabets (“a” (0x61) to “z” (0x7A)) can be input in all communications excepting EIA.
 There are some characters that cannot be displayed.
 In addition, if a different <Display language> (than the <Display language> used for program input) is set and the program is edited, the characters may become corrupted and not display properly.
- (NOTE 13) Data that is input/output as binary data is not necessarily as specified in this table.
 (NOTE 14) (8) in the processing cannot output with EIA. The alarm <<Communication parameter error>> is triggered.

3.5.2 Character code table (conversation mode)

Refer to “3.5.3 Internal data code list” for the codes used internally.

Character	code	Character	code
LF	0A H	:	3A H
CR	0D H	A	41 H
SP	20 H	B	42 H
%	25 H	C	43 H
0	30 H	D	44 H
1	31 H	E	45 H
2	32 H	F	46 H
3	33 H	G	47 H
4	34 H	H	48 H
5	35 H	I	49 H
6	36 H	J	4A H
7	37 H	K	4B H
8	38 H	L	4C H
9	39 H	M	4D H
		N	4E H
		O	4F H
		P	50 H
		Q	51 H
		R	52 H
		S	53 H
		T	54 H
		U	55 H
		V	56 H
		W	57 H
		X	58 H
		Y	59 H
		Z	5A H

- (NOTE) Data that is input/output as binary data is not necessarily as specified in this table.

3.5.3 Internal data code list

This machine uses the unique codes listed below. Make sure that all of the below-mentioned codes can be input to/output from your external equipment.

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

(Internal data code list) “/” indicates the codes in use.

3.5.4 Ethernet Communication

The following methods are available to communicate with the machine over Ethernet:

- Slave station communication from “NC communication software”
- Master station communication to <FTP(S) server>
- Slave station communication from FTP(S) client
- Slave station communication from a browser
- Slave station communication from OPC UA client

Network setting is required to communicate with the machine over Ethernet.

Set communication parameters <Host name>, <Use DHCP>, <IP address>, <Mask bit>, <Default gateway>, <Auto acquisition of DNS server address>, <DNS server address 1>, and <DNS server address 2> according to your network environment.

Contact your network administrator for any unknown points.

In addition, when an unrelated device is connected to the machine on the same network, it causes an additional load on communications. Therefore, take the appropriate steps with the configuration.

3.5.4.1 Slave station communication from “NC communication software”

- Protocol
TCP/IP protocol is used for Ethernet communication.
NC communication device protocol type 2 is encapsulated in the TCP/IP packet data. The machine runs as slave station and is a server in the TCP/IP protocol.
- TCP port number
The machine waits for connection with the client at the TCP port number set to communication parameter <Port NO.>. The client should ask establishment of connection at this TCP port number.
- Establishment and release of connection
Connection is established / released using transmission of one pair of command and response of NC communication device protocol, type 2, as a session, in principle.
When the client does not release the connection and no command arrives for a time period set by communication parameter <Response monitoring time>, the server (machine) releases the connection. If you wish not to release connection from the server, set the <Response monitoring time> to <0>.

- Restrict access
Restrict access to this machine using communication protocol type 2 for an NC communication device by setting the communication parameter <Restrict Ethernet access> to <1: Yes>.
- All commands except a temporary access command
When a temporary access command is issued, the access restriction is temporarily lifted. However, when the communication parameters <Server user name> and <Password as server> are not set, the access restriction cannot be lifted.
Temporary access continues from the previous session until the communication parameter <Access timeout period> elapses.
If there is multiple temporary access commands received from the client side, access restriction is temporarily lifted only for the IP address on the client side when the last temporary access command is issued.
Refer to “3.5.9.3 Access control command” for further details on the temporary access command.

3.5.4.2 FTP communication

General protocols are used and the description is omitted here.

In master station communication, when this machine is set as the FTP(S) client, follow the instructions to set the communication parameters: <FTP(S) server name (IP address)>, <User name as client>, <FTP(S) server port number>, <Password as client> and <Security communication for client>, and then connect to the “FTP(S) server” on the network.

In the case of slave station communication (the machine is an FTP(S) server), the client should use communication parameters <Server user name> and <Password as server> for connection.

The FTP(S) commands that support the FTP server are as follows:

USER, PASS, QUIT, PWD, XPWD, CWD, XCWD, CDUP, XCUP, TYPE, PORT, PASV, LIST, NLST, SIZE, MDTM, RETR, STOR, ABOR, DELE, MKD, XMKD, RMD, XRMD, RNFR(NOTE 1), RNTO, NOOP, AUTH, PBSZ, PROT

(NOTE 1) It returns an error when the specified name is a file.

(NOTE 2) When this machine uses an FTP(S) server, if data is sent to the machine while the data protection is enabled, a data send error will occur. However, an error may not occur depending on the client’s software.

3.5.4.3 Slave station communication from browser

General protocols are used and the description is omitted here.

URL for connection is designated by communication parameter <Host name> or <IP address>.

Enter as follows in the entry field:

http://host name (or IP address)/

or

https://host name (or IP address)

3.5.4.4 Slave station communication from OPC UA client

General protocols are used and the description is omitted here.

The URL for connecting is specified in the communication parameters: <Host name> and <IP address>.

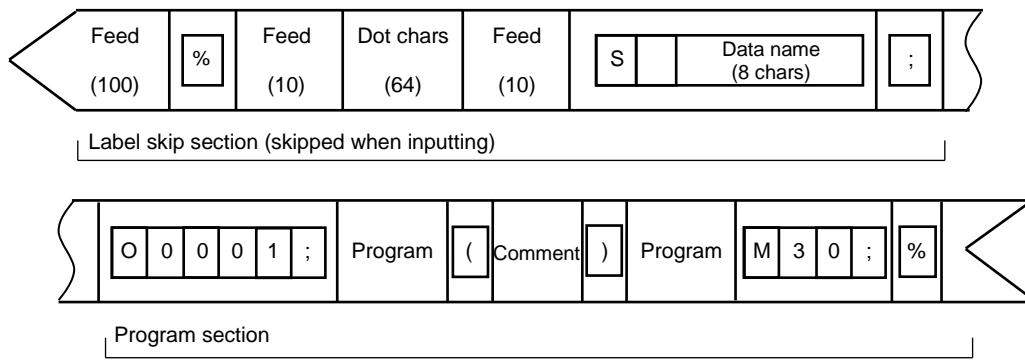
opc.tcp:// host name (or IP address) :4840/

Refer to “4.2 OPC UA” for further details.

3.5.5 General communication device protocol

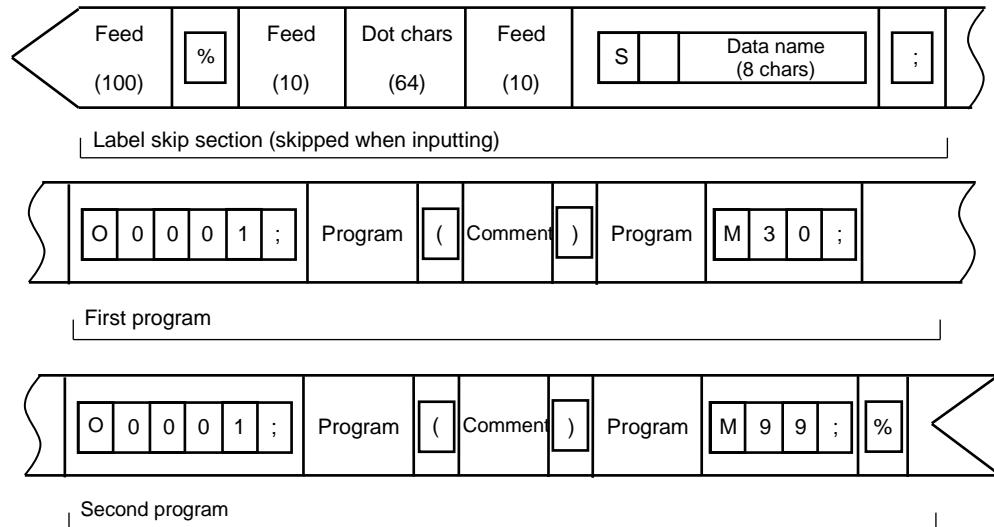
3.5.5.1 Tape format (NC language mode)

- Just one program exists on the tape.

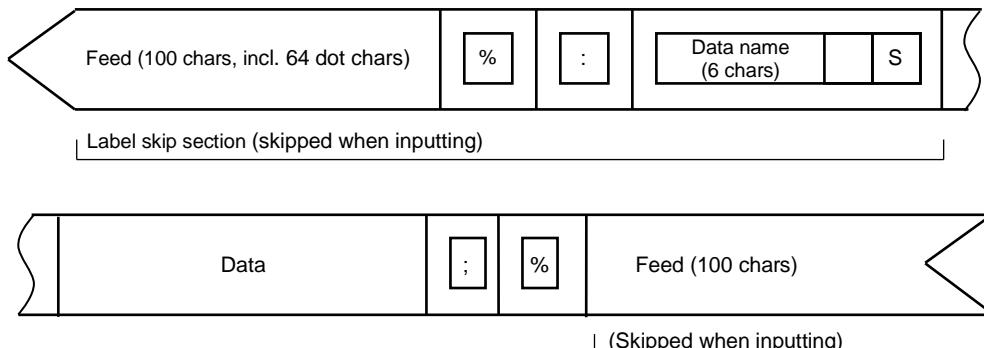


3

- More than one program exists on the tape (input or output all programs)



3.5.5.2 Tape format (conversation mode)



- (NOTE 1) indicates tape start / end code (ISO/ASCII: %; EIA: ER).
- (NOTE 2) indicates end of block code (ISO: LF; EIA: EOB; ASCII: CR + LF).
- (NOTE 3) indicates space (ISO / EIA / ASCII: SP).
- (NOTE 4) Feed is (ISO / ASCII: NULL; EIA: BLANK).
- (NOTE 5) Dot characters are used as the heading of tapes. (Set communication parameter <Output dot character> to <0: No> or <1: Yes> as required.)
- (NOTE 6) Data name and Data name indicate data transfer direction and data name.
- (NOTE 7) The figures in parentheses () indicate the number of characters to be output.

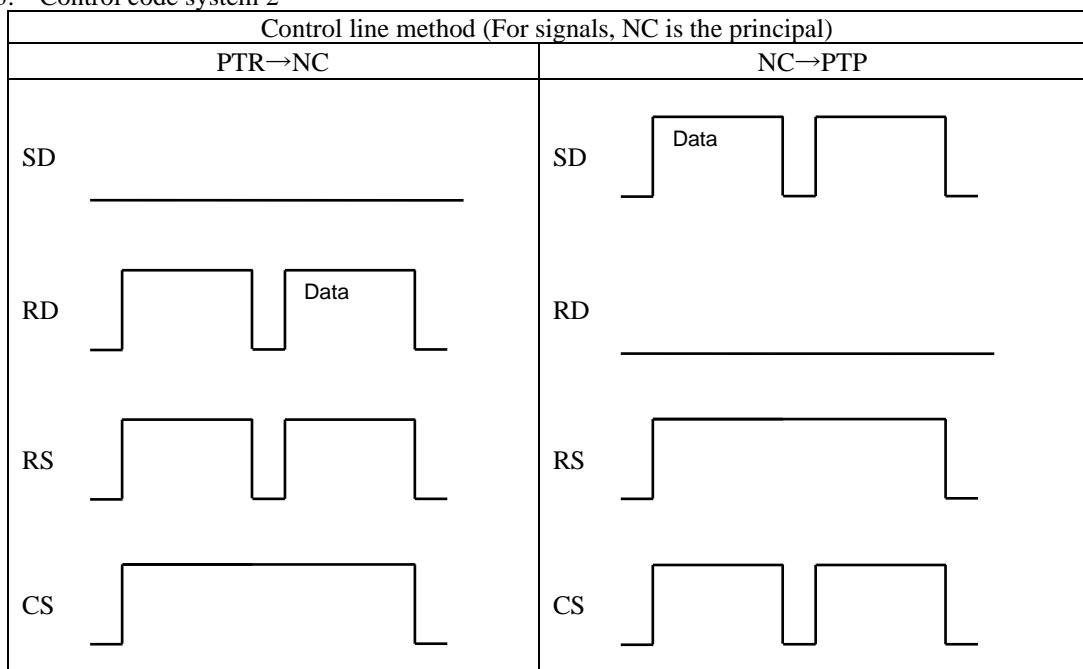
- (NOTE 8) Program number data at the beginning of the program section (O 0 0 0 1 ; and O 0 0 0 2 ;) are added to the output program number when outputting from the NC. When input program number is missing as it is input into NC, the program is registered by the number of this data (this function is available only in the NC language mode).
- (NOTE 9) Program number data at the program top is only used to register the program in NC when the input program number is missing. It is not registered in the memory. Accordingly, the block next to the program number data at the program top is the first block in the memory (available only in the NC language mode).

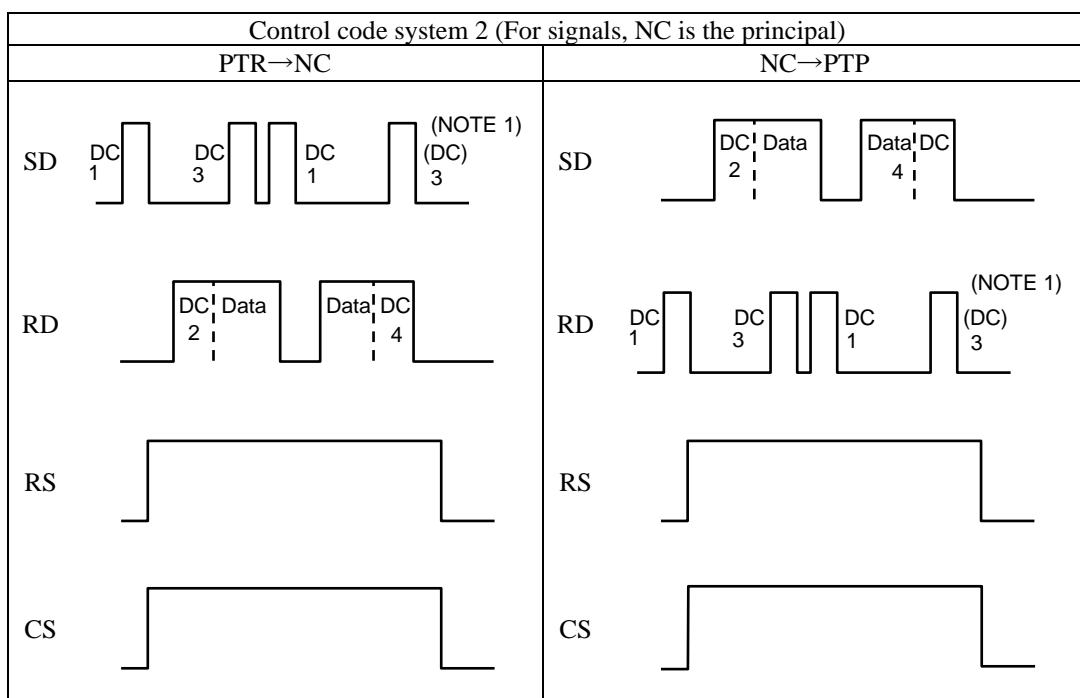
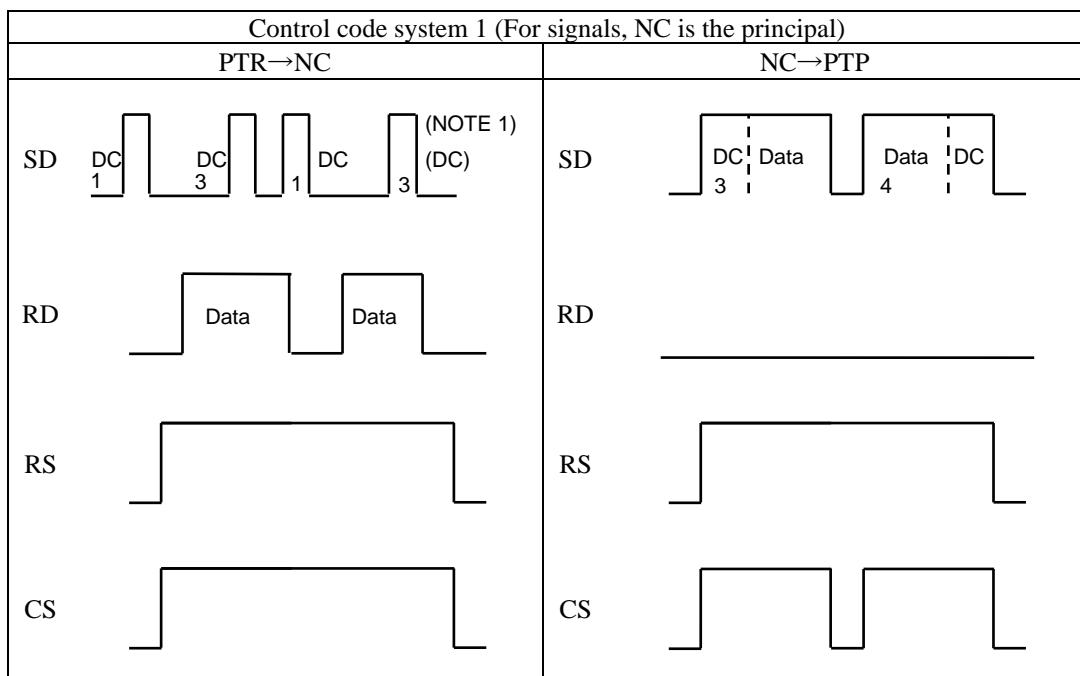
3.5.6 Communication methods of general communication device

3

You can specify one of the following 3 methods by setting communication parameter <Communication mode>.

1. Control line method
2. Control code system 1
3. Control code system 2





(NOTE 1) DC3 code in parentheses are selectable between <0: No> and <1: Yes> according to the setting of communication parameter <Communication end DC3 code>.

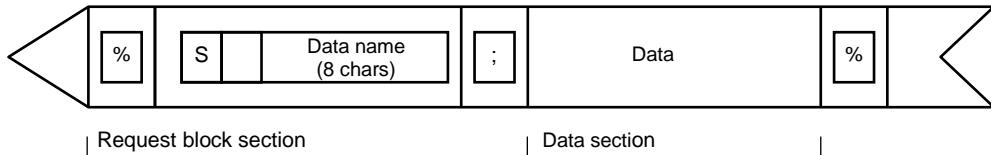
(NOTE 2) Values of DC1 through DC4 are set by communication parameter <DC1 to 4 code>.

3.5.7 NC communication device protocol type 1 (NC language mode)

3.5.7.1 Data output request

Data is output from the master to the slave station.

1. The requested data is output from the master to the slave station by adding a request block before the data.



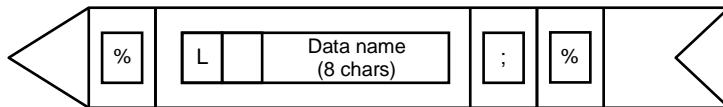
3

2. The slave station saves the data according to the information contained in the request block.

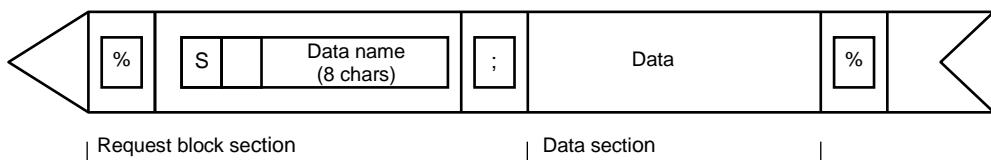
3.5.7.2 Data input request

Data is input from the slave station into the master station.

1. The master station outputs a request block for the data to be input to the master station.



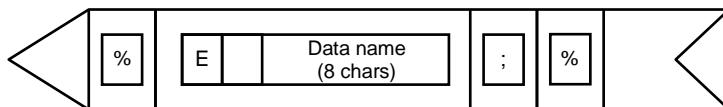
2. The slave station outputs the requested data to the master station by adding a request block at the top of the data.



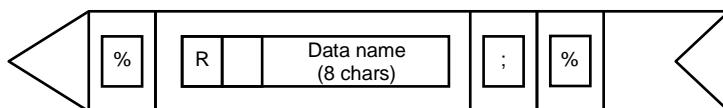
3.5.7.3 Data delete request

Data on the slave station is deleted.

1. The master station outputs a request block for the data to be deleted to the slave station.



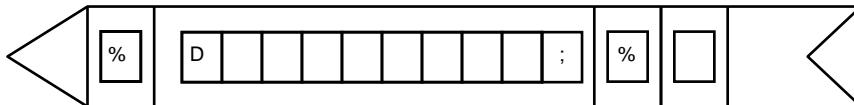
2. The slave station outputs a response block to the master station.



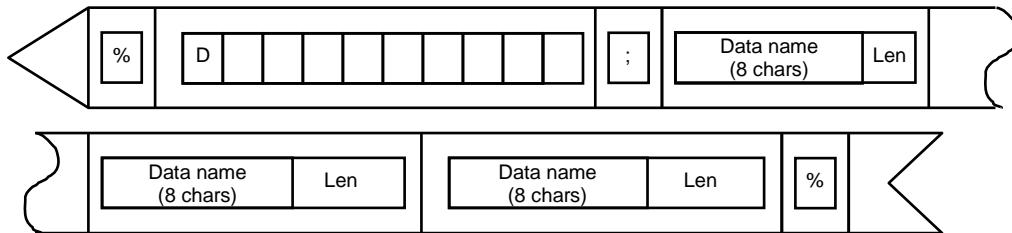
3.5.7.4 Request for inputting information on slave station directory

Directory information of the slave station is input into the master station.

1. The master station outputs the following request block to the slave station:



2. The slave station outputs the directory data to the master station by adding a request block at the top of the data.



(NOTE 1) indicates tape start and tape end code (ISO/ASCII: %; EIA: ER).

(NOTE 2) indicates end of block code (ISO: LF; EIA: EOB; ASCII: CR + LF).

(NOTE 3) indicates end of block code (ISO: LF; EIA: EOB; ASCII: CR + LF).

(NOTE 4) Data name (8 chars) and Data name (8 chars) indicate data transfer direction and data name (10 characters fixed).

indicates data output.

indicates data input.

indicates data deletion.

indicates response to data deletion.

(NOTE 5) Len indicates data size by 001 through 999 (3 characters fixed).

Data size is represented by 1 = 128 bytes.

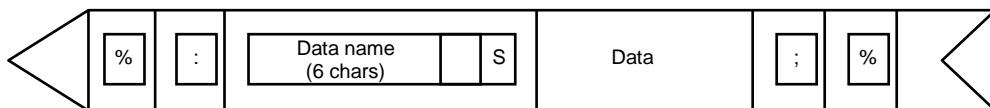
Data name for requesting a directory is the same as (NOTE 4).

3.5.8 NC communication device protocol type 1 (conversation mode)

3.5.8.1 Data output request

Data is output from the master to the slave station.

1. The requested data is output from the master to the slave station by adding a request block before the data.

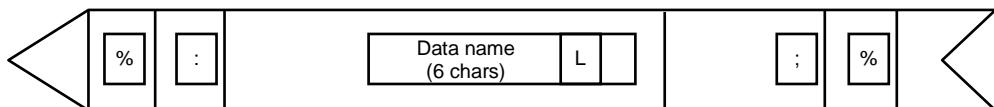


2. The slave station saves the data according to the information contained in the request block

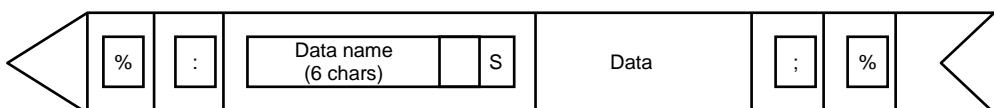
3.5.8.2 Data input request

The data of the slave station is input into the master station.

1. The master station outputs a request block for the data to be input to the master station.



2. The slave station outputs the requested data to the master station by adding a request block at the top of the data.

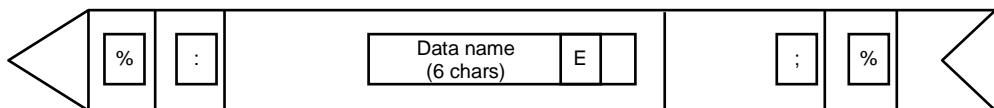


3

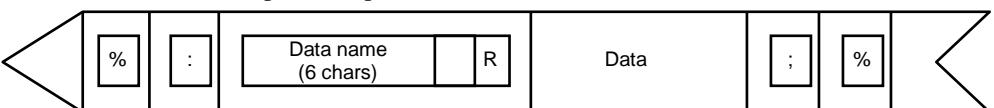
3.5.8.3 Data delete request

Data on the slave station is deleted.

1. The master station outputs a request block for the data to be deleted to the slave station.



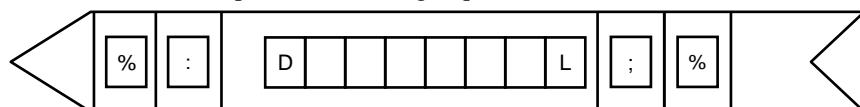
2. The slave station outputs a response block to the master station.



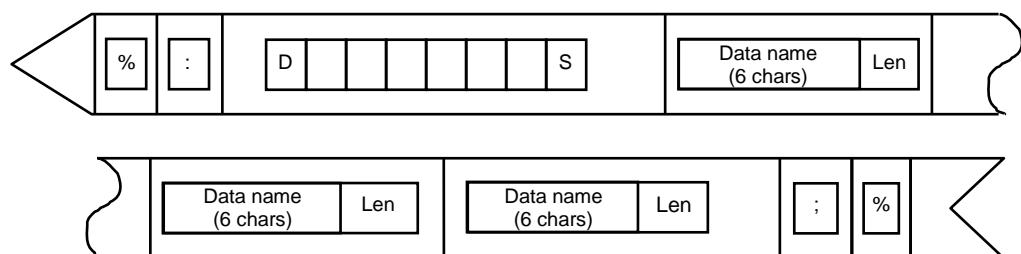
3.5.8.4 Request for slave station directory information

Directory information of the slave station is output to the master station.

1. Master station outputs the following request block to the slave station:



2. The directory data is output from the slave to the master station by adding a request block before the data.



(NOTE 1) indicates tape start / end code (%).

(NOTE 2) indicates end of block code (CR + LF).

(NOTE 3) indicates space (SP).

(NOTE 4) and and and indicate data transfer direction and data name (8 characters fixed).

indicated data output.

indicates data input.

indicates data deletion.

indicates response to data deletion.

(NOTE 5) Len indicates data size by 001 through 999 (3 characters fixed).

Data size is represented by 1 = 128 bytes.

Data name for requesting a directory is the same as (NOTE 4).

3.5.9 NC communication device protocol type 2

Once NC communication device protocol type 2 is set as Command-Response type, the command acceptance status can be externally checked, ensuring problem-free and precise control.

This protocol applies to the case when type 2 is selected for the NC communication device at master station and to the NC communication software (serial or Ethernet) at slave station.

Commands for not just data transfer but remote operations such as startup of memory operation for slave station and operation of external I/O signals are included.

3.5.9.1 Control format

1. Basic format

Command and response consist of:

Header + Data + Footer

Data is not necessarily included depending on cases.

2. Header (19 bytes)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
%	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2

% Start symbol

i1 Identifier – 1 byte

C: Command; R: response

One response of identifier R is always returned to each command of identifier C. The identifier of a response to a command is R, and the header of the same contents, excepting that a completion code is set, is echo-backed.

c1-c3 Command type – 3 bytes

f1-f4 Function – 4 bytes

s1-s8 Message – 8 bytes

r1-r2 Completion code – 2 bytes

00: Normally completed: other than 00: Abnormally completed

Blank boxes appearing in the command header table hereafter indicate a space.

3. Data Section

The portion starting with “LF” until “LF” of the footer appears is defined as the data portion.

4. Footer (4 bytes)

Footer is indicated by LFss%.

“ss” indicates the checksum, which is represented by a 2-digit decimal number.

It is calculated by adding all values from % in the header to the character before LF in the footer in decimal expression, than dividing it by decimal 16, and keeping the remainder.

(NOTE 1) % is the same as % in ISO and ASCII, and ER in EIA

(NOTE 2) LF is the same as LF in ISO, EOB in EIA, and CR+LF in ASCII.

3.5.9.2 Completion code list

Completion code	Meaning
00	Normally ended
01	Invalid data is received
02	Illegal slave command header
04	Illegal slave command check sum
05	Currently in editing or operation mode, so processing is not possible The folder is currently in use; cannot delete.
06	Editing error occurred during file operation.
07	The specified data does not exist. Current or specified folder does not exist.
08	Slave command data name is incorrect. The specified folder name is abnormal.
09	The specified data cannot be saved or deleted.
10	Data protection enabled
11	Remote operation not permitted
13	The item of the received data is not within the allowed range or the number of items doesn't match. A symbol in the receiving data does not follow the record order in the file.
14	Data version error
15	During special startup
16	Cannot read the specified data.
17	Output of drawing data was attempted during drawing.
18	The folder already exists when creating the folder. The folder exists when deleting the folder; cannot delete.
19	Designation of data size is abnormal. Size of binary data is abnormal.
20	Binary data storage error.
21	Auto notification function reserve 1
22	Auto notification function reserve 2
23	Access is restricted
30	The specified program does not exist due to a change in the selected program. When changing the data bank, the specified number is not within the allowed range. When changing the data bank, the specified number is not a data bank. Changing the data bank is attempted while data protection is enabled. When changing the ATC tool, the specified number is not within the allowed range. An illegal signal name was specified via external input/output signal operation. The value is outside the specified range when writing individual data. Illegal signal name is designated in PLC signal operation.
31	An attempt was made to change the selected program while in another mode (not memory operation mode). When changing the data bank, the machine parameter number was changed. Changing the data bank was attempted in a mode other than program edit mode. When changing the ATC tool, the specified tool is already registered. A signal that cannot be updated is specified for updating via external input/output signal operation. Write target is wrong in individual data writing. Attempted to update signals that cannot be updated in PLC signal setting.
32	An attempt was made to change the selected program during operation or editing. An attempt was made to change the selected program while tape operation is selected. Changing the data bank was attempted during operation or editing. When changing the ATC tool, an attempt was made to set a large tool to a pot with a tool attached to the adjacent pot. Character strings other than ON/OFF were specified via external input/output signal operation. Attempted to set a value that cannot be set in PLC signal setting.
33	When changing the ATC tool, the tool is not registered in the specified group. A signal that cannot be turned off was attempted to be turned off via external input/output signal operation.

Completion code	Meaning
34	When changing the ATC tool, changing a magazine item (group/main tool/ drawing color) without a tool number assigned was attempted.
35	When changing the ATC tool, the pot adjacent to the specified pot contains a large tool.
36	Changing the ATC tool was attempted during memory operation.
37	Changing the ATC tool was attempted during MDI operation.
38	Unspecified error occurred during ATC tool change.
39	When changing the ATC tool, registering the unregistered tool in the tool list was attempted.
40	Conflict occurred due to communication using other port.
41	Check sum error occurred in the specified data.
42	Parity error occurred in the specified data.
43	The specified data is too large to be stored.
44	The specified data cannot be stored because programs #8000 to #8999 are write-protected.
45	Machine unit system is different.
46	The tool that is unable to change group/main tool/tool type/drawing color in ATC tool change is set.
60	Mode change not permitted
61	Mode change not permitted signal is on.
62	MDI operation mode
63	During tool change
64	During automatic centering
65	During automatic workpiece measurement
66	Automatic door operation not possible
67	Operation not possible
68	No program
69	Not in memory operation mode (or edit-during-operation mode)
70	The outer door is open.
71	The door is open.
72	The side door is open.
73	Resetting
74	Servo control is on.
75	[FEED HOLD] switch is held down.
76	Zero return was not conducted.
77	Restarting program Sequence search in progress
78	Pallet position error
79	Performing tool breakage detection
80	Program number error Different from pallet program
81	Outer pallet A and B-axes operating
82	No quick table
83	<PALLET> key is set to OFF.
84	Workpiece counter end
85	Executing external output command
86	Memory operation mode
87	External input not available
88	In handle mode
89	XY-axes lock signal is on.
90	Z-axis lock signal is on.
91	*-axis lock signal is on.
92	Pot is not at the top end.
93	Zero return command error
94	Indexing not permitted signal is on.
95	Pallet start reversed
96	Outer pallet operating
97	Communicating

Completion code	Meaning
98	NC or conversation mode is not selected correctly.
99	Reservation

3.5.9.3 Access control command

1. Access control

(1) Temporary Ethernet access

The Ethernet access restriction, for using communication protocol type 2 for an NC communication device, is lifted temporarily. If the password is invalid, the completion code 23 is returned.

Temporary access is not needed for Ethernet access because its access is not restricted. Even if a command is issued, there is no error completion code that is returned.

- Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	E	T	H	L	G	I	N										

- Command data

Header	LF	Username	LF	Password	LF	Footer
--------	----	----------	----	----------	----	--------

Server username...1 to 20 bytes

Specify the character string that is set in the communication parameter <Server user name>.

Server password ...8 to 20 bytes

Specify the character string that is set in the communication parameter <Password as server>.

(2) End temporary Ethernet access

Temporary access ends and the Ethernet access restriction, for using communication protocol type 2 for an NC communication device, is applied.

This is not needed for other access because other access is not restricted. Even if a command is issued, there is no error completion code that is returned.

- Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	E	T	H	L	G	O	T										

3.5.9.4 Data operation command

1. Folder operation

Root folder is shown by “/” and the folder one layer up by “..”.

(Examples of folder name)

“ABC”: Moves to the folder named “ABC” existing in the current folder.

“/ABC” : Moves to the folder named “ABC” existing in the root folder.

“../ABC”: Moves to the folder named “ABC” existing in the master folder.

(NOTE) Folders, excluding some (_ACCESSORY) folders, with data that is not internal NC program data will not display. The user can access that data (in those folders) and perform operations in the root directory/folder.

(1) Request the current folder

Request is made for the path of the current folder of the other party.

- Command header

	i1	c1	c2	c3	f1	f2	f3	f4	S1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	F	L	D	P	W	D											

- Response data

Header	LF	Path	LF	Footer
--------	----	------	----	--------

Path...1 to 255 bytes. Path, including the root folder, is returned.

(2) Request the folder list

Request is made for a list of sub-folders existing in the current folder of the other party.

• Command header

%	C	F	L	D	D	R	Q											
---	---	---	---	---	---	---	---	--	--	--	--	--	--	--	--	--	--	--

Folder list is returned in the format shown below.

• Response data

Header	LF	Folder name	LF	Folder name	LF	Folder name	...	Footer
--------	----	-------------	----	-------------	----	-------------	-----	--------

Folder name...1 to 255 bytes

The footer is output after all existing folders are output.

(NOTE) Folders in the next layer up (..) are also output if the current folder is not the root folder.

(3) Move the current folder

Current folder of the other party to be used in slave station commands is moved to the specified folder.

Path may be included in the folder name to be specified.

• Command header

%	C	F	L	D	C	H	G											
---	---	---	---	---	---	---	---	--	--	--	--	--	--	--	--	--	--	--

• Command data

Header	LF	Folder name	LF	Footer
--------	----	-------------	----	--------

Folder name...1 to 255 bytes

(NOTE) Current folder is saved in memory at each port, and retained until power is turned off.

(4) Create a folder

Folders are created on the other party.

Path may be included in the folder name to be specified.

• Command header

%	C	F	L	D	M	A	K	E										
---	---	---	---	---	---	---	---	---	--	--	--	--	--	--	--	--	--	--

• Command data

Header	LF	Folder name	LF	Footer
--------	----	-------------	----	--------

Folder name...1 to 255 bytes

(NOTE) When specifying a folder including the path, a folder without a parent folder cannot be created. (When using the following “/ABC/DEF”, if the folder /ABC does not exist, then an error is triggered)

(5) Delete a folder

Folders of the other party are deleted.

Path may be included in the folder name to be specified.

- Command header

%	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

- Command data

Header	LF	Folder name	LF	Footer
--------	----	-------------	----	--------

Folder name...1 to 255 bytes

(NOTE 1) Operation programs, edit programs, and the folder specified as the current folder of slave station of any port cannot be deleted.

(NOTE 2) Folders that are used by the internal NC system cannot be deleted.

3

2. Request directory

(NOTE 1) Directories that can be acquired are those in the current folder of the other party. First move the current folder by command and then execute Request directory.

(NOTE 2) Folders (excluding some folders) with data that is not internal NC program data will not display. When requesting data that is saved in those folders, request or update the latest directory data in the root folder.

(1) Request the directories of all data (Maximum of 8 bytes for the data name)

Request the master station to send the directory.

- Command header

%	i1	c1	c2	c3	F1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

Directory information is returned in the format shown below.

- Response data

Header	LF	Data name	Size	Data name	Size	Data name	Size	...	Footer
--------	----	-----------	------	-----------	------	-----------	------	-----	--------

Data name...8 bytes

Size.....10 bytes

Size is indicated by bytes. The footer is output after all existing data is output.

(NOTE 1) Data with a data name that exceeds 8 bytes will not output.

(NOTE 2) Manuals, viewer files, screenshots and notebooks will not output.

(2) Requesting directory for all data

A directory request is carried out to the connecting device.

- Command header

%	i1	c1	c2	c3	F1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

The directory information is issued in a response using the formats below.

- Response data

Header	LF	Data name	LF	Size	LF	Data name	LF	Size	LF	...	Footer
--------	----	-----------	----	------	----	-----------	----	------	----	-----	--------

Data name... 1 to 255 bytes

Size.....10 bytes

The size is displayed by the number of bytes. After the corresponding data is output, the footer is output.

(NOTE) Manuals, viewer files, screenshots and notebooks are output with file extensions.

- (3) Request directory of all data (old type)
Ask Latest directory to the other party.

- Command header

%	C	D	R	Q	A	L	L											
---	---	---	---	---	---	---	---	--	--	--	--	--	--	--	--	--	--	--

Directory information is returned in the format shown below.

- Response data

Header	LF	Data name	Size	Data name	Size	Data name	Size	...	Footer
--------	----	-----------	------	-----------	------	-----------	------	-----	--------

Data name...8bytes

Size.....3bytes

The data size is indicated by the number of blocks. One block contains 128 bytes.

(Data exceeding 999 blocks is represented by 999.)

The footer is output after all existing data is output.

(NOTE 1) Data with a data name that exceeds 8 bytes will not output.

(NOTE 2) Manuals, viewer files, screenshots and notebooks will not output.

- (4) Request a directory by designating the data name (Maximum of 8 bytes for the data name)

Request the master station to send the directory of the designated area.

This function is useful when confirming whether the designated data exists at the master station.

- Command header

%	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

n1n2n3n4n5n6n7n8...Specifies the data name.

- Response data

The data is returned in the same format as the case requesting directories of all data.

(NOTE 1) Data with a data name that exceeds 8 bytes cannot be specified.

(NOTE 2) Manuals, viewer files, screenshots and notebooks cannot be specified.

- (5) Specify data name when requesting directory

A directory request for the specified data is carried out to the connecting device.

This is a convenient operation to check whether or not specific data exists in the connecting directory.

- Command header

%	C	D	R	Q	S	L	L	N										
---	---	---	---	---	---	---	---	---	--	--	--	--	--	--	--	--	--	--

- Command data

Header	LF	Data name	LF	Footer
--------	----	-----------	----	--------

Data name... 1 to 255 bytes (with file extension)

- Response data

The response is issued in the same format as the all data operation.

(NOTE) Manuals, viewer files, screenshots and notebooks are specified with file extensions.

- (6) Ask detailed directory of registered programs only (Maximum of 8 bytes for the data name)

Ask the other party for detailed directory of registered programs only.

- Command header

	i1	c1	c2	C3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	D	R	Q	P	R	A	L										

Directory information is returned in the format shown below.

- Response data

Header	LF	Data name	Size	Comment	Date	Data name	Size	...	Footer
--------	----	-----------	------	---------	------	-----------	------	-----	--------

Data name...8bytes

Size.....10bytes

Comment...60bytes

Date.....14bytes

Size is indicated by bytes. Date is shown by year (4 digits), month (2), day (2), hours (2), minutes (2), and seconds (2), from top.

(NOTE) Data with a data name that exceeds 8 bytes cannot be specified.

- (7) Requesting detailed directory only for registered programs

A detailed directory request only for registered programs is carried out to the connecting device.

- Command header

	i1	c1	c2	C3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	D	R	Q	P	R	L	A										

The directory information is issued in a response using the formats below.

- Response data

Header	LF	Data name	LF	Size	Comment	Date	LF	Data name	LF	Size	...	Footer
--------	----	-----------	----	------	---------	------	----	-----------	----	------	-----	--------

Data name... 1 to 255 bytes

Size.....10 bytes

Comment.....60 bytes

Date.....14 bytes

The size is displayed by the number of bytes. The date is shown as follows from the header: Year (4 digits), month (2 digits), day (2 digits), hour (2 digits), minutes (2 digits), seconds (2 digits).

- (8) Request detailed directory by specifying registered program (Maximum of 8 bytes for the data name)

Request detailed directory to the other party by specifying registered programs

- Command header

	i1	c1	c2	C3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	D	R	Q	P	R	S	L	n1	n2	n3	n4	n5	n6	n7	n8		

n1n2n3n4n5n6n7n8...Data name

Result of search is returned in the format shown below.

- Response data

Header	LF	Data name	Size	Comment	Date	Attribute	LF	Footer
--------	----	-----------	------	---------	------	-----------	----	--------

Data name...8 bytes

Size.....10 bytes

Comment...60 bytes

Date.....14 bytes

Attribute.....1 byte 0: Ordinary state (other than 1 and 2)

1: Program is being used.

2: Edit-prohibited program

Date is shown by year (4 digits), month (2), day (2), hours (2), minutes (2), and seconds (2), from top.

(NOTE) Data with a data name that exceeds 8 bytes cannot be specified.

(9) Requesting detailed directory for specific registered programs

A detailed directory request for specific registered programs is carried out to the connecting device.

- Command header

	i1	c1	c2	C3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	D	R	Q	P	R	L	N										

- Command data

Header	LF	Data name	LF	Footer
--------	----	-----------	----	--------

Data name... 1 to 255 bytes

The search results is issued in a response using the formats below.

- Response data

Header	LF	Data name	LF	Size	Comment	Date	Attribute	LF	Footer
--------	----	-----------	----	------	---------	------	-----------	----	--------

Data name... 1 to 255 bytes

Size..... 10 bytes

Comment...60 bytes

Date.....14 bytes

Attribute.....1 byte 0: Normal status (when not 1 or 2)

1: Program being used

2: Program cannot be edited

The size is displayed by the number of bytes. The date is shown as follows from the header: Year (4 digits), month (2 digits), day (2 digits), hour (2 digits), minutes (2 digits), seconds (2 digits).

3. Save data

(NOTE) A request to save data is issued to the current folder of the connecting device. First move the current folder by command and then request Save data.

(1) Save the specified data in the other party (Maximum of 8 bytes for the data name)

Specified data is transferred to the other party.

- Command header

	i1	c1	c2	C3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	S	A	V					n1	n2	n3	n4	n5	n6	n7	n8		

n1n2n3n4n5n6n7n8...Specifies the data name.

- Command data

Header	LF	...Data...	LF	Footer
--------	----	------------	----	--------

Specified data comprises from LF immediately after the header to LF of the footer.

(2) Saving specific data to connecting device

The specified data is forwarded to the connecting device.

- Command header

%	C	S	A	V	L	N											
---	---	---	---	---	---	---	--	--	--	--	--	--	--	--	--	--	--

- Command data

Header	LF	Data name	LF	...Data...	LF	Footer
--------	----	-----------	----	------------	----	--------

The data name (1 to 255 bytes) comes between the LF right after the header and the next LF. Thereafter, the specified data content comes between the LFs in the footer.

(3) Save the specified data (binary) on the other party (Maximum of 8 bytes for the data name)

Specified data is transferred to the other party by binary.

- Command header

%	C	S	A	V	B	I	N		n1	n2	n3	n4	n5	n6	n7	n8	
---	---	---	---	---	---	---	---	--	----	----	----	----	----	----	----	----	--

n1n2n3n4n5n6n7n8...Specifies the data name.

- Command data

Header	LF	Size	LF	...Data...	LF	Footer
--------	----	------	----	------------	----	--------

Size...1 to 10 bytes. Data size is represented by the number of bytes.

Data...Specified data with the length specified by size (binary data).

(NOTE 1) Items that can be forwarded in binary data are limited to some files, such as PLC programs. Refer to “3.6 Details of communication data” for details. No transmission is possible to the serial port.

(NOTE 2) Manuals, viewer files, screenshots and notebooks cannot be specified.

(4) Saving specific data (binary) to connecting device

The specified data is forwarded in binary to the connecting device.

- Command header

%	C	S	A	V	B	I	L	N									
---	---	---	---	---	---	---	---	---	--	--	--	--	--	--	--	--	--

- Command data

Header	LF	Data name	LF	Size	LF	...Data...	LF	Footer
--------	----	-----------	----	------	----	------------	----	--------

Data name... 1 to 255 bytes → Data name

Size.....1 to 10 bytes → Data size is expressed by the number of bytes.

Data.....Specified data (binary data) for the length specified by the size.

(NOTE 1) Items that can be forwarded in binary data are limited to some files, such as PLC programs. Refer to “3.6 Communication data details” for further details. In addition, data cannot be sent to the serial port.

(NOTE 2) Manuals, viewer files, screenshots and notebooks are specified with file extensions.

4. Read data

(NOTE) A request is issued to read data from the current folder of the connecting device. First, use commands to move the current folder and then issue a request to read the data.

- (1) Read specified data from other party (Maximum of 8 bytes for the data name)
Ask the other party for the specified data, and receive reply data.

- Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	L	O	D					n1	n2	n3	n4	n5	n6	n7	n8		

n1n2n3n4n5n6n7n8...Specifies the data name.

- Response data

The format is the same as the command data for “Save data”.

- (2) Read specified data from connecting device

A request for the specified data is issued to the connecting device, and the response data is received.

- Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	L	O	D	L	N												

- Command data

Header	LF	Data name	LF	Footer
--------	----	-----------	----	--------

Data name... 1 to 255 bytes → Data name

- Response data

Header	LF	...Data...	LF	Footer
--------	----	------------	----	--------

- (3) Read specified data (binary) from other party (Maximum of 8 bytes for the data name)

Ask the other party for specified data and receive replay data.

- Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	L	O	D	B	I	N		n1	n2	n3	n4	n5	n6	n7	n8		

n1n2n3n4n5n6n7n8...Specifies the data name.

- Response data

The format is the same as the command data for “Save data”.

(NOTE 1) Items that can be forwarded in binary data are limited to some files, such as PLC programs. Refer to “3.6 Details of communication data” for details. No transmission is possible to the serial port.

(NOTE 2) Manuals, viewer files, screenshots and notebooks cannot be specified.

(4) Read specified data (binary) from connecting device

A request for the specified data is issued to the connecting device, and the response data is received.

- Command header

%	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

- Command data

Header	LF	Data name	LF	Footer
--------	----	-----------	----	--------

Data name... 1 to 255 bytes → Data name

- Response data

Header	LF	Size	LF	...Data...	LF	Footer
--------	----	------	----	------------	----	--------

Size... 1 to 10 bytes → Data size is expressed by the number of bytes.

Data...Specified data (binary data) for the length specified by the size.

3

(NOTE 1) Items that can be forwarded in binary data are limited to some files, such as PLC programs. Refer to “3.6 Communication data details” for further details. In addition, data cannot be sent to the serial port.

(NOTE 2) Manuals, viewer files, screenshots and notebooks are specified with file extensions.

(5) Read specified records in specified data from other party

Ask the other party for specified records in specified data, and receive the reply data.

- Command header

%	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

n1n2n3n4n5n6n7n8...Specifies data name.

- Command data

Header	LF	Symbol 1	LF	...Symbol n...	LF	Footer
--------	----	----------	----	----------------	----	--------

Symbol n...Symbol for record to be referenced

- Response data

The same format is used as the command data to <Save data>.

(NOTE 1) The specified symbol order must follow the same record order in the file.

(NOTE 2) Only some files can be specified. The following files can be specified.

Data name
Workpiece coordinate zero (Type 1)
Workpiece coordinate zero (Type 2)
Tool data (Type 1)
Tool data (Type 2)
Macro variables (Type 1)
Macro variables (Type 2)

5. Delete files

(NOTE) A request is issued to delete data from the current folder.

First, use commands to move the current folder and then issue a request to delete the data.

(1) Delete specified data of other party (Maximum of 8 bytes for the data name)

Ask the other party to delete the specified data.

The receiving station deletes the specified data and returns a response.

• Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	D	E	L					n1	n2	n3	n4	n5	n6	n7	n8		

n1n2n3n4n5n6n7n8...Specifies the data name.

(NOTE) Manuals, viewer files, screenshots and notebooks cannot be specified.

(2) Deleting specific data from connecting device

A request is issued to the connecting device to delete the specified data.

The receiving station deletes the specified data, and then a response is issued.

• Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	D	E	L	L	N												

• Command data

Header	LF	Data name	LF	Footer
--------	----	-----------	----	--------

Data name... 1 to 255 bytes → Data name

(NOTE) Manuals, viewer files, screenshots and notebooks are specified with file extensions.

(3) Delete all programs of the other party

Ask the other party to delete all NC programs, interactive machining data, and schedule programs. Programs in not only the current folder but also all other folders are deleted. The receiving station deletes all programs and returns a response.

• Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	D	E	L	P	R	A	L										

6. Read individual data

(1) Acquire file control data

File control data is acquired from the NC.

- Command header

%	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	R	E	D	F	I	L	E										

Machining program control data is returned in the format shown below.

- Response data

Header	LF	Number of registrations	Number of possible registrations	Memory usage	Remaining memory	LF	Footer
--------	----	-------------------------	----------------------------------	--------------	------------------	----	--------

Number of registrations..... 4 bytes; number of programs currently registered (total of NC and conversation)

Number of possible registrations... 4 bytes; number of programs that can be registered (total of NC and conversation)

Memory usage..... 10 bytes; memory in use (bytes)

Remaining memory..... 10 bytes; remaining capacity of the memory (bytes)

(NOTE) Number of possible registrations, Memory usage, and Remaining memory include files other than programs such as data banks.

(2) Acquire information on currently executed program (Program No.)

Information on the program currently selected in the memory operation is acquired.

- Command header

%	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	R	E	D	P	R	G	N										

Information on currently executed program is returned in the format shown below.

- Response data

Header	LF	Currently executed program number	Main program number	Currently executed block number	LF	Footer
--------	----	-----------------------------------	---------------------	---------------------------------	----	--------

Currently executed program number... 4 bytes; currently selected program number

Main program number..... 4 bytes; Main program number

Currently executed block number..... 14 bytes;

NC : currently executed block number

Conversation : process (3), tool (2), machining position (3), workpiece number (2), line number (2), infeed (2)

(NOTE 1) Currently executed program number is the same as Main program number when the system is running according to the main program.

(NOTE 2) This field is blank when the program is executing or when the main program is not a number.

(3) Acquire information from an executing program

Information for the program currently selected in memory operation is acquired.

- Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	R	E	D	P	R	G	L										

Information for a program that is executing uses the format below when a response is issued.

- Command header

Header	LF	Currently executed program	LF	Main program	LF	Currently executed block number	LF	Footer
--------	----	----------------------------	----	--------------	----	---------------------------------	----	--------

Currently executed program..... 1 to 255 bytes – currently selected program

Main program..... 1 to 255 bytes – Main program

Currently executed block number... 14 bytes

NC : currently executed block number

Conversation : process (3), tool (2), machining position (3), workpiece number (2), line number (2), infeed (2)

(NOTE) When a main program is executing, the executing program and the main program are the same.

(4) Acquire currently executed programs by the number equivalent to the specified character number

That portion of the currently selected program running in the memory operation which is equivalent to the specified number of characters is acquired, starting from the block number currently being executed.

- Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	R	E	D	P	R	G		c1	c2	c3	c4	c5	c6	c7	c8		

c1c2c3c4c5c6c7c8...Acquired character count: Between 1 and the screen display character count.

The required information on the program is returned in the format shown below.

- Response data

Header	LF	Program	LF	Footer
--------	----	---------	----	--------

Program...That portion of the NC program which is equivalent to the specified number of characters, starting from the block currently being executed.

Those programs that have an execution point are output. Only sub-programs are output when the execution pointer is a sub-program. If a file ends before outputting the data equivalent to the specified number of characters, spaces are output thereafter. An error occurs in the case of conversation mode.

(5) Acquire date and time

Date and time of the other party are acquired.

- Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	R	E	D	D	A	T	E										

Date and time are returned in the format shown below.

- Response data

Header	LF	Date	LF	Footer
--------	----	------	----	--------

Date...14 bytes; shown by year (4 digits), month (2), day (2), hours (2), minutes (2), and seconds (2), from top.

(6) Acquire PLC signal data

Acquires the specified PLC signal data.

(NOTE) You can instruct a command when the communication parameter <Remote operation> is set to <1: Valid>.

- Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	R	E	D	P	L	C	D	k1	k2	k3	k4	n1	n2	n3	n4		

k1k2k3k4...Signal type

X : External input

Y : External output

BX : Internal input (bit)

BY : Internal output (bit)

BDX : Internal input (word)

BDXL : Internal input (long word)

BDY : Internal output (word)

BDYL : Internal output (long word)

M : Internal relay

D : Data register(word)

DL : Data register (long word)

LM0 to 4 : Local relay (high speed 1/2; low speed 1/2)

(LM0: high speed 1; LM1: standard 1; LM2: high speed 2; LM3: standard 2)

LD0 to 4 : Local data register (high speed 1/2; low speed 1/2)

0 to 8191 (decimals)

LDL0 to 4: Local relay (long word)

(high speed 1/2; low speed 1/2)

0 to 8190 (Specify even

decimal numbers)

LTV0 to 4 : Local timer – current value (high speed 1/2; low speed 1/2)

0 to 511 (decimals)

LTP0 to 4 : Local timer – set value (high speed 1/2; low speed 1/2)

0 to 511 (decimals)

LCV0 to 4: Local counter – current value (high speed 1/2; low speed 1/2)

0 to 511 (decimals)

LCP0 to 4 : Local counter – set value (high speed 1/2; low speed 1/2)

0 to 511 (decimals)

- Response data

Header	LF	Set value	LF	Footer
--------	----	-----------	----	--------

Set value...1 byte (when k1k2k3k4 is X/Y/BX/BY/M/LM0 to 3) 0/1

11 byte (when k1k2k3k4 is BDXL/BDYL/DL/SDL0 to 3) -2147483648

to 2147483647

6 bytes (when k1k2k3k4 is other than the above) -32768~32767

- (7) Specify the range and acquire the PLC signal data

Acquires the specified range of the PLC signal data.

(NOTE) When the communication parameter <Remote operation> is set to <1:Valid>, this command can be issued.

- Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	R	E	D	P	L	C	R	k1	k2	k3	k4	n1	n2	n3	n4		

k1k2k3k4...Signal type n1n2n3n4...No.

The signal type and number are the same type and number used in “Acquire PLC signal data”.

- Command data

Header	LF	Data size	LF	Footer
--------	----	-----------	----	--------

Data size...4 bytes, 1 to 9999 (Specify using decimals regardless of the specified signal.)

The signals for the specified data size are referenced from the specified signals in the command header.

(NOTE) If the value has a data size that exceeds the range, it references the signals within the range.

- Response data

Header	LF	Data size	Set value	Set value	...	Set value	LF	Footer
--------	----	-----------	-----------	-----------	-----	-----------	----	--------

Data size...4 bytes, data size for signals that are referenced

Set value...1 byte (when k1k2k3k4 is X/Y/BX/BY/M/LM0 to 3) 0/1

11 bytes (when k1k2k3k4 is BDXL/BDYL/DL/LDL0 to 3)-2147483648 to 2147483647

6 bytes (when k1k2k3k4 is data not specified above) -32768 to 32767

- (8) Acquire all current data bank names

All current data bank names are requested.

- Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	R	E	D	C	D	B	N										

The current data bank names are issued in a response using the formats below.

- Response data

Header	LF	Data bank names	Data bank names	Data bank names	...	LF	Footer
--------	----	-----------------	-----------------	-----------------	-----	----	--------

Data bank names ...8 bytes

- (9) Acquire specific current data bank names

Specific current data bank names are requested.

- Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	R	E	D	C	D	S	L	n1	n2	n3	n4	n5	n6	n7	n8		

n1n2 n3n4 n5n6 n7n8...Data bank names

(NOTE) Specify the data bank names using a format without the data number. (Ex: UPRCM)

When the data number is included, the number is ignored. (Even if the name is entered as “UPRCM1” the name is processed as “UPRCM”)

The current data bank names are issued in a response using the formats below.

- Response data

Header	LF	Data bank names	LF	Footer
--------	----	-----------------	----	--------

Data bank names ...8 bytes

(10) Acquire tool compensation (Tool No. 01 to 99)

The tool length offset, cutter compensation and tool position offset are acquired for a specific tool in the NC language.

- Command header

%	i1	c1	c2	C3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

n1n2... Tool No.: 01 to 99

k1..... Types → 0: Tool length offset, 1: T length wear offset, 2: Cutter compensation,
3: Cutter wear offset, 4: Tool position offset (X), 5: Tool pos. wear offset (X),
6: Tool position offset (Y) and 7: Tool pos. wear offset (Y).

The tool compensation is issued in a response using the formats below.

3

- Response data

Header	LF	Compensation	LF	Footer
--------	----	--------------	----	--------

Compensation... 9 bytes (when k1 is 0, 2, 4 and 6)

8 bytes (when k1 is 1, 3, 5 and 7)

(Commands are issued with decimal points for compensation, and when there is no decimal point, the integer part is processed.)

(11) Acquire tool compensation data (Tool No. 001 to 099 and 201 to 299)

The data for the tool length offset, cutter compensation and tool position offset is acquired for a specific tool in the NC language.

- Command header

%	i1	c1	c2	C3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

n1n2n3... Tool No.: 001 to 099 and 201 to 299

k1..... Types → 0: Tool length offset, 1: T length wear offset, 2: Cutter compensation, 3: Cutter wear offset,
4: Tool position offset (X), 5: Tool pos. wear offset (X),
6: Tool position offset (Y) and 7: Tool pos. wear offset (Y).

The tool compensation is issued in a response using the formats below.

- Response data

Header	LF	Compensation	LF	Footer
--------	----	--------------	----	--------

Compensation... 9 bytes (when k1 is 0, 2, 4 and 6)

8 bytes (when k1 is 1, 3, 5 and 7)

(Commands are issued with decimal points for compensation, and when there is no decimal point, the integer part is processed.)

(12) Acquire tool life (Tool No. 01 to 99)

A specific tool life is acquired in the NC language.

- Command header

%	i1	c1	c2	C3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

n1n2... Tool No.: 01 to 99

k1..... Type → 0: Life unit, 1: Initial life, 2: Life warning, 3: Tool life

- Response data

Header	LF	Set value	LF	Footer
--------	----	-----------	----	--------

Set value... 1 byte (when k1 is 0) for tool life unit → 1: Not counted, 2: Time (min),

3: Drilling (holes), 4: Program (cycles), 5: Time (sec.)

6 bytes (when k1 is 1, 2 or 3) for tool life value

- (13) Acquire tool life data (Tool No. 001 to 099 and 201 to 299)

The specified tool life data is acquired in the NC language.

- Command header

%	C	R	E	D	T	L	L	E	n1	n2	n3	k1						
---	---	---	---	---	---	---	---	---	----	----	----	----	--	--	--	--	--	--

n1n2n3... Tool No.: 001 to 099 and 201 to 299

k1..... Type → 0: Life unit, 1: Initial life, 2: Life warning, 3: Tool life

- Response data

Header	LF	Set value	LF	Footer
--------	----	-----------	----	--------

Set value... 1 byte (when k1 is 0) for tool life unit → 1: Not counted, 2: Time (min),

3: Drilling (holes), 4: Program (cycles), 5: Time (sec.)

7 bytes (when k1 is 1, 2 or 3) for tool life value

- (14) Acquire H/D modal

The current H/D modal value is acquired.

- Command header

%	C	R	E	D	T	O	F	M										
---	---	---	---	---	---	---	---	---	--	--	--	--	--	--	--	--	--	--

The H/D modal value is issued in a response using the formats below.

- Response data

Header	LF	H modal	LF	D modal	Footer
--------	----	---------	----	---------	--------

H modal ...3bytes

D modal ...3bytes

- (15) Acquire macro variable

Acquires the value of the specified macro variable.

- Command header

%	C	R	E	D	M	C	N	M	n1	n2	n1							
---	---	---	---	---	---	---	---	---	----	----	----	--	--	--	--	--	--	--

n1n2n3... Tool No.: 500 to 999

The set value for the macro variable is issued in a response using the formats below.

- Response data

Header	LF	Set value	LF	Footer
--------	----	-----------	----	--------

Set value...12 byte

- (16) Specify the range and acquire the macro variables
Acquires the values for the macro variables in the specified range.

- Command header

%	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
n1n2n3...No.: 500 to 999																		

- Command data

Header	LF	Data size	LF	Footer
--------	----	-----------	----	--------

Data size...3 bytes, 1 to 999

The macro variables for the specified data size are referenced from the specified macro variables in the command header.

3

(NOTE) If the value has a data size that exceeds the range, it references the macro variables within the range.

- Response data

Header	LF	Data size	Set value	Set value	...	Set value	LF	Footer
--------	----	-----------	-----------	-----------	-----	-----------	----	--------

Data size...3 bytes, data size for macro variables that are referenced

Set value...12 bytes

7. Write individual data

- (1) Preset offset amount in relative coordinates

The offset for the relative coordinate position is preset (set again).

- Command header

%	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
a1a2...Axis number: 1 to 15																		

All axes: -1

- Command data

Header	LF	Offset 1	Offset 2	...	LF	Footer
--------	----	----------	----------	-----	----	--------

Offset 1..... 10 bytes; offset for a single specified axis

Offset for the 1st axis when “all axes” is specified.

Offset 2 to 15...10 bytes; Offset for the 2nd through 15th axes are added when “all axes” is specified. (Offsets are commanded with a decimal point. In the absence of a decimal point, the value is treated as an integer.)

- (2) Set tool offset (Tool No. 01 to 99)

The tool length offset, cutter compensation and tool position offset are set for a specific tool in the NC language.

- Command header

%	i1	c1	c2	C3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
n1n2... Tool number: 01 to 99																		

k1..... Type. →0: tool length offset; 1: tool wear offset; 2: tool diameter offset;

3: tool diameter wear offset, 4: Tool position offset (X), 5: Tool pos. wear offset (X),

6: Tool position offset (Y) and 7: Tool pos. wear offset (Y).

- Command data

Header	LF	Offset	LF	Footer
--------	----	--------	----	--------

Offset...9 bytes (for k1 = 0,2,4,6)

8 bytes (for k1 = 1,3,5,7)

(Offsets are commanded with a decimal point. In the absence of a decimal point, the value is treated as an integer.)

(3) Set tool compensation data (Tool No. 001 to 099 and 201 to 299)

The data for the tool length offset and tool position offset is set for a specified tool in the NC language.

- Command header

%	i1	c1	c2	C3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
	C	W	R	T	T	O	F	T	n1	n2	n3	k1						

n1n2n3... Tool No.: 001 to 099 and 201 to 299

k1..... Type 0: Tool length offset, 1: Tool length wear offset, 2: Cutter compensation, 3: Cutter wear offset, 4: Tool position offset (X), 5: Tool pos. wear offset (X), 6: Tool position offset (Y) and 7: Tool pos. wear offset (Y).

- Command data

Header	LF	Compensation	LF	Footer
--------	----	--------------	----	--------

Compensation...9 bytes (when k1 is 0 or 2)

8 bytes (when k1 is 1 or 3)

(Commands are issued with decimal points for compensation, and when there is no decimal point, the integer part is processed.)

3

(4) Set tool life (Tool No. 01 to 99)

Set the life of the tool of the specified NC language.

- Command header

%	i1	c1	c2	C3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
	C	W	R	T	T	L	L	F	n1	n2	k1							

n1n2... Tool number :01 to 99

k1..... Type. →0: life unit; 1: initial life; 2: life warning; 3: life

- Command data

Header	LF	Set value	LF	Footer
--------	----	-----------	----	--------

Setting... 1 byte (when k1 is 0) for tool life unit → 1: Not counted, 2: Time (min), 3:

Drilling (holes), 4: Program (cycles), 5: Time (sec.)

6 bytes (for k1= 1 to 3): life value

(5) Set tool life data (Tool No. 01 to 99 and 201 to 299)

The specified tool life data is set in the NC language.

- Command header

%	i1	c1	c2	C3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
	C	W	R	T	T	L	L	F	n1	n2	k1							

n1n2... Tool No.: 01 to 99 and 201 to 299

k1..... Type → 0: Life unit, 1: Initial life, 2: Life warning, 3: Tool life

- Command data

Header	LF	Set value	LF	Footer
--------	----	-----------	----	--------

Setting... 1 byte (when k1 is 0) for tool life unit → 1: Not counted, 2: Time (min), 3:

Drilling (holes), 4: Program (cycles), 5: Time (sec.)

7 bytes (when k1 is 1, 2 or 3) for tool life value

(6) Set tools to tool groups

Tools are added to the tool group of the specified NC language.

- Command header

%	i1	c1	c2	c3	f1	f2	f3	f4	s1		s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	W	R	T	T	G	R	P	n1		n2	i1	i2	t1	t2	t3			

n1n2... Group number: 01 to 30

i1i2..... Order of use: 01 to 30

t1t2t3... Tool number: 01 to 99 and 201 to 299

(NOTE 1) When specifying an existing order of use, the tool of that order of use is shifted to the next place.

(NOTE 2) Vacancy, if any, before the specified order of use is automatically closed up by advancing the tool of the next-occurring order of use.

3

(7) Set date and time

Date and time of NC are set.

- Command header

%	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	W	R	T	D	A	T	E										

- Command data

Header	LF	Date	LF	Footer
--------	----	------	----	--------

Date... 14 bytes; shown by year (4 digits), month (2), day (2), hours (2), minutes (2), and seconds (2), from top.

(8) Set the operation time

Operation time is set.

- Command header

%	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	W	R	T	O	P	T	M										

- Command data

Header	LF	Operation time	LF	Footer
--------	----	----------------	----	--------

Date... 8 bytes; shown by hours (4 digits), minutes (2), and seconds (2), from top.

(9) Set PLC signal data

The specified PLC signal data is set.

(NOTE 1) You can instruct commands when the communication parameter <Remote operation> is set to <1: Valid>.

(NOTE 2) “M (M001): Internal relay” and “D (DL): Data register” are loaded from and written into the writing range when the PLC program is running. When using this function, set the location outside of the writing range before using the function.

• Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	W	R	T	P	L	C	D	k1	k2	k3	k4	n1	n2	n3	n4		

k1k2k3k4...Signal type	n1n2n3n4...Number
Y : External output	000 to 3FF (hexadecimals)
M : Internal relay	0000 to 8191 (decimals)
D : Data register (word)	0 to 2047 (decimals)
DL : Data register (long word)	0 to 2046 (Specify even decimal numbers)
LM0 to 3 : Local relay (high speed 1/2; low speed 1/2)	0000 to 1023 (decimals)
(LM0: high speed 1; LM1: standard 1; LM2: high speed 2; LM3: standard 2)	
LD0 to 3 : Local data register (high speed 1/2; low speed 1/2)	0 to 2047 (decimals)
LDL0 to 3 : Local data register (long word)	0 to 2046 (Specify even decimal numbers)
(high speed 1/2; low speed 1/2)	
LTV0 to 3 : Local timer – current value (high speed 1/2; low speed 1/2)	0 to 255 (decimals)
LTP0 to 3 : Local timer – set value (high speed 1/2; low speed 1/2)	0 to 255 (decimals)
LCV0 to 3 : Local counter – current value (high speed 1/2; low speed 1/2)	0 to 255 (decimals)
LCP0 to 3 : Local counter – set value (high speed 1/2; low speed 1/2)	0 to 255 (decimals)

• Command data

Header	LF	Set value	LF	Footer
--------	----	-----------	----	--------

Set value... 1 byte (When k1k2k3k4 is Y/M/LM0 - 3) 0/1
 6 bytes (When k1k2k3k4 is LTV0 - 3, LTP0 - 3, LCV0 - 3 or LCP0 - 3)
 0 to 32767
 11 bytes (When k1k2k3k4 is DL/LDL0 - 3) -2147483648 to 2147483647
 6 bytes (When k1k2k3k4 is data not specified above) -32768 to 32767

(10) Set macro variable

The value of the specific macro variable is set.

• Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	W	R	T	M	C	N	M	n1	n2	n1							

n1n2n3...Tool No.: 500 to 999.

• Command data

Header	LF	Set value	LF	Footer
--------	----	-----------	----	--------

Set value...12 bytes
 (Commands are issued with decimal points for the set value, and when there is no decimal point, the integer part is processed.)

8. Clear individual data

(1) Initialize tool life

Life of tool of the specified NC language is initialized.

• Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	C	L	R	T	L	L	F	n1	n2	n3							

n1n2n3...Tool number : 1 to 99 and 201 to 299

(2) Delete tools from tool group

Tools in the tool group of the specified NC language that are registered on the specified order of use are deleted from the tool group.

An alarm <<Tool changed during operation>> occurs and the machine stops when you delete a tool that is registered in the tool group currently used by the program. The tool group number to which the deleted tool belongs is also deleted from the ATC tool registration.

• Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	C	L	R	T	G	R	P	n1	n2	i1	i2						

n1n2... Tool group number : 1 to 30

i1i2... Order of use: 1 to 30

3

(NOTE) Tools after the deleted order of use are moved forward.

3.5.9.5 Operation control command

(NOTE 1) The target of program number designation is the programs present in the current folder of the other party. Instruct commands only after moving the current folder by command.

(NOTE 2) You can instruct commands when the communication parameter <Remote operation> is set to <1: Valid>.

1. Operation command

(1) Start the program operation (specify number)

Memory operation of the specified program is started. Memory operation of the specified program starts when a program number is specified regardless of the input condition of program number select signal (PRO1, PRO2, PRO4, PRO8, PRO16, PRO32, PRO64, or PR9900) of the external input signal.

The program number may be omitted, in which case, the following program is selected:

- When any of the program select signals is input, the program number specified by that signal is used.
- When no program select signals are input, the program number selected in the current memory operation mode is used.

• Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	M	E	M	S	T	R	T	p1	p2	p3	p4						

p1p2p3p4...Specifies the program number to run (may be omitted).

(NOTE) The program cannot be re-opened. During startup, the following error appears: <<Receive command abnormal end (0077)>>.

(2) Starting program operation (specify file)

Start memory operation for specific programs. The memory operation is started for the program files that are specified with their data names, regardless of the input of the program number selection signal (PRO1, PRO2, PRO4, PRO8, PRO16, PRO32, PRO64 and PR9900) in the external input signals.

The data names cannot be omitted.

• Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	M	E	M	S		T	L	N									

• Command data

Header	LF	Data name	LF	Footer
Data name... 1 to 255 bytes				

(NOTE) The program cannot be re-opened. After operation is started, the alarm <<Receive command abnormal end (0077)>> is triggered.

(3) Stopping the program operation

Memory operation is stopped.

When ON is selected for this command, the **[FEED HOLD]** switch keeps the ON state until OFF is selected for this command. It is therefore necessary to select this command to OFF to resume operation.

The machine stops when either the external input signal (EXSTOP) or the state selected by this command is ON. Unless both are OFF, the **[FEED HOLD]** switch recognizes the ON state.

- Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	M	E	M	S	T	O	P	s1	s2	s3							

s1s2s3...ON: A state where **[FEED HOLD]** switch is pressed.

OFF: A state where **[FEED HOLD]** switch is not pressed.

(4) Starting a program externally (specify number)

The specified program is started externally. Memory operation of the specified program starts when a program number is specified regardless of the input condition of program number select signal (PRO1, PRO2, PRO4, PRO8, PRO16, PRO32, PRO64, or PR9900) of the external input signal.

The program number may be omitted, in which case, the following program is selected:

- When any of the program select signals is input, the program number specified by that signal is used.
 - If the program selection number is not input, the program is specified in the user parameter <Pallet 1/2 program>
- External startup reservation, if present, is released on instructing this command.

- Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	M	E	M	Q	T	S	T	p1	p2	p3	p4						

p1p2p3p4...Specifies the program number to run (may be omitted).

(5) Starting program operation with pallet start (specify file)

Use pallet start to start specific programs. The memory operation is started for the program files that are specified with their data names, regardless of the input of the program number selection signal (PRO1, PRO2, PRO4, PRO8, PRO16, PRO32, PRO64 and PR9900) in the external input signals.

The data names cannot be omitted.

If there is a pallet start that is already scheduled, then the scheduled pallet start is cancelled when this command is issued.

- Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	M	E	M	Q	T	L	N										

- Command data

Header	LF	Data name	LF	Footer
Data name... 1 to 255 bytes				

2. Change command

(1) Changing the program selection (specify number)

Program of the memory operation is changed to the program of a specified program number.

No change is available during operation.

This command is available only in the memory operation mode and in the edit mode during operation.

- Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	C	H	G	P	R	O	G	p1	p2	p3	p4						

p1p2p3p4...Specifies the program number.

(2) Changing the selected program (specify file)

The memory operation program can be changed to the program file specified in the data name.

This change is not possible during operation.

This command is only possible during memory operation mode and during edit mode in operation.

- Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	C	H	G	P	R	L	N										

- Command data

Header	LF	Data name	LF	Footer
Data name... 1 to 255 bytes				

(3) Changing the current data bank

Data bank number currently in use is changed.

Data name other than data bank name may be assigned to the data name.

No change is available during operation or when editing a specified data.

Commanding is only available in the edit mode.

- Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	C	H	G	D	B	K		n1	n2	n3	n4	n5	n6	n7	n8		

n1n2n3n4n5n6n7n8...Specifies the data bank name.

(4) Changing the mode

The mode can be changed to a designated mode.

- Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	C	H	G	M	O	D	E	m1	m2	m3	m4						

m1m2m3m4...MNL : Manual mode

MDI : MDI mode

MEM : Memory operation mode

EDIT: Program edit mode

(5) Changing the key status of memory operation mode

This command changes the ON/OFF status of each key used in memory operation mode.

When the door interlock mode is set to <Machine setup> while running in MDI/memory operation, the [DRY] key and [SINGL] key cannot be changed to OFF if that operation results in all of the following keys: [DRY], [SINGL] and [M.LCK] turning OFF.

• Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	C	H	G	k1	k2	k3	k4	s1	s2	s3							

k1k2k3k4... DRYR : [DRY]key s1s2s3... ON : On
 SNGL : [SINGL]key OFF : Off
 OPTS : [OP,STP]key
 BLKS : [B.SKIP]key
 MACL : [M.LCK]key

(6) Changing ATC tool

Tools set to the ATC tool are changed.
No change is available during operation.

• Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	C	H	G	M	A	G	k1	m1	m2	t1	t2	t3					

k1... M : Change tool number
 S : Change group number (NC language mode)
 Change main tool number (conversation mode)
 K : Change tool type
 C : Change color
 D : Delete tool number
 m1m2... Magazine number (00 when commanding spindle tool)
 t1t2t3... Tool number, group number, spindle tool number (for k1 = M or S)
 t1..... 1: Standard tool; 2: large tool; 3: medium tool (for k1 = K)
 t1..... 0: No color, 1: Blue, 2: Red, 3: Purple, 4: Green, 5: Light blue, 6: Yellow,
 7: White (when k1 is C)

3. Signal operation command

(1) Operating External I/O signals

The functions of signals that are prepared as external I/O signals can be used using communication.

Input signals are available for operation and reference, and output signals for reference. When referencing input signals, not only the status of signals due to communication commands but also the signals input into actual terminals (actual signals) are referenced and then the status of signals as recognized by the machine is returned.

Relation between actual signals and signal operation by communication command as well as the signal names that can be commanded are shown in the attached table.

• Command header

	i1	c1	c2	c3	f1	f2	f3	f4	s1	s2	s3	s4	s5	s6	s7	s8	r1	r2
%	C	I	O	C	c1	c2	c3	c4	s1	s2	s3	s4	s5	s6				

c1c2c3c4... REF : Reference
 MOD : Operated the specified signal
 s1s2s3s4s5s6... Signal name (see the attached table)

• Command data in operation and Response data in referencing

Header	LF	d1d2d3	LF	Footer
--------	----	--------	----	--------

d1d2d3... ON : Turns the specified signal ON (when operating);
 specified signal turns ON (when referencing)
 OFF : Turns the specified signal OFF (when operation);
 specified signal turns OFF (when referencing)

External input signal (NC language)
Reference and change are available.

Signal name	Signal operation function	Signal name	Signal operation function	Signal name	Signal operation function
PRO1	ON/OFF	MTEDOK	ON/OFF	OVTR6M	ON/OFF
PRO2	ON/OFF	PREDOK	ON/OFF	OVTR7P	ON/OFF
PRO4	ON/OFF	IOEDOK	ON/OFF	OVTR7M	ON/OFF
PRO8	ON/OFF	CPEDOK	ON/OFF	OVTR8P	ON/OFF
PRO16	ON/OFF	DIROK	ON/OFF	OVTR8M	ON/OFF
PRO32	ON/OFF	MODEOK	ON/OFF	BTSTAL	ON/OFF
PRO64	ON/OFF	LEVEL1	ON/OFF	BTST1	ON/OFF
EXSTRT	ON/OFF	LEVEL2	ON/OFF	BTST2	ON/OFF
OUTST	ON/OFF	LEVEL3	ON/OFF	BTST3	ON/OFF
EXSTOP	ON/OFF	LEVEL4	ON/OFF	BTST4	ON/OFF
EXORG	ON/OFF	WKCLR1	ON/OFF	BTST5	ON/OFF
EXZORG	ON/OFF	WKCLR2	ON/OFF	DRUL1	ON/OFF
CTURN	ON/OFF	WKCLR3	ON/OFF	DRUL2	ON/OFF
MFIN	ON/OFF	WKCLR4	ON/OFF	MOSRU	ON/OFF
EXER10 : EXER99	ON/OFF	DRLOCK	ON/OFF	LBBTS1	ON/OFF
		ATDROP	ON/OFF	LBBTS2	ON/OFF
		ATDRCL	ON/OFF	LBBTS3	ON/OFF
ALMRLS	ON/OFF	OUT1P	ON/OFF		
M460	ON/OFF	OUT1M	ON/OFF		
M462	ON/OFF	OUT2P	ON/OFF	EXREF	ON
M464	ON/OFF	OUT2M	ON/OFF	EXREF2	ON
M466	ON/OFF	OUTLCK	ON/OFF	EXREF3	ON
M468	ON/OFF	UNCLS5	ON/OFF	EXREF4	ON
SPLOCK	ON/OFF	UNCLS6	ON/OFF	EXREF5	ON
ATCLK	ON/OFF	UNCLS7	ON/OFF	EXREF6	ON
XYLOCK	ON/OFF	UNCLS8	ON/OFF	OPSKIP	ON/OFF
ZLOCK	ON/OFF	UNCSP1	ON/OFF	OPSTOP	ON/OFF
4LOCK	ON/OFF	UNCSP2	ON/OFF	EXWORK	ON/OFF
5LOCK	ON/OFF	UNCSP3	ON/OFF	WPEDOK	ON/OFF
6LOCK	ON/OFF	UNCSP4	ON/OFF	MCEDOK	ON/OFF
7LOCK	ON/OFF	CLPLS5	ON/OFF	UINT	ON/OFF
8LOCK	ON/OFF	CLPLS6	ON/OFF	#1000 : #1031	ON/OFF
MDLOCK	ON/OFF	CLPLS7	ON/OFF		
KYLOCK	ON/OFF	CLPLS8	ON/OFF		
PRLOCK	ON/OFF	CLPSP1	ON/OFF	#1200 : #1295	ON/OFF
EDLOCK	ON/OFF	CLPSP2	ON/OFF		
TLEDOK	ON/OFF	CLPSP3	ON/OFF		
UPEDOK	ON/OFF	CLPSP4	ON/OFF		
MPEDOK	ON/OFF	OVTR5P	ON/OFF	EXEMS	ON/OFF
WCEDOK	ON/OFF	OVTR5M	ON/OFF		
MGEDOK	ON/OFF	OVTR6P	ON/OFF	EXRESET	ON

Refer to “1.6.4 External input signals” in the Data Bank & Alarm Manual for further details on each signal function.

EXEMS: The alarm <<Emergency button activated>> or <<[MASTER ON] is off.>> is triggered depending on the machine parameter (system 1: common) setting <Emergency stop switch change>.

EXWORK: No changes can be made while in feature coordinate manufacturing mode (G68.2 modal in progress).

External output signal (NC language)
Only reference is available.

| Signal name |
|-------------|-------------|-------------|-------------|-------------|
| M00 | TOLPRE | FED100 | PNLEN | LBBTL1 |
| M30/1 | ORGFIN | RELESE | PULEN | LBBTL2 |
| M30/2 | SPTURN | COOLSW | BTWRN1 | LBBTL3 |
| M08 | ZPX | CHIPSW | BTWRN2 | |
| M11 | ZPY | PULOFF | BTWRN3 | REFIN |
| M12 | ZPZ | QTSEL1 | BTWRN4 | REFIN2 |
| M14 | ZPSP | QTSEL2 | BTWRN5 | REFIN3 |
| M18 | ZP4 | WAVDSP | BTALM1 | REFIN4 |
| M21 | ZP5 | XPOSSW | BTALM2 | REFIN5 |
| M22 | ZP6 | YPOSSW | BTALM3 | REFIN6 |
| M24 | ZP7 | ZPOSSW | BTALM4 | LSTURN |
| M28 | ZP8 | 4POSSW | BTALM5 | LSSLCT |
| MF | PFIN1 | 5POSSW | BTRUN | #1100 |
| M900 | PFIN2 | 6POSSW | BTLD1 | : |
| M400 | RSTOUT | 7POSSW | BTLD2 | #1131 |
| M402 | TLBRKE | 8POSSW | BTLD3 | #1300 |
| M404 | RUNSTP | OUT1ON | BTLD4 | : |
| M406 | BATALM | OUT2ON | BTLD5 | #1395 |
| M408 | MNTALM | UNCLP5 | HWMO | |
| M480 | GRN | UNCLP6 | RYCHK1 | |
| M482 | YEL | UNCLP7 | XPSSW2 | |
| M484 | RED | UNCLP8 | YPSSW2 | |
| M486 | CNTUP | UCLPP1 | ZPSSW2 | |
| M450 | CNTPRE | UCLPP2 | 4PSSW2 | |
| M451 | STPOUT | UCLPP3 | 5PSSW2 | |
| M455 | STPLED | UCLPP4 | 6PSSW2 | |
| M456 | DROPEN | MGZ1 | 7PSSW2 | |
| AUTO | DRCLS | MGZ2 | 8PSSW2 | |
| STL | INDRCL | MGZ4 | TLDHI | |
| MEMOK | SDDRCL | MGZ8 | TLDLO | |
| MEMMOD | XDR1CL | MGZ16 | TLDON | |
| EXPRUN | XDR2CL | MGZ32 | LDRCL | |
| NCOK | ATDRSL | MGZ64 | RDRCL | |
| ALM | DRRDY | UNLOCK | SLDRCL | |
| ALM2 | DROFIN | ALMA | SRDRCL | |
| ALMLV1 | DRCFIN | MOUT | DRULD1 | |
| ALMLV2 | DRALM | SPIALM | DRULD2 | |
| ASTLV1 | RDYLED | DRHOLD | LBBTW1 | |
| ASTLV2 | DRYRUN | RDBTAL | LBBTW2 | |
| ASTLV3 | SINGL | DIMSW1 | LBBTW3 | |
| ASTLV4 | RESTAT | DIMSW2 | LBBTA1 | |
| ASTLV5 | RPD100 | DIMST1 | LBBTA2 | |
| TOOL | SPN100 | DIMST2 | LBBTA3 | |

Refer to “1.6.5 External output signals” in the Data Bank & Alarm Manual for further details on each signal function.

ALMA: The same signal as ALM.

MOUT: Auxiliary function numbers currently being output are set, in place of ON/OFF, in d1 through d3 of the response data. d1, d2, and d3 are decode values of M900, M21 through M28, and M11 through M18, respectively.

External input signal (Conversation language)
Reference and change are available.

Signal name	Signal operation function	Signal name	Signal operation function	Signal name	Signal operation function
PRO1	ON/OFF	MTEDOK	ON/OFF	OVTR6M	ON/OFF
PRO2	ON/OFF	PREDOK	ON/OFF	OVTR7P	ON/OFF
PRO4	ON/OFF	IOEDOK	ON/OFF	OVTR7M	ON/OFF
PRO8	ON/OFF	CPEDOK	ON/OFF	OVTR8P	ON/OFF
PRO16	ON/OFF	DIROK	ON/OFF	OVTR8M	ON/OFF
PRO32	ON/OFF	MODEOK	ON/OFF	BTSTAL	ON/OFF
PRO64	ON/OFF	LEVEL1	ON/OFF	BTST1	ON/OFF
EXSTRT	ON/OFF	LEVEL2	ON/OFF	BTST2	ON/OFF
OUTST	ON/OFF	LEVEL3	ON/OFF	BTST3	ON/OFF
EXSTOP	ON/OFF	LEVEL4	ON/OFF	BTST4	ON/OFF
EXORG	ON/OFF	WKCLR1	ON/OFF	BTST5	ON/OFF
EXZORG	ON/OFF	WKCLR2	ON/OFF	DRUL1	ON/OFF
CTURN	ON/OFF	WKCLR3	ON/OFF	DRUL2	ON/OFF
MFIN	ON/OFF	WKCLR4	ON/OFF	MOSRU	ON/OFF
EXER10 : EXER99	ON/OFF	DRLOCK	ON/OFF	LBBTS1	ON/OFF
		ATDROP	ON/OFF	LBBTS2	ON/OFF
		ATDRCL	ON/OFF	LBBTS3	ON/OFF
ALMRLS	ON/OFF	OUT1P	ON/OFF		
M460	ON/OFF	OUT1M	ON/OFF	PR9900	ON/OFF
M462	ON/OFF	OUT2P	ON/OFF	EXORG2	ON
M464	ON/OFF	OUT2M	ON/OFF	EXORG3	ON
M466	ON/OFF	OUTLCK	ON/OFF	TPEDOK	ON/OFF
M468	ON/OFF	UNCLS5	ON/OFF	THEDOK	ON/OFF
SPLOCK	ON/OFF	UNCLS6	ON/OFF	CTEDOK	ON/OFF
ATCLK	ON/OFF	UNCLS7	ON/OFF		
XYLOCK	ON/OFF	UNCLS8	ON/OFF	EXEMS	ON/OFF
ZLOCK	ON/OFF	UNCSP1	ON/OFF	EXRESET	ON
4LOCK	ON/OFF	UNCSP2	ON/OFF		
5LOCK	ON/OFF	UNCSP3	ON/OFF		
6LOCK	ON/OFF	UNCSP4	ON/OFF		
7LOCK	ON/OFF	CLPLS5	ON/OFF		
8LOCK	ON/OFF	CLPLS6	ON/OFF		
MDLOCK	ON/OFF	CLPLS7	ON/OFF		
KYLOCK	ON/OFF	CLPLS8	ON/OFF		
PRLOCK	ON/OFF	CLPSP1	ON/OFF		
EDLOCK	ON/OFF	CLPSP2	ON/OFF		
TLEDOK	ON/OFF	CLPSP3	ON/OFF		
UPEDOK	ON/OFF	CLPSP4	ON/OFF		
MPEDOK	ON/OFF	OVTR5P	ON/OFF		
WCEDOK	ON/OFF	OVTR5M	ON/OFF		
MGEDOK	ON/OFF	OVTR6P	ON/OFF		

Refer to “1.6.4 External input signals” in the Data Bank & Alarm Manual for further details on each signal function.

External output signal (Conversation language)
Only reference is available.

| Signal name |
|-------------|-------------|-------------|-------------|-------------|
| M00 | TOLPRE | FED100 | PNLEN | LBBTL1 |
| M30/1 | ORGFIN | RELESE | PULEN | LBBTL2 |
| M30/2 | SPTURN | COOLSW | BTWRN1 | LBBTL3 |
| M08 | ZPX | CHIPSW | BTWRN2 | |
| M11 | ZPY | PULOFF | BTWRN3 | ORGFN2 |
| M12 | ZPZ | QTSEL1 | BTWRN4 | ORGFN3 |
| M14 | ZPSP | QTSEL2 | BTWRN5 | |
| M18 | ZP4 | WAVDSP | BTALM1 | |
| M21 | ZP5 | XPOSSW | BTALM2 | |
| M22 | ZP6 | YPOSSW | BTALM3 | |
| M24 | ZP7 | ZPOSSW | BTALM4 | |
| M28 | ZP8 | 4POSSW | BTALM5 | |
| MF | PFIN1 | 5POSSW | BTRUN | |
| M900 | PFIN2 | 6POSSW | BTLD1 | |
| M400 | RSTOUT | 7POSSW | BTLD2 | |
| M402 | TLBRKE | 8POSSW | BTLD3 | |
| M404 | RUNSTP | OUT1ON | BTLD4 | |
| M406 | BATALM | OUT2ON | BTLD5 | |
| M408 | MNTALM | UNCLP5 | HWMO | |
| M480 | GRN | UNCLP6 | RYCHK1 | |
| M482 | YEL | UNCLP7 | XPSSW2 | |
| M484 | RED | UNCLP8 | YPSSW2 | |
| M486 | CNTUP | UCLPP1 | ZPSSW2 | |
| M450 | CNTPRE | UCLPP2 | 4PSSW2 | |
| M451 | STPOUT | UCLPP3 | 5PSSW2 | |
| M455 | STPLED | UCLPP4 | 6PSSW2 | |
| M456 | DROPEN | MGZ1 | 7PSSW2 | |
| AUTO | DRCLS | MGZ2 | 8PSSW2 | |
| STL | INDRCL | MGZ4 | TLDHI | |
| MEMOK | SDDRCL | MGZ8 | TLDLO | |
| MEMMOD | XDR1CL | MGZ16 | TLDON | |
| EXPRUN | XDR2CL | MGZ32 | LDRCL | |
| NCOK | ATDRSL | MGZ64 | RDRCL | |
| ALM | DRRDY | UNLOCK | SLDRCL | |
| ALM2 | DROFIN | ALMA | SRDRCL | |
| ALMLV1 | DRCFIN | MOUT | DRULD1 | |
| ALMLV2 | DRALM | SPIALM | DRULD2 | |
| ASTLV1 | RDYLED | DRHOLD | LBBTW1 | |
| ASTLV2 | DRYRUN | RDBTAL | LBBTW2 | |
| ASTLV3 | SINGL | DIMSW1 | LBBTW3 | |
| ASTLV4 | RESTAT | DIMSW2 | LBBTA1 | |
| ASTLV5 | RPD100 | DIMST1 | LBBTA2 | |
| TOOL | SPN100 | DIMST2 | LBBTA3 | |

Refer to “1.6.5 External output signals” in the Data Bank & Alarm Manual for further details on each signal function.

3.5.9.6 Auto notification command

1. Control of auto notification function (NC \leftarrow Notification host)

When the communication parameter <Auto notification function> is set to <1: Enable>, the auto notification function can be controlled.

- Command header

	i1	c1	c2	c3	f1	f2	f3	f4	S1	s2	s3	S4	s5	S6	s7	s8	r1	r2
%	C	S	N	C	k1	k2	k3	k4										

k1k2k3k4...Types of controls

STRT: Start (only possible from the set host)

STOP: Stop (not just possible from the set host)

STAT: Acquire status (not just possible from the set host)

3

- Response data

header	LF	Return value	LF	Footer
--------	----	--------------	----	--------

Return value...6 bytes -32768 to 32767

0: End normally (during STRT, STOP)

1: Stopped (during STAT, STOP)

2: Operating for host issued command (during STAT, STRT)

3: Operating for another host (during STAT, STRT)

4: Send being set by another host (during STAT, STRT)

5: Disabled setting for auto notification function

6: Cannot start due to invalid parameter specification (during STRT)

7: Cannot stop due to auto notification being sent (during STOP)

2. Auto notification (NC \rightarrow Notification host)

When the communication parameter <Auto notification function> is set to <1: Enable> and the function is activated, if the SND_REQ(BY1F0) is turned ON from the PLC program, then an auto notification is sent for the notification host from the NC.

- Command header

	i1	c1	c2	C3	f1	f2	f3	f4	s1	s2	s3	s4	s5	S6	s7	s8	r1	r2
%	C	S	N	D														

- When the command data communication parameter <Type of sending data> is set to <0: No data>

header	LF	LF	Footer
--------	----	----	--------

- When the command data communication parameter <Type of sending data> is not set to <0: No data>

header	LF	Type of data	Leading address	Data length	Data	Data	...	LF	Footer
--------	----	--------------	-----------------	-------------	------	------	-----	----	--------

Type of data ...8 bytes

The type of data is defined by the communication parameter <Method to specify sending data> and <Type of sending data> or SND_TYPE(BDY096).

PLCDM : PLC internal relay (0 to 9999)

PLCDM001 : PLC internal relay (10000 to 10239)

PLCDD : PLC data register (word)

PLCDDL : PLC data register (long word)

Leading address...4 bytes

0 to 9999
The leading address is defined by the communication parameter <Method to specify sending data> and <Leading address for sending data> or SND_TOP(BDY097).

The following ranges apply according to the type of data.

0 to 9999 (specified using decimal numbers) for PLCDM

0 to 0239 (specified using decimal numbers) for PLCDM001

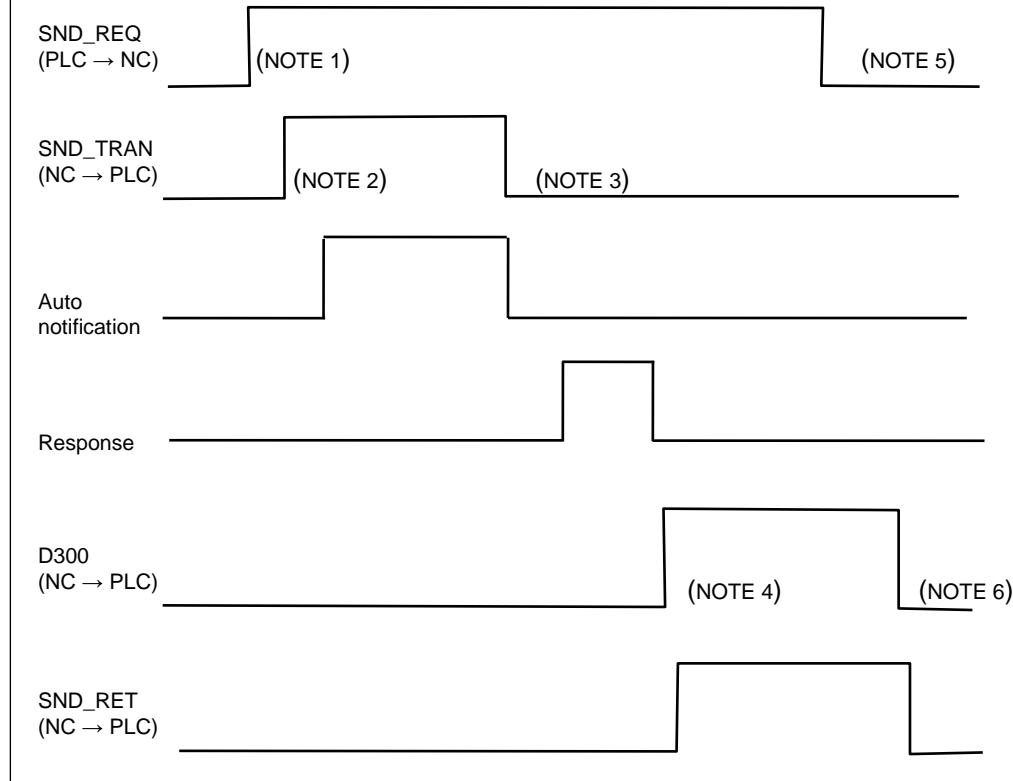
0 to 8191 (specified using decimal numbers) for PLCDD

0 to 8190 (specified using even decimal numbers) for PLCDDL

Data length ...4 bytes	1 to 600 (packets) The data length is defined by the communication parameter <Method to specify sending data> and <Sending data length> or SND_LEN(BDY098). The following ranges apply according to the type of data. Make sure that the “Initial address + Data number” do not exceed the range of the data type. 1 to 600 (packets) for PLCDM/PLCDM001 1 to 100 (packets) for PLCDD 1 to 50 (packets) for PLCDDL
Data (multiple possible)	The number alone for the data length continues. The number of bytes for 1 data is defined by the type of data. Every 1 byte (0/1) for PLCDM/PLCDM001 Every 6 bytes (-32768 to 32767) for PLCDD Every 11 bytes (-2147483648 to 2147483647) for PLCDDL

3. Control method for auto notification function (when standard)

Time chart example of PLC signal when the <Control method> for the auto notification function is set to <0: Standard>
This example shows when the <Data register address for storing error code> is set to <300>.



- (NOTE 1) When the SND_REQ is OFF, the PLC program prepares data for the auto notification and turns the SND_REQ to ON.
- (NOTE 2) The NC confirms that the SND_REQ is ON, and after the SND_TRAN turns ON, the auto notification starts to send.
- (NOTE 3) After the NC sends the auto notification, the SND_TRAN is turned OFF, and the NC waits for a response from the notification destination.
- (NOTE 4) Once the NC receives a response from the notification destination, the error code is stored in D300, and the SND_RET is turned ON.
- (NOTE 5) The PLC program confirms that the SND_RET is ON and then turns the SND_REQ to OFF. (Check D300 before SND-REQ is turned OFF.)
- (NOTE 6) The NC confirms that the SND_REQ is OFF, and after clearing D300, SND_RET is turned OFF.

Error code for auto notification function (Value entered in D300 in example above)

When between 0 and 101

- 0 to 99 : Completion code in the response received from the notification destination.
- 100 : No response has been received from the notification destination.
(Failed while SND command was sending. (Essentially, response was not received))
- 101 : A response was received from the notification destination but was not a number.

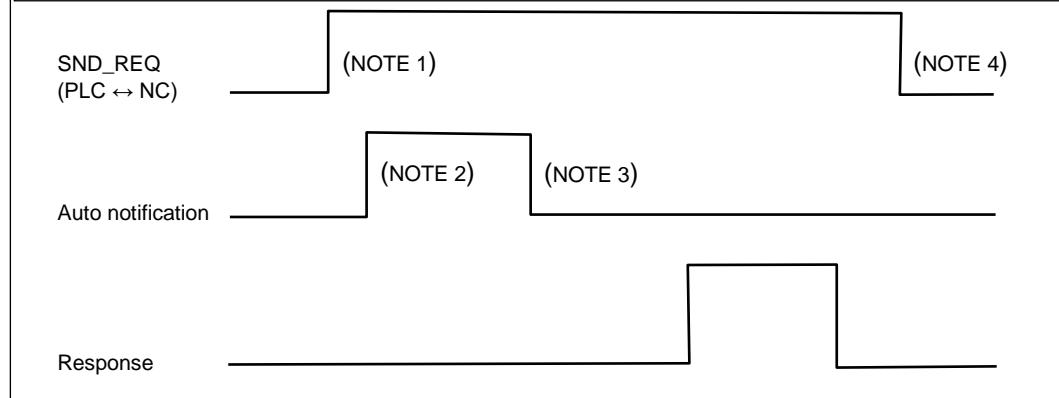
When greater than 1000

- 1100 : Failed TCP/IP connection with notification destination.
- 2100 : Timed out after waiting for response from notification destination.
(After the SND command was sent, the time set in the parameter has elapsed)
- 3xxx : Check sum error, the low-order 3 digits are the same as when between 0 and 101.
- 4100 : It was not an auto notification response.

3

4. Control method for auto notification function (when set to simple)

Time chart of PLC signal when the <Control method> for the auto notification function is set to <1: Simple>



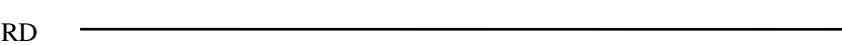
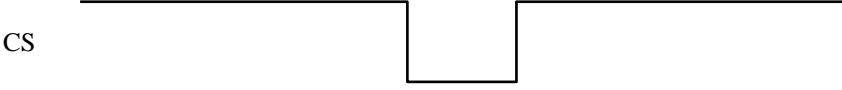
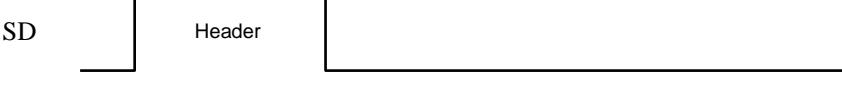
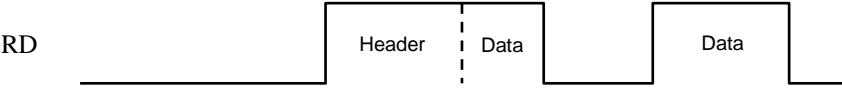
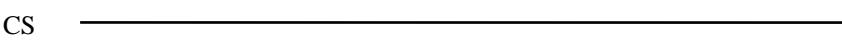
- (NOTE 1) When the SND_REQ is OFF, the PLC program prepares data for the auto notification and turns the SND_REQ to ON.
- (NOTE 2) The NC confirms that the SND_REQ is ON, and the auto notification starts to send.
- (NOTE 3) After the NC sends the auto notification, the NC waits for a response from the notification destination.
- (NOTE 4) After the NC receives a response, the SND_REQ is turned OFF.

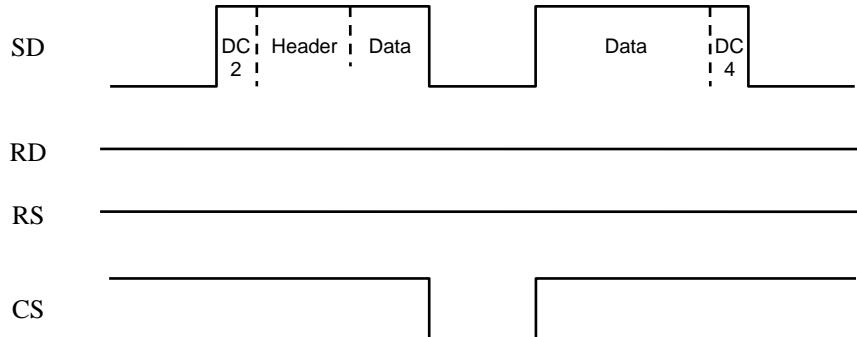
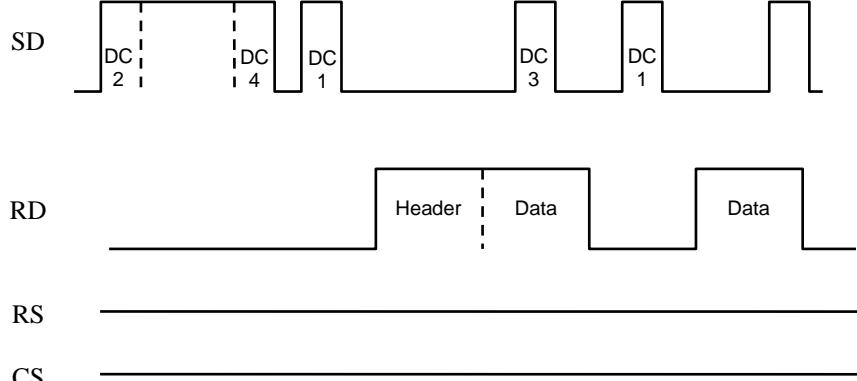
3.5.10 Communication methods of NC communication device

You can specify one of the following 3 methods by setting communication parameter <Communication mode>.

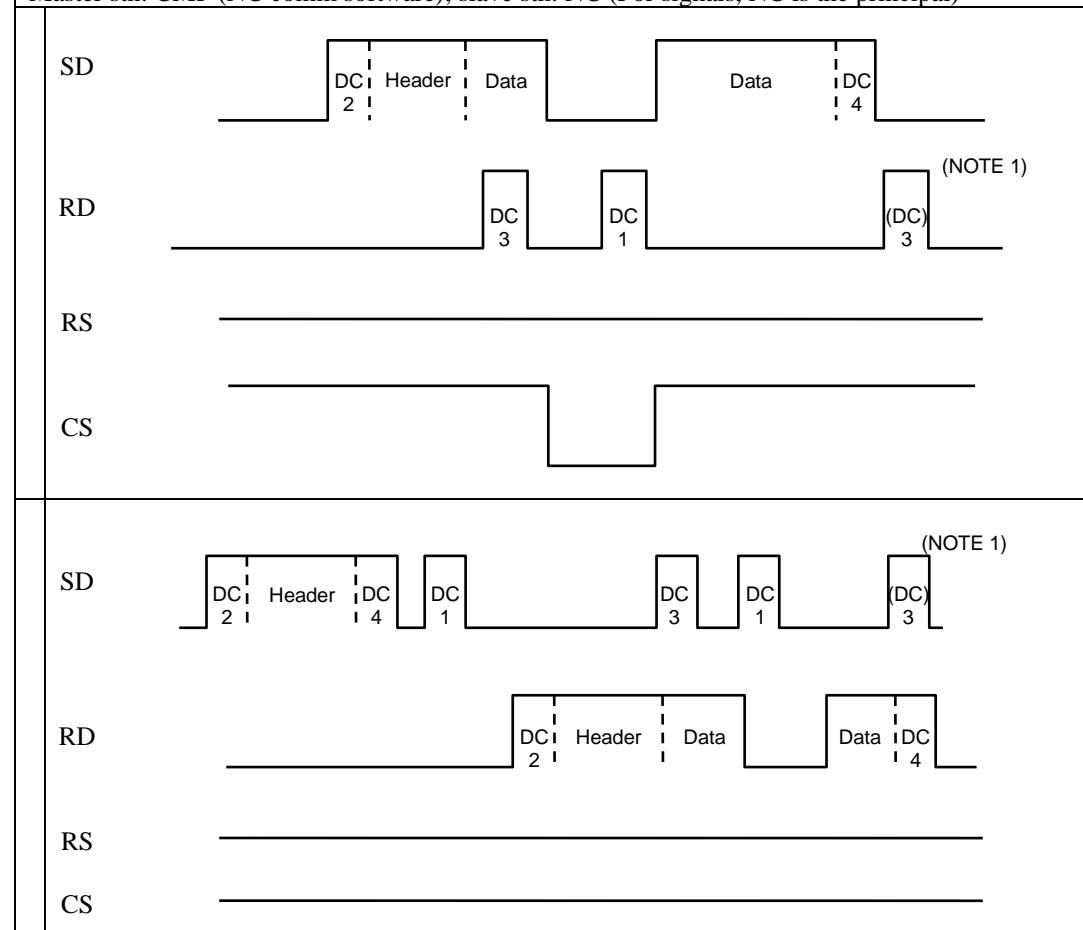
1. Control line method
2. Control code system 1
3. Control code system 2

Control line method
Master stn: CMP (NC comm software); slave stn: NC (For signals, NC is the principal)

CMP→NC	SD	
	RD	
	RS	
	CS	
NC→CMP	SD	
	RD	
	RS	
	CS	

Control code system 1 Master stn: CMP (NC comm software); slave stn: NC (For signals, NC is the principal)	
CMP→NC	 <p>SD</p> <p>RD</p> <p>RS</p> <p>CS</p>
NC→CMP	 <p>SD</p> <p>RD</p> <p>RS</p> <p>CS</p> <p>(NOTE 1)</p>

Control code system 2
Master stn: CMP (NC comm software); slave stn: NC (For signals, NC is the principal)



(NOTE 1) DC3 code in parentheses is selectable between <0: No> and <1: Yes> according to the communication parameter <Communication end DC3 code>.

(NOTE 2) Values of DC1 through DC4 are set by communication parameter <DC1 to 4 code>.

(NOTE 3) For communication with NC as the master station, change NC and CMP with each other in the above table.

3.6 Details of Communication Data

3.6.1 Data name list

The followings are data names' list handled in external I/O.

The other data besides the program data is set up in sub folders for each type of data.

(NOTE) When performing data operations using communication protocol type 2 for an NC communication device, the folders, excluding some (_ACCESSORY) folders, with data that is not internal NC program data will not display.

The user can access that data (in those folders) and perform operations in the root directory/folder.

Explanatory note

pppp: Program number

u: Unit system (M: Metric / I: Inch / D: Current unit system)

n: Data number (When data number is from 0 to 9 and D:0, it represents No.10. When unit system is set to D, it represents the current plane.)

3

Program

Data name		Data name					
Program (NC)		O	p	p	p	p	
Program (NC)		Character string with 32 characters (Uppercase letters, numbers, minus -, plus + and underscore _) (NOTE 6)					
Machining data (Conversation)	Q	u	p	p	p	p	
Schedule program (Conversation)	J	p	p	p	p		
Old machining data (NOTE 2) (Conversation)	K	u	p	p	p	p	
Old machining data (NOTE 3) (Conversation)	G	u	p	p	p	p	
Old machining data (NOTE 4) (Conversation)	N	u	p	p	p	p	
Old machining data (NOTE 5) (Conversation)	O	p	p	p	p		

NC data (Directory: /_DAT)

Data name		Data name					
G/M code macro (NC)	G	M	M	C	N		
User parameter	U	P	R	D	u	n	
External I/O signal	E	X	I	O	D	n	
Communication parameter	C	M	P	R	D	n	
Field network parameter	F	N	P	R	D	n	
Machine parameter	M	P	R	D	n		
Special setting	M	S	P	S	D	n	
Load monitor	T	L	O	A	D	n	
ATC tool data	A	T	C	T	L		
Workpiece coordinate zero (Type 1) (NC)	P	O	S	N	u	n	
Workpiece coordinate zero (Type 2) (NC)	P	O	S	S	u	n	
Tool data (Type 1) (NC)	T	O	L	N	u	n	
Tool data (Type 2) (NC)	T	O	L	S	u	n	
Macro variables (Type 1) (NC)	M	C	R	N	u	n	
Macro variables (Type 2) (NC)	M	C	R	S	u	n	
Tool list (Conversation)	T	O	L	C	u	n	
Tool pattern (Conversation)	T	P	T	N	C	n	
Tapping drill diameter (Conversation)	T	P	U	C	u	n	
Cutting condition (Conversation)	C	N	D	C	u	n	
Old tool list (NOTE 4) (Conversation)	L	u	n				
Old tool pattern (NOTE 4) (Conversation)	P		n				
Old cutting condition (NOTE 4) (Conversation)	C	u	n				

Production data (Directory: /_PRD)

Data name		Data name				
Production data 1	P	R	D	D	1	
Production data 2	P	R	D	D	2	
Production data 3	P	R	D	D	3	
Maintenance notice	M	A	I	N	T	C
Workpiece counter	W	K	C	N	T	R
Measurement results	M	S	R	R	S	D

Machine status monitor (Directory: /_MCM)

Data name		Data name				
Machine monitor data (Production data 4)	M	O	N	T	R	
Input/Output data	I	O				
Memory operation data	M	E	M			
Operation panel data	P	A	N	E	L	
Position data	P	D	S	P		
Version data	V	E	R			
Current alarm data	A	L	A	R	M	

System configuration data (Directory: /_SYS)

Data name		Data name				
Auto thermal distortion compensation data	H	E	A	C	u	
Machine data 1	S	Y	S	D	9	9
Machine data 2	S	Y	S	D	9	8
Machine data 3	S	Y	S	D	9	7
Machine data 4	S	Y	S	D	9	6
Machine data 5	S	Y	S	D	9	5
Machine data 6	S	Y	S	D	9	4
Machine data 11	S	Y	S	D	8	9
Bookmark	S	H	T	C	U	T
Home screen setting	H	O	M	E		
Operation level data	P	R	T	C	T	D

PLC program (Directory: /_PLC)

Data name		Data name				
PLC program (NOTE 7)	P	L	C	P	R	J
PLC signal data	P	L	C	D	A	T
PLC signal monitor	P	L	C	M	O	N

Sampling and log data (Directory: /_LOG)

Data name		Data name				
Drawing data	P	A	I	N	T	D
Alarm log data (Up to data record No. 100)	L	O	G			
Alarm log data (Data records from No. 101 and thereafter)	L	O	G	B	K	
User operation log	O	P	L	O	G	
Power consumption log data	E	P	L	O	G	
Machine characteristics log data	M	C	H	L	O	G
Production performance data base	P	R	L	O	G	

Request code (Directory: /_RQC)

Data name		Data name				
Request code (Slave station)	R	Q	C			
Request code (Master station)	R	Q	C	nnnnnnnyymmdd		
		nnnnnn: Machine No. (User parameter), yy: Last two digits of year, mm: Month, dd: Day				

File viewer (Directory: /_ACCESSORY/_VIEWER)

Data name	Data name
File viewer	Character string with 32 characters (Uppercase letters, numbers, minus -, plus + and underscore _)

Screenshots (Directory: /_ACCESSORY/_VIEWER/_CAPTURE)

Data name	Data name
Screenshots	yyyymmdd_nnnn yyyy: Year, mm: Month, dd: Day nnnn: Sequence number (0000 to 9999)

Notebook (Directory: /_ACCESSORY/_MEMO)

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Data name	Data name
Notebook	M E M O n

Waveform data (Directory: /_WAVE)

Data name	Data name
Waveform display parameter	W V P R M

(NOTE 1) When outputting from a memory card or the FTP, the following file extensions are added to the file names above.

Data name	Extension
PLC program	“.BPP”
Screenshots, notebook	“.PNG”
Manual	“.MNL”
File viewer	One of the following is assigned depending on the file that is input. “.PNG”, “.PDF”, “.BMP”, “.JPG”, “.JPEG”
Production performance data base	“.FDB”
Other data	“.NC” when in NC language mode “.TC” when in conversation language mode

(NOTE 2) TC32B, 31B, 22B, 20B, S2C, S2D data

(NOTE 3) TC32A/ 31A/ 22A/ 20A/ S2A/ S2B/ R2A data

(NOTE 4) TC201, 217/ 227/ 228, 218/ 229, 311/ 323, 312/ 324, 203 data

(NOTE 5) TC211/ 212/ 221, 215/ 225 data

(NOTE 6) Data names with the same name as other data, or data names scheduled in the system cannot be used.

(NOTE 7) The PLC program includes the following files:

High speed control program 1 to 10

Standard control program 1 to 10

User defined function

System defined function

Global OM comment

Program execution setting

Global variable

3.6.2 Operation range

3.6.2.1 Operation from external devices to NC (NC:slave)

Output : Output from NC to external device

(Refer to “3.5 Communication Protocol” for files that can be output according to the record with the specified symbol.)

Input : Input from external device to NC

Deletion : NC file deleted according to request from external device

When the communication parameter <Restrict Ethernet access> is set to <1: Yes>, all output, input and delete operations based on the communication protocol type 2 for the NC communication device are restricted. First, issue a temporary access command and then make the operation request. When a serial port is used, there is no restriction applied.

Refer to the “3.5 Communication protocol” for further details.

○ : Can be operated individually

▲ : Can be operated in a batch

✗ : Cannot be operated

Data name	Output	Input	Deletion
Program (NOTE 1)	○	○	○(NOTE 2)
Machining data (NOTE 1)	○	○	○(NOTE 2)
Schedule program (NOTE 1)	○	○	○(NOTE 2)
Old machining data (K) (NOTE 6)	✗	✗	✗
Old machining data (G) (NOTE 6)	✗	✗	✗
Old machining data (N) (NOTE 6)	✗	✗	✗
Old machining data (O) (NOTE 6)	✗	✗	✗
Workpiece zero point (Type 1) (NOTE 10)	○	○(NOTE 15)	○(NOTE 3)
Workpiece zero point (Type 2) (NOTE 10)	○	○(NOTE 15)	○(NOTE 3)
Tool data (Type 1) (NOTE 10)	○	○(NOTE 11)	○(NOTE 3)
Tool data (Type 2) (NOTE 10)	○	○(NOTE 11)	○(NOTE 3)
Macro variable (Type 1) (NOTE 10)	○	○	○(NOTE 3)
Macro variable (Type 2) (NOTE 10)	○	○	○(NOTE 3)
G/M code macro	○	○	○(NOTE 3)
User parameter	○	○	○(NOTE 3)
External I/O signal	○	○	○(NOTE 3)
Communication parameters	○	○	○(NOTE 3)
Field network parameter	○	○	○(NOTE 3)
Machine parameters	○	○	○(NOTE 3)
Special settings	○	○	○(NOTE 3)
Machining load monitor	○	○	○(NOTE 3)
ATC tool data	○	○(NOTE 4)	✗
Automatic thermal distortion compensation data	○	✗	✗
PLC program (NOTE 1) (NOTE 7) (NOTE 8)	○	○	✗
Tool list	○	○(NOTE 11)	○(NOTE 3)
Tool pattern	○	○	○(NOTE 3)
Tapping drill diameter	○	○	○(NOTE 3)
Cutting condition	○	○	○(NOTE 3)
Old tool list (NOTE 6)	✗	✗	✗
Old tool pattern (NOTE 6)	✗	✗	✗
Old cutting condition (NOTE 6)	✗	✗	✗
Machine data 1 (NOTE 16)	○(NOTE 4)	○(NOTE 4)	✗
Machine data 2	○	○(NOTE 4)	✗
Machine data 3	○	○(NOTE 4)	✗
Machine data 4	○	○(NOTE 4)	✗
Machine data 5	○	○	✗
Machine data 6	○	○(NOTE 4)	✗
Machine data 11 (NOTE 8)	○	○(NOTE 4)	✗
Production data 1	○(NOTE 4)	○(NOTE 4)	✗
Production data 2	○	○(NOTE 4)	✗
Production data 3	○	○	✗
Data for machine monitor (Production data 4)	○	✗	✗

Data name	Output	Input	Deletion
Maintenance notice	○	○	×
Workpiece counter	○	○(NOTE 4)	×
Measurement result	○	○(NOTE 4) (NOTE 13)	×
Drawing data	○(NOTE 5)	○(NOTE 5)	×
Waveform display parameters	○	○(NOTE 12)	×
PLC signal data (NOTE 8)	○	○	×
PLC register monitor	○	○	×
Bookmark	○	○	×
Home screen setting	○	○	×
Input/ output data	○	×	×
Memory operation data	○	×	×
Operation panel data	○	×	×
Position data	○	×	×
Version data	○	×	×
Alarm log data (up to item #100)	○	×	×
Alarm log data (from item #101)	○	×	×
Current alarm data	○	×	×
Operation log (NOTE 8)	○	×	×
Operation level data (NOTE 8)	○	○	×
Request code (NOTE 14)	○	×	×
Manual	×	×	×
File viewer (NOTE 3) (NOTE 8)	○	○	○
Screenshots (NOTE 3) (NOTE 8)	○	○	○
Notebook (NOTE 1) (NOTE 8)	○	○	○
Power consumption log data	○	×	×
Machine characteristics log data	○	×	×
Production performance data base	○	×	×

- (NOTE 1) Cannot be operated while editing the object file.
- (NOTE 2) Cannot be operated while editing the object program.
- (NOTE 3) User operations are not possible while the file is being used.
- (NOTE 4) Cannot be operated during memory run.
- (NOTE 5) Cannot be operated during check drawing.
- (NOTE 6) Old formatted data cannot be operated.
- (NOTE 7) Cannot be operated while displaying PLC monitor screen or PLC I/O screen or while communicating with PLC PROGRAMMING SOFTWARE.
- (NOTE 8) Being binary data, they cannot be input/output in slave station communication through a serial port using "NC-dedicated communication software".
- (NOTE 9) When a data is entered to the NC, the input data is checked. The data that includes the unavailable value cannot be entered.
- (NOTE 10) Despite the difference in the file name and format of data between the machines of type 1 and type 2 in minimum setting unit, either type of data can be operated. When requested for directory, however, only the file names in the current minimum setting unit are returned. (File names in other minimum setting unit are not returned.)
- (NOTE 11) For the active data bank, the relevant tool is deleted from the ATC tools. During memory run or MDI run, an alarm <>Tool changed during operation<> is generated, which stops the operation.
- (NOTE 12) Cannot be operated while measuring waveform data.
- (NOTE 13) Data in other machine unit system cannot be input.
- (NOTE 14) Output is not possible when the machine model does not require a request code.
- (NOTE 15) The workpiece coordinate zero cannot be changed while in feature coordinate manufacturing mode (G68.2 modal in progress)
- (NOTE 16) When input, the alarm <>The machine coordinates may be out of position.<> may trigger after turning ON the power again.

3.6.2.2 Operation from NC to external devices (NC: master) (NC language mode)

Output: Output from NC to external device

Input: Input from external device to NC

Deletion: External device file deleted according to request from NC

○ : Can be operated individually

▲ : Can be operated in a batch

✗ : Cannot be operated

Data name	Program			Data Bank			Maintenance				
	Output	Input	Deletion	Output	Input	Deletion	Output all	Input all	Output all DB	Check output	Delete all
Program (NOTE 1) (NOTE 13)	○	○	○	✗	✗	✗	▲	▲	✗	▲	▲
Machining data (NOTE 1)	✗	✗	✗	✗	✗	✗	▲	▲	✗	▲	▲
Schedule program (NOTE 1)	✗	✗	✗	✗	✗	✗	▲	▲	✗	▲	▲
Old machining data (K) (NOTE 1)	✗	✗	✗	✗	✗	✗	✗	▲	✗	✗	▲
Old machining data (G) (NOTE 1)	✗	✗	✗	✗	✗	✗	✗	▲	✗	✗	▲
Old machining data (N) (NOTE 1)	✗	✗	✗	✗	✗	✗	✗	▲	✗	✗	▲
Old machining data (O) (NOTE 1)	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
Workpiece zero point (Type1)	✗	✗	✗	○ (NOTE 7)	○ (NOTE 8)	○ (NOTE 8)	▲ (NOTE 7)	▲ (NOTE 8)	▲ (NOTE 7)	▲ (NOTE 7)	▲ (NOTE 8)
Workpiece zero point (Type2)	✗	✗	✗	○ (NOTE 7)	○ (NOTE 8)	○ (NOTE 8)	▲ (NOTE 7)	▲ (NOTE 8)	▲ (NOTE 7)	▲ (NOTE 7)	▲ (NOTE 8)
Tool data (Type 1)	✗	✗	✗	○ (NOTE 7)	○ (NOTE 8)	○ (NOTE 8)	○ (NOTE 7)	▲ (NOTE 8)	▲ (NOTE 7)	▲ (NOTE 7)	▲ (NOTE 8)
Tool data (Type 2)	✗	✗	✗	○ (NOTE 7)	○ (NOTE 8)	○ (NOTE 8)	○ (NOTE 7)	▲ (NOTE 8)	▲ (NOTE 7)	▲ (NOTE 7)	▲ (NOTE 8)
Macro variable (Type1)	✗	✗	✗	○ (NOTE 7)	○ (NOTE 8)	○ (NOTE 8)	○ (NOTE 7)	▲ (NOTE 8)	▲ (NOTE 7)	▲ (NOTE 7)	▲ (NOTE 8)
Macro variable (Type2)	✗	✗	✗	○ (NOTE 7)	○ (NOTE 8)	○ (NOTE 8)	○ (NOTE 7)	▲ (NOTE 8)	▲ (NOTE 7)	▲ (NOTE 7)	▲ (NOTE 8)
G/M code macro	✗	✗	✗	○	○	○	▲	▲	▲	▲	▲
User parameter	✗	✗	✗	○	○	○	▲	▲	▲	▲	▲
External I/O signal	✗	✗	✗	○	○	○	▲	▲	▲	▲	▲
Communication parameter	✗	✗	✗	○	○	○	▲	▲	▲	▲	▲
Field network parameter	✗	✗	✗	○	○	○	▲	▲	▲	▲	▲
Machine parameter	✗	✗	✗	○	○	○	▲	▲	▲	▲	▲
Special settings	✗	✗	✗	○	○	○	▲	▲	▲	▲	▲
Machining load monitor	✗	✗	✗	○	○	○	▲	▲	▲	▲	▲
ATC tool data (NOTE 3)	✗	✗	✗	○	○	○	▲	▲	▲	▲	▲
Automatic thermal distortion compensation data (NOTE 4)	✗	✗	✗	○	✗	○	✗	✗	✗	✗	✗
PLC program (NOTE 1) (NOTE 2) (NOTE 5)	✗	✗	✗	○	○	○	▲ (NOTE 6)	▲ (NOTE 6)	▲	▲	▲
Tool list	✗	✗	✗	✗	✗	✗	▲	▲	▲	▲	▲
Tool pattern	✗	✗	✗	✗	✗	✗	▲	▲	▲	▲	▲
Tapping drill diameter	✗	✗	✗	✗	✗	✗	▲	▲	▲	▲	▲
Cutting condition	✗	✗	✗	✗	✗	✗	▲	▲	▲	▲	▲
Old tool list	✗	✗	✗	✗	✗	✗	✗	▲ (NOTE 9)	✗	✗	▲ (NOTE 9)
Old tool pattern	✗	✗	✗	✗	✗	✗	✗	▲ (NOTE 9)	✗	✗	▲ (NOTE 9)
Old cutting condition	✗	✗	✗	✗	✗	✗	✗	▲ (NOTE 9)	✗	✗	▲ (NOTE 9)
Machine data 1	✗	✗	✗	✗	✗	✗	▲	▲	▲	▲	▲
Machine data 2	✗	✗	✗	✗	✗	✗	▲ (NOTE 6)	▲ (NOTE 6)	▲	▲	▲
Machine data 3	✗	✗	✗	✗	✗	✗	▲ (NOTE 6)	▲ (NOTE 6)	▲	▲	▲

Data name	Program			Data Bank			Maintenance				
	Output	Input	Deletion	Output	Input	Deletion	Output all	Input all	Output all DB	Check output	Delete all
Machine data 4	×	×	×	×	×	×	▲	▲ (NOTE 6)	▲	▲	▲
Machine data 5	×	×	×	×	×	×	▲	▲	▲	▲	▲
Machine data 6	×	×	×	×	×	×	▲	▲ (NOTE 6)	▲	▲	▲
Machine data 11 (NOTE 5)	×	×	×	×	×	×	▲	▲	▲	▲	▲
Production data 1	×	×	×	×	×	×	▲	▲	▲	▲	▲
Production data 2	×	×	×	×	×	×	▲	▲	▲	▲	▲
Production data 3	×	×	×	×	×	×	▲	▲ (NOTE 6)	▲	▲	▲
Data for machine monitor (Production data 4)	×	×	×	×	×	×	×	×	×	×	×
Maintenance notice	×	×	×	×	×	×	▲	▲	▲	▲	▲
Workpiece counter	×	×	×	×	×	×	▲	▲	▲	▲	▲
Measurement result	×	×	×	×	×	×	▲	▲ (NOTE 11)	▲	▲	▲
Drawing data	×	×	×	×	×	×	▲	▲	▲	▲	▲
Waveform display parameter	×	×	×	×	×	×	▲	▲ (NOTE 10)	▲	▲	▲
PLC signal data (NOTE 5)	×	×	×	×	×	×	▲	▲	▲	▲	▲
PLC register monitor	×	×	×	×	×	×	▲	▲	▲	▲	▲
Bookmark	×	×	×	×	×	×	▲	▲	▲	▲	▲
Home screen setting	×	×	×	×	×	×	▲	▲	▲	▲	▲
Input/ output data	×	×	×	×	×	×	×	×	×	▲	▲
Memory operation data	×	×	×	×	×	×	×	×	×	▲	▲
Operation panel data	×	×	×	×	×	×	×	×	×	▲	▲
Position data	×	×	×	×	×	×	×	×	×	▲	▲
Version data	×	×	×	×	×	×	×	×	×	▲	▲
Alarm log data (up to item #100)	×	×	×	×	×	×	×	×	×	▲	▲
Alarm log data (from item #101)	×	×	×	×	×	×	×	×	×	▲	▲
Current alarm data	×	×	×	×	×	×	×	×	×	▲	▲
Operation log	×	×	×	×	×	×	×	×	×	▲	▲
Operation level data (NOTE 5)	×	×	×	×	×	×	▲	▲	▲	▲	▲
Request code (NOTE 12)	×	×	×	×	×	×	▲	×	×	▲	▲
Power consumption log data	×	×	×	×	×	×	▲	×	×	▲	▲
Machine characteristics log data	×	×	×	×	×	×	×	×	×	▲	▲
Production performance data base	×	×	×	×	×	×	▲	×	×	▲	▲

- (NOTE 1) Cannot be operated while editing the object file.
- (NOTE 2) Cannot be operated while displaying PLC monitor screen or PLC I/O screen or while communicating with PLC PROGRAMMING SOFTWARE.
- (NOTE 3) Entry is not possible during memory operation.
- (NOTE 4) Cannot be operated when connected to <General COMM device.>
- (NOTE 5) Being binary data, they cannot be input/output when connected to other than <Memory card> or <FTP(S) server.>
- (NOTE 6) Check input is skipped.
- (NOTE 7) The file name and format of data output differ between the machines of type 1 and type 2 in minimum setting unit.
- (NOTE 8) Despite the difference in the file name and format of data between the machines of type 1 and type 2 in minimum setting unit, either type of data can be operated. If data with the same unit system and number exists in the connected device, the data with a file name which is supported by the machine is operated.
- (NOTE 9) Can be operated only when there is no tool list, tool pattern or cutting condition with the same unit system and number in the connected device.

- (NOTE 10) Cannot be operated while measuring waveform data.
 (NOTE 11) Data in other machine unit are skipped.
 (NOTE 12) Output is not possible when the machine model does not require a request code.
 (NOTE 13) When not connected to a <General COMM device> or an <NC COMM device>, any program without an “Opppp” data name cannot be input or output.

3.6.2.3 Operation from NC to external devices (NC: master) (conversation mode)

Output : Output from NC to external device

Input : Input from external device to NC

Deletion : External device file deleted according to request from NC

○ : Can be operated individually

▲ : Can be operated in a batch

✗ : Cannot be operated

Data name	Program			Data Bank			Maintenance				
	Output	Input	Deletion	Output	Input	Deletion	Output all	Input all	Output all DB	Check output	Delete all
Program (NOTE 1)	✗	✗	✗	✗	✗	✗	▲	▲	✗	▲	▲
Machining data (NOTE 1)	○	○	○	✗	✗	✗	▲	▲	✗	▲	▲
Schedule program (NOTE 1)	○	○	○	✗	✗	✗	▲	▲	✗	▲	▲
Old machining data (K) (NOTE 1)	✗	○	○	✗	✗	✗	✗	▲	✗	✗	▲
Old machining data (G) (NOTE 1)	✗	○	○	✗	✗	✗	✗	▲	✗	✗	▲
Old machining data (N) (NOTE 1)	✗	○	○	✗	✗	✗	✗	▲	✗	✗	▲
Old machining data (O) (NOTE 1)	✗	○ (NOTE 10)	✗	✗	✗	✗	✗	✗	✗	✗	✗
Workpiece zero point (Type1)	✗	✗	✗	✗	✗	✗	▲	▲	▲	▲	▲
Workpiece zero point (Type2)	✗	✗	✗	✗	✗	✗	▲ (NOTE 7)	▲ (NOTE 8)	▲ (NOTE 7)	▲ (NOTE 7)	▲ (NOTE 8)
Tool data (Type 1)	✗	✗	✗	✗	✗	✗	▲ (NOTE 7)	▲ (NOTE 8)	▲ (NOTE 7)	▲ (NOTE 7)	▲ (NOTE 8)
Tool data (Type 2)	✗	✗	✗	✗	✗	✗	▲ (NOTE 7)	▲ (NOTE 8)	▲ (NOTE 7)	▲ (NOTE 7)	▲ (NOTE 8)
Macro variable (Type1)	✗	✗	✗	✗	✗	✗	▲ (NOTE 7)	▲ (NOTE 8)	▲ (NOTE 7)	▲ (NOTE 7)	▲ (NOTE 8)
Macro variable (Type2)	✗	✗	✗	✗	✗	✗	▲ (NOTE 7)	▲ (NOTE 8)	▲ (NOTE 7)	▲ (NOTE 7)	▲ (NOTE 8)
G/M code macro	✗	✗	✗	✗	✗	✗	▲	▲	▲	▲	▲
User parameter	✗	✗	✗	○	○	○	▲	▲	▲	▲	▲
External I/O signal	✗	✗	✗	○	○	○	▲	▲	▲	▲	▲
Communication parameter	✗	✗	✗	○	○	○	▲	▲	▲	▲	▲
Field network parameter	✗	✗	✗	○	○	○	▲	▲	▲	▲	▲
Machine parameter	✗	✗	✗	○	○	○	▲	▲	▲	▲	▲
Special settings	✗	✗	✗	○	○	○	▲	▲	▲	▲	▲
Machining load monitor	✗	✗	✗	○	○	○	▲	▲	▲	▲	▲
ATC tool data (NOTE 3)	✗	✗	✗	○	○	○	▲	▲	▲	▲	▲
Automatic thermal distortion compensation data (NOTE 4)	✗	✗	✗	○	✗	○	✗	✗	✗	✗	✗
PLC program (NOTE 1) (NOTE 2)(NOTE 5)	✗	✗	✗	○	○	○	▲ (NOTE 6)	▲ (NOTE 6)	▲	▲	▲
Tool list	✗	✗	✗	○	○	○	▲	▲	▲	▲	▲
Tool pattern	✗	✗	✗	○	○	○	▲	▲	▲	▲	▲
Tapping drill diameter	✗	✗	✗	○	○	○	▲	▲	▲	▲	▲
Cutting condition	✗	✗	✗	○	○	○	▲	▲	▲	▲	▲
Old tool list	✗	✗	✗	✗	○ (NOTE 9)	✗	✗	▲ (NOTE 9)	✗	✗	▲ (NOTE 9)

Data name	Program			Data Bank			Maintenance				
	Output	Input	Deletion	Output	Input	Deletion	Output all	Input all	Output all DB	Check output	Delete all
Old tool pattern	×	×	×	×	○ (NOTE 9)	×	×	▲ (NOTE 9)	×	×	▲ (NOTE 9)
Old cutting condition	×	×	×	×	○ (NOTE 9)	×	×	▲ (NOTE 9)	×	×	▲ (NOTE 9)
Machine data 1	×	×	×	×	×	×	▲	▲	▲	▲	▲
Machine data 2	×	×	×	×	×	×	▲	▲ (NOTE 6)	▲	▲	▲
Machine data 3	×	×	×	×	×	×	▲	▲ (NOTE 6)	▲	▲	▲
Machine data 4	×	×	×	×	×	×	▲	▲ (NOTE 6)	▲	▲	▲
Machine data 5	×	×	×	×	×	×	▲	▲	▲	▲	▲
Machine data 6	×	×	×	×	×	×	▲	▲ (NOTE 6)	▲	▲	▲
Machine data 11 (NOTE 5)	×	×	×	×	×	×	▲	▲	▲	▲	▲
Production data 1	×	×	×	×	×	×	▲	▲	▲	▲	▲
Production data 2	×	×	×	×	×	×	▲	▲	▲	▲	▲
Production data 3	×	×	×	×	×	×	▲	▲ (NOTE 6)	▲	▲	▲
Data for machine monitor (Production data 4)	×	×	×	×	×	×	×	×	×	×	×
Maintenance notice	×	×	×	×	×	×	▲	▲	▲	▲	▲
Workpiece counter	×	×	×	×	×	×	▲	▲	▲	▲	▲
Measurement result	×	×	×	×	×	×	▲	▲ (NOTE 12)	▲	▲	▲
Drawing data	×	×	×	×	×	×	▲	▲	▲	▲	▲
Waveform display parameters	×	×	×	×	×	×	▲	▲ (NOTE 11)	▲	▲	▲
PLC signal data (NOTE 5)	×	×	×	×	×	×	▲	▲	▲	▲	▲
PLC register monitor	×	×	×	×	×	×	▲	▲	▲	▲	▲
Bookmark	×	×	×	×	×	×	▲	▲	▲	▲	▲
Home screen setting	×	×	×	×	×	×	▲	▲	▲	▲	▲
I/O data	×	×	×	×	×	×	×	×	×	▲	▲
Memory run data	×	×	×	×	×	×	×	×	×	▲	▲
Operation panel data	×	×	×	×	×	×	×	×	×	▲	▲
Position data	×	×	×	×	×	×	×	×	×	▲	▲
Version data	×	×	×	×	×	×	×	×	×	▲	▲
Alarm log data (up to item #100)	×	×	×	×	×	×	×	×	×	▲	▲
Alarm log data (from item #101)	×	×	×	×	×	×	×	×	×	▲	▲
Current alarm data	×	×	×	×	×	×	×	×	×	▲	▲
Operation log	×	×	×	×	×	×	×	×	×	▲	▲
Operation level data (NOTE 5)	×	×	×	×	×	×	▲	▲	▲	▲	▲
Request code (NOTE 14)	×	×	×	×	×	×	▲	×	×	▲	▲
Power consumption log data	×	×	×	×	×	×	▲	×	×	▲	▲
Machine characteristics log data	×	×	×	×	×	×	×	×	×	▲	▲
Production performance data base	×	×	×	×	×	×	▲	×	×	▲	▲

(NOTE 1) Cannot be operated while editing the object file.

(NOTE 2) Cannot be operated while displaying PLC monitor screen or PLC I/O screen or while communicating with PLC PROGRAMMING SOFTWARE.

(NOTE 3) Entry is not possible during memory operation.

(NOTE 4) Cannot be operated when connected to <General COMM device.>

(NOTE 5) Being binary data, they cannot be input/output when connected to other than <Memory card> or <FTP(S) server.>

- (NOTE 6) Check input is skipped.
- (NOTE 7) The file name and format of data output differ between the machines of type 1 and type 2 in minimum setting unit.
- (NOTE 8) Despite the difference in the file name and format of data between the machines of type 1 and type 2 in minimum setting unit, either type of data can be operated. If data with the same unit system and number exists in the connected device, the data with a file name which is supported by the machine is operated.
- (NOTE 9) Can be operated only when there is no tool list, tool pattern or cutting condition with the same unit system and number in the connected device.
- (NOTE 10) Can be operated only when connected to general COMM device.
- (NOTE 11) Cannot be operated while measuring waveform data.
- (NOTE 12) Data in other machine unit are skipped.
- (NOTE 13) Output is not possible when the machine model does not require a request code.

3.6.2.4 User operations on external devices from NC (NC: Master station) (File viewer / Manual)

User operations are displayed for the file viewer and manual that are used in the accessories. The user operations are the same in NC language mode and conversation language mode.

Output: Outputs from NC to an external device

Input: Inputs from an external device to NC

Delete: Deletes external device files using a request from the NC

○ : Individual operation available

▲ : Batch operation available

✗ : Operation is not available

Data name	External I/O screen operation				File viewer / Manual				Maintenance			
	Output	Input	Delete	Output all	Input all	Output all DB	Check output	Delete all				
Manual	✗	✗	✗	▲	▲	✗	▲	▲				
File viewer	○	○	○	▲	▲	✗	▲	▲				
Screenshots	○	○	○	▲	▲	✗	▲	▲				
Notebook	○	✗	○	▲	▲	✗	▲	▲				

- (NOTE) When the user parameter (switch 1: data) <Manual output> is set to <0: No>, all data output and inspection data output will not be carried out.

3.6.3 Data compatibility with other models

3.6.3.1 Compatibility of NC language data

When using machining data created for other models, be sure to conduct test runs and check that there is no interference or other problems.

1. Compatibility with TC-217, 227, 218, 228, 229, 311, 312, 323, 324 and 731

Input

Program	Can be input.
Data Bank	Cannot be input.

Output

Program	Can be used. Note: Some codes cannot be used.
Data Bank	Cannot be used.

2. Compatibility with CNC-A00 machine models

Input

Program	Can be input.	
Data Bank	Workpiece coordinates zero position Tool data Macro variables User parameter Machine parameter	Can be input. Note that the fields for the extended workpiece coordinates from 49 to 300, the reference rotary fixture offset and external workpiece coordinates are blank. Can be input. Note that the fields for some items may be blank. (Refer to the table noted later for further details.) Can be input. Note: Items #600 and after are blank. Cannot be input. Cannot be input.

Output

Program	Can be used. Note: Some codes cannot be used.	
Data Bank	Workpiece coordinates zero position Tool data Macro variables User parameter Machine parameter	Can be used. Note that the extended workpiece coordinates from 49 to 300, the reference rotary fixture offset and external workpiece coordinates are deleted. Can be used. Note that some items are deleted. (Refer to the table noted later for further details.) Can be used. Note: Items #600 and after are deleted. Cannot be used. Cannot be used.

3. Compatibility with CNC-B00 machine models

Input

Program	Can be input.	
Data Bank	Workpiece coordinates zero position	Can be input. Note that the fields for the extended workpiece coordinates from 49 to 300 and the reference rotary fixture offset are blank.
	Tool data	Can be input. Note that the fields for some items may be blank. (Refer to the table noted later for further details.)
	Macro variables	Can be input.
	User parameter	Cannot be input.
Machine parameter		Cannot be input.

Output

Program	Can be used.	
	Note: Some codes cannot be used.	
Data Bank	Workpiece coordinates zero position	Can be used. Note that the extended workpiece coordinates from 49 to 300 and the reference rotary fixture offset are deleted.
	Tool data	Can be used. Note that some items are deleted. (Refer to the table noted later for further details.)
	Macro variables	Can be used.
	User parameter	Cannot be used.
Machine parameter		Cannot be used.

4. CNC-C00 machine models

Input

Program	Can be input.	
Data Bank	Workpiece coordinates zero position	Can be input. Note that the fields for the extended workpiece coordinates from 49 to 300 are blank.
	Tool data	Can be input. Note that the fields for some items may be blank. (Refer to the table noted later for further details.)
	Macro variables	Can be input.
	G/M code macro	Can be input. Note that the fields are blank for the folder selections 1/2/3 and the specified folders 2/3 for the G/M code macro programs.
	User parameter	Cannot be input.
	External I/O signal	Cannot be input.
	Communication parameter	Cannot be input.
	Machine parameter	Cannot be input.
	Special setting	Cannot be input.
	Load monitor	Can be input.
ATC tool		Cannot be input.

Output	
Program	Can be used. Note: Some codes cannot be used.
Data Bank	Workpiece coordinates zero position
	Tool data
	Macro variables
	G/M code macro
	User parameter
	External I/O signal
	Communication arameter
	Machine parameter
	Special setting
	Load monitor
ATC tool	ATC tool

Tool data items may not exist and the setting range may vary depending on the machine model. The fields for items that do not exist for input files will be blank, and items that do not exist at the output destination are deleted. In addition, the field is blank for any value that falls outside of the setting range.

○ : Item exists with the same setting range

▲ : Setting range is different

✗ : This item does not exist

Tool data menu	Item	CNC-A00	CNC-B00	CNC-C00
Tool list (1 to 99)	Tool name	✗	○	○
	Life unit	▲ (NOTE 1)	▲ (NOTE 1)	▲ (NOTE 1)
	Initial life	▲ (NOTE 2)	▲ (NOTE 2)	▲ (NOTE 2)
	Life warning	▲ (NOTE 2)	▲ (NOTE 2)	▲ (NOTE 2)
	Tool life	▲ (NOTE 2)	▲ (NOTE 2)	▲ (NOTE 2)
	Peripheral speed	✗	✗	○
	Feed per rotation	✗	✗	○
	Spindle speed (S)	✗	✗	○
	Feedrate (F)	✗	✗	○
	Max. spindle speed	✗	✗	○
	Tool washing	✗	✗	○
	CTS	✗	✗	○
	Tool position offset (X)	✗	✗	○
	Tool pos. wear offset (X)	✗	✗	○
	Tool position offset (Y)	✗	✗	○
	Tool pos. wear offset (Y)	✗	✗	○
	Imaginary tool nose dir.	✗	✗	○
Tool list (201 to 299)		✗	✗	✗

Tool data menu	Item	CNC-A00	CNC-B00	CNC-C00
Tool data range (1 to 99)	Minimum value for tool length offset (X)	×	○	○
	Maximum value for tool length offset (X)	×	○	○
	Minimum value for tool length wear offset (X)	×	○	○
	Maximum value for tool length wear offset (X)	×	○	○
	Minimum value for tool length offset (X)	×	○	○
	Maximum value for tool length offset (X)	×	○	○
	Minimum value for tool length wear offset (X)	×	○	○
	Maximum value for tool length wear offset (X)	×	○	○
	Minimum value for tool position offset (X)	×	×	○
	Maximum value for tool position offset (X)	×	×	○
	Minimum value for tool position wear offset (X)	×	×	○
	Maximum value for tool position wear offset (X)	×	×	○
	Minimum value for tool position offset (Y)	×	×	○
	Maximum value for tool position offset (Y)	×	×	○
	Minimum value for tool position wear offset (Y)	×	×	○
	Maximum value for tool position wear offset (Y)	×	×	○
Tool data range (201 to 299)		×	×	×

(NOTE 1) There are four setting ranges: 1 to 4 (CNC-D00 can be set to <5: Time (sec.)>).

(NOTE 2) The range can be set from 0 to 999,999 (CNC-D00 can be set from 0 to 9,999,999).

3.6.3.2 Compatibility of conversational language data

When using machining data created for other models, be sure to conduct test runs and check that there is no interference or other problems.

(NOTE) Machining data that uses <10. NPT>, <11. Sewing machine thread,> or <12. Miniature screw thread> as screw type, if input to the machine whose machine parameter <Change screw type> is set to <0: Language set> and <Display language> is set to <Japanese> or whose <Change screw type> is set to <1: For Japan>, cannot be edited or used for operation.

1. Compatibility with TC-211, 212, 221, 215, and 225

Input

Machining data	Can be input. Note: Machining sequence, tool pattern, cutting conditions, and tool assignment data are automatically separated from the machining data. Set them again after input.
Data Bank	Cannot be input.

Output

No data can be used.

2. Compatibility with TC-321, 201, 203, 217, 218, 227, 228, 229, 311, 312, 323, and 324
- Input

Machining data	<p>Can be input.</p> <p>(NOTE) Although the machining data can be input, the machine may not operate correctly due to differences in programming specifications for some models. Modify the program while paying attention to the matters below.</p> <p>In addition, when initially performing memory operation, use functions such as single operation, dry run, machine lock, or override, to check that the machine operates correctly.</p> <ol style="list-style-type: none"> 1. Some cutting conditions need to be reset. 2. Rotational transformations in the operation program are deleted. 3. The type of threads may vary for those other than metric coarse thread, metric fine pitch thread, unified coarse thread, and unified fine pitch thread. 4. The command method of the tool change M code varies for some models. Change it if necessary. 5. The Z-axis measurement system M code cannot be used. Delete it.
Data Bank	<p>Even when data banks can be input, the machine may not operate correctly because some items are added or changed. Set and change the data bank appropriately, according to the precautions regarding data banks described in the Operation Manual.</p> <p>In addition, when initially performing memory operation, use functions such as single operation, dry run, machine lock, or override, to check that the machine operates correctly.</p>
	<p>Tool List</p> <p>Can be input. Tool wash and CTS are blank. (NOTE)</p> <ol style="list-style-type: none"> 1. When the data bank is input from the TC-321, 201, 217, 227, or 228, set the tool life again. 2. The type of threads may vary for those other than metric coarse thread, metric fine pitch thread, unified coarse thread, and unified fine pitch thread. <p>Tool pattern</p> <p>Setting Primary Hole</p> <p>Drilling Diameter for Tapping</p> <p>Cutting conditions</p> <p>Parameter</p> <p>Can be input. Cannot be input. Can be input. Note: Some data needs to be reset. Cannot be input.</p>

Output

No data can be used.

3. Compatibility with CNC-A00 machine models

Input

Machining data	Can be input. Notes: 1. Cutting condition (Others) requires partial resetting. 2. The Z-axis measurement system M code cannot be used. Delete it.	
SCHEDULE PROGRAM	Can be input.	
Data Bank	Tool List Tool pattern Setting Primary Hole Drilling Diameter for Tapping Cutting conditions User parameter Machine parameter	Can be input. Tool wash and CTS are blank. Can be input. Can be input. Can be input. Note: Cutting condition 3 (Others) requires partial resetting. Cannot be input. Cannot be input.

Output

Machining data	Cannot be used.	
SCHEDULE PROGRAM	Cannot be used.	
Data Bank	Tool List Tool pattern Setting Primary Hole Drilling Diameter for Tapping Cutting conditions User parameter Machine parameter	Can be used. Tool wash and TCS are deleted. Can be used. Can be used. Can be used. Note: Cutting condition 3 (Others) requires partial resetting. Cannot be used. Cannot be used.

4. Compatibility with CNC-B00 machine models

Input

Machining data	Can be input.	
SCHEDULE PROGRAM	Can be input.	
Data Bank	Tool List Tool pattern Setting Primary Hole Drilling Diameter for Tapping Cutting conditions User parameter Machine parameter	Can be input. Tool wash and CTS are blank. Can be input. Can be input. Can be input. Cannot be input. Cannot be input.

Output

Machining data	Cannot be used.	
SCHEDULE PROGRAM	Cannot be used.	
Data Bank	Tool List Tool pattern Setting Primary Hole Drilling Diameter for Tapping Cutting conditions User parameter Machine parameter	Can be used. Tool wash and CTS are blank. Can be used. Can be used. Can be used. Cannot be used. Cannot be used.

5. CNC-C00 machine models

Input

Machining data	Can be input.		
SCHEDULE PROGRAM	Can be input.		
Data Bank	Tool List	Can be input.	
	Tool pattern	Can be input.	
	Setting Primary Hole Drilling	Can be input.	
	Diameter for Tapping		
	Cutting conditions	Can be input.	
	External I/O signal	Cannot be input.	
	Communication parameter	Cannot be input.	
	Machine parameter	Cannot be input.	
	Special setting	Cannot be input.	
	Load monitor	Can be input.	
	ATC tool	Cannot be input.	

Output

Machining data	Can be used.		
SCHEDULE PROGRAM	Can be used.		
Data Bank	Tool List	Can be used.	
	Tool pattern	Can be used.	
	Setting Primary Hole Drilling	Can be used.	
	Diameter for Tapping		
	Cutting conditions	Can be used.	
	User parameter	Cannot be used.	
	External I/O signal	Cannot be used.	
	Communication parameter	Cannot be used.	
	Machine parameter	Cannot be used.	
	Special setting	Cannot be used.	
	Load monitor	Can be used.	
	ATC tool	Cannot be used.	

3.6.4 File format

The data format is shown for each file.

A comma “,” is used as a delimiter between a symbol and item, or between each item. In addition, a “line break” code is used as a delimiter between each symbol.

- In the table, the delimiter between symbol and item is omitted.
- For the data length, only the data length section for the item is shown, and the symbol as well as the delimiter section is not included.

3.6.4.1 Workpiece counter

Filename: WKCNTR

Symbol	Item	Delimiter	Data length	Notes	NC/Conversation
A01	Workpiece counter 1 (Count)	,	3		NC
	Workpiece counter 1 (current value)	,	6		NC
	Workpiece counter 1 (target value)	,	6		NC
	Workpiece counter 1 (end signal value)	CR+LF	6		NC
A02-A04	Workpiece counter 2-4	Same structure as A01			NC
B01	Workpiece counter 1 (Count)	,	3		Conversation
	Workpiece counter 1 (current value)	,	6		Conversation
	Workpiece counter 1 (target value)	,	6		Conversation
	Workpiece counter 1 (end signal value)	CR+LF	6		Conversation
B02-B04	Workpiece counter 2-4	Same structure as B01			Conversation

A01-A04 and B01-B04 are supported by 1-4 in the “workpiece counter” screen.

3.6.4.2 Production data 2 (Time display)

Filename: PRDD2

Symbol	Item	Delimiter	Data length	Notes
L01	Cycle time (1) (Hrs./Min./0.1 Sec.)	,	9	hhhhmmsss
	Cutting time (1) (Hrs./Min./0.1 Sec.)	,	9	hhhhmmsss
	Other (1) (0.1 sec.)		3	
	Cycle time (2) (Hrs./Min./0.1 Sec.)	,	9	hhhhmmsss
	Cutting time (2) (Hrs./Min./0.1 Sec.)	,	9	hhhhmmsss
	Other (2) (0.1 sec.)		3	
	Program (1)	,	32	
	Program (2)	,	32	
	Program folder (1)	,	33	The leading and last characters are single quotation marks.
	Program folder (2)	,	33	
	Program restart / interruption flag (1)		1	0: Normal 1: Restart 2: Interruption 3: Restart & Interruption
	Program restart / interruption flag (2)		1	Same as above
	Memory operation type (1)	,	1	0: Internal memory operation, 1: Tape operation - General communications device, 2: Tape operation - Memory card
	Memory operation type (2)		1	Same as above
	Operation end counter	CR+LF	4	
S01	Cycle status (cycle time)	,	1	0: Not initialized 1: Cycle initiated 2: Cycle not initiated
	Write index (cycle time)	,	3	0: Initialize 1 or higher : Write location index
	Measurement status (cycle time)	,	3	0: Not measured 1 or higher: Measuring
	Cycle status (specified range measurement)	,	1	0: Not initialized 1: Cycle initiated 2: Cycle not initiated
	Write index (specified range measurement)	,	3	0: Initialize 1 or higher : Write location index
	Measurement status (specified range measurement)	CR+LF	1	0: Not measured 1: Measuring
Q01	Date and time of operation start	,	14	
	Cycle time	,	9	hhhhmmsss
	Cutting time	,	9	hhhhmmsss
	Other	,	3	
	Program	,	34	
	Program folder	,	35	
	Rapid traverse override	,	1	
	Cutting override	,	3	
	Spindle override	,	3	
	Block skip status	,	1	0: OFF 1: ON
	Pallet No.	,	1	0: Not indexed or No QT 1: Pallet 1 2: Pallet 2
	Standard cycle time flag	,	1	0: Cycle time not applicable 1: Cycle time applicable
	Workpiece counter used	,	2	1: Counter 1 2: Counter 2 4: Counter 3 8: Counter 4

Chapter 3 Communication

Symbol	Item	Delimiter	Data length	Notes
	Program restart / interruption flag	,	1	0: Normal 1: Restart 2: Interruption 3: Restart & Interruption
	Memory operation type	,	1	0: Internal memory operation 1: Tape operation - General communications device 2: Tape operation - Memory card
	Language	,	1	0: Conversation 1: NC
	Tool No. 1	,	3	
	Tool No. 2	,	3	
	(Omission)	,	144	
	Tool No. 51	,	3	
	Tool log – Tool No. 1	,	3	
	Tool log – Tool No. 2	,	3	
	(Omission)	,	291	
	Tool log – Tool No. 100	,	3	
	Tool log – Cutting time 1	,	9	hhhhmmsss
	Tool log – Cutting time 2	,	9	hhhhmmsss
	(Omission)	,	873	
	Tool log – Cutting time 100	CR+LF	9	hhhhmmsss
Q02-21	Cycle time log (2-21)	Same structure as Q01		
D001	Date and time of operation start	,	14	
	Measurement time	,	9	hhhhmmsss
	Cutting time	,	9	hhhhmmsss
	Program	,	34	
	Folder name	,	35	
	Program restart / interruption flag	,	1	0: Normal 2: Interruption
	MDI operation flag	CR+LF	1	0: Not MDI operation 1: MDI operation
D002-101	Range time measurement 2-101	Same structure as D001		
M01	Operation time status	,	1	
	Operation time index	CR+LF	2	
N01	Operation time log 1 (Date)	,	8	YYYYMMDD
	Operation time log 1 (Hours, minutes, seconds)	,	6	hhmmss
	Operation time log 1 (No. of operations)	,	5	
	Operation time log 1 (Power ON time)		6	
	Operation time log 1 (#3002)	CR+LF	11	
N02-20	Operation time log 2-20	Same structure as N01		
O01	Panel key switch (Coolant)	,	1	0: OFF, 1: ON
	Panel key switch (Chip shower)	,	1	0: OFF, 1: ON
	Panel key switch (Machine lights)	,	1	0: OFF, 1: ON
	Panel key switch (Table light)		1	0: OFF, 1: ON
	Panel key switch (Pallet select key)	CR+LF	1	0: OFF, 1: 1, 2: 2, 3: 1-2
P01	Relative position offset (X-axis)	,	13	
	Relative position offset (Y-axis)	,	13	
	Relative position offset (Z-axis)	,	13	
	Relative position offset (No 4-axis)	,	13	

Symbol	Item	Delimiter	Data length	Notes
	Relative position offset (No 5-axis)	,	13	
	Relative position offset (No 6-axis)	,	13	
	Relative position offset (No 7-axis)	,	13	
	Relative position offset (No 8-axis)	,	13	
	Relative position offset (P1-axis)	,	12	
	Relative position offset (P2-axis)	,	12	
	Relative position offset (P3-axis)	,	12	
	Relative position offset (P4-axis)	CR+LF	12	

3.6.4.3 Measurement results

Filename: MSRRSD

Symbol	Item	Delimiter	Data length	Notes	NC/Conversation
C01	Unit system	CR+LF	1	0: Metric, 1: Inch	NC
D01	Measurement result 1 (Measurement date and time)	,	14	YYYYMMDDhhmmss	NC
	Measurement result 1 (X)	,	13		NC
	Measurement result 1 (Y)	,	13		NC
	Measurement result 1 (Z)	,	13		NC
	Measurement result 1 (Rotation)	,	13		NC
	Measurement result 1 (G code 1)	,	1	1: G121, 2: G122, 3: G123 4: G124, 5: G125, 6: G126 7: G127, 9: G129, Only the G128 measurement result is 0.	NC
	Measurement result 1 (G code 2)	,	1	8: G128 The measurement result that does not include G128 is 0.	NC
	Measurement result 1 (Effective axis)	CR+LF	3	Bit 3: Rotation, 2: Z, 1: Y, 0: X	NC
D02-D09	Measurement result 1, Log 2-9	Same structure as D01			NC
E01-E09	Measurement result 2	Same structure as D01-D09			NC
F01-F09	Measurement result 3	Same structure as D01-D09			NC
G01-G09	Measurement result 4	Same structure as D01-D09			NC
H01	Measurement result 1 (Measurement date and time)	,	14	YYYYMMDDhhmmss	Conversation
	Measurement result 1 (Measurement type)	,	3	Bit 7: Always 1 5: Rotation Y 4: Rotation X 3: Z-axis height 2: Circle center 1: Parallel 0: Corner	Conversation
	Measurement result 1 (X)	,	13		Conversation
	Measurement result 1 (Y)	,	13		Conversation
	Measurement result 1 (Z)	,	13		Conversation
	(Reference position X)	,	13	Not used	Conversation
	(Reference position Y)	,	13	Not used	Conversation

Symbol	Item	Delimiter	Data length	Notes	NC/ Conversation
	(Reference position Z)	,	13	Not used	Conversation
	Measurement result 1 (Center X)	,	13		Conversation
	Measurement result 1 (Center Y)	,	13		Conversation
	Measurement result 1 (Rotation)	,	13	0-999.999	Conversation
	Measurement result 1 (Effective axis)	,	3	Bit 5: Rotation 4: Center Y 3: Center X 2: Z 1: Y 0: X	Conversation
H02-H09	Measurement result 1, Log 2-9			Same structure as H01	Conversation
I01-I09	Measurement result 2			Same structure as H01-H09	Conversation
J01-J09	Measurement result 3			Same structure as H01-H09	Conversation
K01-K09	Measurement result 4			Same structure as H01-H09	Conversation

3

3.6.4.4 Automatic thermal distortion compensation

Filename: HEACu, u: Unit system (M: Metric I: Inch)

Symbol	Item	Delimiter	Data length	Notes
A0001	Log 1 (No. of calculations)	,	5	
	Log 1 (Reserved)	,	1	Not used (0 fixed)
	Log 1 (Reserved)	,	11	Same as above
	Log 1 (Reserved)	,	10	Same as above
	Log 1 (Reserved)	,	9	Same as above
	Log 1 (Reserved)	,	9	Same as above
	Log 1 (Reserved)	,	7	Same as above
	Log 1 (Reserved)	,	7	Same as above
	Log 1 (Time)	,	14	YYYYMMDDhhmmss
	Log 1 (Average travel speed (Z-axis))	,	14	0.0000~999999.9999 0.00000~99999.99999 (NOTE 1)
	Log 1 (Spindle rotation sum)	,	10	0~4294967295
	Log 1 (Displacement 1 (Z-axis))	,	11	-99.9999~99.9999 -9.99999~9.99999 (NOTE 1)
	Log 1 (Displacement 2 (Z-axis))	,	11	-99.9999~99.9999 -9.99999~9.99999 (NOTE 1)
	Log 1 (Spindle displacement (Z-axis))	,	11	-99.9999~99.9999 -9.99999~9.99999 (NOTE 1)
	Log 1 (Position 1 (Z-axis))	,	13	-999.9999~9999.9999 -999.99999~999.99999 (NOTE 1)
	Log 1 (Position 2 (Z-axis))	,	13	-999.9999~9999.9999 -999.99999~999.99999 (NOTE 1)
	Log 1 (Compensation 1 (Z-axis))	,	13	-9999.9999~9999.9999 -999.99999~999.99999 (NOTE 1)
	Log 1 (Compensation 2 (Z-axis))	,	13	-9999.9999~9999.9999 -999.99999~999.99999 (NOTE 1)
	Log 1 (Lathe spindle rotation sum)	,	10	0~4294967295
	Log 1 (Lathe spindle displacement (Z-axis))	CR+LF	11	-99.9999~99.9999 -9.99999~9.99999 (NOTE 1)
A0002-A10801	Same structure as A0001			
B0001	Log 1 (No. of calculations)	,	5	
	Log 1 (Reserved)	,	1	Not used (0 fixed)
	Log 1 (Reserved)	,	11	Same as above
	Log 1 (Reserved)	,	10	Same as above
	Log 1 (Reserved)	,	9	Same as above
	Log 1 (Reserved)	,	9	Same as above
	Log 1 (Reserved)	,	7	Same as above
	Log 1 (Reserved)	,	7	Same as above

Symbol	Item	Delimiter	Data length	Notes
	Log 1 (Time)	,	14	YYYYMMDDhhmmss
	Log 1 (Average travel speed (X-axis))	,	14	0.0000~999999.9999 0.00000~99999.99999 (NOTE 1)
	Log 1 (Spindle rotation sum)	,	10	0~4294967295
	Log 1 (Ball screw displacement 1 (X-axis))	,	11	-99.9999~99.9999 -9.99999~9.99999 (NOTE 1)
	Log 1 (Ball screw displacement 2 (X-axis))	,	11	-99.9999~99.9999 -9.99999~9.99999 (NOTE 1)
	Log 1 (Spindle displacement (X-axis))	,	11	-99.9999~99.9999 -9.99999~9.99999 (NOTE 1)
	Log 1 (Position 1 (X-axis))	,	13	-9999.9999~9999.9999 -999.99999~999.99999 (NOTE 1)
	Log 1 (Position 2 (X-axis))	,	13	-9999.9999~9999.9999 -999.99999~999.99999 (NOTE 1)
	Log 1 (Compensation 1 (X-axis))	,	13	-9999.9999~9999.9999 -999.99999~999.99999 (NOTE 1)
	Log 1 (Compensation 2 (X-axis))	,	13	-9999.9999~9999.9999 -999.99999~999.99999 (NOTE 1)
	Log 1 (Lathe spindle rotation sum)	,	10	0~4294967295
	Log 1 (Lathe spindle displacement (X-axis))	CR+LF	11	-99.9999~99.9999 -9.99999~9.99999 (NOTE 1)
B0002-B1080	Same structure as B0001			
C0001	Log 1 (No. of calculations)	,	5	
	Log 1 (Reserved)	,	1	Not used (0 fixed)
	Log 1 (Reserved)	,	11	Same as above
	Log 1 (Reserved)	,	10	Same as above
	Log 1 (Reserved)	,	9	Same as above
	Log 1 (Reserved)	,	9	Same as above
	Log 1 (Reserved)	,	7	Same as above
	Log 1 (Reserved)	,	7	Same as above
	Log 1 (Time)	,	14	YYYYMMDDhhmmss
	Log 1 (Average speed on Y-axis)	,	14	0.0000~999999.9999 0.00000~99999.99999 (NOTE 1)
	Log 1 (Spindle rotation sum)	,	10	0~4294967295
	Log 1 (Ball screw displacement 1 (Y-axis))	,	11	-99.9999~99.9999 -9.99999~9.99999 (NOTE 1)
	Log 1 (Ball screw displacement 2 (Y-axis))	,	11	-99.9999~99.9999 -9.99999~9.99999 (NOTE 1)
	Log 1 (Spindle displacement (Y-axis))	,	11	-99.9999~99.9999 -9.99999~9.99999 (NOTE 1)
	Log 1 (Position 1 (Y-axis))	,	13	-9999.9999~9999.9999 -999.99999~999.99999 (NOTE 1)
	Log 1 (Position 2 (Y-axis))	,	13	-9999.9999~9999.9999 -999.99999~999.99999 (NOTE 1)
	Log 1 (Compensation 1 (Y-axis))	,	13	-9999.9999~9999.9999 -999.99999~999.99999 (NOTE 1)
	Log 1 (Compensation 2 (Y-axis))	,	13	-9999.9999~9999.9999 -999.99999~999.99999 (NOTE 1)
	Log 1 (Lathe spindle rotation sum)	,	10	0~4294967295
	Log 1 (Lathe spindle displacement (Y-axis))	CR+LF	11	-99.9999~99.9999 -9.99999~9.99999 (NOTE 1)
C0002-C1080	Same structure as C0001			

(NOTE 1) Minimum digit for micron is a space.

(NOTE 2) Enter the value without changing it.

3.6.4.5 Maintenance notice

Filename: MAINTC

3

Symbol	Item	Delimiter	Data length	Notes
Q01	No.1 (Type)	,	2	0: None 1: Spindle speed (× 1000 revs.) 2: X-axis travel distance (m) [in. × 100 inch] 3: Y-axis travel distance (m) [in. × 100 inch] 4: Z-axis travel distance (m) [in. × 100 inch] 5-9: No 4-8-axes speed (Rotation) 10: Tool change times (No. of times) 11: Magazine turn pitches (Pitch) 12: Center-through-coolant ON time (Hours, minutes, seconds) 13: Center-through-coolant ON times (No. of times) 14: Outer/Front door closings (No. of times) 15: Side door closings (No. of times) 16: Inner door closings (No. of times) 17: Servo ON times (No. of times) 18: Power ON times (No. of times) 19: Power ON time (Hours, minutes, seconds) 20-23: P1-4-axes travel amount 24: Right side door closings (No. of times) 25: Setup chamber left side door closings (No. of times) 26: Setup chamber right side door closings (No. of times)
	No.1 (Message)	,	20	8 half-width characters (Characters that can be entered from the panel). The leading and last characters are single quotation marks.
	No.1 (Function)	,	1	0: Disabled, 1: Enabled
	No.1 (Operator message notification)	,	1	0: Do not notify, 1: Notify
	No.1 (Current value)	,	9	If the set value for the “type” is displayed in a date and time format, 2008/1/1 is converted to 100000000 and any difference in the value is expressed in seconds. If the set value for the “type” is displayed as a time period, the unit is in seconds.
	No.1 (End value)	CR+LF	9	Same as above
Q02-Q16	No.2-No.16			Same structure as Q01

(NOTE) To input into the NC, enter the value for the range that can be set on the NC screen.

3.6.4.6 Production data 3 (Status history)

Filename: PRDD3

Symbol	Item	Delimiter	Data length	Notes
A01	Start index	,	4	
	End index	,	4	
	Status		1	
	File writing index	CR+LF	5	
C01	Current (Start date and time)	,	14	YYYYMMDDhhmmss
	Current (Status)	,	1	1: Power OFF 2: Standby mode 3: Operating 4: Stopped 5: Error
	Current status (Language)	,	1	0: NC, 1: Conversation
	Current status (Program No. / Error No.)	,	34	Program No. when the "status" is "3: Operating" Error No. when the "status" is "5: Error" First two digits: Category number 01:EX,02:EC,03:SV,04:NC 05:IO,06:SP,07:SM,08:SL 09:CM,10:ES,11:FC,90:OM Last four digits: Number
	Current status (Folder name)	,	35	The leading and last characters are single quotation marks.
	Memory operation type	CR+LF	1	0: Internal memory operation, 1: Tape operation - General communications device, 2: Tape operation - Memory card
B0001-B3500	Status log 1-40000	Same structure as C01		

The start date and time is the start time from when the status was changed.

3.6.4.7 Position data

Filename: PDSP

Symbol	Item	Delimiter	Data length	Notes
L01	Language	CR+LF	1	0: NC, 1: Conversation
G01	G00 group	,	3	00-03, 02.2, 03.2, 102, 103, 202, 204, 33, 392 (Outputs 922 and 932 for G02.2 and G03.2)
	G17 group	,	3	17-19
	G22 group	,	3	22, 23
	G40 group	,	3	40-42, 141, 142
	G49 group	,	3	43, 44, 49, 143, 144
	G50 group	,	3	50, 51
	G50.1 group	,	3	501, 511
	G54 group	,	3	54-59, 1-300 (Outputs 1-300 for G54.1G54.300)
	G64 group	,	3	61, 64
	G67 group	,	3	66, 67
	G69 group	,	3	68, 69, 168, 68.2 (Outputs 682 for G68.2)
	G80 group	,	3	73-189
	G90 group	,	3	90, 91
	G94 group	,	3	93, 94, 95
	G97 group	,	3	96, 97
	G98 group	,	3	98, 99
	G54.2 group	,	3	Displays P number (Ex: Outputs 1 when G54.2P1)

Chapter 3 Communication

Symbol	Item	Delimiter	Data length	Notes
	G321 group	CR+LF	3	321-323
M01	M05 group	,	3	03-05, 19, 111
	M09 group	,	3	08, 09
	M97 group	,	3	96, 97
	M141 group	,	3	141, 142
	M221 group	,	3	211, 221
	M222 group	,	3	212, 222
	M223 group	,	3	213, 223
	M224 group	,	3	214, 224
	M230 group	,	3	230, 231
	Reserved	,	3	Reserved
	M252 group	,	3	241-254
	M269 group	,	3	260-267, 269, 280-287, 289
	M270 group	,	3	270-279
	M290 group	,	3	290-293
	M305 group	,	3	303-305
	M401 group	,	3	400, 401
	M403 group	,	3	402, 403
	M405 group	,	3	404, 405
	M407 group	,	3	406, 407
	M409 group	,	3	408, 409
	M419 group	,	3	418, 419
	M431 group	,	3	430, 431
	M435 group	,	3	435-437
	M441 group	,	3	440, 441
	M443 group	,	3	442, 443
	M445 group	,	3	444, 445
	M481 group	,	3	480, 481
	M483 group	,	3	482, 483
	M485 group	,	3	484, 485
	M487 group	,	3	486, 487
	M495 group	,	3	494-495
	Reserved	,	3	Reserved
	M322 group	,	3	322,323
	M389 group	,	3	380-387,389
	M299 group	,	3	298,299
	M474 group	,	3	474,475
	M420 group	,	3	420-423
	M340 group	,	3	340-343
	M300 group	CR+LF	3	300-301
P01	Machine coordinate position (X-axis)	,	13	-9999.9999~9999.9999 -999.99999~999.99999 (NOTE 1)
	- Machine coordinate position (Y to 8-axes)	,	13*7	Same as machine coordinate position (X-axis)
	Machine coordinate position (P1 to P4-axes)	,	12*4	
CR+LF				
P02	Relative coordinate position, X to P4-axes	Same structure as P01		
P03	Absolute coordinate position, X to P4-axes	Same structure as P01		
P04	Remaining distance, X to P4-axes	Same structure as P01		
X01	Feedrate	,	10	
	Spindle speed	,	6	
	Inner pallet	,	1	0: Not indexed/QT not mounted, 1: Inner side pallet 1, 2: Inner side pallet 2
	Spindle tool No.	,	3	
	Next tool No.	,	3	

Symbol	Item	Delimiter	Data length	Notes
	Pot No.	,	2	
	Door interlock/ mode of safe operation	,	1	0: Disable / Maintenance, 1: Enable / Machine setup, 2: Automatic operation
	Outer door	,	1	0: Close, 1: Open
	Inner door	,	1	0: Close, 1: Open
	Side door	,	1	0: Close, 1: Open
	Rapid traverse override	,	1	0: speed1, 1: speed2, 2: speed3, 3: speed4, 4: 100%, 5: 0%
	Feedrate override	,	3	%
	Spindle override	,	3	%
	High accuracy		2	0: OFF 1: Standard 2: Rough 3: Medium rough 4: Medium rough S 5: Finishing 6: Finishing S 7: Adjustment A 8: Adjustment B 9: Adjustment C 21: Accuracy spec. A 22: Accuracy spec. B 23: Accuracy spec. C 60:M260 61:M261 62:M262 63:M263 64:M264 65:M265 66:M266 67:M267 80:M280 81:M281 82:M282 83:M283 84:M284 85:M285 86:M286 87:M287
	Feature coordinate setting status		1	0: Before feature coordinate index 1: During feature coordinate index
	Machining load monitor	CR+LF	3	0: OFF 1 to 99: Parameter number for machining load monitor being used

(NOTE 1) Minimum digit for micron is a space.

3.6.4.8 Memory operation data

Filename: MEM

Symbol	Item	Delimiter	Data length	Notes
A01	Operation folder name	,	35	The leading and last characters are single quotation marks.
	Program	,	34	0: NC, 1: Conversation
	Operation status	,	1	0: Reset, 1: Operation, 2: Temporary stop, 3: Block stop
	Inner pallet status	,	1	0: Not indexed, 1: Inner side No.1, 2: Inner side No.2
	Spare tool	,	1	0: Not used, 1: Being used
	Mode	,	1	
	Expansion	CR+LF	1	0: Normal, 1: Expanded

3.6.4.9 ATC tool

Filename: ATCTL

Symbol	Item	Delimiter	Data length	Notes
M01	Spindle (Tool No.)	,	3	0: Not set, 1 to 99: Tool No., 201 to 299: Tool No., 999: Cap setting
	Spindle (Conversation/NC)	,	1	0: Conversation, 1: NC
	Spindle (Group No. (NC) / Main tool No. (Conversation))	,	2	Group No.: 0 (Not set), 1-30 Main tool No.: 0 (Not set), 1-99
	Spindle (Type)	,	1	1: Standard, 2: Large diameter, 3: Medium diameter
	Spindle (Graph color)	CR+LF	1	0: No color, 1: Blue, 2: Red, 3: Purple, 4: Green, 5: Light blue, 6: Yellow, 7: White
M02-M51	Pot 1-50			Same structure as M01

3

3.6.4.10 Operation panel data

Filename: PANEL

Symbol	Item	Delimiter	Data length	Notes
D01	Outer door	,	1	0: Close, 1: Open
	Inner door	,	1	0: Close, 1: Open
	Side door	CR+LF	1	0: Close, 1: Open
K01	Mode	,	1	0: Manual, 1: MDI operation, 2: Memory operation, 3: Program edit, 4: MDI manual, 5: Operating edit
	Block skip	,	1	0: OFF, 1: ON
	OPT stop	,	1	0: OFF, 1: ON
	Single block	,	1	0: OFF, 1: ON
	Dry run	,	1	0: OFF, 1: ON
	Machine lock	,	1	0: OFF, 1: ON
	Coolant pump	,	1	0: OFF, 1: ON
	Chip shower	,	1	0: OFF, 1: ON
	Machine light	,	1	0: OFF, 1: ON
	Pallet select key		1	0: OFF, 1: 1, 2: 2, 3: 1-2
	Table light			0: OFF, 1: ON
	Door unlock 1			0: OFF, 1: ON
	Door unlock 2	CR+LF		0: OFF, 1: ON
S01	Rapid traverse override	,	1	0: Speed 1, 1: Speed 2, 2: Speed 3, 3: Speed 4, 4: 100%, 5: 0%, 9: Override prohibited
	Feedrate override	,	3	% display, 999: Override prohibited
	Spindle override	,	3	% display, 999: Override prohibited
	Emergency stop	,	1	0: ON, 1: OFF
	Data protection	,	1	0: Enabled, 1: Disabled
	Door interlock mode (right)		1	0: OFF, 1: ON
	Door interlock mode (left)		1	0: OFF, 1: ON
	Enable		1	0: OFF 1: Main operation 2: Handle 3: Pendant 4: Magazine 5: Pallet start
	[MASTER ON]	CR+LF	1	0: OFF, 1: ON

3.6.4.11 Version data

Filename: VER

Symbol	Item	Delimiter	Data length	Notes
M01	Model	CR+LF	12	The leading and last characters are single quotation marks.
V01	Version (Overall)	,	20	The leading and last characters are single quotation marks.
	Version (Main)	,	20	Same as above
	Version (Local)	,	20	Same as above
	Version (Help data)	,	20	Same as above
	Version (Main Boot)	,	20	Same as above
	CM PCB	,	20	Same as above
	CM PCB(Boot)	,	20	Same as above
	Loading system	,	20	
	Loading system(Boot)	,	20	
	Teaching pendant	,	20	
	Teaching pendant(Boot)	CR+LF	20	
S01	Machine I.D. No.		12	
	Additional axis restriction information	,	1	
	Special operation status	CR+LF	1	

3.6.4.12 Current alarm

Filename: ALARM

Symbol	Item	Delimiter	Data length	Notes
E01	Alarm/Operator message No.1	,	22	2 high-order digits: 01: EX, 02: EC, 03: SV, 04: NC, 05: IO, 06: SP, 07: SM, 08: SL, 09: CM, 10: ES, 11: FC, 90: OM Next 4 digits: No. 16 low-order digits: Auxiliary No.
	- Alarm/Operator messages No.2-36 are omitted.	,	22*35	Same as alarm/operator message No.1
		CR+LF		
L01	Loading system alarm message No. 1	,	22	First 3 digits: Category Next 4 digits: Number Last 4 digits: Auxiliary number
	- Omission Loading system alarm message No. 18	,	22*17	Same as <Loading system alarm message No.1>

3.6.4.13 Alarm history

Filename: LOG

Symbol	Item	Delimiter	Data length	Notes
A01	Table status	,	1	Internal data (Unnecessary for reference)
	Table index	,	3	Internal data (Unnecessary for reference)
	Detailed write index	,	2	Internal data (Unnecessary for reference)
	Detailed read index	CR+LF	2	Internal data (Unnecessary for reference)
B0001	Log 1 (Date and time)	,	14	YYYYMMDDhhmmss
	Log 1 (Alarm No.)	,	6	2 high-order digits: 01: EX, 02: EC, 03: SV, 04: NC, 05: IO, 06: SP, 07: SM, 08: SL, 09: CM, 10: ES, 11: FC, 90: OM, 4 low-order digits: No.
	Log 1 (Auxiliary No.)	,	16	
	Log 1 (Attributes)	,	5	
	Log 1 (Operation program No.)	,	34	

Symbol	Item	Delimiter	Data length	Notes
	Log 1 (Edit program No.)	,	34	
	Log 1 (Block No./Job No.)	,	13	Block No. when using the NC language. When using conversation: Job (2)/Tool (2)/Machining position (3)/Workpiece No. (2)/Line No. (2)/Infeed (2).
	Log 1 (Mode)	,	1	0: Manual, 1: MDI, 2: Memory, 3: Edit, 4: MDI manual, 5: Memory edit, 8: Memory operation (Tape operation), 9: Operating edit (Tape operation)
	Log 1 (Screen ID)	,	8	Eight hexadecimal digits or spaces
	Log 1 (Expansion)	,	1	0: Normal, 1: Expanded
	Log 1 (Operation program folder)	,	35	The leading and last characters are single quotation marks.
	Log 1 (Edit program folder)	CR+LF	35	Same as above
B0002-B0100	Log 2 – Log 100	Same structure as B0001		
C0001	Log 1 (Machine coordinates for X-axis)	,	13	
	- Log 1 (Machine coordinates for Y through P4-axes) omitted.	,	13*13	Same structure as log 001 (Machine coordinates for X-axis)
	Log 1 (Remaining distance for X-axis)	,	13	
	- Log 1 (Remaining distance for Y through P4-axes) omitted.	,	13*11	Same structure as log 001 (Remaining distance for X-axis)
C0002-C0100	Log 2 – Log 100	Same structure as C0001		
	Log 1 (Spindle tool)	,	3	
D0001	Log 1 (Spindle speed)	,	5	
	Log 1 (Feed type)	,	1	0: Not traveling, 1: Positioning, 2: Feed axis cutting, 3: Additional axis cutting and 4: Feed axis + Additional axis cutting
	Log 1 (Feedrate)	,	14	
	Log 1 (Door interlock mode)	,	1	0: Maintenance 1: Machine setup 2: Automatic operation
	Log 1 (Outer door)	,	1	0: Close, 1: Open
	Log 1 (Inner door)	,	1	0: Close, 1: Open
	Log 1 (Side door)	,	1	bit0: Right door 0: Close, 1: Open bit1: Left door 0: Close, 1: Open
	Log 1 (Rapid traverse override)	,	1	0: Speed 1, 1: Speed 2, 2: Speed 3, 3: Speed 4, 4: 100%, 5: 0%
	Log 1 (Feedrate override)	,	3	%
	Log 1 (Spindle override)	,	3	%
	Log 1 (Tool length offset H modal)	,	8	0: No offset, 1-99 and 201-299: Tool No.
	Log 1 (Tool position compensation (X))	,	13	Tool position compensation (X) + Tool position wear offset (X)
	Log 1 (Tool position compensation (Y))	,	13	Tool position compensation (Y) + Tool position wear offset (Y)
	Log 1 (Tool length offset (Z))	,	13	Tool length offset (Z) + T length wear offset (Z)
	Log 1 (Cutter compensation D modal)	,	8	0: No offset, 1-99 and 201-299: Tool No.

Symbol	Item	Delimiter	Data length	Notes
	Log 1 (Cutter compensation)	,	13	Cutter compensation + Cutter wear offset
	Log 1(Enable)	,	1	0: OFF 1: Main operation 2: Handle 3: Pendant 4: Magazine 5: Pallet start
	Log 1(Pendant enabled)	CR+LF	1	0: Disable 1: Enable
D0002-D0100	Log 2 – Log 100			Same structure as D0001
E0001-E0100	Log 1-100 (Input main 1-404)	,	4*404*100	Bit expression for 0 or 1
F0001-F0100	Log 1-100 (Output main 1-56)	,	4*56*100	Bit expression for 0 or 1
G0001-G0100	Log 1-100 (Input local 1-5)	,	4*5*100	Bit expression for 0 or 1
H0001-H0100	Log 1-100 (Output local 1-5)	,	4*5*100	Bit expression for 0 or 1
I0001-I0100	Log 1-100 (Deviation for S to P4-axes)	,	11*15*100	
J0001-J0100	Log 1-100 (Execution block)	CR+LF	128*100	
K0001	Log 1 (Current limit)	,	4	
	Log 1 (Current command)	CR+LF	5	
K0002-K0100	Log 2-100			Same structure as K0001
L0001-L0100	Log 1-100 (PLC external input X0-128)	,	4*128*100	Bit expression for 0 or 1
M0001-M0100	Log 1-100 (PLX external output Y0-128)	,	4*128*100	Bit expression for 0 or 1
N0001-N0100	Log 1-100 (PLC internal input BX0-128)	,	4*128*100	Bit expression for 0 or 1
O0001-O0100	Log 1-100 (PLC internal output BY0-128)	,	4*128*100	Bit expression for 0 or 1
P0001-P0100	Log 1-100 (PLC internal input BDX0-128)	,	4*1024*100	Bit expression as 0 or 1
Q0001-Q0100	Log 1-100 (PLC internal output BDY0-128)	,	4*1024*100	Bit expression as 0 or 1

Filename: LOGBK

The LOG and file format is the same.

The data starting from the 101th item in the alarm history is recorded in this file (LOGBK).

3.6.4.14 Data for Machine Monitor (Production Data 4)

Filename: MONTR

Symbol	Item	Delimiter	Data length	Notes
P01	Operation program No.	,	34	
	Edit program No.	,	34	
	Operation folder name	,	258	The leading and last characters are single quotation marks.
	Edit folder name	CR+LF	35	The leading and last characters are single quotation marks.
T01	Total operation time	,	9	
	Power on time	,	9	
	Operation time	CR+LF	9	
C01	Workpiece counter 1 (Count)	,	3	
	Workpiece counter 1 (Current)	,	6	
	Workpiece counter 1 (End)	,	6	
	Workpiece counter 1 (End warning)	CR+LF	6	
C02-C04	Workpiece counter 2-4			Same structure as C01

3.6.4.15 Request code

File name: RQCnnnnnyyymmdd

nnnnnn: Machine No., yy: Year, mm: Month, dd: Day

Symbol	Item	Delimiter	Data length	Notes
A01	Request code	,	12	Upper case letters + Numbers
B01	Machine No.	,	6	
C01	Auxiliary number	,	1	

3.6.4.16 Workpiece coordinate zero (Type 1)

File name: POSNun

u: Unit system (M: Metric I: Inch)

n: Data bank number (0 to 9: “0” is used for “10”)

Symbol	Item	Delimiter	Data length	Notes
G54	X-axis	,	15	-999999.999~999999.999 -99999.9999~999999.999 (NOTE 1)
	Y-axis	,	15	-999999.999~999999.999 -99999.9999~999999.999 (NOTE 1)
	Z-axis	,	15	-999999.999~999999.999 -99999.9999~999999.999 (NOTE 1)
	A-axis	,	15	-999999.999~999999.999 (NOTE 1)
	B-axis	,	15	-999999.999~999999.999 (NOTE 1)
	C-axis	CR+LF	15	-999999.999~999999.999 (NOTE 1)
G55-G59	Same structure as G54			
X01-X300	Extended workpiece coordinate system Same structure as G54			
H01	External workpiece coordinate system Same structure as G54			
B01	Reference rotary fixture offset Reference angle A-axis	,	15	-999999.999~999999.999 (NOTE 1)
	Reference angle B-axis	,	15	-999999.999~999999.999 (NOTE 1)
	Reference angle C-axis	,	15	-999999.999~999999.999 (NOTE 1)
	Reference offset X-axis	,	15	-999999.999~999999.999 -99999.9999~999999.999 (NOTE 1)
	Reference offset Y-axis	,	15	-999999.999~999999.999 -99999.9999~999999.999 (NOTE 1)
	Reference offset Z-axis		15	-999999.999~999999.999 -99999.9999~999999.999 (NOTE 1)
	Axis for calculation	CR+LF		0:A 1:B 2:C 3:A,B 4:A,C 5:B,C

(NOTE 1) When using the micron unit system without purchasing the smallest unit system option, the last digit for the sub micron place holder is a space.

(Example of reference offset on Z-axis: Metric → -99.999 to 99.999 and Inch → -9.9999 to 9.9999)

3.6.4.17 Workpiece coordinate zero (Type 2)

File name: POSSun

The same format as workpiece coordinate zero (type 1) is used, but following point is different.

(NOTE 1) In micron mode as well, the smallest digit values are output as is in the interal data during communication.

3.6.4.18 Tool data (Type 1)

File name: TOLNun

u: Unit system (M: Metric I: Inch)

n: Data bank number (0 to 9: “0” is used for “10”)

Symbol	Item	Delimiter	Data length	Notes
T01	Tool length offset	,	12	-999.999~999.999 -99.9999~99.9999 (NOTE 1)

Symbol	Item	Delimiter	Data length	Notes
	T length wear offset	,	11	-99.999~99.999 -9.9999~9.9999 (NOTE 1)
	Cutter compensation	,	12	-999.999~999.999 -99.9999~99.9999 (NOTE 1)
	Cutter wear offset	,	11	-99.999~99.999 -9.9999~9.9999 (NOTE 1)
	Tool life unit	,	1	1: Not counted 2: Time (min.) 3: Drilling (holes) 4: Program (cycles) 5: Time (sec.)
	Initial tool life / End of tool life	,	7	0~999999
	Tool life warning		7	0~999999
	Tool life		7	0~999999
	Tool name	,	16	The first and last characters in 14 byte character string (2 byte characters possible) is a single quotation mark.
	Peripheral speed		6	0.1~9999.9 (NOTE 3)
	Rotation feed		9	0.01~9.99 0.001~0.999 (NOTE 4)
	S command value		5	1~99999
	F command value		14	0.01~999999.99 0.001~99999.999 (NOTE 4)
	Maximum speed		5	0~999999 0: Rotation not possible
	Tool wash		1	0: Possible 1: Not possible
	CTS		1	0: Possible 1: Not possible
	Tool type number		8	0~99999999 0: Not set
	Tool position offset (X)		12	-999.999~999.999 -99.9999~99.9999 (NOTE 1)
	Tool position wear offset (X)		11	-99.999~99.999 -9.9999~9.9999 (NOTE 1)
	Tool position offset (Y)		12	-999.999~999.999 -99.9999~99.9999 (NOTE 1)
	Tool position wear offset (Y)		11	-99.999~99.999 -9.9999~9.9999 (NOTE 1)
	Virtual teeth direction	CR+LF	1	-999.999~999.999 -99.9999~99.9999 (NOTE 1)
T02-T299	Same structure as T01			
V01	Tool number 1~30 set in group number 1	CR+LF	3*30	1~99, 201~209 (NOTE 2)
V02-Y99	Same structure as V01			
M01	Minimum value for tool length offset		12	-999.999~999.999 -99.9999~99.9999 (NOTE 1)
	Maximum value for tool length offset		12	-999.999~999.999 -99.9999~99.9999 (NOTE 1)
	Minimum value for T length wear offset		11	-99.999~99.999 -9.9999~9.9999 (NOTE 1)
	Maximum value for T length wear offset		11	-99.999~99.999 -9.9999~9.9999 (NOTE 1)
	Minimum value for tool diameter offset		12	-999.999~999.999 -99.9999~99.9999 (NOTE 1)
	Maximum value for tool diameter offset		12	-999.999~999.999 -99.9999~99.9999 (NOTE 1)
	Minimum value for cutter wear offset		11	-99.999~99.999 -9.9999~9.9999 (NOTE 1)
	Maximum value for cutter wear offset		11	-99.999~99.999 -9.9999~9.9999 (NOTE 1)
	Minimum value for tool position offset (X)		12	-999.999~999.999 -99.9999~99.9999 (NOTE 1)
	Maximum value for tool position offset (X)		12	-999.999~999.999 -99.9999~99.9999 (NOTE 1)

Symbol	Item	Delimiter	Data length	Notes
	Minimum value for tool position wear offset (X)		11	-99.999~99.999 -9.9999~9.9999 (NOTE 1)
	Maximum value for tool position wear offset (X)		11	-99.999~99.999 -9.9999~9.9999 (NOTE 1)
	Minimum value for tool position offset (Y)		12	-999.999~999.999 -99.9999~99.9999 (NOTE 1)
	Maximum value for tool position offset (Y)		12	-999.999~999.999 -99.9999~99.9999 (NOTE 1)
	Minimum value for tool position wear offset (Y)		11	-99.999~99.999 -9.9999~9.9999 (NOTE 1)
	Maximum value for tool position wear offset (Y)		11	-99.999~99.999 -9.9999~9.9999 (NOTE 1)
M02-M299	Same structure as M01			

- (NOTE 1) The last digit is a blank space when the unit is a micron.
 (NOTE 2) When there is a blank space, the cell shifts up to fill in the gap.
 (NOTE 3) It does not output rounding off to the smallest digit value. However, if the value only occupies the last digit (0 when not that value), the value is rounded off when outputting in micron mode.
 (NOTE 4) The metric and inch sizes are different.

3.6.4.19 Tool data (Type 2)

File name: TOLSun

u: Unit system (M: Metric I: Inch)

n: Data bank number (0 to 9: “0” is used for “10”)

The same format as tool data (type 1) is used, but following point is different.

- (NOTE 1) In micron mode as well, the smallest digit values are output as is in the internal data during communication.

3.6.4.20 Macro variables (Type 1)

File name: MCRNun

u: Unit system (M: Metric I: Inch)

n: Data bank number (0 to 9: “0” is used for “10”)

Symbol	Item	Delimiter	Data length	Notes
C500	Variable	,	11	-999999.999~999999.999 -99999.9999~99999.9999 (NOTE 1)
C501-C999	Same structure as C500			

- (NOTE 1) The last digit is a blank space when the unit is a micron.

3.6.4.21 Macro variables (Type 2)

File name: MCRSun

u: Unit system (M: Metric I: Inch)

n: Data bank number (0 to 9: “0” is used for “10”)

The same format as macro variables (type 1) is used, but following point is different.

- (NOTE 1) In micron mode as well, the smallest digit values are output as is in the internal data during communication.

3.6.4.22 Machining load monitor

File name: TLOADn

n: Data bank number (0 to 9: "0" is used for "10")

Symbol	Item	Delimiter	Data length	Notes
A01	Load monitor method	,	1	0: Peak value 1: Average
	Time constant	,	3	1~999
	Stop level for max.	,	1	0~3
	Stop level for min.	,	1	0~3
	Max. machining load	,	7	0.000~999.999
	Min. machining load	CR+LF	7	0.000~999.999
A02-A99	Same structure as A01			
A201-A209	Same structure as A01			
B01	Machining load monitor function	,	1	0: Disable 1: Enable
	Machining load monitor during override	CR+LF	1	0:No monitor 1:Monitor

3.6.4.23 Power consumption data

File name: EPLOG

Symbol	Item	Delimiter	Data length	Notes
D001	Date and time (Year, month, day, hour)	,	10	yyyymmddhh
	Servo (all axes)	,	5	
	Coolant pump	,	5	
	CTS pump	,	5	
	Chip shower pump	,	5	
	Cyclone suction pump	,	5	
	24 V system	,	5	
	NC control	,	5	
	LCD backlight	,	5	
	Chip conveyor	,	5	
	Chip auger	,	5	
	Automatic oiling device or automatic greasing device	,	5	
	Spindle cooling fan	,	5	
	Servo control	,	5	
	User device 1	,	5	
	User device 2	,	5	
	User device 3	,	5	
	User device 4	,	5	
	User device 5	,	5	
	User device 6	,	5	
	User device 7	,	5	
	User device 8	CR+LF	5	
D002-D744	Same structure as D01			
C001	Date and time (Year, month, day, hour, minute, second)	,	14	yyyymmddhhmmss
	Measurement time	,	9	hhhhmmss
	Folder name	,	35	
	Program name	,	34	
	Servo (all axes)	,	5	
	Coolant pump	,	5	
	CTS pump	,	5	
	Chip shower pump	,	5	
	Cyclone suction pump	,	5	
	24 V system	,	5	
	NC control	,	5	
	LCD backlight	,	5	
	Chip conveyor	,	5	
	Chip auger	,	5	
	Automatic oiling device or automatic greasing device	,	5	

Chapter 3 Communication

Symbol	Item	Delimiter	Data length	Notes
	Spindle cooling fan	,	5	
	Servo control	,	5	
	User device 1	,	5	
	User device 2	,	5	
	User device 3	,	5	
	User device 4	,	5	
	User device 5	,	5	
	User device 6	,	5	
	User device 7	,	5	
	User device 8	CR+LF	5	
C002-C004	Same structure as C001			
A01	Start date and time for total (servo (all axes))	,	14	yyyymmddhhmmss
	Power consumption (servo (all axes))	,	9	
	Start date and time for total (coolant pump)	,	14	yyyymmddhhmmss
	Power consumption (coolant pump)	,	9	
	Start date and time for total (CTS pump)	,	14	yyyymmddhhmmss
	Power consumption (CTS pump)	,	9	
	Start date and time for total (chip shower pump)	,	14	yyyymmddhhmmss
	Power consumption (chip shower pump)	,	9	
	Start date and time for total (cyclone suction pump)	,	14	yyyymmddhhmmss
	Power consumption (cyclone suction pump)	,	9	
	Start date and time for total (24 V system)	,	14	yyyymmddhhmmss
	Power consumption (24 V system)	,	9	
	Start date and time for total (NC control)	,	14	yyyymmddhhmmss
	Power consumption (NC control)	,	9	
	Start date and time for total (LCD backlight)	,	14	yyyymmddhhmmss
	Power consumption (LCD backlight)	,	9	
	Start date and time for total (chip conveyor)	,	14	yyyymmddhhmmss
	Power consumption (chip conveyor)	,	9	
	Start date and time for total (chip auger)	,	14	yyyymmddhhmmss
	Power consumption (chip auger)	,	9	
	Start date and time for total (automatic oiling device or automatic greasing device)	,	14	yyyymmddhhmmss
	Power consumption (automatic oiling device or automatic greasing device)	,	9	
	Start date and time for total (spindle cooling fan)	,	14	yyyymmddhhmmss
	Power consumption (spindle cooling fan)	,	9	
	Start date and time for total (servo control)	,	14	yyyymmddhhmmss
	Power consumption (servo control)	,	9	
	Start date and time for total (user device 1)	,	14	yyyymmddhhmmss
	Power consumption (user device 1)	,	9	
	Start date and time for total (user device 2)	,	14	yyyymmddhhmmss
	Power consumption (user device 2)	,	9	
	Start date and time for total (user device 3)	,	14	yyyymmddhhmmss
	Power consumption (user device 3)	,	9	
	Start date and time for total (user device 4)	,	14	yyyymmddhhmmss

Symbol	Item	Delimiter	Data length	Notes
	Power consumption (user device 4)	,	9	
	Start date and time for total (user device 5)	,	14	yyyymmddhhmmss
	Power consumption (user device 5)	,	9	
	Start date and time for total (user device 6)	,	14	yyyymmddhhmmss
	Power consumption (user device 6)	,	9	
	Start date and time for total (user device 7)	,	14	yyyymmddhhmmss
	Power consumption (user device 7)	,	9	
	Start date and time for total (user device 8)	,	14	yyyymmddhhmmss
	Power consumption (user device 8)	CR+LF	9	

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CHAPTER 4

SERVER FUNCTIONS

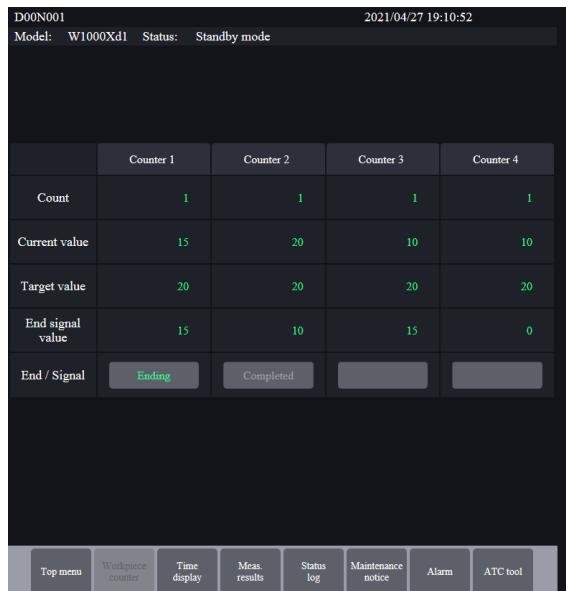
4

- 4.1 **HTTP (Hyper Text Transfer Protocol)**
- 4.2 **OPC UA**

4.1 HTTP (Hyper Text Transfer Protocol)

4.1.1 Outline

The machine can serve as a web server and you can browse the web pages provided by the machine through the PC. The user can monitor this machine from a computer browser.



4

- * It is required to connect the machine to the network and make settings for the network beforehand. Refer to the “3.5 Communication protocol” for further details.

Using the value set for the <Host name> or the <IP address> in the communication parameters, specify an URL (address) as shown below in the PC browser.

http:// host name (or IP address)

or

https:// host name (or IP address)

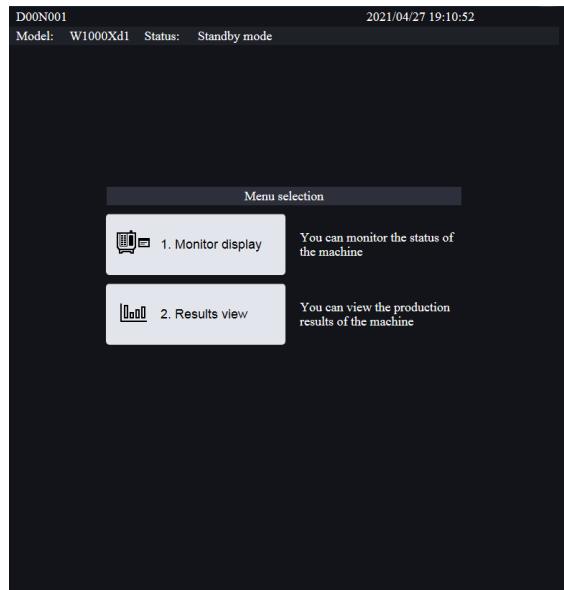
When the communication parameter <Restrict Ethernet access> is set to <1: Yes>, the login screen is displayed.

Enter the user name and password that are set: <Server user name> and <Password as server>, and then press the <Log On> button.

(NOTE 1) The password is not encrypted when logging into the HTTP server. To encrypt the password, login to the HTTPS server.

(NOTE 2) If a certificate warning is displayed when accessing the HTTPS server, this machine's server certificate, or a certificate for the certificate authority who issued this machine's server certificate must be registered as a trusted certificate. Follow the instructions in the browser to register the certificate.

This displays the top page of the machine whose URL you have specified in the browser.



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If you want to display another machine on the network, replace the <Host name> or <IP address> in the URL with that of the desired machine.

4.1.1.1 Operation requirements

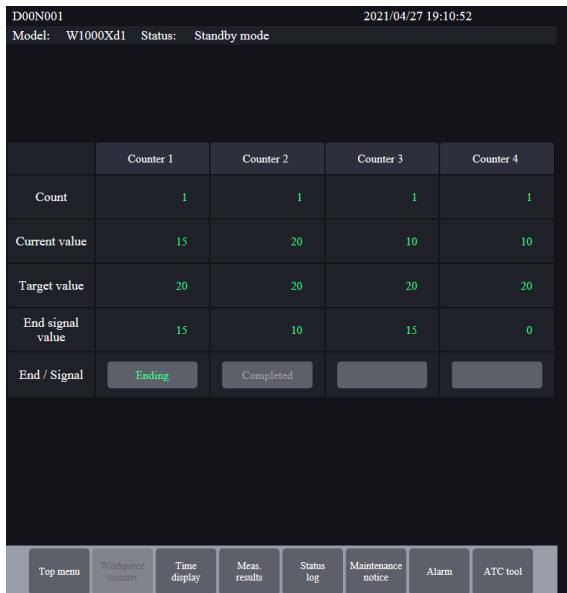
The following OS and web browser versions are compatible.

		OS
		Windows 10 Pro 64bit
Browser	Microsoft Internet Explorer	Product version 11.0.19041.1
	Microsoft Edge	89.0.774.75
	Google Chrome	89.0.4389.114
	Mozilla Firefox	82.0.3

(NOTE) Enable the JavaScript function for the browser.

4.1.2 Monitor display

The status of the specified machine can be monitored.
Click the <Monitor display> on the <TOP> page.

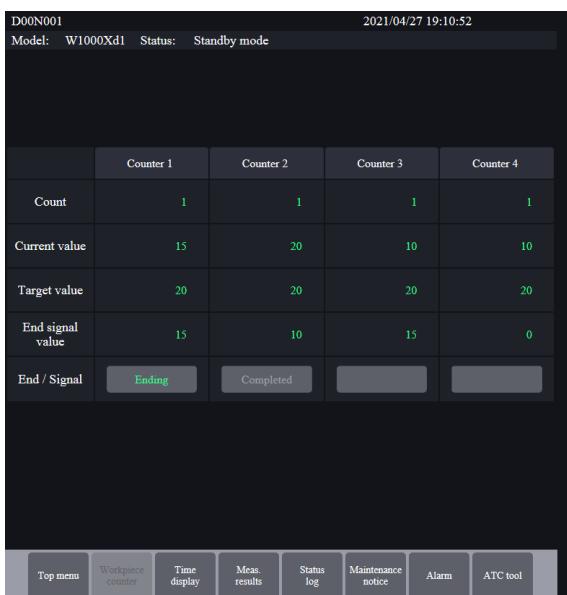


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- * The displayed status is updated every minute.

4.1.2.1 Workpiece counter

Click on the <Workpiece counter> key on the <Monitor display> page.
Refer to “4.5.1 Workpiece counter” in Operation Manual I for details about content that can be displayed.
On the monitor display, a numerical value cannot be set for the following items: <Count>, <Current value>, <Target value> and <End signal value>.



4.1.2.2 Time display

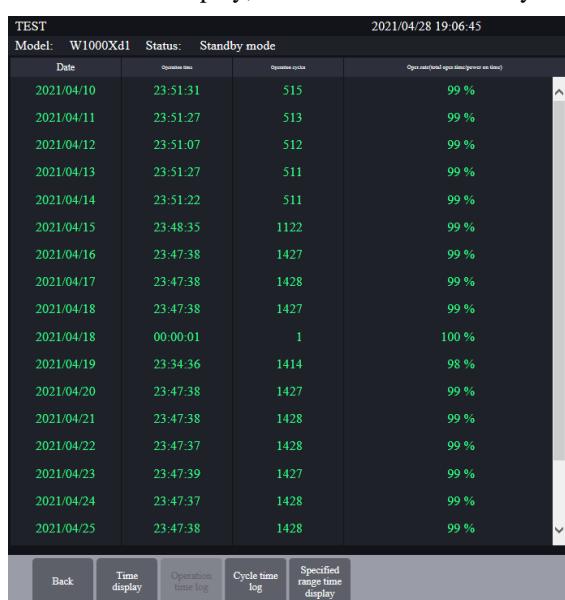
Click on the <Time display> key on the <Monitor display> page.



The function key can be used to change between <Time display>, <Operation time log>, <Cycle time log> and <Specified range time display>.

Refer to “4.5.2 Time display” in Operation Manual I for details about content that can be displayed.

On the monitor display, the <To delete the history> key does not display.



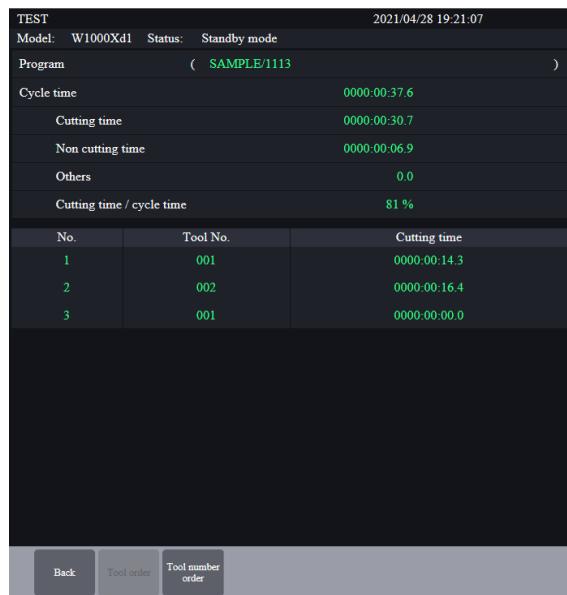
Chapter 4 Server Functions

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TEST		2021/04/28 19:06:45						
Model: W1000Xd1 Status: Standby mode		Program	P	Logic	Cycle time	Cutting time	True cutting time	Others
Date and time of measurement date								
2021/04/28 19:02:27	1113	-	NC	0000:00:37.6	0000:00:30.7	0000:00:06.9	0.0	0.0
2021/04/28 19:02:11	1112	-	NC	0000:00:09.1	0000:00:06.1	0000:00:03.0	0.0	0.0
2021/04/28 19:01:58	1112	-	NC	0000:00:09.1	0000:00:06.1	0000:00:03.0	0.0	0.0
2021/04/28 19:01:08	1111	-	NC	0000:00:37.4	0000:00:29.9	0000:00:07.5	0.0	0.0
2021/04/28 19:00:07	1111	-	NC	0000:00:37.4	0000:00:29.9	0000:00:07.5	0.0	0.0
2021/04/28 18:39:36	1111	-	NC	0000:00:38.1	0000:00:29.9	0000:00:08.2	0.0	0.0
2021/04/28 18:32:24	1111	-	NC	? 0000:00:07.9	0000:00:04.7	0000:00:03.2	0.0	0.0
2021/04/28 18:31:45	1111	-	NC	0000:00:38.4	0000:00:29.9	0000:00:08.5	0.0	0.0
2021/04/28 09:40:16	0031	-	Conv.	? 0000:26:11.0	0000:26:09.5	0000:00:01.5	0.0	0.0
2021/04/28 09:24:24	0031	-	Conv.	? 0000:02:25.6	0000:02:24.9	0000:00:00.7	0.0	0.0
2021/04/27 19:35:50	0031	-	Conv.	? 0000:00:05.1	0000:00:04.4	0000:00:00.7	0.0	0.0
2021/04/27 19:34:11	0031	-	Conv.	? 0000:00:19.7	0000:00:19.4	0000:00:00.3	0.0	0.0
2021/04/27 19:33:52	0031	-	Conv.	? 0000:00:01.1	0000:00:00.0	0000:00:01.1	0.0	0.0
2021/04/27 19:32:00	0031	-	Conv.	? 0000:00:00.3	0000:00:00.0	0000:00:00.3	0.0	0.0
2021/04/27 19:12:46	0031	-	Conv.	? 0000:10:39.9	0000:10:38.6	0000:00:01.3	0.0	0.0
2021/04/27 19:11:15	0030	-	Conv.	? 0000:00:00.0	0000:00:00.0	0000:00:00.0	0.0	0.0

TEST		2021/04/28 19:06:45				
Model: W1000Xd1 Status: Standby mode		Program	Measurement time	Cutting time	True cutting time	
Date and time of measurement date						
2021/04/28 19:02:45	1113		0000:00:20.0	0000:00:16.4	0000:00:03.6	
2021/04/28 19:02:14	1112		0000:00:05.4	0000:00:03.2	0000:00:02.2	
2021/04/28 19:02:01	1112		0000:00:05.4	0000:00:03.2	0000:00:02.2	
2021/04/28 19:01:26	1111		0000:00:20.1	0000:00:15.9	0000:00:04.2	
2021/04/28 19:00:24	1111		0000:00:20.1	0000:00:15.9	0000:00:04.2	

After clicking on data you wish to reference on the <Cycle time log> page, it changes to the <Tool log> page.



Model:	W1000Xd1	Status:	Standby mode
Program	(SAMPLE/1113)		
Cycle time	0000:00:37.6		
Cutting time	0000:00:30.7	Non cutting time	0000:00:06.9
Others	0.0	Cutting time / cycle time	81 %
No.	Tool No.	Cutting time	
1	001	0000:00:14.3	
2	002	0000:00:16.4	
3	001	0000:00:00.0	

Back Tool order Tool number order

4

Click on the title <No.> or <Tool order> key to sort the order based on the tools being used. Click on the title <Tool No.> or <Tool number order> key to sort the order based on the tool number.

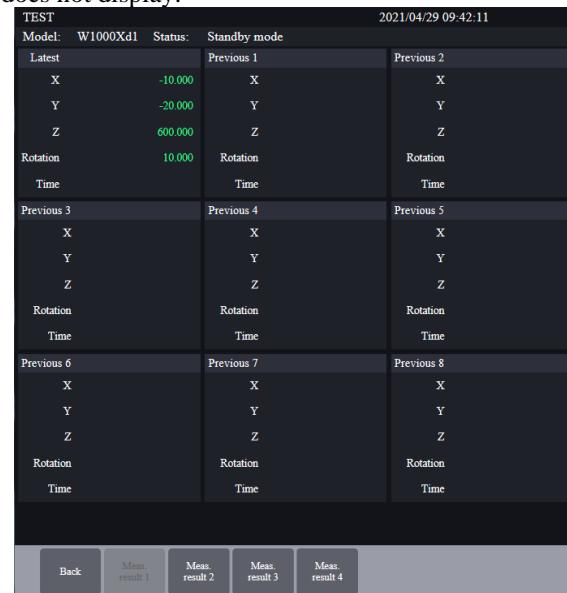
4.1.2.3 Measurement results

Click on the <Meas. results> key on the <Monitor display> page.

Use the function keys to select a measurement result (1 to 4) to display.

Refer to “4.5.4 Measurement results” in Operation Manual I for details about content that can be displayed.

The numerical values cannot be edited on the monitor display. In addition, the <Delete all> key does not display.



Latest	Previous 1	Previous 2
X	-10.000	X
Y	-20.000	Y
Z	600.000	Z
Rotation	10.000	Rotation
Time	Time	Time
Previous 3	Previous 4	Previous 5
X	X	X
Y	Y	Y
Z	Z	Z
Rotation	Rotation	Rotation
Time	Time	Time
Previous 6	Previous 7	Previous 8
X	X	X
Y	Y	Y
Z	Z	Z
Rotation	Rotation	Rotation
Time	Time	Time

Back Meas. result 1 Meas. result 2 Meas. result 3 Meas. result 4

4.1.2.4 Status log

Click on the <Status log> key on the <Monitor display> page.

Refer to “45.8 Status history” in Operation Manual I for details about content that can be displayed.

On the monitor display, the <Delete data> key does not display.

TEST		2021/04/29 09:42:11				
Model: W1000Xd1 Status: Standby mode		Total time				
Date		Off	Standby	Error	Operating	Stopped
04/29 (Today)		00:00	09:35	00:03	00:02	00:00
04/28 (Yesterday)		09:27	12:13	01:29	00:32	00:17
04/27 (2 days ago)		04:25	07:28	00:18	11:14	00:33
04/26 (3 days ago)		00:00	00:00	00:00	24:00	00:00
04/25 (4 days ago)		00:00	00:00	00:00	24:00	00:00
04/24 (5 days ago)		00:00	00:00	00:00	24:00	00:00
04/23 (6 days ago)		00:00	00:00	00:00	23:59	00:00

Back Today Yesterday 2 days ago 3 days ago 4 days ago 5 days ago 6 days ago

4

Clicking the desired date on the <Status history> page switches to the <Detailed display> page for the date.

TEST		2021/04/29 09:42:11	
Model: W1000Xd1 Status: Standby mode		04/29 (Today)	
Date	Status	Time	Error No./Program No.
	Standby mode	00:00:00 - 09:14:00	
	Error occurred	09:14:00 - 09:17:47	0506 *
	Standby mode	09:17:47 - 09:22:00	
	Running	09:22:00 - 09:22:38	SAMPLE/1111
	Standby mode	09:22:38 - 09:22:42	
	Running	09:22:42 - 09:23:19	SAMPLE/1111
	Standby mode	09:23:19 - 09:23:28	
	Running	09:23:28 - 09:23:37	SAMPLE/1112
	Standby mode	09:23:37 - 09:23:38	
	Running	09:23:38 - 09:23:48	SAMPLE/1112
	Standby mode	09:23:48 - 09:23:53	
	Running	09:23:53 - 09:24:31	SAMPLE/1113
	Standby mode	09:24:31 - 09:24:32	
	Running	09:24:32 - 09:25:10	SAMPLE/1113
	Standby mode	09:25:10 - 09:41:56	
	Error occurred	09:41:56 - 09:41:57	4000 *

Back Sort by status

Click on the title <Status> or <Sort by status> key to sort the order based on the status. Click on the title <Time> or <Sort by time> key to sort the order based on the time. If the data is currently sorted based on the status, then the <Sort by time> key is displayed. If the data is currently sorted based on the time, then the <Sort by status> key is displayed.

TEST			2021/04/29 09:42:11
Date	04/29 (Today)		
Status	Time	Error No./Program No.	
Power is off (00:00:00)			
Error occurred (00:03:48)	09:14:00 - 09:17:47	0506 *	
	09:41:56 - 09:41:57	4000 *	
Running (00:02:50)	09:22:00 - 09:22:38	SAMPLE/1111	
	09:22:42 - 09:23:19	SAMPLE/1111	
	09:23:28 - 09:23:37	SAMPLE/1112	
	09:23:38 - 09:23:48	SAMPLE/1112	
	09:23:53 - 09:24:31	SAMPLE/1113	
	09:24:32 - 09:25:10	SAMPLE/1113	
Stopped (00:00:00)			
Standby mode (09:35:19)	00:00:00 - 09:14:00		
	09:17:47 - 09:22:00		
	09:22:38 - 09:22:42		
	09:23:19 - 09:23:28		
	09:23:37 - 09:23:38		
	09:23:48 - 09:23:53		

Back Sort by time

4.1.2.5 Maintenance notice

Click on the <Maintenance notice> key on the <Monitor display> page.
Refer to “4.5.10 Maintenance notice” in Operation Manual I for details about content that can be displayed.

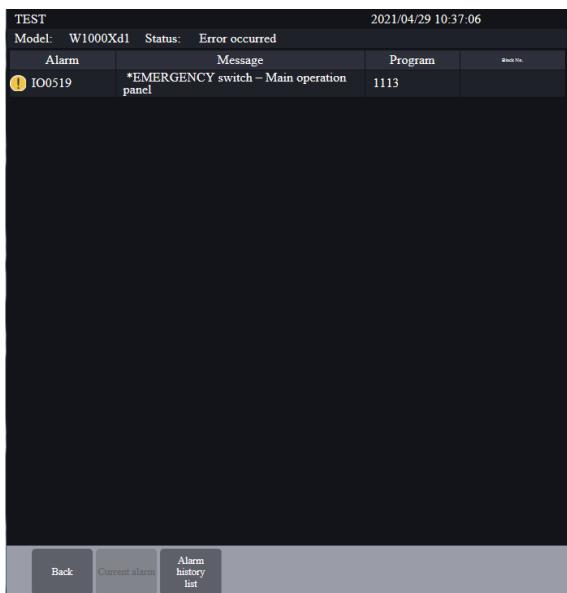
The items cannot be edited on the monitor display.

TEST			2021/04/29 10:37:06
Model	W1000Xd1	Status	Error occurred
1	Spindle speed (x1000revs)	S	Valid
			Current value 1000 Target value 1000 Status Not notified Status Tgt val over
2	X-axis travel distance (m)	X	Valid
			Current value 100 Target value 1000 Status Not notified Status Normal
3	Y-axis travel distance (m)	Y	Valid
			Current value 200 Target value 1000 Status Not notified Status Normal
4	Z-axis travel distance (m)	Z	Valid
			Current value 300 Target value 1000 Status Not notified Status Normal
5	QT-axis speed (rotation)	QT	Valid
			Current value 100 Target value 1000 Status Not notified Status Normal
6	5th-axis speed (rotation)	5AXIS	Valid
			Current value 200 Target value 1000 Status Not notified Status Normal
7	6th-axis speed (rotation)	6AXIS	Valid
			Current value 300 Target value 1000 Status Not notified Status Normal
8	7th-axis speed (rotation)	7AXIS	Valid
			Current value 100 Target value 1000 Status Not notified Status Normal
9	8th-axis speed (rotation)	8AXIS	Valid
			Current value 200 Target value 1000 Status Not notified Status Normal
10	No. of tool changes (times)		Valid
			Current value 300 Target value 1000 Status Not notified Status Normal
11	None		

Top Menu Workpiece counter Time display Meas. results Status log Maintenance notice Alarm ATC tool

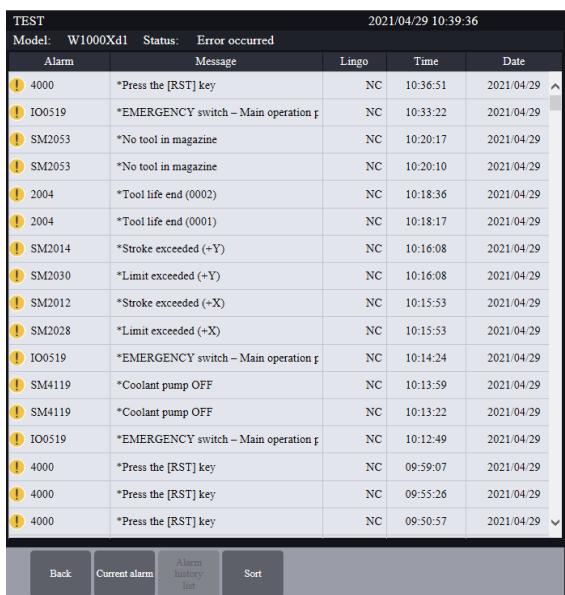
4.1.2.6 Alarm

Click on the <Alarm> key on the <Monitor display> page.



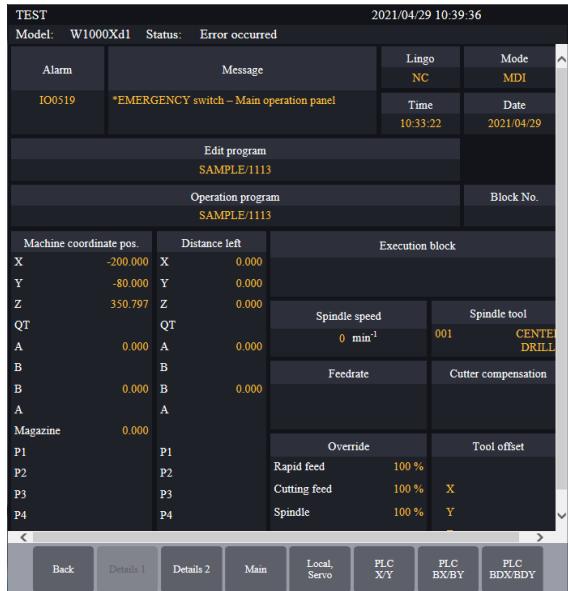
The function key can be used to switch between the <Current alarm> and <Alarm history list>. Refer to “Chapter 2 Alarms” in the Data Bank & Alarm Manual for details about content that can be displayed.

On the monitor display, even if an alarm or operator message is selected under <Current alarm>, the cause or recovery procedure will not display.



Under the <Alarm history list>, click on the title <Alarm> or <No. order> key to sort the order based on the alarm number. Click on the title <Date> or <Time> key to sort the order based on the time. Click on the <Total occurrences> key to sort the order based on the alarm occurrences.

In addition, the user can click on the cell of each alarm to display the alarm details.



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Similar to the NC screen, the function keys can be used to display detailed information.

4.1.2.7 ATC tool

Click on the <ATC tool> key on the <Monitor display> page.

Refer to “4.4.1 ATC tool (details) screen” in Operation Manual I for details about content that can be displayed.

On the monitor display, the following keys do not display: <Program settings>, <Set tool>, <List>, <Program list> and <Initialize life>. In addition, the program and tool cannot be set.

Program(SAMPLE/1113)						
Tool No.	Tool name	Tool dia.	Gang	Tool life	Tool type	Color
01	001 CENTER DRILL1	100.000x0.000		100min	STD tool	Blue
02	002 DRILL1	80.000x0.000		200min	STD tool	Red
03	003 ENDMILL1	78.000x0.000		100min	STD tool	Purple
04	004 ENDMILL2	50.000x0.000		200min	STD tool	Green
05	005 DRILL2	70.000x0.000	*****		STD tool	Cyan
06					STD tool	
07					STD tool	
08					STD tool	
09					STD tool	
10					STD tool	
11					STD tool	

4.1.3 Performance Display

The user can view the production performance of the specified machine. Refer to “6.6 Production performance” for information that can be displayed.

4.2 OPC UA

4.2.1 Overview

When this machine is set as an OPC UA server, the user can read and write the information from the machine on the OPC UA client. The user can monitor and control this machine from the OPC UA client in the host system (SCADA: Supervisory Control And Data Acquisition, MES: Manufacturing Execution System, etc.).

- * It is required to connect the machine to the network and make settings for the network beforehand. Refer to the “3.5 Communication protocol” for further details.

Use the value set in the communication parameter <Host name> or <IP address>, and specify the URL (address) as shown below for the OPC UA client.

opc.tcp:// host name (or IP address):4840/

The port number is fixed at 4840, and a maximum of ten compatible OPC UA clients can be connected.

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- (NOTE) When an attempt is made to make another connection after the OPC UA client has reached the maximum available connections, the following status code is returned to the connection request from the OPC UA client: BadTooManySessions(0x80560000).

4.2.2 Security Functions

The OPC UA server security functions are set in the communication parameter (Ethernet/FTP): <Server user name>, <Password as server> and <OPC UA security communication>.

Communication parameter	Value	Description
<Server user name> <Password as server>	Set	Verifies the user with a user name and password and then connects to the network.
	Not set	Connects to the network without verifying the user and without a user name. (NOTE 1)
<OPC UA security communication>	0: None	Operates without a OPC UA security policy. Communication is carried out without security.
	1: Basic128Rsa15	Operates with a “Sign and encrypt” OPC UA security policy. (NOTE 2)
	2: Basic256	In the communication, messages are signed to prevent falsification and encrypted to prevent tapping.

- (NOTE 1) When the communication parameter (Ethernet/FTP) <Restrict Ethernet access> is set to <1: Yes>, if <Server user name> and <Password as server> are not set, then the OPC UA server function is disabled. When the OPC UA client is connected while the OPC UA server function is disabled, the following status code is returned to the connection request: BadTepInternalError(0x80820000).

- (NOTE 2) If the <OPC UA security communication> is set to another setting besides <0: None>, then the user needs to input the server certificate for this machine and input the certificate for the connecting OPC UA client as an OPC UA client certificate. If there is no valid server certificate for this machine, then the alarm <<Security communication error>> is triggered and the OPC UA server is not enabled. If the connecting OPC UA client certificate is not input, then the status code: BadCertificateUntrusted(0x801A0000) is returned for the connection request from the OPC UA client. Refer to “3.4.10 Certificate input/output” for details about the certificate input operations.

- (NOTE 3) If a certificate warning is displayed when accessing the OPC UA server, this machine’s server certificate, or a certificate for the certificate authority who issued this machine’s server certificate must be registered as a trusted certificate. Follow the instructions on each client to register the certificate.

4.2.3 Data Structure

The nodes on the OPC UA server are shown below in the address space that is expressed in a tree structure. The user can specify the ID node for each node and read and write information with the OPC UA client.

4.2.3.1 Description of figures

	: Object node
	: Folder node
	: Variable node
	: Property node
	: Function node

4.2.3.2 Overall structure

Tree structure	Name	Node ID
	Root	i=84
 	Objects	i=85
 	BrotherMC	s=BrotherMC
 	ATC	s=ATC
 	I/O	s=IO
 	Machine	s=Machine
 	NC	s=NC
 	Panel	s=Panel
 	PLC	s=PLC
 	Resources	s=Resources
 	DataBase	s=Resources/DataBank
 	Directory	s=Resources/Directory
 	MemoryCard	s=Resources/MemoryCard
 	Types	i=86
 	View	i=87

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Node description

Name	Read & write	Data type	Description
Root	Not available	-	This is the root node of the address space. It is an OPC UA prescribed node.
Objects	Not available	-	This is the object folder node on the OPC UA server. It is an OPC UA prescribed node.
BrotherMC	Not available	-	This is an object node related to this machine.
ATC	Not available	-	This is an object node related to the ATC.
I/O	Not available	-	This is an object node related to external I/O signals.
Machine	Not available	-	This is an object node related to the machine.
NC	Not available	-	This is an object node related to the control unit.
Panel	Not available	-	This is an object node related to the operation panel.
PLC	Not available	-	This is an object node related to the internal PLC.
Resources	Not available	-	This is an object node related to the resources.
DataBase	Not available	-	This is an object node related to the data banks inside the resources.
Directory	Not available	-	This is an object node related to the files and folders inside the resources.

Name	Read & write	Data type	Description
MemoryCard	Not available	-	This is an object node related to the memory card inside the resources.
Types	Not available	-	This is a folder node for type definitions on the OPC UA server. It is an OPC UA prescribed node.
View	Not available	-	This is a view folder node on the OPC UA server. It is an OPC UA prescribed node.

4.2.3.3 ATC node

Tree structure	Name	Node ID
ATC	s=ATC	
Data	s=ATC/Data	
ATCTL	s=ATC/Data/ATCTL	
M01	s=ATC/Data/ATCTL/M01	
M	s=ATC/Data/ATCTL/M01/M	
S	s=ATC/Data/ATCTL/M01/S	
K	s=ATC/Data/ATCTL/M01/K	
C	s=ATC/Data/ATCTL/M01/C	
M02	s=ATC/Data/ATCTL/M02	
...	...	
M51	s=ATC/Data/ATCTL/M51	

Node description

Name	Read & write	Data type	Description
Data	Not available	-	This is an object node related to the ATC tool data.
ATCTL	Available	String	This acquires or sets the ATC tool data. Refer to “3.6.4 File format” for details on formatting.
M**(**=01~51)	Not available	-	This is a variable node related to the ATC tool data.
M	Available	String	This acquires or sets the tool number for the specified ATC tool data. (NOTE) If a null character is set to the value, the tool number is deleted.
S	Available	String	This acquires or sets the group number (NC language) / main tool number (conversation language) for the specified ATC tool data.
K	Available	String	This acquires or sets the tool type for the specified ATC tool data.
C	Available	String	This acquires or sets the graph color for the specified ATC tool data.

4.2.3.4 I/O node

Tree structure	Name	Node ID
I/O	s=IO	
Data	s=IO/Data	
ExternalIOSignal	s=IO/Data/ExternalIOSignal	
Name	s=IO/Data/ExternalIOSignal/Name	
MOUT	s=IO/Data/MOUT	
IO	s=IO/Data/IO	

Node description

Name	Read & write	Data type	Description
Data	Not available	-	This is an object node related to I/O signals.
ExternalIOSignal	Available	Boolean	This acquires or sets the external I/O signals.
Name	Available	String	This acquires or sets the node for the external I/O signals after setting the signal name that reads and writes for the name node. Refer to the “3.5 Communication protocol” for details about the signal names.
MOUT	For reading only	String	This acquires the auxiliary function numbers during output.
IO	For reading only	String	This acquires the I/O data.

4.2.3.5 Machine node

Tree structure	Name	Node ID
	Machine	s=Machine
	Data	s=Machine/Data
	HEAC	s=Machine/Data/HEAC
	Name	s=Machine/Data/HEAC/Name
	NameFormat	s=Machine/Data/HEAC/NameFormat
	MCHLOG	s=Machine/Data/MCHLOG
	SYSD89	s=Machine/Data/SYSD89
	SYSD94	s=Machine/Data/SYSD94
	SYSD95	s=Machine/Data/SYSD95
	SYSD96	s=Machine/Data/SYSD96
	SYSD97	s=Machine/Data/SYSD97
	SYSD98	s=Machine/Data/SYSD98
	SYSD99	s=Machine/Data/SYSD99

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Node description

Name	Read & write	Data type	Description
Data	Not available	-	This is an object node related to the machine data.
HEAC	For reading only	String	This acquires the automatic thermal distortion compensation data.
Name	Available	String	This acquires the HEAC node after setting the data name for the name node.
NameFormat	For reading only	String	The name format node can acquire the format for the data name that is set for the name node. Refer to “3.6.4 File format” for details on the data format of the automatic thermal distortion compensation. Refer to “3.6 Communication data details” for details on the format of the data names.
MCHLOG	For reading only	String	This acquires the machine characteristics log data.
SYSD89	Available	ByteString	This acquires or sets the machine data 11.
SYSD94	Available	String	This acquires or sets the machine data 6.
SYSD95	Available	String	This acquires or sets the machine data 5.
SYSD96	Available	String	This acquires or sets the machine data 4.
SYSD97	Available	String	This acquires or sets the machine data 3.
SYSD98	Available	String	This acquires or sets the machine data 2.
SYSD99	Available	String	This acquires or sets the machine data 1.

4.2.3.6 NC node

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Tree structure	Name	Node ID
NC	NC	s=NC
Accessory	Accessory	s=NC/Accessory
SHTCUT	SHTCUT	s=NC/Accessory/SHTCUT
Alarm	Alarm	s=NC/Alarm
ALARM	ALARM	s=NC/Alarm/ALARM
CRLOG	CRLOG	s=NC/Alarm/CRLOG
LOG	LOG	s=NC/Alarm/LOG
LOGBK	LOGBK	s=NC/Alarm/LOGBK
MemoryOperation	MemoryOperation	s=NC/MemoryOperation
MEM	MEM	s=NC/MemoryOperation/MEM
RunningProgram	RunningProgram	s=NC/MemoryOperation/RunningProgram
FileValue	FileValue	s=NC/MemoryOperation/RunningProgram/FileValue
Length	Length	s=NC/MemoryOperation/RunningProgram/FileValue/Length
SelectedProgram	SelectedProgram	s=NC/MemoryOperation/SelectedProgram
StartPalletProgram	StartPalletProgram	s=NC/MemoryOperation/StartPalletProgram
InputArguments	InputArguments	s=NC/MemoryOperation/StartPalletProgram/InputArguments
StartProgram	StartProgram	s=NC/MemoryOperation/StartProgram
InputArguments	InputArguments	s=NC/MemoryOperation/StartProgram/InputArguments
StopProgram	StopProgram	s=NC/MemoryOperation/StopProgram
InputArguments	InputArguments	s=NC/MemoryOperation/StopProgram/InputArguments
ProductionMonitor	ProductionMonitor	s=NC/ProductionMonitor
MAINTC	MAINTC	s=NC/ProductionMonitor/MAINTC
MONTR	MONTR	s=NC/ProductionMonitor/MONTR
MSRRSD	MSRRSD	s=NC/ProductionMonitor/MSRRSD
PRDD1	PRDD1	s=NC/ProductionMonitor/PRDD1
PRDD2	PRDD2	s=NC/ProductionMonitor/PRDD2
PRDD3	PRDD3	s=NC/ProductionMonitor/PRDD3
WKCNTR	WKCNTR	s=NC/ProductionMonitor/WKCNTR
SupportApplication	SupportApplication	s=NC/SupportApplication
EPLOG	EPLOG	s=NC/SupportApplication/EPLOG
HOME	HOME	s=NC/SupportApplication/HOME
PAINTD	PAINTD	s=NC/SupportApplication/PAINTD
WVPRM	WVPRM	s=NC/SupportApplication/WVPRM
System	System	s=NC/System
Date	Date	s=NC/System/Date
H/D_Modal	H/D_Modal	s=NC/System/HD_Modal

Tree structure	Name	Node ID
└─ Mode	Mode	s=NC/System/Mode
└─ OperationTime	OperationTime	s=NC/System/OperationTime
└─ PDSP	PDSP	s=NC/System/PDSP
└─ RelativeCoordOffset	RelativeCoordOffset	s=NC/System/RelativeCoordOffset
└─ Axis_X	Axis_X	s=NC/System/RelativeCoordOffset/Axis_X
└─
└─ Axis_P4	Axis_P4	s=NC/System/RelativeCoordOffset/Axis_P4
└─ VER	VER	s=NC/System/VER
└─ PRTCTD	PRTCTD	s=NC/System/PRTCTD
└─ RQC	RQC	s=NC/System/RQC

Node description

Name	Read & write	Data type	Description
Accessory	Not available	-	This is an object node related to the accessories.
SHTCUT	Available	String	This acquires or sets the bookmark data.
Alarm	Not available	-	This is an object node related to the alarms.
ALARM	For reading only	String	This acquires the current alarm data. Refer to “3.6.4 File format” for details on formatting.
CRLOG	For reading only	String	This acquires the collision log data.
LOG	For reading only	String	This acquires the alarm log data (up to data record No. 100). Refer to “3.6.4 File format” for details on formatting.
LOGBK	For reading only	String	This acquires the alarm log data (from data record No. 101). Refer to “3.6.4 File format” for details on formatting.
MemoryOperation	Not available	-	This is an object node related to memory operation.
MEM	For reading only	String	This acquires the memory operation data. Refer to “3.6.4 File format” for details on formatting.
RunningProgram	For reading only	String[]	This acquires the operating program information. [0]: Executing program [1]: Main program [2]: Executing block number
FileValue	For reading only	String	This acquires the executing program. This acquires the file value after setting the file size for acquiring to the length node.
Length	Available	Int32	When -1 is set to the length node, the length of the number of characters displayed onto the screen is acquired.
SelectedProgram	Available	String	This acquires or sets the selected program.
StartPalletProgram	-	Function	This uses the start pallet for the program operation.
StartPalletProgram/ InputArguments	Available	String	This executes the start pallet program node after setting the program name to the input arguments node.
StartProgram	-	Function	This starts the program operation.
StartProgram/ InputArguments	Available	String	This executes the start program node after setting the program name to the input arguments node.
StopProgram	-	Function	This stops the program operation.
StopProgram/ InputArguments	Available	String	This executes the stop program node after setting “whether the [FEED HOLD] switch is pressed or not” to the input arguments node.
ProductionMonitor	Not available	-	This is an object node related to the production monitor.
MAINTC	Available	String	This acquires or sets the maintenance notice. Refer to “3.6.4 File format” for details on formatting.
MONTR	For reading only	String	This acquires the machine monitor data (production data 4). Refer to “3.6.4 File format” for details on formatting.
MSRRSD	Available	String	This acquires or sets the measurement results. Refer to “3.6.4 File format” for details on formatting.
PRDD1	Available	String	This acquires or sets production data 1.

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Name	Read & write	Data type	Description
PRDD2	Available	String	This acquires or sets production data 2. Refer to “3.6.4 File format” for details on formatting.
PRDD3	Available	String	This acquires or sets production data 3. Refer to “3.6.4 File format” for details on formatting.
WKCNTR	Available	String	This acquires or sets the workpiece counter. Refer to “3.6.4 File format” for details on formatting.
SupportApplication	Not available	-	This is an object node related to the support application.
EPLOG	For reading only	String	This acquires the power consumption log data. Refer to “3.6.4 File format” for details on formatting.
HOME	Available	String	This acquires or sets the home screen settings.
PAINTD	Available	String	This acquires or sets the graph data.
WVPRM	Available	String	This acquires or sets the waveform display parameter.
System	Not available	-	This is an object node related to the control unit system.
Date	Available	String	This acquires or sets the date and time. The format is as follows: The date is shown as follows from the header: Year (4 digits), month (2 digits), day (2 digits), hour (2 digits), minutes (2 digits), seconds (2 digits). Ex: December 31, 2020, 23:59:59 → 20201231235959
H/D_Modal	For reading only	String[]	This acquires H/D modal. [0]: H modal [1]: D modal
Mode	Available	String	This acquires or sets the mode. The format is as follows: MNL: Manual mode MDI: MDI mode MEM: Memory operation mode EDIT: Program edit mode
OperationTime	Available	String	This acquires or sets the operation time. The format is as follows: The time from the header: Hour (4 digits), minutes (2 digits), seconds (2 digits). Ex: 1 hr., 1 min., 1 sec. → 00010101
PDSP	For reading only	String	This acquires the position data. The format is the same as the data that is processed with the external input and output. Refer to “3.6.4 File format” for details on formatting.
RelativeCoordOffset	For reading only	String	This is a variable node related to the relative coordinates offset data.
Axis_** (**=X,Y,Z,4,5,6,7, 8,P1~P4)	Available	String	This acquires or sets the offset for the relative coordinate position of the specified axis number. Issue an offset command with a decimal point. If there is no decimal point, then the value is processed as an integer.
VER	For reading only	String	This acquires the version data. Refer to “3.6.4 File format” for details on formatting.
PRTCTD	Available	ByteString	This acquires or sets the operation level data.
RQC	For reading only	String	This acquires the request code. Refer to “3.6.4 File format” for details on formatting.

4.2.3.7 Panel node

Tree structure	Name	Node ID
Panel	s=Panel	
Data	s=Panel/Data	
OPLOG	s=Panel/Data/OPLOG	
PANEL	s=Panel/Data/PANEL	
Keys	s=Panel/Keys	
B.SKIP	s=Panel/Keys/B.SKIP	
DRY	s=Panel/Keys/DRY	
M.LCK	s=Panel/Keys/M.LCK	
OP.STP	s=Panel/Keys/OP.STP	
SINGL	s=Panel/Keys/SINGL	

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Node description

Name	Read & write	Data type	Description
Data	Not available	-	This is an object node related to the operation panel data.
OPLOG	For reading only	ByteString	This acquires the operation log.
PANEL	For reading only	String	This acquires the operation panel data. Refer to “3.6.4 File format” for details on formatting.
Keys	Not available	-	This is an object node related to the operation panel keys.
B.SKIP	Available	Boolean	This acquires or sets the [B.SKIP] key status. True: ON False: OFF
DRY	Available	Boolean	This acquires or sets the [DRY] key status. True: ON False: OFF
M.LCK	Available	Boolean	This acquires or sets the [MLCK] key status. True: ON False: OFF
OP.STP	Available	Boolean	This acquires or sets the [Optional stop] key status. True: ON False: OFF
SINGL	Available	Boolean	This acquires or sets the [SINGL.] key status. True: ON False: OFF

4.2.3.8 PLC node

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Tree structure	Name	Node ID
PLC	PLC	s=PLC
Data	Data	s=PLC/Data
PLCDAT	PLCDAT	s=PLC/Data/PLCDAT
PLCMON	PLCMON	s=PLC/Data/PLCMON
PLCPRJ	PLCPRJ	s=PLC/Data/PLCPRJ
SignalData	SignalData	s=PLC/Data/SignalData
Name	Name	s=PLC/Data/SignalData/Name
M	M	s=PLC/Data/M
M00000	M00000	s=PLC/Data/M/M00000
...
D	D	s=PLC/Data/D
D0000	D0000	s=PLC/Data/D/D0000
...

Node description

Name	Read & write	Data type	Description
Data	Not available	-	This is an object node related to the PLC data.
PLCDAT	Available	ByteString	This acquires or sets the PLC signal data.
PLCMON	Available	String	This acquires or sets the PLC registration monitor.
PLCPRJ	Available	ByteString	This acquires or sets the PLC program.
SignalData	Available	Int32	This acquires or sets the specified PLC signal data.
Name	Available	String	This acquires or sets the node for the Signal Data after setting the address that reads and writes to the name node. Refer to "Chapter 4 OM" in the PLC System Manual for details on the signal names.
M	Not available	-	This is the folder node for the PLC internal relay.
M***** (*****=00000~10239) decimals	Available	Boolean	This acquires or sets the PLC internal relay.
D	Not available	-	This is the folder node for the PLC data register (word).
D**** (****=0000~8191) decimals	Available	Int16	This acquires or sets the PLC data register (word).

4.2.3.9 Data bank node

Tree structure	Name	Node ID
	DataBase	s=Resources/DataBank
└ CurrentDataBanks	CurrentDataBanks	s=Resources/DataBank/CurrentDataBanks
└ CMPRD	CMPRD	s=Resources/DataBank/CMPRD
└ Name	Name	s=Resources/DataBank/CMPRD/Name
└ NameFormat	NameFormat	s=Resources/DataBank/CMPRD/NameFormat
└ CurrentDataBank	CurrentDataBank	s=Resources/DataBank/CMPRD/CurrentDataBank
└ CNDC	CNDC	s=Resources/DataBank/CNDC
└ Name	Name	s=Resources/DataBank/CNDC/Name
└ NameFormat	NameFormat	s=Resources/DataBank/CNDC/NameFormat
└ CurrentDataBank	CurrentDataBank	s=Resources/DataBank/CNDC/CurrentDataBank
└ EXIOD	EXIOD	s=Resources/DataBank/EXIOD
└ Name	Name	s=Resources/DataBank/EXIOD/Name
└ NameFormat	NameFormat	s=Resources/DataBank/EXIOD/NameFormat
└ CurrentDataBank	CurrentDataBank	s=Resources/DataBank/EXIOD/CurrentDataBank
└ FNPRD	FNPRD	s=Resources/DataBank/FNPRD
└ Name	Name	s=Resources/DataBank/FNPRD/Name
└ NameFormat	NameFormat	s=Resources/DataBank/FNPRD/NameFormat
└ CurrentDataBank	CurrentDataBank	s=Resources/DataBank/FNPRD/CurrentDataBank
└ GMMC	GMMC	s=Resources/DataBank/GMMC
└ Name	Name	s=Resources/DataBank/GMMC/Name
└ NameFormat	NameFormat	s=Resources/DataBank/GMMC/NameFormat
└ CurrentDataBank	CurrentDataBank	s=Resources/DataBank/GMMC/CurrentDataBank
└ MCRN	MCRN	s=Resources/DataBank/MCRN
└ Name	Name	s=Resources/DataBank/MCRN/Name
└ NameFormat	NameFormat	s=Resources/DataBank/MCRN/NameFormat
└ CurrentDataBank	CurrentDataBank	s=Resources/DataBank/MCRN/CurrentDataBank
└ C500	C500	s=Resources/DataBank/MCRN/C500
└ Value	Value	s=Resources/DataBank/MCRN/C500/Value
└ C501	C501	s=Resources/DataBank/MCRN/C501
└
└ MCRS	MCRS	s=Resources/DataBank/MCRS
└ Name	Name	s=Resources/DataBank/MCRS/Name
└ NameFormat	NameFormat	s=Resources/DataBank/MCRS/NameFormat
└ CurrentDataBank	CurrentDataBank	s=Resources/DataBank/MCRS/CurrentDataBank
└ C500	C500	s=Resources/DataBank/MCRS/C500
└ Value	Value	s=Resources/DataBank/MCRS/C500/Value
└ C501	C501	s=Resources/DataBank/MCRS/C501

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Tree structure	Name	Node ID
...
MPRD		s=Resources/DataBank/MPRD
Name		s=Resources/DataBank/MPRD/Name
NameFormat		s=Resources/DataBank/MPRD/NameFormat
CurrentDataBank		s=Resources/DataBank/MPRD/CurrentDataBank
M11000000		s=Resources/DataBank/MPRD/M11000000
M11000001		s=Resources/DataBank/MPRD/M11000000/M11000001
...
M11010000		s=Resources/DataBank/MPRD/M11010000
...
MSPSD		s=Resources/DataBank/MSPSD
Name		s=Resources/DataBank/MSPSD/Name
NameFormat		s=Resources/DataBank/MSPSD/NameFormat
CurrentDataBank		s=Resources/DataBank/MSPSD/CurrentDataBank
POSN		s=Resources/DataBank/POSN
Name		s=Resources/DataBank/POSN/Name
NameFormat		s=Resources/DataBank/POSN/NameFormat
CurrentDataBank		s=Resources/DataBank/POSN/CurrentDataBank
G054		s=Resources/DataBank/POSN/G054
...
X001		s=Resources/DataBank/POSN/X001
...
H001		s=Resources/DataBank/POSN/H001
B001		s=Resources/DataBank/POSN/B001
...
POSS		s=Resources/DataBank/POSS
Name		s=Resources/DataBank/POSS/Name
NameFormat		s=Resources/DataBank/POSS/NameFormat
CurrentDataBank		s=Resources/DataBank/POSS/CurrentDataBank
G054		s=Resources/DataBank/POSS/G054
...
X001		s=Resources/DataBank/POSS/X001
...
H001		s=Resources/DataBank/POSS/H001
B001		s=Resources/DataBank/POSS/B001
...
TLOAD		s=Resources/DataBank/TLOAD
Name		s=Resources/DataBank/TLOAD/Name

Tree structure	Name	Node ID
- +	NameFormat	s=Resources/DataBank/TLOAD/NameFormat
- -	CurrentDataBank	s=Resources/DataBank/TLOAD/CurrentDataBank
+ -	TOLC	s=Resources/DataBank/TOLC
- +	Name	s=Resources/DataBank/TOLC/Name
- +	NameFormat	s=Resources/DataBank/TOLC/NameFormat
- -	CurrentDataBank	s=Resources/DataBank/TOLC/CurrentDataBank
+ -	TOLN	s=Resources/DataBank/TOLN
- +	Name	s=Resources/DataBank/TOLN/Name
- +	NameFormat	s=Resources/DataBank/TOLN/NameFormat
- -	CurrentDataBank	s=Resources/DataBank/TOLN/CurrentDataBank
+ -	T001	s=Resources/DataBank/TOLN/T001
- +	L90_X	s=Resources/DataBank/TOLN/T001/L90_X
- +	L90_Y	s=Resources/DataBank/TOLN/T001/L90_Y
- +	L90_Z	s=Resources/DataBank/TOLN/T001/L90_Z
- +	L90_R	s=Resources/DataBank/TOLN/T001/L90_R
- +	L91_X	s=Resources/DataBank/TOLN/T001/L91_X
- +	L91_Y	s=Resources/DataBank/TOLN/T001/L91_Y
- +	L91_Z	s=Resources/DataBank/TOLN/T001/L91_Z
- +	L91_R	s=Resources/DataBank/TOLN/T001/L91_R
- +	L97_Q	s=Resources/DataBank/TOLN/T001/L97_Q
- +	L97_R	s=Resources/DataBank/TOLN/T001/L97_R
- +	L97_W	s=Resources/DataBank/TOLN/T001/L97_W
- +	L97_V	s=Resources/DataBank/TOLN/T001/L97_V
-
+ -	V001	s=Resources/DataBank/TOLN/V001
- +	ToolNo1	s=Resources/DataBank/TOLN/V001/ToolNo1
-
+ -	M001	s=Resources/DataBank/TOLN/M001
-
+ -	TOLS	s=Resources/DataBank/TOLS
- +	Name	s=Resources/DataBank/TOLS/Name
- +	NameFormat	s=Resources/DataBank/TOLS/NameFormat
- -	CurrentDataBank	s=Resources/DataBank/TOLS/CurrentDataBank
+ -	T001	s=Resources/DataBank/TOLS/T001
- +	L90_X	s=Resources/DataBank/TOLS/T001/L90_X
- +	L90_Y	s=Resources/DataBank/TOLS/T001/L90_Y
- +	L90_Z	s=Resources/DataBank/TOLS/T001/L90_Z
- +	L90_R	s=Resources/DataBank/TOLS/T001/L90_R

Node description

Name	Read & write	Data type	Description
CurrentDataBanks	For reading only	String[]	This acquires all current data bank names.
CMPRD	Available	String	This acquires or sets the communication parameter.
CMPRD/Name	Available	String	This acquires or sets the CMPRD node after setting the data name for the name node.
CMPRD/NameFormat	For reading only	String	The name format node can acquire the format for the data name that is set for the name node. Refer to “3.6 Communication data details” for details on the format of the data names.
CMPRD/CurrentDataBank	Available	String	This acquires or sets the current data bank name for the communication parameter.
CNDC	Available	String	This acquires or sets the cutting conditions.
CNDC/Name	Available	String	This acquires or sets the CNDC node after setting the data name for the name node.
CNDC/NameFormat	For reading only	String	The name format node can acquire the format for the data name that is set for the name node. Refer to “3.6 Communication data details” for details on the format of the data names.
CNDC/CurrentDataBank	Available	String	This acquires or sets the current data bank name for the cutting conditions.
EXIOD	Available	String	This acquires or sets the external I/O signals.
EXIOD/Name	Available	String	This acquires or sets the EXIOD node after setting the data name for the name node.
EXIOD/NameFormat	For reading only	String	The name format node can acquire the format for the data name that is set for the name node. Refer to “3.6 Communication data details” for details on the format of the data names.
EXIOD/CurrentDataBank	Available	String	This acquires or sets the current data bank name for the external I/O signals.
FNPRD	Available	String	This acquires or sets the fieldbus network parameter.
FNPRD/Name	Available	String	This acquires or sets the FNPRD node after setting the data name for the name node.
FNPRD/NameFormat	For reading only	String	The name format node can acquire the format for the data name that is set for the name node. Refer to “3.6 Communication data details” for details on the format of the data names.
FNPRD/CurrentDataBank	Available	String	This acquires or sets the current data bank name for the fieldbus network parameter.
GMMC	Available	String	This acquires or sets the G and M code macros (NC language).
GMMC/Name	Available	String	This acquires or sets the GMMC node after setting the data name for the name node.
GMMC/NameFormat	For reading only	String	The name format node can acquire the format for the data name that is set for the name node. Refer to “3.6 Communication data details” for details on the format of the data names.
GMMC/CurrentDataBank	Available	String	This acquires or sets the current data bank name for the G and M code macros (NC language).
MCRN	Available	String	This acquires or sets the macro variables (type 1) (NC language).
MCRN/Name	Available	String	This acquires or sets the MCRN node after setting the data name for the name node.
MCRN/NameFormat	For reading only	String	The name format node can acquire the format for the data name that is set for the name node. Refer to “3.6.4 File format” for details on the macro variable (Type 1) (NC) format. Refer to “3.6 Communication data details” for details on the format of the data names.
MCRN/CurrentDataBank	Available	String	This acquires or sets the current data bank name for the macro variables (type 1) (NC language).

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Name	Read & write	Data type	Description
MCRN/C*** (***=500~999)	Available	String	This acquires or sets the macro variables (type 1) (NC language) for the specified symbol. This applies to the macro variables (Type 1) (NC) for the data names set to the MCRN/Name node.
MCRN/C***/Value (***=500~999)	Available	String	This acquires or sets the specified macro variable (type 1) (NC language). This applies to current data banks and macro variables (NC) for the minimum unit settings, regardless of the MCRN/Name node value.
MCRS	Available	String	This acquires or sets the macro variables (type 2) (NC language).
MCRS/Name	Available	String	
MCRS/NameFormat	For reading only	String	This acquires or sets the MCRS node after setting the data name for the name node. The name format node can acquire the format for the data name that is set for the name node. Refer to “3.6.4 File format” for details on the macro variable (Type 2) (NC) format. Refer to “3.6 Communication data details” for details on the format of the data names.
MCRS/CurrentDataBank	Available	String	This acquires or sets the current data bank name for the macro variables (type 2) (NC language).
MCRS/C*** (***=500~999)	Available	String	This acquires or sets the macro variables (type 1) (NC language) for the specified symbol. This applies to the macro variables (Type 2) (NC) for the data names set to the MCRS/Name node.
MCRS/C***/Value (***=500~999)	Available	String	This acquires or sets the specified macro variable (type 1) (NC language). This applies to current data banks and macro variables (NC) for the minimum unit settings, regardless of the MCRS/Name node value.
MPRD	Available	String	This acquires or sets the machine parameter.
MPRD/Name	Available	String	
MPRD/NameFormat	For reading only	String	This acquires or sets the MPRD node after setting the data name for the name node. The name format node can acquire the format for the data name that is set for the name node. Refer to “3.6 Communication data details” for details on the format of the data names.
MPRD/CurrentDataBank	Available	String	This acquires or sets the current data bank name for the machine parameter.
M****0000	Available	String	This acquires or sets the machine parameter for the specified symbol. This applies to the machine parameters set to the MPRD/Name node.
MSPSD	Available	String	This acquires or sets the special settings.
MSPSD/Name	Available	String	
MSPSD/NameFormat	For reading only	String	This acquires or sets the MSPSD node after setting the data name for the name node. The name format node can acquire the format for the data name that is set for the name node. Refer to “3.6 Communication data details” for details on the format of the data names.
MSPSD/CurrentDataBank	Available	String	This acquires or sets the current data bank name for the special settings.

Name	Read & write	Data type	Description
POSN	Available	String	This acquires or sets the workpiece coordinate zero (type 1) (NC language).
POSN/Name	Available	String	This acquires or sets the POSN node after setting the data name for the name node.
POSN/NameFormat	For reading only	String	The name format node can acquire the format for the data name that is set for the name node. Refer to “3.6.4 File format” for details on the workpiece coordinate zero (Type 1) (NC) format. Refer to “3.6 Communication data details” for details on the format of the data names.
POSN/CurrentDataBase	Available	String	This acquires or sets the current data bank name for the workpiece coordinate zero (type 1) (NC language).
POSN/G*** (***=054~059)	Available	String	This acquires or sets the workpiece coordinate zero (type 1) (NC language) for the specified symbol. G***: Workpiece coordinates
POSN/X*** (***=001~300)	Available	String	X***: For extended workpiece coordinates
POSN/H001	Available	String	H***: External workpiece coordinates
POSN/B*** (***=001~008)	Available	String	B***: Reference rotary fixture offset This applies to the workpiece coordinate zero (Type 1) (NC) set to the POSN/Name node.
POSS	Available	String	This acquires or sets the workpiece coordinate zero (type 2) (NC language).
POSS/Name	Available	String	This acquires or sets the POSS node after setting the data name for the name node.
POSS/NameFormat	For reading only	String	The name format node can acquire the format for the data name that is set for the name node. Refer to “3.6.4 File format” for details on the workpiece coordinate zero (Type 2) (NC) format. Refer to “3.6 Communication data details” for details on the format of the data names.
POSS/CurrentDataBase	Available	String	This acquires or sets the current data bank name for the workpiece coordinate zero (type 2) (NC language).
POSS/G*** (***=054~059)	Available	String	This acquires or sets the workpiece coordinate zero (type 2) (NC language) for the specified symbol. G***: Workpiece coordinates
POSS/X*** (***=001~300)	Available	String	X***: For extended workpiece coordinates
POSS/H001	Available	String	H***: External workpiece coordinates
POSS/B*** (***=001~008)	Available	String	B***: Reference rotary fixture offset This applies to the workpiece coordinate zero (Type 2) (NC) set to the POSS/Name node.
TLOAD	Available	String	This acquires or sets the machining load monitor.
TLOAD/Name	Available	String	This acquires or sets the TLOAD node after setting the data name for the name node.
TLOAD/NameFormat	For reading only	String	The name format node can acquire the format for the data name that is set for the name node. Refer to “3.6.4 File format” for details on the machining load monitoring format. Refer to “3.6 Communication data details” for details on the format of the data names.
TLOAD/CurrentDataBase	Available	String	This acquires or sets the current data bank name for the machining load monitor.
TOLC	Available	String	This acquires or sets the tool list (conversation language).
TOLC/Name	Available	String	This acquires or sets the TOLC node after setting the data name for the name node.
TOLC/NameFormat	For reading only	String	The name format node can acquire the format for the data name that is set for the name node. Refer to “3.6 Communication data details” for details on the format of the data names.
TOLC/CurrentDataBase	Available	String	This acquires or sets the current data bank name for the tool list (conversation language).

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Name	Read & write	Data type	Description
TOLN	Available	String	This acquires or sets the tool data (type 1) (NC language).
TOLN/Name	Available	String	This acquires or sets the TOLN node after setting the data name for the name node.
TOLN/NameFormat	For reading only	String	The name format node can acquire the format for the data name that is set for the name node. Refer to “3.6.4 File format” for details on the tool data (Type 1) (NC) format. Refer to “3.6 Communication data details” for details on the format of the data names.
TOLN/CurrentDataBase	Available	String	This acquires or sets the current data bank name for the tool data (type 1) (NC language).
TOLN/T*** (***=001~099, 201~299)	Available	String	This acquires or sets the data for the specified tool. T***: Tool data This applies to the tool data (Type 1) (NC) set to the TOLN/Name node.
TOLN/T***/Lxx_y (xx=90,91,97, y=X,Y,Z,R,Q,W,V)	Available	String	This acquires or sets the specified machine parameter. L90_X: Tool position offset (X) L90_Y: Tool position offset (Y) L90_Z: Tool length offset L90_R: Cutter compensation L91_X: Tool position wear offset (X) L91_Y: Tool position wear offset (Y) L91_Z: Tool length offset (Z) L91_R: Cutter wear offset L97_Q: Tool life monitoring L97_R: Tool life L97_W: Life warning L97_V: Initial life / End-of-life This applies to current data banks and tool data (NC) for the minimum unit settings, regardless of the TOLN/Name node value.
TOLN/V*** (***=001~030)	Available	String	This acquires or sets the tool data (type 1) (NC language) for the specified symbol. V***: Tool group This applies to the tool data (Type 1) (NC) set to the TOLN/Name node.
TOLN/V***/ToolNoxx (xx=01~30)	Available	String	This acquires or sets the tool in the specified tool order for the specified tool group. (NOTE 1) If a tool is specified at a position in the tool order that is already registered, then the tool position that is already registered is shifted down in the order. (NOTE 2) If there is an open position in the tool order, then all the tools shift up to fill that position. (NOTE 3) If a null character is set to the value, the registered tool is deleted from the tool group. The tools after those deleted in the tool order shift up to fill the deleted position(s). This applies to current data banks and tool data (NC) for the minimum unit settings, regardless of the TOLN/Name node value.
TOLN/M*** (***=001~099, 201~299)	Available	String	This acquires or sets the tool data (type 1) (NC language) for the specified symbol. M***: Tool data range This applies to the tool data (Type 1) (NC) set to the TOLN/Name node.

Name	Read & write	Data type	Description
TOLS	Available	String	This acquires or sets the tool data (type 2) (NC language).
TOLS/Name	Available	String	This acquires or sets the TOLS node after setting the data name for the name node.
TOLS/NameFormat	For reading only	String	The name format node can acquire the format for the data name that is set for the name node. Refer to “3.6.4 File format” for details on the tool data (Type 2) (NC) format. Refer to “3.6 Communication data details” for details on the format of the data names.
TOLS/CurrentDataBase	Available	String	This acquires or sets the current data bank name for the tool data (type 2) (NC language).
TOLS/T***	Available	String	This acquires or sets the tool data (type 2) (NC language) for the specified symbol. T***: Tool data This applies to the tool data (Type 2) (NC) set to the TOLS/Name node.
TOLS/T***/L**_*	Available	String	This acquires or sets the specified machine parameter. L90_X: Tool position offset (X) L90_Y: Tool position offset (Y) L90_Z: Tool length offset L90_R: Cutter compensation L91_X: Tool position wear offset (X) L91_Y: Tool position wear offset (Y) L91_Z: Tool length offset (Z) L91_R: Cutter wear offset L97_Q: Tool life monitoring L97_R: Tool life L97_W: Life warning L97_V: Initial life / End-of-life This applies to current data banks and tool data (NC) for the minimum unit settings, regardless of the TOLS/Name node value.
TOLS/V***	Available	String	This acquires or sets the tool data (type 2) (NC language) for the specified symbol. V***: Tool group This applies to the tool data (Type 2) (NC) set to the TOLS/Name node.
TOLS/V***/ToolNo**	Available	String	This acquires or sets the tool in the specified tool order for the specified tool group. (NOTE 1) If a tool is specified at a position in the tool order that is already registered, then the tool position that is already registered is shifted down in the order. (NOTE 2) If there is an open position in the tool order, then all the tools shift up to fill that position. (NOTE 3) If a null character is set to the value, the registered tool is deleted from the tool group. The tools after those deleted in the tool order shift up to fill the deleted position(s). This applies to current data banks and tool data (NC) for the minimum unit settings, regardless of the TOLS/Name node value.
TOLS/M***	Available	String	This acquires or sets the tool data (type 2) (NC language) for the specified symbol. M***: Tool data range This applies to the tool data (Type 2) (NC) set to the TOLS/Name node.

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Name	Read & write	Data type	Description
TPTNC	Available	String	This acquires or sets the tool pattern (conversation language).
TPTNC/Name	Available	String	This acquires or sets the communication parameter.
TPTNC/NameFormat	For reading only	String	This acquires or sets the TPTNC node after setting the data name for the name node. The name format node can acquire the format for the data name that is set for the name node. Refer to “3.6 Communication data details” for details on the format of the data names.
TPTNC/CurrentDataBase	Available	String	This acquires or sets the current data bank name for the tool pattern (conversation language).
TPUC	Available	String	This acquires or sets the tapping drill diameter (conversation language).
TPUC/Name	Available	String	This acquires or sets the TPUC node after setting the data name for the name node. The name format node can acquire the format for the data name that is set for the name node. Refer to “3.6 Communication data details” for details on the format of the data names.
TPUC/NameFormat	For reading only	String	This acquires or sets the current data bank name for the tapping drill diameter (conversation language).
UPRD	Available	String	This acquires or sets the user parameter.
UPRD/Name	Available	String	This acquires or sets the communication parameter.
UPRD/NameFormat	For reading only	String	This acquires or sets the UPRD node after setting the data name for the name node. The name format node can acquire the format for the data name that is set for the name node. Refer to “3.6 Communication data details” for details on the format of the data names.
UPRD/CurrentDataBase	Available	String	This acquires or sets the current data bank name for the user parameter.
U****00	Available	String	This acquires or sets the user parameter for the specified symbol. This applies to the user parameters set to the UPRD/Name node.

4.2.3.10 Directory node

Tree structure	Name	Node ID
Directory	Directory	s=Resources/Directory
Path	Path	s=Resources/Directory/Path
CreateFolder	CreateFolder	s=Resources/Directory/CreateFolder
InputArguments	InputArguments	s=Resources/Directory/CreateFolder/InputArguments
DeleteFile	DeleteFile	s=Resources/Directory/DeleteFile
InputArguments	InputArguments	s=Resources/Directory/DeleteFile/InputArguments
DeleteFolder	DeleteFolder	s=Resources/Directory/DeleteFolder
InputArguments	InputArguments	s=Resources/Directory/DeleteFolder/InputArguments
DeleteAllProgram	DeleteAllProgram	s=Resources/Directory/DeleteAllProgram
File	File	s=Resources/Directory/File
Name	Name	s=Resources/Directory/File/Name
BinaryValue	BinaryValue	s=Resources/Directory/File/BinaryValue
Value	Value	s=Resources/Directory/File/Value
Files	Files	s=Resources/Directory/Files
Name	Name	s=Resources/Directory/Files/Name
Folders	Folders	s=Resources/Directory/Folders
Name	Name	s=Resources/Directory/Folders/Name
Programs	Programs	s=Resources/Directory/Programs
Name	Name	s=Resources/Directory/Programs/Name

Node description

Name	Read & write	Data type	Description
Path	Available	String	This acquires or sets the current folder. The root folder is expressed by a slash (/) and a folder (one level higher in the directory) is expressed by two periods (..).
CreateFolder	-	Function	This creates a folder for the current folder.
CreateFolder/ InputArguments	Available	String	This executes the create folder node after setting the folder name to the input arguments node.
DeleteFile	-	Function	This deletes a file in the current folder.
DeleteFile/ InputArguments	Available	String	This executes the delete node after setting the file name to the input arguments node.
DeleteFoder	-	Function	This deletes a folder in the current folder.
DeleteFoder/ InputArguments	Available	String	This executes the delete node after setting the folder name to the input arguments node.
DeleteAllProgram	-	Function	This deletes all NC language programs, conversation language machining data and schedule programs.
File	Not available	-	This is an object node related to the file data.
File/Name	Available	String	This acquires or sets the data for the file in the current folder.
BinaryValue	Available	ByteString	This acquires or sets the value node or binary value node after setting the file name for the name node.
Value	Available	String	
Files	For reading only	String[]	This acquires a list of files in the current folder. This acquires only the information for the specified file after

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Name	Read & write	Data type	Description
Files/Name	Available	String	<p>setting the file name for the name node. The format is as follows: [0][0]: File name for file 1 [0][1]: Size for file 1 [1][0]: File name for file 2 ...</p>
Folders	For reading only	String[]	<p>This acquires a list of folders in the current folder. This acquires only the information for the specified folder after setting the folder name for the name node.</p>
Folders/Name	Available	String	<p>The format is as follows: [0]: Folder 1 [1]: Folder 2 ...</p>
Programs	For reading only	String[][]	<p>This acquires a list of programs in the current folder. This acquires only the information for the specified program after setting the program name for the name node.</p>
Programs/Name	Available	String	<p>The format is as follows: [0][0]: Data name for program 1 [0][1]: Size for program 1 [0][2]: Comment for program 1 [0][3]: Date for program 1 [1][0]: Data name for program 2 ... The date format is as follows: The date is shown as follows from the header: Year (4 digits), month (2 digits), day (2 digits), hour (2 digits), minutes (2 digits), seconds (2 digits). Ex: December 31, 2020, 23:59:59 → 20201231235959</p>

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4.2.3.11 Memory card node

Tree structure	Name	Node ID
	MemoryCard	s=Resources/MemoryCard
	ManagedData	s=Resources/MemoryCard/ManagedData

Node description

Name	Read & write	Data type	Description
ManagedData	For reading only	String[]	<p>This acquires the management data for the memory card. [0]: Number of registered data [1]: Number of available data that can be registered [2]: Memory being used [3]: Available memory</p>

4.2.4 DiagnosticInfo

When the OPC UA server fails to process the request from the client due to the machine status, the following status code is returned to the client processing request:

BadRequestNotAllowed(0x80E40000).

In this situation, a detailed description of the cause for the failure is set and returned to “additionalInfo” in “DiagnosticInfo”. A two-digit number is set as a character string to “additionalInfo”. The following table provides a description of each two-digit number.

additional Info	Meaning
00	Normally ended
01	Invalid data is received
02	Illegal slave command header
04	Illegal slave command check sum
05	Currently in editing or operation mode, so processing is not possible The folder is currently in use; cannot delete.
06	Editing error occurred during file operation.
07	The specified data does not exist. Current or specified folder does not exist.
08	Slave command data name is incorrect. The specified folder name is abnormal.
09	The specified data cannot be saved or deleted.
10	Data protection enabled
11	Remote operation not permitted
13	The item of the received data is not within the allowed range or the number of items doesn't match. A symbol in the receiving data does not follow the record order in the file.
14	Data version error
15	During special startup
16	Cannot read the specified data.
17	Output of drawing data was attempted during drawing.
18	The folder already exists when creating the folder. The folder exists when deleting the folder; cannot delete.
19	Designation of data size is abnormal. Size of binary data is abnormal.
20	Binary data storage error.
21	Auto notification function reserve 1
22	Auto notification function reserve 2
23	Access is restricted
30	The specified program does not exist due to a change in the selected program. When changing the data bank, the specified number is not within the allowed range. When changing the data bank, the specified number is not a data bank. Changing the data bank is attempted while data protection is enabled. When changing the ATC tool, the specified number is not within the allowed range. An illegal signal name was specified via external input/output signal operation. The value is outside the specified range when writing individual data. Illegal signal name is designated in PLC signal operation.
31	An attempt was made to change the selected program while in another mode (not memory operation mode). When changing the data bank, the machine parameter number was changed. Changing the data bank was attempted in a mode other than program edit mode. When changing the ATC tool, the specified tool is already registered. A signal that cannot be updated is specified for updating via external input/output signal operation. Write target is wrong in individual data writing. Attempted to update signals that cannot be updated in PLC signal setting.

additional Info	Meaning
32	An attempt was made to change the selected program during operation or editing. An attempt was made to change the selected program while tape operation is selected. Changing the data bank was attempted during operation or editing. When changing the ATC tool, an attempt was made to set a large tool to a pot with a tool attached to the adjacent pot. Character strings other than ON/OFF were specified via external input/output signal operation. Attempted to set a value that cannot be set in PLC signal setting.
33	When changing the ATC tool, the tool is not registered in the specified group. A signal that cannot be turned off was attempted to be turned off via external input/output signal operation.
34	When changing the ATC tool, changing a magazine item (group/main tool/ drawing color) without a tool number assigned was attempted.
35	When changing the ATC tool, the pot adjacent to the specified pot contains a large tool.
36	Changing the ATC tool was attempted during memory operation.
37	Changing the ATC tool was attempted during MDI operation.
38	Unspecified error occurred during ATC tool change.
39	When changing the ATC tool, registering the unregistered tool in the tool list was attempted.
40	Conflict occurred due to communication using other port.
41	Check sum error occurred in the specified data.
42	Parity error occurred in the specified data.
43	The specified data is too large to be stored.
44	The specified data cannot be stored because programs #8000 to #8999 are write-protected.
45	Machine unit system is different.
46	The tool that is unable to change group/main tool/tool type/drawing color in ATC tool change is set.
60	Mode change not permitted
61	Mode change not permitted signal is on.
62	MDI operation mode
63	During tool change
64	During automatic centering
65	During automatic workpiece measurement
66	Automatic door operation not possible
67	Operation not possible
68	No program
69	Not in memory operation mode (or edit-during-operation mode)
70	The outer door is open.
71	The door is open.
72	The side door is open.
73	Resetting
74	Servo control is on.
75	[FEED HOLD] switch is held down.
76	Zero return was not conducted.
77	Restarting program Sequence search in progress
78	Pallet position error
79	Performing tool breakage detection
80	Program number error Different from pallet program
81	Outer pallet A and B-axes operating
82	No quick table
83	<PALLET> key is set to OFF.
84	Workpiece counter end
85	Executing external output command
86	Memory operation mode

additional Info	Meaning
87	External input not available
88	In handle mode
89	XY-axes lock signal is on.
90	Z-axis lock signal is on.
91	*-axis lock signal is on.
92	Pot is not at the top end.
93	Zero return command error
94	Indexing not permitted signal is on.
95	Pallet start reversed
96	Outer pallet operating
97	Communicating
98	NC or conversation mode is not selected correctly.
99	Reservation

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CHAPTER 5

DATA PROTECTION

5

- 5.1 Operation Levels
- 5.2 Automatic Data Backup

5.1 Operation Levels

5.1.1 Outline

Six operation levels are provided, at each of which data to be prevented from being changed and operation to be prevented can be set. By making settings for these operation levels, the machine is protected from erroneous operations.

Operation level	Operator	Setting
Level 0 (low)	User	Neither password nor external input signal
Level 1	User	Password or external signal (LEVEL1)
Level 2	User	Password or external input signal (LEVEL2)
Level 3	User	Password or external input signal (LEVEL3)
Level 4	User	Password or external input signal (LEVEL4)
Level 5	User	Password

- Detailed settings can be registered for each data such as programs and data banks at each operation level, and only the data set to <Op. Enabled> at the current operation level are permitted to be edited.

Detailed settings can also be registered for keys, switches and screen displays.

In some cases as shown below, however, some data cannot be operated even if they are set to <Op. Enabled>.

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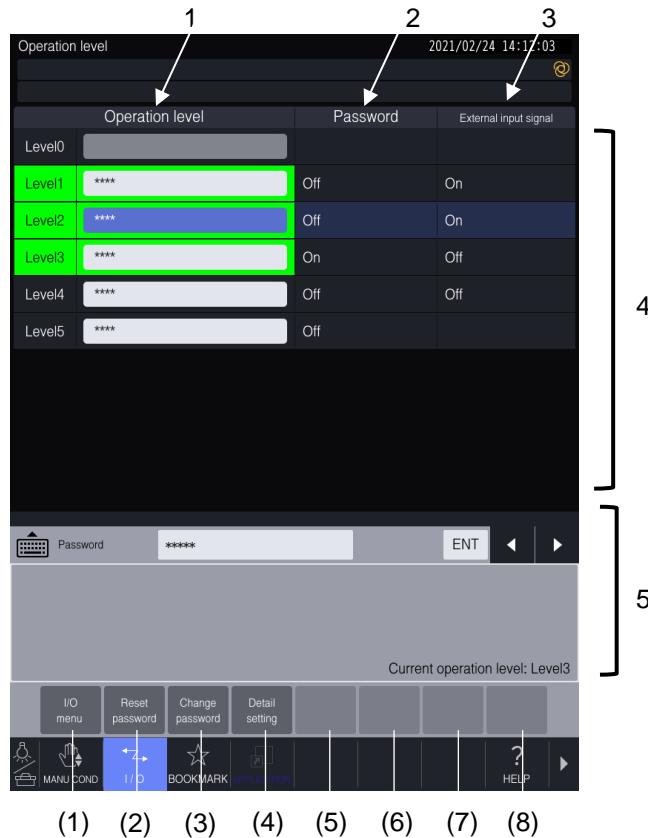
- (1) When [DATA PROTECTION] switch is enabled;
- (2) When editing is prevented by the combination of external input signals (EDLOCK, PRLOCK, TLEDOK, UPEDOK, MPEDOK, ECEDOK, MGEDOK, MTEDOK, WPEDOK, MCEDOK, TPEDOK, THEDOK, CTEDOK and DIROK);
- (3) When data protection is ON for editing of programs #8000-8999;
- (4) When operation is prevented by the combination of external input signals (MDLOCK, KYLOCK, MODEOK); or
- (5) When operation is prevented by PLC input signals (KYLOCK1 to 6).

(NOTE) Data can be changed through the operator using G10 or macro variables even if the data is set to <Op. disabled>

- If an operation set to <Op. disabled> is attempted, an operator message <<No operation is possible under the current level>> is generated.
- The operation level restricts input communication as well, but the check operation is possible.
- For Input all data banks or for Maintenance (Input all data), data set to <Op. disabled> are skipped. (An operator message <<Operation disable data has been skipped>> is generated.)

5.1.2 Set operation level

5.1.2.1 Operation Level Screen



(1) (2) (3) (4) (5) (6) (7) (8)

Description of screen display

Position	Name	Description
1	Operation level	Displays the operation levels that can be changed. An operation level with a set password displays <*****> for other levels.
2	Password	Displays <ON> for an operation level where the password is successfully entered. When a password is successfully entered for another operation level, the <ON> display changes for that level.
3	External input signal	Displays the current external input signal status. When multiple signals are turned ON, the color of all the operation levels that are turned ON become green.
4	Operation level list	Displays a list of operation levels that can be changed.
5	Data input field/ Instructions area	Displays a data input field for entering and changing a password when changing operation levels. The current operation level is displayed.

Description of Screen Operation

1. Description of function key operations

Column	Position	Label	Description
1	(1)	<I/O menu>	Goes back to the input/output menu screen.
	(2)	<Reset password>	Turns <OFF> all <Password> settings and changes to operation level 0. Note, when the external input signal is ON, it changes to the operation level where the signal is ON.
	(3)	<Change password>	Displays the <Operation level Change password> screen. Refer to “5.1.3 Change password” for further details.
	(4)	<Detail setting>	Displays the <Operation level detailed setting> screen. Refer to “5.1.4 Edit detail settings” for further details.
	(5)		
	(6)		
	(7)		
	(8)		

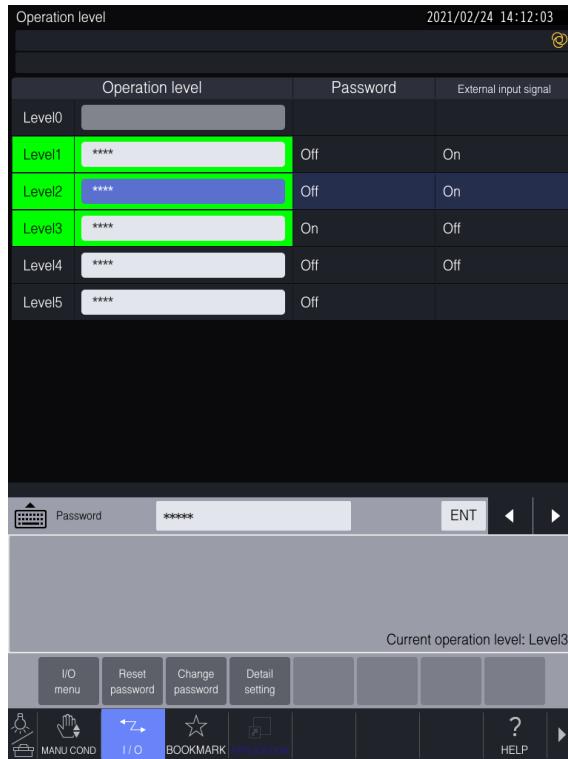
2. Description of operation level operations

- When the correct password is entered and the [ENT] key is pressed, the user can change the operation level.

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5.1.2.2 Setting by password

1. Select <Operation level> from the I/O menu to display the Operation level screen.



2. Move the cursor to the operation level that you wish to set, enter the password into the data input field and press the [ENT] key.
 - If the password is entered correctly, the <Password> function is turned <ON>.
 - If the password is entered incorrectly, the following operator message appears: <<The password is wrong.>> Re-enter the correct password.

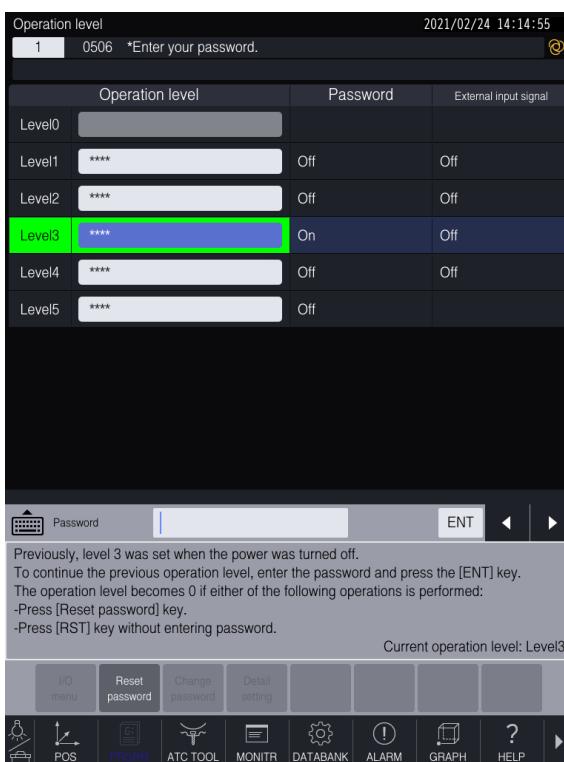
The following table shows the factory settings for the password.

Operation level	Password
Level 1	(Not set)
Level 2	(Not set)
Level 3	(Not set)
Level 4	(Not set)
Level 5	LEVEL5

3. When the <Reset password> key is pressed, all the <Password> settings turn <OFF> and the operation level changes to 0.

(NOTE) The operation level is maintained even if the power is turned OFF. In this situation, the operation level screen is displayed when the power is turned ON, and the password input is requested for the current operation level. The screen cannot be changed until the operation level setting has been completed using one of the following procedures. In addition, the following alarm occurs:
<<*Enter your password.>> (Stop level 5, Cancel level 2)

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- Enter the password into the data input field and press the [ENT] key to set the current operation level.
- When the <Reset password> key or the [RST] key is pressed, all the <Password> settings turn <OFF>.
- Turn ON the external input signal for a higher level than the current operation level.
- The only valid keys on this screen are the alphanumeric keys, the [RST] key and the <Reset password> key.
- If the password is entered incorrectly 5 times in a row, all <Password> settings are automatically turned <OFF>.
- When the password is not set (factory settings) for levels 1 through 4, the operation level screen does not display when the power is turned ON. It starts up at the level when the power was turned OFF. (Excluding level 5)

5.1.2.3 Setting by external input signals

As an alternative to entering a password for operation levels 1 through 4, the operation level can be set by entering the external input signals: “LEVEL1”, “LEVEL2”, “LEVEL3” and “LEVEL4”.

- Actual external input signal that is input from the terminal
- External input signal operation using the slave station command.
- External input signal key.
- PLC input signal.

Turn OFF the external input signal to return to the previous operation level.

(NOTE) When multiple external input signals are turned ON, the highest operation level is enabled for the signals that are turned ON.

5.1.2.4 Precautions

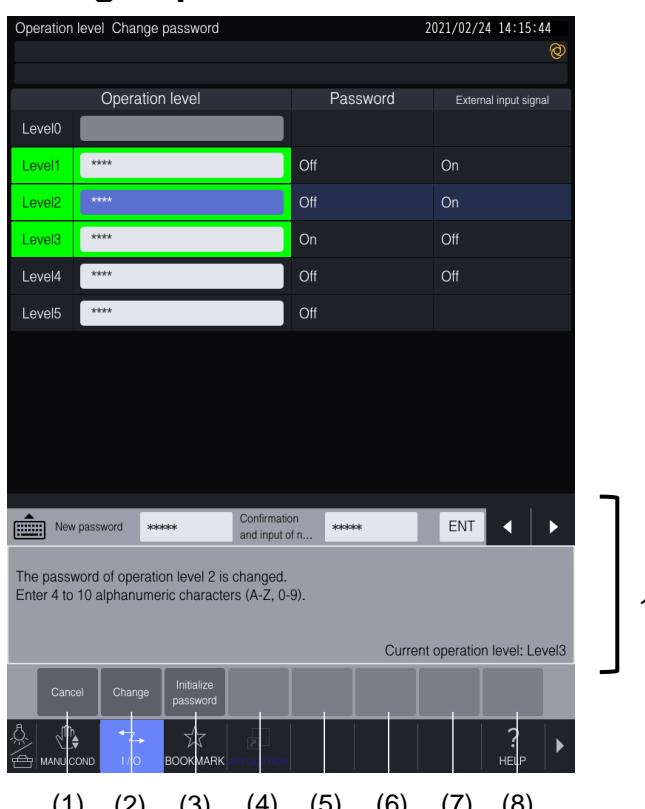
- When the operation levels for the password and the external input signal are both set, the highest valid operation level is enabled.
- When the operation levels for the password and the external input signal are both set, if the password is turned OFF, the operation level for the external input signal is enabled, or viceversa.
- When the operation level is changed, the following operator message appears: <<Operation level setting (*)>>.

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5.1.3 Change password

Passwords can be changed.

5.1.3.1 Change Operation Level Password Screen



(1) (2) (3) (4) (5) (6) (7) (8)

Description of screen display

Position	Name	Description
1	Data input field/Instructions area	Displays the data input field and instructions area for changing a password. The current operation level is displayed.

Description of screen operation

1. Description of function key operations

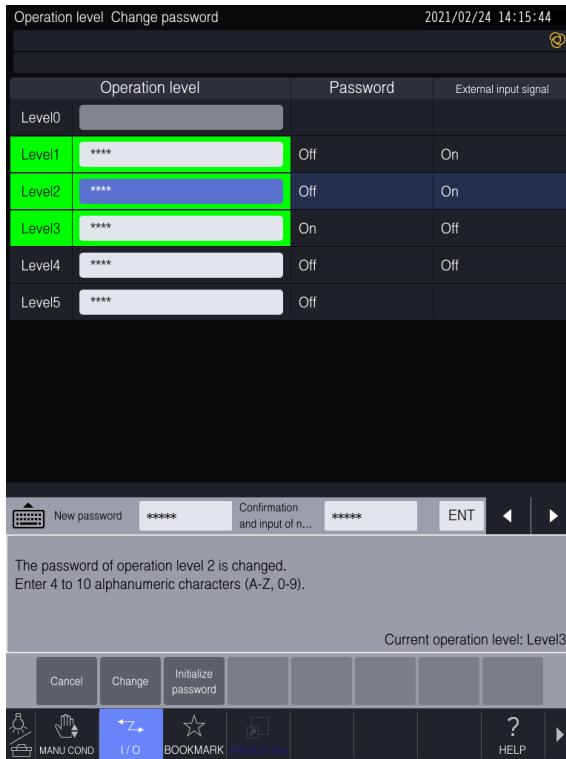
Column	Position	Label	Description
1	(1)	<Cancel>	Cancels the password change.
	(2)	<Change>	Changes the password for the operation level that is selected. After confirming the change, the selection is displayed in the function display area. Press <Yes> to set the new password, and press <No> to cancel the password change.
	(3)	<Initialize password>	Changes the password back to the factory-default password. After confirming the change, the selection is displayed in the function display area. Press <Yes> to change it back to the factory-default password, and press <No> to cancel the password change.
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

2. Description of operation level operations

- When the user taps to select an operation level to change the password, the data input field and instructions area are displayed to make the change. Or, the [CURSOR] keys (up/down) can be used to select an operation level. Then, the data input field and instructions area are displayed to make the password change.
- The password can be changed for the current level and any lower level. As a result, a level higher than the current operation level cannot be selected. Therefore, first set the current operation level to a level higher than the operation level where you wish to change the password, and then change the password.
- Use 4 to 10 alphanumeric characters (A to Z and 0 to 9) to set the password.

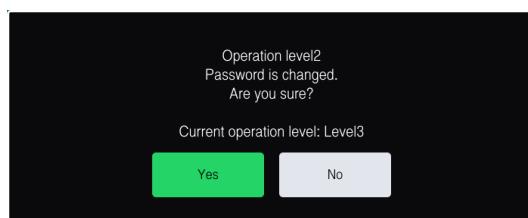
5.1.3.2 Changing password

1. On the <Operation level screen>, move the cursor to the operation level where you wish to change the password. Then, press the <Change password>.
- The <Operation level Change password> screen is displayed.



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2. Enter a new password in the upper input area and press [ENT].
For confirmation, enter the new password again in the lower input area and press [ENT].
After pressing the <Change> key, the new password selection is displayed in the function display area to confirm the password change.

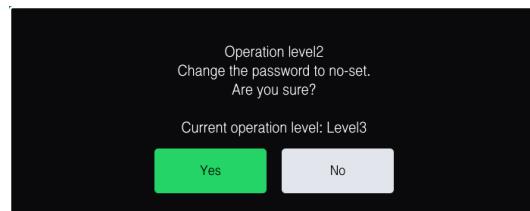


3. Press the <Yes> key.
This changes the password and returns the screen to the Original one.

5.1.3.3 Changing password to no-set

Operation levels 1 to 4 can be changed to the password no-set state.

On the <Operation level Change password> screen, do not enter anything into the data input field. Then, after pressing the <Change> key, a message is displayed in the function display area indicating no password will be set.



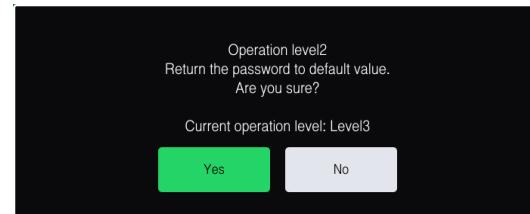
- * If the password is not set, just pressing the [ENT] key performs the same operation as successfully entering the password. (The operator message <<The password is wrong,>> appears after pressing the [ENT] key with text entered into the data input field.)

5.1.3.4 Reset password to default value

Passwords can be returned to the default values.

On the <Operation level Change password> screen, press the <Initialize password> key.

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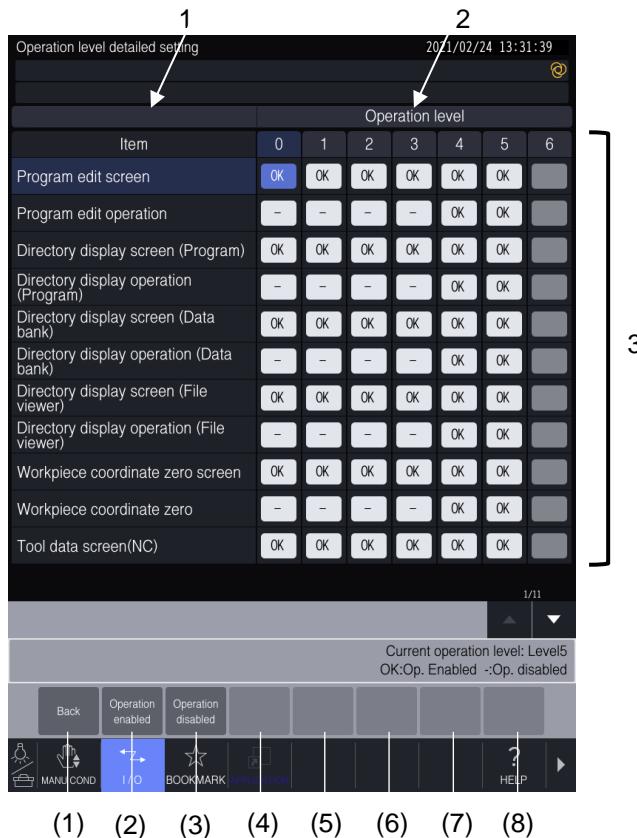
5.1.4 Edit detailed settings

Detailed settings can be changed at each operation level.

Press the <Detail setting> key on the <Operation level> screen to display the <Operation level detailed setting> screen.

5.1.4.1 Operation Level Detailed Setting Screen

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Description of screen display

Position	Name	Description
1	Data protection	Displays the data protection.
2	Operation level	Displays operation levels 1 to 5.
3	Data protection list	Displays a list of set values in the data protection for each operation level.

Description of screen operation

1. Description of function key operations

Column	Position	Label	Description
1	(1)	<Back>	Exits the detailed setting screen, and goes back to the <Operation level> screen.
	(2)	<Operation enabled>	Enables data operation. The display changes to <OK>.
	(3)	<Operation disabled>	Disables data operation. The display changes to <->.
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

2. Description of detailed setting operations for operation level
 - Use the tap operation or [CURSOR] keys to move the cursor to the item and operation level you wish to change. Then, press the <Operation enabled> or <Operation disabled> key.
 - The color changes to highlight the changed part.

Operation level restrictions

- Detailed settings can be changed only when the current operation level is set to level 5.
- For operation level 5, the user can change the operation settings (<Operation enabled>/<Operation disabled>) only for items that are already set to <Operation enabled>. For the other operation levels, the user can freely change the operation settings (<Operation enabled>/<Operation disabled>) for each item.
- The user cannot change the operation settings (<Operation enabled>/<Operation disabled>) for items in operation level 5 (except for those items stated above).

5.1.4.2 Change Detailed Settings

1. Press the <Detail setting> key on the <Operation level> screen.
The detailed setting screen is displayed.

2. Move the cursor to the item and operation level you wish to change. Then, press the <Operation enabled> or <Operation disabled> key.

5.1.4.3 Item List

List of detailed setting items are as shown below.

Items	Remarks
Program edit screen	Menu selection is unavailable.
Program edit operation	Editing programs (NC program, processing data, schedule program)
Directory display screen (program)	Screen selection is not available. Menu selection is unavailable when both programs and data banks are prevented.
Directory display operation (program)	Directory operations (file operation, folder operation, G code conversion)
Directory display screen (Data bank)	Screen selection is not available. Menu selection is unavailable when both programs and data banks are prevented.
Directory display operation (Data bank)	Directory operation (current plane change, file operation)
Directory display screen (File viewer)	Screen selection is not available.
Directory display operation (File viewer)	Directory operation (File operations)
Workpiece coordinate zero point screen	Menu selection is unavailable.
Workpc. coord. zero	
Tool data screen(NC)	Menu selection is unavailable.
Tool data	
Macro variable screen	Menu selection is unavailable.
Macro variables	
G/M code macro screen	Menu selection is unavailable.
G/M code macro	
User parameter screen	Menu selection is unavailable.
User parameter	
External I/O signal screen	Menu selection is unavailable.
External I/O signal	
Communication parameter screen	Menu selection is unavailable.
Communication parameter	
Field network parameter screen	Menu selection is unavailable.
Field network parameter	
Machine parameter screen	Menu selection is unavailable.
Machine parameter	
Special setting selection screen	Screen selection is not available. The menu cannot be selected when access is restricted to all the screens below. <ul style="list-style-type: none">• Rapid feed adjust. screen• Special setting selection screen
Rapid feed adjust. screen	Screen selection is not available. The menu cannot be selected when access is restricted to all the screens below. <ul style="list-style-type: none">• Rapid feed adjust. screen• Special setting selection screen
Special setting	
Tool list screen(Conversation)	Menu selection is unavailable.
Tool list	
Tool pattern screen	Menu selection is unavailable.
Tool pattern	
Tap prepared hole drill diameter screen	Menu selection is unavailable.
Tapping drill dia.	
Cutting condition screen	Menu selection is unavailable.
Cutting conditions	
ATC tool data	Initialize tool life excluded
Initialize ATC tool life	
Workpiece counter	Setting, editing (Clear current value excluded)
Clear work counter current value	Clear current value/ work counter clear signal only
Measurement results	Measurement results, batch deletion

Items	Remarks
Therm. distortion comp.	Operation state setting, data deletion
Status log	Data deletion
Production monitor - Others	Tool breakage detection – No. of operations remaining
Maintenance notice	
Cycle time log/Tool log	Delete data
Current position counter reset	Counter reset
Output signal value	Main, slave, local
ATC maintenance mode	
Upgrade	Menu selection is unavailable.
PLC I/O control screen	Menu selection is unavailable.
PLC I/O control operations	Current value change and registered monitor change
High speed / Standard control program screen	Program cannot be selected
High speed control program 1 to 9	
High speed control program 10	
Standard control program 1 to 9	
Standard control program 10	
User defined function screen	Program cannot be selected
User defined function	
System defined function screen	Program cannot be selected
System defined function	
PLC project operation	Execution setting, conversion mode setting, global variable setting
Set drawing	
Operation program	Change through external program selection signal or pallet program is possible.
Program protect	Program #8000-8999 protect ON/OFF change
Bookmark	Edit operations (register/move/delete) are not possible on the <Bookmark> screen.
[MANU] key	Cannot be changed to MANU + MDI mode.
[MDI] key	
[MEM] key	
[EDIT] key	Cannot be changed to MEM + EDIT mode.
[B.SKIP] key	
[OP. STOP] key	
[SINGL.] key	
[MLCK.] key	
[DRY] key	
<PALLET> key	
[CLT .P] key	
[CHP.F] key	
<LIGHT> key	
<TABLE LIGHT> key	
[Z.RTN] key	
Operation level password change screen	Screen change is unavailable.
Operation level detail setting screen	Screen change is unavailable.
External I/O program screen	Menu selection is unavailable. I/O, communication parameters
External I/O program	
External I/O data bank screen	Menu selection is unavailable. I/O, communication parameter I/O
External I/O data bank	
External I/O file viewer screen	Menu selection is not available I/O and communication parameter
External I/O file viewer	
External I/O notebook screen	Menu selection is not available Output and communication parameter

Items	Remarks
External I/O notebook	
External I/O maintenance screen	Menu selection is unavailable. I/O, communication parameters, format I/O
External I/O maintenance	
Mode for enabling and disabling servo	
Machining load monitor screen	Menu selection is not available.
Machining load monitor	
Spindle maintenance mode	
Touch panel hardware calibration	Changing to the touch panel hardware calibration screen and calibration execution are not possible.
Support application (ATC tool) screen	Support application cannot be selected.
Support application (ATC tool)	When the ATC tool data operations are disabled, the magazine tool registration and the tool type cannot be edited. When the tool data or the tool data list operations are disabled, the tool data on the <ATC tool (Set tool)> screen or the items on the tool data list cannot be edited. When the user parameter operations are disabled, the items on the screens: <ATC tool (tool change operation settings)> and <ATC tool (ATC monitoring function)> cannot be edited.
Support application (tool life) screen	Support application cannot be selected.
Support application (tool life)	When the tool data or the tool data list operations are disabled, the tool life cannot be edited. However, if the initialize operation for the ATC tool life is disabled, the tool life can be edited.
Support application (adjust machine parameter) screen	Support application cannot be selected.
Support application (adjust machine parameter)	When the user parameter operations are disabled, the user parameters cannot be edited.
Support application (production results) screen	Support application cannot be selected.
Support application (power consumption) screen	Support application cannot be selected.
Support application (power consumption)	
Support application (waveform display) screen	Support application cannot be selected.
Support application (waveform display)	
Support application (PLC) screen	Support application cannot be selected.
Support application (recovery support)	
Support application (home screen setting) screen	Support application cannot be selected. Accessories (register shortcuts) cannot be selected.
Support application (home screen setting)	
Accessories (file viewer) screen	Accessories cannot be selected.
Accessories (notebook) screen	Accessories cannot be selected.
Accessories (notebook)	

5.2 Automatic Data Backup

5.2.1 Summary

This function regularly backs up the data bank in the NC in order to minimize damage in the event that the data is lost or accidentally cleared.

When a memory card for the backup on the control panel is installed, the user can also back up larger size data such as program data, built-in PLC data, certificate data and cryptographic key data. Refer to “8.2.1 Automatic data backup” in the Installation Manual for details on connecting and removing a backup memory card on the control panel.

(NOTE) This function may not be available for certain scheduled backups, such as when backing up data that is in use. We recommend using the external input/output communication function, for example, to be absolutely sure that critical data is backed up.

5.2.2 Automatic Backup Settings

5.2.2.1 Backup types

Select one of the automatic backup types in the table below. Set the type in the user parameter (switch 1: data).

<Execute automatic data backup>	Overview
0: No	The backup is not executed.
1: When power is OFF	The data is backed up each time that the power is turned OFF. Only the data in the data bank is backed up. This setting is the factory-default setting for this parameter.
2: When power is ON (after specified number of days has elapsed)	The backup is executed after the specified number of days has elapsed (at the specified time) while the power is ON. When the <Save location for automatic data backup> is set to <1: Memory card for backup>, the data in the data bank, the NC program/conversation machining data, the built-in PLC data, the certificate data and the cryptographic key data can be backed up.

<Save location for automatic data backup>	Overview
0:NC	The data in the NC is backed up. Only the data in the data bank is backed up. This setting is the factory-default setting for this parameter.
1: Memory card for backup	The data is backed up to the memory card used for backup on the control panel. When the <Execute automatic data backup> is set to <2: When power is ON (after specified number of days has elapsed)>, the NC program/conversation machining data, the built-in PLC data, the certificate data and the cryptographic key data can be backed up.

5.2.2.2 Backup when power is ON (after specified number of days has elapsed) and settings

When the parameter <Execute automatic data backup> is set to <2: When power is ON (after specified number of days has elapsed)> and the number of days in the user parameter <Automatic data backup interval> has elapsed (since the previous backup), then the data backup starts at the <Automatic data backup time>. <Automatic data backup interval> and <Automatic data backup time> are set in the user parameter (switch 1: data).

This setting assumes that the backup will be executed during a lunch break or similar time period when the machine power is left ON but the machine is not operating. The customer should use this setting so that it matches customer's production cycle or schedule.

-
- (NOTE 1) If the automatic backup cannot be started at the preset backup time, then the backup will execute at the <Automatic data backup time> on the following day. The following factors could be a potential reason why the backup would not execute.
- Machine power was not turned ON.
 - Machine was running in automatic operation at the backup start time.
 - If the machine is not in a normal state, there might be a problem with the backup memory card where the firmware version is updated or the memory card might not be installed.
- (NOTE 2) When the backup is cancelled after it has already started, the data that was backed up (up until the cancellation) will be deleted when the backup is executed on the following day.
- (NOTE 3) If the backup operation prevents the use of certain data (for example edited data is being saved when the backup is executing), then the backup is skipped for that data.

5.2.3 Automatic Backup Execution

5.2.3.1 Automatic backup when power is OFF

When the user parameter (switch 1: data) <Execute automatic data backup> is set to <1: When power is OFF>, the following is the operation flow for the power OFF timing: the automatic backup is executed, it exits the backup operation and then the power is shut OFF.

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- (NOTE) The power shut OFF timing may become longer due to this function. In particular, when the <Save location for automatic data backup> is set to <1: Memory card for backup>, the backup operation may cancel and the power may turn OFF depending on the performance of the backup memory card.

5.2.3.2 Backup when power is ON (after specified number of days has elapsed)

When the user parameter (switch 2: data) <Execute automatic data backup> is set to <2: When power is ON (after specified number of days has elapsed)>, the data backup starts at the <Automatic data backup time> on the backup day.

Once the data backup starts, the operator message <Automatic backup in progress> displays on top of the screen and the message continues to display until the backup is finished. While the operator message is displayed, do not do the following: edit a data bank, edit a machining program, perform automatic operation, read data being transferred or browse/edit the PLC screen under the support application.

The time it takes for the data to back up varies depending on the program size and performance of the backup memory card.

- (NOTE) If one of the following operations is carried out while the automatic backup is in progress, the backup operation is cancelled.
- When the power is turned OFF
 - When automatic operation is launched
 - When there is a problem with the backup memory card

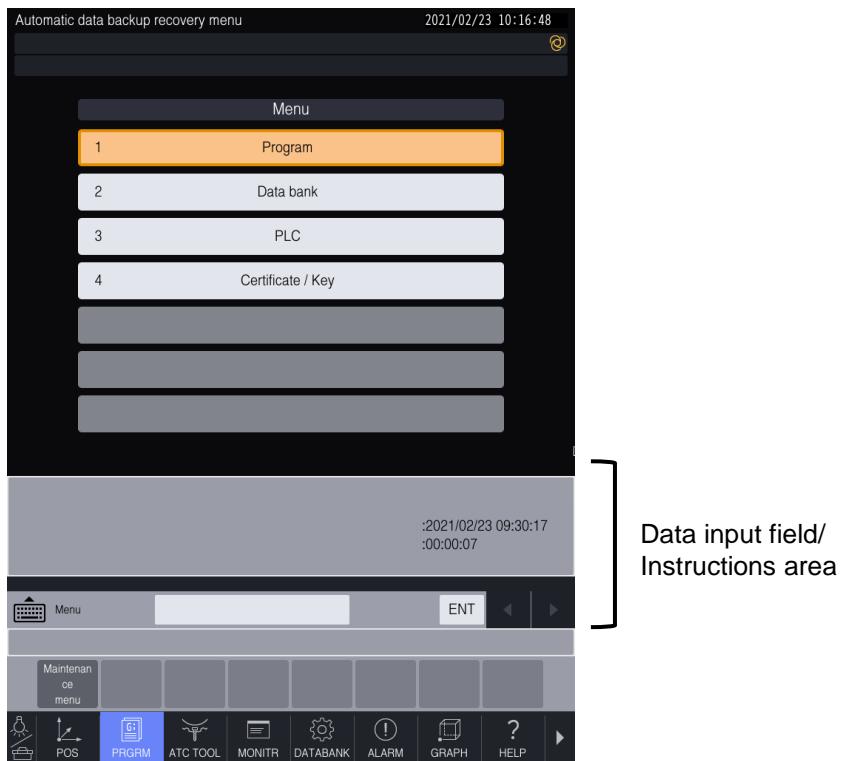
5.2.4 Backup Data Recovery

5.2.4.1 Overview/Automatic data backup recovery menu

When data is automatically backed up, the user can restore it to the NC directory on each recovery screen for the following: program data, data banks, PLC data, certificate data and cryptographic key data. Follow the procedure below to display the <Automatic data backup recovery menu> screen, and select the desired data from the menu list.

1. Set the [DATA PROTECTION] switch to “Disable”.
2. Press the [EDIT] key to display the <Program edit menu> screen.
3. Select <External I/O> to display the <External I/O menu> screen.
4. Select <Maintenance> to display the <Maintenance menu> screen.
5. Enter “15”, and then press the [ENT] key.
Or, select <Backup data recovery>.

6. The <Automatic data backup recovery menu> screen is displayed.
The screen cannot be changed during memory operation or during edit mode while operating.



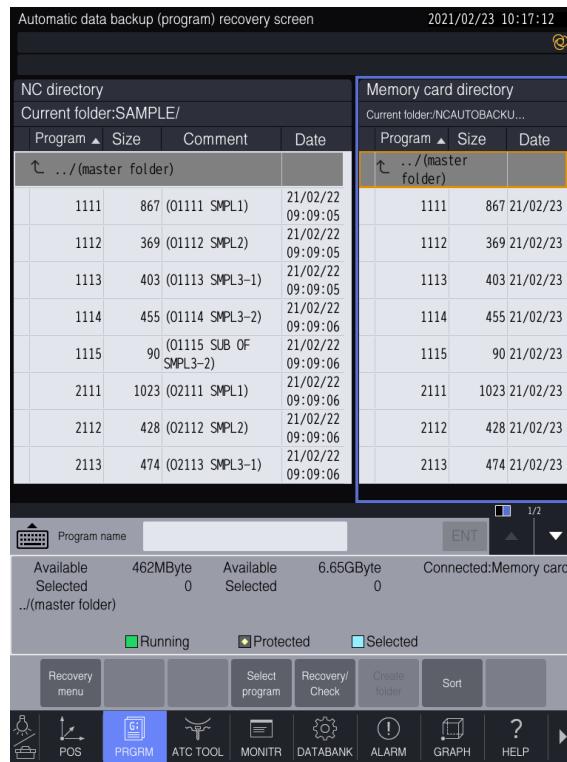
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Name	Description
Menu	<p>There is a list of menu selections for the automatic data backup recovery. Only the <Data bank> can be selected when <Execute automatic data backup> is set to <1: When power is OFF> or when <Save location for automatic data backup> is set to <0: NC>.</p> <p><Program> Restores programs from the backup memory card.</p> <p><Data bank> Restores data banks from the NC or the backup memory card.</p> <p><PLC> Restores PLC programs from the backup memory card.</p> <p><Certificate / Key> Restores certificate and cryptographic key data from the backup memory card.</p>
Data input field/ Instructions area	<p>Displays the information that was automatically backed up (previous time) in the instructions area.</p> <p>After the data is automatically backed up, if the <Memory card for backup> is replaced, the data that is displayed in the menu selections will be different.</p> <p><Backup start date and time> Displays the date and time to start the automatic data backup.</p> <p><Required time> Displays the time from when the automatic data backup starts until it is complete. If the data backup is cancelled in the middle of the operation, a hyphen (-) is displayed.</p> <p>When using the backup memory card, re-set the <Automatic data backup time> as needed because it will depend on the available writing speed for the media.</p>

Right after formatting, the user parameter (switch 1: data) <Save location for automatic data backup> becomes blank. As a result, the <Backup start date and time> and the <Required time> that are displayed on the <Automatic data backup recovery menu> screen may not match the information displayed on the recovery screen after making a selection.

5.2.4.2 Automatic data backup (program) recovery

Select <Program> on the <Automatic data backup recovery menu> screen.



5

Data input field/
Instructions area

Description of screen display

Name	Description
NC directory	Displays a list of programs that are saved to the NC directory. The path for the current folder (currently displayed) and a list of programs are displayed (only for programs in the language that is set in <Conversation/NC language change>). When using the conversation language, any machining data that is based in a different unit system is indicated by the letter "M" (for meters) or "I" (for inches), which is displayed at the beginning.
Memory card directory (back up)	Displays a list of programs that are backed up in the memory card that is currently installed. The path for the currently displayed folder and a list of programs are displayed (only for programs in the language that is set in <Conversation/NC language change>).
Data input field /Instructions area	The instructions area is the same as on the program (external I/O) screen.

Description of screen operation

1. Description of function key operations

Label	Description
<Recovery menu>	Goes back to the recovery menu screen.
<Program>	Selects multiple programs or folders in the memory card directory (backup) in order to carry out a recovery operation.
<Recovery/Check>	Restores the data when the data protection is disabled. A verification check is carried out when the data protection is enabled. Programs or folders that are selected in the memory card directory (backup) are restored and checked. Programs in the folder are restored and checked when a folder is selected.
<Create folder>	Creates a new folder in the NC directory.
<Sort>	Sorts the programs according to the date, the program or the comments. Data can be sorted in ascending and descending order.

2. Description of program area

- The user can tap on the program name, size, comment or date in the title section to change back and forth between ascending and descending order.
- The user can tap on a program to select it.
- Tap on a folder to move and go inside that folder.
- An item can be selected with the [CURSOR] keys (up and down).
- After a folder is selected and the [ENT] key is pressed, the focus moves to inside that folder.

Recovery operation

Programs or folders that are selected in the memory card directory (backup) are restored to the NC directory.

Before performing an operation, set the [DATA PROTECTION] switch to “Disable”.

How to restore a program or folder

Use the cursor or tap operation to select a program or folder in the memory card directory (backup), and then press the <Recovery /Check> key.

If the program name (that specifies the destination for data recovery) already exists in the NC directory, a message will appear to confirm whether to overwrite the data or not. Press the <Yes> key to overwrite, and press the <No> key to cancel overwriting.

When the folder recovery or multiple programs are restored, after pressing the <Input all remaining> key, all remaining programs are overwritten. Press the <Cancel> key to cancel the operation.

For folder recovery, when the user taps on a folder, that folder will be used as the destination of the data recovery. When the recovery is executed, the programs and sub folders inside the source are input to the selected folder.

Check operation

Programs and folders can be verified and checked. The operation procedure is the same as the recovery operation, and the recovery destination is verified and checked.

Before performing an operation, set the [DATA PROTECTION] switch to “Enable”.

Program selection

After pressing the <Select program> key, the following screen is displayed. Select multiple programs or folders in the memory card directory (backup) to perform a recovery operation.



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1. Description of function key operations

Label	Description
<Back>	Goes back to the <Operate between folders> screen.
<Start / End selection>	Specifies a range to select multiple programs or folders. Move the cursor to the start position for selecting the program or folder range and press the [ENT] key. Then, move the cursor to the last program or folder in the range, and press the [ENT] key again.
<Select all>	Selects all programs or folders in the memory card directory (backup). Only programs in the language that is set in the <Conversation/NC language change> are selected.
<Deselect all>	Deselects all of the programs or folders.
<Recovery/Check>	Same as the <Automatic backup data (program) recovery> screen.

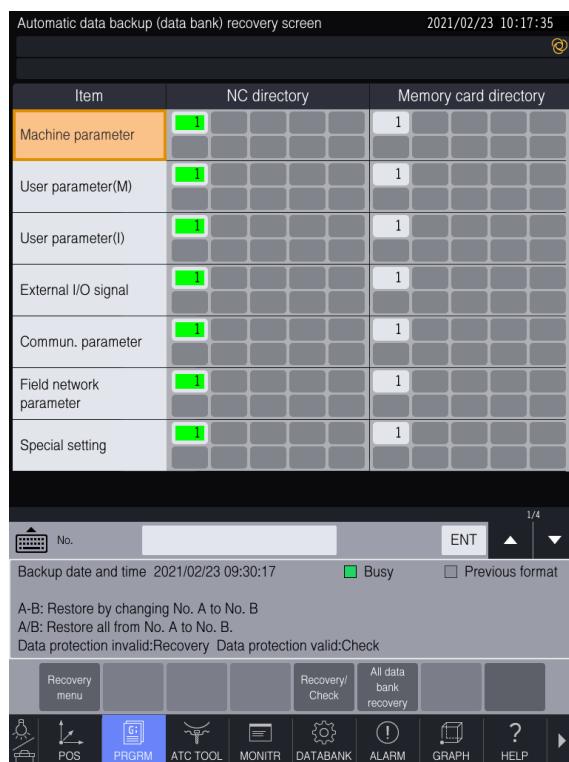
2. Description of program area

When performing one of the following operations in the memory card directory (backup), the user can select multiple programs or folders.

- Using a tap operation to select programs and folders.
- Using the cursor to select programs or folders, and then pressing the [ENT] key.

5.2.4.3 Automatic data backup (data bank) recovery

Select <Data bank> on the <Automatic data backup recovery menu> screen.



5

Data input field/
Instructions area

Description of screen display

Name	Description
Item	This is the name of the parameter item. The parameters that are specific to a machine unit setting have an "(M)" for meter or an "(I)" for inch.
NC directory	Displays the status of the data bank for the NC. The number for the data bank (1-10) is displayed. The data number that is valid is highlighted in green. If an old file format or a format error is detected, the number is displayed in parenthesis. In addition, it is highlighted in dark grey.
NC directory (backup) / Memory card directory (backup)	Displays the data banks that were backed up on the NC PCB or to the memory card. The number for the data bank (1-10) is displayed. The displayed data varies depending on the user parameter (switch 1: data) <Save location for automatic data backup>. If an old file format or a format error is detected, the number is displayed in parenthesis. In addition, it is highlighted in dark grey.
Data input field/ Instructions area	The instructions area displays the <Backup date and time> for the data bank file (at the cursor position) on the NC PCB or in the backup memory card. There is no display when nothing has been saved.

Description of screen operation

1. Description of function key operations

Label	Description
<Recovery menu>	Goes back to the recovery menu screen.
<Recovery/Check>	When a data bank number in the NC directory or in the memory card (backup) directory is selected and the <Recovery/Check> key is pressed, a message appears asking to specify the destination for the recovery or verification check. It shows the location for restoring data when the data protection is disabled. It shows the location for verifying and checking when the data protection is enabled.
<All data bank recovery>	Restores all backed up data in the NC directory (backup) or memory card directory (backup) to the NC directory.
<Delete all saved data>	Deletes all backup data in the NC directory (backup). A deletion confirmation appears in a popup window display. Press the <Yes> key to clear all the data, and press the <No> key to cancel the clear operation.

2. Item operations

- The user can scroll through the items with the **[CURSOR]** keys (up and down).
- When the user taps on an item or a data number to select it, the cursor moves to that item.

3. Data number operations

- The user can tap on a data number to select it.

Recovery operation

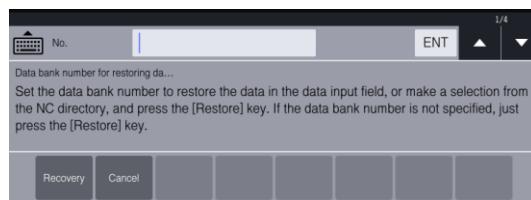
When a data bank number in the NC directory (backup) or memory card directory (backup) is selected, the user can perform a recovery operation.

Before performing an operation, set the **[DATA PROTECTION]** switch to “Disable”.

The user can select only one data bank number as the source for each item.

How to restore a data bank

- Use the following operations in the NC directory (backup), and specify the source for recovery.
 - Tap on a data bank number and then select the <Recovery/Check> key.
 - Use the cursor or tap on an item to select it. Enter a data bank number into the data input field to restore that data, and then press the **[Set]** key and <Recovery/Check> key.
- A message appears indicating how to specify the destination for the data recovery.



- Set the data bank number for data recovery into the data input field, or make a selection from the NC directory, and press the <Recovery> key to restore the data. If you do not want to specify a data bank number, then just press the <Recovery> key.

If the data bank number (that specifies the destination for data recovery) already exists in the NC directory, a message will appear to confirm whether to overwrite the data or not. Press the <Yes> key to overwrite, and press the <No> key to cancel overwriting.

When multiple data bank numbers are restored, after pressing the <Yes to all> key, all remaining data bank numbers are overwritten. Press the <Cancel> key to cancel the operation.

It is possible to restore the data to the NC directory even when the data is in an old file format or when the data bank has a format error. However, the data must be corrected by editing the data bank.

How to use the data input field for recovery

Use the data input field to enter a number(s), as shown below, and then press the <Recovery/Check> key.

Input example	Recovery operation		
	NC directory (back up)	→	NC directory
1	1	→	Use the data input field again to specify a number to restore the data to.
1-5	1	→	5
1/10	All data banks from 1 to 10	→	All data banks from 1 to 10
1 3 5	1, 3, 5	→	1, 3, 5

Check operation

The check and verification is carried out for the data bank number. The operation procedure is the same as the recovery operation, and the recovery destination is verified and checked.

Before performing an operation, set the [DATA PROTECTION] switch to “Enable”.

5.2.4.4 Automatic data backup (PLC) recovery

Select <PLC> on the <Automatic data backup recovery menu> screen.



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Description of screen display

Name	Description
NC directory	Displays the PLC status in the NC. When a project exists, <1> is displayed.
Memory card directory (back up)	When a project exists that is backed up in the memory card, <1> is displayed.

Description of screen operation

1. Description of function key operations

Label	Description
<Recovery menu>	Goes back to the recovery menu screen.
<Recovery>	Restores the PLC program selected in the memory card directory (backup) when the data protection is disabled.

Recovery operation

Perform the following steps before the recovery operation.

- Set the **[DATA PROTECTION]** switch to “Disable”.
- Set the <Parameter change> to <Writable> on the <extension I/O maintenance> screen.
- Set the user parameter (switch 1: system) <PLC program protection> to <0:Invalid>.

An operator message appears and the <Automatic data backup (PLC) recovery> screen cannot be opened in the following situations.

Conditions	Operator messages
<ul style="list-style-type: none"> • When a screen under the <PLC (Menu)> screen is opened in the PLC support application • When communicating with the PLC programming software 	<<There is a PLC program currently being edited /communicating>>
When the machine has not been restarted after a version update	<<PLC program is being input>>

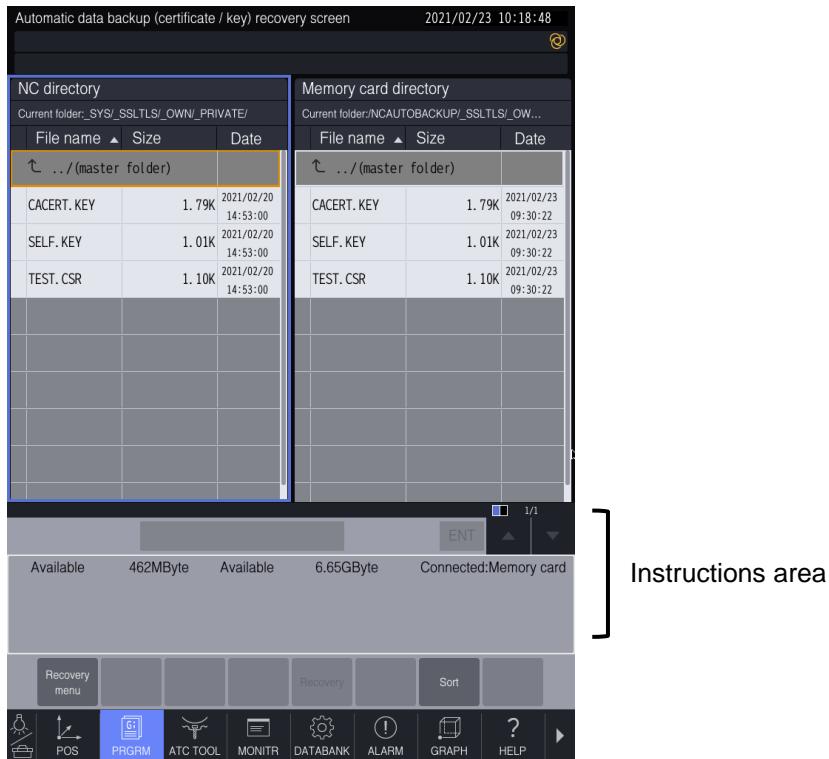
How to restore a PLC program

Press the <Recovery> key.

When the PLC program exists in the NC directory, a message will appear to confirm whether to overwrite the data or not. Press the <Yes> key to overwrite, and press the <No> key to cancel overwriting.

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5.2.4.5 Automatic data backup (certificate / key) recovery



Description of screen display

Name	Description
NC directory	Displays a list of certificate, key and folder data that is saved to the NC directory.
Memory card directory (back up)	Displays a list of certificate, key and folder data that is backed up in the backup memory card.
Instructions area	Displays the full path of the certificate and key data that is selected with the cursor.

Description of screen operation

1. Description of function key operations

Label	Description
<Recovery menu>	Goes back to the recovery menu screen.
<Recovery>	Restores the data when the data protection is disabled. Recovery <ul style="list-style-type: none"> • Restores the certificate, key and folder data that is selected in the memory card directory (backup).
<Sort>	Sorts according to the file name, size and date. Data can be sorted in ascending and descending order.

2. Description of the certificate and key data list

- The user can tap on the file name, size or data in the title section to change back and forth between ascending and descending order.
- The user can tap on a file name to select it.
- Tap on a folder name to move and go inside that folder.
- An item can be selected with the **[CURSOR]** keys (up and down).
- After a folder is selected and the **[ENT]** key is pressed, the focus moves to inside that folder.

(NOTE) When a folder is moved in the NC directory, the data also moves to the same folder in the memory card directory (backup). When a folder is moved in the memory card directory (backup), the same also applies in the NC directory.

Recovery operation

Certificate and key data specified in the memory card directory (backup) is restored to the NC directory.

Before performing an operation, set the **[DATA PROTECTION]** switch to “Disable”.

How to restore certificate and key data

Perform the following operation in the memory card directory (backup) to restore the data.

- Use the cursor or tap on the certificate or key data to select it, and then press the <Recovery> key.

If another file with the same name already exists in the NC directory, a message will appear to confirm whether to overwrite the data or not. Press the <Yes> key to overwrite, and press the <No> key to cancel overwriting.

When restoring multiple files, after pressing the <Yes to all> key, all remaining files are overwritten. Press the <Cancel> key to cancel the operation.

(NOTE) When the server certificate that is currently being used is overwritten, the operator message <<Press the **[RST]** key>> appears.

5.2.5 Folder Configuration in Backup Memory Card

When the <Save location for automatic data backup> is set to <1: Memory card for backup>, the folder structure is configured as follows for the backup memory card.

Folder name	Overview
NcAutoBackup	Stores the data from the last backup operation. The information for this folder can be viewed on the automatic data backup recovery screen.
NcAutoBackup_xxxxxxx	Stores the data from the backup operation that was carried out the time before last (up to 4 times ago). xxxxxxx: Refers to the date of the backup operation.
NcAutoBackup_tmp	This data folder is used when the backup operation is being carried out.

When the automatic backup operation is started, the folder “NcAutoBackup” is renamed as “NcAutoBackup_xxxxxxx”. During the backup operation, the data is saved in a temporary folder “NcAutoBackup_tmp”. Once the backup is complete, the backup folder “NcAutoBackup” is renamed and the file with the oldest date (“NcAutoBackup_xxxxxxx”) is deleted. If the backup is cancelled in the middle of the operation, the folder “NcAutoBackup_tmp” will be deleted when the next automatic backup operation is started on the following day.

The folder structure for “NcAutoBackup” and “NcAutoBackup_xxxxxxx” is as follows.

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File name	Overview
DATABANK.BAK	Saves a data bank file. This file cannot be used for external input and output in master station or slave station communication.
¥_PLC¥Data under this folder	This is the PLC data. This can be used for external input and output in master station or slave station communication.
¥_SYS¥_SSLTLS¥Data under this folder	This is the certificate and key data. This can be used for external input and output in master station or slave station communication.
Other folders and files not mentioned above	This includes the NC program and conversation language machining data. This can be used for external input and output in master station or slave station communication.

CHAPTER 6

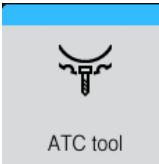
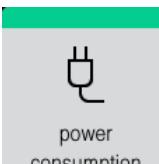
SUPPORT APPLICATION

- 6.1 Support Application**
- 6.2 Adjust Machine Parameters**
- 6.3 ATC Tool**
- 6.4 Tool Life**
- 6.5 Waveform Display**
- 6.6 Production Performance**
- 6.7 Power Consumption**
- 6.8 Recovery Support**
- 6.9 Inspection**
- 6.10 PLC**
- 6.11 Home Screen Setting**

6.1 Support Application

6.1.1 Support Applications

Support applications refer to a function that groups different screens and operations for the user to carry out different work tasks, such as for machine setup and maintenance. These applications help the user reference machine data, enable the user to edit data or perform machine operations as well as improve work efficiency.

Icon	Overview
	Various parameters related to machining can be set. Adjust machinin...
	Different functions related to the tool change operation are available, for example, registering an ATC tool, referencing and editing tool data for tools registered to a magazine, tool life management and tool change support. ATC tool
	Displays the tool life data for tools registered to magazines. The user can check whether the tool life has expired or will soon expire on a tool, and the user can also initialize or reset the tool life for multiple tools all at once. Tool life
	The signal status and servo information can be shown in real time in a graphical display. Waveform display
	The production performance application has two functions: one for collecting machine information and registering that data chronologically in a database, and one for displaying the information (registered in the database) using different graphics. production performance
	The power consumption application offers different power consumption related functions, such as referencing power consumption data, measuring the power consumption per cycle or setting related parameters. * The accuracy of the power consumption figures is not guaranteed. Use these figures as a reference. power consumption
	The support application (recovery support) helps restore operation from an error status (i.e. tapping stopped or is stuck in a workpiece due to an alarm or a power outage). recovery support
	The functions below can be selected in the support application (inspection). <ul style="list-style-type: none"> • Measure motor insulation resistance • Brake load test inspection

Icon	Overview
	The support application (PLC) offers different functions related to monitoring the OMs that make up the PLC system, as well as creating and managing PLC programs.
	In the home screen setting application, the different settings related to the home screen can be configured.

The user can open a support application regardless of the operation mode, but there are some operations that can only be used in certain operation modes depending on the function. Refer to each support application explanation for further details.

6.1.2 How to Open Support Applications

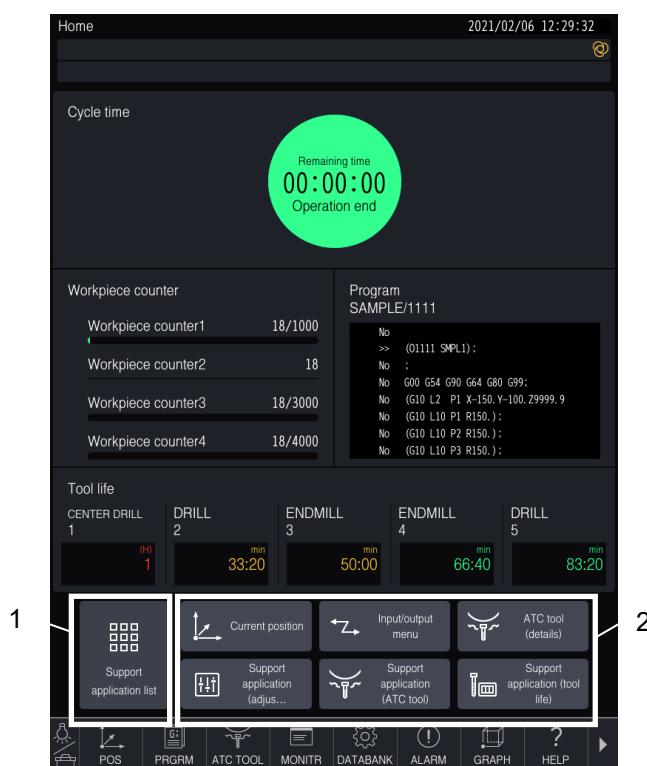
6.1.2.1 Open from home screen

Press the <Support application list> key (1 in figure).

Or, after registering an application screen as a shortcut, press the corresponding shortcut key (2 in figure).

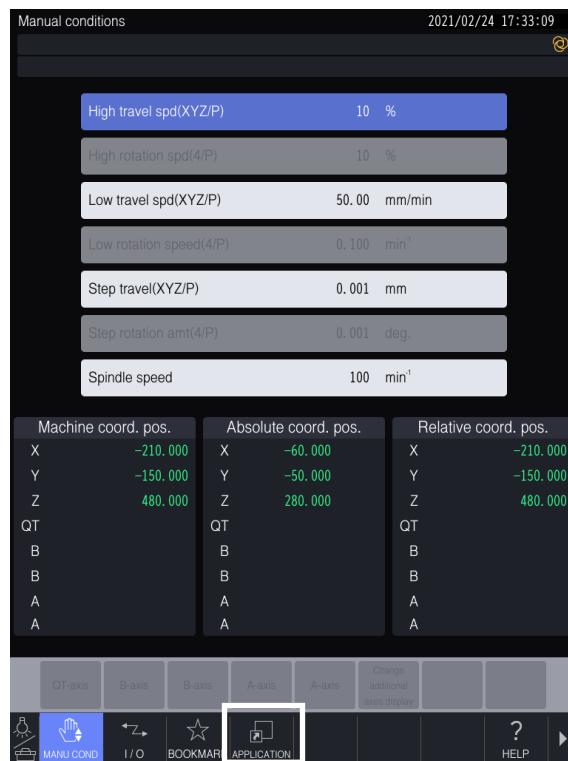
Refer to “7.5 Register shortcuts” for details on how to register a shortcut.

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6.1.2.2 Open using screen key

Press the <APPLICATION> key.



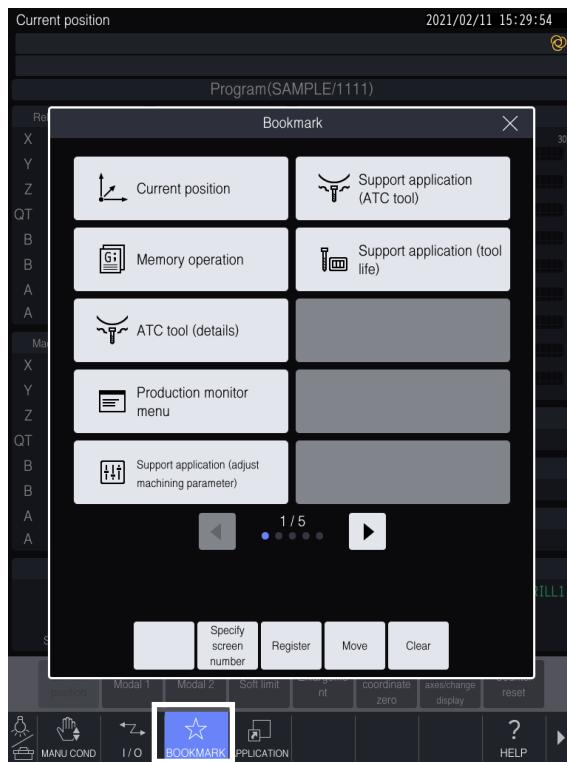
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After the <APPLICATION> key is pressed, either the <Support application list> screen or the corresponding support application screen is displayed (whichever was displayed last). If neither of the above scenarios applies, the <APPLICATION> key will gray out.

6.1.2.3 Open from bookmark screen

After registering an application screen as a shortcut, press the <BOOKMARK> key.

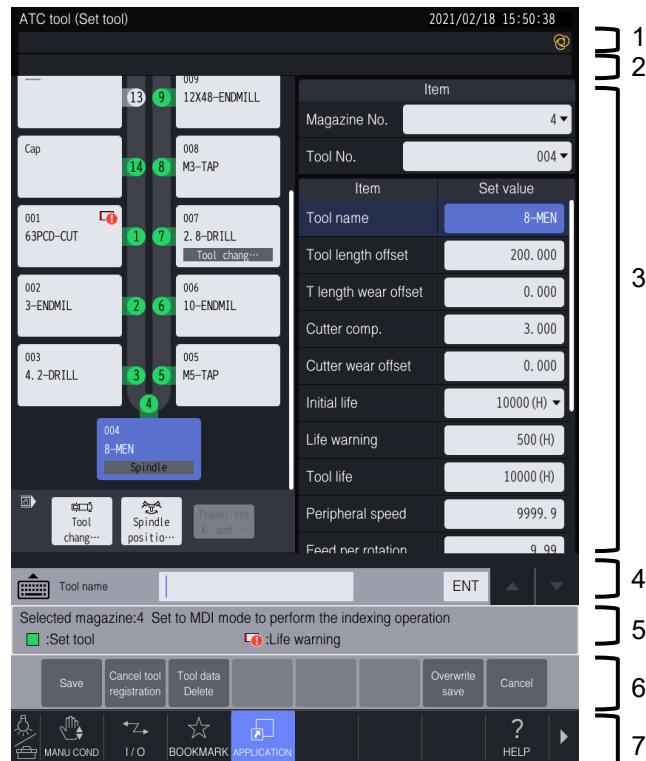
Refer to “4.11 Bookmarks” in Operation Manual I for details on how to register a bookmark.



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6.1.3 Support Application Screen

The following describes the general screen layout used and shared among the support applications.



Position	Name	Description
1	Title display area	This area displays the title of the current screen on the left side. The current date and time are displayed on the right side.
2	Alarm/Operator message area	This area displays current alarms and operator messages. Pictographs that indicate the machine status are displayed on the right side.
3	Main display area	This area is the main display for a support application.
4	Data input area	This area is displayed when data input is needed. Numbers or letters, or item number selections in the instructions area can be entered.
5	Instructions area	This area displays operating instructions or detailed data on a given screen.
6	Function display area	This area displays selections for machine operation.
7	Control key display area	Displays the screen keys and/or the subtool keys.

6.1.4 Data Editing

There are support applications that allow the user to edit data banks and different settings, such as in the user parameters or tool data. After the content is edited in the support application, the changes are then applied to the data banks. If that data is changed on the data bank screen or if there is a data change that is transmitted, the values in the support application screen are updated in real time. The timing when edited data is saved varies depending on the support application. It is saved after a value is input and the [ENT] key is pressed, or it is saved after a value is input and the <Save> key, the <Save and end> key or the <Overwrite save> key is pressed. Refer to each support application explanation for further details.

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(NOTE) When the <Save> key, the <Save and end> key or the <Overwrite save> key is used to save data during memory or MDI operation, then operation may stop. In addition, there is data that cannot be saved during operation on certain support application screens.

6.1.5 Data Protection

Being able to open a support application or enabling/disabling the editing function in a support application can be set at each operation level. However, even when a support application has the edit operations enabled, if there is another screen (besides a support application) that uses that data or item but has the edit operations disabled, then the edit operations become disabled in the support application.

6.1.6 Key & Switch Operation

The following shows the operations and functions when the main keys and switches are pressed while a support application screen is displayed.

Pressed key/switch	Operation when pressed
[HOME] key	Changes to the <Home> screen. When pressed while editing data in a support application, the screen changes to the home screen but the editing state is maintained. Thereafter, when the support application is re-opened, editing can be resumed again.
[RST] key	The support application screen does not change. In addition, even when <Cancel editing when resetting> is set to <1:Yes>, the edited data is not discarded in the support application, and the editing state is maintained. When the machine is operating, this key stops each axis immediately (it stops after the operation is completed for ATC, tapping and thread cutting).
Mode key	Changes the operation mode. The support application screen does not change. In addition, the edited content in the support application will be maintained.
Screen key	Changes to the corresponding screen. When pressed while editing data in a support application, the screen changes to the home screen but the editing state is maintained. Thereafter, when the support application is re-opened, editing can be resumed again.
Keys related to manual operation mode (NOTE)	When using manual operation mode, all keys can be used.
[START] switch	When using memory operation or MDI operation mode, this key starts program operation. However, the operations may be restricted or limited in some support applications. Refer to each support application explanation for further details.
[FEED HOLD] switch	When the machine is operating, this key stops each axis temporarily (it stops after the operation is completed for ATC, tapping and thread cutting). The [START] switch can be used to restart in memory and MDI operation modes.
[EMERGENCY] switch	Stops machine operation immediately and turns OFF the servo.
Alarm/Operator message area	Changes to the <Current Alarm/Operator message> screen. The edited content in the support application will be maintained.

(NOTE) The following keys are the “Keys related to manual operation mode”.

- [Z.RTN]
- <P.INDX>
- [MAG.F] and [MAG.R]
- [ATC]
- [SP.CW] and [SP.STOP]
- [L. SP]
- [RPD], [JOG] and [STEP]
- [+] and [-]
- [+X], [-X], [+Y], [-Y], [+Z], [-Z], [+4] and [-4]

6.2 Adjust Machine Parameters

6.2.1 Overview

The user can set and configure various parameters related to machining in the adjust machine parameter application.

The adjust machine parameter application is broken down into the following basic screens.

1. Load weight settings screen
The user can set the load weight on the table. The user can adjust the acceleration of the positioning operation to the best speed with this set value.
2. Machining mode settings screen
The user can adjust the conditions to achieve a balance between machining accuracy, smoothness and machining time.
3. Shorten cycle time settings screen
The user can shorten the cycle time by configuring the settings for the tapping/drilling operation, the in-position check operation or the cutting feed operation.

6.2.2 Types of Editable Data

Some of the data below can be edited in the adjust machine parameter application.

- User parameters

6.2.3 Screen Layout & Description

6.2.3.1 Machining parameter adjustment (menu) screen

6



Description of screen display

Position	Name	Description
1	1. Load weight settings	Displays the load weight settings screen.
2	2. Machining mode settings	Displays the machining mode settings screen.
3	3. Shorten cycle time settings	Displays the shorten cycle time settings screen.

Description of function key

Position	Label	Description
(1)	<End application>	Closes the adjust machine parameter application.
(2)		
(3)		
(4)		
(5)		
(6)		
(7)		
(8)		

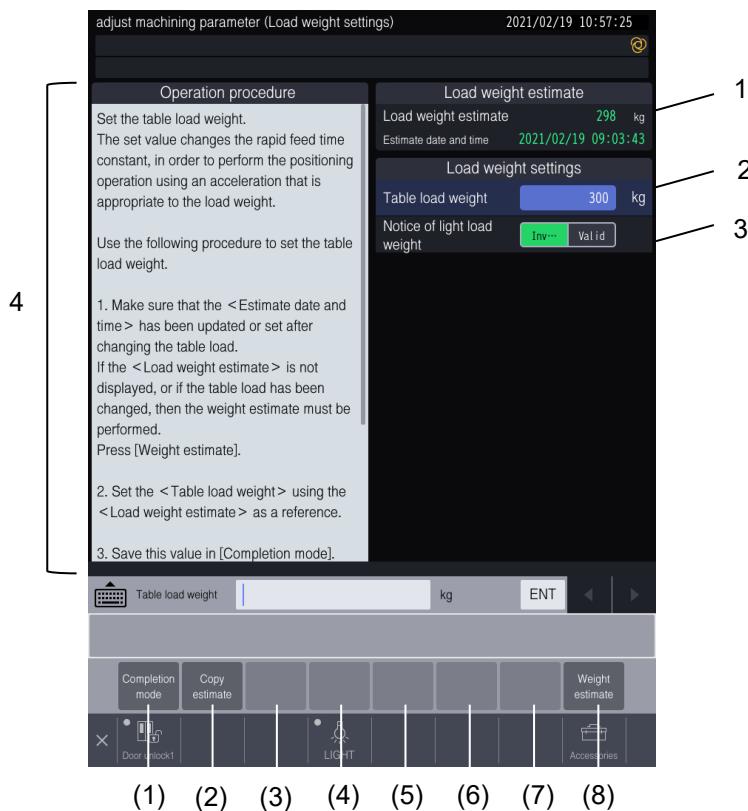
6.2.4 Load Weight Settings

6.2.4.1 Overview

The user can estimate the table load weight and set parameters related to that table weight using the load weight setting function. Any content that is edited here is reflected in the user parameters. This function can only be used on machine models with a moving table.

6.2.4.2 Machining parameter adjustment (load weight settings) screen

The user can check the results of the estimate for the table load weight and set parameters related to that table weight.



6

Description of screen display

Position	Name	Description
1	Load weight estimate	Displays the estimated value of the load weight and the date and time of that estimate.
2	Table load weight	The user can set the value for the user parameter (switch 1: common) <Table load weight>.
3	Notice of light load weight	The user can set the value for the user parameter (switch 1: common) <Notice of light load weight>.
4	Procedure guide	Displays a procedure guide for setting the load weight.

Description of function key

Position	Label	Description
(1)	<Completion mode>	Refer below.
(2)	<Copy estimate>	Copies the <Load weight estimate> to the <Table load weight>.
(3)		
(4)		
(5)		
(6)		
(7)		
(8)	<Weight estimate>	Changes to the <Machining parameter adjustment (Weight estimate)> screen.

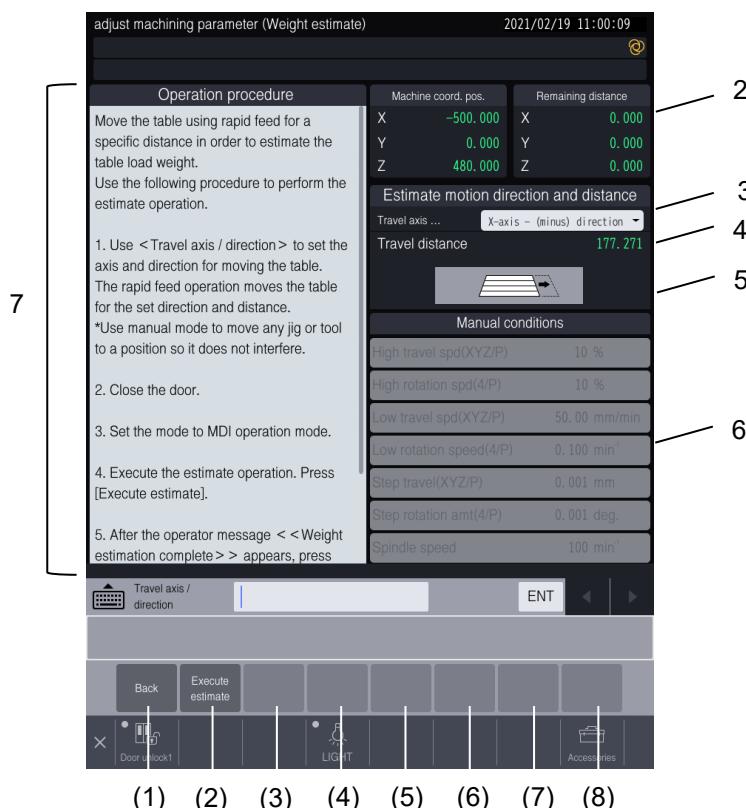
Description of keys in completion mode

Position	Label	Description
(1)	<Save and end>	Saves the new set values for <Table load weight> and <Notice of light load weight>, and closes the load weight settings.
(2)		
(3)		
(4)	<Cancel w/o saving changes>	Discards the edited content and closes the table weight settings.
(5)		
(6)		
(7)	<Overwrite save>	Saves the new set values for <Table load weight> and <Notice of light load weight>, and then returns to editing.
(8)	<Cancel>	Returns to editing.

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6.2.4.3 Machining parameter adjustment (Weight estimate) screen

The table is moved using rapid feed for a specific distance in order to estimate the table load weight. For operation details, follow the screen instructions.

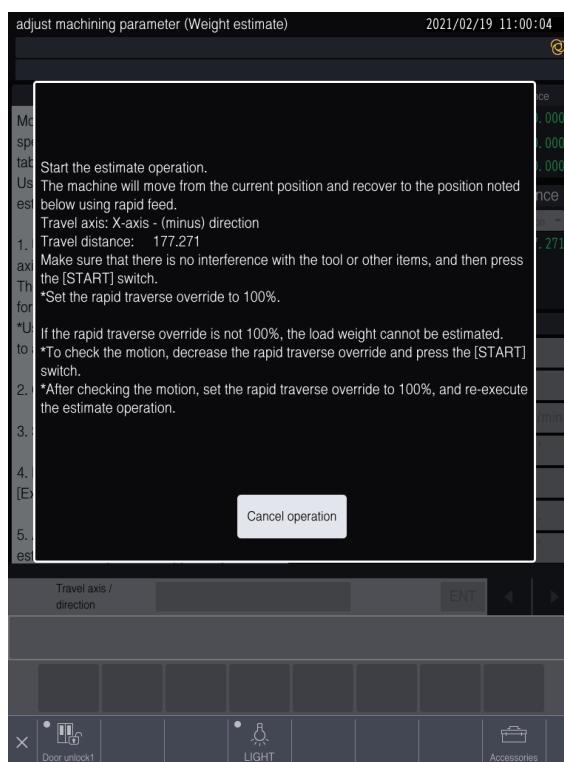


Description of screen display

Position	Name	Description
1	Machine coordinate position	Displays the current coordinate value in a coordinate system that is unique to the machine.
2	Remaining distance	Displays the remaining distance (distance not yet travelled) in the travel command for the estimate operation.
3	Travel axis / direction	Selects the axis and direction where the table moves.
4	Travel distance	Displays the travel distance of the table. The required travel distance varies depending on the machine model and axis.
5	Travel direction display	Displays a figure that shows the travel direction of the table, per the set value of <Travel axis / direction>.
6	Manual conditions	Displays the conditions (travel speed, travel amount, rotation amount and spindle speed) when using an axis in manual mode.
7	Procedure guide	Displays a procedure guide for estimating the weight.

Description of function key

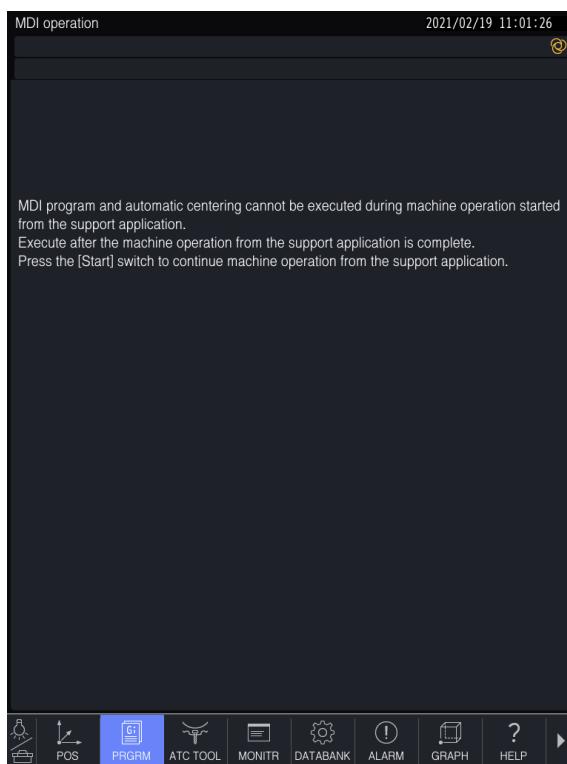
Position	Label	Description
(1)	<Back>	Changes to the <Machining parameter adjustment (load weight settings)> screen.
(2)	<Execute estimate>	Executes the estimate operation. When the key is selected, a popup screen is displayed. In the following situations, the key is grayed out and cannot be selected. - When not using MDI manual mode - When an MDI program is running - When automatic centering is operating - When the machine is operating from another support application
(3)		
(4)		
(5)		
(6)		
(7)		
(8)		



After the <Execute estimate> key is pressed, a popup screen is displayed. When the [START] switch is pressed while the popup screen is displayed, the estimate operation starts and the popup screen disappears. After the <Cancel operation> key is pressed, the popup screen disappears. When the [START] switch is pressed while the popup message screen is not displayed, the alarm <<Support application (adjust machining parameter) motion deselected>> is triggered.

If the user changes to another screen while the popup screen is displayed and the [START] switch is pressed, the estimate operation is carried out. However, after the user changes to the <MDI operation> screen / <Automatic centering> screen, or to the support application (ATC tool) / support application (tool life) screen and then the [START] switch is pressed, the machine starts operation following the last screen that was opened (<MDI operation>, <Automatic centering>, support application (ATC tool), support application (tool life), support application (machining parameter adjustment) - <Machining parameter adjustment (Weight estimate)> screen).

- (NOTE 1) When one of the following operations is performed, the popup is cancelled.
- When the [START] switch is pressed and the estimate operation is started
 - When the <Cancel operation> key is pressed
 - When changing to a mode that is not MDI operation mode
 - When changing to one of the following: <MDI operation> screen, <Automatic centering> screen, support application (ATC tool) or support application (tool life)
 - When the power is turned OFF
- (NOTE 2) The mode cannot be changed while the estimate operation is in progress. Otherwise, the alarm <<Weight estimate in progress>> is triggered.
- (NOTE 3) When the <PRGRM> key is pressed while the estimate operation is in progress, a screen like the following is displayed.



After the estimate operation is complete, the screen goes back to the standard <MDI operation> screen and the <Automatic centering> screen display.

6.2.5 Machining Mode Settings

6.2.5.1 Overview

The machining mode setting function streamlines the steps required for adjusting parameters in order to access and use high accuracy mode quickly. Any content that is edited here is reflected in the user parameters.

There are two functions available: the “High accuracy (machining mode) function” for selecting the desired function from the graph on the screen and “High accuracy (accuracy specification mode) function” for directly specifying the accuracy level.

Use the desired mode to support the machining content.

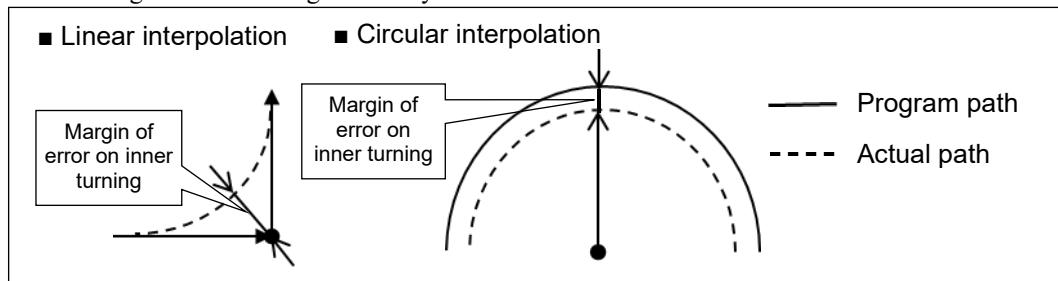
6.2.5.2 High accuracy (machining mode) function

The user can use the high accuracy (machining mode) function to browse from 6 available machining modes and select the one that best fits the machining content, for example, the user can select an option that focuses on machining accuracy or on the smoothness of the machining surface.

Machining mode	Description
Standard	Standard setting that balances accuracy and smoothness
Rough	Setting with shorter machining time
Medium rough	Setting between rough and finishing
Medium rough S	Setting focused on machining surface quality
Finishing	Setting focused on true accuracy for program command
Finishing S	Setting focused on machining surface quality and true accuracy of program commands, machining time is longer

6

The accuracy refers to the margin of error on the inner turning that occurs during linear interpolation and circular interpolation as shown in the diagram below. The margin of error on the inner turning decreases in high accuracy mode.



The user can add 3 more customized machining modes in addition to the 6 modes noted above.

Machining mode	Description
Adjustment A	Machining mode A set by customer
Adjustment B	Machining mode B set by customer
Adjustment C	Machining mode C set by customer

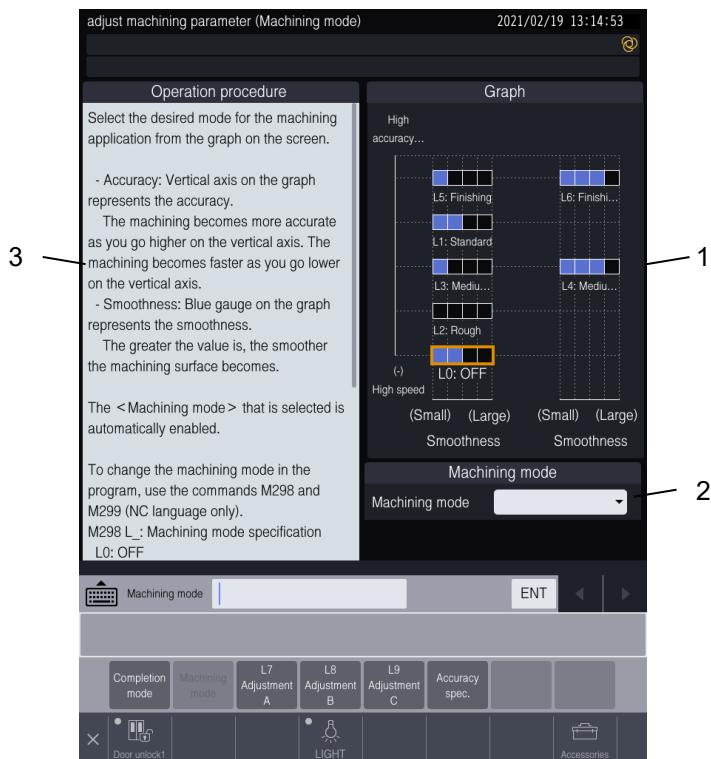
Usage

This section provides a description on using the high accuracy (machining mode) function.

There are 6 basic machining modes for the high accuracy (machining mode) function, and there are an additional 2 modes (machining mode adjustment) that the user can customize based on the basic modes.

Machining mode

1. Open the <Machining parameter adjustment (Machining mode)> screen.



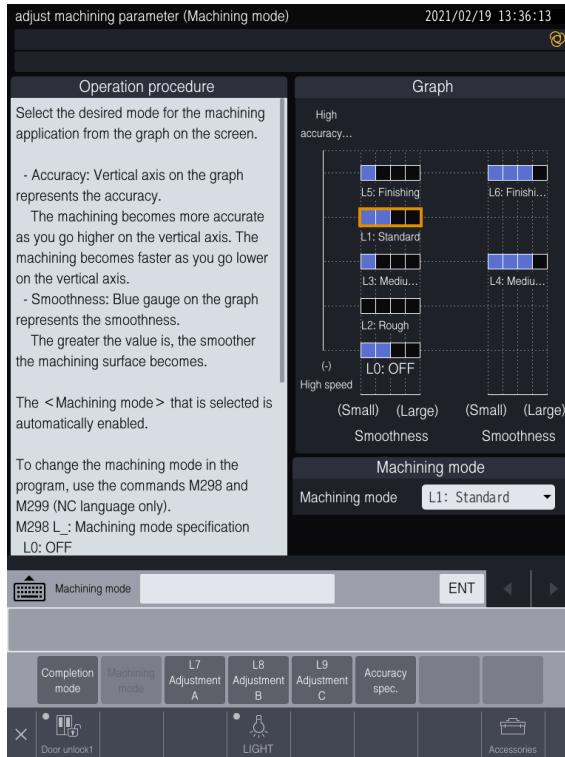
6

Description of screen display

Position	Name	Description
1	Graph	Displays the performance in each machining mode in a graph. Tap on a machining mode on the graph to select it for the <Machining mode>.
2	Machining mode	Selects the desired machining mode from the displayed list.
3	Procedure guide	Displays a procedure guide for the machining mode setting.

2. Tap on a machining mode on the graph, or tap on an item under <Machining mode> to select the desired machining mode setting.

e.g.) When <L1. Std> is set for the <Machining mode>



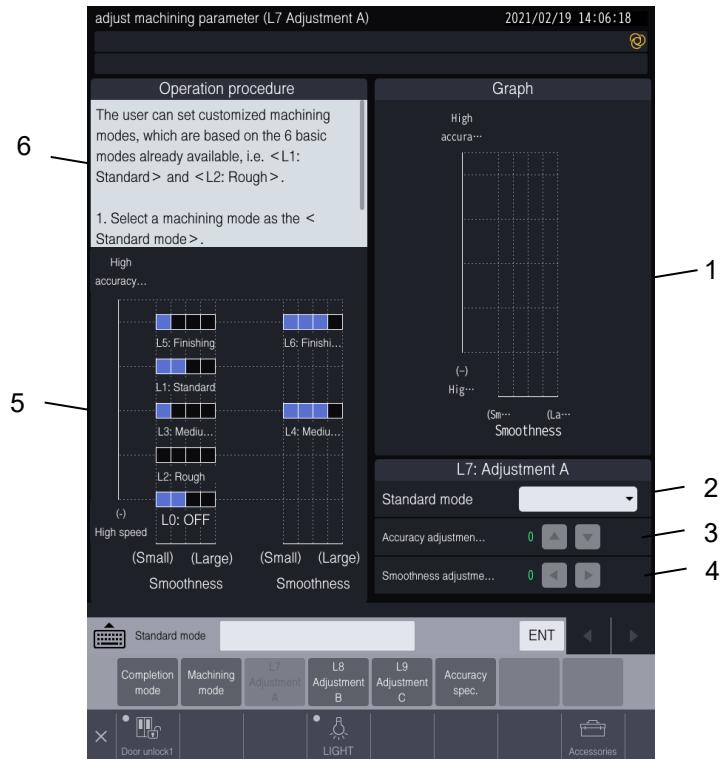
3. Press the <Completion mode> key to complete and exit the editing. After pressing the [RST] key, the setting appears.

Machining mode adjustment

After setting <L7. Adjust. A>, <L8. Adjust. B> and <L9. Adjust. C> for the machining mode, the user can add the customized machining modes, which are based on the 6 basic modes already available, i.e. <L1. Std.> and <L2: Rough>.

The following procedure is a description when adding <L7. Adjust. A>. The procedures for adding <L8. Adjust. B> and <L9. Adjust. C> are the same.

1. Open the <Machining parameter adjustment (L7 adjustment A)> screen.

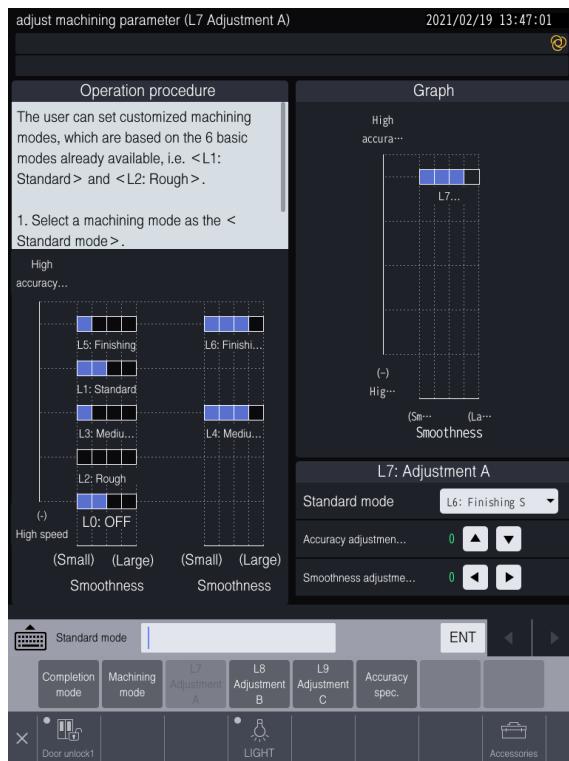


Description of screen display

Position	Name	Description
1	Graph	Displays the performance in adjustment A mode in the graph.
2	Standard mode	Selects the standard machining mode in adjustment A mode.
3	Accuracy adjustment	Adjusts the accuracy for adjustment A mode.
4	Smoothness adjustment	Adjusts the smoothness for adjustment A mode.
5	Reference graph	Displays the performance of each standard machining mode in the graph.
6	Procedure guide	Displays a procedure guide for the machining mode adjustment.

- Set <Standard mode> for the mode that will be the standard. <L7: Adjustment A> is displayed in the graph. The grayed out adjustment buttons for <Accuracy adjustment value> and <Smoothness adjustment value> are enabled and become available.

e.g.) When <L6. Finishing S> is set for the <Standard mode>

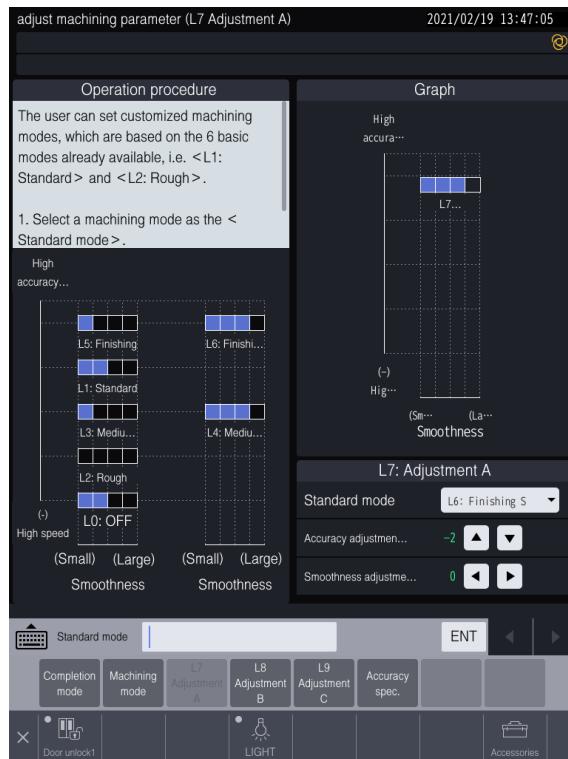


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3. Set the <Accuracy adjustment value> for the standard mode using the up and down arrow buttons. The accuracy is displayed on the vertical axis in the graph. The higher the value is, the more accurate (goes up) the machining becomes. The smaller the value is, the faster (goes down) the machining becomes. The accuracy can be adjusted to 5 levels in the positive and negative directions for the standard mode.

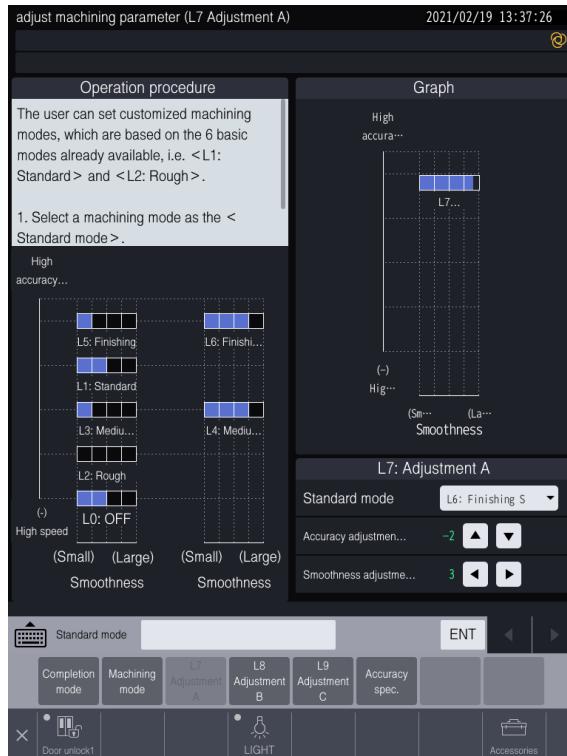
If the <Accuracy adjustment value> is changed, the <L7: Adjustment A> on the graph moves vertically only for the increment set for the standard mode.

e.g.) When <6: Finish S> is set for the <Standard mode> and <-2> is set for <Accuracy adjustment value>



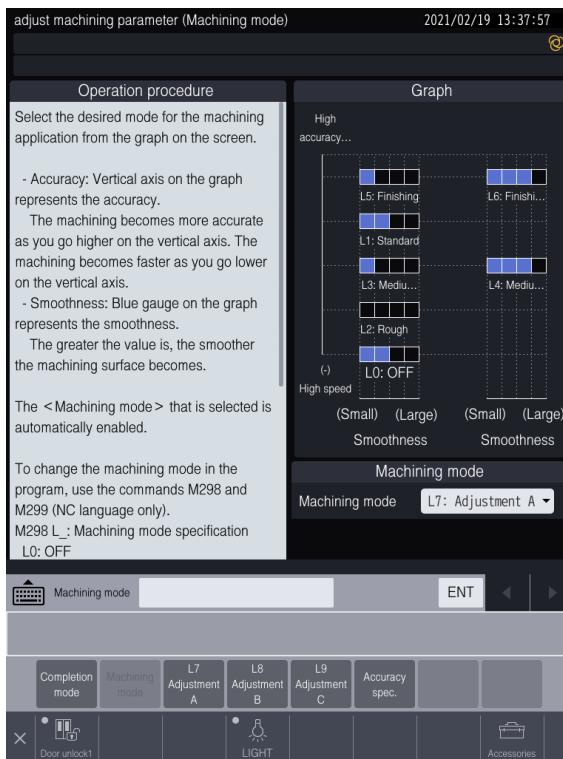
4. Set the <Smoothness adjustment value> for the standard mode using the left and right arrow buttons. The smoothness level is displayed by the blue gauge on the graph. The higher the value is (as the blue gauge becomes greater), the smoother the machining surface becomes. The smoothness level can be adjusted to 5 levels in the positive and negative directions for the standard mode (When <L2: Rough> is set for the standard mode, a negative value cannot be set for the <Smoothness adjustment value>). If the <Smoothness adjustment value> is changed, the blue gauge for <L7: Adjustment A> on the graph changes only for the increment set for the standard mode.

e.g.) When <6. Finishing S> is set for the <Standard mode>, and <-2> is set for <Accuracy> and <3> is set for smoothness



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5. Open the <Machining parameter adjustment (Machining mode)> screen. Tap on the item <Machining mode> and select <7: Adjust. A> from the displayed list.



6. Press the <Completion mode> key to complete and exit the editing. After pressing the [RST] key, the setting appears.

(NOTE) The position and the blue gauge on the graph for <L7: Adjustment A> to <L9: Adjustment C> show the relationship with the standard mode. When comparing with a mode that is not the standard mode, the position on the graph and the relationship with the blue gauge may be different from the actual machining results.

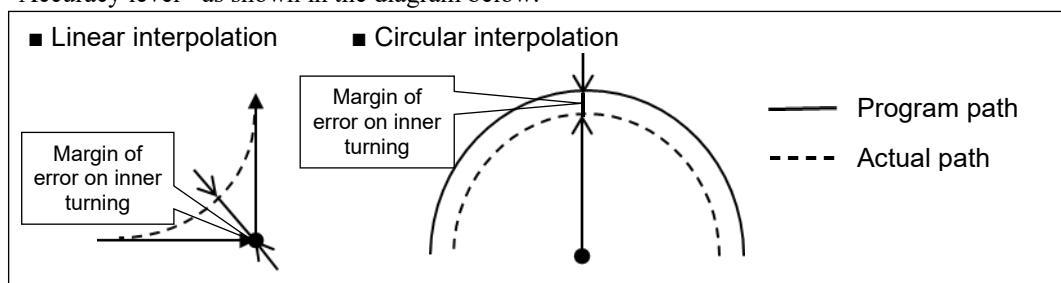
Restrictions

- Depending on the machining mode, the alarm <<The high-accuracy B is being executed>> may trigger and switching the dry run may be unavailable during cutting travel.
- Depending on the machining mode, if cutting travel is carried out in single operation mode, the alarm <<Command interrupted in high-accuracy mode B>> is triggered.
- Depending on the machining mode, the feed axis and the additional axis cannot be moved at the same time.
- M96 (interrupt type macro) cannot be used.
- When using a feedrate faster than 20,000 mm/min and the machining mode is changed, the alarm <<Feedrate error>> may trigger.
- When equipped with the option: high accuracy B/smooth path offset, the cycle time may become shorter and the machining surface may change slightly.
- The following restrictions apply when the smooth path offset function is enabled. Refer to “Chapter 13 (1) High-accuracy mode AIII” and “Chapter 13 (2) High-accuracy mode B” in the Programming Manual (NC) for further details on the smooth path offset function.
 - Block stop position in single operation mode is different from the program command position.
 - The mode cannot be changed.
 - The dry run cannot be changed.
 - A block that is cutting with the smooth path offset function cannot be specified as a block for resuming or restarting the program. If it is specified, the alarm <<Program restart error>> is triggered.
 - If the user parameter (high accuracy: common) <Smooth path offset cancel angle> is set too large, the alarm <<Curve speed error>> may be triggered.
 - The user parameter (high accuracy: high accuracy A/B) <Minute block deletion distance> does not apply to blocks where the smooth path offset function has been cancelled. However, this excludes when the user parameter (high accuracy: common) <Minute block deletion when smooth path offset is cancelled> is set to <1: Yes>.

(NOTE) When a function command is accidentally issued even though it is not available in the selected machining mode, the alarm <<Invalid command in machining mode>> is triggered.

6.2.5.3 High accuracy (accuracy specification mode) function

When using the <Accuracy spec. mode>, the machining automatically decelerates so that if a margin of error on inner turning, between the actual path and the programmed path, occurs when performing linear or circular interpolation, the difference is less than the value specified in the <Accuracy level> as shown in the diagram below.



There are 3 accuracy specification modes, and the default factory settings are as follows. The set value is a guide and cannot always be guaranteed to fall within the tolerance.

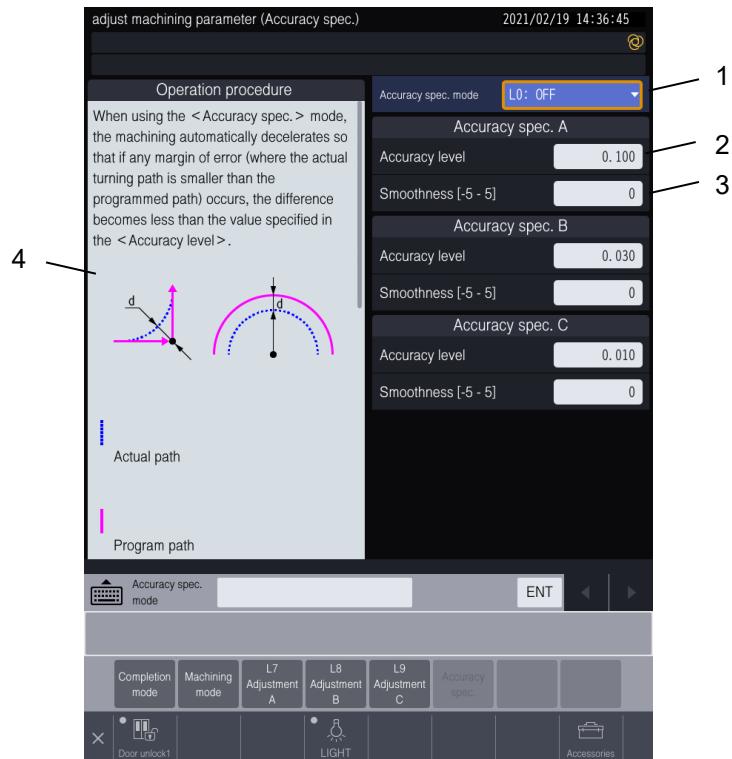
Accuracy specification mode	Description
Accuracy spec. A	Rough
Accuracy spec. B	Medium rough
Accuracy spec. C	Finishing

Usage

The following description is a setting procedure for <L21. Accuracy spec. A>.

The setting procedures for <L22. Accuracy spec. B> and <L23. Accuracy spec. C> are the same.

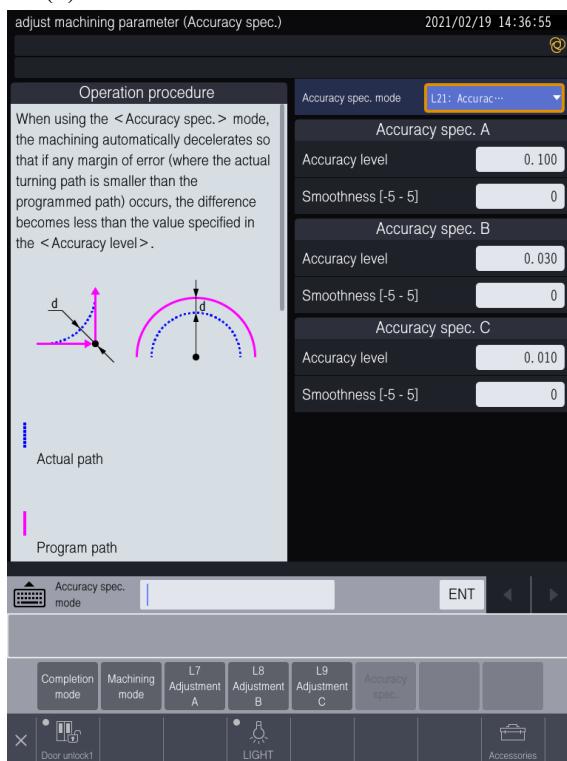
1. Open the <Machining parameter adjustment (accuracy specification)> screen.



Description of screen display

Position	Name	Description
1	Accuracy specification mode	Selects the desired accuracy specification mode from the displayed list.
2	Accuracy level	Enter the target accuracy in mm (setting units depends on the user parameter (switch 1: system) <Machine unit system>).
3	Smoothness	Sets the smoothness level. The higher the value is, the smoother the machining surface becomes.
4	Procedure guide	Displays a procedure guide for the machining mode setting.

2. Tap on the item <Accuracy spec. mode> and select <L21: Accuracy spec. A>. The <Accuracy spec. A> is the mode for rough machining in the default factory settings. To adjust the accuracy and machining time, change the accuracy level and the smoothness in steps (3) and (4).



3. Enter the target accuracy in units (setting units depends on the user parameter (switch 1: system) <Machine unit system>) of mm for the <Accuracy level>, and press the [ENT] key.
 4. Set the smoothness level in <Smoothness>. The higher the value is, the smoother the machining surface becomes.
 5. Press the <Completion mode> key to complete and exit the editing. After pressing the [RST] key, the setting appears.

Restrictions

- The feed axis and the additional axis cannot be moved at the same time while in accuracy specification mode.
- When equipped with the option: high accuracy mode B (Look ahead 1000 blocks, smooth path offset), the cycle time may become shorter and the machining surface may change slightly.
- M96 (interrupt type macro) cannot be used.
- The following restrictions apply when the smooth path offset function is enabled. The following restrictions apply when the smooth path offset function is enabled. Refer to “Chapter 13 (1) High-accuracy mode AIII” and “Chapter 13 (2) High-accuracy mode B” in the Programming Manual (NC) for further details on the smooth path offset function.
 - Block stop position in single operation mode is different from the program command position.
 - The mode cannot be changed.
 - The dry run cannot be changed.
 - A block that is cutting with the smooth path offset function cannot be specified as a block for resuming or restarting the program. If it is specified, the alarm <<Program restart error>> is triggered.
 - If the user parameter (high accuracy: common) <Smooth path offset cancel angle> is set too large, the alarm <<Curve speed error>> may be triggered.
 - The user parameter (high accuracy: high accuracy A/B) <Minute block deletion distance> does not apply to blocks where the smooth path offset function has been cancelled. However, this excludes when the user parameter (high accuracy: common) <Minute block deletion when smooth path offset is cancelled> is set to <1: Yes>.

(NOTE) When a function command is accidentally issued even though it is not available during accuracy specification mode, the alarm <<Invalid command in accuracy specification mode>> is triggered.

6.2.5.4 Description of function key

Position	Label	Description
(1)	<Completion mode>	Refer below.
(2)	<Machining mode>	Changes to the <Machining parameter adjustment (Machining mode)> screen.
(3)	<L7 adjustment A>	Changes to the <Machining parameter adjustment (L7 adjustment A)> screen.
(4)	<L8 adjustment B>	Changes to the <Machining parameter adjustment (L8 adjustment B)> screen.
(5)	<L9 adjustment C>	Changes to the <Machining parameter adjustment (L9 adjustment C)> screen.
(6)	<Accuracy specification>	Changes to the <Machining parameter adjustment (accuracy specification)> screen.
(7)		
(8)		

Description of keys in completion mode

Position	Label	Description
(1)	<Save and end>	Saves the edited content and closes the machining mode settings.
(2)		
(3)		
(4)	<Cancel w/o saving changes>	Discards the edited content and closes the machining mode settings.
(5)		
(6)		
(7)	<Overwrite save>	Saves the edited content and returns to editing.
(8)	<Cancel>	Returns to editing.

6

6.2.5.5 Mode selection using program command (NC language only)

Issue an M298 command in memory operation to set the machining mode or the accuracy specification mode.

Command format

M298 L

Issue a machining mode or an accuracy specification mode command by using the numerical values that come after the “L” (Refer to the table below).

L0 (OFF) is the setting that does not use high accuracy mode. The same is true when the <Machining mode> and <Accuracy spec. mode> are both <L0: OFF>.

L0	OFF
L1	Standard
L2	Rough
L3	Medium rough
L4	Medium rough S
L5	Finishing
L6	Finishing S
L7	Adjustment A
L8	Adjustment B
L9	Adjustment C
L21	Accuracy spec. A
L22	Accuracy spec. B
L23	Accuracy spec. C

(NOTE) If a command is issued when high accuracy mode A/B is ON, the alarm <<Unavailable modal for machining mode specification>> is triggered and operation stops.

Issuing an M299 command can cancel the machining mode that was initiated by the command M298.

Command format

M299

The M298 command is canceled regardless of the following operations.

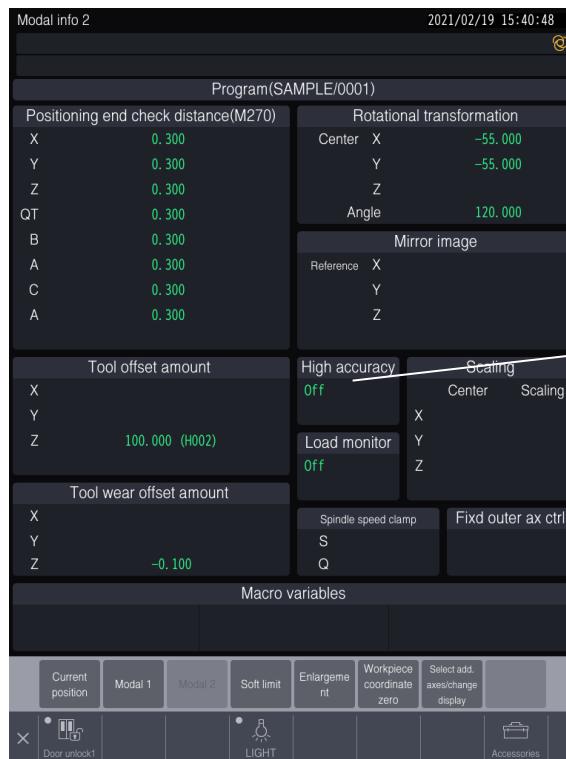
- If the power is turned ON
- If the **[RST]** key is pressed
- If an operation resets the memory operation such as pressing the **[Z. RTN]** key in manual operation mode
- If end of program (M02, M30) is executed

The following is an example of a program when <L1: Standard> is set for the <Machining mode>.

```
(Program example)
G00 X0 Y0 Z0;
;
G01 X20. Y30. Z50.; ← <L1:Std.> machining mode
X40. Y20. Z30.;
;
M260; ← High accuracy mode A (Level 1) ON
G01 X20. Y30. Z50.; ←
X40. Y20. Z30.;
M269; ← High accuracy mode A (Level 1) OFF
;
M298 L5; ← <L5:Finishing> machining mode ON
G01 X20. Y30. Z50.; ←
X40. Y20. Z30.;
M299; ← <L5Finishing> machining mode OFF
;
G01 X20. Y30. Z50.; ← <L1:Std.> machining mode
X40. Y20. Z30.;
;
M30;
```

6.2.5.6 Check Current Mode

The current status of the high accuracy mode (1 in figure) can be checked on the <Modal info 2> screen.



6

1

Status	Description
OFF	High accuracy mode is not be used.
Standard	The machine is operating in <L1:Standard> machine mode.
Rough	The machine is operating in <L2:Rough> machine mode.
Medium rough	The machine is operating in <L3:Medium rough> machine mode.
Medium rough S	The machine is operating in <L4:Medium rough S> machine mode.
Finishing	The machine is operating in <L5:Finishing> machine mode.
Finishing S	The machine is operating in <L6:Finishing S> machine mode.
Adjustment A	The machine is operating in <L7:Adjust. A> machine mode.
Adjustment B	The machine is operating in <L8:Adjust. B> machine mode.
Adjustment C	The machine is operating in <L9:Adjust. C> machine mode.
Accuracy spec. A	The machine is operating in accuracy specification mode: <L21:Accuracy spec. A>.
Accuracy spec. B	The machine is operating in accuracy specification mode: <L22:Accuracy spec. B>.
Accuracy spec. C	The machine is operating in accuracy specification mode: <L23:Accuracy spec. C>.
M260 to M267	The machine is operating in high accuracy mode A.
M280 to M287	The machine is operating in high accuracy mode B.

6.2.6 Shorten Cycle Time Settings

6.2.6.1 Overview

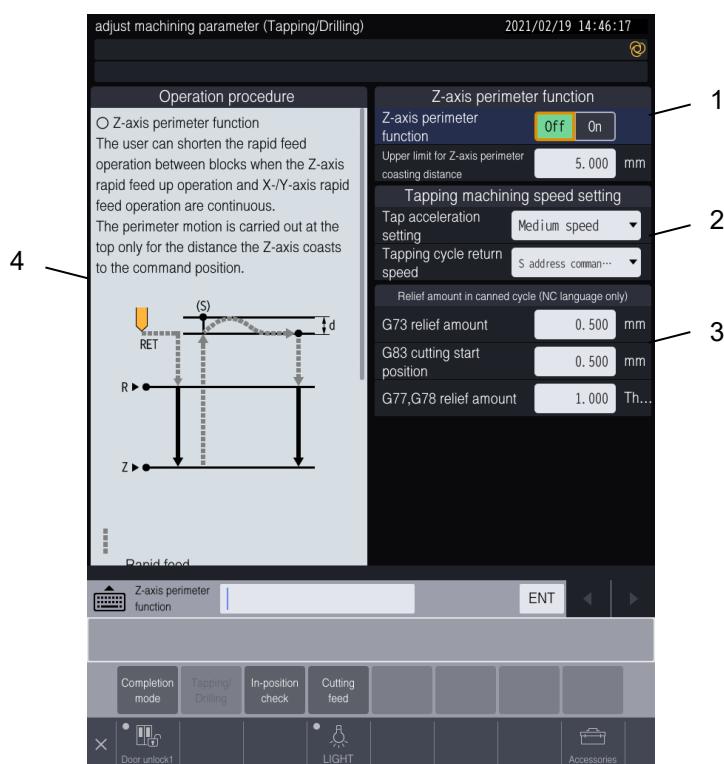
The shorten cycle time setting function can be used to shorten the cycle time by configuring the settings for the tapping/drilling operation, the in-position check operation or the cutting feed operation.

Any content that is edited here is reflected in the user parameters.

6.2.6.2 Machining parameter adjustment (tapping/drilling) screen

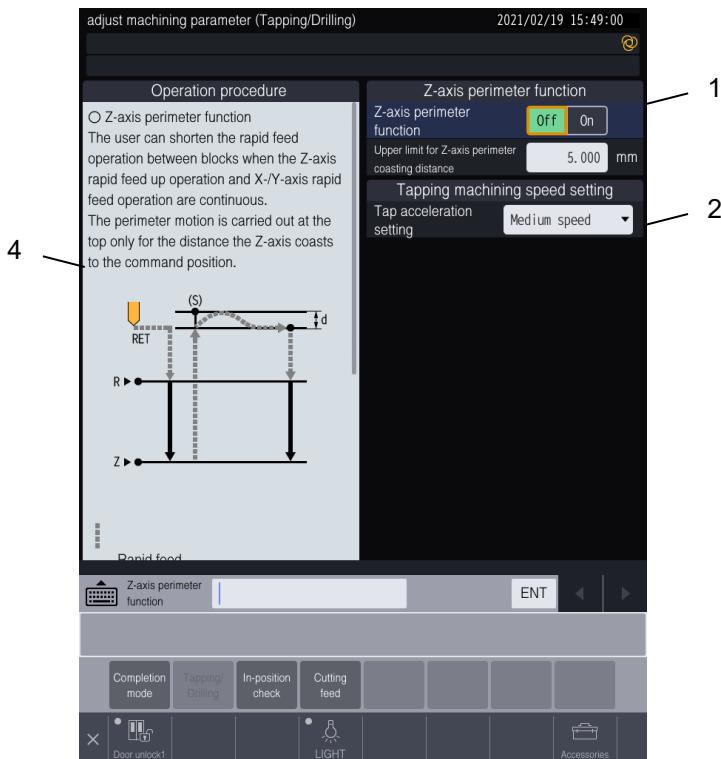
The user can set the parameters related to the tapping and drilling operations. Refer to the screen instructions or to “1.5 User parameter” in the Data Bank & Alarm Manual for further details.

(For NC language)



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(For conversation language)



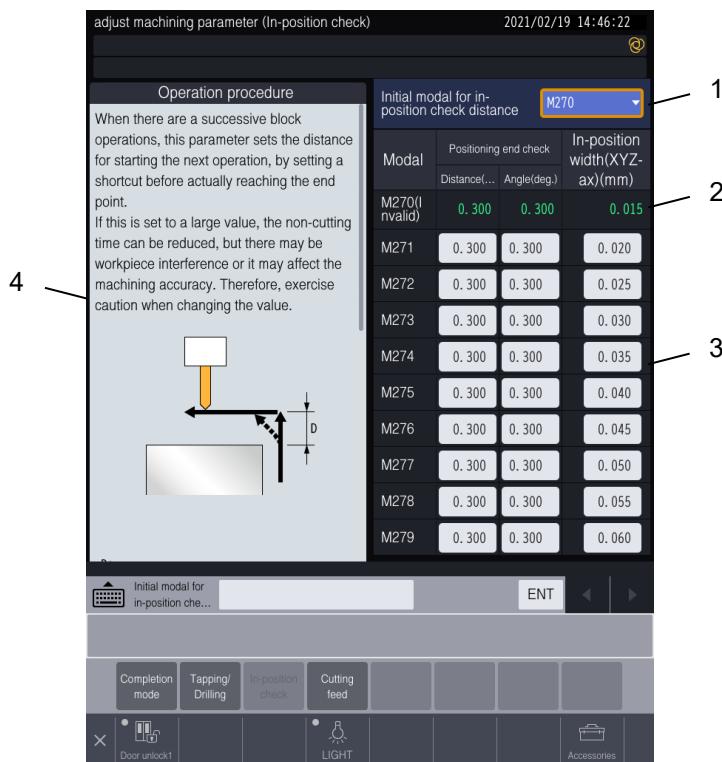
6

Description of screen display

Position	Name	Description
1	Z-axis perimeter function	Sets the Z-axis perimeter function.
2	Tapping machining speed setting	Configures the high speed setting for the tapping cycle.
3	Relief amount in canned cycle (NC language only)	Sets the relief amount and the cutting start position when performing drilling or tapping operations in a cancel cycle.
4	Procedure guide	Displays an explanation of each function.

6.2.6.3 Machining parameter adjustment (in-position check) screen

The user can set parameters related to the in-position check. Refer to the screen instructions or to “1.5 User parameter” in the Data Bank & Alarm Manual for further details.



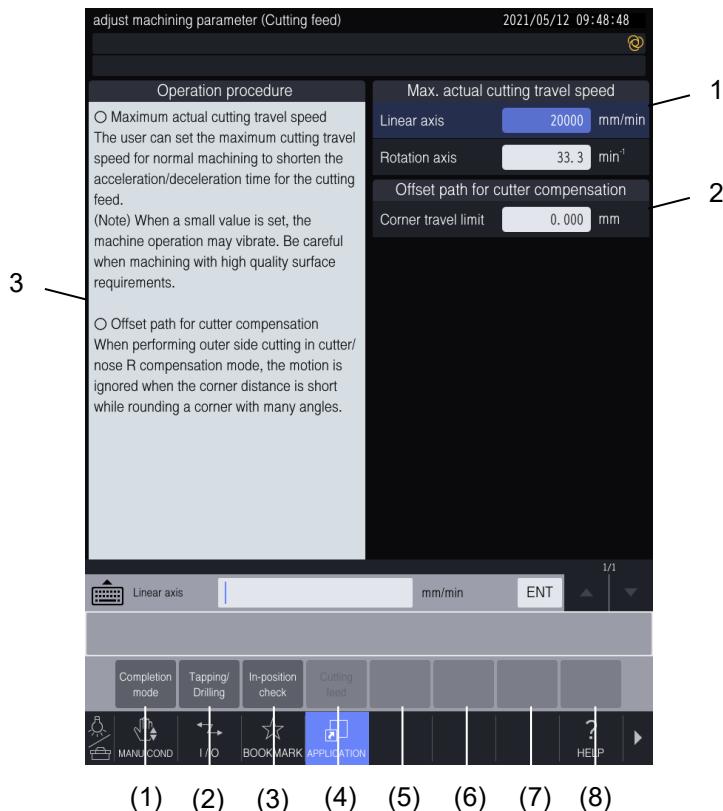
6

Description of screen display

Position	Name	Description
1	Initial modal for in-position check	Sets the modal for the in-position check distance.
2	Default value	Displays the default value for the in-position check distance.
3	In-position check distance setting	Sets the positioning end check distance, the positioning end check angle and the in-position width for each modal.
4	Procedure guide	Displays setting instructions for the in-position check distance.

6.2.6.4 Machining parameter adjustment (cutting feed) screen

The user can set parameters related to the cutting feed. Refer to the screen instructions or to “1.5 User parameter” in the Data Bank & Alarm Manual for further details.



6

(1) (2) (3) (4) (5) (6) (7) (8)

Description of screen display

Position	Name	Description
1	Maximum actual cutting travel speed	Sets the maximum cutting travel speed used for normal machining.
2	Corner travel limit	Configures the settings related to the offset path for the cutter compensation.
3	Procedure guide	Displays an explanation of each function.

6.2.6.5 Description of function key

Position	Label	Description
(1)	<Completion mode>	Refer below.
(2)	<Tapping/Drilling>	Changes to the <Machining parameter adjustment (tapping/drilling)> screen.
(3)	<In-position check>	Changes to the <Machining parameter adjustment (in-position check)> screen.
(4)	<Cutting feed>	Changes to the <Machining parameter adjustment (cutting feed)> screen.
(5)		
(6)		
(7)		
(8)		

Description of keys in completion mode

Position	Label	Description
(1)	<Save and end>	Saves the edited content and closes the shorten cycle time settings.
(2)		
(3)		
(4)	<Cancel w/o saving changes>	Discards the edited content and closes the shorten cycle time settings.
(5)		
(6)		
(7)	<Overwrite save>	Saves the edited content and returns to editing.
(8)	<Cancel>	Returns to editing.

6.3 ATC Tool

6.3.1 Overview

The support application (ATC tool) offers different functions related to the tool change operation, for example, registering a tool, referencing and editing tool data for tools registered to a magazine, tool life management and tool change support.

The support application (ATC tool) is broken into four basic screens.

1. <ATC tool (program settings)> screen
The user can register tools that are used in programs to magazines.
2. <ATC tool (set tool)> screen
The user can reference and edit tool data for tools registered to a magazine.
In addition, the user can register a given tool to a magazine.
3. <ATC tool (tool change operation settings)> screen
Sets the user parameters related to tool change operation.
4. <ATC tool (ATC monitoring function)> screen
Sets the user parameters related to the ATC monitoring function.

The user can also use the following tool change support functions and execute them in MDI operation mode at the <ATC tool (program settings)> or <ATC tool (set tool)> screen.

- Tool change position index for a magazine
- Spindle position index for a magazine
- X- and Y-axes travel during tool change (column travel machine model only (excluding R-series 40 magazine specification))

6

6.3.2 Types of Editable Data

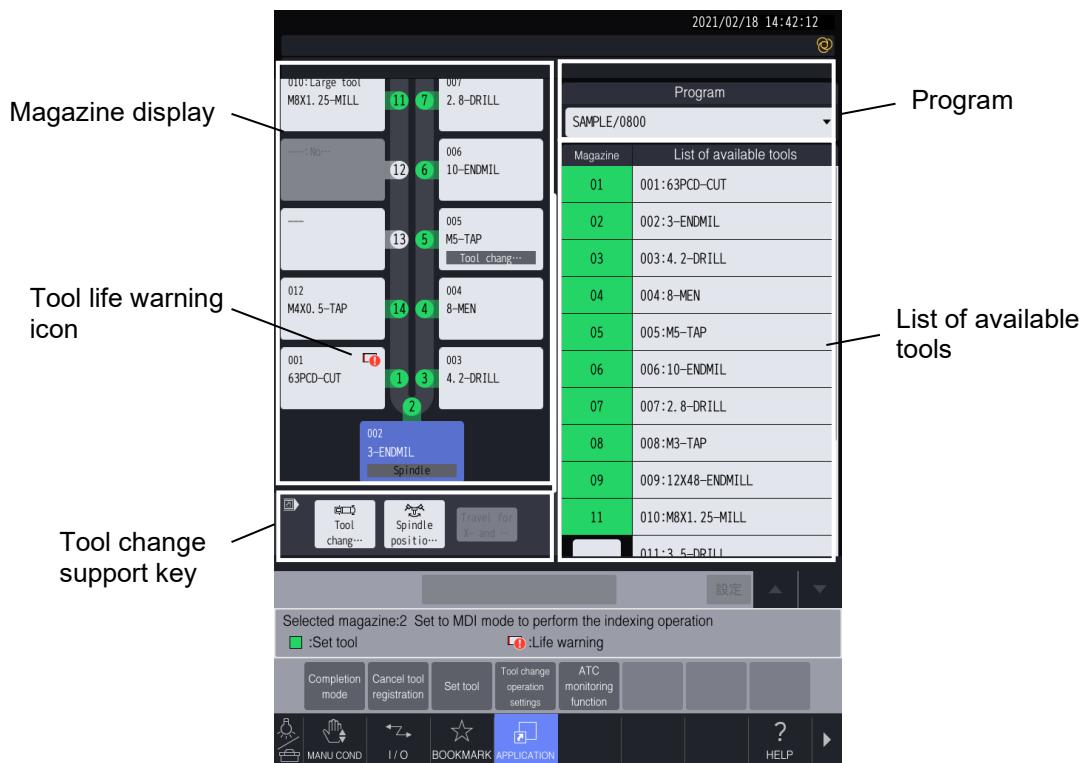
The following data can be edited in the support application (ATC tool).

- ATC tool data
- Tool data (NC language)
- Tool list (Conversation language)
- User parameters

6.3.3 Screen Layout & Description

6.3.3.1 ATC tool (program settings) screen

Tools required for running programs can be registered to the magazines.



6

Description of Screen

Magazine display

The magazine number as well as the tool number and tool name registered to that magazine are displayed. In addition, the following icon is displayed when the tool reaches its tool life warning.

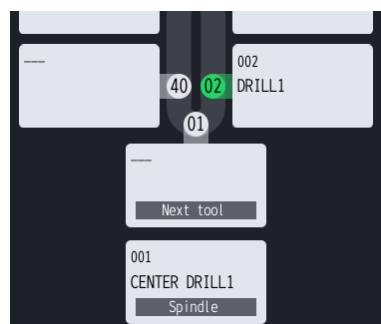


The magazine for the current spindle position is displayed on the bottom-most position. When the magazines rotate, the magazine for the spindle position is displayed again at the bottom-most position after the rotation operation is complete. The user can check all the magazines by scrolling up and down.

Magazine numbers are highlighted in green when they are registered to tools that are used in the currently selected program.

After tapping on a magazine display, the magazine becomes selected. The selected magazine number is displayed in the instructions area.

When a machine model equipped with an arm type ATC mechanism is used, the spindle is separated in the display as shown below.



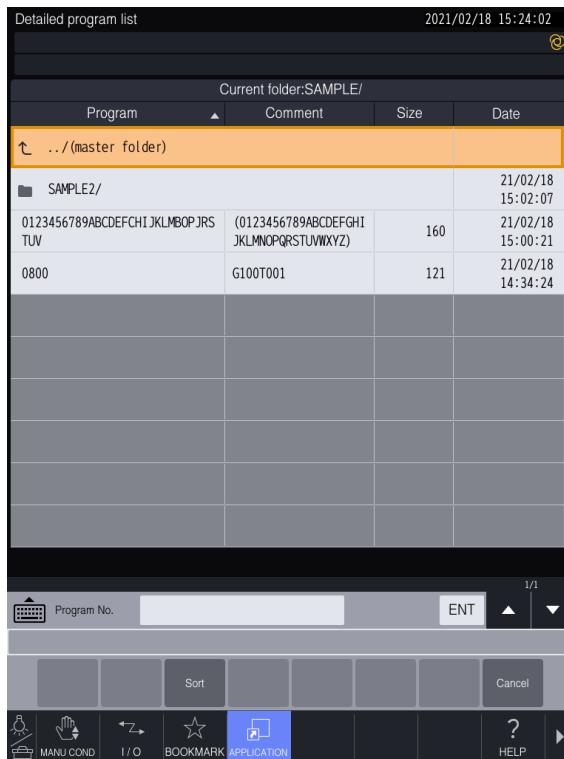
(NOTE) When changing the setting for the user parameter (switch 1: system) <Conversation/NC language change>, the tools which were set before the language change are displayed in red and cannot be used with the newly set language.

Program selection

The program name that is currently selected is displayed. To change a program, tap on the program to select it from the display list. The following items are displayed on the list.

- <Operation program>
- <Edit program>
- <Other programs>

When the <Other programs> is selected, the program list is displayed.



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(NOTE) When the user parameter (switch1: operation) <Select memory operation> is set to <1:Tape>, the program cannot be selected.

List of available tools

A list is displayed showing the tools required for operating the currently selected program. The order specified in the program is displayed. The magazine numbers for magazines registered to tools are highlighted in green.

Tool change support key

There are 3 keys: <Tool change position index>, <Spindle position index> and <Travel for X- and Y-axes enabled>. The <Travel for X- and Y-axes enabled> key is only displayed for column travel machine models (excluding the R-series 40 magazine specification).

These keys are enabled only in MDI operation mode when a magazine is selected for said operations. In the following situations, the keys are grayed out and cannot be selected.

- When not using MDI manual mode
- When an MDI program is running
- When automatic centering is operating
- When the machine is operating from another support application

Description of Function Key

Position	Label	Description
(1)	<Completion mode>	Refer below.
(2)	<Cancel tool registration>	Cancels the registration for a magazine with a registered tool, or cancels the registration for a tool that is registered to a magazine in the list of available tools. When not selected, the key is grayed out and cannot be pressed.
(3)	<Set tool>	If pressed when a magazine is selected, or when a tool that is registered to a magazine is selected, the screen changes to the <ATC tool (set tool)> screen. When not selected, the key is grayed out and cannot be pressed.
(4)		
(5)		
(6)		
(7)		
(8)		

Description of keys in end mode

Position	Label	Description
(1)	<Save and end>	Saves the registration information for an edited magazine and closes the support application.
(2)		
(3)		
(4)	<Undo editing and exit>	Discards the edited content and closes the support application.
(5)		
(6)		
(7)	<Overwrite save>	Overwrites and saves the registration information for an edited magazine and then returns to editing.
(8)	<Cancel>	Returns to editing.

Magazine Registration for Available Tool

There are 3 ways to register a tool to a magazine.

Selecting a magazine first

1. From the magazines on the left side of the screen, tap on the magazine where you wish to register the tool. Thereafter, that magazine becomes selected.
2. From the list of available tools on the right side of the screen, tap on a tool to register it to a magazine. After the tool is registered to the selected magazine, the selection becomes deselected.

Selecting a tool first

1. From the list of available tools on the right side of the screen, tap on a tool to register it to the magazine. Thereafter, the tool becomes selected.
2. From the magazines on the left side of the screen, tap on the magazine where you wish to register a tool. Thereafter, the selected tool is registered to the magazine and the selection becomes deselected.

After tapping on the selected magazine or tool once more, the selection becomes deselected.

Entering a magazine number directly

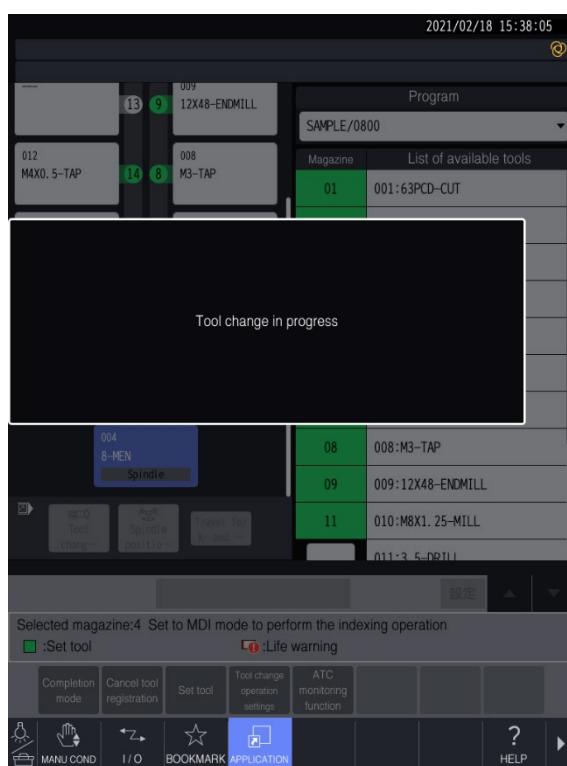
1. From the list of available tools, tap on a magazine number (blank field) for a tool that is not registered to a magazine to select that magazine.
2. After entering the magazine number you wish to register and pressing the [Enter] key, the tool becomes registered to the specified magazine and the selection becomes deselected.

If one of the registration operations above is used on a magazine that already has another registered tool, the alarm <<This magazine is already registered.>> is triggered and the tool will not register.

To re-register a another new tool, first, cancel the registration. Tap on the magazine to cancel the registration. After pressing the <Cancel tool registration> key, the registration is cancelled. Once the register and cancel operations are complete, the information is saved in completion mode.

A tool cannot be registered and the registration cannot be cancelled during memory and MDI operation modes. The screen can only be referenced.

A screen like the following is displayed during the tool change operation. Screen-tap operations are disabled for other areas besides the control key display area.

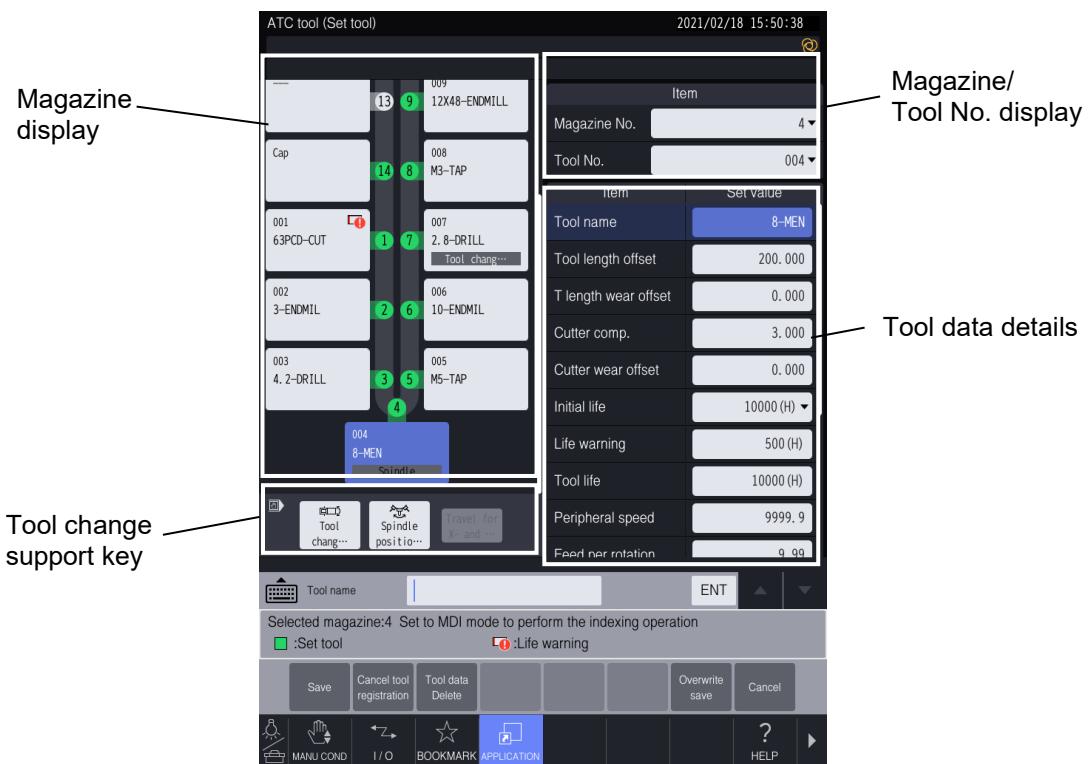


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- (NOTE 1) Even when the <Support application (ATC tool)> is set to an operation level where it can be used, if <ATC tool data> cannot be accessed, the editing operation is not available.
- (NOTE 2) Even if a screen operation is in progress, any value change that is transmitted or communicated will be saved. However, if the same magazine is edited via communication and through a screen operation, the edited value will be saved through the screen operation after pressing the <Save and end> key or the <Overwrite save> key.

6.3.3.2 ATC tool (set tool) screen

The user can reference and edit specific tool data for tools registered to a magazine, and the user can also register a given magazine to a tool.



6

Description of Screen

Magazine display

The display is the same as the program setting screen.

Magazine/Tool No. display

The selected magazine number is displayed in the field <Magazine No.>. Instead of tapping on the magazine display, the user can also specify the number to select a magazine.

The number of a tool registered to a selected magazine is displayed in the field <Tool No.>. To change the registration, select a tool number from the list or enter the number directly. The tool number and tool name are displayed in the list. To set a cap, select <0: Cap>.



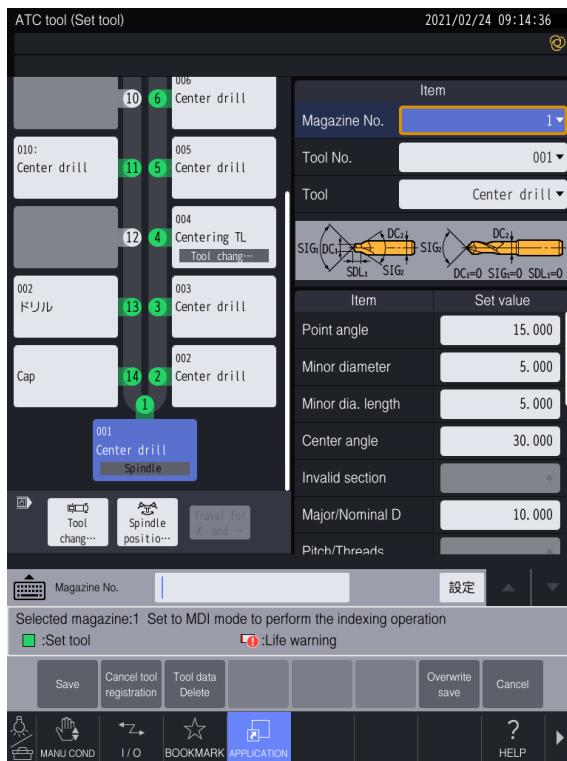
6

Tool data details

Specific tool data is displayed for the corresponding <Tool No.>. Each item can be selected and edited.

Refer to “1.3 Tool data (NC language)” in the Data Bank & Alarm Manual for further details on each display item.

When using conversation language, the screen display shows the user which item is currently being input.



Refer to “1.11 Tool list (conversation language)” in the Data Bank & Alarm Manual for further details on each display item.

- (NOTE 1) Even when the <Support app (ATC tool)> is set to an operation level where it can be used, if <ATC tool data> cannot be accessed, the operator message <<No operation is possible under the current level.>> is triggered and editing is not available. In addition if <Tool data> cannot be accessed, the operator message <<No operation is possible under the current level.>> is triggered and editing is not available. When <Tool list> operations are not possible, the same applies.
- (NOTE 2) When the edit screen is displayed and the data is changed using a function not on the screen, the values on the edit screen are updated in real time, or a message indicating a data change will appear outside of that edit window. Refer to “1.1 Data bank overview” in the Data Bank & Alarm Manual for further details.

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Tool change support key

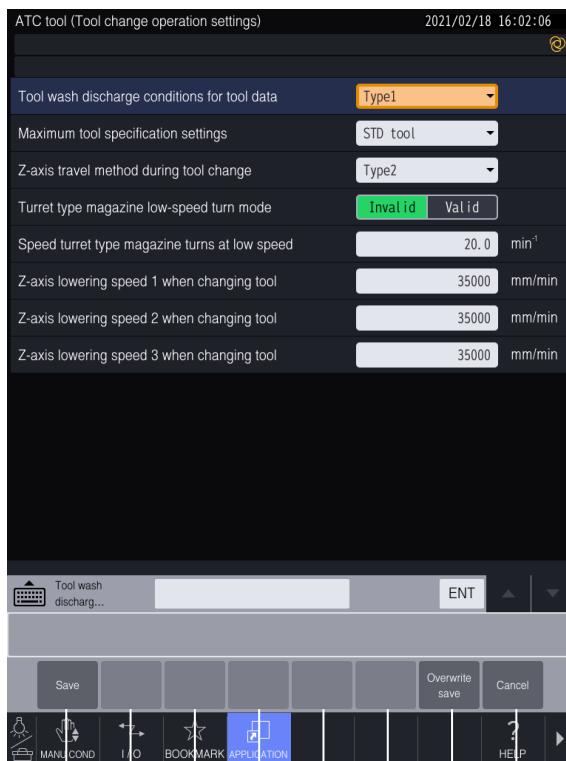
The display is the same as the program setting screen.

Description of function key

Position	Label	Description
(1)	<Save>	Saves the edited tool data and the registration information for the magazine. Then, the screen changes to the <ATC tool (program settings)> screen.
(2)	<Cancel tool registration>	Cancels the registration for a magazine with a registered tool, or cancels the registration for a tool that is registered to a magazine in the list of available tools.
(3)	<Delete tool data>	A pop-up screen is displayed to confirm whether to proceed with deleting the tool data in the current display. If <Yes> is selected, the selected tool data (about a single tool) is deleted.
(4)		
(5)		
(6)		
(7)	<Overwrite save>	Overwrites and saves the registration information for the edited tool data and magazine, and then returns to editing.
(8)	<Cancel>	A popup message is displayed to confirm whether to discard the edited content. If <Yes> is selected, the screen changes to the <ATC tool (program settings)> screen.

6.3.3.3 ATC tool (tool change operation settings) screen

Set the parameters related to the tool change operation. Any content that is edited here is reflected in the user parameters. Refer to “1.5 User parameters” in the Data Bank & Alarm Manual for further details.



(1) (2) (3) (4) (5) (6) (7) (8)

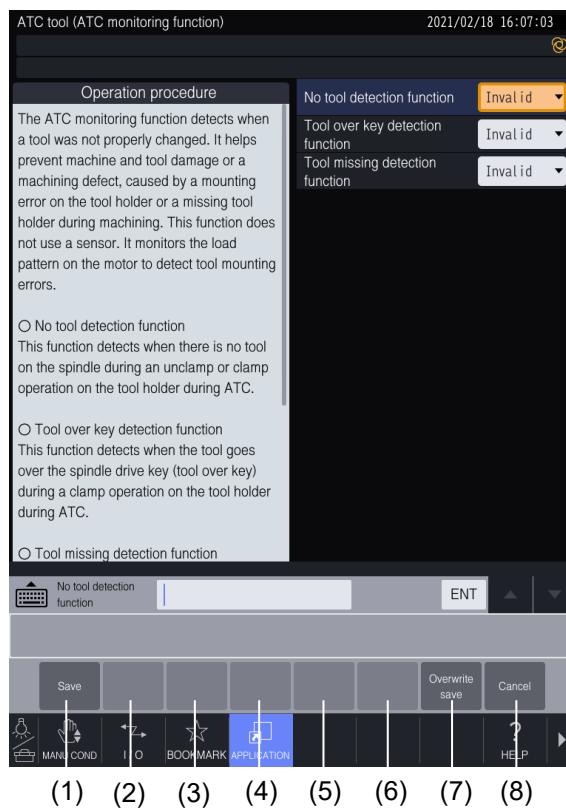
6

Description of function key

Position	Label	Description
(1)	<Save>	Saves the user parameters and changes to the <ATC tool (program settings)> screen.
(2)		
(3)		
(4)		
(5)		
(6)		
(7)	<Overwrite save>	Overwrites and saves the edited user parameters and then returns to editing.
(8)	<Cancel>	Changes to the <ATC tool (program settings)> screen.

6.3.3.4 ATC tool (ATC monitoring function) screen

The user can set the parameters related to the ATC monitoring function. Any content that is edited here is reflected in the user parameters. Refer to the screen instructions or to “Chapter 4 ATC monitoring function” in the Data Bank & Alarm Manual for further details.



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(NOTE) When the machine model is equipped an arm type ATC mechanism and the <ATC monitoring function> key is pressed, then the operator message <<There is no corresponding function.>> appears and the screen cannot be changed to the <ATC tool (ATC monitoring function)> screen.

Description of function key

Position	Label	Description
(1)	<Save>	Saves the user parameters and changes to the <ATC tool (program settings)> screen.
(2)		
(3)		
(4)		
(5)		
(6)		
(7)	<Overwrite save>	Overwrites and saves the edited user parameters and then returns to editing.
(8)	<Cancel>	Changes to the <ATC tool (program settings)> screen.

6.3.4 Tool Change Support Functions

The tool change support functions index the magazine tool change position, index the spindle position and move the X- and Y-axes during a tool change. The functions can be executed on the <ATC tool (program settings)> screen as well as the <ATC tool (set tool)> screen.

These functions are enabled only in MDI operation mode when a magazine is selected for said operations.

(NOTE) These functions cannot be executed while a door is open. Refer to the “Door interlock function” in Operation Manual I for details about the door status definitions.

6.3.4.1 Tool Change Position Index

The selected magazine or tool is indexed to the change position. The tool change position is set in the machine parameter (system 1: common) <Manual tool change position offset>, and it varies depending on the machine model.

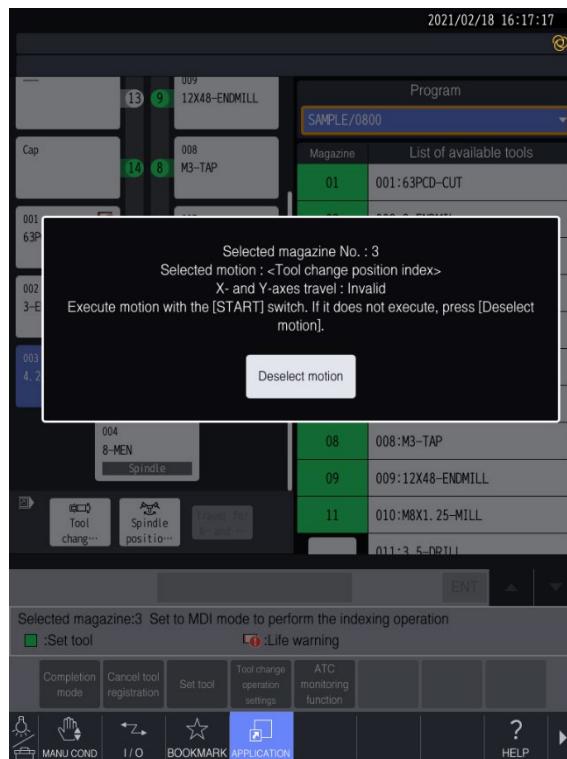
When specifying a magazine

Tap on a magazine on the left side of the screen, or enter a <Magazine No.> on the top-right of the <ATC tool (set tool)> screen to specify the magazine number that you wish to index at the tool change position.

When specifying a tool

In the tool list on the right side of the <ATC tool (program settings)> screen, when the user taps on a tool that is already registered to a magazine (tool highlighted in green in the magazine column), the magazine that is registered with the specified tool is selected.

The magazine that is selected above is highlighted in blue. After the <Tool change position index> key is pressed in this situation, a popup screen is displayed.

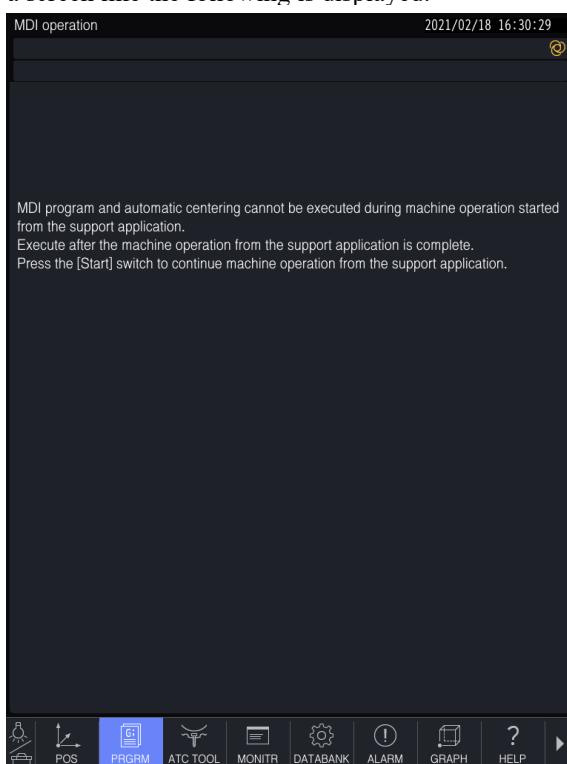


When the [START] switch is pressed while the popup screen is displayed, the selected magazine is indexed to the tool change position and the popup screen disappears. After pressing the <Deselect motion> key, the popup screen disappears and the <Tool change position index> key becomes deselected. When the [START] switch is pressed while deselected, the alarm <<Support application (ATC tool) motion deselected>> is triggered.

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After the <Tool change position index> key is selected (popup screen is displayed), if the user changes to another screen and the [START] switch is pressed, the tool change position is indexed. However, after the user changes to the <MDI operation> screen, <Automatic centering> screen, or the <Machining parameter adjustment (Weight estimate)> screen for the support application (machining parameter adjustment) and then the [START] switch is pressed, the machine starts operation following the last screen that was opened (support application (ATC tool), support application (tool life), <MDI operation>, <Automatic centering> and support application (machining parameter adjustment) - <Adjust machining parameter (Weight estimate)> screens).

- (NOTE 1) When the <Tool change position index> key is selected and one of the following operations is performed before pressing the [START] key, the <Tool change position index> key becomes deselected.
- When the <Deselect motion> is pressed
 - When changing to a mode that is not MDI operation mode
 - When changing to the <MDI operation> screen or the <Automatic centering> screen
 - When changing to the support application (tool life)
 - When changing to the <Machining parameter adjustment (Weight estimate)> screen for the support application (machining parameter adjustment)
 - When the power is turned OFF
- (NOTE 2) The mode cannot be changed while the tool change position is indexing. The alarm <<Machine is operating from support application (ATC tool)>> is triggered.
- (NOTE 3) When the <PRGRM> key is pressed while the tool change position is being indexed, a screen like the following is displayed.



After the tool change position is indexed, the screen goes back to the standard <MDI operation> screen and the <Automatic centering> screen display.

Operation details

(For turret type ATC machine model)

1. The Z axis raises to the Z-axis zero point and at the same time the spindle orientation is carried out.
2. When X- and Y-axes travel is enabled, the X- and Y-axes travel to (user parameter switch1: manual operation) <X-axis position when changing tool in manual mode> and <Y-axis position when changing tool in manual mode>.
3. The Z-axis raises to the ATC zero point.
4. The specified magazine is indexed to the tool change position, and the operation is completed. The magazine rotates using the shortest random access path.

If executed while the Z-axis is positioned at the Z-axis zero point, only spindle orientation is carried out for the operation in 1.

If executed while the Z-axis is positioned at the ATC zero point, the Z-axis operation is omitted. And, the only operations carried out are the X- and Y-axes travel and the magazine index.

(NOTE 1) When the operation is complete, the Z-axis does not lower to the Z-axis zero point. When the tool attachment is complete, change the mode to manual operation mode, press the [ATC] key and lower the Z-axis to the Z-axis zero point.

(NOTE 2) When the [FEED HOLD] switch is pressed during an operation step, the following operation is carried out.

When pressed during the operation in 1:

The raising Z-axis stops immediately. The spindle orientation is executed.

When pressed during the operation in 2:

The X- and Y-axes stop immediately.

When pressed during the operation in 3:

The Z-axis raises to the ATC zero point and stops. The magazine does not rotate.

When pressed during the operation in 4:

The magazine rotation does not stop.

(For arm type ATC machine model)

1. The specified magazine is indexed to the tool change position, and the operation is completed. The magazine rotates using the shortest random access path.

(NOTE 1) The magazine rotation does not stop even when the [FEED HOLD] switch is pressed during operation in 1.

(NOTE 2) The tool change position does not index for the spindle tool.

When operation is stopped by pressing the [FEED HOLD] switch, the operation can be restarted by pressing the [START] switch again. After pressing the [RST] key, if operation stops due to a stop level 2 alarm or higher, the popup display disappears and the <Tool change position index> key is deselected.

6.3.4.2 Spindle Position Index

The selected magazine or tool is indexed to the spindle position. The spindle position is not indexed for invalid pots and magazines set with caps. In addition, a spindle position index is not possible when changing a different size tool (replacing large tool with standard tool) on a machine model equipped with an arm type ATC. How to specify other magazines and other related notes are the same as the tool change position index.

Operation details

(For turret type ATC machine model)

1. The Z axis raises to the Z-axis zero point and at the same time the spindle orientation is carried out.
2. When X- and Y-axes travel is enabled, the X- and Y-axes travel to (user parameter switch1: manual operation) <X-axis position when changing tool in manual mode> and <Y-axis position when changing tool in manual mode>.
3. The Z-axis raises to the ATC zero point.
4. The specified magazine is indexed to the spindle position. The magazine rotates using the shortest random access path.
5. The Z-axis is lowered down to the Z-axis zero point and the operation is completed.

(NOTE) When the **[FEED HOLD]** switch is pressed during an operation step, the following operation is carried out.

When pressed during the operation in 1:

The raising Z-axis stops immediately. The spindle orientation is executed.

When pressed during the operation in 2:

The X- and Y-axes stop immediately.

When pressed during the operation in 3:

The Z-axis raises to the ATC zero point and stops. The magazine does not rotate.

When pressed during the operation in 4:

Magazine rotation does not stop and it is indexed to the spindle position. The Z-axis does not lower.

When pressed during the operation in 5:

The Z-axis lowers to the Z-axis zero point without stopping.

(For arm type ATC machine model)

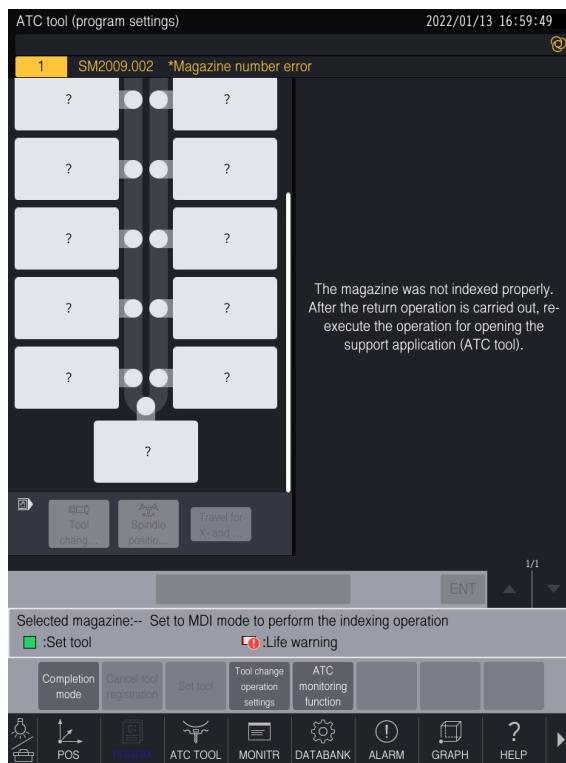
1. The Z axis travels to the ATC zero point and the spindle orientation is carried out. In addition, the magazine is indexed at the same time. After the indexing is complete, the pot shutter opens, and the standby pot for the next tool lowers. The magazine rotates using the shortest random access path.
2. The X- and Y-axes travel to the machine parameter (system 1: common) <X-axis ATC position> and <Y-axis ATC position>.
3. The arm rotates, moves vertically and the tool is changed.
4. Then, the pot raises, the X- and Y-axes travel to the machine zero point, and the Z-axis travels to the Z-axis zero point. After the pot raises, the pot shutter closes.

(NOTE) When the **[FEED HOLD]** switch is pressed during an operation step, it stops after the operation per step is completely finished.

When operation is stopped by pressing the **[FEED HOLD]** switch, the operation can be restarted by pressing the **[START]** switch again. After pressing the **[RST]** key, if operation stops due to a stop level 2 alarm or higher, the popup display disappears and the <Spindle position index> key is deselected.

6.3.5 Error Display

When the support application (ATC tool) is opened after the alarm <<Magazine number error>> is triggered, then a screen like the following is displayed.



6

It is not possible to register an ATC tool or edit tool data.

6.4 Tool Life

6.4.1 Overview

Displays the tool life data for tools registered to magazines. The user can check whether the tool life has expired or will soon expire on a tool, and the user can also initialize or reset the tool life for multiple tools all at once.

In addition, there are various tool change support functions in the same way as the ATC tool application. Refer to “6.3 ATC tools” for details about the tool change support function.

6.4.2 Types of Editable Data

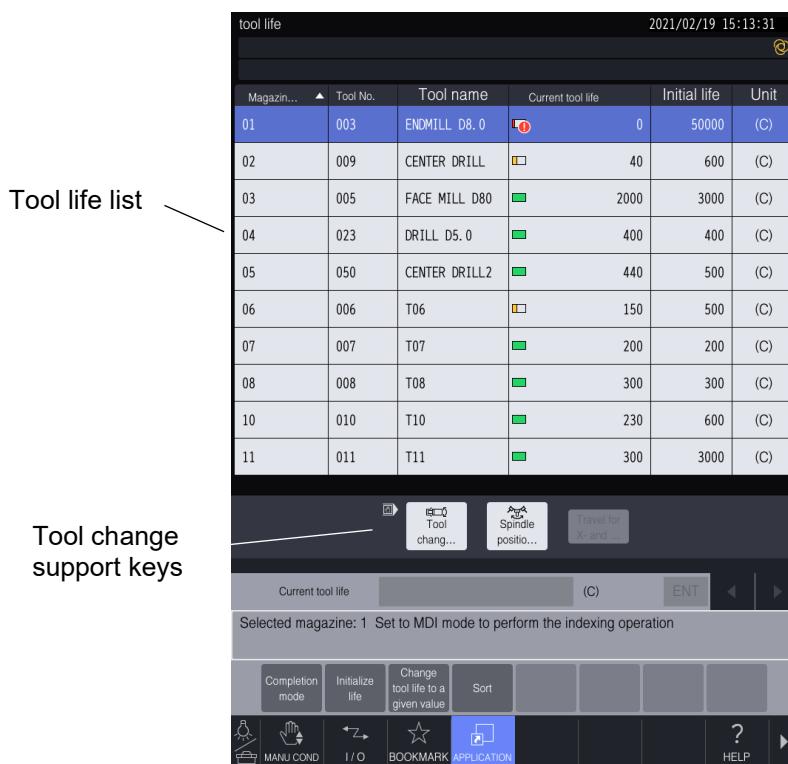
The following data can be edited in the tool life application.

- Tool data (NC language) (only tool life)
- Tool list (conversation language) (only tool life)

(NOTE) Even when the <Tool data> (or <Tool list>) is set to an operation level that is restricted, if the <Initialize ATC tool life> operation is available, then editing is possible.

6.4.3 Screen Layout & Description

6.4.3.1 Tool Life



6

Description of screen

- Tool life list

The tool number, the tool name, the current tool life, the initial tool life and the tool life unit are displayed for tools registered to a magazine. The display is updated in real time based on any tool changes or the tool life count.

If the user parameter <Tool life counting method> is set to <1:Type2> (count up method), the item <Initial life> is displayed as <End-of-life>.

When the display shows <End-of-life> and the <Change tool life display(Type2)> is set to <1:Display 2>, the remaining tool life value is displayed in the <Current tool life>.

In the <Current tool life> field, an icon is displayed and changes accordingly as the remaining tool life becomes shorter. As a result, the user can quickly reference and confirm the remaining tool life.

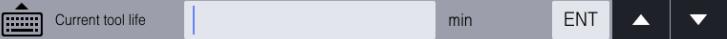
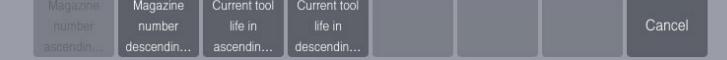
Remaining tool life	Long tool life → → Short tool life remaining			
Icon				

The display change conditions are the same as the color change conditions for the tool life on the home screen. Refer to “4.1 Home screen” in Operation Manual I for further details.

Move the cursor or use the tap operation to select a tool.

- Tool change support key
- Refer to “6.3 ATC tools” for further details.

Description of function key

Position	Label	Description
(1)	<Completion mode>	Refer below.
(2)	<Initialize life>	Initializes the <Current tool life> for the selected tool. When a tool is not selected, the key is grayed out and cannot be pressed.
(3)	<Change tool life to a given value>	Enables the user to enter a value for the <Current tool life>. When a tool is not selected, the key is grayed out and cannot be pressed.  Selected magazine: 3 Set to MDI mode to perform the indexing operation  <Cancel>: Cancels value input and goes back to the previous screen.
(4)	<Sort>	Re-organizes the tool life data. After this key is pressed, the function layout display changes.  <Magazine number ascending order>: Displays the magazine numbers starting from the smallest number. <Magazine number descending order>: Displays the magazine numbers starting from the largest number. <Current tool life in ascending order>: Displays the tool life starting from the smallest value. <Current tool life in descending order>: Displays the tool life starting from the largest value. <Cancel>: Cancels sorting and goes back to the previous screen.
(5)		
(6)		
(7)		
(8)		

Description of keys in completion mode

Position	Label	Description
(1)	<Save and end>	Saves the edited tool life and closes the support application.
(2)		
(3)		
(4)	<Undo editing and exit>	Discards the edited content and closes the support application.
(5)		
(6)		
(7)	<Overwrite save>	Overwrites and saves the registration information for an edited magazine and then returns to editing.

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Position	Label	Description
(8)	<Cancel>	Returns to editing.

Tool life initialization

There are two options available to initialize or reset the tool life, either set the initial default value registered in the tool data or set another given value.

Select the desired tool for initializing by moving the cursor or tapping on it. After pressing the <Initialize life> key, the value is set to the following depending on the parameter.

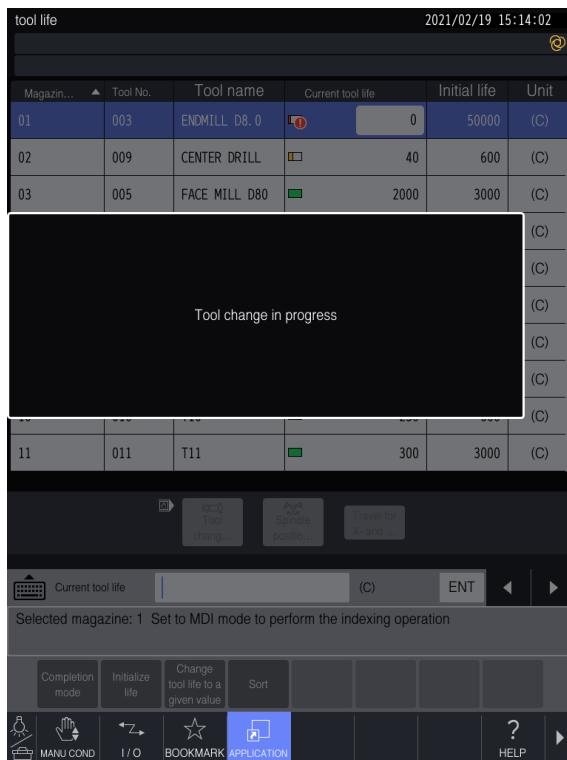
Parameter		Set value
<Tool life counting method>		<Change tool life display (Type2)>
<Type1> (Counting down method)		- <Initial life> value
<Type2> (Counting up method)		<0:Display 1> 0
		<1:Display 2> 0 (<End-of-life> value in display)

To set to a given value, move the cursor or tap on the line of the desired tool to select it. After pressing the <Change tool life to a given value>, the user can enter a value into the data input field. When a value is entered and the [ENT] key is pressed, the value entered to <Current tool life> is displayed. If the user does not press the [ENT] key and presses the <Cancel> key or taps on another line or moves the cursor up/down, then the operation is cancelled.

Magazin...	▲ Tool No.	Tool name	Current tool life	Initial life	Unit
01	003	ENDMILL D8.0	0	50000	(C)
02	009	CENTER DRILL	40	600	(C)

6

The tool life cannot be edited during memory and MDI operation modes. The screen can only be referenced. In addition, a screen like the following is displayed during the tool change operation. Screen-tap operations are disabled for other areas besides the control key display area.



Once the above operation is carried out on all the tools for initialization, the information is saved after pressing <Completion mode>.

(NOTE) When the edit screen is displayed and the data is changed using a function not on the screen, the values on the edit screen are updated in real time, or a message indicating a data change will appear outside of that edit window. Refer to "1.1 Data bank overview" in the Data Bank & Alarm Manual for further details.

6.5 Waveform Display

The signal status and servo information can be shown in real time in a graphical display.

6.5.1 Overview of Waveform Display Functions

The waveform display function shows 2 waveforms: the current waveform and the saved data waveform.

Current waveform...The waveform that is displayed shows the most recently measured waveform or the waveform being currently measured.

Saved data waveform...The saved waveform data is loaded and displayed.

Flow of operations for current waveform

1. Set the information to be measured on the <Waveform display (current waveform (set))> screen.
2. Start the measurement.
3. Stop the measurement.
4. Use zoom to adjust the waveform that is displayed on the waveform screen.
5. Save the measurement data as necessary.

Flow of operations for saved data waveform

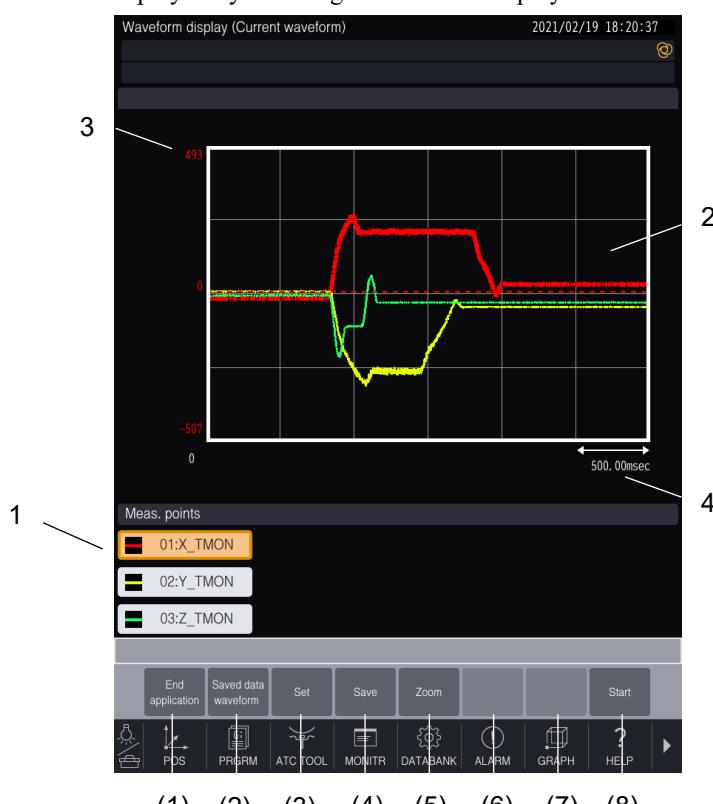
1. Select the waveform to be loaded from the <Waveform display (waveform of saved data (list))> screen.
2. Use zoom to adjust the waveform that is displayed on the <Waveform display (saved data waveform)> screen.
3. Save the data again as necessary.

6.5.2 Current Waveform

The following describes the screen that displays the most recently measured waveform or the waveform being currently measured.

6.5.2.1 Current Waveform Screen

This screen is displayed by selecting <Waveform display> from the <Input/output menu> screen.



Position	Name	Description
1	Measurement points	This is a type of measurement point. A measurement point can be selected by tapping on the type of measurement point, or by entering a number key. The user can select measurement point 1 with the [1] key. In the same way, the user can select measurement points 2 through 9 with the corresponding keys ([2] to [9]). In addition, the user can select measurement point 10 with the [0] key.
2	Measurement waveform display range	The measured waveform is displayed. The waveform that is selected is displayed in bold. The waveform can be controlled by using a tap operation. Refer to “6.5.2.3 Adjusting waveforms (zoom)” for further details.
3	Vertical axis scale	This is the vertical axis scale for the measurement points that are selected. If the measurement type is a signal, then this item is not displayed. 0 values for measurement points that are selected are displayed by a dotted line.
4	Time axis scale	This is a time axis scale. 0 values for time are displayed by a dotted line.

Function key display area

Column	Position	Label	Description
1	(1)	<End application>	Closes the support application
	(2)	<Saved data waveform>	Displays screen that shows the waveform saved internally. The selection setting <1: Memory card> for <Select save location> is not available. This cannot be selected during a measurement.
	(3)	<Set>	Sets the measurement parameters. This cannot be selected during a measurement.
	(4)	<Save> <Save/Log>	<Save> is displayed only when <0: Internal> is set for <Select save location>. The measured data is saved internally. This cannot be selected during a measurement. <Save/Log> is displayed only when <1: Memory card> is set for <Select save location>. The measured data is saved to the memory card. In addition, the key changes the file name that is saved to the memory card. This cannot be selected during a measurement.
	(5)	<Zoom>	Zooms in/out on the displayed wave. This cannot be selected during a measurement.
	(6)		
	(7)		
	(8)	<Start> <Stop>	Starts and stops the measurement.

6.5.2.2 Starting/Stopping Measurement

There are two methods for the start and stop trigger when taking measurement data sampling: one method uses M code to specify the start and stop during an operation program, and one method uses the function key on the waveform display screen to specify the start and stop. However, the same method does not need to be used to start and stop the measurement. For example, M code can be used to start the measurement and the function key can be used to stop it. In addition, the sampling can be stopped using a special signal trigger as well. Refer to “6.5.4.1 Common parameters settings” for further details.

Using M code

Execute “M238” while in memory operation mode (conversation/NC) or MDI operation mode to start sampling.

Similarly, use “M239” to stop sampling.

Using the function key

Press the <Start> key on the <Waveform display (current waveform)> screen to start sampling. After sampling starts, the key changes to <Stop>.

Press the <Stop> key to stop the sampling.

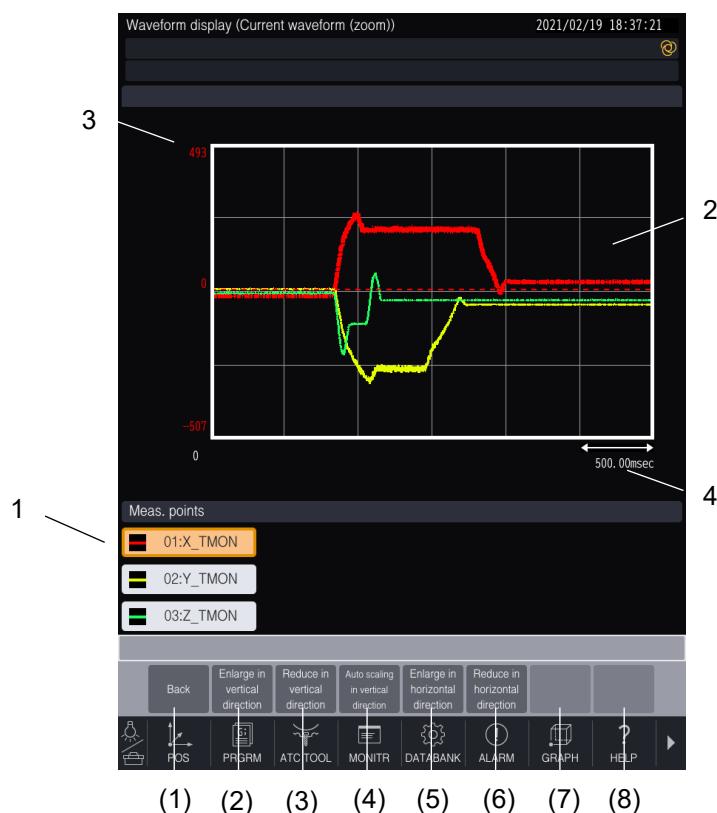
6.5.2.3 Adjusting Waveforms (Zoom)

Press the <Zoom> key on the <Waveform display (current waveform)> screen to display the <Waveform display (current waveform (zoom))> screen.

The display for the measurement points that are selected on the <Waveform display (current waveform)> screen can be adjusted using the cursor.

Note that the user can tap on the type of measurement points or use the number keys to select the measurement points from the <Waveform display (current waveform (zoom))> screen as well.

However, the user cannot zoom in/out or adjust the position using a tap operation in the <Measurement waveform display range> while a measurement is in progress.



Position	Name	Description
1	Measurement points	This is a type of measurement point. A measurement point can be selected by tapping on the type of measurement point, or by entering a number key. The user can select measurement point 1 with the [1] key. In the same way, the user can select measurement points 2 through 9 with the corresponding keys ([2] to [9]). In addition, the user can select measurement point 10 with the [0] key.
2	Measurement waveform display range	The measured waveform is displayed. The waveform that is selected is displayed in bold. The waveform can be controlled by using touch (tap with finger) and key operations. Refer to "6.5.2.3 Adjusting waveforms (zoom)" for further details.
3	Vertical axis scale	This is the vertical axis scale for the measurement points that are selected. If the measurement type is a signal, then this item is not displayed. 0 values for measurement points that are selected are displayed by a dotted line.
4	Time axis scale	This is a time axis scale. 0 values for time are displayed by a dotted line.

Function key display area

Column	Position	Label	Description
1	(1)	<Back>	Changes to the <Waveform display (current waveform)> screen.
	(2)	<Enlarge in vertical direction>	Expands the display of the waveform in a vertical direction.
	(3)	<Reduce in vertical direction>	Shrinks the display of the waveform in a vertical direction.
	(4)	<Auto scaling in vertical direction>	Automatically adjusts the size of the waveform in a vertical direction.
	(5)	<Enlarge in horizontal direction>	Expands the display of the waveform in a horizontal direction.
	(6)	<Reduce in horizontal direction>	Shrinks the display of the waveform in a horizontal direction.
	(7)		
	(8)		

Zoom screen operations

1. Enlarging and reducing in a vertical direction
 - (1) The waveform for the measurement points that are selected are displayed in bold.
 - (2) Press the <Enlarge in vertical direction> key to extend the waveform in a vertical direction. At this time, the numerical value that is displayed on the vertical axis changes at the same time as the waveform display.
 - (3) Press the <Reduce in vertical direction> key to reduce the waveform in a vertical direction. At this time, the numerical value that is displayed on the vertical axis changes at the same time as the waveform display.
 - (4) Press the <Auto scaling in vertical direction> key to automatically scale the width in a vertical direction for the waveform. At this time, the numerical value that is displayed on the vertical axis changes at the same time as the waveform display.

Note that the auto scaling uses the maximum and minimum values from the start of the measurement until it is stopped.

 - * If the <Auto scaling in vertical direction> key is pressed when the waveform has been adjusted using the up and down keys, the auto scaling is performed, and at the same time, the waveform moves to the center position after the auto scale operation.
- (5) Press the <Back> key to return to the previous screen.
2. Enlarging and reducing in a horizontal direction
 - (1) The waveform for the measurement points that are selected are displayed in bold.
 - (2) Press the <Enlarge in horizontal direction> key or use the pinch-in operation (with your fingers) in a horizontal direction on the <Measurement waveform display range> in order to extend the waveform in a horizontal direction. At this time, the numerical value that is displayed on the horizontal axis changes at the same time as the waveform display.
 - (3) Press the <Reduce in horizontal direction> key or use the pinch-in operation (with your fingers) in a horizontal direction on the <Measurement waveform display range> in order to shrink the waveform in a horizontal direction. At this time, the numerical value that is displayed on the horizontal axis changes at the same time as the waveform display.
 - (4) Press the <Back> key to return to the previous screen.

(NOTE) As opposed to the vertical direction, here the operations also effect the waveform even where the measurement points have not been selected. The displayed scale in the horizontal direction is also used in each measurement point.

3. Position adjustment (Up/down)
 - (1) The waveform for the measurement points that are selected are displayed in bold.
 - (2) Press the [CURSOR ↑] and [CURSOR ↓] keys or drag the <Measurement waveform display range> up/down to move the waveform up and down. At this time, the numerical value that is displayed on the vertical axis changes at the same time as the waveform display.
 - (3) Press the <Back> key to return to the previous screen.

4. Position adjustment (Left/right)
 - (1) The waveform for the measurement points that are selected are displayed in bold.
 - (2) Press the **[CURSOR ←]** and **[CURSOR →]** keys or drag the <Measurement waveform display range> left/right to move the waveform left and right.
 - (3) Press the <Back> key to return to the previous screen.

6.5.2.4 Save (Internal)

This operation is used to <Select save location> as <0: Internal>.

The measured data can be saved internally.

1. Press the <Save> key on the <Waveform display (current waveform)> screen to display the <Waveform display (current waveform (save))> screen.
A list is displayed for the waveform data that is saved.

Position	Name	Description
1	Current waveform (save)	Displays the number, size, comment and date of the waveform that is saved.
2	Data input field	The user can enter a comment for the waveform that is saved.

Function key display area

Column	Position	Label	Description
1	(1)	<Register>	Saves the waveform.
	(2)	<Cancel>	Cancels the save operation.
	(3)		
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

2. Enter the number that you wish to save, or use the cursor and press the [ENT] key.
 3. The data input field changes to a comment field. Enter a comment and press the <Register> key to save the waveform.
 4. After the data is saved, the screen automatically returns to the previous screen.

- (NOTE 1) This operation can only be carried out when the measurement has not been performed. The <Save> key cannot be pressed during a measurement.

(NOTE 2) 1 through 9999 can be selected for saving data.

(NOTE 3) The saved data also includes the scale and parameter information that is currently displayed.

(NOTE 4) Press the <Cancel> key to return to the previous waveform display screen without saving the data.

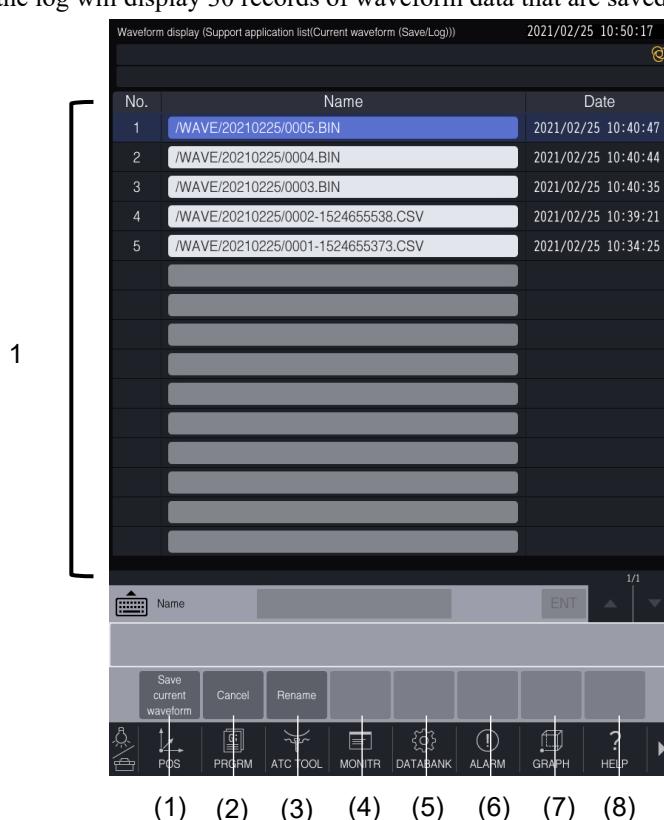
6.5.2.5 Save/Log (Memory Card)

This operation is used to <Select save location> as <1: Memory card>. The measured data can be saved to the memory card. In addition, the file name for the waveform data saved to the memory card can be changed.

Save

The measured data can be saved to the memory card.

1. Press the <Save/Log> key on the <Waveform display (current waveform)> screen to display the <Waveform display (current waveform (save/log))> screen. (After the power is turned ON, the log will display 30 records of waveform data that are saved.)



Position	Name	Description
1	Current waveform (Save/Log)	Displays the number, name and date of the current waveform data that is saved after turning ON the power.

Function key display area

Column	Position	Label	Description
1	(1)	<Save current waveform>	Saves the waveform.
	(2)	<Cancel>	Cancels the save operation.
	(3)	<Rename>	Changes the file name for the waveform data saved to the memory card.
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

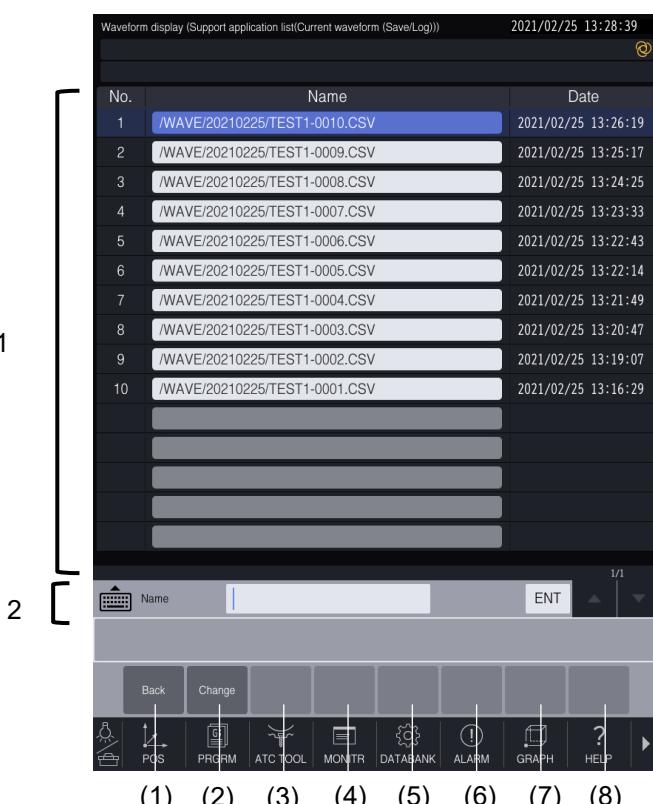
2. Press the <Save current waveform> key to save the waveform.
3. After the data is saved, the screen automatically returns to the previous screen.

- (NOTE 1) The items displayed are part of the log and do not display what is in the memory card.
- (NOTE 2) The waveform cannot be saved to the memory card in the following situations.
- When measurement is in progress (The <Save/Log> key cannot be pressed during a measurement.)
 - When the memory card cannot be recognized
 - When the memory card is being accessed by another function
 - When the available space on the memory card is not enough
- (NOTE 3) The folder: “WAVE\yyyymmdd” (yyy: year, mm: month, dd: day) is automatically created in the memory card and the data is saved inside that folder.
- (NOTE 4) The file name for the saved data is output as “<Specify character string assigned to file output to memory card>-(Sequence number).(Extension)” or just as “(Sequence number).(Extension)”.
- Refer to “6.5.6 File name for memory card output” for further details.
- (NOTE 5) Press the <Cancel> key to return to the <Waveform display (current waveform)> screen without saving the data.

Change file name

The file name for the waveform data saved to the memory card can be changed.

1. Press the <Save/Log> key on the <Waveform display (current waveform)> screen to display the <Waveform display (current waveform (save/log))> screen. (The log will display 30 records of waveform data that have been previously saved.)
2. After pressing the <Rename> key on the <Waveform display (current waveform (save/log))> screen, the cursor and data input field to change the filename are displayed.



(1) (2) (3) (4) (5) (6) (7) (8)

Position	Name	Description
1	Change current waveform (Save/Log) file name	Displays the number, name and date of the current waveform data that is saved after turning ON the power.
2	Data input field	Enter the desired name to set the waveform.

Function key display area

Column	Position	Label	Description
1	(1)	<Back>	Saves the waveform.
	(2)	<Change>	Changes the waveform file name to the desired name.
	(3)		
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

3. Move the cursor to the file to be changed.
4. Enter the file name to be saved, and press the <Change> key. The following characters can be used for the file name: “0 to 9”, “A to Z” and “() –”. The file name has a maximum of 32 characters. The entire file name can be changed except for the extension.
5. If the change is acceptable, the file name is updated and changed.

(NOTE 1) The items displayed are part of the log and do not display what is in the memory card.

(NOTE 2) The file name cannot be changed in the following situations.

- When measurement is in progress (The <Save/Log> key cannot be pressed during a measurement.)
- When the memory card cannot be recognized
- When the memory card is being accessed by another function
- When another file with the same name is already inside the folder
- When the corresponding file is not found inside the folder
- When invalid characters are used to rename the file

(NOTE 3) Press the <Back> key to return to the <Waveform display (current waveform (save/log)> screen.

(NOTE 4) This list is the log for measurement data that is saved. When connecting a separate memory card, the file with the same name specified in the log is changed. In addition, the alarm <<Required data not found>> is triggered when the specified file with same name is not found in the log.

6.5.2.6 Measurement Parameter Settings

Press the [ENT] key on the <Waveform display (current waveform)> screen to display the <Waveform display (current waveform (set))> screen.

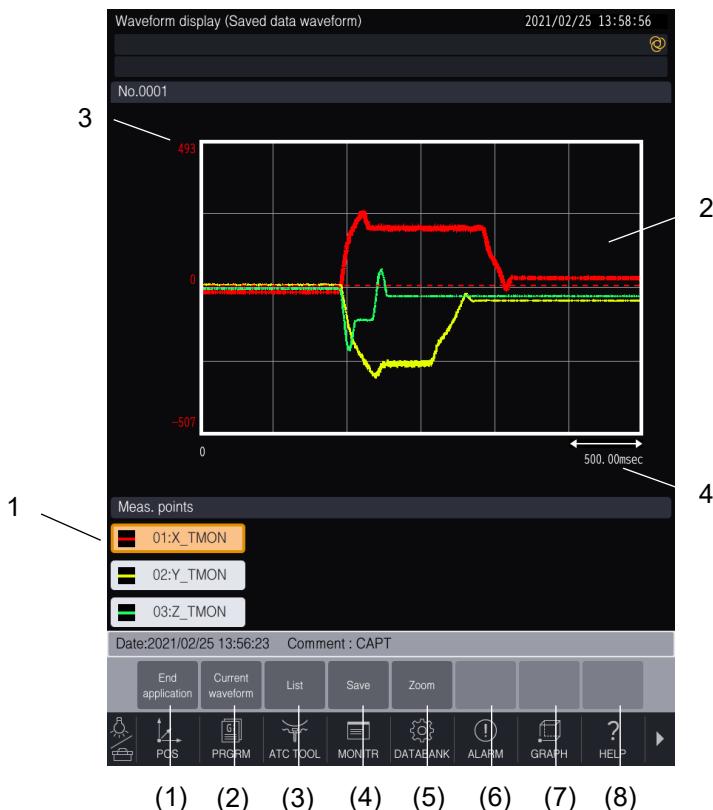
Refer to “6.5.4 Parameters” for further details on the parameters.

6.5.3 Saved Data Waveform

The following describes the screen that displays the waveform data saved internally. This operation can be used only when <Select save location> is set to <0: Internal>.

6.5.3.1 Saved Data Waveform Screen

This screen is displayed when the <Saved data waveform> key is selected on the <Waveform display (current waveform)> screen.



Position	Name	Description
1	Measurement points	This is a type of measurement point. A measurement point can be selected by tapping on the type of measurement point, or by entering a number key. The user can select measurement point 1 with the [1] key. In the same way, the user can select measurement points 2 through 9 with the corresponding keys ([2] to [9]). In addition, the user can select measurement point 10 with the [0] key.
2	Measurement waveform display range	The measured waveform is displayed. The waveform that is selected is displayed in bold. The waveform can be controlled by using a tap operation. Refer to “6.5.2.3 Adjusting waveforms (zoom)” for further details.
3	Vertical axis scale	This is the vertical axis scale for the measurement points that are selected. If the measurement type is a signal, then this item is not displayed. 0 values for measurement points that are selected are displayed by a dotted line.
4	Time axis scale	This is a time axis scale. 0 values for time are displayed by a dotted line.

Function key display area

Column	Position	Label	Description
1	(1)	<End application>	Changes to the original screen before opening the application. * If a shortcut from the <Home> screen is used to open an application, then the screen changes to the <Home> screen (original screen). If the application is opened from the <Support application list> screen, then the screen changes to the <Support application list> screen (original screen).
	(2)	<Current waveform>	Displays the current waveform.
	(3)	<List>	Displays a list of the waveform data that is saved.
	(4)	<Save>	Changes the data that is displayed to a number and saves the data.
	(5)	<Zoom>	Zooms in/out on the displayed wave.
	(6)		
	(7)		
	(8)		

6.5.3.2 Loading Saved Data

The data that is saved internally can be loaded to display the waveform and numerical values.

1. Press the <List> key on the <Waveform display (saved data waveform)> screen to display the <Waveform display (saved data waveform (list))> screen.

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Position	Name	Description
1	Waveform of saved data (list)	Displays the number, size, comment and date of the waveform that is saved.
2	Data input field	The user can enter a number for reading or loading a waveform.

Function key display area

Column	Position	Label	Description
1	(1)	<Read>	Reads the waveform and loads it onto the display.
	(2)	<Cancel>	Cancels the read operation and returns to the <Waveform display (saved data waveform)> screen.
	(3)	<Sort>	Re-organizes the saved data.
	(4)		
	(5)	<Clear>	Deletes or clears the saved data that is selected.
	(6)		
	(7)		
	(8)	<All clear>	Deletes or clears all the saved data.

2. Enter a number or use the cursor, and press the [ENT] key or the <Read> key.
3. The data is loaded and the information is displayed.

6.5.3.3 Cancel

Press the <Cancel> key to return to the <Waveform display (saved data waveform)> screen.

6.5.3.4 Sort

Press the <Sort> key to sort the order of the saved data. The confirmation message <Select the sort order.> is displayed in the instructions area.

- <Storage num. in ascending order> : Displays the saved numbers starting from the smallest number.
 <Storage num. in descending order> : Displays the saved numbers starting from the largest number.
 <Date (ascending)> : Displays starting from the data with the oldest date.
 <Date (descending)> : Displays starting from the data with the most recent date.
 <Comment (ascending)> : Displays in alphabetical order using the comment character string.
 <Comment (descending)> : Displays in reverse alphabetical order using the comment character string.
 <Cancel> : Cancels the sort operation and returns to the previous function.

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6.5.3.5 Delete Save Data

The data saved internally can be deleted.

1. Press the <List> key on the <Waveform display (saved data waveform)> screen to display the <Waveform display (saved data waveform (list))> screen.
2. Enter a number or use the cursor, and press the <Clear> key.
3. The confirmation message <Delete?> is displayed.

Pressing the <Yes> key deletes the saved data, and it stays at the same screen.

Pressing the <No> key cancels the delete operation, and it stays at the same screen.

6.5.3.6 Delete All Saved Data

All the data saved internally can be deleted.

1. Press the <List> key on the <Waveform display (saved data waveform)> screen to display the <Waveform display (saved data waveform (list))> screen.
2. Press the <All clear> key.
3. The confirmation message <Delete all?> is displayed.

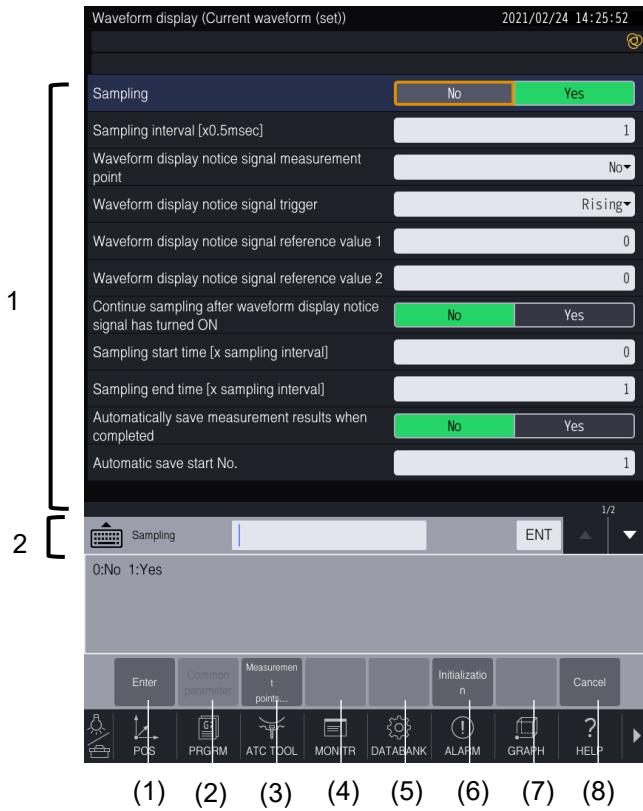
Pressing the <Yes> key deletes all saved data, and it stays at the same screen.

Pressing the <No> key cancels the delete operation, and it stays at the same screen.

6.5.4 Parameters

Press the [ENT] key on the <Waveform display (current waveform)> screen to display the <Waveform display (current waveform (set))> screen.

If a parameter is changed, the current waveform is deleted.



6

Position	Name	Description
1	Current waveform (set)	Displays the setting item and value for the waveform display function.
2	Data input field	This field is for entering the set value.

Function key display area

Column	Position	Label	Description
1	(1)	<Enter>	Saves the current settings.
	(2)	<Common parameter>	Displays the common parameter.
	(3)	<Measurement points parameter>	Displays the measurement points parameter.
	(4)		
	(5)		
	(6)	<Initialization>	Initializes the set value.
	(7)		
	(8)	<Cancel>	Cancels the setting change.

6.5.4.1 Common Parameter Settings

Sampling

To perform sampling, set to <1: Yes>.

If it is set to <0: No>, sampling is not carried out even if the measurement start operation is performed.

Sampling interval

This sets the interval for measurement points that are sampled.

The actual sampling interval is the value set $\times 0.5$ sec.

Waveform display notice signal

A notification signal about the waveform display can be output (external output) based on a comparison between the measurement data and reference values, when the measurement signal rises and falls.

- Waveform display notice signal measurement point
Set the measurement point number that becomes the reference for outputting a notification signal for the waveform display.
Refer to “6.5.4.2 Measurement point parameter settings” for further details about measurement points.
- Waveform display notification signal trigger / reference value 1 / reference value 2
The waveform display notice signal is output depending on the status of the measurement point specified in the parameter <Waveform display notice signal measurement point>.
 - When the <Measurement data> specified in the <Waveform display notice signal measurement point> is set to <2: Signal> and the <Signal size> is 1:
 - 0: Rise... Output signal turns ON when the measurement data changes from 0 to 1.
 - 1: Fall... Output signal turns ON when the measurement data changes from 1 to 0.
 - 2: More than... Output signal turns ON when the measurement data is more than <Reference value 1>.
 - 3: Less than... Output signal turns ON when the measurement data is less than <Reference value 1>.
 - All other settings except those noted above are ignored.
- When the <Measurement data> specified in the <Waveform display notice signal measurement point> is set to <1: Servo inf.>, <3: Sensor inf.> or <2. Signal> and the <Signal size> is not set to 1:
 - 0: Rise... Output signal turns ON when the measurement data is less than <Reference value 1> and then exceeds <Reference value 1>.
 - 1: Fall... Output signal turns ON when the measurement data is more than <Reference value 1> and then drops below <Reference value 1>.
 - 2: More than... Output signal turns ON when the measurement data is more than <Reference value 1>.
 - 3: Less than... Output signal turns ON when the measurement data is less than <Reference value 1>.
 - 4: Out of range Output signal turns ON when the measurement data is smaller than <Reference value 1> or the range is larger than <Reference value 2>.
However, the output signal turns OFF when the sampling starts.
- Continue sampling after waveform display notice signal has turned ON
 - 0: No... When the output signal turns ON, the sampling stops.
 - 1: Yes... Even when the output signal turns ON, the sampling continues.
- Sampling start time/stop time

When the setting <Continue sampling after waveform display notice signal has turned ON> is configured to <0: No>, set the sampling range for the measurement data.

 - Start time... The measurement data is taken only for the range when it goes back to the set value starting from when the trigger conditions are met. However, if the set value is 0, all the data is kept from where the measurement starts. (Setting range: 0 to 9999)
 - Stop time... The measurement is stopped when it is delayed only for the set value starting from when the trigger conditions are met. (Setting range: 1 to 9999)

Automatically save measurement results when completed

Set to <1: Yes> to automatically save the results when the measurement is completed.

When <Select save location> is set to <0: Internal>:

When it automatically saves the results, it saves the results internally when the measurement is complete, in the order starting from the number specified in <Automatic save start No.>.

When the <Automatic save end No.> is reached, the results are overwritten and saved again for <Automatic save start No.>.

When it automatically saves, the comment for the saved data is saved in an empty field.

When <Select save location> is set to <1: Memory card>:

When the results are automatically saved, the data is saved to the memory card in the folder: ¥WAVE¥yyyymmdd (yyyy: year, mm: month, dd: day). The filename for the saved data is output as <Specify character string assigned to file output to memory card>-(Sequence number).(Extension) or just as (Sequence number).(Extension). Refer to “6.5.6 File name for memory card output” for further details.

However, when the waveform measurement is carried out in tape operation (memory card), the operator message <<The waveform data has not been recorded>> appears when the measurement is complete, and the results cannot be automatically saved.

(NOTE) The waveform cannot be saved to the memory card in the following situations.

- When the memory card cannot be recognized
- When the memory card is being accessed by another function
- When the available space on the memory card is not enough

Start automatic measurement when power is turned ON

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The automatic measurement starts when the power is turned ON.

Select save location

Set the save location for the measured waveform.

The waveform data is saved internally when set to <0: Internal>. The data cannot be output to the memory card.

The waveform data is saved to the memory card when set to <1: Memory card>. In addition, the current waveform is deleted when the power is turned OFF.

Memory card output format

Set the format when the measured data file is saved to the memory card.

The waveform data file is saved in the ASCII format when set to <0:ASCII>. The file extension that is used is “.CSV”.

The waveform data file is saved in binary format when set to <1: Binary>. The file extension that is used is “.BIN”.

Refer to “6.5.7 Data structure for memory card output” for further details on the data structure. This parameter is valid only when <Select save location> is set to <1: Memory card>.

Assign character string to file output to memory card

When saving the waveform data file to the memory card, the setting <Specify character string assigned to file output to memory card> is used to select whether to specify the waveform file name or not.

When <Specify character string assigned to file output to memory card> is set to <0: No>, a character string is not assigned.

When <Specify character string assigned to file output to memory card> is set to <1: Yes>, a character string is assigned.

Refer to “6.5.6 File name for memory card output” for further details on the file name.

This parameter is valid only when <Select save location> is set to <1: Memory card>.

Specify character string assigned to file output to memory card

When outputting the waveform data file to the memory card, the character string set to the waveform file name is assigned. The following characters can be used for the file name: “0 to 9”, “A to Z” and “() –”. The file name has a maximum of 27 characters.

This parameter is valid only when <Select save location> is set to <1: Memory card>.

Save standby at measurement start

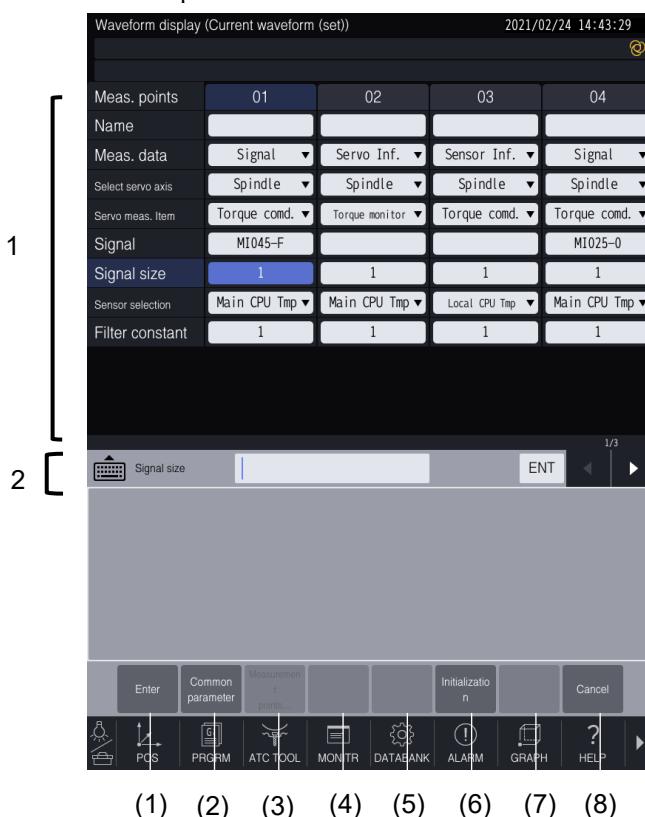
The user can set the operation to start when the M238 command is issued while measurement data is being saved, after specifying the measurement end (<Stop> key or M239) in the waveform display. When set to <0: No>, the measurement starts without waiting for the waveform data to finish saving. The alarm <<The waveform data is being stored>> is triggered and measurement is not carried out.

When set to <1: Yes>, operation waits for the saving to finish on the block where the command M238 is issued, and then the measurement starts. After the measurement starts, the operation continues onto the next block. The operator message <<Waveform data is saved>> appears until the saving of the waveform data is finished.

6.5.4.2 Measurement Point Parameter Settings

The measurement data can be set for each measurement point.

Up to 10 measurement points can be set.



Position	Name	Description
1	Current waveform (set)	Displays the setting item and value for the waveform display function.
2	Data input field	This field is for entering the set value.

Function key display area

Column	Position	Label	Description
1	(1)	<Enter>	Saves the current settings.
	(2)	<Common parameter>	Displays the common parameter.
	(3)	<Measurement points parameter>	Displays the measurement points parameter.
	(4)		
	(5)		
	(6)	<Initialization>	Initializes the set value.
	(7)		
	(8)	<Cancel>	Cancels the setting change.

Measurement point name and measurement data

1. Name

Set the name of the measurement point that appears on the waveform display screen. If the name is not set, a default name based on the measurement type appears on the <Waveform display (current waveform)> screen.

Move the cursor to the name field for the measurement point, and enter a new name. A maximum of 16 half-width characters can be used.

2. Measurement data

Set the type of measurement data.

<0: None>

<1: Servo inf.>

<2: Signal>

<3: Sensor inf.>

Set <Meas. data> for measurement points not being used to <0: None>. If just one measurement point is not set (measurement data for all points set to <0: None>), then it is processed the same as when the common parameter <Sampling> is set to <0: No> and sampling is not carried out at all.

When measuring servo information

1. Measurement data

Set to <1: Servo inf.>.

2. Select servo axis

Select the axis used to take a measurement. One of the following axes can be selected.

<0: Spindle, 1: X-axis, 2: Y-axis, 3: Z-axis, 4: QT-axis, 5: 5th-axis, 6: 6th-axis, 7: 7th-axis, 8: 8th-axis, 9: M-axis, 10: AT-axis, 11: P1-axis, 12: P2-axis, 13: P3-axis, 14: P4-axis>

3. Servo measurement items

Select a measurement item in the servo information.

The display unit for <0: Torque comd. [%]>, <1: Torque monitor [%]> and <2: Effective load [%]> is 0.1%. For <2: Effective load [%]>, the result for the calculation within the measurement range is displayed.

The display unit for <3: Machine load [Nm]> is 0.001 Nm, and only the spindle can be measured.

The display unit for <4: Machining load 2 [Nm]> is 0.001 Nm, and only the spindle can be measured.

<0: Torque comd. [%]>

<1: Torque monitor [%]>

<2: Effective load [%]>

<3: Machining load 1[Nm]>

<4: Machining load 2 [Nm]>

(NOTE 1) <3: Machining load 1> and <4: Machining load 2> can only be used on machine models where the machining load monitor function is available for use. 0 is selected for machine models where the machining load monitor function is not available for use. Refer to “Chapter 3 Machining load monitor function” in the Data Bank & Alarm Manual for further details.

(NOTE 2) The value that is measured may change depending on factors such as fluctuation in the temperature, power voltage or motor temperature.

(NOTE 3) The value that is measured may change if a component is replaced like the motor.

4. Filter constant

Set the filter value for the measurement data when displaying the waveform. The sampling interval is used for the unit, and the filter uses a moving average filter. The setting range is: 1 to 99.

5. Other items

Not used. (Even when a value is set for another item, it is ignored.)

When measuring signal information

1. Measurement data

Set to <2: Signal>.

2. Signal

Select a method to specify the I/O signal from the following.

• Main I/O

This method uses the bit to specify the main input number and output number.

Enter in the following order: "I/O type", "No.", "-" and "Bit".

Ex: When specifying the main input 3-Bit A

[M] [I] [0] [0] [3] [-] [A] [ENT]

(When specifying for output, change [I] to [O].)

The number range for input is 001 to 160, and for output, it is 001 to 041.

The bit range for input and output is 0 to F.

• Extension I/O

This method uses the bit to specify the extension input number and output number.

Enter in the following order: "I/O type", "No.", "-" and "Bit".

Ex: When specifying the extension input 3-Bit A

[E] [I] [0] [3] [-] [0] [A] [ENT]

(When specifying for output, change [I] to [O].)

The number range for input and output is 01 to 64, and the bit range is 00 to 1F for input and output.

• PLC I/O

This method issues X and Y commands for the PLC.

Enter in the following order: "I/O type" and "No.".

Ex: When specifying the PLC input X002A

[X] [0] [2] [A] [ENT]

The number range for input and output is 000 to 7FF.

When specifying for output, change [I] to [O].

• PLC data

This method issues D (data) commands for the PLC.

Enter in the following order: "I/O type" and "No.".

Ex: When specifying the PLC input D100

[D] [0] [1] [0] [0] [ENT]

The number range is 0000 to 8191.

If the format does not match, or if there is no input (output) number that corresponds, the error <<Input data error>> is triggered.

• Loading system input/output

This method uses the bit to specify the loading system input number or output number.

Enter in the following order: "I/O type", "No.", "-" and "Bit".

Ex: When specifying the loading system input 3-Bit A

[B] [I] [0] [0] [3] [-] [A] [ENT]

(When specifying for output, change [I] to [O].)

The number range for input is 001 to 104, and for output, it is 001 to 096.

The bit range for input and output is 0 to F.

3. Signal size

Set the size to be measured using the specified signal. The setting range is: 1 to 32.

• Main I/O, expansion I/O, PLC I/O and loading system I/O

The bit number is specified.

Ex: When specifying the main input 13-Bit 0 to F

Signal "MI013-0"

Set signal size to "16"

The data formats for these signals, when measured, vary depending on the signal size that is set.

1 to 15: Data without signs

16 to 32: Data with signs

- PLC data
The word number is specified. The setting range is: 1 to 2.
Ex: When specifying the PLC data D100 to 101
Signal “D0100”
Set signal size to “2”
When not entered, it is set to 1.
4. Filter constant
Set the filter value for the measurement data when displaying the waveform. The sampling interval is applied for the unit.
The filter uses a moving average filter. The setting range is: 1 to 99.
 5. Other items
Not used.

When measuring sensor information

1. Measurement data
Set to <3: Sensor inf.>.
2. Sensor selection
Select the sensor used to take a measurement.
0: Main CPU temperature
1: Local CPU temperature
2: Control box temperature
3: Main operations box temperature
5: Control box acceleration X
6: Control box acceleration Y
7: Control box acceleration Z
8: Operations box 1 acceleration X
9: Operations box 1 acceleration Y
10: Operations box 1 acceleration Z
14: AC power voltage R
15: AC power voltage S
16: AC power voltage T
21: TP temperature (Teaching pendant temperature)
22: TP acceleration X
23: TP acceleration Y
24: TP acceleration Z
26: AC power frequency R
27: AC power frequency S
28: AC power frequency T
3. Filter constant
Set the filter value for the measurement data when displaying the waveform. The sampling interval is applied for the unit.
The filter uses a moving average filter. The setting range is: 1 to 99.
4. Other items
Not used.

6.5.4.3 Initialization

The common and measurement point parameters are initialized.

- Perform a 0 clear operation (or reset to the minimum value if 0 is outside of the range) or delete settings for all parameters.
1. Press the <Initialization> key.
 2. The confirmation message <Initialize?> is displayed in the instructions area.
Press the <Yes> key to initialize the common parameters as well as the measurement point parameters. Then, the screen returns to the <Waveform display (current waveform)> screen. At the <Waveform display (current waveform)> screen, the waveform and the measurement points that were displayed before are now deleted.
Pressing the <No> key cancels the delete operation, and it stays at the same screen.

6.5.5 Restrictions

6.5.5.1 Measurement Time

Sampling interval: x 0.5 msec

Measurement points: 10 points

A measurement can be taken for approximately 1 minute using the above conditions.

The time that can be measured (sampling qty.) changes depending on the number of measurement points.

When the sampling interval is 0.5 ms with a total of one measurement point, the total time is approximately 5 minutes 30 seconds. When the sampling interval is 10 ms with a total of ten measurement points, the total time is approximately 20 minutes.

6.5.5.2 Sampling Start Delay

A delay occurs from the time the trigger starts the sampling for the measurement data until the actual data is recorded.

Immediately after the sampling is started using “M238”, the data may not be recorded. Therefore, issue a dwell command.

6.5.5.3 When Waveform Data is Being Saved

While the current waveform is being saved, the function keys are greyed out and the following operations are unavailable.

- Starting measurement for measurement data
- Changing parameters for waveform display
- Displaying saved data waveform
- Adjusting the waveform (zoom)

6.5.5.4 Waveform Output After Changing Setting <Select Save Location>

Waveform output is not possible when the setting <Select save location> is changed. The waveform data that is already saved as <Internal> cannot be saved to the <Memory card>. In addition, the waveform data that is already saved to the <Memory card> cannot be saved as <Internal>. Before measuring, specify the setting <Select save location> beforehand.

6.5.5.5 Saving Waveform Data When [DATA PROTECTION] Switch is Enabled

The waveform data is saved even when the [DATA PROTECTION] switch is enabled or when the PLC input signal (PROTECT) is ON. To protect waveform data from automatically being overwritten (does not <Automatically save measurement results when completed>), set a different data range from the protected data range specified by the <Automatic save start No.> and <Automatic save end No.>.

6.5.6 File Name for Memory Card Output

When <Select save location> is set to <Memory card>, the file name is decided as follows when the file is saved.

When <Assign character string to file output to memory card> is set to <0: No>: (Sequence number).(Extension)

When <Assign character string to file output to memory card> is set to <1: Yes>: (Character string assigned)-(Sequence number).(Extension)

(Character string assigned: Character string set in <Specify character string assigned to file output to memory card>, Sequence number: Number from 0001 to 9999, Extension: Based on extension of <File output format>)

- Ex: When “SAMPLE” is specified for <Specify character string assigned to file output to memory card> and the <File output format> is <1: ASCII>
- When <Assign character string to file output to memory card> is set to <0: No>: 0001.CSV
 - When <Assign character string to file output to memory card> is set to <1: Yes>: SAMPLE-0001.CSV

When the sequence number reaches 9999, the number starts again from 0001. The sequence number is maintained even when the power is turned OFF. In addition, when the date changes, the save folder changes and the sequence number starts from 0001 again.

When the same file name already exists, a number based on the date is assigned to the end of the file name and then it is saved. However, when the same file name containing a number based on the date already exists, the operator message <<The waveform data has not been recorded>> appears and the file cannot be saved. A file name containing a number based on the date is decided as follows.

When <Assign character string to file output to memory card> is set to <0: No>:
(Sequence number)-(Number based on date (10 digits)).(Extension)

When <Assign character string to file output to memory card> is set to <1: Yes>:
(Character string assigned)-(Sequence number)-(Number based on date (10 digits)).(Extension)

(NOTE) The sequence number does not reset even if another memory card is connected.

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6.5.7 Data Structure for Memory Card Output

When <Select save location> is set to <1: Memory card>, the file is output in the format that corresponds to the setting <Memory card output format>.

6.5.7.1 Binary Format Output

When the <Memory card output format> is set to <1: Binary>, the following information and data is output as one binary data set.

Sampling data

Item	Value	Notes
Identifier	'W001' (4 byte)	Fixed
Information block size	(4 byte)	Sampling data size
Sampling data 1	(4 byte * Valid measurement points)	
Sampling data 2		
:	:	
Sampling data n	(4 byte * Valid measurement points)	n is the number of sampling points

Waveform display parameter

The waveform display parameter is assigned when the file is saved.

Item	Value	Notes
Identifier	'X001' (4 byte)	Fixed
Information block size	(4 byte)	Waveform display parameter size
Waveform display parameter	Variable length	Refer to “WVPRM” format. ASCII characters are assigned as is.

6.5.7.2 ASCII Format Output

When the <Memory card output format> is set to <0: ASCII>, the following information and data is output as one CSV file (comma delimiters).

Sampling data

Item	Value	Notes
Sampling data 1	Measurement point 1 sample, measurement point 2 sample...measurement point m sample	m is the total valid number of points
Sampling data 2	:	
:	:	
Sampling data n	Measurement point 1 sample, measurement point 2 sample...measurement point m sample	n is the number of sampling points

Waveform display parameter

The waveform display parameter is assigned when the file is saved.

Item	Value	Notes
Waveform display parameter		Refer to “WVPRM” file format. ASCII characters are assigned as is.

6.5.7.3 Waveform Display Parameter

WVPRM

Symbol	Item	Delimiter	Data length	Notes
B001	Sampling	,	1	0: No, 1: Yes
	Sampling interval	,	4	
	Waveform display notice signal measurement point	,	2	0: None, 1-10: Measurement points 1-10
	Waveform disp.notice signal trigger	,	1	0: Rising, 1: Trailing, 2: Above, 3: Less, 4: Out of range
	Waveform display notice signal reference value 1	,	11	
	Waveform display notice signal reference value 2	,	11	
	Continue sampling after waveform display notice signal has turned ON	,	1	0: No, 1: Yes
	Sampling start time	,	6	
	Sampling end time	,	6	
	Automatically save measurement results when completed	,	1	0: No, 1: Yes
	Automatic save start No.	,	4	
	Automatic save end No.	,	4	
	Start automatic measurement when power is turned ON	,	1	0: No, 1: Yes
	Time axis scale (horizontal)	,	5	Internal data
	Select save location	,	1	0: Internal, 1: Memory card
	Memory card output format	,	1	0: ASCII, 1: Binary
	Assign character string to file output to memory card	,	1	0: No, 1: Yes
	Specify character string assigned to file output to memory card	,	29	Up to 27 half-width characters: “0 to 9”, “A to Z” and “() –”. The leading and last characters are single quotation marks.
	Save standby at measurement start	CR+LF	1	0: No, 1: Yes
C001	Measurement point 1 (Measurement point name)	,	18	16 half-width characters. The leading and last characters are single quotation marks.

Symbol	Item	Delimiter	Data length	Notes
	Measurement point 1 (Measurement data)	,	1	0: None, 1: Servo inf., 2: Signal, 3: Sensor inf.
	Measurement point 1 (Select servo axis)	,	2	0: Spindle, 1: X-axis, 2: Y-axis, 3: Z-axis, 4: 4th-axis, 5: 5th-axis, 6: 6th-axis, 7: 7th-axis, 8: 8th-axis, 9: M-axis, 11: P1-axis, 12: P2-axis, 13: P3-axis, 14: P4-axis
	Measurement point 1 (Servo meas. item)	,	2	0: Torque command value, 1: Torque monitor value, 2: Actual torque value 3: Machining load 1 4: Machining load 2
	Measurement point 1 (Signal (Type))	,	1	0: Main input, 1: Main output, 2: Extension input, 3: Extension output, 4: PLC input, 5: PLC output, 6: PLC data, 7: Loading system input, 8: Loading system output
	Measurement point 1 (Signal (Number))	,	4	
	Measurement point 1 (Signal (Bit))	,	2	
	Measurement point 1 (Signal size)	,	2	
	Measurement point 1 (Sensor selection)	,	2	0: Main CPU temperature 1: Local CPU temperature 2: Control box temperature 3: Main operation panel temperature 5: Control panel acceleration X 6: Control panel acceleration Y 7: Control panel acceleration Z 8: Operation panel 1 acceleration X 9: Operation panel 1 acceleration Y 10: Operation panel 1 acceleration Z 14: AC power voltage R 15: AC power voltage S 16: AC power voltage T
	Measurement point 1 (Filter constant)	,	2	
	Measurement point 1 (Minimum display unit)	,	1	Internal data
	Measurement point 1 (Maximum on vertical display scale)	,	10	Internal data
	Measurement point 1 (Minimum on vertical display scale)	CR+LF	10	Internal data
C002-C010	Measurement point 2 - Measurement point 10			Same structure as C001
D001	Time cursor 1 position	,	6	Internal data
	Time cursor 2 position	,	6	Internal data
	Left data position on screen	,	6	Internal data
	Automatic save No.	CR+LF	4	Internal data

6.6 Production Performance

6.6.1 Overview

The production performance application has two functions: one for collecting machine information and registering that data chronologically in a database, and one for displaying the information (registered in the database) using different graphics.

The production performance application is broken down into the following basic screens.

1. <Production performance (production performance)> screen
Displays this machine's past production performance and a production forecast going forward based on the workpiece counter information.
2. <Production performance (operational performance)> screen
Displays this machine's operational performance based on the status log information.

6.6.2 Type of data collection

In the production performance application, the information below can be collected from this machine and registered chronologically into the database.

Category	Data collection
Memory operation	Program name
	Folder name
	Memory operation type (Internal memory operation / Tape operation (General communications device) / Tape operation (Memory card))
	Cycle time
	Cutting time
	Date and time of operation start
	Language (NC/Conversation)
Workpiece counter	Current value for workpiece counters 1 to 4
	Target value for workpiece counters 1 to 4
	Language (NC/Conversation)
Alarm log	Date and time of alarm
	Alarm (Alarm/Operator message No.)
	Auxiliary number
	Operation program name
	Operation folder name
	Edit program name
	Edit folder name
	Block/Job No.
	Mode
	Screen
Status log	Memory operation type (Internal memory operation / Extended memory operation / Tape operation (General communications device) / Tape operation (Memory card))
	Status (Power OFF / Standby / Error / Program running / Program paused)
	Start date and time of each status

(NOTE 1) If the date and time are changed on this machine, any data with a timestamp after the newly set date and time will be deleted (because it becomes the future), in order to avoid any chronological conflict.

(NOTE 2) If the alarm <<Battery has expired. (Local)>> is triggered and the machine's date and time are reset, data is not deleted but the data collection is paused temporarily. Once the current date and time are set in the user parameter (switch 1: system), any data with a timestamp after the newly set date and time will be deleted (because it becomes the future) and the data collection will resume again.

6.6.3 Screen Layout & Description

6.6.3.1 Production performance (menu) screen



Description of screen display

Position	Name	Description
1	1. Performance display	Displays the <Production performance (production performance)> screen.

Description of function key

Position	Label	Description
(1)	<End application>	Closes the production performance application.
(2)		
(3)		
(4)		
(5)		
(6)		
(7)		
(8)		

6.6.3.2 Production Performance Screen

This screen displays the past performance on a specified workpiece counter and the production forecast going forward. 10000 records of past performance data can be saved (approximately 3 months worth of data given a rate of continuous production of 8 hours per day where the workpiece counter increases by 1 piece per 5 minutes).



Description of screen display

Position	Name	Description
1	Production performance graph	Displays the past performance on a specified workpiece counter and the production forecast going forward in a graph.
2	Production status and total units produced	Displays the current total production status and total units produced.
3	Display setting	Sets the <Data collection period>, <Workpiece counter> and <Display range>. When the <Display> key is pressed, the screen data is updated.

Production performance graph

The past performance on a specified workpiece counter and the production forecast going forward are displayed in a graph. Depending on the display range at the bottom of the screen, the data is displayed over a 24 hour, 7 day or 31 day period. The top of the screen shows the dates and times for that display range.



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Position	Name	Description
1	Target value	Displays the target value on a specified workpiece counter with a green dotted line. If there is no target value set, the line is not displayed.
2	End date and time of forecast	Displays the forecasted date and time (with a green dotted line and comment box) when the future target value will be reached based on the past performance recorded on the specified workpiece counter. However, if one of the following applies, it will not display. <ul style="list-style-type: none"> • Target value is not set • Current date is after the end date of the data collection period • There is not enough data for a forecast
3	Forecasted total	Displays the forecasted total (with a light blue dotted line) based on the past performance recorded on the specified workpiece counter. However, if one of the following applies, it will not display. <ul style="list-style-type: none"> • Current date is after the end date of the data collection period • There is not enough data for a forecast
4	Counter value	Displays the current performance history on a specified workpiece counter with a light blue line.
5	Units produced	Displays the number of units produced per hour/day for a specified workpiece counter using a bar graph.
6	<Show previous> key	Displays the previous time period in the graph. The key is grayed out and cannot be pressed if the graph for the previous time period cannot be displayed.
7	<Show next> key	Displays the next time period in the graph. The key is grayed out and cannot be pressed if the graph for the next time period cannot be displayed.

Production status and total units produced

The current production status and total units produced are displayed.

Name	Description
Current counter value	Displays the most current value on the specified workpiece counter, regardless of the data collection period.
Target value	Displays the current target value on the specified workpiece counter, regardless of the data collection period.
Total units produced	Displays the total number of units produced overall (in the data collection period) for a specified workpiece counter.

Display setting

The <Data collection period>, <Workpiece counter> and <Display range> can be set.

Name	Description
Data collection period	<p>Sets the period for displaying the production performance graph.</p> <p><Start date>: Sets the start date for the time period used in the display. The initial value is the date with the oldest data that is recorded in the database.</p> <p><End date>: Sets the end date for the time period used in the display. The initial value is the machine's current date.</p> <p>If the <Start date> is set to a date that is after the <End date> and the <Display> key is pressed, the operator message <<Input data error>> appears.</p>
Workpiece counter	<p>Sets the workpiece counter that is displayed in the production performance graph.</p> <p><NC1> to <NC4>: Display the workpiece counters 1 to 4 in the NC language.</p> <p><Conversation 1> to <Conversation 4>: Display the workpiece counters 1 to 4 in the conversation language.</p>
Display range	<p>Sets the period that can be displayed in the production performance graph.</p> <p><24 hours>:</p> <p>Displays the production performance graph on an hourly basis. The display shows data from 00:00 to 23:59 for the end date that was specified in the data collection period.</p>  <p><7 days>:</p> <p>Displays the production performance graph on a daily basis. The display shows 7 days worth of data with the end date in the data collection period shown on the right.</p> 

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Name	Description
	<p><31 days>: Displays the production performance graph on a daily basis. The display shows 31 days worth of data with the end date in the data collection period shown on the right.</p> 
<Display> key	<p>Press to update the screen data. If the data collection period is changed, the end date for the data collection period on the right side of the production performance graph is updated. If the workpiece counter or the display range is changed, without changing the data collection period, the date and time on the right side of the production performance graph (currently displayed) is fixed and updated. Displayed data is updated every 5 minutes.</p>

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Description of function key

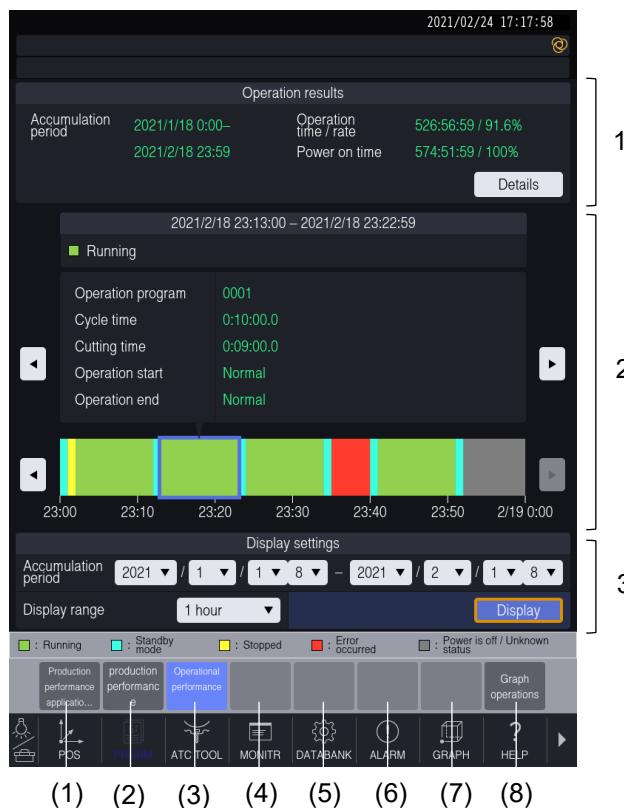
Position	Label	Description
(1)	<Production performance application menu>	Goes back to the <Production performance (menu)> screen.
(2)	<Production performance>	Displays the <Production performance (production performance)> screen.
(3)	<Operational performance>	Displays the <Production performance (operational performance)> screen.
(4)		
(5)		
(6)		
(7)		
(8)	<Graph operations>	Displays the function keys related to the graph.

Description of function keys for graph operations

Position	Label	Description
(1)	<Show previous>	Displays the previous time period in the graph. The key is grayed out and cannot be pressed if the graph for the previous time period cannot be displayed.
(2)	<Show next>	Displays the next time period in the graph. The key is grayed out and cannot be pressed if the graph for the next time period cannot be displayed.
(3)		
(4)		
(5)		
(6)		
(7)		
(8)	<Cancel>	Goes back to the original function key display.

6.6.3.3 Operational performance screen

The operational performance based on the status log information is displayed. 10000 records of operation data can be saved (approximately 3 months worth of data given a rate of continuous production of 8 hours per day where the operation status changes one time every 5 minutes on average).



Description of screen display

Position	Name	Description
1	Data collection period and details	Displays the data collection period, and the operation time, operation rate and power ON time during that period.
2	Operational performance graph	Displays the log for the operational status in a graph. In addition, the selected operational status information is displayed.
3	Display setting	Sets the <Data collection period> and <Display range>. When the <Display> key is pressed, the screen data is updated.

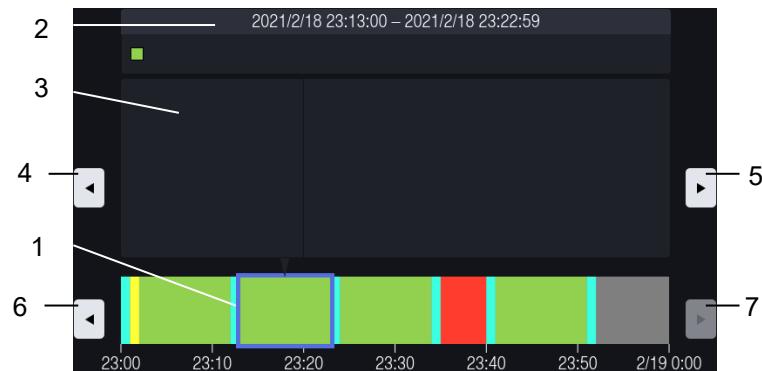
Data collection period and details

The data collection period, and the operation time, operation rate and power ON time during that period are displayed.

Name	Description
Operation time	Displays the total time during the power ON time, excluding errors.
Operation rate	Displays a percentage of the operation time divided by the power ON time.
Power ON time	Displays the total time in data collection period excluding the power OFF and unknown status time. A percentage of the power ON time divided by the data collection period is displayed.
<Details> key	Displays the <Production performance (status ratio)> screen.

Operational performance

The log for the operational status is displayed in a graph. In addition, the selected operational status information is displayed.



6

Position	Name	Description										
1	Operational status	<p>Displays the log for the operational status in a graph. The graph is displayed in 5 different colors. Each color refers to the following:</p> <ul style="list-style-type: none"> Green Running Light blue Standby mode Yellow Stopped Red Error occurred Gray Power OFF / Status unknown <p>(NOTE) The unknown status is displayed when the time period shown in the graph refers to a future date from the current date and time.</p>										
2	Operational information	Displays the start time and end time for the selected operational status, and the type of status.										
3	Operational information (Details)	<p>Displays detailed information on the selected operational status. The displayed content varies depending on the type of operational status.</p> <p><Running>:</p> <p>Displays information about the program that was running during the period for the selected operational status.</p> <table border="1"> <tr> <td>Operation program</td> <td>0001</td> </tr> <tr> <td>Cycle time</td> <td>0:10:00.0</td> </tr> <tr> <td>Cutting time</td> <td>0:09:00.0</td> </tr> <tr> <td>Operation start</td> <td>Normal</td> </tr> <tr> <td>Operation end</td> <td>Normal</td> </tr> </table> <p>Operation program</p> <p>Cycle time</p> <p>Cutting time</p> <p>Start operation</p>	Operation program	0001	Cycle time	0:10:00.0	Cutting time	0:09:00.0	Operation start	Normal	Operation end	Normal
Operation program	0001											
Cycle time	0:10:00.0											
Cutting time	0:09:00.0											
Operation start	Normal											
Operation end	Normal											

Position	Name	Description																						
		Operation end	Displays the status when the operation program has ended. Paused is displayed when the subsequent operational status is a stop. If the status is abnormal, interruption is displayed. Otherwise, normal is displayed in all other situations.																					
		<Error occurred>: Displays information about alarms that triggered during the period for the selected operational status.																						
		<table border="1"> <thead> <tr> <th>Alarm</th> <th>Message</th> <th>Program</th> <th>Block</th> </tr> </thead> <tbody> <tr> <td>IO0523</td> <td>* communication error ()</td> <td>0001</td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Alarm	Message	Program	Block	IO0523	* communication error ()	0001															
Alarm	Message	Program	Block																					
IO0523	* communication error ()	0001																						
		Tap on an alarm or operator message to reference the details. The <Alarm history(Details)> screen is displayed for the selected alarm or operator message. Refer to "Chapter 2 Alarms" in the Data Bank & Alarm Manual for further details.																						
		<Standby mode>, <Stopped>, <Power OFF/Unknown status>: None																						
4	<Show previous status> key	Selects the operational status prior to the currently selected one. If the operational status that is currently selected shows the initial status for the current period, then the key displays the previous period and selects the last status from that period. The key is grayed out and cannot be pressed if there is no previous status.																						
5	<Show next status> key	Selects the next operational status after the currently selected one. If the operational status that is currently selected shows the last status for the current period, then the key displays the next period and selects the initial status from that period. The key is grayed out and cannot be pressed if there is no next status.																						
6	<Show previous> key	Displays the previous time period in the graph. The key is grayed out and cannot be pressed if the graph for the previous time period cannot be displayed.																						
7	<Show next> key	Displays the next time period in the graph. The key is grayed out and cannot be pressed if the graph for the next time period cannot be displayed.																						

Display setting

Sets the <Data collection period> and <Display range>.

Name	Description
Data collection period	Sets the period for displaying the operational performance graph. <Start date>: Sets the starts date for the time period used in the display. The initial value is the date with the oldest data that is recorded in the database. <End date>: Sets the end date for the time period used in the display. The initial value is the machine's current date. If the <Start date> is set to a date that is after the <End date> and the <Display> key is pressed, the operator message <<Input data error>> appears.

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Name	Description
Display range	<p>Sets the period that can be displayed in the operational performance graph.</p> <p><1 hour>: Displays 1 hour's worth of data, with the most recent data in the data collection period on the right.</p> <p><3 hours>: Displays 3 hour's worth of data, with the most recent data in the data collection period on the right.</p> <p><6 hours>: Displays 6 hour's worth of data, with the most recent data in the data collection period on the right.</p>
<Display> key	<p>Press to update the screen data.</p> <p>When the data collection period is changed, the data is updated with the most recent data in the data collection period on the right.</p> <p>If the display range is changed, without changing the data collection period, the time on the right side of the operational performance graph (currently displayed) is fixed and updated.</p> <p>Displayed data is updated every 5 minutes.</p>

Description of function key

Position	Label	Description
(1)	<Production performance application menu>	Goes back to the <Production performance (menu)> screen.
(2)	<Production performance>	Displays the <Production performance (production performance)> screen.
(3)	<Operational performance>	Displays the <Production performance (operational performance)> screen.
(4)		
(5)		
(6)		
(7)		
(8)	<Graph operations>	Displays the function keys related to the graph.

6

Description of function keys for graph operations

Position	Label	Description
(1)	<Show previous>	<p>Displays the previous time period in the graph.</p> <p>The key is grayed out and cannot be pressed if the graph for the previous time period cannot be displayed.</p>
(2)	<Show next>	<p>Displays the next time period in the graph.</p> <p>The key is grayed out and cannot be pressed if the graph for the next time period cannot be displayed.</p>
(3)	<Show previous status>	<p>Selects the operational status prior to the currently selected one.</p> <p>If the operational status that is currently selected shows the initial status for the current period, then the key displays the previous period and selects the last status from that period.</p> <p>The key is grayed out and cannot be pressed if there is no previous status.</p>
(4)	<Show next status>	<p>Selects the next operational status after the currently selected one.</p> <p>If the operational status that is currently selected shows the last status for the current period, then the key displays the next period and selects the initial status from that period.</p> <p>The key is grayed out and cannot be pressed if there is no next status.</p>
(5)		
(6)		
(7)		
(8)	<Cancel>	Goes back to the original function key display.

6.6.3.4 Status ratio screen

The ratio of the operational status is displayed for the overall data collection period (that is set on the operational performance screen), and the data is also displayed for each day of that period.



Description of screen display

Position	Name	Description
1	Overview of status ratio	<p>Displays the ratio of the operational status for the overall data collection period and also for each day of that period. Each day is displayed in sequential order starting from the end of the data collection period.</p> <p>(NOTE) The maximum number of days that can be shown is 31 days when displaying the ratio of the operational status screen. If the data collection period exceeds 31 days, the message <Display next 31 days> appears on the last line of the data list. Press <Display next 31 days> to add the next 31 days to the display.</p>
2	Display setting	Sets whether to include or not include the power OFF time in the status ratio calculation. When the <Display> key is pressed, the screen data is updated.

Description of function key

Position	Label	Description
(1)	<Back>	Goes back to the <Production performance (operational performance)> screen.
(2)		
(3)		
(4)		
(5)		
(6)		
(7)		
(8)		

6.7 Power Consumption

6.7.1 Overview

The power consumption application offers different power consumption related functions, such as referencing power consumption data, measuring the power consumption per cycle or setting related parameters.

- * The accuracy of the power consumption figures is not guaranteed. Use these figures as a reference.

The power consumption application is broken down into the following basic functions.

1. Power consumption today
This screen shows the current power consumption and the power consumption graph for today.
2. Power consumption log
This screen shows the log of the power consumption for the last month.
3. 1 cycle measurement
This screen measures and shows the power consumption per program cycle.
4. Parameter setting
The screen is used to set the power consumption for a customer installed device, set parameters related to power consumption and set the screen display features.

6.7.2 Types of Editable Data

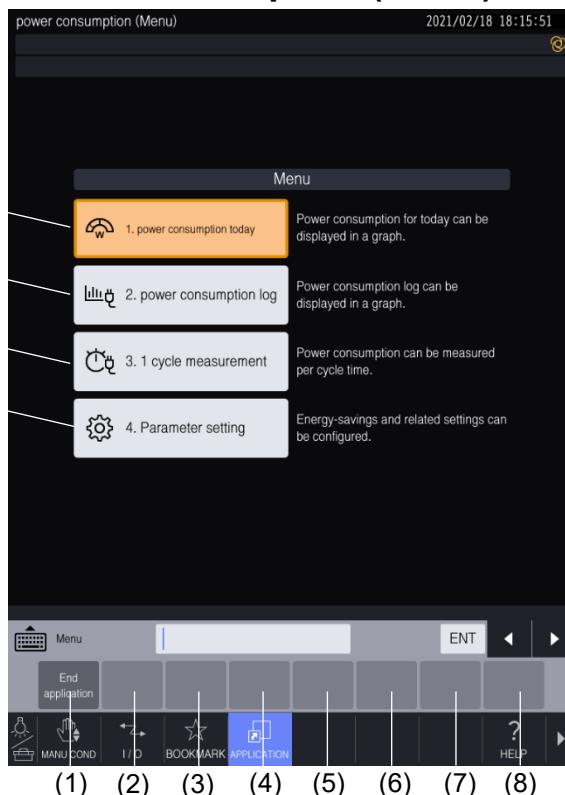
Some of the data below can be edited in the power consumption application.

- User parameter

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6.7.3 Details

6.7.3.1 Power consumption (menu)



Description of screen display

Position	Name	Description
1	1. Power consumption today	Displays the <Power consumption (power consumption today)> screen.
2	2. Power consumption log	Displays the <Power consumption (power consumption log)> or <Power consumption (total power consumption)> screen.
3	3. 1 cycle measurement	Displays the <Power consumption (1 cycle measurement)> screen.
4	4. Parameter setting	Displays the <Power consumption (power consumption related settings)>, <Power consumption (power consumption setting)>, <Power consumption (user device setting)> or <Power consumption (display setting)> screen.

Description of function key

Position	Label	Description
(1)	<End application>	Closes the power consumption application
(2)		
(3)		
(4)		
(5)		
(6)		
(7)		
(8)		

6.7.3.2 Power consumption today

This screen shows the current power consumption and the power consumption graph for today (based on the time specified by the customer).

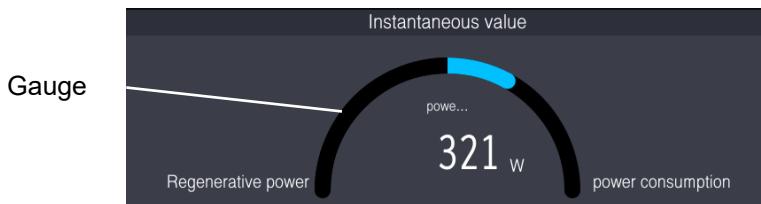


(1) (2) (3) (4) (5) (6) (7) (8)

Description of screen display

Position	Name	Description
1	Instantaneous value	Shows the gauge and value for the current power consumption.
2	Power consumption level for today	Displays the power consumption level per hour in a graph.

Instantaneous value



The gauge and value for the current power consumption are displayed. When power is being consumed, a positive value is displayed at the center and the gauge level extends to the right side. When power is being regenerated, a negative value is displayed at the center and the gauge level extends to the left side. The maximum value on the gauge can be set in the parameters. Refer to “6.7.3.5 Parameter setting” for further details.

The power consumption display shows a total value for the machine’s overall power consumption as well as values for the option devices and user devices installed by the customer. The power consumption of a user device needs to be set for it to be reflected in the display. Refer to “6.7.3.5 Parameter setting” for further details.

6

Power consumption level for today

The power consumption level is displayed per hour up to the present time based on the time set by the customer. The time is set in the <Graph display start position – Daily graph>. Refer to “6.7.3.5 Parameter setting” for further details.

The graph of the power consumption levels is displayed in 4 different colors. Each color refers to the following:

- Purple Total power consumption for all servo axes
- Blue Total power consumption for each pump
- Orange Total power consumption for user devices
- Green Total power consumption for all other items

Description of function key

Position	Label	Description
(1)	<Power consumption application menu>	Goes back to the <Power consumption (menu)> screen.
(2)		
(3)		
(4)		
(5)		
(6)		
(7)		
(8)		

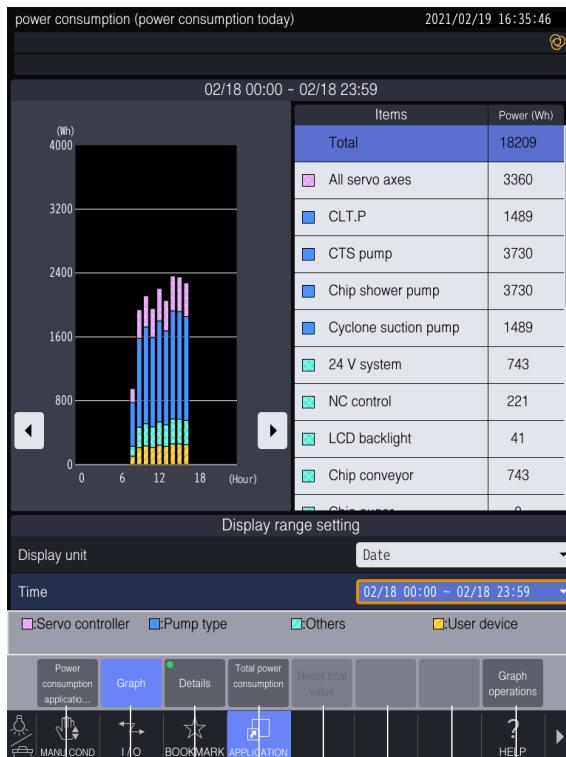
6.7.3.3 Power Consumption Log

This screen shows the log of the machine's overall power consumption level. The power consumption levels for approximately one month are saved to the log when the machine continues to be used without turning OFF the power. The power consumption is displayed as zero during the time period while the power is OFF.

The power consumption log is broken down into 2 basic screens.

- <Power consumption (power consumption log)> screen
- <Power consumption (total power consumption)> screen

The function keys can be used to switch between these screens.



(1) (2) (3) (4) (5) (6) (7) (8)

Description of function key

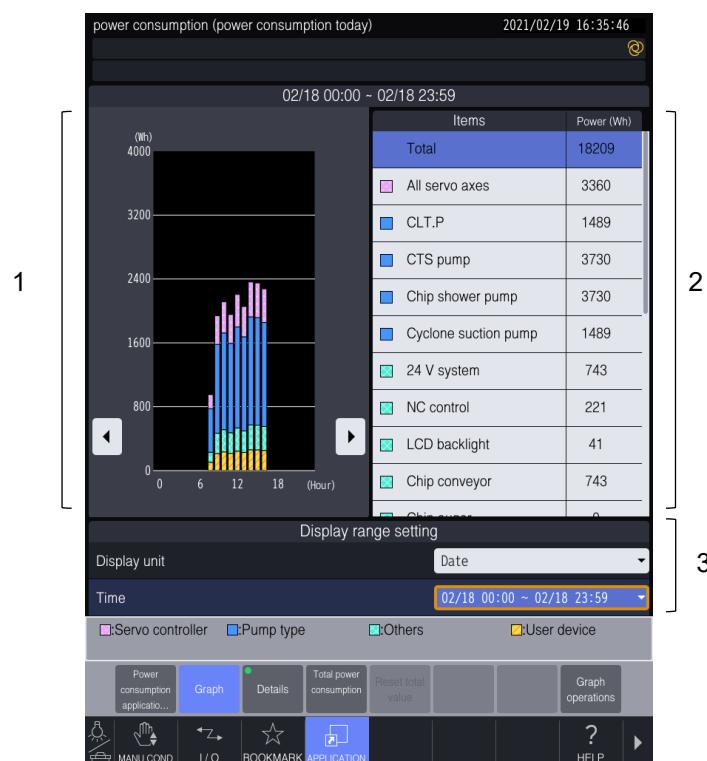
Position	Label	Description
(1)	<Power consumption application menu>	Goes back to the <Power consumption (menu)> screen.
(2)	<Graph>	Displays the <Power consumption (power consumption log)> screen.
(3)	<Detail display>	Shows and hides the detail display of the power consumption. On the <Power consumption (power consumption log)> screen, this key is available when <Day> is selected for the <Display unit>.
(4)	<Total power consumption>	Displays the <Power consumption (total power)> screen.
(5)	<Reset total value>	Clears the total power consumption for the selected item. The key is grayed out and cannot be pressed on all screens except the <Power consumption (total power)> screen.
(6)		
(7)		
(8)	<Graph operations>	Displays the function keys related to the graph. The key is grayed out and cannot be pressed on all screens except the <Power consumption (power consumption log)> screen.

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Description of function keys for graph operations

Position	Label	Description
(1)	<Show previous>	Displays the graph for the previous day or previous week. The key is grayed out and cannot be pressed when the graph for the previous day or previous week cannot be displayed.
(2)	<Show next>	Displays the graph for the next day or next week. The key is grayed out and cannot be pressed when the graph for the next day or next week cannot be displayed.
(3)		
(4)		
(5)		
(6)		
(7)		
(8)	<Cancel>	Goes back to the original function key display.

Power consumption log



6

Description of screen display

Position	Label	Description
1	Power consumption graph	Displays the log for the power consumption level in a graph.
2	Power consumption detail display	Displays the power consumption of each item for the time period shown in the graph. This is shown when the detail display is enabled with the <Detail display> key.
3	Display range setting	Sets the <Display unit> and the <Time>.

Power consumption graph

The log for the power consumption level is displayed in a graph. The settings for the range at the bottom of the screen are used to display the data by day, week or month. The display range for the date and time is shown on the top of the screen.

The user can either swipe to the left or tap on the right arrow to display the graph for the next day or the next week. Or, the user can swipe to the right or tap on the left arrow to display the graph for the previous day or the previous week.

When the log display reaches the oldest data, the left arrow disappears. When the log display reaches the newest data, the right arrow disappears.

When the <Display unit> is set to <Week>



The power consumption level is displayed for each date in the graph. Data is displayed for seven days starting from the specified day in the <Graph display start position – Weekly graph>.

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When the <Display unit> is set to <Month>



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The power consumption level is displayed for the dates in the graph. The graph displays data for the previous 31 days starting from today.

The <Period> is grayed out and cannot be selected. In addition, even if the user swipes the graph to the left or right, the display range will not change.

Power consumption detail display

This is shown when the advanced display is enabled with the <Detail display> key. The detail display can only be displayed when the <Display unit> is set to <Day>.

When the data for today is displayed, the total values for each item are shown from the time that is specified in <Graph display start - Daily graph> up to the current time. When the data for the previous day (or before that) is displayed, the total values are shown for a 24 hour period starting from the time that is specified.

Each of the following items can be checked individually.

Item	Description
<Servo (all axes)>	This power shows how much is consumed by the spindle, X-, Y-, Z- and additional axes. The value is the difference after subtracting the regenerative power.
<24 V system>	This power shows how much is consumed in the 24 V power system, such as the internal light or terminal block.
<NC control>	This power shows how much is consumed by the NC PCB, etc.
<LCD backlight>	This power shows how much is consumed by the LCD backlight.
<Coolant pump>	This power shows how much is consumed by the coolant pump drive.
<CTS pump>	This power shows how much is consumed by the CTS pump drive.
<Chip shower pump>	This power shows how much is consumed by the chip shower pump drive.
<Cyclone suction pump>	This power shows how much is consumed by the cyclone suction pump drive.
<Chip conveyor>	This power shows how much is consumed by the chip conveyor drive.
<Coil conveyor>	This power shows how much is consumed by the chip auger drive.
<Automatic oiling (or automatic greasing)>	This power shows how much is consumed by the automatic oiling (or automatic greasing) drive.
<Spindle cooling fan>	This power shows how much is consumed by the spindle cooling fan drive.
<Servo control>	This power shows how much is consumed by the control circuit, such as the servo amplifier.

Item	Description
<User device 1> to <User device 8>	This power shows how much is consumed by each user device. When the <Name> field for the user parameter (power consumption: user device setting) is not blank, the set name is displayed.

The user can scroll up and down through the detail display. After tapping on an item, the power consumption level per hour is displayed for the selected item in the graph on the left side.

Display range setting

Specifies the <Display unit> and the <Period>.

Total power consumption



1

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Description of screen display

Position	Label	Description
1	Total power consumption table	Displays the total power consumed to date per item.

Total power consumption table

The total power consumed from the <Start date and time for total> to the current date/time is displayed. After selecting an item and pressing the <Reset total value> key, the total power is reset to zero and the count starts again.

If the total power exceeds 999,999,999 [Wh], the total value stops counting thereafter. When the total value is stopped, the total power turns red and the icon below is displayed.

	Upper limit icon for total value
--	----------------------------------

6.7.3.4 1 Cycle Measurement

This screen measures and shows the power consumption per program cycle. The measurement results are displayed for the previous 4 cycles. The user can check the breakdown of the power consumption data.

power consumption (Total power consumption)					2021/02/19 18:31:11
	Latest	Previous 1	Previous 2	Previous 3	
Folder	SAMPLE	SAMPLE	SAMPLE	SAMPLE	
Program	1111	1111	1111	1111	
	2021/02/19 18:26:40	2021/02/19 18:21:49	2021/02/19 18:17:35	2021/02/19 18:11:35	
Measurement time	00:04:00	00:04:00	00:04:00	00:04:01	
Total	55 Wh	54 Wh	54 Wh	53 Wh	
Measurement value details					
All servo axes	8 Wh	7 Wh	7 Wh	7 Wh	
CLT.P	12 Wh	12 Wh	12 Wh	12 Wh	
CTS pump	0 Wh	0 Wh	0 Wh	0 Wh	
Chip shower pump	0 Wh	0 Wh	0 Wh	0 Wh	
Cyclone suction pump	0 Wh	0 Wh	0 Wh	0 Wh	
24 V system	4 Wh	4 Wh	4 Wh	4 Wh	
NC control	1 Wh	1 Wh	1 Wh	1 Wh	
LCD backlight	1 Wh	1 Wh	1 Wh	0 Wh	
<input type="button" value="Power consumption application menu"/> <input checked="" type="button" value="Enable measurement"/> <input type="button" value="Stop current measurement"/> <input type="button" value="MANU COND"/> <input type="button" value="I/O"/> <input type="button" value="BOOKMARK"/> <input type="button" value="APPLICATION"/> <input type="button" value="HELP"/> <input type="button" value="?"/>					

(1) (2) (3) (4) (5) (6) (7) (8)

6

Description of screen display

Position	Label	Description
1	1 cycle measurement data	Displays the corresponding programs, the measurement start date/time, the measurement cycle time and the total measurement values.
2	Measurement value details	Displays the breakdown of the power consumption. The user can scroll up and down through the details of the measurement values.

Description of function key

Position	Label	Description
(1)	<Power consumption application menu>	Goes back to the <Power consumption (menu)> screen.
(2)	<Enable measurement>	Enables and disables the 1 cycle measurement function. Mark is ON: Measurement is enabled. Mark is OFF: Measurement is disabled. The measurement is disabled when the power is turned ON.
(3)	<Stop current measurement>	This can only be pressed while a measurement is in progress. If pressed during a measurement, the measurement results are not saved when the currently executing program ends.
(4)		
(5)		
(6)		
(7)		
(8)		

1 Cycle measurement

The procedure below is for the cycle measurement.

1. Press the <Enable measurement> key to enable the measurement.
2. Start the program in memory operation mode.
3. The measurement results are displayed under the column <Latest> at the end of the program.
- * The previous measurement results are displayed under the column <Latest> until the program ends.

While the measurement is enabled, the measurement results are saved every time the memory operation is started. However, if one of the following conditions is not met, the measurement results are not saved for the program that is running.

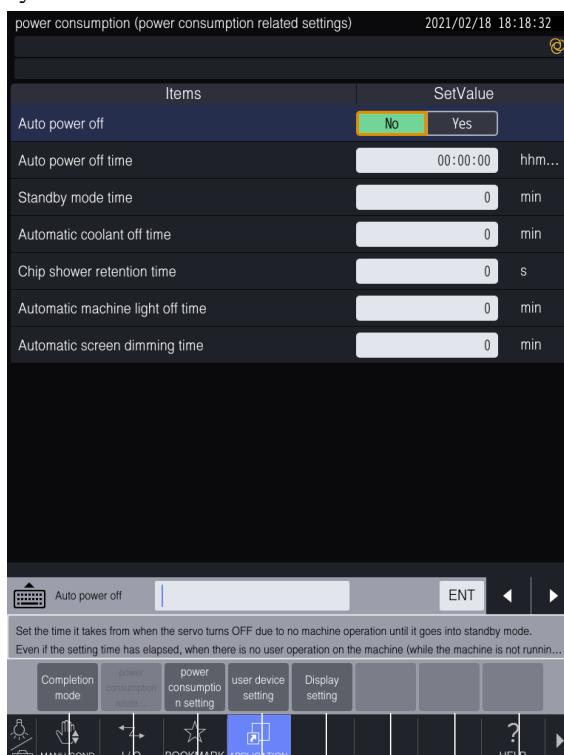
- When the <Stop current measurement> key is pressed
- When the <Enable measurement> key is pressed and the measurement is disabled
- When the memory operation is started while the measurement is disabled
- When operation stops due to a stop level 3 or higher alarm
- When the [RST] key is pressed
- When the operation is reset
- When the power is turned OFF

6.7.3.5 Parameter setting

The parameter setting is broken down into 4 basic screens.

- <Power consumption (power consumption related settings)> screen
- <Power consumption (power consumption setting)> screen
- <Power consumption (user device setting)> screen
- <Power consumption (display setting)> screen

The function keys can be used to switch between these screens.



(1) (2) (3) (4) (5) (6) (7) (8)

Description of function key

Position	Label	Description
(1)	<Completion mode>	Displays the <Completion mode> menu. Refer to “1.1 Data bank overview” in the Data Bank & Alarm Manual for further details on the ways to exit editing mode.
(2)	<Power consumption related settings>	Displays the <Power consumption (power consumption related settings)> screen.
(3)	<Power consumption setting>	Displays the <Power consumption (power consumption setting)> screen.
(4)	<User device setting>	Displays the <Power consumption (user device setting)> screen.
(5)	<Display setting>	Displays the <Power consumption (display setting)> screen.
(6)		
(7)		
(8)		

Power consumption related settings

This screen contains different user parameters related to the power consumption. Any content that is edited here is reflected in the user parameters. The user can edit the following parameters.

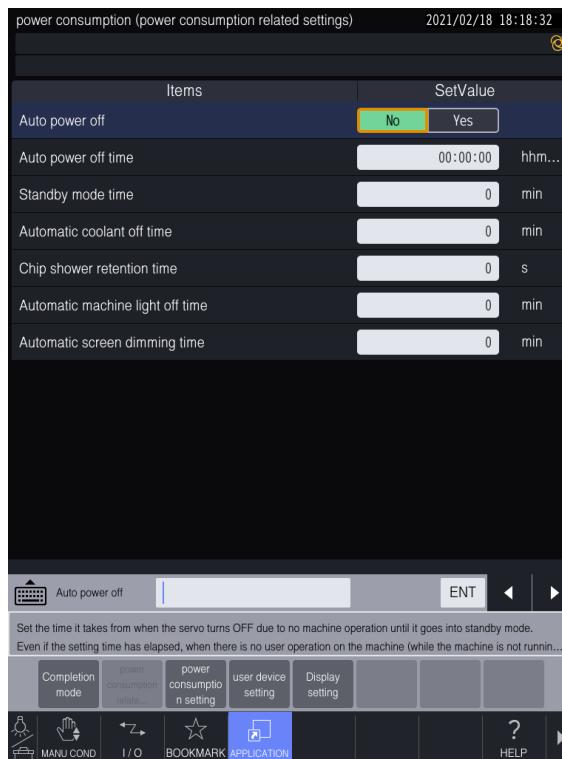
Switch 1: Common

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No.	Item name	Setting range	Description
	Auto power off	0: No 1: Yes	Set active/inactive for automatic power off function. When “1: Yes” is set, power is automatically turned off when automatic power off time arrived. Power is also turned off during operation if the following conditions are satisfied: <ul style="list-style-type: none"> • Program end (Program is regarded to be ended even by restart, and external activation reservation) • Temporary suspension of operation or block stop
	Auto power off time	000000~235959 (00:00:00~23:59:59)	Set the time until power automatically turns off when “1: Yes” is set for “Auto power off”. When “1: Yes” is set, “Auto off is on” is displayed on the screen.
	Standby mode time	0~999min (0:Does not turn off automatically)	Set the time after the servo motor is turned off until standby mode is entered when the machine is not operated. When no machine operation is performed even after the preset time has elapsed, the servo motors for all axes turn off and standby mode is entered, and the alarm message <<*STANDBY MODE>> is displayed. (Note that this alarm is not registered in the alarm log.) Perform any of the following operations, and the servo controller turns on and operation is enabled. <ul style="list-style-type: none"> • All of operations on the operation panel • Operation activation from outside (activation, external activation, remote command for communication, etc.) operation

Switch 1: Installation

No.	Item name	Setting range	Description
	Automatic coolant off time	0~999min (0:Does not turn off automatically)	Set the time until coolant pump is turned off, when coolant pump operates in a state that the machine isn't operating (LEDs of both activation and stop are OFF). Auto-recovery is achieved by subsequent activation, external activation. Since it takes time from when pump is turned on until coolant is actually served in such a case, activation is delayed by the coolant delay time in case of auto-recovery. Coolant pump LED blinks when coolant pump was automatically turned OFF.
	Chip shower retention time	0~99s	Set the time that the chip shower remains ON after M401 is executed. The chip shower turns off when the time preset here has elapsed. (NOTE) The setting value is transmitted to built-in PLC and the function is implemented on a circuit in the built-in PLC. If the default PLC program is changed, the function may not operate as intended following this set value.
	Automatic machine light off time	0~999min (0:Does not turn off automatically)	Set the time after the machine light turns on until it turns off. When "1" or more (minute) is set, the machine light turns off when the preset time has elapsed after the machine light turned on.
	Automatic screen dimming time	0~999min	Automatically clears the screen when entry operation using switches are not performed within the time preset here. 0: Does not dim automatically



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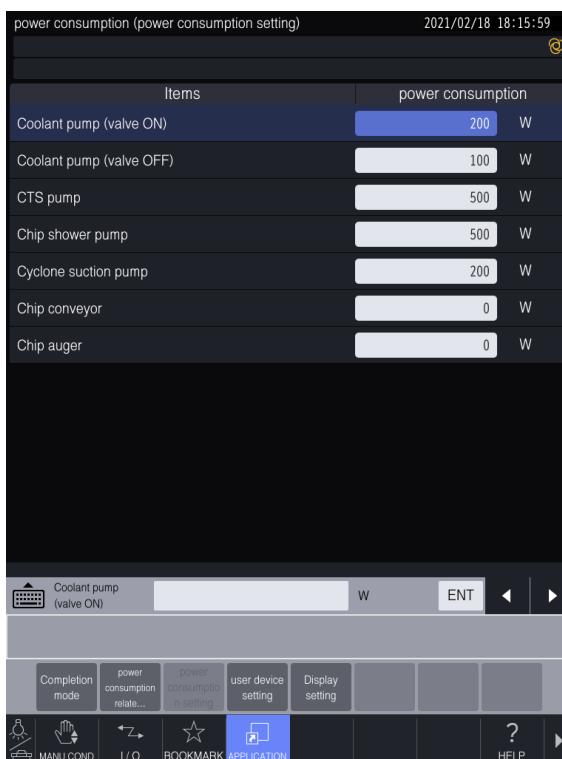
When the screen turns off because of the <Automatic screen dimming time> setting, the user can press a key, such as the [RST] key or [Home] key, on the operation panel to turn the screen back on.

Refer to “7.6 Display OFF” for further details.

Power consumption setting

The user can set the power consumption for each option device. The power consumption set here and the power consumption from the operation time of the option device are calculated. If the customer installs a device that is different from the standard specification, then the power consumption can be changed. After the edited content is saved, the changes are reflected in the power consumption calculation.

If there is no option device, then there are no changes that are applied to the power consumption calculation.



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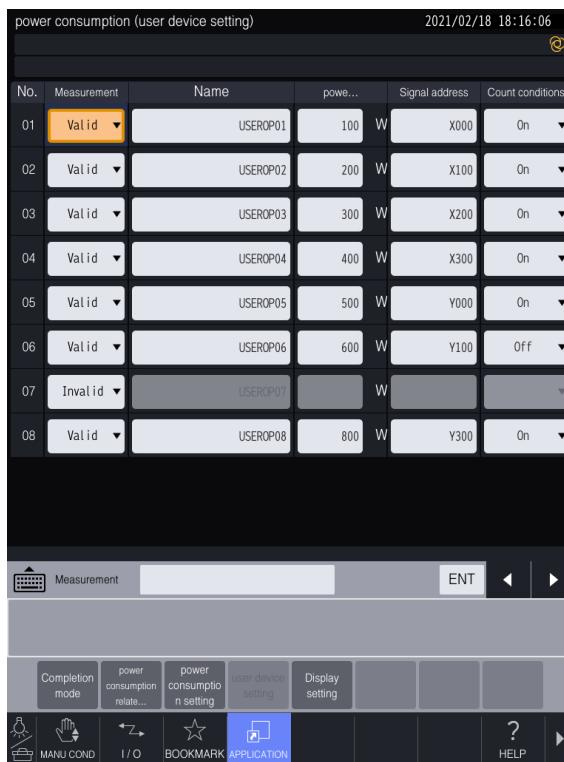
The power condition 60 Hz/200 V is set as the default value for each pump parameter. Refer to the parameters in “6.7.3.6 Parameter setting (frequency/voltage specifications)” to use other frequency and voltage specifications.

Item description

Power consumption setting			
No.	Item name	Setting range	Description
140001	Coolant pump (When valve is ON)	0 to 99999 W	Sets the power that is consumed when the device is operating. The power consumption amount is calculated from the set value and the device's operation time.
140002	Coolant pump (When valve is OFF)		
140003	CTS pump		
140004	Chip shower pump		
140005	Cyclone suction pump		
140006	Chip conveyor		
140007	Coil conveyor		

User device setting

Apart from the option devices, the customer can also calculate the power consumption for other devices that the customer installs, by setting the power consumption of the device and setting the address for the ON/OFF signal of the device. A maximum of 8 devices can be set. After the edited content is saved, the changes are reflected in the power consumption calculation.

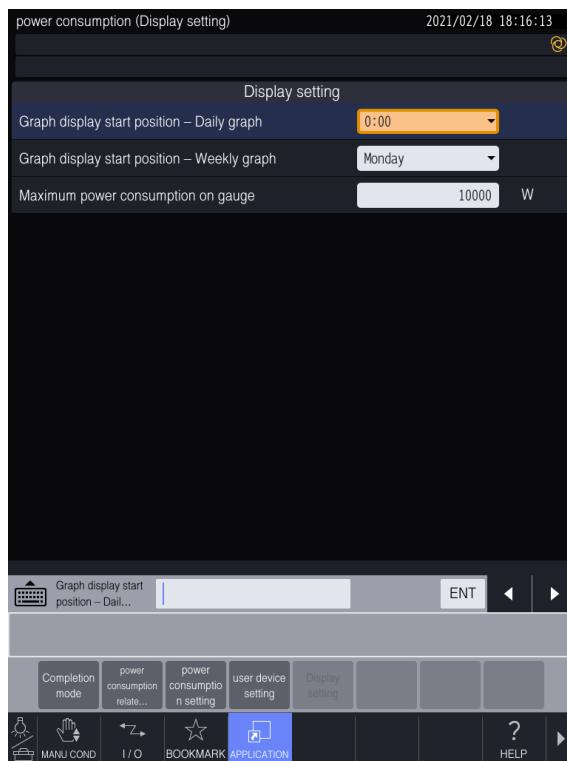


Item description

User device setting			
No.	Item name	Setting range	Description
1410*1 *:1 to 8	Measurement	0: Disable 1: Enable	Calculates the power consumption following the setting in the corresponding column when set to <1: Enable>. When set to disable, the other items are grayed out.
1410*2 *:1 to 8	Name	Characters that can be input from the panel: Max. 20	Registers the name of a given device. A maximum of 20 characters can be entered from the panel using the available characters.
1410*3 *:1 to 8	Power consumption	0 to 99999 W	Sets the power that is consumed when the device is operating. The power consumption is calculated from the set value and the device's operation time.
1410*4 *:1 to 8	Signal address	X000 to X7FF Y000 to Y7FF	Sets the signal address that issues the ON/OFF command for the device. The user can specify the external input relay (X000 to X7FF) and the external output relay (Y000 to Y7FF). The user can set the terminal block assignment for the <External input signal (External input signal)> and the <External I/O signal (External output signal)>.
1410*5 *:1 to 8	Count conditions	0: Count while ON 1: Count while OFF	Sets whether to start counting when the signal (specified in <Signal address>) turns ON or when it turns OFF.

Display setting

The user can set items related to the screen display.



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Item description

Display setting			
No.	Item name	Setting range	Description
145001	Graph display start position – Daily graph	0 to 23 (clock time)	When the <Display unit> is set to <Day> on the <Power consumption log> screen, this item sets the clock time displayed on the left side of the graph. This setting is also reflected in the graph display on the <Power consumption today> screen.
145002	Graph display start position – Weekly graph	Sun to Sat	When the <Display unit> is set to <Week> on the <Power consumption log> screen, this item sets the day of the week displayed on the left side of the graph.
145003	Maximum power consumption on gauge	1~99999 W	Sets the maximum power consumption or regenerative power (instantaneous value) on the gauge for the <Power consumption today> screen.

6.7.3.6 Parameter Setting (Frequency/Voltage Specifications)

Set the following parameters for each frequency and voltage specification. (When equipped with the standard option pump)

Change the parameters when the customer makes arrangements and procures the pump. Follow the reference, and set the motor output power for the pump motor to be used.

W1000Xd1

	Frequency	60Hz			50Hz		[W]
		200V	220V	230V	200V	220V	
140001	Coolant pump (valve ON)	189	195	201	132	144	
140002	Coolant pump (valve OFF)	169	175	181	121	133	
140003	CTS pump	661	669	672	548	571	
140004	Chip shower pump	577	589	601	375	398	
140005	Cyclone suction pump	402	412	416	256	269	

R450Xd1 100/150L

	Frequency	60Hz			50Hz		[W]
		200V	220V	230V	200V	220V	
140001	Coolant pump (valve ON)	215	222	226	147	159	
140002	Coolant pump (valve OFF)	173	180	184	123	135	
140003	CTS pump (non-EU)	617	625	632	498	522	
	*1	*1	*1	*1	*1	*1	
140004	CTS pump (EU)	559	563	565	420	429	
	*1	*1	*1	*1	*1	*1	
140005	Chip shower pump	567	579	585	357	376	
	*1	*1	*1	*1	*1	*1	
140005	Cyclone suction pump	416	425	430	262	274	
	*1	*1	*1	*1	*1	*1	

*1: 150 L only

R650Xd1(14/22/28MG) 200/250L

	Frequency	60Hz			50Hz		[W]
		200V	220V	230V	200V	220V	
140001	Coolant pump (valve ON)	213	219	223	146	159	
140002	Coolant pump (valve OFF)	172	179	183	122	134	
140003	CTS pump (non-EU)	650	657	661	542	561	
	CTS pump (EU)	588	591	591	456	460	
140004	Chip shower pump (200L)	602	615	625	410	437	
	*2	*2	*2	*2	*2	*2	
140004	Chip shower pump (250L)	1076	1096	1106	690	726	
	*3	*3	*3	*3	*3	*3	
140005	Cyclone suction pump	407	415	419	257	269	

*2: 200L only *3: 250L only

R650Xd1(40MG) 250L

	Frequency	60Hz			50Hz		[W]
		200V	220V	230V	200V	220V	
140001	Coolant pump (valve ON)	200	207	212	139	151	
140002	Coolant pump (valve OFF)	166	173	178	119	130	
140003	CTS pump (non-EU)	625	633	638	521	541	
	CTS pump (EU)	566	570	570	439	444	
140004	Chip shower pump	1076	1096	1106	690	726	
140005	Cyclone suction pump	404	411	414	255	267	

Chapter 6 Support Application

R450Xd1/R650Xd1 Chip conveyor		[W]				
	Frequency	60Hz			50Hz	
	Power voltage	200V	220V	230V	200V	220V
140001	Coolant pump (valve ON)	214	221	225	146	158
140002	Coolant pump (valve OFF)	172	179	184	122	134
140003	CTS pump (non-EU)	559	573	582	475	507
	CTS pump (EU)	506	516	520	400	416
140004	Chip shower pump	614	624	630	407	431
140005	Cyclone suction pump	408	416	420	259	271
140006	Chip conveyor	527	540	546	382	406

S300Xd1/S500Xd1/S700Xd1/U500Xd1 50L		[W]				
	Frequency	60Hz			50Hz	
	Power voltage	200V	220V	230V	200V	220V
140001	Coolant pump (valve ON)	198	202	203	129	134
140002	Coolant pump (valve OFF)	124	127	130	87	92

S300Xd1/S500Xd1/S700Xd1/U500Xd1 100L		[W]				
	Frequency	60Hz			50Hz	
	Power voltage	200V	220V	230V	200V	220V
140001	Coolant pump (valve ON)	229	234	238	154	166
140002	Coolant pump (valve OFF)	171	177	180	121	133
140004	Chip shower pump	314	324	327	203	215

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S300Xd1/S500Xd1/S700Xd1/U500Xd1 150L		[W]				
	Frequency	60Hz			50Hz	
	Power voltage	200V	220V	230V	200V	220V
140001	Coolant pump (valve ON)	202	207	209	141	153
140002	Coolant pump (valve OFF)	175	182	187	125	137
140003	CTS pump (non-EU)	663	667	669	551	570
	CTS pump (EU)	539	543	550	457	467
140004	Chip shower pump	504	521	522	328	347
140005	Cyclone suction pump	390	394	400	248	263

6.8 Recovery Support

6.8.1 Overview

The support application (recovery support) helps restore operation from an error status (i.e. tapping stopped or is stuck in a workpiece due to an alarm or a power outage).

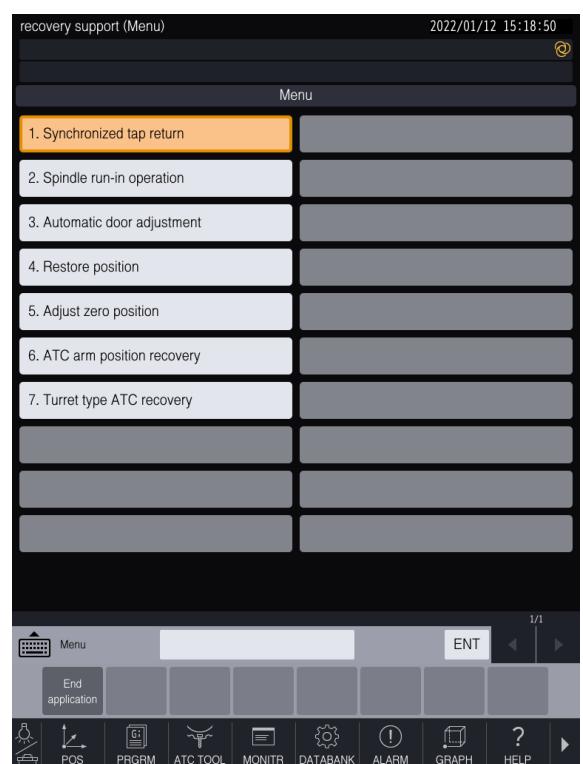
The functions below can be selected in the support application (recovery support).

- Synchronized tap return
- Spindle run-in operation
- Automatic door adjustment
- Position recovery
- Adjust zero position
- ATC arm position recovery
- Turret type ATC recovery

6.8.2 Screen Layout & Description

6.8.2.1 Menu screen

This screen is displayed by selecting the <Support application (recovery support)> screen.



6

Position	Name	Description
1	Menu	<p>Displays the recovery support menu screen. Tap on a menu item to open that screen.</p> <p><Synchronized tap return> Refer to “6.8.5 Synchronized tap return” for further details.</p> <p><Spindle run-in operation> Refer to “6.8.4 Spindle run-in operation” for further details.</p> <p><Automatic door adjustment> Refer to “6.8.3 Automatic door adjustment” for further details.</p> <p><Position recovery> Refer to “6.8.6 Position recovery” for further details.</p> <p><Adjust zero position> Refer to “6.8.8 Zero position adjustment” for further details.</p> <p><ATC arm position recovery> Refer to “6.8.7 ATC arm position recovery” for further details.</p> <p><Turret type ATC recovery> Refer to “6.8.9 Turret type ATC recovery” for further details.</p> <p>The menu cannot be selected on some machine models and specifications. In this situation, the operator message <<There is no corresponding function>> (Stop level 1, cancel level 1) appears.)</p>

Description of function key

Position	Label	Description
(1)	<End application>	Closes the support application
(2)		
(3)		
(4)		
(5)		
(6)		
(7)		
(8)		

6

6.8.3 Automatic Door Adjustment

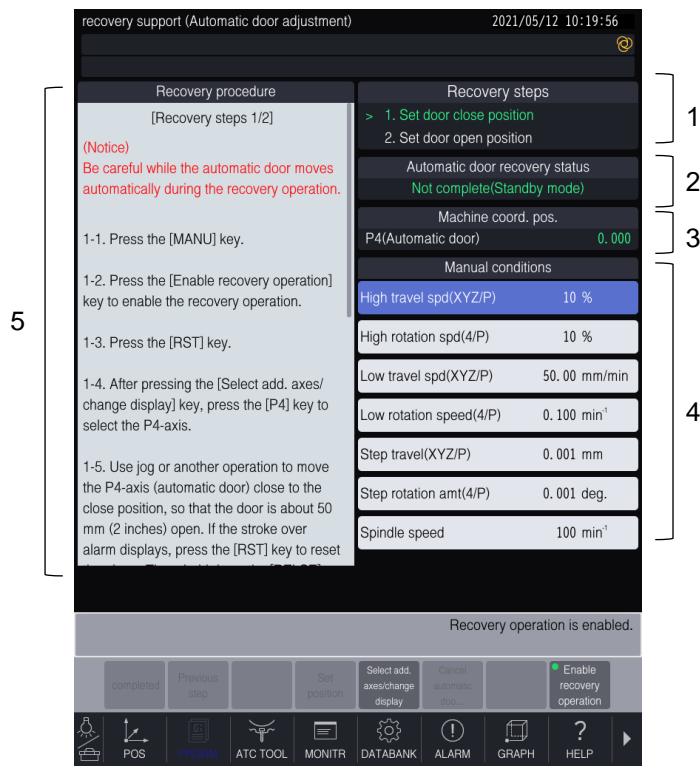
When the positioning relationship of the automatic door is out of alignment, this function adjusts the door to the proper position (zero position).

6.8.3.1 Recovery support (automatic door adjustment) screen

- The alarm <<Door operation timeout>> or <<Door open timeout>> is triggered right in the middle of the automatic door operation.
- The next time the power is turned ON after the power is lost due to the aforementioned status.
- The P4-axis motor replacement is detected when the power is turned ON and the machine is equipped with an automatic door (machine parameter (system 1: automatic door) <Option> is set to <1:Yes>).
- It was detected that the motor encoder data is one revolution different than the value when the power was last turned OFF.
- <Automatic door adjustment> is selected from the support application (recovery support) menu.

The <Recovery support (automatic door adjustment)> screen is displayed when one of the aforementioned conditions applies.

When the machine parameter (system 1: automatic door) <Option> is set to <1:No>, the alarm <<There is no corresponding function>> is triggered.



Description of screen display

Position	Name	Description
1	Recovery steps	Highlights the recovery operation currently required. When that operation is complete, the next operation is highlighted.
2	Automatic door recovery status	<p>Displays the recovery status of the automatic door.</p> <p><Not complete (Standby mode)>: The position adjustment for the automatic door is not complete. The recovery operation is in standby mode.</p> <p><Not complete (Door closed)>: The position adjustment for the automatic door is not complete. The recovery for the door close operation is complete.</p> <p><Not complete (Door opened)>: The position adjustment for the automatic door is not complete. The recovery for the door open operation is complete.</p> <p><Recovery operation in progress>: Operation is in progress for the automatic door position adjustment.</p> <p><Completed>: The position adjustment for the automatic door is complete.</p>
3	Machine coordinate position	Displays the P4-axis (automatic door) machine coordinate value.
4	Manual conditions	Displays the conditions (travel speed, travel amount, rotation amount and spindle speed) when using an axis in manual mode.
5	Procedure guide	Displays instructions for the recovery procedure.

Description of screen operation

1. Description of function key operation

Column	Position	Label	Description
1	(1)	<Completion>	Closes and ends the support application (recovery support).
	(2)	<To previous step>	Goes back to the previous recovery step.
	(3)		
	(4)	<Set position>	Enters and sets the close position of the automatic door. When pressed, the message <The machine position will adjust to the current position. Proceed?> is displayed. Select one of the following. <Yes>: Sets the position. <No>: Returns to the previous screen.
	(5)	<Select add. Axes /change display>	Displays the names of additional axes and the PLC axes in the function area. They are displayed in the order that they are set in the parameters <4th row display axis> to <12th row display axis>.
	(6)	<Cancel automatic door adjustment>	Cancels the automatic change to the <Recovery support (automatic door adjustment)> screen after turning the power OFF and ON.
	(7)		
	(8)	<Enable recovery operation>	Enables or disables the recovery operation. When enabled or disabled, the operator message <<Press the [RST] key.>> appears. When set to <Valid>, the user can press the [RST] key to reset the alarm and perform a recovery. The other function keys are disabled (selection not possible). When changing to a mode that is not manual mode and a number key or letter key is input, the following operator message appears: <<Invalidate the restoration operation.>> and the key input is ignored. The screen cannot be changed to another support application screen. The recovery operation is ignored when set to <Invalid>.

When <Select add. axes/change display> key is pressed

1	(1)	<Completion>	Exits the mode used to switch between additional axis selection and display.
	(2)~(6)	<*-axis> *: Additional axis and PLC-axis	Selects either the additional axis or PLC-axis to display and operate with the [+4] and [-4] keys. Only one axis can be selected. The selected key changes color.
	(7)	<Change additional axes display>	Changes the set of axes that display from (2) to (6) alternating between the <4th - 8th row display axis> and the <9th - 12th row display axis> setting in the user parameter (switch 1: common).
	(8)		

6.8.3.2 Operation procedure

The adjustment of the automatic door is executed in the following order:

1. Adjustment of close position
2. Adjustment of open position

For operation details, follow the screen instructions.

(NOTICE) Be careful while the automatic door moves automatically during the recovery operation.

6.8.4 Spindle Run-in Operation

On a high-speed spindle, the grease distribution in the spindle bearing may change during transportation and storage. If the spindle is rotated at a high speed under said conditions, the spindle may seize or burn out.

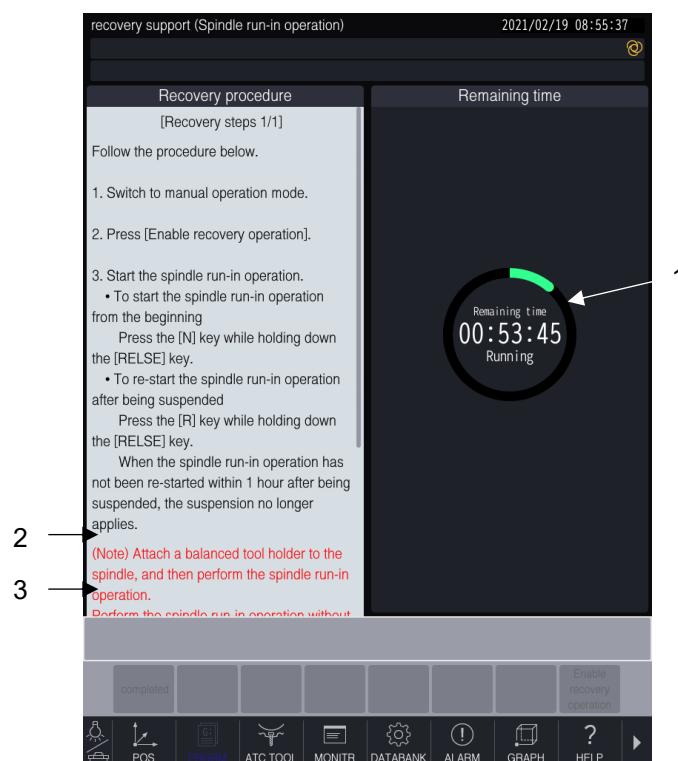
Thus, a run-in operation is required before actual machining if the power has been turned OFF for a long period of time.

If the spindle run-in operation is required, an alarm is triggered which prompts the user to perform a run-in operation when the power is turned ON. When this alarm is triggered, perform the spindle run-in operation.

6.8.4.1 Recovery support (spindle run-in operation) screen

When the <Spindle run-in operation> is selected from the support application (recovery support) menu, the following screen is displayed.

(The operator message <<There is no corresponding function.>> appears on machine models without this support function.)



6

Description of screen display

Position	Name	Description
1	Operation status	Displays the status of the spindle run-in operation and the time it takes until it ends.
2	Balanced tool holder	We recommend a balance grade of G2.5 or higher for the tool holder. (Refer to ISO1940-1 and ISO8821)
3	Spindle run-in operation without the tool holder	The rotation noise for the spindle may get louder but this is characteristic of the specification and not a problem with performance or function.

Description of screen operation
Description of function key operations

Column	Position	Label	Description
1	(1)	<Completion>	Closes and ends the support application (recovery support).
	(2)		
	(3)		
	(4)		
	(5)		
	(6)		
	(7)		
	(8)	<Enable recovery operation>	Enables or disables the spindle run-in operation. Changing to another support application screen is not possible when recovery operation is enabled.

6.8.4.2 Spindle Run-in Procedure

1. Run-in operation when prompted by an alarm

When a spindle test run (or run-in) operation is required, the alarm <<Perform Spindle run-in operation>> is triggered. Follow the procedure below to execute a spindle test run.

- When the power is turned ON, the alarm <<Perform Spindle run-in operation>> is triggered.

The alarm above is triggered in the following situations:

- The spindle run-in operation has never been performed before.
- The power has remained OFF for 720 hours or longer.
- When the power is turned ON with time/date setting values that are older than when the power was turned OFF.

- Press the [RST] key.

- Select <Spindle run-in operation> from the support application (recovery support).

- Switch to manual operation mode.

- Press the <Enable recovery operation> key.

- The top left part of the <Enable recovery operation> key lights up.
- The <Completion> key grays out.

When changing to a mode that is not manual mode and a number key or letter key is pressed, the following operator message appears: <<Invalidate the restoration operation.>> and the key input is ignored.

- Press the [RELSE] + [N] keys to start the spindle test run-in operation.

- <Running> is displayed.
- The [Enable recovery operation] key is grayed out.
- The time displayed for <Remaining time> gradually decreases.

- When the status changes to <Operation end>, the spindle test run-in operation is complete. Recovery operation is disabled. The <Completion> key and <Enable recovery operation> key are enabled.

2. Operation from support application (recovery support)

The spindle test run-in operation can be performed at any time regardless of the alarm status. Perform the procedure from step 3 in the previous section.

3. Stopping spindle run-in operation

If one of the following operations is performed or if a status below applies during the spindle test run-in operation, the operation stops and the status changes to <Stopped>.

- [SP.STOP] key is pressed
- Reset
- Machine lock is enabled or disabled
- Stop level 4 alarm or higher is triggered
- Change door interlock mode status

To restart the spindle run-in operation, press the [RELSE] + [R] keys.

- If run-in operation is not restarted within one hour (including when the power is turned OFF) after operation has stopped, the run-in operation starts from the beginning again even if the [RELSE] + [R] keys are pressed.
- If memory operation is performed while the spindle run-in operation has stopped, the run-in operation starts from the beginning again even if the [RELSE] + [R] keys are pressed.

4. Special notes on spindle run-in operation
 - (1) When recovery operation is <Valid> on the <Recovery support (spindle run-in operation)> screen, if the mode is changed or if a number key, a letter key or the home key is pressed, the following operator message appears: <<Invalidate the restoration operation.>> and the key input is ignored.
 - (2) When recovery operation is <Valid> on the <Recovery support (spindle run-in operation)> screen, the operations in manual operation mode, besides [SP.STOP], are ignored and the following operator message appears: <<Operation other than restoration op is prohibited.>>.
 - (3) Spindle run-in operation cannot be started under the following conditions:
 - The machine lock is ON (<<Press [M.LCK] to disable machine lock>> appears.)
 - The SPLOCK signal is ON (<<Spindle lock signal on>> appears.)
 - When the door is open (<<Door open>> appears.)
 - A stop level 2 alarm or higher is triggered.
 - (4) The recovery operation cannot be enabled in the following conditions even when the <Enable recovery operation> key is pressed.
 - The lathe spindle is selected (Alarm: <<Selection of a spindle is abnormal.>>).
 - Constant peripheral speed is being controlled (Alarm: <<Constant peripheral speed is being controlled>>).
 - Manual operation mode is being used (Alarm: <<Manual operation mode>>).
 - The spindle is rotating (Alarm: <<Spindle rotating>>).
 - The lathe spindle is rotating (Alarm: <<Lathe spindle is rotating>>).
 - ATC maintenance mode is engaged (alarm: <<Changing to ATC maintenance mode>>).
 - Synchronized tap return in progress (Alarm: <<Execute synchronized tap return>>).
 - Changing to mode for enabling and disabling servo (Alarm <<Changing to the mode for enabling and disabling servo>> is triggered.)
 - Brake load test is not executed (<<Brake load test is not complete>> is triggered.)
 - Spindle maintenance mode is engaged (alarm: <<Changing to spindle maintenance mode>>).
 - (5) The spindle override is disabled (set at 100%) during the spindle run-in operation.
 - (6) Memory operation cannot be started while the alarm <<Perform Spindle run-in operation>> is triggered.
 - (7) The alarm <<The spindle running-in has not been completed yet.>> is triggered when a spindle rotation command is issued during the alarm <<Perform Spindle run-in operation>>.

6.8.4.3 List of Alarms and Operator Messages

Alarm description	Stop	Recovery	Cause	Recovery procedure
Perform Spindle run-in operation (NOTE 1)	4	2	Immediately after machine installation or after not operating the machine for a long period, the spindle run-in operation must be executed.	Press the [RST] key. Use the support application (recovery support) to execute the spindle test run-in operation.
The spindle running-in has not been completed yet.	4	2	Spindle rotation command was specified even though the spindle run-in operation was not completed.	Press the [RST] key. Use the support application (recovery support) to execute the spindle test run-in operation.
Perform Spindle run-in operation (NOTE 2)	1	1	Immediately after machine installation or after not operating the machine for a long period, the spindle run-in operation must be executed.	Use the support application (recovery support) to execute the spindle test run-in operation.
Manual operation mode	1	1	An operation was carried out that enabled the recovery/inspection operation during manual operation.	Enable the recovery/inspection operation after manual operation is finished.
Spindle rotating	1	1	An operation was carried out that enabled the recovery/inspection operation during spindle rotation.	Enable the recovery/inspection operation after manual operation is finished.

Alarm description	Stop	Recovery	Cause	Recovery procedure
Lathe spindle is rotating	1	1	A recovery/inspection operation was carried out during lathe spindle rotation.	Stop the lathe spindle, and then perform the recovery / inspection operation.

- (NOTE 1) This alarm is only triggered when the power is turned ON.
- (NOTE 2) This alarm can be triggered at any time until the spindle run-in is complete. (It does not display during the spindle run-in operation.)
The message <Perform Spindle run-in operation> is displayed on the <Manual conditions> screen.

Operator message description	Stop	Recovery	Cause	Recovery procedure
Execute synchronized tap return	1	1	An operation was performed to enable the recovery/inspection operation, which was not a synchronized tap return, when the synchronized tap return was not restored.	(A) First, perform a synchronized tap return. (B) If synchronized tap return cannot be performed first, press the <Cancel synchronized tap return> key on the synchronized tapping return recovery screen to reset synchronized tapping recovery. Then, perform the necessary recovery operations.
Constant peripheral speed is being controlled	1	1	An operation was performed that cannot be executed while the constant peripheral speed is being controlled.	Cancel the constant peripheral speed control.
Selection of a spindle is abnormal.	1	1	An operation was attempted that cannot be executed on the spindle that is currently selected.	Check the spindle that is currently selected.
Changing to ATC maintenance mode	1	1	An operation was performed that cannot be executed while changing to ATC maintenance mode.	Exit ATC maintenance mode.
Operation other than restoration op is prohibited.	1	1	An operation command other than recovery was issued after the recovery and inspection operation was enabled.	Complete the recovery before issuing a command for another operation.
Invalidate the restoration operation.	1	1	(A) The mode was switched to another mode besides manual operation mode, or a number key or a letter key was pressed, while the recovery/inspection function was enabled. (B) The position adjustment for next axis was carried out while the recovery operation was enabled.	Disable the recovery/inspection function first before operating.
Changing to the mode for enabling and disabling servo	1	1	An operation was performed that cannot be executed while in the mode for enabling and disabling the servo.	Exit the mode for enabling and disabling the servo.
Changing to spindle maintenance mode	1	1	An operation was performed that cannot be executed while changing to spindle maintenance mode.	Exit spindle maintenance mode.

6.8.4.4 Signals

The following signal turns ON when the alarm <<Perform Spindle run-in operation>> is triggered.

External output signal

Signal name	Symbol	Mode that controls output				Function
		Manual	MDI	Memory	Edit	
Spindle run-in execute request	SPIALM	○	○	○	○	Turns ON when the spindle run-in operation needs to be executed.

NC → PLC output signal

User program	Signal name	Symbol	Conversation / NC	Signal description
	Spindle run-in execute request	SPIALM	Common	Same as external output signal

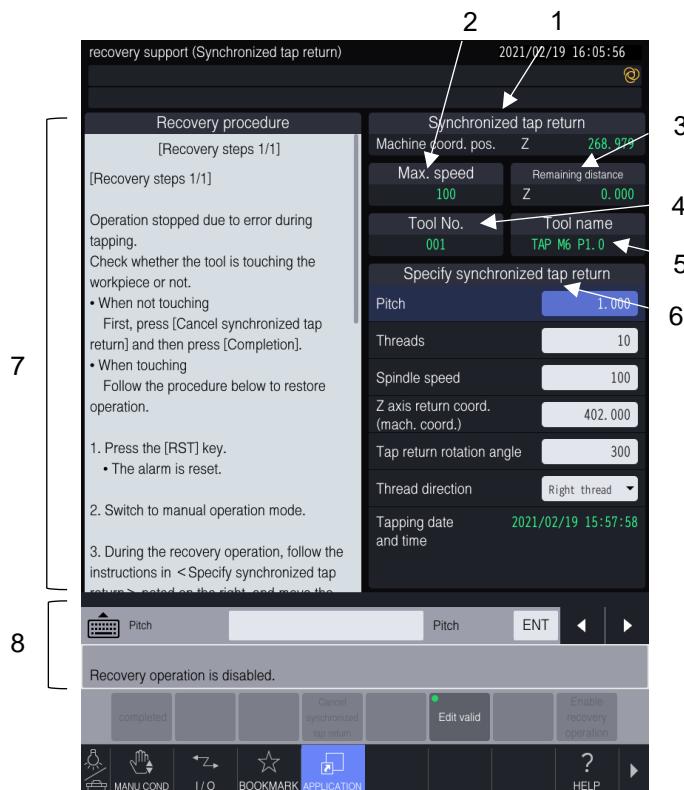
6.8.5 Synchronized Tap Return

A tapping tool that has been stopped while cutting into the workpiece, due to a power failure or emergency stop, can be pulled out.

6.8.5.1 Recovery support (synchronized tap return) screen

- When a stop level 5 alarm is triggered in the middle of a tap operation while in memory or MDI operation mode
- When the power is turned ON again after there has been a loss in power in the middle of a tap operation while in memory or MDI operation mode
- When the <Synchronized tap return> is selected from the support application (recovery support) menu

The <Recovery support (synchronized tap return)> screen is displayed when one of the aforementioned conditions applies.



Description of screen display

Position	Name	Description
1	Z-axis machine coordinate value	Displays the Z-axis machine coordinate value.
2	Maximum speed	Displays the maximum speed (user parameter (switch 1: manual operation) <Max. tapping speed (when returning tap)>).
3	Remaining distance	Displays the remaining distance in the travel command until reaching the Z-axis return coordinate.
4	Tool number	Displays the spindle tool information.
5	Tool name	
6	Specify synchronized tap return	Refer to “ <u>Specify synchronized tap return</u> ” for details about the synchronized tap return.
7	Procedure guide	Displays instructions for a recovery procedure.
8	Data input field /Instructions area	Displays the current recovery operations (enable/disable). The data input field is displayed for changing the command value of the synchronized tap return.

Specify synchronized tap return

When the <Recovery support (synchronized tap return)> screen is displayed, the values that specify the synchronized tap return are displayed. The user can edit the following items (excluding the tapping date and time) when specifying the synchronized tap return.

6

Name	Description
Pitch/number of threads	Displays the pitch/number of threads for the most recent tapping command.
Spindle speed	Displays the smaller value between the value for the most recent tapping command and the value which is set in the user parameter (switch 1: manual operation) <Max. tapping speed (when returning tap)>.
Z-axis return coordinate	Displays the Z-axis coordinate (machine coordinate) shown at the start of most recent tapping command.
Tap return rotation angle	Displays the value that was previously entered for the tap return rotation angle on the <Recovery support (synchronized tap return)> screen.
Thread direction	Displays the thread direction (right thread or left thread) for the most recent tapping command.
Tapping date and time	Updates the values for the aforementioned items (pitch/number of threads, Z-axis return coordinate, tap return rotation angle and thread direction) in the display at the tap start and displays the date and time of the update.

Description of screen operation

1. Description of function key operations

Column	Position	Label	Description
1	(1)	<Completion>	Closes and ends the support application (recovery support).
	(2)		
	(3)		
	(4)	<Cancel synchronized tap return>	Cancels the automatic change to the <Recovery support (synchronized tap return)> screen after turning the power OFF and ON. In addition, after the <Cancel synchronized tap return> key is pressed, the operator message <<Check the tapping tool in the spindle>> appears.
	(5)		
	(6)	<Edit valid>	Enables or disables the edit operation. When the edit operation is <Valid>, the values that specify the synchronized tap return can be edited. The <Completion> and <Cancel synchronized tap return> keys are disabled (selection not possible). When the edit operation is <Invalid>, the values that specify the synchronized tap return cannot be edited.
	(7)		

Column	Position	Label	Description
	(8)	<Enable recovery operation>	Enables and disables recovery operation. Recovery operation is possible when set to <Valid>. The other function keys are disabled (selection not possible). When changing to a mode that is not manual mode and a number key or letter key is pressed, the following operator message appears: <<Invalidate the restoration operation.>> and the key input is ignored. In addition, the screen cannot be changed to another support application screen. The recovery operation is ignored when set to <Invalid>.

2. Description of synchronized tap return operations
 - Press the <Edit valid> key to display the data input field and enable editing. At this time, the <Pitch> under <Specify synchronized tap return> is selected for editing. Editing is not possible when recovery operation is enabled. Press the <Enable recovery operation> key to disable the recovery operation.
 - The following items can be edited: Pitch/threads, speed, Z-axis return coordinate, tap return rotation angle and thread direction. The user can use the tap operation or cursor keys (up/down) to select the input items.
 - After the user enters a given command value for the synchronized tap return, the user can press the [ENT] key to change the command value of the selected synchronized tap return. To edit the thread direction, enter “1” for the right thread and “2” for the left thread, and press the [ENT] key. Or, the user can also use the tap operation to display the pull-down menu. Then, the user can use the tap operation again to make a selection and set the screw direction.
 - If the synchronized tap return operation is carried out when the values are set for both the pitch and threads, the operation is performed with the pitch value.
 - When the speed is changed, the value entered by the user is displayed until the next tapping operation in memory or MDI mode is performed or until the power is turned ON. However, if the value entered is larger than user parameter (switch 1: manual operation) <Max. tapping speed (when returning tap)>, the speed is clamped at the <Max. tapping speed (when returning tap)> during operation.
 - The unit setting is between 1 and 360° for the tap return rotation angle.
 - If the [RELSE] + [H] keys are pressed when the edit items are not set, the operator message <<Setting data error>> appears.
 - If the feedrate calculated from the pitch/threads and speed exceeds the limit value, the alarm <<Feedrate error>> is triggered when the [RELSE] + [H] keys are pressed.

6.8.5.2 Operation Procedure

When a stop level 5 alarm is triggered during a tapping process

When a stop level 5 alarm is triggered during tapping, the <Recovery support (synchronized tap return)> screen is displayed. At the same time, the operator message <<Switch to manual operation mode for restoration>> appears.

1. Press the [RST] key. The alarm will reset.
2. Switch to manual operation mode.
3. During the recovery operation, follow the instructions in <Specify synchronized tap return> on the screen, and move the axes.
To change a value, press <Edit valid> and change it.
4. Press the <Enable recovery operation> key.
5. Start tap return.

When the [H] key is pressed with the [RELSE] key held down, the tapping tool will automatically pull out up to the <Z axis return coord.>. (NOTE 2)

In addition, when the [F] key is pressed with the [RELSE] key held down, the tapping tool will rotate and pull out, turning each time the key is pressed based on <Tap return rotation angle>. (NOTE 3)

6. When the tapping tool is completely pulled out (reaching the Z-axis return coordinate), the operator message <<Restoration completed, so invalidate restoration>> appears.
7. After the <Enable recovery operation> key is pressed to disable recovery, the operator message <<Check the tapping tool in the spindle.>> appears.
8. Press <Completion>.

If the power is turned OFF before step 7 is completed, the operator message <<Check the tapping tool in the spindle.>> will appear when the power is turned ON the next time.

When power is turned OFF during tapping due to a power failure, etc.

After the power is turned ON, the <Recovery support (synchronized tap return)> screen automatically displays. In addition, the operator message <<Check the tapping tool in the spindle.>> also appears at the same time. The subsequent operation procedure is the same as the one performed when a stop level 5 alarm is triggered.

- (NOTE 1) 0 is displayed as the remaining distance until step 5 (press the [RELSE] + [H] keys) is performed.
- (NOTE 2) If the [RELSE] + [H] keys are pressed only once, operation is restored to the Z-axis return coordinate. (The recovery operation is not carried out only while the keys are pressed.)
- (NOTE 3) When the [RELSE] + [F] keys are pressed once, operation is restored in steps following the specified tap return rotation angle. When the keys are pressed several times, operation is restored to the Z-axis return coordinate. (The recovery operation is not carried out only while the keys are pressed.)

6.8.5.3 Special notes

- (NOTE 1) The <Cancel synchronized tap return> key is valid when a stop level 5 alarm is triggered during tapping or when tapping is stopped due to the power turning OFF. The key is invalid (grayed out) when the synchronized tap return is completed or when the <Cancel synchronized tap return> key is pressed.
- (NOTE 2) During the synchronized tap return operation, the Z-axis only moves or raises in the upward direction. If the [RELSE] + [H] keys or the [RELSE] + [F] keys are pressed when the current Z-axis coordinate is greater than the Z-axis return coordinate, the Z-axis does not lower. At this time, the operator message <<Synchr. tapping return restoration position error>> appears and the key operation is ignored. If the <Enable recovery operation> key is pressed when the ATC arm is not positioned at the zero point, the following operator message appears: <<Restore the ATC arm position.>> and key operation is ignored.
- (NOTE 3) If a manual operation is attempted before recovery using the synchronized tap return, the operator message <<Operation other than restoration op is prohibited>> appears.
- (NOTE 4) Even if the synchronized tap return operation is executed, the modal does not change.
- (NOTE 5) During the synchronized tap return operation, the <Cancel synchronized tap return>, <Edit valid> and <Enable recovery operation> keys are invalid (grayed out) and key input is not possible.
- (NOTE 6) When the synchronized tap return operation is attempted while the machine is locked, the operator message <<Press [M.LCK] to disable machine lock>> appears and the synchronized tap return operation cannot be executed.
- (NOTE 7) If the <Enable recovery operation> key is pressed while constant peripheral speed is controlled (G96 modal), the message <<Constant peripheral speed is being controlled>> appears and the operation is invalid.
- (NOTE 8) Cancel the constant peripheral speed control (G97 modal) and proceed with the operation.
- (NOTE 9) If the <Enable recovery operation> key is pressed when the alarm <<Changed to the ATC maintenance mode.>> is triggered, the operator message <<Changing to ATC maintenance mode>> appears and the operation becomes invalid. Exit ATC maintenance mode and then perform the operation.
- (NOTE 10) If the <Enable recovery operation> key is pressed during manual mode, the alarm <<Manual operation mode>> is triggered and the operation becomes invalid. Exit manual mode and then perform the operation.
- (NOTE 11) If the <Enable recovery operation> key is pressed during spindle rotation, the alarm <<Spindle rotating>> appears and the operation becomes invalid. Stop spindle rotation and then perform the operation.
- (NOTE 12) If the <Enable recovery operation> key is pressed during lathe spindle rotation, the alarm <<Lathe spindle is rotating>> appears and the operation becomes invalid. Stop spindle rotation and then perform the operation.
- (NOTE 13) When the user parameter (switch 2: common) <Tap override> is set to <1: Spindle override>, the spindle override is applied to the cutting feedrate and spindle speed during the synchronized tap return. However, if the spindle override is greater than 100%, the motion is carried out at 100%.

- (NOTE 14) When the user parameter (switch 1: common) <Tap override> is set to <2: Feedrate override>, the feedrate override is applied to the cutting feedrate and spindle speed during the synchronized tap return. However, if the cutting feedrate override is greater than 100%, the motion is carried out at 100%.
- (NOTE 15) If the <Enable recovery operation> key is pressed when the alarm <<Change to spindle maintenance mode>> is triggered, the operator message <<Changing to spindle maintenance mode>> appears and the operation becomes invalid. Exit spindle maintenance mode and then perform the operation.

6.8.5.4 Update command for synchronized tap return

NC language

- G74 (*)
- G84 (*)
- G77
- G78
- G133
- G134
- G177
- G178

Conversation language

- Tapping job
- Counter boring tap job
- Rolled tap job
- Counter boring rolled tap job
- Motion call job (Motion: Cutting, Motion type: Tap)
- Motion call job (Motion: Cutting, Motion type: Single direction tapping)

* When the G74 and G84 commands are issued, the pitch is calculated from the F and S commands. The result is set as the values that are specified for the synchronized tap return.

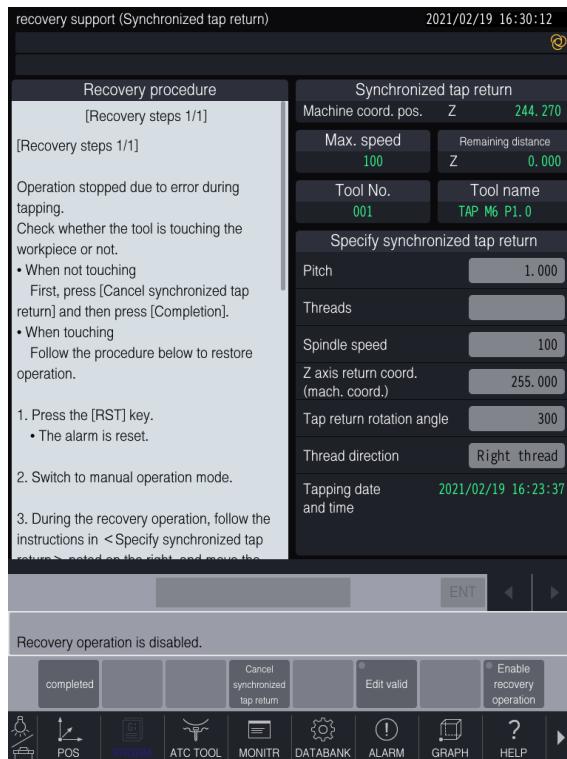
- (NOTE 1) If the tapping command above is executed during machine lock, the values specified for the synchronized tap return are not updated.
- (NOTE 2) If the tapping command above is executed during a dry run, the values specified for the synchronized tap return are updated. However, the dry run offset amount is added to the Z-axis return coordinate.
- (NOTE 3) When the screw pitch is less than the <Minimum tapping pitch> in the machine parameter (system 1: common), the alarm <<Pitch data error>> is triggered.

6.8.5.5 Example of Synchronized Tap Return Operation

1. For NC language

```
N1 G54 G90 G99 (G54 Z:200.000)
N2 G100 T1 G43 H1 Z10. (H1:50.000)
N3 G77 R5. Z-20. I1. S6000
N4 M30
```

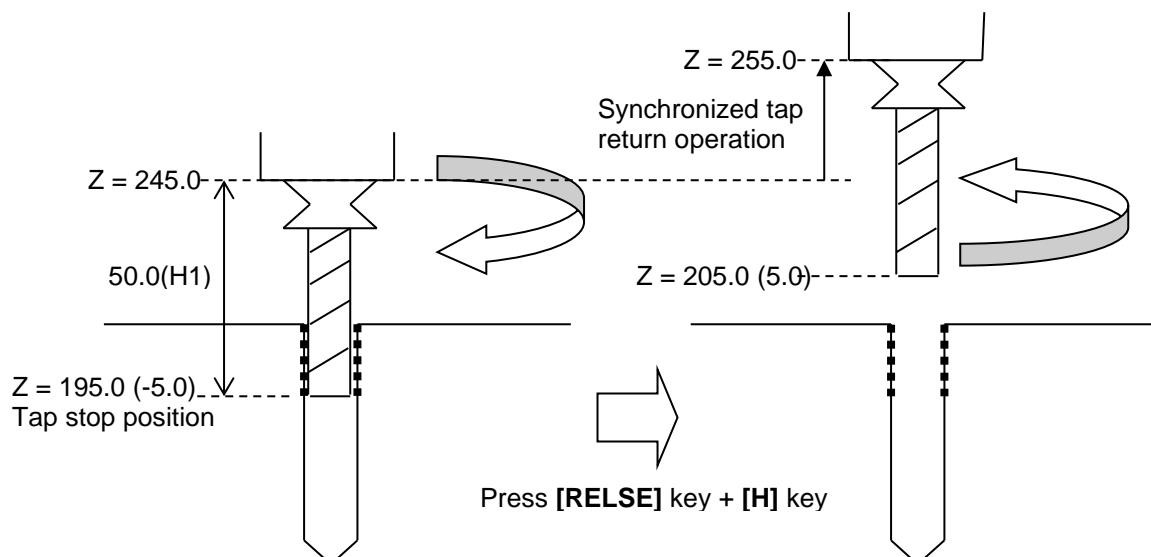
If N3 tapping is stopped midway at $Z = -5.0$ (absolute coordinate) due to a power failure, etc., the synchronized tap return screen is displayed as follows:



6

Follow the guide and press the **[H]** key with the **[RELSE]** key held down to display the remaining distance (Initial value: 15.000). The Z-axis raises from the current coordinate 245.000 up to 255.000 with a pitch of 1.0 mm, a spindle speed of 100 min^{-1} and using reverse rotation.

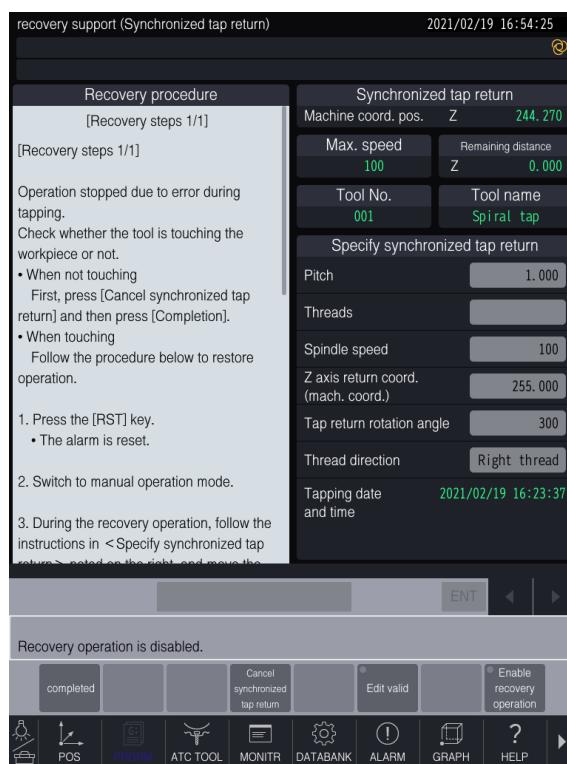
* The Z-axis coordinate in brackets () indicates the coordinate value in the G54 absolute coordinate system.



2. For conversation language

Workpiece zero	X -200.000 Y -200.000 Z 300.000
	A ? B ?
Return height (job change)	Height 50.000
Workpiece	1
Workpiece material	ADC12
Job 001 Tapping	Torsion Right thread Thread M6.000×1.000 Prepared hole depth 5.100 Chamfering 0.000
	Pattern Point
	Z-axis position Bottom of hole Blind Depth 10.000
	Height 0.000 Return height 2.000
	XY position X 0.000 Y 0.000
	Peripheral speed Peripheral speed 100% Feed 100%
Main program end	

After the primary hole drilling is finished, if tapping (tapping tool length: 100.000) is stopped midway at Z = -5.0 (absolute coordinate) due to a power failure, etc., the <Recovery support (synchronized tap return)> screen is displayed as follows:



6

Follow the guide and press the [H] key with the [RELEASE] key held down to display the remaining distance (Initial value: 7.000). The Z-axis raises from the current coordinate 395.000 up to 402.000 with a pitch of 1.0 mm, a spindle speed of 100 min⁻¹ and using reverse rotation.

6.8.6 Restore position

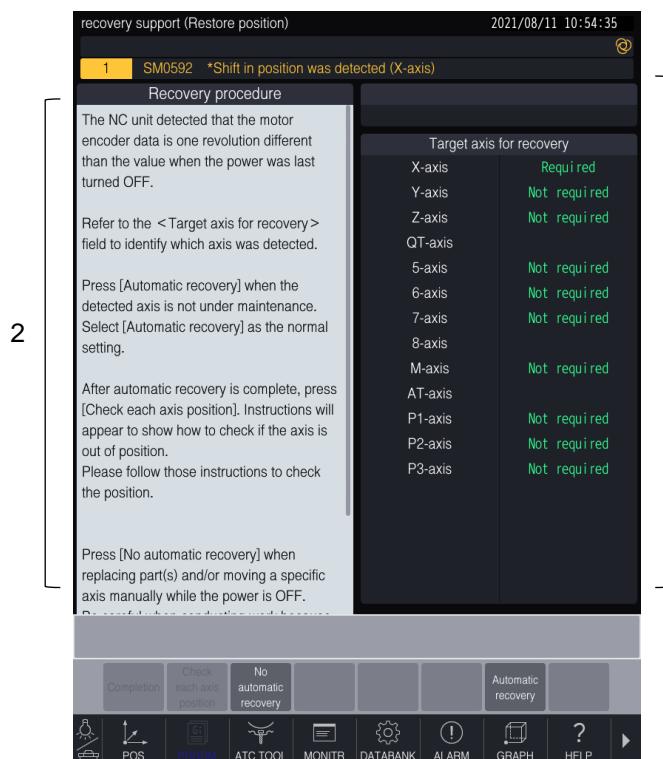
6.8.6.1 Overview

The position recovery function can restore the machine to the correct position when it is detected that the motor encoder data is one revolution different than the value when the power was last turned OFF. In addition, the user can follow the directions to confirm whether each axis is in the correct position or not.

6.8.6.2 Recovery support (restore position) screen

The <Recovery support (restore position)> screen appears when the alarm <<Shift in position was detected (*-axis)>> is triggered on an axis. If the power is turned OFF after the alarm <<Shift in position was detected (*-axis)>> is triggered, the <Recovery support (restore position)> screen appears when the power is turned ON the next time.

Follow the instructions on the screen to restore the position.



6

2

1

Description of screen display

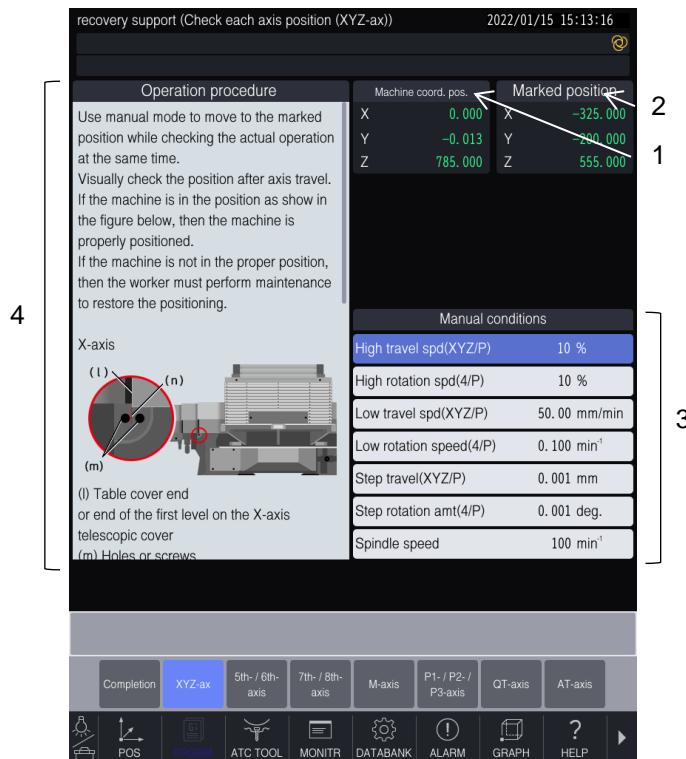
Position	Name	Description
1	Target axis for recovery	Displays the axes where the position needs to be restored. <Required>: Position needs to be restored on this axis. <Not required>: Position does not need to be restored on this axis.
2	Procedure guide	Displays instructions for the recovery procedure.

Description of screen operation
Description of function key operations

Column	Position	Label	Description
1	(1)	<Completion>	Closes and ends the support application (recovery support).
	(2)	<Check each axis position>	Changes to the <Recovery support (check each axis position)> screen.
	(3)	<No automatic recovery>	Displays a popup message asking the user whether to exit without doing automatic recovery on the target axes. Select <Yes> to go back to the <Recovery support (restore position)> screen without doing automatic recovery on the target axes. Select <No> to go back to the <Recovery support (restore position)> screen.
	(4)		
	(5)		
	(6)		
	(7)	<Automatic recovery>	Displays a popup message asking the user whether to do automatic recovery on the target axes. Select <Yes> so that the absolute values are automatically restored on the target axes. Select <No> to go back to the <Recovery support (restore position)> screen.
	(8)		

6.8.6.3 Recovery support (check each axis position (excluding M-axis)) screen

The user can check if each axis (X-, Y-, Z-, 5th-, 6th-, P1-, P2- and P3-axes) is in the correct position or not. Follow the instructions on the screen to check the position.



6

Description of screen display

Position	Name	Description
1	Machine coordinate position	Displays the current coordinate value in the machine coordinate system.
2	Marked position	Displays the machine coordinate position as a guide when moving an axis to the marked position.
3	Manual conditions	Displays the conditions (travel speed, travel amount, rotation amount and spindle speed) when using an axis in manual mode.
4	Operation procedure	Displays instructions for the operation procedure.

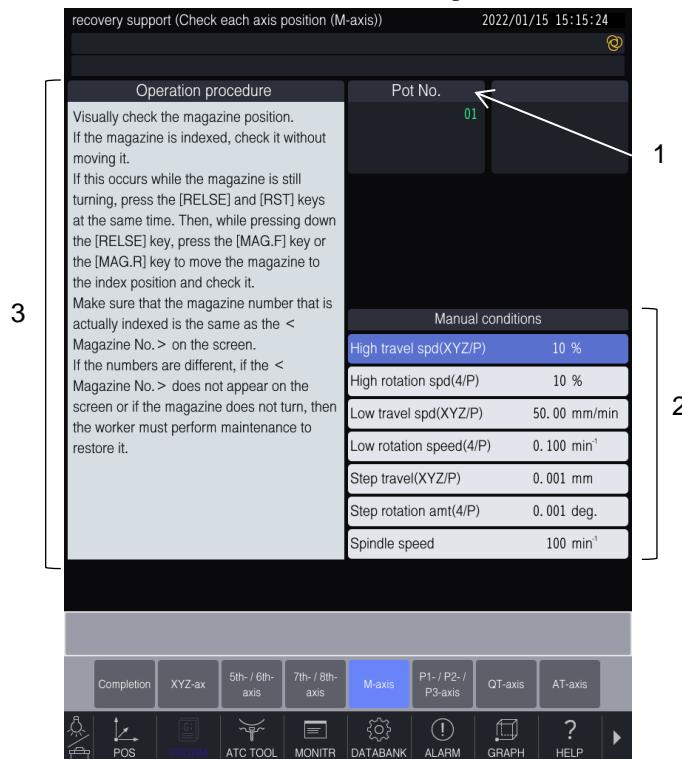
Description of screen operation

Description of function key operations

Column	Position	Label	Description
1	(1)	<Completion>	Closes and ends the support application (recovery support).
	(2)	<XYZ-axis>	Displays the <Recovery support (check each axis position (XYZ-axis))> screen.
	(3)	<5th- / 6th-axis>	Displays the <Recovery support (check each axis position (5th- / 6th-axis))> screen.
	(4)	<7th- / 8th-axis>	Displays the <Recovery support (check each axis position (7th- / 8th-axis))> screen.
	(5)	<M-axis>	Displays the <Recovery support (check each axis position (M-axis))> screen.
	(6)	<P1- / P2- / P3-axis>	Displays the <Recovery support (check each axis position (P1- / P2- / P3-axis))> screen.
	(7)	<QT-axis>	Displays the <Recovery support (Check each axis position (QT-axis))> screen.
	(8)	<AT-axis>	Displays the <Recovery support (Check each axis position (AT-axis))> screen.

6.8.6.4 Recovery support (check each axis position (M-axis)) screen

The user can check whether the M-axis is in the correct position or not. Follow the instructions on the screen to check the position.



Description of screen display

Position	Name	Description
1	Magazine No. Pot No.	The display varies depending on the type of ATC. When the machine model is not equipped with arm type ATC, the magazine number is displayed for the spindle that is currently indexed. When the machine model is equipped with arm type ATC, the magazine number is displayed for the next tool pot.
2	Manual conditions	Displays the conditions (travel speed, travel amount, rotation amount and spindle speed) when using an axis in manual mode.
3	Operation procedure	Displays instructions for the operation procedure.

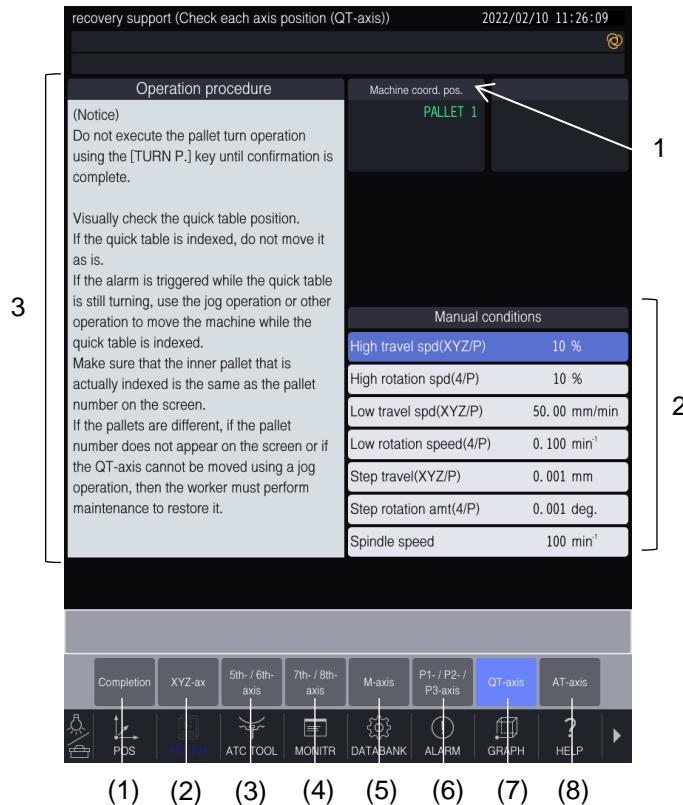
Description of screen operation

Description of function key operations

Column	Position	Label	Description
1	(1)	<Completion>	Closes and ends the support application (recovery support).
	(2)	<XYZ-axis>	Displays the <Recovery support (check each axis position (XYZ-axis))> screen.
	(3)	<5th- / 6th-axis>	Displays the <Recovery support (check each axis position (5th- / 6th-axis))> screen.
	(4)	<7th- / 8th-axis>	Displays the <Recovery support (check each axis position (7th- / 8th-axis))> screen.
	(5)	<M-axis>	Displays the <Recovery support (check each axis position (M-axis))> screen.
	(6)	<P1- / P2- / P3-axis>	Displays the <Recovery support (check each axis position (P1- / P2- / P3-axis))> screen.
	(7)	<QT-axis>	Displays the <Recovery support (Check each axis position (QT-axis))> screen.
	(8)	<AT-axis>	Displays the <Recovery support (Check each axis position (AT-axis))> screen.

6.8.6.5 Recovery Support (Check Each Axis Position (QT-axis)) Screen

The user can check whether the QT-axis is in the correct position or not. Follow the instructions on the screen to check the position.



6

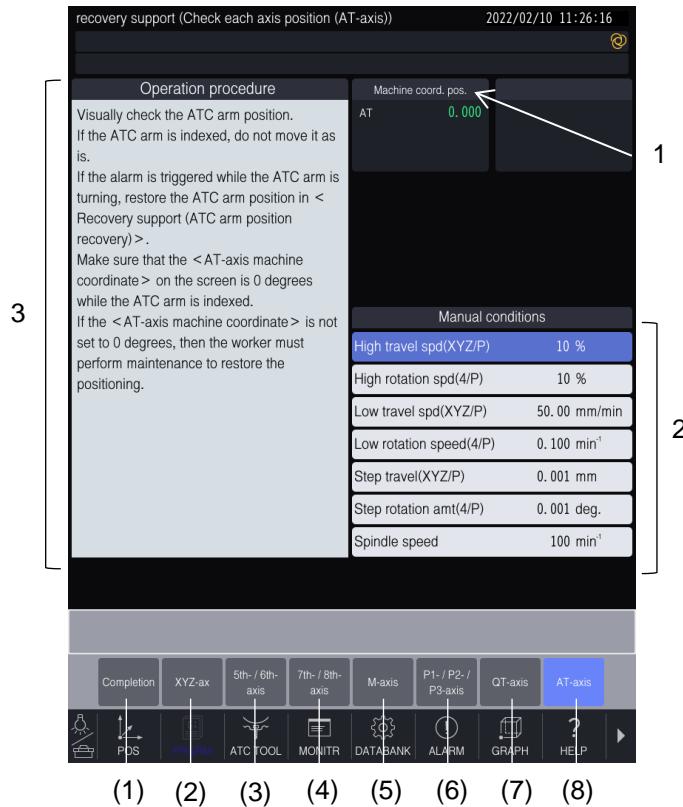
Description of screen display

Position	Name	Description
1	Machine coordinate position	Displays the current coordinate value in the machine coordinate system.
2	Manual conditions	Displays the conditions (travel speed, travel amount, rotation amount and spindle speed) when using an axis in manual mode.
3	Operation procedure	Displays instructions for the operation procedure.

Column	Position	Label	Description
1	(1)	<Completion>	Closes and ends the support application (recovery support).
	(2)	<XYZ- axis>	Displays the <Recovery support (Check each axis position (XYZ- axis))> screen.
	(3)	<5th- / 6th-axis>	Displays the <Recovery support (Check each axis position (5th- / 6th-axis))> screen.
	(4)	<7th- / 8th-axis>	Displays the <Recovery support (Check each axis position (7th- / 8th-axis))> screen.
	(5)	<M-axis>	Displays the <Recovery support (Check each axis position (M-axis))> screen.
	(6)	<P1- / P2- / P3- axis>	Displays the <Recovery support (Check each axis position (P1- / P2- / P3-axis))> screen.
	(7)	<QT-axis>	Displays the <Recovery support (Check each axis position (QT-axis))> screen.
	(8)	<AT-axis>	Displays the <Recovery support (Check each axis position (AT-axis))> screen.

6.8.6.6 Recovery Support (Check Each Axis Position (AT-axis)) Screen

The user can check whether the AT-axis is in the correct position or not. Follow the instructions on the screen to check the position.



Description of screen display

Position	Name	Description
1	Machine coordinate position	Displays the current coordinate value in the machine coordinate system.
2	Manual conditions	Displays the conditions (travel speed, travel amount, rotation amount and spindle speed) when using an axis in manual mode.
3	Operation procedure	Displays instructions for the operation procedure.

Column	Position	Label	Description
1	(1)	<Completion>	Closes and ends the support application (recovery support).
	(2)	<XYZ- axis>	Displays the <Recovery support (Check each axis position (XYZ- axis))> screen.
	(3)	<5th- / 6th-axis>	Displays the <Recovery support (Check each axis position (5th- / 6th-axis))> screen.
	(4)	<7th- / 8th-axis>	Displays the <Recovery support (Check each axis position (7th- / 8th-axis))> screen.
	(5)	<M-axis>	Displays the <Recovery support (Check each axis position (M-axis))> screen.
	(6)	<P1- / P2- / P3- axis>	Displays the <Recovery support (Check each axis position (P1- / P2- / P3-axis))> screen.
	(7)	<QT-axis>	Displays the <Recovery support (Check each axis position (QT-axis))> screen.
	(8)	<AT-axis>	Displays the <Recovery support (Check each axis position (AT-axis))> screen.

6.8.7 ATC arm position recovery

If the ATC arm stops at a halfway position due to a power failure or emergency stop when the ATC arm turns during ATC operation, the user can restore the ATC position following the instructions.

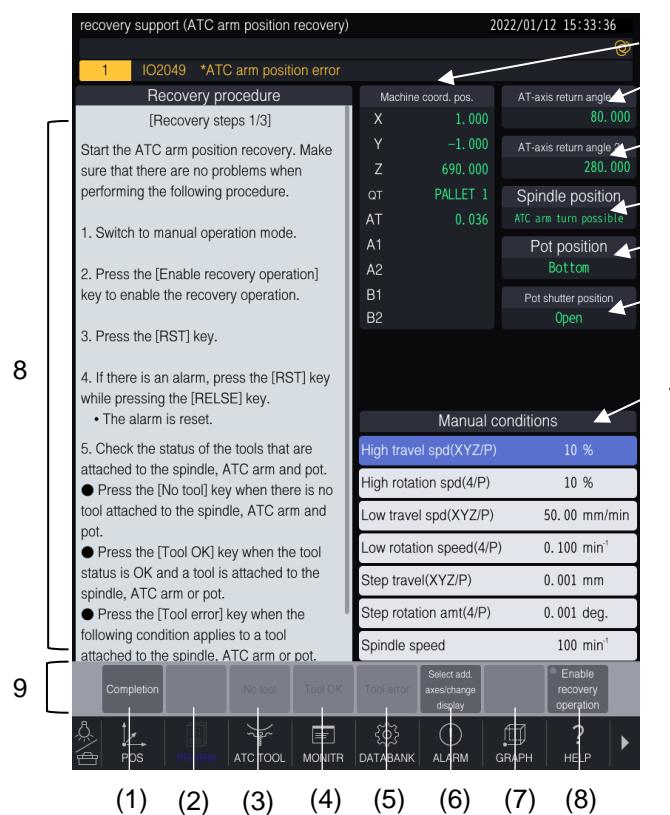
6.8.7.1 Enable/Disable Function

This function is enabled for machine models equipped with the arm type ATC mechanism.

6.8.7.2 <Recovery Support (ATC Arm Position Recovery)> Screen

If the alarm <<ATC arm position error>> is triggered, the <Recovery support (ATC arm position recovery)> screen is displayed. During memory/MDI operation, the operator message <<Switch to manual operation mode for restoration>> appears at the same time.

In addition, when <ATC arm position recovery> is selected from the support application (recovery support) menu, the <Recovery support (ATC arm position recovery)> screen is displayed.



Description of screen display

Position	Name	Description
1	Machine coordinate position	Displays the current machine coordinate position of each axis.
2	AT-axis return angle 1	Displays the value for machine parameter (system 3: common) <Return angle 1 for AT-axis>.
3	AT-axis return angle 2	Displays the value for machine parameter (system 3: common) <Return angle 2 for AT-axis>.
4	Spindle position	<ATC arm turn possible>: The spindle is at a position from the zero point that is less than <Spindle orientation tolerance> (machine parameter (system 1: common)). <ATC arm cannot turn>: The spindle is not at a position from the zero point that is less than <Spindle orientation tolerance> (machine parameter (system 1: common)). (This also includes when the spindle position is undefined.)
5	Pot position	<Bottom>: The pot position is at the bottom. <Top>: The pot position is at the top. <>: The pot position is not at the bottom or top.
6	Pot shutter position	<Open>: The pot shutter is open. <Close>: The pot shutter is closed. <>: The pot shutter is neither open nor closed.
7	Manual conditions	Displays the conditions (travel speed, travel amount, rotation amount and spindle speed) when using an axis in manual mode.
8	Procedure guide	Displays instructions for a recovery procedure.
9	Data input field/ Instructions area	Displays the current recovery operations (enable/disable).

Description of screen operation

1. Description of function key operations

The function key display varies depending on the recovery step.

• Recovery step 1

Column	Position	Label	Description
1	(1)	<Completion>	Closes and ends the support application (recovery support). Selection is not possible when recovery operation is enabled. The key is grayed out.
	(2)		
	(3)	<No tool>	Select when there is no tool attached to the spindle, ATC arm and pot. The key cannot be selected when recovery operation is disabled or when the alarm is not reset. The key is grayed out.
	(4)	<Tool OK>	Select when the tool status is OK and a tool is attached to the spindle, ATC arm or pot. The key cannot be selected when recovery operation is disabled or when the alarm is not reset. The key is grayed out.
	(5)	<Tool error>	Select when the following condition applies to a tool attached to the spindle, ATC arm or pot. - Spindle drive key or ATC arm/pot key is not inside the key pocket on the tool holder. The key cannot be selected when recovery operation is disabled or when the alarm is not reset. The key is grayed out.

Column	Position	Label	Description
	(6)	<Select add. axes/ change display>	Displays the names of additional axes and the PLC axes in the function area. They are displayed in the order that they are set in the user parameters (switch 1: common) <4th row display axis> to <12th row display axis>.
	(7)		
	(8)	<Enable recovery operation>	Enable or disable the recovery operation. When enabled or disabled, the operator message <<Press the [RST] key.>> appears. When set to <Enable>, the user can press the reset key to reset the alarm and perform a recovery. When changing to a mode that is not manual mode and a number key or letter key is input, the following operator message appears: <<Invalidate the restoration operation>> and the key input is ignored. The screen cannot be changed to another support application screen. The recovery operation is ignored when set to <Disable>.

When <Select add. axes/change display> key is pressed

Column	Position	Label	Description
1	(1)	<Completion>	Exits the mode used to switch between additional axis selection and display.
	(2)~(6)	<*axis> *: Additional axis and PLC-axis	Selects either the additional axis or PLC-axis to display and operate with the [+4] and [-4] keys. Only one axis can be selected. The selected key changes color.
	(7)	<Change additional axes display>	Changes the set of axes that display from (2) to (6) alternating between the <4th - 8th row display axis> and the <9th - 12th row display axis> setting in the user parameter (switch 1: common).
	(8)		

- Recovery step 2

Column	Position	Label	Description
1	(1)	<Completion>	Closes and ends the support application (recovery support). Selection is not possible when recovery operation is enabled. The key is grayed out.
	(2)	<Previous step>	Goes back to recovery step 1.
	(3)		
	(4)		
	(5)		
	(6)		
	(7)		
	(8)	<Enable recovery operation>	Same as <Enable recovery operation> key in recovery step 1.

- Recovery step 3

Column	Position	Label	Description
1	(1)	<Completion>	Closes and ends the support application (recovery support). Selection is not possible when recovery operation is enabled. The key is grayed out.
	(2)		
	(3)		
	(4)		
	(5)		
	(6)		
	(7)		
	(8)	<Enable recovery operation>	Same as <Enable recovery operation> key in recovery step 1.

- Description of ATC arm position recovery operation
 - There are three recovery steps: 1, 2 and 3, and the steps progress depending on the function key or recovery operation.
 - In recovery step 2, multiple operations may be required depending on the machine status.

6.8.7.3 Operation Procedure

- Switch to manual operation mode, follow the instructions on each screen and perform the ATC arm position recovery operation.
- When a recovery operation is executed that is not in the instructions, the operator message <<Recovery operation disabled>> appears and the operation is ignored.
- When the recovery operation is enabled, some operations are restricted, such as changing to another mode.

6.8.7.4 Special Notes

1. The <Recovery support (ATC arm position recovery)> screen changes to the default screen for manual operation mode, from when the alarm <<ATC arm position error>> is triggered until the recovery operation is complete. Therefore, if the [RST] key is pressed in manual operation mode, or if the mode is changed to another mode and then changed back to manual operation mode again, the <Recovery support (ATC arm position recovery)> screen is displayed. However, this does not apply when the alarm <<ATC return position error>> is triggered.
2. When the alarm <<ATC arm position error>> is triggered during manual operation mode, the screen currently being displayed changes to the <Recovery support (ATC arm position recovery)> screen.
3. When the alarm <<ATC arm position error>> is triggered, enable the recovery operation in manual operation mode, and press the [RELSE] and [RST] keys to reset the alarm.
4. After pressing the [RELSE] and [RST] keys in manual operation mode to reset the alarm <<ATC arm position error>>, if an attempt is made to perform manual operation when the recovery operation is not complete, the operator message <<Operation other than restoration op is prohibited.>> appears.
5. When the alarm <<ATC recovery position error>> is triggered or when the <<ATC recovery position error>> is triggered during recovery operation while on the <Recovery support (ATC arm position recovery)> screen, recovery is not possible on the <Recovery support (ATC arm position recovery)> screen. Execute the recovery operation in ATC maintenance mode.
6. When the recovery operation for the ATC arm position is complete, the operator message <<Restoration completed, so invalidate restoration.>> is triggered.
7. In recovery step 3, press the <Enable recovery operation> key to make the recovery operation invalid. After pressing the [RST] key, then the operator message <<Check ATC tool.>> appears.
8. If the power is turned OFF during the following period, the operator message <<Check ATC tool.>> will appear when the power is turned ON the next time.
 - From when the alarm <<ATC arm position error>> is triggered until the recovery step 3 operation is completed (when the alarm <<ATC arm position error>> is triggered in manual operation mode).
 - From when the <Recovery support (ATC arm position recovery)> screen is displayed (by pressing the [MANU] key to change to manual operation mode) until recovery step 3 operation is completed (when the alarm <<ATC arm position error>> is triggered in another mode besides manual operation mode).
9. If the <Enable recovery operation> key is pressed during manual mode, the alarm <<Manual operation mode>> is triggered and the operation becomes invalid. Exit manual mode and then perform the operation.
10. When performing a manual operation (that is not a handle operation) while in handle mode, the alarm <<Handle mode>> is triggered and the operation is invalid. Set the axis selection switch for the handle to <OFF> and then perform manual operation.
11. If the <Enable recovery operation> key is pressed during spindle rotation, the alarm <<Spindle rotating>> appears and the operation becomes invalid. Stop spindle rotation and then perform the operation.
12. If the <Enable recovery operation> key is pressed during lathe spindle rotation, the alarm <<Lathe spindle is rotating>> appears and the operation becomes invalid. Stop spindle rotation and then perform the operation.
13. The ATC arm position recovery operation cannot be executed while the door interlock mode is set to service mode. The alarm <<Operation restricted in service mode>> is triggered.

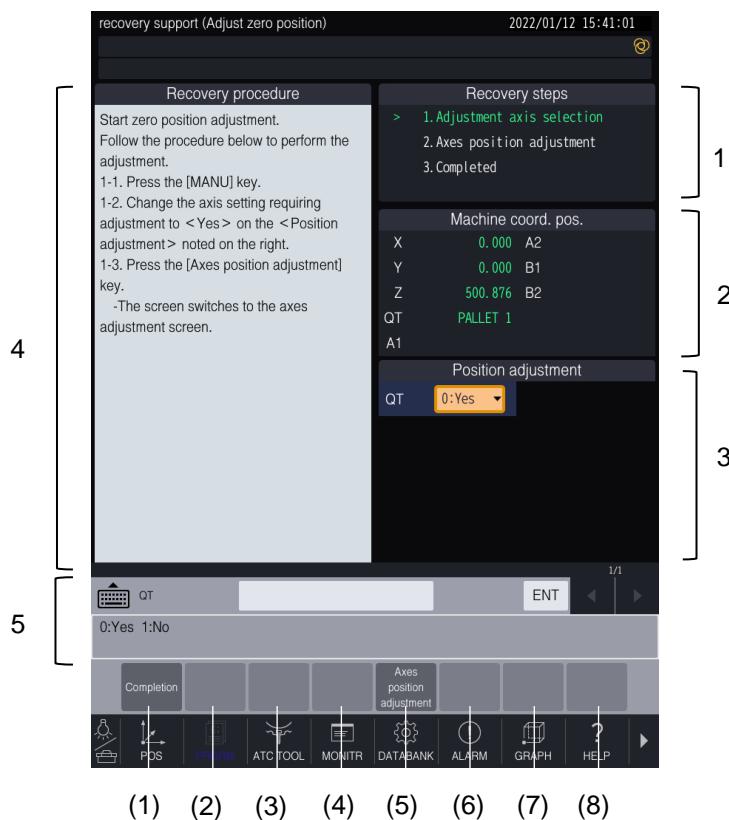
6.8.8 Zero Position Adjustment

When the zero position requires adjustment after a work task such as replacing the motor, the user can follow the procedure instructions and adjust the zero position.

6.8.8.1 Recovery Support (Adjust Zero Position) Screen

- When an axis with a motor replacement is detected at power ON and requires a zero position adjustment
- When the power is turned OFF during zero position adjustment and the adjustment is required at the next power ON
- When <Adjust zero position> is selected from the support application (recovery support) menu

The <Recovery support (adjust zero position)> screen is displayed when one of the aforementioned conditions applies.



(1) (2) (3) (4) (5) (6) (7) (8)

6

Description of screen display

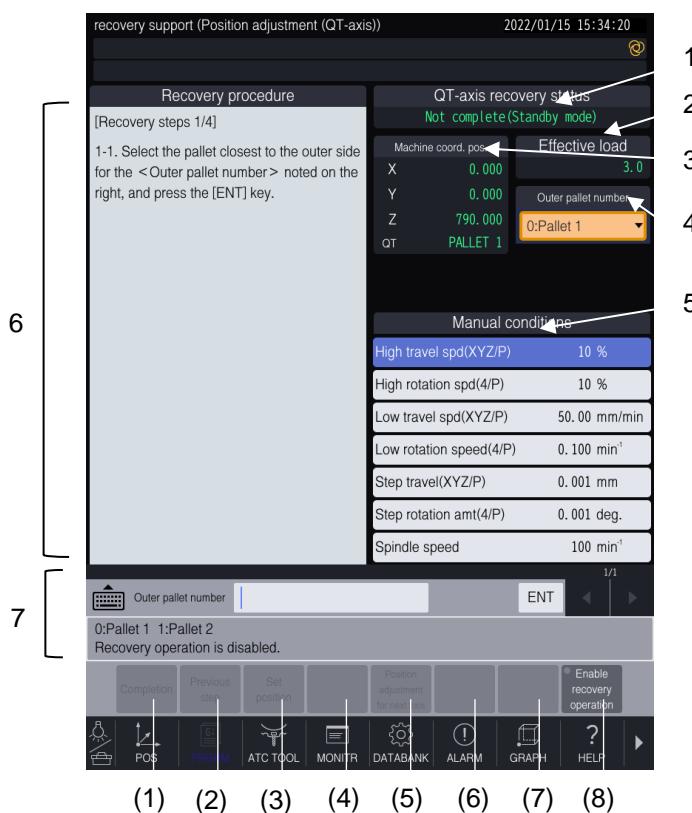
Position	Name	Description
1	Recovery steps	Highlights the recovery operation currently required. When that operation is complete, the next operation is highlighted.
2	Machine coordinate position	Displays the machine coordinate value.
3	Position adjustment	Displays the axes where the zero position can be adjusted. The user can change the display setting for the zero position adjustment to <Yes> or <No>. <Yes>: Executes the zero position adjustment. <No>: Does not execute the zero position adjustment.
4	Recovery procedure	Displays instructions for the recovery procedure.
5	Data input field/ Instructions area	Displays the data input field for setting the position adjustment.

Description of screen operation
Description of function key operations

Column	Position	Label	Description
1	(1)	<Completion>	Closes and ends the support application (recovery support).
	(2)		
	(3)		
	(4)		
	(5)		
	(6)	<Axes position adjustment>	Changes to the position adjustment screen for each axis.
	(7)		
	(8)		

6.8.8.2 Recovery Support (Adjust Zero Position (QT-axis)) Screen

6



Description of screen display

Position	Name	Description
1	QT-axis recovery status	Displays the recovery status of the QT-axis. Not complete (Standby mode): Position adjustment for the QT-axis is not complete. Recovery operation is in standby mode. Recovery operation in progress: Position adjustment is in progress for QT-axis. Completed: Position adjustment for the QT-axis is complete. Re-check: Position re-adjustment for the QT-axis is required.
2	Effective load	Displays the current effective load monitor for the QT-axis. In recovery steps 2 to 4, if this value is larger than 30.0 when attempting to move the QT-axis, the alarm <<QT-axis servo error (Overload 1)>> may trigger and the QT-axis may stop during operation.
3	Machine coordinate position	Displays the current machine coordinate position on the X-, Y-, Z-and QT-axes. Prior to adjustment, the positioning is out of alignment with the actual machine position.
4	Outer pallet number	Selects the pallet number close to the outer side.
5	Manual conditions	Displays the conditions (travel speed, travel amount, rotation amount and spindle speed) when using an axis in manual mode.
6	Recovery procedure	Displays instructions for the recovery procedure on the QT-axis.
7	Data input field/ Instructions area	Displays the current recovery operations (enable/disable). The data input field is displayed for changing the outer pallet number.

Description of screen operationDescription of function key operations

Column	Position	Label	Description
1	(1)	<Completion>	Closes and ends the support application (recovery support). Selection is not possible when recovery operation is enabled. The key is grayed out.
	(2)	<Previous step>	Goes back to the previous recovery step.
	(3)	<Set position>	Sets the axis position that is being adjusted.
	(4)		
	(5)	<Position adjustment for next axis>	Changes to the position adjustment for the next axis. When there is no position adjustment on the next axis, the screen changes to the recovery support (adjust zero position) screen.
	(6)		
	(7)		
	(8)	<Enable recovery operation>	Enables or disables the recovery operation.

6.8.8.3 Operation Procedure

When the position adjustment is set to <Yes> on the <Recovery support (adjust zero position)> screen, the user can press the <Axes position adjustment> key.

If operation stops due to an alarm, a power failure or emergency stop while the turret type ATC is operating, then the user can follow the instructions and restore the position of the Z-axis or magazine axis.

6.8.8.4 Restrictions

If an attempt is made to change to another mode from manual operation mode before the zero position adjustment is complete, then the alarm <<Position adjustment is not complete>> is triggered and the operation mode cannot be changed.

6.8.9 Turret Type ATC Recovery

6.8.9.1 Overview

If operation stops due to an alarm, a power failure or emergency stop while the turret type ATC is operating, then the user can follow the instructions and restore the position of the Z-axis or magazine axis.

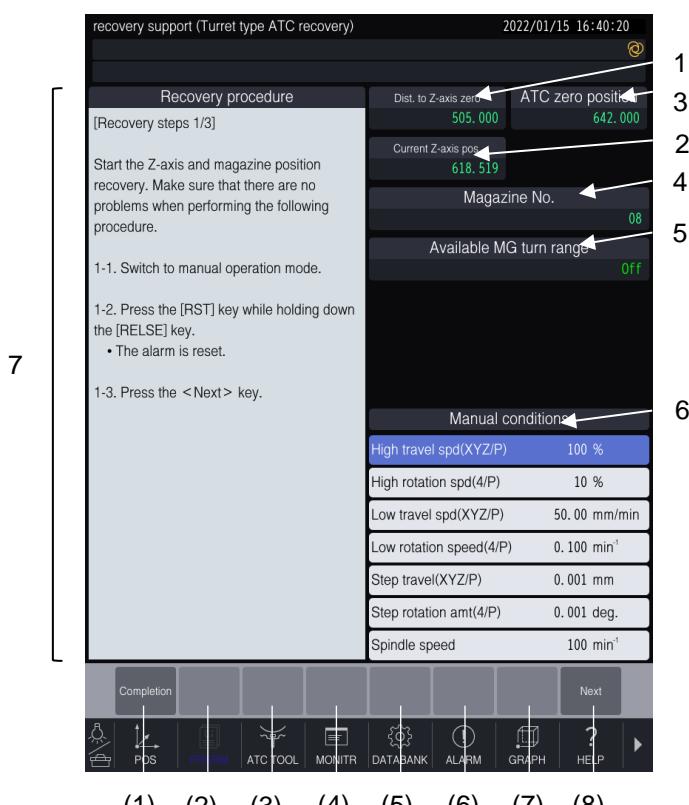
6.8.9.2 Recovery Support (Turret Type ATC Recovery) Screen

The <Recovery support (turret type ATC recovery)> screen is displayed when one of the following conditions applies. At the same time, the operator message <<Switch to manual operation mode for restoration>> appears.

- When a stop level 5 alarm is triggered in the middle of a tool change operation while in memory or MDI operation mode
- When the power is turned ON again after there has been a loss in power in the middle of a tool change operation while in memory or MDI operation mode
- When a stop level 5 alarm in the ATC area is triggered in the middle of a brake load test while in memory or MDI operation mode
- When the power is turned ON again after there has been a loss in power in the ATC area during a brake load test while in memory or MDI operation mode
- When <Turret type ATC recovery> is selected from the support application (recovery support) menu

When there is no turret type ATC and <Turret type ATC recovery> is selected from the support application (recovery support) menu, the operator message <<There is no corresponding function.>> appears.

6



Description of screen display

Position	Name	Description
1	Distance to Z-axis zero	Displays the value for the machine parameter (system 1: X-, Y- and Z-axes) <Distance to zero point> (Z-axis).
2	Current Z-axis position	Displays the Z-axis machine coordinate value.
3	ATC zero position	Displays the sum of the value for the machine parameter (system 1: X-, Y- and Z-axes) <Distance to zero point> (Z-axis) and the value for the machine parameter (system 1: common) <Distance to ATC>.
4	Magazine No.	Displays the magazine number for the spindle that is currently indexed.
5	Available magazine turn range	Displays whether the magazine can be turned or not at the current Z-axis position. The magazine can be turned when <On> is displayed.
6	Manual conditions	Displays the conditions (travel speed, travel amount, rotation amount and spindle speed) when using an axis in manual mode.
7	Procedure guide	Displays instructions for the recovery procedure.

Description of function key

Column	Position	Label	Description
1	(1)	<Completion>	Closes and ends the support application (recovery support).
	(2)		
	(3)		
	(4)		
	(5)		
	(6)		
	(7)		
	(8)	<Next>	Displays the next recovery step. The function key does not display when the recovery is complete.

6.8.9.3 Operation Procedure

Perform the operations following the instructions on the <Recovery support / Turret type ATC recovery> screen.

6.9 Inspection

6.9.1 Overview

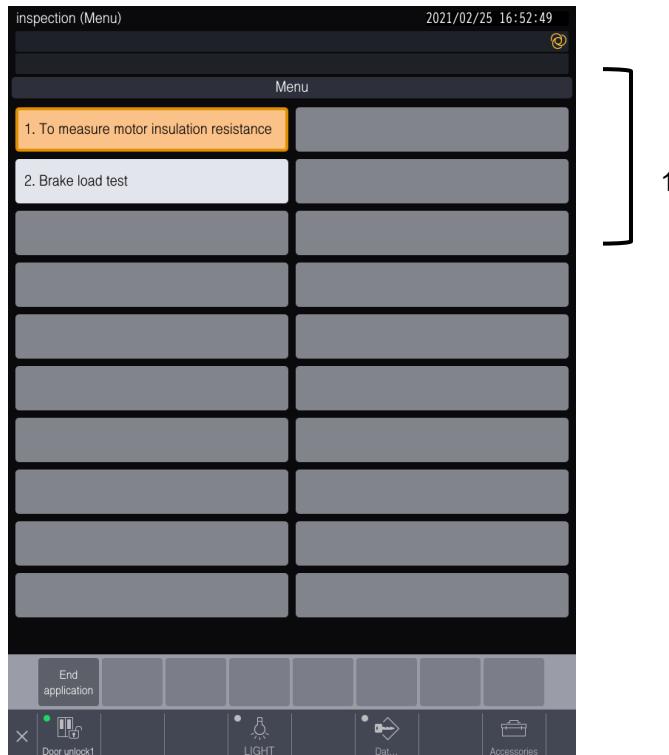
The functions below can be selected in the support application (inspection).

- Measure motor insulation resistance
- Brake load test

6.9.2 Screen Layout & Description

6.9.2.1 Menu screen

This screen is displayed by selecting the <Support application (inspection)> screen.



6

Position	Name	Description
1	Menu	<p>Displays the inspection menu screen.</p> <p>Tap on a menu item to open that screen.</p> <p><To measure motor insulation resistance></p> <p>Refer to “6.9.3 Measure motor insulation resistance” for further details.</p> <p><Brake load test></p> <p>Refer to “9.5 Brake load test” in the Installation Manual for further details.</p>

Description of function key

Position	Label	Description
(1)	<End application>	Closes the support application
(2)		
(3)		
(4)		
(5)		
(6)		
(7)		
(8)		

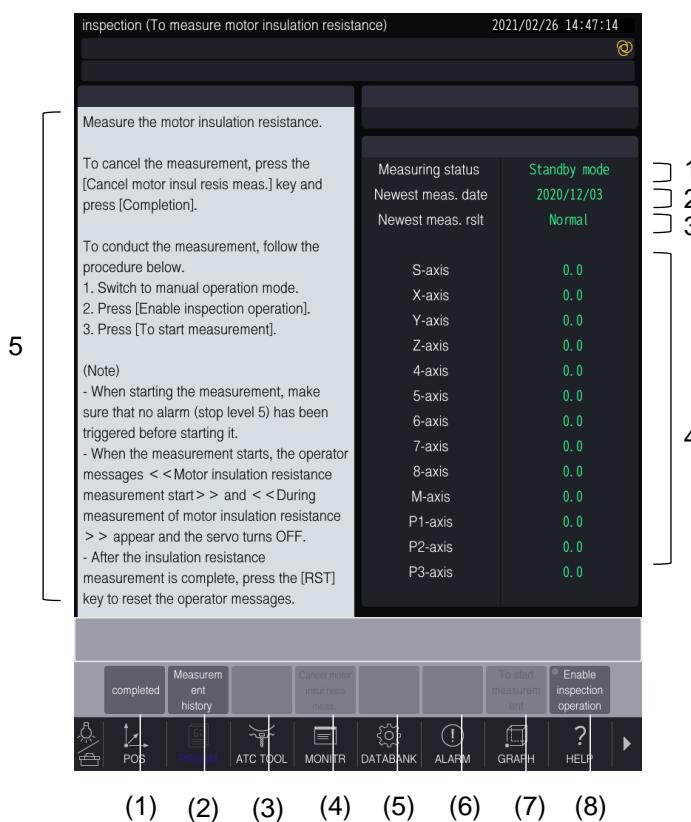
6.9.3 Measure Motor Insulation Resistance

Motor insulation resistance measurement function is used to measure the motor insulation resistance. Per the parameter setting, an operator message prompting the user to measure the insulation resistance appears when the power is turned ON. In this situation, the user must measure the insulation resistance.

6.9.3.1 Inspection (Measure motor insulation resistance) screen

The screen <Inspection (Meas. motor insulation resistance)> is displayed in the following situations.

- When the motor insulation resistance needs to be measured after the power is turned ON
- When the motor insulation resistance measurement is selected from the support application (inspection) menu



Description of screen display

Position	Name	Description
1	Measuring status	Displays the measuring status.
2	Newest measurement date	Displays the latest date when the insulation resistance is measured.
3	Newest measurement result	Displays the latest results when the insulation resistance is measured.
4	S-axis to AT-axis	Displays the monitor values for each axis that is measured.
5	Procedure guide	Displays the instructions for the measurement operation in the inspection procedure.

Description of screen operation
Description of function key operations

Column	Position	Label	Description
1	(1)	<Completion>	Closes and ends the <Support application (inspection)>.
	(2)	<Measurement history>	Changes to the <Inspection (Motor insulation resistance measurement history)> screen.
	(3)		
	(4)	<Cancel motor insulation resistance meas.>	Cancels the measurement of the motor insulation resistance when the operator message <<Measure the motor insulation resistance.>> appears.
	(5)		
	(6)		
	(7)	<To start measurement>	Displays a popup message to confirm the measurement start, as shown in the figure below. Select <Yes> to start the measurement operation. Select <No> to go back to the <Inspection (Meas. motor insulation resistance)> screen.
	(8)	<Enable inspection operation>	Enables and disables the inspection operation to measure the motor insulation resistance. Changing to another support application screen is not possible when inspection operation is enabled.

6



6.9.3.2 Procedure for Measuring the Motor Insulation Resistance

1. Measurement when prompted by an operator message
If motor insulation resistance needs to be measured, the operator message <<Measure the motor insulation resistance>> appears. Use the following procedure to measure the insulation resistance.
 - (1) When the power is turned ON, the operator message <<Measure the motor insulation resistance>> appears and the screen below is displayed at the same time.
 - The operator message appears when the following occurs:
 - * The user parameter (switch 1: common) <Motor insulation resistance measurement interval> has elapsed since the last measurement.
 - <Standby mode> is displayed for <Measuring status>.
 - The date for the last insulation resistance measurement is displayed for the <Newest meas. date>.
 - The result for the last insulation resistance measurement is displayed for the <Newest meas. rslt>.
 - The values that were monitored during the last insulation resistance measurement are displayed for the <S-axis> to the <AT-axis>.
 - To cancel the motor insulation resistance measurement, press the <Cancel motor insulation meas.> key.
 - (2) If an alarm (Stop level 5) is triggered, reset the alarm.
 - Start the insulation resistance measurement when the servo is turned ON. When the <DOOR INTERLOCK MODE> is set to <AUTOMATIC> or <SETTING>, close the door. Lock the door if it is unlocked when the user parameter (switch 1: door) <Door lock method> is set to <0: Automatic lock when door closes>.
 - (3) Press <Enable inspection operation>.
 - The top left part of the <Enable inspection operation> key lights up.

- (4) Press <To start measurement>.
- When the popup message for confirming the measurement start is displayed, select <Yes>.
 - The <Measuring status> changes to <During measurement> and then the measurement starts.
 - The operator messages <<Motor insulation resistance measurement start>> and <<During measurement of motor insulation resistance>> appear and the servo turns OFF.
 - During the measurement, all of the functions are grayed out and cannot be used.
- (5) When the <Operation status> changes to <Measurement end>, the measurement is complete.
- The <Newest meas. date> and <Newest meas. rslt> are updated.
 - The values that are monitored during the measurement are displayed for the <S-axis> to the <AT-axis>.
- (6) Press the [RST] key to reset the operator message.
- (7) Press <Enable inspection operation>.
- (8) Press <Completion> to close and end the <Support application (inspection)>.
2. Measure motor insulation resistance in manual operation mode
- The motor insulation resistance can be measured at any time regardless if an operation message appears.
- (1) Change to manual operation mode, and then select <Meas. motor insulation resistance> from the <Inspection (menu)>.
- Use the procedure in the previous section to perform the measurement.
3. Stopping the motor insulation resistance measurement
- Perform the operation below to force the measurement to stop.
- Turn OFF the power
4. Special notes on measuring the motor insulation resistance
- When inspection operation is <Valid> on the <Inspection (Meas. motor insulation resistance)> screen, if a mode key is input, the following operator message appears: <<During measurement of motor insulation resistance>> and the key input is ignored.
 - Operation cannot be performed in manual operation mode on the <Inspection (Meas. motor insulation resistance)> screen. The operator message <<During measurement of motor insulation resistance>> appears.
 - While the operator message <<Measure the motor insulation resistance.>> is shown, the <Inspection (Meas. motor insulation resistance)> screen is displayed if the manual operation mode is changed.
 - When the power ON time is less than 50 hours, the operator message <<Measure the motor insulation resistance>> appears even if the interval for measuring the motor insulation resistance is exceeded. (Except when the motor insulation resistance has already been measured once.)
 - If the alarm <<Battery has expired. (Local)>> is triggered when turning the power ON, the operator message <<Measure the motor insulation resistance>> will not appear.
 - The motor insulation resistance measurement operation will not start during operation in manual mode operation (Machine zero return, spindle rotation or lathe spindle rotation, etc.).

5. Screen display description

Item name	Description	
Measuring status	Standby mode	Status after the power is turned ON and after being reset.
	During measurement	Status when the motor insulation resistance is being measured.
	Measurement end	Status when the motor insulation resistance measurement has ended.
Newest meas. date	Displays the date when the most recent measurement was completed.	
Newest meas. rslt	Normal	Status indicating that the values that are monitored during the motor insulation resistance measurement are normal.
	Warning	Status warning the user about the values that are monitored during the motor insulation resistance measurement. This is displayed when the monitored value on any of the axes is smaller than user parameter (switch 1: common) <Motor insulation resistance monitoring acceptable value (alarm)>. (If both warning and error (abnormal) apply, the error takes precedent.)
	Abnormal	Status indicating that the values that are monitored during the motor insulation resistance measurement are abnormal. This is displayed when the monitored value on any of the axes is smaller than user parameter (switch 1: common) <Motor insulation resistance monitoring acceptable value (abnormal)>. This is also displayed when the measurement is not completed even if machine parameter (system 1: common) <Motor insulation resistance measurement timeout time> has elapsed on an axis.
S-axis to AT-axis	Value	The value that is monitored on each axis during the motor insulation resistance measurement. Range: 0.0 to 99.9 (When the monitored value is 100 or greater, it is displayed as "99.9".) Unit: megohm Note that the measurement on each axis is executed when the measurement for all axes ends abnormally.
	Timeout	Displays when the measurement cannot be completed within the machine parameter (switch 1: common) <Motor insulation resistance measurement timeout time>.
	Blank	When the axis does not exist or when the measurement has been forced to end. (Even in this situation, the display is blank because the PLC-axis cannot be measured due to the amplifier type.)

6.9.3.3 Inspection (Motor insulation resistance measurement history) screen

When <Measurement history> is pressed on the <Inspection (Meas. motor insulation resistance)> screen, the <Inspection (Motor insulation resistance measurement history)> screen is displayed.



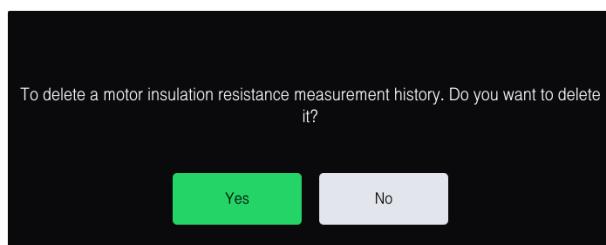
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Description of screen display

Position	Name	Description
1	Newest measurement result	<p>Displays the most recent measurement results.</p> <p><Newest date>: Displays the date when the most recent measurement was completed.</p> <p><Results>: Displays the value that is monitored on all axes during the insulation resistance measurement. The displayed information is the same as the <Newest meas. rslt> on the <Inspection (Meas. motor insulation resistance)> screen.</p> <p><S> to <AT>: Displays the value that is monitored on each axis during the insulation resistance measurement. The displayed information is the same as the <Inspection (Meas. motor insulation resistance)> screen. Note that the timeout is abbreviated and displayed as <Tout>.</p>
2	Measurement history	<p>Displays 100 measurement records in the measurement history. A recent history is always displayed in order starting from the top-left.</p> <p><Date>: Displays the dates when the measurements were completed.</p> <p><Results>: Displays the results for the insulation resistance measurement. The displayed information is the same as the <Newest meas. rslt> on the <Inspection (Meas. motor insulation resistance)> screen.</p>

Description of screen operation
Description of function key operations

Column	Position	Label	Description
1	(1)	<Back>	Changes to the <Inspection (Meas. motor insulation resistance)> screen.
	(2)		
	(3)		
	(4)		
	(5)		
	(6)		
	(7)		
	(8)	<To delete the history>	Displays a popup message to confirm deleting the measurement history, as shown in the figure below. Select <Yes> to delete the measurement history. Select <No> to go back to the <Inspection (Motor insulation resistance measurement history)> screen.



6

(NOTE) When the user parameter (switch 1: common) <Motor insulation resistance measurement interval> has elapsed after a measurement history was deleted, the operator message <<Measure the motor insulation resistance.>> appears.

6.9.3.4 Parameters

User parameter (Switch 1)

Item name	Setting range	Description
Motor insulation resistance measurement interval	0 to 999 days	Set the interval to display the operator message in order to prompt the user to measure the motor insulation resistance. The operator message <<Measure the motor insulation resistance>> is displayed when the power is turned ON if the preset number of days has passed since the previous measurement. When "0" is set, the operator message does not display.
Motor insulation resistance monitoring acceptable value (abnormal)	0.0 to 99.9 megohm	Set the tolerance when monitoring the insulation resistance for measuring a single axis in the motor insulation resistance measurement. <<Motor insulation resist. monit. value is abnormal>> is displayed when the value monitored for the insulation resistance is lower than preset value.
Motor insulation resistance monitoring acceptable value (alarm)	0.0 to 99.9 megohm	Set the tolerance when monitoring the insulation resistance for measuring a single axis in the motor insulation resistance measurement. <<Motor insulation resist. monitor value is warned>> is displayed when the value monitored for the insulation resistance is lower than preset value.

Machine parameter (System 1)

Item name	Setting range	Description
Motor insulation resistance measurement timeout time	0.0 to 9.9 seconds	Set the timeout period when measuring the motor insulation resistance. The measurement is cancelled when the set time period has elapsed even if the measurement is not complete.

6.9.3.5 Alarms and Operator Messages

Alarms

Name	Stop and cancel levels	Cause	Recovery procedure
Measurement impossible because alarm occurring	4,2	The motor insulation resistance measurement was started when an alarm (stop level 5) was triggered.	Execute measurement after resetting the alarm.
Motor insulation resist. monit. value is abnormal.	5,2	The monitor value during the motor insulation resistance measurement is abnormal.	The motor insulation resistance has dropped. Use the manual to troubleshoot and check if the insulation resistance drop is caused by the motor or by the cable. Then, make plans to replace what is needed. Press the [RST] key to clear the alarm (Normal operation is possible after the alarm is cleared).
Motor insulation resist. monitor value is warned.	5,2	A warning is shown for the monitor value during the motor insulation resistance measurement.	The motor insulation resistance has dropped. Use the manual to troubleshoot and check if the insulation resistance drop is caused by the motor or by the cable. Then, make plans to replace what is needed. Press the [RST] key to clear the alarm (Normal operation is possible after the alarm is cleared).

Operator messages

Name	Stop and cancel levels	Cause	Recovery procedure
Motor insulation resistance measurement start	5,2	This alarm is triggered at the start of the motor insulation resistance measurement. Turn OFF the servos on all axes.	
During measurement of motor insulation resistance	5,2	This alarm is triggered during the motor insulation resistance measurement. Turn OFF the servo relay.	
Measure the motor insulation resistance.	1,1	This alarm is triggered after the user parameter (switch 1: common) <Motor insulation resistance measurement interval> has elapsed since the last measurement was taken. The alarm continues to display until the motor insulation resistance is measured. If the status is reset on the <Inspection (Meas. motor insulation resistance)> screen, the operator message disappears. However, it appears again when the power is turned ON the next time.	
During measurement of motor insulation resistance	1,1	(A) An attempt was made to change the mode when inspection operation is <Valid> on the <Inspection (Meas. motor insulation resistance)> screen. (B) An attempt was made to perform a manual operation when the <Inspection (Meas. motor insulation resistance)> screen was displayed.	

6.9.4 Brake Load Test

Refer to “9.5 Brake load test” in the Installation Manual for further details.

6.10 PLC

6.10.1 Overview

The support application (PLC) offers different functions related to monitoring the OMs that make up the PLC system, as well as creating and managing PLC programs.

Refer to the “PLC System Manual” for further details on the PLC functions.

- (NOTE 1) When one of the following operations is carried out, the operator message <<PLC function cannot be used>> appears. Even if the <Support application (PLC)> is selected, the <PLC (Menu)> screen will not display. Turn the power OFF and back ON again.
 - Firmware version update
 - External input of PLC signal data
 - PLC format
- (NOTE 2) After the PLC program is input, if the [RST] key is not pressed, the alarm <<PLC program is being input>> is triggered even when the <Support application (PLC)> is selected. The <PLC (Menu)> screen will not display.
- (NOTE 3) If the data structure in the PLC program is corrupt, the alarm <<Checksum error (PLC: common file)>> is triggered. Even if the <Support application (PLC)> is selected, the <PLC (Menu)> screen will not display. Perform the PLC format operation.
- (NOTE 4) While the Ethernet communication is in progress with the PLC programming software, the previous screen cannot be displayed from the <PLC (Menu)> screen. The message <Screen cannot change to another screen due to monitoring> is displayed in the instructions area.

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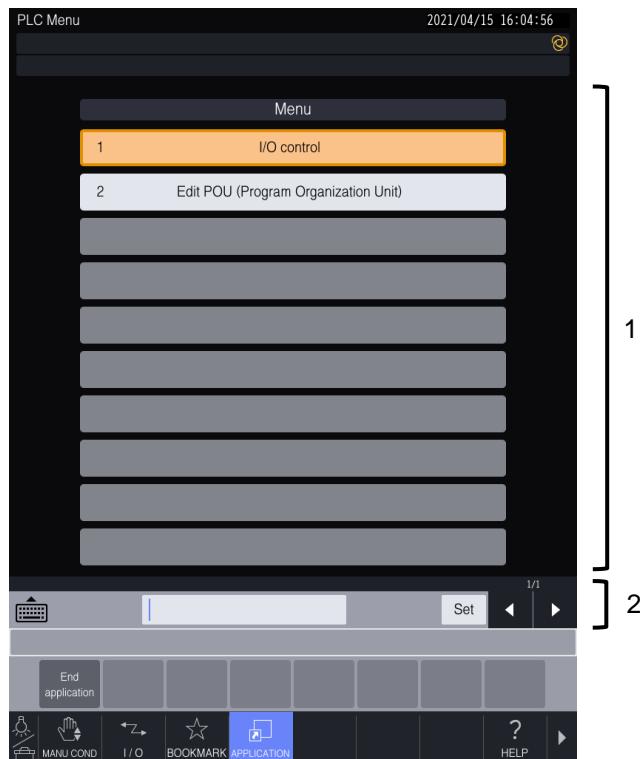
6.10.2 Types of Editable Data

Refer to the “PLC System Manual” about the types of editable data in the support application (PLC).

6.10.3 Screen Layout & Description

6.10.3.1 PLC Menu Screen

This screen is displayed by selecting the <Support application (PLC)> screen.



Position	Name	Description
1	Menu	<p>Displays the PLC menu screen. Tap on a menu item to open that screen. <I/O control></p> <p>Displays the <I/O control menu> screen. Refer to “Chapter 5 I/O information” in the PLC System Manual for further details.</p> <p><Edit POU (Program Organization Unit)></p> <p>Displays the <Edit POU> screen. Refer to “Chapter 6 Program organization unit” in the PLC System Manual for further details.</p>
2	Data input field	This field is for entering and selecting a menu number.

Description of function key

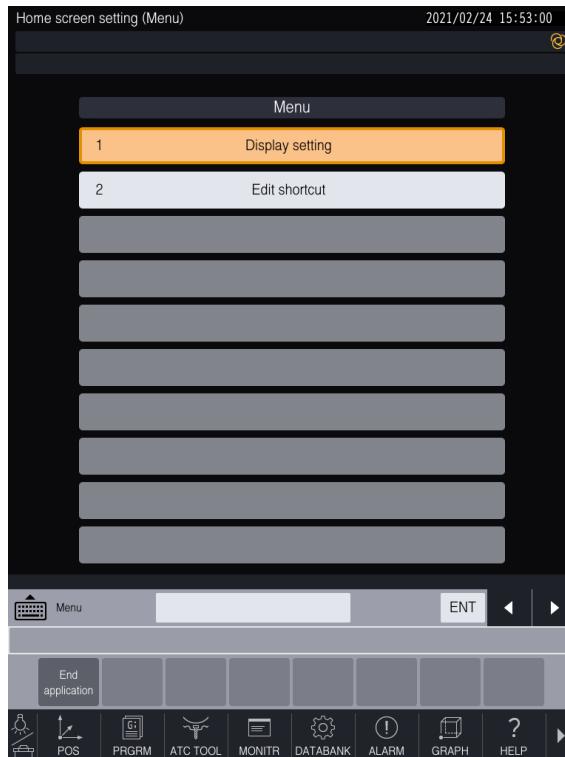
Position	Label	Description
(1)	<End application>	Closes the support application
(2)		
(3)		
(4)		
(5)		
(6)		
(7)		
(8)		

6.11 Home Screen Setting

6.11.1 Overview

In the home screen setting application, the different settings related to the home screen can be configured.

When the home setting screen application is selected from the support application list, the following menu screen appears.



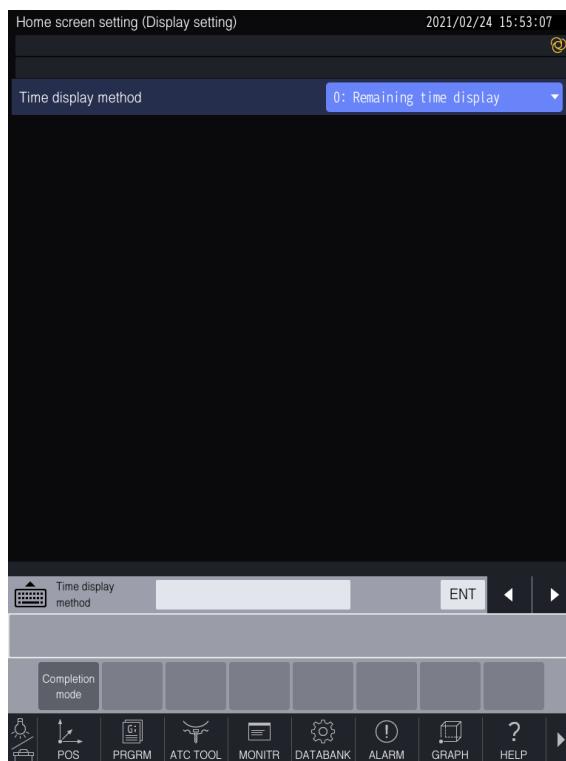
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Menu item	Description
Display setting	Sets the parameters related to the home screen display.
Edit shortcuts	The user can delete or re-arrange the registered shortcuts that are displayed on the home screen.

6.11.2 Menu Description

6.11.2.1 Home screen setting (display setting)

After selecting <Display setting> from the menu screen, the following screen is displayed and the settings can be changed.



6

List of setting items

Item name	Setting range	Description
Time display method	0: Remaining time display 1: Elapsed time display	Specifies the display method for the time display on the home screen. When <Remaining time display> is specified, this indicates how much time is remaining until the memory operation ends. When <Elapsed time display> is specified, this indicates how much time has elapsed since the memory operation started.

Description of function key operation

Position	Label	Description
(1)	<Completion mode>	See below
(2)		
(3)		
(4)		
(5)		
(6)		
(7)		
(8)		

Description of keys in completion mode

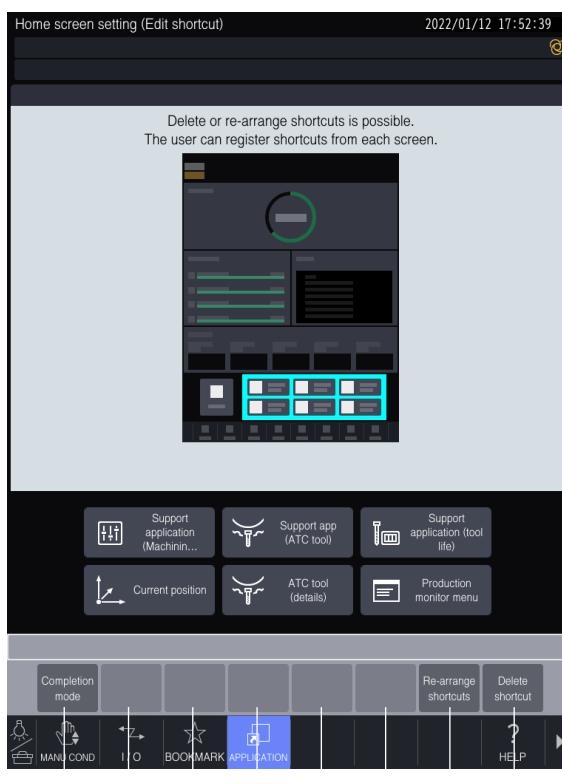
Position	Label	Description
(1)	<Save and end>	Saves the edited display setting and closes the support application.
(2)		
(3)		
(4)	<Undo editing and exit>	Discards the edited content and closes the support application.
(5)		
(6)		
(7)	<Overwrite save>	Overwrites and saves the edited display setting and then returns to editing.
(8)	<Cancel>	Returns to editing.

6.11.2.2 Home screen setting (edit shortcuts)

Edit shortcut mode

After selecting <Edit shortcuts> from the menu screen, the following screen is displayed.

6



(1) (2) (3) (4) (5) (6) (7) (8)

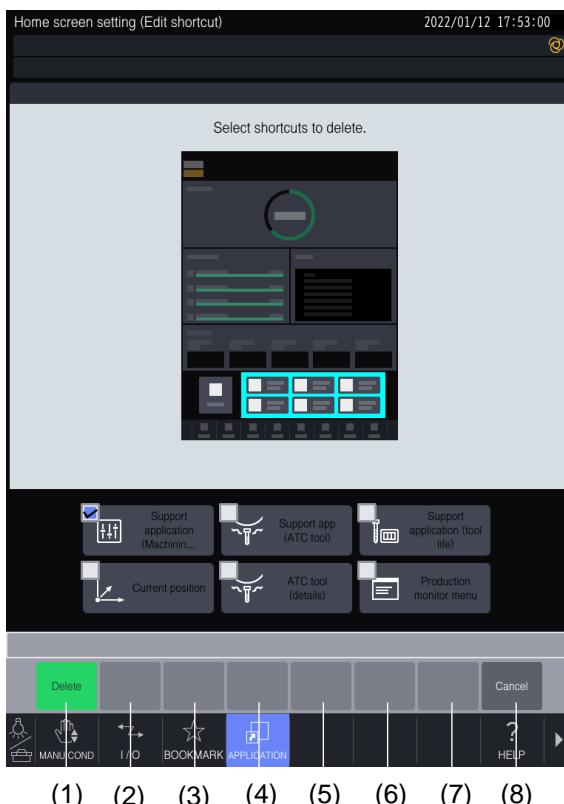
Description of function key operation

Position	Label	Description
(1)	<Completion mode>	See below
(2)		
(3)		
(4)		
(5)		
(6)		
(7)	<Re-arrange shortcuts>	Changes to re-arrange shortcut mode.
(8)	<Delete shortcut>	Changes to delete shortcut mode.

Description of keys in completion mode

Position	Label	Description
(1)	<Save and end>	Saves the edited shortcuts and closes the support application.
(2)		
(3)		
(4)	<Undo editing and exit>	Discards the edited content and closes the support application.
(5)		
(6)		
(7)	<Overwrite save>	Overwrites and saves the edited shortcuts and then returns to editing.
(8)	<Cancel>	Returns to editing.

Delete shortcut mode

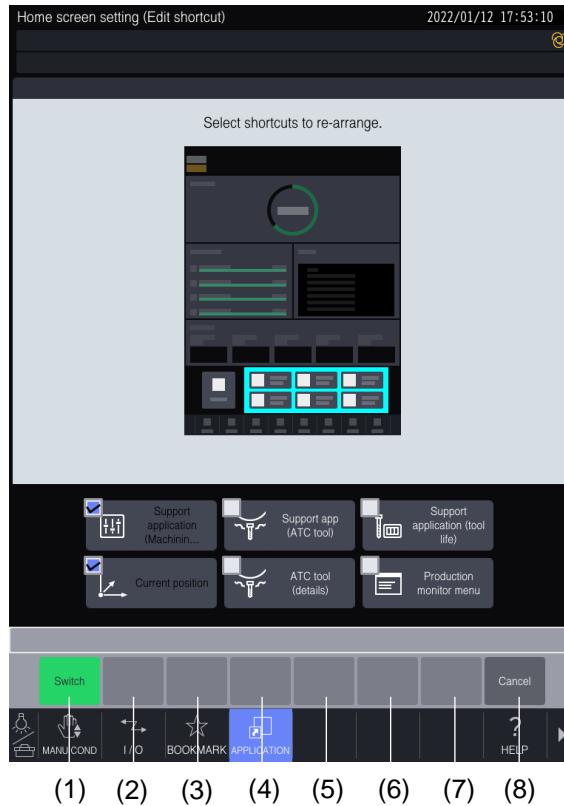


Description of function key operation

Position	Label	Description
(1)	<Delete>	Deletes the shortcut key(s) ticked with a checkmark, and then changes to the edit shortcut mode.
(2)		
(3)		
(4)		
(5)		
(6)		
(7)		
(8)	<Cancel>	Cancels the delete operation, and then changes to the edit shortcut mode.

Tap on the shortcut key that you wish to delete, and then a checkmark will appear there (multiple checkmarks possible). Press the <Enter> key to proceed and delete the shortcut key(s).

Re-arrange shortcut mode



6

Description of function key operation

Position	Label	Description
(1)	<Switch>	Switches the position of two shortcut keys ticked with a checkmark, and then changes to the edit shortcut mode.
(2)		
(3)		
(4)		
(5)		
(6)		
(7)		
(8)	<Cancel>	Cancels the re-arrange operation, and then changes to the edit shortcut mode.

Tick a checkmark for the two shortcut keys that you wish to re-arrange. After pressing the <Enter> key, the shortcut keys switch positions.

CHAPTER 7

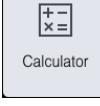
ACCESSORIES

- 7.1 **Accessories**
- 7.2 **File Viewer**
- 7.3 **Notebook**
- 7.4 **Calculator**
- 7.5 **Register Shortcuts**
- 7.6 **Display OFF**

7.1 Accessories

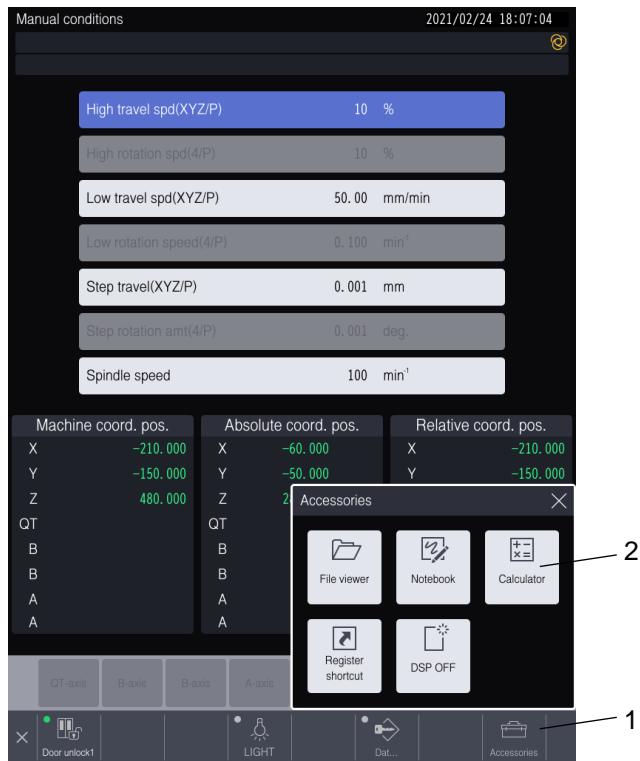
7.1.1 Accessories?

Accessories refer to a group of functions that makes NC operation more user-friendly. They offer support to the customer, making it easier to operate the NC with functions like viewing documents, such as manuals, performing calculations and setting up shortcuts.

Icon	Overview
 File viewer	The file viewer is a function that displays a given file on the NC screen. The file viewer allows the user to view manuals, screenshots and/or documents/images created by the customer.
 Notebook	The notebook is a function that allows the user to write and record notes using the handwriting feature or key entry.
 Calculator	The calculator is a function for performing calculations such as the four arithmetic operations and other calculations using functions, such as trigonometric functions. In addition, the user can use the calculator and apply or insert the results to user parameters or programs. And, the user can also apply or insert values (copied from a program) into the calculator.
 Register shortcut	Shortcut registration is a function that allows the user to create and register shortcuts for screens and support applications, which are used frequently, to the home screen for quick and easy access.
 DSP OFF	The user can press <DSP OFF> from the accessories list to turn off the screen display.

7.1.2 How to Open Accessories

1. Select an accessory using the subtool keys in the control key display area (1 in figure). A list of accessories is displayed in the popup window.
2. Select the desired accessory from the list (2 in figure).
3. After selecting, the accessories list disappears and the selected accessory is displayed in a pop-up window.



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An accessory can be opened on most screens in any operation mode. However, an accessory cannot be opened on certain screens where the subtool keys are not available.

7.1.3 Accessories Displaying Simultaneously

Multiple accessories from the accessories list cannot be displayed at the same time. When an attempt is made to display the accessories list while a given accessory is already displayed, that accessory becomes hidden and the list will display. The edited content in the accessory that is hidden will be maintained. However, if an attempt is made to display the accessories list even though the list is already displayed, then the list will become hidden.

7.1.4 Accessories Screen Selection

When an attempt is made to open an accessory or when the user taps on a given position in the accessory, the accessory screen becomes selected and the area outside of the accessory window turns blue.



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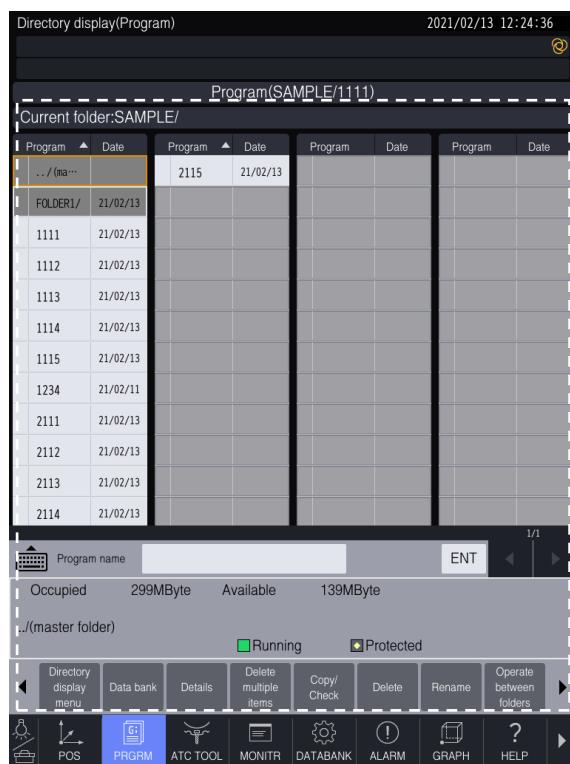
At this time, the functions available within the accessory window can be used.

In addition, when the user taps on the screen that is not an accessory window, then the accessory window becomes deselected. At this time, the screen or window behind the accessory window can be used.

Note that in each situation, the behavior from a key operation, switch operation or panel operation varies depending on the accessory. Refer to the chapter of each accessory for further details.

7.1.5 Accessories Screen Operation

Some accessories can be moved to a different position within the screen. Those accessories can be moved to the main display area, input area, instructions area and function display area (range is indicated by the dotted line below).



7.1.6 Data Protection

Being able to launch an accessory or enabling/disabling the editing function can be set at each operation level. Launching an accessory refers to the first time a user opens an accessory after turning ON the power, or opening an accessory again after closing it with the <Close> key. When an attempt is made to launch an accessory that has been disabled, or when an attempt is made to use the editing function in an accessory that has been disabled, the operator message <<No operation is possible under the current level.>> is triggered. However, even when that accessory/function is disabled, the operator message does not trigger and the accessory or function can be used if the accessory is already displayed or if it is (opened but) hidden.

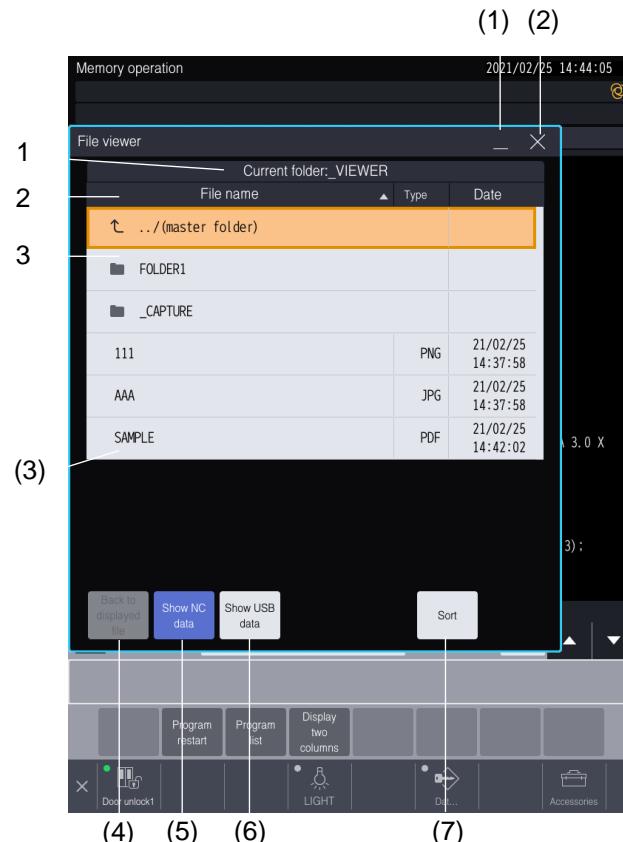
7.2 File Viewer

7.2.1 Overview

The file viewer is a function that displays a given file on the NC screen.
The file viewer allows the user to view manuals, screenshots and/or documents/images created by the customer.

(NOTE) Images (images in _MEMO/) saved with the notebook function in the accessories cannot be viewed. Use the notebook function to view images saved in the notebook.

7.2.2 File Selection Screen

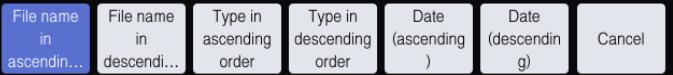


7.2.2.1 Description of Screen Display

Position	Name	Description
1	Current folder	Shows the folder currently displayed in the file list.
2	Category display	Displays the categories for the listed content. The list can be re-organized in ascending and descending order by tapping on the <File name>, <Format> and <Date>.
3	File list	Displays a list of subfolders and files in the current folder. The cursor is positioned at the file that is currently selected in the display. If there is no file currently displayed, the top file in the file list is automatically selected. <File name> : File name When the file name is long, the display is abbreviated. <Format> : File format <Date> : File updated

(NOTE) Only files with compatible formats are displayed in the file viewer on the file selection screen.

7.2.2.2 Description of Screen Operation

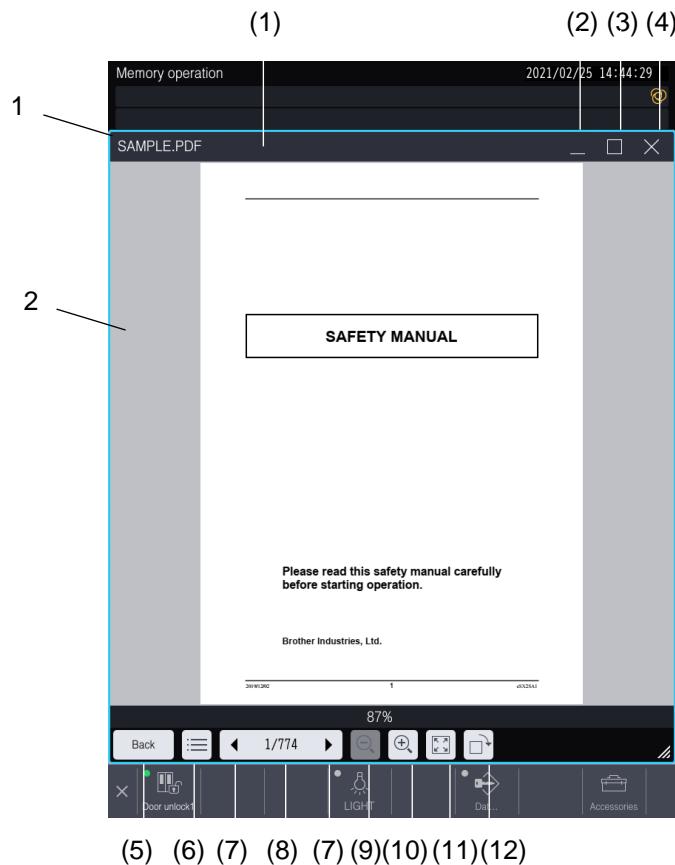
Position	Name	Description
(1)	Minimize	Minimizes or hides the file viewer on the screen. The current folder does not change even if minimized or hidden. Select the file viewer from the accessories using the subtool key to display the file viewer again.
(2)	Close	Closes the file viewer. / is the current folder if the file viewer is re-launched again.
(3)	File name	Displays a given file after tapping on that file name in the file list, or after pressing the [Setting] key when that file is selected. If there are many files, all of the files cannot be displayed on the screen. The user can use a swipe operation to display files that are not shown.
(4)	<Back to displayed file>	Goes back to the file display screen when a file is already displayed. This key cannot be used (grayed out) when a file is not displayed.
(5)	<Show NC data>	Displays a list of files in the NC.
(6)	<Show memory card data>	Displays a list of files in a memory card.
(7)	<Sort>	Re-organizes the file list data. After this key is pressed, the display changes to the following screenshot. 

(NOTE) The files inside the memory card cannot be displayed in the following situations. An alarm such as <<Memory card error>> is triggered or an operator message appears depending on the situation.

- When the memory card is not connected
- When performing an input/output all data transfer, when POPEN is processing in memory operation, or when communicating with memory card
- When tape operation is executing in the memory card

7.2.3 File Display Screen

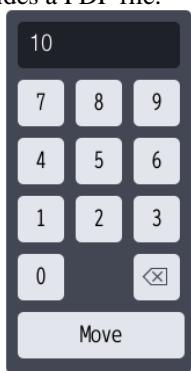
7.2.3.1 Description of Screen Display



Position	Name	Description
1	File name	Displays a file name. The maximum number of characters that can be displayed varies depending on the screen size.
2	File display area	Displays the selected file on the file list screen.

7.2.3.2 Description of Screen Operation

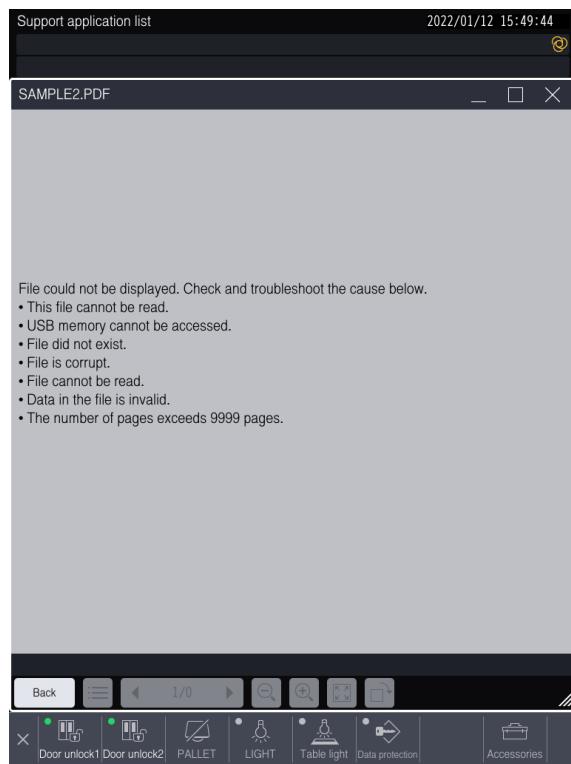
Position	Name	Description
(1)	Title bar	Displays a file name. While touching this area, the window can be dragged to a different position within the main display area on the NC screen (if it is not maximized).
(2)	Minimize	Minimizes or hides the file viewer on the screen. The displayed content is maintained even if the file viewer is hidden. Select the file viewer from the accessories using the subtool key to display the file viewer again.
(3)	Maximize	Maximizes or enlarges the window to fill the whole screen.
(4)	Close	Closes the file viewer. When closing the file viewer, if a file that was opened is displayed again, then the display shows the page that was opened the last time. (NOTE 1)
(5)	Back	Goes back to the file selection screen. When going back to the file selection screen, if a file that was opened is displayed again, then the display shows the page that was opened the last time. (NOTE 1)

Position	Name	Description
(6)	Table of contents	Displays the table of contents on the left side screen. Tap on the <>> button at the top-right corner to hide the table of contents. Tap on a section in the table of contents to jump to the header of that section. The table of contents cannot be used (grayed out) when displaying another file format (not a PDF file) or when using a PDF file that does not contain a table of contents.
(7)	Previous page / Next page	Tap on the left and right page buttons (arrows) to move to the previous page or to the next page.
(8)	Page jump	After tapping on page number field, the following number keys are displayed. The display jumps to the page number that is entered. This feature cannot be used (grayed out) when displaying another file format besides a PDF file.
		
(9)	Zoom out	Zooms out on the file currently displayed. Zooming out is also possible using a pinch-in (using your fingers) operation.
(10)	Zoom in	Zooms in on the file currently displayed. Zooming in is also possible using a pinch-out (using your fingers) operation.
(11)	Fit page to window	Enlarges or reduces the file being displayed to the window size.
(12)	Rotate view	Rotates the file being displayed 90° clockwise.
(13)	Resize window	Resizes the window by dragging the button inward or outward.

(NOTE 1) A maximum of 10 files can be saved on the page that was previously opened. If 11 files or more were opened, only the most recent 10 files are saved.
When the power is turned OFF, the information on the page that was previously opened is cleared.

7.2.3.3 File Display Error Screen

The <File display error> screen appears when the file cannot be displayed due to various factors.



7.2.4 Display Method of Files

7.2.4.1 Display User Files

The documents and images created by the customer can be shown.

1. Input the created document and/or image into the NC.
Input the file into the folder for _VIEWER/ or _VIEWER.
2. Select the input image on the file selection screen.

The user can display data from a memory card.

1. Insert the memory card into the NC, and make a selection on the file selection screen.

7.2.4.2 Display Screenshots

The user can display images saved with the screenshot function.

1. Use the screenshot function to save the screen.
The screen is saved to _VIEWER/_CAPTURE/.
Refer to “4.12.1 Screenshot function” in Operation Manual I for details on the screenshot function.
2. Move to _VIEWER/_CAPTURE/ on the file selection screen, and select a saved image.

7.2.4.3 Display Manual

The user can display the SPEEDIO manual.

1. Move to _MANUAL/ on the file selection screen, and select the manual.

7.2.5 File Operations with File Viewer

The user can use the directory display function to perform file operations.

Refer to “1.4 Directory display” for further details.

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(NOTE) File operations are not possible with the directory display function while displaying the manual.

7.2.6 File Viewer Input/Output

The external input and output function can be used to perform file operations.

Refer to “3.2 Master station communication” for further details.

(NOTE) File input and output is not possible with the external input and output function while displaying the manual.

7.2.7 Compatible File Formats

The following file formats are compatible with the file viewer.

- PDF (Portable Document Format)

Compatible version: 1.7

- PNG (Portable Network Graphics)
- BMP (Bit Map)
- JPEG (Joint Photographic Experts Group)

(NOTE 1) Depending on the PDF version or the file structure, the file may not display or the displayed file may differ from the original file.

(NOTE 2) The JPEG extension is possible with both JPG and JPEG.

7.2.7.1 Incompatible Files

If the extensions are different from the file formats, then the <File display error> screen is displayed.

Refer to “7.2.3.3 File display error screen” for further details.

7.2.8 Key Operations & Functions

The following shows the function of each key on the operation panel and NC screen when using the file viewer.

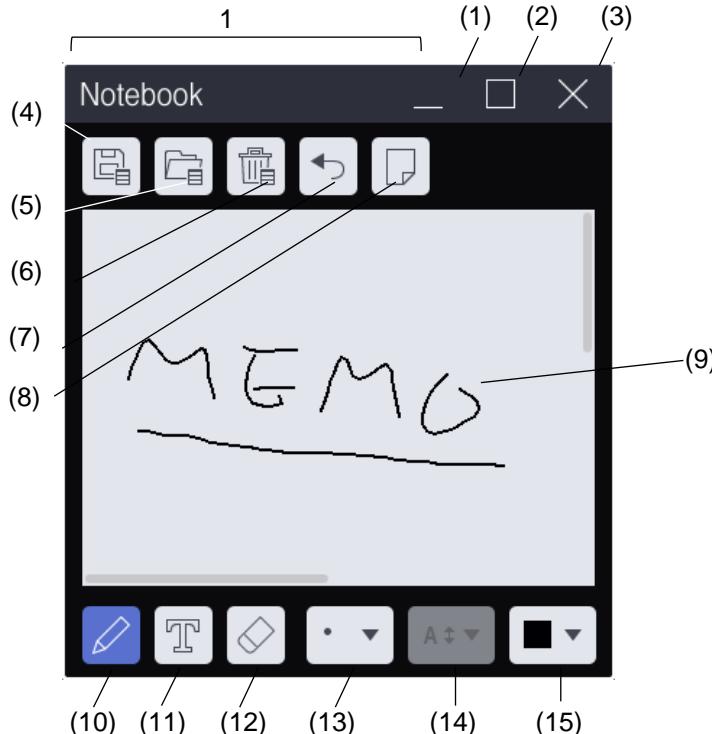
Key operation and panel operation	Function of key operation and panel operation
[HOME], [RST], [MANU], [MDI], [MEM] and [EDIT]	Displays the screen for the key that was pressed. The file viewer is hidden, but the displayed content or data is maintained.
[EOB/ENT] and [CURSOR]	When a key on the left is used after tapping on the file selection screen, a file can be selected. However, the left and right [CURSOR] keys are ignored. When a key on the left is used after tapping on the file display screen, the input is ignored. When a key on the left is used after tapping on a screen other than the file viewer, the function of the key that was pressed for that screen (other than the file viewer) is carried out. In either situation, the file viewer stays displayed.
Numerical value, letter, symbol, [INS], [CAN], [DEL], [BACK SPACE], [SHIFT]	When a key on the left is used after tapping on the file viewer screen, the input is ignored. When a key is used after tapping on a screen other than the file viewer, the function of the key that was pressed for that screen (other than the file viewer) is carried out. In either situation, the file viewer stays displayed.
Other operation panel keys	The function of the key that is pressed is carried out, regardless of the file viewer. For example, when [Z.RTN] is pressed in manual operation mode, a zero return operation is carried out.
Keys in the function key and control key display areas for changing screen	Changes the screen. The file viewer stays displayed.
Press alarm or operator message area to change screen	Displays the <Current Alarm/Operator message> screen. The file viewer is hidden, but the displayed content or data is maintained.

7.3 Notebook

7.3.1 Overview

The notebook is a function that allows the user to write and record notes using the handwriting feature or key entry.

7.3.2 Screen Display

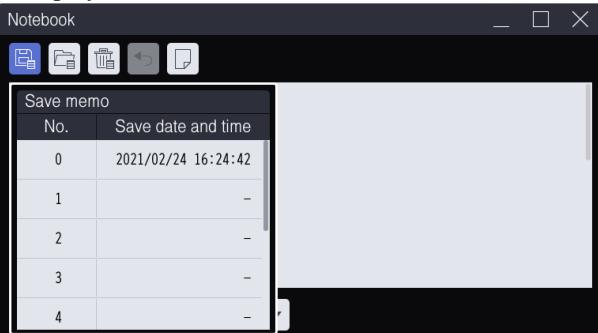
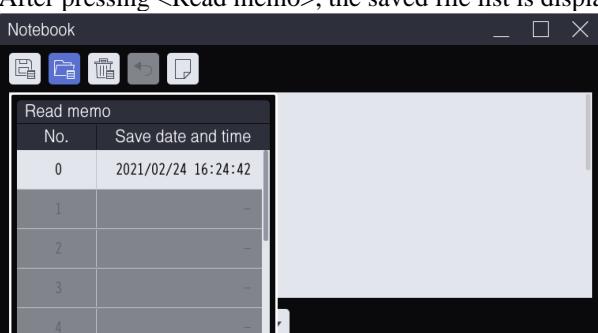


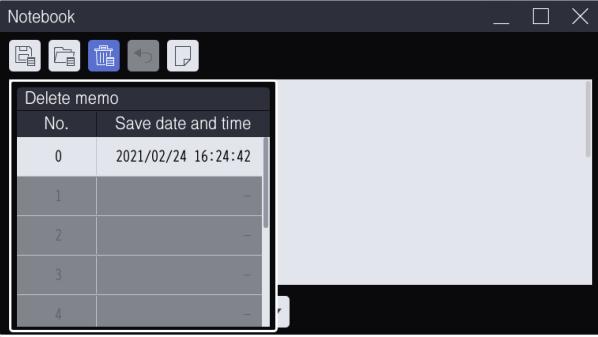
7.3.2.1 Description of Screen Display

No.	Item name	Description
1	Title bar	Displays a title. While touching this area, the window can be dragged to a different position within the main display area on the NC screen, depending on the screen size.

7.3.2.2 Description of Screen Operation

No.	Item name	Description
(1)	<Minimize>	Hides the notebook on the screen. The edited content is maintained even if the notebook is hidden. Select the notebook from the accessories using the subtool key to display the notebook again.
(2)	<Resize window>	Changes the window size. There are three types of window sizes. Size 1: Entire main display area Size 2: Half of the height in size 1 Size 3: Half of the width in size 2 Each time <Resize window> is pressed, the size of the window changes per the following order: Size 3 → Size 2 → Size 1 → Size 3. When using Size 2 and 3, the notebook window can be dragged (by touching the title bar and dragging the window) to a different position within the main display area. The size of notes written in the memo area is fixed and does not change even when the window is resized. When using Size 2, a vertical scroll bar is displayed on the right edge of the notebook window. For Size 3, vertical and horizontal scroll bars are displayed on the right and bottom edges of the memo area.

No.	Item name	Description
(3)	<Close>	Closes the notebook. If there is new or edited content written in the memo area when <Close> is pressed, a popup window displays the message <Save?>. After pressing <Yes>, the saved file list is displayed. After tapping on the save date/time field and saving the file, the notebook closes. After pressing <No>, the notebook closes without saving the currently edited content. After pressing <Cancel>, the popup window disappears without closing the notebook.
(4)	<Save memo>	<p>Saves the edited content. After pressing <Save memo>, the saved file list is displayed.</p>  <p>There are numbers assigned to each saved file with a corresponding date and time when the file was saved. A hyphen (-) is displayed in the field for numbers that do not have a saved file. Tap on the save date/time field for the number where you wish to save the edited content. At this time, the save date/time is automatically updated to the current date/time. However, if the user taps on a number assigned to a file that is already saved, a popup window displays the message <Overwrite?>. After pressing <Yes>, the saved content is overwritten. After the file is saved, the saved file list disappears. After pressing <No>, the saved file list disappears without overwriting the data.</p>
(5)	<Read memo>	<p>Shows the content that was previously saved for the user to view and read.</p> <p>After pressing <Read memo>, the saved file list is displayed.</p>  <p>If there is new or edited content written in the memo area and the user taps on a position where there is a save date/time written in, a popup window displays the message <Discard the edited content?>. After pressing <Yes>, the edited content is discarded. Then, the saved content is displayed in the memo area and the saved file list disappears. After pressing <No>, the saved content does not display in the memo area and the saved file list disappears. Thereafter, the user can begin editing again.</p>

No.	Item name	Description
(6)	<Delete memo>	<p>Deletes the content that was previously saved. After pressing <Delete memo>, the saved file list is displayed.</p>  <p>When the user taps on a position where there is a save date/time written in, a popup window displays the message <Delete?>. After pressing <Yes>, the file is deleted. After pressing <No>, the file is not deleted. In either situation, the saved file list disappears.</p>
(7)	<Undo>	Clears or undoes the content that was just edited and changes the content back to the way it was. If <Undo> is pressed successively, the content keeps changing each time to the previous state (maximum: 10 times).
(8)	<Clear memo>	Deletes all edited content that is displayed in the memo area. When <Clear memo> is pressed, a popup window displays the message <Clear all?>. After pressing <Yes> is pressed, all edited content that is displayed in the memo area is deleted, and the popup window display disappears. After pressing <No> is pressed, the content in the memo area is not deleted, and the popup window display disappears. However, after pressing <Yes>, <Undo> cannot not be used to change the content back to the previous state (before clearing).
(9)	Memo area	This area is for writing or recording notes and memos.
(10)	<Handwrite>	Changes to handwriting mode. Handwriting mode allows the user to draw lines by touching and sliding inside the memo area. In addition, the line width and color can be changed by using <Line width> and <Color>.

No.	Item name	Description														
(11)	<Text>	<p>Changes to text mode. In text mode, when user taps on the memo area, a text box and cursor appear. At this time, the user can input characters by pressing the number, letter or symbol keys located on the operation panel. When is pressed while the text box is displayed, the size of the entire text box changes and the font size can be changed accordingly. If the user taps another key or position besides the title bar, the or the <Line color> while the text box is displayed, then the character input is carried out.</p> <p>After the text box is displayed, the user can edit the characters and move the cursor by pressing the following keys.</p> <table border="1"> <thead> <tr> <th>Key type</th><th>Operation</th></tr> </thead> <tbody> <tr> <td>Number keys, character keys and symbol keys</td><td>Enters text into the text box.</td></tr> <tr> <td>[EOB/ENT] key</td><td>Ends a line and starts a new one in the text box (line break).</td></tr> <tr> <td>[INS] key</td><td>Inserts a character or overwrites. When the key is pressed while the LED is on, the key will insert a character. When the key is pressed while the LED is off, the key will overwrite a character.</td></tr> <tr> <td>[DEL] key</td><td>When the LED for the [INS] key is on, the character to the right of the cursor inside the text box is deleted. When the LED for the [INS] key is off, the character at the cursor is deleted.</td></tr> <tr> <td>[BACK SPACE] key</td><td>Deletes the character to the left of the cursor in the text box.</td></tr> <tr> <td>[CURSOR] key</td><td>Moves the cursor in the text box.</td></tr> </tbody> </table> <p>[BACK SPACE], for example, cannot be used to delete a character that has been input. Use the <Eraser> (discussed later) and other keys to edit and delete the text.</p>	Key type	Operation	Number keys, character keys and symbol keys	Enters text into the text box.	[EOB/ENT] key	Ends a line and starts a new one in the text box (line break).	[INS] key	Inserts a character or overwrites. When the key is pressed while the LED is on, the key will insert a character. When the key is pressed while the LED is off, the key will overwrite a character.	[DEL] key	When the LED for the [INS] key is on, the character to the right of the cursor inside the text box is deleted. When the LED for the [INS] key is off, the character at the cursor is deleted.	[BACK SPACE] key	Deletes the character to the left of the cursor in the text box.	[CURSOR] key	Moves the cursor in the text box.
Key type	Operation															
Number keys, character keys and symbol keys	Enters text into the text box.															
[EOB/ENT] key	Ends a line and starts a new one in the text box (line break).															
[INS] key	Inserts a character or overwrites. When the key is pressed while the LED is on, the key will insert a character. When the key is pressed while the LED is off, the key will overwrite a character.															
[DEL] key	When the LED for the [INS] key is on, the character to the right of the cursor inside the text box is deleted. When the LED for the [INS] key is off, the character at the cursor is deleted.															
[BACK SPACE] key	Deletes the character to the left of the cursor in the text box.															
[CURSOR] key	Moves the cursor in the text box.															
(12)	<Eraser>	Changes to eraser mode. The user can edit and delete content by touching and sliding inside the memo area.														
(13)	<Line width>	Changes the width or thickness of the line when in handwriting mode. In addition, this key changes the width or thickness of the eraser range when in eraser mode. There are three widths: thick, medium and thin.														
(14)		Changes the font size. The font can only be changed in text mode. There are three font sizes: large, medium and small.														
(15)	<Color>	Changes the color of the handwritten line or the text. There are five colors: black, red, blue, green and orange. The color cannot be changed in eraser mode.														

(NOTE) If edit operation is not possible at the current operation level, when the user taps on the memo area, the alarm <<No operation is possible under the current level.>> is triggered and the memo or notes cannot be edited.

7.3.3 Key Operations & Functions

The following shows the function of each key on the operation panel and NC screen when using the notebook.

Key operation and panel operation	Function of key operation and panel operation
[HOME], [RST], [MANU], [MDI], [MEM] and [EDIT]	Changes to the screen for the key that was pressed. The notebook is hidden, but the edited content or data is maintained.
Numerical value, letter, symbol, [EOB/ENT], [INS], [DEL], [BACK SPACE], [CURSOR]	After tapping on the notebook, if the text box is displayed for the memo area, the characters in the text box will be edited and the cursor will move when the keys are used. If the text box is not displayed for the memo area, the key operations are ignored. When a key is used after tapping on a screen other than the notebook, the function of the key that was pressed for that screen (other than the notebook) is carried out. In either situation, the notebook stays displayed.
Other keys not noted above	The function of the key that is pressed for a particular screen (besides notebook) is carried out. For example, when [Z.RTN] is pressed in manual operation mode, a zero return operation is carried out. The notebook stays displayed.
Keys in the function key and control key display areas for changing screen	Changes the screen. The notebook stays displayed.
Press alarm or operator message area to change screen	Changes to the <Current Alarm/Operator message> screen. The notebook is hidden, but the edited content or data is maintained.

7.3.4 Data When Power is Turned OFF

When the power is turned OFF, any new or edited content that is not saved will be discarded. The content or data that is already saved will not be discarded.

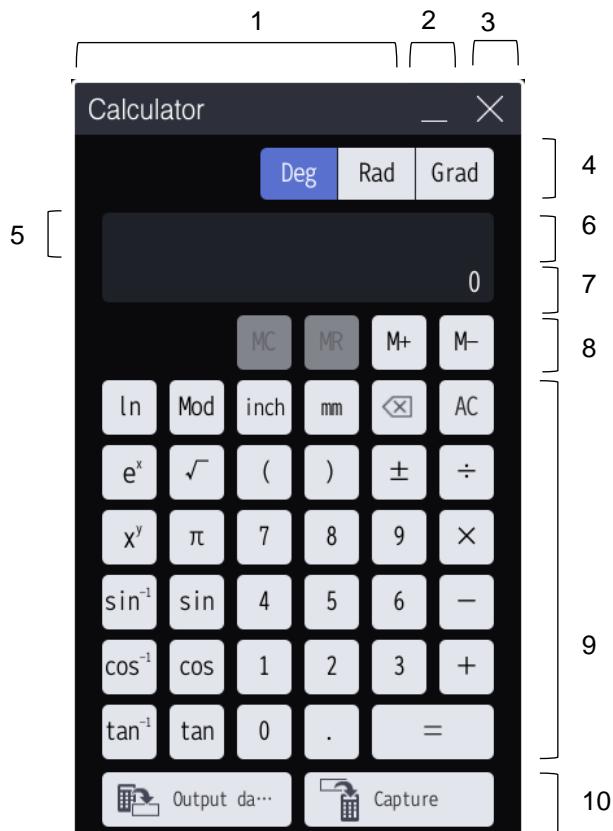
7.4 Calculator

7.4.1 Overview

The calculator is a function for performing calculations such as the four arithmetic operations and other calculations using functions, such as trigonometric functions. In addition, the user can use the calculator and apply or insert the results to user parameters or programs. And, the user can also apply or insert values (copied from a program) into the calculator.

7.4.2 Screen & Key Layout

The following description includes a list of calculator keys and calculation examples.



7

No.	Item name	Description
1	Title bar	Displays a title. While touching this area, the window can be dragged to a different position within the main display area on the NC screen.
2	Minimize key	Hides the calculator on the screen. The calculation formula and results are maintained even if the calculator is hidden.
3	Close key	Closes the calculator. Any calculation formula and/or results are deleted after the calculator is closed.
4	Angle unit key	Switches the angle unit to “Deg” (degrees), “Rad” (Radian) or “Grad” (Grad). After pressing the key, the color changes. Even if the key is pressed, the values that display in the calculation result display area do not change.
5	Memory display area	Displays the value saved for the memory key. There is no display when no value has been saved. When a value has been saved, “M (value)” is displayed.
6	Calculation formula display area	Displays the calculation formula. When the close key is pressed to exit the calculator, or when the clear key is pressed, the calculation formula is cleared. When a formula is long, the display is abbreviated.
7	Calculation result display area	Displays the calculation result. A maximum of 12 digits (including integers and decimal point numbers) can be displayed.

No.	Item name	Description
8	Memory key	<p><MC>: Deletes the value saved in the memory.</p> <p><MR>: The value saved in the memory is displayed in the calculation result display area.</p> <p><M+>: Adds the value displayed in the calculation result display area to the memory value and saves the new value.</p> <p><M->: Subtracts the value displayed in the calculation result display area from the memory value and saves it.</p>
9	Computation key	<p>These keys are used to perform various calculations or computations.</p> <p><0> to <9> and <.>: Inputs the corresponding value.</p> <p><+>, <->, <×>, <÷>: Performs the corresponding arithmetic operation.</p> <p><=>: Enters the calculation to produce a result.</p> <p><(>, <)>: Inserts the corresponding parenthesis. The parentheses can be used to perform calculations.</p> <p><±>: Changes the sign for the value displayed in the calculation result display area.</p> <p><√>: Calculates the square root.</p> <p><ln>: Calculates the natural logarithm.</p> <p><e^x>: Calculates powers based on the constant <i>e</i>.</p> <p><x^y>: Calculates <i>x</i> to the power <i>y</i>.</p> <p><Mod>: Calculates the remainder.</p> <p><π>: Displays <i>pi</i>. When pressed, up to 12 digits of <i>pi</i> are displayed.</p> <p><sin>, <cos>, <tan>: Calculates trigonometric functions. When calculating, be sure to check the correct angle unit setting.</p> <p><sin⁻¹>, <cos⁻¹>, <tan⁻¹>: Calculates inverse trigonometric functions. When calculating, be sure to check the correct angle unit setting.</p> <p><inch>: Divides the value displayed in the calculation result display area by 25.4.</p> <p><mm>: Multiplies 25.4 by the value displayed in the calculation result display area.</p> <p><[Delete]>: Deletes the smallest (rightmost) value or decimal point value that is entered into the calculation result display area. When a computation key is used to display a value in the calculation result display area, that value cannot be deleted.</p> <p><AC>: Deletes the value displayed in the calculation result display area and sets the value to 0 (zero). In addition, the key deletes mathematical expressions displayed in the calculation result display area.</p>
10	Input/Output key	<p><Input>: The user can input the value on the NC screen into the calculation result display area. Refer to “7.4.7 Input data into calculator” for further details.</p> <p><Output>: The user can output the calculation result to the NC screen. Refer to “7.4.6 Output data from calculator” for further details.</p>

7.4.3 Display Fields for Calculation Formula & Results

When a key is pressed, the calculation formula display area and calculation result display areas are as follows.

Pressed key	Calculation formula display area	Calculation result display area
<(>	“(“ is displayed.	No change.
<)>	“)” is displayed. Only the same number of closing parentheses “)” as the opening parentheses “(“ can be input.	Displays the calculation result.
<√>	\sqrt{a} is displayed. (a is the value that is displayed in the calculation result display area before the key is pressed)	Same as above.
<ln>	$\ln(a)$ is displayed. (a is the value that is displayed in the calculation result display area before the key is pressed)	Same as above.
<e ^x >	e^x is displayed. (a is the value that is displayed in the calculation result display area before the key is pressed)	Same as above.
<x ^y >	x^y is displayed. (a is the value that is displayed in the calculation result display area before the key is pressed)	No change.
<Mod>	a% is displayed. (a is the value that is displayed in the calculation result display area before the key is pressed)	Same as above
<π>	No change.	12 digits of pi are displayed.
<sin> <cos> <tan>	Display changes when the angle unit key is pressed. When “Deg” is selected, sind, cosd and tand are displayed. When “Rad” is selected, sinr, cosr and tanr are displayed. When “Grad” is selected, sing, cosg and tang are displayed.	Displays the calculation result.
<sin ⁻¹ > <cos ⁻¹ > <tan ⁻¹ >	Display changes when the angle unit key is pressed. When “Deg” is selected, arcsind, arccosd and arctand are displayed. When “Rad” is selected, arcsinr, arccosr and arctanr are displayed. When “Grad” is selected, arcsing, arccosg and arctang are displayed.	Same as above.

7.4.4 Calculation Operation & Examples

The following shows calculation examples when using computation keys.

Calculation example	Order showing pressed keys	Calculation result
When calculating $\sqrt{9}$	<9> <√> <=>	3
When calculating e^0	<0> <e ^x > <=>	1
When calculating $\ln(e)$ (e is Napier's constant)	<2.71828182845906> <ln> <=> or <1> <e ^x > <ln> <=>	1
When calculating 2^3	<2> <x ^y > <3> <=>	8
When calculating the remainder of $8 \div 3$	<8> <Mod> <3> <=>	2
When calculating $\sin(90)$ (90 is in deg)	When the angle unit key is set to “Deg”: <9> <0> <sin> <=>	1
When calculating $1 + \sin(90)$ (90 is in deg)	When the angle unit key is set to “Deg”: <1> <+> <9> <0> <sin> <=>	2
When calculating $\tan(\pi/4)$ ($\pi/4$ is in Rad)	When the angle unit key is set to “Rad”: <π> <÷> <4> <=> <tan> <=>	1
When using parentheses to calculate $9 \times (4-2)$	<9> <×> <(> <4> <-> <2> <)> <=> or <9> <×> <(> <4> <-> <2> <=>	18
When using the four arithmetic operation keys to multiply successively	<2> <×> <3> <=> <×> <3> <=> or <2> <×> <3> <=> <=>	18
When multiplying the same value successively	<2> <×> <2> <=> or <2> <×> <=>	4

- If the value exceeds 13 digits (including the integer and decimal value) like for π , the 13th digit is rounded off.
- If the integer in the calculation result exceeds 13 digits, the calculation result is displayed as an exponent notation. For example, when calculating $999,999,999,999,999 + 1$, the calculation result is displayed as $1e+12$. In addition, if the calculation result has less than 11 decimal places, it is displayed as an exponent notation. For example, when calculating $0.00000000001 / 2$, the calculation result is displayed as $5e-12$.
- Up to 10 sets of parentheses can be input.
- The modulo operation is calculated using the least absolute remainder. As a result, when the divisor and/or dividend are negative values, refer to the following examples: $-5 \% 3$ is evaluated as -2 , $5 \% -3$ is evaluated as 2 and $5 \% -3$ is evaluated as -2 .

When the calculation is not possible, a message appears indicating that the calculation is not possible when $<=$, $<>$ or one of the 4 arithmetic operation keys is pressed. The display for each situation is shown below. In addition, only the clear key can be used after said display.

- When performing a calculation where the exponent in the result is greater than $+308$ or less than -308 , the calculation is not carried out and $<\text{Digit limit exceeded}>$ is displayed in the calculation result display area.
- If a given number is divided by 0, the message $<\text{Cannot divide by 0}>$ is displayed in the calculation result display area.
- When $\ln(0)$ is calculated or when $<\ln>$ or $<\sqrt>$ is calculated for a negative number, the message $<\text{Invalid input}>$ appears in the calculation result display area.
- When calculating the remainder, which is 0, after dividing a given number (Ex: $3 \text{ Mod } 0$), the message $<\text{Results are not defined}>$ is displayed in the calculation result display area.

7.4.5 Calculation Formula Input

7.4.5.1 Character Count for Calculation Formula

Each character in the calculation result display area is counted as 1 character. For example, after pressing $<3>$ and $<\sqrt>$, $\sqrt{3}$ in the display is counted as 7 characters.

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7.4.5.2 Character Limit for Calculation Formula

Up to 80 characters can be input for the calculation formula. After reaching 80 characters while still in the middle of the formula, no more numbers will input into the calculation result display area, even if a number key is pressed. And, the calculation formula display area will blink once. When performing a calculation with 81 or more characters, press $<=$ once before reaching 80 characters, and then perform the calculation. Thereafter, when an arithmetic operation key is pressed, the calculation formula is cleared and a new calculation formula is input.

7.4.6 Output Data from Calculator

The user can press $<\text{Output}>$ to output the calculation result from the calculator to a data input field or to an editing field on the program edit screen.

To output the calculation result to a data input field, select an item, highlight the position with the cursor and press $<\text{Output}>$. The calculation result is output to the data input field. After selecting the setting item, press **[EOB/ENT]** or **[Enter]** to set the data to the item with the calculation result.

To output the calculation result to an editing field, move the cursor to the desired position and press $<\text{Output}>$.

If the $<\text{Output}>$ key is pressed when a message appears indicating that the calculation is not possible, then nothing is output.

When $<\text{Output}>$ is pressed, if there is no cursor positioned in the data input field or in the editing field, the alarm $<<\text{Writing not possible}>>$ is triggered.

If the calculation result is used for the exponent notation, when the data input field is selected and $<\text{Output}>$ is pressed, the alarm $<<\text{Writing not possible}>>$ is triggered.

7.4.7 Input Data into Calculator

The user can press <Input> to input a program value into the calculation result on the calculator. To input a program value into the calculation result, first use the copy or cut operation to copy or cut the desired value on the program edit screen. Next, press <Input>. Values or symbols that can be input include numbers (0 to 9), a decimal point and positive and negative signs. If the character string includes numbers and/or symbols that cannot be imported, only those numbers or symbols that can be imported are imported.

7.4.8 Key Operations & Functions

The following shows the function of each key on the operation panel and NC screen when using the calculator.

Key operation and panel operation	Function of key operation and panel operation
[HOME], [RST], [MANU], [MDI], [MEM] and [EDIT]	Changes to the screen for the key that was pressed. The calculator is hidden, but formulas and calculation results are maintained.
[EOB/ENT], cursor, [INS], [CAN], [DEL], [BACK SPACE], number, letter, symbol, [SHIFT], [RELSE]	Calculator does not respond when the user first taps the calculator and then uses a key. When a key is used after tapping on a screen other than the calculator, the function of the key that was pressed for that screen (other than the calculator) is carried out. In either situation, the calculator stays displayed.
Other keys not noted above	The function of the key that is pressed for a particular screen (besides calculator) is carried out. For example, when [Z.RTN] is pressed in manual operation mode, a zero return operation is carried out. The calculator stays displayed.
Keys in the function key and control key display areas for changing screen	Changes the screen. The calculator stays displayed.
Press alarm or operation message area to change screen	Changes to the <Current Alarm/Operator message> screen. The calculator is hidden, but formulas and calculation results are maintained.

7.4.9 Data When Power is Turned OFF

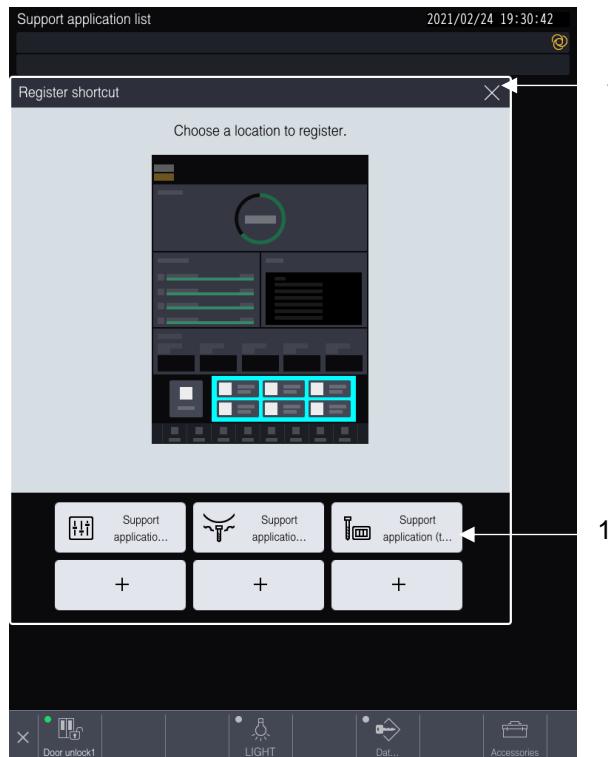
After the power is turned OFF, any calculation formula and/or calculation results are discarded.

7.5 Register Shortcuts

7.5.1 Overview

Shortcut registration is a function that allows the user to create and register shortcuts for screens and support applications, which are used frequently, to the home screen for quick and easy access.

7.5.2 Shortcut Registration Screen



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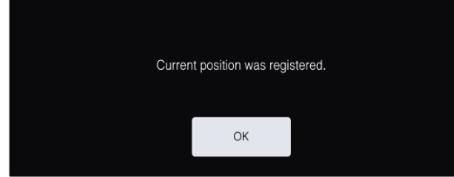
Position	Name	Description
1	Shortcut registration key	Press this key to register a shortcut for the screen that is currently displayed. There are 6 positions available to register shortcut keys on the home screen. When the screen name is too long, the display is abbreviated.
2	Close	Closes the shortcut registration screen

7.5.3 Shortcut Registration Procedure

Follow the shortcut registration procedure below.

1. Open a screen or support application that you wish to register as a shortcut.
2. Press the <Accessories> key from the tools on the bottom of the screen, and then press <Register shortcut> from the accessories displayed at the center of the screen.
3. Press the plus (+) sign shown under the “7.5.2 Shortcut registration screen” (1 in figure).
4. A message such as the following is displayed.

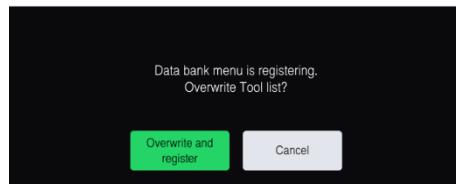
Ex: When <Current position> screen is registered.



5. After pressing <OK>, the shortcut registration is complete.

If a position is pressed that is already registered (in step 3), a message is displayed like the following. Press <Overwrite and register> to overwrite the data and register it again.

Ex: When an attempt is made to register the <Tool list> screen at the position where the <Data bank menu> screen is registered.



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- (NOTE) When registering a support application, the support application itself is registered but the subscreens inside the application cannot be registered.
The operation is the same as when the support application icon is pressed from the <Support application list>.

7.5.4 Screens and Support Applications Available for Registering

The screens where shortcuts can be registered are the same as those that can be registered using the bookmark function. If a screen cannot be registered as a shortcut, the <Register shortcut> key in the accessories list is grayed out. Refer to “4.11 Bookmarks” in Operation Manual I for further details.

7.5.5 Edit Shortcuts

Refer to “6.11 Home screen setting” for further details on shortcut edit operations.

7.6 Display OFF

7.6.1 Display OFF

The user can press <DSP OFF> from the accessories list to turn off the screen display. When the user parameter (switch 1: common) <Automatic screen dimming time> is set, the screen automatically dims when no operation has been performed for a specified time.

When one of the following keys is pressed, the screen is displayed again.

- Number keys, character keys and symbol keys
- Cursor keys
- **[HOME]** key
- **[MANU]** key, **[MDI]** key, **[MEM]** key and **[EDIT]** key
- **[RST]** key

In addition, if the user parameter (switch 1: common) <Alarm display when screen is dimmed> is set to <0: Alarm screen>, when a new alarm or operator message is triggered, the screen will turn back on and the alarm screen will display. However, the screen stays dimmed even if the next alarm triggers and regardless of the setting for <Alarm display when screen is dimmed>.

<<Screen is dirty. Touch panel low sensitivity mode.>>

<<Calibration error on touch panel hardware>>

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CHAPTER 8

SUPPLEMENT

- 8.1 Help
- 8.2 Display in different languages

8.1 Help

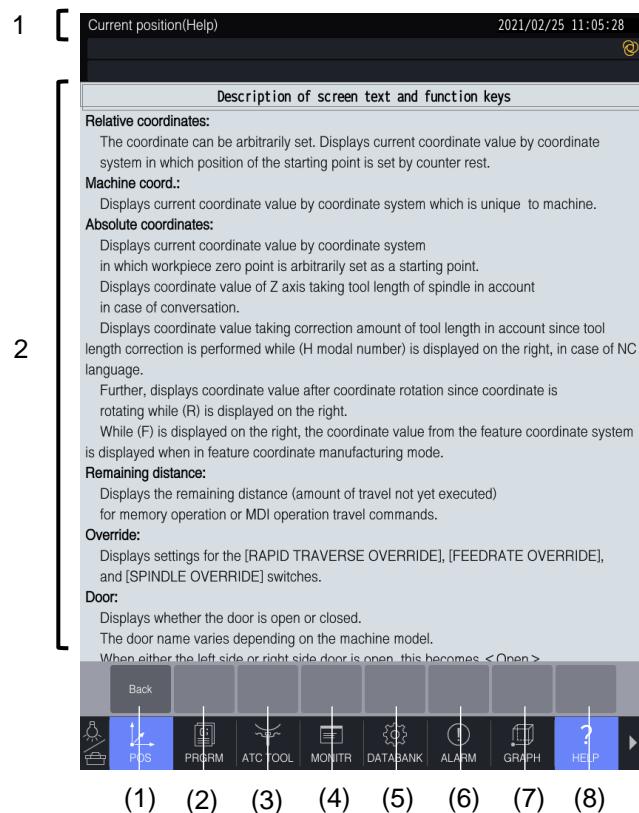
8.1.1 Help screen

8.1.1.1 Outline

Help screen displays information such as the operating method of the currently displayed screen and the contents of the relevant parameter.

Displayed state and contents of Help screen differ from key to key on each screen.

1. Press the <HELP> key.
2. After returning to the original screen, press the <HELP> key again. Or, press the <Back> key.



8.1.1.2 Description of screen display

Position	Name	Description
1	Help title	Displays the screen name that provides an explanation for help.
2	Help content	Displays the help instructions and content.

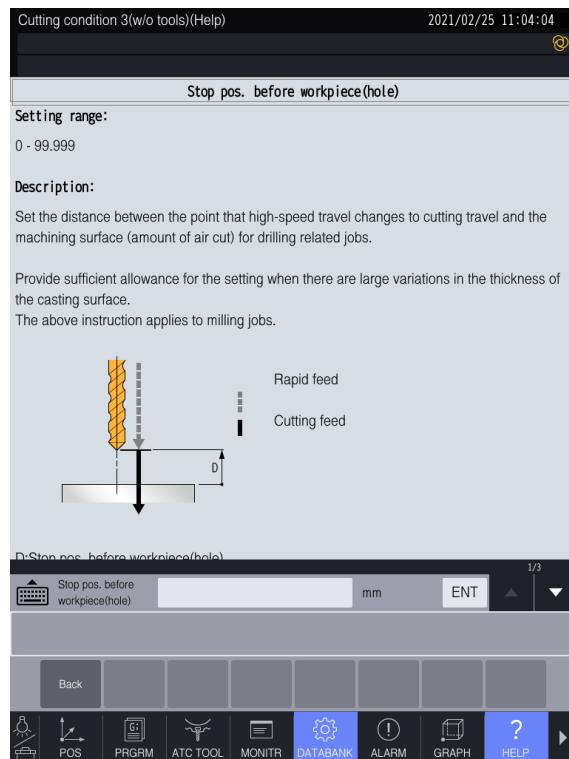
8.1.1.3 Description of screen operation

1. Description of function key operations

Column	Position	Label	Description
1	(1)	<Back>	Closes the help screen and goes back to the screen where help is displayed.
	(2)		
	(3)		
	(4)		
	(5)		
	(6)		
	(7)		
	(8)		

2. Description of function key operations

- The user can swipe up and down to scroll through the help content and instructions.
When pressing the <HELP> key on a screen with the <Help> sign at the lower right of the teaching area, the Help screen dedicated to the relevant screen appears.
- Help screen at the entry of parameters
Pressing the <HELP> key in setting a value for parameters such as user parameters or conversation cutting conditions, the description of the relevant parameter appears.
A value can be entered in the input field provided in the teaching area.
- * The setting range is displayed in micron units even when using submicron units.



8.2 Display in different languages

8.2.1 Changing display language

The text language on the machine unit display can be specified in the machine parameter (system 1: common) <Display language>.

The following languages can be selected and displayed: Japanese, English, German, French, Chinese (simplified), Portuguese, Italian, Polish, Czech, Spanish and Korean.

When the machine parameter <Display language> is changed, the displayed language will change after the reset operation.

When the machine parameters are not provided or if the machine parameter file is destroyed, the display is given in English. However, display language can be selected temporarily by a predetermined operation at power-ON.

For how to select temporary display language, refer to “8.2.2 Selecting temporary display language” described later.

In the data display area permitting entry of character string, selecting a display language other than Japanese may cause garbled characters or incorrect display of characters, if Japanese is set for the data of character string or if a file name or folder name in the connected device for external I/O is in Japanese.

The same situation occurs as with Chinese, German umlaut marks, and French accent marks.

Of the characters usable in comment sections, only the following characters can be displayed correctly even if the display language is changed.

Hexadecimal code	2*H	3*H	4*H	5*H	6*H	7*H
*0 H	(SP) (NOTE)	0	@	P	^	p
*1 H	!	1	A	Q	a	q
*2 H	"	2	B	R	b	r
*3 H	#	3	C	S	c	s
*4 H	\$	4	D	T	d	t
*5 H		5	E	U	e	u
*6 H	&	6	F	V	f	v
*7 H	'(NOTE)	7	G	W	g	w
*8 H	((NOTE))	8	H	X	h	x
*9 H) (NOTE)	9	I	Y	i	y
*A H	*	:	J	Z	j	z
*B H	+	;	K	[k	{
*C H	,	<	L	\(NOTE)	l	
*D H	-	=	M]	m	}
*E H	.	>	N	^	n	~
*F H	/	?	O	_	o	

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(NOTE) 20H (SP) refers to space.

27H “” (apostrophe) is displayed only between “(” (control-out) and “)” (control-in) in NC programs.

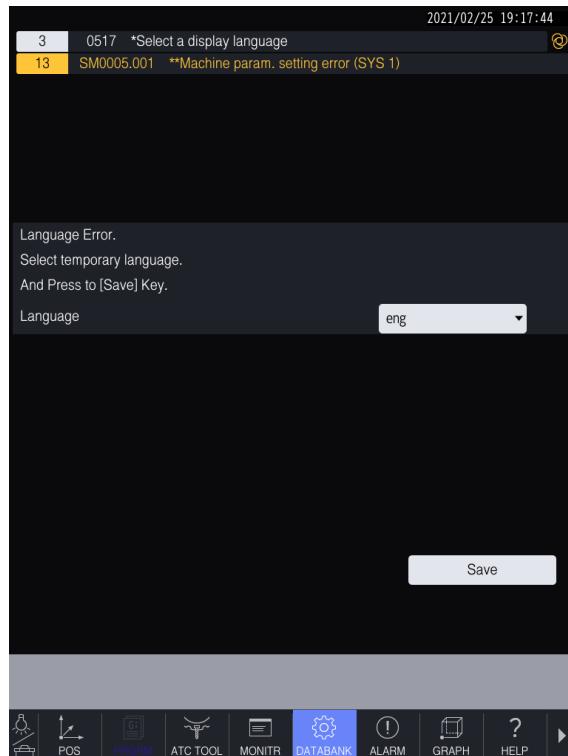
28 “(” and 29H “)” are displayed in the area allowing input of comments in other than NC programs. They are used as control-out and control-in in NC programs.

The 5CH “¥” (Yen symbol) is displayed as a “\” (backslash) in English, German, French, Chinese, Portuguese, Italian, Polish, Czech, Spanish and Korean.

8.2.2 Selecting temporary display language

When there are no machine parameters, or when the machine parameter file is corrupt, the display language is unknown and it is automatically set to English. Note, in this situation, the user can specify the display language temporarily using the startup operations.

1. The system starts up and the following screen is displayed.



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2. Select a language from the combo box to display temporarily.
3. When the <Save> key is pressed after the language is selected, then that language is displayed on the screen.
The display language that is specified temporarily will be disabled if the power is turned OFF before completing the recovery.

(NOTE) Before pressing <Save>, if the [RST] key and a mode key are pressed to change the screen, the English display is set. To switch the language, change the machine parameter <Display language>.

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