

OPERATION MANUAL
for
NC-5K/5SK
MODELING MACHINE

MIMAKI ENGINEERING Co., Ltd.

5-9-41 Kitashinagawa, Shinagawa-ku, Tokyo 141, Japan

Phone: +81-3-5420-8671 Facsimile: +81-3-5420-8585

D200533

This equipment has been tested and found comply with the limits for a class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Requests

- MANUAL has been carefully prepared. In case of doubt by any chance, however, please contact the dealer or our sales office near you.
- Please note in advance that the manufacturer will not be responsible for any financial loss or lost profit by use of this unit or for any claims by a third party.
- MANUAL may be modified for improvement without notice.
- If MANUAL becomes illegible due to reasons of fire/damage, please purchase a new one at one of our sales offices.

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Preface

Thank you very much for purchasing “Modeling Machine, NC-5K/5SK”

This operation manual (hereinafter referred to as “MANUAL” ’ explains how to handle “Modeling Machine, NC-5K/5SK” (hereinafter referred as ‘this unit’) to fully exploit its function and to operate it safely. Furthermore, please keep MANUAL near you during operation and make use of it.




Notes regarding safety.

Read MANUAL carefully to avoid dangers.

- Correct and careful operation is required to use this unit safely. Read MANUAL carefully prior to using this unit, and do not perform engraving or modeling until MANUAL is fully understood. Operation of this unit with insufficient understanding may cause accidents or physical injuries.

Definition of warning/caution.

- In this MANUAL, caution notes are indicated with titles of “DANGER”, “WARNING” and “CAUTION”. Definition of each title is follows.

 DANGER	A case which may cause serious injury to the extent that part of the human body is lost or after-effect remains for a lifetime.
 WARNING	A case which may cause medium level injury (blow, fracture or cut).
 CAUTION	A case which may cause failure of this unit or damage to the facility.

Observance of the contents of MANUAL.

- Observe the contents of MANUAL, and do not perform operation which is not prescribed in MANUAL. If any operation not prescribed in MANUAL is to be performed by any chance, take all necessary actions from safety standpoint at your own responsibility.

Limitation of the purpose of use.

- This unit is a machine tool intended for engraving and modeling. Do not use this unit for purposes other than engraving or modeling.

Observance of safety rules of the workshop.

- Please limit operator of this unit to someone who has thoroughly read the MANUAL. Be careful not to have people having no involvement in the work (children, aged people, spectator etc.) get close to this unit. Furthermore, keep the tools to be used in work, such as cutter/end mill/spanner, in a place where children cannot reach.
- Dispose unusable cutter/end mill as dangerous items.

Clothing and protector during work.

- As for the clothing during work, avoid loose Clothes or clothes with decorations not to be caught in machines, and try to wear safe and convenient-to-work clothing instead. Furthermore, bundle long hair. If there is a possibility for metalchips to be scattered, wear protection lenses during work.

Caution Notes

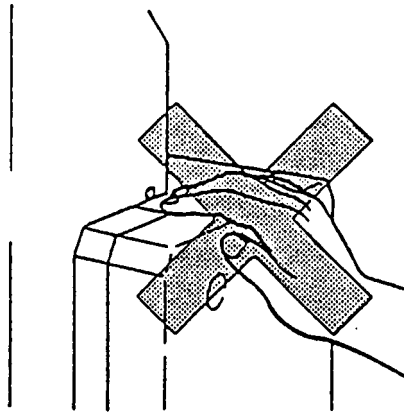
**DANGER**
DANGER

Do not touch head, X-bar and spindle rotating part.

When this unit is in operation or is receiving data, do not touch head or X-bar, or place your hand between X-bar groove and head.

There is a danger that your finger may be caught between X-bar groove and head, and cut.

Stand 30 cm or more away from this unit during operation, and do not get close to this unit except when stopping this unit or operating the panel.



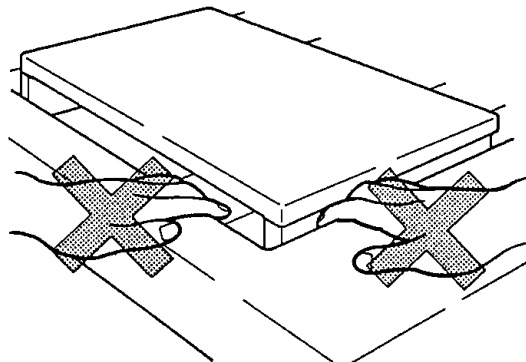
**WARNING**
WARNING

Do not touch other than operation panel and emergency switch during operation of this unit.

When this unit is in operation or is receiving data, do not place your hand on the table or frame, or get your face close to this unit.

There is a danger that your hand may be caught between moving table and frame, and suffer a fracture or a scratch.

Stand 30 cm or more away from this unit during operation, and do not get close to this unit except when stopping this unit or operating the panel.




WARNING

Do not touch the tool while the spindle lamp is on.

When this unit receives data while the spindle lamp is on, spindle will rotate
Do not have your hand or face get close to this unit. You may get injured on your hand or face.
Replace tool only after turning the power off or setting the spindle to off.

Firmly fix the tool and work.

Make sure to attach tool and to fix work correctly and firmly.
If done incorrectly, tool edge may be nicked during cutting, or tool or work may fall out of its position, causing injury.
Understand the attaching method, and fix them correctly.


CAUTION

Observance of the conditions for installation place.

Install this unit selecting a place where the following conditions are satisfied.
If not, it may cause failure or this unit.

- A place which is not exposed to direct sun light.
- A place where there is no drastic temperature difference.
(Within 5 ~ 40 °C)
- A place where humidity is within 35 ~ 75 % (RH).
- A place where trash or dust will not blow in.
- Place where tools or machines creating lot of oil or metalchips are not existing.
- A stage which is not slanted or without level difference.
- A place where sufficient space for installation and maintenance can be secured.

Turn off the power or host computer at the time of cable connection.

Make sure to turn off the power of host computer when connecting the cable.
Furthermore, connect the cable in a way that it will not touch the moving part of this unit.
If cable connection is made while the power is on, it may cause malfunction of this unit.

Connect the power cable to 3 pin receptacle.

Connect power cable of this unit to 3 pin receptacle, If 3 pin receptacle is not available, make sure to ground using the enclosed grounding adapter.
If not grounded, there is a danger for electrical shock or failure of this unit.

Do not unplug connector during operation.

Do not unplug power cable or connector and turn the power off during operation. It may cause failure of this unit.
If the power must be turned off in emergency, press “EMERGENCY” switch.

**Do not cut by force.**

Do not make the depth of cut too deep or cut by force. The edge may be nicked and may cause injury by the broken piece. Perform cutting according to the cutting conditions of this unit.

Do not apply strong vibration to this unit.

Do not apply strong vibration as this unit is a precision equipment. There is a danger that cutting accuracy get out of order or the electronics fail.

When moving this unit, separate electrical equipment box from the main unit, and lift the main unit by 2~3 people.

Caution when using water/oil.

Do not pour water or oil on the head/Y bar/electrical equipment box of this unit. It may cause failure of precision parts or electrical shock.

Pay sufficient attention when using machining oil or that sort.

Caution for cleaning.

Do not use blower type device, such as air gun, for cleaning metalchips. Metalchips may get into precision parts and cause failure.

Use vacuum type cleaner for cleaning.

Spindle Front Cover

If the spindle front cover (P. 1.4) is opened while the machine is in operation, the operation will be interrupted by the door sensor. X-, Y- and Z-axis stop on the spot and the spindle motor stops.



The purpose of this function is not to temporarily stop the machine but to ensure safety. To temporarily stop the machine, be sure to operate the **START/STOP** on the operation panel. It has to be remembered that the spindle front cover has to be closed by strongly depressing the cover knob then ascertain that it has been properly closed.

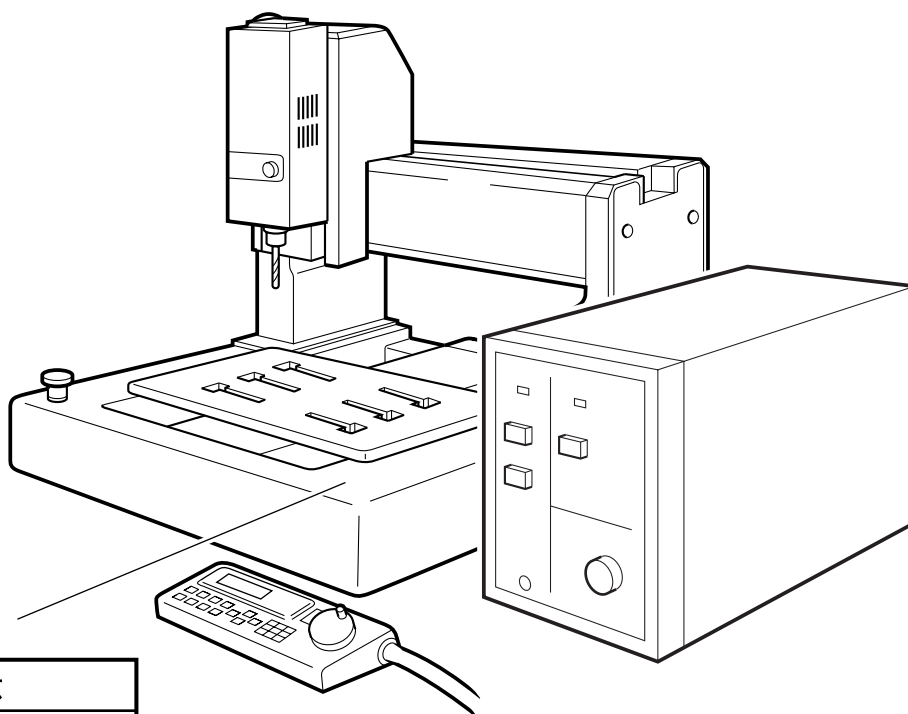
Under the following state, neither the machine operation will be interrupted nor the spindle will stop. In this case, the machine will not stop even when operating the **START/STOP**.

- When spindle is shifted by the jog keys or jog dials for setting the origin or the spindle ascends along the Z-axis upon completion of operation.
- When spindle is shifted by the jog keys or jog dials for setting the cutting area or the spindle ascends along the Z-axis upon completion of operation.
- When the mechanical origin is being detected after turning on the power to the machine.
- When the Z-axis origin is being automatically detected.
- While viewing is carried out during the pause or spindle goes up along the Z-axis during the movement.
- When spindle goes up at re-start of operation after it has entered the pause state during G command and has been shifted by operating the jog keys.

Regarding the Safety Label

Considerations for safety have been given in the manufacture of this unit. To cope with the worst case, however, safety labels are attached to dangerous parts of this unit.

Locations where safety labels are attached.



 注 意
取扱説明書を読み、十分理解してから 本装置をお使いください。 不十分な理解で操作すると、重度の身体的 な損害につながる恐れがあります。 取扱説明書の内容を守って操作することは、 使用者の責任です。
 CAUTION
Do not operate this machine unless you have read and understand the instructions in the Operation Manual. Improper machine operation is dangerous and could result in injury. The Operator Manual is shipped with this equipment. Proper operation is your responsibility.

Daily Maintenance

The method of cleaning the main unit is explained below.

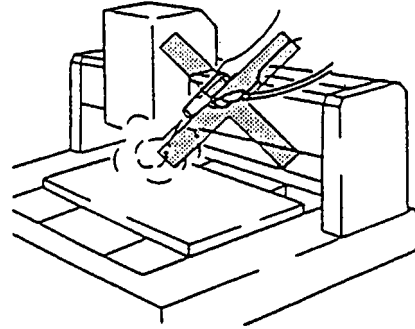


Do not use blower type cleaner for cleaning of metalchips.

Do not use blower type cleaner, such as the air gun, for cleaning of metalchips. Metalchips may get into the precision parts and cause failures. Use vacuum type cleaner instead.

Do not use abrasives or solution for wiping off the dirt.

Never use cleanser containing abrasives or solvent, such as thinner, for wiping off the dirt. Soak a cloth with water or alcohol, and wipe with it.



Cleaning of the main unit

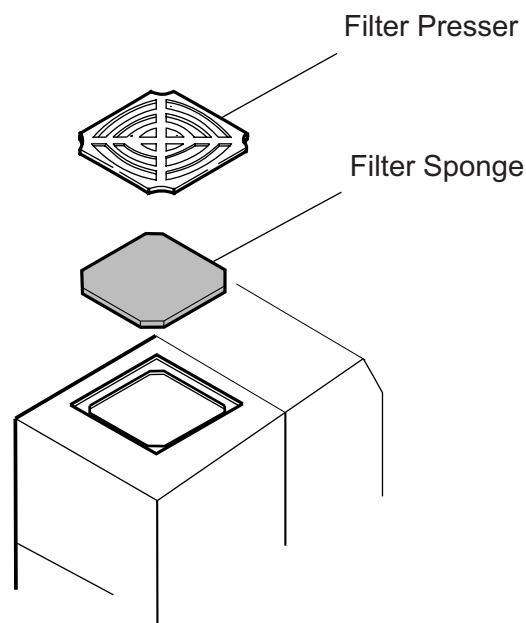
In case of slight dirty, wipe with a dry cloth.

In case of tough dirt, soak a soft cloth with alcohol and wipe with it.

Cleaning the head cooling fan (P.1.4)

Dust is likely to gather on the head cooling fan. It is therefore necessary to clean it up once a week.

- Remove the filter presser by fingers and take out the filter sponge.
- If the filter sponge is not heavily stained, lightly tap the sponge to remove dust. If it is heavily stained, softly wash it in water and dry it well.



Cleaning the filter (P. 1.4) of the electrical box

To clean up the filter, turn the electrical box upside down.

- Remove the screw from the filter presser with a Phillips type screwdriver. Then, take out the filter sponge.
- If the filter sponge is not heavily stained, lightly tap the sponge to remove dust, If it is heavily stained, softly wash it in water and dry it well.

The Purpose of Use and Features

The purpose of use of this unit.

This unit is precision equipment designed for three dimensional engraving.

Please use it as a machine tool for engraving/modeling.

Features of this unit

The main features of this unit are explained as follows.

- **It can be interfaced with NC output CAD.**

Because it can be interfaced with NC output CAD, it is compatible to three dimensional fabrication by concurrent 3 axis driving.

- **Wide fabrication area.**

Because of the wide fabrication area of X=483 mm, Y=305 mm and Z stroke of 110 mm, ideal modeling environment is realized.

Furthermore, rotation of spindle motor is selectable anywhere in the range of 2000 rpm ~ 1500 rpm.

At any rotational speed, it responds to tool/work flexibly at strong and stable torque.

- **Easy tool exchange.**

As collet chuck type is employed for fixing the tool, tool exchange can be made quickly without fail.

- **Complete line of accessories.**

For fixing the work, the following jigs are available.

- Center vise (with plate jig)
- T slot table (clamp jig is sold separately)

By use of these jigs, various types of works can be set.

Furthermore, the following cutters for engraving are available.

Please select the one suitable to your engraving.

- ST 0.2 (SPB-0014)
- ST 0.4 (SPB-0010)
- ST 1.0 (SPB-0015)

Definition of Terminology

Major terminologies used in MANUAL are explained as follows.

TOOL:

The tools attached to the head (spindle) for engraving/modeling are called TOOL. The following are the tools used with this unit.

- End mill
- Cutter for engraving
- Collet
- locknut

WORK:

The material to be engraved, such as acrylic resin, stainless steel, ABS are called WORK.

X AXIS, Y AXIS, Z AXIS:

The movement of this unit in left/right, front/rear and up/down directions are called X axis, Y axis and Z axis, respectively.

G CODE:

NC code that this unit can understand and execute is called G CODE.

IN OPERATION:

The status where this unit is engraving while receiving data, or head or table is being moved by operation panel, or while this unit is self-testing are called IN OPERATION.

WARNING:

The status where this unit is waiting for data at start mode is called WARNING.

CUTTING:

The status where this unit is actually cutting, such as during data receiving or during selftesting, is called CAUTION.

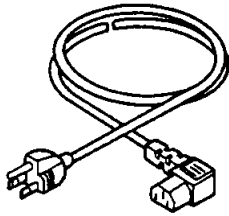
CHAPTER 1 PREPARATION

In this chapter, the work that is necessary from the time of purchase of this machine through unpacking and installation, and the necessary terminology, will be explained.

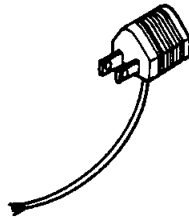
Check of Accessories

After opening the packing carton, check to make sure that all of the standard accessories are there. If any of the accessories are missing or damaged, please contact your dealer.*1

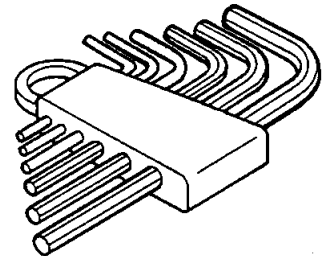
Standard Accessories



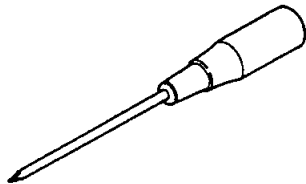
1) Power cable



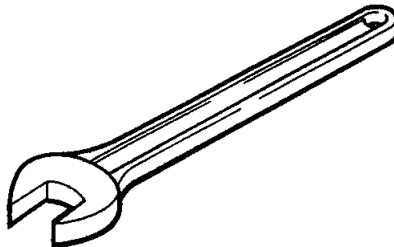
2) 3-pin to 2-pin conversion adapter



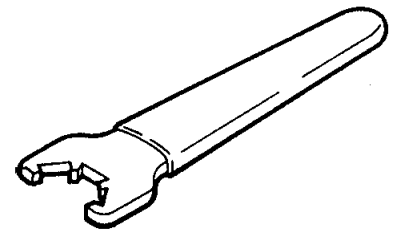
3) Set of hexagonal wrenches (AWS-0770)



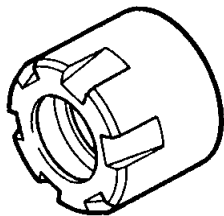
4) Phillips-head screwdriver



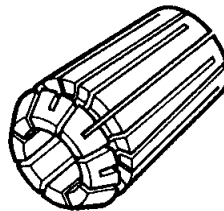
5) Spanner (14 mm)



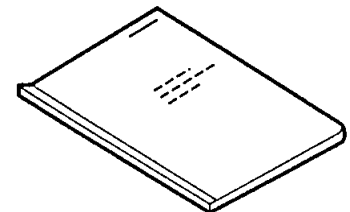
6) Wrench key for locknut (EFS-16)



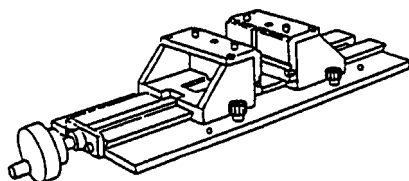
7) Locknut



8) Collet 6, 10



9) Operation Manual (D200533)



10) Center vice

11) End mill 6, 10 1 pc. each

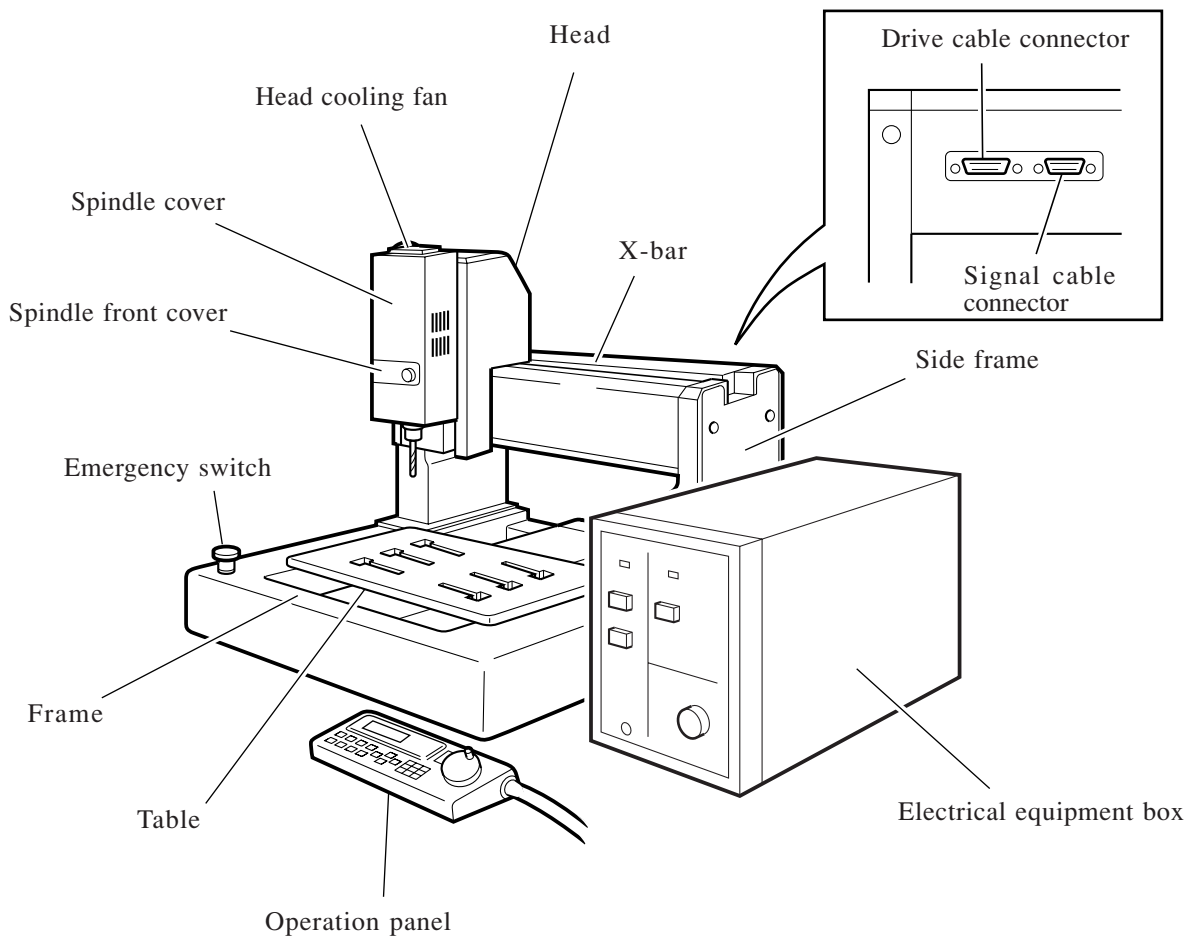
*1 The cutter blade is not a standard accessory.

Please select the number and type that you need from among the expendable supplies.

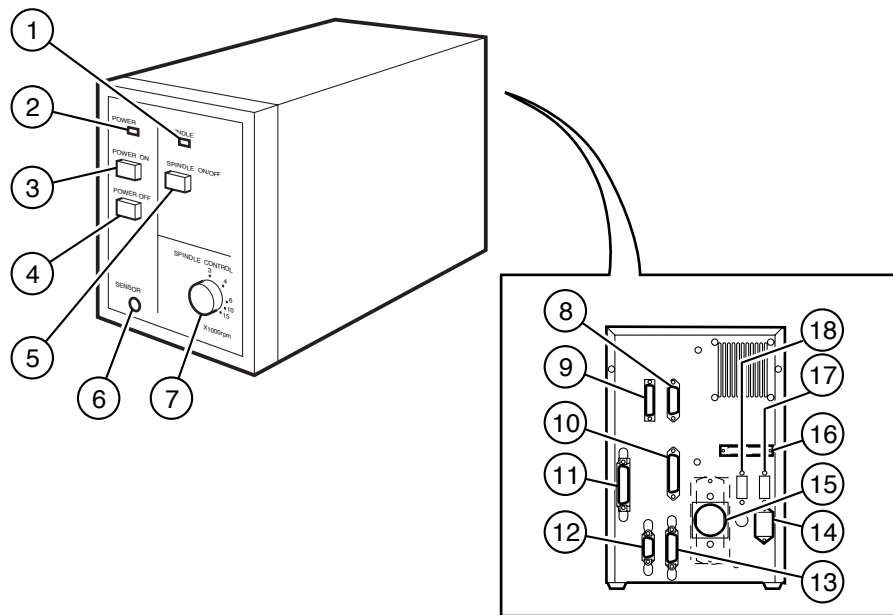
Names and Functions of Parts of Main unit

The names of the principal parts of this unit are as follows.

Please refer to the pages indicated for detailed descriptions of the names and functions.

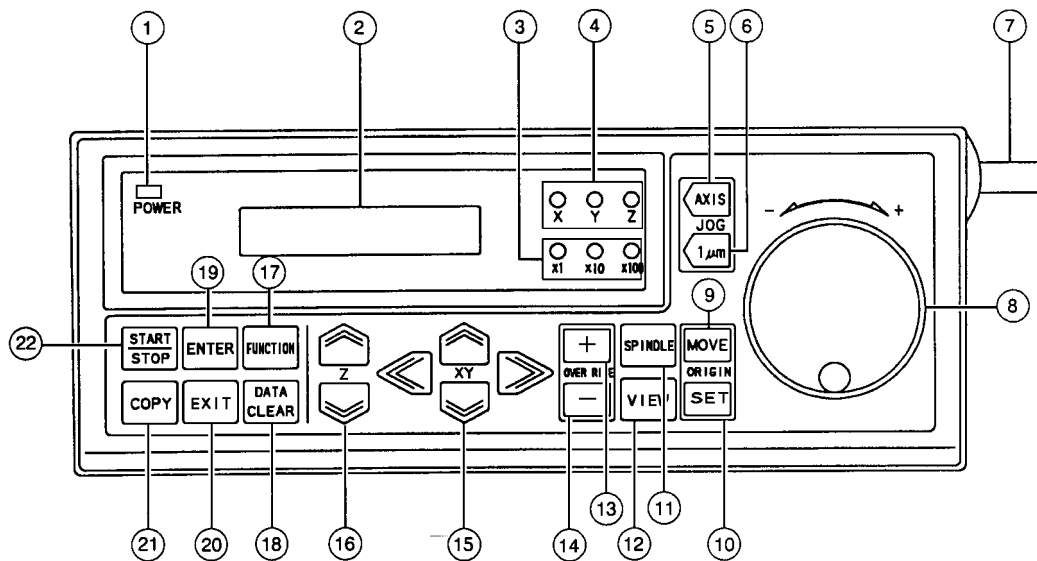


Electrical equipment box






















No.	Name	Function
1	Spindle lamp	It will be on when the spindle on/off switch is turned on. It will be off when the spindle on/off switch is turned off or when the power is turned off.
2	Power lamp	It will be on when the power is turned on, and it will be off when the power is turned off.
3	Power on switch	Turns power on.
4	Power off switch	Turns power off.
5	Spindle on/off switch	Turns the spindle rotation on and off.
6	ZS sensor inlet	The optional ZS sensor is connected to this point.
7	Spindle control knob	Adjusts the spindle rotation speed.
8	Signal cable plug-in port	Connected to the main unit via a signal cable.
9	RS-232C Interface	This machine is connected to a host computer via an RS-232C cable.
10	Drive cable plug-in port	Connected to the main unit via a drive cable.
11	Parallel connector	This machine is connected to a host computer via a parallel cable.
12	B-axis motor connector	The optional accessory B-axis motor is connected here.
13	Operation panel cable plug-in port	The operation panel cable is plugged in here.
14	Power cord plug-in port	The power cable for this machine is plugged in here.
15	Service power plug-in port	Auxiliary power receptacle. Actuator of 10 A or less can be used in line operation with the spindle.
16	External I/O terminal block	This block is used to connect an external equipment and the machine.
17	Main power breaker	This is the main power breaker.
18	Service power circuit breaker	This is the service power circuit breaker.

Operation Panel



No.	Name	Symbol in Operation Manual	Function
1	Power lamp	Power lamp	Lights up when power is turned on.
2	LCD display		Displays necessary information for the operator. (20 digits x 2 lines)
3	Jog step lamp	Jog step lamp	The lamp corresponding to the jog step selected when jog dial is effective lights up.
4	Jog axis lamp	Jog axis lamp	The lamp corresponding to the jog axis selected when jog dial is effective lights up.
5	Jog axis key		This key is used to specify the X, Y or Z-axis when setting the stop mode, origin or cutting area, thereby causing the jog dial to be effective.
6	Jog step key		This key is used to select the stepping amount for 1 pulse of the jog dial.
7	Operation panel cable	Operation panel cable	Connects to the rear panel of the electrical equipment box.
8	Jog dial	Jog dial	This dial is used, by turning, to move the selected axis when setting the origin or the cutting area.
9	Origin move key		This key is used move the X/Y axis to the origin.
10	Origin set key		This key is used to specify the origin or X, Y or Z.
11	Spindle key		This key is used to turn on/off the spindle when setting the origin or the cutting area.
12	View key		Moves the head to the standby position.

No.	Name	Symbol in Operation Manual	Function
13	Override key		This key is used to increase the operating speed. (Only effective under the start mode)
14	Override key		This key is used to decrease the operating speed. (Only effective under the start mode)
15	Arrow keys	 or Arrow key* ¹	Move the head along the X and Y axis when in stop mode.   :Move the head left or right.   :Move the table toward the rear or forward. When in function mode, these keys have the following roles.   :Select values of settings.   :Change the display page.
16	Z-axis keys	 	Move the Z-axis: raise and lower the head.
17	Function key		Puts the system into function mode.
18	Data clear key		This key is used to clear data.
19	ENTER key		
20	EXIT key		Terminates the operation.
21	Copy key		Starts copying.
22	Start/Stop key		Switches between Start mode and Stop mode; and temporarily halts the action.

*1 The generic term for these four keys.

Selecting an Installation Location

The method of selecting a location for installation of this unit is explained as follows.



Observance of the conditions for installation location.

Install this unit at a location which satisfies the following conditions.

If not satisfied, it may cause failure of this unit.

- A place which is not exposed to direct sun light.
- A place where there is no drastic temperature difference. (within 5 ~ 40°C)
- A place where humidity is within 35 ~ 75 % (Rh).
- A place where trash or dust will not blow in.
- A place where tools or machines creating lot of oil or metalchips are not existing.
- A stage which is not slanted or without level difference.
- A place where sufficient space for installation and maintenance can be secured.

Select installation location by observing the above notes.

Rough guide to installation space and maintenance space (unit: mm)

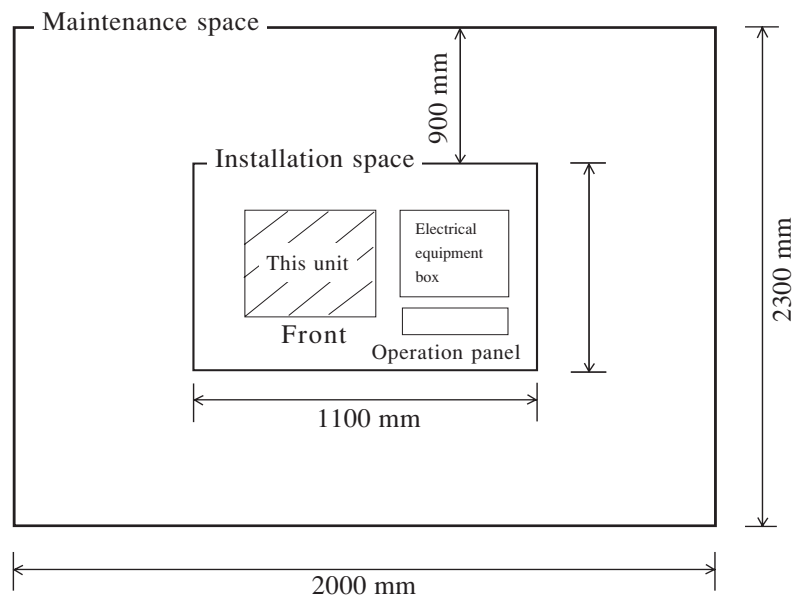
Installation space means; a space necessary for this unit to operate properly.

Do not place anything in the area as it will hinder operation.

Maintenance space means; a space necessary to perform maintenance work for this unit.

Things may be placed in the area if they can be moved easily.

But make sure to move them out of the area during maintenance work.



Cable Connections

Kind of cables and connecting position of the cables are explained.



Turn off the power of host computer when connecting cable.

- Connect power cable or RS cable after turning off the power of host computer. If connection is made while the power is on, it may cause electrical shock or failure of this unit. Furthermore, connect the cable in a way that it will not touch the moving part of this unit.

Connect the power cable to 3 pin receptacle.

- Connect power cable of this unit to 3 pin receptacle. If 3 pin receptacle is not available, make sure to ground using the enclosed grounding adapter. If not grounded, there is a danger for electrical shock or failure of this unit.

Types of cable

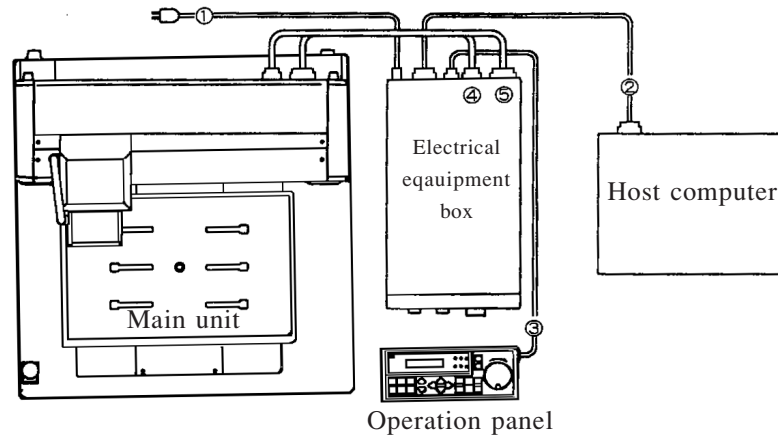
The following are the five cables needed to be connected for operation of this unit.

No.	Name (on name plate)	Function
1	Power cable (no name plate)	Plug one end into the electrical equipment box rear panel, and the other end into an electrical outlet.
2	RS-232C / 8BIT PARALLEL	Connect to the electrical equipment box and the host computer. (This is an optional accessory.)
3	Operation panel cable (KEY)	This cable comes out of the operation panel. Connect to the electrical equipment box rear panel.
4	Signal cable (SIGNAL)	These cables are connected between this unit and the electrical equipment box. There are plug-in ports on the rear panels of both this unit and the electrical equipment box.
5	Drive cable (DRIVE)	

Connecting position of the cable

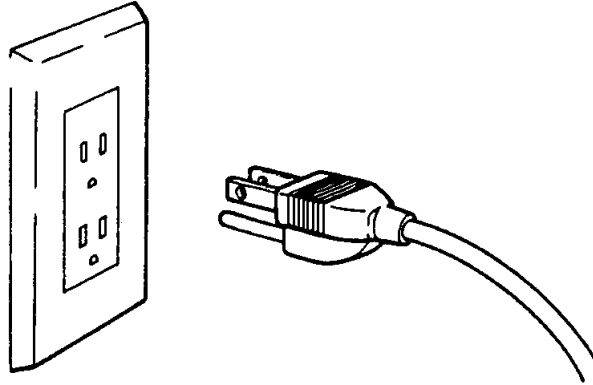
Once the installation location has been decided, connect the cables.
Connect them with reference to the diagram below.

There are name plates on some of the cable and connectors. Check the name plates when connecting the cables.

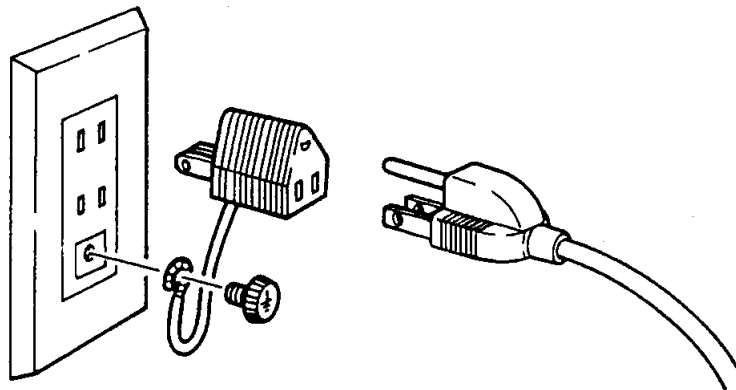


Power cable connection (to the outlet)

The power cable for this unit has a 3-pin plug.
Connect it to a properly grounded 3-pin outlet.



To connect the cable to a 2-pin outlet, use the accessory grounding adapter.



Note that the sharp of the receptacle varies in different localities.

CHAPTER 2 PRIOR TO OPERATION

In this chapter, basic operations to be performed prior to operation are explained.

The Method of Emergency Stop/Emergency Stop Release

If immediate stop of this unit is required for emergency, execute emergency stop.

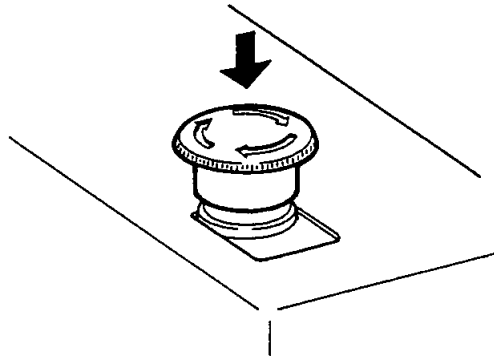
When this unit is in emergency stop status, power will be off and all received data will be erased.

While this unit is in emergency stop status, the power will not be on even if you press the power switch. If power on is required, emergency stop must be released first.

The method of emergency stop

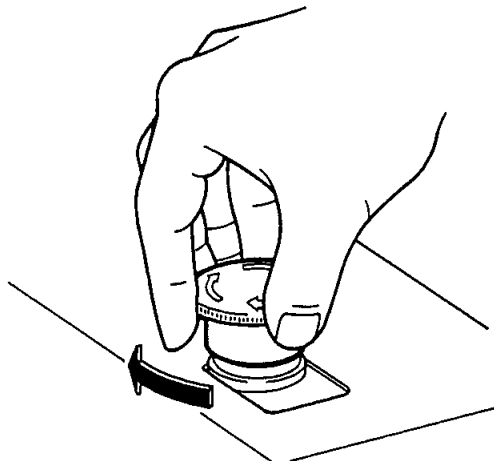
Press “EMERGENCY switch” which is located at the left front top of this unit.

By pressing “EMERGENCY switch”, this unit will enter emergency stop status and power will be shut off.



Releasing an Emergency Stop

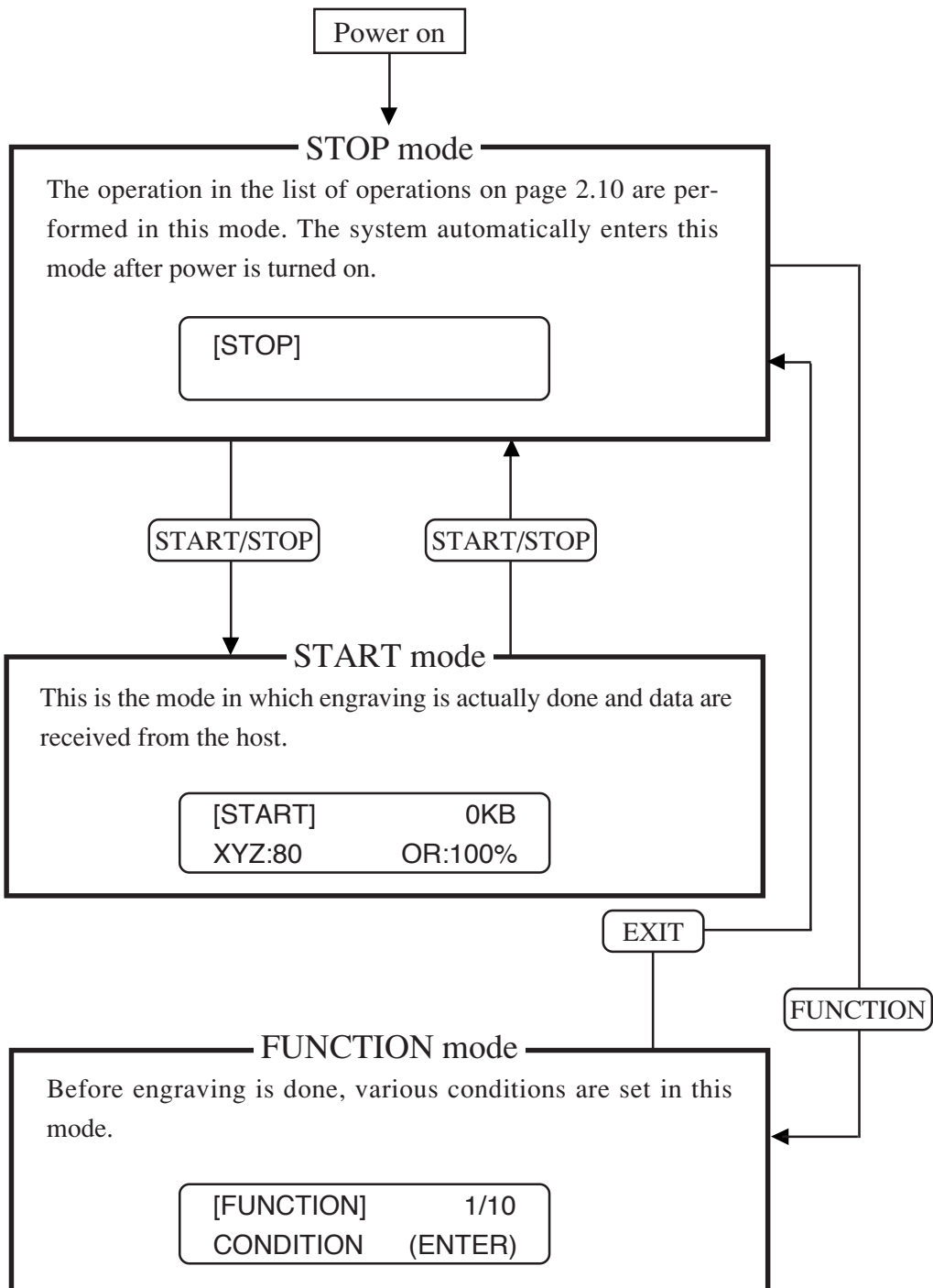
To release an emergency stop, turn the Emergency switch in the direction of the arrow. After the emergency stop is released, the power initially remains off. To resume work, turn the power on again.



On the Modes

Each mode is explained below.

Roughly speaking, there are three modes available to this unit, namely stop mode, start mode and function mode. The mode can be switched from one to another by key operation on the operation panel.



On STOP mode

Whenever the power is turned on, the unit automatically enters this mode.

The operations given in the list of operations on p. 2.10 are performed in this mode.

[STOP]

Pressing the **FUNCTION** key in the stop mode, the unit will enter the function mode. (P. 2.8)

Under this mode, the operation of the unit can be temporarily stopped.

If the **START/STOP** key is pressed while the unit is in operation, the unit will abort the operation and enter the stop mode.

[STOP]

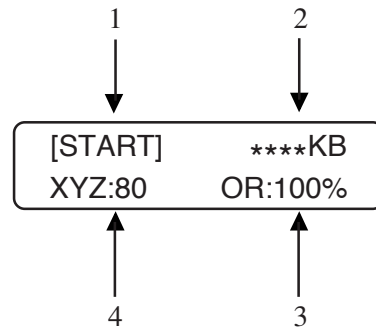
* * * * * PAUSE * * * * *

- At this time, X and Y axis will immediately stop, but Z axis will move to the upper most position and then stop. The spindle motor will also stop.

On START mode

In this mode this unit waits for data from the host computer and actually dies the engraving.
When **START/STOP** is pressed while in STOP mode, the unit goes into START mode.

G command



No.	LCD display	Meaning
1	[START]	This indicates that the unit is currently in START mode.
2	***KB	This indicates the amount of data in the reception buffer.
3	OR:100%	This indicates the override value (%).
6	XYZ:80	This indicates the X-Y-Z axis cutting speed (mm/s)

On the received data overwrite function

In START mode, if data are not received from the host computer for 10 seconds or more, the data which are subsequently received are overwritten on data previously received.

On the override function

This function changes the operation speed within START mode.

The override value can be varied 50 % to 200 %. When it is set 50 %, The X-Y axis and Z axis movement speeds are half of the setting; when it is set to 200 %, they are twice the settings. *1

- 1) Press or to vary the override value.

It varies in step of 10 %.

[START]	0KB
XYZ:80	OR:100%

*1 It should be noted that maximum speed is 85 (mm/s)

On FUNCTION mode

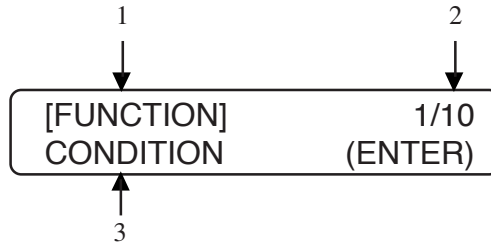
When **[FUNCTION]** is pressed in STOP mode, the system goes into FUNCTION mode.

The conditions that are necessary for cutting can be set in this mode.

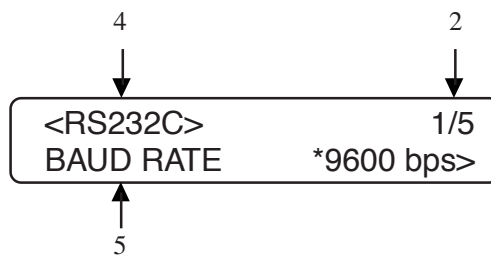
[FUNCTION], **[ENTER]**, **[EXIT]**, **[<]**, **[>]**, **[^]** and **[v]** can be used

There are three types of LCD display, type A, type B and type C.

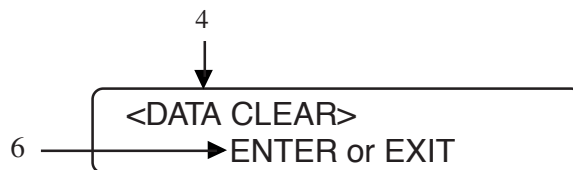
Type A



Type B



Type C



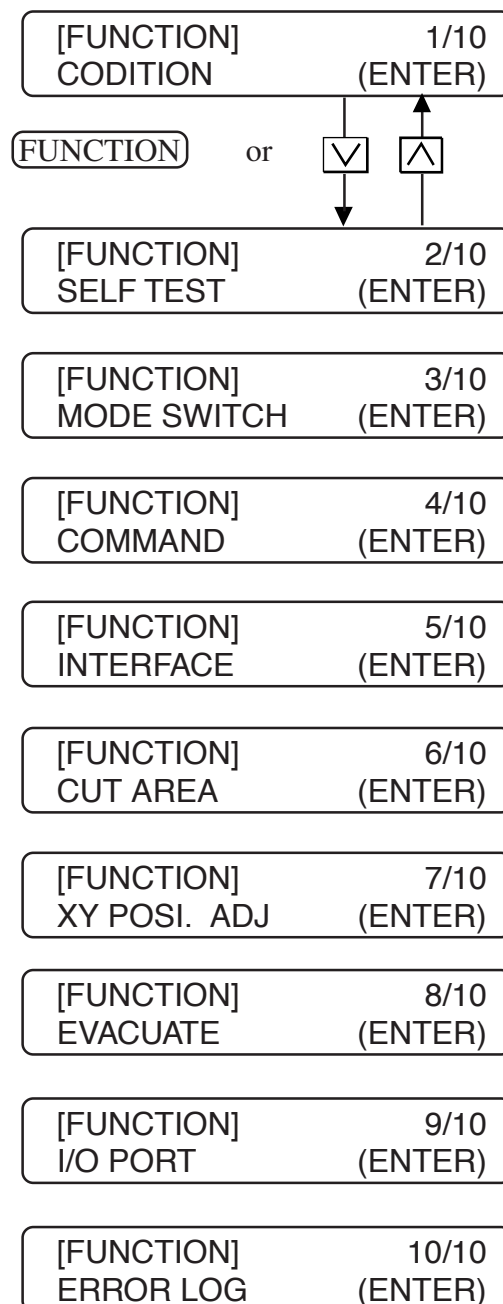
No.	LCD display	Meaning
1	[FUNCTION]	Indicates that the system is currently in FUNCTION mode.
2	*/* ——— A) B)	A) Indicates all page numbers. B) The current page number is shown. Can be changed by pressing [v] or [^] .
3	CONDITION	Indicates the operation item.
4	<*****>	Indicates the operation item. *1
5	BAUD RATE	Indicates the setting item.
6	ENTER or EXIT "ENTER" or EXIT	When [ENTER] is pressed, a test etc. is executed. *2 When [EXIT] is pressed, the test etc. is cancelled.

*1 For details of this item, see the next page.

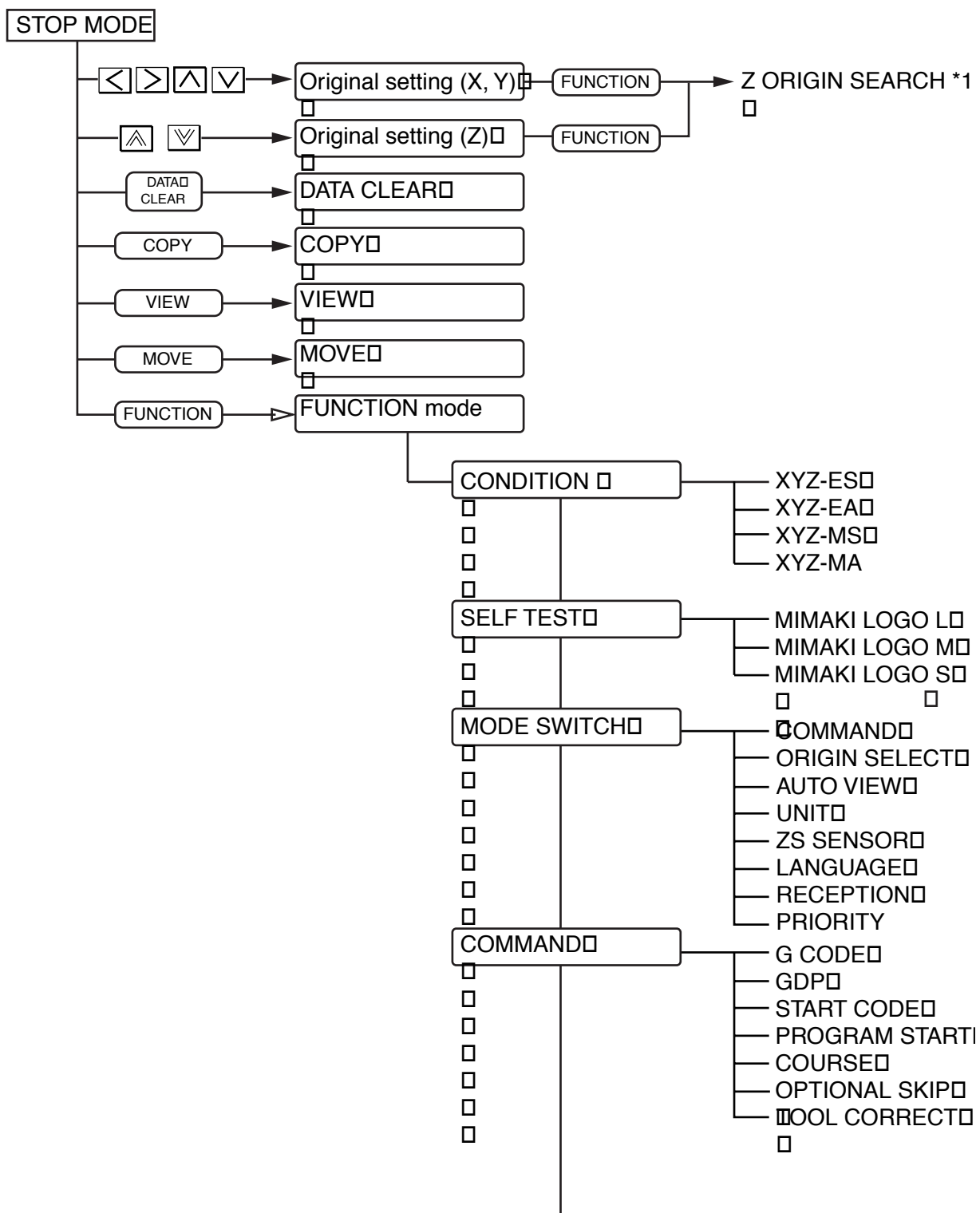
*2 When "ENTER" or EXIT is indicated, the action takes place immediately, so use caution.

The following operations can be performed in FUNCTION mode.

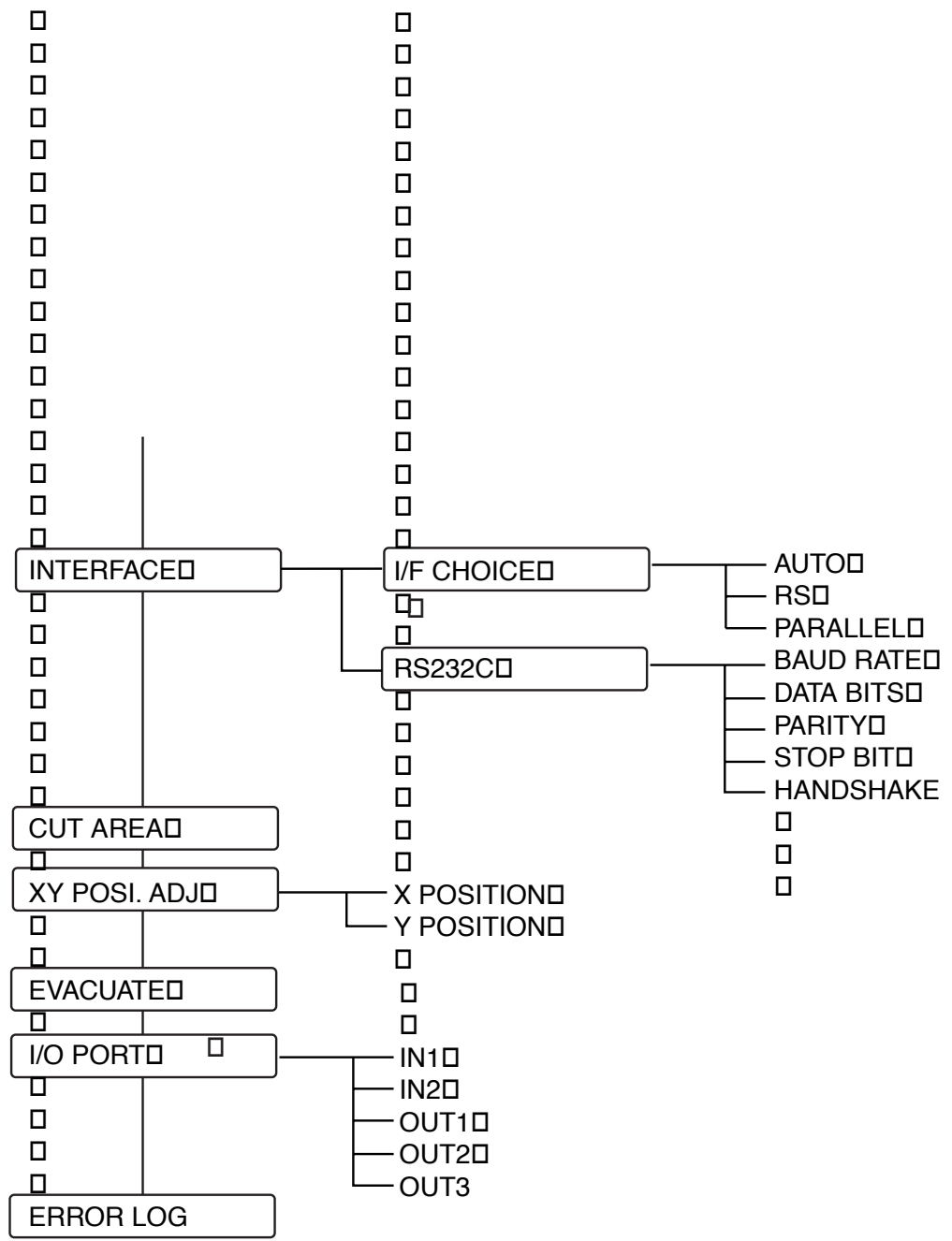
No.	Operation	Description
1	CONDITION	Sets the cutting depth, UP distance and cutting speed.
2	SELF TEST	There is a pattern used to check the engraving quality.
3	MODE SWITCH	There are eight settings for adjustment.
4	COMMAND	There are seven settings for adjustment.
5	INTERFACE	Select interface and set the communication conditions for RS-232C.
6	CUT AREA	Sets the effective cutting area to match the work piece.
7	XY POSI. ADJ	XY origin is finely adjusted.
8	EVACUATE	Head position by view function is finely adjusted.
9	I/O PORT	External I/O port is specified.
10	ERROR LOG	Indicates the error.



List of Operations



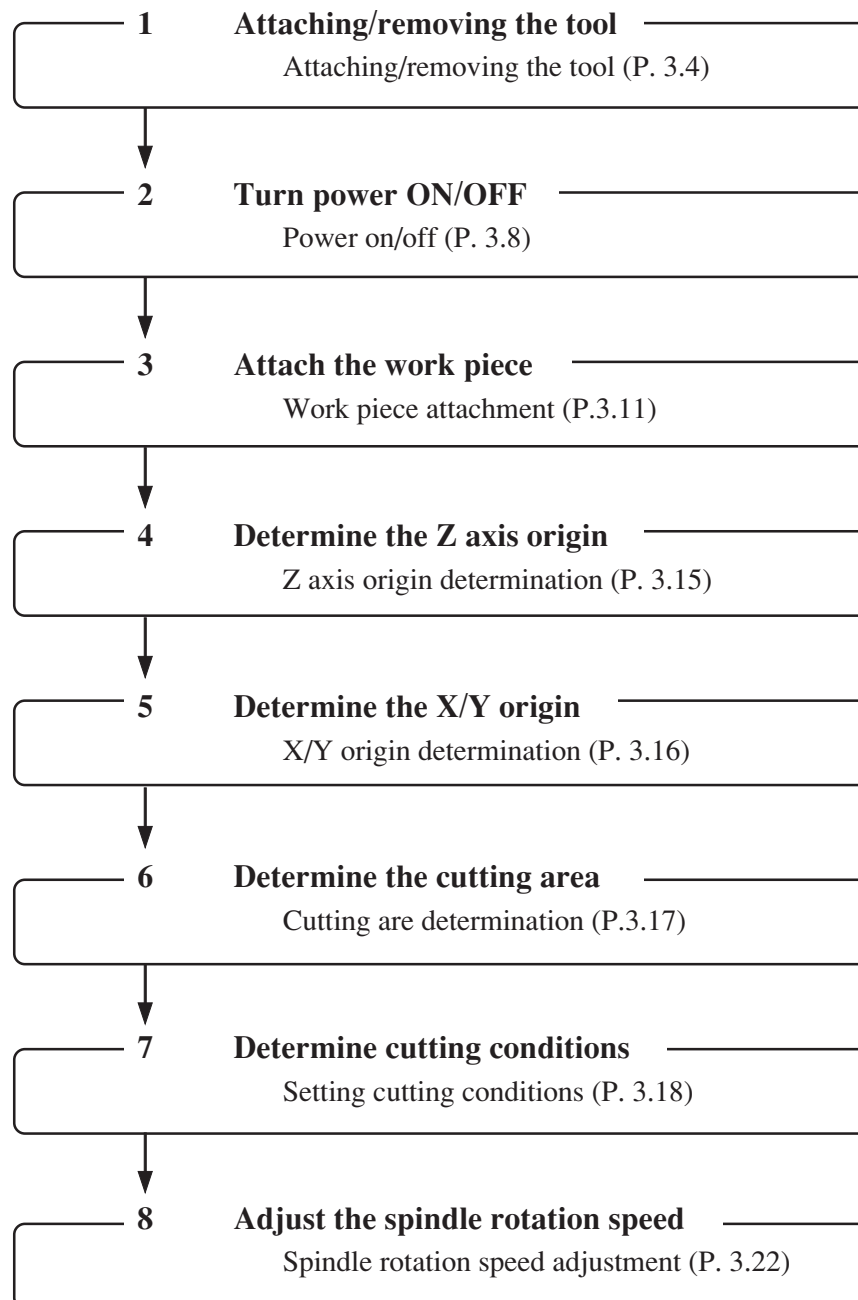
*1 Effective when the optional ZS sensor is connected to the unit.



CHAPTER 3 BASIC OPERATIONS

In this chapter, the basic operations necessary to perform engraving are explained in accordance with the flow.

Basic operation Procedure



Attachment/Removal of Tool

Name of each part of tool, the method of attachment/removal of tool are explained as follows.

Warning



When attaching/removing tool, turn the power off or turn spindle switch off.

When attaching/removing end mill, make sure to turn the power off or turn spindle switch off.

If data is received while the spindle lamp is on, the spindle will rotate and there is a danger of cutting off your finger.

Fix the tool without fail.

Attach the tool correctly and firmly without fail. If not attached firmly, it may cause nicking of tool edge resulting injury by broken pieces. Attach the tool according to the procedure.

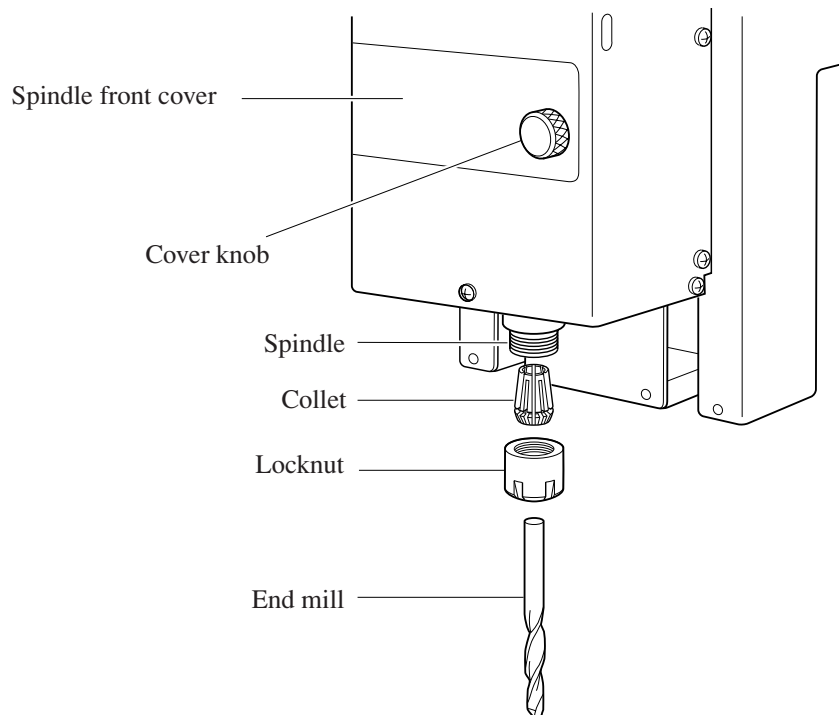
As for the end mill, the ones with shank diameter of 6 mm and 10 mm can be attached.

ST type engraving cutter (SPB-0014, SPB-0010, SPB-0015) which is sold separately can be attached.

Please select the tool suitable to the work to be engraved.

Name of each part

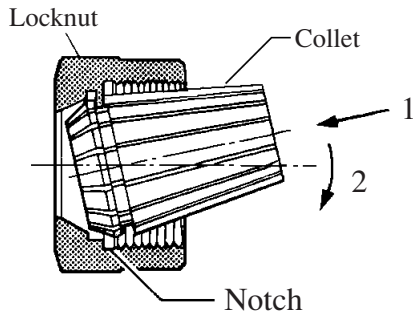
Name of each tool part is as follows.



The method of attaching end mill is explained below.
Please attach end mill according to the following procedure.

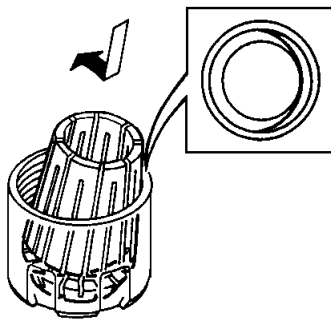
Procedure for attaching end mill

1. Attach collet to the spindle



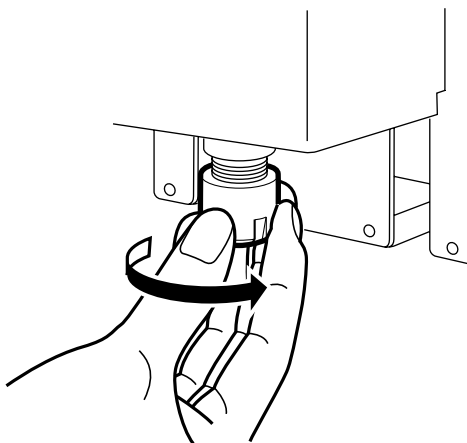
There is a notch, as illustrated on the right, provided on the thrust ring inside the locknut.

1)



Insert collet into locknut in a way that the tip of collet is hooked to the notch portion of locknut.

2)

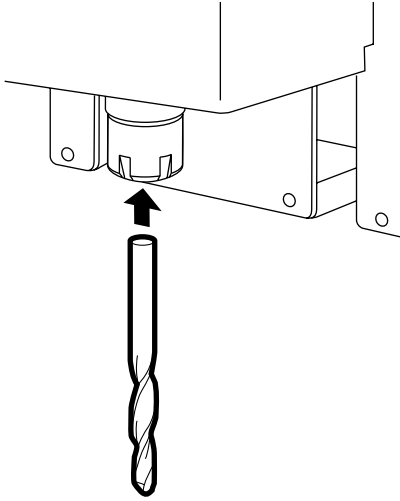


Attach locknut with collet inserted to the spindle.

Hold the locknut with collet inserted and turn clockwise to screw into the threaded portion of the spindle lightly but firm enough so that the locknut will not drop.

2. Attach end mill to collet

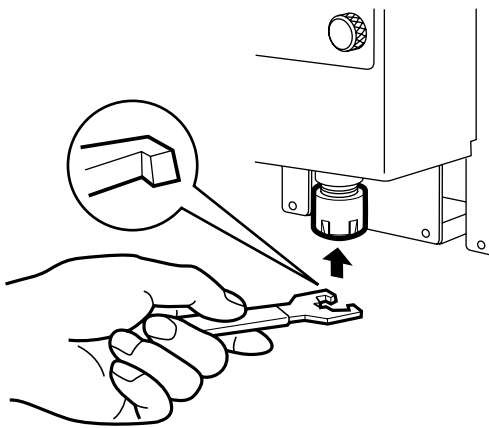
1)



Insert end mill from the bottom or collet in a length longer than the collet length (approximately 27 mm)

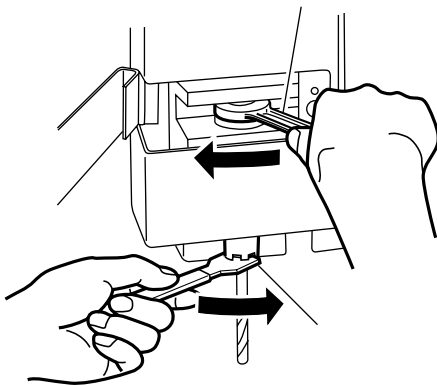
Tighten locknut by hand firm enough so that the end mill will not drop.

2)



Tighten the nut with a spanner. There are front and rear sides to a spanner for tightening. Hold the beveled side or mouthpiece up.

3)



Apply 14 mm spanner to the spindle nut and apply spanner for locknut to the locknut. Turn each spanner inward as illustrated to fix end mill.

Removal of end mill

Removal of end mill is explained below.

Removal of end mill is effected by following the attachment procedure in reverse order.

Remove end mill according to the following procedure.



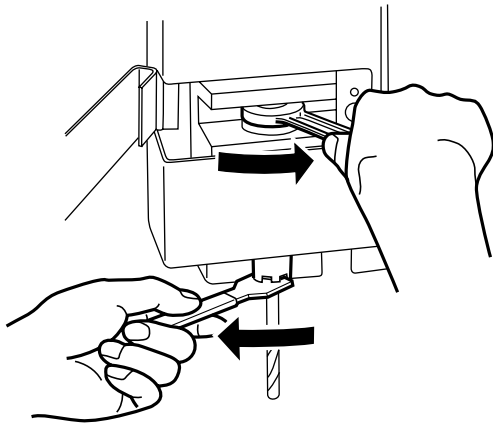
Loosen the nut slowly.

When loosening the locknut, turn each spanner slowly as the end mill may drop down.

Furthermore, be careful of the edge when removing the end mill.

Removing procedure

1)



Apply each spanner to spindle nut and lock-nut, respectively.

Turn each spanner outward slowly as illustrated to loosen each nut.

2)

Take each spanner off the nut and remove end mill slowly.

Turn the Power on/off

The method of turning the power ON/OFF is explained below.

The method of power on

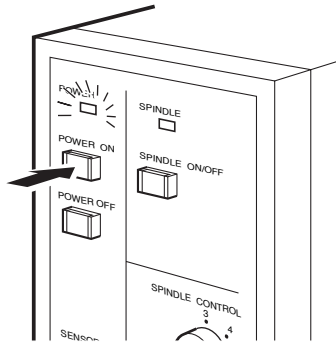


Look around prior to turning the power on.

Before turning the power on, look around to see if there is anybody not involved in the operation, if anything is placed on the head and moving part, and if cables are connected correctly.

When the head moves to the standby position after power on, you may suffer a fracture of bone in your hand or face if you get too close to the head. Furthermore, if cables are not connected correctly, it may cause electrical shock or failure of this unit.

1)



Press “POWER ON switch” of the electrical equipment box.

2)

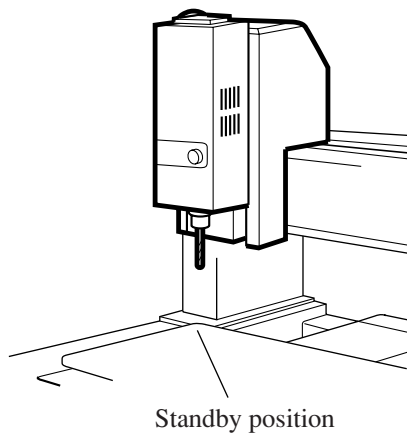
”POWER lamp” on the electrical equipment box and “POWER lamp” on the operation panel will be on.

3)

LCD on the operation panel will display the message as shown on the right. (Numbers displayed may be different by the model.)

SYSTEM VER 1.00

4)



Head and table will move to the standby position, and fine adjustment of origin point is conducted.

If X/Y origin data are stored, they will move to standby position and then to the stored origins.

5)

After moving to the X/Y origins, LCD will display the message as shown on the right.

[STOP]

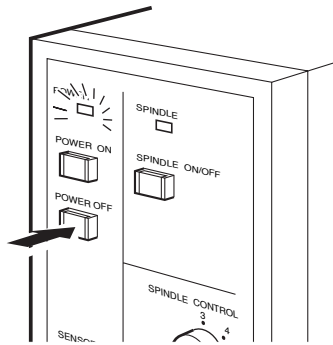
The method of power off



Press “POWER OFF switch” firmly.

If pressed lightly or released too quickly, power will not be turned off.

1)



Press “POWER OFF switch” on the electrical equipment box firmly for approximately 3 seconds.

Confirm that the power lamp goes off, then release the switch.

Attaching a Workpiece

Types of work and the method to fix them and to attach them are explained below.



Work must be fixed firmly.

Fix the work without fail according to the method specified below. There is a danger that the operator may be injured by the work which came off due to incomplete fixing. Furthermore, there is a possibility that engraving may be made out of alignment or table or vise be damaged.

Type of work

This unit can operate with the following two types of work.

Both of them are optional accessories.

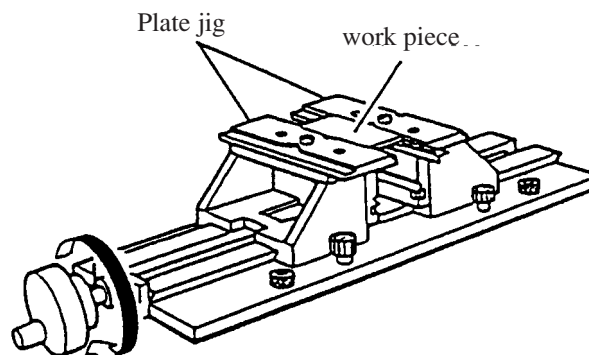
So, please purchase the one suitable to your application.

No.	Type	Applications
1	Center vise	It can be used for mounting cylindrically shaped or thick work. Small work, which is normally difficult to fix, can be fixed, too.
2	T slot table	It can be used from thin work to up to 45 mm thick work. Relatively large sized plate shaped work can fixed.

1. Center vise

This method is effective for holding work pieces that cannot be held tightly by a suction table, such as thick work pieces and small work pieces.

Grip the work piece in the plate jig, and tighten it securely.

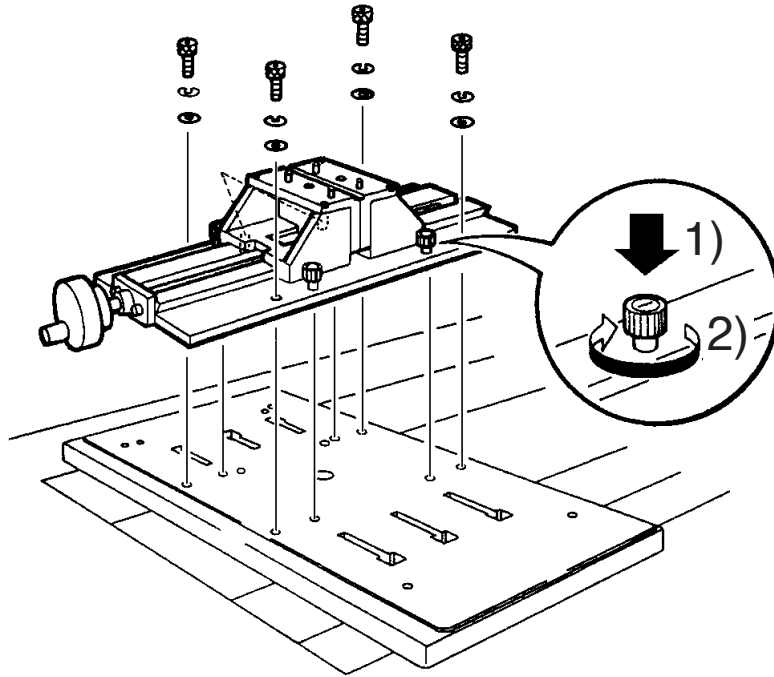


Installing the center vise

Install the optional center vise.

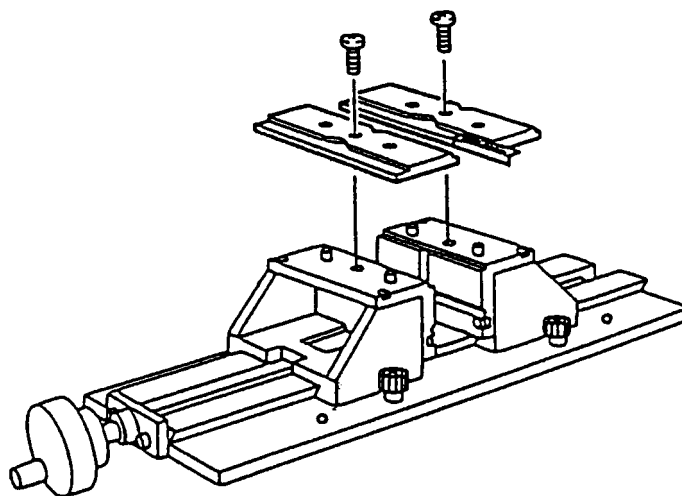
Attach the center vise by tightening four screws and four bolts.

Fit the projecting portion (a) of the center vise in the recess on the table.

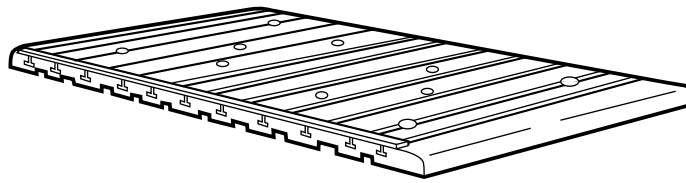


Using the plate jig

When using the center vise, attach the plate jig to the unit

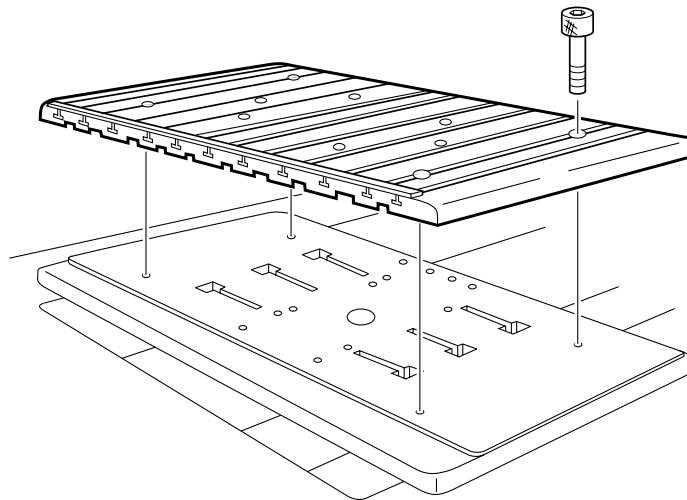


2. T slot table



The method to mount T slot table

Mount T slot table, which is an optional accessory, to the table.
Eight screws are used for mounting.

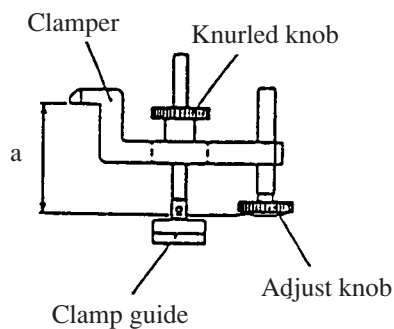


Regarding the clamp jig

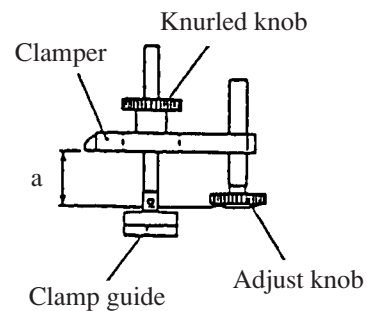
There are two types of clamp jig as follows.

“a” is the work thickness. Prior to mounting to the table, adjust the adjust knob depending on the work thickness.

Type H
(for work thickness of 22~45 mm)



Type S (for thin work)
(for work thickness of 0~30 mm)



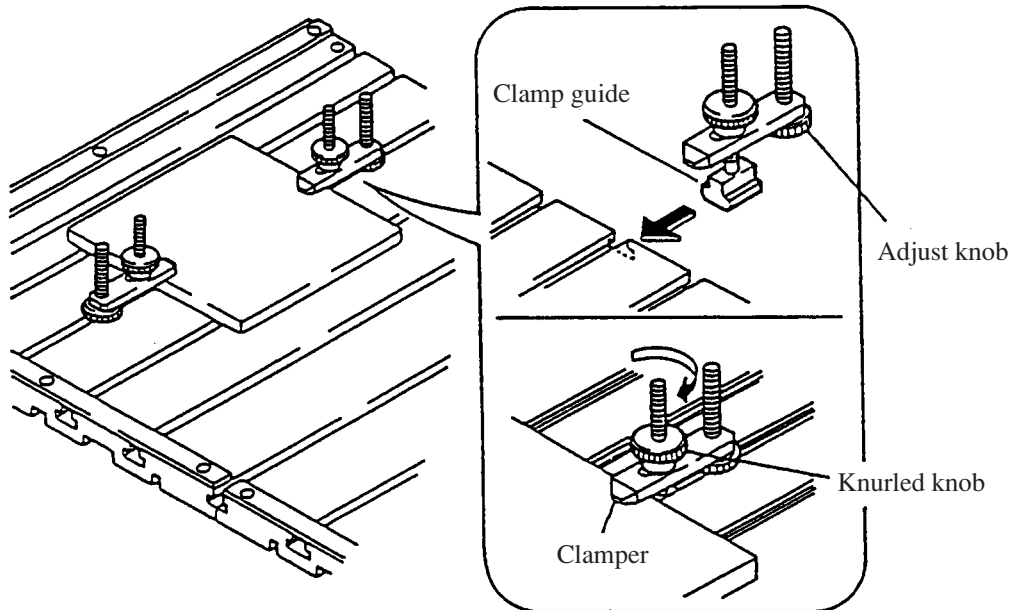
“a” in the figure above represents work thickness. Prior to mounting to the table, adjust the adjust knob according to the work thickness.

Mounting of work on the T slot table

When mounting work on the T slot table, clamp jig will be required. Please purchase one as necessary.

- 1 Adjust the adjust knob according to the work thickness as described in the previous page , and insert clamp guide into the slot of the T slot table.
- 2 Set the jig in a way that the work will come underneath the clamber, and fully tighten the knurled knob by turning it in the arrow direction.

After tightening, Check if the work is not rickety.



Setting of Z Axis Origin

Setting of Z axis origin is explained below.

Z axis origin is used as a reference point for cut depth and up amount.

Basically, Z axis origin is the highest surface of the work to be cut, but it may vary depending on the CAD/CAM software used.

Adjust to match to the CAD/CAM software to be used.

Setting procedure

Prior to setting the Z axis origin, attach end mill.

When the power is turned on or when work or tool is replaced, make sure to set the Z axis origin.

- 1) Lower the head by key until the end mill edge gets close to the work.

Z of jog axis lamp and jog step lamp will be on.

<ORIGIN1> S:OFF [mm]
Z±xxx.xxx

- 2) Lower the head further by using jog dial until the end mill edge touches the work.

At this time, the head position becomes the Z axis origin.

<ORIGIN1> S:OFF [mm]
Z±xxx.xxx

- 3) When key is pressed, axis to be moved by jog dial can be selected. Lamp of the selected jog axis will be on. Here, Select Z axis.

- 4) When key is pressed, travel amount per 1 jog-dial pulse can be selected. *1

The lamp of the selected jog step will be on.

- 5) When key is pressed while spindle on/off switch on the electrical equipment box is ON, spindle on/off can be selected.

<ORIGIN1> S:ON [mm]
Z±xxx.xxx

- 6) Press key to set Z axis origin

<ORIGIN1> S:ON [mm]
Z±0.000

- 7) Press key after the setting.

Head moves to the highest point and the unit returns to the stop mode.

Then, the spindle will stop.

Jog axis lamp and jog step lamp will go off. When G command is selected, the unit returns to stop mode while Z axis and spindle stay in the current status.

[STOP]

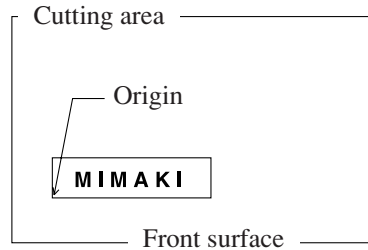
*1 Refer to P.4.6 for the moving speed.

Setting the X•Y Origin

Setting of X,Y axis origins is explained below.

The X,Y origin (hereinafter called “origin”) is the lower left corner point of data on engraving.

Perform engraving the origin as point of reference as shown in the figure below (in the case where MIMAKI logo is engraved in a self-test).



Setting procedures

Set X,Y axis origins after setting the Z axis origin.

- 1) Set to stop mode. (P.2. 5)
- 2) Move the origin to a position desired to be set by , , and keys or jog dial.
Jog axis lamp and jog step lamp will be on.
- 3) When key is pressed, axis to be moved by jog dial can be selected.
Lamp of the select jog axis will be on.
Here, select X axis or Y axis.
- 4) When key is pressed, travel amount per 1 jog dial pulse can be selected.
The lamp of 1 selected jog step will be on.
- 5) When key is pressed, spindle on/off can be selected.
- 6) Press key.
If the message as shown on the right is displayed, Press key to confirm. *1
- 7) After the setting, press key.
The unit will return to stop mode.

[STOP]

<ORIGIN1> S:OFF [mm]
X±xxx.xxx Y±xxx.xxx

<ORIGIN1> S:OFF [mm]
X 0.000 Y 0.000

<ORIGIN1> S:OFF [mm]
ENTER or EXIT

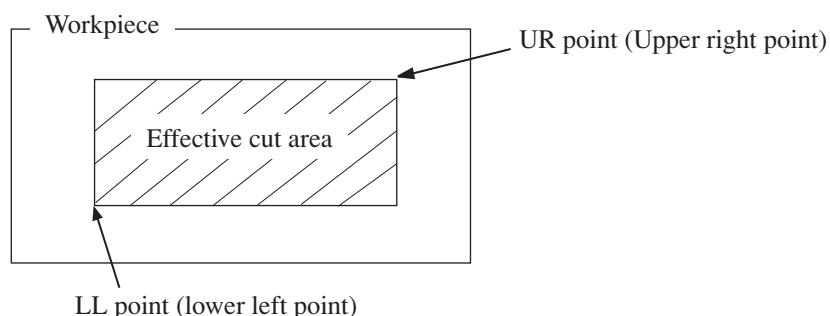
<STOP>

*1 When key is pressed, setting will be cancelled.

Setting the Cut Area

Setting the cut area is explained.

Specify an effective cut area in accordance with the work piece to be engraved.



Setting procedure

- 1) Press the **FUNCTION** key (or \blacktriangle or \blacktriangledown key) to cause the LCD to give indication of the sixth page under the function mode.
- 2) Press the **ENTER** key to cause the LCD to give indication shown on the right.

[FUNCTION]	6/10
CUT AREA	(ENTER)

- 3) Press the **ENTER** key, and the head will move to the existing LL point.

<CUT AREA>	
LOWER LEFT	"ENTER"

The jog axis lamp and the jog step lamp light up.

Move the head, using the arrow keys and the jog dial, to a get LL point.*1

- 4) Press the **ENTER** key to provisionally set the LL point.

<AREA L/L>	[mm]
X±xxx.xxx	Y±xxx.xxx

Indication shown on the right appears.

- 5) Press the **ENTER** key, and the head will move to the existing UR point.

<CUT AREA>	
UPPER RIGHT	"ENTER"

Move the head, using the arrow keys and the jog dial, to a target UR point.*1

- 6) Press the **ENTER** key to enter the LL point and UR point. Then the indication the LCD returns to that in step 1.*2

<AREA U/R>	[mm]
X±xxx.xxx	Y±xxx.xxx

Both the jog axis lamp and the jog step lamp go out.

*1 The axis to be moved by the jog dial can be selected by pressing the **AXIS** key.

The moving amount of the head for one pulse controlled by the jog dial can be selected by pressing the **1 μm** key.

*2 If the margin of LL point and UR point are less than 5mm, the LCD is shown on **ERR30 OPERATION** and the setting is not carried out.

Cutting Conditions Setting

Before engraving is performed, set the following cutting conditions.

Setting	Meaning	Setting range
XYZ-ES (XYZ axis cutting speed)	This sets the X-Y-Z axis cutting speed.	0.5, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 30, 40, 50, 60, 70, 80, 85 mm/s
XYZ-EA (XYZ axis cutting acceleration)	This sets the X-Y-Z axis cutting acceleration.	0.05, 0.1, 0.15, 0.2, 0.25, 0.3 G
XYZ-MS (XYZ axis moving speed)	This sets the X-Y-Z axis moving speed.	10, 15, 20, 30, 40, 50, 60, 70, 80, 85 mm/s
XYZ-MA (XYZ axis moving acceleration)	This sets the X-Y-Z axis moving acceleration.	0.05, 0.1, 0.15, 0.2, 0.25, 0.3 G

Using NC-5SK, the max speed of the XYZ-ES and XYZ-MS is 60mm/s.

Guide for cutting conditions

Cutting conditions, rotating speed of the spindle and tool to be used have to be changed in accordance with the type of engraving and the workpiece to be used. Set appropriate cutting conditions using the table below as a guide. *1

Workpiece	Type of tool	Cutting depth	Number of revolutions	Engraving speed (mm/s)	
		(mm)	(rpm)	XY axis	Z axis
Modeling	End mill $\phi 3$	1	12000	4	4
Wax	End mill $\phi 6$	2	6000	5	5
ABS	End mill $\phi 10$	3	4000	6	6

When performing modeling, specify cutting conditions considering the following four precautions.

1. If the rotating speed of the spindle is too high, chips will remain and soil the engraved surface.
2. In general, quality of the engraved surface differs depending on cutting method, such as down cut and up-cut.
3. If the cutting width is too small, finished quality of cutting may be impaired.
4. Cutting conditions for side-face cutting and those for recessing are different.

*1 The cutting conditions shown in the table are mere reference. If the finished state of the engraved surface is not acceptable finely adjust the cutting conditions appropriately.

Setting procedure

Cut depth is normally designated from the host computer, but when there is no designation from the host computer or when self-test (P.4.9) is being performed, set the cut depth in the cut condition setting process.

- 1) Press the **FUNCTION** key (or the **▲** or **▼** key) to cause the LCD to give the indication of the first page under the function mode.

[FUNCTION] 1/10
CONDITION (ENTER)

- 2) Press the **ENTER** key to cause the LCD to give indication shown on the right. Select a value for the cutting speed using the **<** or **>** key.

<CONDITION> 1/4
XYZ-ES *10mm/s>

- 3) Press the **▲** key to cause the LCD to give the indication shown on the right. Select a value for the cutting acceleration amount using the **<** or **>** key.

<CONDITION> 2/4
XYZ-EA *0.2G>

- 4) Press the **▼** key to cause the LCD to give the indication shown on the right.
Select a value for the moving speed in XYZ axis using the **<** or **>** key.

<CONDITION> 3/4
XYZ-MS *80mm/s>

- 5) Press the **▼** key to cause the LCD to give the indication shown on the right.
Select a value for the moving acceleration in XYZ axis using the **<** or **>** key.

<CONDITION> 4/4
XYZ-MA *0.3G>

- 6) Press the **ENTER** key to enter the set values. *1

[FUNCTION] 1/10
CONDITION (ENTER)

- 7) After the completion of the setting procedure press the **EXIT** key to make the unit to enter the stop mode.

[STOP]

*1 Pressing the **EXIT** key cancels the set value.

On Spindle Rotation

Turning spindle rotation on and off

To turn spindle rotation on or off, press the Spindle on/off switch on the electrical equipment box. Turn the spindle on or off as necessary for the type of work being performed.



During spindle rotation on, do not have your hand or face get close to the moving part or the head.

During spindle rotation on, never get close to the moving part or the head as it is dangerous.

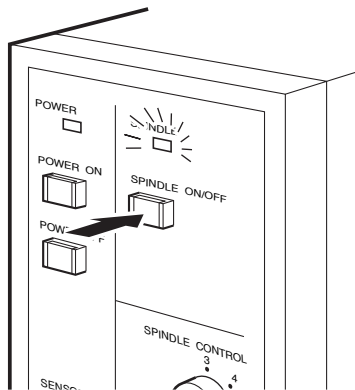
You may get injured on your hand or face by the rotating spindle.

When spindle rotation is on

When the spindle lamp on the electrical equipment box is lit, this unit is on spindle on status. Even when the spindle is on, rotation does not start immediately.

Rotation starts automatically when “MIMAKI LOGO” is executed in a self-test.

1)



Press the Spindle on/off switch on the electrical equipment box.

2)

The spindle lamp lights up.

When spindle rotation is off

When the spindle lamp on the electrical equipment box is off, the unit is in the state where the spindle rotation is off.

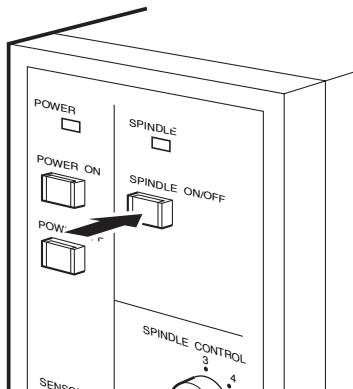
Set the spindle to the off state when attaching a pen or the like to the spindle.

At this time, the spindle will not rotate even the unit receives data.

The spindle does not rotate, either, even if you press the **SPINDLE** key, When setting the origin or the cut area.

When the spindle that has been rotating stops, the unit is rendered inoperative for approximately three seconds until the spindle totally stops.

1)



Press the Spindle on/off switch on the electrical equipment box.

2)

The Spindle lamp goes off.

Spindle rotation speed adjustment

The spindle rotation speed is adjusted with the adjustment knob (P.1.5) on the electrical equipment box. Referring to the cutting conditions table (P. 3.18), adjust the speed to match the work being done.

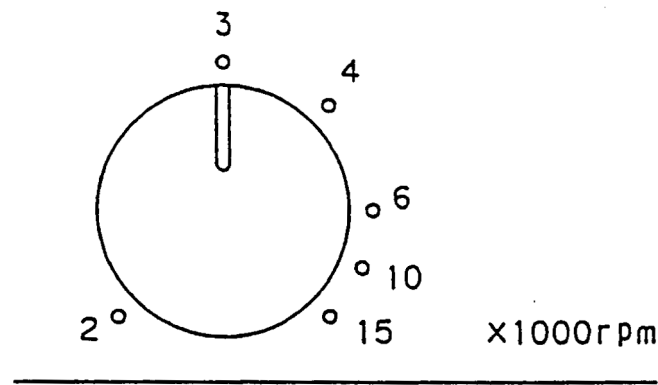


Do not change the spindle rotation speed abruptly.

Turn the spindle control knob slowly. Abrupt change of the number of revolutions will cause the spindle to stop.

In this case, the stop of the spindle is taken as an erroneous operation. So, turn off the power to the unit once, then return it on.

SPINDLE CONTROL



Checking the rotation of the spindle

To check the rotation of the spindle without sending data, select the origin setting and press the **SPINDLE**.*1

If the spindle on/off switch is set to the off state, the spindle will not rotate even if the **SPINDLE** key is pressed.

Set the spindle on/off switch to the on state and allow the spindle to rotate.

*1 When the spindle that has been rotating stops, the unit is rendered inoperative for approximately three seconds until the spindle totally stops.

Wait for a while before you start a subsequent work.

CHAPTER 4 PRACTICAL OPERATION AND ADJUSTMENT

In this chapter, practical operation and adjustment are explained.

Moving the Head

Moving the head

The head of the unit moves in the three different directions, X, Y and Z axis.

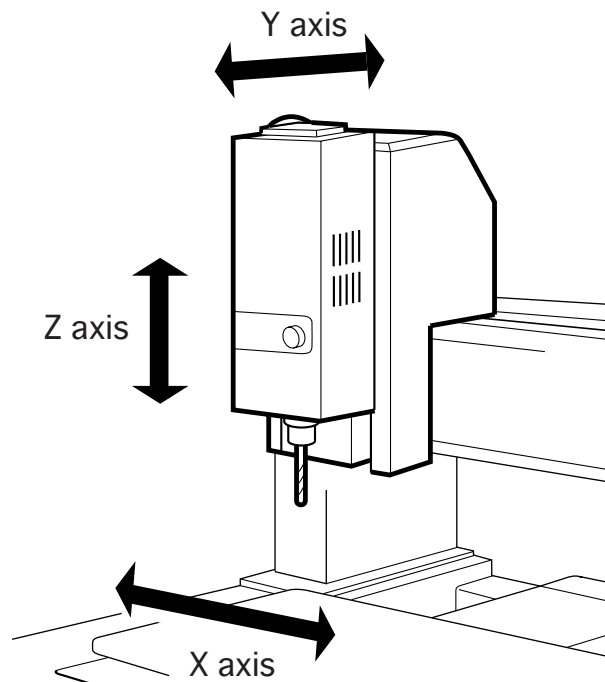


Do not get close to the moving part while the head is moving.

When the head is moved, do not have your hand or face get close to the head, or X bar, or the table. Your hand may be caught in the slot of the head or the X bar and suffer a fracture. When moving the head, look around for safety, and stay away from the unit except for stopping the unit or operating the panel.

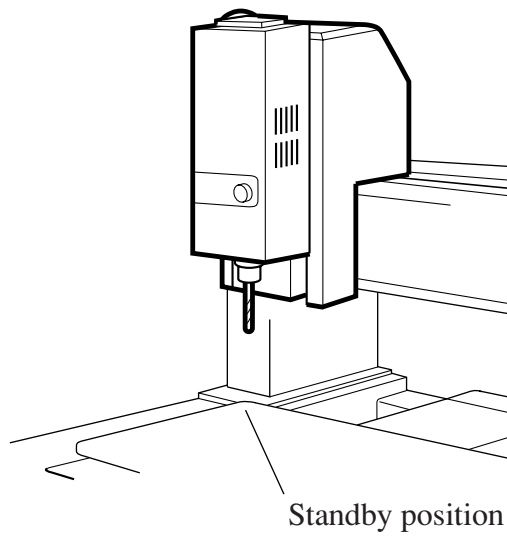
Type or head movement

In addition to the head movement by jog key or jog dial, the head can also be moved by view function and **MOVE** key.



Viewing

View function is explained below.



View function is a function to move the head to its standby position (That is, head is at the extreme left, table is at the forefront and Z axis is at the highest point).

The method to perform VIEW

- 1) Press **START/STOP** to enter STOP mode.
- 2) Press **VIEW** to call the display at right.
- 3) When **ENTER** is pressed, viewing is executed and then the head is moved to the standby position. After the movement, the system returns to STOP mode.

[STOP]

<VIEW>
"ENTER" or EXIT

<VIEW>
ON PRACTIC !

[STOP]

Setting to the head standby position

The head movement by view function is explained below.

- 1) Press the **[START/STOP]** key to cause the unit to enter the stop mode.

[STOP]

- 2) Press the **[FUNCTION]** key to cause the LCD to give the indication of the 8th page under the function mode.

[FUNCTION] 8/10
EVACUATE (ENTER)

- 3) Press the **[ENTER]** key to cause the LCD to give the indication shown on the right.*1

<EVACUATE>
"ENTER" or EXIT

- 4) Press the **[ENTER]** key and then the head is moved to the standby position.

<EVACUATE> [mm]
X 0.000 Y 305.000

- 5) Press the **[▲] [▼] [◀] [▶]** key and then the head is setted to the standby position.

<EVACUATE> [mm]
X 483.000 Y 305.000

- 6) Press the **[ENTER]** key to enter the set values.

[FUNCTION] 8/10
EVACUATE (ENTER)

- 7) After the completion of the setting procedure, press the **[EXIT]** key to make the unit to enter the stop mode.

[STOP]

Moving to the X.Y Origin

The head movement using **MOVE** key is explained below.
Press **MOVE** key to move the head to the preset X.Y origins.

- 1) Press the **START/STOP** key to cause the unit to enter the stop mode.
- 2) Press the **MOVE** key to cause the LCD to give the indication shown on the right.
- 3) Press the **ENTER** key and the head starts to travel to the XY origin. The Z axis moves to the highest position or its stroke. After the respective destinations are reached, the unit returns to the stop mode.

[STOP]

<MOVE>
"ENTER" or EXIT

<MOVE>
ON PRACTIC !

[STOP]







Regarding the Moving Speed

Moving speed or X, Y and Z axis

Speed of moving by arrow key or jog dial is explained below.



Arrow keys

When moved by arrow keys (, , , , , ), the speed will be fixed.

- , , ,  80 mm/s
- ,  20 mm/s

At this time, jog axis lamp will be on depending on the arrow key selected.

Jog dial

- Press the  key and select the axis you desire to move.
- Press the  key and select the dial step.

Refer to the table below for speed.

Axis moving speed	Slow <— —> Fast		
Dial step	x1 (1 μm/pulse)	x10 (10 μm/pulse)	x100 (100 μm/pulse)
Dial rotation speed	Low-speed rotation <— —> High-speed rotation		

Automatic Z Origin Detection

Automatic Z origin detection

ZS sensor, which is an optional accessory, is necessary to enable auto Z origin detection. In the case of ZS sensor, height need to be registered in advance. (p.4.14)



Attach ZS sensor only for auto Z axis origin detection.
When not in use, make sure to remove it.

By using ZS sensor, detection/setting of Z origin can be made automatically. If ZS sensor is not in use, set the Z axis origin by referring to “ setting of Z axis origin (p.3.15)”.

Z origin detection procedure

- 1) Move the head by jog key or jog dial in a way that the edge will come to the Z origin. Connect the connector of ZS sensor and set the ZS sensor at a point right underneath the edge.
- 2) Press **FUNCTION** key. Spindle will stop. If connector of ZS sensor is not connected, it will become an error. (ERR53 ZS SENSOR) Furthermore, if Z axis position is too low, it will also become an error.
- 3) Press **ENTER** key. Z axis will start to lower. If you wish to stop during detection, press **START/STOP** key. The unit will return to 1). If connector is pulled out during detection, it will become an error (ERR53 ZS SENSOR) and returns to 1).
- 4) After detection, Z axis will move up to the highest position and the unit will return to 1).
- 5) Remove ZS sensor.

<ORIGIN1> S : OFF [mm]
X±xxx.xxx Y±xxx.xxx

<Z ORIGIN SEARCH>
“ENTER” or EXIT

<Z ORIGIN SEARCH>
ON PRACTIC !

When engraving is made at auto Z origin, but cut depth is not appropriate.

It is considered that height characteristics of ZS sensor has changed or that height correction value is incorrect.

In such case, make height correction of ZS sensor.

Adjust ZS sensor value of operation switch.

Finely Adjusting the X.Y Origin

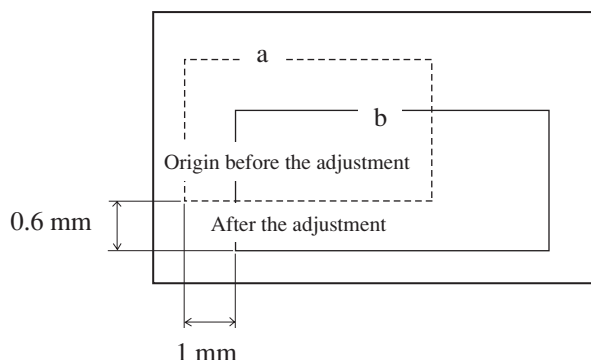
The location of the X Y origin can be finely adjusted. The finely adjusted value stored in memory even when re-turning on the power to the machine.

Set item	Description	Set value
X POSITION	Distance (on the X axis) from the specified origin to the X adjusted origin is set.	-1.00 to 0 to +1.00 mm (0.01 mm pitch)
Y POSITION	Distance (on the Y axis) from the specified origin to the adjusted origin is set.	

To move the engraving position from a to b, set as follows:

X origin = +1.00 mm

Y origin = -0.60 mm



- 1) Press the **[START/ STOP]** key to allow the unit to enter the stop mode.
- 2) Press the **[FUNCTION]** key (or the **[▲]** or **[▼]** key) to cause the LCD to give the indication of the seventh page under the function mode.
- 3) Press the **[ENTER]** key to cause the LCD to give the indication shown on the right. Select an adjustment value for the X axis using the **[◀]** or **[▶]** key. Inputting a plus (+) value moves data to the right. Inputting a minus (-) value moves data to the left.
- 4) Press the **[▼]** key to cause the LCD to give the indication shown on the right. Select an adjustment value for the X axis using the **[◀]** or **[▶]** key. Inputting a plus (+) value moves data toward you. Inputting a minus (-) value moves data away from you.
- 5) Press the **[ENTER]** key to enter the set values.*1
- 6) After the completion of the setting procedure, press the **[EXIT]** key to make the unit to enter the stop mode.

[STOP]

[FUNCTION] 7/10
XY POSI. ADJ (ENTER)

<XY POSI. ADJ> 1/2
X POSITION 1 *+0.00mm>

<XY POSI. ADJ> 2/2
Y POSITION 1 *+0.00mm>

[FUNCTION] 7/10
XY POSI. ADJ (ENTER)

[STOP]

*1 When **[EXIT]** is pressed, the settings are canceled and display 2) returns.

On the Self-Tests

MIMAKI logo engraving

The engraving quality can differ depending on the material and thickness of the work piece being engraved. The engraving quality can be checked by engraving a test pattern. If the engraving quality is not good, reset the cutting conditions, cutting depth, spindle speed, etc.

- 1) Press **[START/ STOP]** to enter STOP mode.

[STOP]

- 2) Use the arrow keys to move the head to the start position, then set the X•Y•Z origin (p.3.16).

- 3) Press **[FUNCTION]** (or **[▲]** or **[▼]**) to display the 2nd page of function mode.

[FUNCTION] 2/10
SELF TEST (ENTER)

- 4) Press **[ENTER]** to call the display at right.

<SELF TEST> 1/3
MIMAKI LOGO L (ENTER)

- 5) Use the **[▲]** and **[▼]** keys to select an appropriate size. The display shown at right appears.

MIMAKI LOGO (L) : Large

MIMAKI LOGO (M) : Medium

MIMAKI LOGO (S) : Small

<SELF TEST> 2/3
MIMAKI LOGO M (ENTER)

<SELF TEST> 3/3
MIMAKI LOGO S (ENTER)

- 6) Press **[ENTER]** is to call the display at right.

<MIMAKI LOGO>
"ENTER" or EXIT

- 7) When **[ENTER]** is pressed again, the test starts. *1
When the test ends, press **[EXIT]** to return to STOP mode.

[STOP]

*1 When **[EXIT]** is pressed, the self-test is canceled and display 3) returns.

On Copying

How to copy or errors that occur during copying are follows.
Data in the receiving buffer can be cut.



No data sent from the bust computer during copy process.

Do not send data from the host computer during copy process as it may cause an error.
Send the data in advance.

How to copy

- 1) Press **START/ STOP** to put the unit into STOP mode.

[STOP]

- 2) Press **COPY** to call the display at right.

<COPY>
"ENTER" or EXIT

- 3) Press **ENTER** to start copying. *1

<COPY> 0 KB
XYZ : 80 OR : 100%

- 4) When copying is completed, the unit returns to STOP mode.

[STOP]

Errors that can occur during copying

If one of the following errors occurs during copying, take the action indicated.

ERR31 NO DATA

[Cause] There are no data in the buffer.

[Action] Send data from the host before copying.

ERR32 OVER DATA

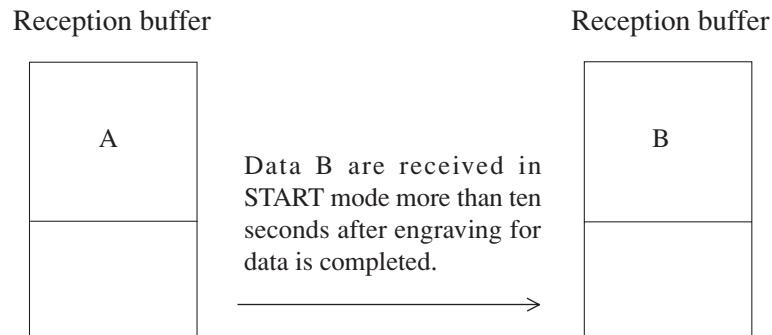
[Cause] The amount of data received exceeds 10 MB.

[Action] Resend data in an amount less than 10 MB.

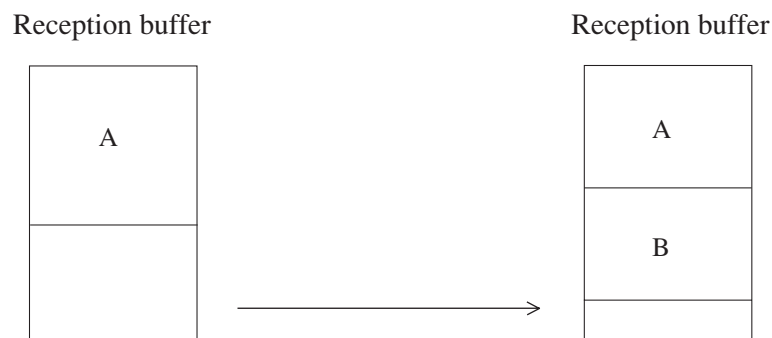
*1 When **EXIT** is pressed, the copying is canceled and the unit returns to STOP mode.

The relation between the received data overwrite function and the copy function

In START mode, if new data are sent from the host more than ten seconds after the engraving is completed, the data in the reception buffer of this unit are cleared and replaced by the new data. If copying is performed after engraving for the new data is completed, only the new data are copied.



If new data are sent from the host before ten seconds have passed since the completion of engraving for the data set A, the new data are added to the tail end of data set A (the same happens if the system is switched into STOP mode before ten seconds have elapsed and then data B are sent). In this case, if data are copied after engraving for data set B is completed, both data sets A and B are copied.



Data Clear

Clear the data in the receiving buffer. Even after data clear, cutting based on the previously sent data is possible by copying. If data is newly sent, however, data before data clear cannot be used for cutting.

Clearing Data

- 1) Press **START/ STOP** to put the unit into STOP mode.

[STOP]

- 2) Press **DATA CLEAR** to call the display at right.

<DATA CLEAR>
ENTER or EXIT

- 3) When **ENTER** is pressed again^{*1}, the data in the buffer are cleared.

- 4) When data clearing is completed, press **EXIT** to return to STOP mode.

[STOP]

^{*1} When **EXIT** is pressed, the data clearing is canceled and display [STOP] mode reappears.

Switching the Operation Switches

Among the operation switches, there are the following settings. Switch the set values as necessary.

Setting	Content	Setting value
COMMAND	This sets the command and the resolution.	<u>G</u>
ORIGIN SELECT	This selects the origin position to use in setting origin.	<u>1</u> , 2, 3, 4, 5, 6
AUTO VIEW	This sets whether after action is completed until the head goes to the standby position or not.	<u>OFF</u> , ON
UNIT	This selects whether the coordinates, for example when the head moves, are to be displayed in units of millimeters or inches.	<u>mm</u> , inch
ZS SENSOR	In case where the ZS sensor is used for the first time, enter the height of the ZS sensor in prior. This is an automatic Z axis coordinate setting; when the Z origin does not match, the ZS sensor height is set.	<u>20.00 mm</u> 18.00 - 22.00
LANGUAGE	This selects the language on display.	<u>ENGLISH</u> JAPANESE
RECEPTION	This sets whether cutting starts on time reception or after collect reception.	<u>NORMAL</u> , COLLECT
PRIORITY	This sets whether cutting condition gives priority to host computer or to panel setting.	<u>HOST</u> , PANEL

The mark (under line) indicates an initial value.

- 1) Press **[START/ STOP]** to enter STOP mode. [STOP]

- 2) Press **[FUNCTION]** (or the **[▲]** or **[▼]** key) to display the 3rd page of FUNCTION mode. [FUNCTION] 3/10
MODE SWITCH (ENTER)

- 3) Press **[ENTER]** to call the display at right.
Use the **[◀]** and **[▶]** keys to select the mode switch value.*1 <MODE SWITCH> 1/8
COMMAND *G>

- 4) Press **[▼]** to call the display at right.
Use the **[◀]** and **[▶]** keys to select the origin select value.*1 <MODE SWITCH> 2/8
ORIGIN SELECT *1>

- 5) Press **[▼]** to call the display at right.
Use the **[◀]** and **[▶]** keys to select the autoview value.*1 <MODE SWITCH> 3/8
AUTO VIEW *OFF>

- 6) Press **[▼]** to call the display at right.
Use the **[◀]** and **[▶]** keys to select the unit value.*1 <MODE SWITCH> 4/8
UNIT *mm>

- 7) Press **[▼]** to call the display at right.
Use the **[◀]** and **[▶]** keys to select the ZS sensor value.*1 <MODE SWITCH> 5/8
ZS SENSOR *20.00mm>

- 8) Press **[▼]** to call the display at right.
Use the **[◀]** and **[▶]** keys to select the language.*1 <MODE SWITCH> 6/8
LANGUAGE *ENGLISH>

- 9) Press **[▼]** to call the display at right.
Use the **[◀]** and **[▶]** keys to select the reception value. <MODE SWITCH> 7/8
RECEPTION *NORMAL>

- 10) Press **[▼]** to call the display at right.
Use the **[◀]** and **[▶]** keys to select the priority value.*1 <MODE SWITCH> 8/8
PRIORITY *HOST>

- 11) Press **[ENTER]** to finalize the settings.*1 [FUNCTION] 3/10
MODE SWITCH (ENTER)

- 12) After the settings are completed, press **[EXIT]** to return to STOP mode. [STOP]

*1 When **[EXIT]** is pressed, the settings are canceled and display 2) returns.

Command

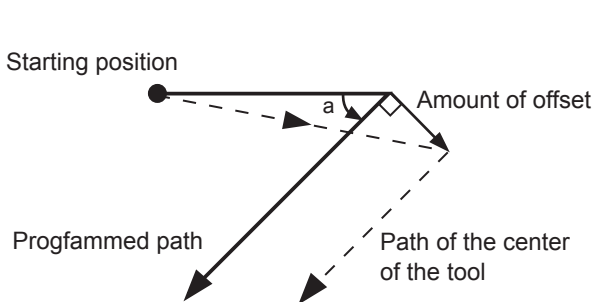
Set command-dependent contents, optional skip, tool diameter correction, etc.

Setting	Content	Setting value
G CODE	This selects the G command code system. When AUTO is selected, the code system is judged by the program start code.	<u>ASCII</u> , ISO, EIA, AUTO
GDP	This selects the command resolution. The unit setting can be selected if the decimal point for numbers is omitted. If the decimal point is present, the unit of mm (or inch) results.	<u>0.001 mm</u> , 1.0 mm 0.0001 inch 1.0 inch
START CODE	This selects the starting signal to be sent to the host computer. If it is not necessary, select OFF. When a value other than OFF is selected and no data is present in the receive buffer, the selected code is sent to the host computer when the START/STOP is pressed.	<u>OFF</u> , DC1 DC2 DC3 DC4
PROGRAM START	This selects presence or absence of the program start code (% or ER) at the top of data.	<u>ON</u> , OFF
COURSE	This selects the path for "Outer Route" when starting or stopping tool diameter correction.*1	<u>A</u> , B
OPTIONAL SKIP	This selects the optional skip operation when the OPTIONAL SKIP command (/) is received.	<u>OFF</u> ON
TOOL CORRECT	This selects the value of the amount of correction which is used for tool path correction.	<u>0.000mm</u> , -300.00 - 300.00

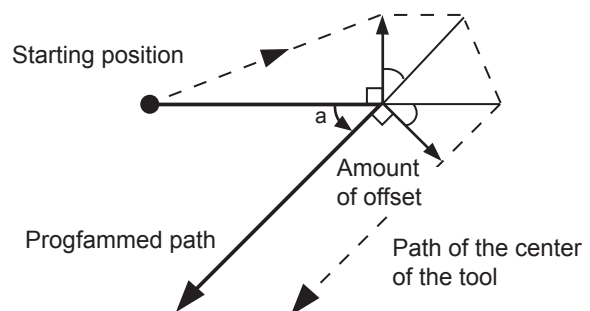
The mark (under line) indicates an initial value.

When you select the OPTIONAL SKIP and TOOL CORRECT, proceed with the detailed setting.

*1 When the outside angle is an acute angle ($a < 90^\circ$)



From straight line to straight line (type A)



From straight line to straight line (type B)

- 1) Press **[START/ STOP]** to enter STOP mode. [STOP]

- 2) Press **[FUNCTION]** (or the **[▲]** or **[▼]** key) to display the 4th page of FUNCTION mode. [FUNCTION] 4/10
COMMAND (ENTER)

- 3) Press **[ENTER]** to call the display at right.
Use the **[◀]** and **[▶]** keys to select the G code value. ^{*1} <COMMAND> 1/7
G CODE *ASCII>

- 4) Press **[▼]** to call the display at right.
Use the **[◀]** and **[▶]** keys to select the GDP value. ^{*1} <COMMAND> 2/7
GDP *0.001mm>

- 5) Press **[▼]** to call the display at right.
Use the **[◀]** and **[▶]** keys to select the start code value. ^{*1} <COMMAND> 3/7
START CODE *OFF>

- 6) Press **[▼]** to call the display at right.
Use the **[◀]** and **[▶]** keys to select the program start value. ^{*1} <COMMAND> 4/7
PROGRAM START *ON>

- 7) Press **[▼]** to call the display at right.
Use the **[◀]** and **[▶]** keys to select the course. ^{*1} <COMMAND> 5-7
COURSE *A>

- 8) Press **[▼]** to call the display at right.
Press **[ENTER]** to enter the page of setting OPTIONAL SKIP. <COMMAND> 6/7
OPTIONAL SKIP (ENTER)

- 9) Press **[▼]** to call the display at right.
Press **[ENTER]** to enter the page of setting TOOL CORRECT. <COMMAND> 7/7
TOOL CORRECT (ENTER)

- 10) Expect for 6,7 page, press **[ENTER]** to finalize the settings. ^{*1} [FUNCTION] 4/10
COMMAND (ENTER)

- 11) After the settings are completed, press **[EXIT]** to return to STOP mode. [STOP]

^{*1} When **[EXIT]** is pressed, the settings are canceled and display 2) returns.

OPTIONAL SKIP

When you setting optional skip, skip the disposition of command that it begin from optional skip command(/).

- 1) Use the and keys to select the optional skip.

<COMMAND> 6/7
OPTIONAL SKIP (ENTER)

- 2) Press to finalize the settings, and display the page of command setting returns.

<OPTIONAL SKIP> 1/9
No.1 *OFF>

<COMMAND> 6/7
OPTIONAL SKIP (ENTER)

TOOL CORRECT

- 1) Use the and keys to select the tool correct value.

<COMMAND> 7/7
TOOL CORRECT (ENTER)

- 2) Press to finalize the settings, and display the page of command setting returns.

<TOOL CORRECT> 1/20
No.1 *0.000mm>

<COMMAND> 7/7
TOOL CORRECT (ENTER)

Communication Conditions Setting

Select the interface and set the RS-232C interface communication conditions.

1. Select the interface.

Item	LCD display	Meaning
I/F CHOICE	<u>AUTO</u>	automatic
	RS	RS-232C
	PARALLEL	8bit parallel

2. Set the RS-232C interface communication conditions.

Item	LCD display	Meaning
BAUD RATE	1200, 2400,	1200 bps, 2400 bps
	4800, <u>9600</u> ,	4800 bps, 9600 bps
	19200, 38400,	19200 bps, 38400 bps
	57600, 115200	57600 bps, 115200 bps
DATA BITS	7	7 bits
	<u>8</u>	8 bits
PARITY	<u>NON</u>	no parity check
	EVEN	even parity
	ODD	odd parity
STOP BITS	<u>1</u>	1 bit
	2	2 bits
HANDSHAKE	<u>HARD</u>	Hardware handshake
	X_CODE	XON/XOFF handshake

The mark (under line) indicates an initial value.

- 1) Press **START/ STOP** to enter STOP mode. [STOP]

- 2) Press **FUNCTION** (or the **▲** or **▼** key) to display the 5th page of FUNCTION mode. [FUNCTION] 5/10
INTERFACE (ENTER)

- 3) Press **ENTER** to call the display at right.
Use the **◀** and **▶** keys to select the interface. <INTERFACE> 1/2
I/F CHOICE *AUTO>

- 4) Press **ENTER** to call the display at right.
Use the **◀** and **▶** keys to RS232C. <INTERFACE> 2/2
RS232C (ENTER)

- 5) Press **ENTER** to call the display at right.
Use the **◀** and **▶** keys to select the baud rate value. <RS232C> 1/5
BAUD RATE *9600 bps>

- 6) Press to call the display at right.
Use the **◀** and **▶** keys to select the data bits. <RS232C> 2/5
DATA BITS *8>

- 7) Press to call the display at right.
Use the **◀** and **▶** keys to select the parity value. <RS232C> 3/5
PARITY *NON>

- 8) Press to call the display at right.
Use the **◀** and **▶** keys to select the stop bit value. <RS232C> 4/5
STOP BITS *1>

- 9) Press to call the display at right.
Use the **◀** and **▶** keys to select the handshake value. <RS232C> 5/5
HANDSHAKE *HARD>

- 10) Press **ENTER** to finalize the settings.*¹ [FUNCTION] 5/10
INTERFACE (ENTER)

- 11) After the settings are completed, press **EXIT** to return to STOP mode. [STOP]

*¹ When **EXIT** is pressed, the settings are canceled and display 2) returns.

Setting the External I/O Port

When an external I/O terminal block is used to handle signals between the unit and an external device, set functions of the respective ports. Refer to “External block diagram” for the electrical specifications.

IN port (input port)

IN port 1

Used to pause/re-start of commands.

H (1): RE-start (Command is executed)

L (0): Pause (Same state as being stopped using the

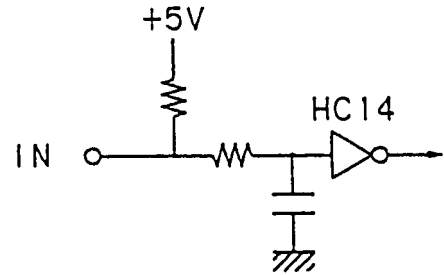
START/ STOP key)

- When [N] is set to “pause,” the execution of a command can be suspended or restarted by an external signal under the start mode.
- When [N] is set to “off” in the I/O port setting procedure, input of the port is rendered ineffective.

IN port 2

This port is reserved for an extended use in the future.

Input circuit (①) TTL input



OUT port (output port)

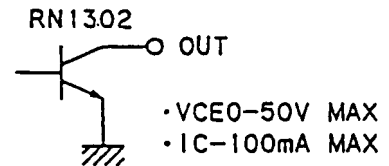
OUT port 1

Used to output the state of the spindle.

H (1): Spindle off

L (0): Spindle on

If the spindle switch on the electrical equipment box is set to the off position, the OUT port 1 outputs “LOW” as long as the spindle is internally in the on state.



OUT port 2

Used to output an erroneous state.

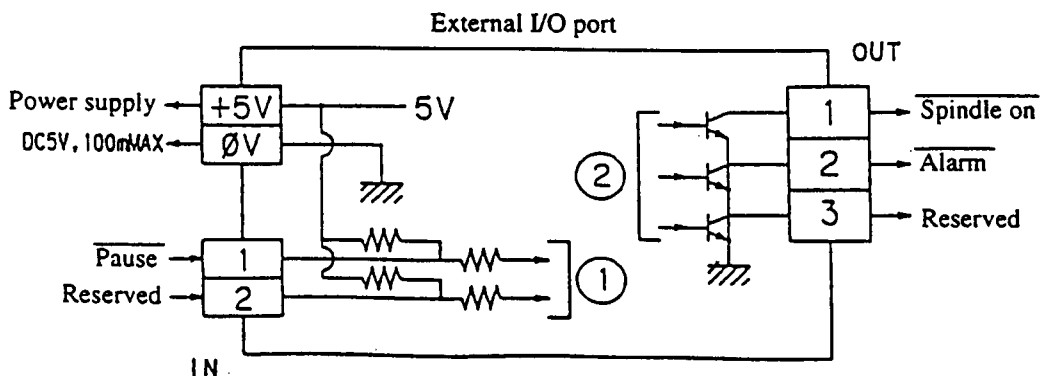
H (1): Abnormal

L (0): Normal

OUT port 3

This port is reserved (always in the “Low” state).

External block diagram



Setting procedure

- 1) Press the **[START/ STOP]** key to allow the unit to enter the stop mode.

[STOP]

- 2) Press the **[FUNCTION]** key (or the **[▲]** or **[▼]** key) to cause the LCD to give the indication of the ninth page under the function mode.

[FUNCTION] 9/10
I/O PORT (ENTER)

- 3) Press the **[ENTER]** key to cause the LCD to give the indication shown on the right. Select the function of the input port 1 using the **[◀]** and **[▶]** key. (p.4.18)

<I/O PORT> 1/5
IN1 *OFF>

- 4) Press the **[▼]** key to cause the LCD to give the indication shown on the right. The function of the IN port 2 is reserved, so the set value cannot be changed.

<I/O PORT> 2/5
IN2 *OFF*

- 5) Press the **[▼]** key to cause the LCD to give the indication shown on the right. The set value cannot be changed.

<I/O PORT> 3/5
OUT1 *SPINDLE*

- 6) Press the **[▼]** key to cause the LCD to give the indication shown on the right. The set value cannot be changed.

<I/O PORT> 4/5
OUT2 *ERROR*

- 7) Press the **[▼]** key to cause the LCD to give the indication shown on the right. The set value cannot be changed.

<I/O PORT> 5/5
OUT3 *OFF*

- 8) Press **[ENTER]** key for setting.*¹

[FUNCTION] 9/10
I/O PORT (ENTER)

- 9) When setting is complete, press **[EXIT]** key to return to stop mode.

[STOP]

*¹ If **[EXIT]** key is pressed, setting will be cancelled and it will return to the display in 2) above.

ERROR LOG

The error log is explained bellow.

- ERR14 BLOCK LENGTH
- ERR15 COMMAND
- ERR16 COMMAND SKIP
- ERR17 COMMAND NOP
- ERR18 PARAMETER

- 1) Press the **START/ STOP** key to allow the unit to enter the stop mode.

[STOP]

- 2) Press the **FUNCTION** key (or the **▲** or **▼** key) to cause the LCD to give the indication of the 10th page under the function mode.

[FUNCTION] 10/10
ERROR LOG (ENTER)

- 3) Press the **ENTER** key to cause the LCD to give the indication shown on the right. ^{*1}

<ERROR LOG> nn t
XXXXXXXXXXXXXXXXXXXXXX

nn= error number
t= error indication
xx= error details

Until turn the power off or next error occur, information on the error has held.

- 9) Confirm the error log, press **EXIT** key to return to stop mode.

[STOP]

^{*1} When the error occurs and displays **ERR ?? ******
Stop Data Press EXIT , press **EXIT** and return to to display in 3) above. If confirmed the error and **EXIT** key is pressed , it will return to stop mode.

CHAPTER 5 OCCURRENCE OF ERRORS AND CORRECTIVE MEASURES

In this chapter, corrective measure to be taken when errors occur or the engraving is not finished as desired.

Error Messages and Corrective Measures

Error of which error no. is shown on the LCD

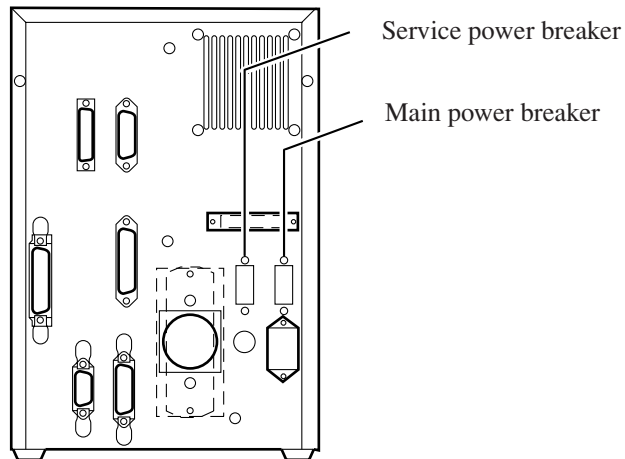
No.	Error indication	Cause	Corrective measure
00	ERR00 MAIN ROM	Flash ROM has failed.	Corrective measure
02	ERR02 MAIN RAM	System RAM has failed.	Contact your dealer.
04	ERR04 EEPROM	EEPROM for the control of motor has failed.	
05	ERR05 HAND SHAKE	CPU circuit board has failed.	
06	ERR06 BUFFER	Receive buffer has failed.	
14	ERR14 BLOCK LENGTH Stop Data Press EXIT	The number of characters for one block of G command is 128 or more.	Divide the block appropriately or delete unnecessary data to decrease the number of characters for one block less than 128.
15	ERR15 COMMAND Stop Data Press EXIT	Command which cannot be treated is received.	Stop receiving data and Press the EXIT key. Delete the code indicated.
16	ERR16 COMMAND SKIP		
17	ERR17 COMMAND NOP		
18	ERR18 PARAMETER Stop Data Press EXIT	Parameter expected for the numerical value range is received.	Stop receiving data and Press the EXIT key. Correct the order of parameter indicated.
20	ERR20 I/O Stop Data Press EXIT	Communication conditions are wrong.	Execute "Data clear" operation (p.4.13). Then, check the communication conditions. (p.4.19)
27	ERR27 BUFFER OVER	RS-232C interface between the unit and the host computer has failed.	
30	ERR30 OPERATION	Improper operation has been performed.	Carry out a proper operation.
31	ERR31 NO DATA	There is no data.	Refer to "Copying data".
32	ERR32 OVER DATA	The amount of data received exceeds 10 MB.	

No.	Error indication	Cause	Corrective measure	
40	ERR40 X LOAD	X axis motor has been applied with an excessive load.	Re-turn on the power to the unit, check the cutting conditions and re-send data. If the same error recurs, contact your dealer.	
41	ERR41 Y LOAD	Y axis motor has been applied with an excessive load.		
42	ERR42 Z LOAD	Z axis motor has been applied with an excessive load.		
43	ERR43 X CURRENT	X axis motor has been applied with an overcurrent.		
44	ERR44 Y CURRENT	Y axis motor has been applied with an overcurrent.		
45	ERR45 Z CURRENT	Z axis motor has been applied with an overcurrent.		
46	ERR46 B LOAD	B axis motor has been applied with an excessive load.		
47	ERR47 B CURRENT	B axis motor has been applied with an overcurrent.		
50	ERR50 X SENSOR	X axis origin cannot be found.		If this error frequently arises, contact your dealer.
51	ERR51 Y SENSOR	If this error frequently arises, contact your dealer.		
52	ERR52 Z SENSOR	If this error frequently arises, contact your dealer.		
53	ERR53 ZS SENSOR	ZS sensor has not been securely installed on the unit.	Securely connect the connector of the ZS sensor.	
70	ERR70 SPINDLE	Breaker for the protection of spindle motor has tripped.	Turn off the power to the unit, and turn on the power to the unit again. Check whether the cutting conditions are correct before sending data. If the same error resurs even after performing the aforementioned operation, cintact your dealer.	
		Spindle has been applied with an excessive load, which has caused the spindle to stop rotating.		

No.	Error indication	Cause	Corrective measure
71	ERR71 VACUUM	Service receptacle (for vacuum) has exceeded its rated current (10 A).	Turn off the power to the unit. Change the vacuum cleaner with another one of which current is equal to or smaller than the rated capacity. Then, press the breaker and turn on the power to the unit. (p.3.8)
81	ERR81 X OFFSCALE Stop Data Press EXIT	Point specified by a G command is off-scale.	On the host computer Stop receiving data and Press the EXIT key. Change the command value so that it is not off-scale. On this unit Stop receiving data and press the EXIT key. Re-specify the XY axis origin and Z axis origin so that they are not off-scale.(p.3.15)(p.3.16)
82	ERR82 Y OFFSCALE Stop Data Press EXIT		
83	ERR83 Z OFFSCALE Stop Data Press EXIT		
90	ERR90 F/W	Built-in software has failed.	Re-turn on the power to the unit, and perform the operation again. (p.3.8) If the same error arises, contact your dealer.
91	ERR91 DIVIDE		

Breakers

The electrical equipment box is equipped with two breakers.(p.1.5)



The respective breakers trip while giving the following error messages on the LCD.

XXXXXXXXXXXXXXXXXXXXX
ERR71 VACUUM

[Cause]

Service power breaker supply has exceeded its rated capacity (10A).

[Corrective measure]

Turn off the power to the unit measure and press the breaker. Replace the vacuum cleaner with another one that does not cause an excess of the rated capacity.

What to do If There Seems to be Trouble

If any of the following troubles has arisen, check the following points before contacting your dealer or our office.

The unit cannot be powered up.

Description: The power lamp on the operation panel fails to light up even when the power switch is turned on.

Point to be checked	Corrective measure
1 Is the power cable securely connected?	Securely connect the power cable to the main unit and the receptacle. (p.1.10)
2 Is the operation panel cable securely connected to the main unit?	Securely connect the operation panel cable to the main unit. (p.1.10)
3 Has the main power breaker turned off?	Turn on the power to the main power breaker. (p.1.5)
4 Has the Emergency switch been released?	Release the Emergency switch. (p.2.3)

The cutter fails to come down.

Description: The unit operates with the cutter raised.

Point to be checked	Corrective measure
1 Has a Z axis origin been specified?	Properly specify a Z axis origin.(p.3.15)

The spindle fails to rotate.

Description: The unit operates while the spindle is not rotating.

Point to be checked	Corrective measure
1 Is the spindle lamp on the electrical equipment box off?	Press the spindle "ON/OFF switch" to cause the spindle lamp to go out. (p.3.21)
2 Has the unit received a spindle rotation stop command from the host computer?	Press the (SPINDLE) key during the "origin setting" procedure under the stop mode to check whether the spindle rotates. If it does, suppose that the trouble is caused by a command. Release the command in accordance with the instruction manual for the host computer.

Finished state of engraving is poor in quality.

Description: There are burns on the engraved surface.

Point to be checked	Corrective measure
1 Are the cutting conditions improper?	Check whether the cutting conditions are suited to the material used. (p.3.18)
2 Has the cutter blade worn out?	Replace the cutter with a new one.
3 Is the cutting depth for one stroke of the cutter excessive?	If chips gather on the tool, remove them.
4 Is machining oil used?	In case where aluminum or brass is to be cut, cut the material while applying an appropriate amount of machining oil to it.

CHAPTER 6 APPENDIX

Basic Specifications

Item		NC-5K	NC-5SK	
XY axis	Machining range	483 x 305 mm		
	Speed	For machining	0.5,1,2,3,4,5,6,7,8,9,10,15,20,30,40,50,60,70,80,85 mm/s	0.5,1,2,3,4,5,6,7,8,9,10,15,20,30,40,50,60 mm/s
		For traveling	10,15,20,30,40,50,60,70,80,85 mm/s	10,15,20,30,40,50,60 mm/s
	Acceleration	For machining	0.05, 0.1, 0.15, 0.2, 0.25, 0.3 G	
		For traveling	0.05, 0.1, 0.15, 0.2, 0.25, 0.3 G	
Functional resolution	0.5 μm			
Z axis	Maximum stroke	110 mm		
	Speed	For machining	Same as the machining speed for the X/Y axis	
		For traveling	Same as the traveling speed for the X/Y axis	
	Acceleration	For machining	Same as the machining acceleration for the X/Y axis	
		For traveling	Same as the traveling acceleration for the X/Y axis	
Functional resolution	0.5μm			
Spindle	Max. Number of revolutions	15000 rpm		
	Change-over of speed	Stepless variation from 2000 to 15000 rpm		
Accuracy of flatness		0.3 mm	0.2 mm	
Accuracy of distance		±0.15 mm or 0.05 % of a traveling amount, whichever a larger one	±0.05 mm	
Accuracy of right angle		±0.3 mm / 300 mm	±0.03 mm (483 x 305)	
Accuracy of repeatability		0.05 mm	0.03 mm	
Reproducibility of origin		±0.1 mm		
Commands		G codes		
Program steps		0.001 mm, 1.0 mm, 0.0001 inch, 1.0 inch		
Maximum dead-weight of table		10 kg (differs in accordance with cutting conditions)		
Capacity of data receive buffer		10 M byte		
Interface		8bit parallel (IEEE1284) / RS-232C		
Power supply voltage		AC100 V		
Power supply frequency		50 / 60Hz		
Power consumption		1400 VA (when the load applied to the spindle is maximized)		
Use environment		10 to 35 °C 35 to 75 % (Rh) With no dew condensation		
Outside dimensions (W) x (D) x (H)		725 x 755 x 660 mm (Main unit) 225 x 600 x 340 mm (Electrical equipment box)		
Weight of the main unit		Main unit: approx. 75 kg, Electrical equipment box: approx. 25 kg		

*1 Constant temperature

Modeling main dimensions

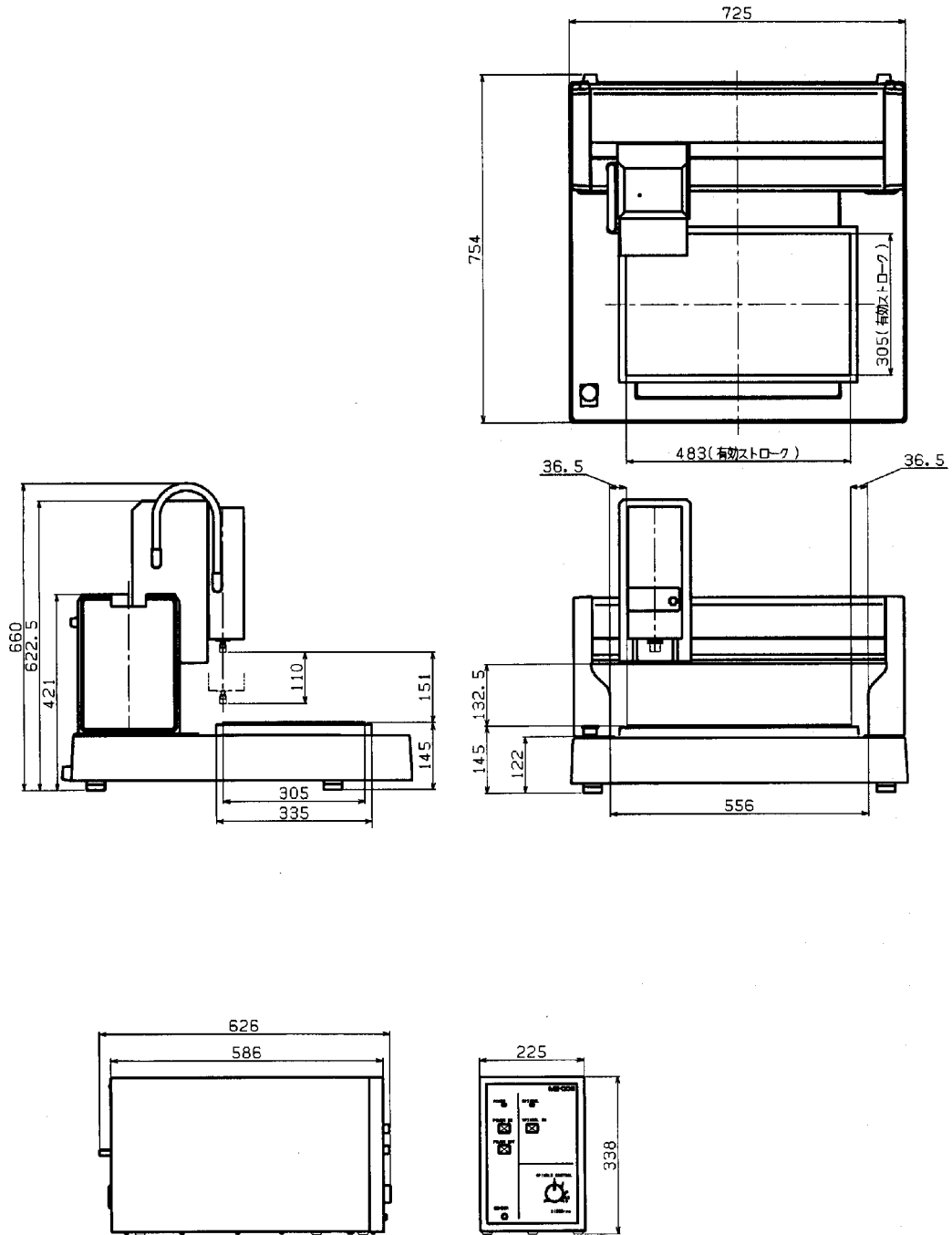


Table of Responding NC Code

The table below indicates the NC codes to which the machine responds.

Contact our office in your area for detailed specifications of machine.

No.	NC code	Function	No.	NC code	Function
1	G00	Positioning	24	G80	Fixed cycle cancel
2	G01	Linear interpolation	25	G81	Drilling cycle
3	G02	Circular interpolation CW	26	G82	Drilling cycle (with dwell)
4	G03	Circular interpolation CCW	27	G83	Deep-drilling cycle
5	G04	Dwell	28	G85	Boring cycle
6	G10	Input the amount of offset to program	29	G86	Boring cycle
7	G17	XY plane designation	30	G89	Boring cycle (with dwell)
8	G18	ZX plane designation	31	G90	Absolute input
9	G19	YZ plane designation	32	G91	Incremental input
10	G20	Input of inch	33	G92	Coordinate system setting
11	G21	Input of metric	34	G98	Initial level reset
12	G28	Automatic reversion to reference	35	G99	R point level reset
13	G40	Tool correct cancel	36	M00	Program stop
14	G41	Tool correct left	37	M01	Optional stop
15	G42	Tool correct right	38	M02	End of program
16	G50	Scaling cancel	39	M03	Main shaft normal rotation
17	G51	Scaling	40	M05	Main shaft stop
18	G54	Work coordinate system 1	41	M06	Tool exchange
19	G55	Work coordinate system 2	42	M30	End of program
20	G56	Work coordinate system 3	43	M98	Sub-Program call
21	G57	Work coordinate system 4	44	M99	Sub-Program completion
22	G58	Work coordinate system 5	45	()	Note part
23	G59	Work coordinate system 6	46	/	Optional skip

Interface Specifications

1. Specifications

(CCITT V24, EIA RS-232C, JIS X5101)

Transmission mode : Asynchronous mode

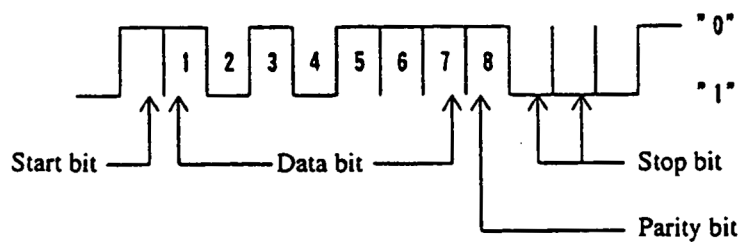
Transmission speed : 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bits/sec

Stop bit : 1, 2 bits

Parity check : Odd number, even number, not performed

Data length : 7, 8 bits

2. Example of data signal form



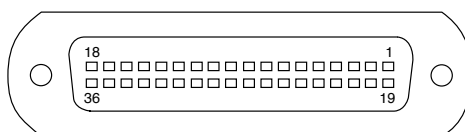
Pin	Abbreviation	Designation	Direction of signal	
1	FG (AA)	Safety grounding	<div style="display: flex; align-items: center; justify-content: center;"> <div style="border: 1px solid black; width: 100px; height: 150px; margin-right: 10px;"></div> <div style="text-align: center;"> <p>----></p> <p><----</p> <p>----></p> <p><----</p> <p><----</p> <p>----></p> </div> <div style="border: 1px solid black; width: 100px; height: 150px; margin-left: 10px;"></div> </div>	<div style="display: flex; align-items: center; justify-content: center;"> <div style="text-align: center; width: 100px; height: 150px;"> <p>This unit</p> </div> <div style="text-align: center; width: 100px; height: 150px;"> <p>Host Computer</p> </div> </div>
2	SD (BA)	Send data		
3	RD (BB)	Receive data		
4	RS (CA)	Request for send		
5	CS (CB)	Sending is possible		
6	DR (CC)	Data set ready		
7	SG (AB)	Grounding for single		
8	ER (CD)	Data terminal ready		

Specifications for bi-directional parallel interface

Basic specifications

Item	Specification
Transmitting method	Bidirectional parallel (IEEE1284-compliant)
Signal level	TTL level
Connector	Equivalent to ANFENOR 57-30360

Configuration of connector and signal table



Pin No.	Abbreviation	Name of signal	Source of signal
1	STROBE	Data strobe	Computer
2 ~ 9	DATA1 ~ DATA8	Data	Computer
10	ACK	Acknowledge	Device
11	BUSY	Busy	Device
12	PE	Paper end	Device
13	SELECT	Select	Device
14	AUTO FEED XT	Auto-feed XT	Computer
15	N.C	—	—
16	SG	Signal ground	—
17	FG	Frame ground	—
18	POWER	Power	Device
19 ~ 30	SG	Signal ground	—
31	INPUT PRIME	Input prime	Computer
32	DATA ERROR	Data error	Device
33	N.C	—	—
34, 35	N.C	—	—
36	SELECT IN	Select in	Computer

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