INSTRUCTION MANUAL
for
DISPLAY UNIT

DU900 SERIES

SOKKI ELECTRONICS

CONTENTS

The DU902 and DU903 Display Units have been designed for use with lathes. The DU902 displays X and Z-axes, while the DU903 can accommodate X, Z_1 (tool slide) and Z_2 (carriage) axes. Six cutting tool offset values can be stored in the DU902 and DU903 Units.

1. FEATURES

† The radius or diameter of a workpiece can be displayed by changing the parameter switch settings. When the diameter is selected, a ϕ sign is shown on the display.

† Tool offset positions in the X and Z-axis directions can be stored on the 6 keys [T1]~[T6]. The offsets can be quickly recalled when the cutting tool is changed.

† The Z-axis shifting function allows the machining datum surface to be transferred to a new location on the Z-axis, while preserving the cutting tool offset values which have been set relative to it.

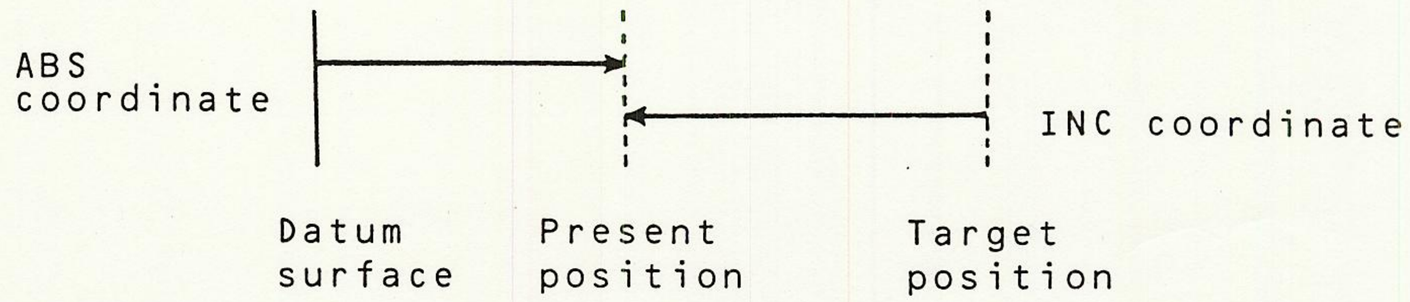
† Absolute zero point function
The datum surface can be defined and recalled at any time in combination with the Jiki Scales that have an absolute zero point (JS1, JS3 and JS5 series).

† High resolution
The DU900 series can display resolutions between 10 μm and 0.5 μm, depending on the required machining work. When the displayed value becomes zero, an audio tone sounds to warn the operator.

† Dual Z-axis ($Z_1 + Z_2$) summing function (DU903 only)
The Z sum ($Z_1 + Z_2$) or difference ($Z_2 - Z_1$) of the Z_1-axis (tool slide) and Z_2-axis (carriage) can be displayed. Therefore, the exact position of the cutting tool in the Z-axis (longitudinal) direction can be quickly determined.

† Choice of display modes

The absolute (ABS) coordinate mode displays the distance of the present position from a datum point. The incremental (INC) coordinate mode displays the distance of the present position from the target position.



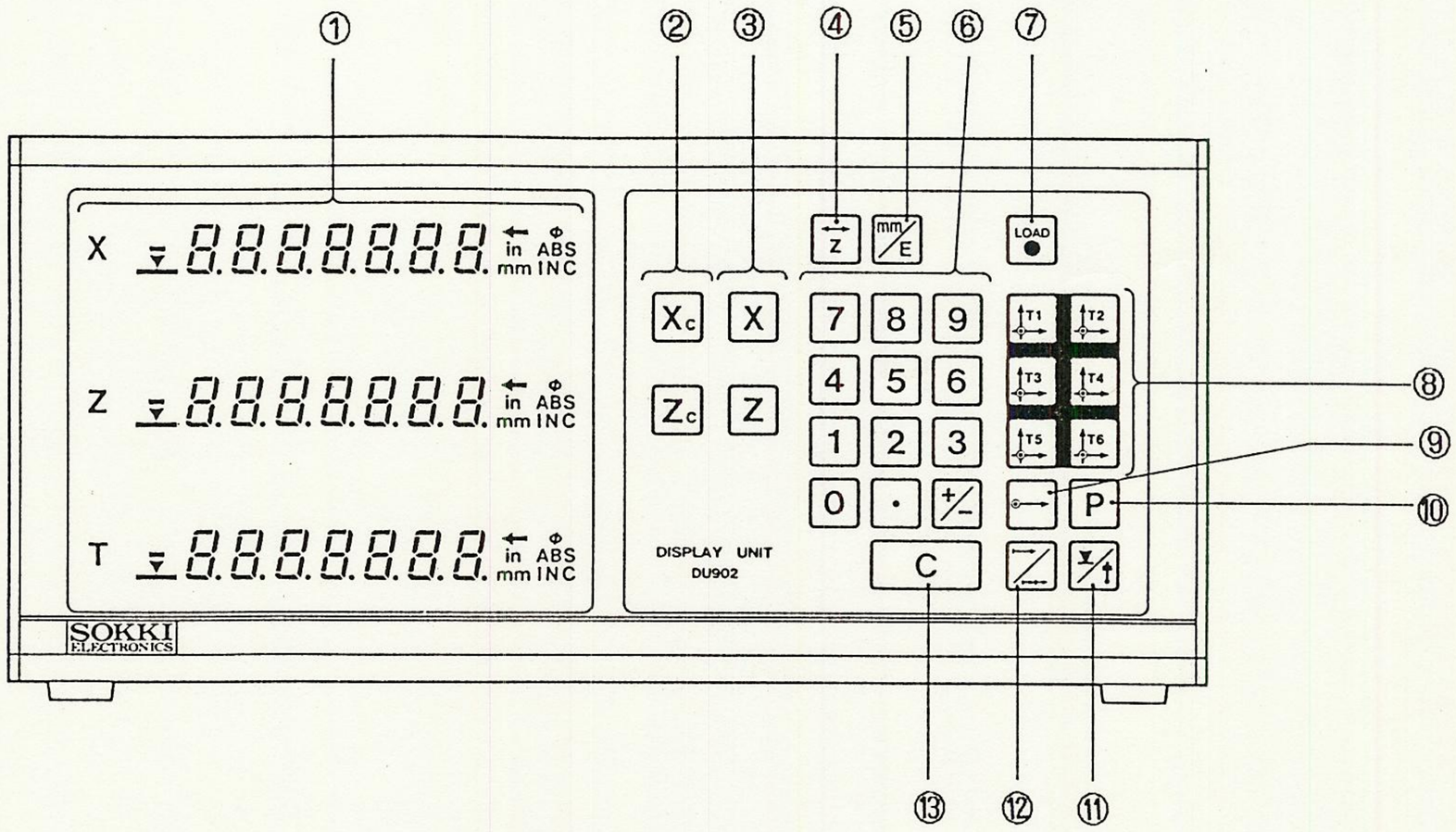
† Error messages

Error codes are displayed when the scale unit is moved faster than the response speed or when faults occur in the display unit.

2. NAMES AND FUNCTIONS OF PARTS

2.1 Front and Rear Panel of DU902

2.1.1 Front Panel of DU902



① X-axis display
Z-axis display
Tool offset No. display

② X and Z-axis reset keys
Clears display to reset the display to zero in the INC coordinate display. Can also be used to reset display just after power is turned on.

③ Axis select keys
Selects X or Z-axes.

④ Z-axis shifting key
Transfers the position of the machining datum surface to a new location on the Z-axis, while preserving the cutting tool offset positions which have been set relative to it.

⑤ mm/inch selector key
Selects millimeters or inches as the measurement unit and converts mm to inches.

⑥ Numeral setting keys
Enters the numerical values for positionings.

⑦ LOAD lamp

Flashes when the LOAD function using the absolute zero point is being used.

⑧ Cutting tool offset keys [T1]～[T6]

Used to store up to 6 tool offset values for individual cutting tools.

⑨ ABS positioning key

Used to set the position in relation to the zero point of the ABS coordinate display.

⑩ Preset key

Used when presetting values on the selected axis and to set the position in relation to the present point.

⑪ Zero point loading key

Used to determine the machining datum surface with respect to the absolute zero point of the scale.

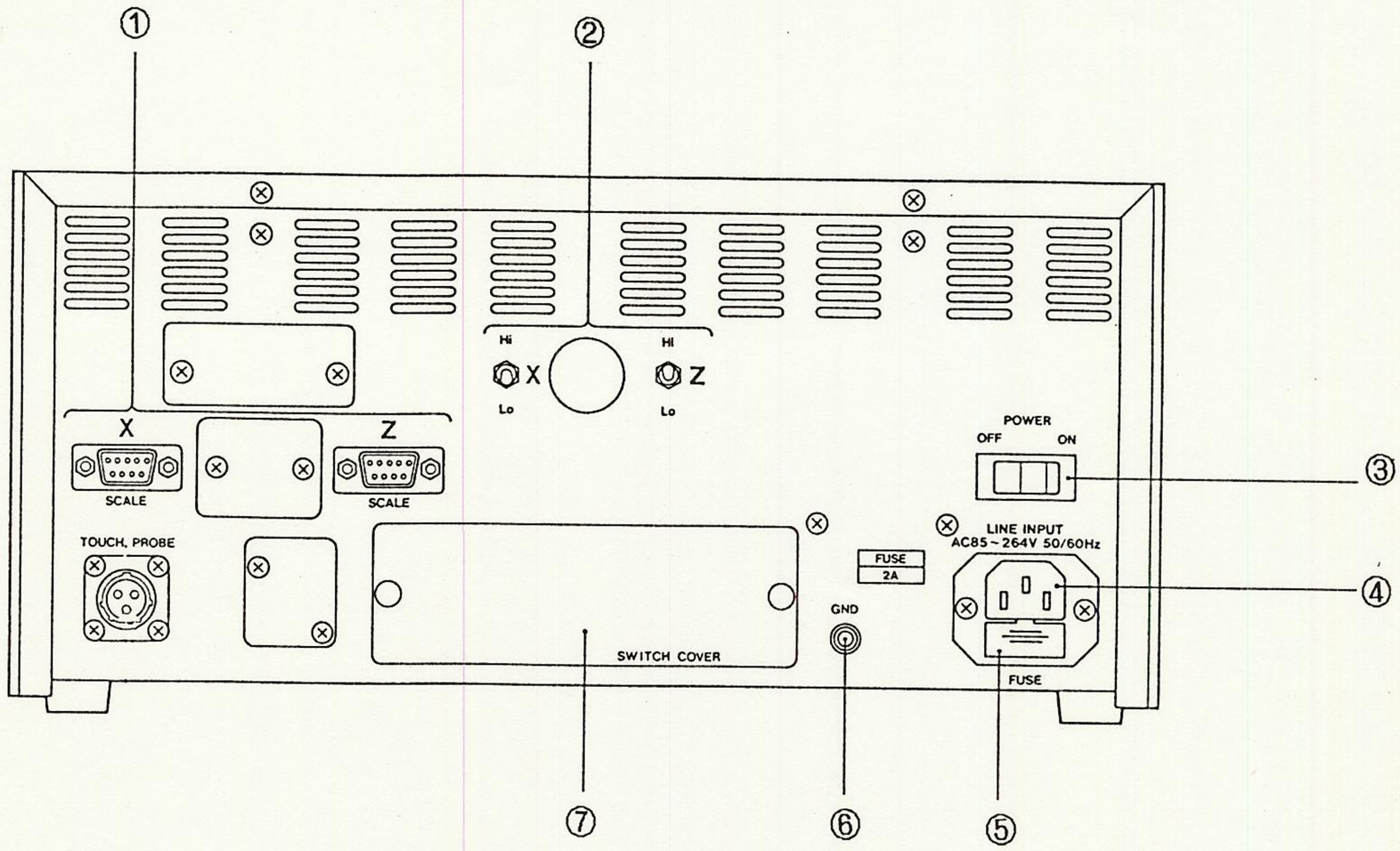
⑫ ABS/INC Mode selector key

Used when checking the absolute value on the selected axis.

⑬ Clear key

Clears entry of numerals and functions.

2.1.2 Rear Panel of DU902



① X and Z-axis scale input connectors

Connection for X and Z-axis scales.

② Display resolution selector switch

When the internal parameter switches SW5-1 (X-axis) or SW9-1 (Z-axis) are set to OFF, the display resolution can be made either Hi (0.5 μm/5 μm) or Lo (1 μm/10 μm). (The factory setting of the switches prior to shipment are all OFF.

Hi 0.5 μm/5 μm

Lo 1 μm/10 μm

(either 0.5 μ/1 μm or 5 μm/10 μm display resolution can be selected using the internal parameter switch SW18.)

③ Power switch

④ Line input

⑤ Midget fuse 19195-2A (250V AC, 2A)

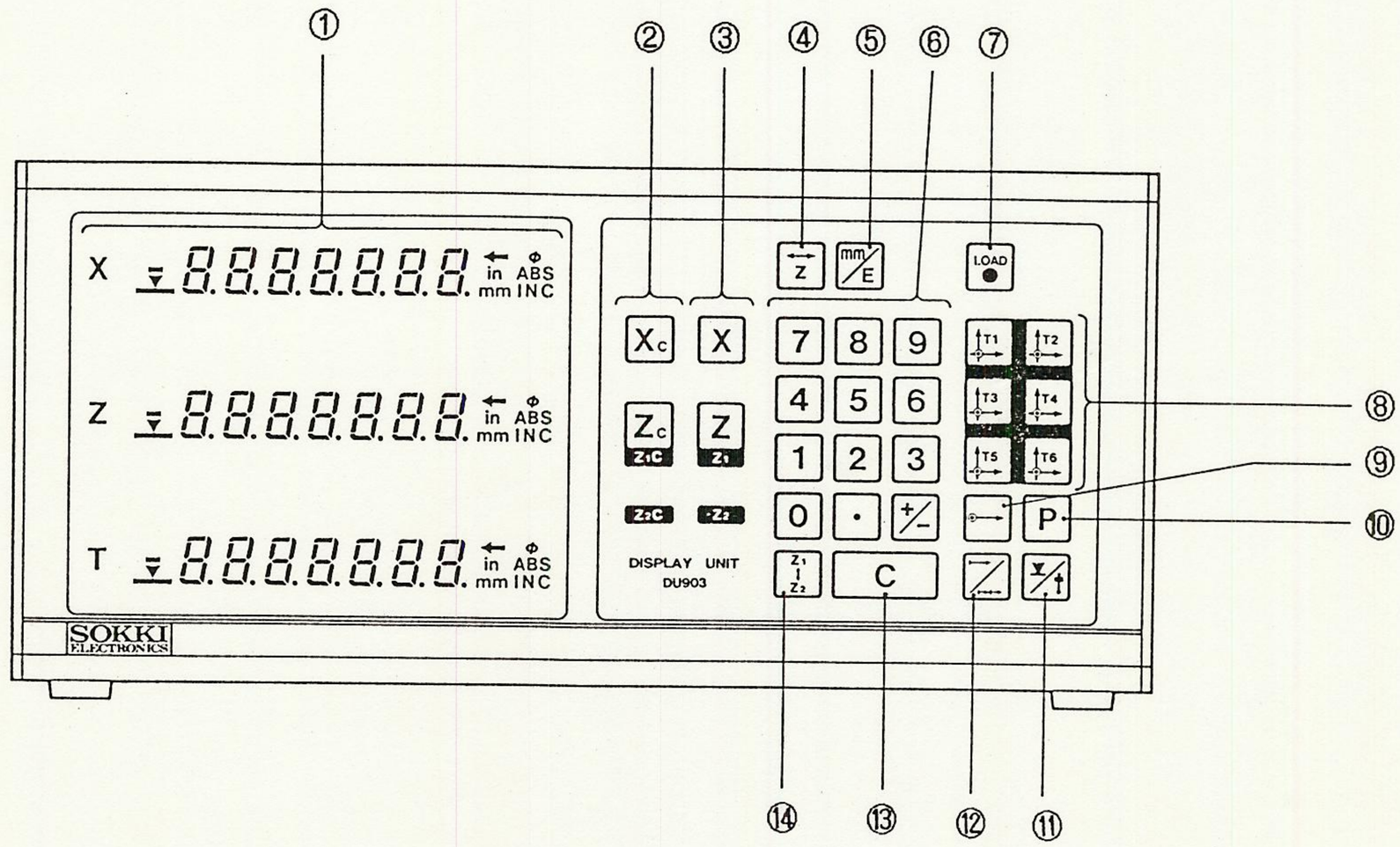
⑥ Ground terminal

⑦ Parameter switch cover

Remove to set parameter switches for various modes.

2.2 Front and Rear Panel of DU903

2.2.1 Front Panel of DU903



① X-axis display
Z-axis display (Z_1-axis display)
Tool offset No. display (Z_2-axis display)

② X, Z, Z_1 and Z_2-axis reset keys
Clears display to reset the display to zero in the INC coordinate display. Can also be used to reset display just after power is turned on.

③ Axis select keys
Selects X, Z, Z_1 or Z_2-axes.

④ Z-axis shifting key
Transfers the position of the machining datum surface to a new location on the Z-axis, while preserving the cutting tool offset positions which have been set relative to it.

⑤ mm/in selector key
Selects millimeters or inches as the measurement unit and converts mm to inches.

⑥ Numeral setting keys
Enters the numerical values for positionings.

⑦ LOAD Lamp

Flashes when the LOAD function using the absolute zero point is being used.

⑧ Cutting tool offset keys [T1]~[T6]

Used to store up to 6 tool offset values for individual cutting tools.

⑨ ABS positioning key

Used to set the position in relation to the zero point of the ABS coordinate display.

⑩ Preset key

Used when presetting values on the selected axis and to set the position in relation to the present point.

⑪ Zero point loading key

Used to determine the standard point with respect to the absolute zero point of the scale.

⑫ ABS/INC mode selector key

Used when checking the absolute value on the selected axis.

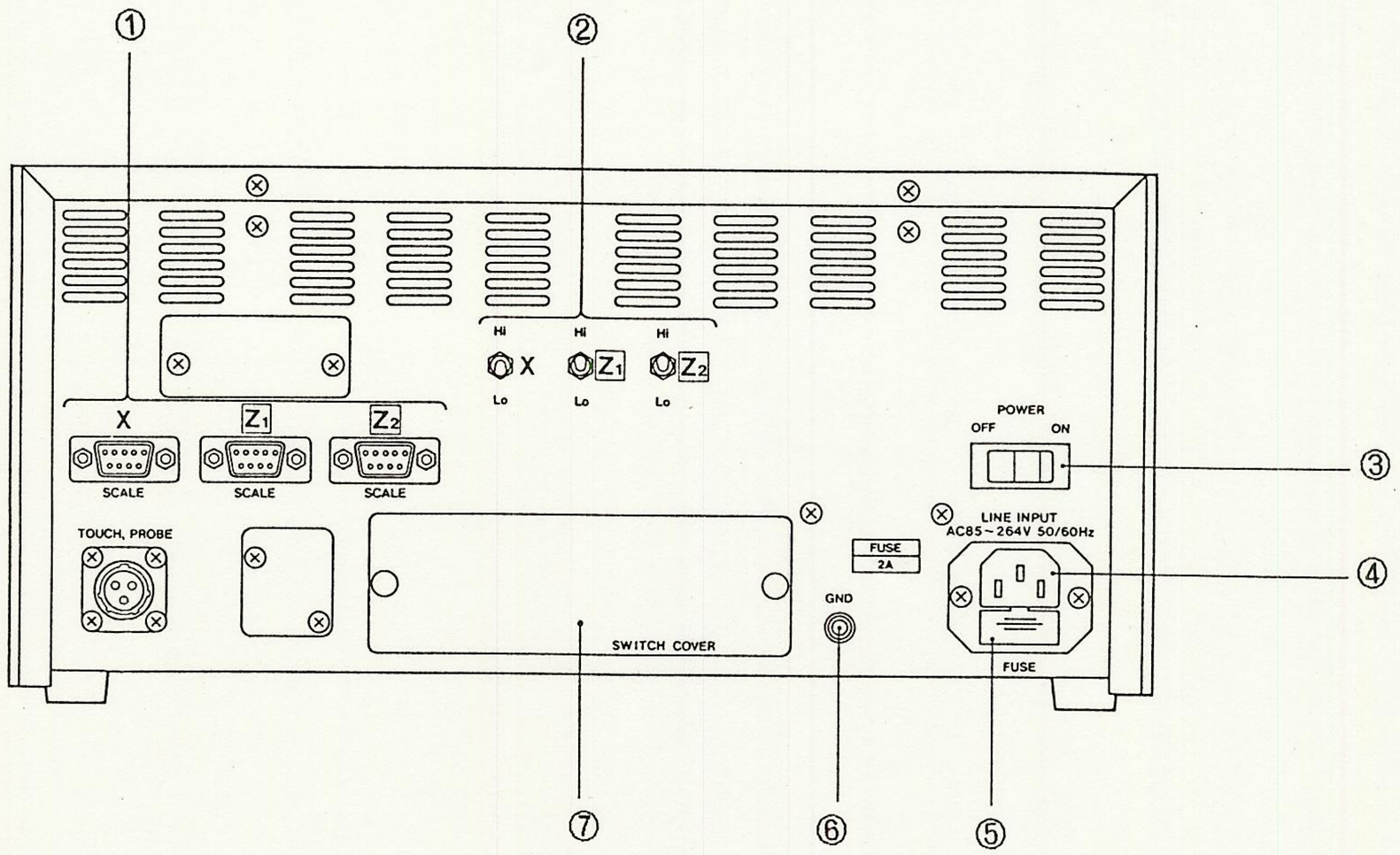
⑬ Clear key

Clears entry of numerals and functions.

⑭ Z-axis (Z_1 , Z_2) separation key

Used to separate the Z-axis display into its two components, Z_1 (tool slide) and Z_2 (carriage), which are displayed on the Z and T displays respectively.

2.2.2 Rear Panel of DU903



① X, Z_1 and Z_2-axis scale input connectors
Connection for X, Z_1 (tool slide) and Z_2 (carriage)-axis scales.

② Display resolution selector switch
When the internal parameter switches SW5-1 (X-axis), SW9-1 (Z_1-axis) or SW13-1 (Z_2-axis) are set to OFF, the axis display resolution can be made either Hi (0.5 μm/5 μm) or Lo (1 μm/10μm). (Factory setting of the switches prior to shipment are all OFF.)

Hi 0.5 μm/5 μm

Lo 1 μm/10μm

(Either 0.5 μm/1 μm or 5μm/10μm display resolution can be selected by setting the internal parameter switch SW18.)

③ Power switch

④ Line input

⑤ Fuse holder
Midget fuse 19195-2A (250V AC, 2A)

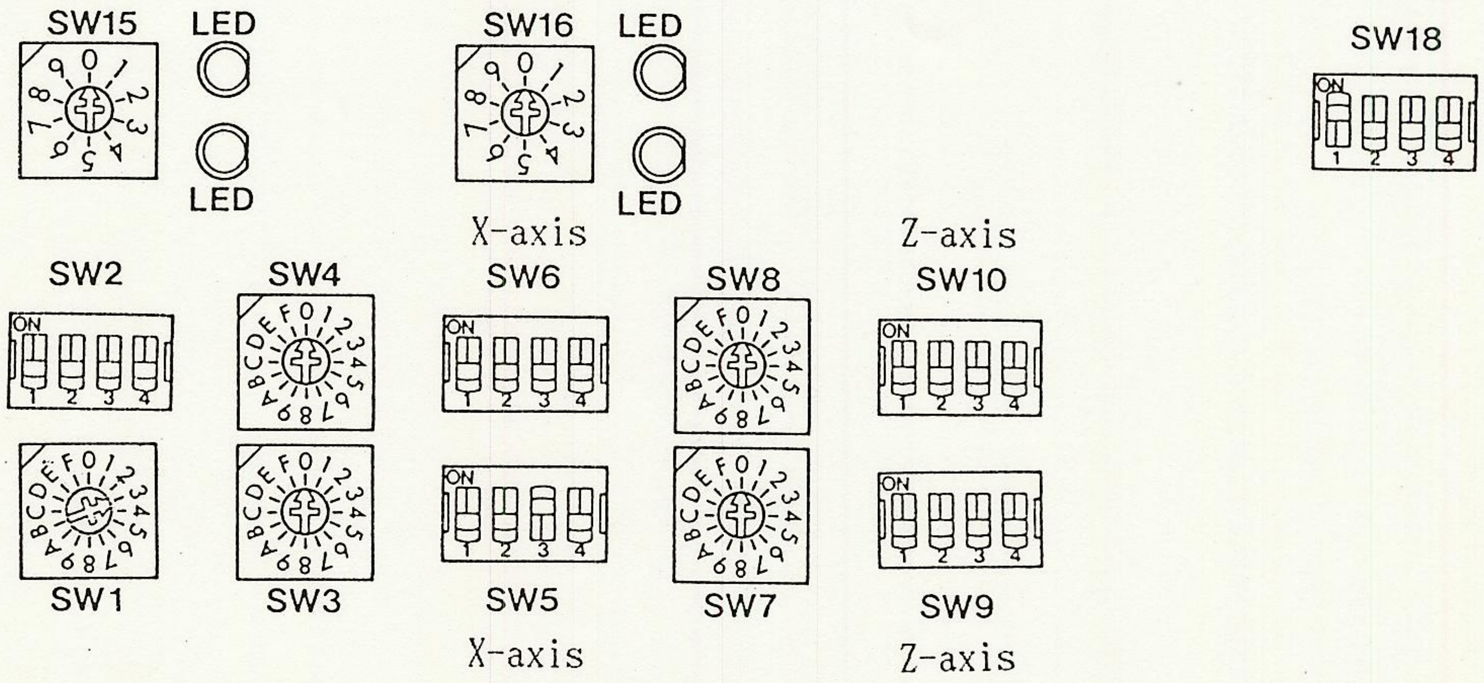
⑥ Ground terminal

⑦ Switch cover
Remove to set parameter switches for various modes.

2.3 Parameter Switches DU902 / DU903

The parameter switches can be seen when the switch cover ⑧ on the rear panel is removed.
These switches are used to set the axis display resolution, polarity and zero point detecting directions in the Display Units.
Note: Before changing switch settings, turn the power off.

2.3.1 Parameter Switches for the DU902



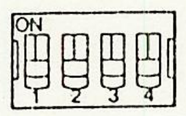
SW1: Not used

SW2: Selection of mm or inches.

SW2	Function	ON	OFF
1	mm/in conversion switch	mm/in key can be used.	mm only
2	LOAD function	———	Zero point
3	not used	———	not used
4	set to OFF	———	OFF

<Factory setting>

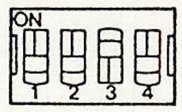
SW2



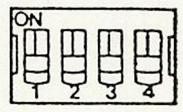
SW5: } Selection of { X-axis / Z-axis } resolution, sign and diameter display.
SW9: }

SW5 and SW9	OFF	ON
1 (Display resolution)	Outer	Low
2 (Display sign)	+	−
3 (Display diameter)	×1	×2
4 (Traveling direction of ABS zero point)	+	−

<Factory settings>

SW5 

X

SW9 

Z

Notes:

① Low: 10μm or 1μm is set with the internal switch SW18. The outer resolution selector switch is not used.

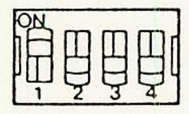
② Outer: Display resolution selectable with the outer resolution selector switch.

SW15 and SW16: Adjustment switches for the X and Z-axis absolute zero points. (for details, see 3.3)

SW18: Display resolution selection.

SW18	5μm/10μm	0.5μm/1μm
1 (X-axis)	OFF	ON
2 (Z-axis)	OFF	ON
3 (Not used)	OFF	
4 (Not used)	OFF	

<Factory setting>

SW18 

Notes:

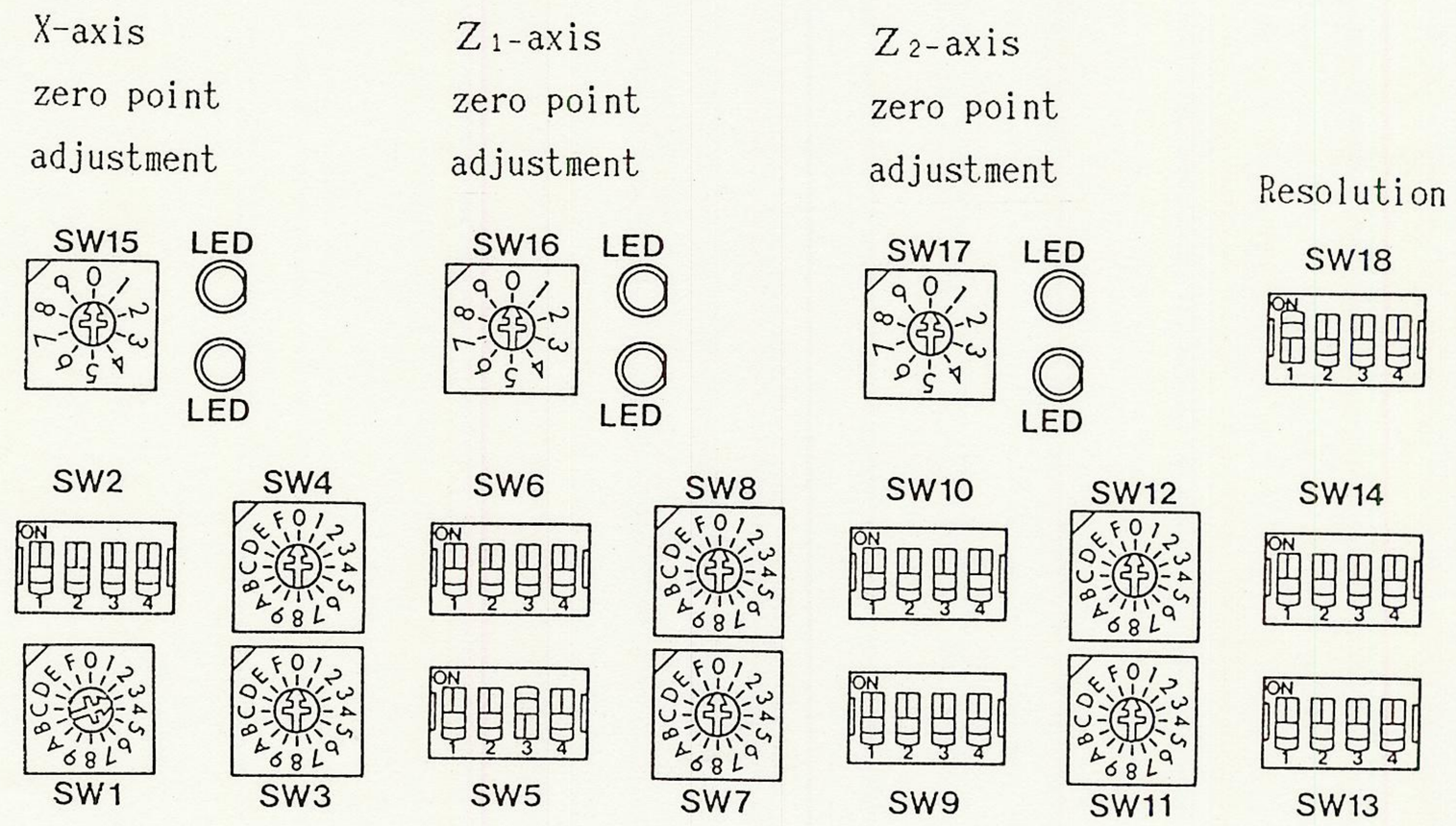
① Polarity: The traveling direction of the scale and the + or - sign of the display unit can be matched.

② Diameter: Double the actual traveling distance can be displayed.

③ Zero point direction: The traveling direction for zero point detection can be changed.

Note: Adjust the zero point of the scale after changing the zero point detecting direction.

2.3.2 Parameter Switches for the DU903



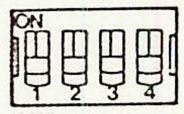
SW1: Not used

SW2: Selection of mm or inches
Display Z-axis sum ($Z_1 + Z_2$) or difference ($Z_2 - Z_1$).

SW2	Function	ON	OFF
1	mm/in conversion switch	mm/in key can be used.	mm only
2	LOAD function		Zero point
3	Z-axis function	Difference ($Z_2 - Z_1$)	Sum ($Z_1 + Z_2$)
4	OFF position fixed		OFF position fixed

<Factory setting>

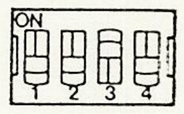
SW2

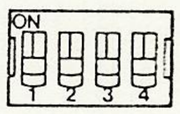


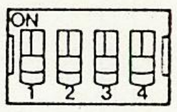
SW5: }
SW9: } Selection of {X-axis, Z_1-axis, Z_2-axis} resolution, sign and diameter display.
SW13: }

SW5, SW9 and SW13	OFF	ON
1 (Display resolution)	Outer	Low
2 (Display sign)	+	−
3 (Display diameter)	×1	×2
4 (Traveling direction of ABS zero point)	+	−

<Factory settings>

SW5  X

SW9  Z_1

SW13  Z_2

Notes:

① Low: 10μm or 1μm is set with the internal switch SW18.
The outer resolution selector switch ③ is not used.

② Outer: Display resolution selectable with the outer resolution selector switch ③.

SW15: X-axis
SW16: Z_1-axis
SW17: Z_2-axis
} adjustment switches for the absolute zero point. (for details, see 3.3)

SW18: Display resolution selection.

SW18	5 μm/10 μm	0.5 μm/1 μm
1 (X-axis)	OFF	ON
2 (Z_1-axis)	OFF	ON
3 (Z_2-axis)	OFF	
4 (Not used)	OFF	

<Factory setting>

SW18

Notes:

① Polarity: The traveling direction of the scale and the + or - sign of the display unit can be matched.

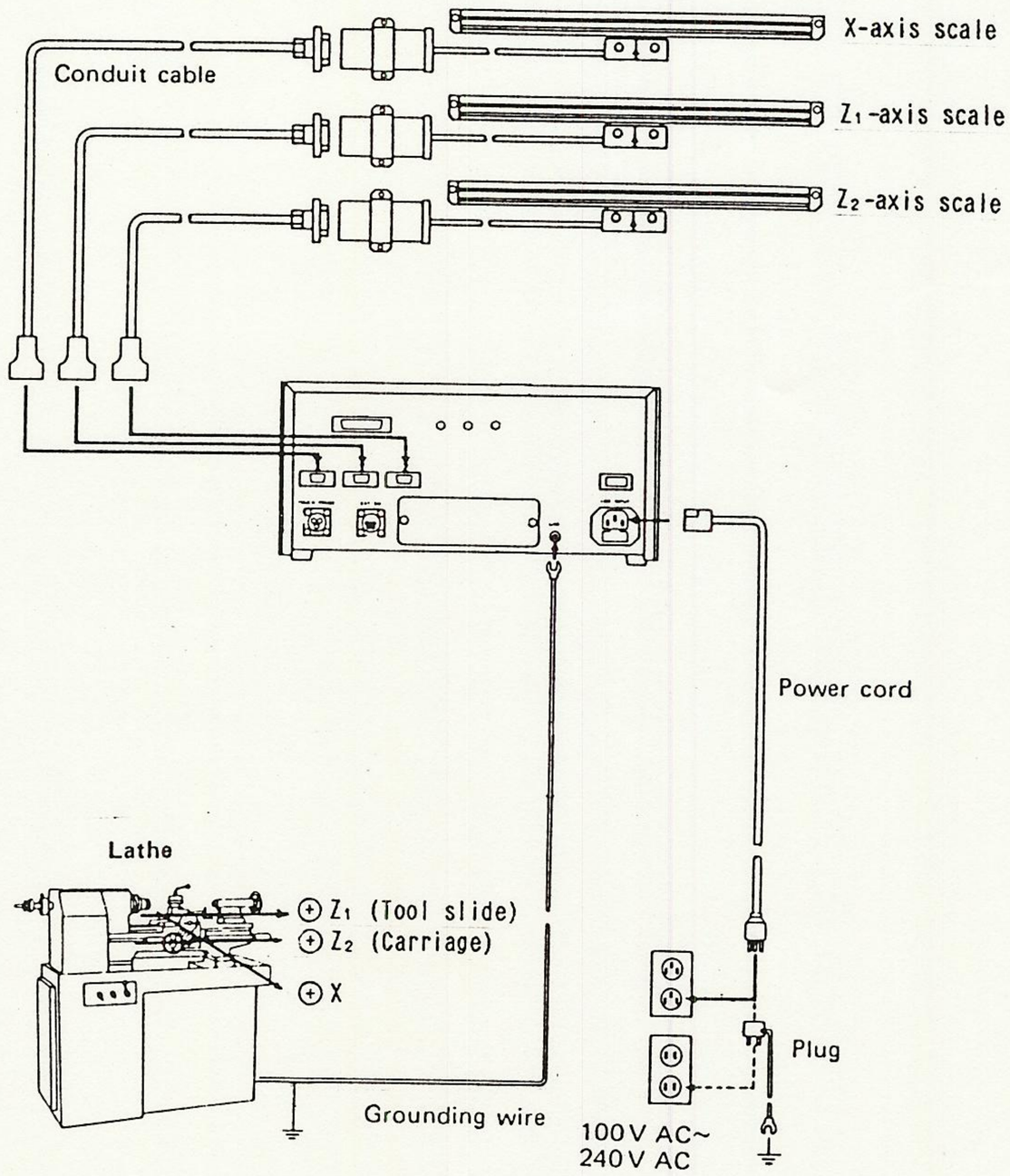
② Diameter: Double the actual traveling distance can be displayed.

③ Zero point direction: The traveling direction for zero point detection can be changed.

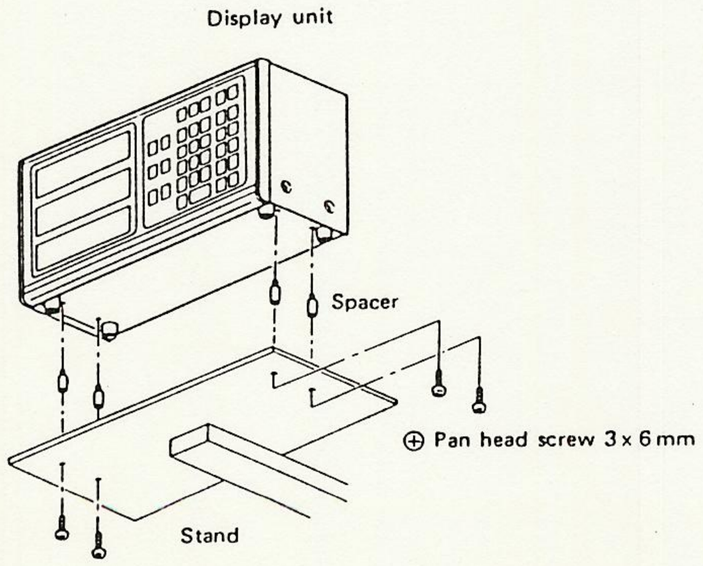
Note: Adjust the zero point of the scale after changing the zero point detecting direction.

3. INSTALLATION

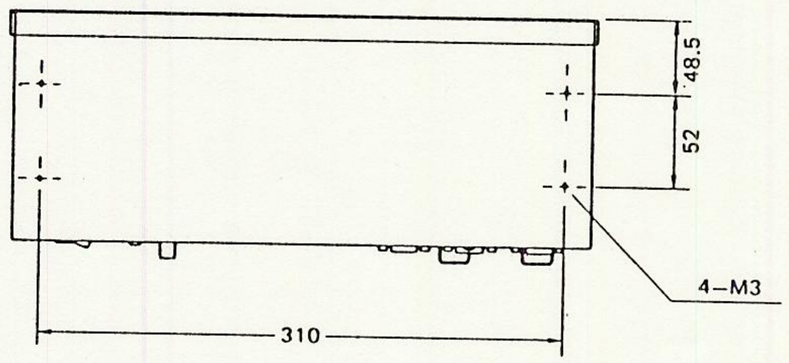
3.1 Connection Diagram



* Mount the DU902/DU903 on the stand with the screws provided.



Dimensions of mounting holes on display unit (Unit: mm)



3.2 Precautions for Installation

1) Use a power supply in the range of 100V to 240V AC (+10% to -15%), 50/60Hz. Never use a higher voltage.

2) Connect the conduit cable to the connector of the specified axis on the display unit.

3) Connect the ground terminal of the DU902/DU903 to the machine tool using the attached grounding wire (The machine tool should also be grounded).

4) Install the signal and unit power cables away from the machine power cable.

5) Install the DU902/DU903 away from coolant and swarf sources.

6) Maintain the ambient temperature in the range of 0℃ to 45℃. Do not expose to radiation from direct sunlight or other heat sources.

3.3 Adjustment of the Absolute Zero Point

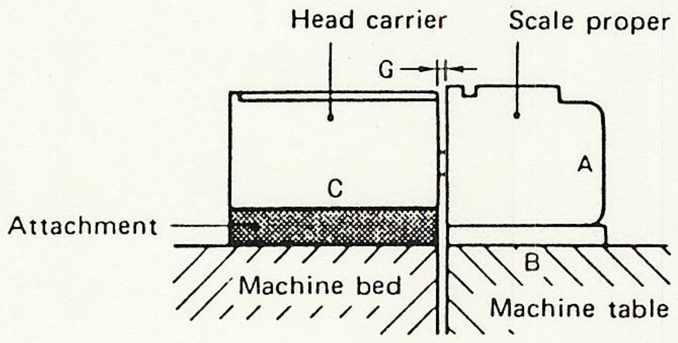
The Jiki Scales "JS1 series", "JS3 series" and "JS5 series" are provided with an absolute zero point. By using the absolute zero point detecting function, the datum point can be defined and recalled at any time in combination with the DU900 series Display Unit and the Jiki Scales. Check and adjust the absolute zero point as follows after mounting the display unit and scales on the machine.

3.3.1 Confirmation of Jiki Scales Setting Accuracy

1) To detect the absolute zero point, the Scale must be mounted correctly to the machine.

<Mounting accuracy>

Make sure that the parallelism of each surface is within the following limits before absolute zero point adjustment.



A: Scale measuring surface
B: Scale mounting surface
C: Head carrier mounting surface
G: Gap between scale proper and head carrier

A·B	within 0.1mm
C	within 0.1mm
Parallelism of B and C	within 0.1mm
Space between B and C	7 ±0.1mm (JS1), 15±0.1mm (JS3, JS5)
G	2.5 ± 0.1mm

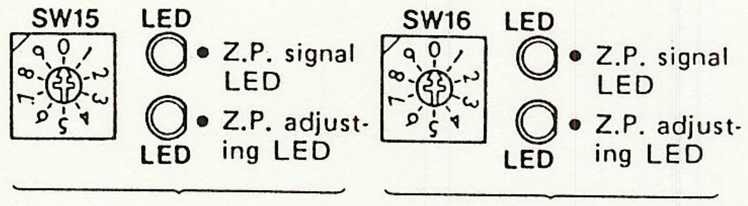
2) If the gap (G) is not 2.5 ± 0.1mm, insert the thickness gauge between the scale proper and the head carrier near the absolute zero point mark and adjust the gap using the mounting screws of the head carrier.

3.3.2 Adjustment

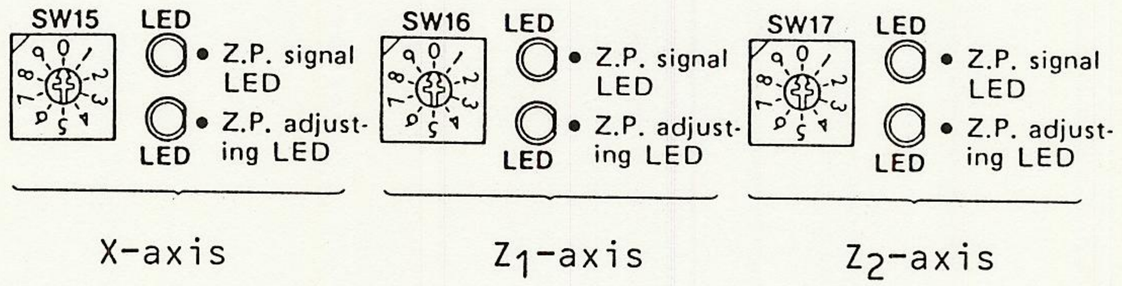
1) Remove the parameter switch cover.

2) There is a zero point signal LED and a zero point adjusting LED to the right of each axis absolute zero point adjustment switch.

<DU902>

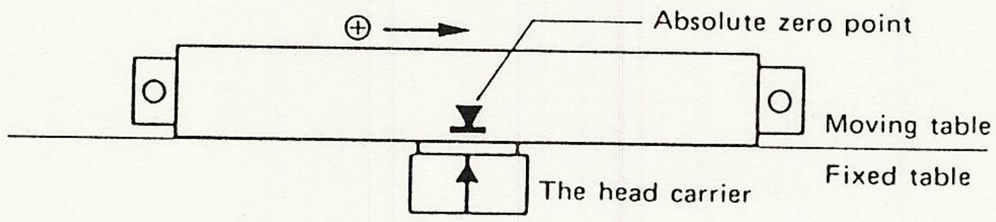


<DU903>



3) The absolute zero point is detected when the head carrier passes over the zero point while the scale is being moved in one direction. Check the directional switch settings (SW5-4, SW9-4 and SW13-4). Either the + or - direction can be set using these parameter switches. (Factory setting is +.)

Note: Before changing the switch setting, turn the power OFF.
Re-adjust the absolute zero point after changing the direction.



4) After turning the power ON, move the scale unit in the direction determined in the above section to pass the zero point. When the moving speed is less than 1.9m/min. in the resolution of 0.5μm/1μm (or 3.5m/min. in the resolution of 5μm/10μm), the zero point signal LED comes on at the moment the head carrier passes the absolute zero point.

5) If the zero point adjusting LED does not come on, turn the zero point adjusting switch one point clockwise.

6) Repeat again from step 4).

The zero point adjusting switch can be adjusted on a position of 0 to 7 points.

3.4 Review of Parameter Switch Settings

Just after turning on the power switch, the setting of the parameter switches can be displayed using the [C] key as follows.

Power → Initial display

↓

→[C] X SW3 SW4 SW6-1 SW6-2 SW6-3 SW6-4

Z (Z_1) SW7 SW8 SW10-1 SW10-2 SW10-3 SW10-4

(Z_2) SW11 SW12 SW14-1 SW14-2 SW14-3 SW14-4

SW3, 4, 7, 8, 11, 12 ····· 0 to F

SW6, 10, 14 ····· 0 or 1 (0: OFF, 1: ON)

↓

[C] X SW1 SW2-1 SW2-2 SW2-3 SW2-4

Z (Z_1) SW1 SW2-1 SW2-2 SW2-3 SW2-4

(Z_2) SW1 SW2-1 SW2-2 SW2-3 SW2-4

SW1 ····· 0 to F

SW2 ····· 0 or 1 (0: OFF, 1: ON)

↓

[C] X SW5-1 SW5-2 SW5-3 SW5-4 SW18-1

Z (Z_1) SW9-1 SW9-2 SW9-3 SW9-4 SW18-2

(Z_2) SW13-1 SW13-2 SW13-3 SW13-4 SW18-3

SW5, 9, 13, 18 ····· 0 or 1 (0: OFF, 1: ON)

↓

[C] X F F — F F F F

Z (Z_1) F F — F F F F

(Z_2) F F — F F F F

F ····· 0 to F or space (Service number)

↓

[Xd], [Zd]

4. BASIC OPERATION

4.1 Power-On and Display Clearing

1) Switch on. After all the segments light up, the display is shown as follows:

X . . . . . .mm
Z . . . . . .mm
T . . . . . .mm

2) Press [Xc] and [Zc] to clear the display. The display shows the value prior to the power-off operation.

<Example>

X 12.345 mm ABS ø
Z 67.890 mm ABS
T No.1

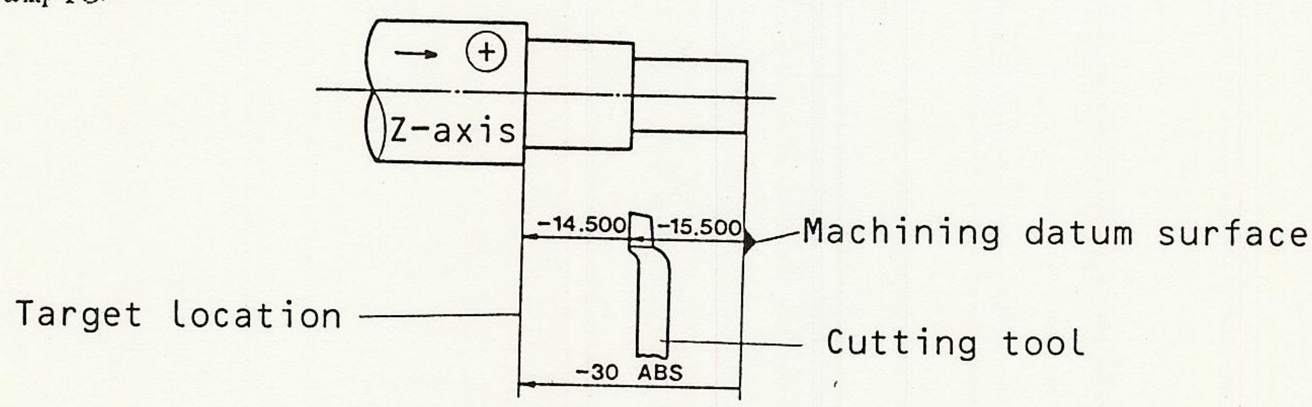
3) To clear the previous values, press [Xc] or [Zc]

X 0.000 mm INC ø
Z 0.000 mm INC

4.2 Absolute Positioning Operation [ABS]

The absolute positioning key is used for positioning the dimensions from the datum surface to the target point.
Once the datum surface has been set, it is possible to obtain accurate target positionings without depending on the tool's current position and the error of the previous target positioning.
After setting the target points, the displays are in the INC coordinate mode. The ABS coordinate value from the datum surface to the present position can be confirmed by changing the display mode by pressing the [X] (or [Z]) and [Z] keys.

<Example>



<e.g.> On completion of the first part of a machining operation, the Z-axis display shows -15.500 mm ABS.

<Display>

X
Z — 15.500 mm ABS
T No.1 ····· Tool offset number
(for details, see 4.5)

Enter the next target point value, -30mm, using the ABS positioning key.

<Operation>

[Z][±][3][0][ABS]

<Display>

X
Z 14.500 mm INC ··· Distance to the target location
T No.1 from the current location.

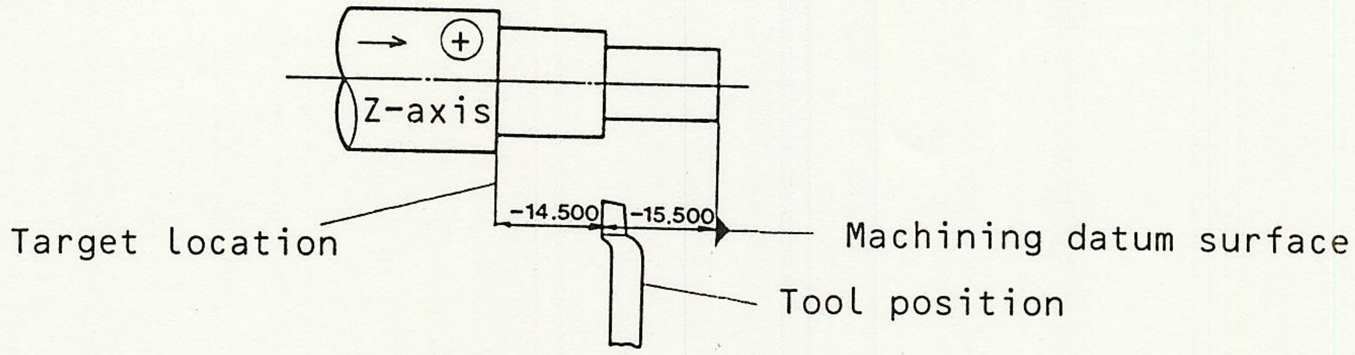
Move the Z-axis until the display shows 0.

Note: An audio tone sounds just before 0 is displayed.

4.3 Preset Positioning Operation [P]

The preset positioning key is used for positioning of the distance from the present cutting tool location to the target location. In preset positioning, the keyed-in value is displayed as you entered it, therefore enter the distance from the target location to the present location (negative value from the present location to the target location).

<Example>



<e.g.> On completion of the first part of a machining operation, the Z-axis display shows -15.500mm$_{ABS}$.

<Display>

X

Z −15.500 mm$_{ABS}$

T No.1 ..... Tool offset number

Enter the dimension from the present location to the target location using the preset key [P].

<Operation>

[Z][1][4][·][5][P]

<Display>

X

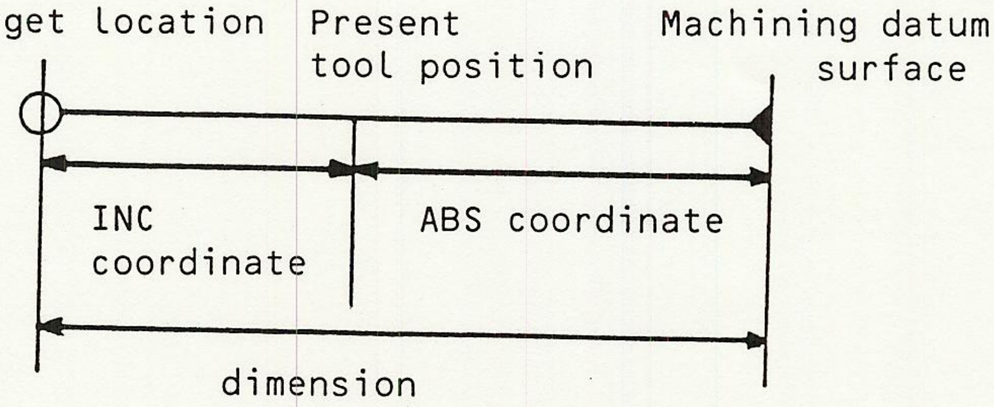
Z 14.500 mm$_{INC}$

T No.1

Then, move the Z-axis until the display shows 0 to position the cutting tool.

Note: In preset positioning, errors in the cutting tool position are carried on to the next position. However, this is often preferred, because it ensures an accurate span between the present and target position.
In contrast, absolute positioning always shows the value measured from the datum surface, and errors are not carried forward.

4.4 ABS/INC Conversion [Z]



- The distance between the machining datum surface and the target location is generally described as the "dimension" which is shown in the machining drawing.
- A target location can be set using the [⊷] or [P] keys.
- Switching between the ABS coordinate display and the INC coordinate display is accomplished using the keys [X] and [Z] for the X-axis ([Z] and [Z] for the Z-axis).When a machining is carried out using the preset positioning key [P] or the absolute positioning key [⊷], press [Z] to display the distance between the datum surface and the present tool position.

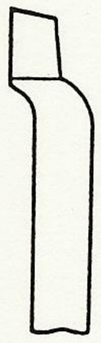
<e.g.>

①	The present tool position.(INC value)	X	0.000 ϕ_{INC}
②	Press [X] and [Z].		⇩
③	ABS coordinate is displayed.	X	−30.000 ϕ_{ABS}
④	Press [X] and [Z] again.		⇩
	(The value returns the initial INC value)	X	0.000 ϕ_{INC}

4.5 Cutting Tool Offset Keys [T1]~[T6]

Because different cutting tools may be used to machine a workpiece, it is necessary to apply the offsets from the tool cutting positions to the Z-axis datum surface and the X-axis rotation centre of the lathe. The cutting tool offset keys [T1]~[T6] are used to store the offset values for each cutting tool and are used to apply the offsets when a cutting tool is changed.

4.5.1 Entry of Cutting Tool Offset Values



A: Offset tool

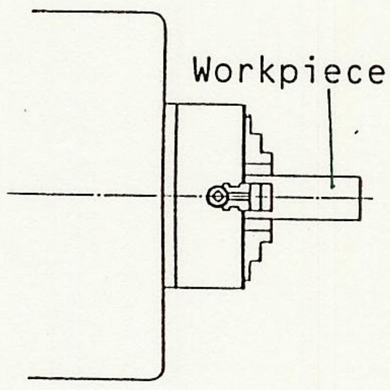
B: Grooving tool

C: Cutting-off tool

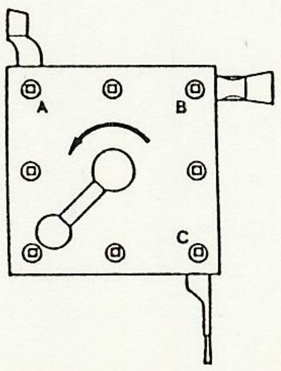
Cutting tool { A: for outer diameter machining
B: for groove machining
C: for cut-off machining

1) A micrometer is required.

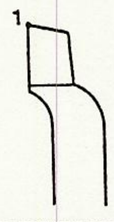
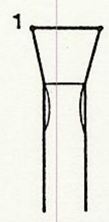
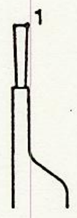
2) Mount the first workpiece in the lathe.



3) Attach the three cutting tools to the tool rest. The tool rest can be turned to select the required tool.



4) Cutting tool offset points.

Cutting tool	Offset point	Offset key
A		1 offset point set to key T_1
B		1 offset point set to key T_2
C		1 offset point set to key T_3

5) Switch on the power in the display unit and make sure that the display shows as follows:

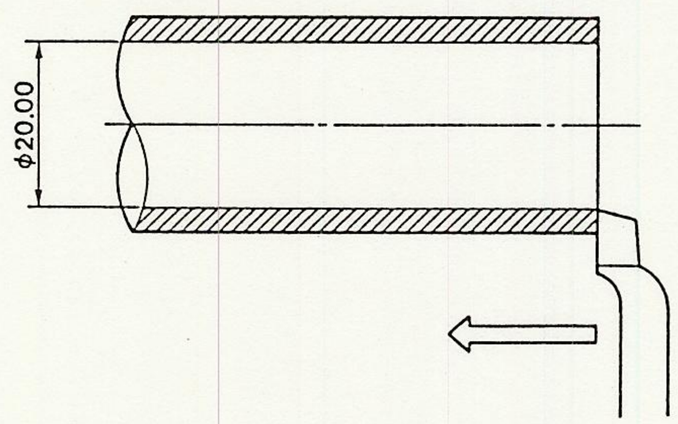
X . . . . . mm

Z . . . . . mm

T . . . . . mm

6)ⓐ Offset of cutting tool A

① Machine the diameter of the first workpiece with the cutting tool and leave the tool in position.



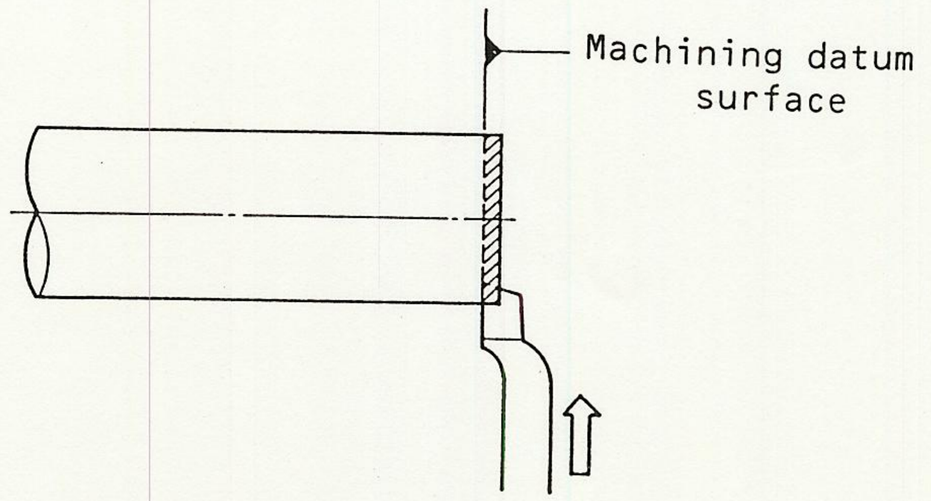
② Measure the workpiece diameter with the micrometer.

<e.g.> φ20mm

③ Enter the measured value as follows:

X 2 0 T;

④ Move the cutting tool A to machine the first workpiece in the Z-axis direction to produce the machining datum surface and leave the tool in this position.



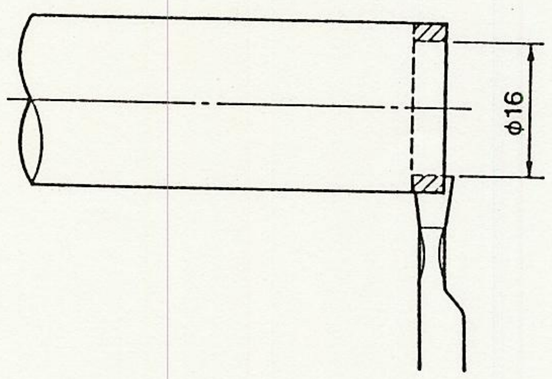
⑤ Enter the value as follows:

Z 0 T;

ⓑ Offset of cutting tool B

① Turn the tool rest to select cutting tool B.

② Machine the workpiece to the required X-axis value with cutting tool B and leave the tool in position.



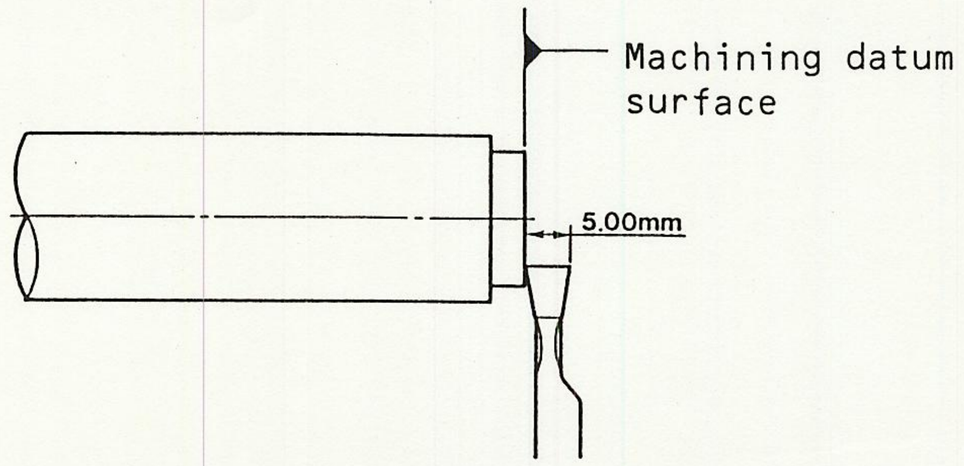
③ Measure the diameter with the micrometer.

<e.g.> φ 1 6 mm

④ Enter the measured value as follows:

X 1 6 T2

⑤ Move the cutting tool B until it touches the Z-axis machining datum point.



⑥ Press Z 0 T2.

The offset for cutting tool B has now been set to T2.

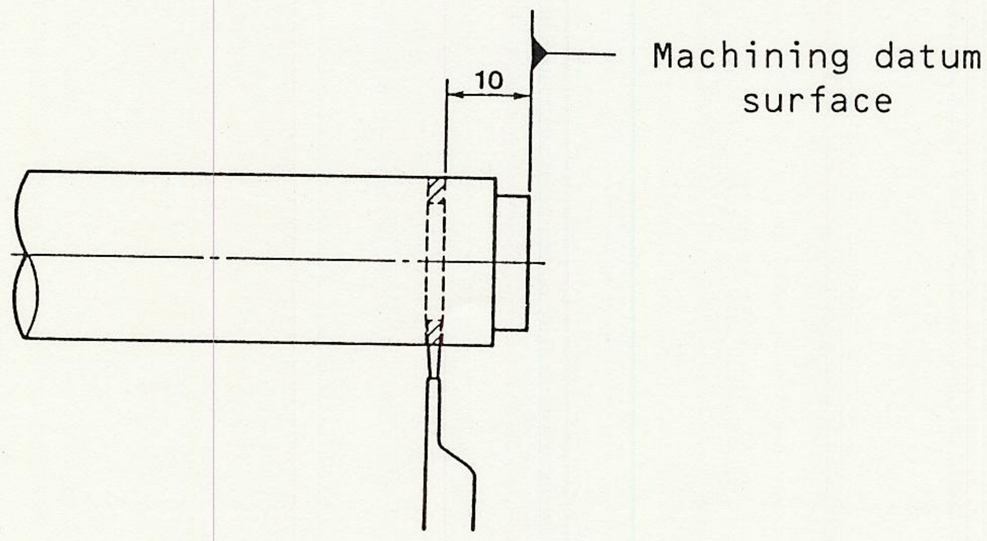
Measure the width of the cutting tool B with the micrometer.

(e.g. 5mm)

ⓒ Offset of cutting tool C

① Turn the tool rest to select cutting tool C.

Cut into the workpiece, then measure the distance between the cutting edge and the machining datum surface with the micrometer.



② Enter the measured value as follows:

<e.g.> Distance= −10mm

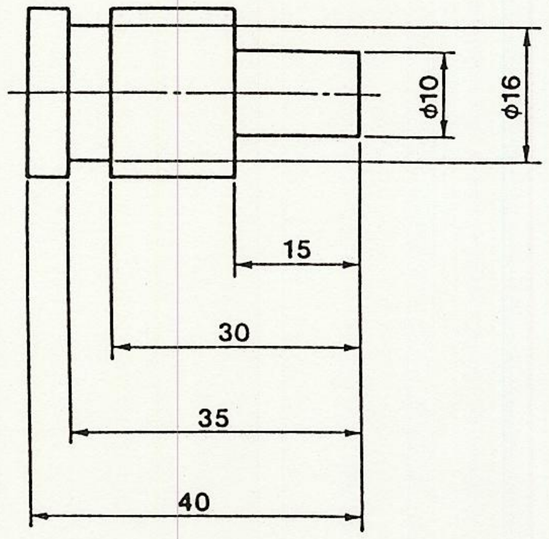
Z ± 1 0 T3

Note: Dimensions shown to the left of the machining datum surface should be input as negative values.

The offset for cutting tool C has now been set to T3.

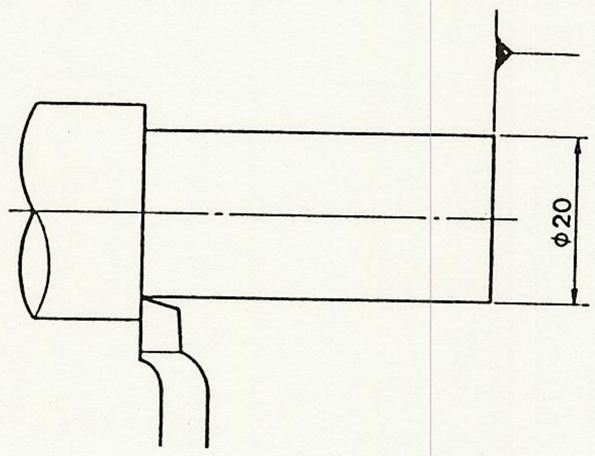
4.6 Example of Machining Operation

Using the cutting tools A, B and C and the offset keys T1~T3, machine the workpiece below.



4.6.1 Cutting Tool A

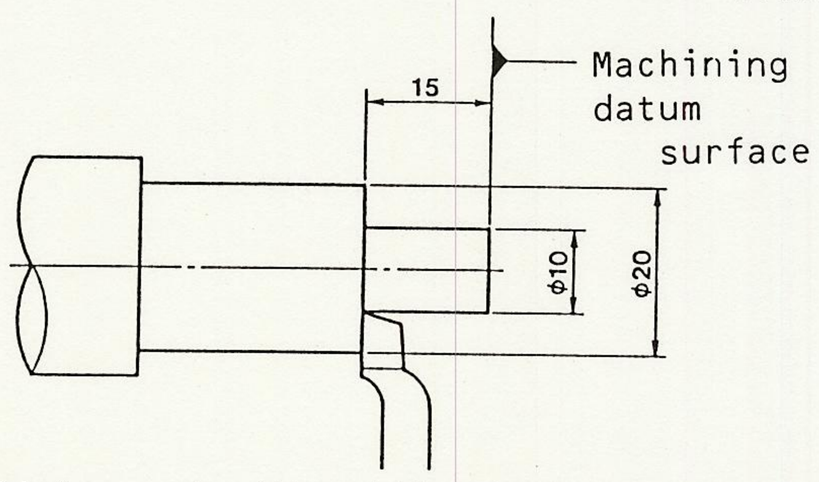
1) Mount the workpiece in the chuck of the lathe.
2) Turn the tool rest to select cutting tool A.
3) Press the T1 key to recall the cutting tool A offset values.
4) Machine the workpiece in the Z-axis direction to produce the machining datum surface (Z=0). Then machine from Z=0 to Z=-43mm with a diameter of X=20mm.



<Display>

X 20.000 mm ABS φ
Z -43.000 mm ABS φ
T No.1

5) Machine from Z=0 to Z=-15 with a diameter of X=10mm.



<Display>

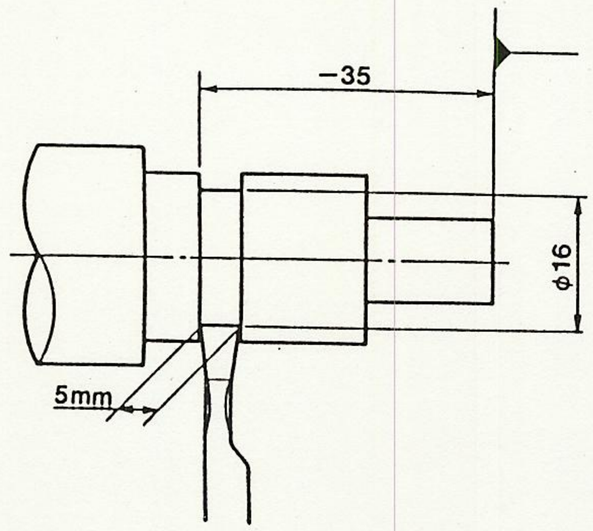
X 10.000 mm ABS φ
Z -15.000 mm ABS
T No.1

Machining work with cutting tool A has been completed.

4.6.2 Turn the Tool Rest to Select Cutting Tool B (width=5mm)

Press the T2 key to recall the cutting tool B offset values.

Machine the workpiece at Z=-35mm to a diameter of X=φ16mm.



<Display>

X 16.000 mm φ ABS

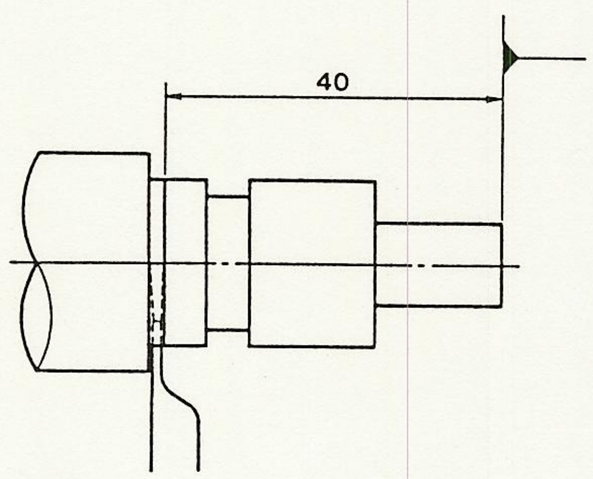
Z -35.000 mm ABS

T No.2

Machining work with cutting tool B has been completed.

4.6.3 Turn the Tool Rest to Select Cutting Tool C

Press the T3 key to recall the cutting tool C offset values. Cut off the workpiece at Z=-40mm.



<Display>

X

Z -40.000 mm φ ABS

T No.3

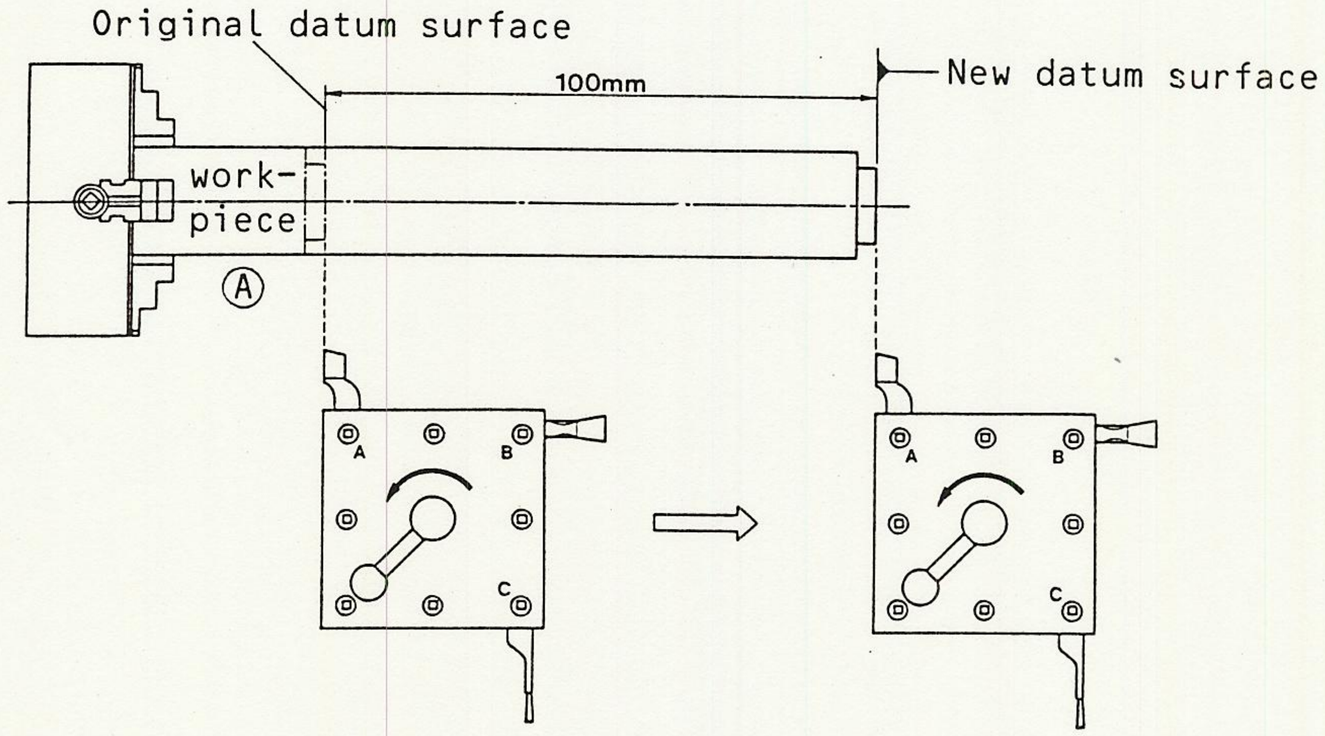
Machining work with cutting tool C has been completed. The workpiece has now been completed according to the original machine drawing.

4.7 Z-Axis Shifting Operation

The [Z] key is used to transfer the machining datum surface to a new location along the Z-axis while preserving the cutting tool offset positions which have been set relative to it.
When the DU903 Display Unit displays the Z_1 and Z_2-axes values, this function can not be used.

4.7.1 When Machining Workpieces of Different Lengths Using the Same Tool Offsets

1) To machine a longer workpiece after machining workpiece Ⓐ.



2) Replace workpiece Ⓐ with the new workpiece. Machine the new datum surface. The display reads, for example, 100mm.

<Display e.g.>

Z 100.000 mm_{ABS}

T No.1

3) To shift the previous datum surface to this new value i.e. T_1 =0, press,

[Z][0][T1]

The machining datum surface and tool offsets are transferred to the the location and the Z value is set to 0.

It is also possible to assign any another value to T_1 (Datum surface).

4.7.2 Offset the New Datum Surface by +5mm

· Press Z 5 T.

<Display>

Z 5.000 mm ABS

T No.1

Note: After the Z-axis shifting operation, the value of the absolute zero point is changed so that the selected cutting tool is correctly referenced to the new datum surface.

4.8 Loading a Required Value to the Absolute Zero Point and Recalling the Previous Value

1) When the parameter switch SW2-2 is set to OFF, the display shows the absolute zero point mode. (Factory setting: OFF)

2) A required value can be loaded to the absolute zero point.

<Example> To LOAD 0 to the absolute zero point

① Press X 0 ⇥. When ⇥ is pressed, the LOAD lamp lights and the ▽ sign is displayed.

② When the head carrier passes the absolute zero point, the lamp goes off, the ▽ sign disappears and the required value is loaded to the zero point.

③ In the same way, any other value can be loaded to the absolute zero point; e.g. X ± 5 ⇥ loads -5 to the zero point after the head carrier has been passed over the zero point position.

3) The previous value set to the absolute zero point can be recalled.

<Example>

<Operation>	<Display>		
	X	15.235 mm ABS	The present position of the head carrier.
X ORIGIN	X ▽	40.000 mm ABS	The value stored on the zero point is displayed.
	*** Load lamp flashes ***		Pass the head carrier over the absolute zero point
	*** Load lamp goes off ***		40mm is loaded to the position of the absolute zero point.
	X	42.345 mm ABS	The head carrier has gone past the absolute zero point position.

Notes:

① The value set to the absolute zero point prior to the power-off operation can be recalled in the display, even though the head carrier may have been moved after the power was switched off.

② When the tool offset keys (T1 to T8) are selected, the value stored on the absolute zero point changes so that the correct position of the head carrier relative to the absolute zero point is maintained at all times.

4) As the DU903 has absolute zero points on both the Z_1 and Z_2 scales, the Z-axis display should first be split into the Z_1 and Z_2-axis components before using the zero point functions.
Operate as follows to load each absolute zero point.
<Display e.g.>

T1	X	
	Z	80.000 mm ABS
	T	No.1

① Press the separation key [Z1/Z2] to separate the Z-axis value on the absolute zero point into the values for the Z_1 and Z_2 axes.
Note: If the Z-axis separation key [Z1/Z2] is not pressed, the Z_1 and Z_2 absolute zero point values can not be loaded to the zero points.
<Display e.g.>

[Z1/Z2]	X	
	Z	20.000 mm ABS for Z_1-axis
	T	60.000 mm ABS for Z_2-axis

② Recall the stored value on the absolute zero point of the Z_1-axis and load it to the absolute zero point of the Z_1-axis by pressing [Z1] and [▽/△] and moving the tool slide to pass the absolute zero point. The ▽ sign is displayed until the head carrier passes the absolute zero point.
<Display e.g.>

[Z1][▽/△]	X	
	Z	35.000 mm ABS (Z_1)
	T	60.000 mm ABS (Z_2)

③ In the same way, recall the stored value on the Z_2-axis absolute zero point and load it to the absolute zero point of the Z_2-axis. The ▽ sign is displayed until the head carrier passes the absolute zero point.
<Display e.g.>

[Z2][▽/△]	X	
	Z	35.000 mm ABS (Z_1)
	T	90.000 mm ABS (Z_2)

④ Press the separation key [Z1/Z2] again to combine the values of the Z_1 and Z_2 axes.
<Display e.g.>

[Z1/Z2]	X	
	Z	125.000 mm ABS
	T	No.1

4.9 MM/INCH Conversion

mm or inches can be converted with the key after the parameter switch SW2-1 has been switched on.
(Inch: SW2-1 → ON)

<Example>

<Operation>	<Display e.g.>	
	X	54.600 mm ABS
	Z	24.570 mm ABS
	X	2.1496 in ABS
	Z	0.9674 in ABS

Note: The conversion of millimeters to inches is computed in binary, to reduce the computation time. The last digit of the inch display may differ slightly from that computed by decimal computation.

5. ERROR DISPLAY

If there is any fault in the measurement, the error codes shown in the following table will be displayed.

Display	Type of error	Cause	Action
All the displays light up, then	Power error	During operation, power was interrupted. (The same display appears when power is turned on.)	Press [Xc] (or [Zc]).
E01	Memory back-up error	1) When power is turned on after not having supplied power for more than one week. 2) When an instantaneous power failure unnoticeable to the operator occurs during operation. Note: Data will not remain in the memory of the display unit.	Press [Xc] (or [Zc]) to clear the display and re-enter data.
E02	Scale signal error	The scale unit is not properly connected with the display unit.	Connect the scale unit properly after turning the power off, then turn the power on.

Display	Type of error	Cause	Action
E.....	Over speed	The traveling speed of the scale exceeds the maximum response speed.	Press Xc (or Zc).
F.....	Overflow	The measured value exceeds the maximum value that can be displayed.	

6. NOTES FOR DU903 DISPLAY UNIT

1) The display resolutions for the Z_1 and Z_2 axes should be set to the same value.

2) The Z_1 and Z_2-axis values are normally displayed only when loading values to the absolute zero points.

3) The values in the absolute zero point memory of the Z_1 and Z_2-axis scales will vary according to the cutting tool offset selected. After the absolute zero point loading on the Z_1 and Z_2-axis scales, the correct positions after the cutting tool offset will be displayed in the dual Z sum function.

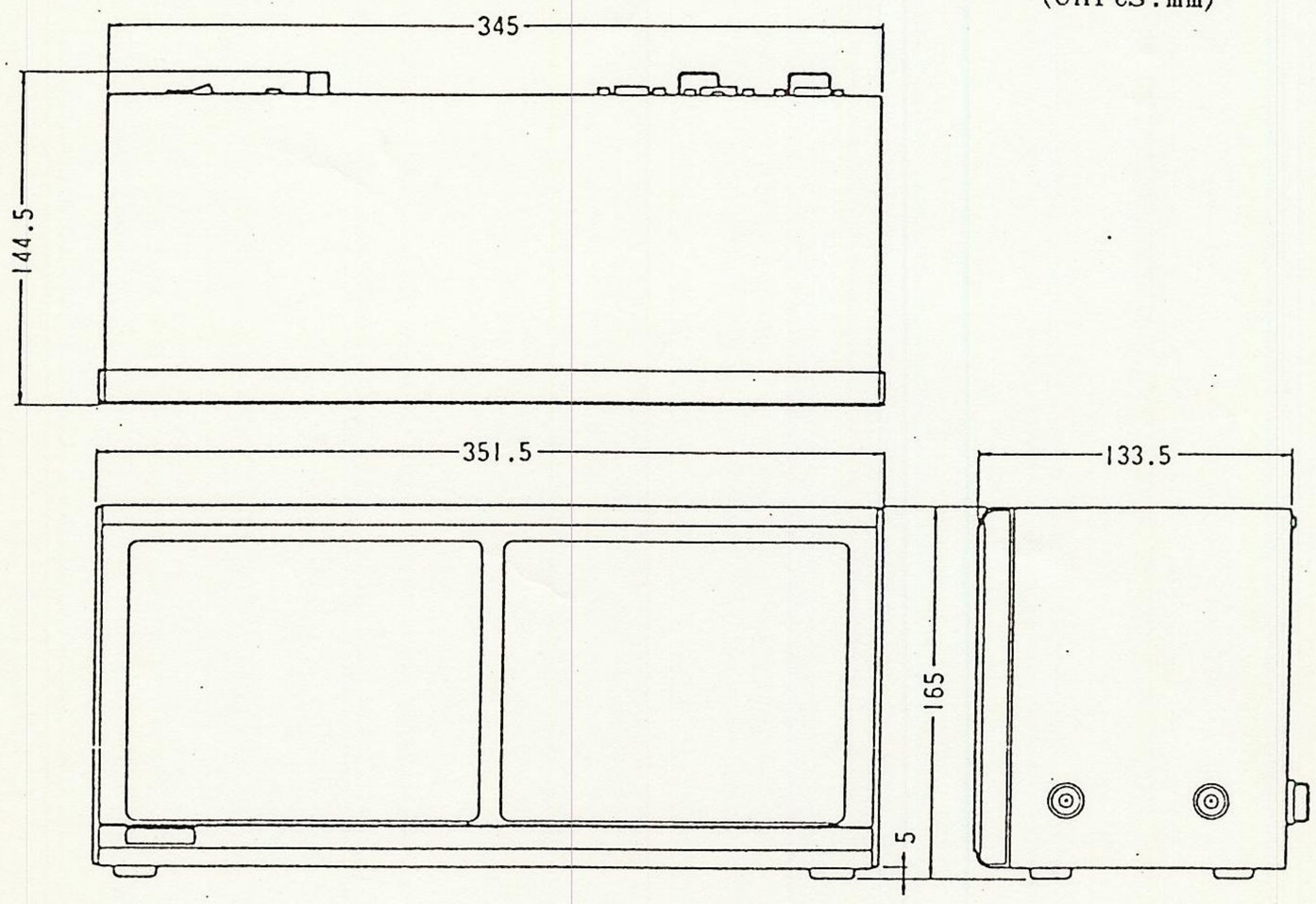
4) In the Z ($Z_1 + Z_2$) sum function, when either of the Z_1 or Z_2 axis values has been displayed in the absolute mode, the Z value (total of $Z_1 + Z_2$) is displayed as an absolute value.

7. SPECIFICATIONS

Display:	Green fluorescent display tube, 7-digits with - sign
Resolution:	5μm/10μm, 0.5μm/1μm (Selectable with the internal parameter switches) 5μm (0.5μm), 10μm (1μm) (Selectable with the external switch)
Diameter display function:	Provided
Cutting tool offset function:	Provided
Z-axis shifting function:	Provided
Dual Z-axis function:	DU903 only
Reset function:	Provided
Preset function:	Provided
MM/INCH conversion function:	Provided
Scale polarity conversion function:	Provided
ABS positioning function:	Provided
ABS/INC conversion function:	Provided
Absolute zero point loading function:	Provided
Memory back-up:	About one week
Power supply:	AC100V, 117V, 220V, 240V +10% to −15% 50/60Hz (AC85-264V)
Weight:	3.5kg
Operating temperature:	0℃～+45℃ (32°F to 113°F)
Storage temperature:	−10℃～+50℃ (14°F to 112°F)

8. EXTERNAL VIEW DRAWING

(Units:mm)



9. ACCESSORIES

Power cable	1 pc
Plug	1 pc
Grounding wire	1 pc
Spacer	4 pcs
Screws (pan head screw 3×6mm)	4 pcs
Axis display label	1 set
Operation manual	1 copy

10. TYPES OF DISPLAY UNIT

Type	Number of axis
DU902	X and Z-axes
DU903	X, Z_1 and Z_2 -axes

The specification and appearance of the products may be changed for improvement and may differ from those appearing in catalogs and in the instruction manual.