# FS100 OPTIONS
# INSTRUCTIONS

**FOR INFORM LANGUAGE**

- Upon receipt of the product and prior to initial operation, read these instructions thoroughly, and retain for future reference.

- This instruction is applicable to both FS100 and FS100L controllers.

MOTOMAN INSTRUCTIONS

| (FOR SMALL -SIZED MANIPULATORS) | (FOR LARGE AND MEDIUM-SIZED MANIPULATORS) |
|---|---|
| MOTOMAN-□□□ INSTRUCTIONS | MOTOMAN-□□□ INSTRUCTIONS |
| FS100 INSTRUCTIONS | FS100L INSTRUCTIONS |
| FS100 OPERATOR'S MANUAL | FS100 OPERATOR'S MANUAL |
| FS100 MAINTENANCE MANUAL | FS100L MAINTENANCE MANUAL |

The FS100 OPERATOR'S MANUAL above is applicable to both FS100 and FS100L controllers.

YASKAWA ELECTRIC CORPORATION

YASKAWA

**⚠ MANDATORY**

- This manual explains the INFORM language of the FS100 system. Read this manual carefully and be sure to understand its contents before handling the FS100.

- General items related to safety are listed in the Chapter 1: Safety of the FS100 Instructions. To ensure correct and safe operation, carefully read the FS100 Instructions before reading this manual.

**⚠ CAUTION**

- Some drawings in this manual are shown with the protective covers or shields removed for clarity. Be sure all covers and shields are replaced before operating this product.

- The drawings and photos in this manual are representative examples and differences may exist between them and the delivered product.

- YASKAWA may modify this model without notice when necessary due to product improvements, modifications, or changes in specifications. If such modification is made, the manual number will also be revised.

- If your copy of the manual is damaged or lost, contact a YASKAWA representative to order a new copy. The representatives are listed on the back cover. Be sure to tell the representative the manual number listed on the front cover.

- YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids your product's warranty.

NOTE
This instruction manual is applicable to both FS100 (a controller for small-sized manipulators) and FS100L (a controller for large and medium-sized manipulators).

The description of "FS100" refers to both "FS100" and "FS100L" in this manual unless otherwise specified.

# Notes for Safe Operation

Read this manual carefully before installation, operation, maintenance, or inspection of the FS100.

In this manual, the Notes for Safe Operation are classified as "DANGER", "WARNING", "CAUTION", "MANDATORY", or "PROHIBITED".

| | |
|---|---|
| ⚠ DANGER | Indicates an imminent hazardous situation which, if not avoided, could result in death or serious injury to personnel. |
| ⚠ WARNING | Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to personnel. |
| ⚠ CAUTION | Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury to personnel and damage to equipment. It may also be used to alert against unsafe practices. |
| 🛈 MANDATORY | Always be sure to follow explicitly the items listed under this heading. |
| 🚫 PROHIBITED | Must never be performed. |

Even items described as "CAUTION" may result in a serious accident in some situations.

At any rate, be sure to follow these important items.

NOTE To ensure safe and efficient operation at all times, be sure to follow all instructions, even if not designated as "DANGER", "WARNING" and "CAUTION".

> ⚠️ **WARNING**
>
> - Before operating the manipulator, check that servo power is turned OFF when the emergency stop buttons on the front door of the DX200 and the programming pendant are pressed.
>   When the servo power is turned off, the SERVO ON LED on the programing pendant is turned off.
>
> Injury or damage to machinery may result if the emergency stop circuit cannot stop the manipulator during an emergency. The manipulator should not be used if the emergency stop buttons do not function.
>
> *Fig. : Emergency Stop Button*
>
> - In the case of not using the programming pendant, be sure to supply the emergency stop button on the equipment. Then before operating the manipulator, check to be sure that the servo power is turned OFF by pressing the emergency stop button.
>   Connect the external emergency stop button to the 5-6 pin and 16-17 pin of the robot system signal connector (CN2).
>
> - Upon shipment of the FS100, this signal is connected by a jumper cable in the dummy connector. To use the signal, make sure to prepare a new connector, and then input it.
>
> If the signal is input with the jumper cable connected, it does not function, which may result in personal injury or equipment damage.
>
> - Once the emergency stop button is released, clear the cell of all items which could interfere with the operation of the manipulator. Then turn the servo power ON.
>
> Injury may result from unintentional or unexpected manipulator motion.
>
> *Fig. : Release of EM*
>
> TURN
>
> - Observe the following precautions when performing teaching operations within the P-point maximum envelope of the manipulator:
>
>   – Be sure to use a lockout device to the safeguarding when going inside.
>     Also, display the sign that the operation is being performed inside the safeguarding and make sure no one closes the safeguarding.
>
>   – View the manipulator from the front whenever possible.
>
>   – Always follow the predetermined operating procedure.
>
>   – Ensure that you have a safe place to retreat in case of emergency.
>
> Improper or unintended manipulator operation may result in injury.
>
> The emergency stop button is located on the programing pendant.

⚠ **WARNING**

- Confirm that no person is present in the P-point maximum envelope of the manipulator and that you are in a safe location before:

  – Turning on the power for the FS100.

  – Moving the manipulator with the programming pendant.

  – Running the system in the check mode.

  – Performing automatic operations.

Injury may result if anyone enters the working envelope of the manipulator during operation.  Always press an emergency stop button immediately if there are problems.

⚠ **CAUTION**

- Perform the following inspection procedures prior to conducting manipulator teaching.  If problems are found, repair them immediately, and be sure that all other necessary processing has been performed.

  – Check for problems in manipulator movement.

  – Check for damage to insulation and sheathing of external wires.

- Always return the programming pendant to the hook on the cabinet of the FS100 after use.

The programming pendant can be damaged if it is left in the manipulator's work area, on the floor, or near fixtures.

- Read and understand the Explanation of Warning Labels in the FS100 Instructions before operating the manipulator:

## Definition of Terms Used Often in This Manual

The MOTOMAN is the YASKAWA industrial robot product.

The MOTOMAN usually consists of the manipulator, the FS100 controller, manipulator cables, the FS100 programming pendant (optional), and the FS100 programming pendant dummy connector (optional).

In this manual, the equipment is designated as follows:

| Equipment | Manual Designation |
|---|---|
| FS100 controller | FS100 |
| FS100 programming pendant | Programming pendant |
| Cable between the manipulator and the controller | Manipulator Cable |
| FS100 programming pendant dummy connector | Programming pendant dummy connector |

Descriptions of the programming pendant keys, buttons, displays and keyboard of the PC are shown as follows:

| Equipment | | Manual Designation |
|---|---|---|
| Programming Pendant | Character Keys | The keys which have characters printed on them are denoted with [ ]. ex. [ENTER] |
| | Symbol Keys | The keys which have a symbol printed on them are not denoted with [ ] but depicted with a small picture. ex. PAGE key  The Cursor is an exception, and a picture is not shown. |
| | Axis Keys Numeric Keys | "Axis Keys" and "Numeric Keys" are generic names for the keys for axis operation and number input. |
| | Keys pressed simultaneously | When two keys are to be pressed simultaneously, the keys are shown with a "+" sign between them, ex. SHIFTkey  +COORD key  |
| | Mode Key | Three kinds of modes that can be selected by the mode key are denoted as follows: REMOTE, PLAY, or TEACH |
| | Button | Three buttons on the upper side of the programming pendant are denoted as follows: HOLD button START button EMERGENCY STOP button |
| | Displays | The menu displayed in the programming pendant is denoted with { }. ex. {JOB} |
| PC Keyboard | | The name of the key is denoted ex. Ctrl key on the keyboard |

# Description of the Operation Procedure

In the explanation of the operation procedure, the expression "Select • • • " means that the Cursor is moved to the object item and the SELECT key is pressed, or that the item is directly selected by touching the screen.

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# Contents

# 1    Outline of INFORM

## 1.1    About INFORM

### 1.1.1    INFORM III

The robot programming language used with FS100 is called INFORM III. INFORM III is composed of the instruction and the additional item (tag and numeric data).

$$\underline{MOVJ}\ \underline{VJ}=\underline{50.00}$$

Tag   Numeric data

Instruction
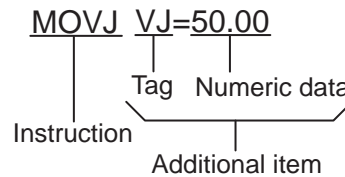
Additional item

- Instruction: It is used to execute the operation and processing. In the case of a move instruction, when a position is taught, the move instruction is automatically displayed according to the interpolation method.

- Additional item: The speed, time, etc. are set according to the type of instruction.  Numeric data and character data are added to the tag that specifies the condition as necessary.

### 1.1.2    Type of Instruction

The instruction is divided into several types in terms of each process and operation.

| Type | Content | Instruction Example |
|---|---|---|
| I/O Instruction | It is the instruction used to control the I/O. | DOUT, WAIT |
| Control Instruction | It is the instruction used to control the processing and operation. | JUMP, TIMER |
| Operating Instruction | It is the instruction by which the variables, etc. are used and operated. | ADD, SET |
| Move Instruction | It is an instruction concerning the movement and the speed. | MOVJ, REFP |
| Shift Instruction | It is an instruction used when a present teaching position is shifted. | SFTON, SFTOF |
| Instruction which adheres to instruction | It is an instruction which adheres to the instruction. | IF, UNTIL |
| Work Instruction | It is an instruction concerning work. | TOOLON |
| Optional Instruction | It is an instruction concerning optional functions. It can only be used when the function is available. | - |

**1.1.3 Instruction Set**

To improve operation efficiency, the number of instructions to be registered is limited.  All instructions are executed, regardless of the instruction set during playback, etc.

- Subset Instruction Set
  Only high instructions which are used frequently are in the subset instruction set.  The number of instructions is small, which allows for easier selecting and input.

- Standard Instruction Set / Expanded Instruction Set
  All INFORM III instructions can be registered.  For these two sets, the number of additional items which can be used by each instruction is different.  The following function cannot be used with a standard instruction set, but operation is easier because the number of data decreases when the instruction is registered.

  - Local Variable, Use of Array Variable

  - Use of Variable to Additional Item (Ex.: MOVJ VJ=I000)

1.1.3.1 Selecting Instruction Set

Select an instruction set in the teaching condition window.

1. Select {SETUP} under the main menu

2. Select {TEACHING COND}

   – The teaching condition window appears.
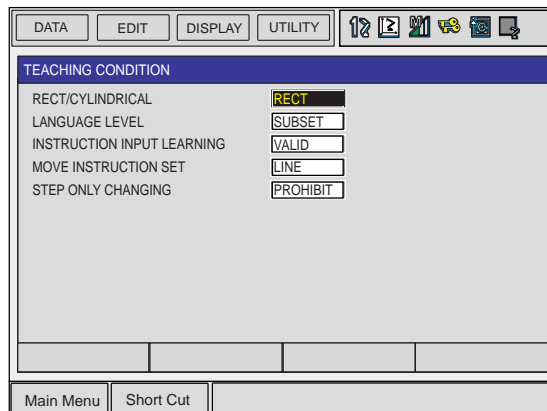


3. Select "LANGUAGE LEVEL"

   – The instruction set selection dialog box appears.
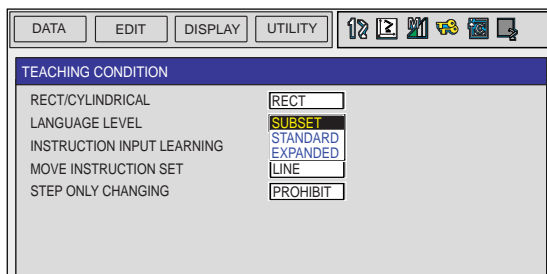
4.  Select the language level (instruction set)

   –  The language level is selected.



| DATA | EDIT | DISPLAY | UTILITY |
|------|------|---------|---------|

TEACHING CONDITION

| RECT/CYLINDRICAL | RECT |
| LANGUAGE LEVEL | EXPANDED |
| INSTRUCTION INPUT LEARNING | VALID |
| MOVE INSTRUCTION SET | LINE |
| STEP ONLY CHANGING | PROHIBIT |

Main Menu    Short Cut

## 1.1.4   Variables to be Used in Instructions

Variables can be used as numeric data for the additional item of the instructions in the standard and expanded instruction sets.

Also, the instructions in the expanded instruction set can use local variables and array variables.

> NOTE
> • The applicable variable differs depending on the additional item.
>
> • The number of local variables to be used must be set in the job header display.  For setting the number of local variables, refer to the FS100 Operator's Manual "3.9.11 Editing Local Variables".

1.1.4.1   Set Value of Variable and Numeric Data

The unit of the numeric data for the additional item of the instruction decides the set value of variable and the value of the additional item at execution.

< Example >

TIMER tag (T=)

TIMER T=I000

When a variable is used for the numeric data of the TIMER tag, the unit of numeric data is <u>0.001</u> <u>seconds</u>.

When 1000 is set for I000, the value when the instruction is executed is 1.00 seconds.

## 1.2    Registration of Instructions

### 1.2.1    Registration

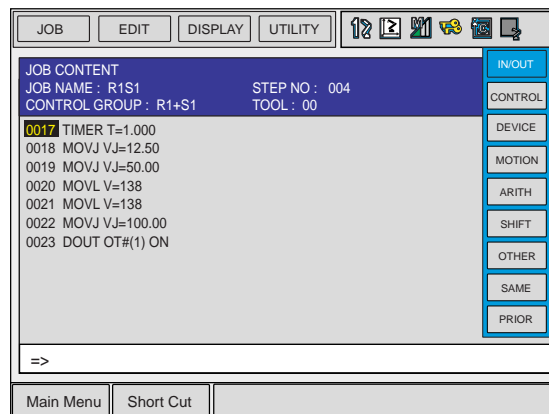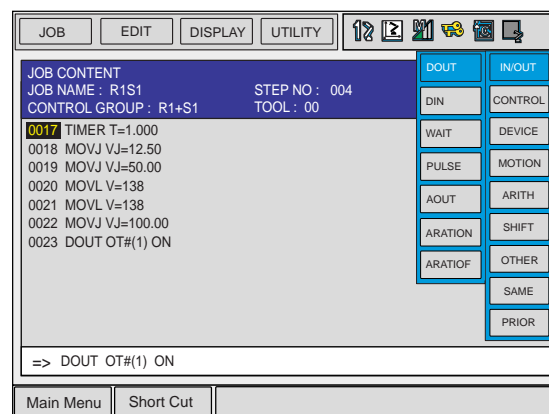Press [INFORM LIST] . while the job content window is shown to register instructions.

1. Select {JOB} under the main menu

2. Select {JOB}

   – The job content window appears.

3. Press [INFORM LIST]

   – The job instruction group list dialog box appears.

```
┌──────┬──────┬─────────┬─────────┬──────────────────┐
│ JOB  │ EDIT │ DISPLAY │ UTILITY │ 🔧 🔲 🔩 🔧 🔧 🔲 │
├──────┴──────┴─────────┴─────────┴──────┬───────────┤
│ JOB CONTENT                            │  IN/OUT   │
│ JOB NAME :  R1S1        STEP NO :  004  ├───────────┤
│ CONTROL GROUP :  R1+S1     TOOL :  00   │  CONTROL  │
│                                         ├───────────┤
│ 0017  TIMER T=1.000                     │  DEVICE   │
│ 0018  MOVJ VJ=12.50                     ├───────────┤
│ 0019  MOVJ VJ=50.00                     │  MOTION   │
│ 0020  MOVL V=138                        ├───────────┤
│ 0021  MOVL V=138                        │  ARITH    │
│ 0022  MOVJ VJ=100.00                    ├───────────┤
│ 0023  DOUT OT#(1) ON                    │  SHIFT    │
│                                         ├───────────┤
│                                         │  OTHER    │
│                                         ├───────────┤
│                                         │  SAME     │
│                                         ├───────────┤
│                                         │  PRIOR    │
│                                         └───────────┤
│ =>                                                  │
├──────────────┬──────────────┬──────────────────────┤
│  Main Menu   │  Short Cut   │                        │
└──────────────┴──────────────┴──────────────────────┘
```

4. Select the desired instruction group

   – The job instruction group list dialog box appears.

```
┌──────┬──────┬─────────┬─────────┬──────────────────┐
│ JOB  │ EDIT │ DISPLAY │ UTILITY │ 🔧 🔲 🔩 🔧 🔧 🔲 │
├──────┴──────┴─────────┴─────────┼─────────┬────────┤
│ JOB CONTENT                     │  DOUT   │ IN/OUT │
│ JOB NAME :  R1S1    STEP NO : 004├─────────┼────────┤
│ CONTROL GROUP : R1+S1  TOOL : 00 │  DIN    │CONTROL │
│                                  ├─────────┼────────┤
│ 0017  TIMER T=1.000              │  WAIT   │ DEVICE │
│ 0018  MOVJ VJ=12.50              ├─────────┼────────┤
│ 0019  MOVJ VJ=50.00              │  PULSE  │ MOTION │
│ 0020  MOVL V=138                 ├─────────┼────────┤
│ 0021  MOVL V=138                 │  AOUT   │ ARITH  │
│ 0022  MOVJ VJ=100.00             ├─────────┼────────┤
│ 0023  DOUT OT#(1) ON             │ ARATION │ SHIFT  │
│                                  ├─────────┼────────┤
│                                  │ ARATIOF │ OTHER  │
│                                  └─────────┼────────┤
│                                            │ SAME   │
│                                            ├────────┤
│                                            │ PRIOR  │
│                                            └────────┤
│ =>  DOUT  OT#(1)  ON                                │
├──────────────┬──────────────┬──────────────────────┤
│  Main Menu   │  Short Cut   │                        │
└──────────────┴──────────────┴──────────────────────┘
```

5. Select the desired instruction

   – The instruction is displayed in the input buffer line.

6. Press [ENTER]

   – The instruction displayed in the input buffer line is registered in the job.
   Also, if the instruction must be registered during the job, press [INSERT] before pressing [ENTER].

> SUPPLE
> -MENT    Refer to the Operator's Manual "3.6 Editing Instructions" for details on editing instructions.
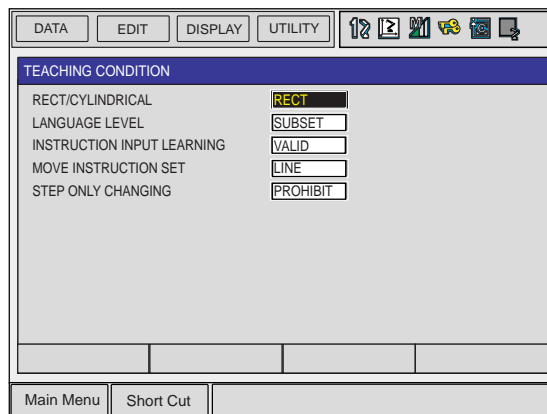
**1.2.2   Learning Function**

With the learning function, an instruction can be registered with the same additional items as those previously registered with the instruction.
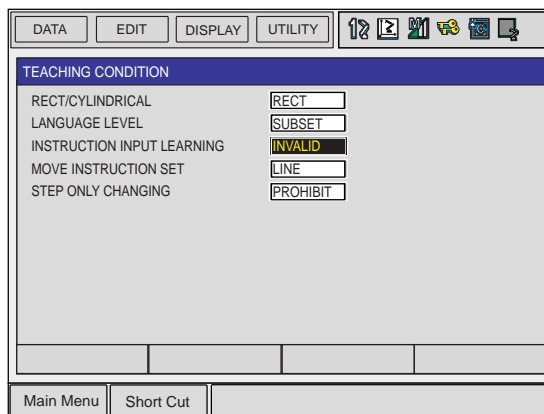
Validate the learning function to minimize the number of instruction registries.

Set the learning function to valid or invalid in the teaching condition window.

1.  Select {SETUP} under the main menu

2.  Select {TEACHING COND}

    – The teaching condition window appears.

```
┌──────────────────────────────────────────────────────┐
│  DATA    EDIT    DISPLAY   UTILITY   ⏻  ▣ ▨ ▦ ▨ ▣      │
├──────────────────────────────────────────────────────┤
│ TEACHING CONDITION                                     │
│                                                        │
│ RECT/CYLINDRICAL              RECT                      │
│ LANGUAGE LEVEL                SUBSET                    │
│ INSTRUCTION INPUT LEARNING    VALID                     │
│ MOVE INSTRUCTION SET          LINE                      │
│ STEP ONLY CHANGING            PROHIBIT                  │
│                                                        │
│                                                        │
│                                                        │
│ Main Menu   Short Cut                                  │
└──────────────────────────────────────────────────────┘
```

3.  Move the cursor to "INSTRUCTION INPUT LEARNING".

    – The condition "VALID" or "INVALID" is switched each time [SELECT] is pressed.

```
┌──────────────────────────────────────────────────────┐
│  DATA    EDIT    DISPLAY   UTILITY   ⏻  ▣ ▨ ▦ ▨ ▣      │
├──────────────────────────────────────────────────────┤
│ TEACHING CONDITION                                     │
│                                                        │
│ RECT/CYLINDRICAL              RECT                      │
│ LANGUAGE LEVEL                SUBSET                    │
│ INSTRUCTION INPUT LEARNING    INVALID                   │
│ MOVE INSTRUCTION SET          LINE                      │
│ STEP ONLY CHANGING            PROHIBIT                  │
│                                                        │
│                                                        │
│                                                        │
│ Main Menu   Short Cut                                  │
└──────────────────────────────────────────────────────┘
```

## 1.3    Detail Edit Window

All instructions have a detail edit window.

The detail edit window is used for adding, modifying, and deleting additional items in the instruction.
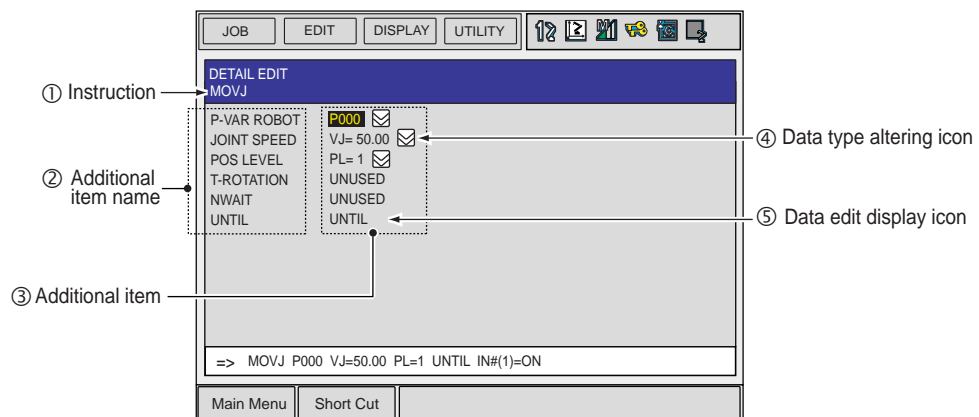


**①Instructions**

Indicates the instruction.

**②Additional Item Name**

Indicates the name of the additional item (type).

**③Additional Item**

Indicates the additional item.
The tag selection dialog box appears when the cursor is on the additional item and [SELECT] is pressed.
When "NOT USED" is selected, the tag is omitted (if it can be omitted).

**④Data Type Altering Icon**

Alters the type of numeric data.
For example, if the 50.00 of VJ=50.00 (constant type) is changed to I000 (integer-type variable), it becomes VJ=I000.

**⑤Detail Edit Display Icon**

Indicates the detail edit display is shown.

## 1.4    Registration of Expression

### 1.4.1    Expression

With INFORM III, an expression can be added to the SET instruction.

< Example >

$$\text{SET } \underline{B000} \; \underline{( B001 + B002 ) / B003 - ( B004 + B005 ) * B006}$$
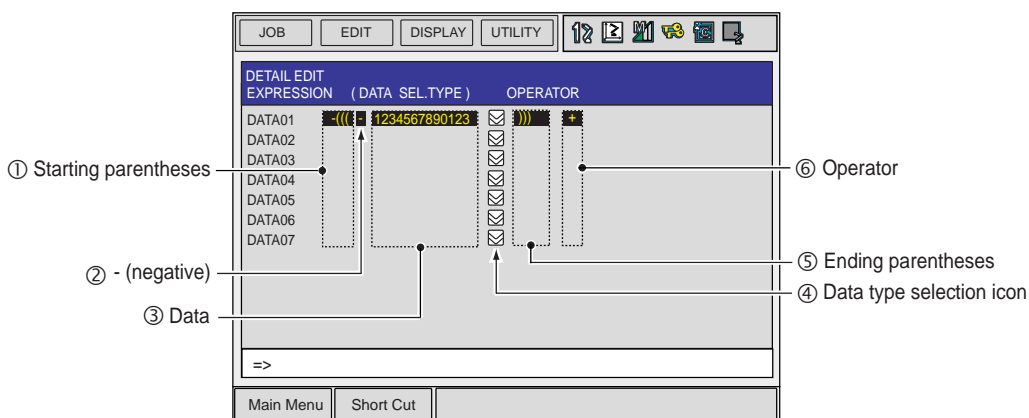
Result stored destination        Expression

Register an expression in the DETAIL EDIT window.

> **SUPPLE-MENT**    Expressions can be registered only when "STANDARD" or "EXPANDED" has been selected for the language level (instruction set).

The DETAIL EDIT window for expression is shown below.



①**Starting parentheses**
Move the cursor to the parentheses, and press [SELECT].  Each time [SELECT] is pressed, three types of parentheses show up in the following order.

$$( \; \rightarrow \; (( \; \rightarrow \; ((( \; \rightarrow \; -( \; \rightarrow \; -(( \; \rightarrow \; -(((  $$

②**- (negative)**
Move the cursor to the desired position, and press [SELECT].  Each time [SELECT] is pressed, the negative is alternately added and omitted and vice versa.

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③**Data**

The data type of the expression is indicated.  The following types of data can be registered.

- Constant (byte type, integer type, double-precision type, and real-number type)

- Byte type variable (B, B[], LB, and LB[])
  Integer type variable (I, I[], LI, and LI[])

- Double-precision type variable (D, D[], LD, and LD[])

- Real-number type variable (R, R[], LR, and LR[])

Move the cursor to the desired position, and press [SELECT] to enter the numeric value input status.  Change the numeric value of the constant data and the variable number.
Change the data type by using the mData type selection icon.

④**Data type selection icon**

Change the data type in the following manner.
Move the cursor to the data type to be changed, and press [SELECT].
A dialog box with the selectable data types is displayed.  Move the cursor to the data type to be selected and press [SELECT].
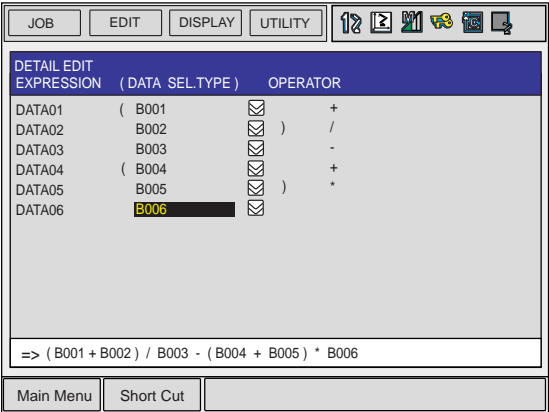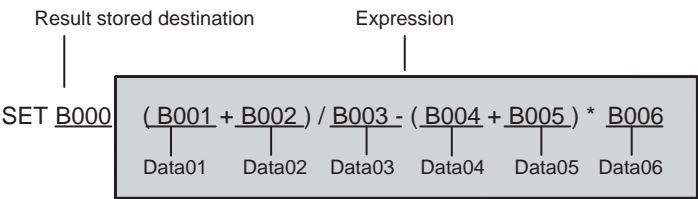
⑤**Ending parentheses**

Move the cursor to the parentheses and press [SELECT].  Each time [SELECT] is pressed, three types of parentheses show up in the following order.

$$) \ \rightarrow \ )) \ \rightarrow \ )))$$

⑥**Operator**

Move the cursor to the operator to be changed and press [SELECT].
The operator selection dialog box is displayed.  Move the cursor to the operator to be selected and press [SELECT].
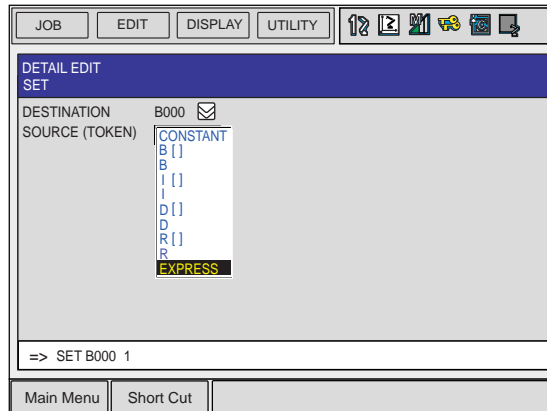
< Example of the DETAIL EDIT display for expression >

Result stored destination          Expression

SET B000    ( B001 + B002 ) / B003 - ( B004 + B005 ) *  B006

Data01   Data02  Data03   Data04   Data05  Data06

| JOB | EDIT | DISPLAY | UTILITY |

DETAIL EDIT
EXPRESSION    ( DATA  SEL.TYPE )       OPERATOR

| DATA01 | ( | B001 | ☑ | + |
| DATA02 | | B002 | ☑ ) | / |
| DATA03 | | B003 | ☑ | - |
| DATA04 | ( | B004 | ☑ | + |
| DATA05 | | B005 | ☑ ) | * |
| DATA06 | | B006 | ☑ | |

=> ( B001 + B002 ) / B003 - ( B004 + B005 ) * B006

| Main Menu | Short Cut | |

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### 1.4.2   Registration

1. Select {JOB} under the main menu

2. Select {JOB}

3. Press [INFORM LIST]

4. Select "ARITH"

5. Select "SET"

6. Press [SELECT]

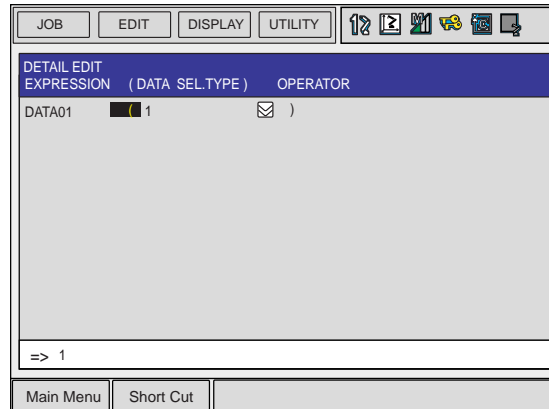   – The DETAIL EDIT window for the SET instruction appears.
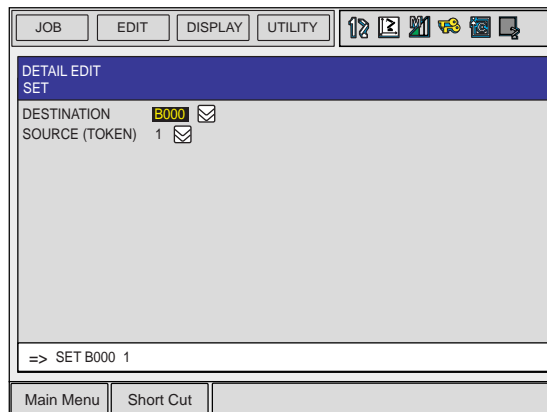


7. Move the cursor to the button ⌄ beside "SOURCE(TOKEN)"
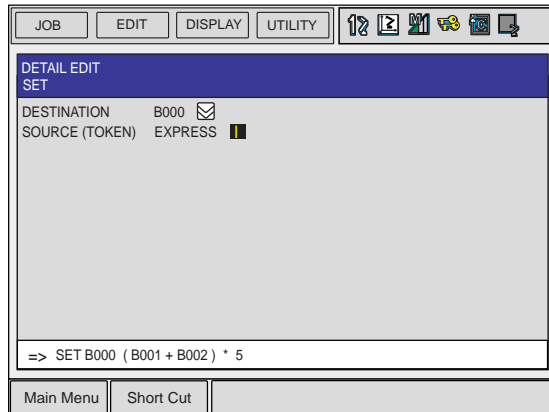
   – The selection dialog box appears.



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8.  Select "EXPRESS"

    – The DETAIL EDIT window for expression appears.

| JOB | EDIT | DISPLAY | UTILITY | |
|---|---|---|---|---|

DETAIL EDIT
EXPRESSION    ( DATA  SEL.TYPE )      OPERATOR

DATA01        ▇( 1                ☒    )

=>  1

| Main Menu | Short Cut | |
|---|---|---|

9.  Enter the expression and press [ENTER]

    – The DETAIL EDIT window for the SET instruction appears.

| JOB | EDIT | DISPLAY | UTILITY | |
|---|---|---|---|---|

DETAIL EDIT
SET

DESTINATION        B000  ☒
SOURCE (TOKEN)    EXPRESS  ▮▮

=>  SET B000  ( B001 + B002 )  *  5

| Main Menu | Short Cut | |
|---|---|---|

10. Press [ENTER]

    – The JOB CONTENT window appears.

11. Press [ENTER]

    – The SET instruction indicated in the input buffer line is registered.
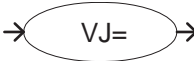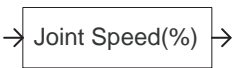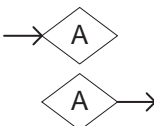
## 1.5    INFORM Structure

An example of the INFORM structure is shown in the following structure flowchart.

The INFORM structure chart is composed of the structure elements (instruction, tag, and data).  The order of the rows is shown with the numbers and arrows.
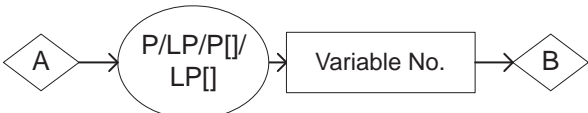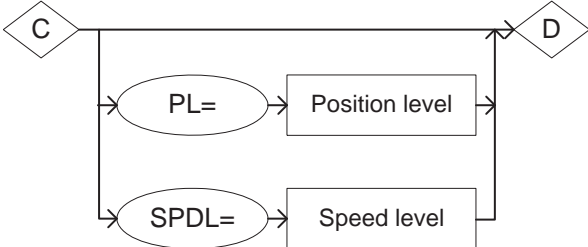
1.5.0.1    Example of Structure
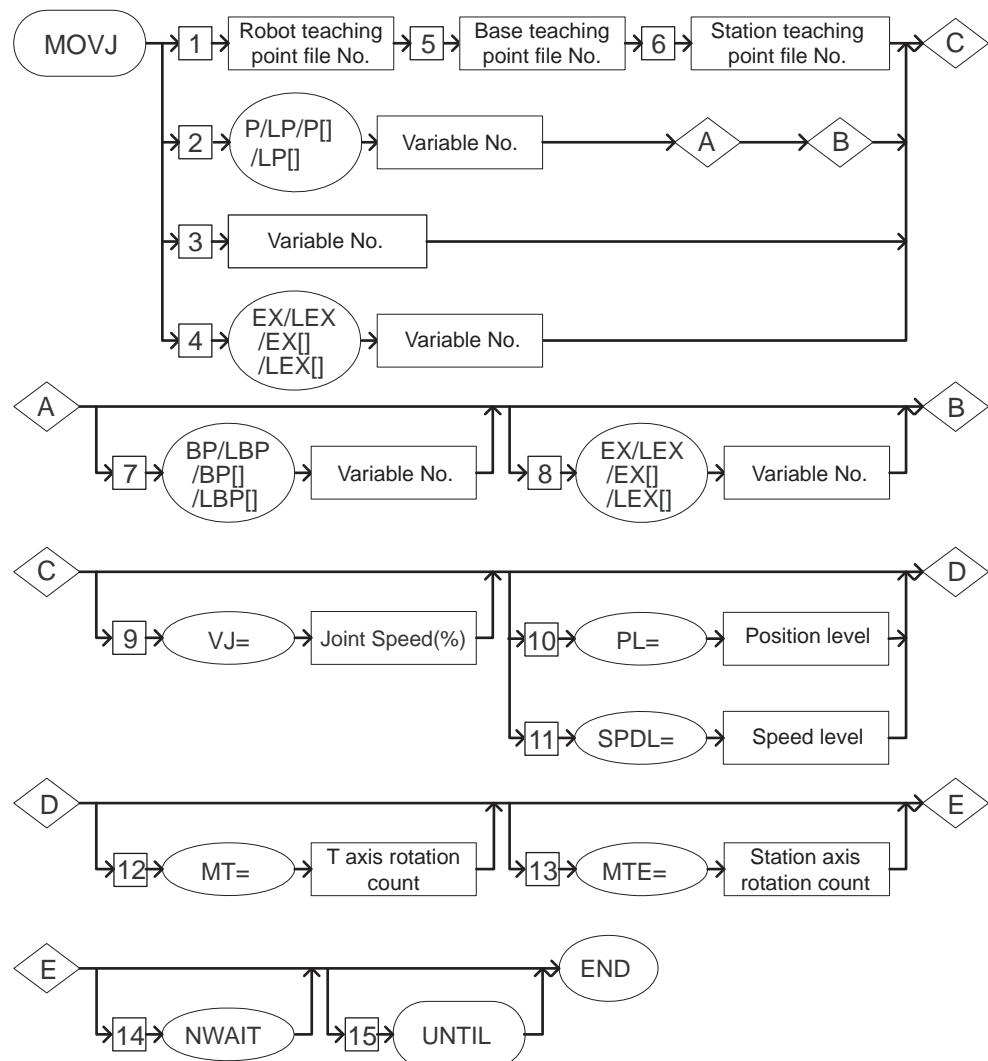
1.5.0.2   INFORM Structure Elements

| INFORM Structure Element | Explanation | Note |
|---|---|---|
| MOVJ → | Indicates the instruction. | In this example, the "MOVJ" instruction is indicated. |
| → VJ= → | Indicates the tag. | In this example, the "VJ=" instruction is indicated. |
| → Joint Speed(%) → | Indicates the numeric data. | In this example, "Joint speed" is set with the unit %. |
| → END | Indicates the end of the instruction. | |
| → A<br>A → | Indicates the connection. | |
| → 1 → | Indicates the tag order. | |

1.5.0.3   Meaning of INFORM Structure

| INFORM Structure | Meaning |
|---|---|
| A → P/LP/P[]/LP[] → Variable No. → B | This is an indispensable tag.<br>In this example, it is necessary to add a tag from [P Variable /LP Variable /P Array /LP Array]. |
| A → B<br>NWAIT | This is a tag that can be omitted.<br>In this example, the NWAIT tag can be omitted. |
| C → D<br>PL= → Position level<br>SPDL= → Speed level | This is a tag that can be selected.<br>In this example, either PL= tag or SPDL= tag can be selected. |

1.5.0.4   Explanation Table

The explanation table in this manual can be described as follows.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 1 | OT # (Output number) | Specifies the output number signal. | No:1 to 1024<br>Variable B/I/D/LB/LI/LD can be used. |

- NO.
  Indicates the tag number.  Corresponds to the number in the INFORM structure.

- Tag
  Indicates the surface description of the tag.

- Explanation
  Provides an explanation of the tag.
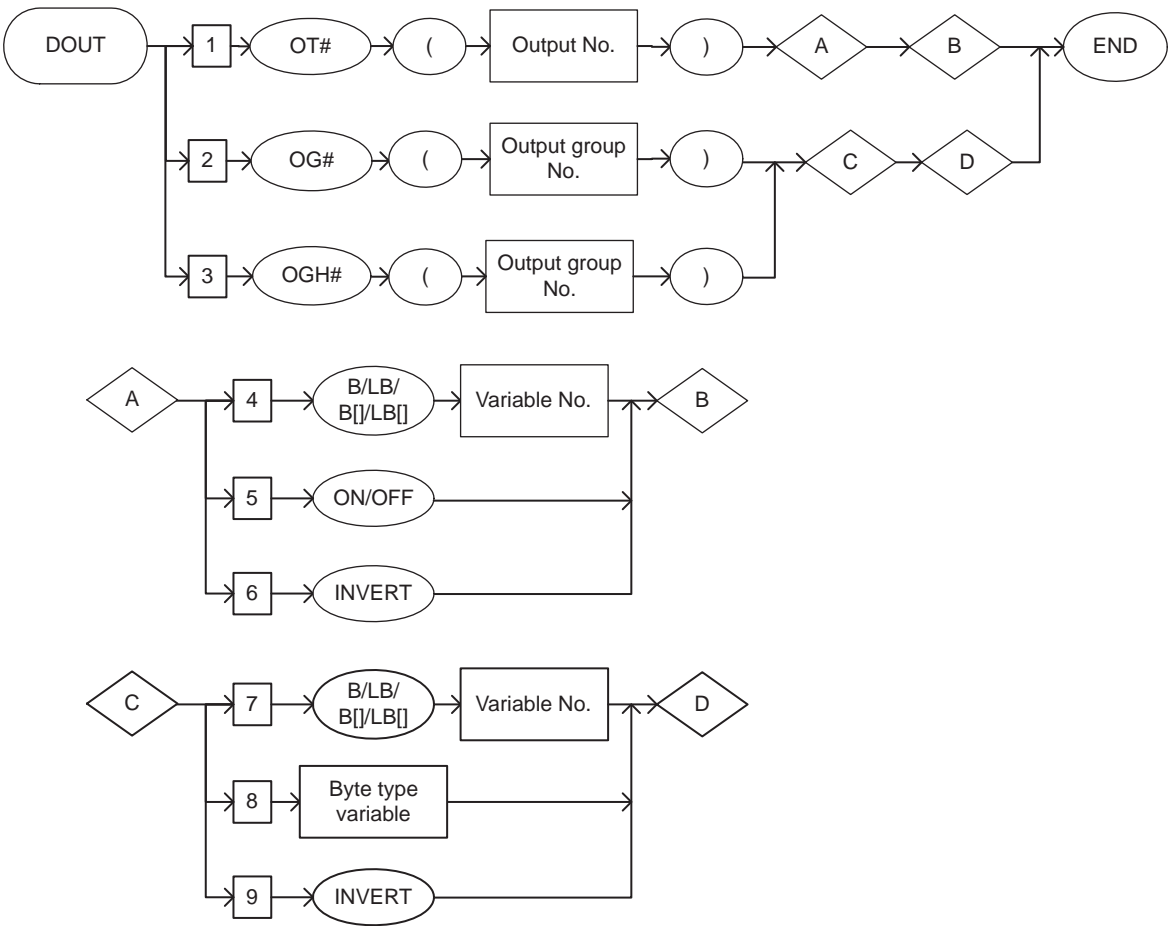
# 2    INFORM Explanation

## 2.1    I/O Instructions

# DOUT

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Available | Available | Available |

**Function**

Turns the general output signal on and off.

**Construction**

**Explanation**

### 1. OT# (Output number) /OG# (Output group number) / OGH# (Output group number)

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 1 | OT#(Output number) | Specifies the output number signal. | No:1 to 1024 Variable B/I/D/LB/LI/LD can be used. |
| 2 | OG#(Output group number) | Specifies the output number group signal (1group 8 points). | No:1 to 128 Variable B/I/D/LB/LI/LD can be used. |
| 3 | OGH#(Output group number) | Specifies the output number group signal (1group 4 points). | No:1 to 256 Variable B/I/D/LB/LI/LD can be used. |

SUPPLE -MENT

**Output signal**

Output signal OT#(xx) is 1 point, OGH#(xx) is 1 group 4 points, and OG#(xx) is 1 group 8 points.

| OT#(8) | OT#(7) | OT#(6) | OT#(5) | OT#(4) | OT#(3) | OT#(2) | OT#(1) |
|--------|--------|--------|--------|--------|--------|--------|--------|
| OGH#(2) | | | | OGH#(1) | | | |
| OG#(1) | | | | | | | |

### 2. OT# (Output number) /OG# (Output group number) / OGH# (Output group number)

When OT# (output number) is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 4 | B Variable number/ LB Variable number / B [Array number]/ LB [Array  number] | The least significant bit of the specified byte type variable specifies on/off of the output signal. | Least significant bit: 0: OFF 1: ON |
| 5 | ON/OFF | Specifies on/off of the output signal. | |
| 6 | INVERT | Refers the current signal status to output OFF when the status is ON, and output ON when the status is OFF. | |

### 3. B Variable number / LB Variable number / B [Array number] / LB [Array number] / Byte type constant

When OG# (Output group number) or OGH# (Output group number) is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 7 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies on/off of the output signal by the specified bit value byte type variable. | bit: 0: OFF 1: ON |
| 8 | Byte type constant | When the constant byte type is expressed in bit form, the corresponding on/off output signal is specified. Specifies on/off of the output signal by bit value. | |
| 9 | INVERT | Refers the current signal status to output OFF when the status is ON, and output ON when the status is OFF. | |

**Example**

   (1)  DOUT OT#(12) ON
       General output signal no. 12 is turned on.

   (2)  SET B000 24
       DOUT OG#(3) B000
       B000=24(Decimal)= 00011000(Binary)

| OT#(24) | OT#(23) | OT#(22) | OT#(21) | OT#(20) | OT#(19) | OT#(18) | OT#(17) |
|---------|---------|---------|---------|---------|---------|---------|---------|
| OG#(3) | | | | | | | |

ON

General output signals nos. 20 and 21 are turned on.

# DIN

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Available | Available | Available |

**Function**

Refers to the byte type variable for the status of the signal.

**Construction**
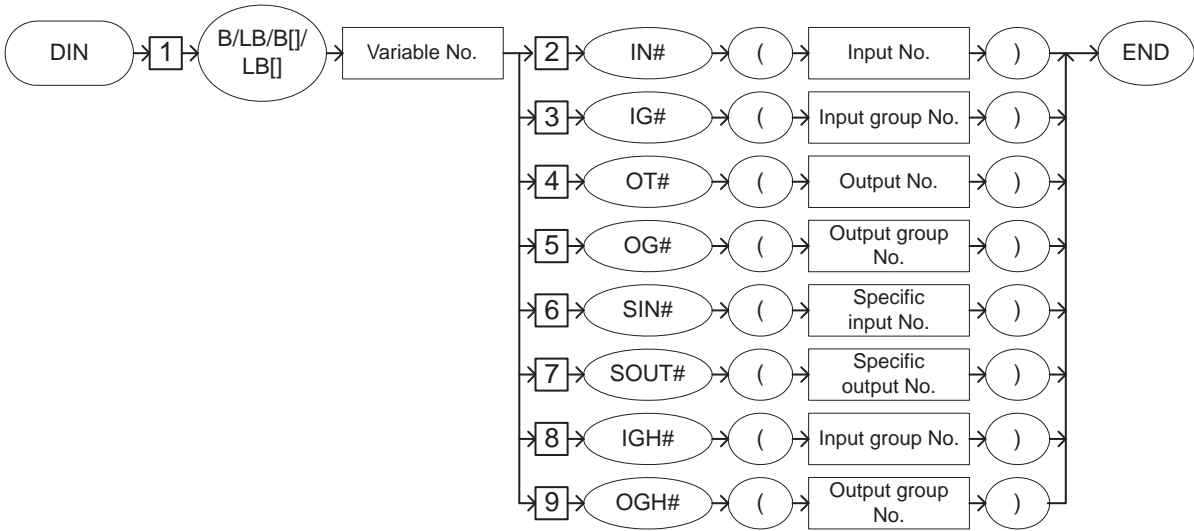


**Explanation**

## 1. B Variable Number / LB Variable Number / B [Array Number] / LB [Array Number]

Add the following tag.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 1 | B Variable Number/ LB Variable Number/ B [Array Number]/ LB [Array Number] | Specifies the number of byte type variable for the signal. | |

**2. IN#(Input number) / IG#(Input group number) / OT#(Output number) /OG#(Output group number) / SIN#(Specific input number) / SOUT#(Specific output number) / IGH#(Input group number) / OGH#(Output group number)**

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 2 | IN#(Input number) | Specifies the general input signal number which shows the signal status. | No:1 to 1024 Variable B/I/D/LB/LI/LD can be used. |
| 3 | IG#(Input group number) | Specifies the general input group signal number (1 group 8 points) which shows the signal status. | No:1 to 128 Variable B/I/D/LB/LI/LD can be used. |
| 4 | OT#(Output number) | Specifies the general output signal number which shows the signal status. | No:1 to 1024 Variable B/I/D/LB/LI/LD can be used. |
| 5 | OG#(Output group number) | Specifies the general output group signal number (1 group 8 points) which shows the signal status. | No:1 to 128 Variable B/I/D/LB/LI/LD can be used. |
| 6 | SIN#(Specific input number) | Specifies the specific input signal number which shows the signal status. | No:1 to 1280 Variable B/I/D/LB/LI/LD can be used. |
| 7 | SOUT#(Specific output number) | Specifies the specific output signal number which shows the signal status. | No:1 to 1600 Variable B/I/D/LB/LI/LD can be used. |
| 8 | IGH#(Input group number) | Specifies the general input group number (1 group 4 points) signal which shows the signal status. | No:1 to 256 Variable B/I/D/LB/LI/LD can be used. |
| 9 | OGH#(Output group number) | Specifies the number of general output group (1 group 4 points) signal which shows the signal status. | No:1 to 256 Variable B/I/D/LB/LI/LD can be used. |

SUPPLE-MENT

**Input signal**

Input signal IN#(xx) is 1 point, IGH#(xx) is 1 group 4 points, and IG#(xx) is 1group 8 points.

| IN#(8) | IN#(7) | IN#(6) | IN#(5) | IN#(4) | IN#(3) | IN#(2) | IN#(1) |
|--------|--------|--------|--------|--------|--------|--------|--------|
| IGH#(2) | | | | IGH#(1) | | | |
| IG#(1) | | | | | | | |

**Example**

(1)  DIN B016 IN#(12)
     The on/off status of general input signal no.12 is shown in byte
     type variable No.16. When the general input signal No.12 is on,
     the status of the general input signal is B016=1 (deci-
     mal)=00000001(binary).

(2)  DIN B002 OG#(8)
     The on/off status of general output signal nos. 57-64 is
     shown in byte type variable No.2.
     In the following cases, the status of the general output signal
     is B002=150 (decimal)= 10010110 (binary).

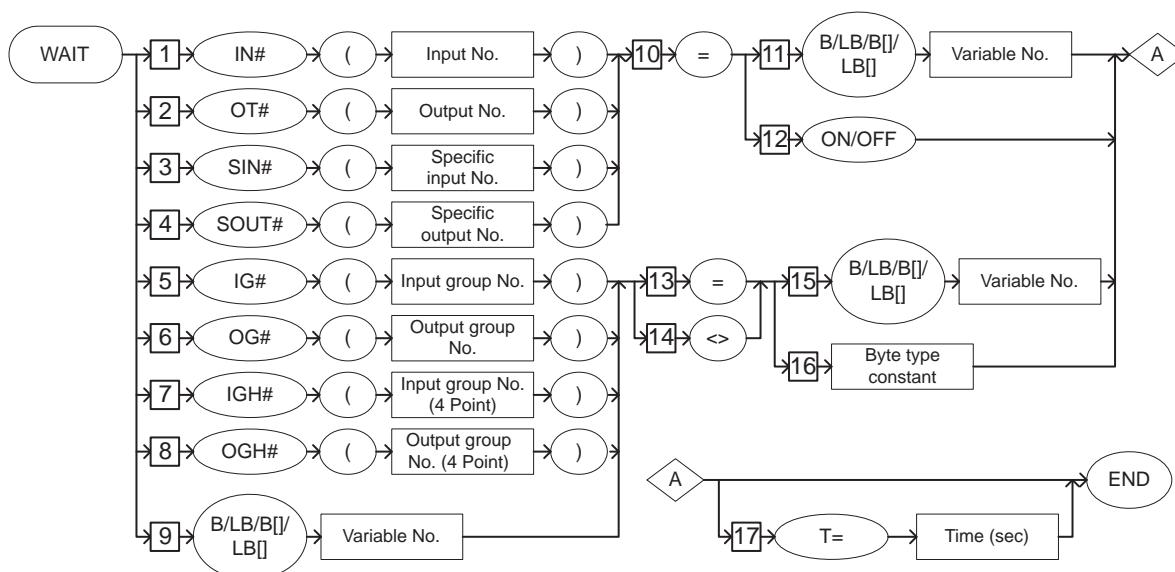| OT#(64) | OT#(63) | OT#(62) | OT#(61) | OT#(60) | OT#(59) | OT#(58) | OT#(57) |
|---------|---------|---------|---------|---------|---------|---------|---------|
| OG#(8) | | | | | | | |

ON

# WAIT

**Function**

Waits until the status of the external signal or byte type variable is the same as the specified status.

**Construction**



**Explanation**

**1. IN#(Input number) / OT#(Output number) / SIN#(Specific input number) /SOUT#(Specific output number) / IG#(Input group number) / OG#(Output group number) / IGH#(Input group number) / OGH#(Output group number) / B Variable Number / LB Variable Number / B [Array Number] / LB [Array Number]**

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 1 | IN#(Input number) | Specifies the number of the general input signal for the waiting condition. | No:1 to 1024 Variable B/I/D/LB/LI/LD can be used. |
| 2 | OT#(Output number) | Specifies the number of the general output signal for the waiting condition. | No:1 to 1024 Variable B/I/D/LB/LI/LD can be used. |
| 3 | SIN#(Specific input number) | Specifies the number of the specific input signal for the waiting condition. | No:1 to 1280 Variable B/I/D/LB/LI/LD can be used. |
| 4 | SOUT#(Specific output number) | Specifies the number of the specific output signal for the waiting condition. | No:1 to 1600 Variable B/I/D/LB/LI/LD can be used. |

| No | Tag | Explanation | Note |
|---|---|---|---|
| 5 | IG#(Input group number) | Specifies the number of general input group (1 group 8 points) signal for the waiting condition. | No:1 to 128 Variable B/I/D/LB/LI/LD can be used. |
| 6 | OG#(Output group number) | Specifies the number of general output group (1 group 8 points) signal for the waiting condition. | No:1 to 128 Variable B/I/D/LB/LI/LD can be used. |
| 7 | IGH#(Input group number) | Specifies the number of general input group (1 group 4 points) signal for the waiting condition. | No:1 to 256 Variable B/I/D/LB/LI/LD can be used. |
| 8 | OGH#(Output group number) | Specifies the number of general output group (1 group4 points) signal for the waiting condition. | No:1 to 256 Variable B/I/D/LB/LI/LD can be used. |
| 9 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the byte type variable for the waiting condition. | |

## 2. =

When an IN# (input number), OT# (output number), SIN# (specific input number), or SOUT# (specific output number) is selected from the table in part 1 of this Explanation, add the following tag.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 10 | = | It is equal. | |

## 3. B Variable number /LB Variable number / B [Array number] / LB [Array number] / ON / OFF

When an IN# (input number), OT#(output number), SIN# (specific input number), or
SOUT# (specific output number) is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 11 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies byte type variable which becomes a waiting condition. | Least significant bit: 0:OFF 1:ON |
| 12 | ON/OFF | Specifies on/off of the waiting condition. | |

## 4. =/<>

When an IG# (input group number), OG# (output group number), IGH# (input group number), OGH# (output group number), B variable number, LB variable number, B [array number], or LB [array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 13 | = | It is equal. | |
| 14 | <> | It is not equal. | |

## 5. B Variable number / LB Variable number / B [Array number] / LB [Array number] / Byte type constant

When an IG# (input group number), OG# (output group number), IGH# (input group number), OGH# (output group number), B variable number, LB variable number, B [array number], or LB [array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 15 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies byte type variable which becomes a waiting condition. | |
| 16 | Byte type constant | The waiting condition is specified by byte type constant. | |

## 6. T=time

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 17 | T=time | Specify the waiting time. When the time specified here ends, if the status and the condition are not the same, the next instruction is executed. | Time: 0 to 65.535 seconds It is possible to specify at time by the I/LI/I/LI variable (Units: 0.001 seconds). |

**Example**

(1)  WAIT IN#(12)=ON
     Waits until general input signal no.12 is turned on.
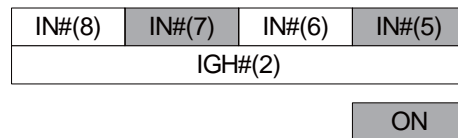

(2)  SET B000 5
     SET B002 16
     WAIT SIN#(B000)=B002 T=3.000

     B002=16 (Decimal)=00010000 (Binary)
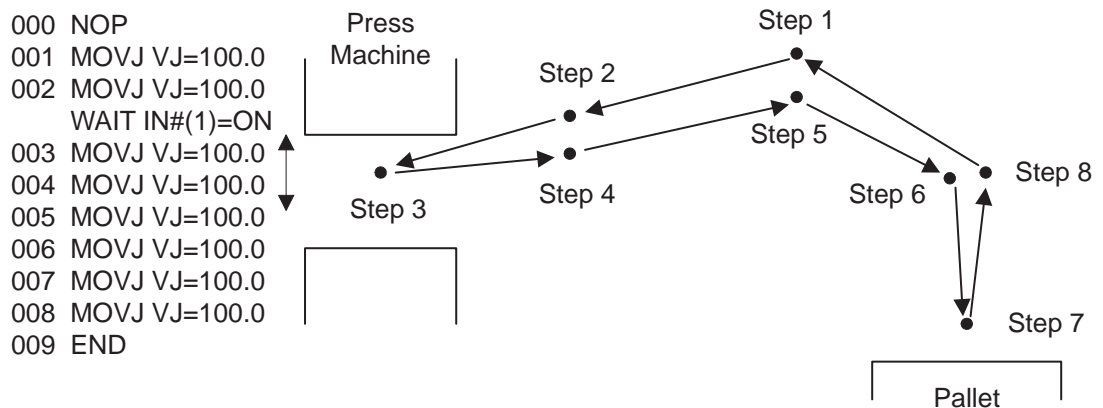     Waits until specific input signal no.5 is turned off.
     However, after three seconds, even if the signal is not turned off,
     the next instruction is executed.


(3)  WAIT IGH#(2)<>5
     5 (Decimal)=0101 (Binary)

| IN#(8) | IN#(7) | IN#(6) | IN#(5) |
|--------|--------|--------|--------|
| IGH#(2) | | | |

|  |  |  | ON |

     Waits until general input signal nos.5 and 7 are turned off and gen-
     eral input signal nos. 6 and 8 are turned on.


(4)  Example of press machine handling.

```
000  NOP
001  MOVJ VJ=100.0
002  MOVJ VJ=100.0
     WAIT IN#(1)=ON
003  MOVJ VJ=100.0
004  MOVJ VJ=100.0
005  MOVJ VJ=100.0
006  MOVJ VJ=100.0
007  MOVJ VJ=100.0
008  MOVJ VJ=100.0
009  END
```

Press Machine

Step 1
Step 2
Step 3
Step 4
Step 5
Step 6
Step 7
Step 8
Pallet

     The robot cannot be moved to step 3 while the press is closed.
     Open/close of the press machine (Open: ON, Shut: OFF) is allo-
     cated to general input signal No.1.
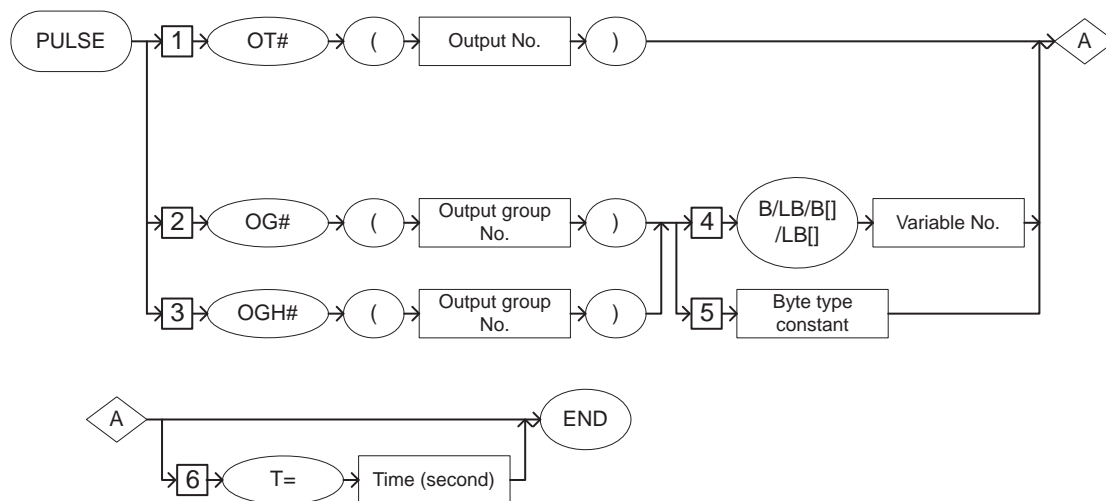     The robot waits until general input signal No.1 turns on at step 2.

# PULSE

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Available | Available | Available |

### Function

The pulse signal is output to the general output signal only for the specified time.

The PULSE instruction, without waiting for completion of the instruction, executes the next one.

### Construction



### Explanation

### 1. OT# (output number) / OG# (output group number) / OGH# (output group number)

Choose one of the tags from the following table..

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 1 | OT# (Output No.) | Specifies the number of the signal to which the pulse signal is output. | No.: 1 to 1024 Variable B/I/D/LB/LI/ LD can be used. |
| 2 | OG# (Output group No.) | Specifies the group number of the signal (1 group 8 points) to which the pulse signal is output. | No.: 1 to 128 Variable B/I/D/LB/LI/ LD can be used. |
| 3 | OGH# (Output group No.) | Specifies the group number of the signal (1 group 4 points) to which the pulse signal is output. | No.: 1 to 256 Variable B/I/D/LB/LI/ LD can be used. |

## 2. B Variable number / LB Variable number / B [Array number] / LB [Array number] / Byte type constant

When OG# (output group number) or OGH# (output group number) in the above table is selected, choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 4 | B Variable number/ LB Variable number/ B [Array Number] / LB [Array Number] | Specifies the number of the corresponding pulse output signal when the contents of the specified byte type variable is expressed in bits. | Bit: <br> 0: OFF <br> 1: ON |
| 5 | Byte type constant | Specifies the number of the corresponding pulse output signal when the specified byte type constant is expressed in bits. | |

## 3. T=Time

The following tag can be added or omitted.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 6 | T=Time | Specifies the time during which the pulse signal is output. <br> The pulse signal is output during the specified time T. | Units: seconds <br> Variable I/LI/I[]/LI[] can be used. <br> (Units: 0.001 seconds) <br> When the time is not specified, the pulse signal is output during 0.30 seconds. |

**Example**
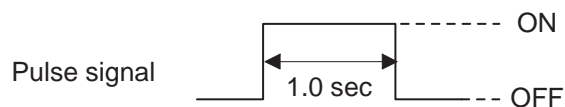
(1)  PULSE OT#(128)
    The pulse signal is output for 0.30 seconds to general output signal No.128.

Pulse signal

0.3sec
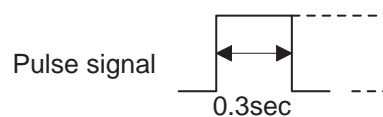
(2)  SET B000 5
     PULSE OT#(B000) T=1.000

The pulse signal is output for 1.0 seconds to general output signal No.5.

Pulse signal          1.0 sec          ON

                                        OFF

(3)  SET B000 24
     PULSE OG#(3) B000

     B000=24 (Decimal)=00011000 (Binary)

| OT#(24) | OT#(23) | OT#(22) | OT#(21) | OT#(20) | OT#(19) | OT#(18) | OT#(17) |
|---------|---------|---------|---------|---------|---------|---------|---------|
| | | | | | OG#(3) | | |

ON

The pulse signal is output for 0.30 seconds to the general output signal No.'s 20 and 21.

# AOUT
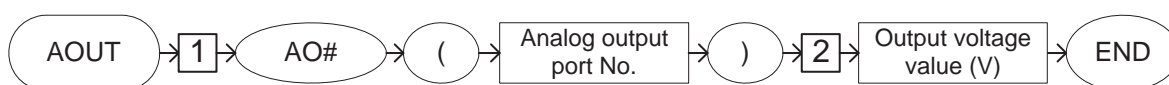
| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Not available | Available | Available |

### Function

Outputs the set voltage value to the general-purpose analog output port.

### Construction



### Explanation

### 1. AO# (Analog output port number)

Add the following tag.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 1 | AO# (Analog output port number) | Specifies the number of the analog output port to which the set voltage value is output. | No.: 1 to 40 Variable B/I/D/LB/LI/LD can be used. |

### 2. Output voltage value

Add the following tag.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 2 | Output voltage value | Specifies the output voltage value. | Voltage value: -10.00 to +10.00 Variable I/LI/I[]/LI[] can be used. (Units: 0.01 V) |

### Example

(1)   SET I000 970
      AOUT AO#(1) I000
      The voltage of 9.7 V is output to the analog output port No. 1.
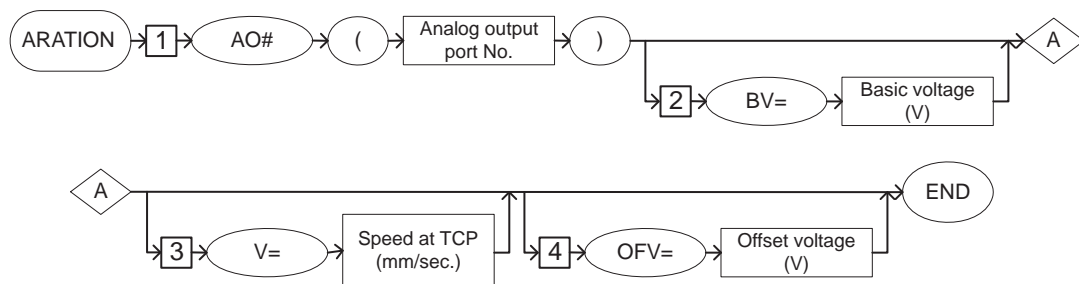
2-14

# ARATION

| SUBSET | STANDARD | EXPANDED |
|---|---|---|
| Not available | Available | Available |

### Function

Starts the analog output corresponding to the speed.

ARATION is valid during linear interpolation, circular interpolation, and spline interpolation.  ARTION is carried out during playback or FWD operation, but not while operating an axis.

### Construction



### Explanation

## 1. AO# (Analog output port number)

Add the following tag.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 1 | AO# (Analog output port number) | Specifies the number of the analog output port that outputs the voltage corresponding to the speed. | No.: 1 to 40 Variable B/I/D/LB/LI/LD can be used. |

## 2. BV=Basic voltage

The following tag can be added or omitted.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 2 | BV=Basic voltage | Specifies the voltage to be output when running at the speed set in part 3 of this Explanation. | Voltage value: -10.00 to +10.00 V Variable I/LI/I[]/LI[] can be used. (Units: 0.01 V) |

### 3. V=Basic speed

The following tag can be added or omitted.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 3 | V=Basic speed | Specifies the speed at which the set voltage value is output. | Speed: 0.1 to 1500.0 mm/s. Variable B/I/D/LB/LI/LD can be used. (Units: 0.1 mm/s.) |

### 4. OFV=Offset voltage

The following tag can be added or omitted.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 4 | OFV=Offset voltage | Specifies the analog voltage to be output at the motion speed "0". | Voltage value: -10.00 to +10.00 V Variable I/LI/I[]/LI[] can be used. (Units: 0.01 V) |

**Analog output function corresponding to the speed**

SUPPLE
-MENT

To regulate the thickness of the sealing or paint, etc. when sealing and painting, the amount of discharged material should be adjusted according to the motion speed of the manipulator.

The analog output function corresponding to the speed automatically changes the analog output value according to the manipulator's motion speed.

ARATION and ARTIOF instructions are used to carry out this function.

On the base of the set value for the ARATION instruction, the output characteristic, which decides the relation between the motion speed and the analog voltage, is calculated.  The analog output corresponding to speed is output according to this output characteristic.



**Example**

(1)
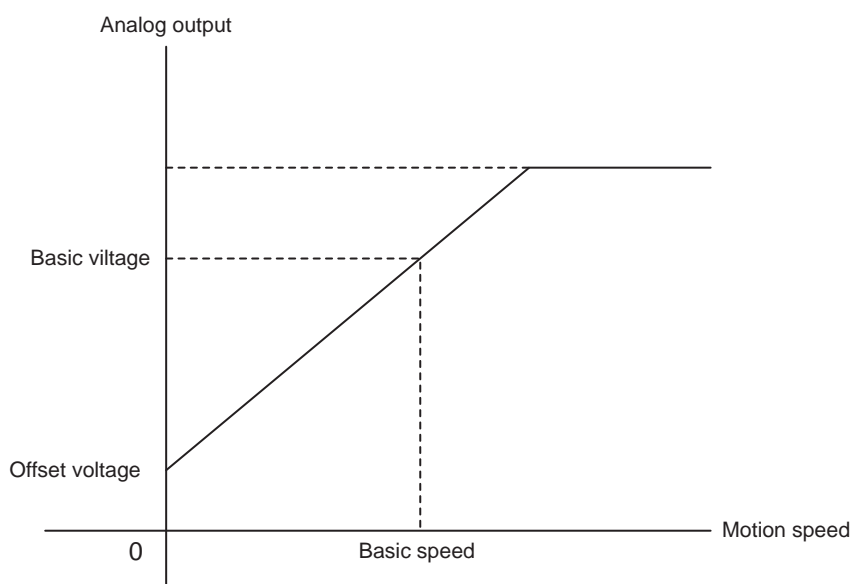
| | Output voltage (V) |
|---|---|
| MOVJ VJ=50.00 | |
| ARATION AO#(1) BV=7.00 V=150.0 OFV=-10.0 | 7.00 |
| MOVL V=50.0 | -4.33 |
| MOVC V=100.0 | 1.33 |
| MOVC V=100.0 | 1.33 |
| MOVC V=100.0 | 1.33 |
| MOVL V=200.0 | 10.00 |

When the basic voltage is 7.00 V at a motion speed of 150.0 mm/sec for the analog output port number 1, an offset voltage of -10.0 V is output.

2-17

Analog voltage

Basic voltage

Offset voltage

50    100    150    200

Basic speed

Motion speed
(mm/sec)
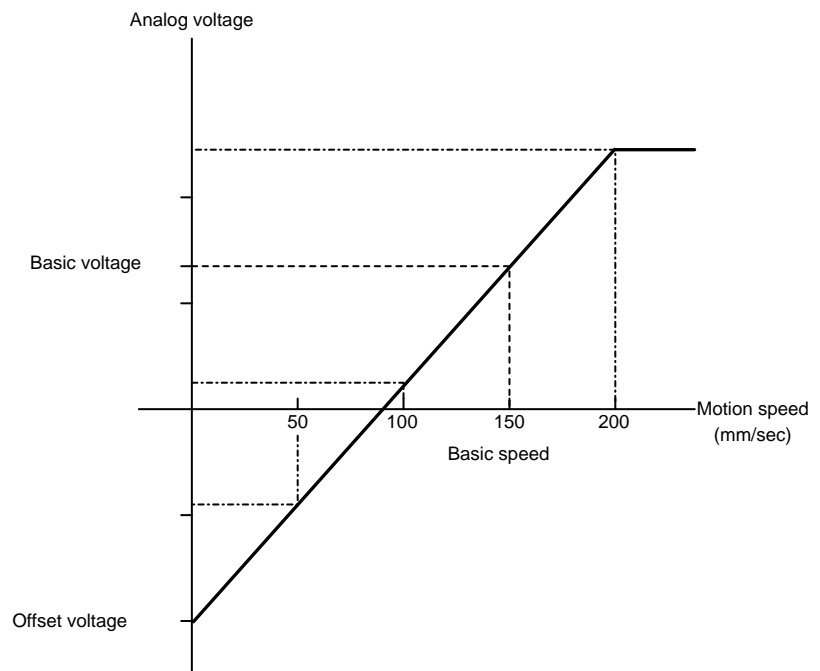
# ARATIOF

| SUBSET | STANDARD | EXPANDED |
|---|---|---|
| Not available | Available | Available |

**Function**

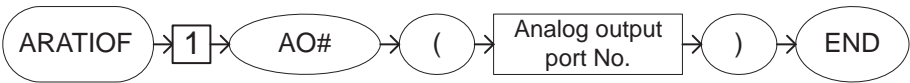Cancels the analog output corresponding to the speed.

**Construction**

ARATIOF → 1 → AO# → ( → Analog output port No. → ) → END

**Explanation**

### 1. AO# (Analog output port number)

Add the following tag.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 1 | AO# (Analog output port number) | Specifies the number of the general-purpose analog output port for which the analog output corresponding to speed is to be cancelled. | No.: 1 to 40 Variable B/I/D/LB/LI/LD can be used. |

**Example**

(1)   ARATIOF AO#(1)
       The analog output corresponding to the speed at the analog out-
       put port number 1 is cancelled.

# ANTOUT

The ANTOUT instruction can be used only with parameter S4C008.

| SUBSET | STANDARD | EXPANDED | Parameter |
|--------|----------|----------|-----------|
| Not available | Available | Available | S2C646 |

**Function**

Carries out the anticipation output function to adjust the timing of the signal output.

SUPPLE-MENT

**Anticipation output function**

The anticipation output function is a signal output timing adjustment function to advance or delay the ON/OFF timing of 32 general-purpose outputs and 16 general-purpose output groups.  The signal can be output before or after the manipulator reaches the step.

This function corrects work timing errors due to delays in the motions of a peripheral device and/or the manipulator.

Setting the time to a negative value (-) advances the signal output.

This can be used to correct work timing errors due to delays in the motions of a peripheral device.
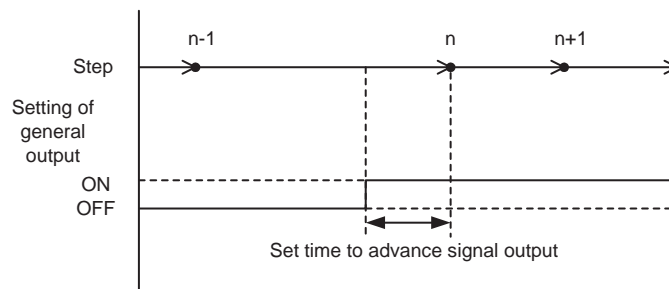
Setting the time to a positive value (+) delays the signal output.

This can be used to correct work timing errors due to delays in the motions of the manipulator.

<Advanced signal output>

The signal is output before the manipulator reaches the step.

| Step | Instructions |
|------|-------------|
| n-1  | MOVL        |
| n    | MOVL NWAIT  |
|      | ANTOUT AT#(1) ON |
| n+1  | MOVL        |

Step

Setting of general output

ON
OFF

Set time to advance signal output

<Delayed signal output>

The signal is output after the manipulator reaches the step.

| Step | Instructions |
|------|-------------|
| n-1  | MOVL        |
| n    | MOVL NWAIT  |
|      | ANTOUT AT#(2) ON |
| n+1  | MOVL        |

Step

Setting of general output

ON
OFF

Set time to delay signal output
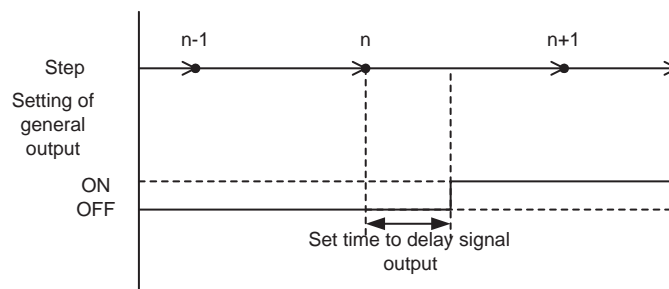
**Construction**
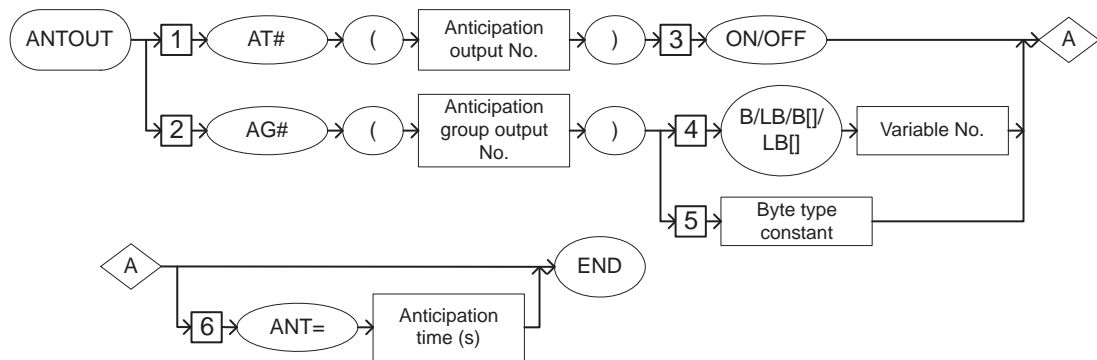


**Explanation**

### 1. AT# (Anticipation output number) / AG# (Anticipation group output number)

Choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 1 | AT# (Anticipation output number) | Specifies the number of the signal whose timing is adjusted. | No.: 1 to 32 Variable B/I/D/LB/LI/LD can be used. |
| 2 | AG# (Anticipation group output number) | Specifies the group number of the signal whose timing is adjusted. | No.: 1 or 16 Variable B/I/D/LB/LI/LD can be used. |

**Settings for the anticipation output signal**

Set the number of the output signal for the anticipation output in the ANTICIPATION OUT-
PUT display.



**A. OT OUTPUT (Setting range: 1 to 1024)**
  Allocate the number of the general-purpose output whose signal timing is to be adjusted
  to AT NO. 1 to 32.
**B. ON TIME (Setting range: -32.768 to 32.767 seconds)**
  Set the delay/advance time for turning ON the signal.
**C. OFF TIME (Setting range: -32.768 to 32.767 seconds)**
  Set the delay/advance time for turning OFF the signal.
**D. OG OUTPUT (Setting range: 1 to 128)**
  Allocate the group number of the general-purpose output whose signal timing is to be
  adjusted to AG NO. 1 and 16.
**E. TIME (Setting range: -32.768 to 32.767 seconds)**
  Set the delay/advance time for carrying out the group output.

**2. ON/OFF**

When an AT# (anticipation output number) is selected from the table in
part 1 of this Explanation, add the following tag.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 3 | ON/OFF | Specifies the ON/OFF status of the signal whose output timing is adjusted. | |

## 3. B Variable number / LB Variable number / B [Array number] / LB [Array number] / Byte type constant

When an AG# (anticipation group output number) is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 4 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the ON/OFF status of the output signal corresponding to each bit when the contents of the specified byte type variable is expressed in bits. | Bit:<br>  0: OFF<br>  1: ON |
| 5 | Byte type constant | Specifies the ON/OFF status of the output signal corresponding to each bit when the contents of the specified byte type variable is expressed in bits. | |

## 4. ANT=Anticipation time

The following tag can be added or omitted.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 6 | ANT=Anticipation time | Specifies the delay/advance time for the output signal timing. | Units: seconds Variable I/LI/I[]/LI[] can be used.  (Units: 0.001 seconds) When the time is not specified, the time set in the signal timing adjustment file is applied. |

**Example**

(1)   <u>Step</u>       <u>Instructions</u>
      n-1         MOVL V=100
      n           MOVL V=100 NWAIT
                ANTOUT AT#(1) ON
      n+1         MOVL V=100

Turns ON the general-purpose signal number 10 0.5 seconds before the manipulator reaches the step.(Advanced signal output)

## 2.2   Control Instruction

# JUMP

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Available | Available | Available |

**Function**

Jumps to specified label or job.

**Construction**



2-25
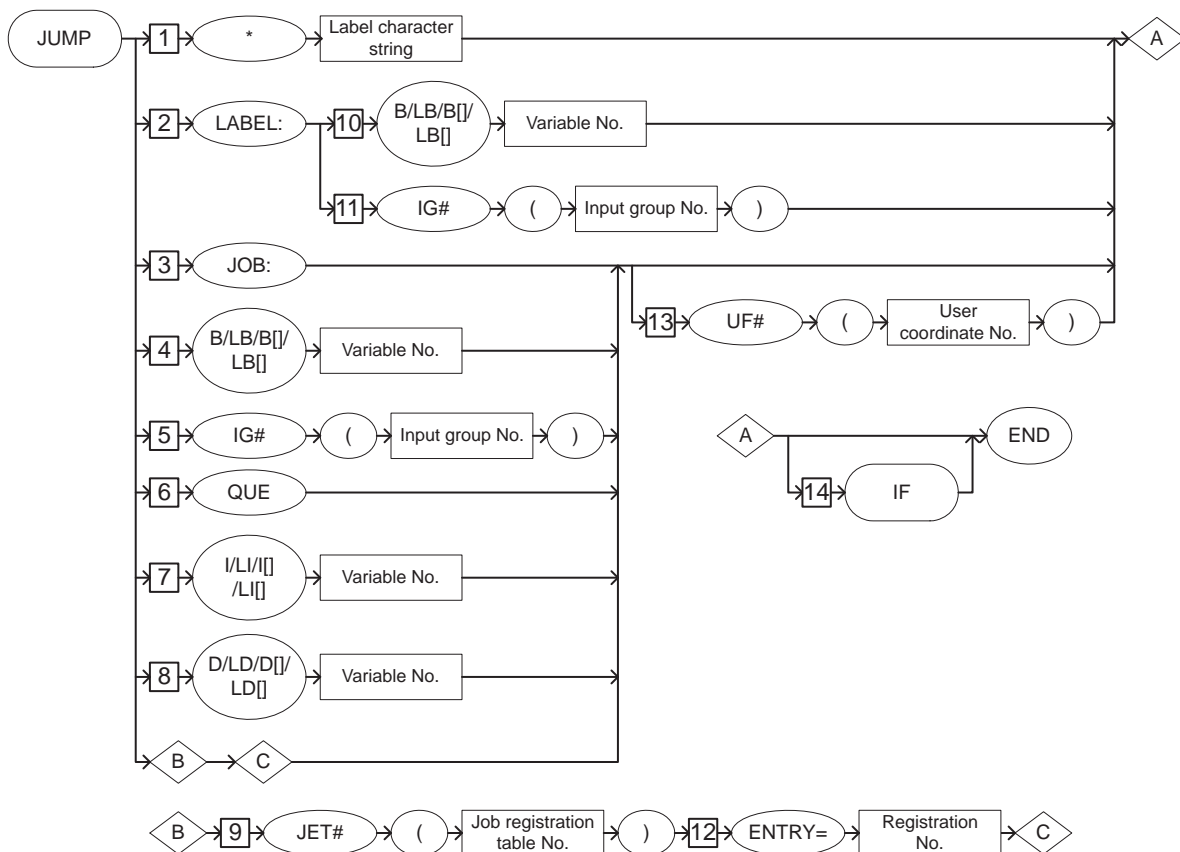
**Explanation**

1. **\*Label character string /LABEL:/JOB:/B Variable number /LB Variable number /B [Array number] /LB [Array number] /IG# (Input group number) / QUE/I Variable number/LI Variable number/I [Array number]/LI [Array number]/D Variable number/LD Variable number/ D [Array number]/LD [Array number]/ JET# (Job registration table number)**

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 1 | *Label strings | Specifies the label string. | String: 16 characters |
| 2 | LABEL: | The numerical value specified by byte type variable or input group number is considered a label. | |
| 3 | JOB: | Specifies the job. | |
| 4 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | The numerical value specified by byte type variable is considered to be a job. | |
| 5 | IG#(Input group number) | The numerical value specified by the input group number is considered to be a job. | No:1 to 128 Variable B/I/D/LB/LI/LD can be used. |
| 6 | QUE | Jumps to the job stored in the queue. | Available only in the queue function (option: S2C641). |
| 7 | I Variable number/ LI Variable number/ I [Array number]/ LI [Array number] | The numerical value specified by the integer type variable is considered to be the job. | |
| 8 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | The numerical value specified by the double-precision type variable is considered to be the job. | |
| 9 | JET# (Job registration table number) | Specifies the job registration table number. The job of the jump destination can be registered in the job registration table. | No.: 1 to 3 Variable B/I/D/LB/LI/LD can be used. Available only with the job registration table function (option: S2C443) |

### 2. B Variable number / LB Variable number / B [Array number] / LB [Array number] / IG# (Input group number)

When a LABEL: is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 10 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the byte type variable in which the numerical value for the label is set. | |
| 11 | IG#(Input group number) | Specifies the input group number of the numerical value for the label. | No:1 to 128 B/I/D/LB/LI/LD Variable can be used. |

### 3. ENTRY=Registration number

When a JET#(job registration table number) is selected from the table in part 1 of this Explanation, add the following tag.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 12 | ENTRY=Registration number | Specifies the registration number of the job registered in the specified job registration table. | No.: 1 to 1024 Variable B/B[]/LB/LB[]/I/ I[] can be used. |

### 4. UF# (User coordinate number)

When JOB:, B variable number, LB variable number, B [Array number], LB [Array number], IG# (Input group number), QUE, I Variable number, LI Variable number, I [Array number], LI [Array number], D Variable number, LD Variable number, D [Array number], LD [Array number], or JET# (Job registration table number) is selected from the table in part 1 of this Explanation,  the following tag can be added.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 13 | UF# (User coordinate number) | Specifies the coordinates of the job. | Available only in the relative job function. |

### 5. IF

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 14 | IF | Specifies the IF instruction. | Refer to *chapter 2.6 "Instruction Which Adheres to an Instruction" at page 2-208.* |

**Example**

   (1)   JUMP *1
       Jumps to *1.


   (2)   JUMP JOB:TEST1 UF#(2)
       Jumps to the job named TEST1. TEST1 works in user coordinate
       system No.2.


   (3)   SET B000 1
       JUMP B000 IF IN#(14)=ON
       If input signal no.14 is on, it jumps to job "1".

# CALL

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Available | Available | Available |

**Function**

Calls the specified job.

**Construction**

| Argument | | | |
|---|---|---|---|
| 1 | B / LB / B[] / LB[] | Variable No. | E N D |
| 2 | I / LI / I[] / LI[] | Variable No. | |
| 3 | D / LD / D[] / LD[] | Variable No. | |
| 4 | R / LR / R[] / LR[] | Variable No. | |
| 5 | S / LS / S[] / LS[] | Variable No. | |
| 6 | P / LP / P[] / LP[] | Variable No. | |
| 7 | BP / LBP / BP[] / LBP[] | Variable No. | |
| 8 | EX / LEX / EX[] / LEX[] | Variable No. | |
| 9 | Byte type constant | | |
| 10 | Integer type constant | | |
| 11 | Double-precision type constant | | |
| 12 | Real type constant | | |
| 13 | Character type constant | | |

**Explanation**

**1. JOB: / B Variable number / LB Variable number / B [Array number] / LB [Array number] / IG#(Input group number) / QUE/I Variable number/LI Variable number/I [Array number]/LI [Array number]/D Variable number/LD Variable number/ D [Array number]/ LD [Array number]/ JET# (Job registration table number)**

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 1 | JOB: | Specifies a job to be called. | |
| 2 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | The numerical value specified by the byte type variable is considered as the job to be called. | |
| 3 | IG# (Input group number) | The numerical value specified by the input group number is considered as the job to be called. | No:1 to 128 Variable B/I/D/LB/LI/LD can be used. |
| 4 | QUE | The job stored in the queue is called. | Available only in the queue function (option: S2C641). |
| 5 | I Variable number/ LI Variable number/ I [Array number]/ LI [Array number] | The numerical value specified by the integer type variable is considered as the job to be called. | |
| 6 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | The numerical value specified by the double-precision type variable is considered as the job to be called. | |
| 7 | JET# (Job registration table number) | Specifies the table number of the job registration. The job to be called can be registered in the job registration table. | No.: 1 to 3 Variable B/I/D/LB/LI/LD can be used. Available only in the job registration table function (option: S2C443) |

## 2. ENTRY=Registration number

When a JET#(job registration table number) is selected from the table in part 1 of this Explanation, add the following tag.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 8 | ENTRY=Registration number | Specifies the registration number of the job registered in the specified job registration table. | No.: 1 to 1024 Variable B/B[]/LB/LB[]/I/I[]/ LI/LI[] can be used. |

## 3. UF# (User coordinate number)

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 9 | UF# (User coordinate number) | Specifies the user coordinate system of the job to be called. | Available only in the relative job function. |

## 4. IF

The following tag can be added or omitted.

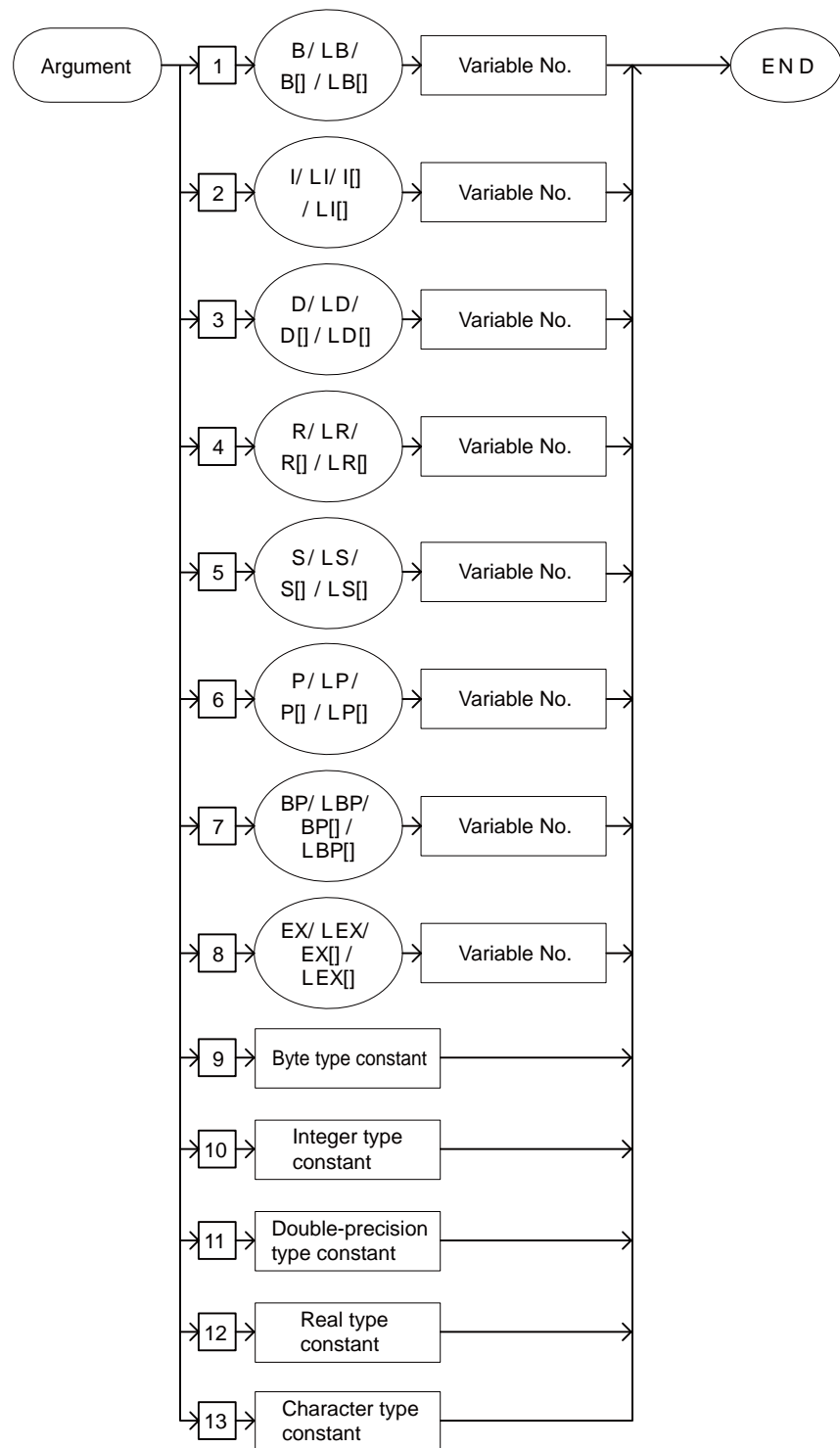| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 10 | IF | Specifies the IF instruction. | Refer to *chapter 2.6 "Instruction Which Adheres to an Instruction" at page 2-208*. |

## 5. Argument

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 11 to 18 | Argument (all types of variables and constants) | Eight arguments (from 11 to 18) can be passed to the job to be called.  All types of variables and constants can be used as arguments. | |

**Example**

(1)  CALL JOB:TEST1
     The job named TEST1 is called.


(2)  SET B000 1
     CALL B000 IF IN#(14)=ON
     If input signal No.14 is on, it calls the job "1".

## 5. 1 Outline (CALL Instruction with Argument)

The CALL instruction was the function with which the calling job would only call and execute the specified called job.  This time, the function to pass information to the called job as arguments was newly added.
Up to 8 arguments can be passed.

The RET instruction only meant the return of the execution from the called job.  This time, it became possible to return one return value to the calling job.  This enables the transfer of information without using the global variable to pass information.  Thus, it makes the management of information easier, the number of lines of the calling job fewer, and the process simpler.


(1) CALL Instruction with Argument

For example, when creating the job which only waits for incoming in order to wait for the incoming of I/Os, the input number's incoming to be waited for had to be set to the global variable, and the information had to be passed from the calling job to the called job.  For example, the case when the input of specified three points are IN#(1), IN#(5), and IN#(7) is as follows:

<Calling Job>

NOP

SET B000 1

SET B001 5

SET B002 7

CALL JOB: WAIT_INPUT

     :

<Called Job>

Job name: WAIT_INPUT


NOP

WAIT IN#(B000)   ON

WAIT IN#(B001)   ON

WAIT IN#(B002)   ON

RET


This makes the calling job program long, and the global variable will be used only for this information transfer.


By using the CALL instruction with argument, the above can be described as follows:


<Calling Job>

NOP

CALL JOB: WAIT_INPUT (1, 5, 7)

        :


<Called Job>

Job name: WAIT_INPUT


NOP

GETARG LB000, IARG#(1)// INPUT NUMBER 1 (receiving the argument 1)

GETARG LB001, IARG#(2)// INPUT NUMBER 2 (receiving the argument 1)

GETARG LB002, IARG#(3)// INPUT NUMBER 3 (receiving the argument 1)

WAIT IN#(LB000)   ON

WAIT IN#(LB001)   ON

WAIT IN#(LB002)   ON

RET


This makes the calling job program only one-line long.  Also, the called job can be made by using only the local variable.

(2) RET Instruction with Return Value

For example, to create the job which adds any two register values, the register number had to be passed from the calling job, and in the called job, the calculation result had to be entered in any of the global variable, then the calling job had to refer to that.  This can be described as follows:

<Calling Job>

NOP

SET B000 1

SET B001 2

CALL JOB: ADD_REG

GET I0100   I099          ; Returns the calculation result to I099

<Called Job>

Job name: ADD_REG

NOP

GETREG I000 MREG#(B000)

GETREG I099 MREG#(B001)

ADD I099 I000

RET

By using the CALL instruction with argument and the RET instruction with return value, the above can be described as follows:

<Calling Job>

NOP

CALL JOB: ADD_REG (1, 2)

GETS I001 $RV        ; Receives the addition result as the return value at $RV

<Called Job>

Job name: ADD_REG

NOP

GETARG   LB000   IARG#(1)// Register 1

GETARG   LB001   IARG#(2)// Register 2

GETREG LI000 MREG#(LB000)

GETREG LI001 MREG#(LB001)

ADD LI001 I000

RET LI001        ; Returns the addition result as the return value

Thus, the global variable to receive and pass the answer is no longer necessary.

## 5. 2 Operating Procedure

(1) Addition of Argument to CALL Instruction

1) Creating a Called Job

As an example, the job which resets 8 I/Os specified by arguments is created as follows:

1.  Create a job.
    As the example below, the job "MULTI_OUTPUT_RESET" is created.

2.  Register local variables.
    Arguments will be received by local variables.  Thus, at least, the local variables to receive arguments must be defined.  In the example, 8 byte-type variables are defined.
    Open "JOB HEADER" and make the setting of <LOCAL VAR NUM>.
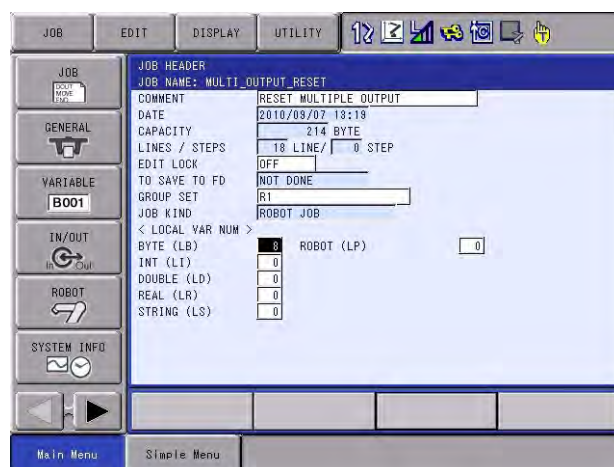


3.  Define arguments.
    As shown below, select the pull-down menu {DISPLAY}, then {ARGUMENT INFO}.
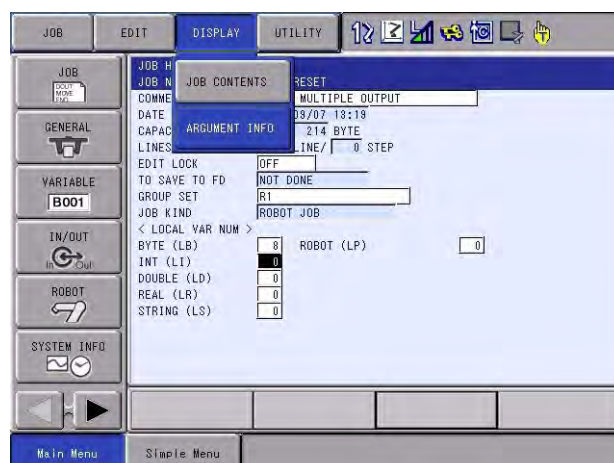
The following display appears.  Then, make the setting of arguments.
Set "ARG. 1 to 8" on the left to "USE", set "OUTPUT1 to 8" as
"COMMENT", then select "BYTE" as "TYPE".  Select {EXECUTE} to
complete the registration of arguments.
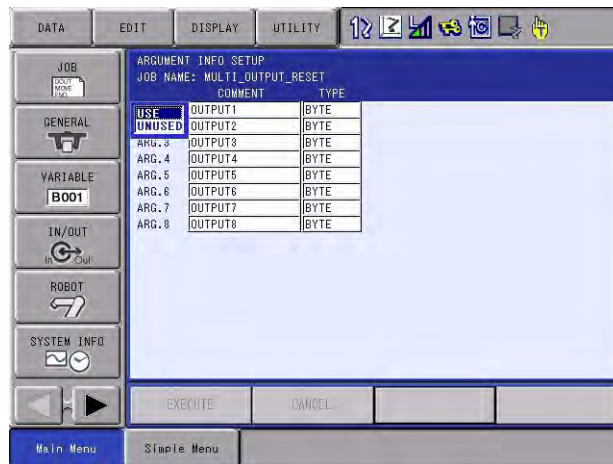


4.  Describe the job content.

(1)  Describe lines to receive arguments.
Press [INFORM LIST], and select {CONTROL}, then "GETARG" to
register instructions to receive arguments.  (To register the
GETARG instruction, select {Main Menu}, {SETUP}, then
{TEACHING COND.}, and set "LANGUAGE LEVEL" to
"EXPANDED".)  In this case, the above-mentioned COMMENT will
be automatically displayed as the comments on the line of
GETARG instructions as shown below.  Note that arguments must
be received by the local variable.
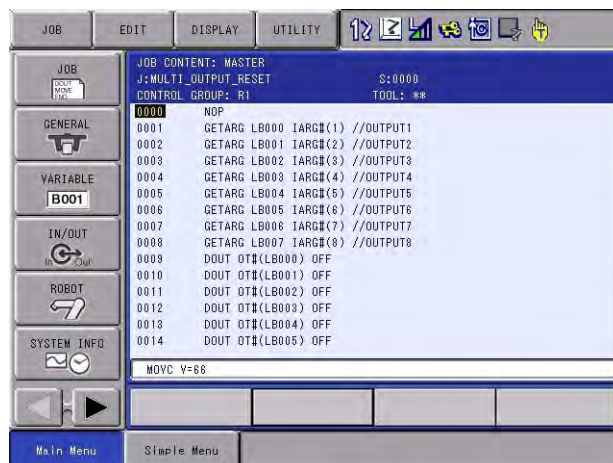
(2)   The job content is as follows:

NOP
GETARG LB000 IARG#(1)   //OUTPUT1
GETARG LB000 IARG#(2)   //OUTPUT2
GETARG LB000 IARG#(3)   //OUTPUT3
GETARG LB000 IARG#(4)   //OUTPUT4
GETARG LB000 IARG#(5)   //OUTPUT5
GETARG LB000 IARG#(6)   //OUTPUT6
GETARG LB000 IARG#(7)   //OUTPUT7
GETARG LB000 IARG#(8)   //OUTPUT8
DOUT OT#(LB000) OFF
DOUT OT#(LB001) OFF
DOUT OT#(LB002) OFF
DOUT OT#(LB003) OFF
DOUT OT#(LB004) OFF
DOUT OT#(LB005) OFF
DOUT OT#(LB006) OFF
DOUT OT#(LB007) OFF
RET

(3)   Describe the calling job.
As shown below, call "MULTI_OUTPUT_RESET" in the job.
In this case, if the called job has 8 arguments, 8 arguments must
be listed here.  If the numbers are not the same, "Alarm 4608:
WRONG EXECUTION OF GETARG INST" occurs at execution.
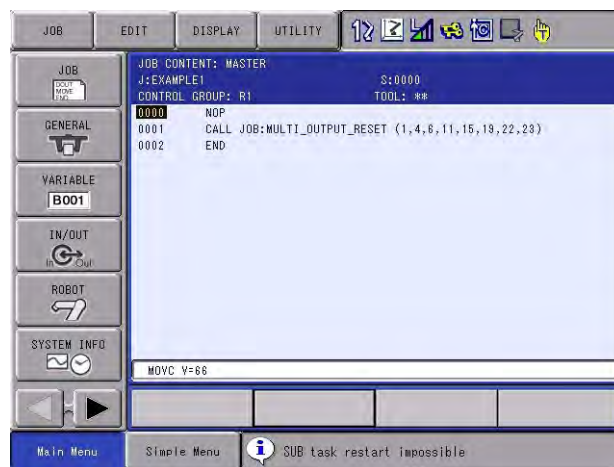


(2) RET Instruction with Return Value

1) Creating a Called Job

As an example, the job which returns 2 specified register values as the
return value is created as follows:

1.  Create a job.
As the example below, the job "ADD_REG" is created.

2.  Register local variables.
    Register 2 byte-type variables and 3 integer-type variables.
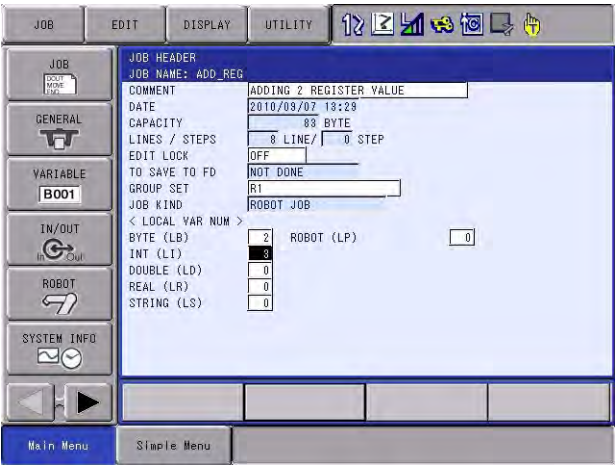


3.  Define arguments.
    As shown below, define 2 arguments.
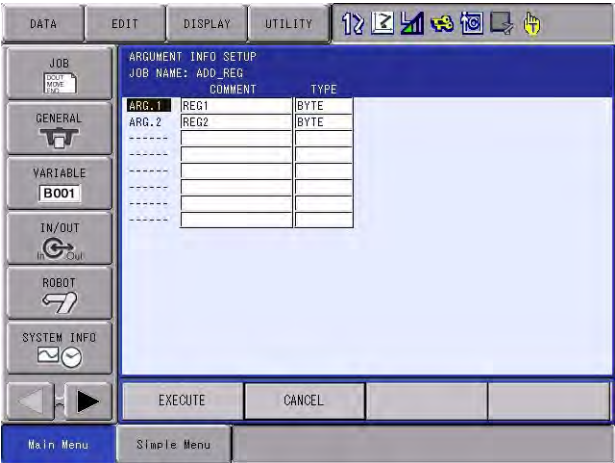


4.  Describe the job content.
    Describe the job content as shown below.  LI000 is newly added as the return value at the RET instruction.  Thus, the addition result will be returned as the return value.
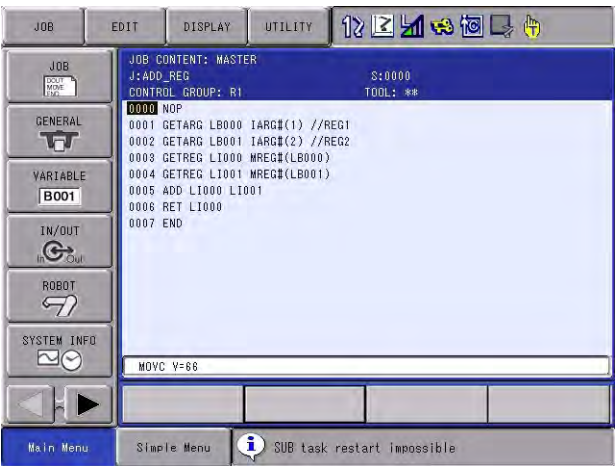
(1)  Describe the calling job.
As shown below, describe the calling job.  The register numbers to specify are the registers 0 and 1 as "CALL JOB: ADD_REG (0, 1)" shows.
The return value is received at GETS I000 $RV.  Thus, the addition result will be returned to I000.
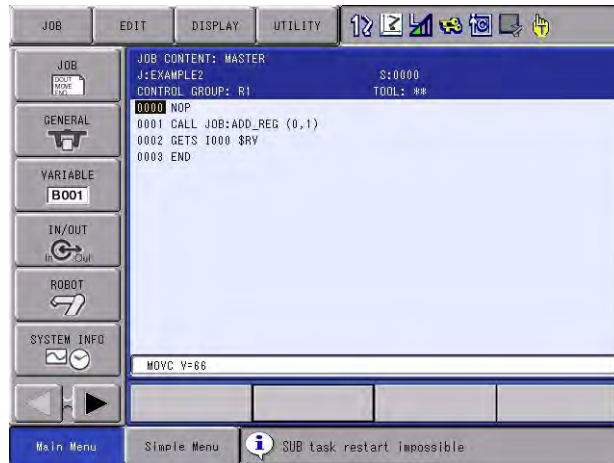
**JOB Stack**

When CALL instruction is executed, a specified job is called up and the information of the calling job is stored in the JOB stack.  By executing END or RET instruction, the job execution goes back to the calling job, referring to the information in the JOB stack.

[Start]  [A]
(1)    NOP                    (2)    [A-1]
       CALL JOB:A-1                  NOP
(5)    TIMER T=1.00          (3)    TIMER T=1.00
[End]  END                   (4)    END

JOB Stack

(1)          (2)    JOB:A      · · ·      (4)      (JOB:A)
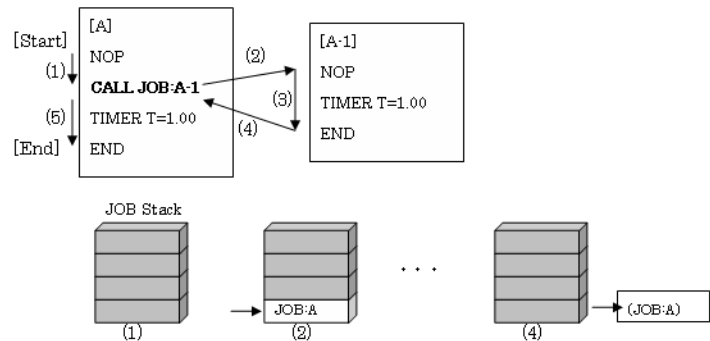
NOTE

The JUMP:JOB instruction calls up a specified job, however, the information of the calling job isn't stored in the JOB stack, so the job execution doesn't go back to the calling job.

[Start]  [B]
(1)    NOP                    (2)    [B-1]
       JUMP:JOB:B-1                  NOP
       TIMER T=1.00          (3)    TIMER T=1.00
       END                  [End]   END

JOB Stack

(1)
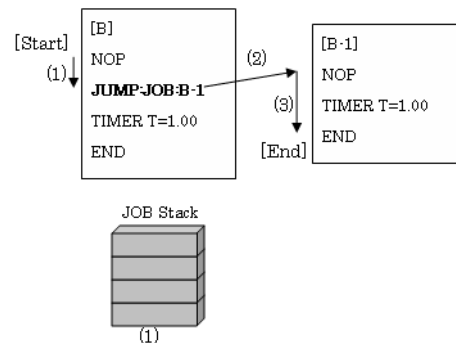
Even when executing JUMP:JOB instruction in the job called by CALL instruction, the job execution goes back to the calling job by executing END or RET instruction after that, referring to the content of the JOB stack.
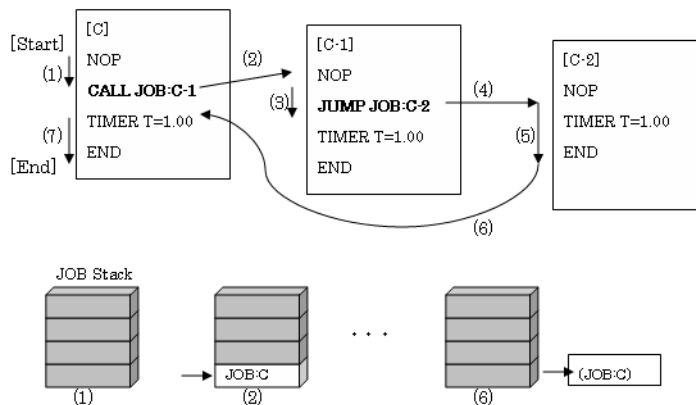


**NOTE**   At this time, the control goes back without going through the job which JUMP:JOB instruction is executed, so the manipulator may make an unintentional motion. If there isn't any special reasons, use CLEAR STACK instruction before or after the JUMP:JOB instruction to clear the JOB stack.
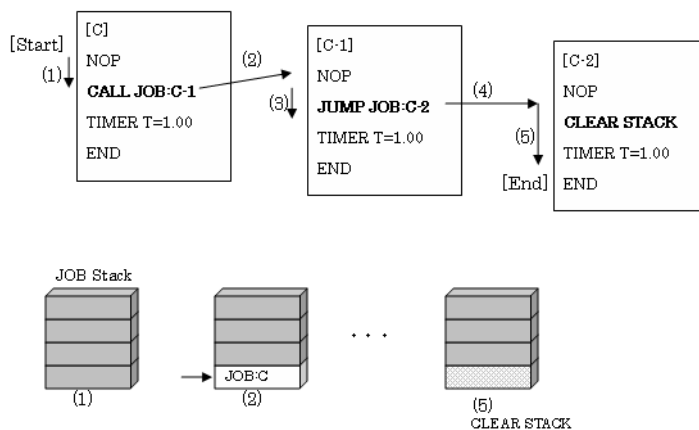
> **NOTE**
>
> This is the case that CALL instruction is executed in a job with control groups ([D] in the figure below) to call a job with control groups ([D-1]), and JUMP:JOB instruction is executed in the job ([D-1]) to call a job without control groups. When the job execution turns back to the job with control groups ([D]) from the job without control groups ([D-2]) by executing END or RET instruction and a move instruction is executed after that, "AL4429: WRONG SPECIFIED CONTROL GROUP [10]" occurs and the move instruction is prohibited from executing.
> Also in this case, as mentioned above, use CLEAR STACK instruction before or after executing JUMP:JOB instruction to clear the JOB stack.
>
> ```
> [D]→R1                          [D-1]→R1                        [D-2]→NON GROUP
> [Start]  NOP            (2)      NOP                    (4)     NOP
>   (1)    CALL JOB:D-1  →         JUMP JOB:D-2  →                TIMER T=1.00
>   (7)    MOVx          (3)       TIMER T=1.00          (5)      END
> [End]    END                     END
>
>          AL4429-[10]                                    (6)
>
>     JOB Stack                              . . .
>
>        (1)                  JOB:D                        (JOB:D)
>                              (2)                          (6)
> ```
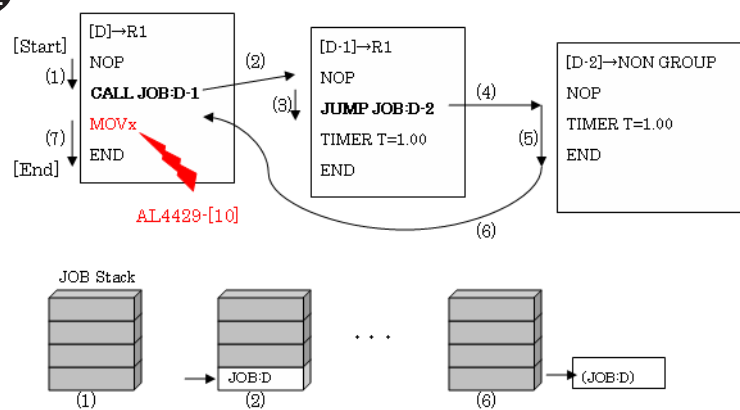
# GETARG

| SUBSET | STANDARD | EXPANDED |
|---|---|---|
| Not available | Not available | Available |

### Function

This is the instruction to receive arguments for the CALL instruction and macro instruction.  When the instruction is executed, the argument data added to the CALL instruction or macro instruction is retrieved, then stored in the local variable specified to be used in the CALL job or macro job.

### Construction
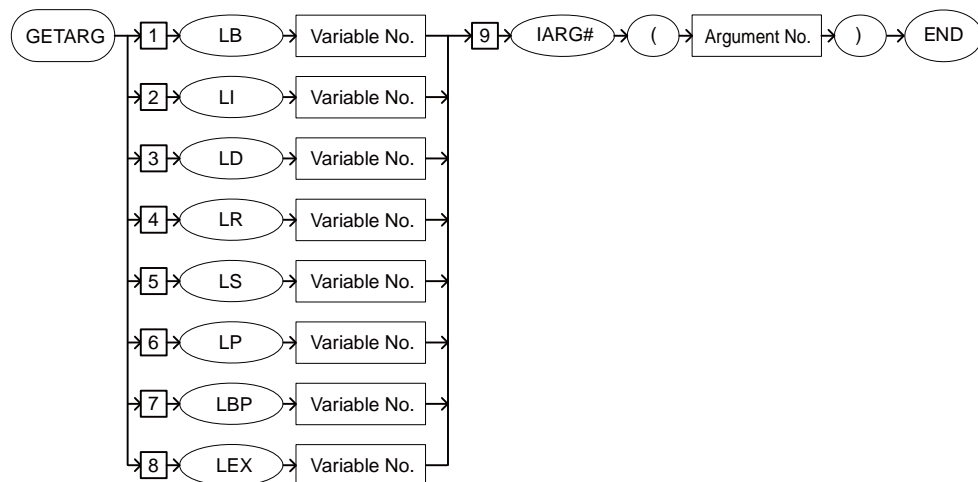


### Explanation

### 1. LB, LI, LD, LR, LS, LP, LBP, LEX

Select one of the tags from the following table.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 1 | LB Variable number<br>LB [Array number] | Specifies the local byte type variable which stores the argument. | |
| 2 | LI Variable number<br>LI [Array number] | Specifies the local integer type variable which stores the argument. | |
| 3 | LD Variable number<br>LD [Array number] | Specifies the local double precision type variable which stores the argument. | |
| 4 | LR Variable number<br>LR [Array number] | Specifies the local real type variable which stores the argument. | |
| 5 | LS Variable number<br>LS [Array number] | Specifies the local character type variable which stores the argument. | |

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 6 | LP Variable number<br>LP [Array number] | Specifies the local robot axis position type variable which stores the argument. | |
| 7 | LBP Variable number<br>LBP [Array number] | Specifies the local base axis position type variable which stores the argument. | |
| 8 | LEX Variable number<br>LEX [Array number] | Specifies the local station axis position type variable which stores the argument. | |

## 2. IARG# (Argument No.)

Make sure to specify this.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 9 | IARG#<br>(Argument No.) | Specifies the argument number to be stored in the local variable. | |

**Example**

(1)  An example is shown below.

```
Calling job                        Called job：SEALON

NOP                                NOP
MOVJ VJ=100                        GETARG LI000 IARG#(1) ----Stores the first argument data "8"
WAIT IN#(1)=ON                     OUT OT#(10) ON            in LI000
MOVJ VJ=50                         MUL LI000 10
CALL JOB:SEALON (8)                WAIT IN#(10)=ON
MOVL V=125                         AOUT AO#(1) LI000 -------Outputs the analog voltage based
   :                              END                        on the first argument data
```
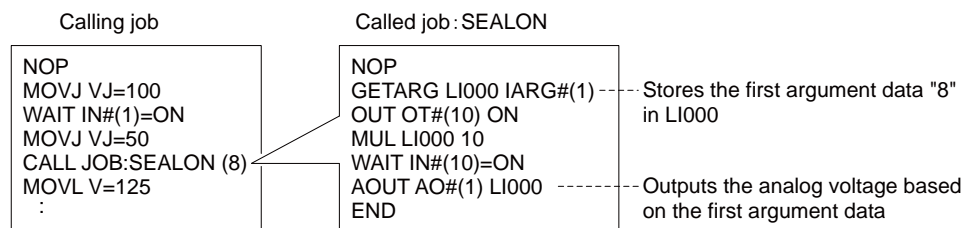
# TIMER

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Available | Available | Available |

### Function

Stops for the specified time.

### Construction

TIMER → 1 → T= → Time (s) → END
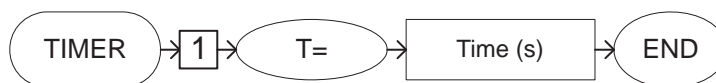
### Explanation

**1. T=timer**

Add the following tag.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 1 | T=timer | Specifies the stopping time. | Timer: 0.001 to 65.535 seconds Variable I/LI/I[]/LI[] can be used. (Units: 0.001 seconds) |

### Example

(1)  TIMER T=12.500
     Stops for 12.5 seconds.


(2)  SET I002 50
     TIMER T=I002
     Stops for 0.05 seconds.

# *(LABEL)

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Available | Available | Available |

### Function

Specifies the label for the jump.

### Construction

```
( LABEL ) → [1] → ( * ) → [ Label strings ] → ( END )
```
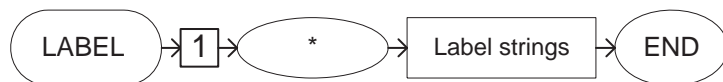
### Explanation

### 1. *Label strings

Add the following tag.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 1 | *Label strings | Specifies the label strings. | String: 16 characters |

### Example

(1)  NOP
 *1
 JUMP JOB:1 IF IN#(1)=ON
 JUMP JOB:2 IF IN#(2)=ON
 JUMP *1
  END

Repeat
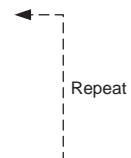
IF general input signal No.1 and No.2 are off, if loops infinitely
between "*1" and "JUMP *1".

NOTE    The label is effective only in the same job.  It does not jump
to the same label in other jobs.

# '(COMMENT)

| SUBSET | STANDARD | EXPANDED |
|:---:|:---:|:---:|
| Available | Available | Available |

**Function**

Specifies the comment.

**Construction**

COMMENT → 1 → ' → Comment strings → END
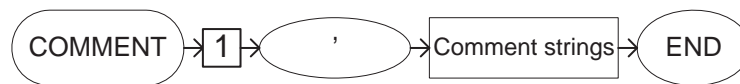
**Explanation**

## 1. 'Comment strings

Add the following tag.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 1 | 'Comment strings | Specifies the comment. | String: 32 characters |

**Example**

```
(1)  NOP
     'Waiting Position
     MOVJ VJ=100.00
     MOVJ VJ=100.00
     MOVJ VJ=25.00
     'Work Start
     TOOLON
     MOVL V=138
     'Work End
     TOOLOF
     MOVJ VJ=25.00
     'Waiting Position
     MOVJ VJ=100.00
     END
     The comment clarifies the job content.
```

# RET

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Available | Available | Available |

**Function**

Returns from the called job to the calling job.

**Construction**
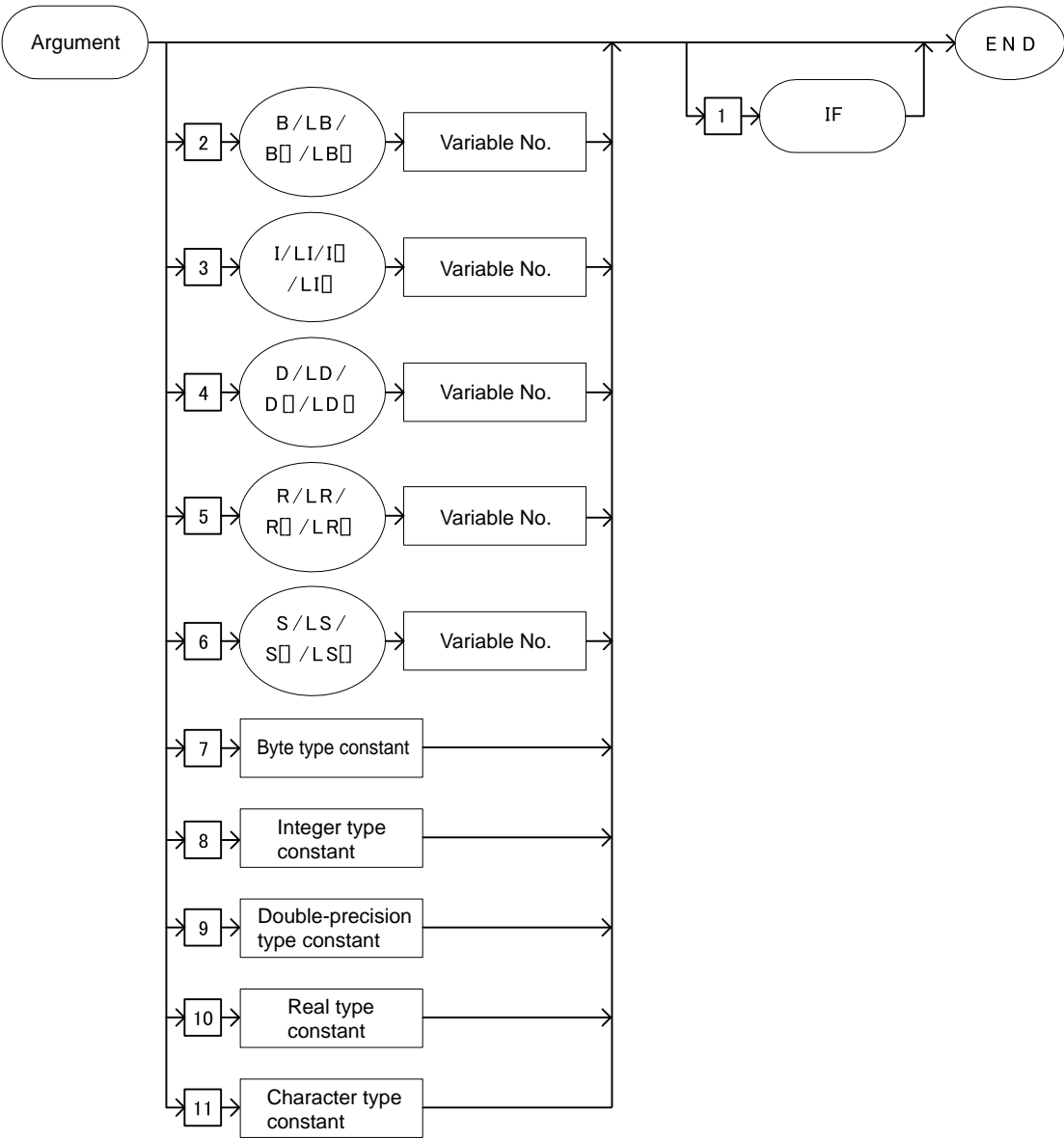
**Explanation**

### 1. IF

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 1 | IF | Specifies the IF instruction. | Refer to *chapter 2.6 "Instruction Which Adheres to an Instruction" at page 2-208.* |

**Example**

(1)   RET IF IN#(12)=ON
If general input signal No.12 is on, it returns to the job of the call origin.

| JOB:1 | Execution order | JOB:2 |
|-------|-----------------|-------|
| NOP<br>MOVJ VJ=100.00<br>MOVJ VJ=100.00<br>CALL JOB:2<br>MOVJ VJ=100.00<br><br><br><br>END | | NOP<br>DOUT OT#(1) ON<br>WAIT IN#(1)=ON<br>DOUT OT#(1) OFF<br>RET IF IN#(12)=ON<br>END |
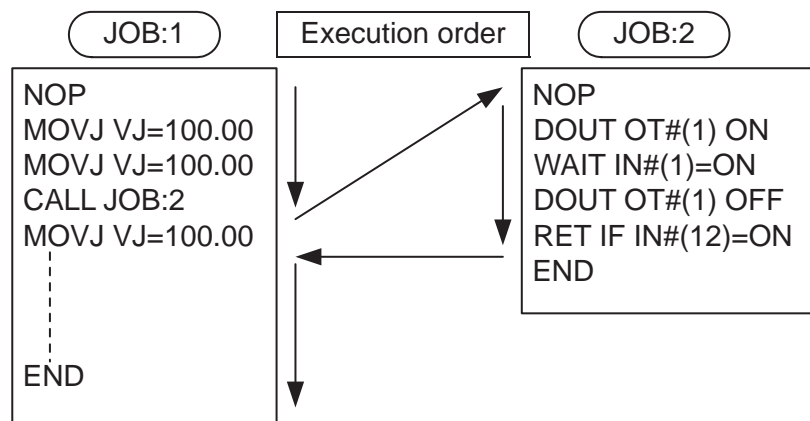
### 2. Return Value

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 2 to 10 | Variables other than position type variables and constants | Can return the return value to the call-origin job. | |

Arguments can be added to the CALL instruction, and the return value can be returned with the RET instruction.  Variables other than the position type variables (P variable, BP variable, EX variable, and PX variable) and constants can be returned as the return value.

At the call-origin job, the return value is received by the GETS instruction. For details, refer to "5. Argument (*page 2-32*)" in the explanation of the CALL instruction.

**Example**

The following example is the case when the value returned from JOB: SAMPLE is received by I000.

CALL   JOB: SAMPLE

GETS I000 $RV


In this case, at JOB: SAMPLE, the argument must be added to RET as follows:


NOP

         :

RET   LI000

END


## 3. Related Instruction 1 GETARG

# NOP

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Not available | Available | Available |

**Function**

Carries out no operation.

**Construction**

```
  ( N O P )  ───────▶  ( E N D )
```
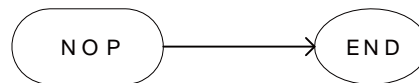
**Example**

(1)  NOP
     END

# PAUSE

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Not available | Available | Available |

### Function

Stops the job temporarily.

### Construction
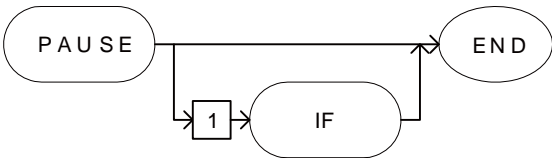


### Explanation

## 1. IF

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 1 | IF | Specifies the IF instruction. | Refer to *chapter 2.6 "Instruction Which Adheres to an Instruction" at page 2-208*. |

### Example

(1)  PAUSE IF IN#(12)=ON
Stops the job temporarily if general-purpose input signal number 12 is ON.

# CWAIT

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Not available | Available | Available |

**Function**

Releases the NWAIT execution (which simultaneously executes the manipulator operation and instructions excluding the move instruction) and waits for the next instruction line to be carried out.

CWAIT is used with the NWAIT tag, an additional item of a move instruction.

**Construction**

C W A I T ⟶ E N D
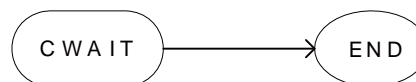
**Example**

(1)    &lt;Step&gt;          &lt;Instructions&gt;
      n-1             MOVL V=100
      n                MOVL V=100 NWAIT
                        DOUT OT#(1) ON
                        CWAIT
                        DOUT OT#(1) OFF
      n+1            MOVL V=100

Turns ON the general-purpose output signal number 1 when the manipulator starts moving from the step n-1 to the step n, and turns it OFF when the manipulator reaches the step n.

# MSG

| SUBSET | STANDARD | EXPANDED |
|---|---|---|
| Not available | Available | Available |

**Function**

Displays the message.

**Construction**



**Explanation**

## 1. "Message strings"

| No | Tag | Explanation | Note |
|---|---|---|---|
| 1 | "Message strings" | Specifies the message. | String: 32 characters |

# ADVINIT

| SUBSET | STANDARD | EXPANDED |
|---|---|---|
| Not available | Not available | Available |

**Function**

When the same variable is used for multiple systems in the optional independent control function, ADVINIT controls the timing to change the variable data among the systems.

ADVINIT is an instruction used to control FS100 internal processing, therefore, executing this instruction does not affect the job.

**Construction**
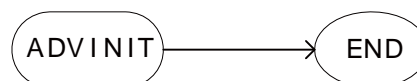
# ADVSTOP

| SUBSET | STANDARD | EXPANDED |
|---|---|---|
| Not available | Not available | Available |

**Function**

When the same variable is used for multiple systems in the optional independent control function, ADVSTOP controls the access timing of the variable data among the systems.

ADVSTOP is an instruction used to control FS100 internal processing, therefore, executing this instruction does not affect the job.

**Construction**

 A D V S T O P ──────► E N D
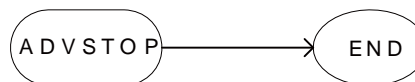
# PRINT

| SUBSET | STANDARD | EXPANDED |
|---|---|---|
| Not available | Available | Available |

### Function

Shows the specified character string and variable on the terminal display.

* Terminal display: Select {Main Menu}, {IN/OUT}, then {TERMINAL} to show it.

If the independent control function is enabled, the page is different for each task.

### Construction

PRINT <Data 1> <Data 2>
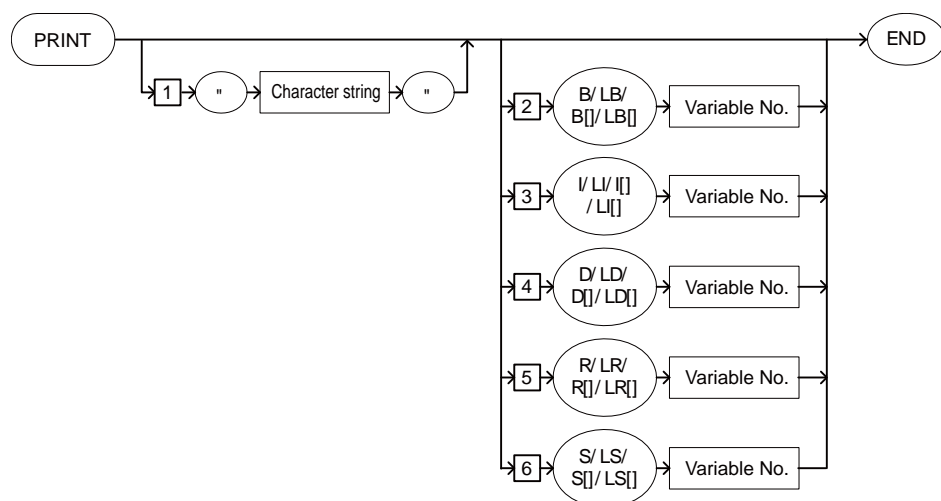


### Explanation

**1. Character string: Shows the specified character string on the terminal display.**

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 1 | Character string | Specifies the character string to be shown on the terminal display. | <Data 1><br>String: 32 characters |

**2. B Variable number / LB Variable number / B [Array number] / LB [Array number] / I Variable number / LI Variable number / I [Array number] / LI [Array number] / D Variable number / LD Variable number / D [Array number] / LD [Array number] / R Variable number / LR Variable number / R [Array number] / LR [Array number] / S Variable number / LS Variable number / S [Array number] / LS [Array number]**

Select one of the above 2. to add or omit.

* To show the character string and variable on the terminal display, specify "character string %*" as the character string tag of the above 1.  (%x (hexadecimal), %o (octal), %d (decimal), %s (character string), %f (real number), %e (exponent))

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 2 | B Variable number/<br>LB Variable number/<br>B [Array number]/<br>LB [Array number] | Specifies the byte type variable number. | <Data 2> |
| 3 | I Variable number/<br>LI Variable number/<br>I [Array number]/<br>LI [Array number] | Specifies the integer type variable number. | <Data 2> |
| 4 | D Variable number/<br>LD Variable number/<br>D [Array number]/<br>LD [Array number] | Specifies the double-precision type variable number. | <Data 2> |
| 5 | R Variable number/<br>LR Variable number/<br>R [Array number]/<br>LR [Array number] | Specifies the real type variable number. | <Data 2> |
| 6 | S Variable number/<br>LS Variable number/<br>S [Array number]/<br>LS [Array number] | Specifies the character type variable number. | <Data 2> |

**Example**

(1)  PRINT "TEST"
Show TEST on the terminal display.

```
JOB CONTENT: MASTER
J:SAMPLE                        S:0000
CONTROL GROUP: R1               TOOL: **
0000 NOP
0001 PRINT "TEST"
0002 END

  MOVC V=66

TERMINAL   : MASTER
TEST
```

(2)  PRINT "TEST\n"
Show TEST on the terminal display, and start a new line.

```
JOB CONTENT: MASTER
J:SAMPLE                        S:0000
CONTROL GROUP: R1               TOOL: **
0000 NOP
0001 PRINT "TEST1 \n"
0002 PRINT "TEST2"
0003 END
  MOVC V=66

TERMINAL   : MASTER
TEST1
TEST2
```
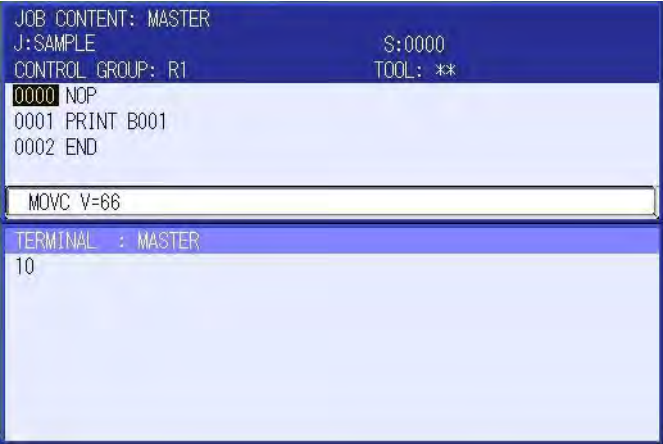
(3)  PRINT "TEST%d" B001
Show TEST on the terminal display, and display the value of B001
in decimal notation.

```
JOB CONTENT: MASTER
J:SAMPLE                        S:0000
CONTROL GROUP: R1               TOOL: **
0000 NOP
0001 PRINT "TEST %d" B001
0002 END

  MOVC V=66

TERMINAL   : MASTER
TEST 10
```

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(4)   PRINT B001
Show the value of B001 on the terminal display.

# CLS

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Not available | Available | Available |

**Function**

Deletes the character string shown on the terminal display.

**Construction**

$$C L S \longrightarrow E N D$$
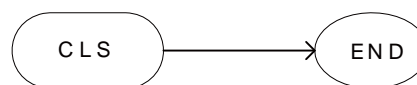
**Example**

(1)  CLS
     Deletes the character string shown on the terminal display.



<Before executing CLS instruction>



<After executing CLS instruction>

# ABORT

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Not available | Available | Available |

### Function

Suspends playback, and shows "Robot is stopped by execution ABORT command." on the human interface display area.

After the playback is suspended by ABORT instruction, it will not restart until the job is reselected on the JOB SELECT window.

### Construction
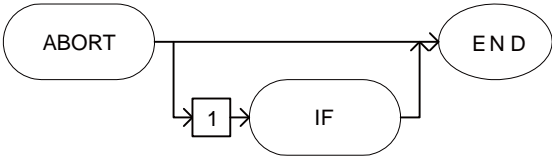


### Explanation

#### 1. IF

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 1 | IF | Specifies the IF instruction. | Refer to *chapter 2.6 "Instruction Which Adheres to an Instruction" at page 2-208*. |

### Example

(1)  ABORT
Stops the playback of job, and displays the message "Robot is stopped by execution ABORT command."

(2)  ABORT  IF  B000=1
Stops the playback of job when B000 is 1, and displays the message "Robot is stopped by execution ABORT command."

# SETUALM

| SUBSET | STANDARD | EXPANDED |
|---|---|---|
| Not available | Available | Available |

**Function**

Generates an alarm with any given number, name and subcode.

**Construction**
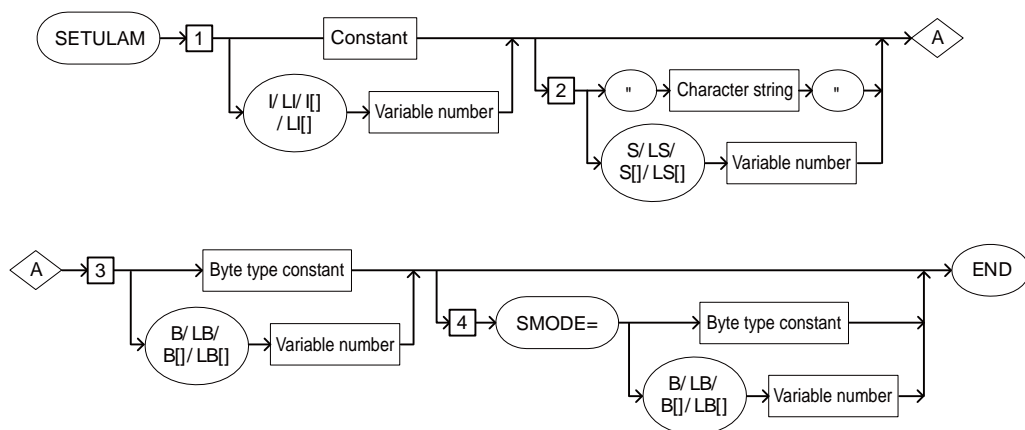


**Explanation**

## 1. Alarm Code

Add the following tag.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 1 | I Variable number/<br>LI Variable number/<br>I [Variable number]/<br>LI [Variable number]/<br>[Constant] | Specifies the integer type variable number. | Number: 8000 to 8999 |

## 2. Alarm Name

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 2 | S Variable number/<br>LS Variable number/<br>S [Array number]/<br>LS [Array number]/<br>[Character string] | Specifies the alarm name. | String: 32 characters<br>S variable: 16 characters |

## 3. Subcode

Add the following tag.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 3 | B Variable number/<br>LB Variable number/<br>B [Array number]/<br>LB [Array number]/<br>[Byte type constant] | Specifies the byte type variable number. | Number: 0 to 255 |

## 4. SMODE (Operation Stop Mode)

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 4 | B Variable number/<br>LB Variable number/<br>B [Array number]/<br>LB [Array number]/<br>[Byte type constant] | Specifies SMODE (operation stop mode). | Number:<br>0: All Tasks Job Stop<br>1: No Job Stop<br>2: Each Task Job Stop |

**Example**

(1)  SETUALM  8000  0
   The alarm with the alarm number 8000 and subcode 0 occurs.

(2)  SETUALM  8000  "ALM"  0  SMODE=1
   The alarm with the alarm number 8000, alarm name ALM, and
   subcode 0 occurs.
   If SMODE is 1, the job does not stop.

> NOTE
>
> By this instruction, the execution of job is stopped according to SMODE after the alarm occurs.
>
> It does not guarantee that the execution of job stops immediately after the instruction is executed.

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# DIALOG

| SUBSET | STANDARD | EXPANDED | PARAMETER |
|---|---|---|---|
| Not available | Available | Available | S2C400 |

**Function**

Shows the dialog during the execution of job.

If the current display is not the PLAYBACK window, the PLAYBACK window is displayed when the dialog is shown by the execution of DIALOG instruction.

The job does not proceed while the dialog is shown (waiting for button input).

**Construction**
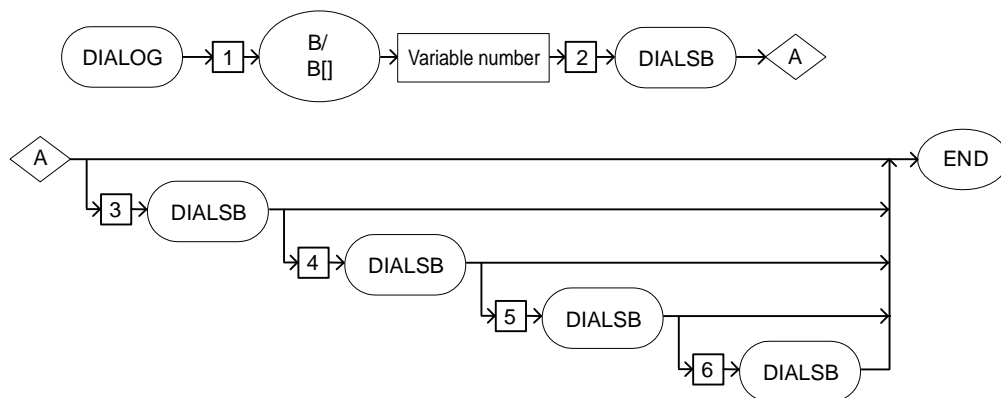


**Explanation**

## 1. B Variable number / B [Array number]: Selection result

Select the first, second, third, fourth, and fifth button to store 1, 2, 3, 4, and 5 in the specified B variable respectively.

Make sure to add the following tag.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 1 | B Variable number/ B [Array number] | Specifies the byte type variable number. | |

## 2. DIALSB (First)

Shows a message and one button in the dialog.
For details, refer to "DIALSB".

Make sure to add the following tag.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 2 | DIALSB | Select the button shown by this instruction to store 1 in the selection result. | |

## 3. DIALSB (Second and after)

Adds a message and one button in the dialog.
For details, refer to "DIALSB".

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 3 | DIALSB | Select the button shown by this instruction to store 2 in the selection result. | |
| 4 | DIALSB | Select the button shown by this instruction to store 3 in the selection result. | |
| 5 | DIALSB | Select the button shown by this instruction to store 4 in the selection result. | |
| 6 | DIALSB | Select the button shown by this instruction to store 5 in the selection result. | |

**Example**

The variable settings are shown below.

(1)   DIALOG B000 DIALSB B001 B002 S000 B003 B004 S001
      Shows the message of S000 at coordinates (B001, B002), and
      shows the button with the name of S001 at coordinates (B003,
      B004).
      When the button is clicked, the result is stored in B000.

```
PLAYBACK: MASTER
J:SAMPLE                              S:0000
CONTROL GROUP: R1                     TOOL: **
0001 DIALOG B000 DIALSB B001 B002 S000 B003 B004 S001
0002 END




              MESSAGE1
              B1
```

(2)   DIALOG B000 DIALSB B001 B002 S000 B003 B004 S001
                  DIALSB B005 B006 S002 B007 B008 S003
      Shows the message of S000 at coordinates (B001, B002), and
      shows the button with the name of S001 at coordinates (B003,
      B004).
      Shows the message of S002 at coordinates (B005, B006), and
      shows the button with the name of S003 at coordinates (B007,
      B008).
      When the button is clicked, the result is stored in B000.
      (With B1, 1 is stored.  With B2, 2 is stored.)

```
PLAYBACK: MASTER
J:SAMPLE                              S:0000
CONTROL GROUP: R1                     TOOL: **
0001 DIALOG B000 DIALSB B001 B002 S000 B003 B004 S001 DIALSB B0
0002 END



              MESSAGE1
              B1
              MESSEAGE2
              B2
```

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(3)  DIALOG B000 DIALSB B001 B002 S000 B003 B004 S001
              DIALSB B005 B006 S002 B007 B008 S003
              DIALSB B009 B010 S004 B011 B012 S005
              DIALSB B013 B014 S006 B015 B016 S007
              DIALSB B017 B018 S008 B019 B020 S009

Shows the message of S000 at coordinates (B001, B002), and shows the button with the name of S001 at coordinates (B003, B004).

Shows the message of S002 at coordinates (B005, B006), and shows the button with the name of S003 at coordinates (B007, B008).

Shows the message of S004 at coordinates (B009, B010), and shows the button with the name of S005 at coordinates (B011, B012).

Shows the message of S006 at coordinates (B013, B014), and shows the button with the name of S007 at coordinates (B015, B016).

Shows the message of S008 at coordinates (B017, B018), and shows the button with the name of S009 at coordinates (B019, B020).

When the button is clicked, the result is stored in B000.

(1, 2, 3, 4, and 5 is stored with B1, B2, B3, B4, and B5, respectively.)



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# DIALSB

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Not available | Available | Available |

**Function**

Specifies the structure of the dialog (the display position of the message and button) shown by the DIALOG instruction.

* Can be selected only in the DIALOG instruction.

**Construction**
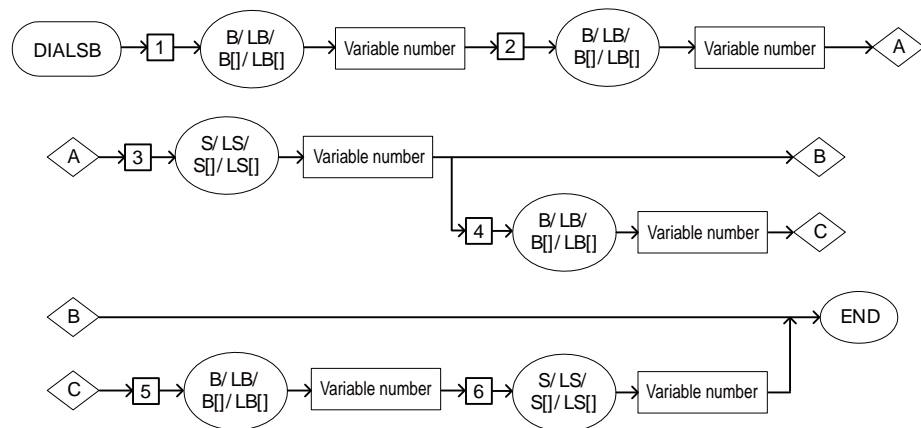


**Explanation**

### 1. B Variable number / LB Variable number / B [Array number] / LB [Array number]: Message X coordinates

Add the following tag.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 1 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the byte type variable number. | |

### 2. B Variable number / LB Variable number / B [Array number] / LB [Array number]: Message Y coordinates

Add the following tag.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 2 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the byte type variable number. | |

### 3. S Variable number / LS Variable number / S [Array number] / LS [Array number]: Message character string

Add the following tag.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 3 | S Variable number/ LS Variable number/ S [Array number]/ LS [Array number] | Specifies the character string type variable number. | |

### 4. B Variable number / LB Variable number / B [Array number] / LB [Array number]: Button X coordinates

Make sure to add the following tag for the first DIALSB in the DIALOG instruction.

For the second and after, the following tag can be added or omitted.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 4 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the byte type variable number. | |

### 5. B Variable number / LB Variable number / B [Array number] / LB [Array number]: Button Y coordinates

Make sure to add the following tag for the first DIALSB in the DIALOG instruction.

For the second and after, the following tag can be added or omitted.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 5 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the byte type variable number. | |

### 6. S Variable number / LS Variable number / S [Array number] / LS [Array number]: Button character string

Make sure to add the following tag for the first DIALSB in the DIALOG instruction.

For the second and after, the following tag can be added or omitted.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 6 | S Variable number/ LS Variable number/ S [Array number]/ LS [Array number] | Specifies the character string type variable number. | |

## 2.3   Operating Instruction

# CLEAR

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Available | Available | Available |

**Function**

In Data 1, the variable content from the specified number on, is cleared to 0 only by the amount specified in Data 2.

**Construction**

CLEAR    <Data 1>    <Data 2>
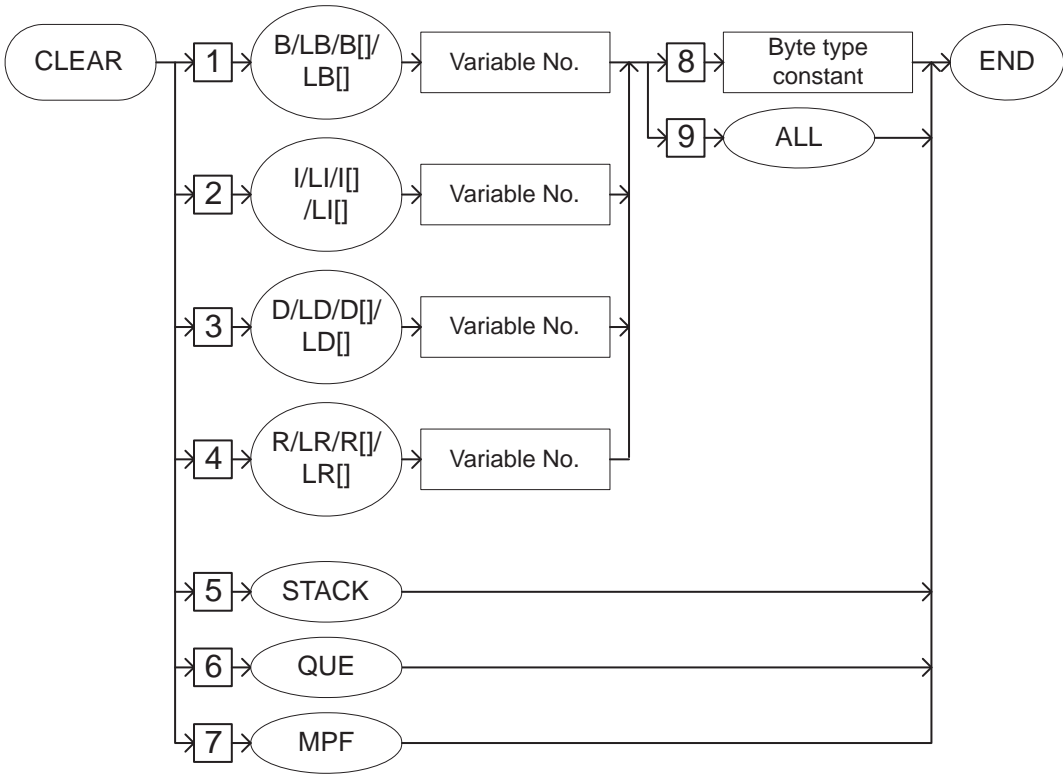
**Explanation**

**1. B Variable number /LB Variable number /B [Array number] /LB [Array number] /I Variable number /LI Variable number /I [Array number] /LI [Array number] /D Variable number /LD Variable number /D [Array number] /LD [Array number] /R Variable number/ LR Variable number /R [Array number] /LR [Array number] /STACK/QUE/MPF**

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 1 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable to be cleared. | < Data 1 > |
| 2 | I Variable number/ LI Variable number/ I [Array number]/ LI [Array number] | Specifies the number of the integer type variable to be cleared. | < Data 1 > |
| 3 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the number of the double precision type variable to be cleared. | < Data 1 > |
| 4 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real type variable to be cleared. | < Data 1 > |
| 5 | STACK | There are eight stacks, and they store the called position. | < Data 1 > |
| 6 | QUE | Clears all the job queues. | <Data 1> Available only with the job queue function (option: S2C641) |

**About the job call stack**

SUPPLE
-MENT

There are 12 stacks, and they store the called position.



## 2. Byte type constant /ALL

When a B Variable number, LB Variable number, B [Array number], LB [Array number], I Variable number, LI Variable number, I [Array number], LI [Array number], D Variable number, LD Variable number, D [Array number], LD [Array number], R Variable number, LR Variable number, R [Array number], or LR [Array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 8 | Byte type constant | Specifies the number cleared starting from the number of the specified variable. | |
| 9 | ALL | All variables starting from the number of the specified variable are cleared. | |

**Example**

(1)  CLEAR B003 10
     The content of the variables from B003 to B0012 are cleared to 0.

(2)  CLEAR D010 ALL
     The content of all the double precision type variables is cleared to 0 starting from D010.

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(3)   CLEAR STACK
All the job call stacks are cleared.

# INC

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Available | Available | Available |

**Function**

Adds one to the content of the specified variable.

**Construction**



**Explanation**

**1. B Variable number /LB Variable number /B [Array number] /LB [Array number] /I Variable number/ LI Variable number /I [Array number] /LI [Array number] /D Variable number/ LD Variable number /D [Array number] /LD [Array number]**

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 1 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable. | |
| 2 | I Variable number/ LI Variable number/ I [Array number]/ LI [Array number] | Specifies the number of the integer type variable. | |
| 3 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the number of the double precision type variable. | |

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**Example**

(1)  NOP
     SET B000 0
     *1
     MOVJ VJ=100.00          1 is repeatedly added to B000
     MOVJ VJ=50.00           until it reaches 200.

     INC B000                1 is added to B000.
     JUMP *1 IF B000<200
     END

# DEC

| SUBSET | STANDARD | EXPANDED |
|---|---|---|
| Not available | Available | Available |

## Function

Subtracts 1 from a specified variable.

## Construction



## Explanation

### 1. B Variable number/LB Variable number/B [Array number]/LB [Array number]/I Variable number/LI Variable number/I [Array number]/LI [Array number]/D Variable number/LD Variable number/D [Array number]/LD [Array number]
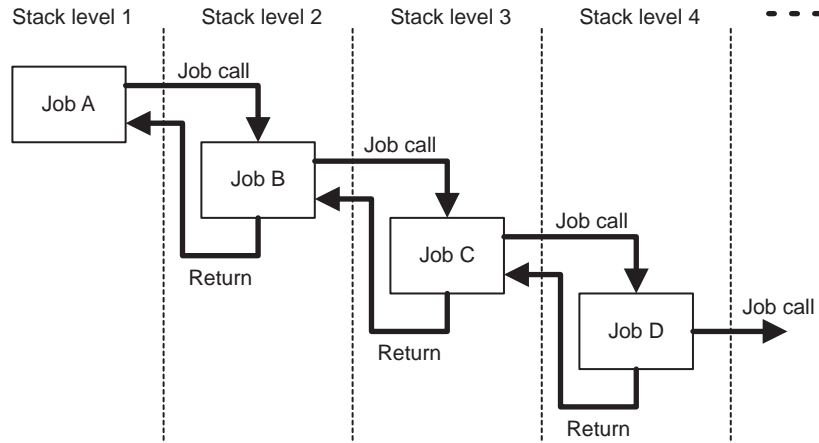
Choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 1 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable from which 1 is subtracted. | |
| 2 | I Variable number/ LI Variable number/ I [Array number]/ LI [Array number] | Specifies the number of the integer type variable from which 1 is subtracted. | |
| 3 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the number of the double-precision type variable from which 1 is subtracted. | |

**Example**

(1)  NOP
     SET B000 200
     *1
     MOVJ VJ=100.00          1 is repeatedly subtracted
     MOVJ VJ=50.00           from B000 until it reaches 0.

     DEC B000                1 is subtracted from B000.
     JUMP *1 IF B000=0
     END

# SET

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Available | Available | Available |

**Function**

Sets Data 2 to Data 1.

**Construction**

SET    <Data 1>    <Data 2>

A → 9 → Byte type constant → B

→ 10 → B/LB/B[]/LB[] → Variable No.

→ 11 → I/LI/I[]/LI[] → Variable No.

→ 12 → D/LD/D[]/LD[] → Variable No.

→ 13 → R/LR/R[]/LR[] → Variable No.

→ 14 → Expression

C → 15 → Integer type constant → D

→ 16 → B/LB/B[]/LB[] → Variable No.

→ 17 → I/LI/I[]/LI[] → Variable No.

→ 18 → D/LD/D[]/LD[] → Variable No.

→ 19 → R/LR/R[]/LR[] → Variable No.

→ 20 → Expression

E → 21 → Double-precision type constant → F

→ 22 → B/LB/B[]/LB[] → Variable No.

→ 23 → I/LI/I[]/LI[] → Variable No.

→ 24 → D/LD/D[]/LD[] → Variable No.

→ 25 → R/LR/R[]/LR[] → Variable No.

→ 26 → Expression

G → 27 → Real-number type constant → H

→ 28 → B/LB/B[]/LB[] → Variable No.

→ 29 → I/LI/I[]/LI[] → Variable No.

→ 30 → D/LD/D[]/LD[] → Variable No.

→ 31 → R/LR/R[]/LR[] → Variable No.

→ 32 → Expression

I → 33 → Character type constant → J

→ 34 → S/LS/S[]/LS[] → Variable No.

**Explanation**

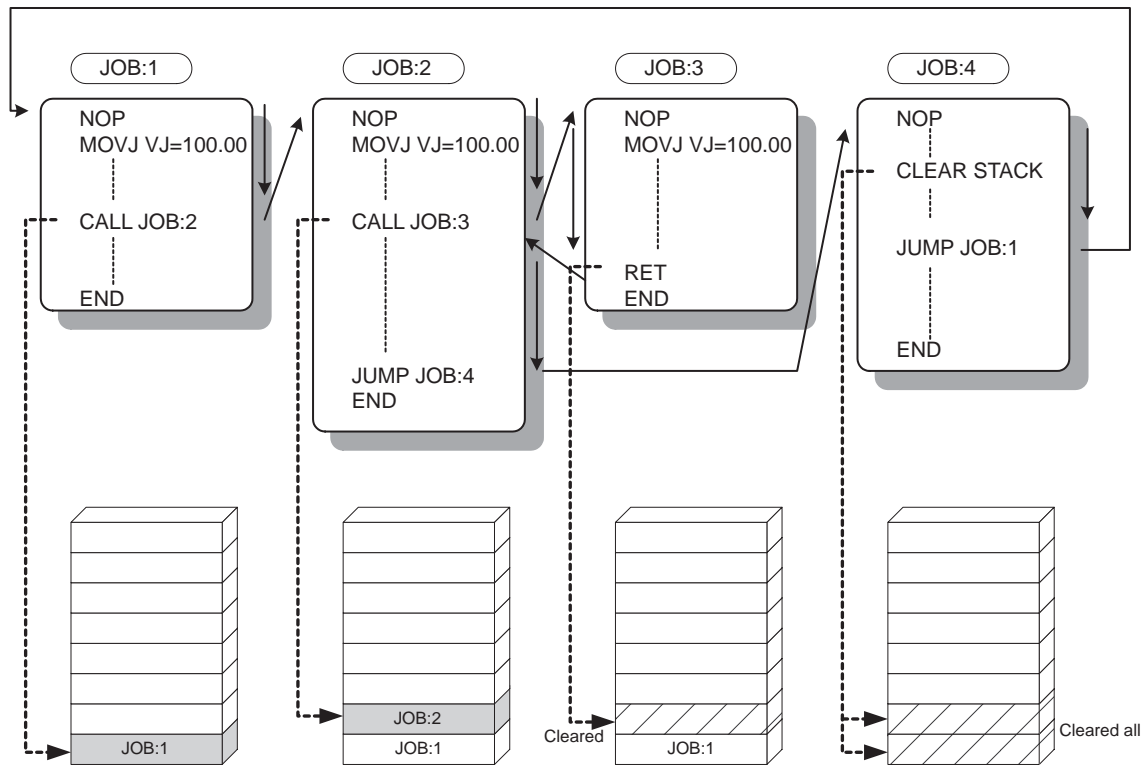**1. B Variable number /LB Variable number /B [Array number] /LB [Array number] /I Variable number /LI Variable number /I [Array number] /LI [Array number] /D Variable number /LD Variable number /D [Array number] /LD [Array number] /R Variable number /LR Variable number /R [Array number] /LR [Array number] /S Variable number /LS Variable number /S [Array number] /LS [Array number] /P Variable number /LP Variable number /P [Array number] /LP [Array number] /BP Variable number /LBP Variable number /BP [Array number] /LBP [Array number] /EX Variable number /LEX Variable number / EX [Array number] /LEX [Array number]**

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 1 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable to which data is set. | < Data1> |
| 2 | I Variable number/ LI Variable number/ I [Array number]/ LI [Array number] | Specifies the number of the integer type variable to which data is set. | < Data 1> |
| 3 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the number of the double precision type variable to which data is set. | < Data 1> |
| 4 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real type variable to which data is set. | < Data 1> |
| 5 | S Variable number/ LS Variable number/ S [Array number]/ LS [Array number] | Specifies the number of the character type variable to which data is set. | < Data 1> |
| 6 | P Variable number/ LP Variable number/ P [Array number]/ LP [Array number] | Specifies the number of the robot axis positional variable to which data is set. | < Data 1> |
| 7 | BP Variable number/ LBP Variable number/ BP [Array number]/ LBP [Array number] | Specifies the number of the base axis positional variable to which data is set. | < Data 1> |
| 8 | EX Variable number/ LEX Variable number/ EX [Array number]/ LEX [Array number] | Specifies the number of the station axis positional variable to which data is set. | < Data 1> |

## 2. Byte type constant /B Variable number /LB Variable number /B [Array number] /LB [Array number] /I Variable number /LI Variable number /I [Array number] / LI [Array number] /D Variable number /LD Variable number /D [Array number] /LD [Array number] /R Variable number /LR Variable number /R [Array number] /LR [Array number]/Expression

When a B Variable number, LB Variable number, B [Array number], or LB [Array number] is selected from the table part 1 of this Explanation, choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 9 | Byte type constant | Specifies the byte type constant. | < Data 2> |
| 10 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable. | < Data 2> |
| 11 | I Variable number/ LI Variable number/ I [Array number]/ LI [Array number] | Specifies the number of the integer type variable. | < Data 2> |
| 12 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the number of the double precision type variable. | < Data 2> |
| 13 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real type variable. | < Data 2> |
| 14 | Expression | Specifies the expression. | <Data 2> For details of setting the expression, refer to *chapter 1.4 "Registration of Expression" at page 1-8.* |

**3. Integer type constant /B Variable number /LB Variable number /B [Array number] /LB [Array number] /I Variable number /LI Variable number /I [Array number] /LI [Array number] /D Variable number /LD Variable number /D [Array number] /LD [Array number] / R Variable number /LR Variable number /R [Array number] /LR [Array number]/Expression**

When an I Variable number, LI Variable number, I [Array number], or LI [Array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 15 | Integer type constant | Specifies the integer type constant. | < Data 2> |
| 16 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable. | < Data 2> |
| 17 | I Variable number/ LI Variable number/ I [Array number]/ LI [Array number] | Specifies the number of the integer type variable. | < Data 2> |
| 18 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the number of the double precision type variable. | < Data 2> |
| 19 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real type variable. | < Data 2> |
| 20 | Expression | Specifies the expression. | <Data 2> For details of setting the expression, refer to *chapter 1.4 "Registration of Expression" at page 1-8*. |

## 4. Double precision type constant /B Variable number / LB Variable number /B [Array number] /LB [Array number] /I Variable number /LI Variable number /I [Array number] /LI [Array number] /D Variable number /LD Variable number /D [Array number] /LD [Array number] /R Variable number /LR Variable number /R [Array number] /LR [Array number]/ Expression

When a D Variable number, LD Variable number, D [Array number], or LD [Array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 21 | Double precision type constant | Specifies the double precision type constant. | < Data 2> |
| 22 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable. | < Data 2> |
| 23 | I Variable number/ LI Variable number/ I [Array number]/ LI [Array number] | Specifies the number of the integer type variable. | < Data 2> |
| 24 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the number of the double precision type variable. | < Data 2> |
| 25 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real type variable. | < Data 2> |
| 26 | Expression | Specifies the expression. | <Data 2> For details of setting the expression, refer to *chapter 1.4 "Registration of Expression" at page 1-8.* |

**5. Real type constant /B Variable number /LB Variable number /B [Array number] /LB [Array number] /I Variable number /LI Variable number /I [Array number] / LI [Array number] /D Variable number /LD Variable number /D [Array number] /LD [Array number] /R Variable number /LR Variable number /R [Array number] /LR [Array number]/Expression**

When an R Variable number, LR Variable number, R [Array number], or LR [Array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 27 | Real type constant | Specifies the real type constant. | < Data 2> |
| 28 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable. | < Data2> |
| 29 | I Variable number/ LI Variable numb er/ I [Array number]/ LI [Array number] | Specifies the number of the integer type variable. | < Data 2> |
| 30 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the number of the double precision type variable. | < Data 2> |
| 31 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real type variable. | < Data 2> |
| 32 | Expression | Specifies the expression. | <Data 2> For details of setting the expression, refer to *chapter 1.4 "Registration of Expression" at page 1-8*. |

### 6. Character type constant /S Variable number /LS Variable number /S [Array number] /LS [Array number]

When an S Variable number, LS Variable number, S [Array number], or LS [Array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 33 | Character type constant | Specifies the character type data. | < Data 2> |
| 34 | S Variable number/ LS Variable number/ S [Array number]/ LS [Array number] | Specifies the number of the character type variable. | < Data 2> |

### 7. P Variable number /LP Variable number /P [Array number] /LP [Array number]

When a P Variable number, LP Variable number, P [Array number], or LP [Array number] is selected from the table in part 1 of this Explanation, add the following tag.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 35 | P Variable number/ LP Variable number/ P [Array number]/ LP [Array number] | Specifies the number of the robot axis position variable. | < Data 2> |

### 8. BP Variable number /LBP Variable number /BP [Array number] /LBP [Array number]

When a BP Variable number, LBP Variable number, BP [Array number], or LBP [Array number] is selected from the table in part 1 of this Explanation, add the following tag.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 36 | BP Variable number/ LBP Variable number/ BP [Array number]/ LBP [[Array number] | Specifies the number of the base axis position variable. | < Data 2> |

### 9. EX Variable number /LEX Variable number /EX [Array number] /LEX [Array number]

When an EX Variable number, LEX Variable number, EX [Array number], or LEX [Array number] is selected from the table in part 1 of this Explanation, add the following tag.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 37 | EX Variable number/ LEX Variable number/ EX [Array number]/ LEX [Array number] | Specifies the number of the station axis position variable. | < Data 2> |

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**Example**

(1)  SET B000 0
     0 is set in B000.


(2)  SET P000 P001
     The content of P001 is set in P000.

# ADD

| SUBSET | STANDARD | EXPANDED |
|---|---|---|
| Available | Available | Available |

**Function**

Adds Data 1 and Data 2, and stores the result in Data 1.

**Construction**

Add   <Data 1>   <Data 2>

A →| 8 |→ Byte type constant →| B |

→| 9 | ( B/LB/B[]/ LB[] ) → Variable No. →

→| 10 | ( I/LI/I[] /LI[] ) → Variable No. →

→| 11 | ( D/LD/D[]/ LD[] ) → Variable No. →

→| 12 | ( R/LR/R[]/ LR[] ) → Variable No. →

| C |→| 13 |→ Integer type constant →| D |

→| 14 | ( B/LB/B[]/ LB[] ) → Variable No. →

→| 15 | ( I/LI/I[] /LI[] ) → Variable No. →

→| 16 | ( D/LD/D[]/ LD[] ) → Variable No. →

→| 17 | ( R/LR/R[]/ LR[] ) → Variable No. →

| E |→| 18 |→ Double-precision type constant →| F |

→| 19 | ( B/LB/B[]/ LB[] ) → Variable No. →

→| 20 | ( I/LI/I[] /LI[] ) → Variable No. →

→| 21 | ( D/LD/D[]/ LD[] ) → Variable No. →

→| 22 | ( R/LR/R[]/ LR[] ) → Variable No. →

| G |→| 23 |→ Real-number type constant →| H |

→| 24 | ( B/LB/B[]/ LB[] ) → Variable No. →

→| 25 | ( I/LI/I[] /LI[] ) → Variable No. →

→| 26 | ( D/LD/D[]/ LD[] ) → Variable No. →

→| 27 | ( R/LR/R[]/ LR[] ) → Variable No. →

**Explanation**

**1. B Variable number/LB Variable number/B [Array number]/LB [Array number]/I Variable number/LI Variable number/I [Array number]/LI [Array number]/ D Variable number/LD Variable number/D [Array number]/LD [Array number]/R Variable number/LR Variable number/R [Array number]/LR [Array number]/P Variable number/LP Variable number/P [Array number]/LP [Array number]/BP Variable number/LBP Variable number/BP [Array number]/LBP [Array number]/EX Variable number/LEX Variable number/EX [Array number]/LEX [Array number]**

Choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 1 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable to be added. | \<Data 1\> |
| 2 | I Variable number/ LI Variable number/ I [Array number]/ LI [Array number] | Specifies the number of the integer type variable to be added. | \<Data 1\> |
| 3 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the number of the double-precision type variable to be added. | \<Data 1\> |
| 4 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real-number type variable to be added. | \<Data 1\> |
| 5 | P Variable number/ LP Variable number/ P [Array number]/ LP [Array number] | Specifies the number of the robot axis position type variable to be added. | \<Data 1\> |
| 6 | BP Variable number/ LBP Variable number/ BP [Array number]/ LBP [Array number] | Specifies the number of the base axis position type variable to be added. | \<Data 1\> |
| 7 | EX Variable number/ LEX Variable number/ EX [Array number]/ LEX [Array number] | Specifies the number of the station axis position type variable to be added. | \<Data 1\> |

## 2. Byte type constant/B Variable number/LB Variable number/B [Array number]/LB [Array number]/I Variable number/LI Variable number/I [Array number]/LI [Array number]/D Variable number/LD Variable number/D [Array number]/LD [Array number]/R Variable number/LR Variable number/R [Array number]/LR [Array number]

When a B Variable number, LB Variable number, B [Array number], or LB [Array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 8 | Byte type constant | Specifies the byte type data to be added. | <Data 2> |
| 9 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable to be added. | <Data 2> |
| 10 | I Variable number/LI Variable number/ I [Array number]/ LI [Array number] | Specifies the number of the integer type variable to be added. | <Data 2> |
| 11 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the number of the double-precision type variable to be added. | <Data 2> |
| 12 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real-number type variable to be added. | <Data 2> |

## 3. Integer type constant/B Variable number/LB Variable number/B [Array number]/LB [Array number]/I Variable number/LI Variable number/I [Array number]/LI [Array number]/D Variable number/LD Variable number/D [Array number]/LD [Array number]/R Variable number/LR Variable number/R [Array number]/LR [Array number]

When an I Variable number, LI Variable number, I [Array number], or LI [Array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 13 | Integer type constant | Specifies the integer type data to be added. | <Data 2> |
| 14 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte-type variable to be added. | <Data 2> |

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 15 | I Variable number/LI Variable number/ I [Array number]/ LI [Array number] | Specifies the number of the integer type variable to be added. | <Data 2> |
| 16 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specified the number of the double-precision type variable to be added. | <Data 2> |
| 17 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real-number type variable to be added. | <Data 2> |

**4. Double-precision type constant/B Variable number/ LB Variable number/B [Array number]/LB [Array number]/I Variable number/LI Variable number/I [Array number]/LI [Array number]/D Variable number/LD Variable number/D [Array number]/LD [Array number]/R Variable number/LR Variable number/R [Array number]/LR [Array number]**

When a D Variable number, LD Variable number, D [Array number], or LD [Array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 18 | Double-precision type constant | Specifies the double-precision type data to be added. | <Data 2> |
| 19 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable to be added. | <Data 2> |
| 20 | I Variable number/LI Variable number/ I [Array number]/ LI [Array number] | Specifies the number of the integer type variable to be added. | <Data 2> |
| 21 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the number of the double-precision type variable to be added. | <Data 2> |
| 22 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real-number type variable to be added. | <Data 2> |

5. **Real-number type constant/B Variable number/LB Variable number/B [Array number]/LB [Array number]/I Variable number/LI Variable number/I [Array number]/LI [Array number]/D Variable number/LD Variable number/D [Array number]/LD [Array number]/R Variable number/LR Variable number/R [Array number]/LR [Array number]**

When an R Variable number, LR Variable number, R [Array number]. or LR [Array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 23 | Real-number type constant | Specifies the real-number type data to be added. | <Data 2> |
| 24 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable to be added. | <Data 2> |
| 25 | I Variable number/LI Variable number/ I [Array number]/ LI [Array number] | Specifies the number of the integer type variable to be added. | <Data 2> |
| 26 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the number of the double-precision type variable to be added. | <Data 2> |
| 27 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real-number type variable to be added. | <Data 2> |

6. **P Variable number/LP Variable number/P [Array number]/LP [Array number]**

When a P Variable number, LP Variable number, P [Array number], or LP [Array number] is selected from the table in part 1 of this Explanation, add the following tag.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 28 | P Variable number/ LP Variable number/ P [Array number]/ LP [Array number] | Specifies the number of the robot axis position type variable to be added. | <Data 2> |

### 7. BP Variable number/LBP Variable number/BP [Array number]/LBP [Array number]

When a BP Variable number, LBP Variable number, BP [Array number], or LBP [Array number] is selected from the table in part 1 of this Explanation, add the following tag.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 29 | BP Variable number/ LBP Variable number/ BP [Array number]/ LBP [Array number] | Specifies the number of the base axis position type variable to be added. | <Data 2> |

### 8. EX Variable number/LEX Variable number/EX [Array number]/LEX [Array number]

When an EX Variable number, LEX Variable number, EX [Array number], or LEX [Array number] is selected from the table in part 1 of this Explanation, add the following tag.

| No | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 30 | EX Variable number/ LEX Variable number/ EX [Array number]/ LEX [Array number] | Specifies the number of the station axis position type variable to be added. | <Data 2> |

**Example**

(1)   ADD B000 10
      Adds 10 to B000, and stores the result in B000.

(2)   ADD I000 I001
      Adds I001 to I000, and stores the result in I000.

(3)   ADD P000 P001
      Adds P001 to P000, and stores the result in P000.

# SUB

| SUBSET | STANDARD | EXPANDED |
|---|---|---|
| Not available | Available | Available |

### Function

Subtracts Data 2 from Data 1, and stores the result in Data 1.

### Construction

SUB <Data 1> <Data 2>

A → 8 → Byte type constant → B

9 → B/LB/B[]/LB[] → Variable No.

10 → I/LI/I[]/LI[] → Variable No.

11 → D/LD/D[]/LD[] → Variable No.

12 → R/LR/R[]/LR[] → Variable No.

C → 13 → Integer type constant → D

14 → B/LB/B[]/LB[] → Variable No.

15 → I/LI/I[]/LI[] → Variable No.

16 → D/LD/D[]/LD[] → Variable No.

17 → R/LR/R[]/LR[] → Variable No.

E → 18 → Double-precision type constant → F

19 → B/LB/B[]/LB[] → Variable No.

20 → I/LI/I[]/LI[] → Variable No.

21 → D/LD/D[]/LD[] → Variable No.

22 → R/LR/R[]/LR[] → Variable No.

G → 23 → Real-number type constant → H

24 → B/LB/B[]/LB[] → Variable No.

25 → I/LI/I[]/LI[] → Variable No.

26 → D/LD/D[]/LD[] → Variable No.

27 → R/LR/R[]/LR[] → Variable No.

**Explanation**

**1. B Variable number/LB Variable number/B [Array number]/LB [Array number]/I Variable number/LI Variable number/I [Array number]/LI [Array number]/ D Variable number/LD Variable number/D [Array number]/LD [Array number]/R Variable number/LR Variable number/R [Array number]/LR [Array number]/P Variable number/LP Variable number/P [Array number]/LP [Array number]/BP Variable number/LBP Variable number/BP [Array number]/LBP [Array number]/EX Variable number/LEX Variable number/EX [Array number]/LEX [Array number]**

Choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 1 | B Variable number/<br>LB Variable number/<br>B [Array number]/<br>LB [Array number] | Specifies the number of the byte type variable to be subtracted. | <Data 1> |
| 2 | I Variable number/<br>LI Variable number/<br>I [Array number]/<br>LI [Array number] | Specifies the number of the integer type variable to be subtracted. | <Data 1> |
| 3 | D Variable number/<br>LD Variable number/<br>D [Array number]/<br>LD [Array number] | Specifies the number of the double-precision type variable to be subtracted. | <Data 1> |
| 4 | R Variable number/<br>LR Variable number/<br>R [Array number]/<br>LR [Array number] | Specifies the number of the real-number type variable to be subtracted. | <Data 1> |
| 5 | P Variable number/<br>LP Variable number/<br>P [Array number]/<br>LP [Array number] | Specifies the number of the robot axis position type variable to be subtracted. | <Data 1> |
| 6 | BP Variable number/<br>LBP Variable number/<br>BP [Array number]/<br>LBP [Array number] | Specifies the number of the base axis position type variable to be subtracted. | <Data 1> |
| 7 | EX Variable number/<br>LEX Variable number/<br>EX [Array number]/<br>LEX [Array number] | Specifies the number of the station axis position type variable to be subtracted. | <Data 1> |

## 2. Byte type constant/B Variable number/LB Variable number/B [Array number]/LB [Array number]/I Variable number/LI Variable number/I [Array number]/LI [Array number]/D Variable number/LD Variable number/D [Array number]/LD [Array number]/R Variable number/LR Variable number/R [Array number]/LR [Array number]

When a B Variable number, LB Variable number, B [Array number], or LB [Array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 8 | Byte type constant | Specifies the byte type data to be subtracted. | <Data 2> |
| 9 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable to be subtracted. | <Data 2> |
| 10 | I Variable number/ LI Variable number/ I [Array number]/ LI [Array number] | Specifies the number of the integer type variable to be subtracted. | <Data 2> |
| 11 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the number of the double-precision type variable to be subtracted. | <Data 2> |
| 12 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real-number type variable to be subtracted. | <Data 2> |

## 3. Integer type constant/B Variable number/LB Variable number/B [Array number]/LB [Array number]/I Variable number/LI Variable number/I [Array number]/LI [Array number]/D Variable number/LD Variable number/D [Array number]/LD [Array number]/R Variable number/LR Variable number/R [Array number]/LR [Array number]

When an I Variable number, LI Variable number, I [Array number], or LI [Array number] is selected from the table part 1 of this Explanation, choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 13 | Integer type constant | Specifies the integer type data to be subtracted. | <Data 2> |
| 14 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable to be subtracted. | <Data 2> |

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 15 | I Variable number/<br>LI Variable number/<br>I [Array number]/<br>LI [Array number] | Specifies the number of the integer type variable to be subtracted. | \<Data 2\> |
| 16 | D Variable number/<br>LD Variable number/<br>D [Array number]/<br>LD [Array number] | Specifies the number of the double-precision type variable to be subtracted. | \<Data 2\> |
| 17 | R Variable number/<br>LR Variable number/<br>R [Array number]/<br>LR [Array number] | Specifies the number of the real-number type variable to be subtracted. | \<Data 2\> |

**4. Double-precision type constant/B Variable number/ LB Variable number/B [Array number]/LB [Array number]/I Variable number/LI Variable number/I [Array number]/LI [Array number]/D Variable number/LD Variable number/D [Array number]/LD [Array number]/R Variable number/LR Variable number/R [Array number]/LR [Array number]**

When a D Variable number, LD Variable number, D [Array number], or LD [Array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 18 | Double-precision type constant | Specifies the double-precision type data to be subtracted. | \<Data 2\> |
| 19 | B Variable number/<br>LB Variable number/<br>B [Array number]/<br>LB [Array number] | Specifies the number of the byte type variable to be subtracted. | \<Data 2\> |
| 20 | I Variable number/<br>LI Variable number/<br>I [Array number]/<br>LI [Array number] | Specifies the number of the integer type variable to be subtracted. | \<Data 2\> |
| 21 | D Variable number/<br>LD Variable number/<br>D [Array number]/<br>LD [Array number] | Specifies the number of the double-precision type variable to be subtracted. | \<Data 2\> |
| 22 | R Variable number/<br>LR Variable number/<br>R [Array number]/<br>LR [Array number] | Specifies the number of the real-number type variable to be subtracted. | \<Data 2\> |

## 5. Real-number type constant/B Variable number/LB Variable number/B [Array number]/LB [Array number]/I Variable number/LI Variable number/I [Array number]/LI [Array number]/D Variable number/LD Variable number/D [Array number]/LD [Array number]/R Variable number/LR Variable number/R [Array number]/LR [Array number]

When an R Variable number, LR Variable number, R [Array number], or LR [Array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 23 | Real-number type constant | Specifies the real-number type data to be subtracted. | <Data 2> |
| 24 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable to be subtracted. | <Data 2> |
| 25 | I Variable number/ LI Variable number/ I [Array number]/ LI [Array number] | Specifies the number of the integer type variable to be subtracted. | <Data 2> |
| 26 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the number of the double-precision type variable to be subtracted. | <Data 2> |
| 27 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real-number type variable to be subtracted. | <Data 2> |

## 6. P Variable number/LP Variable number/P [Array number]/LP [Array number]

When a P Variable number, LP Variable number, P [Array number], or LP [Array number] is selected from the table in part 1 of this Explanation, add the following tag.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 28 | P Variable number/ LP Variable number/ P [Array number]/ LP [Array number] | Specifies the number of the robot axis position type variable to be subtracted. | <Data 2> |

## 7. BP Variable number/LBP Variable number/BP [Array number]/LBP [Array number]

When a BP Variable number, LBP Variable number, BP [Array number], or LBP [Array number] is selected from the table in part 1 of this Explanation, add the following tag.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 29 | BP Variable number/ LBP Variable number/ BP [Array number]/ LBP [Array number] | Specifies the number of the base axis position type variable to be subtracted. | <Data 2> |

## 8. EX Variable number/LEX Variable number/EX [Array number]/LEX [Array number]

When an EX Variable number, LEX Variable number, EX [Array number], or LEX [Array number] is selected from the table in part 1 of this Explanation, add the following tag.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 30 | EX Variable number/ LEX Variable number/ EX [Array number]/ LEX [Array number] | Specifies the number of the station axis position type variable to be subtracted. | <Data 2> |

**Example**

  (1)  SUB B000 10
      Subtracts 10 from B000, and stores the result in B000.

  (2)  SUB I000 I001
      Subtracts I001 from I000, and stores the result in I000.

  (3)  SUB P000 P001
      Subtracts P001 from P000, and stores the result in P000.
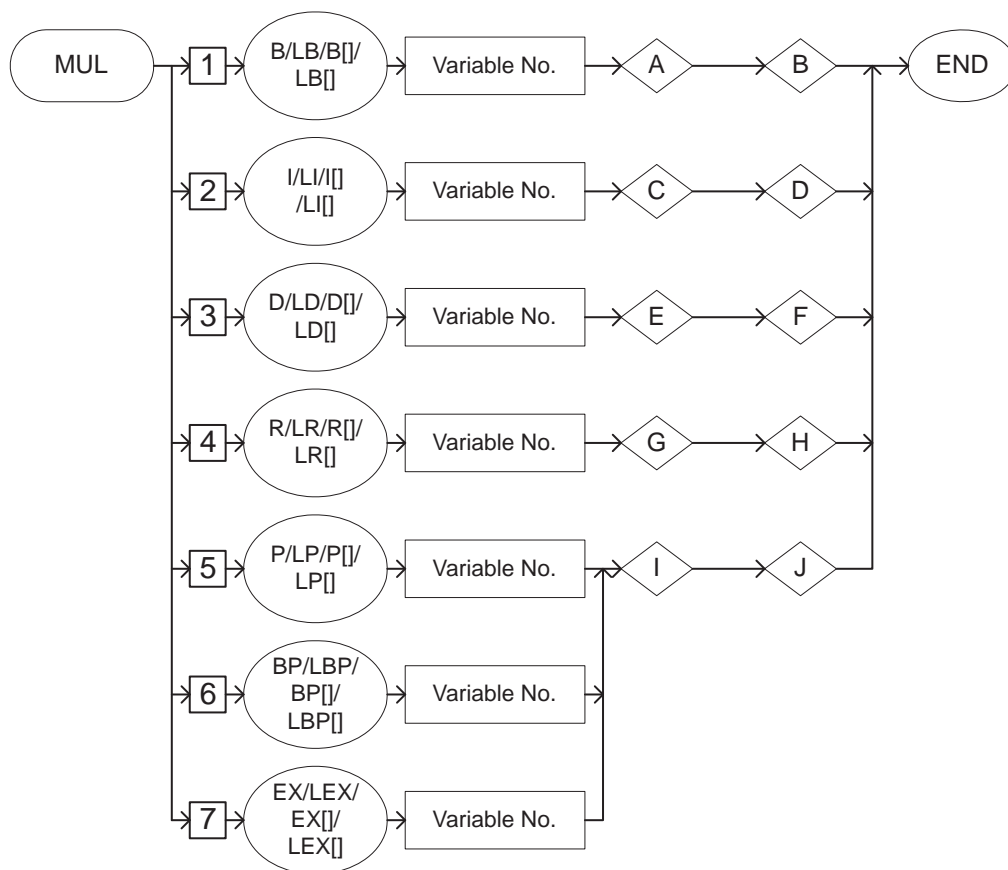
# MUL

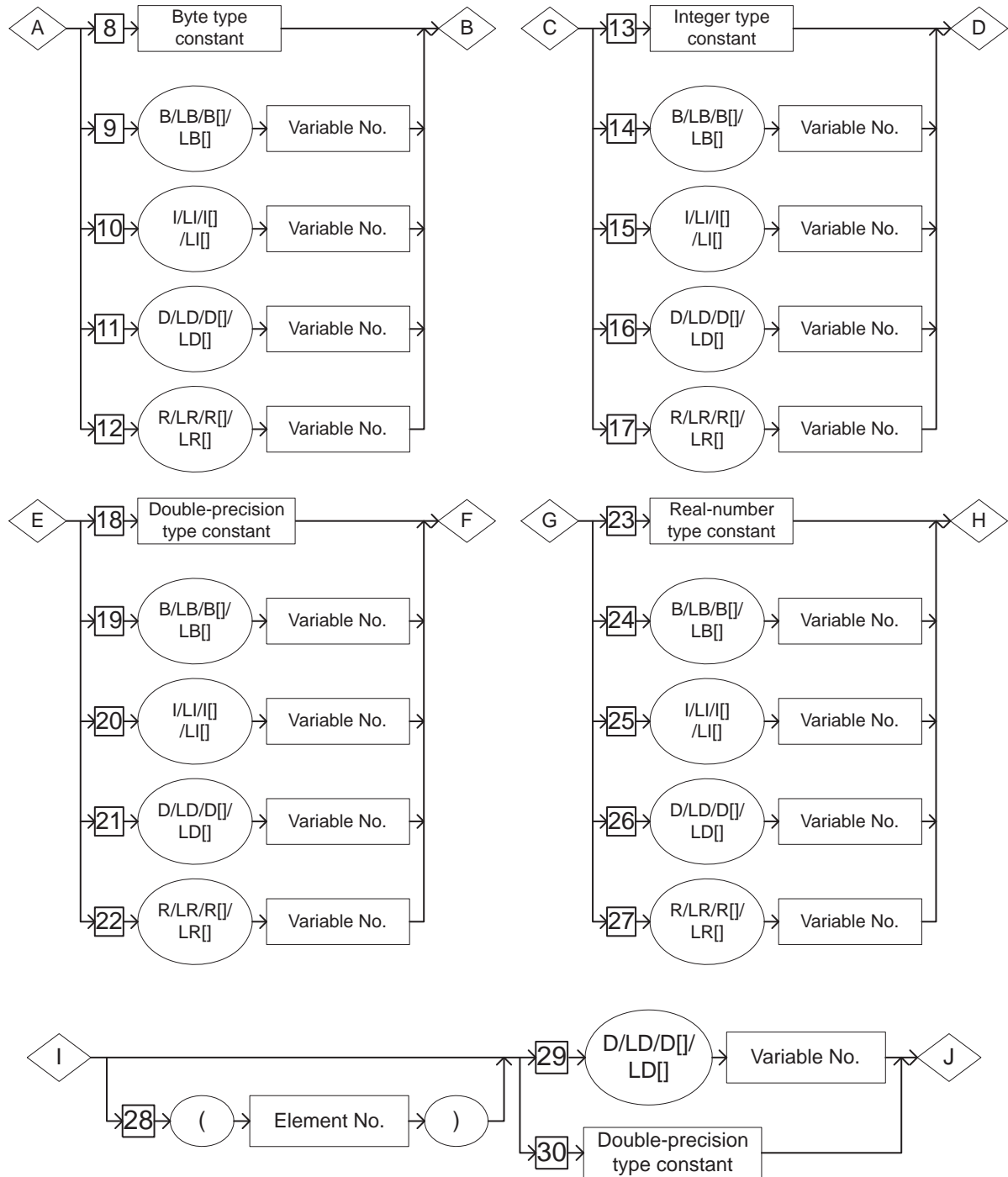| SUBSET | STANDARD | EXPANDED |
|:---:|:---:|:---:|
| Not available | Available | Available |

**Function**

Multiplies Data 1 by Data 2, and stores the result in Data 1.

**Construction**

MUL  <Data 1>  <Data 2>

**Explanation**

**1. B Variable number/LB Variable number/B [Array number]/LB [Array number]/I Variable number/LI Variable number/I [Array number]/LI [Array number]/D Variable number/LD Variable number/D [Array number]/LD [Array number]/R Variable number/LR Variable number/R [Array number]/LR [Array number]/P Variable number/LP Variable number/P [Array number]/LP [Array number]/BP Variable number/LBP Variable number/BP [Array number]/LBP [Array number]/EX Variable number/LEX Variable number/EX [Array number]/LEX [Array number]**

Choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 1 | B Variable number/ LB Variable number B [Array number]/ LB [Array number] | Specifies the number of the byte type variable to be multiplied. | <Data 1> |
| 2 | I Variable number/ LI Variable number/ I [Array number]/ LI [Array number] | Specifies the number of the integer type variable to be multiplied. | <Data 1> |
| 3 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the number of the double-precision type variable to be multiplied. | <Data 1> |
| 4 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real-number type variable to be multiplied. | <Data 1> |
| 5 | P Variable number/ LP Variable number/ P [Array number]/ LP [Array number] | Specifies the number of the robot axis position type variable to be multiplied. | <Data 1> |
| 6 | BP Variable number/ LBP Variable number/ BP [Array number]/ LBP [Array number] | Specifies the number of the base axis position type variable to be multiplied. | <Data 1> |
| 7 | EX Variable number/ LEX Variable number/ EX [Array number]/ LEX [Array number] | Specifies the number of the station axis position type variable to be multiplied. | <Data 1> |

## 2. Byte type constant/B Variable number/LB Variable number/B [Array number]/LB [Array number]/I Variable number/LI Variable number/I [Array number]/LI [Array number]/D Variable number/LD Variable number/D [Array number]/LD [Array number]/R Variable number/LR Variable number/R [Array number]/LR [Array number]

When a B Variable number, LB Variable number, B [Array number], or LB [Array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 8 | Byte type constant | Specifies the byte type data to be multiplied. | <Data 2> |
| 9 | B Variable number/<br>LB Variable number/<br>B [Array number]/<br>LB [Array number] | Specifies the number of the byte type variable to be multiplied. | <Data 2> |
| 10 | I Variable number/<br>LI Variable number/<br>I [Array number]/<br>LI [Array number] | Specifies the number of the integer type variable to be multiplied | <Data 2> |
| 11 | D Variable number/<br>LD Variable number/<br>D [Array number]/<br>LD [Array number] | Specifies the number of the double-precision type variable to be multiplied. | <Data 2> |
| 12 | R Variable number/<br>LR Variable number/<br>R [Array number]/<br>LR [Array number] | Specifies the number of the real-number type variable to be multiplied. | <Data 2> |

## 3. Integer type constant/B Variable number/LB Variable number/B [Array number]/LB [Array number]/I Variable number/LI Variable number/I [Array number]/LI [Array number]/D Variable number/LD Variable number/D [Array number]/LD [Array number]/R Variable number/LR Variable number/R [Array number]/LR [Array number]

When an I Variable number, LI Variable number, I [Array number], or LI [Array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 13 | Integer type constant | Specifies the integer type data to be multiplied. | <Data 2> |
| 14 | B Variable number/<br>LB Variable number/<br>B [Array number]/<br>LB [Array number] | Specifies the number of the byte type variable to be multiplied. | <Data 2> |

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 15 | I Variable number/ LI Variable number/ I [Array number]/ LI [Array number] | Specifies the number of the integer type variable to be multiplied. | <Data 2> |
| 16 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the number of the double-precision type variable to be multiplied. | <Data 2> |
| 17 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real-number type variable to be multiplied. | <Data 2> |

**4. Double-precision type constant/B Variable number/ LB Variable number/B [Array number]/LB [Array number]/I Variable number/LI Variable number/I [Array number]/LI [Array number]/D Variable number/LD Variable number/D [Array number]/LD [Array number]/R Variable number/LR Variable number/R [Array number]/LR [Array number]**

When a D Variable number, LD Variable number, D [Array number], or LD [Array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 18 | Double-precision type constant | Specifies the double-precision type data to be multiplied. | <Data 2> |
| 19 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable to be multiplied. | <Data 2> |
| 20 | I Variable number/ LI Variable number/ I [Array number]/ LI [Array number] | Specifies the number of the integer type variable to be multiplied. | <Data 2> |
| 21 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the number of the double-precision type variable to be multiplied. | <Data 2> |
| 22 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real-number type variable to be multiplied. | <Data 2> |

5. **Real-number type constant/B Variable number/LB Variable number/B [Array number]/LB [Array number]/I Variable number/LI Variable number/I [Array number]/LI [Array number]/D Variable number/LD Variable number/D [Array number]/LD [Array number]/R Variable number/LR Variable number/R [Array number]/LR [Array number]**

When an R Variable number, LR Variable number, R [Array number], or LR [Array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
| --- | --- | --- | --- |
| 23 | Real-number type constant | Specifies the real-number type data to be multiplied. | <Data 2> |
| 24 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable to be multiplied. | <Data 2> |
| 25 | I Variable number/ LI Variable number/ I [Array number]/ LI [Array number] | Specifies the number of the integer type variable to be multiplied. | <Data 2> |
| 26 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the number of the double-precision type variable to be multiplied. | <Data 2> |
| 27 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real-number type variable to be multiplied. | <Data 2> |

6. **(Element number)**

When a P Variable number, LP Variable number, P [Array number], LP [Array number], BP Variable number, LBP Variable number, BP [Array number], LBP [Array number], EX Variable number, LEX Variable number, EX [Array number], or LEX [Array number] is selected from the table in part 1 of this Explanation, the following tag can be added or omitted.

| No. | Tag | Explanation | Note |
| --- | --- | --- | --- |
| 28 | (Element number) | Specifies the element of the position type variable to be multiplied. If omitted, all the elements of the position type variable are specified. | Element number: 1 to 255 Variable B/LB can be used. |

> **SUPPLE-MENT**
>
> **Element of position type variable**
>
> The element of position type variable differs depending on the type of variable as follows.
>
> • Robot axis position type variable
>
> <Pulse type>
>
> (1): 1st axis data, (2): 2nd axis data, (3): 3rd axis data, (4) 4th axis data, (5): 5th axis data, (6) 6th axis data, (7): 7th axis data, (8): 8th axis data
>
> <XYZ type>
>
> (1): X axis data, (2): Y axis data, (3) Z axis data,
> (4): Rx axis data
> (5): Ry axis data, (6): Rz axis data, (7): Re axis data
>
> • Base axis position type variable
>
> (1): 1st axis data, (2): 2nd axis data ✦✦✦
>
> • Station axis position type variable
>
> (1): 1st axis data, (2): 2nd axis data ✦✦✦

### 7. D Variable number/LD Variable number/D [Array number]/LD [Array number]/ Double-precision type constant

When a P Variable number, LP Variable number, P [Array number], LP [Array number], BP Variable number, LBP Variable number, BP [Array number], LBP [Array number], EX Variable number, LEX Variable number, EX [Array number], or LEX [Array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table after (Element number) of 6.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 29 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the number of the double-precision variable by which the element of position type variable is multiplied. | <Data 2> |
| 30 | Double-precision type constant | Specifies the double-precision type data by which the element of position type variable is multiplied. | <Data 2> |

**Example**

  (1)  MUL B000 10
      Multiplies B000 by 10, and stores the result in B000.

  (2)  MUL I000 I001
      Multiplies I000 by I001, and stores the result in I000.

  (3)  SET D000 2
      MUL P000 (3) D000
      Multiplies the Z axis data of P000 by D000 (D000=2), and stores the result in P000.
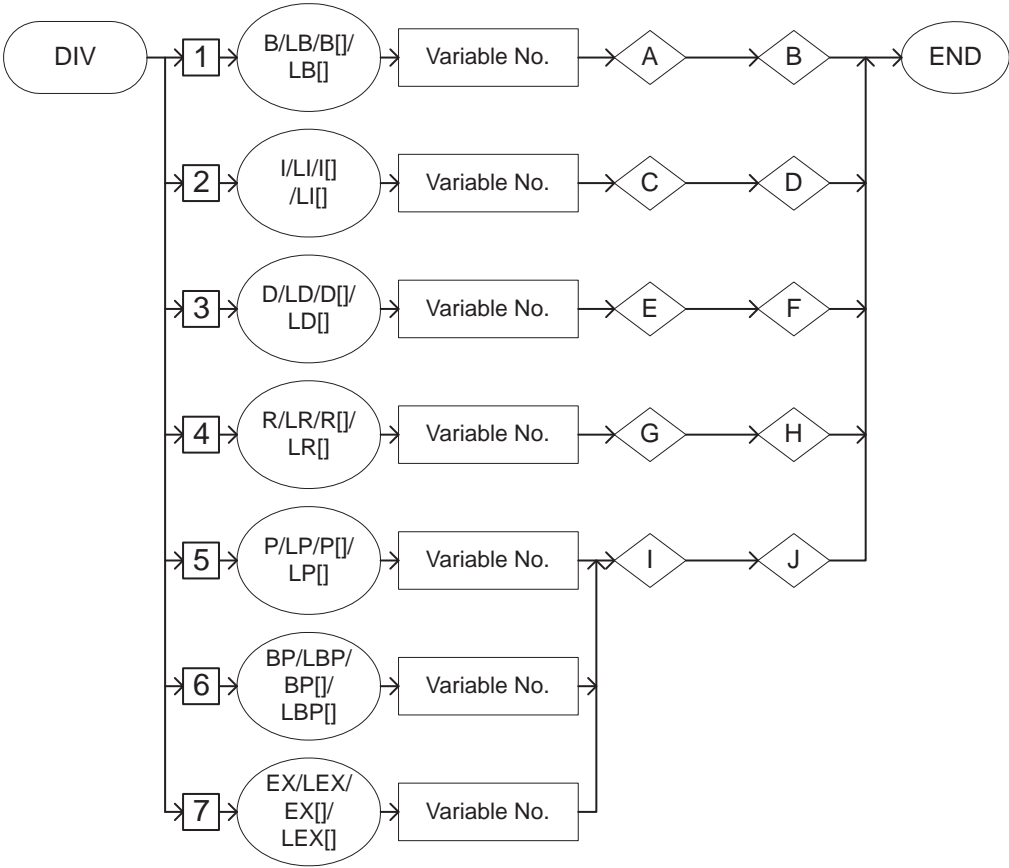
# DIV

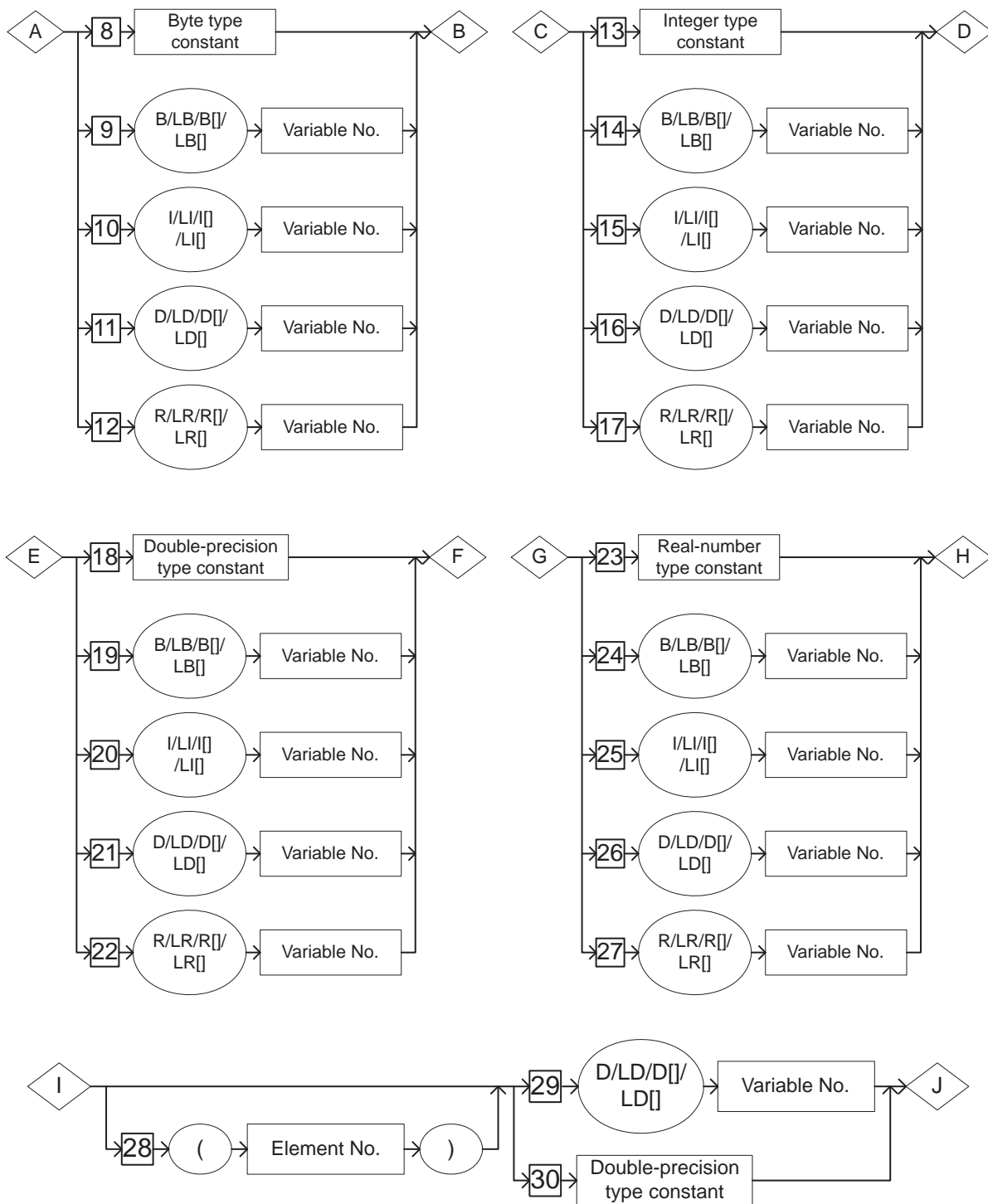| SUBSET | STANDARD | EXPANDED |
|---|---|---|
| Not available | Available | Available |

### Function

Divides Data 1 by Data 2, and stores the result in Data 1.

### Construction

DIV  <Data 1>  <Data 2>

 **Explanation** 

**1. B Variable number/LB Variable number/B [Array number]/LB [Array number]/I Variable number/LI Variable number/I [Array number]/LI [Array number]/ D Variable number/LD Variable number/D [Array number]/LD [Array number]/R Variable number/LR Variable number/R [Array number]/LR [Array number]/P Variable number/LP Variable number/P [Array number]/LP [Array number]/BP Variable number/LBP Variable number/BP [Array number]/LBP [Array number]/EX Variable number/LEX Variable number/EX [Array number]/LEX [Array number]**

Choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 1 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable to be divided. | <Data 1> |
| 2 | I Variable number/ LI Variable number/ I [Array number]/ LI [Array number] | Specifies the number of the integer type variable to be divided. | <Data 1> |
| 3 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the number of the double-precision type variable to be divided. | <Data 1> |
| 4 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real-number type variable to be divided. | <Data 1> |
| 5 | P Variable number/ LP Variable number/ P [Array number]/ LP [Array number] | Specifies the number of the robot axis position type variable to be divided. | <Data 1> |
| 6 | BP Variable number/ LBP Variable number/ BP [Array number]/ LBP [Array number] | Specifies the number of the base axis position type variable to be divided. | <Data 1> |
| 7 | EX Variable number/ LEX Variable number/ EX [Array number]/ LEX [Array number] | Specifies the number of the station axis position type variable to be divided. | <Data 1> |

## 2. Byte type constant/B Variable number/LB Variable number/B [Array number]/LB [Array number]/I Variable number/LI Variable number/I [Array number]/LI [Array number]/D Variable number/LD Variable number/D [Array number]/LD [Array number]/R Variable number/LR Variable number/R [Array number]/LR [Array number]

When a B Variable number, LB Variable number, B [Array number], or LB [Array number] is selected from the table in part 1 of this explanation, choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 8 | Byte type constant | Specifies the byte type data by which Data 1 is divided. | <Data 2> |
| 9 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable by which Data 1 is divided. | <Data 2> |
| 10 | I Variable number/ LI Variable number/ I [Array number]/ LI [Array number] | Specifies the number of the integer type variable by which Data 1 is divided. | <Data 2> |
| 11 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the number of the double-precision type variable by which Data 1 is divided. | <Data 2> |
| 12 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real-number type variable by which Data 1 is divided. | <Data 2> |

## 3. Integer type constant/B Variable number/LB Variable number/B [Array number]/LB [Array number]/I Variable number/LI Variable number/I [Array number]/LI [Array number]/D Variable number/LD Variable number/D [Array number]/LD [Array number]/R Variable number/LR Variable number/R [Array number]/LR [Array number]

When an I Variable number, LI Variable number, I [Array number], or LI [Array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 13 | Integer type constant | Specifies the integer type data by which Data 1 is divided. | <Data 2> |
| 14 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable by which Data 1 is divided. | <Data 2> |

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| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 15 | I Variable number/<br>LI Variable number/<br>I [Array number]/<br>LI [Array number] | Specifies the number of the integer type variable by which Data 1 is divided. | <Data 2> |
| 16 | D Variable number/<br>LD Variable number/<br>D [Array number]/<br>LD [Array number] | Specifies the number of the double-precision type variable by which Data 1 is divided. | <Data 2> |
| 17 | R Variable number/<br>LR Variable number/<br>R [Array number]/<br>LR [Array number] | Specifies the number of the real-number type variable by which Data 1 is divided. | <Data 2> |

**4. Double-precision type constant/B Variable number/ LB Variable number/B [Array number]/LB [Array number]/I Variable number/LI Variable number/I [Array number]/LI [Array number]/D Variable number/LD Variable number/D [Array number]/LD [Array number]/R Variable number/LR Variable number/R [Array number]/LR [Array number]**

When a D Variable number, LD Variable number, D [Array number], or LD [Array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 18 | Double-precision type constant | Specifies the double-precision type data by which Data 1 is divided. | <Data 2> |
| 19 | B Variable number/<br>LB Variable number/<br>B [Array number]/<br>LB [Array number] | Specifies the number of the byte type variable by which Data 1 is divided. | <Data 2> |
| 20 | I Variable number/<br>LI Variable number/<br>I [Array number]/<br>LI [Array number] | Specifies the number of the integer type variable by which Data 1 is divided. | <Data 2> |
| 21 | D Variable number/<br>LD Variable number/<br>D [Array number]/<br>LD [Array number] | Specifies the number of the double-precision type variable by which Data 1 is divided. | <Data 2> |
| 22 | R Variable number/<br>LR Variable number/<br>R [Array number]/<br>LR [Array number] | Specifies the number of the real-number type variable by which Data 1 is divided. | <Data 2> |

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## 5. Real-number type constant/B Variable number/LB Variable number/B [Array number]/LB [Array number]/I Variable number/LI Variable number/I [Array number]/LI [Array number]/D Variable number/LD Variable number/D [Array number]/LD [Array number]/R Variable number/LR Variable number/R [Array number]/LR [Array number]

When an R Variable number, LR Variable number, R [Array number], or LR [Array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 23 | Real-number type constant | Specifies the real-number type data by which Data 1 is divided. | <Data 2> |
| 24 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable by which Data 1 is divided. | <Data 2> |
| 25 | I Variable number/ LI Variable number/ I [Array number]/ LI [Array number] | Specifies the number of the integer type variable by which Data 1 is divided. | <Data 2> |
| 26 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the number of the double-precision type variable by which Data 1 is divided. | <Data 2> |
| 27 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real-number type variable by which Data 1 is divided. | <Data 2> |

## 6. (Element number)

When a P Variable number, LP Variable number, P [Array number], LP [Array number], BP Variable number, LBP Variable number, BP [Array number], LBP [Array number], EX Variable number, LEX Variable number, EX [Array number], or LEX [Array number] is selected from the table in part 1 of this Explanation, the following tag can be added or omitted.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 28 | (Element number) | Specifies the element of the position type variable by which Data 1 is divided. If omitted, all the elements of the position type variable are specified. | Element number: 1 to 255 Variable B/LB can be used. |

### 7. D Variable number/LD Variable number/D [Array number]/LD [Array number]/Double-precision type constant

When a P Variable number, LP Variable number, P [Array number], LP [Array number], BP Variable number, LBP Variable number, BP [Array number], LBP [Array number], EX Variable number, LEX Variable number, EX [Array number], or LEX [Array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table after (Element number) of 6.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 29 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the number of the double-precision variable by which the element of the position type variable is divided. | <Data 2> |
| 30 | Double-precision type constant | Specifies the double-precision type data by which the element of the position type variable is divided. | <Data 2> |

**Example**

(1)  DIV B000 10
    Divides B000 by 10, and stores the result in B000.

(2)  DIV I000 I001
    Divides I000 by I001, and stores the result in I000.

(3)  SET D000 2
    DIV P000 (3) D000
    Divides the Z axis data by D000 (D000=2), and stores the result in P000.

# CNVRT

| SUBSET | STANDARD | EXPANDED |
|---|---|---|
| Not available | Available | Available |

**Function**

Converts the pulse type position type variable of Data 2 to the XYZ type position type variable in the specified coordinate system, and stores the result in Data 1.

**Construction**

CNVRT  <Data 1>  <Data 2>  Coordinate system designation



**Explanation**

## 1. PX Variable number/LPX Variable number/PX [Array number]/LPX [Array number]

Add the following tag.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 1 | PX Variable number/ LPX Variable number/ PX [Array number]/ LPX [Array number] | Specifies the number of the expanded position type variable where the converted data is stored. | <Data 1> |

> **Expanded position type variables**
>
> SUPPLE-MENT
>
> The expanded position type variable is a position type variable that depends on the control group in the job.
>
> <Example>
>
> • When the control group is R1:
>   PX000 indicates P000.
>
> • When the control group is R1 + B1:
>   PX000 indicates P000 and BP000.
>
> • When the control group is R1 + B1 + ST1:
>   PX000 indicates P000 + BP000 + EX000.
>
> • When the control group is R1 + R2 + B1 + B2 + ST1 in the coordinated job (master R1 + B1):
>   PX000 indicates the following:
>   P000: R2 (slave), P001: R1 (master)
>   BP000: B2 (slave), BP001: B1 (master)
>   EX000: ST1

## 2. PX Variable number/LPX Variable number/PX [Array number]/LPX [Array number]

Add the following tag.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 2 | PX Variable number/ LPX Variable number/ PX [Array number]/ LPX [Array number] | Specifies the number of the expanded position type variable to be converted. | <Data 2> |

## 3. BF/RF/TF/UF# (User coordinate number)/MTF

Choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 3 | BF | Specifies the conversion in the base coordinate system. | |
| 4 | RF | Specifies the conversion in the robot coordinate system. | |
| 5 | TF | Specifies the conversion in the tool coordinate system. | |
| 6 | UF# (User coordinate number) | Specifies the conversion in the user coordinate system. | No.: 1 to 16 Variable B/I/D/LB/LI/LD can be used. |
| 7 | MTF | Specifies the conversion on the master tool coordinate system. On the master tool coordinate system, the data is converted to a position relative to the master manipulator. | Available only with the optional independent coordinate function. |

**Example**

(1)  CNVRT PX000 PX001 BF

For the job R1, the pulse type position data of P001 is converted to the XYZ type position data in the base coordinate system and stores the converted data in P000.
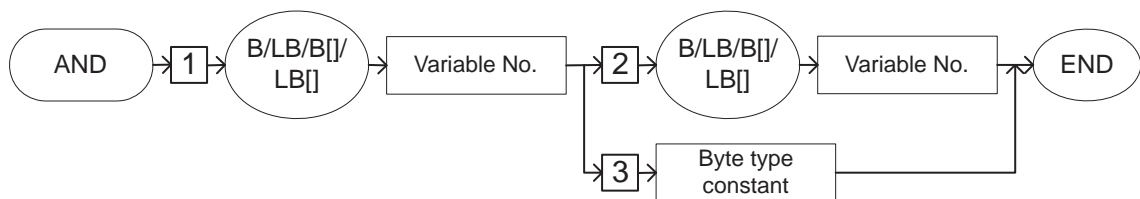
# AND

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Not available | Available | Available |

### Function

Carries out logical multiplication of Data 1 and Data 2, and stores the result in Data 1.

### Construction

AND  <Data 1>  <Data 2>



### Explanation

## 1. B Variable number/LB Variable number/B [Array number]/LB [Array number]

Add the following tag.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 1 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable for which the logical multiplication is carried out. | <Data 1> |

## 2. B Variable number/LB Variable number/B [Array number]/LB [Array number]/Byte type constant

Choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 2 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable for which the logical multiplication is carried out. | <Data 2> |
| 3 | Byte type constant | Specifies the byte type data for which the logical multiplication is carried out. | <Data 2> |

**Example**

(1)  SET B000 5
     SET B010 1
     AND B000 B010

     Carries out the logical multiplication of B000 (0000 0101) and
     B010 (0000 0001), and stores the result (0000 0001=1) in B000.
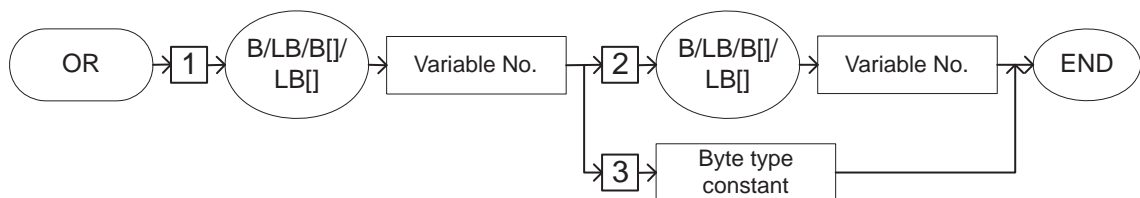
# OR

| SUBSET | STANDARD | EXPANDED |
|---|---|---|
| Not available | Available | Available |

**Function**

Carries out the logical sum of Data 1 and Data 2, and stores the result in Data 1.

**Construction**

OR  <Data 1>  <Data 2>



**Explanation**

## 1. B Variable number/LB Variable number/B [Array number]/LB [Array number]

Add the following tag.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 1 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable for which the logical sum is carried out. | <Data 1> |

## 2. B Variable number/LB Variable number/B [Array number]/LB [Array number]/Byte type constant

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 2 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable for which the logical sum is carried out. | <Data 2> |
| 3 | Byte type constant | Specifies the byte type data for which the logical sum is carried out. | <Data 2> |

**Example**

(1) SET B000 5
SET B010 10
OR B000 B010

Carries out the logical sum of B000 (0000 0101) and B010 (0000 1010), and stores the result (0000 1111=15) in B000.

# NOT

| SUBSET | STANDARD | EXPANDED |
|---|---|---|
| Not available | Available | Available |

## Function

Carries out the logical negation of Data 2, and stores the result in Data 1.

## Construction

NOT  <Data 1>   <Data 2>
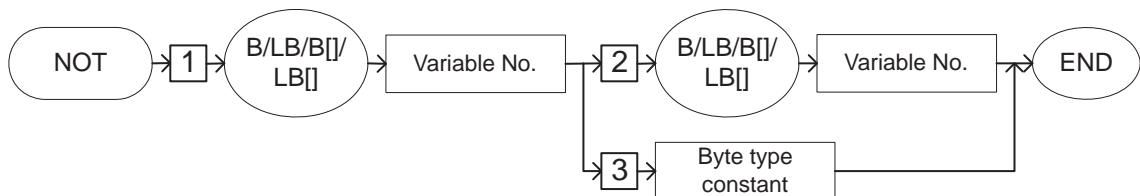


## Explanation

### 1. B Variable number/LB Variable number/B [Array number]/LB [Array number]

Add the following tag.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 1 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable to store the result of logical negation. | <Data 1> |

### 2. B Variable number/LB Variable number/B [Array number]/LB [Array number]/Byte type constant

Choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 2 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable for which the logical negation is carried out. | <Data 2> |
| 3 | Byte type constant | Specifies the byte type data for which the logical negation is carried out. | <Data 2> |

**Example**

(1)  SET B000 0
      SET B010 1
      NOT B000 B010

      Carries out the logical negation of B010 (0000 0001), and stores the result (1111 1110=254) in B000.

# XOR

| SUBSET | STANDARD | EXPANDED |
|---|---|---|
| Not available | Available | Available |

### Function

Carries out the logical exclusive OR of Data 1 and Data 2, and stores the result in Data 1.

### Construction

XOR  <Data 1>  <Data 2>



### Explanation

## 1. B Variable number/LB Variable number/B [Array number]/LB [Array number]

Add the following tag.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 1 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable for which the exclusive OR is carried out. | <Data 1> |

## 2. B Variable number/LB Variable number/B [Array number]/LB [Array number]/Byte type constant

Choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 2 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable for which the exclusive OR is carried out. | <Data 2> |
| 3 | Byte type constant | Specifies the byte type data for which the exclusive OR is carried out. | <Data 2> |

**Example**

(1)  SET B000 1
SET B010 5
XOR B000 B010

Carries out the exclusive OR of B000 (0000 0001) and B010 (0000 0101), and stores the result (0000 0100=4) in B000.

# MFRAME

| SUBSET | STANDARD | EXPANDED |
|---|---|---|
| Not available | Available | Available |

### Function

Creates the user coordinates according to three types of position data; Data 1, Data 2, and Data 3.

Data 1 indicates the position data of the defined point ORG; Data 2 indicates the position data of the defined point XX; and Data 3 indicates the position data of the defined point XY.

### Construction

MFRAME  User coordinate designation   <Data 1>   <Data 2>   <Data 3>
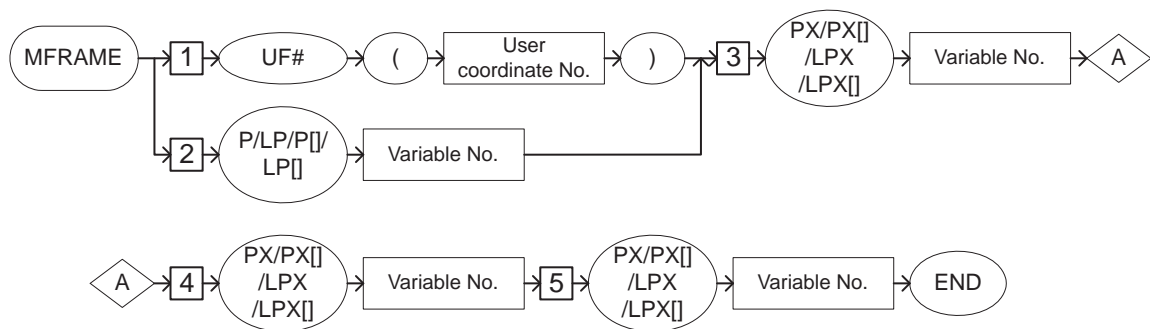


### Explanation

**1. UF# (User coordinate number)/P Variable number/LP Variable number/P [Array number]/LP [Array number]**

Choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 1 | UF# (User coordinate number) | Allocates the number for the user coordinate to be created. | No.: 1 to 16 Variable B/I/D/LB/LI/LD can be used. |
| 2 | P Variable number/ LP Variable number/ P [Array number]/ LP [Array number] | Specifies the number of the position type variable where the coordinate values of the user coordinate to be created is stored. | |

### 2. PX Variable number/LPX Variable number/PX [Array number]/LPX [Array number]

Add the following tag.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 3 | PX Variable number/ LPX Variable number/ PX [Array number]/ LPX [Array number] | Specifies the number of the expanded position type variable where the position data of the user coordinate's defined point ORG has been stored. | <Data 1> |

### 3. PX Variable number/LPX Variable number/PX [Array number]/LPX [Array number]

Add the following tag.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 4 | PX Variable number/ LPX Variable number/ PX [Array number]/ LPX [Array number] | Specifies the number of the expanded position type variable where the position data of the user coordinate's defined point XX has been stored. | <Data 2> |

### 4. PX Variable number/LPX Variable number/PX [Array number]/LPX [Array number]

Add the following tag.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 5 | PX Variable number/ LPX Variable number/ PX [Array number]/ LPX [Array number] | Specifies the number of the expanded position type variable where the position data of the user coordinate's defined point XY has been stored. | <Data 3> |

**Example**

(1)   MFRAME UF#(1) PX000 PX001 PX002

For the job R1, the user coordinate number 1 is created according to three types of position data; P000, P001, and P002 of the user coordinate system.

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# SETE

| SUBSET | STANDARD | EXPANDED |
|---|---|---|
| Not available | Available | Available |

**Function**

Sets Data 2 in the element of position type variable of Data 1.

**Construction**

SETE  <Data 1>  (Element number)  <Data 2>
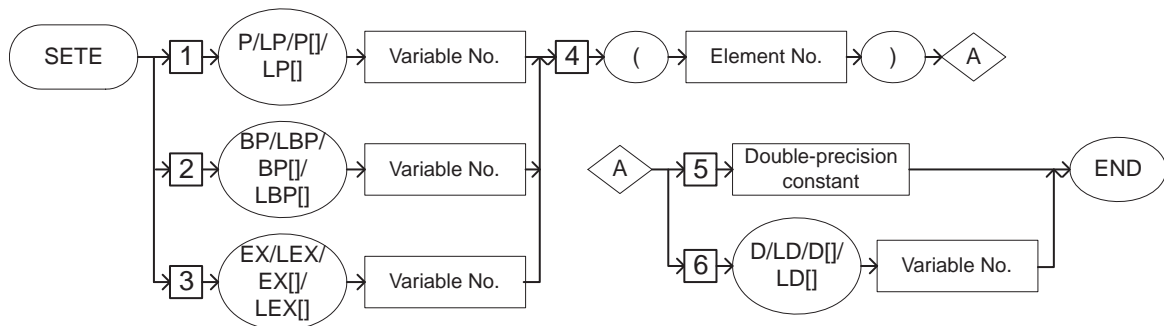


**Explanation**

**1. P Variable number/LP Variable number/P [Array number]/LP [Array number]/BP Variable number/LBP Variable number/BP [Array number]/LBP [Array number]/BP [Array number]/LBP [Array number]/EX Variable number/LEX Variable number/EX [Array number]/LEX [Array number]**

Choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 1 | P Variable number/ LP Variable number/ P [Array number]/ LP [Array number] | Specifies the number of the robot axis position type variable where Data 2 is set as an element. | <Data 1> |
| 2 | BP Variable number/ LBP Variable number/ BP [Array number]/ LBP [Array number] | Specifies the number of the base axis position type variable where Data 2 is set as an element. | <Data 1> |
| 3 | EX Variable number/ LEX Variable number/ EX [Array number]/ LEX [Array number] | Specifies the number of the station axis position type variable where Data 2 is set as an element. | <Data 1> |

### 2. (Element number)

Add the following tag.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 4 | (Element number) | Specifies the element of the position type variable to be set. | Element No.: 1 to 255 Variable B/LB can be used. |

### 3. Double-precision type constant/D Variable number/ LD Variable number/D [Array number]/LD [Array number]

Choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 5 | Double-precision type constant | Specifies the double-precision type data to be set. | <Data 2> |
| 6 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the number of the double-precision type variable to be set. | <Data 2> |

**Example**

(1)   SETE P000 (3) 2000

2000 is set in the Z axis data of P000.

# GETE

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Not available | Available | Available |

**Function**

Stores the element of position type variable of Data 2 in Data 1.

**Construction**

GETE  <Data 1>  <Data 2>  (Element number)
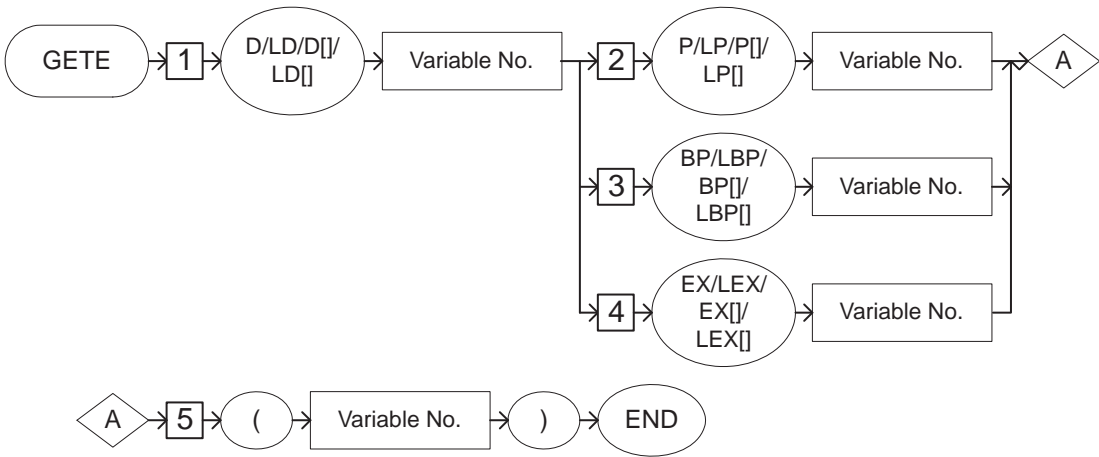


**Explanation**

## 1. D Variable number/LD Variable number/D [Array number]/LD [Array number]

Add the following tag.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 1 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the number of the double-precision type variable where the element of position type variable is stored. | <Data 1> |

**2. P Variable number/LP Variable number/P [Array number]/LP [Array number]/BP Variable number/LBP Variable number/BP [Array number]/LBP [Array number]/EX Variable number/LEX Variable number/EX [Array number]/LEX [Array number]**

Choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 2 | P Variable number/ LP Variable number/ P [Array number]/ LP [Array number | Specifies the number of the robot axis position type variable to be stored. | \<Data 2\> |
| 3 | BP Variable number/ LBP Variable number/ BP [Array number]/ LBP [Array number] | Specifies the number of the base axis position type variable to be stored. | \<Data 2\> |
| 4 | EX Variable number/ LEX Variable number/ EX [Array number]/ LEX [Array number] | Specifies the number of the station axis position type variable to be stored. | \<Data 2\> |

**3. (Element number)**

Add the following tag.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 5 | (Element number) | Specified the number of the of the position type variable element to be stored. | Element No.: 1 to 255 Variable B/LB can be used. |

**Example**

(1)  GETE D000 P000 (3)

The Z axis data of P000 is stored in D000.

# GETS

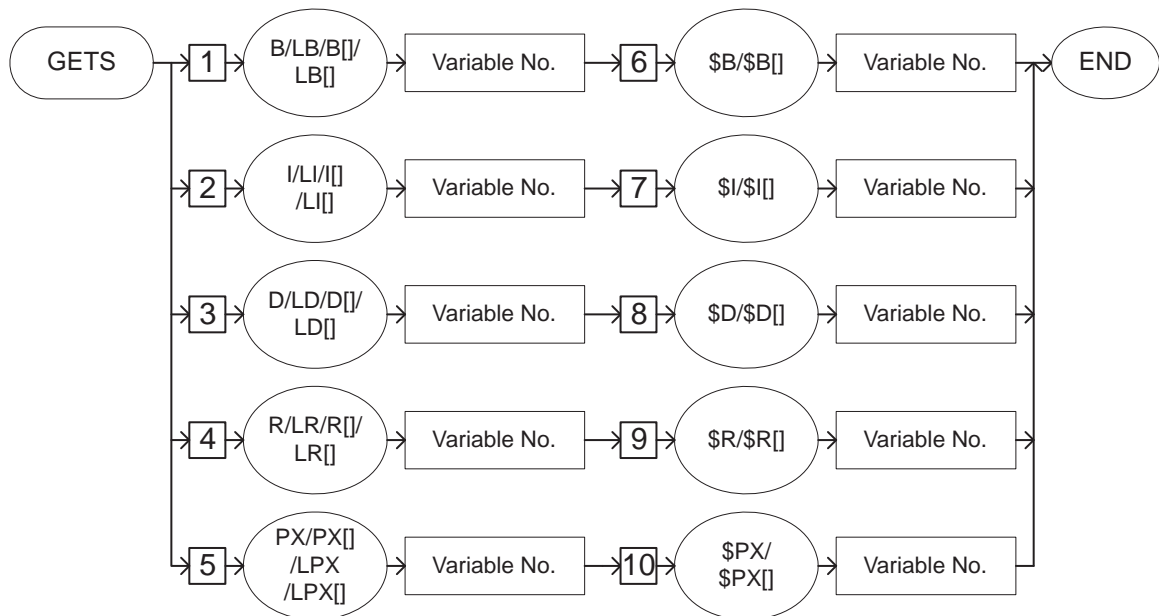| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Not available | Available | Available |

**Function**

Stores the system variable of Data 2 in Data 1.

**Construction**

GETS  <Data 1>  <Data 2>

**Explanation**

**1. B Variable number/LB Variable number/B [Array number]/LB [Array number]/I Variable number/LI Variable number/I [Array number]/LI [Array number]/D Variable number/LD Variable number/D [Array number]/LD [Array number]/R Variable number/LR Variable number/R [Array number]/LR [Array number]/PX Variable number/LPX Variable number/PX [Array number]/LPX [Array number]**

Choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 1 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable to store the system variable. | <Data 1> |
| 2 | I Variable number/ LI Variable number/ I [Array number]/ LI [Array number] | Specifies the number of the integer type variable to store the system variable. | <Data 1> |
| 3 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the number of the double-precision type variable to store the system variable. | <Data 1> |
| 4 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real-number type variable to store the system variable. | <Data1> |
| 5 | PX Variable number/ LPX Variable number/ PX [Array number]/ LPX [Array number] | Specifies the number of the expanded position type variable to store the system variable. | <Data 1> |

SUPPLE
-MENT

**System variable**

The system variables are written by the controller system and can be referred only by a GETS instruction.  The following system variables are available.

| System Variable | Type | No. | Explanation |
|---|---|---|---|
| $B type variable | Byte type | $B002 | Detected /Not detected by the optional SRCH instruction<br>0: Not detected, 1: Detected |
| | | $B008 | Result of the optional SYSTART instruction<br>1: Normal termination, 0: Abnormal termination |
| | | $B014 | Result of the optional HSEN instruction<br>1: Setting status completed, 0: Others |
| | | $B016 | The number of RIN#(1)s detected by the optional NSRCH instruction |
| | | $B017 | The number of RIN#(2)s detected by the optional NSRCH instruction |
| | | $B018 | The number of RIN#(3)s detected by the optional NSRCH instruction |
| | | $B019 | The number of RIN#(4)s detected by the optional NSRCH instruction |
| | | $B020 | The number of RIN#(5)s detected by the optional NSRCH instruction |
| | | $B021 | The number of RIN#(6)s detected by the optional NSRCH instruction |
| $PX type variable | Expanded position type | $PX000 | Current value (pulse type) |
| | | $PX001 | Current value (XYZ type) |
| | | $PX002 | Position detected by the optional SRCH instruction (pulse type) |
| | | $PX003 | Position detected by the optional STCH instruction (XYZ type) |
| | | $PX005 | Teaching position (pulse type) |
| | | $PX006 | Operation target position (pulse type) |
| | | $PX008 | Feedback value (XYZ type) |
| | | $PX011 to $PX018 | Registered position of REFP 1 to 8 |
| | | $PX021 to $PX028 | Registered position of SREFP 1 to 8 |
| | | $PX100 to $PX149 | RIN#(1)'s detected position by the optional NSRCH instruction (pulse type) |

Continued

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SUPPLE-MENT

Continued

| System Variable | Type | No. | Explanation |
|---|---|---|---|
| $PX type variable | Expanded position type | $PX150 to $PX199 | RIN#(1)'s detected position by the optional NSRCH instruction (XYZ type) |
| | | $PX200 to $PX249 | RIN#(2)'s detected position by the optional NSRCH instruction (pulse type) |
| | | $PX250 to $PX299 | RIN#(2)'s detected position by the optional NSRCH instruction (XYZ type) |
| | | $PX300 to $PX349 | RIN#(3)'s detected position by the optional NSRCH instruction (pulse type) |
| | | $PX350 to $PX399 | RIN#(3)'s detected position by the optional NSRCH instruction (XYZ type) |
| | | $PX400 to $PX449 | RIN#(4)'s detected position by the optional NSRCH instruction (pulse type) |
| | | $PX450 to $PX499 | RIN#(4)'s detected position by the optional NSRCH instruction (XYZ type) |
| | | $PX500 to $PX549 | RIN#(5)'s detected position by the optional NSRCH instruction (pulse type) |
| | | $PX550 to $PX599 | RIN#(5)'s detected position by the optional NSRCH instruction (XYZ type) |
| | | $PX600 to $PX649 | RIN#(6)'s detected position by the optional NSRCH instruction (pulse type) |
| | | $PX650 to $PX699 | RIN#(6)'s detected position by the optional NSRCH instruction (XYZ type) |

### 2. $B Variable number/$B [Array number]

When a B Variable number, LB Variable number, B [Array number], or LB [Array number] is selected from the table in part 1 of this Explanation, add the following tag.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 6 | $B Variable number/ $B [Array number] | Specifies the number of the byte type system variable to be stored. | <Data 2> |

### 3. $I Variable number/$I [Array number]

When an I Variable number, LI Variable number, I [Array number], or LI [Array number] is selected from the table in part 1 of this Explanation, add the following tag.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 7 | $I Variable number/ $I [Array number] | Specifies the number of the integer type system variable to be stored. | <Data 2> |

### 4. $D Variable number/$D [Array number]

When a D Variable number, LD Variable number, D [Array number], or LD [Array number] is selected from the table in part 1 of this Explanation, add the following tag.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 8 | $D Variable number/ $D [Array number] | Specifies the number of the double-precision type system variable to be stored. | <Data 2> |

### 5. $R Variable number/$R [Array number]

When an R Variable number, LR Variable number, R [Array number], or LR [Array number] is selected from the table in part 1 of this Explanation, add the following tag.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 9 | $R Variable number/ $R [Array number] | Specifies the number of the real-number type system variable to be stored. | <Data 2> |

### 6. $PX Variable number/$PX [Array number]

When a PX Variable number, LPX Variable number, PX [Array number], or LPX [Array number] is selected from the table in part 1 of this Explanation, add the following tag.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 10 | $PX Variable number/ $PX [Array number] | Specifies the number of the expanded position type system variable to be stored. | <Data 2> |

**Example**

(1)  GETS B000 $B002

The result of the SRCH instruction is stored in B000.

(2)  GETS PX000 $PX000

For the job R1, the pulse type current value is stored in P000.

# SQRT

| SUBSET | STANDARD | EXPANDED |
|---|---|---|
| Not available | Available | Available |

**Function**

Calculates the square root of Data 2, and stores the result in Data 1.

**Construction**

SQRT  <Data 1>  <Data 2>



**Explanation**

### 1. R Variable number/LR Variable number/R [Array number]/LR [Array number]

Add the following tag.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 1 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real-number type variable to store the result. | <Data 1> |

### 2. R Variable number/LR Variable number/R [Array number]/LR [Array number]/Real-number type constant

Choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 2 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real-number type variable whose square root is calculated. | <Data 2> |
| 3 | Real-number type constant | Specifies the real-number type data whose square root is calculated. | <Data 2> |

**Example**

(1)  SQRT R000 2

1.414214E + 00 is stored in R000.

# SIN

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Not available | Available | Available |

## Function

Calculates the sine of Data 2, and stores the result in Data 1.

## Construction

SIN <Data 1> <Data 2>



## Explanation

### 1. R Variable number/LR Variable number/R [Array number]/LR [Array number]

Add the following tag.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 1 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real-number type variable to store the result. | <Data 1> |

### 2. R Variable number/LR Variable number/R [Array number]/LR [Array number]/Real-number type constant

Choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 2 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real-number type variable whose sine is calculated. | <Data 2> |
| 3 | Real-number type constant | Specifies the real-number type data whose sine is calculated. | <Data 2> |

**Example**

(1) SIN R000 60

  8.660254E - 01 is stored in R000.

# COS

| SUBSET | STANDARD | EXPANDED |
|---|---|---|
| Not available | Available | Available |

**Function**

Calculates the cosine of Data 2, and stores the result in Data 1.

**Construction**

COS  <Data 1>  <Data 2>



**Explanation**

## 1. R Variable number/LR Variable number/R [Array number]/LR [Array number]

Add the following tag.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 1 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real-number type variable to store the result. | <Data 1> |

## 2. R Variable number/LR Variable number/R [Array number]/LR [Array number]/Real-number type constant

Choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 2 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real-number type variable whose cosine is calculated. | <Data 2> |
| 3 | Real-number type constant | Specifies the real-number type data whose cosine is calculated. | <Data 2> |

**Example**

(1)  COS R000 60

5.000000E - 01 is stored in R000.

# ATAN

| SUBSET | STANDARD | EXPANDED |
|---|---|---|
| Not available | Available | Available |

**Function**

Calculates the arc tangent of Data 2, and stores the result in Data 1.

**Construction**

ATAN  <Data 1>  <Data 2>



**Explanation**

## 1. R Variable number/LR Variable number/R [Array number]/LR [Array number]

Add the following tag.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 1 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real-number type variable to store the result. | <Data 1> |

## 2. R Variable number/LR Variable number/R [Array number]/LR [Array number]/Real-number type constant

Choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 2 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real-number type variable whose arc tangent is calculated. | <Data 2> |
| 3 | Real-number type constant | Specifies the real-number type data whose arc tangent is calculated. | <Data 2> |

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**Example**

(1)  ATAN R000 60

8.904516E + 01 is stored in R000.

# MULMAT

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Not available | Available | Available |

### Function

Calculates the matrix multiplication of Data 2 and Data 3, and stores the result in Data 1.

### Construction

MULMAT  <Data 1>  <Data 2>  <Data 3>



### Explanation

## 1. P Variable number/LP Variable number/P [Array number]/LP [Array number]

Add the following tag.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 1 | P Variable number/ LP Variable number/ P [Array number]/ LP [Array number] | Specifies the number of the position type variable to store the result. | <Data 1> |

## 2. P Variable number/LP Variable number/P [Array number]/LP [Array number]

Add the following tag.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 2 | P Variable number/ LP Variable number/ P [Array number]/ LP [Array number] | Specifies the number of the position type variable for which the matrix multiplication is calculated. | <Data 2> |

### 3. P Variable number/LP Variable number/P [Array number]/LP [Array number]

Add the following tag.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 3 | P Variable number/ LP Variable number/ P [Array number]/ LP [Array number] | Specified the number of the position type variable for which the matrix multiplication is calculated. | <Data 3> |

**Example**

---

SUPPLE -MENT

**MULMAT and INVMAT instructions**

The amount of shift for a three-dimensional shift can be obtained by using the MULMAT and INVMAT instructions.

The instructions, exclusive to the FS100, to obtain the shift amount are used for the optional three-dimensional shift function. However, the amount of the three-dimensional shift can be also obtained by using the standard instructions, MULMAT and INVMAT.

The target value for a three-dimensional shift can be calculated by the following equation.

$$Pnew=P3d \times Pold$$

Where Pnew: Target position after a three-dimensional shift

P3d: Three-dimensional shift amount

Pold: Taught position

The amount of a three-dimensional shift can be obtained as follows:

$$P3d=Pnew \times Pold^{-1}$$

---

(1)  MOVL P010 V=500
      GETS PX020 $PX001          Stores the current XYZ type value in P020.
      INVMAT P021 P010           Calculates the inverse matrix of the taught position.
      MULMAT P023 P020 P021      The amount of the three-dimensional

# INVMAT

| SUBSET | STANDARD | EXPANDED |
|---|---|---|
| Not available | Available | Available |

### Function

Calculates the inverse matrix of Data 2, and stores the result in Data 1.

### Construction

INVMAT  <Data 1>  <Data 2>



### Explanation

## 1. P Variable number/LP Variable number/P [Array number]/LP [Array number]

Add the following tag.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 1 | P Variable number/ LP Variable number/ P [Array number]/ LP [Array number] | Specifies the number of the position type variable to store the result. | <Data 1> |

## 2. P Variable number/LP Variable number/P [Array number]/LP [Array number]

Add the following tag.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 2 | P Variable number/ LP Variable number/ P [Array number]/ LP [Array number] | Specifies the number of the position type variable for which the inverse matrix is calculated. | <Data 2> |

**Example**

(1)  MOVL P010 V=500
      GETS PX020 $PX001      Stores the current XYZ type value in P020.
      INVMAT P021 P010      Calculates the inverse matrix of the taught position.
      MULMAT P023 P020 P021    The amount of the three-dimensional

# SETREG

| SUBSET | STANDARD | EXPANDED |
|---|---|---|
| Not available | Available | Available |

## Function

Copies the specified integer type variable data into the register.

## Construction
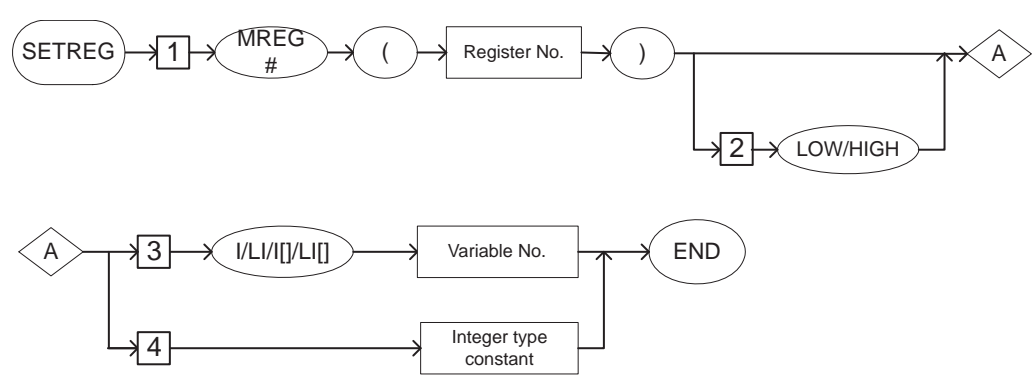


## Explanation

### 1. MREG# (Register number)

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 1 | MREG# (Register number) | Specifies the register number to save the data. | No.: 0 to 599 Variable B/I/D/LB/LI/LD can be used. |

### 2. LOW/HIGH

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 2 | LOW/HIGH | Specifies when copying the data into the lower/higher 8 bits of the register. | |

### 3. I Variable number/LI Variable number/I [Array number]/LI [Array number]

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 3 | I Variable number/<br>LI Variable number/<br>I [Array number]/<br>LI [Array number] | Specifies the data number to be saved in the register. | |
| 4 | Integer type variable | Input the data to be saved in the register. | |

# GETREG

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Not available | Available | Available |

### Function

Copies the specified register data into the integer type variable.

### Construction
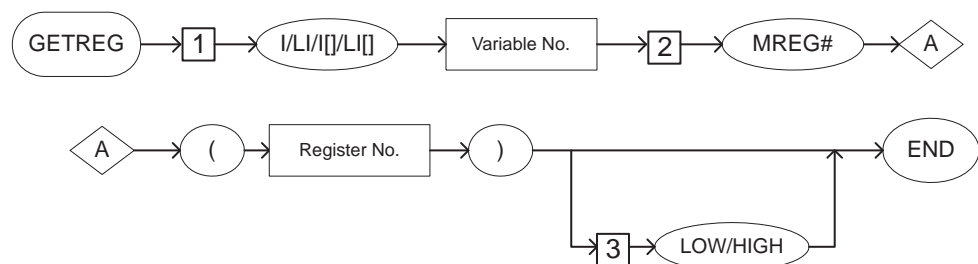


### Explanation

#### 1. I Variable number/LI Variable number/I [Array number]/LI [Array number]

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 1 | I Variable number/ LI Variable number/ I [Array number]/ LI [Array number] | Specifies the number of the integer type variable to save the register data. | |

#### 2. MREG# (Register number).

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 2 | MREG# (Register number) | Specifies the desired register number to be saved into the integer type variable. | No.: 0 to 999 Variable B/I/D/LB/LI/LD can be used. |

#### 3. LOW/HIGH

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 3 | LOW/HIGH | Specifies when saving the lower/higher 8 bits out of 16 bits register. | |

## 2.4   Move Instruction

# MOVJ

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Available | Available | Available |

**Function**

Moves to the teaching position by joint interpolation.

**Construction**

The tag which can be used is limited by the type of the job.



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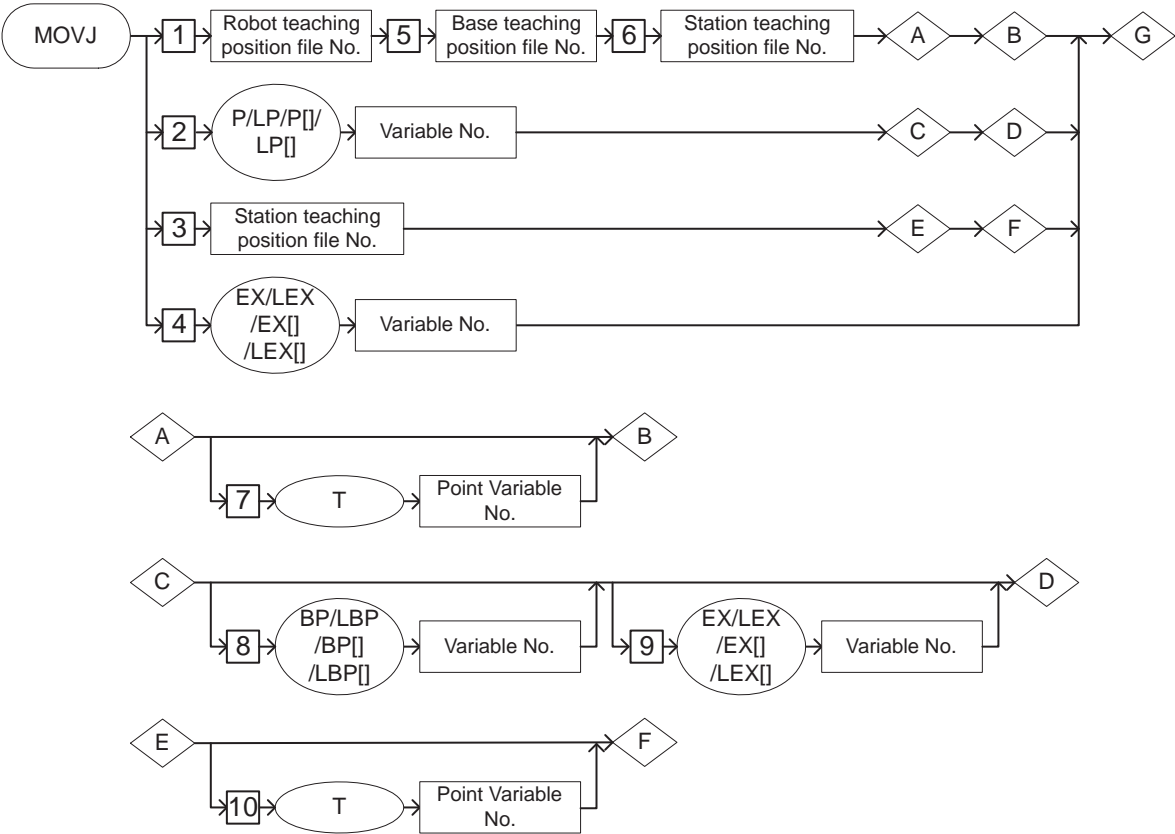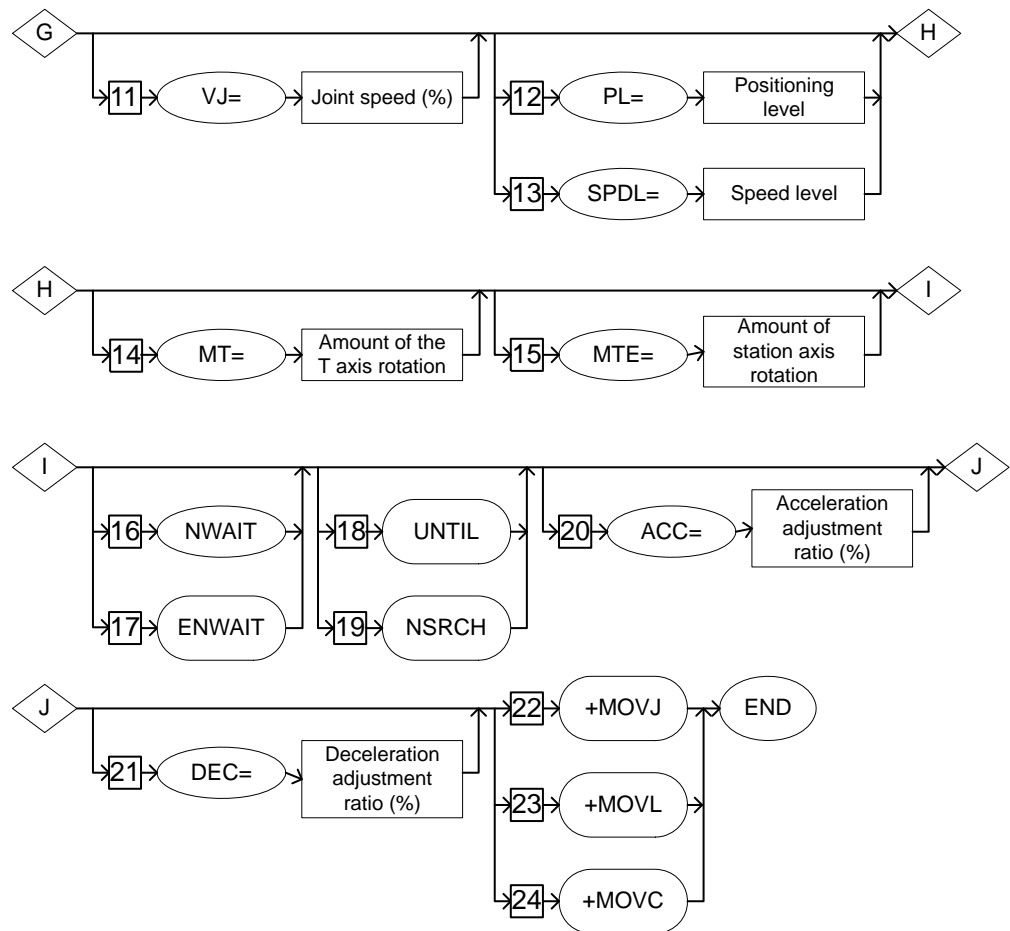
*Table 2-1: Job Type and Control Group*

| No. | Job Type | Control Group | Remarks |
|-----|----------|---------------|---------|
| 1 | Single | One manipulator (standard) | |
| 2 | Single | One manipulator with base axis | |
| 3 | Single | One manipulator with station axis | |
| 4 | Single | One manipulator with base and station axes | |
| 5 | Single | Station axis only | |
| 6 | Coordinated | Two manipulators | Optional |
| 7 | Coordinated | Two manipulators with base axis | Optional |

*Table 2-2: Availability of Each Tag*

| No | Tag | Control Group | | | | | | | Note |
|---|---|---|---|---|---|---|---|---|---|
| | | **1** | **2** | **3** | **4** | **5** | **6** | **7** | |
| 1 | Robot teaching position file number | ● | ● | ● | ● | × | ● | ● | |
| 2 | P/LP/P[]/LP[] | ● | ● | ● | ● | × | ● | ● | |
| 3 | Station teaching position file number | × | × | × | × | ● | × | × | |
| 4 | EX/LEX/EX[]/LEX[] | × | × | × | × | ● | × | × | |
| 5 | Base axis teaching position file number | × | ● | × | ● | × | × | × | |
| 6 | Station teaching position file number | × | × | ● | ● | × | × | × | |
| 7 | T | ○ | ○ | ○ | ○ | × | ○ | ○ | Optional |
| 8 | BP/LBP/BP[]/LBP[] | × | ● | × | ● | × | × | ● | |
| 9 | EX/LEX/EX[]/LEX[] | × | × | ● | ● | × | × | × | |
| 10 | T | × | × | × | × | ○ | × | × | Optional |
| 11 | VJ= | ● | ● | ● | ● | ● | ● | ● | |
| 12 | PL= | ● | ● | ● | ● | ● | ● | ● | |
| 13 | SPDL= | ○ | ○ | ○ | ○ | × | ○ | ○ | Optional |
| 14 | MT= | ○ | ○ | ○ | ○ | × | × | × | Optional |
| 15 | MTE= | × | × | ○ | ○ | ○ | × | × | Optional |
| 16 | NWAIT | ● | ● | ● | ● | ● | ● | ● | |
| 17 | ENWAIT | ○ | ○ | ○ | ○ | ○ | ○ | ○ | Optional |
| 18 | UNTIL | ● | ● | ● | ● | ● | ● | ● | |
| 19 | NSRCH | ○ | ○ | ○ | ○ | ○ | ○ | ○ | Optional |
| 20 | ACC= | ● | ● | ● | ● | ● | ● | ● | |
| 21 | DEC= | ● | ● | ● | ● | ● | ● | ● | |
| 22 | +MOVJ | × | × | × | × | × | ○ | ○ | Optional |
| 23 | +MOVL | × | × | × | × | × | ○ | ○ | Optional |
| 24 | +MOVC | × | × | × | × | × | ○ | ○ | Optional |

●: Available
○: Available only with optional function enabled
×: Not available

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**Explanation**

## 1. Robot teaching position file number /P Variable number /LP Variable number /P [Array number] /LP [Array number] /Station teaching position file number /EX Variable number /LEX Variable number /EX [Array number] /LEX [Array number]

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 1 | Robot teaching position file number | The robot axis teaching position in each step is written in this file unconditionally when the step is taught. This teaching position cannot be edited. | On the job display, this tag is not displayed. |
| 2 | P Variable number/ LP Variable number/ P [Array number]/ LP [Array number] | Specifies the position variable number of the robot axis. Moves to the position data set in the variable of the specified number. | Variable number: 000 to 127 |
| 3 | Station teaching position file number | The station axis teaching position in each step is written in this file unconditionally when the step is taught. This teaching position cannot be edited. | On the job display, this tag is not displayed. |
| 4 | EX Variable number/ LEX Variable number/ EX [Array number]/ LEX [Array number] | Specifies the position variable number of the station axis. Moves to the position data set in the variable of the specified number. | Variable number: 000 to 127 |

SUPPLE -MENT

**Position Variables**

There are the following three kinds of position variables.

Robot axis        :  P000-P127

Base axis         :  BP000-BP127

Station axis      :  EX000-EX127

A position variable can store the position data as pulse type or XYZ type.

SUPPLE -MENT

**Local Variables and Arrangement Variables**

Local variables and arrangement variables are available only for the expanded instruction set.

P000 and P[0] show the same one.

## 2. Base Teaching Position File Number

When a robot teaching position file number is selected from the table in part 1 of this Explanation, add the following tag.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 5 | Base teaching position file number | The base axis teaching position in each step is written in this file unconditionally when the step is taught. This teaching position cannot be edited. | On the job display, this tag is not displayed. |

## 3. Station Teaching Position File Number

When a robot teaching position file number is selected from the table in part 1 of this Explanation, add the following tag.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 6 | Station teaching position file number | The station axis teaching position in each step is written in this file unconditionally when the step is taught. This teaching position cannot be edited. | On the job display, this tag is not displayed. |

## 4. T Point Variable number

When a robot teaching position file number is selected from the table in part 1 of this Explanation, the following tag can be added or omitted.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 7 | T Point Variable number | Specifies the number of the point variable. The point variable manages the teaching positions registered in the job, and is used to move the manipulator to the same position several times in one job. | Available only with the optional point variable function. |

### 5. BP Variable number /LBP Variable number /BP [Array number] /LBP [Array number]

When a P Variable number, LP Variable number, P [Array number], or LBP [Array number] is selected from the table in part 1 of this Explanation, the following tag can be added.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 8 | BP Variable number/ LBP Variable number/ BP [Array number] / LBP [Array number] | Specifies the position variable number of the base axis. Moves to the position data set in the variable of the specified number. | Variable number: 000 to 127 |

### 6. EX Variable number /LEX Variable number /EX [Array number] /LEX [Array number]

When a P Variable number, LP Variable number, P [Array number], or LP [Array number] is selected from the table in part 1 of this Explanation, the following tag can be added.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 9 | EX Variable number/ LEX Variable number/ EX [Array number]/ LEX [Array number] | Specifies the position variable number of the station axis. Moves to the position data set in the variable of the specified number. | Variable number: 000 to 127 |

### 7. T Point Variable number

When a robot teaching position file number is selected from the table in part 1 of this Explanation, the following tag can be added or omitted.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 10 | T Point Variable number | Specifies the number of the point variable. The point variable manages the teaching positions registered in the job, and is used to move the manipulator to the same position several times in one job. | Available only with the optional point variable function. |

### 8. VJ=Joint speed

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 11 | VJ=Joint speed | Specifies the joint speed. The joint speed is shown in the ratio to the highest speed. When the joint speed is omitted, the operation is performed at the speed decided beforehand. | Speed: 0.01% to 100.00% Variable B/B[]/LB/LB[]/I/ I[]/LI/LI[]/D/D[]/ LD/LD[] can be used. (Units: 0.01%) |

## 9. PL=Position level /SPDL=Speed level

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 12 | PL=Position level | Specifies the position level.<br>The approach level when the manipulator passes the position where the teaching procedure was performed is called a positioning level. | Level: 0 to 8<br><br>Variable B/B[]/LB/LB[]/I/I[]/LI/LI[]/D/D[]/ LD/LD[] can be used. |
| 13 | SPDL=Speed level | Specifies the speed level.<br>The speed level is the tag for the robot to end the execution of the move instruction in the state of servo float control, and to confirm the state which has stopped. The operation ends when the speed feedback pulse of all axes goes below a constant value, and the manipulator is considered to have stopped. | Level: Only 0<br>Available only with the optional servo-float function.<br>Refer to the servo-float function for details. |

SUPPLE-MENT

**Position level**

The approach level when the manipulator passes the position where the teaching procedure was performed is called a position level.
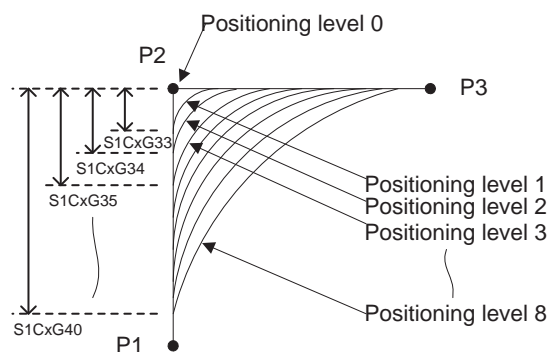


The approach level is set by the following parameters. (position zone)

Position level 1: S1CxG33($\mu$m)

Position level 2: S1CxG34($\mu$m)

Position level 3: S1CxG35($\mu$m)

Position level 4: S1CxG36($\mu$m)

Position level 5: SICxG37 ($\mu$m)

Position level 6: SICxG38 ($\mu$m)

Position level 7: SICxG39 ($\mu$m)

Position level 8: SICxG40 ($\mu$m)

### 10. MT=Amount of the T axis rotation

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 14 | MT=Amount of the T axis rotation | Specifies the amount of the T axis rotation. The amount of the T axis rotation specifies the amount of movement of T axis by the number of rotations. | Amount of rotation: -32768 to 32767 Available only with the optional axis endless function. Refer to the axis endless function for details. |

### 11. MTE= Amount of the station axis rotation

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 15 | MTE= Amount of the station axis rotation | Specifies the amount of the station axis rotation. The operation of the station axis can be specified by the number of rotations. | Amount of rotation: -32768 to 32767 Available only with the optional axis endless function. |

### 12. NWAIT/ENWAIT

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 16 | NWAIT | Specifies the NWAIT instruction. The NWAIT instruction carries out the instructions excluding the move instruction from that step on, at the same time as the manipulator is carrying out that step. | |
| 17 | ENWAIT | Specifies the ENWAIT instruction. The ENWAIT instruction carries out the instructions excluding the move instructions from that step on, before reaching the next step. | Available only with the conditional NWAIT function (option: S2C576) Refer to ENWAIT of *chapter 2.6 "Instruction Which Adheres to an Instruction" at page 2-220.* |

### 13. UNTIL/NSRCH

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 18 | UNTIL | Specifies the UNTIL instruction.<br>The UNTIL instruction is a tag instruction by which the condition of the input signal is evaluated during operation.<br>When the condition of the input signal is full, the robot executes the next instruction. | Refer to UNTIL of *chapter 2.6  "Instruction Which Adheres to an Instruction" at page 2-218.* |
| 19 | NSRCH | Specifies the NSRCH instruction.<br>The NSRCH instruction carries out the position detection without stopping the manipulator's motion. | Available only with the optional search-in-motion function. |

### 14. ACC=Acceleration adjustment ratio

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 20 | ACC=Acceleration adjustment ratio | Specifies the acceleration adjustment ratio.<br>The ACC instruction reduces the amount of acceleration in the specified ratio. | Acceleration adjustment ratio: 20% to 100%<br>Variable B/B[]/LB/LB[]/I/I[]/LI/LI[]/D/D[]/LD/LD[] can be used. |

### 15. DEC=Deceleration adjustment ratio

The following tag can be added or omitted.

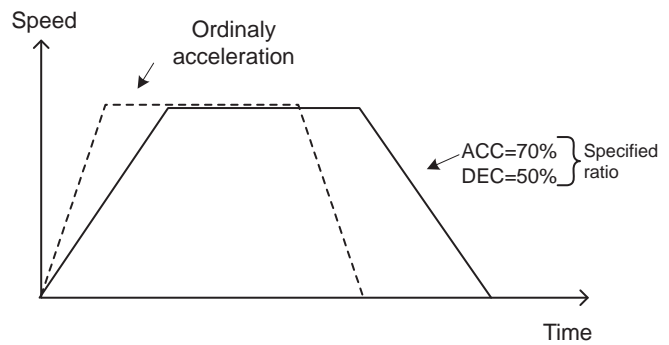| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 21 | DEC=Deceleration adjustment ratio | Specifies the deceleration adjustment ratio.<br>The DEC instruction reduces the amount of deceleration in the specified ratio. | Deceleration adjustment ratio: 20% to 100%<br>Variable B/B[]/LB/LB[]/I/I[]/LI/LI[]/D/D[]/LD/LD[] can be used. |

**Acceleration adjustment ratio**

SUPPLE
-MENT

The acceleration adjustment ratio (ACC) reduces the amount of acceleration in the specified ratio.

Using this function can reduce the load inertia on the tool and the workpiece.

### 16. +MOVJ/+MOVL/+MOVC/+MOVS

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 22 | +MOVJ | Specifies the joint interpolation motion instruction on the master manipulator's side. | Available only with the optional coordinate function. Refer to the independent/coordinated function. |
| 23 | +MOVL | Specifies the linear interpolation motion instruction on the master manipulator's side. | Available only with the optional coordinate function. Refer to the independent/coordinated function. |
| 24 | +MOVC | Specifies the circular interpolation motion instruction on the master manipulator's side. | Available only with the optional coordinate function. Refer to the independent/coordinated function. |

**Example**

(1)  MOVJ P000 VJ=50.00
Move from the manipulator's waiting position to step 1. Move by
joint interpolation at a speed of 50%.
The position in Step 1 is registered to the P variable no. 0.
The path during movement is not specified. Be careful of interfer-
ence.
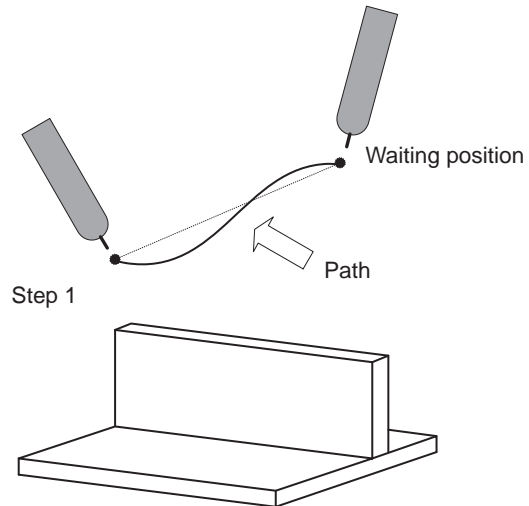
# MOVL

| SUBSET | STANDARD | EXPANDED |
|:---:|:---:|:---:|
| Available | Available | Available |

## Function

Moves to the teaching position by linear interpolation.

## Construction

The tag which can be used is limited by the type of the job.
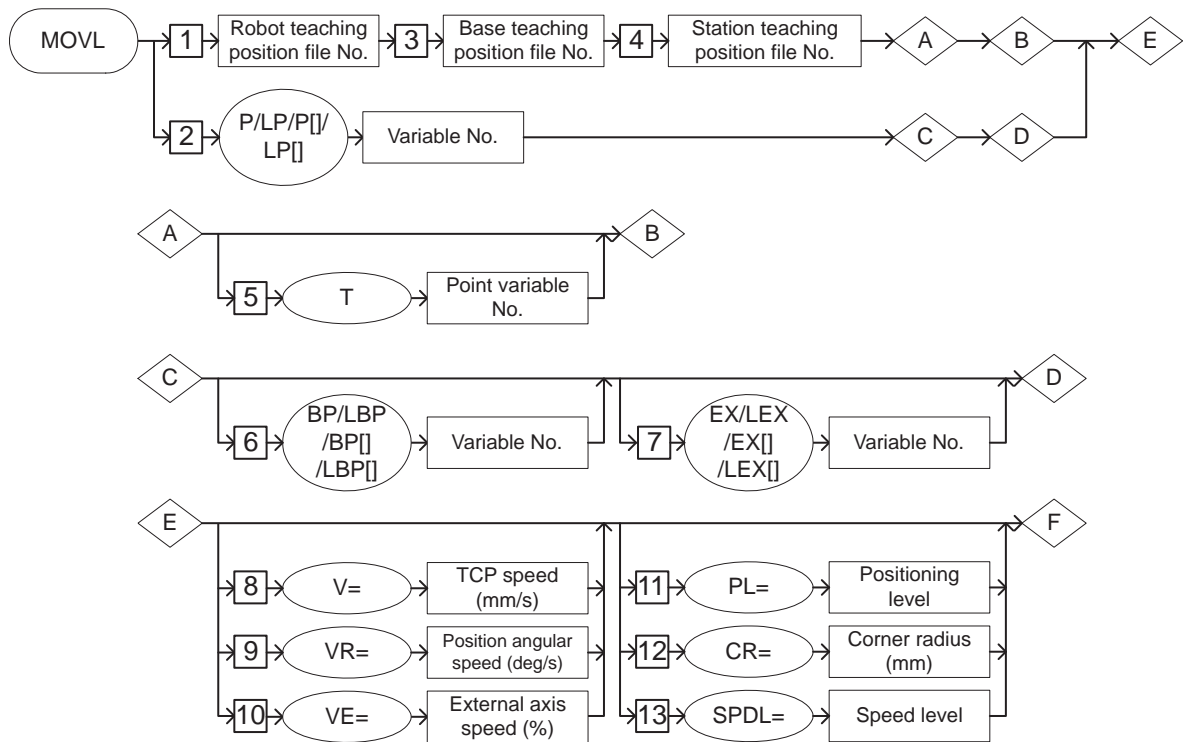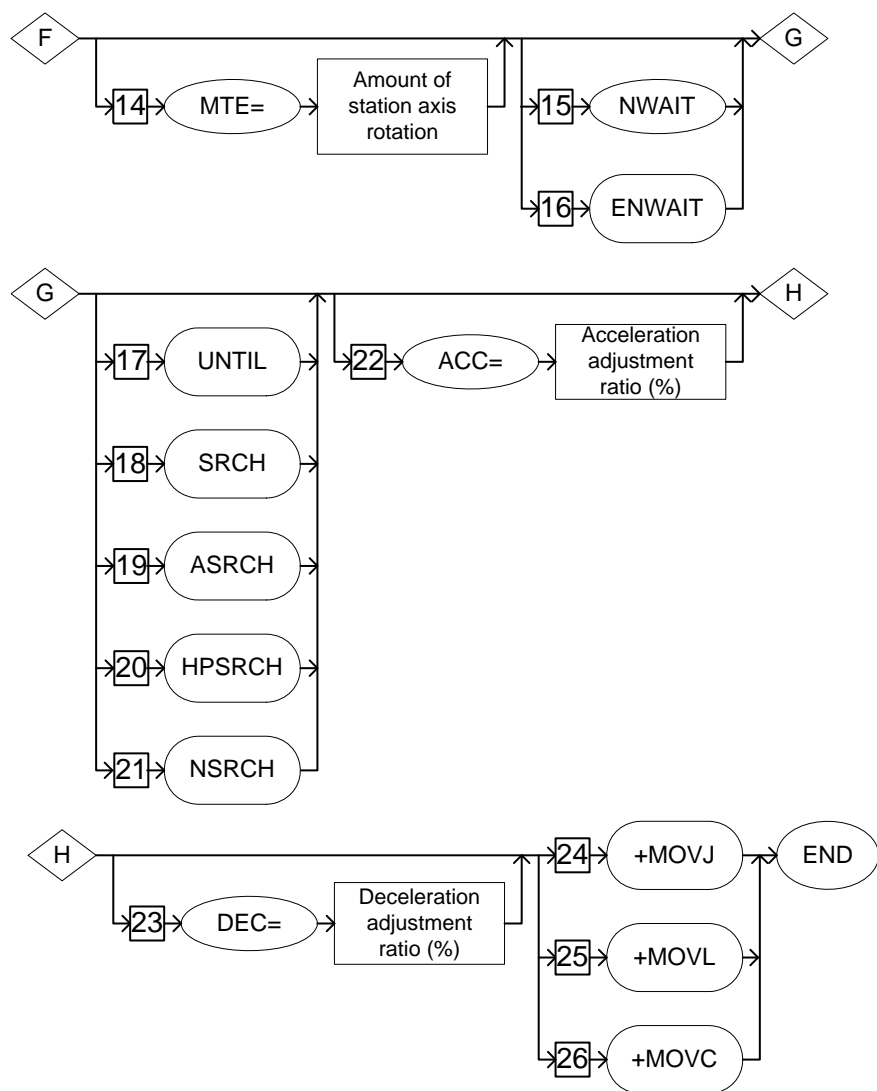
Table 2-3: Job Type and Control Group

| No. | Job Type | Control Group | Remarks |
|---|---|---|---|
| 1 | Single | One manipulator (standard) | |
| 2 | Single | One manipulator with base axis | |
| 3 | Single | One manipulator with station axis | |
| 4 | Single | One manipulator with base and station axes | |
| 5 | Coordinated | Two manipulators | Optional |
| 6 | Coordinated | Two manipulators with base axis | Optional |

*Table 2-4: Availability of Each Tag*

| No | Tag | Control Group | | | | | | Note |
|---|---|---|---|---|---|---|---|---|
| | | **1** | **2** | **3** | **4** | **5** | **6** | |
| 1 | Robot teaching position file number | ● | ● | ● | ● | ● | ● | |
| 2 | P/LP/P[]/LP[] | ● | ● | ● | ● | ● | ● | |
| 3 | Base axis teaching position file number | × | ● | × | ● | × | ● | |
| 4 | Station teaching position file number | × | × | ● | ● | × | × | |
| 5 | T | ○ | ○ | ○ | ○ | ○ | ○ | Optional |
| 6 | BP/LBP/BP[]/LBP[] | × | ● | × | ● | × | ● | |
| 7 | EX/LEX/EX[]/LEX[] | × | × | ● | ● | × | × | |
| 8 | V= | ● | ● | ● | ● | ● | ● | |
| 9 | VR= | ● | ● | ● | ● | ● | ● | |
| 10 | VE= | × | × | ● | ● | × | × | |
| 11 | PL= | ● | ● | ● | ● | ● | ● | |
| 12 | CR= | ● | ● | ● | ● | ● | ● | |
| 13 | SPDL= | ○ | ○ | ○ | ○ | ○ | ○ | Optional |
| 14 | MTE= | × | × | ○ | ○ | × | × | Optional |
| 15 | NWAIT | ● | ● | ● | ● | ● | ● | |
| 16 | ENWAIT | ○ | ○ | ○ | ○ | ○ | ○ | Optional |
| 17 | UNTIL | ● | ● | ● | ● | ● | ● | |
| 18 | SRCH | ○ | ○ | ○ | ○ | ○ | ○ | Optional |
| 19 | ASRCH | ○ | ○ | ○ | ○ | ○ | ○ | Optional |
| 20 | HPSRCH | ○ | ○ | ○ | ○ | ○ | ○ | Optional |
| 21 | NSRCH | ○ | ○ | ○ | ○ | ○ | ○ | Optional |
| 22 | ACC= | ● | ● | ● | ● | ● | ● | |
| 23 | DEC= | ● | ● | ● | ● | ● | ● | |
| 24 | +MOVJ | × | × | × | × | ○ | ○ | Optional |
| 25 | +MOVL | × | × | × | × | ○ | ○ | Optional |
| 26 | +MOVC | × | × | × | × | ○ | ○ | Optional |

●: Available
○: Available only with optional function enabled
×: Not available

### 1. Robot teaching position file number /P Variable number /LP Variable number /P [Array number] /LP [Array number]

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 1 | Robot teaching position file number | The robot axis teaching position in each step is written in this file unconditionally when the step is taught. This teaching position cannot be edited. | On the job display, this tag is not displayed. |
| 2 | P Variable number/ LP Variable number/ P [Array number]/ LP [Array number] | Specifies the position variable number of the robot axis. Moves to the position data set in the variable of the specified number. | Variable number : 000 to 127 |

### 2. Base Teaching Position File Number

When a robot teaching position file number is selected from the table in part 1 of this Explanation, add the following tag.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 3 | Base teaching position file number | The base axis teaching position in each step is written in this file unconditionally when the step is taught. This teaching position cannot be edited. | On the job display, this tag is not displayed. |

### 3. Station Teaching Position File Number

When a robot teaching position file number is selected from the table in part 1 of this Explanation, add the following tag.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 4 | Station teaching position file number | The station axis teaching position in each step is written in this file unconditionally when the step is taught. This teaching position cannot be edited. | On the job display, this tag is not displayed. |

### 4. T Point Variable number

When the robot teaching position file number is selected from the table in part 1 of this Explanation, the following can be added or omitted.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 5 | T Point Variable number | Specifies the point variable number. The point variable manages the teaching position registered in the job, and is used to move the manipulator to the same position several times in one job. | Available only with the optional point variable function. |

### 5. BP Variable number /LBP Variable number /BP [Array number] /LBP [Array number]

When a P Variable number, LP Variable number, P [Array number], or LP [Array number] is selected from the table in part 1 of this Explanation, the following tag can be added.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 6 | BP Variable number/ LBP Variable number/ BP [Array number]/ LBP [Array number] | Specifies the position variable number of the base axis. Moves to the position data set in the variable of the specified number. | Variable number: 000 to 127 |

### 6. EX Variable number /LEX Variable number /EX [Array number] /LEX [Array number]

When a P Variable number, LP Variable number, P [Array number], or LP [Array number] is selected from the table in part 1 of this Explanation, the following tag can be added.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 7 | EX Variable number/ LEX Variable number/ EX [Array number]/ LEX [Array number] | Specifies the position variable number of the station axis. Moves to the position data set in the variable of the specified number. | Variable number: 000 to 127 |

### 7. V=Tool center point speed /VR=Position angular speed /VE=External axis speed

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 8 | V=Tool center point speed | Specifies the tool center point speed. Specifies the unit of rate using the operation condition setting screen. | Variable B/B[]/LB/LB[]/I/ I[]/LI/LI[]/D/D[]/ LD/LD[] can be used. (Units: 0.1 mm/s) |
| 9 | VR=Position angular speed | Specifies the position angular speed. | Variable B/B[]/LB/LB[]/I/ I[]/LI/LI[]/D/D[]/ LD/LD[] can be used. (Units: 0.1 deg./s) |
| 10 | VE=External axis speed | Specifies the external axis speed. | Speed: 0.01% to 100.00% Variable B/B[]/LB/LB[]/I/ I[]/LI/LI[]/D/D[]/ LD/LD[] can be used. (Units: 0.01 %) |

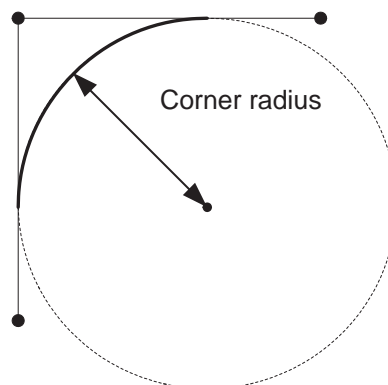### 8. PL=Position level /CR=Corner radius /SPDL=Speed level

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 11 | PL=Position level | Specifies the position level.<br>The position level is a level of the approach when the manipulator passes the position where the teaching procedure was performed. | Level: 0 to 8<br>Variable B/B[]/LB/LB[]/I/I[]/LI/LI[]/D/D[]/ LD/LD[] can be used. |
| 12 | CR=Corner radius | Specifies the corner radius.<br>The manipulator operates by circular interpolation in which the corner radius is specified. | Radius: 1 mm to 6553.5 mm<br>Variable B/B[]/LB/LB[]/I/I[]/LI/LI[]/D/D[]/ LD/LD[] can be used. (Units: 0.1 mm) |
| 13 | SPDL=Speed level | Specifies the speed level.<br>The speed level is the tag for the robot to end the execution of the move instruction in the state of the servo float control, and to confirm the state which has stopped. The operation ends when the speed feedback pulse of all axes goes below a constant value, and the manipulator is considered to have been stopped. | Level: Only 0<br><br>Available only with the optional servo-float function.<br>Refer to the servo-float function for details. |

SUPPLE-MENT

**Corner radius**

The manipulator operates by circular interpolation in which the corner radius is specified.



Corner radius

## 9. MTE= Amount of station axis rotation

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 14 | MTE=Amount of station axis rotation | Specifies the amount of station axis rotation.<br>The operation of the station axis can be specified by the number of rotations. | Amount of rotation:<br> -32768 to 32767<br><br>Available only with the optional axis endless function.<br>Refer to the axis endless function for details. |

## 10. NWAIT/ENWAIT

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 15 | NWAIT | Specifies the NWAIT instruction.<br>The NWAIT instruction carries out the instructions excluding the move instruction from that step on, at the same as time the manipulator is carrying out that step. | |
| 16 | ENWAIT | Specifies the ENWAIT instruction.<br>The ENWAIT instruction carries out the instructions excluding the move instructions from that step on, before reaching the next step. | Available only with the conditional NWAIT function. (option: S2C576)<br>Refer to ENWAIT of *chapter 2.6 "Instruction Which Adheres to an Instruction" at page 2-220.* |

## 11. SRCH/UNTIL/ASRCH/HPSRCH/NSRCH

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 17 | SRCH | Specifies the SRCH instruction.<br>The SRCH instruction is a tag which detects the start point. | Available only with the optional start point searching function.<br>Refer to the Starting point detection function for details. |
| 18 | UNTIL | Specifies the UNTIL instruction.<br>The UNTIL instruction is a tag by which the conditions of the input signal are evaluated during operation.<br>When the condition of the input signal is full, the robot executes the next instruction. | Refer to UNTIL of *chapter 2.6 "Instruction Which Adheres to an Instruction" at page 2-218.* |

| No | Tag | Explanation | Note |
|---|---|---|---|
| 19 | ASRCH | Specifies the ASRCH instruction.<br>The ASRCH instruction detects input signal's voltage. | Available only with the optional general-purpose sensor function.<br>Refer to General-purpose Sensor function for details. |
| 20 | HPSRCH | Specifies the HPSRCH instruction.<br>The HPSRCH instruction detects the position of the zero-point. | Available only with the optional zero-point position detection function.<br>Refer to the Zero-point Position Detection function for details. |
| 21 | NSRCH | Specifies the NSRCH instruction.<br>The NSRCH instruction detects a position without stopping the motion. | Available only with the optional search-in-motion function. |

## 12. ACC=Acceleration adjustment ratio

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 22 | ACC=Acceleration adjustment ratio | Specifies the acceleration adjustment ratio.<br>The ACC instruction reduces the amount of acceleration in the specified ratio. | Acceleration adjustment ratio: 20% to 100%<br>Variable B/B[]/LB/LB[]/I/I[]/LI/LI[]/D/D[]/ LD/LD[] can be used. |

## 13. DEC=Deceleration adjustment ratio

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 23 | DEC=Deceleration adjustment ratio | Specifies the deceleration adjustment ratio.<br>The DEC instruction reduces the amount of deceleration in the specified ratio. | Deceleration adjustment ratio: 20% to 100%<br>Variable B/B[]/LB/LB[]/I/I[]/LI/LI[]/D/D[]/ LD/LD[] can be used. |

## 14. +MOVJ/+MOVL/+MOVC

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 24 | +MOVJ | Specifies the joint interpolation motion instruction on the master manipulator's side. | Available only with the optional coordinate function. Refer to the independent/coordinated function. |
| 25 | +MOVL | Specifies the linear interpolation motion instruction on the master manipulator's side. | Available only with the optional coordinate function. Refer to the independent/coordinated function. |
| 26 | +MOVC | Specifies the circular interpolation motion instruction on the master manipulator's side. | Available only with the optional coordinate function. Refer to the independent/coordinated function. |

**Example**

(1)   NOP
      MOVJ VJ=50.00
      MOVJ VJ=25.00
      MOVJ VJ=12.50     ◆◆◆ Step 3
      MOVL V=138        ◆◆◆ Step 4
      Moves from Step 3 to Step 4 by the linear interpolation at a rate of 138cm/min.



2-174
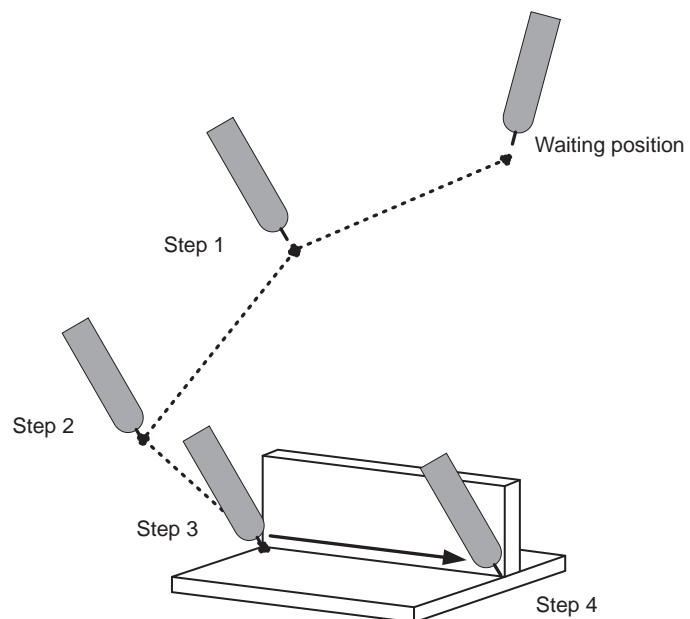
# MOVC

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Available | Available | Available |

**Function**

Moves to the teaching position by circular interpolation.

**Construction**

The tag which can be used is limited by the type of the job.
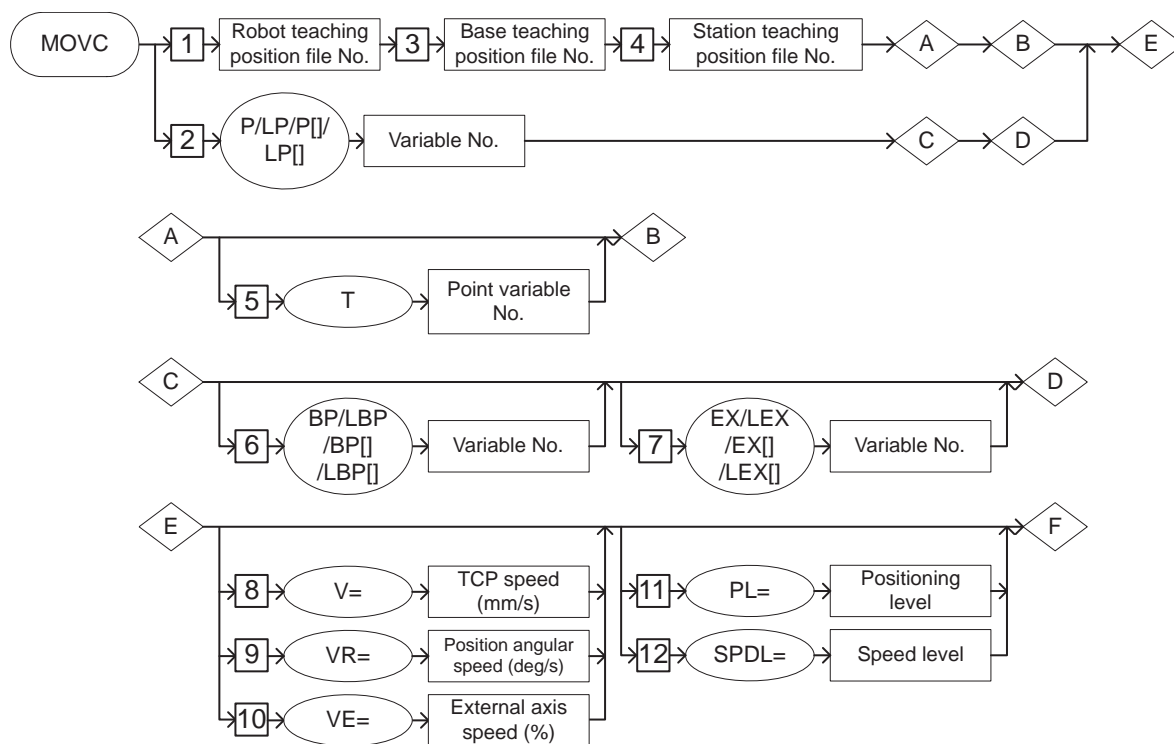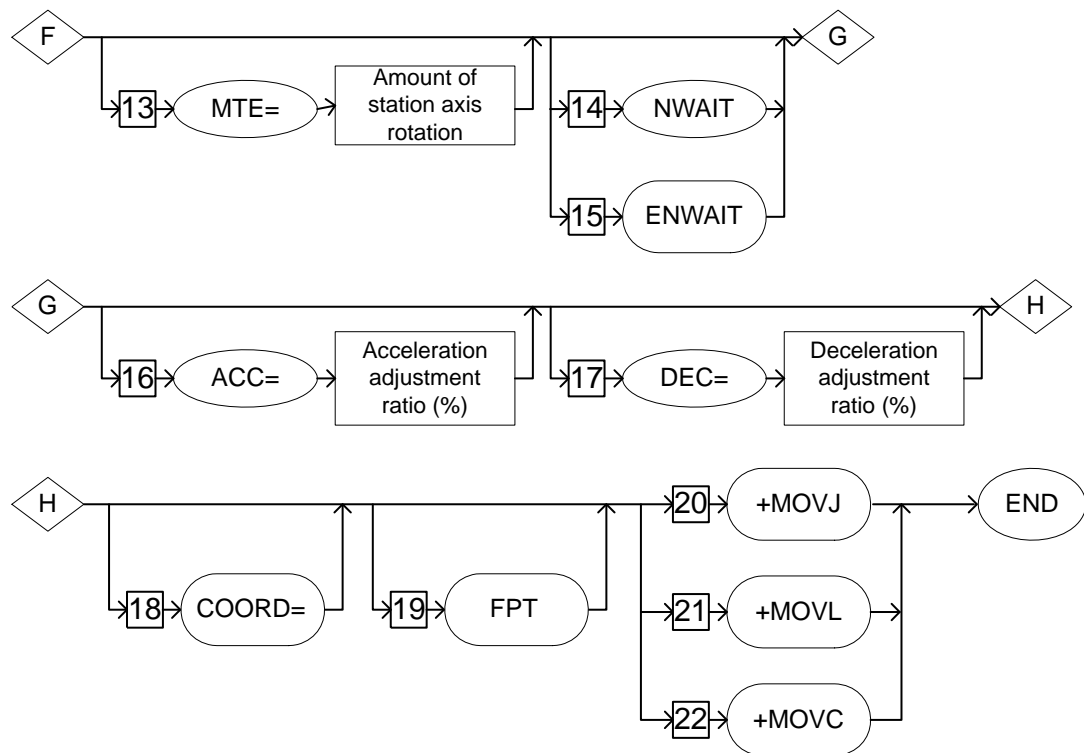
*Table 2-5: Job Type and Control Group*

| No. | Job Type | Control Group | Remarks |
|---|---|---|---|
| 1 | Single | One manipulator (standard) | |
| 2 | Single | One manipulator with base axis | |
| 3 | Single | One manipulator with station axis | |
| 4 | Single | One manipulator with base and station axes | |
| 5 | Coordinated | Two manipulators | Optional |
| 6 | Coordinated | Two manipulators with base axis | Optional |

*Table 2-6: Availability of Each Tag*

| No | Tag | Control Group 1 | 2 | 3 | 4 | 5 | 6 | Note |
|----|-----|---|---|---|---|---|---|------|
| 1 | Robot teaching position file number | ● | ● | ● | ● | ● | ● | |
| 2 | P/LP/P[]/LP[] | ● | ● | ● | ● | ● | ● | |
| 3 | Base teaching position file number | × | ● | × | ● | × | ● | |
| 4 | Station teaching position file number | × | × | ● | ● | × | × | |
| 5 | T | ○ | ○ | ○ | ○ | ○ | ○ | Optional |
| 6 | BP/LBP/BP[]/LBP[] | × | ● | × | ● | × | ● | |
| 7 | EX/LEX/EX[]/LEX[] | × | × | ● | ● | × | × | |
| 8 | V= | ● | ● | ● | ● | ● | ● | |
| 9 | VR= | ● | ● | ● | ● | ● | ● | |
| 10 | VE= | × | × | ● | ● | × | × | |
| 11 | PL= | ● | ● | ● | ● | ● | ● | |
| 12 | SPDL= | ○ | ○ | ○ | ○ | ○ | ○ | Optional |
| 13 | MTE= | × | × | ○ | ○ | × | × | Optional |
| 14 | NWAIT | ● | ● | ● | ● | ● | ● | |
| 15 | ENWAIT | ○ | ○ | ○ | ○ | ○ | ○ | Optional |
| 16 | ACC= | ● | ● | ● | ● | ● | ● | |
| 17 | DEC= | ● | ● | ● | ● | ● | ● | |
| 18 | COORD= | ● | ● | ● | ● | ● | ● | |
| 19 | FPT | ● | ● | ● | ● | ● | ● | |
| 20 | +MOVJ | × | × | × | × | ○ | ○ | Optional |
| 21 | +MOVL | × | × | × | × | ○ | ○ | Optional |
| 22 | +MOVC | × | × | × | × | ○ | ○ | Optional |

●: Available

○: Available only with optional function enabled

×: Not available

**Example**

## 1. Robot teaching position file number /P Variable number /LP Variable number /P [Array number] /LP [Array number]

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 1 | Robot teaching position file number | The robot axis teaching position in each step is written in this file unconditionally when the step is taught. This teaching position cannot be edited. | On the job display, this tag is not displayed. |
| 2 | P Variable number/ LP Variable number/ P [Array number]/ LP [Array number] | Specifies the position variable number of the robot axis. Moves to the position data set in the variable of the specified number. | Variable number: 000 to 127 |

## 2. Base Teaching Position File Number

When a base teaching position file number is selected from the table in part 1 of this Explanation, added the following tag.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 3 | Base teaching position file number | The base axis teaching position in each step is written in this file unconditionally when the step is taught. This teaching position cannot be edited. | On the job display, this tag is not displayed. |

## 3. Station Teaching Position File Number

When a base teaching position file number is selected from the table in part 1 of this Explanation, added the following tag.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 4 | Station teaching position file number | The station axis teaching position in each step is written in this file unconditionally when the step is taught. This teaching position cannot be edited. | On the job display, this tag is not displayed. |

## 4. T Point Variable number

When the robot teaching position file number is selected from the table in part 1 of this Explanation, the following tag can be added or omitted.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 5 | T Point Variable number | Specifies the point variable number. The point variable manages the teaching position registered in the job, and is used to move the manipulator to the same position several times in one job. | Available only with the optional point variable function. |

### 5. BP Variable number /LBP Variable number /BP [Array number] /LBP [Array number]

When a P Variable number, LP Variable number, P [Array number], or LP [Array number] is selected from the table in part 1 of this Explanation, the following tag can be added.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 6 | BP Variable number/ LBP Variable number/ BP [Array number]/ LBP [Array number] | Specifies the position variable number of the base axis. Moves to the position data set in the variable of the specified number. | Variable number: 000 to 127 |

### 6. EX Variable number /LEX Variable number /EX [Array number] /LEX [Array number]

When a P Variable number, LP Variable number, P [Array number], or LP [Array number] is selected from the table in part 1 of this Explanation, the following tag can be added.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 7 | EX Variable number/ LEX Variable number/ EX [Array number]/ LEX [Array number] | Specifies the position variable number of the station axis. Moves to the position data set in the variable of the specified number. | Variable number: 000 to 127 |

### 7. V=Tool center point speed /VR=Position angular speed /VE=External axis speed

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 8 | V=Tool center point speed | Specifies the tool center point speed. Specifies the unit of rate using the operation condition setting screen. | Variable B/B[]/LB/LB[]/I/ I[]/LI/LI[]/D/D[]/ LD/LD[] can be used. (Units: 0.1 mm/s) |
| 9 | VR=Position angular speed | Specifies the position angular speed. | Variable B/B[]/LB/LB[]/I/ I[]/LI/LI[]/D/D[]/ LD/LD[] can be used. (Units: 0.1 deg/s) |
| 10 | VE=External axis speed | Specifies the external axis speed. | Speed: 0.01% to 100.00% Variable B/B[]/LB/LB[]/I/ I[]/LI/LI[]/D/D[]/ LD/LD[] can be used.(Units: 0.01 %) |

## 8. PL=Position level /SPDL=Speed level

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 11 | PL=Position level | Specifies the position level.<br>The position level is a level of the approach when the manipulator passes the position where the teaching procedure was performed. | Level: 0 to 8<br>Variable B/B[]/LB/LB[]/I/I[]/LI/LI[]/D/D[]/ LD/LD[] can be used. |
| 12 | SPDL=Speed level | Specifies the speed level.<br>The speed level is a tag for the robot to end the execution of the move instruction in the state of servo float control, and to confirm the state which has stopped. The operation ends when the speed feedback pulse of all axes goes below a constant value, and the manipulator is considered to have been stopped. | Level: Only 0<br><br>Available only with the optional servo-float function. |

## 9. MTE=Amount of station axis rotation

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 13 | MTE=Amount of station axis rotation | Specifies the amount of station axis rotation.<br>The operation of the station axis can be specified by the number of rotations. | Amount of rotation: -100 to 100<br><br>Available only with the optional axis endless function. |

## 10. NWAIT/ENWAIT

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 14 | NWAIT | Specifies the NWAIT instruction.<br>The NWAIT instruction carries out the instructions excluding the move instruction from that step on, at the same time as the manipulator is carrying out that step. | |
| 15 | ENWAIT | Specifies the ENWAIT instruction.<br>The ENWAIT instruction carries out the instructions excluding the move instructions from that step on, before reaching the next step. | Available only with the conditional NWAIT function. (option: S2C576)<br>Refer to ENWAIT of *chapter 2.6 "Instruction Which Adheres to an Instruction" at page 2-220*. |

## 11. ACC=Acceleration adjustment ratio

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 16 | ACC=Acceleration adjustment ratio | Specifies the acceleration adjustment ratio. The ACC instruction reduces the amount of acceleration in the specified ratio. | Acceleration adjustment ratio: 20% to 100% Variable B/B[]/LB/LB[]/I/I[]/LI/LI[]/D/D[]/LD/LD[] can be used. |

## 12. DEC=Deceleration adjustment ratio

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 17 | DEC=Deceleration adjustment ratio | Specifies the deceleration adjustment ratio. The DEC instruction reduces the amount of deceleration in the specified ratio. | Deceleration adjustment ratio: 20% to 100% Variable B/B[]/LB/LB[]/I/I[]/LI/LI[]/D/D[]/LD/LD[] can be used. |

## 13. COORD=Arc attitude control specification

The following tag can be added or omitted.

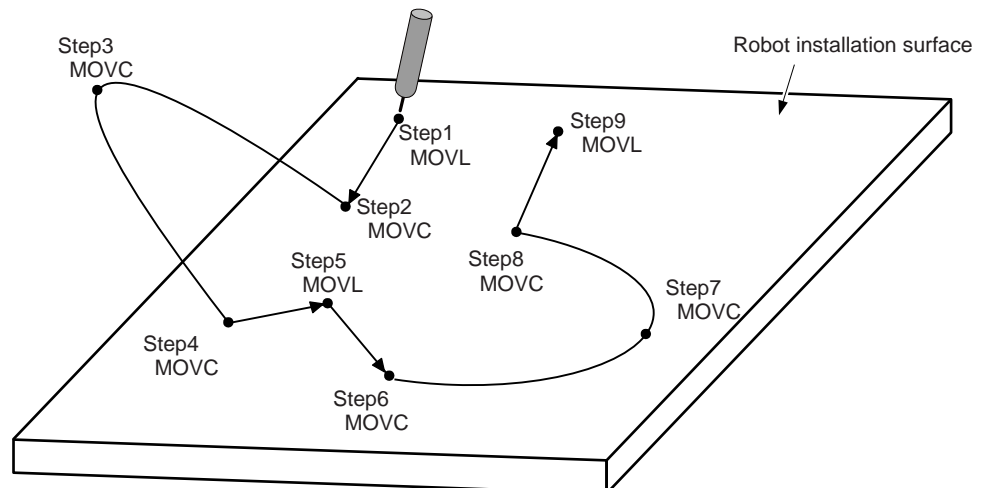| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 18 | COORD=Arc attitude control specification | Specifies the attitude control of arc.<br>This is not usually needed, but depending on teaching, the intended circular motion may not be performed.<br>In this case, specify as follows.<br>When the circular surface is parallel with the robot installation surface, specify as COORD = 0.<br>When the circular surface is not parallel with the robot installation surface, specify as COORD = 1. | |

**Example**

```
NOP
MOVL V=138
MOVC V=138  COORD=1          ⬩⬩⬩Step 2
MOVC V=138  COORD=1          ⬩⬩⬩Step 3
MOVC V=138  COORD=1          ⬩⬩⬩Step 4
MOVL V=138
MOVC V=138  COORD=0          ⬩⬩⬩Step 6
MOVC V=138  COORD=0          ⬩⬩⬩Step 7
MOVC V=138  COORD=0          ⬩⬩⬩Step 8
MOVL V=138
END
```

Step 2 to 4 performs the attitude control based on the circular surface.

Step 6 to 7 performs the attitude control based on the robot installation surface.

### 14. FPT=Arc end-point setting

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 21 | FPT=Arc end-point setting | Specifies the end-point of the arc (the point at which the curvature of the arc is to be changed). | |

**Example**

(1)  NOP
     MOVL V=138
     MOVC V=138          ◆◆◆Step 2
     MOVC V=138          ◆◆◆Step 3
     MOVC V=138          ◆◆◆Step 4
     MOVC FPT V=138      ◆◆◆Step 5
     MOVC V=138          ◆◆◆Step 6
     MOVC V=138          ◆◆◆Step 7
     MOVL V=138
     END

Moves from Step 2 to Step 7 by circular interpolation at a rate of 138 cm/min.
Moves to Step 3 in a circular arc formed with the teaching points in Steps 2, 3, and 4.
Moves to Step 4 in a circular arc formed with the teaching points in Steps 3, 4, and 5.
Moves to Step 5 in a circular arc formed with the teaching points in Steps 3, 4, and 5.
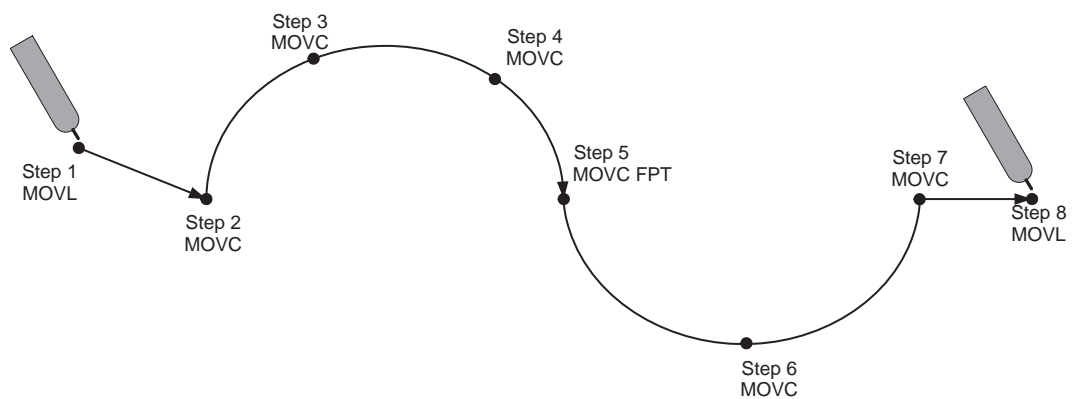Moves to Step 6 in a circular arc formed with the teaching points in Steps 5, 6, and 7.
Moves to Step 7 in a circular arc formed with the teaching points in Steps 5, 6, and 7.



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## 15. +MOVJ/+MOVL/+MOVC

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 18 | +MOVJ | Specifies the joint interpolation motion instruction on the master manipulator's side. | Available only with the optional coordinate function. Refer to the independent/coordinated function. |
| 19 | +MOVL | Specifies the linear interpolation motion instruction on the master manipulator's side. | Available only with the optional coordinate function. Refer to the independent/coordinated function. |
| 20 | +MOVC | Specifies the circular interpolation motion instruction on the master manipulator's side. | Available only with the optional coordinate function. Refer to the independent/coordinated function. |

# IMOV

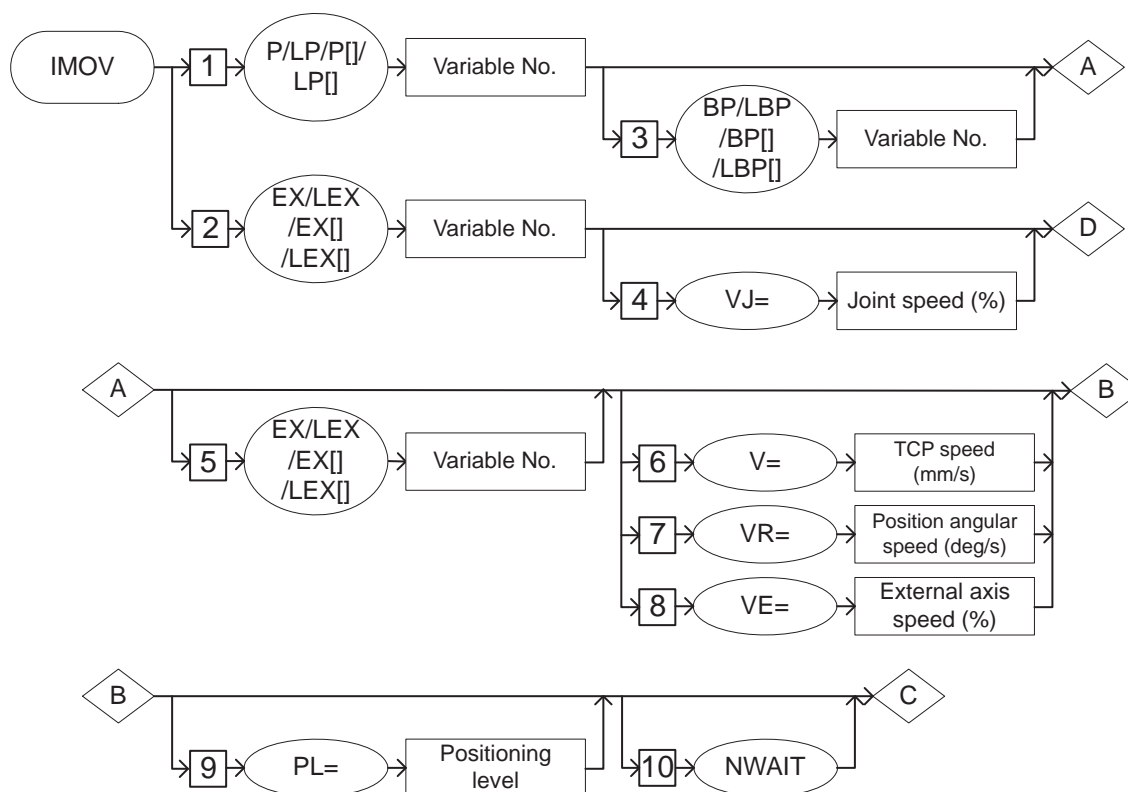| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Available | Available | Available |

**Function**

Moves by linear interpolation from the current position for the specified incremental value.

**Construction**

The tag which can be used is limited by the type of the job.
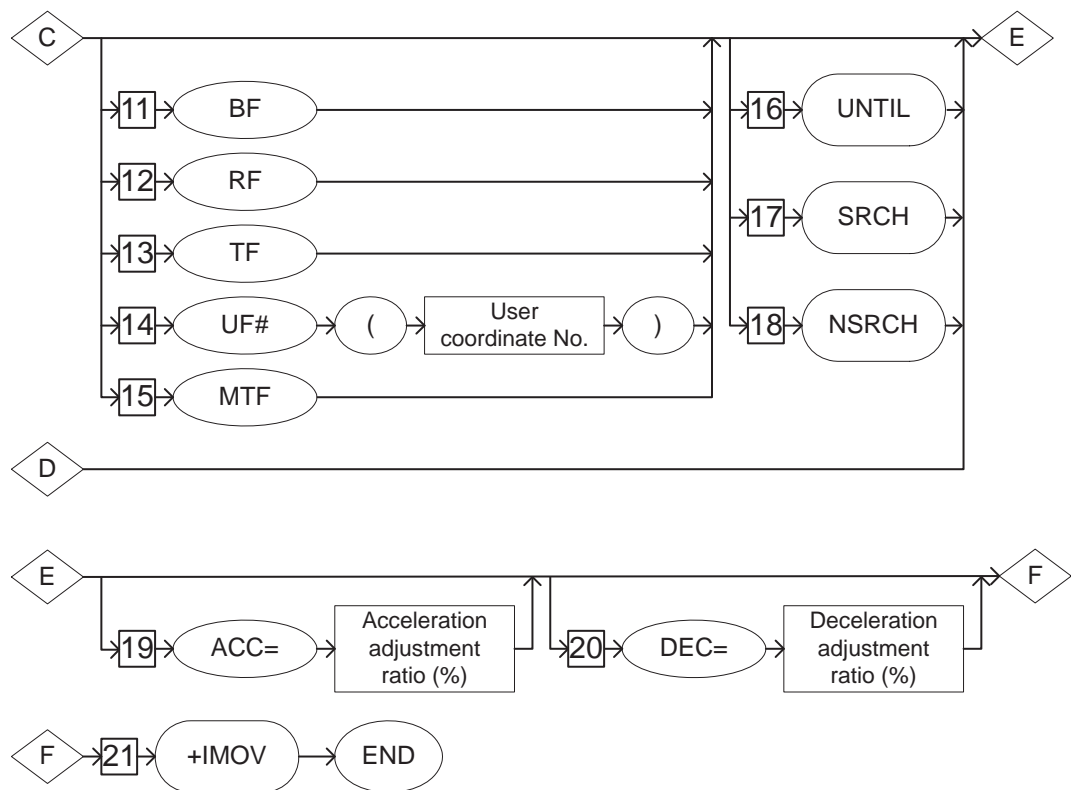
*Table 2-7: Job Type and Control Group*

| No. | Job Type | Control Group | Remarks |
|-----|----------|---------------|---------|
| 1 | Single | One manipulator (standard) | |
| 2 | Single | One manipulator with base axis | |
| 3 | Single | One manipulator with station axis | |
| 4 | Single | One manipulator with base and station axes | |
| 5 | Single | Only station axis | |
| 6 | Coordinated | Two manipulators | Optional |
| 7 | Coordinated | Two manipulators with base axis | Optional |

*Table 2-8: Availability of Each Tag*

| No | Tag | Control Group | | | | | | | Note |
|---|---|---|---|---|---|---|---|---|---|
| | | **1** | **2** | **3** | **4** | **5** | **6** | **7** | |
| 1 | P/LP/P[]/LP[] | ● | ● | ● | ● | × | ● | ● | |
| 2 | EX/LEX/EX[]/LEX[] | × | × | × | × | ● | × | × | |
| 3 | BP/LBP/BP[]/LBP[] | × | ● | × | ● | × | ● | × | |
| 4 | VJ= | × | × | × | × | ● | × | × | |
| 5 | EX/LEX/EX[]/LEX[] | × | × | ● | ● | × | × | × | |
| 6 | V= | ● | ● | ● | ● | × | ● | ● | |
| 7 | VR= | ● | ● | ● | ● | × | ● | ● | |
| 8 | VE= | × | × | ● | ● | × | × | × | |
| 9 | PL= | ● | ● | ● | ● | × | ● | ● | |
| 10 | NWAIT | ● | ● | ● | ● | × | ● | ● | |
| 11 | BF | ● | ● | ● | ● | × | ● | ● | |
| 12 | RF | ● | ● | ● | ● | × | ● | ● | |
| 13 | TF | ● | ● | ● | ● | × | ● | ● | |
| 14 | UF#() | ● | ● | ● | ● | × | ● | ● | |
| 15 | MTF | × | × | × | × | × | ● | ● | |
| 16 | UNTIL | ● | ● | ● | ● | × | ● | ● | |
| 17 | SRCH | ○ | ○ | ○ | ○ | × | ○ | ○ | Optional |
| 18 | NSRCH | ○ | ○ | ○ | ○ | × | ○ | ○ | Optional |
| 19 | ACC= | ● | ● | ● | ● | ● | ● | ● | |
| 20 | DEC= | ● | ● | ● | ● | ● | ● | ● | |
| 21 | +IMOV | × | × | × | × | × | ○ | ○ | Optional |

●: Available
○: Available only with optional function enabled
×: Not available

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**Explanation**

## 1. P Variable number /LP Variable number /P [Array number] /LP [Array number] /EX Variable number / LEX Variable number /EX [Array number] /LEX [Array number]

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 1 | P Variable number / LP Variable number / P [Array number]/ LP [Array number] | Specifies the position variable number of the manipulator axis. Moves the axis according to the position data set in the specified variable number. | Variable number: 000 to 127 |
| 2 | EX Variable number / LEX Variable number / EX [Array number]/ LEX [Array number] | Specifies the position variable number of the station axis. Moves the axis according to the position data set in the specified variable number. | Variable number: 000 to 127 |

## 2. BP Variable number /LBP Variable number /BP [Array number] /LBP [Array number]

When a P Variable number, LP Variable number, P [Array number], or LP [Array number] is selected from the table in part 1 of this Explanation, the following tag can be added.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 3 | BP Variable number / LBP Variable number / BP [Array number]/ LBP [Array number] | Specifies the position variable number of the base axis. Moves the axis according to the position data set in the specified variable number. | Variable number: 000 to 127 |

## 3. VJ=Joint speed

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 4 | VJ=Joint speed | Specifies the joint speed. The joint speed in a ratio to the highest speed. Operates at the speed decided beforehand when the joint speed is omitted. | Speed: 0.01% to 100.00% Variable B/B[]/LB/LB[]/I/ I[]/LI/LI[]/D/D[]/ LD/LD[] can be used. (Units: 0.01 %) |

### 4. EX Variable number /LEX Variable number /EX [Array number] /LEX [Array number]

When a P Variable number, LP Variable number, P [Array number], or LP [Array number] is selected from the table in part 1 of this Explanation, the following tag can be added.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 5 | EX Variable number / LEX Variable number / EX [Array number]/ LEX [Array number] | Specifies the position variable number of the station axis. Moves the axis according to the position data set in the specified variable number. | Variable number: 000 to 127 |

### 5. V=Tool center point speed /VR=Position angular speed /VE=External axis speed

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 6 | V=Tool center point speed | Specifies the tool center point speed. Specifies the unit of rate using the operation condition setting screen. | Speed: 0.1 mm to 1500.0 mm/s The units can be changed by setting the parameter S2C173. Variable B/B[]/LB/LB[]/I/ I[]/LI/LI[]/D/D[]/ LD/LD[] can be used. (Units: 0.1 mm/s) |
| 7 | VR=Position angular speed | Specifies the position angular speed. | Speed: 0.1 degrees to 180.0 degrees/s Variable B/B[]/LB/LB[]/I/ I[]/LI/LI[]/D/D[]/ LD/LD[] can be used. (Units: 0.1 deg/s) |
| 8 | VE=External axis speed | Specifies the external axis speed. | Speed: 0.01% to 100.00% Variable B/B[]/LB/LB[]/I/ I[]/LI/LI[]/D/D[]/ LD/LD[] can be used.(Units: 0.01 %) |

### 6. PL=Position level

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 9 | PL=Position level | Specifies the position level. The positioning level is a level of the approach when the manipulator passes the position where the teaching procedure was done. | Level: 0 to 8 Variable B/B[]/LB/LB[]/I/ I[]/LI/LI[]/D/D[]/ LD/LD[] can be used. |

## 7. NWAIT

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 10 | NWAIT | Specifies the NWAIT instruction.<br>The NWAIT instruction carries out the instructions excluding the move instruction from that step on, at the same as time the manipulator is carrying out that step. | |

## 8. BF/RF/TF/UF# (User coordinate number)

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 11 | BF | Specifies the increment value in the base coordinate system. | |
| 12 | RF | Specifies the increment value in the robot coordinate system. | |
| 13 | TF | Specifies the increment value in the tool coordinate system. | |
| 14 | UF#(User coordinate number) | Specifies the increment value in the user coordinate system. | No: 1 to 16<br>Variable B/I/D/LB/LI/LD can be used. |
| 15 | MTF | Specifies the incremental value in the master tool coordinate system.<br>In the master tool coordinate system, position data is converted to positions relative to the master manipulator. | Available only with the optional independent/ coordinated function. |

## 9. UNTIL/SRCH/NSRCH

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 16 | UNTIL | Specifies the UNTIL instruction.<br>The UNTIL instruction is a tag by which the conditions of the input signal are evaluated during operation.<br>When the condition of the input signal is full, the robot executes the next instruction. | Refer to UNTIL of *chapter 2.6 "Instruction Which Adheres to an Instruction" at page 2-218*. |
| 17 | SRCH | Specifies the SRCH instruction.<br>The SRCH instruction is a tag which detects the start point. | Available only with the optional start point searching function.<br>Refer to the Starting point detection function for details. |
| 18 | NSRCH | Specifies the NSRCH instruction.<br>The NSRCH instruction detects a position without stopping the motion. | Available only with the optional search-in-motion function. |

## 10. ACC=Acceleration adjustment ratio

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 19 | ACC=Acceleration adjustment ratio | Specifies the acceleration adjustment ratio. The ACC instruction reduces the amount of acceleration in the specified ratio. | Acceleration adjustment ratio: 20% to 100% Variable B/B[]/LB/LB[]/I/ I[]/LI/LI[]/D/D[]/ LD/LD[] can be used. |

## 11. DEC=Deceleration adjustment ratio

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 20 | DEC=Deceleration adjustment ratio | Specifies the deceleration adjustment ratio. The DEC instruction reduces the amount of deceleration in the specified ratio. | Deceleration adjustment ratio: 20% to 100% Variable B/B[]/LB/LB[]/I/ I[]/LI/LI[]/D/D[]/ LD/LD[] can be used. |

## 12. +IMOV

Add the following tag.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 21 | +IMOV | Specifies the move instruction for an incremental value of the master manipulator. | Available only with the optional coordinate function. Refer to the independent/coordinated function for details. |

**Example**

(1)  IMOV P000 V=138 RF
Moves from the current position at a rate of 138cm/min for the incremental value specified in P000 in the robot coordinate system.

# SPEED

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Available | Available | Available |

### Function

Sets the playback speed. The manipulator operates at the speed specified in the SPEED instruction when the speed is not specified in the move instruction.

### Construction

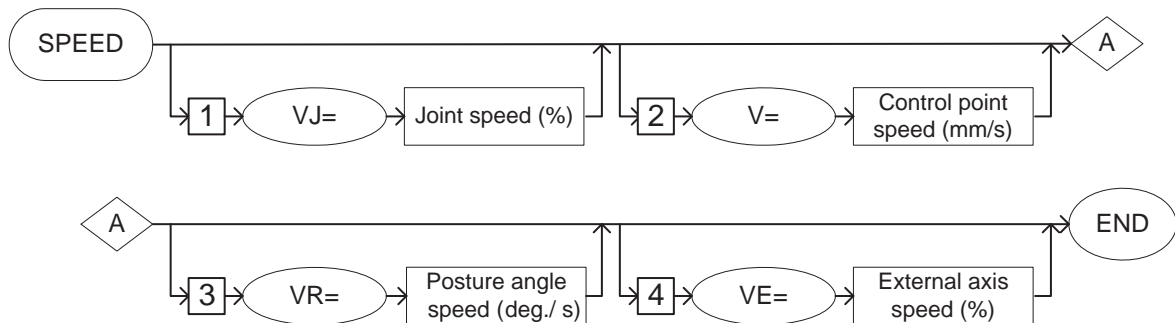The tag which can be used is limited by the type of the job.



*Table 2-9: Job Type and Control Group*

| No. | Job Type | Control group | Remarks |
|-----|----------|---------------|---------|
| 1 | - | One manipulator (standard) | |
| 2 | - | One manipulator with station axis | |
| 3 | - | Station axis only | |

*Table 2-10: Availability of Each Tag*

| No | Tag | Control Group | | | Note |
|----|-----|---|---|---|------|
| | | 1 | 2 | 3 | |
| 1 | VJ= | ● | ● | ● | |
| 2 | V= | ● | ● | × | |
| 3 | VR= | ● | ● | × | |
| 4 | VE= | × | ● | × | |

●: Available
×: Not available

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**Explanation**

### 1. VJ=Joint speed

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 1 | VJ=Joint speed | Specifies the joint speed.<br>The joint speed is shown in the ratio to the highest speed.<br>Operates at the speed decided beforehand when the joint speed is omitted. | Speed: 0.01% to 100.00%<br>Variable B/B[]/LB/LB[]/I/I[]/LI/LI[]/D/D[]/ LD/LD[] can be used. (Units: 0.01%) |

### 2. V=Tool center point speed

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 2 | V=Tool center point speed | Specifies the tool center point speed.<br>Specifies the unit of rate using the operation condition setting screen. | Variable B/B[]/LB/LB[]/I/I[]/LI/LI[]/D/D[]/ LD/LD[] can be used. (Units: 0.1 mm/s) |

### 3. VR=Position angular speed

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 3 | VR=Position angular speed | Specifies the position angular speed. | Variable B/B[]/LB/LB[]/I/I[]/LI/LI[]/D/D[]/ LD/LD[] can be used. (Units: 0.1 deg/s) |

### 4. VE=External axis speed

The following tag can be added or omitted.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 4 | VE=External axis speed | Specifies the external axis speed. | Speed: 0.01% to 100.00%<br>Variable B/B[]/LB/LB[]/I/I[]/LI/LI[]/D/D[]/ LD/LD[] can be used.(Units: 0.01%) |

**Example**

(1)   NOP
        MOVJ VJ=100.00                                    Moves at the joint speed
        MOVL V=138                                          100.00%.
                                                                        •••Moves at the control point
        SPEED VJ=50.00 V=276 VR=30.0      speed 138cm/min.
        MOVJ                                                       •••Moves at the joint speed
        MOVL                                                       50.00%.
                                                                        •••Moves at the control point
         MOVL VR=60.0                                    speed 276 cm/min.
                                                                        •••Moves at the position angular
        END                                                         speed 60.0 degree/s.

# REFP

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Available | Available | Available |

**Function**

It is an instruction to register the position data referred to in a job.

The position data registered by REFP can be stored in the position variable by GETS instruction. (Refer to GETS of *chapter 2.3  "Operating Instruction" at page 2-134*.)

**Construction**
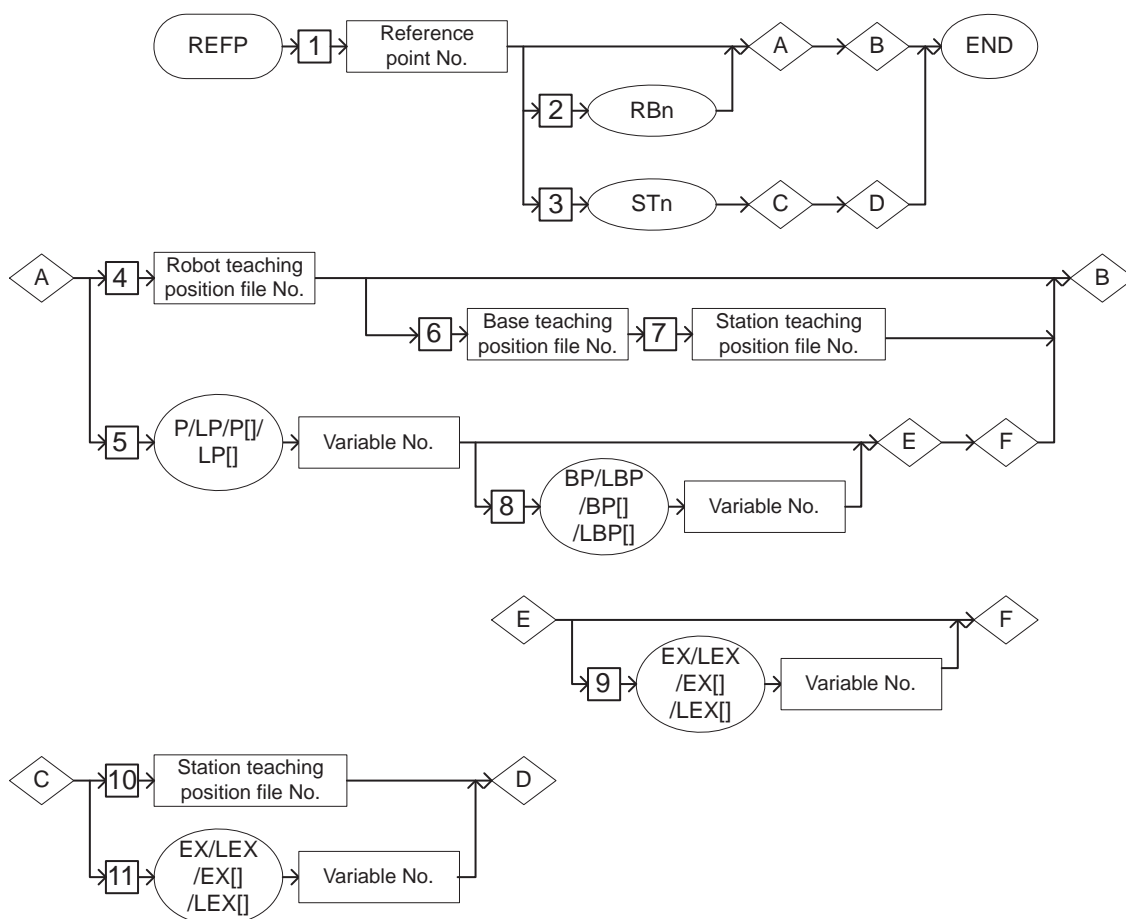
The tag which can be used is limited by the type of the job.

Table 2-11: Job Type and Control Group

| No. | Job Type | Control Group | Remarks |
|---|---|---|---|
| 1 | Single | One manipulator (standard) | |
| 2 | Single | One manipulator with base axis | |
| 3 | Single | One manipulator with station axis | |
| 4 | Single | One manipulator with base and station axes | |
| 5 | Single | Station axis only | |
| 6 | Coordinated | Two manipulators | Optional |
| 7 | Coordinated | Two manipulators with base axis | Optional |
| 8 | Coordinated | Coordinated job with one manipulator and the station axis (designated as master) | Optional |
| 9 | Coordinated | Coordinated job with one manipulator (with base axis) and the station axis (designated as master) | Optional |

Table 2-12: Availability of Each Tag

| No | Tag | Control Group | | | | | | | | | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| 1 | Reference point number | ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| 2 | RBn | × | × | × | × | × | ● | ● | ● | ● | |
| 3 | STn | × | × | × | × | × | × | × | ● | ● | |
| 4 | Robot teaching position file number | ● | ● | ● | ● | × | ● | ● | ● | ● | |
| 5 | P/LP/P[]/LP[] | ● | ● | ● | ● | × | ● | ● | ● | ● | |
| 6 | Base-axis teaching position file number | × | ● | × | ● | × | × | ● | × | ● | |
| 7 | Station teaching position file number | × | × | ● | ● | × | × | × | × | × | |
| 8 | BP/LBP/BP[]/LBP[] | × | ● | × | ● | × | × | ● | × | ● | |
| 9 | EX/LEX/EX[]/LEX[] | × | × | ● | ● | × | × | × | × | × | |
| 10 | Station teaching position file number | × | × | × | × | ● | × | × | ● | ● | |
| 11 | EX/LEX/EX[]/LEX[] | × | × | × | × | ● | × | × | ● | ● | |

●: Available
×: Not available

**Explanation**

## 1. Reference Point Number

Add the following tag.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 1 | Reference point number | Specifies the reference point (REFP) number. | Reference points: 1 to 8 |

### 2. RBn/STn

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 2 | RBn | Specifies the robot to which the reference point is to be input. | n: 1 to 2<br>RB1: Robot 1 |
| 3 | STn | Specifies the station to which the reference point is to be input. | n: 1 to 3<br>ST1: Station 1 |

### 3. Robot teaching position file number /P Variable number /LP Variable number /P [Array number] /LP [Array number]

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 4 | Robot teaching position file number | The position in the reference point where the robot axis is taught is unconditionally written in this file. This teaching position cannot be edited. | On the job display, this tag is not displayed. |
| 5 | P Variable number/<br>LP Variable number/<br>P [Array number]/<br>LP [Array number] | Specifies the position variable number of the robot axis. The position data set in the variable of the specified number becomes a reference point. | Variable number:<br>000 to 127 |

### 4. Base Teaching Position File Number

When the robot teaching position file number is selected from the table in part 3 of this Explanation, add the following tag.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 6 | Base teaching position file number | The position in the reference point where the base axis is taught is unconditionally written in this file. This teaching position cannot be edited. | On the job display, this tag is not displayed. |

### 5. Station Teaching Position File Number

When the robot teaching position file number is selected from the table in part 3 of this Explanation, add the following tag.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 7 | Station teaching position file number | The position in the reference point where the station axis is taught is unconditionally written in this file. This teaching position cannot be edited. | On the job display, this tag is not displayed. |

### 6. BP Variable number /LBP Variable number /BP [Array number] /LBP [Array number]

When a P Variable number, LP Variable number, P [Array number], or LP [Array number] is selected from the table in part 3 of this Explanation, the following tag can be added.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 8 | BP Variable number/ LBP Variable number/ BP [Array number]/ LBP [Array number] | Specifies the position variable number of the base axis. The position data set in the variable of the specified number becomes a reference point. | Variable number: 000 to 127 |

### 7. EX Variable number /LEX Variable number /EX [Array number] /LEX [Array number]

When a P Variable number, LP Variable number, P [Array number], or LP [Array number] is selected from the table in part 3 of this Explanation, the following tag can be added.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 9 | EX Variable number/ LEX Variable number/ EX [Array number]/ LEX [Array number] | Specifies the position variable number of the station axis. The position data set in the variable of the specified number becomes a reference point. | Variable number: 000 to 127 |

### 8. Station teaching position file number/EX Variable number /LEX Variable number /EX [Array number] / LEX [Array number]

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 10 | Station teaching position file number | The station axis teaching position in each step is written in this file unconditionally when the step is taught. This teaching position cannot be edited. | On the job display, this tag is not displayed. |
| 11 | EX Variable number/ LEX Variable number/ EX [Array number]/ LEX [Array number] | Specifies the position variable number of the station axis. The position data set in the variable of a specified number becomes a reference point. | Variable number: 000 to 127 |

## 2.5   Shift Instruction

# SFTON

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Available | Available | Available |

**Function**

Begins the parallel shift operation. The amount of the parallel shift is set in a positional variable by the increment value of X, Y, and Z in each coordinate system.

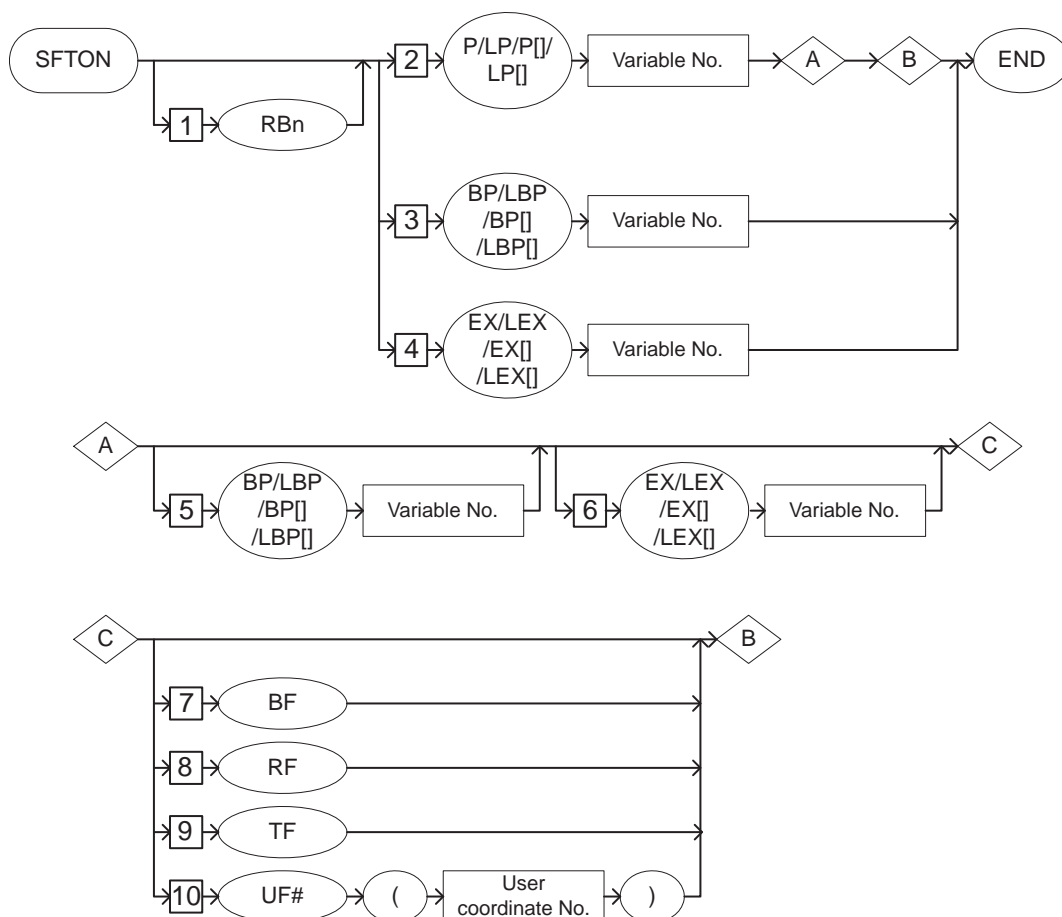**Construction**

The tag which can be used is limited by the type of the job.

Table 2-13: Job Type and Control Group

| No. | Job Type | Control Group | Remarks |
|---|---|---|---|
| 1 | Single | One manipulator (standard) | |
| 2 | Single | One manipulator with base axis | |
| 3 | Single | One manipulator with station axis | |
| 4 | Single | One manipulator with base and station axes | |
| 5 | Single | Station axis only | |
| 6 | Coordinated | Two manipulators | Optional |
| 7 | Coordinated | Two manipulators with base axis | Optional |
| 8 | Coordinated | Coordinated job with one manipulator and the station axis (designated as master) | Optional |
| 9 | Coordinated | Coordinated job with one manipulator (with base axis) and the station axis (designated as master) | Optional |

Table 2-14: Availability of Each Tag

| No | Tag | Control Group | | | | | | | | | Note |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| 1 | RBn | × | × | × | × | × | ● | ● | ● | ● | |
| 2 | P/LP/P[]/LP[] | ● | ● | ● | ● | × | ● | ● | ● | ● | |
| 3 | BP/LBP/BP[]/LBP[] | × | ● | × | ● | × | × | ● | × | ● | |
| 4 | EX/LEX/EX[]/LEX[] | × | × | ● | ● | ● | × | × | ● | ● | |
| 5 | BP/LBP/BP[]/LBP[] | × | ● | × | ● | × | × | ● | × | ● | |
| 6 | EX/LEX/EX[]/LEX[] | × | × | ● | ● | × | × | × | ● | ● | |
| 7 | BF | ● | ● | ● | ● | × | ● | ● | ● | ● | |
| 8 | RF | ● | ● | ● | ● | × | ● | ● | ● | ● | |
| 9 | TF | ● | ● | ● | ● | × | ● | ● | ● | ● | |
| 10 | UF#() | ● | ● | ● | ● | × | ● | ● | ● | ● | |

●: Available
×: Not available

**Explanation**

**1. RBn**

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 1 | RBn | Specifies the robot that is to execute a shift operation. | n: 1 to 2 RB1: Robot 1 |

**2. P Variable number /LP Variable number /P [Array number] /LP [Array number] /BP Variable number / LBP Variable number /BP [Array number] /LBP [Array number] /EX Variable number /LEX Variable number /EX [Array number] /LEX [Array number]**

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 2 | P Variable number/ LP Variable number/ P [Array number]/ LP [Array number] | Specifies the position variable number of the robot axis by which the shift value is set. Only the increment value set in the variable of the specified number shifts. | Variable number: 000 to 127 |
| 3 | BP Variable number/ LBP Variable number/ BP [Array number]/ LBP [Array number] | Specifies the position variable number of the base axis by which the shift value is set. Only the increment value set in the variable of the specified number shifts. | Variable number: 000 to 127 |
| 4 | EX Variable number/ LEX Variable number/ EX [Array number]/ LEX [Array number] | Specifies the position variable number of the station axis by which the shift value is set. Only the increment value set in the variable of the specified number shifts. | Variable number: 000 to 127 |

**3. BP Variable number /LBP Variable number /BP [Array number] /LBP [Array number]**

When a P Variable number, LP Variable number, P [Array number], or LP [Array number] is selected from the table in part 2 of this Explanation, the following tag can be added.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 5 | BP Variable number/ LBP Variable number/ BP [Array number]/ LBP [Array number] | Specifies the position variable number of the base axis by which the shift value is set. Only the increment value set in the variable of the specified number shifts. | Variable number: 000 to 127 |

**4. EX Variable number /LEX Variable number /EX [Array number] /LEX [Array number]**

When a P Variable number, LP Variable number, P [Array number], or LP [Array number] is selected from the table in part 2 of this Explanation, the following tag can be added.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 6 | EX Variable number/ LEX Variable number/ EX [Array number]/ LEX [Array number] | Specifies the position variable number of the station axis by which the shift value is set. Only the increment value set in the variable of the specified number shifts. | Variable number: 000 to 127 |

## 5. BF/RF/TF/UF# (User coordinate number)

When a P Variable number, LP Variable number, P [Array number], or LP [Array number] is selected from the table in part 2 of this Explanation, choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 7 | BF | Specifies the increment value in the base coordinate system. | |
| 8 | RF | Specifies the increment value in the robot coordinate system. | |
| 9 | TF | Specifies the increment value in the tool coordinate system. | |
| 10 | UF#(User coordinate number) | Specifies the increment value in the user coordinate system. | No.1 to 16 Variable B/I/D/LB/LI/LD can be used. |

**Example**

(1)  NOP
         MOVJ VJ=50.0
         MOVL V=138
         SFTON P000 UF#(1)
         MOVL V=138
         MOVL V=138
         MOVL V=138
         SFTOF
         MOVL V=138
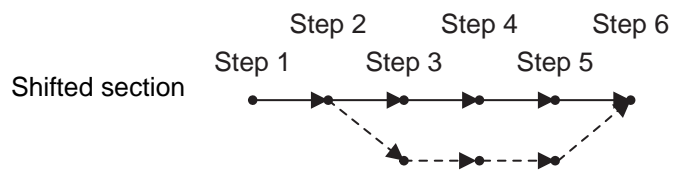


Shift between Step 3 and Step 5 in the user coordinate system.

# SFTOF

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Available | Available | Available |

**Function**

Ends the parallel shift operation.

**Construction**

The tags to be added are decided according to the type of the job.
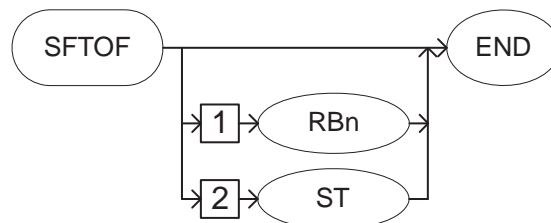


*Table 2-15: Job Type and Control Group*

| No. | Job Type | Control group | Remarks |
|-----|----------|---------------|---------|
| 1 | Single | One manipulator (standard) | |
| 2 | Coordinated | Two manipulators (without station axis) | Optional |
| 3 | Coordinated | Two manipulators (with station axis) | Optional |

*Table 2-16: Availability of Each Tag*

| No | Tag | Control group | | | Note |
|----|-----|---|---|---|------|
| | | 1 | 2 | 3 | |
| 1 | RBn | × | ● | ● | |
| 2 | ST | × | × | ● | |

●: Available
×: Not available

2-203

**Explanation**

### 1. RBn/ST

Choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 1 | RBn | Specifies the robot that is to end the shift operation. | n: 1 to 2<br>RB1: Robot 1 |
| 2 | ST | Ends the station axis shift operation. | |

**Example**

```
(1)  NOP
     MOVJ VJ=50.0
     MOVL V=138
     SFTON P000 UF#(1)
     MOVL V=138
     MOVL V=138
     MOVL V=138
     SFTOF
     MOVL V=138
```

Shifted section



Shift between Step 3 and Step 5 in the user coordinate system.

2-204
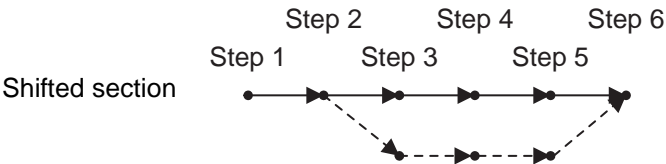
# MSHIFT

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Not available | Available | Available |

### Function

Calculates the amount of the shift in the specified coordinate system according to Data 2 and Data 3 and stores the result in Data 1.

Data 2 indicates the reference position to carry out the parallel shift, and Data 3 is the target position (shifted position).

### Construction

MSHIFT  <Data 1>  Coordinate system designation  <Data 2>  <Data 3>
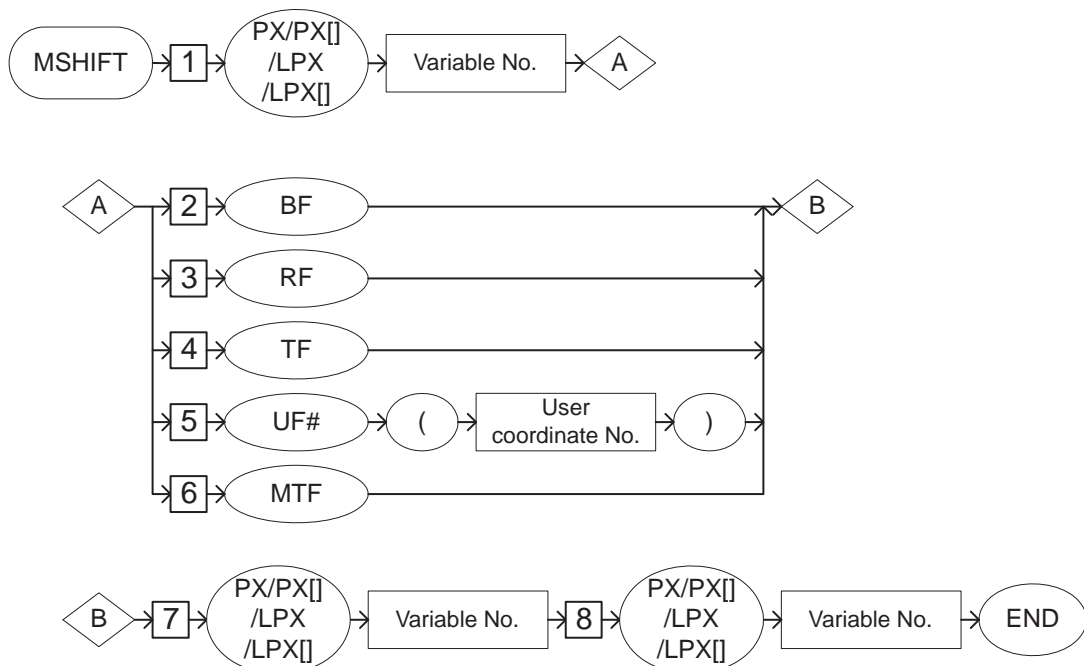
> **Explanation**

### 1. PX Variable number/LPX Variable number/PX [Array number]/LPX [Array number]

Add the following tag.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 1 | PX Variable number/ LPX Variable number/ PX [Array number]/ LPX [Array number] | Specifies the number of the expanded position variable to store the calculated shift. | <Data 1> |

### 2. BF/RF/TF/UF# (User coordinate number)/MTF

Choose one of the tags from the following table.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 2 | BF | Specifies the calculation of the shift amount in the base coordinate system. | |
| 3 | RF | Specifies the calculation of the shift amount in the robot coordinate system. | |
| 4 | TF | Specifies the calculation of the shift amount in the tool coordinate system. | |
| 5 | UF# (User coordinate number) | Specifies the calculation of the shift amount in the user coordinate system. | No.: 1 to 16 Variable B/I/D/LB/LI/LD can be used. |
| 6 | MTF | Specifies the calculation of the shift amount in the master tool coordinate system. | Available only with the optional independent/ coordinated function. |

### 3. PX Variable number/LPX Variable number/PX [Array number]/LPX [Array number]

Add the following tag.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 7 | PX Variable number/ LPX Variable number/ PX [Array number]/ LPX [Array number] | Specifies the expanded position type variable number of the reference position to calculate the amount of the shift. | <Data 2> |

### 4. PX Variable number/LPX Variable number/PX [Array number]/LPX [Array number]

Add the following tag.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 8 | PX Variable number/ LPX Variable number/ PX [Array number]/ LPX [Array number] | Specifies the expanded position type variable number of the target position to calculate the amount of the shift. | <Data 3> |

**Example**

| (1) | NOP | : Moves to the reference position. |
|-----|-----|-----|
| | MOVJ VJ=20.00 | : Sets the current position (the reference |
| | GETS PX000 $PX000 | position) in the position variable P000. |
| | MOVJ VJ=20.00 | : Moves to the target position. |
| | GETS PX001 $PX000 | : Sets the current position (the target |
| | MSHIFT PX010 BF PX000 PX001 | position) in the position variable P001. |
| | END | : Calculates the shift amount and stores it in |
| | | the position variable P010. |

## 2.6    Instruction Which Adheres to an Instruction

# IF

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Available | Available | Available |

### Function

Evaluates the various conditions during operation.  This instruction is added after other instructions for processing.

### Construction

IF  <Comparison element 1>  =,  <>,  <=,  >=,  <,  >  <Comparison element 2>

E → 14 = → 20 Byte type constant → F
15 <>
16 >
17 >= → 21 B/LB/B[]/ LB[] → Variable No.
18 <
19 <= → 22 I/LI/ I[]/LI[] → Variable No.
23 D/LD/D[]/ LD[] → Variable No.
24 R/LR/R[]/ LR[] → Variable No.

G → 25 = → 31 Integer type constant → H
26 <>
27 >
28 >= → 32 B/LB/B[]/ LB[] → Variable No.
29 <
30 <= → 33 I/LI/ I[]/LI[] → Variable No.
34 D/LD/D[]/ LD[] → Variable No.
35 R/LR/R[]/ LR[] → Variable No.

I → 36 = → 42 Double integer type constant → J
37 <>
38 >
39 >= → 43 B/LB/B[]/ LB[] → Variable No.
40 <
41 <= → 44 I/LI/ I[]/LI[] → Variable No.
45 D/LD/D[]/ LD[] → Variable No.
46 R/LR/R[]/ LR[] → Variable No.

**Explanation**

**1. IN# (Input number) /IG# (Input group number) /B Variable number /LB Variable number /B [Array number] /LB [Array number] /I Variable number /LI Variable number /I [Array number] /LI [Array number] /D Variable number /LD Variable number /D [Array number] /LD [Array number] /R Variable number /LR Variable number /R [Array number] /LR [Array number]**

Choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|---|---|---|---|
| 1 | IN# (Input number) | Specifies the number of the general input signal to be compared. | <Comparison element 1> No.: 1 to 1024 Variable B/I/D/LB/LI/LD can be used. |
| 2 | IG# (Input group number) | Specifies the number of the general input group signal to be compared. | <Comparison element 1> No.: 1 to 128 Variable B/I/D/LB/LI/LD can be used. |
| 3 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the number of the byte type variable to be compared. | <Comparison element 1> |
| 4 | I Variable number/ LI Variable number/ I [Array number]/ LI [Array number] | Specifies the number of the integer type variable to be compared. | <Comparison element 1> |
| 5 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the number of the double precision type variable to be compared. | <Comparison element 1> |
| 6 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the number of the real type variable to be compared. | <Comparison element 1> |

**2. =**

When an IN#(Input number) is selected from the table in part 1 of this Explanation, add the following tag.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 7 | = | It is equal. | |

### 3. B Variable number /LB Variable number /B [Array number] /LB [Array number] /ON /OFF

When an IN#(Input number) is selected from the table in part 1 of this Explanation, choose one of the tags from the following table after the equal sign (=) is added from the table in part 2 of this Explanation.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 8 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the byte type variable which becomes a comparison condition. | <Comparison element 2> Least significant bit: 0: OFF 1: ON |
| 9 | ON/OFF | The comparison condition is specified as ON or OFF. | <Comparison element 2> |

**4. =/<>**

When an IG#(Input group number) is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 10 | = | It is equal. | |
| 11 | <> | It is not equal. | |

## 5. B Variable number /LB Variable number /B [Array number] /LB [Array number] /ON /OFF

When an IG#(Input group number) is selected from the table in part 1 of this Explanation, choose one of the tags from the following table after "=" or "<>" are added from the table in part 4 of this Explanation.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 12 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the byte type variable which becomes a comparison condition. | \<Comparison element 2\> |
| 13 | Byte type constant | The comparison condition is specified by byte type constant. | \<Comparison element 2\> |

## 6. =/<>/>/>=/</<=

When a B Variable number, LB Variable number, B [Array number], or LB [Array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 14 | = | It is equal. | |
| 15 | <> | It is not equal. | |
| 16 | > | It is greater than. | |
| 17 | >= | It is greater than or equal. | |
| 18 | < | It is less than. | |
| 19 | <= | It is less than or equal. | |

## 7. Byte type constant /B Variable number /LB Variable number /B [Array number] /LB [Array number] /I Variable number /LI Variable number /I [Array number] / LI [Array number] /D Variable number /LD Variable number /D [Array number] /LD [Array number] /R Variable number /LR Variable number /R [Array number] /LR [Array number]

When a B Variable number, LB Variable number, B [Array number], or LB [Array number] is selected from the table in part 1 of this Explanation, choose one of the tags in the following table after "=", "<>", ">", ">=", "<" or "<=" is selected from the table in part 6 of this Explanation.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 20 | Byte type constant | The comparison condition is specified by the byte type constant. | \<Comparison element 2\> |
| 21 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the byte type variable number which becomes a comparison condition. | \<Comparison element 2\> |

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 22 | I Variable number/<br>LI Variable number/<br>I [Array number]/<br>LI [Array number] | Specifies the integer type variable number which becomes a comparison condition. | \<Comparison element 2\> |
| 23 | D Variable number/<br>LD Variable number/<br>D [Array number]/<br>LD [Array number] | Specifies the double precision type variable number which becomes a comparison condition. | \<Comparison element 2\> |
| 24 | R Variable number/<br>LR Variable number/<br>R [Array number]/<br>LR [Array number] | Specifies the real type variable number which becomes a comparison condition. | \<Comparison element 2\> |

### 8. =/<>/>/>=/</<=

When an I Variable number, LI Variable number, I [Array number] or LI [Array number] is selected the table in part 1 of this Explanation, choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 25 | = | It is equal. | |
| 26 | <> | It is not equal. | |
| 27 | > | It is greater than. | |
| 28 | >= | It is greater than or equal. | |
| 29 | < | It is less than. | |
| 30 | <= | It is less than or equal. | |

**9. Integer type constant /B Variable number /LB Variable number /LB Variable number /B [Array number] /LB [Array number] /I Variable number /LI Variable number /I [Array number] /LI [Array number] /D Variable number /LD Variable number /D [Array number] /LD [Array number] / R Variable number /LR Variable number /R [Array number] /LR [Array number]**

When an I Variable number, LI Variable number, I [Array number], or LI [Array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table after selecting "=", "<>", ">", ">=", "<" or "<=" from the table in part 8 of this Explanation.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 31 | Integer type constant | The comparison condition is specified by the integer type constant. | <Comparison element 2> |
| 32 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the byte type variable number which becomes a comparison condition. | <Comparison element 2> |
| 33 | I Variable number/ LI Variable number/ I [Array number]/ LI [Array number] | Specifies the integer type variable number which becomes a comparison condition. | <Comparison element 2> |
| 34 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the double precision type variable number which becomes a comparison condition. | <Comparison element 2> |
| 35 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the real type variable number which becomes a comparison condition. | <Comparison element 2> |

**10. =/<>/>/>=/</<=**

When a D Variable number, LD Variable number, D [Array number] or LD [Array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 36 | = | It is equal. | |
| 37 | <> | It is not equal. | |
| 38 | > | It is greater than. | |
| 39 | >= | It is greater than or equal. | |
| 40 | < | It is less than. | |
| 41 | <= | It is less than or equal. | |

**11. Double precision type constant/ B Variable number /LB Variable number /B [Array number] /LB [Array number] /I Variable number /LI Variable number /I [Array number] /LI [Array number] /D Variable number /LD Variable number /D [Array number] /LD [Array number] /R Variable number /LR Variable number /R [Array number] /LR [Array number]**

When a D Variable number, LD Variable number, D [Array number], or LD [Array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table after "=", "<>", ">", ">=", "<" or "<=" is selected from the table in part 10 of this Explanation.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 42 | Double precision type constant | The comparison condition is specified by the double precision type constant. | <Comparison element 2> |
| 43 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the byte type variable number which becomes a comparison condition. | <Comparison element 2> |
| 44 | I Variable number/ LI Variable number/ I [Array number]/ LI [Array number] | Specifies the integer type variable number which becomes a comparison condition. | <Comparison element 2> |
| 45 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the double precision type variable number which becomes a comparison condition. | <Comparison element 2> |
| 46 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the real type variable number which becomes a comparison condition. | <Comparison element 2> |

**12. =/<>/>/>=/</<=**

When an R Variable number, LR Variable number, R [Array number] or LR [Array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 47 | = | It is equal. | |
| 48 | <> | It is not equal. | |
| 49 | > | It is greater than. | |
| 50 | >= | It is greater than or equal. | |
| 51 | < | It is less than. | |
| 52 | <= | It is less than or equal. | |

**13. Real type constant /B Variable number /LB Variable number /B [Array number] /LB [Array number] /I Variable number /LI Variable number /I [Array number] / LI [Array number] /D Variable number /LD Variable number /D [Array number] /LD [Array number] /R Variable number /LR Variable number /R [Array number] /LR [Array number]**

When an R Variable number, LR Variable number, R [Array number], or LR [Array number] is selected from the table in part 1 of this Explanation, choose one of the tags from the following table after "=", "<>", ">", ">=", "<" or "<=" is selected from the table in part 12 of this Explanation.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 53 | Real type constant | The comparison condition is specified by the real type constant. | <Comparison element 2> |
| 54 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the byte type variable number which becomes a comparison condition. | <Comparison element 2> |
| 55 | I Variable number/ LI Variable number/ I [Array number]/ LI [Array number] | Specifies the integer type variable number which becomes a comparison condition. | <Comparison element 2> |
| 56 | D Variable number/ LD Variable number/ D [Array number]/ LD [Array number] | Specifies the double precision type variable number which becomes a comparison condition. | <Comparison element 2> |
| 57 | R Variable number/ LR Variable number/ R [Array number]/ LR [Array number] | Specifies the real type variable number which becomes a comparison condition. | <Comparison element 2> |

**Example**

   (1)  SET B000 1
       JUMP B000 IF IN#(14)=ON
       It jumps to Job 1 if input signal No.14 is turned ON.

   (2)  JUMP *2 IF D005<=D006
       Jumps to *2 if D005 is below D006.

# UNTIL

| SUBSET | STANDARD | EXPANDED |
|--------|----------|----------|
| Not available | Available | Available |

**Function**

Evaluates the input conditions during operation.  This instruction is added after other instructions for processing.

**Construction**
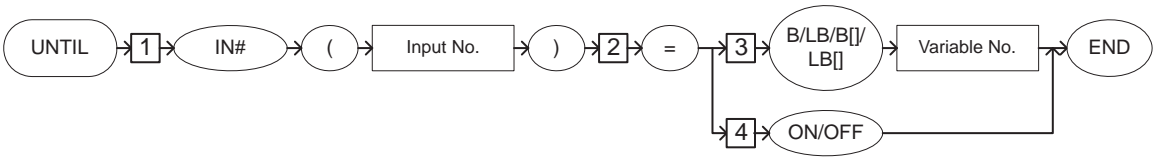


**Explanation**

### 1. IN# (Input number)

Add the following tag.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 1 | IN# (Input number) | Specifies the number of the general-purpose input signal which becomes a input condition. | No.: 1 to 1024 Variable B/I/D/LB/LI/LD can be used. |

### 2. =

Add the following tag.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 2 | = | It is equal. | |

### 3. B Variable number/LB Variable number/B [Array number]/LB [Array number]/ON/OFF.

Choose one of the tags from the following table after "=" is selected from the table in part 2 of this Explanation.

| No. | Tag | Explanation | Note |
|---|---|---|---|
| 3 | B Variable number/ LB Variable number/ B [Array number]/ LB [Array number] | Specifies the byte type variable to be the condition of execution. | Least significant bit: 0: OFF 1: ON |
| 4 | ON/OFF | Specifies the condition as ON or OFF. | |

**Example**

(1) Step 1  MOVJ VJ=100.00
Step 2  MOVJ VJ=50.00 UNTIL IN#(14)=ON
Step 3  MOVJ VJ=25.00

The axis moves toward Step 2 until input signal No. 14 is turned ON.  When input signal No. 14 is turned ON, the axis moves toward Step 3.

Step 1 MOVJ VJ=100.00

Input signal No. 14 is turned ON.

Step 3

Step 2
MOVJ VJ=50.00 UNTIL
IN#(14)=ON
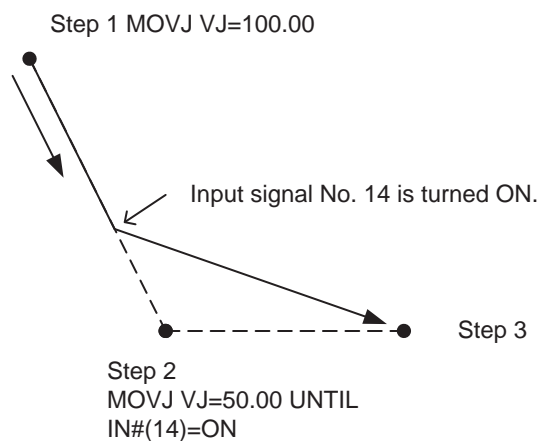
# ENWAIT

| SUBSET | STANDARD | EXPANDED | Parameter |
|--------|----------|----------|-----------|
| Available | Available | Available | S2C714 |

**Function**

Carries out, in advance for the specified time, an instruction other than a move instruction on the instruction line next to the move instruction that was added with ENWAIT.

**Construction**

$$\text{ENWAIT} \rightarrow \boxed{1} \rightarrow \text{T=} \rightarrow \boxed{\text{Time (s)}} \rightarrow \text{END}$$
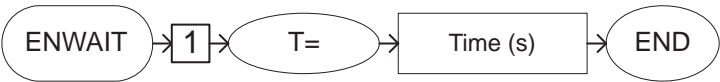
**Explanation**

## 1. T=Time

Add the following tag.

| No. | Tag | Explanation | Note |
|-----|-----|-------------|------|
| 1 | T=Time | Specifies the time in which the next instruction excluding a move instruction is carried out. | Time: 0 to 65.536 seconds<br>Variable I/LI/I []/LI [] can be used.<br>(Units: 0.001 seconds) |

**Example**

(1)  Step 1  MOVL V=136
     Step 2  MOVL V=136 ENWAIT T=3.000
            DOUT OT#(1) ON

DOUT on the next instruction line is carried out 3 seconds before reaching Step 2.

Step 1 MOVL V=136

Step 2
MOVL V=136 ENWAIT T=3.000

3 seconds

DOUT OT#(1) ON
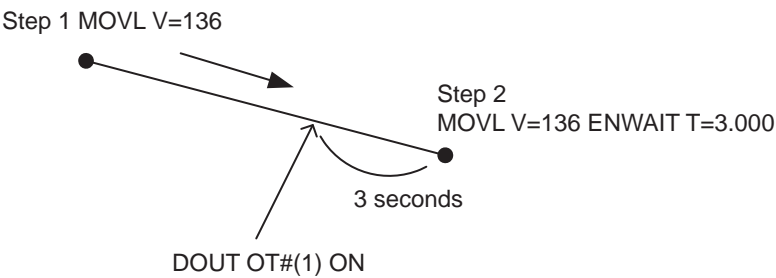
## 2.7   General-purpose Instruction

# TOOLON

| SUBSET | STANDARD | EXPANDED | APPLICATIONS |
|--------|----------|----------|--------------|
| Available | Available | Available | General-purpose |

### Function

Turns ON the work instruction.
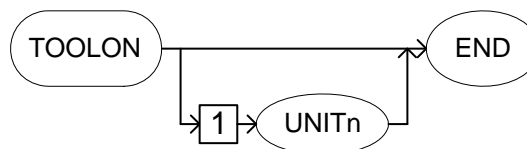
### Construction



### Explanation

### 1. UNITn

Choose one of the tags from the Unit（Equipment）. These tags are valid for a system with multiple applications in which two or more general-purpose applications are included. These tags are not displayed when there is only one application.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 1 | UNITn | Specifies the Unit (Equipment). | n: 1 to 2<br>UNIT1: UNIT1 |

### Example

(1)  TOOLON

Turns ON the work instruction.
Turns ON the work start instruction (dedicated output relay #51530) and waits for the work start response (dedicated input relay #41130). When the work start response is turned ON, the next instruction is carried out.
The work start response relay is designed to turn ON immediately after the output of the work start instruction.

# TOOLOF

| SUBSET | STANDARD | EXPANDED | APPLICATIONS |
|--------|----------|----------|--------------|
| Available | Available | Available | General-purpose |

**Function**

Turns OFF the work instruction.
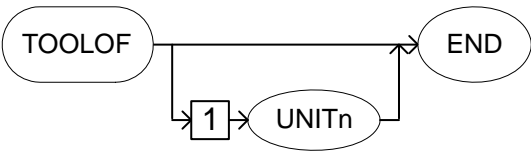
**Construction**



**Explanation**

## 1. UNITn

Choose one of the tags from the Unit (Equipment).  These tags are valid for a system with multiple applications in which two or more general-purpose applications are included.  These tags are not displayed when there is only one application.

| No | Tag | Explanation | Note |
|----|-----|-------------|------|
| 1 | UNITn | Specifies the Unit  (Equipment). | n: 1 to 2<br>UNIT1: UNIT1 |

**Example**

(1)  TOOLOF

Turns OFF the work instruction.
Turns ON the work end instruction (dedicated output relay #51531) and waits for the work end response (dedicated input relay #41131).  When the work end response is turned ON, the next instruction is carried out.
The work end response relay is designed to turn ON immediately after the output of the work end instruction.

# FS100 OPTIONS
# INSTRUCTIONS

**FOR INFORM LANGUAGE**