

Part 1 Overview of RML-1

- [1-1 Command Set](#)
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1-1. Command Set

RML-1 commands are grouped as commands for mode 1, commands for mode 2, and commands that are common to both mode 1 and mode 2.

mode 1 : Composed of one letter or symbol; based on DXY-GL.

mode 2 : Composed of two letters; based on RD-GL.

Common to mode 1 and mode 2 : Composed of an "!" plus two letters.

Special Command in the Comment : Composed of an "@RML" plus some letters in the comment "()".

For all three, the unit of measurement for the coordinate system is 1/100 mm.

Character codes are 8-bit ASCII, with valid letters, numerals, and symbols being those of ASCII code 0x7f or lower.

Codes of 0x80 or higher result in an error.

Under 7-bit communication parameters, codes are converted to 8 bits and the most significant bit is interpreted as "0" (zero).

1-2. Supported RML-1 Commands

mode 1 :

@
D
F
H
I
J
M
R
V
W
Z
^
-

mode 2 :

DF
IN
PA
PD
PR
PU
SP
VS

Common to mode 1 and mode 2 :

IDW
!IO
!MC
!NR
!OA
!OH
!PZ
!RC
!VW
!VZ
!ZM
!ZO
!ZE
!ZZ

Special Command in the Comment : END

ENTER
SET

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1-3. Command Error List

Error List

- 0 No error
- 1 Unrecognized command
The error-causing command is ignored.
- 2 Incorrect number of parameters
The error-causing command is ignored.
- 3 Parameter overflow
The error-causing command is ignored.

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Part 2 Command Format

- [2-1 Description](#)
- [2-2 Format for mode 1](#)
- [2-3 Format for mode 2](#)
- [2-4 Format for Commands Common to mode 1 and mode 2](#)
- [2-5 Specific Examples of Special Cases](#)
- [2-6 Format for Comment](#)

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2-1. Description

Commands are made up of letters and some symbols.

Parameters are made up of numerals, which may be signed.

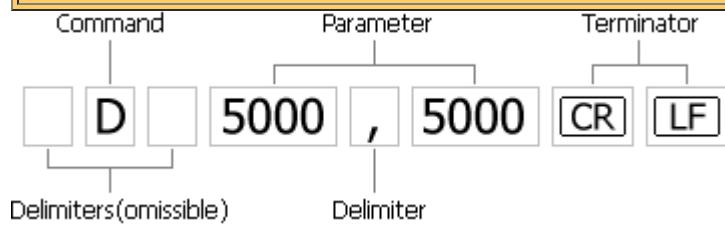
Commands and parameters are separated by delimiters and terminators.

Commands and parameters are 8-bit ASCII codes, with meaningful characters having a most significant bit of "0" (zero).

An error occurs when the most significant bit is not 0.

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2-2. Format for mode 1



Delimiter

For the delimiter before the command, an ASCII-code space (0x20) or higher, or ";" (semicolon), can be used.

More than one delimiter can be used, with no limit on the number.

For the delimiter after the command, a space or tab character can be used. Any other character results in an error.

Here as well, more than one delimiter can be used, with no limit on the number.

The delimiters before and after the command can be omitted.

The "," (comma) is used as the delimiter for parameters. Only a single one can be used.

The delimiter for parameters cannot be omitted.

Command

A command is expressed as a single letter of the alphabet or, depending on the model, as a "@", "!", "^", or "_".

If command is preceded by a numeral or by "+", "-", or ".", it is read and discarded with [error 2](#).

All other characters at 0x20 or lower, and ";", are ignored.

When a single letter is recognized, a case-insensitive comparison is performed against the list of valid commands for the model, and if the character string does not match it is discarded with [error 1](#).

Comparison is made with no distinction between upper and lower case.

If a match is made, the corresponding command is executed. Get parameters as required.

Parameter

The "," (comma) is used as the delimiter for parameters.

For more information, refer to the "Parameter" section of [the description of format for mode 2.](#)

Terminator

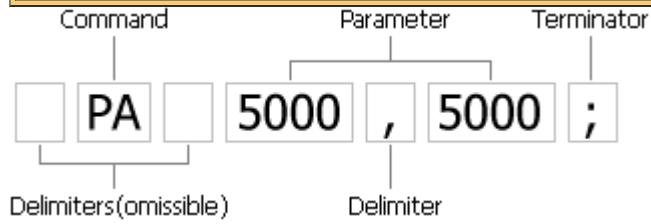
This is "CR + LF".

Unless specially noted otherwise, this can be omitted when followed by the next command.

Special conditions are described in section [2-5.](#)

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2-3. Format for mode 2



Delimiter

For the delimiter before the command, an ASCII-code space (0x20) or higher, or ";" (semicolon), can be used.

More than one delimiter can be used, with no limit on the number.

For the delimiter after the command, a space or tab character can be used. Any other character results in an error.

Here as well, more than one delimiter can be used, with no limit on the number.

The delimiters before and after the command can be omitted.

The "," (comma) is used as the delimiter for parameters. Only a single one can be used.

The delimiter for parameters cannot be omitted.

Command

A command is made up of two letters of the alphabet.

A command is interpreted correctly even if one or more space or tab is interposed between the first and second characters.

These may be of any number, but use of any character other than a space or tab results in the character being read and discarded with [error 1](#).

If the first letter of a command is preceded by a numeral or by "+", "-", or ".", it is read and discarded with [error 2](#). All other characters at 0x20 or lower, and ";", are ignored.

The string is segmented at two-letter boundaries and comparison is performed against the list of valid commands for the model.

If no match is made, the command is read and discarded with [error 1](#).

Comparison is made with no distinction between upper and lower case. If a match is made, the command is executed. Parameters are obtained as required.

Parameter

This is a numeral and "+", "-", or ".".

The "+" may be omitted.

The value "5000" must follow without any intervening extra characters.

If a character other than a numeral or "+", "-", and "." appears, the character string up to that point is taken to be a single parameter.

A parameter has no E expression. They are composed only of numerals and ".", "+", and "-".

A parameter that is larger or smaller than the expected value results in [error 3](#), and the portion corresponding to that parameter is not executed.

Special conditions are described in section [2-5](#).

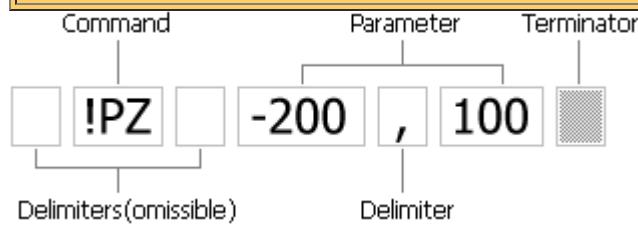
Terminator

This is ";".

Unless specially noted otherwise, this can be omitted when followed by the next command.

Special conditions are described in section [2-5](#).

2-4. Format for Commands Common to mode 1 and mode 2



Delimiter

For the delimiter before the command, an ASCII-code space (0x20) or higher, or ";" (semicolon), can be used.

More than one delimiter can be used, with no limit on the number.

For the delimiter after the command, a space or tab character can be used. Any other character results in an error.

Here as well, more than one delimiter can be used, with no limit on the number.

The delimiters before and after the command can be omitted.

The "," (comma) is used as the delimiter for parameters. Only a single one can be used.

The delimiter for parameters cannot be omitted.

Command

Except for the addition of "!", the system is similar to mode 2.

When "!" is detected, interpretation of the following letter follows the rules for mode 2 commands.

For more information, refer to the "Command" section of [the description of format for mode 2](#).

Parameter

This is similar to the parameters for mode 2.

Terminator

The [terminator] is "CR + LF" for mode 1 and ";" for mode2.

Unless specially noted otherwise, this can be omitted when followed

by the next command.

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2-5. Specific Examples of Special Cases

When a parameter contains a special character (when a "+", "-", ".", or numeric string in a parameter string delimited by a command character and a delimiter or terminator loses its significance as a numerical value), the character is treated as a terminator.

Examples

PA100,,100;	is equivalent to PA100,;,100;
PA100++100;	is equivalent to PA100;++100;
PA100..100;	is equivalent to PA100.;.100;
PA100,.100.0;	is equivalent to PA100,0.100;.0;
PA 100 . 0, 100;	is equivalent to PA100,0;0,100;
PA - 100, 100;	is equivalent to PA-;100,100;
PA . 100, 100;	is equivalent to PA0;100,100;
PD,	is equivalent to PD;,
PD\$	is equivalent to PD;\$
PD<	is equivalent to PD;<
PD^C	is equivalent to PD;^C
PD[TAB]0,1;	is equivalent to PD0,1;
PD-[CR]0,1;	is equivalent to PD-;0,1;

When getting parameters, only the number of parameters that could be obtained completely and correctly is executed.

Following are examples using a command "XX" that requires between zero and four parameters.

(Specifically, cases resulting in an error are excluded.)

XX-;	is executed with zero parameters.
XX 100,-;	is executed with one parameter.
XX 100,100,-;	is executed with two parameters.
XX 100,100,200,-;	is executed with three parameters.

XX 100,100,200,200; is executed with four parameters.
XX is executed with four parameters.
100,100,200,200,300; Only the required parameters are obtained.
 The final ",300" is passed to the next
 command search.

In command processing, two letters must be obtained for mode 2 commands and common commands.

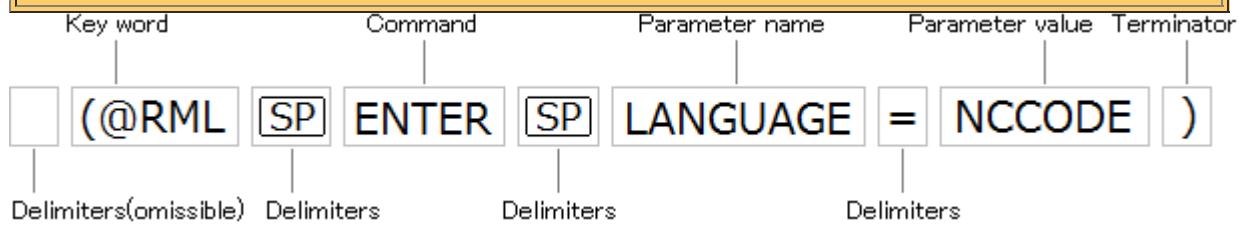
Even when the portion is only one letter and the determination is made that there is no corresponding command, it is necessary to get one more letter.

Examples

PU;PPDF; In this case, processing as PP + DF; is performed.

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2-6. Format for Comment



Comment

You can write a comment in "()". The string in the comment is ignored.
Nested parentheses are also supported.
Line break and ";" are forbidden in the comment.

Special Command in the Comment

Use "@RML" next to "(", then it enables the interpretation of special command in the comment.
It is allowed to use only one special command in one comment.
 "(" and ")" are forbidden in the special command. The character ")" ends the comment.
Even if the special command cannot be interpreted or cannot run, an error is not occurred.

Command

A command is separated by a space, tab character or ")" and comparison is performed against the list of valid commands for the model.
If a match is made, the command is executed. Parameters are obtained as required.

Delimiter

For the delimiter before the command, an ASCII-code space (0x20) or higher, or ";" (semicolon), can be used.
More than one delimiter can be used. There is no limit on the number of delimiter used.
A space is required after "@RML" and after command.

You can insert before/after "=" following parameter name and before ")" following parameter value.

Here as well, more than one delimiter can be used. There is no limit on the number of delimiter used.

Parameter

A parameter name is separated by "=".

After parameter name, A parameter value is separated by space, tab character or ")".

A parameter value can be multiple values separated by ",".

Terminator

This is ")" : a character to end of comment.

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Part 3 Descriptions of Commands

- [3-1 mode 1 Commands](#)
- [3-2 mode 2 Commands](#)
- [3-3 Commands Common to mode 1 and mode 2](#)
- [3-4 Special Commands in the Comment](#)

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3-1. mode 1 Commands

- @ Input Z1&Z2
- D Draw
- F Velocity X,Y-axis
- H Home
- I Relative Draw
- J Tool Change
- M Move
- R Relative Move
- V Velocity Z-axis
- W Dwell
- Z Three Axis Simultaneous Feed
- ^ Call mode2

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@	Input Z1&Z2
---	-------------

Format

```
@ z1(,z2) [terminator]  
@ [terminator]
```

Parameter range

Depends on the model

Description

This sets point Z1 and Z2 in the workpiece coordinate system.

Z1 is the tool height for movement effected by a PD command with no parameter, and Z2 is the tool height for movement effected by a PU command with no parameter.

Z1 and Z2 specify a relative value from Z0 in the workpiece coordinate system.

When Z2 is not specified, the value already in effect is reused.

When no parameter exists, Z1 is reset to zero and Z2 is reset to the machine's highest point. Note, however, that when the setting has already been made on the machine, it is reset to the machine's value.

If either Z1 or Z2 (but not both) generates an error, the setting is made for the value that did not generate an error.

When Z2 is set outside the work area, the tool-up height is the machine's highest point.

Errors

[Error 3](#) results if Z1 is higher than zero or if Z2 is less than zero.

[Error 3](#) similarly results when Z1 specifies a relative value from the Z-axis origin point that results in a location outside the work area.

No error results when Z2 is outside the work area.

Other Matters

When Z1 and Z2 can be set using either a command or the control panel, the setting made last takes effect.

Operation is identical to the [!PZ command](#) common to modes 1 and 2.

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D

Draw

Format

D x1,y1,x2,y2, .. xn,yn [terminator]
D [terminator]

Parameter range

Depends on the model

Description

This sequentially cuts line segments between coordinates specified from the present tool location, in the sequence x1,y1, x2,y2,..., xn,yn. The coordinate values are all absolute coordinates. Thereafter the system is in the absolute-coordinate mode.

For more information about coordinate modes, refer to ["5-3. Effects on Other Commands."](#)

When this command is received and tool movement starts, the following operations are performed.

- When the spindle can rotate, it is rotated.
- Operation waits until rotation stabilizes.
- When the location is higher than Z1, movement to Z1 is performed at the speed specified by the !VZ or V command.
When the location is lower than Z1, movement to Z1 is performed at maximum speed.
- Movement is performed to the first target site specified by (x1, y1).

Errors

For the parameters, a pair of values, x and y, constitute a single set, and more than one set can be stated.

When the number of parameters is odd, each pair is sequentially interpreted from the beginning as x and y and is executed accordingly,

and the final remaining single parameter generates [error 2](#).
The final remaining parameter is ignored.

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F	Velocity X,Y-axis
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Format

F tool-speed [terminator]
F [terminator]

Parameter range

Depends on the model

Description

This sets the speed of tool movement along the X and Y axes.

F without a parameter is set to the default speed.

When the value of the parameter is the model's capacity or higher, the model's Maximum speed is used.

When the value of the parameter is the model's capacity or lower, the model's minimum speed is used.

In operation, achieving the actual given parameter value cannot be guaranteed.

Depending on the length of the line segment, operation may be slower than the value specified by the parameter because of an inability to accelerate fully.

The minimum units of measurement for the maximum and minimum speeds that can be achieved differ according to the machine.

("Minimum unit of measurement" refers to a settable granularity of 1 mm/sec. or 0.1 mm/sec.)

This means that the speed achieved may differ even when identical parameter values are specified.

For example, F 0 may result in a speed of 0.5 mm/sec. on one model, and a speed of 0.3 mm/sec. on another.

The default speed setting also varies according to the model.

Errors

An out-of-range parameter results in [error 3](#).

When the parameter is within range, no error occurs, but speed is limited according to the capability of the machine.

Other Matters

Operation is identical to the mode-2 [VS command](#).

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Format

H [terminator]

Description

This moves the tool to the uppermost position, then moves to the XY origin point in workpiece coordinate system.

After movement is complete, rotation of the spindle motor is stopped. Command errors are cleared.

After movement is complete, the "tool-up" and "absolute-coordinate mode" settings are made. (Refer to ["5-3. Effects on Other Commands."](#))

If the XY origin point is outside the cutting range, the tool stops at the maximum clip location to which movement is possible. The location of the stop at this time is used as the present position for subsequent operation. (When movement to a location outside the area is attempted using an ordinary movement command and movement stops at the clip location, movement to the next destination uses a path from the logical coordinates.)

Errors

No error is generated.

Other Matters

There is no change before and after command execution in the XY origin point or in the value of Z0 (Z origin point) set on the machine.

I**Relative Draw****Format**

```
I dx1,dy1,dx2,dy2, ... dxn,dyn [terminator]  
I [terminator]
```

Parameter range

Depends on the model

Description

This cuts a line segment at the Z1 height from the present tool position to the location specified by the amount of movement (dx1, dy1) along the X and Y axes. It also cuts a line segment at the Z1 height from the movement destination to the location specified by the amount of movement (dx2, dy2). This is repeated to perform cutting up to the specified final location.

The coordinate values are all relative coordinates, and after this command the system goes into the relative-coordinate mode. (For more information about coordinate modes, refer to "["5-3. Effects on Other Commands."](#)) When this command is received and tool movement starts, the following operations are performed.

- When the spindle can rotate, it is rotated.
- Operation waits until rotation stabilizes.
- When the location is higher than Z1, movement to Z1 is performed at the speed specified by the !VZ or V command.
When the location is lower than Z1, movement to Z1 is performed at maximum speed.
- Movement is performed to the first target site specified by (dx1, dy1).

Errors

For the parameters, a pair of values, dx and dy, constitute a single set, and more than one set can be stated.

When the number of parameters is odd, each pair is sequentially interpreted from the beginning as dx and dy and is executed accordingly, and the final remaining single parameter generates [error 2](#).

The final remaining parameter is ignored.

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J

Tool Change

Format

```
J tool-number [terminator]  
J [terminator]
```

Parameter range

-32768 to 32767

Description

This changes the tool.

On a machine equipped with a tool-change feature, this changes to the tool of the specified tool number.

When no tool-change feature is available, this command is ignored.

Valid tool numbers differ according to the machine, and the range which results in an error is also machine-dependent.

When no parameter or a parameter of 0 (zero) is given, the tool now held is returned.

Errors

Specifying an unusable tool number results in [error 3](#).

Other Matters

Operation is identical to the mode-2 [SP command](#).

M

Move

Format

```
M x1,y1,x2,y2, .. xn,yn [terminator]  
M [terminator]
```

Parameter range

Depends on the model

Description

This sequentially moves linearly at the Z2 height between coordinates specified from the present tool location, in the sequence x1,y1, x2,y2,..., xn,yn.

The coordinate values are all absolute coordinates, and the system goes into the absolute-coordinate mode. (For more information about coordinate modes, refer to ["5-3. Effects on Other Commands."](#))

When this command is received and tool movement starts, the following operations are performed.

- When the spindle can rotate, it is rotated.
- Operation waits until rotation stabilizes.
- When the location is higher than Z2, movement to Z2 is performed at the speed specified by the !VZ or V command.
When the location is lower than Z2, movement to Z2 is performed at maximum speed.
- Movement is performed to the first target site specified by (x1, y1).

Errors

For the parameters, a pair of values, x and y, constitute a single set, and more than one set can be stated.

When the number of parameters is odd, each pair is sequentially interpreted from the beginning as x and y and is executed accordingly,

and the final remaining single parameter generates [error 2](#).
The final remaining parameter is ignored.

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R

Relative Move

Format

```
R dx1,dy1,dx2,dy2, ... dxn,dyn [terminator]  
R [terminator]
```

Parameter range

Depends on the model

Description

This moves a line segment at the Z2 height from the present tool position to the location specified by the amount of movement (dx1, dy1) along the X and Y axes. It also moves a line segment at the Z2 height from the movement destination to the location specified by the amount of movement (dx1, dy1). This is repeated to perform moving up to the specified final location.

Movement is performed at the model's maximum speed.

The coordinate values are all relative coordinates, and after this command the system goes into the relative-coordinate mode. (For more information about coordinate modes, refer to ["5-3. Effects on Other Commands."](#))

When this command is received and tool movement starts, the following operations are performed.

- When the spindle can rotate, it is rotated.
- Operation waits until rotation stabilizes.
- When the location is higher than Z2, movement to Z2 is performed at the speed specified by the !VZ or V command.
When the location is lower than Z2, movement to Z2 is performed at maximum speed.
- Movement is performed to the first target site specified by (dx1, dy1).

Errors

For the parameters, a pair of values, dx and dy, constitute a single set, and more than one set can be stated.

When the number of parameters is odd, each pair is sequentially interpreted from the beginning as dx and dy and is executed accordingly, and the final remaining single parameter generates [error 2](#).

The final remaining parameter is ignored.

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V

Velocity Z-axis

Format

V tool-up/down speed [terminator]
V [terminator]

Parameter range

Depends on the model

Description

This sets the speed of tool movement along the Z axis.

V without a parameter is set to the default speed.

When a parameter is present and is a settable speed, the speed is set to the value of the parameter.

When the parameter is not a settable value, the maximum or minimum settable value is set automatically.

Achievement of the specified speed is not guaranteed.

Depending on the length of the line segment, the specified speed may not be reached because of an inability to accelerate fully.

The minimum units of measurement for the maximum and minimum speeds that can be achieved differ according to the machine.

("Minimum unit of measurement" refers to a settable granularity of 1 mm/sec. or 0.1 mm/sec.)

This means that the speed achieved may differ even when identical parameter values are specified.

For example, F 0 may result in a speed of 0.5 mm/sec. on one model, and a speed of 0.3 mm/sec. on another.

The default speed setting also varies according to the model.

Errors

An out-of-range parameter results in [error 3](#).

When the parameter is within range, no error occurs, but speed is limited according to the capability of the machine.

Other Matters

Operation is identical to the [!VZ command](#) common to modes 1 and 2.

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W	Dwell
----------	-------

Format

```
W dwell-time [terminator]
W [terminator]
```

Parameter range

Depends on the model

Description

When the cutting direction changes, dwell (waiting) for the specified interval occurs before operation is performed.

When W is used without a parameter, the default value is applied (0 msec.).

When a two-dimensional command such as [PD or PU](#) is used, the dwell operation is performed just before the PD tool-down operation or just before moving the XY plane period parameters.

It is also performed just before changing from tool-down to tool-up with PU.

However, it is not performed when a PU parameter manipulates the XY plane.

In the case of a PU or PD command without parameters, it is performed just before the tool-up or tool-down operation.

In the case of a three-dimensional movement command such as [!ZZ](#), it is performed just before the operation of that command is carried out.

Operations other than the command's are unaffected.

Errors

An out-of-range parameter results in [error 3](#).

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Z

Three Axis Simultaneous Feed

Format

```
Z x1,y1,z1,... [terminator]
```

Parameter range

Depends on the model

Description

This moves simultaneously along the three axes from the present coordinates to the specified coordinate values.

The speed is as set by the [V](#) or [!VZ](#) command.

The parameters are interpreted as absolute coordinates when the absolute-coordinate mode has been set prior to this command and are interpreted as relative values when then relative-coordinate mode has been set prior to this command. (For more information about coordinate modes, refer to ["5-3. Effects on Other Commands."](#))

Errors

For the parameters, three values -- x, y, and z -- make up one set, and more than one set can be stated.

When the number of parameters is not a multiple of three, the parameters are interpreted and executed in sequence from the start as x, y, and z, and the final one or final two result in [error 2](#).

The final remaining parameter or parameters are ignored.

Other Matters

Operation is identical to the [!ZZ command](#) common to modes 1 and 2.

^

Call mode2

Format

^ [mode 2 command] [parameter] ... [parameter]
[terminator(;)]

Parameter range

This depends on the mode 2 command set.

Description

This calls a mode 2 command from mode 1.

For parameters, refer to the description for the called mode 2 command.

When only "^" is given, this instruction set does not end until a mode 2 command is executed or until a numeral, sign, or other such data that results in a mode 2 error is encountered.

Errors

This command itself does not generate any errors.

Generation of an error by the mode 2 command is possible.

Also, if the called mode 2 command does not exist, then in principle [error 1](#) for mode 2 is generated at that time.

3-2. mode 2 Commands

DF Default
IN Initialize
PA Plot Absolute
PD Tool Down
PR Plot Relative
PU Tool Up
SP Select Tool
VS Velocity Select

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DF	Default
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Format

DF [terminator]

Description

This sets some present settings to their default values.

1. This sets to absolute coordinates mode.
2. XY speed is set to the default value.
The default value is model-dependent.
3. Z speed is set to the default value.
The default value is model-dependent.
4. Dwell time is set to 0.
5. Spindle rotation is permitted.
6. Z1 and Z2 value are initialized.
The default value is model-dependent.

Errors

No error is generated.

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IN	Initilaize
----	------------

Format

IN [terminator]

Description

This performs the same operations as the standard settings made by the DF command, as well as making the following settings.

1. Move the tool to the tool-up position.
2. Clear errors.
3. Stop the spindle motor.
4. Reset the coordinate values.

When the present coordinates are outside the clipping area, they are reset to within the clipping area (the present tool position).

The coordinates do not change when they are within the clipping area.

Errors

No error is generated.

Other Matters

There is no change before and after command execution in the XY origin point or in the value of Z0 (Z origin point) set on the machine.

PA

Plot Absolute

Format

```
PA x1,y1(,x2,y2, ....) [terminator]  
PA [terminator]
```

Parameter range

Depends on the model

Description

This performs movement to the coordinate location of the parameters, without changing the present state of the tool (up or down).

This effects the absolute-coordinate mode after command execution, regardless of the whether any parameters are present. (For more information about coordinate modes, refer to "["5-3. Effects on Other Commands."](#))

Errors

For the parameters, a pair of values, x and y, constitute a single set, and more than one set can be stated.

When the number of parameters is odd, each pair is sequentially interpreted from the beginning as x and y and is executed accordingly, and the final remaining single parameter generates [error 2](#).

The final remaining parameter is ignored.

PU/PD

Tool Up/Down

Format

```
PU x1,y1(,x2,y2, ....) [terminator]  
PU [terminator]  
PD x1,y1(,x2,y2, ....) [terminator]  
PD [terminator]
```

Parameter range

Depends on the model

Description

PU or PD without parameters performs only a tool-up or tool-down operation.

When parameters are present, the command performs the tool-up or tool-down operation, then operates to the coordinate value specified by the parameters.

Specified parameters are interpreted as coordinates when in the absolute-coordinate mode and as an amount of movement when in the relative-coordinate mode. (For more information about coordinate modes, refer to ["5-3. Effects on Other Commands."](#))

The up or down position uses the height specified on the machine or by the [!PZ](#) or [@](#) command.

The tool-up location is the Z2 location.

The tool-down location is the Z1 location.

When Z2 is outside the clipping area, this raises the tool to the machine's highest point.

Performing movement along the X and Y axes while in this state effects movement with the height remaining unchanged at the highest point.

If a PD command is encountered, operation is performed without change regardless of whether the machine's setting for "pause on return to clipping area" is on or off. (The availability of this feature varies

according to the machine.)

The operating speed for the PD command is set using the [VS](#) or [F](#) command.

However, the speed specified by the VS or F command may not necessarily be achieved. Depending on the length of the line segment for the operation, the specified speed may not be reached.

The specified speed is reached when the line segment is long enough to allow sufficient acceleration.

PU operates at a particular specified speed, regardless of the VS command.

This ordinarily the model's highest speed, but it may be set at a lower value in some cases.

For PU, similarly to PD, the specified speed is reached when a line segment of the length required for acceleration is present.

Errors

For the parameters, a pair of values, x and y, constitute a single set, and more than one set can be stated.

When the number of parameters is odd, each pair is sequentially interpreted from the beginning as x and y and is executed accordingly, and the final remaining single parameter generates [error 2](#).

The final remaining parameter is ignored.

Other Matters

Z2 can be set outside the cutting range, and its value is retained.

If Z0 is lowered so that Z2 comes within the effective range, its value is used.

PR

Plot Relative

Format

```
PR x1,y1(,x2,y2, ....) [terminator]  
PR [terminator]
```

Parameter range

Depends on the model

Description

This performs movement to the coordinate location of the parameters, without changing the present state of the tool (up or down).

This effects the relative-coordinate mode after command execution, regardless of the whether any parameters are present. (For more information about coordinate modes, refer to ["5-3. Effects on Other Commands."](#))

Errors

For the parameters, a pair of values, x and y, constitute a single set, and more than one set can be stated.

When the number of parameters is odd, each pair is sequentially interpreted from the beginning as x and y and is executed accordingly, and the final remaining single parameter generates [error 2](#).

The final remaining parameter is ignored.

SP

Select Tool

Format

```
SP tool-number [terminator]  
SP [terminator]
```

Parameter range

-32768 to 32767

Description

This changes the tool.

On a machine equipped with a tool-change feature, this changes to the tool of the specified tool number.

When no tool-change feature is available, this command is ignored.

Valid tool numbers differ according to the machine, and the range which results in an error is also machine-dependent.

When no parameter or a parameter of 0 (zero) is given, the tool now held is returned.

Errors

Specifying an unusable tool number results in [error 3](#).

Other Matters

Operation is identical to the mode-1 [J command](#).

VS

Velocity Select

Format

```
VS tool-speed [terminator]  
VS [terminator]
```

Parameter range

Depends on the model

Description

This sets the speed of tool movement along the X and Y axes.

VS without a parameter is set to the default speed.

When the value of the parameter is the model's capacity or higher, the model's maximum speed is used.

When the value of the parameter is the model's capacity or lower, the model's minimum speed is used.

In operation, achieving the actual given parameter value cannot be guaranteed.

Depending on the length of the line segment, operation may be slower than the value specified by the parameter because of an inability to accelerate fully.

The minimum units of measurement for the maximum and minimum speeds that can be achieved differ according to the machine.

("Minimum unit of measurement" refers to a settable granularity of 1 mm/sec. or 0.1 mm/sec.)

This means that the speed achieved may differ even when identical parameter values are specified.

For example, VS 0 may result in a speed of 0.5 mm/sec. on one model, and a speed of 0.3 mm/sec. on another.

The default speed setting also varies according to the model.

Errors

An out-of-range parameter results in [error 3](#).

When the parameter is within range, no error occurs, but speed is limited according to the capability of the machine.

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3-3. Commands Common to mode 1 and mode 2

- IDW** Dwell
- IMC** Motor Control
- INR** Not Ready
- IPZ** Set Z1 & Z2
- IRC** Revolution Control
- VW** Move to view position
- VZ** Velocity Select Z-axis
- ZM** Z-axis Move
- ZQ** Set Z0
- ZE** Extension Axis Move
- ZZ** XYZ Axis
- Simultaneous Feed

!DW

Dwell

Format

```
! DW dwell-time [terminator]  
! DW [terminator]
```

Parameter range

Depends on the model

Description

When the cutting direction changes, dwell (waiting) for the specified interval occurs before operation is performed.

When !DW is used without a parameter, the default value is applied (0 msec.).

There is no wait time when the cutting direction changes.

When a two-dimensional command such as [PD or PU](#) is used, the dwell operation is performed just before the PD tool-down operation or just before moving the XY plane period parameters.

It is also performed just before changing from tool-down to tool-up with PU.

However, it is not performed when a PU parameter manipulates the XY plane.

In the case of a PU or PD command without parameters, it is performed just before the tool-up or tool-down operation.

In the case of a three-dimensional movement command such as [!ZZ](#), it is performed just before the operation of that command is carried out.

Operations other than the command's are unaffected.

Errors

An out-of-range parameter results in [error 3](#).

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!IO	Input Origin
-----	--------------

Format

```
!IO [terminator]  
!IO x,y [terminator]
```

Parameter range

Depends on the model

Description

This sets the origin point for the X/Y axis.

The x/y parameter are interpreted as a coordinate value in the machine coordinate system when in the absolute-coordinate mode and as an amount of movement when in the relative-coordinate mode. (For more information about coordinate modes, refer to ["5-3. Effects on Other Commands."](#))

The default state of the machine (when no command has been sent) is the absolute-coordinate mode.

The absolute-coordinate mode is in effect even after an [IN](#) or [DF](#) command has been sent.

When no parameter is present, the default value is used.

The default is model-dependent.

Errors

When the number of parameters is one, [error 2](#) occurs.

A value for the x/y parameter those are outside the X/Y-axis movement range results in [error 3](#).

Format

```
!MC n [terminator]  
!MC [terminator]
```

Parameter range

Depends on the model

Description

When parameter n is other than 0 or when the parameter is omitted, the spindle motor is set to a rotatable state.

Actual rotation takes place at the time of tool movement by a subsequent command.

Thereafter, when the tool is moved by a command, the spindle motor is made to rotate from a stopped state, and then the movement is performed.

When n is 0, rotation thereafter is prohibited.

If the movement axis is presently in operation due to a command, rotation is stopped after the operation ends.

This command is effective in performing rotation or stoppage after waiting until the motor actually stops.

Errors

No error is generated.

Other Matters

!MC 0 is used when operation with the spindle remaining stopped is desired, such as in the scribing mode.

When in this state, all operations that rotate the spindle are prohibited. To cancel this state, one of the following methods must be used.

- Switch off the power.

- Send "!MC 1;".
- Send "IN;".
- Send "DF;".

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!NR	Not Ready
-----	-----------

Format

```
!NR [terminator]
```

Description

This puts the machine in a paused state.

No parameter is required.

Other Matters

No command exists for canceling the paused state.

Accordingly, action must be taken on the machine to cancel the pause.

Depending on the machine, movement of the tool to some specific location may be performed while paused.

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!OA

Output Actual Position

Format

```
!OA [terminator]
```

Description

When the machine receives this command, the machine outputs the following three values in ASCII code.

x, y, z [CR (0x0d)]

(x,y,z) values indicate the tool position when the machine receives the command.

The coordinate is a relative position from user origin and these values can be fed by minimum increment of 0.01mm(0.01mm is the unit of the command).

If using USB connection, the information is sent to the computer via bulk-in data transfer.

Error

No error is generated.

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!OH

Output Hard Clip Limits

Format

`!OH [terminator]`

Description

When the machine receives this command, the machine outputs the following three values in ASCII code.

`xmin, ymin, zmin, xmax, ymax, zmax [CR (0x0d)]`

(xmin,ymin,zmin) : These values indicate the minimum value of work area. (xmax,ymax,zmax) : These values indicate the maximum value of work area.

These values are the mechanical coordinate and these values can be fed by minimum increment of 0.01mm(0.01mm is the unit of the command).

If using USB connection, the information is sent to the computer via bulk-in data transfer.

Error

No error is generated.

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!PZ

Set Z1 & Z2

Format

```
!PZ z1(,z2) [terminator]  
!PZ [terminator]
```

Parameter range

Depends on the model

Description

This sets the Z1 and Z2 points in the workpiece coordinate system. Z1 is the tool height for movement effected by a PD command with no parameter, and Z2 is the tool height for movement effected by a PU command with no parameter.

Z1 and Z2 are specified as relative values from Z0 (the Z-axis origin point) in the workpiece coordinate system.

When Z2 is not specified, the present value for Z2 is carried over without change.

When no parameter exists, Z1 is reset to zero and Z2 is reset to the machine's highest point. Note, however, that when the setting has already been made on the machine, it is reset to the machine's value. If an error occurs with either Z1 or Z2, the setting is made for the one for which no error resulted.

When Z2 is set outside the work area, the tool-up height is the machine's highest point.

Errors

Error3 results if Z1 is higher than zero or if Z2 is less than zero.

Error 3 similarly results when Z1 specifies a relative value from the Z-axis origin point that results in a location outside the work area.

No error results when Z2 is outside the work area.

Other Matters

When Z1 and Z2 can be set using either a command or the control panel, the setting made last takes effect.

Operation is identical to the mode-1 [@command](#).

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Format

```
!RC n [terminator]  
!RC [terminator]
```

Parameter range

0 to 8388607

Description

This sets the rotating speed of the spindle motor.

Operation varies according to the value of the parameter.

■ When at 0 to 99

The setting range for spindle speed is divided into 16 stages from 0 to 15.

These are not absolute values.

A value of 0 is the lowest spindle speed, and 15 is the maximum speed.

Values higher than 15 are clipped to 15.

However, on a machine described below that interprets a value of 100 or more as an rpm value, values of 99 or less are clipped to 15.

■ When at 100 to 8388607

Models that can specify the spindle speed as a direct rpm value specify the value directly.

However, the actual effective number of digits is model-dependent. For example, a value of 3124 may produce such differing results as 3,000 rpm, 3,100 rpm, 3,120 rpm, or 3,124 rpm, depending on the model.

Digits other than effective digits are discarded.

Also, when a spindle speed exceeding the model's capacity is specified, the model's maximum speed is used. Similarly, when a spindle speed below the model's capacity is specified, the model's minimum speed is used.

The setting is enabled after operation of the X, Y, and Z motors stops. When there is no parameter, no execution is performed. The command is ignored.

Depending on the model, it may not be possible to manipulate the spindle rotating speed using commands. In such cases, the command, including the parameter, is ignored.

Errors

A negative parameter (less than 0) results in [error 3](#).

Parameters exceeding 8388607 also result in [error 3](#) and no execution.

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!VW

Move to view position

Format

`!VW [terminator]`

Description

Stop the spindle and move to view position.

No parameter is required.

Error

No error occurs.

Other Matters

The position of view position depends on the model.

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!VZ

Velocity Select Z-axis

Format

```
!VZ s [terminator]  
!VZ [terminator]
```

Parameter range

Depends on the model

Description

This sets the speed of tool movement along the Z axis.

!VZ without a parameter is set to the default speed.

When a parameter is present and is a settable speed, the speed is set to the value of the parameter.

When the parameter is not a settable value, the maximum or minimum settable value is set automatically.

Achievement of the specified speed is not guaranteed.

Depending on the length of the line segment, the specified speed may not be reached because of an inability to accelerate fully.

The minimum units of measurement for the maximum and minimum speeds that can be achieved differ according to the machine.

("Minimum unit of measurement" refers to a settable granularity of 1 mm/sec. or 0.1 mm/sec.)

This means that the speed achieved may differ even when identical parameter values are specified.

For example, !VZ 0 may result in a speed of 0.5 mm/sec. on one model, and a speed of 0.3 mm/sec. on another.

The default speed setting also varies according to the model.

Errors

An out-of-range parameter results in [error 3](#).

When the parameter is within range, no error occurs, but speed is limited according to the capability of the machine.

Other Matters

Operation is identical to the mode-1 [V command](#).

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!ZM

Z-axis Move

Format

```
! ZM z [terminator]  
! ZM [terminator]
```

Parameter range

Depends on the model

Description

Movement to the Z-axis coordinate value specified by the z parameter is performed.

The X and Y axes do not operate at that time.

The z parameter is interpreted as a coordinate value in the machine coordinate system when in the absolute-coordinate mode and as an amount of movement when in the relative-coordinate mode. (For more information about coordinate modes, refer to "["5-3. Effects on Other Commands."](#))

The default state of the machine (when no command has been sent) is the absolute-coordinate mode.

It is also interpreted as an absolute coordinate after an IN or DF command.

When no parameter is present, no execution is performed.

Errors

A value for the z parameter that is outside the Z-axis movement range results in [error 3](#).

!ZO	Set Z0
------------	--------

Format

!ZO z [terminator]
!ZO [terminator]

Parameter range

Depends on the model

Description

This sets the origin point for the Z axis.

The z parameter is interpreted as a coordinate value in the machine coordinate system when in the absolute-coordinate mode and as an amount of movement when in the relative-coordinate mode. (For more information about coordinate modes, refer to "["5-3. Effects on Other Commands."](#))

The default state of the machine (when no command has been sent) is the absolute-coordinate mode.

The absolute-coordinate mode is in effect even after an [IN](#) or [DF](#) command has been sent.

When no parameter is present, the default value is used.
The default is model-dependent.

Errors

A value for the z parameter that is outside the Z-axis movement range results in [error 3](#).

!ZE

Extension axis Move

Format

```
!ZE (Xx1) (Yy1) (Zz1) (Aa1) (: (Xx2) (Yy2) (Zz2) (Aa2)
... ) [terminator]
```

Parameter range

Axis name : A through Z or a through z

Value : Depends on the model

Description

This moves (or rotates) the specified axis from the present coordinate or angle to the specified coordinate or angle.

Each parameter that follows !ZE is given in a format composed of a letter of the alphabet indicating the name of an axis and a numerical value indicating the movement-destination coordinate.

For example, the command to move to the location when the X axis is 100, the Z axis is 200, and the A axis is 90 is !ZE

X100Z200A90[terminator].

Also, axis names are not case-distinctive. This means that "A" and "a" mean the same thing.

The parameter for a rotation axis is specified as an angle.

The minimum resolution angle and the direction of rotation vary according to the model used.

!ZE A30.5 [terminator] -- This rotates the A axis by 30.5 degrees.

The axis parameters may be specified in any order.

!ZE Z300X100Y200 [terminator] is equivalent to !ZE X100Y200Z300 [terminator].

The movement speed is as set by the [V](#) or [!VZ](#) command.

When rotation of the rotation axis is involved, the rotation speed varies according to the model used.

When there is no parameter, no execution is performed. The parameters are interpreted as a coordinate value in the machine coordinate system when in the absolute-coordinate mode and as an amount of movement when in the relative-coordinate mode. (For more information about coordinate modes, refer to ["5-3. Effects on Other Commands."](#))

Multiple settings may be made by separating parameters using the ":" separator.

Axes for which nothing is specified keep their present location and do not operate.

Example: When the present locations (for X, Y, Z, and A) are respectively at the (100, 200, 300, 45) coordinates and !ZE X123Y456:X987Z-200 [terminator] is given, the X and Y axes first move simultaneously to (123, 456). At this time the other axes for which nothing was specified (the Z and A axes) remain stopped. Next, the X and Z axes move simultaneously to the coordinates (987, -200). Similarly, the axes for which nothing was specified (the Y and A axes) remain stopped.

Giving only separators without stating any parameters at all does not generate an error, but no operation is performed.

Example: !ZE:: [terminator]

Specifying an axis that the model used does not have causes the specification for that axis to be ignored, but the other axes operate. When "!ZE X100Y200Z300 [terminator]" is specified for a model that has no Y axis, the parameter for Y-axis movement is ignored, but the other axes (X and Z) move to their respectively specified locations.

Movement operation occurs only after interpretation of the separator or terminator.

When !ZE X100Y200:Z300A400; is given, the X and Y axes respectively move to (100, 200) when the first separator is interpreted. Next, the Z and A axis respectively move to (300, 400) when the final terminator is interpreted.

If an error occurs in a parameter statement, operation including the

parameter where the error occurred and everything thereafter up to the terminator is skipped as invalid data.

When !ZE X100Y200:Z300A:X0Y0Z0 [terminator] is given, firstly, the X and Y axes respectively move to (100, 200) at the first separator. Then, because the next set of parameters contains an "A" parameter with no specified numerical value, [error 3](#) occurs at this point, and everything up to the final terminator is skipped.

Consequently, the only operation of the foregoing command is to move the X and Y axes respectively to (100, 200).

Errors

Parameters that attempt simultaneous movement of axes that cannot operate at the same time (such as the Y and A axes on an MDX-650 equipped with a rotating axis) result in [error 3](#).

!ZE X100Y200Z300A90 [terminator] -- This attempts to operate the Y and A axes simultaneously, resulting in an error.

Specifying the same axis two or more times without delimiting the statements by a separator results in [error 2](#).

!ZE X100Y200X300 [terminator] -- This specifies an X-axis parameter twice, resulting in an error.

Giving only the name of an axis without specifying a numerical value results in [error 3](#).

Specifying only a numerical value without stating the name of an axis also results in [error 3](#).

!ZE X100Y [terminator] -- No movement-destination coordinate is specified for the Y axis, resulting in an error.

!ZE 100 [terminator] -- No axis name is specified, resulting in an error.

One or more spaces occurring between the command "!ZE" and a parameter such as "X100" or between a parameter such as "X" and a numerical value such as "100" does not result in an error, but a numerical value that is not an unseparated string results in [error 3](#).

!ZE X 100 Y 200 : Z 300 A 90 [terminator] -- Normal operation

!ZE X 100 Y 2 00 [terminator] -- The final "00" is interpreted as

having a missing axis name, resulting in an error.

Attempting to specify an axis using a character other than A through Z (or a through z) results in [error 3](#).

Other Matters

The names of axes vary according to the model used.

The terminator for this command may not be omitted.

On a model equipped with a rotation axis, the rotation speed of the axis depends on the model used.

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!ZZ

XYZ Axis Simultaneous Feed

Format

```
!ZZ x1,y1,z1,... [terminator]
```

Parameter range

Depends on the model

Description

This moves simultaneously along the three axes from the present coordinates to the specified coordinate values.

The speed is as set by the [V](#) or [!VZ](#) command.

When no parameter is present, no operation is performed.

The parameters are interpreted as absolute coordinates when the absolute-coordinate mode has been set prior to this command and are interpreted as relative values when then relative-coordinate mode has been set prior to this command. (For more information about coordinate modes, refer to ["5-3. Effects on Other Commands."](#))

Errors

For the parameters, three values -- x, y, and z -- make up one set, and more than one set can be stated.

When the number of parameters is not a multiple of three, the parameters are interpreted and executed in sequence from the start as x, y, and z, and the final one or final two result in [error 2](#).

The final remaining parameter or parameters are ignored.

Other Matters

Operation is identical to the mode-1 [Z command](#).

@RML END

End Job

Format

(@RML END)

Description

This command ends current job and change to ready state.
The job ends without waiting timeout of milling data transferring.

Other Matters

When the machine receives other milling commands after this command, the machine once changes to ready state and restarts processing command.

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@RML ENTER LANGUAGE

Enter Language

Format

(@RML ENTER LANGUAGE=lang)

Parameter range

NCCODE : Change to NC-Code.

RML-1 : Change to RML-1.

Description

This command changes the command interpreter.

After this command, the machine starts interpreting in a chosen language.

Other Matters

This command to change the language mode is only for a machine model that supports NC-Code.

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@RML SET JOBNAME

Set Job Name

Format

```
(@RML SET JOBNAME=name)
```

Parameter range

ASCII code string (Alphanumeric and symbol)

Description

This command sets the job name.

The name is displayed on the machine display etc.

@RML SET TOTALTIME

Set Job Estimated Time

Format

```
(@RML SET TOTALTIME=time,bytes)
```

Parameter range

time: 0 to 2147483647

bytes: 0 to 2147483647

Description

This command sets the job estimated time.

The parameter "time" is the total estimated time[sec] of the file.

The parameter "bytes" is the total file size[bytes] of the file.

The machine calculates the progress rate from the file size and the number of bytes of processed command, then calculates the remaining time from the estimated time.

The calculated remaining time is displayed on the machine display etc.

@RML SET PROGRESSTIME

Set Job Estimated Progress Time

Format

```
(@RML SET PROGRESSTIME=time,bytes)
```

Parameter range

time: 0 to 2147483647

bytes: 0 to 2147483647

Description

This command sets the job estimated progress time.

The parameter "time" is the estimated progress time[sec] of the file since the job began.

The parameter "bytes" is the number of bytes from the head of the file. The machine calculates the progress rate from information from TOTALTIME and this command and the number bytes of processed command, then calculates the remaining time from the estimated time. The calculated remaining time is displayed on the machine display etc.

Other Matters

Usually, describe this command multiple at a regular interval after TOTALTIME command.

If there is no TOTALTIME command before this command, this command is invalid.

Even if there is no PROGRESSTIME command, it is possible to calculate the remaining time if there is a TOTALTIME command.

If the rate of the number of bytes of the milling command and processing time is variable, PROGRESSTIME command is effective to calculate the remaining time accurately.

Part 4 Device Control Commands

- [4-1 Format of Device Control Commands](#)
 - [4-2 Descriptions of Device Control Commands](#)
- ESC.K Command-quit command

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4-1. Format of Device Control Commands

[ESC] .K
[ESC] .M P1 ; P2 ; P3 ; P4 ; P5; P6:
([ESC] corresponds to hexadecimal 1B.)

Although these are used to illustrate the format, the ESC.M and ESC.T commands are not supported in RML-1.

Commands

These are composed of [ESC], a "." (period), and a letter of the alphabet (or one of a limited set of symbols), for a total of three characters.

These must be given in the sequence of [ESC], period, letter.

This sequence starts when an [ESC] is received from the computer. When a sequence is determined not to correspond to the foregoing, it is interpreted as a mode 1, mode 2, or common command. If the character following [ESC] . is unsupported, then communication error 11 is generated and the sequence ends. At this time the [ESC] . is read and discarded, and the character sent subsequently is passed to the interpretation sequence for commands common to modes 1 and 2.

Parameters

These are numerals only, and the delimiter for parameters is ";" . Whenever a ";" appears, the value is interpreted and the setting is made.

A device control command that has a parameter requires a terminator to indicate the end of the command.

The ":" (colon) is used as the terminator, and cannot be omitted. Parameter values may be omitted; when omitted, the setting is made using the default value.

Example for the Command Interpretation

ESC.M:

In the foregoing case, all are assumed to be omitted, and defaults are used for all.

ESC.M;;13:

In the foregoing case, the first through third parameters are interpreted as being omitted, the fourth parameter is interpreted to be 13, and parameters thereafter are interpreted as being omitted. Default values are used for the omitted parameters.

The numerical range is from 0 to 65535.

An out-of-range value results in communication [error 13](#) and is not used; the default value is used instead.

The sequence is continued and the next parameter is awaited.

If a character other than a numeral, ";" or ":" appears during the course of a parameter, the parameter is interpreted as being omitted, its value is discarded, and the default value is used instead.

Additionally, [error 12](#) is generated and the sequence ends.

The problematic character that is other than a numeral, ";" or ":" is passed to the data buffer.

ESC.T10XYZ;100;...

In the foregoing case, ESC.T is interpreted up to 10, the following X is determined to be uninterpretable. Everything up to ESC.T10 is interpreted by the device control sequence, and the portion from X and after is passed to the interpretation sequence for commands common to modes 1 and 2.

At this time, [error 12](#) (incorrect parameter) is generated. Subsequent parameters are interpreted as being omitted and are set to their default values, and the sequence is ended.

ESC.T1000;20XYZ;...

In the foregoing case, the first parameter is set as specified.

Default settings are made for the second and later parameters, and the sequence ends.

At this time, [error 12](#) (incorrect parameter) is generated, and the

portion from X and after is passed to the interpretation sequence for commands common to modes 1 and 2.

ESC.T1000;2000;XYZ;...

The 1000, 2000 parameters are processed correctly.

The appearance of X results in [error 12](#) and the sequence ends.

The portion from X and after is passed to the interpretation sequence for commands common to modes 1 and 2.

ESC.T1000;2000;ESC

The 1000, 2000 parameters are processed correctly.

The appearance of ESC results in [error 12](#) and the sequence ends.

Thereafter, a device control sequence is interpreted as having been newly generated.

The second [ESC] results in processing similar to that described above, and [error 12](#) is generated again.

Note, however, that at this time the second [ESC] is not passed to the interpretation sequence for commands common to modes 1 and 2.

When there is an excessively large number of parameters.

[Error 14](#) is generated and the excess parameters are ignored.

For the device control sequence, interpretation continues without change.

Parameters read and discarded are not passed to the interpretation sequence for commands common to modes 1 and 2.

Error List

0 No error.

10 Multiple output requests.

Output for the earliest request is executed, and the superfluous output request or requests are ignored.

An ignored command is not passed to the interpretation sequence for commands common to modes 1 and 2.

11 Device control command error

Everything up to [ESC]. is read and discarded.

Error-causing characters thereafter are not interpreted and are not

- passed to the interpretation sequence for commands common to modes 1 and 2.
- 12 Incorrect parameter.
The parameter that generated the error is set again using its default value.
 - 13 Parameter overflow.
The parameter that generated the error is set again using its default value.
 - 14 Too many parameters.
 - 15 A framing error, parity error, or overrun error occurred.
 - 16 The receive buffer experienced overflow.
This occurs in cases such as when the handshake settings do not match.
 - 17 Not used.
On some models this is assigned to baud-rate error, but this error cannot be detected unless there is hardware support.
Normally this is error 15.
 - 18 Other unspecifiable communication error.
Normally this is not generated and is not used.
This is used in cases of special need to provide notification of some communication error.

Multiple Errors

The errors described here are all communication-related, and are unrelated to errors that may occur in the interpretation of RML-1 commands.

Specifically, this applies only to 10 through 18, and has no connection with errors whose numbers are less than 10.

When more than one error occurs, the first error number is the one that is saved.

Those coming after are ignored.

Parallel connection

The extent of interpretation is model-dependent, but cases of operation similar to when using the serial connection are also possible.

Note that those commands which are physically inoperable, such as those that perform response, are naturally not supported.

Replot

Nothing is performed.

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4-2. Descriptions of Device Control Commands

[ESC.K](#) Command-quit command

Other device control commands are unsupported.

[ESC] . K

Command-quit command

Format

[ESC] . K

Description

This ends operation of the command now being executed and discards without executing it all buffered data until the next ESC.K after the command is processed.

Errors

None.

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Part 5 Appendix

- [5-1 Operation on Return from Outside the Operating Range](#)
- [5-2 Spindle motor](#)
- [5-3 Effects on Other Commands](#)

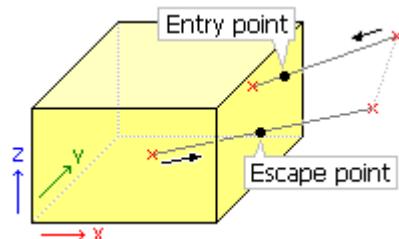
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5-1. Operation on Return from Outside the Operating Range

Specifying a coordinate outside the operating range results in an attempt to move to that point, and movement stops at the boundary of the range.

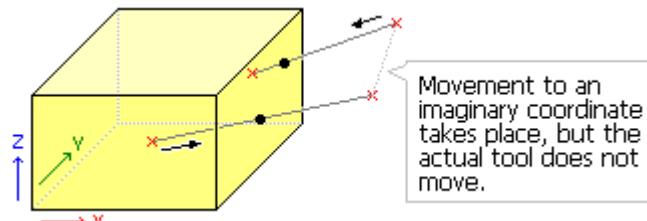
This location where the stop occurs is called the "escape point."

Conversely, the point on the range-boundary plane when returning to within the range is called the "entry point."



A movement command outside the range is processed as movement from one imaginary point to another.

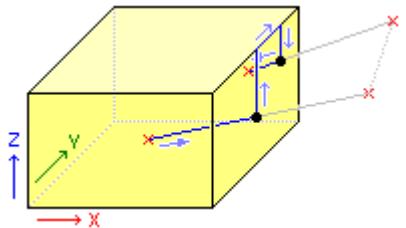
The tool does not move at this time.



Specifying a point inside the operating range results in tool movement as described below.

1. The tool rises from the escape point to the highest point.
(Movement is along the Z axis only; no movement on the X or Y axis is performed.)
2. The tool moves to the area above the entry point with no change in height.
3. The tool descends to the entry point.
(Movement is along the Z axis only; no movement on the X or Y axis is performed.)
4. Depending on the machine's settings, operation may pause here.
In such cases, cancel the pause.

5. The tool moves to the point specified by the command.



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5-2. Spindle motor

About Rotation of the Spindle Motor

- When rotation has not been prohibited, rotation starts just before actual operation when a command that involves movement is sent.
When movement is involved, movement is performed after waiting for a certain time to allow rotation to stabilize.
If the spindle is already rotating, movement is performed immediately without any dwell (wait) time.
- When an !MC 0 or IN command is received, rotation is stopped.
- When a command that does not involve movement is received, rotation is unaffected.
Rotation continues if in progress or remains stopped if stopped.

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5-3. Effects on Other Commands

■ Coordinate Modes

1. Absolute coordinates

M, D, H, IN, PA, DF

After execution of these commands, the system goes into the absolute-coordinate mode.

Thereafter the mode remains unchanged until a command effecting the relative-coordinate mode is received.

2. Relative coordinates

I, R, PR

After execution of these commands, the system goes into the relative-coordinate mode.

Thereafter the mode remains unchanged until a command effecting the absolute-coordinate mode is received.

3. Commands affected by the relative- or absolute-coordinate mode

PU, PD, Z, !ZZ, !ZM, !ZO, !ZE, !IO

These commands are executed with absolute coordinates when in the absolute-coordinate mode and with relative coordinates when in the relative-coordinate mode.

The relative- or absolute-coordinate mode is not changed.

4. Commands unaffected by the relative- or absolute-coordinate mode

@, !PZ, !, F, V, W, !DW, !MC, !NR, !RC, !VZ

Execution always uses relative values for parameters, even when in the absolute-coordinate mode.

There are no affected parameters.

■ Tool Up/Down

Tool-up/down operation when a PA or PR is combined with another command

H, M, R, D, I, IN, PU, PD

When a PA or PR command is executed after one of these commands, the

tool-up or -down state is dependent on the result of the command just before.

1. One of the commands just described is executed.
2. Another command is executed.
3. The PA or PR command is executed.

At this time, the raised or lowered state of the tool does not follow the result of step 2, but instead follows the result of step 1.

The default value for the tool with the PA or PR command is the raised state.

The raised or lowered state of the tool before and after command execution is indicated below.

1. H, M, R, IN, PU
The tool is put into the raised state.
If necessary, tool movement is performed while in the raised state, and the raised state is maintained thereafter.
2. D, I, PD
The tool is put into the lowered state.
If necessary, tool movement is performed while in the lowered state, and the lowered state is maintained thereafter.
3. F, V, W, Z, DF, !DW, !MC, !ZZ, !ZO, !ZM, !ZE,
!IO
No change occurs in the tool state before and after execution.
Movement is performed if necessary.

3-4. Special Commands in the Comment

END End job

ENTER Enter language

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