

# **SHOPMASTER**

## ***PRO-LINE DRO*** TM

**DIGITAL READOUT SYSTEM**

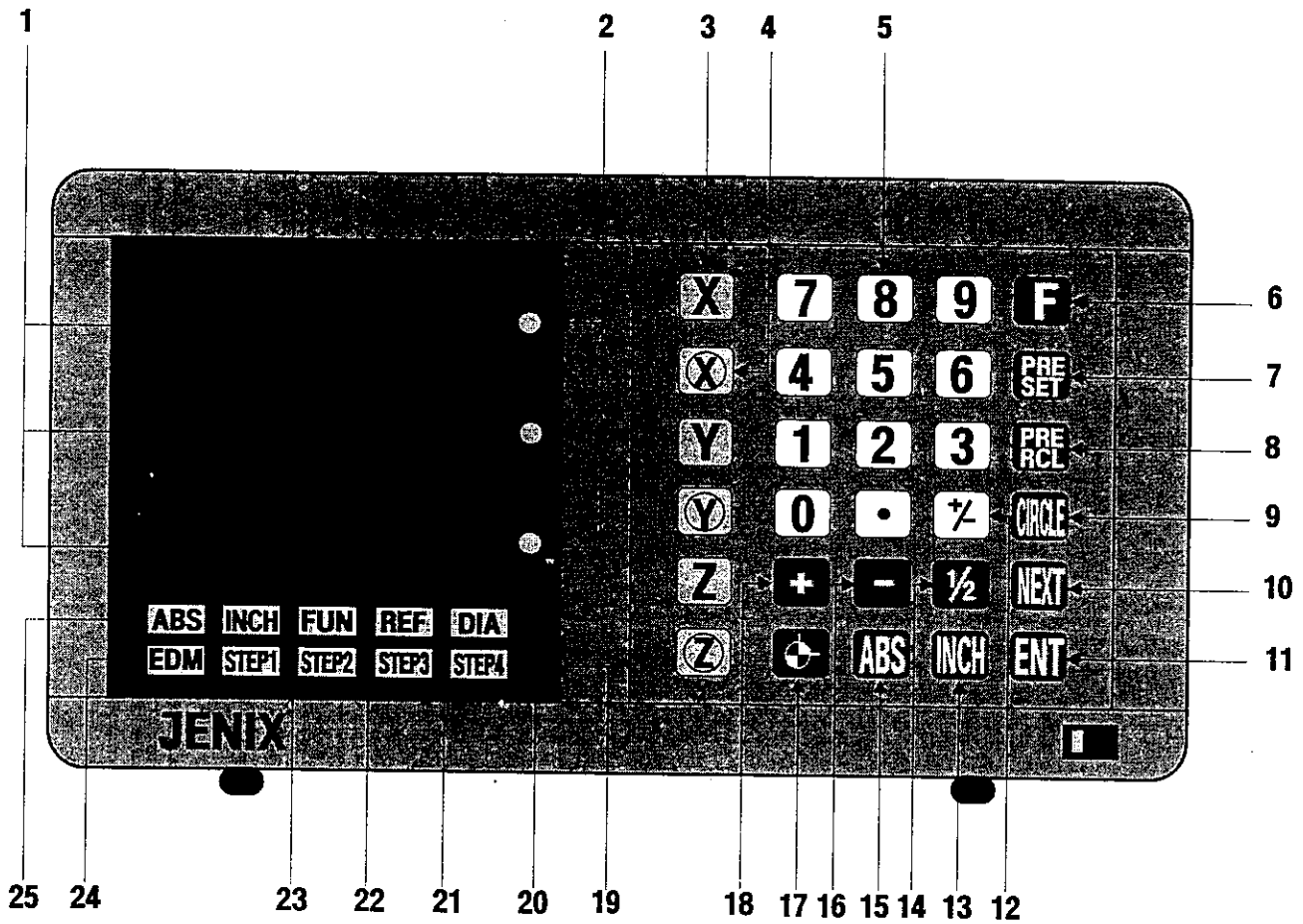
**OPERATIONS MANUAL**

**SHOPMASTER MANUFACTURING INC. 2005**

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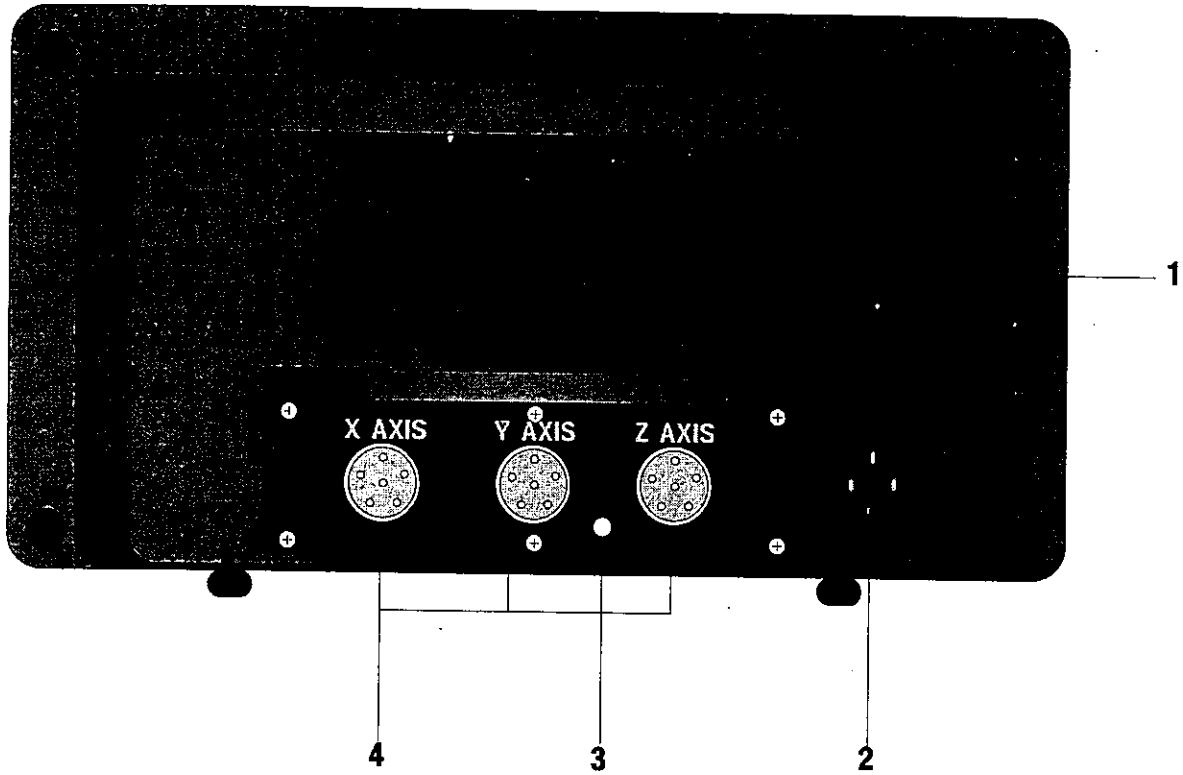
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- 1. Displaying Area
- 2. Axis indication lamp
- 3. Axis selection
- 4. Axis zero key
- 5. Number key
- 6. Function
- 7. Preset
- 8. Preset Recall
- 9. Bolt hole Circle
- 10. Next
- 11. Enter
- 12. (+),(-) Reverse

- 13. MM/INCH Selection
- 14. Half divide
- 15. INCR/ABS selection
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- 20. DIA/RAD lamp
- 21. Reference lamp
- 22. Function lamp)
- 23. INCH lamp
- 24. EDM lamp
- 25. Absolute Position lamp






1. Warning Label
2. Fuse and Power source
3. Ground Terminal
4. Connectors for Scale

## 1. Basic Operation







Operate by following sequence:


- ① Select Axis
- ② Select Function to be used
- ③ Input numerals(or value)
- ④ Push "Enter" button

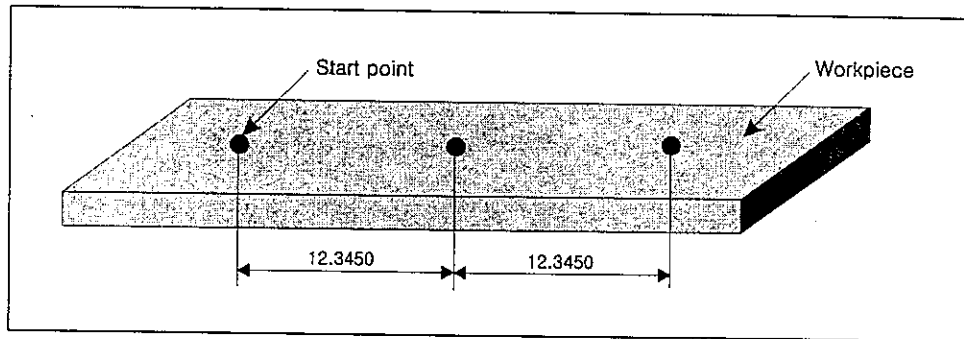
INDICATION		
 Input	 Key operation	 Example

## 2. How to preset











Use this when you input some numerals and process workpiece all the same length in succession

Key Operation				
				
				

 After inputting 12.3450, and use this value continuously.







<Dwg.1>

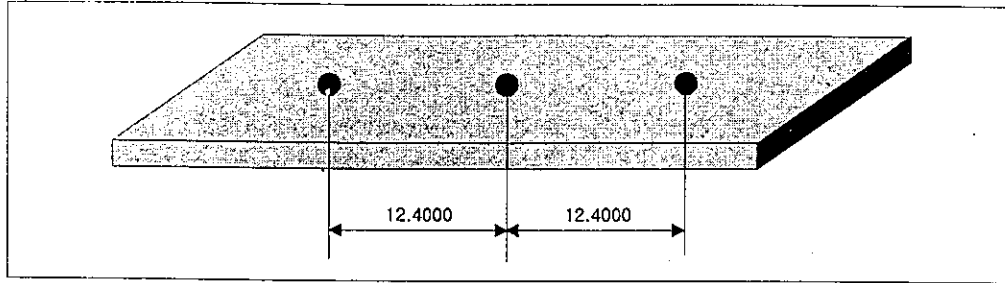
Example									
Input "12.3450"									
        									
	<table border="1"> <tr> <td>X</td> <td>12.3450</td> </tr> <tr> <td>Y</td> <td>00000</td> </tr> <tr> <td>Z</td> <td>00000</td> </tr> <tr> <td></td> <td>INCH</td> </tr> </table>	X	12.3450	Y	00000	Z	00000		INCH
X	12.3450								
Y	00000								
Z	00000								
	INCH								

## 3. Preset Recall

Use this when you use the value continuously after recalling pre-inputted coordinate.

Key Operation	
	
	

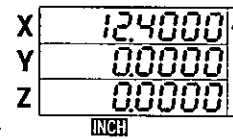
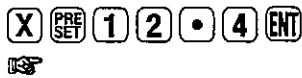
 Boring 3 holes, by the intervals of 12.4000



<Dwg.2>

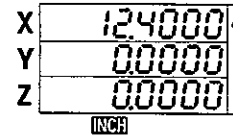
**Example**

**1** Input "12.4000"



**2** Move table of machine until X axis displays 0.0000

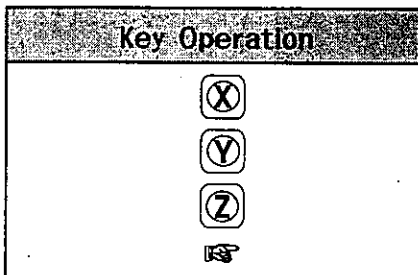
**3** Try to recall the inputted value, "12.4000"



※ This function helps you use same values continuously

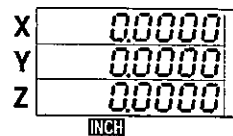
**4. Display Zero**

To make X, Y and Z axis displaying 0.0000

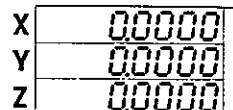


**Example**

**1** To display all axis "0.0000"

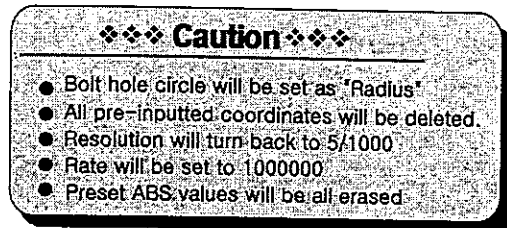
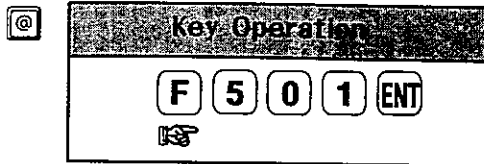


**2** To display one axis "0.0000"



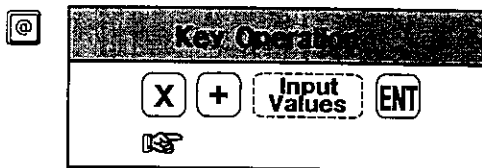
## 5. Initialization

If initializing is conducted, rate will be reset to 1000000 (means 1.0) which is the same status of shipping at the factory.



## 6. Addition

To add some value to the present displayed one.



To add 13.0000 to the present displayed 12.3450

**Example**

Displayed 12.3450

Plus(+) 13.0000

X + 1 3 ENT

Hand icon pointing to the keys.

→

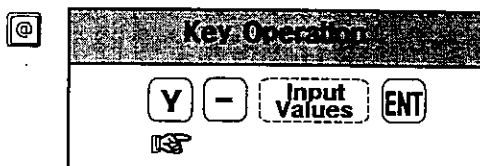
X	12.3450
Y	00000
Z	00000
	INCH

→

X	25.3450
Y	00000
Z	00000
	INCH

## 7. Subtraction

To deduct some value from the present displayed one.



To deduct 14.0000 from the present displayed 32.7450

**Example**

Displayed 32.7450

Subtract 14.0000

Y - 1 4 ENT

Hand icon pointing to the keys.

→

X	00000
Y	32.7450
Z	00000
	INCH

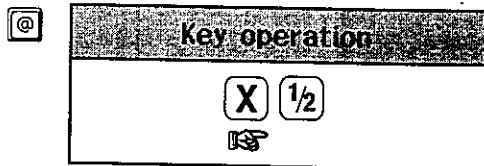
→

X	00000
Y	18.7450
Z	00000
	INCH



## 8. Dividing into 1/2

To find the middle point of the distance from one point to another, and to process at the point.



Trying to process at the middle point of 12.4000

**Example**

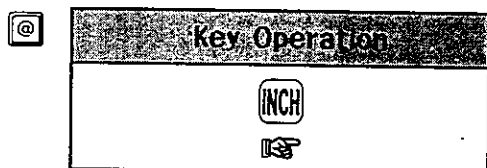
Displaying 12.4000 to which table has been moved

Dividing 12.4000 into 1/2




## 9. MM/INCH Conversion

To convert the unit of "MM" to "INCH".

- ▶ The status of "INCH" button is in un-pushed (INCH lamp off).
- ▶ By pushing "INCH" button, it is converted into INCH (INCH lamp on).
- ▶ By pushing one more time, it goes back to "MM".

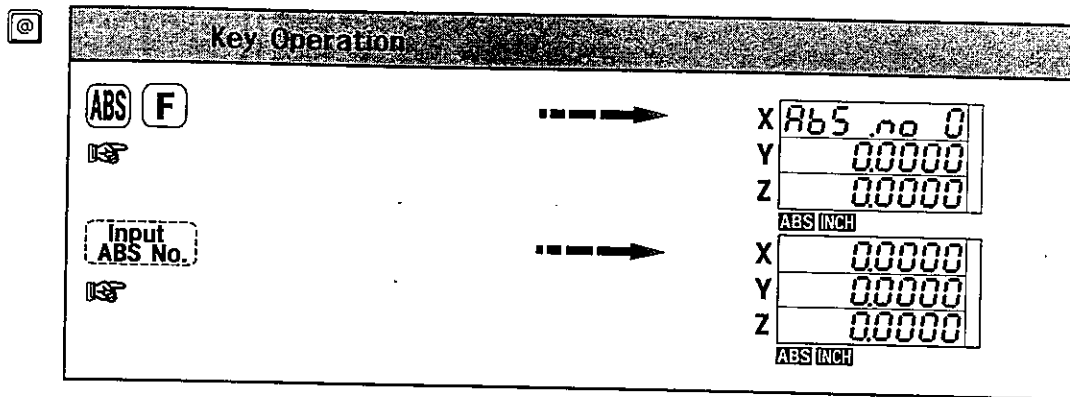


## 10. ABS/INCR Conversion

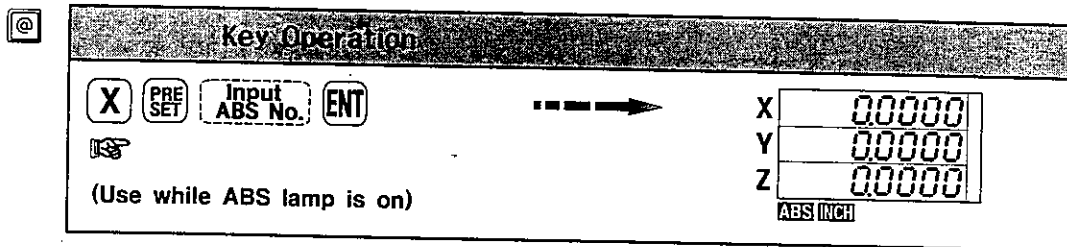
- ▶ Use this when we input the coordinate of a point as an absolute position.
- ▶ Can be saved up to 10 points, available ABS number from 0 to 9.
- ▶ Un-pushed "ABS" button means that the present mode is INCR.
- ▶ By pushing "ABS" button, it is converted to ABS function (ABS lamp on).
- ▶ When you use ABS function, other function keys don't work except for , , .

# 1) How to input ABS number & Values

## (1) How to input ABS number



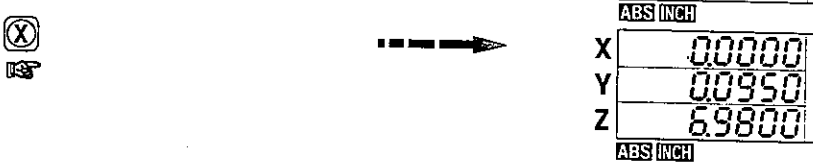
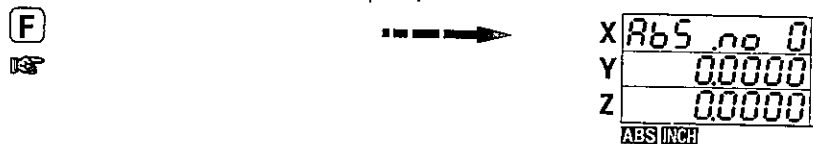
## (2) How to input each coordinate



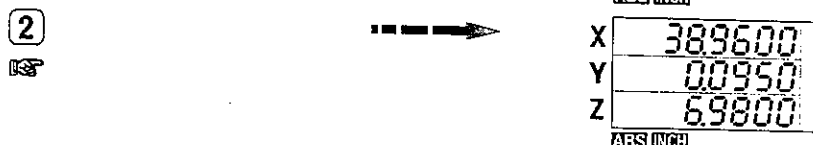
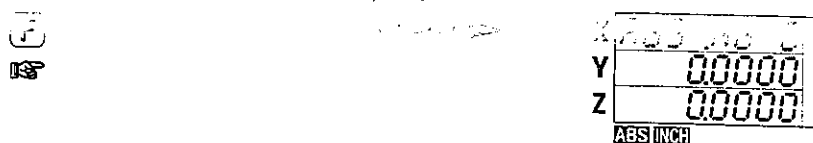
- ①. In ABS No.2, input 0.0000 to X axis
- ②. In ABS No.2, input 15.0000 to X-axis

### Example

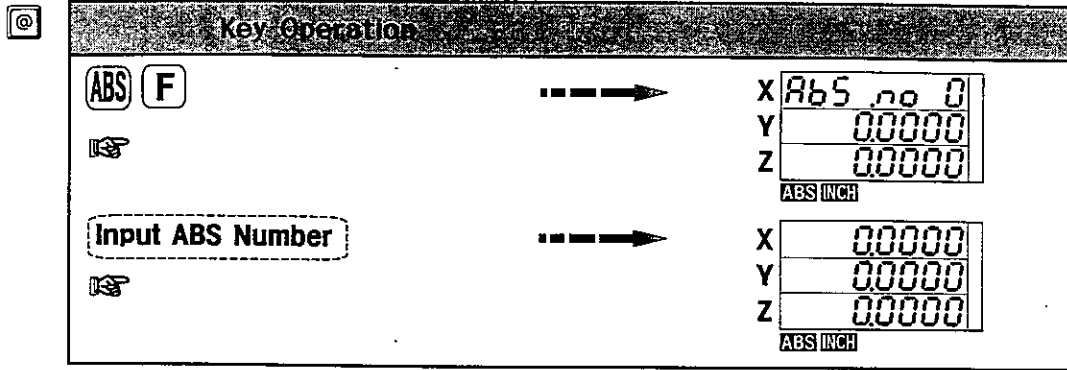
**1** Input 0.0000 to X-axis. (ABS lamp on)



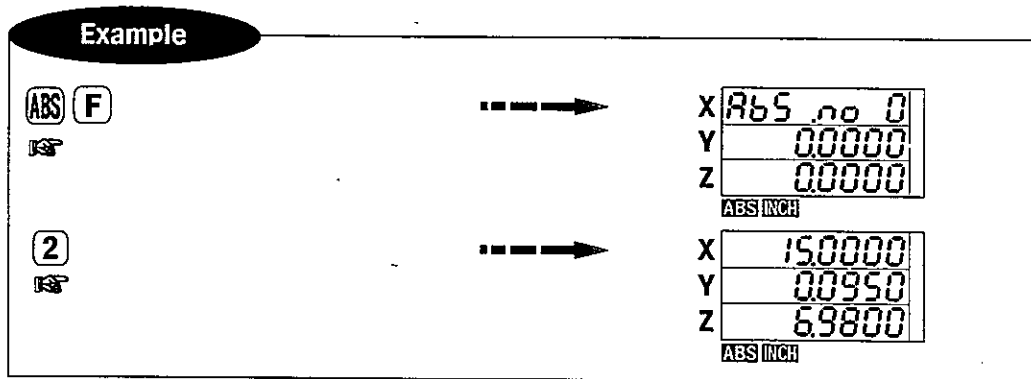
**2** Input 15.0000 to A-axis (ABS lamp on)



## 2) Recalling pre-inputted ABS values



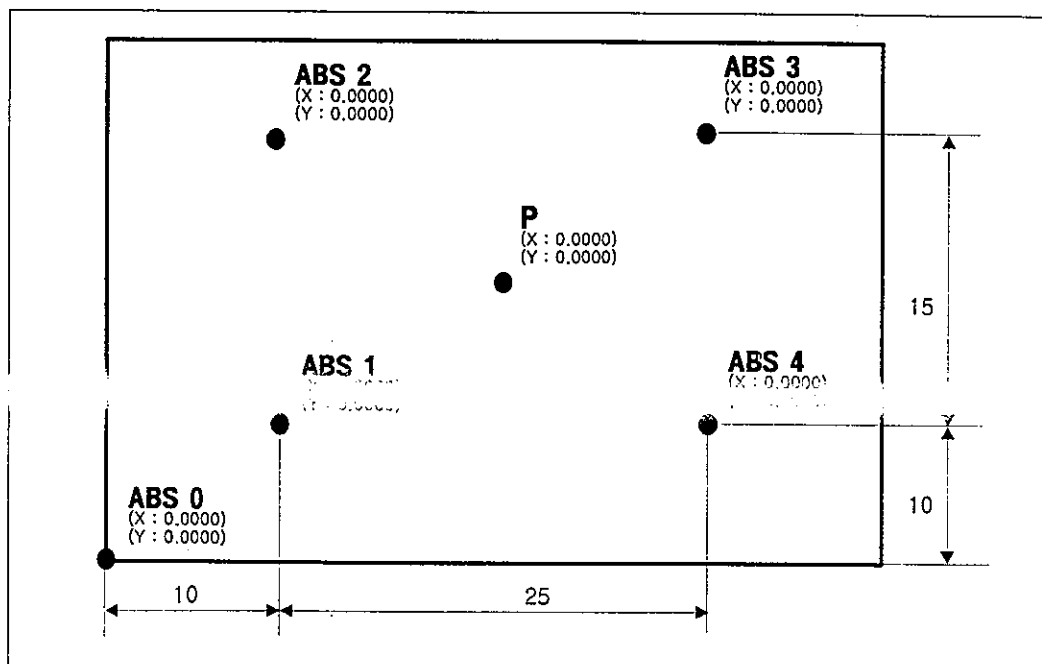
Recalling the X-axis value "15.0000" which is assigned to ABS No.2



## 3) Absolute Positioning (ABS)

(1) How to set absolute position

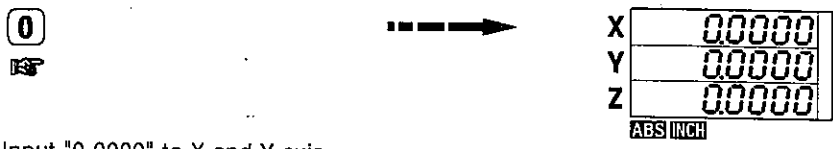
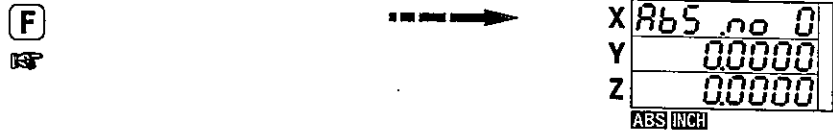
Setting 5 ABS positions



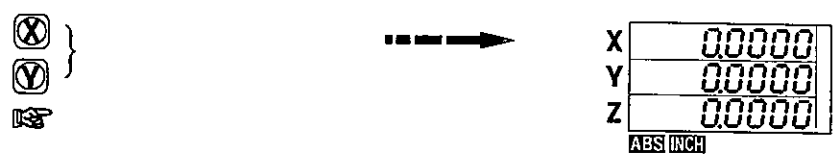
**Example**

- The sequence to set ABS is as follows:  
(The status of ABS lamp should be in "on")

**1 Assigning ABS No. 0** (Input "0" while the ABS lamp is on)

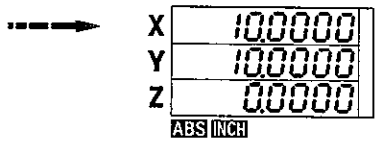


▶ Input "0.0000" to X and Y axis.

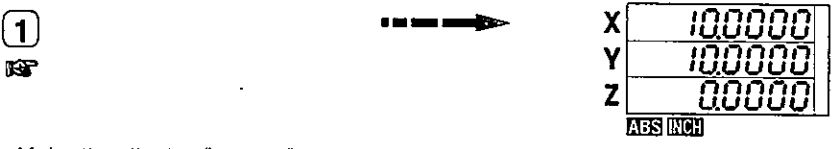
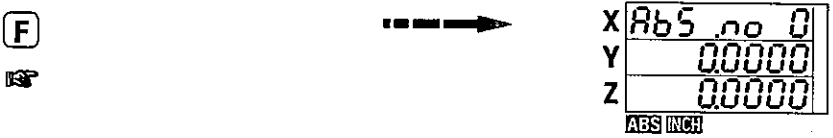


**2 Assigning ABS no.1**

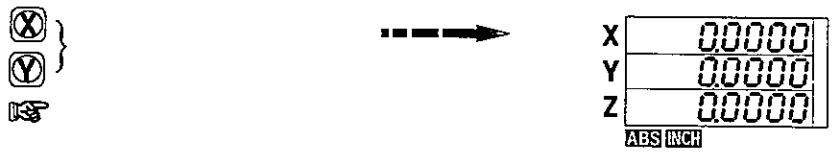
- ▶ Move X and Y table until "10.0000" display on both X and Y area of a counter, and assign it ABS No.1
- Move X, Y table until "10.0000" displays.



▶ Input "F" and "1" while ABS lamp is on.



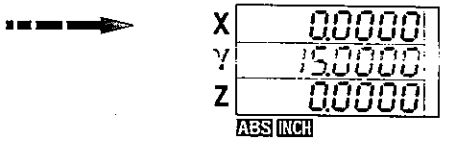
▶ Make the display "0.0000" each by pushing Zero button.



**3 Assigning ABS no.2**

- ▶ Move Y-axis table until "15.0000" display, and assign it ABS no.2

Move Y-axis table to the value of "15.0000".



**Example**

▶ Input "F" and "2" while ABS lamp is on.



X	AbS no 1
Y	00000
Z	00000
ABS INCH	



X	00000
Y	150000
Z	00000
ABS INCH	

▶ Input "0.0000" by pushing Zero-set button.



X	00000
Y	00000
Z	00000
ABS INCH	

**4 Assigning ABS no. 3**

▶ Move X-axis table until "25.0000" displays, and assign it ABS No.3

Move X-axis table until "25.0000" displays.



X	250000
Y	00000
Z	00000
ABS INCH	

▶ Input "F" and "3" while ABS lamp is on.



X	AbS no 2
Y	00000
Z	00000
ABS INCH	



X	250000
Y	00000
Z	00000
ABS INCH	

▶ Input "0.0000" by pushing Zero-set button.



X	00000
Y	00000
Z	00000
ABS INCH	

**5 Assigning ABS no. 4**

▶ Move Y-axis table until "-15.0000" displays, and assign it ABS No.4.

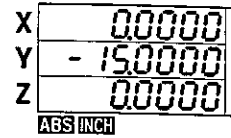
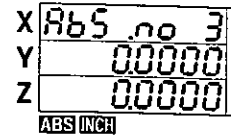
Move Y-axis table until "-15.0000" displays.



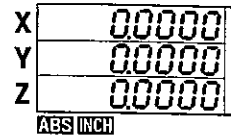
X	00000
Y	-150000
Z	00000
ABS INCH	

**Example**

▶ Input "F" and "4" while ABS lamp is on.



▶ Input "0.0000" by pushing Zero-set button.



Like upper examples, up to ABS no.10 can be assigned.

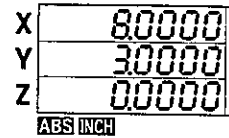
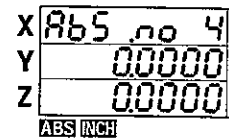
**(2) Recalling pre-inputted ABS Number**



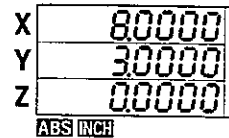
Ex.) <Dwg. 3> Recalling ABS No.1 while the position of a tool is at the "P".  
(When ABS lamp is off, position of "P" is random)

**Example**

▶ Push ABS button (lamp on) and push "F" and "1".



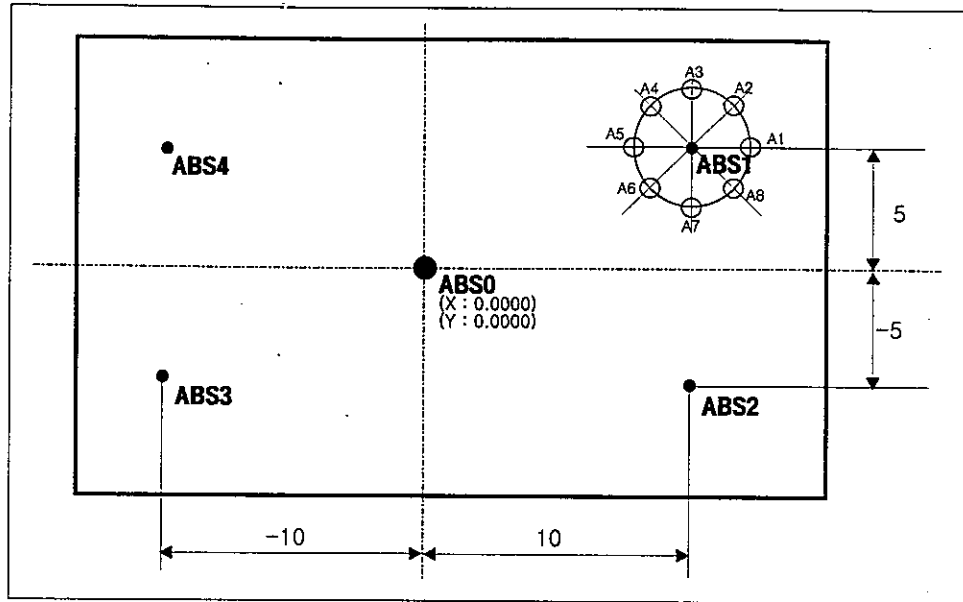
▶ "8.0000" and "3.0000" display each X and Y area.



When you move X and Y-axis until the displays come down to "0.0000", the position of pre-inputted ABS No.1 can be found easily like this. You can recall the rest inputted ABS numbers in this way.

(3) Assigning sub points(ABS1~4) which apart from a central point(ABS0).

Ex.) Sub point ABS1 is another central point for small holes of A1~A8. <Dwg.4>



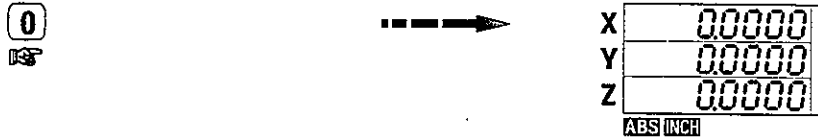
<Dwg.4>

**Example**

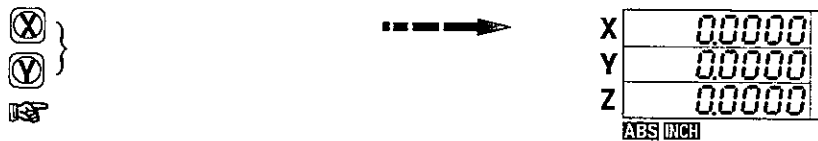
- The followings show the sequence to assign sub points(ABS1~4).  
(Only available while ABS lamp is on.)

**1 Assigning ABS 0**

▶ Input "F" and "0" while ABS lamp is on.

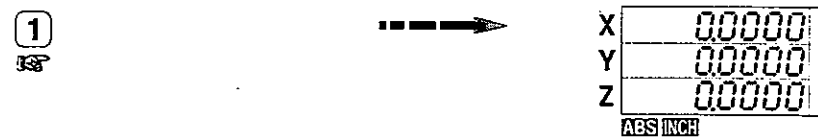
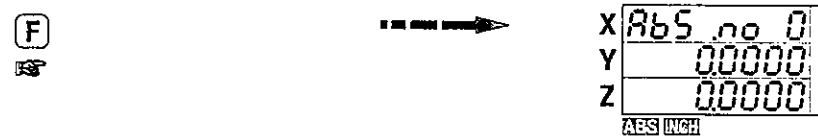


▶ Input "0.0000" to X and Y-axis by using zero-set key.



**2 Assigning ABS No 1**

▶ Input "F" and "1" while ABS lamp is on.



**Example**

▶ Input "-10.0000" to X-axis, "-5.0000" to Y-axis.

X **PRE SET** 1 0 +/- **ENT**  
 Y **PRE SET** 5 +/- **ENT**  




X	- 10.0000
Y	- 5.0000
Z	00000
ABS INCH	

**3 Assigning ABS No.2**

▶ Input "2" while ABS lamp is on.

**F**  





X	AbS no 1
Y	00000
Z	00000
ABS INCH	

**2**  




X	00000
Y	00000
Z	00000
ABS INCH	

▶ Input "-10.0000" to X-axis , "5.0000" to Y-axis.

X **PRE SET** 1 0 +/- **ENT**  
 Y **PRE SET** 5 **ENT**  




X	- 10.0000
Y	5.0000
Z	00000
ABS INCH	

**4 Assigning ABS No.3.**

▶ Input "3" while ABS lamp is on.

**F**  




X	AbS no 2
Y	00000
Z	00000
ABS INCH	

**3**  




X	00000
Y	00000
Z	00000
ABS INCH	

▶ Input "10.0000" to X-axis, "5.0000" to Y-axis.

X **PRE SET** 1 0 **ENT**  
 Y **PRE SET** 5 **ENT**  




X	10.0000
Y	5.0000
Z	00000
ABS INCH	

**5 Assigning ABS No.4.**

▶ Input "4" while ABS lamp is on.

**F**  




X	AbS no 3
Y	00000
Z	00000
ABS INCH	

**4**  




X	00000
Y	00000
Z	00000
ABS INCH	



### Example

▶ Input "10.0000" to X-axis, "-5.0000" to Y-axis.

X PRE SET 1 0 ENT  
Y PRE SET 5 +/- ENT  
⏏



X	10.0000
Y	-5.0000
Z	0.0000

ABS INCH

※ Assigning ABS No.0 and ABS 1 ~ ABS 4 can be made like this way.

#### (4) Recalling pre-inputted sub points(ABS1~4) which apart from a central point(ABS0).

Ex.) < Dwg.4 > Finding the position of pre-inputted ABS No.1

### Example

▶ Recall ABS No.1 by pushing "F" and "1".

F  
⏏



X	ABS no 0
Y	0.0000
Z	0.0000

ABS INCH

1  
⏏



X	0.0000
Y	0.0000
Z	0.0000

ABS INCH

▶ "-10.0000", "-5.0000" display as below.

X	-10.0000
Y	-5.0000
Z	0.0000

ABS INCH

▶ Move X and Y-table until "0.0000" is displayed each area.

Move tables and make display "0.0000".

X	0.0000
Y	0.0000
Z	0.0000

ABS INCH




The rest sub points ( ABS 2 ~ ABS 4) can be easily recalled and the points of A1 ~ A8 can also be recalled as the same way.

## 11. Function Key

Function key has 11 features as shown below.

- ① Zero Setting of Display ("0.0000")
- ② Memory in /out
- ③ Delete Memory
- ④ Lathe (Addition of two axis value)
- ⑤ Double Counting (Lathe - DIA)
- ⑥ Initializing
- ⑦ Bolt hole circle and Converting Axis direction.
- ⑧ Converting Resolution
- ⑨ (+),(-) Direction Conversion
- ⑩ Rate (Error Compensation)
- ⑪ FND(display) Checking

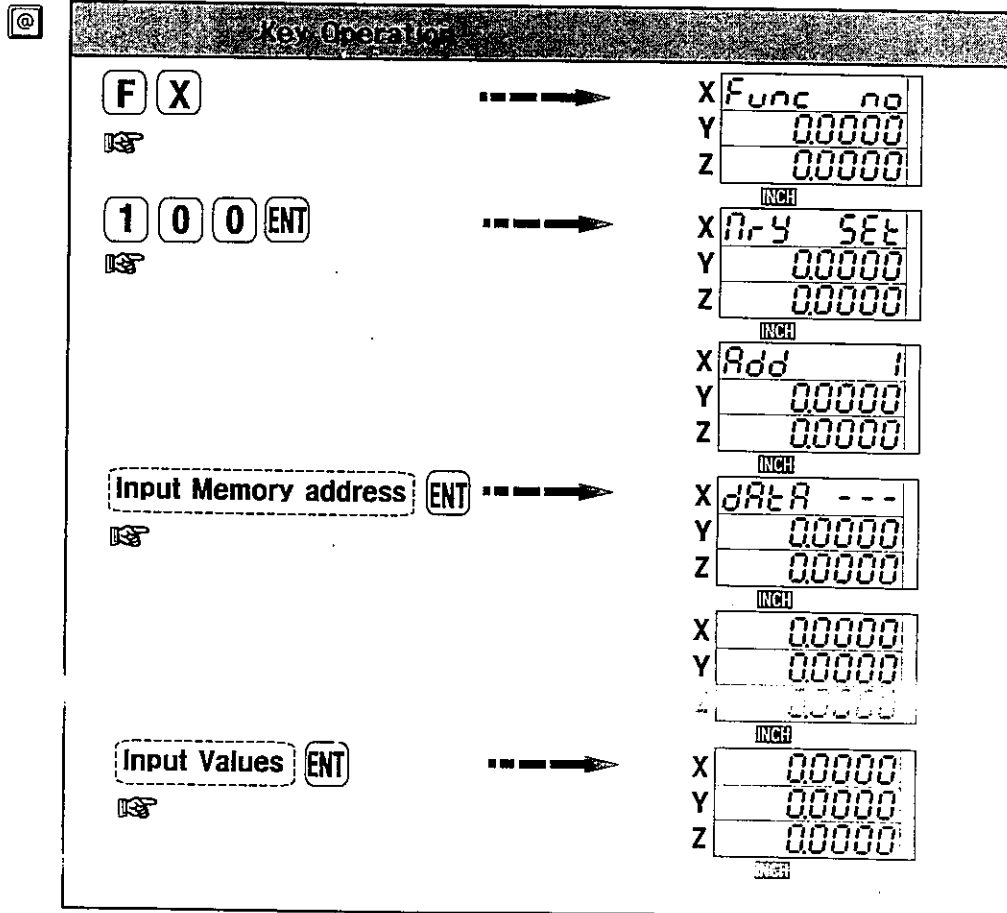
1) Display Zero : same as page 6

Zero set button :   

2) Memory in / out

- Memorizing the coordinate of a tool beforehand, repeated processing can be made easily with it.
- Up to 50 memories per axis can be inputted.

(1) Memory Setting



<Ref.> When you need to input several memory addresses at a time, press **F** key twice after previous inputting completion. After finishing all memory assigning works, don't forget to push **ENT** key to finish all procedure normally.(Example : see the next page)

- How to input several memory addresses continuously.

**Key Operation**

<b>F X</b> ☞	----->	X Func no Y 00000 Z 00000 INCH
<b>1 0 0 ENT</b> ☞	----->	X nry SEt Y 00000 Z 00000 INCH
<b>Input Memory address ENT</b> ☞	----->	X Rdd 1 Y 00000 Z 00000 INCH
<b>Input Values</b> ☞	----->	X dAtA --- Y 00000 Z 00000 INCH
<b>NEXT NEXT</b> ☞	----->	X 00000 Y 00000 Z 00000 INCH
	----->	X Rdd 2 Y 00000 Z 00000 INCH

☞ Ex.) Memory address to be assigned is 25 and the value is "10.1250"

**Example**

<b>F X</b> ☞	----->	X Func no Y 00000 Z 00000 INCH
<b>1 0 0 ENT</b> ☞	----->	X nry SEt Y 00000 Z 00000 INCH
<b>2 5 ENT</b> ☞	----->	X Rdd 1 Y 00000 Z 00000 INCH
<b>1 0 . 1 2 5 ENT</b> ☞	----->	X dAtA --- Y 00000 Z 00000 INCH
	----->	X 10.1250 Y 00000 Z 00000 INCH

Ex.) Memory address of X-axis is 25 , its value is "3.1310"  
and input X-axis 26, the value of "3.2320" continuously.

**Example**

**F X**  
[F] [X]



X Func no  
Y 00000  
Z 00000

**1 0 0 ENT**  
[1] [0] [0] [ENT]



INCH  
X PrY SEt  
Y 00000  
Z 00000

**2 5 ENT**  
[2] [5] [ENT]



X Add 1  
Y 00000  
Z 00000

**3 . 1 3 1**  
[3] [.] [1] [3] [1]



INCH  
X dAtA ---  
Y 00000  
Z 00000

**NEXT NEXT**  
[NEXT] [NEXT]



INCH  
X 00000  
Y 00000  
Z 00000

**ENT**  
[ENT]



INCH  
X 3.1310  
Y 00000  
Z 00000

**3 . 2 3 2 ENT**  
[3] [.] [2] [3] [2] [ENT]



INCH  
X Add 26  
Y 00000  
Z 00000

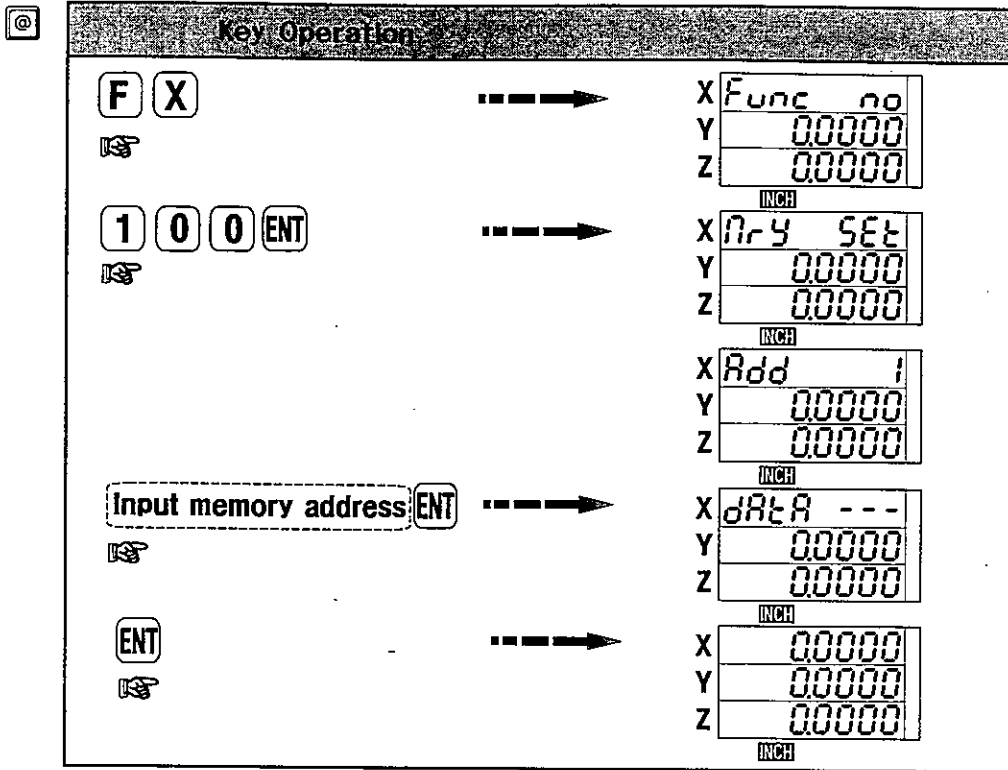
INCH  
X dAtA ---  
Y 00000  
Z 00000

INCH  
X 3.2320  
Y 00000  
Z 00000

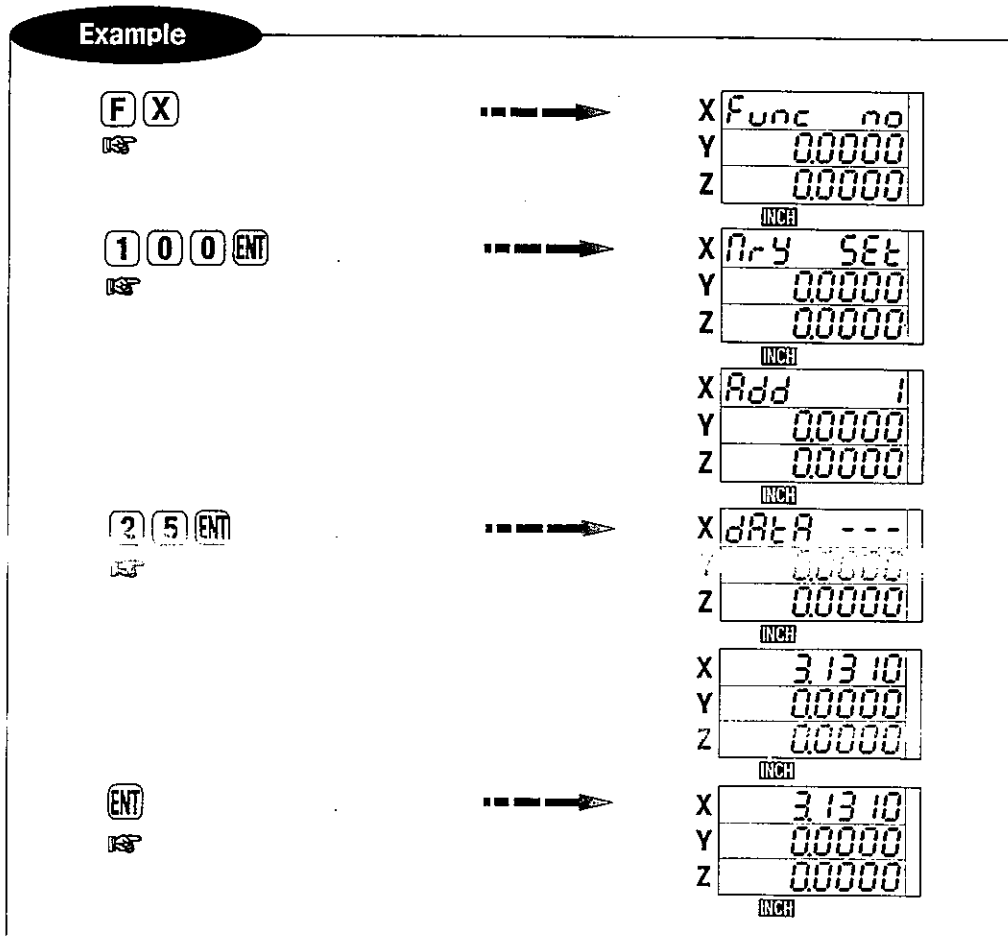
INCH

(2) Memory Recall

Recalling the value which is assigned to the memory.

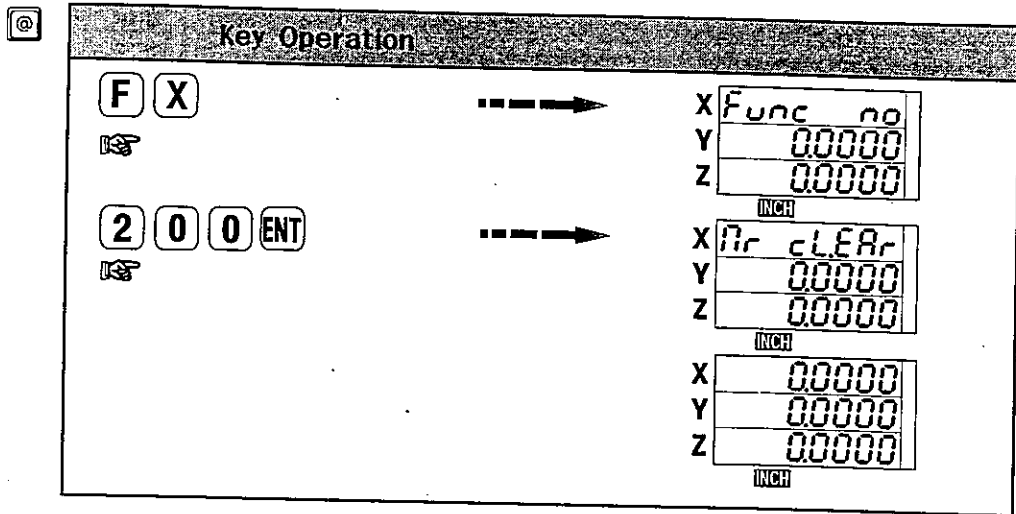


Ex.) Recall the memory no.25 of which value is "31.310"



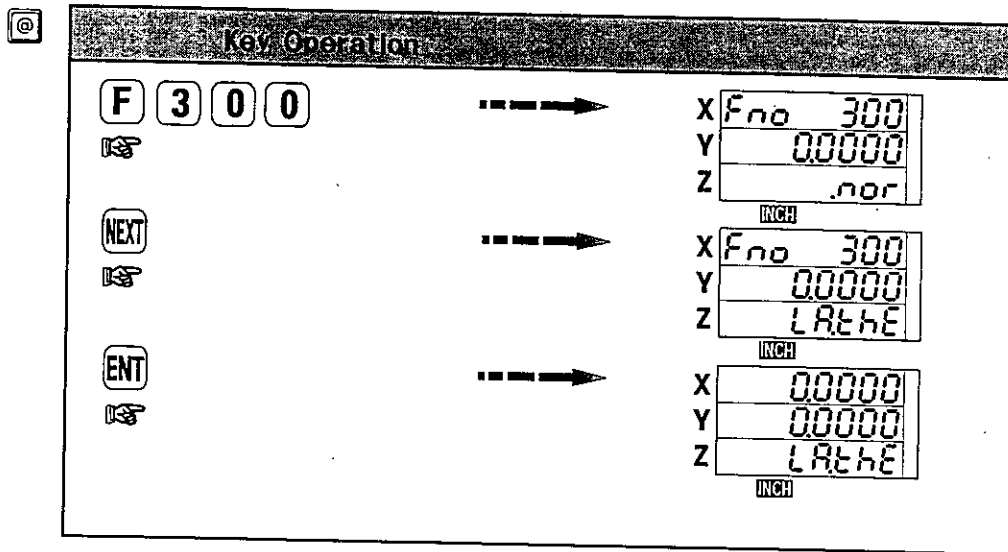
### 3) Clearing Memory

It is used to clear all data of memory.  
 (Caution: whole data from 0 through 49 will be deleted by this function)



< Ref.> When you want to delete only one value in a certain memory address, use " Memory set " and input "0.0000" over the value.

### 4) Addition of two(Y&Z) axis value (Lathe Function)



- The values of Y and Z-axis are summed to display at on Y-axis panel, and automatically, Z- axis doesn't work.
- In sum-up mode, using key is available for Y-axis, and turn back to normal status, "0.0000" appear in the Z-axis.
- In this status, if Z-axis is moved, the moved digital value will be summed to display at Y-axis.
- in the same status, ABS function is available.

Ex.) If Y=12.3400, Z=1.2350, the summed up value to be displayed at Y-axis is as below.

**Example**

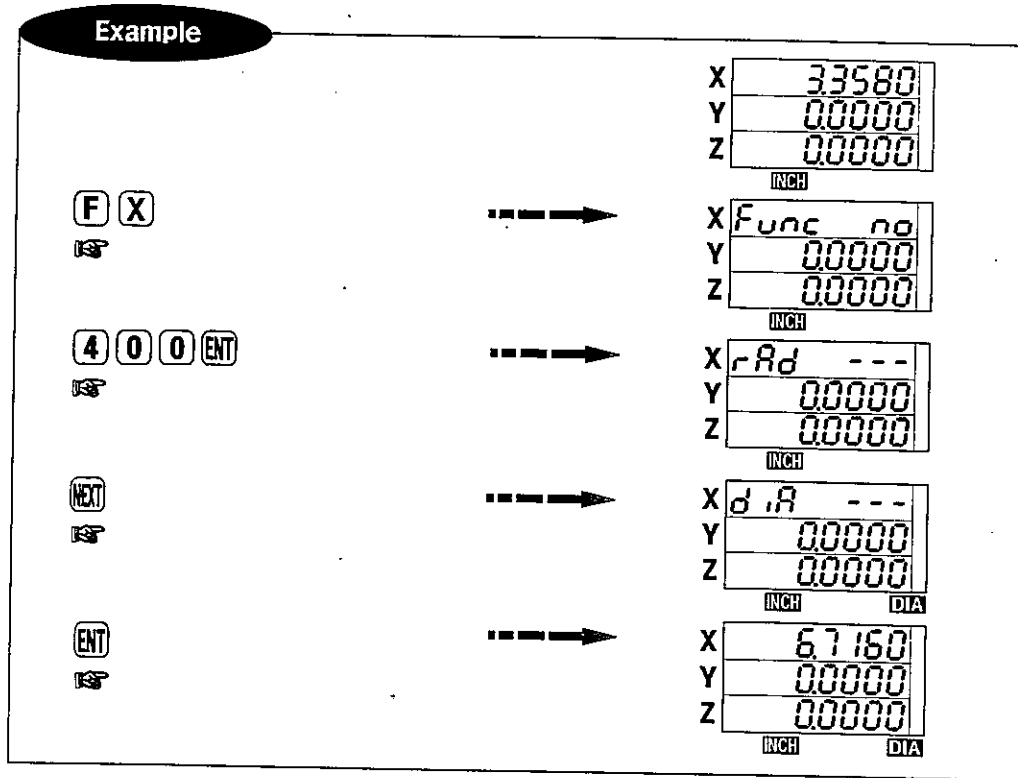
<b>F</b> <b>3</b> <b>0</b> <b>0</b>	→	X 00000 Y 123400 Z 12350 INCH
<b>NEXT</b>	→	X Fno 300 Y 123400 Z .nor INCH
<b>ENT</b>	→	X Fno 300 Y 123400 Z LAtHe INCH
<b>ENT</b>	→	X 00000 Y 135750 Z LAtHe INCH

### 5) Double Counting (for Lathe function - DIA)

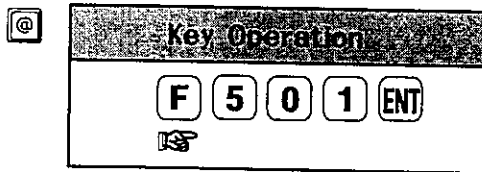
**Key Operation**

<b>F</b> <b>X</b>	→	X Func no Y 00000 Z 00000 INCH
<b>4</b> <b>0</b> <b>0</b> <b>ENT</b>	→	X rAd --- Y 00000 Z 00000 INCH
<b>NEXT</b>	→	X d .R --- Y 00000 Z 00000 INCH DIA
<b>ENT</b>	→	X 00000 Y 00000 Z 00000 INCH DIA

Ex.) In "RAD" mode, if X-axis value is "3.3580" and we change the mode "DIA", then double value of "3.3580" will be displayed.



**6) Initialization** : same as page 7.



**❖❖❖ Caution ❖❖❖**

- Bolt hole circle will be set as "Radius".
- All pre-inputted coordinates will be deleted.
- Resolution will turn back to 5/1000.
- Rate will be set to 1000000.
- Preset ABS values will be all erased.

**7) Bolt Hole Circle and Base axis changing**

There are 4 details function as below.

- ① Set base direction as X and Y-axis.
- ② Set base direction as X and Z-axis.
- ③ Set base direction as Y and Z-axis.
- ④ Set bolt hole circle as diameter or radial (DIA/RAD).

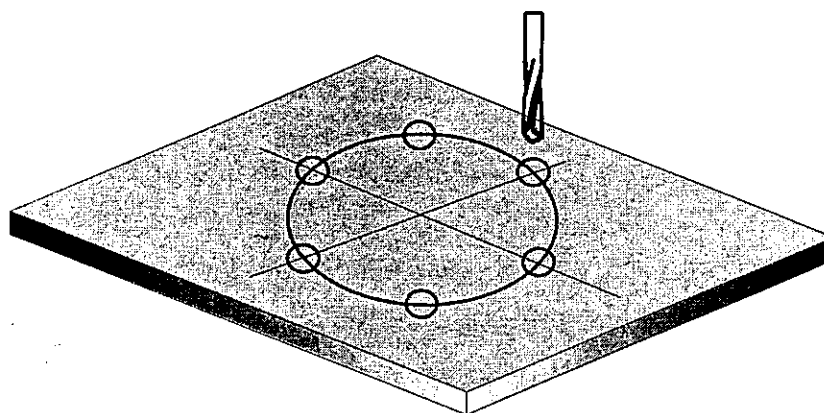


(1) Set direction as X and Y-axis.

Key Operation

<b>F</b> <b>6</b> <b>0</b> <b>0</b>	→	X Fno 600
		Y c ir PArA
		Z 00000
		INCH
<b>ENT</b>	→	X c ir cLE
		Y PArA SEt
		Z 00000
		INCH

- If you input **CIRCLE**, axis-setting lamp will be "ON".
- Maximum division is up to 10,000.
- Below is shown bolt hole circling in a plane.

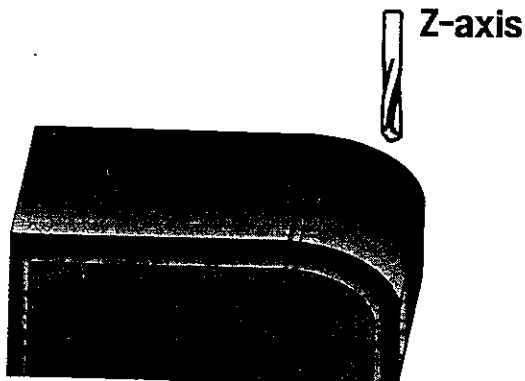


(2) Set direction as X and Z-axis.

Key Operation

<b>F</b> <b>6</b> <b>0</b> <b>1</b>	→	X Fno 601
		Y c ir PArA
		Z 0000
		INCH
<b>ENT</b>	→	X c ir cLE
		Y 0000
		Z PArA SEt
		INCH

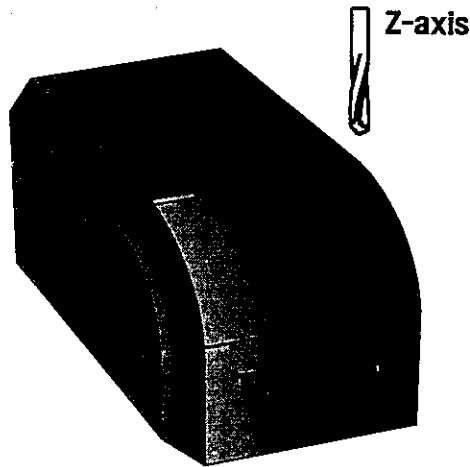
- The lamp of X, Z-axis are "ON" if you press **CIRCLE** key like the above.
- The number of maximum bolt hole circle is 10,000.
- You can set axis direction as X, Z-axis as below.



(3) Set direction as Y and Z-axis.

Key Operation		
F 6 0 2	→	X Fno 602 Y c ir PArA Z 00000 INCH
ENT	→	X 00000 Y c ir cLE Z PArA SEt INCH

- The lamps of X, Y axis is "ON" if you press **CIRCLE** key like the above.
- The number of maximum bolt hole circle is 10,000.
- You can set axis direction as Y, Z as below.

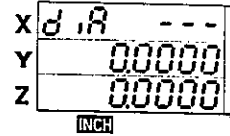


(4) Set bolt hole circle as diameter or radial (DIA/RAD).

Key Operation		
F 6 0 3	→	X Fno 603 Y c ir PArA Z 00000 INCH
ENT	→	X c ir cLE Y d IArAEEr Z 00000 INCH

**Example**

① Set by diameter (DIA)



② Set by radial (RAD)



▶ RAD mode is preset from the factory

**(5) Bolt Hole Circle**

▶ To process bolt hole circle, 4 factors below are needed:

- ① Radial: **r** (or diameter: **d**)
- ② Numbers of hole: **d-no**
- ③ Start angle: **Sp**
- ④ Finish angle: **Ep**

▶ Maximum range is as below:

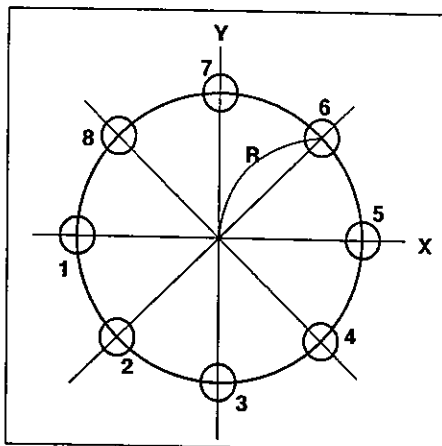
- ① Radial (or diameter): 80 inch
- ② Maximum hole number: up to 9999
- ③ Start and finish angle are available up to the 3rd decimal point.  
ex) 10.5405 → x      25.450 → o

**Key Operation**

	Input ( r ) or ( d )			X r.Rd ---	Y 00000	Z 00000	INCH
	Input ( d-no )			X 00000	Y d-no	Z 00000	INCH
	Input ( Sp )			X 00000	Y Sp 0000	Z 00000	INCH
	Input ( Eph )			X 00000	Y Ep 0000	Z 00000	INCH

Ex.) Here is an example of bolt hole circle.

Radial(r) = 10.0  
 Holes number (d-no) = 8  
 Start angle (Sp) = 0.0°  
 Finish angle (Ep) = 360.0°  
 Axis set = X and Y



❖❖❖ **Caution** ❖❖❖

- Before beginning, axis direction should be set firstly.
- Move X, Y table until X and Y indicate 0.0000.
- For the next hole, push **NEXT** key, and repeat the same.

**Example**

1. The key operating sequence as follows:

<b>CIRCLE</b> IS	➡	X <i>rAd</i> --- Y 00000 Z 00000 [NEXT]
<b>1 0 ENT</b> IS	➡	X 100000 Y <i>d-no</i> Z 00000 [NEXT]
<b>8 ENT</b> IS	➡	X 100000 Y <i>SP</i> 0000 Z 00000 [NEXT]
<b>0 ENT</b> IS	➡	X 100000 Y <i>EP</i> 0000 Z 00000 [NEXT]
<b>3 6 0 ENT</b> IS	➡	X 100000 Y 00000 Z 00000 [NEXT]

2. Bolt hole circle

① The process position of the first hole

➡	X 100000 Y 00000 Z 00000 [NEXT]
---	--

- Move X-table until it shows "0.0000", and make a hole at the point.

② For the second hole, push next key twice.

<b>NEXT NEXT</b> IS	➡	X -29290 Y 70710 Z 00000 [NEXT]
------------------------	---	--

- Move X and Y table until they show "0.0000" each, and make a hole at the point.

### Example

③ For the third hole, push next key twice.



X	- 707 10
Y	29290
Z	00000

INCH

- Move X and Y table until 0.0000 display

④ For the fourth hole, push next key twice.



X	- 707 10
Y	- 29290
Z	00000

INCH

- Move X and Y table until 0.0000 display

⑤ For the fifth hole, push next key twice.



X	- 29290
Y	- 707 10
Z	00000

INCH

- Move X and Y table until 0.0000 display

⑥ For the sixth hole, push next key twice.



X	29290
Y	- 707 10
Z	00000

INCH

- Move X and Y table until 0.0000 display

⑦ For the seventh hole, push next key twice.



X	707 10
Y	- 29290
Z	00000

INCH

- Move X and Y table until 0.0000 display

⑧ For the eighth hole, push next key twice.



X	707 10
Y	29290
Z	00000

INCH

- Move X and Y table until 0.0000 display

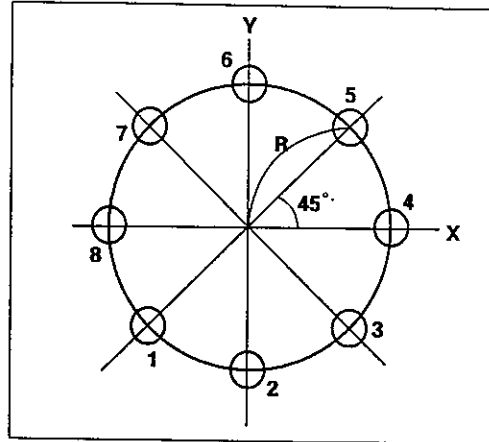
- Bolt hole circling direction is counter-clockwise
- If Sph is bigger than 0.0 and it is a circle of 360(=range angle)  
Eph can be calculated as below.  
(But, except for a circle of which range angle is smaller than 360°)

$$\text{Finishing angle (Eph)} = \text{range angle}(360^\circ) + \text{Starting angle (Eph)}$$

Ex.) Bolt hole circle with below factors.

Radial( $r$ ) = 20.0  
 Holes number ( $d-no$ ) = 8  
 Start angle ( $Sp$ ) = 45.0°  
 Finish angle ( $Ep$ ) = 360.0°+45.0°  
 Axis setting = X and Y-axis

※ For finish angle,  
 360 should be always added to  
 start angle, if it is a complete circle.



**Example**

1. The key operating sequence is as follows:

	→	X $rAd$ --- Y 00000 Z 00000 <small>INCH</small>
<b>1</b> <b>0</b> <b>ENT</b>	→	X 100000 Y $d-no$ Z 00000 <small>INCH</small>
<b>8</b> <b>ENT</b>	→	X 100000 Y $SP$ 0000 Z 00000 <small>INCH</small>
<b>4</b> <b>5</b> <b>ENT</b>	→	X 100000 Y $EP$ 0000 Z 00000 <small>INCH</small>
<b>4</b> <b>0</b> <b>5</b> <b>ENT</b>	→	X 70710 Y 70710 Z 00000 <small>INCH</small>

2. Bolt hole circle

① The process position of the first hole.

→	X 70710 Y 70710 Z 00000 <small>INCH</small>
---	--

● Move X and Y table until they show "0.0000" each, and make a hole at the point.

② For the second hole, push next key twice.

<b>NEXT</b> <b>NEXT</b>	→	X -70710 Y 29290 Z 00000 <small>INCH</small>

● Move X and Y table until they show "0.0000" each, and make a hole at the point.

## Example

③ For the third hole, push next key twice.



X	- 707 10
Y	- 29290
Z	00000

INCH

• Move X and Y table until 0.0000 display

④ For the fourth hole, push next key twice.



X	- 29290
Y	- 707 10
Z	00000

INCH

• Move X and Y table until 0.0000 display

⑤ For the fifth hole, push next key twice.



X	29290
Y	- 707 10
Z	00000

INCH

• Move X and Y table until 0.0000 display

⑥ For the sixth hole, push next key twice.



X	707 10
Y	- 29290
Z	00000

INCH

• Move X and Y table until 0.0000 display

⑦ For the seventh hole, push next key twice.



X	707 10
Y	29290
Z	00000

INCH

• Move X and Y table until 0.0000 display

⑧ For the eighth hole, push next key twice.



X	29290
Y	707 10
Z	00000

INCH

• Move X and Y table until 0.0000 display

## 8. Converting Resolution

There are 4 selectable resolutions

- ① 0.0002 inch (5/1000 mm)
- ② 0.00004 inch (1/1000 mm)
- ③ 0.002 inch (5/100 mm)
- ④ 0.0004 inch (1/100 mm)

## (1) 0.0002 inch (5/1000 mm)

**Key Operation**

<b>F X</b> ☞	----->	X Func no
		Y 00000
		Z 00000
		INCH
<b>7 0 0 ENT</b> ☞	----->	X ScALE ch
		Y 00000
		Z 00000
		INCH
		X 0
		Y 00000
		Z 00000
		INCH
<b>5 ENT</b> ☞	----->	X 5
		Y 00000
		Z 00000
		INCH
		X 00000
		Y 00000
		Z 00000
		INCH

## (2) 0.00004 inch (1/1000 mm)

**Key Operation**

<b>F X</b> ☞	----->	X Func no
		Y 00000
		Z 00000
		INCH
<b>7 0 0 ENT</b> ☞	----->	X ScALE ch
		Y 00000
		Z 00000
		INCH
		X 0
		Y 00000
		Z 00000
		INCH
<b>1 ENT</b> ☞	----->	X 1
		Y 00000
		Z 00000
		INCH
		X 00000
		Y 00000
		Z 00000
		INCH



(3) 0.002 inch (5/100 mm)

**Key Operation**

<b>F X</b> ☞	→	X Func no Y 00000 Z 00000 INCH
<b>7 0 0 ENT</b> ☞	→	X ScALE ch Y 00000 Z 00000 INCH
		X 0 Y 00000 Z 00000 INCH
<b>5 0 ENT</b> ☞	→	X 50 Y 00000 Z 00000 INCH
		X 00000 Y 00000 Z 00000 INCH

(4) 0.0004 inch (1/100 mm)

**Key Operation**

<b>F X</b> ☞	→	X Func no Y 00000 Z 00000 INCH
<b>7 0 0 ENT</b> ☞	→	X ScALE ch Y 00000 Z 00000 INCH
		X 0 Y 00000 Z 00000 INCH
<b>1 0 ENT</b> ☞	→	X 10 Y 00000 Z 00000 INCH
		X 00000 Y 00000 Z 00000 INCH

## 9) Converting Counting Direction

You can convert counting direction from +(-) to -(+)

Key Operation		
<b>F X</b> ☞	----->	X Func no Y 00000 Z 00000 INCH
<b>8 0 0 ENT</b> ☞	----->	X dir t--- Y 00000 Z 00000 INCH
<b>NEXT</b> ☞	----->	X dir ---1 Y 00000 Z 00000 INCH
<b>ENT</b> ☞	----->	X 00000 Y 00000 Z 00000 INCH

## 10) Using Rate-correction Function

- It can be displayed according to magnification you require against actual length.
- It also can be applied to rotary encoder.
- Usually, the rate to be set is "1.000000" (it shows as 1000000).
- Allowable range is from 0.000001 to 9.999999 and have accuracy under 6th of decimal point.
- If the rate is set as "0.000000", nothing displays but 0.000000.

Key Operation		
<b>F X</b> ☞	----->	X Func no Y 00000 Z 00000 INCH
<b>9 0 0 ENT</b> ☞	----->	X RATE SET Y 00000 Z 00000 INCH
<b>Input value</b> ☞	----->	X 1000000 Y 00000 Z 00000 INCH
<b>ENT</b> ☞	----->	X 00000 Y 00000 Z 00000 INCH

< Note > If the rate is "0.000000", the value does not change and shows as it was, even though we move a certain axis.

Ex.) When you change rate of X axis, "1.000000" to "0.996000".

**Example**

<p><b>F X</b>  </p>	<p>-----&gt;</p>	<table border="1" style="border-collapse: collapse; width: 100px;"> <tr><td>X</td><td>Func no</td></tr> <tr><td>Y</td><td>00000</td></tr> <tr><td>Z</td><td>00000</td></tr> <tr><td colspan="2" style="text-align: center;">INCH</td></tr> </table>	X	Func no	Y	00000	Z	00000	INCH	
X	Func no									
Y	00000									
Z	00000									
INCH										
<p><b>9 0 0 ENT</b>  </p>	<p>-----&gt;</p>	<table border="1" style="border-collapse: collapse; width: 100px;"> <tr><td>X</td><td>rATE SET</td></tr> <tr><td>Y</td><td>00000</td></tr> <tr><td>Z</td><td>00000</td></tr> <tr><td colspan="2" style="text-align: center;">INCH</td></tr> </table>	X	rATE SET	Y	00000	Z	00000	INCH	
X	rATE SET									
Y	00000									
Z	00000									
INCH										
<p><b>0 . 9 9 6</b>  </p>	<p>-----&gt;</p>	<table border="1" style="border-collapse: collapse; width: 100px;"> <tr><td>X</td><td>0996000</td></tr> <tr><td>Y</td><td>00000</td></tr> <tr><td>Z</td><td>00000</td></tr> <tr><td colspan="2" style="text-align: center;">INCH</td></tr> </table>	X	0996000	Y	00000	Z	00000	INCH	
X	0996000									
Y	00000									
Z	00000									
INCH										
<p><b>ENT</b>  </p>	<p>-----&gt;</p>	<table border="1" style="border-collapse: collapse; width: 100px;"> <tr><td>X</td><td>00000</td></tr> <tr><td>Y</td><td>00000</td></tr> <tr><td>Z</td><td>00000</td></tr> <tr><td colspan="2" style="text-align: center;">INCH</td></tr> </table>	X	00000	Y	00000	Z	00000	INCH	
X	00000									
Y	00000									
Z	00000									
INCH										

⇒ **RATE COMPENSATION**

$$\text{Compensation Rate} = \frac{\text{Actual Length : measured by Block gauge}}{\text{Measured Length : Counter's value}}$$

Ex.1) When actual length 10inch, measured length is 10.24inch.

$$\frac{10}{10.24} = 0.976562$$

Ex.2) When actual length is 10inch, measured length is 9.996inch.

$$\frac{10}{9.996} = 1.000400$$

## 11) Checking Display Area (FND check)

It is used to check defects of FND (seven segments) that express digitalized figures on the display of a counter.

**Key Operation**

F
5
0
0

## 12. Reference Function



When a worker moves a bed of machine inadvertently or there is a sudden power failure, it is used to find datum(reference) point again.

Use this in regular sequence.

- ① Memorize or input reference point.
- ② Recall reference point.
- ③ Move to reference point.

### 1) Memorize reference point

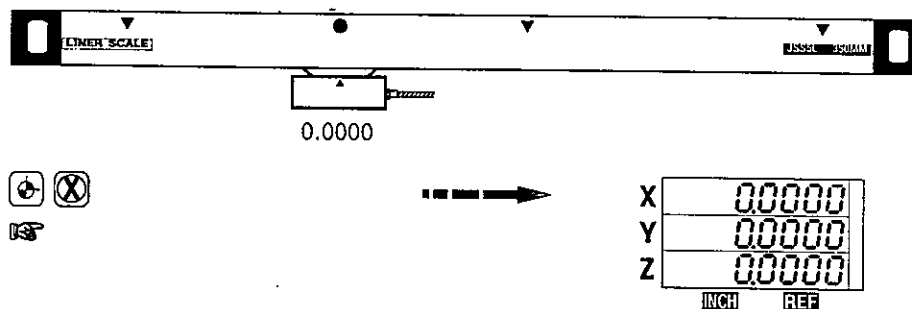
The operation is as follows:

- ① Make a starting point to "0.0000" in status of reference key, , on.
- ② Move left or right from the starting point until when a certain lamp of axis chosen is on.
- ③ Push  key.

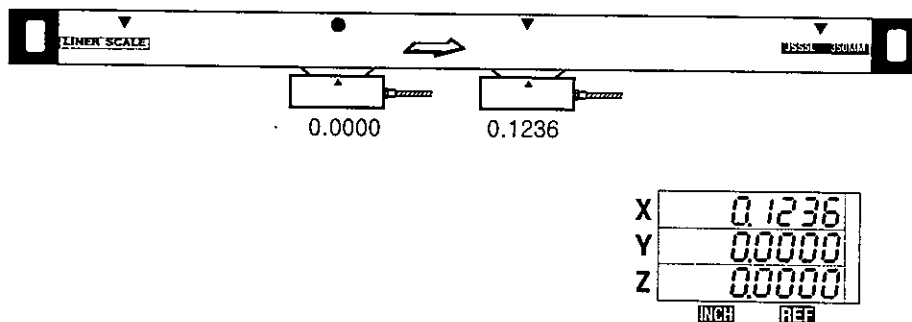
Ex.) You can memorize starting point like the following steps:


#### Example

- 1** Make a starting point to "0.0000" in status of Reference key is ON.



- 2** Move left or right from the starting point until a certain lamp of axis chosen is on.






- 3** Press  key when lamp of a certain axis is ON.



## 2) Recall reference point

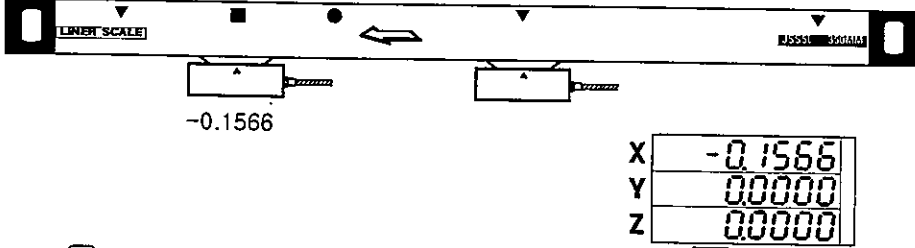
You can recall reference point as the following steps:


- ① Move to nearby reference point.
- ② Press  key.
- ③ Move left or right from the starting point until when a certain lamp of axis chosen is on.
- ④ Press  key.




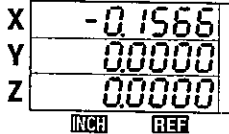
 Ex.) You can recall reference point like the following steps:

**Example**

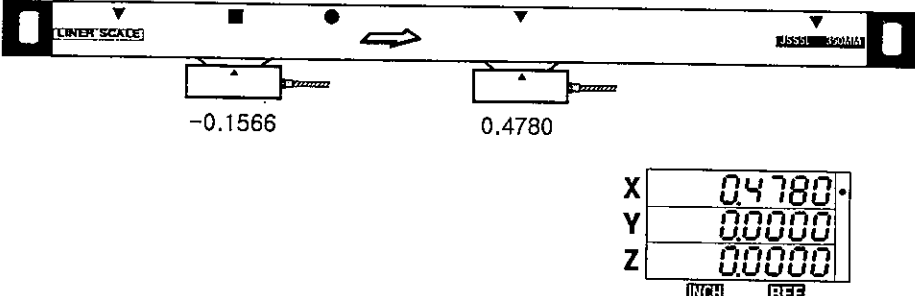
**1** Move to nearby reference point.




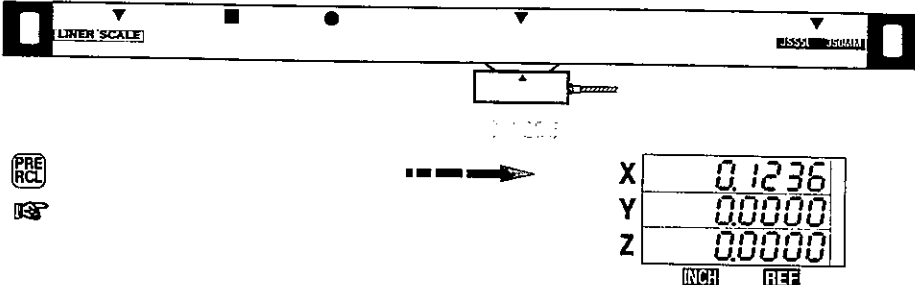
**2** Push  Key.

**3** Move left or right from the starting point until the selected axis lamp is on.



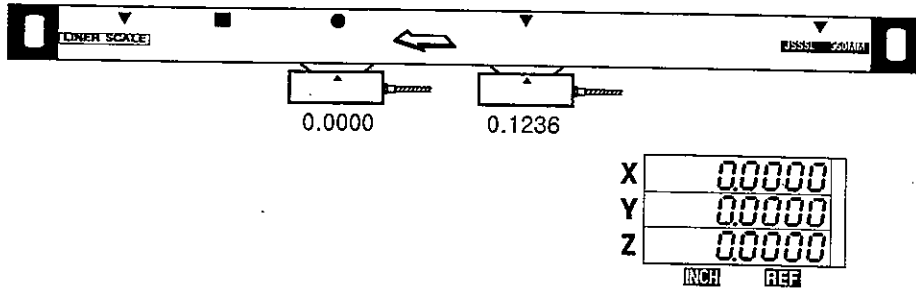
**4** Push  key when a lamp of certain axis is ON.



### 3) Find reference point

#### Example

Move a certain axis to the point of "0.0000".



## Unit 4. EDM

Option keys used in EDM is as follows:

- ① **EDM** Key : when you change to EDM mode.
- ② **AUTO** Key : when inputting numbers in STEP.
- ③ **NEXT** Key : move to next STEP, ex) STEP-1, STEP-2, STEP-3, STEP4
- ④ **ENT** Key : after inputting from STEP-1 to STEP-4.

### 1 Basic Operation

Other Keys except **EDM**, **AUTO**, **NEXT**, **ENT**, Numeral keys, decimal point and (+/-) key are not operative.

**Key Operation**

**EDM** key : This is the key to change to EDM mode. If you press **EDM**, lamp is ON.

**EDM** → X 00000  
Y 00000  
Z 00000  
INCH  
EDM

**AUTO** key : This is the key to input numbers in STEP.

**AUTO** → X STEP - 1  
Y 00000  
Z 00000  
INCH  
EDM

**NEXT** key : move to the next step (ex.)STEP-1 to STEP-2 or STEP-3 to STEP-4.

**NEXT** → X STEP - 2  
Y 00000  
Z 00000  
INCH  
EDM

**< Note >** You must press this key to do next process of electric discharging after one cycle of electric discharging.  
If you press this key, the lamp of STEP is ON.

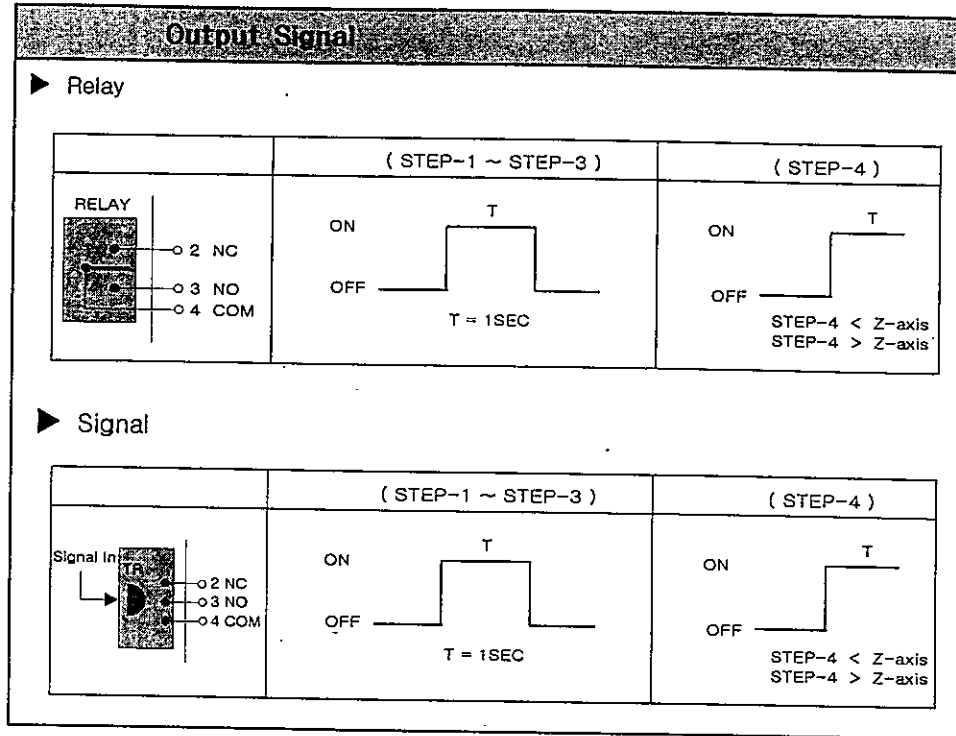
**ENT** key : This is the key to complete process after inputting in STEP.

**ENT** → X 00000  
Y 00000  
Z 00000  
INCH  
EDM

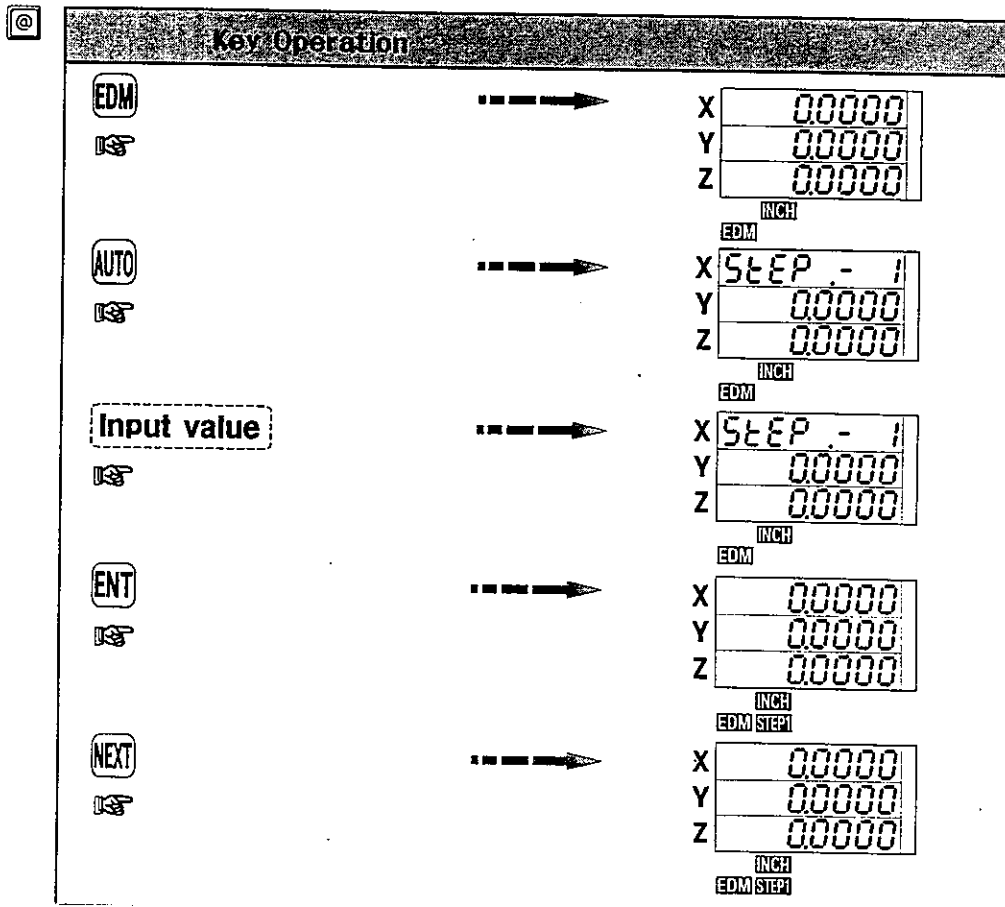
- ▶ In EDM mode, when you want to input value, each axis will display as follows:  
X-axis : It shows from STEP-1 to STEP-4  
Y-axis : It is place for inputting values. (Input values are displayed)
- ▶ When discharging workpiece after inputting values in STEP, each axis shows as follows:  
X-axis : It displays values input in STEP.  
(The lowest values of Z-axis)  
In case of setting Up- It displays the highest value out of value of movement of Z-axis.  
(The highest value of Z-axis)
- ▶ You must press the " next" key, for electric discharging, after finishing one cycle of electric discharging and the lamp of STEP must be ON for electric discharging.
- ▶ If number is input only into one STEP, the lamp of STEP1 is ON. If numbers are input more than one STEP, each lamp of STEP will be ON.
- ▶ Even if numbers are input into STEP randomly, it automatically memorize from the lowest to the highest with order.

## 2 Output Signal

From STEP-1 to STEP-3 output signal is activated one time during one(1) second. At final STEP-4, if Z-axis(electrode) value is higher (Up set) or lower (Dn set) than last STEP, it continuously moves.



## 3 Key Input & Example





## 4. Discharging Direction Conversion

This is used when you wish to change direction of discharging

Ex.) When you wish to change value of Z-axis.

- ① In case that the value of coming down get close to MINUS {-}
  - You can change it into PLUS (+)
- ② In case that the value of coming down get close to PLUS {+}
  - You can change it into MINUS (-)

Key Operation

● Set to UP

<div style="border: 1px solid black; display: inline-block; padding: 2px 5px; margin: 2px;">F</div> <div style="border: 1px solid black; display: inline-block; padding: 2px 5px; margin: 2px;">5</div> <div style="border: 1px solid black; display: inline-block; padding: 2px 5px; margin: 2px;">0</div> <div style="border: 1px solid black; display: inline-block; padding: 2px 5px; margin: 2px;">2</div>	→	<table border="1" style="border-collapse: collapse; width: 100%;"> <tr><td>X</td><td>Fno</td><td>.502</td></tr> <tr><td>Y</td><td>Edn</td><td>d.ir0</td></tr> <tr><td>Z</td><td>d.ir</td><td>dn-</td></tr> <tr><td colspan="3" style="text-align: center; font-size: small;">INCH</td></tr> </table>	X	Fno	.502	Y	Edn	d.ir0	Z	d.ir	dn-	INCH		
X	Fno	.502												
Y	Edn	d.ir0												
Z	d.ir	dn-												
INCH														
<div style="border: 1px solid black; display: inline-block; padding: 2px 5px; margin: 2px;">NEXT</div>	→	<table border="1" style="border-collapse: collapse; width: 100%;"> <tr><td>X</td><td>Fno</td><td>.502</td></tr> <tr><td>Y</td><td>Edn</td><td>d.ir0</td></tr> <tr><td>Z</td><td>d.ir</td><td>uP-</td></tr> <tr><td colspan="3" style="text-align: center; font-size: small;">INCH</td></tr> </table>	X	Fno	.502	Y	Edn	d.ir0	Z	d.ir	uP-	INCH		
X	Fno	.502												
Y	Edn	d.ir0												
Z	d.ir	uP-												
INCH														
<div style="border: 1px solid black; display: inline-block; padding: 2px 5px; margin: 2px;">ENT</div>	→	<table border="1" style="border-collapse: collapse; width: 100%;"> <tr><td>X</td><td>00000</td></tr> <tr><td>Y</td><td>00000</td></tr> <tr><td>Z</td><td>00000</td></tr> <tr><td colspan="2" style="text-align: center; font-size: small;">INCH</td></tr> </table>	X	00000	Y	00000	Z	00000	INCH					
X	00000													
Y	00000													
Z	00000													
INCH														

---

● Set to DOWN

<div style="border: 1px solid black; display: inline-block; padding: 2px 5px; margin: 2px;">F</div> <div style="border: 1px solid black; display: inline-block; padding: 2px 5px; margin: 2px;">5</div> <div style="border: 1px solid black; display: inline-block; padding: 2px 5px; margin: 2px;">0</div> <div style="border: 1px solid black; display: inline-block; padding: 2px 5px; margin: 2px;">2</div>	→	<table border="1" style="border-collapse: collapse; width: 100%;"> <tr><td>X</td><td>Fno</td><td>.502</td></tr> <tr><td>Y</td><td>Edn</td><td>d.ir0</td></tr> <tr><td>Z</td><td>d.ir</td><td>uP-</td></tr> <tr><td colspan="3" style="text-align: center; font-size: small;">INCH</td></tr> </table>	X	Fno	.502	Y	Edn	d.ir0	Z	d.ir	uP-	INCH		
X	Fno	.502												
Y	Edn	d.ir0												
Z	d.ir	uP-												
INCH														
<div style="border: 1px solid black; display: inline-block; padding: 2px 5px; margin: 2px;">NEXT</div>	→	<table border="1" style="border-collapse: collapse; width: 100%;"> <tr><td>X</td><td>Fno</td><td>.502</td></tr> <tr><td>Y</td><td>Edn</td><td>d.ir0</td></tr> <tr><td>Z</td><td>d.ir</td><td>dn-</td></tr> <tr><td colspan="3" style="text-align: center; font-size: small;">INCH</td></tr> </table>	X	Fno	.502	Y	Edn	d.ir0	Z	d.ir	dn-	INCH		
X	Fno	.502												
Y	Edn	d.ir0												
Z	d.ir	dn-												
INCH														
<div style="border: 1px solid black; display: inline-block; padding: 2px 5px; margin: 2px;">ENT</div>	→	<table border="1" style="border-collapse: collapse; width: 100%;"> <tr><td>X</td><td>00000</td></tr> <tr><td>Y</td><td>00000</td></tr> <tr><td>Z</td><td>00000</td></tr> <tr><td colspan="2" style="text-align: center; font-size: small;">INCH</td></tr> </table>	X	00000	Y	00000	Z	00000	INCH					
X	00000													
Y	00000													
Z	00000													
INCH														

When Z-axis is coming down to MINUS(-), you must set DN, if reverse, you must set UP.  
 (After setting Up or Dn, you must move from STEP-1 to STEP-4 with use of "NEXT" key for confirmation of setting and proper work)

### Notice

- ◎ To begin EDM processing, you should push "NEXT" button.
- ◎ EDM processing should be made, when the STEP lamp is in the status of " on".
- ◎ If Z-axis has + value as it moves down, UP should be set.
- ◎ If Z-axis has - value as it moves down, DN should be set.

### ● Changing to UP(+)

When Z-axis moves down, change its value from (-) to (+)

#### Example

**F** **5** **0** **2**  
F502



X Fno 502  
Y Edn dir 0  
Z dir dn-  
INCH

**NEXT**  
NEXT



X Fno 502  
Y Edn dir 0  
Z dir uP-  
INCH

**ENT**  
ENT



X 00000  
Y 00000  
Z 00000  
INCH

**F** **Z**  
FZ



X Func no  
Y 00000  
Z 00000  
INCH

**8** **0** **0** **ENT**  
800ENT



X 00000  
Y 00000  
Z dir t---  
INCH

**NEXT**  
NEXT



X 00000  
Y 00000  
Z dir ---+  
INCH

**ENT**  
ENT



X 00000  
Y 00000  
Z 00000  
INCH

### ● Changing to DN(-)

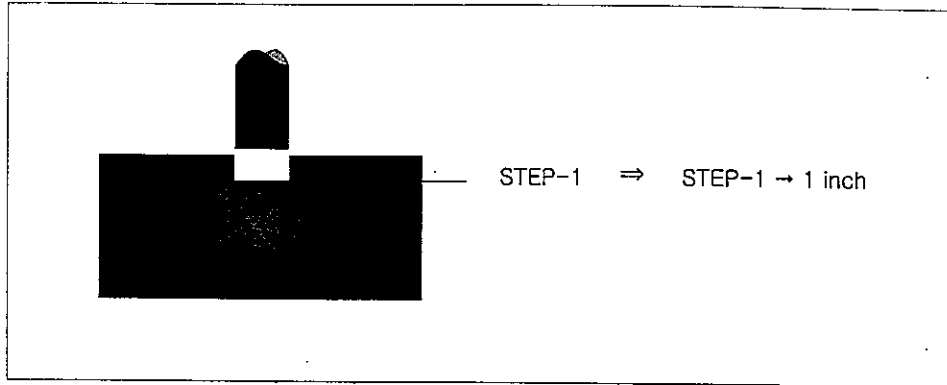
When Z-axis moves down, change its value from (+) to (-)

**Example**

<b>F</b> <b>5</b> <b>0</b> <b>2</b> [F] [5] [0] [2]	→	X <b>Fno</b> .502 Y <b>Edn</b> d.ir0 Z <b>d ir</b> .UP- INCH
<b>NEXT</b> [NEXT]	→	X <b>Fno</b> .502 Y <b>Edn</b> d.ir0 Z <b>d ir</b> .dn- INCH
<b>ENT</b> [ENT]	→	X 00000 Y 00000 Z 00000 INCH
<b>F</b> <b>Z</b> [F] [Z]	→	X <b>Func no</b> Y 00000 Z 00000 INCH
<b>8</b> <b>0</b> <b>0</b> <b>ENT</b> [8] [0] [0] [ENT]	→	X 00000 Y 00000 Z <b>d ir</b> ---+ INCH
<b>NEXT</b> [NEXT]	→	X 00000 Y 00000 Z <b>d ir</b> t--- INCH
<b>ENT</b> [ENT]	→	X 00000 Y 00000 Z 00000 INCH

## 5 Examples

Ex.1) In case you wish to process electric discharging like the follow drawing:



⇒ You can memorize number as the following steps:

**Example**

EDM ISP	→	X 00000 Y 00000 Z 00000 INCH EDM
AUTO 1 ISP	→	X STEP - 1 Y 10000 Z 00000 INCH EDM
ENT ISP	→	X 10000 Y 00000 Z 00000 INCH EDM STEP1
NEXT ISP	→	X 10000 Y 00000 Z 00000 INCH EDM STEP1

● As the above example, in case of STEP-1 is 1 inch, the numbers memorized from STEP-2 to STEP-4 is as follow:

STEP-1 = 1 inch

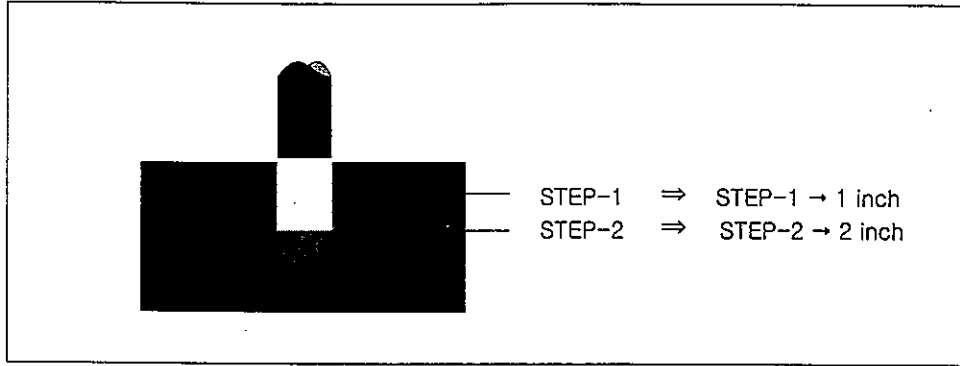
STEP-2 = 1 inch

STEP-3 = 1 inch

STEP-4 = 1 inch

and only the STEP1 lamp is turned ON

Ex. 2) In case you wish to process electric discharging as the follow drawing:



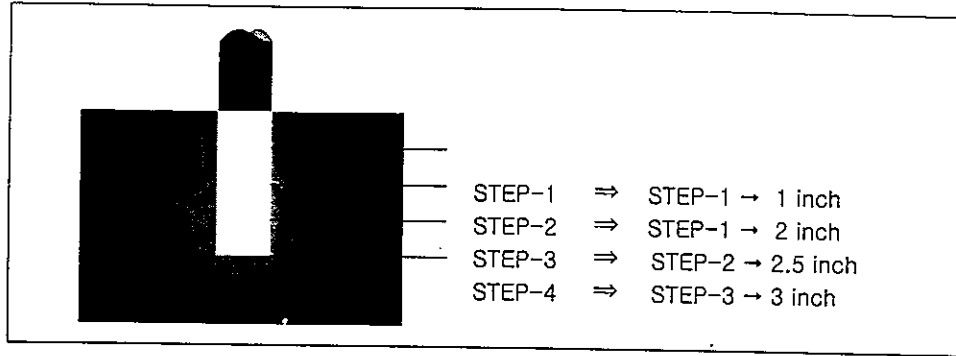
⇒ You can memorize numbers like following steps:

**Example**

EDM ⏏	→	<table border="0"> <tr><td>X</td><td>00000</td></tr> <tr><td>Y</td><td>00000</td></tr> <tr><td>Z</td><td>00000</td></tr> <tr><td colspan="2" style="text-align: center;">INCH</td></tr> <tr><td colspan="2" style="text-align: center;">EDM</td></tr> </table>	X	00000	Y	00000	Z	00000	INCH		EDM	
X	00000											
Y	00000											
Z	00000											
INCH												
EDM												
AUTO 1 ⏏	→	<table border="0"> <tr><td>X</td><td>STEP - 1</td></tr> <tr><td>Y</td><td>10000</td></tr> <tr><td>Z</td><td>00000</td></tr> <tr><td colspan="2" style="text-align: center;">INCH</td></tr> <tr><td colspan="2" style="text-align: center;">EDM</td></tr> </table>	X	STEP - 1	Y	10000	Z	00000	INCH		EDM	
X	STEP - 1											
Y	10000											
Z	00000											
INCH												
EDM												
NEXT 2 ⏏	→	<table border="0"> <tr><td>X</td><td>STEP - 2</td></tr> <tr><td>Y</td><td>20000</td></tr> <tr><td>Z</td><td>00000</td></tr> <tr><td colspan="2" style="text-align: center;">INCH</td></tr> <tr><td colspan="2" style="text-align: center;">EDM</td></tr> </table>	X	STEP - 2	Y	20000	Z	00000	INCH		EDM	
X	STEP - 2											
Y	20000											
Z	00000											
INCH												
EDM												
ENT ⏏	→	<table border="0"> <tr><td>X</td><td>10000</td></tr> <tr><td>Y</td><td>00000</td></tr> <tr><td>Z</td><td>00000</td></tr> <tr><td colspan="2" style="text-align: center;">INCH</td></tr> <tr><td colspan="2" style="text-align: center;">EDM STEP1 STEP2</td></tr> </table>	X	10000	Y	00000	Z	00000	INCH		EDM STEP1 STEP2	
X	10000											
Y	00000											
Z	00000											
INCH												
EDM STEP1 STEP2												
NEXT ⏏	→	<table border="0"> <tr><td>X</td><td>10000</td></tr> <tr><td>Y</td><td>00000</td></tr> <tr><td>Z</td><td>00000</td></tr> <tr><td colspan="2" style="text-align: center;">INCH</td></tr> <tr><td colspan="2" style="text-align: center;">EDM STEP1 STEP2</td></tr> </table>	X	10000	Y	00000	Z	00000	INCH		EDM STEP1 STEP2	
X	10000											
Y	00000											
Z	00000											
INCH												
EDM STEP1 STEP2												

- As shown in the drawing, STEP-1 is 1 inch, STEP-2 is 2 inch, numbers memorized from STEP-3 to STEP-4 is as follow:  
 STEP-1 = 1 inch  
 STEP-2 = 2 inch  
 STEP-3 = 2 inch  
 STEP-4 = 2 inch  
 and only two lamps of STEP1 and STEP2 are turned ON.

Ex. 3) In case you wish to process electric discharging as the follow drawing:



⇒ You can memorize numbers like the following steps:

**Example**

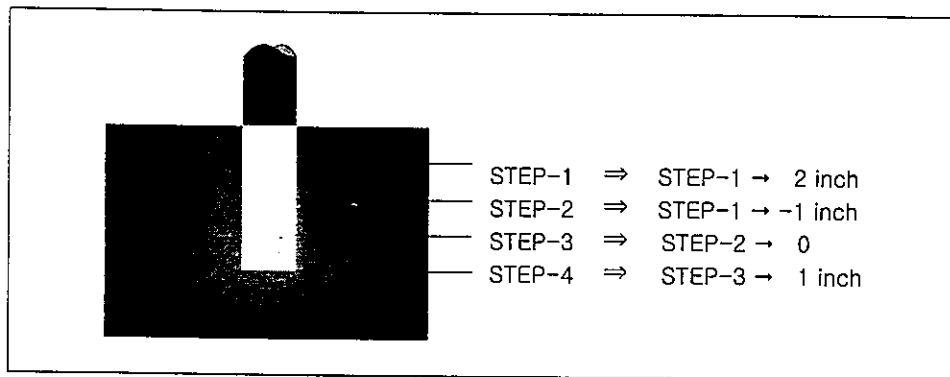
EDM [ENT]	→	X 00000 Y 00000 Z 00000 INCH EDM
NEXT 1 [ENT]	→	X STEP - 1 Y 10000 Z 00000 INCH EDM
NEXT 2 [ENT]	→	X STEP - 2 Y 20000 Z 00000 INCH EDM
NEXT 2 . 5 [ENT]	→	X STEP - 3 Y 25000 Z 00000 INCH EDM
NEXT 3 [ENT]	→	X STEP - 4 Y 30000 Z 00000 INCH EDM
ENT [ENT]	→	X 10000 Y 00000 Z 00000 INCH EDM STEP1 STEP2 STEP3 STEP4
NEXT [ENT]	→	X 10000 Y 00000 Z 00000 INCH EDM STEP1 STEP2 STEP3 STEP4

- As the above example, numbers from STEP-1 to STEP-4 are memorized as follows:  
 STEP-1 = 1 inch  
 STEP-2 = 2 inch  
 STEP-3 = 2.5 inch  
 STEP-4 = 3 inch  
 all lamps from STEP1 to STEP4 are turned ON.

- The number displayed in X-axis is the value memorized in STEP-1. As the drawing below, if the value of Z-axis is bigger than that of X-axis after starting process, 1st output signal is activated. At the same time, STEP-2 value is automatically indicated at X-axis and the lamp of STEP1 is OFF. This process can be done with the condition of "UP set". With this method, if you process up to STEP4, this is the end of one cycle for processing and if you want to process again for the accurate processing, output signal is activated only at STEP-4 position and lamp is in status of OFF.

- In case you want to move to process at other position, you must press "NEXT" Key. At this time, the value of Z-axis must be lower than STEP-1 and the lamp will be ON. (In case of setting by "Up") and you can operate only after lamp of STEP is ON.

Ex.4) In case you wish to process electric discharging with random input of number to STEPS.



⇒ You can memorize number like the following steps:

**Example**

 	→	<table border="0" style="width: 100%;"> <tr><td>X</td><td>00000</td></tr> <tr><td>Y</td><td>00000</td></tr> <tr><td>Z</td><td>00000</td></tr> </table> <p style="text-align: center; font-size: small;">INCH EDM</p>	X	00000	Y	00000	Z	00000
X	00000							
Y	00000							
Z	00000							
 	→	<table border="0" style="width: 100%;"> <tr><td>X</td><td>STEP - 1</td></tr> <tr><td>Y</td><td>20000</td></tr> <tr><td>Z</td><td>00000</td></tr> </table> <p style="text-align: center; font-size: small;">INCH EDM</p>	X	STEP - 1	Y	20000	Z	00000
X	STEP - 1							
Y	20000							
Z	00000							
 	→	<table border="0" style="width: 100%;"> <tr><td>X</td><td>STEP - 2</td></tr> <tr><td>Y</td><td>-10000</td></tr> <tr><td>Z</td><td>00000</td></tr> </table> <p style="text-align: center; font-size: small;">INCH EDM</p>	X	STEP - 2	Y	-10000	Z	00000
X	STEP - 2							
Y	-10000							
Z	00000							
 	→	<table border="0" style="width: 100%;"> <tr><td>X</td><td>STEP - 3</td></tr> <tr><td>Y</td><td>00000</td></tr> <tr><td>Z</td><td>00000</td></tr> </table> <p style="text-align: center; font-size: small;">INCH EDM</p>	X	STEP - 3	Y	00000	Z	00000
X	STEP - 3							
Y	00000							
Z	00000							
 	→	<table border="0" style="width: 100%;"> <tr><td>X</td><td>STEP - 4</td></tr> <tr><td>Y</td><td>10000</td></tr> <tr><td>Z</td><td>00000</td></tr> </table> <p style="text-align: center; font-size: small;">INCH EDM</p>	X	STEP - 4	Y	10000	Z	00000
X	STEP - 4							
Y	10000							
Z	00000							
 	→	<table border="0" style="width: 100%;"> <tr><td>X</td><td>-10000</td></tr> <tr><td>Y</td><td>00000</td></tr> <tr><td>Z</td><td>00000</td></tr> </table> <p style="text-align: center; font-size: small;">INCH EDM STEP1 STEP2 STEP3 STEP4</p>	X	-10000	Y	00000	Z	00000
X	-10000							
Y	00000							
Z	00000							

### Example

• Like above Ex.4, the numbers inputted from STEP-1 to STEP-4 are memorized as follows:

STEP-1 = -1 inch  
 STEP-2 = 0  
 STEP-3 = 1 inch  
 STEP-4 = 2 inch




X	-10000
Y	00000
Z	00000

INCH  
EDM STEP1 STEP2 STEP3 STEP4

The lamps from STEP1 to STEP4 are all ON.  
Numbers can be memorized in order regardless of sequence of input.


## 6. Normal Value Tracking

It is used when you want to know the status of Normal in present status of EDM. And you can look each value of X, Y axis in status of Normal. (You must press "F" key in status of EDM) You can see the value of X, Y-axis in status of "normal" if you press "F" key.

@


**Key Operation**

**F**



### Example


In EDM mode....



X	20000
Y	00000
Z	00000

INCH  
EDM STEP1 STEP2 STEP3 STEP4


**F**



X	23690
Y	36580
Z	00000

INCH  
EDM STEP1 STEP2 STEP3 STEP4

**F**



X	20000
Y	00000
Z	00000

INCH  
EDM STEP1 STEP2 STEP3 STEP4



## Unit 5. INSTALLATION

### 1) Installation and precaution

- ① Grounding of the display counter should be made for safety.
  - ② To prevent malfunction, please do not put near around other electrical appliance which may cause noise.
  - ③ Prevent foreign body like lubricating oil and dirt from flowing into scales.
  - ④ Select the installation position near the object to be measured or the workpiece as possible to ensure the high accuracy.
  - ⑤ Care must be taken so that the scale is not bent or twisted on installation.
  - ⑥ Avoid installing the unit in a place where the environmental conditions change drastically due to high electric field, temperature change, etc.
  - ⑦ It is recommended to put a protective cover over the scale to prevent the scale from breaking during the process
- Mount the scale for the head carrier to face down or sideways.

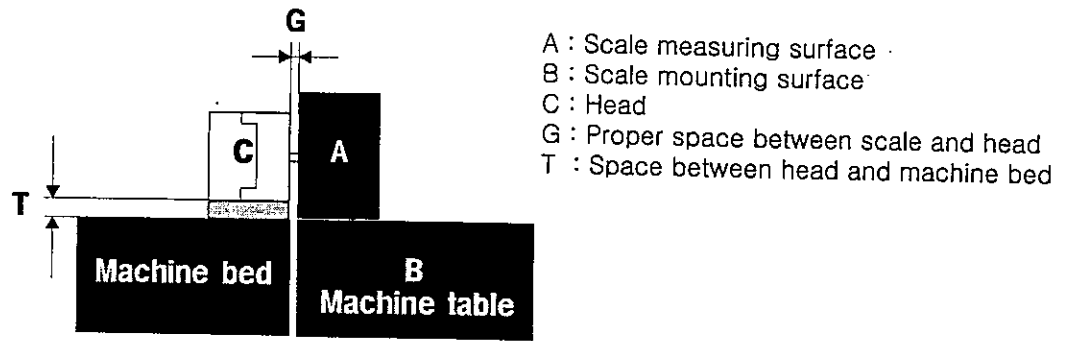


#### Required Tools for installation

Electric Drill :  $\phi 3.5$ ,  $\phi 4.3$ ,  $\phi 5.2$   
Tap : M4, M5, M6  
Dial Gauge : 1/100 mm  
Tap Handle  
Screwdriver  
Wrench set

## 2) Mounting Accuracy

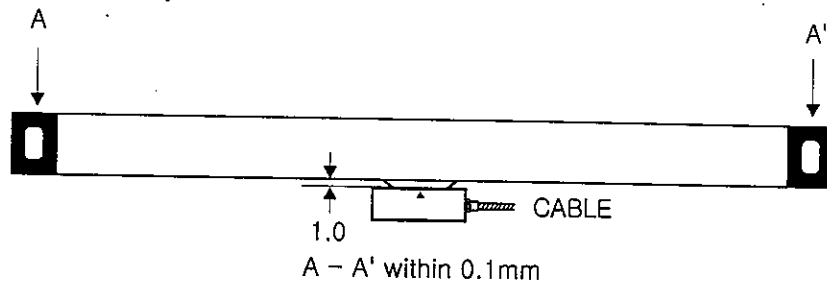
- Mount the unit parallel with machine axis within the following limits:



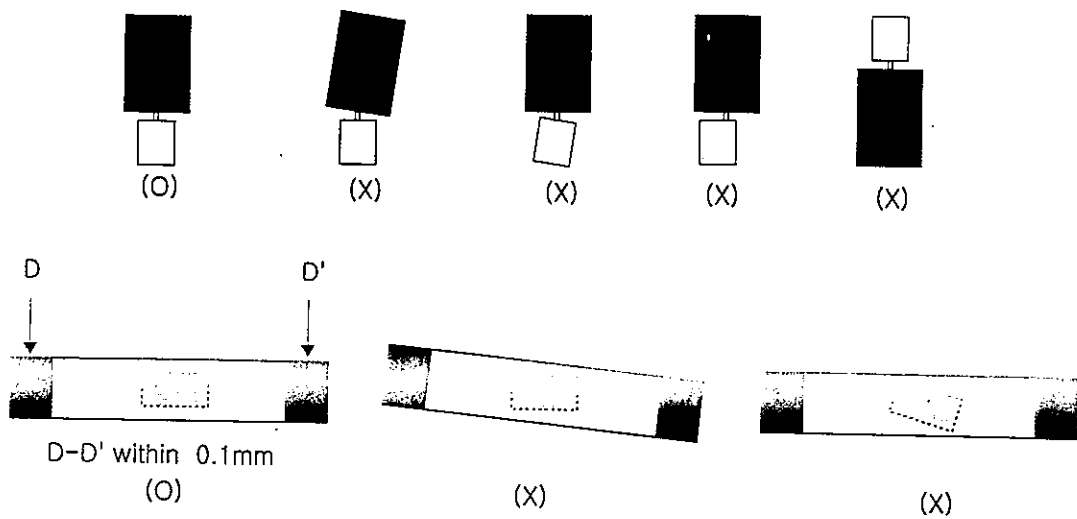
The following gap should be maintained.

Parallel line gap : below 0.0039" (0.1mm)

- T :  $0.1378''(3.5\text{mm}) \pm 0.0039''(0.1\text{mm}) \rightarrow \text{JSM}$   
 $0''(0\text{mm}) \pm 0.0039''(0.1\text{mm}) \rightarrow \text{JSS}$
- G :  $1.0\text{mm} \pm 0.1\text{mm}$



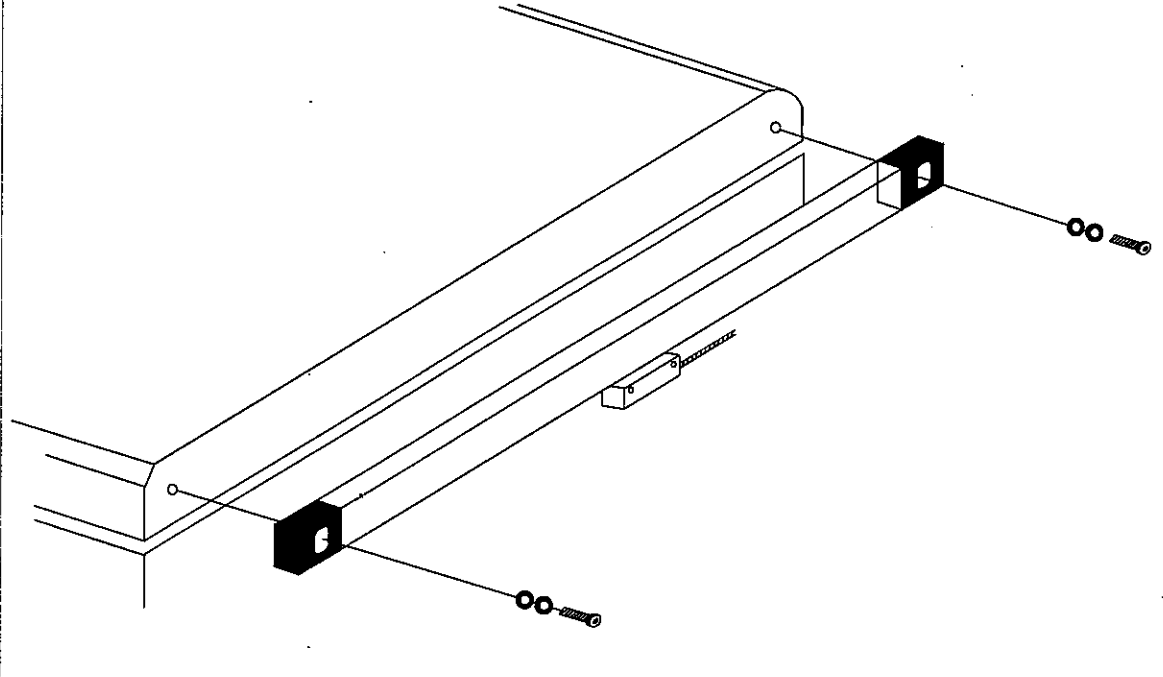
- Install like the follow drawing:



### 3) Scale mounting

#### (1) Positioning, Drilling, Temporary fixing.

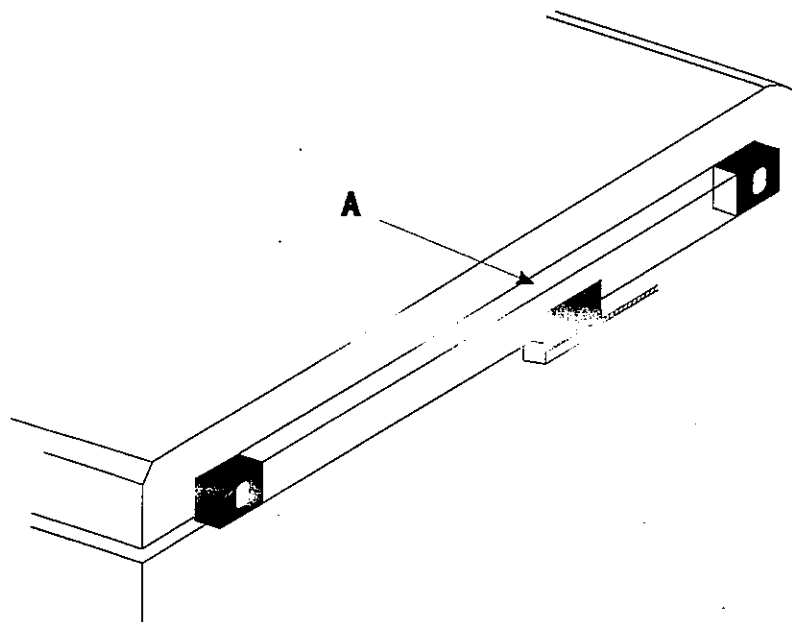
By determining mounting position on mounting surface of machine bed, drill and tap holes. Fix the scale temporarily to the machine table, using the hexagon socket head bolt.



#### (2) Mounting

Using dial gauge, measure horizontal angle of A.

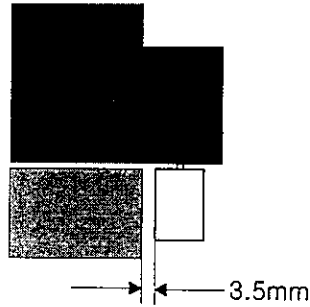
- Scales over 1000mm, check alignment and if it is fixed in a proper space.
- If the alignment of A don't be measured with Digital Gauge, facing area of alignment mark is parallel in both direction.



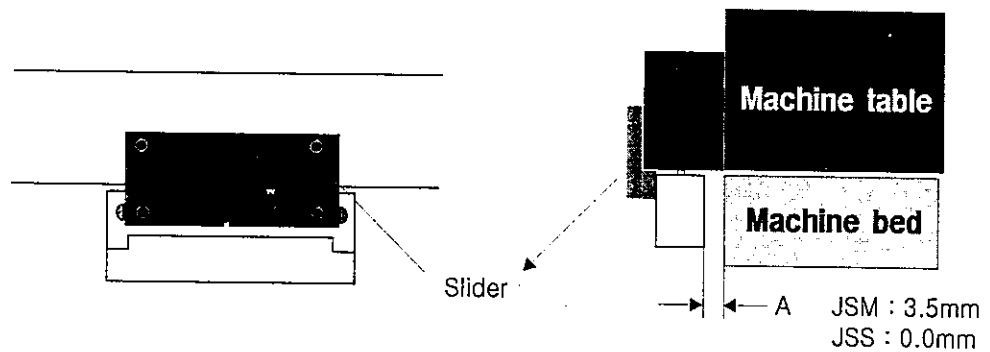
### (3) Head carrier Mounting

- When the scale is attached directly to the table, the thickness of the attachment should be  $0.1378'' (3.5\text{mm}) \pm 0.0039'' (0.1\text{mm})$ .  
It is recommended to use shim washer for the adjustment of the thickness

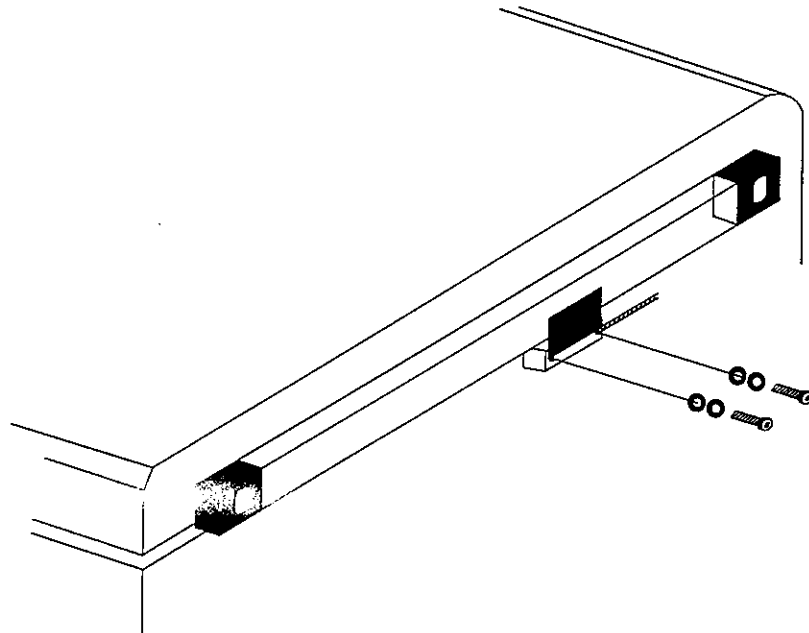
► for JSM



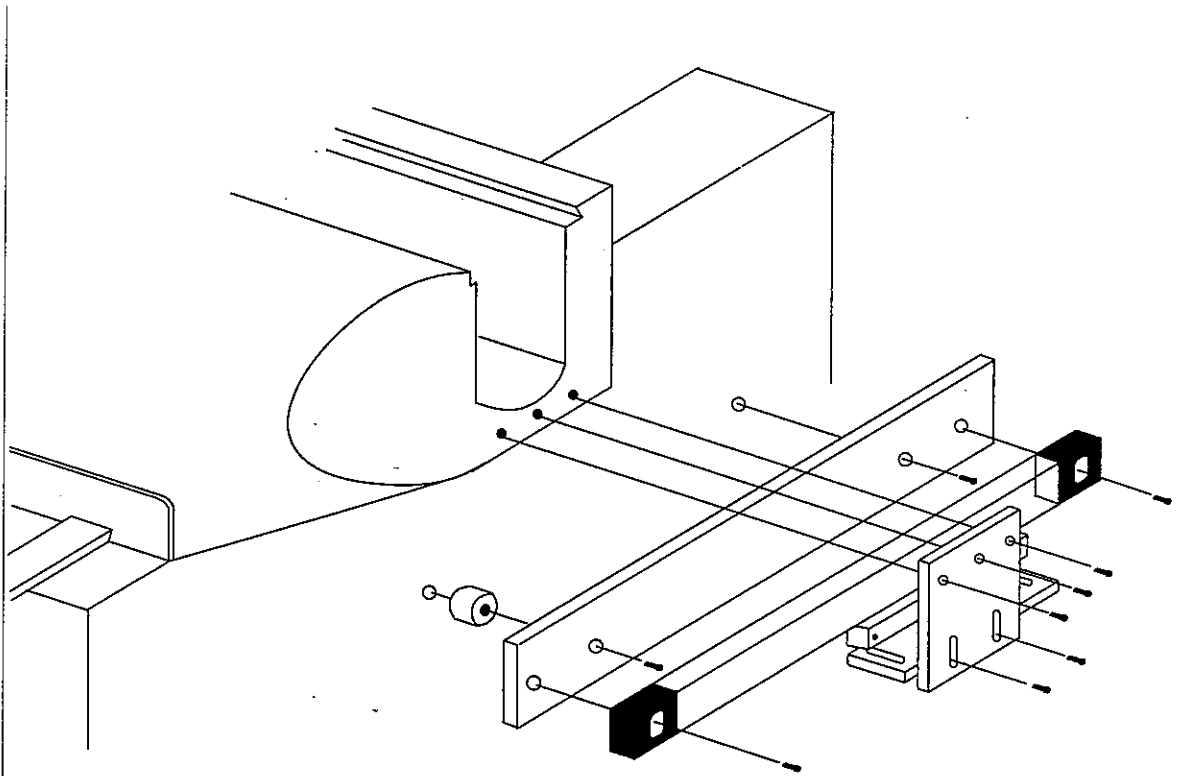
- Remove two screws/bolts to slider that fasten head parts so that the head carrier is separated from scale.



- When ready, move head to the position to be installed, then drill at the position of the bed of a machine.
- Remove slider after installation.



- With a mark at the end of scale as a datum line, gap between head and scale should be equal.



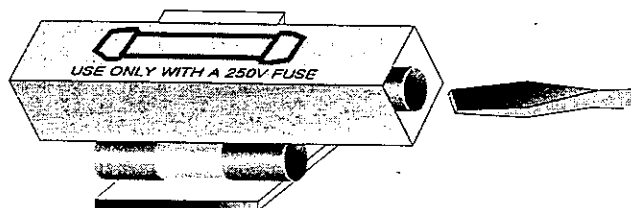
Occurred Error	Checking point
▶ Counter is not energized.(No power)	<ul style="list-style-type: none"> <li>● Check the power source.</li> <li>● Check if the fuse is blown out.</li> <li>● Check if the power cord is connected to terminal rightly.</li> </ul>
▶ The Fuse blows out frequently.	<ul style="list-style-type: none"> <li>● Check the status of supplying power is unstable.</li> <li>● Unfix the scale's connector from counter and check the state.</li> <li>● If the fuse still blow off even though there found no problem, call service center for repair.</li> </ul>
▶ Power is on but no display on counter.	<ul style="list-style-type: none"> <li>● Check the inflow of lubricating oil or fluid into key board.</li> <li>● Unfix the scale's connector from counter and check the status.</li> <li>● Confirm the status of connection is right.</li> </ul>
▶ When error occur on a counter.	<ul style="list-style-type: none"> <li>● Check connection status between scaie and counter.</li> <li>● Check if the installation bolts are loose and ground status.</li> <li>● Try to re-connect after exchanging the connectors with other axis connectors .</li> <li>● Check if dirts, lubricating oil or others be stick into the scale. Prevent them from getting into so that accuracy be maintain as good as it is new.</li> <li>● Check if the machine that DRO installed has backlash.</li> <li>● Check if scale is damaged from any impact or twist.</li> </ul>
▶ Displayed value stand still or fixed when the machine's table(scale) is moving.	<ul style="list-style-type: none"> <li>● Check the rate.</li> <li>● Rate should be "1000000" which means "1.0" or "1:1".</li> <li>● Check the connection between counter and scale as below:  <div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;"> <b>F X 9 0 0 ENT 1 . 0 ENT</b> </div> </li> </ul>
▶ Only one axis out of three doesn't work.	<ul style="list-style-type: none"> <li>● Replace the scale with other normal one and check it again.</li> </ul>
▶ When "DIA" lamp is on.	<ul style="list-style-type: none"> <li>● Change it into "RAD" mode by using double counting function  <div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;"> <b>F X 4 0 0 ENT NEXT NEXT NEXT ENT</b> </div> </li> </ul>
▶ Doubled value display on a counter.	<ul style="list-style-type: none"> <li>● Check "RATE".</li> <li>● Check if the lamp of "DIA" is on and change it as below:  <div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;"> <b>F X 4 0 0 ENT NEXT NEXT NEXT ENT</b> </div> </li> <li>● The "RATE" should be "1000000":  <div style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center;"> <b>F X 9 0 0 ENT 1 . 0 ENT</b> </div> </li> </ul>
<p>▶ There is no problem in the machine but displayed value has the same numeral difference which has (+) or (-) value.</p> <p>▶ Difference between displayed distance and actual distance which is measured by Block Gauge or other measurement instrument.</p>	<ul style="list-style-type: none"> <li>● Compensate for the difference with "RATE" function.  <math display="block">C = \frac{A}{M}</math> </li> <li>EX) <math>\frac{200}{299.1000} = 1.003009</math></li> <li>EX) <math>\frac{200}{200.0500} = 0.999750</math></li> </ul>
▶ Remarks	<ul style="list-style-type: none"> <li>● Be careful for lubrication oil and other dirts not to flow into keyboard or scale that can cause errors.</li> </ul>

## Unit 7. Changing a Fuse

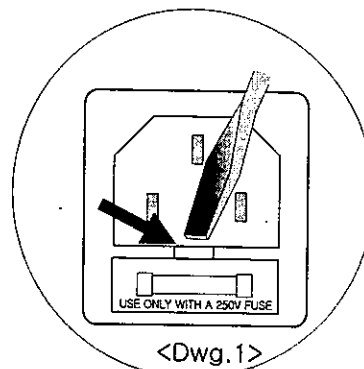
NOTICE: Use only a fuse for 250V 2A.(1 spare fuse is inside fuse capsule)

Before changing a fuse, disconnect the power cable. To take out the fuse capsule, using a tip of (-)type screwdriver or other tool like that, push and pull out the arrow marked area in the <Dwg.1>.

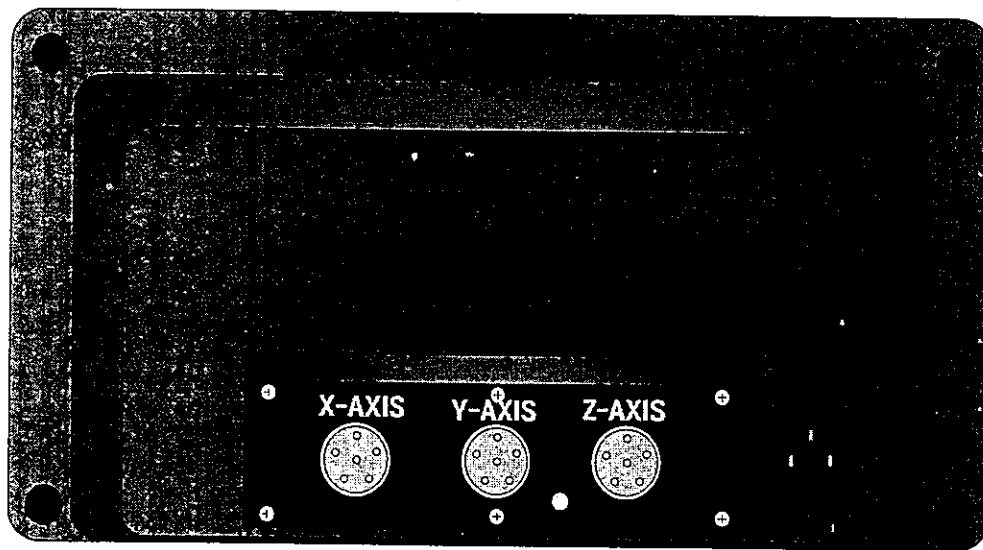
A spare fuse is inside the fuse capsule. To take it out, just push the other end as shows in the <Dwg.2>.



<Dwg.2>



<Dwg.1>



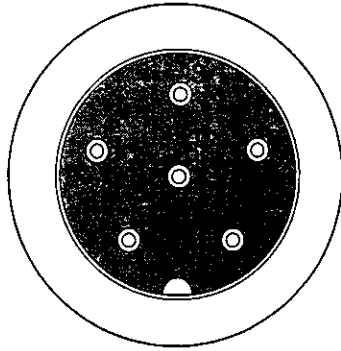
Voltage range : 110V ~ 220V  
Capacity for fuse : 2A

※ Initial Setting Values from the factory are as follows:

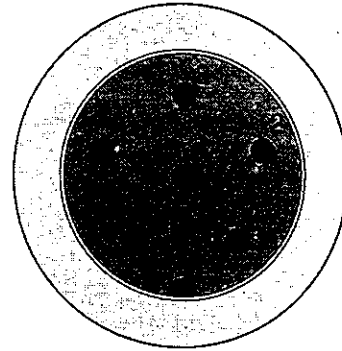
RATE:	1.000000
DIVIDING CIRCLE:	X, Y-AXIS
RAD/DIA:	RAD
RESOLUTION:	5/1000
MM/INCH:	MM
CLEAR MEMORY:	0.0000(each of 50)
ABS:	0.0000(each of 10)
EDM:	UP ( 10 / a step )

※ This manual explains on the basis of this initial value.

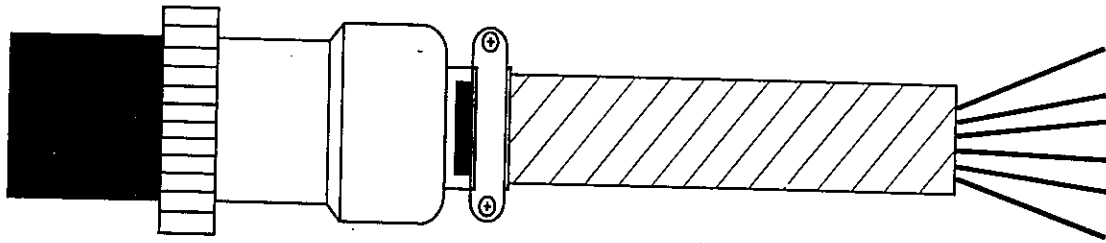
**Unit 8. Connector;** Connection of counter and scale, pin assignment



COUNTER  
 1 PIN : + (+5V)  
 2 PIN : A  
 3 PIN : B  
 4 PIN : Z  
 5 PIN : - (0V)  
 6 PIN : SHIELD

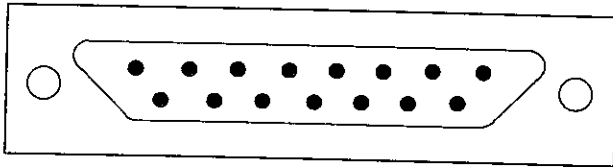


SCALE  
 1 PIN : + (+5V)  
 2 PIN : A  
 3 PIN : B  
 4 PIN : Z  
 5 PIN : - (0V)  
 6 PIN : SHIELD

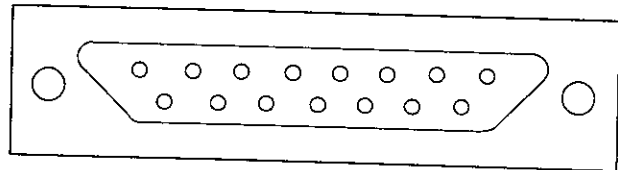


SCALE  
 1 RED : + (+5V)  
 2 YELLOW : A (+4.2V)  
 3 WHITE : B (+4.2V)  
 4 GREEN : Z (+0.4V)  
 5 BLACK : - (+0V)  
 6 BLUE : SHIELD (GND)

※ EDM Signal



COUNTER  
 2 PIN : A (YELLOW)  
 3 PIN : B (RED)  
 4 PIN : COM (WHITE)

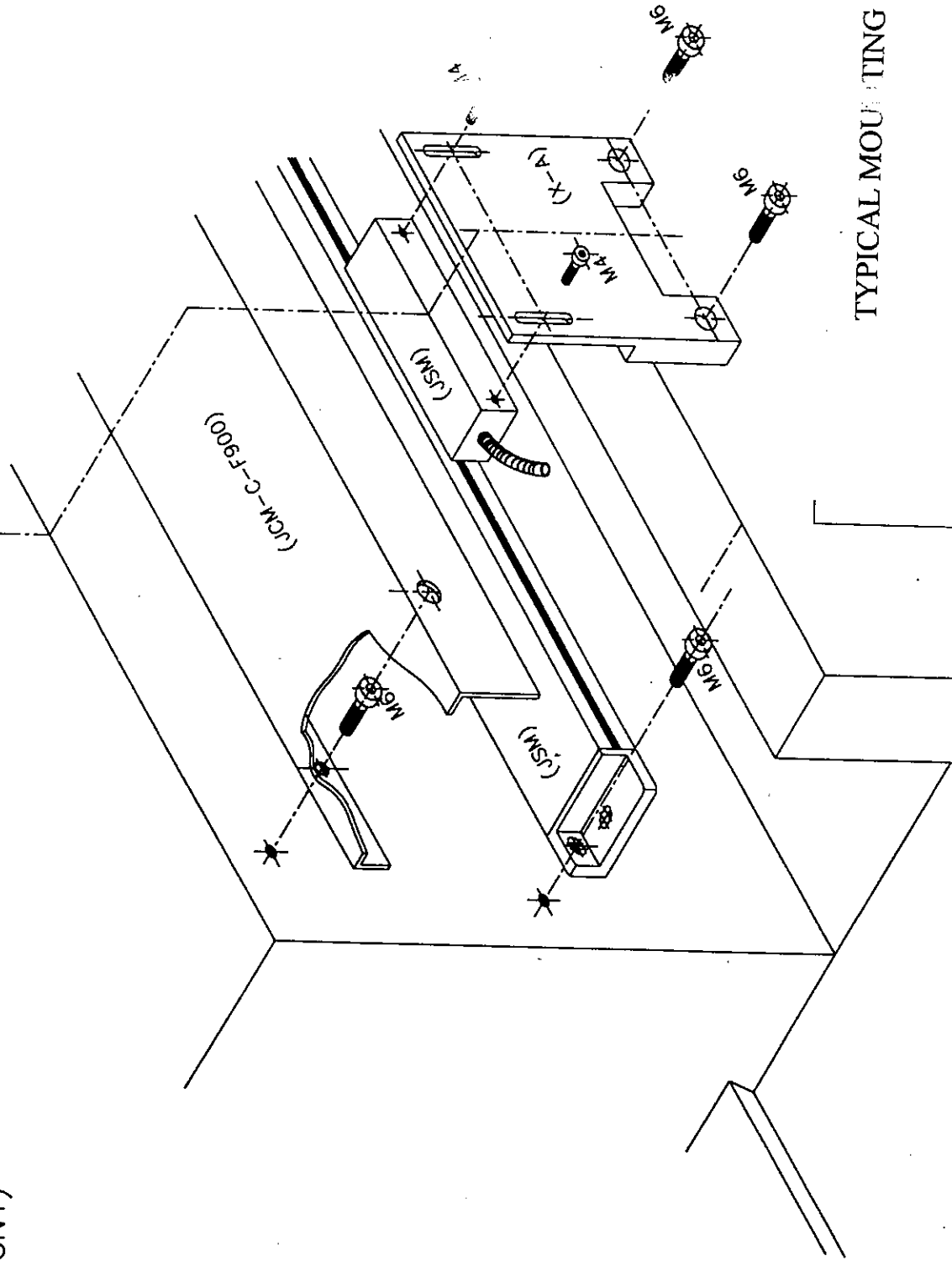


SCALE  
 2 PIN : A (WHITE)  
 3 PIN : B (GREEN)  
 4 PIN : COM (BLACK)



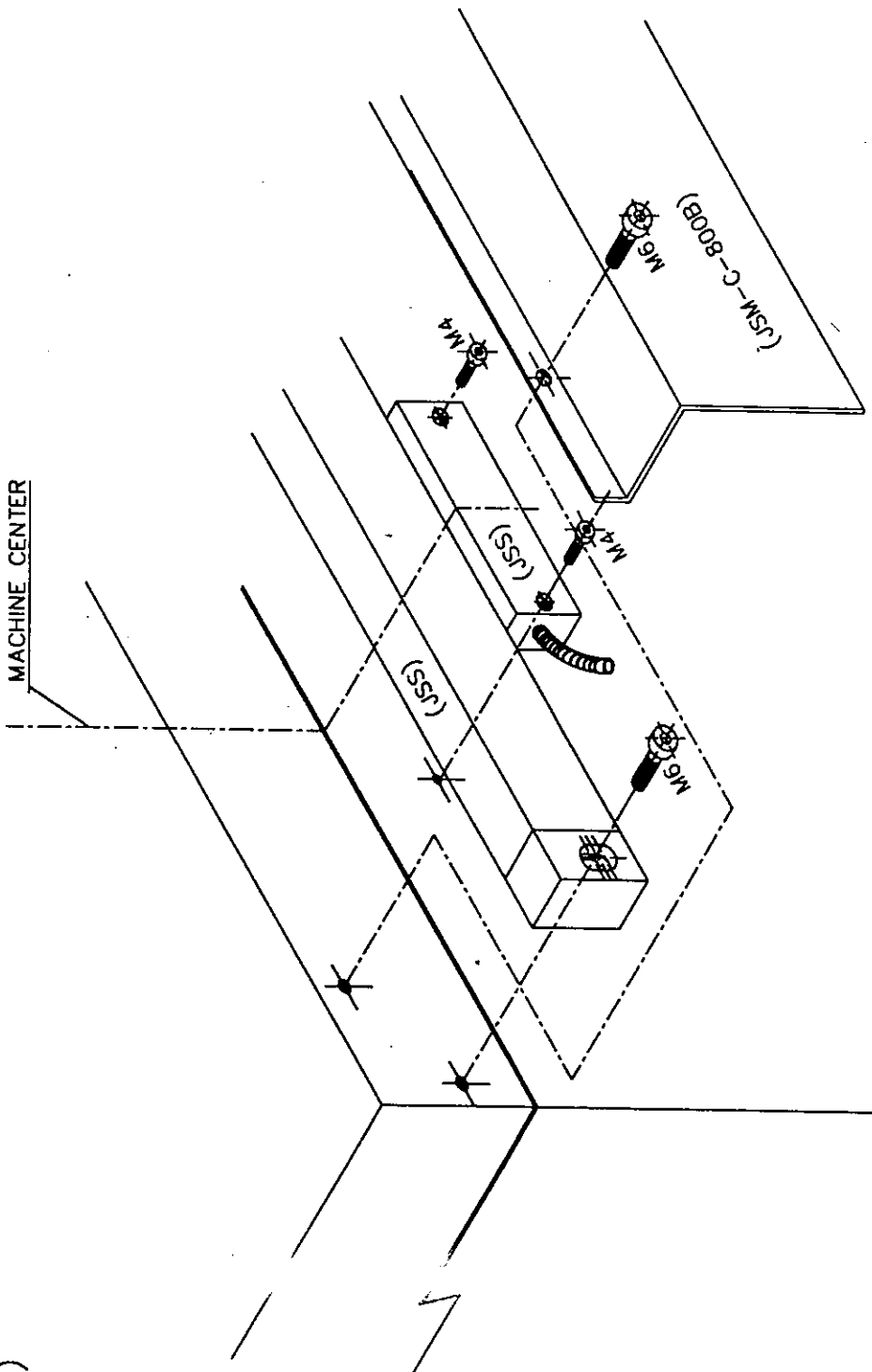
JSM-A (X-AXIS)  
(FRONT)

MACHINE CENTER



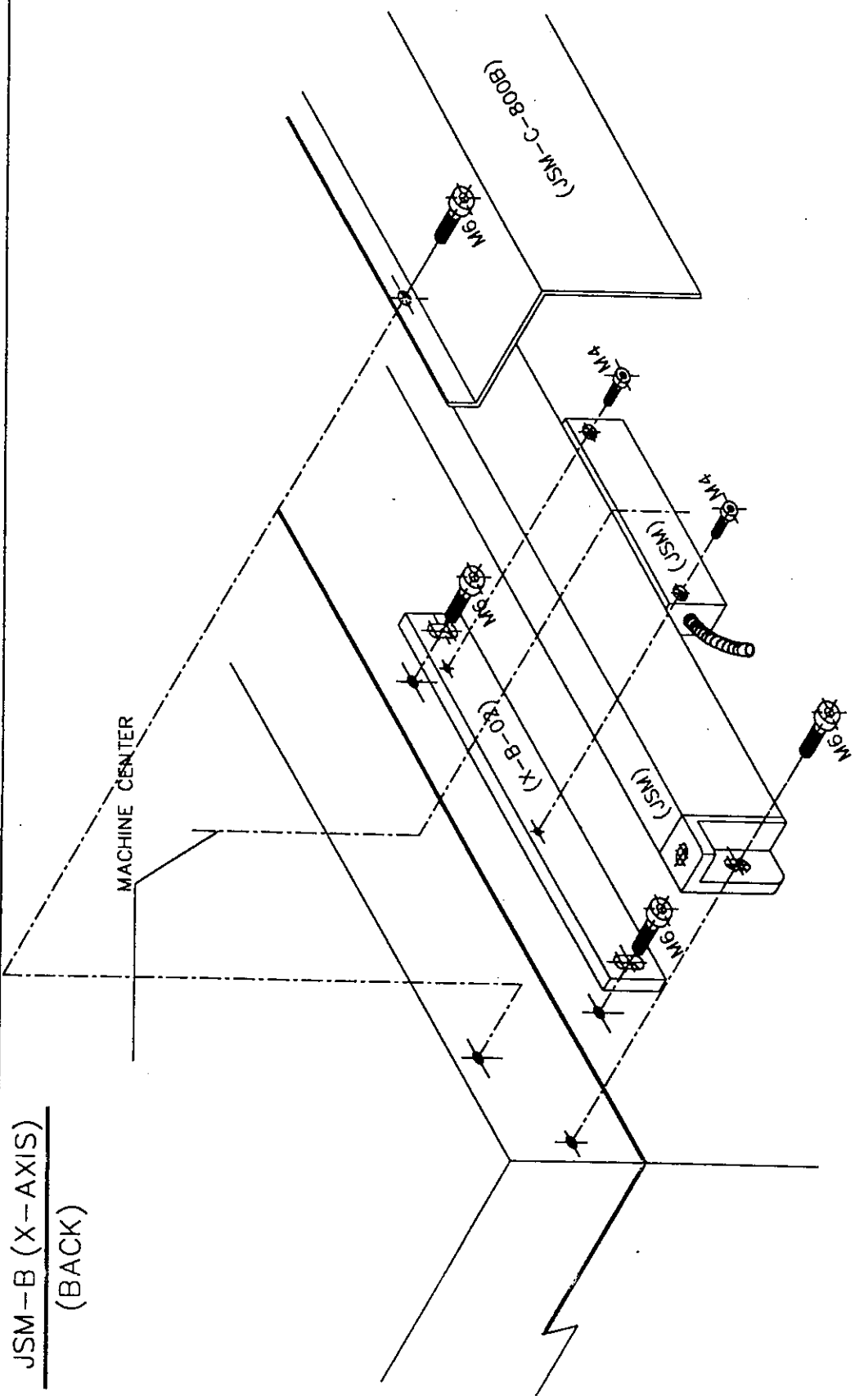
TYPICAL MOUNTING STYLES

JSM-C (X-AXIS)  
(BACK)



TYPICAL MOUNTING STYLES

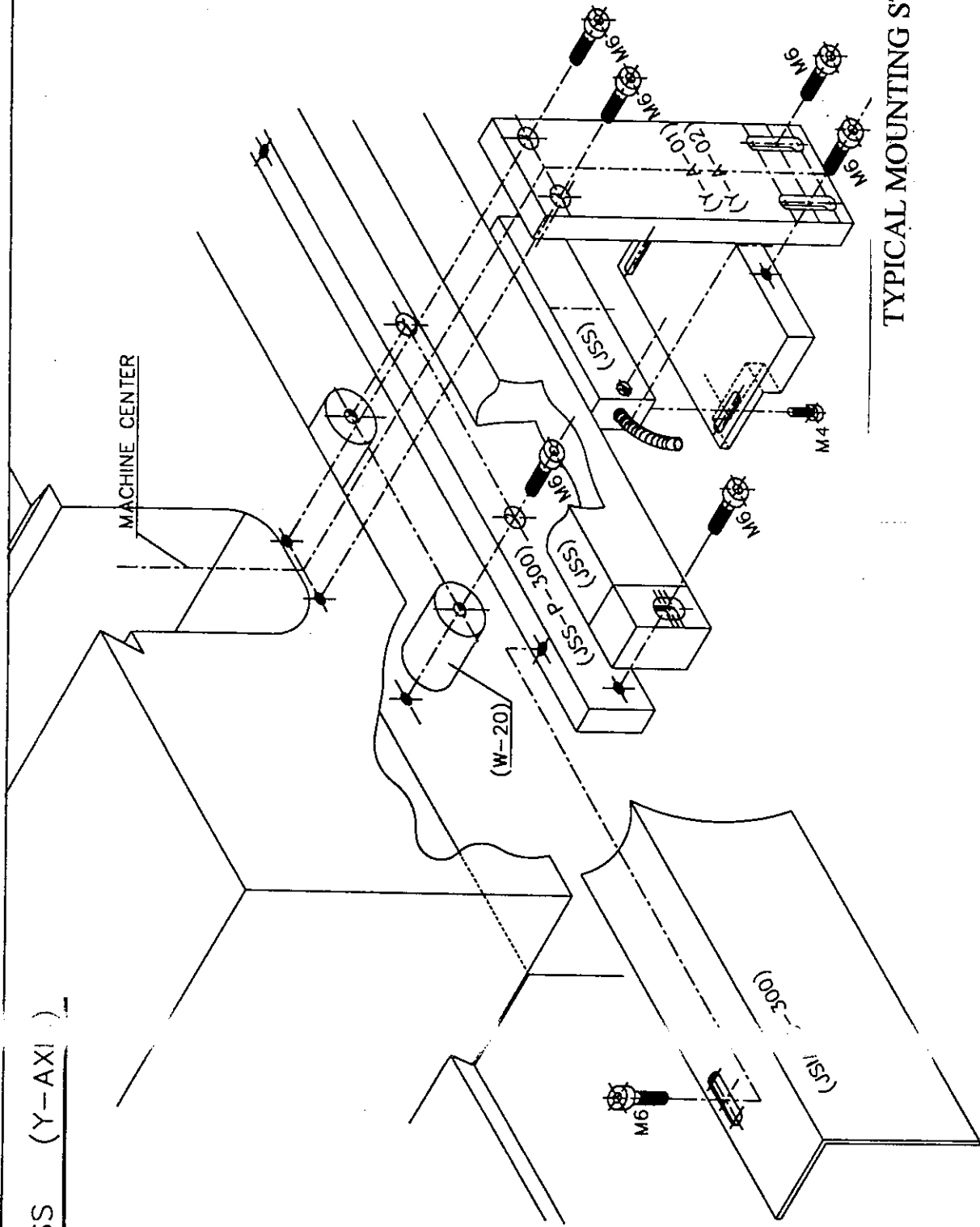
JSM-B (X-AXIS)  
(BACK)



TYPICAL MOUNTING STYLES

JSS (Y-AXI)

MACHINE CENTER



TYPICAL MOUNTING STYLES