FAPT

PROGRAMMING EXAMPLE

CNC Lathe

MORI FANUC 15TF

MORI SEIKI

FM-F15TF-1E

CONTENT

1. MACHINING DRAWING P-1

2. BLANK DRAWING P-2

3. PRIMARY MACHINING PROCESS P-2

4. SECONDARY MACHINING PROCESS P-3

4.1 Chucking Drawing P-3

4.2 Tooling P-3

5. PREPARATION P-4

6. EXECUTING THE SYMBOLIC FAPT FUNCTION P-5

6.1 Menu 1 (Display for Inputting Data for the Blank) P-5

6.2 Menu 2 (Blank Figure) P-7

6.3 Menu 3 (Setting the Turret Indexing Position) P-32

6.4 Menu 4 (Setting the Machining Method) P-34

6.4.1 O.D. roughing P-35

6.4.2 I.D. roughing P-44

6.4.3 O.D. finishing P-49

6.4.4 I.D. finishing P-53

6.4.5 Grooving P-57

6.4.6 Necking P-61

6.4.7 Threading P-63

6.5 Menu 5 ..... P-67

6.5.1 Initial display P-67

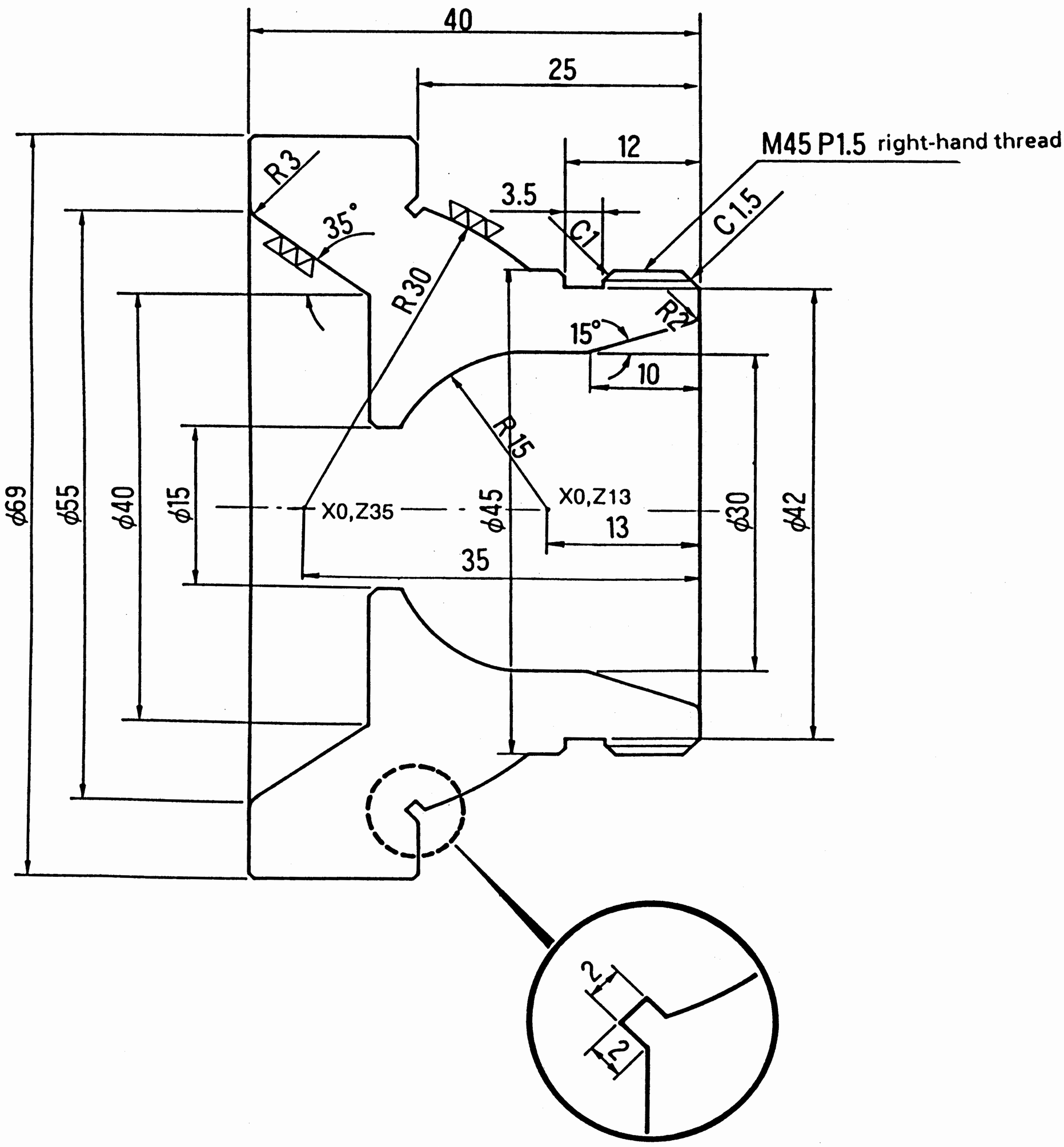
6.5.2 Checking the tool locus P-68

6.5.3 Storing data to the CNC memory P-69

6.5.4 Process list P-70

6.6 Menu 6 (Simulation of Machining) P-71

1. MACHINING DRAWING (unit: mm)

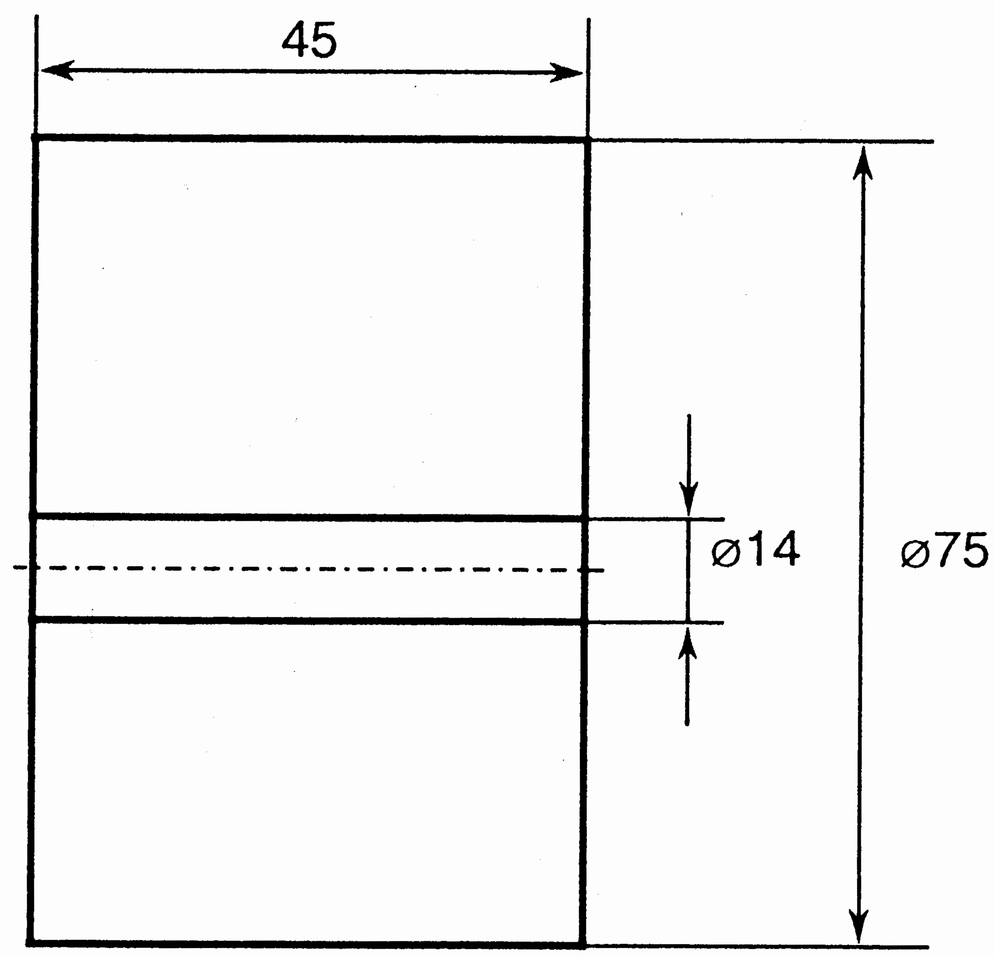


* All surface roughness ▽▽ unless otherwise specified.
* All corner chamfer C0.5 unless otherwise specified.

2. BLANK (RAW MATERIAL) DRAWING (unit: mm)

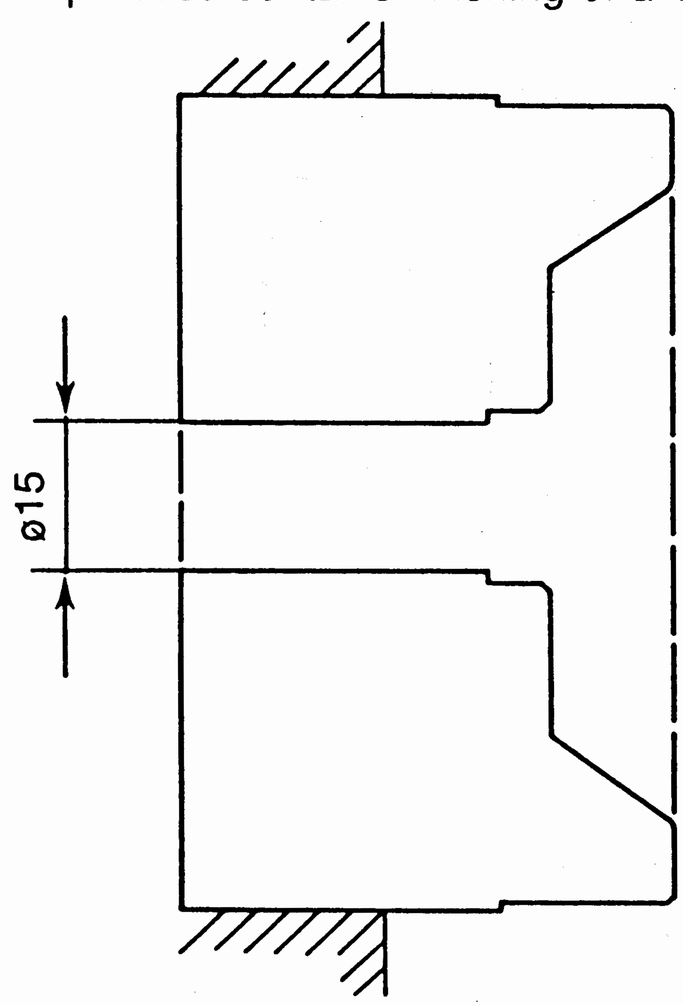
Blank size	O.D. . . .	75mm
	Length . .	45mm
	I.D.	14mm

The material used in this example shall be S45C(carbon steel).



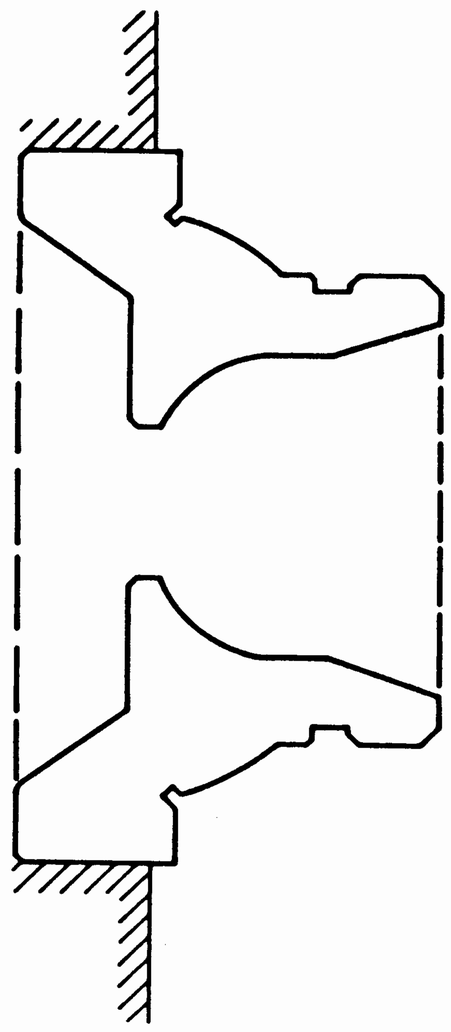
3. PRIMARY MACHINING PROCESS

The workpiece should be machined to the following shape before programming according to this example. This process contains finishing of a 15mm dia. section.



4. SECONDARY MACHINING PROCESS

4.1 Chucking Drawing



The section of the blank marked by solid lines has already been machined to have an I.D. of 14mm.

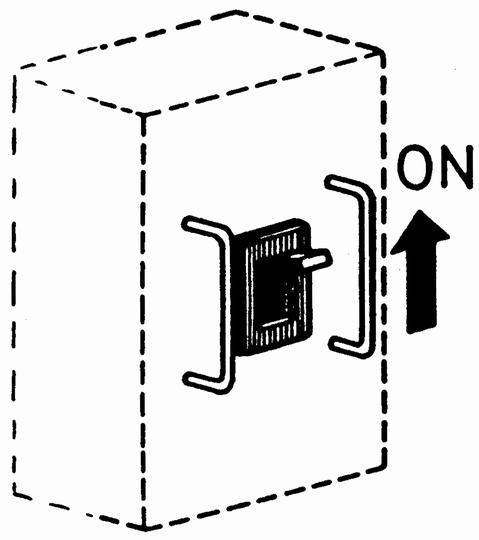
The chucking depth assume that 13mm.

4.2 Tooling

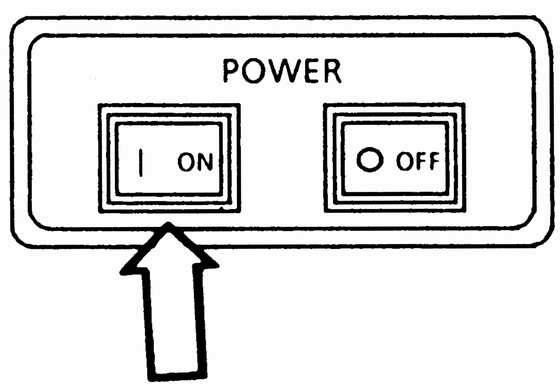
Machining Process	Tool Required	Tool ID No.	Nose Radius (R)	Turret Setting No.	Tool Position Offset No.
1. O.D. (face) roughing	PCLNR2525	301	0.8	2	2
2. I.D. roughing		401	0.8	3	3
3. O.D. finishing	WTKNR2525	708	0.4	4	4
4. I.D. finishing		801	0.4	5	5
5. Grooving		931	0.2	6	6
6. Necking	Special	999(931)	0.2	8	8
7. Threading		31	0.2	10	10

5. PREPARATION

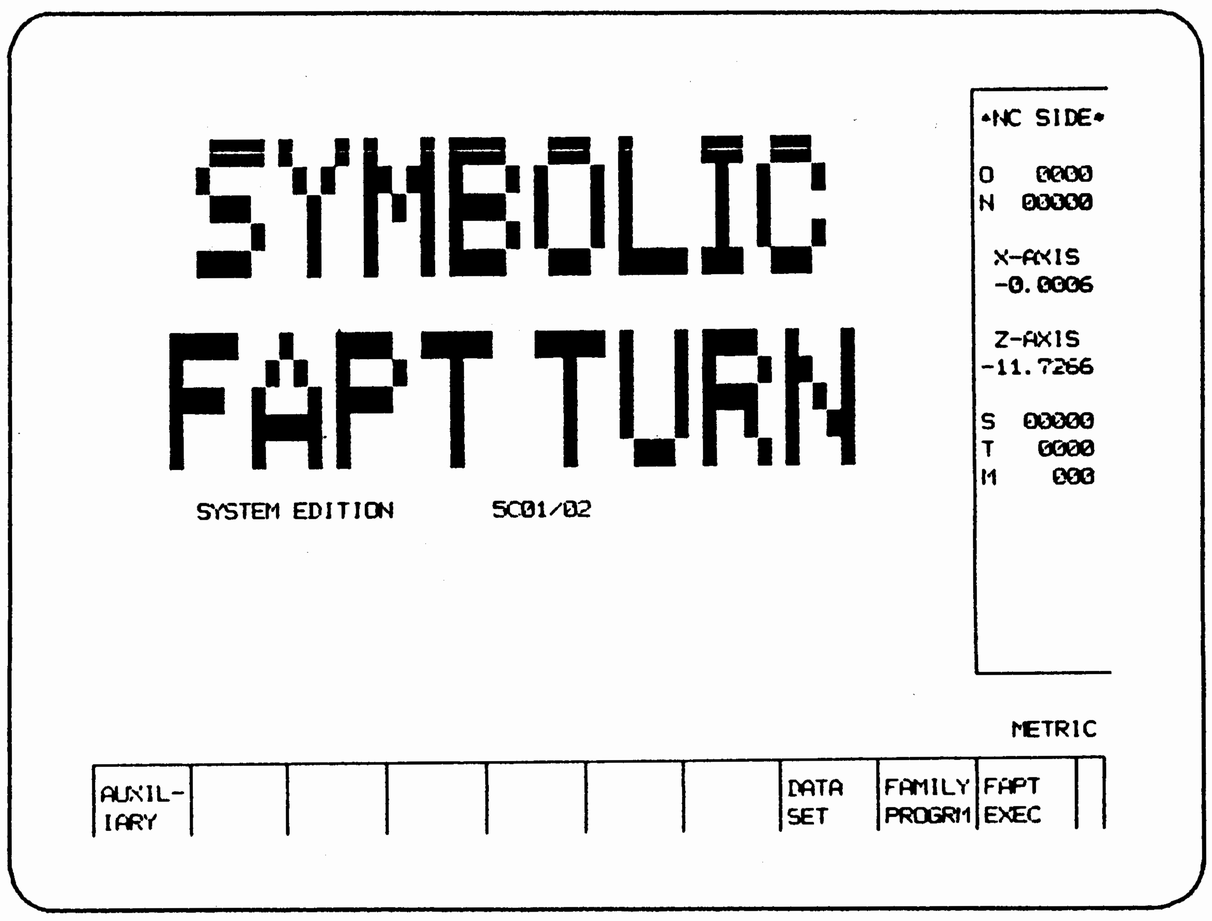
1) Turn the main switch of the CNC lathe ON.



2) Turn the power supply to the control panel ON.

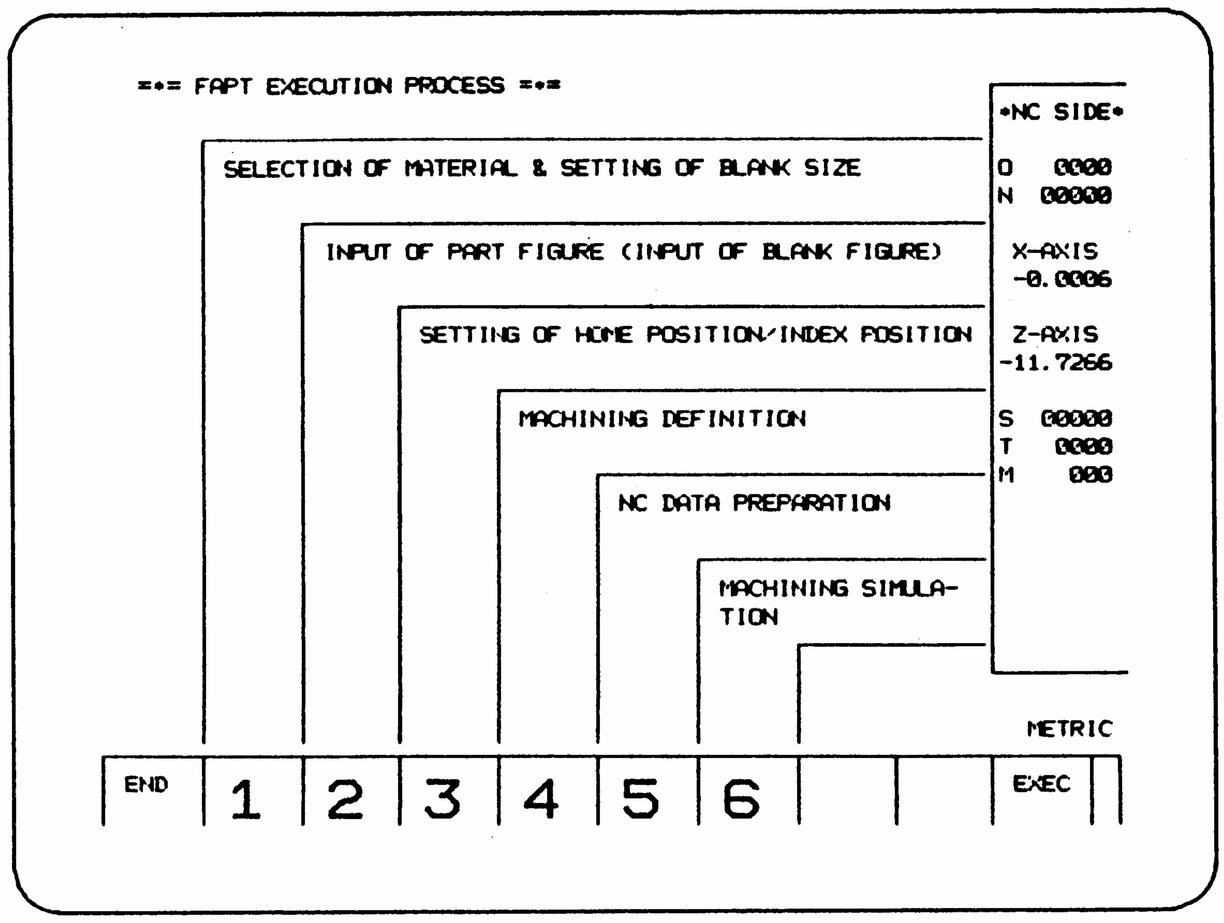


The initial display of the Symbolic FAPT function will appear on the screen.



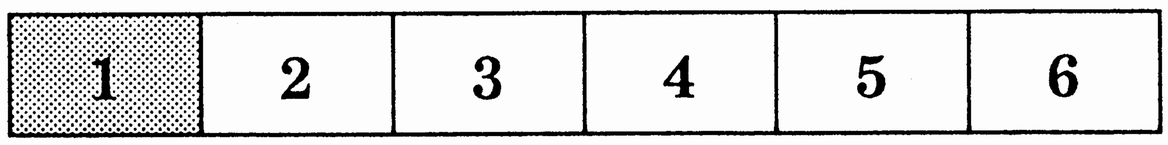
6. EXECUTING THE SYMBOLIC FAPT FUNCTION

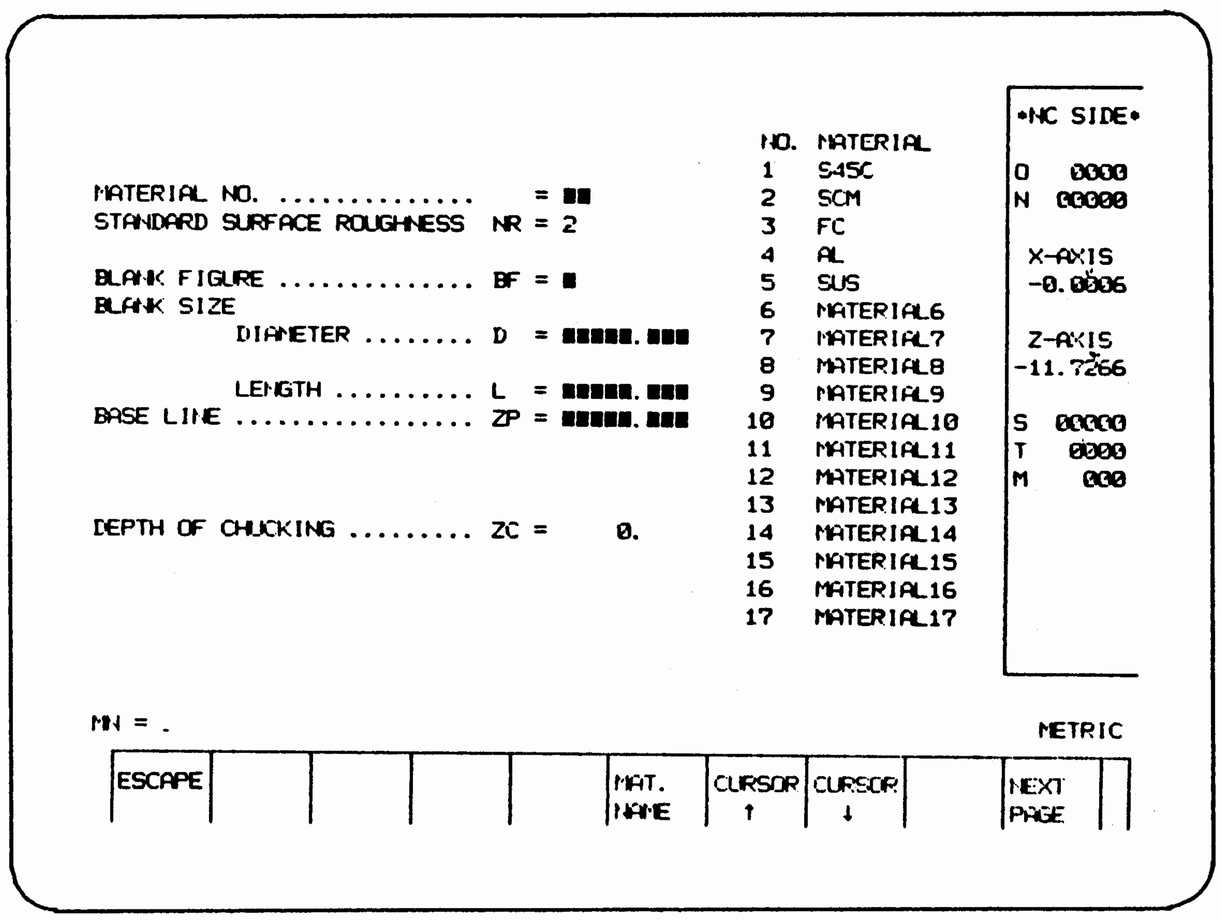
Press the [**FAPT EXEC**] Soft-key to display the main menu.



6.1 Menu 1 :SELECTION OF MATERIAL &SETTING OF BLANK SIZE

1) Press the [1] Soft-key to display Menu 1.



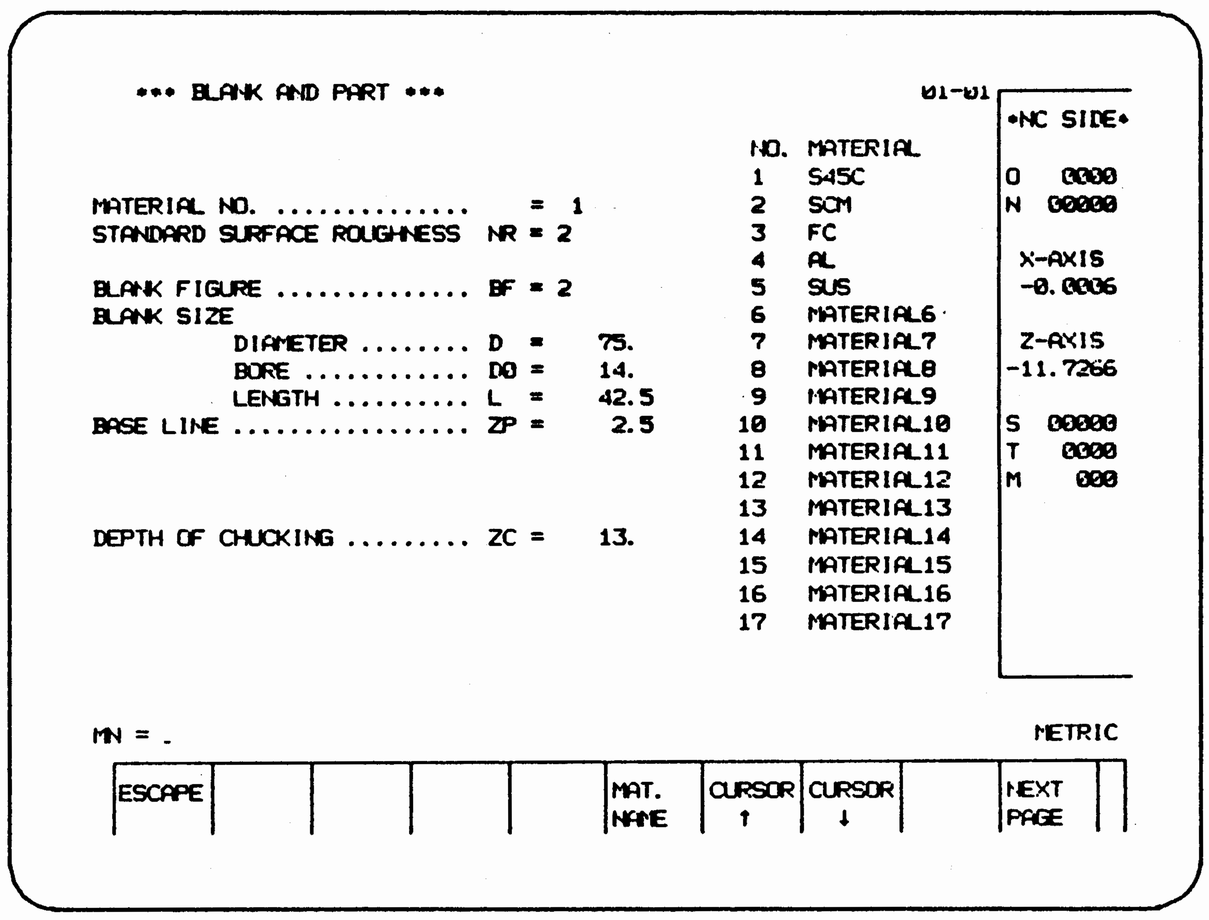


2) Input the data for the blank.
   Input the following data.

MATERIAL NO. :	Key-in "**1**" and then press the [**INPUT**] Key at MN = .
STANDARD SURFACE ROUGHNESS : ▽▽	Key-in "**2**" and then press the [**INPUT**] Key at nr =.
BLANK FIGURE	Key-in "**2**" and then press the [**INPUT**] Key at BF =.
BLANK SIZE:DIAMETER	Key-in "**75**" and then press the [**INPUT**] Key at D =.
BORE	Key-in "**14**" and then press the [**INPUT**] Key at D0 =.
LENGTH	Key-in "**42.5**" and then press the [**INPUT**] Key at L =.
BASE LINE	Key-in "**2.5**" and then press the [**INPUT**] Key at ZP =.
DEPTH OF CHUCKING	Key-in "**13**" and then press the [**INPUT**] Key at ZC =.

Menu 2 will be displayed after all the above data has been input.

Note:
All of the above data can be input by using "," as a delimiter between data input items. In this case, the input format for the above data would be:1,2,2,75,14,42.5,2.5,13 and press



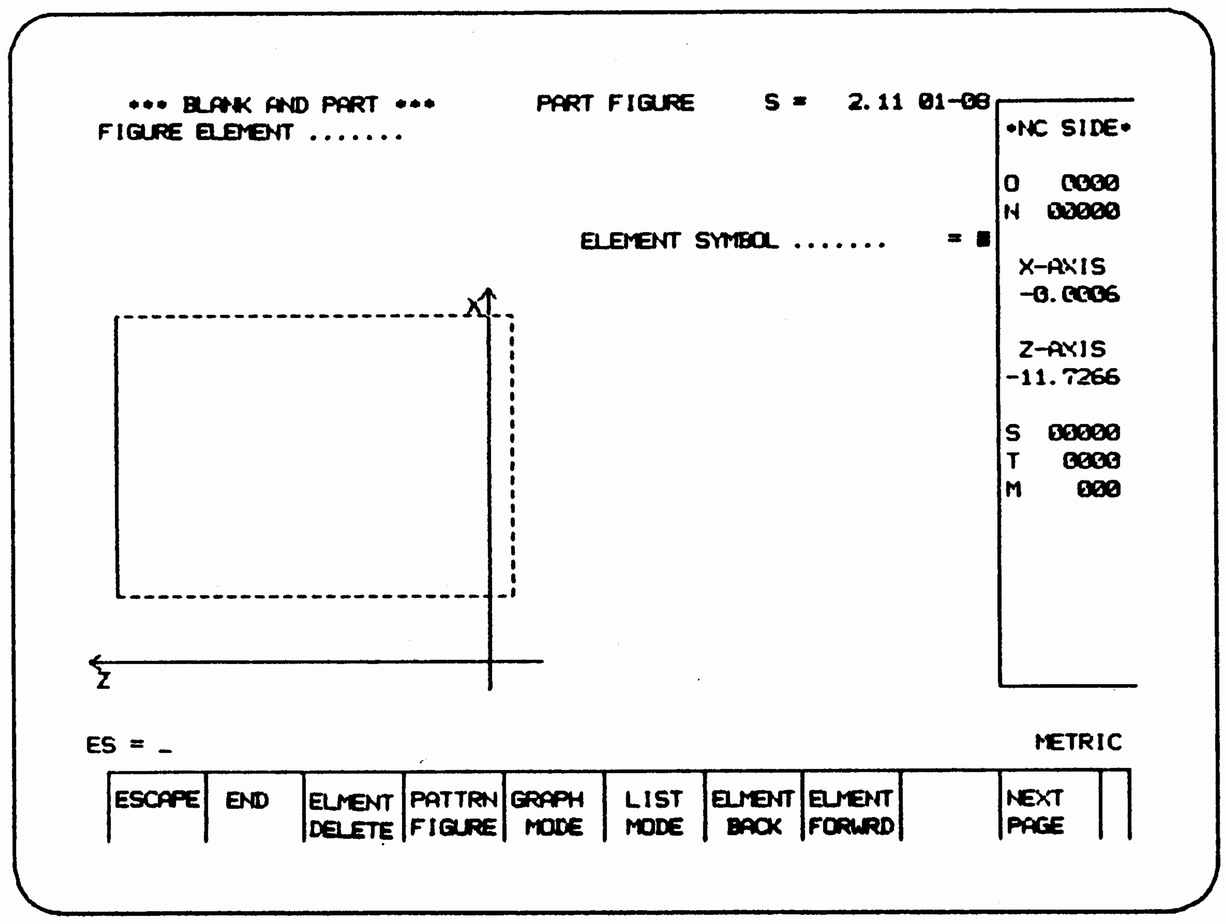
Note : When you have noticed an error in the input data:

1. *If you notice the error before pressing the [**INPUT**] Key, press the [**CAN**] Key and input the correct value.*
2. *If you notice an error after pressing the [**INPUT**] Key, then press either [**CURSOR ↑**] or [**CURSOR ↓**] Soft-key to bring the cursor to the item to be corrected and input the correct value.*

1	2	3	4	5	6

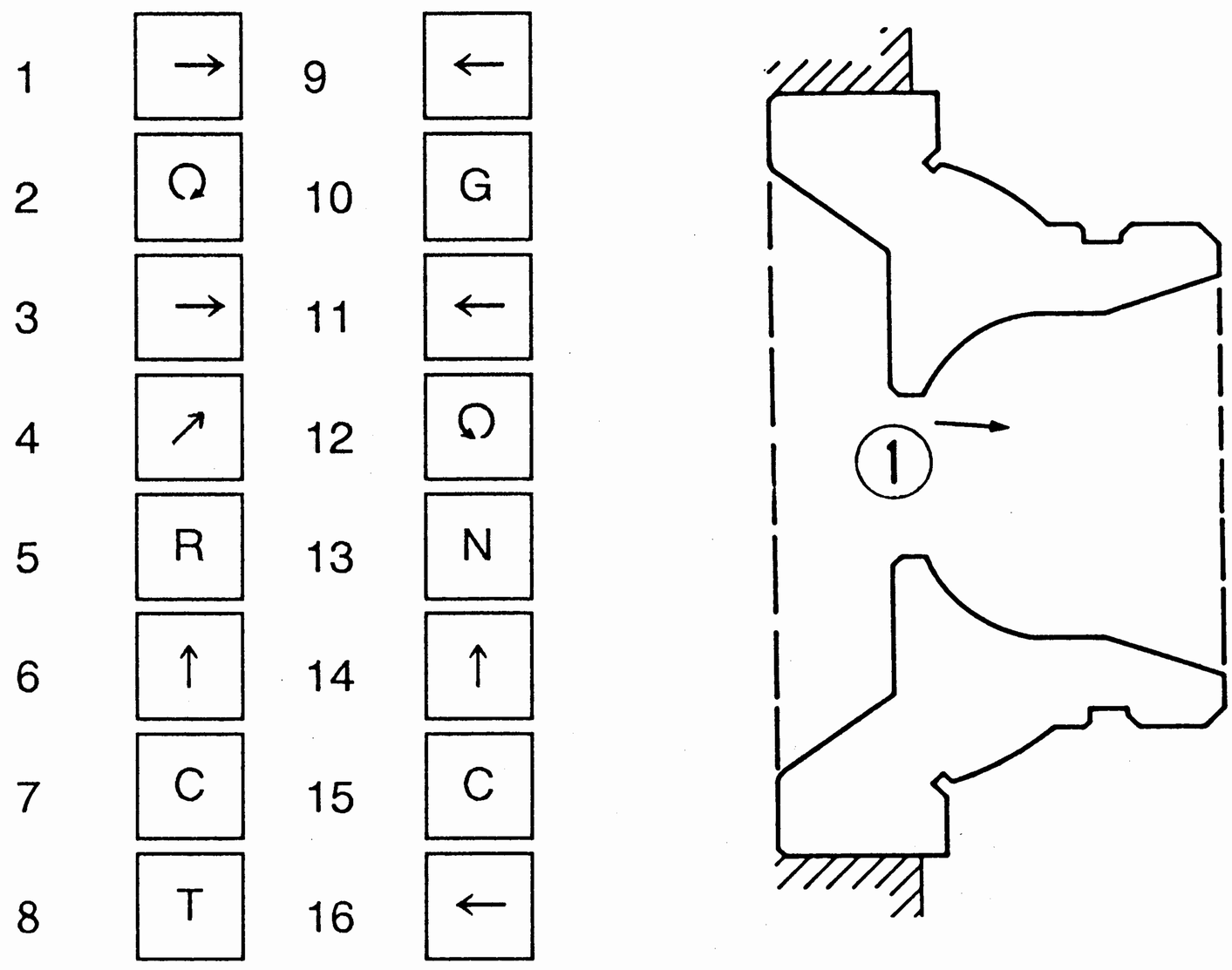
6.2 Menu 2 : INPUT OF PART FIGURE (INPUT OF BLANK FIGURE)

The blank figure will be displayed by a dotted line. The prompt (ES =) for the first element figure will be displayed blinking on screen.



■ Before Inputting the Element

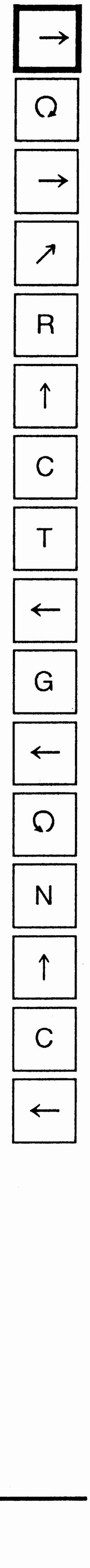
Before inputting the part figure in Menu 2, consider the order of the element symbols you are about to use for input. The part figure will be drawn starting from the I.D.

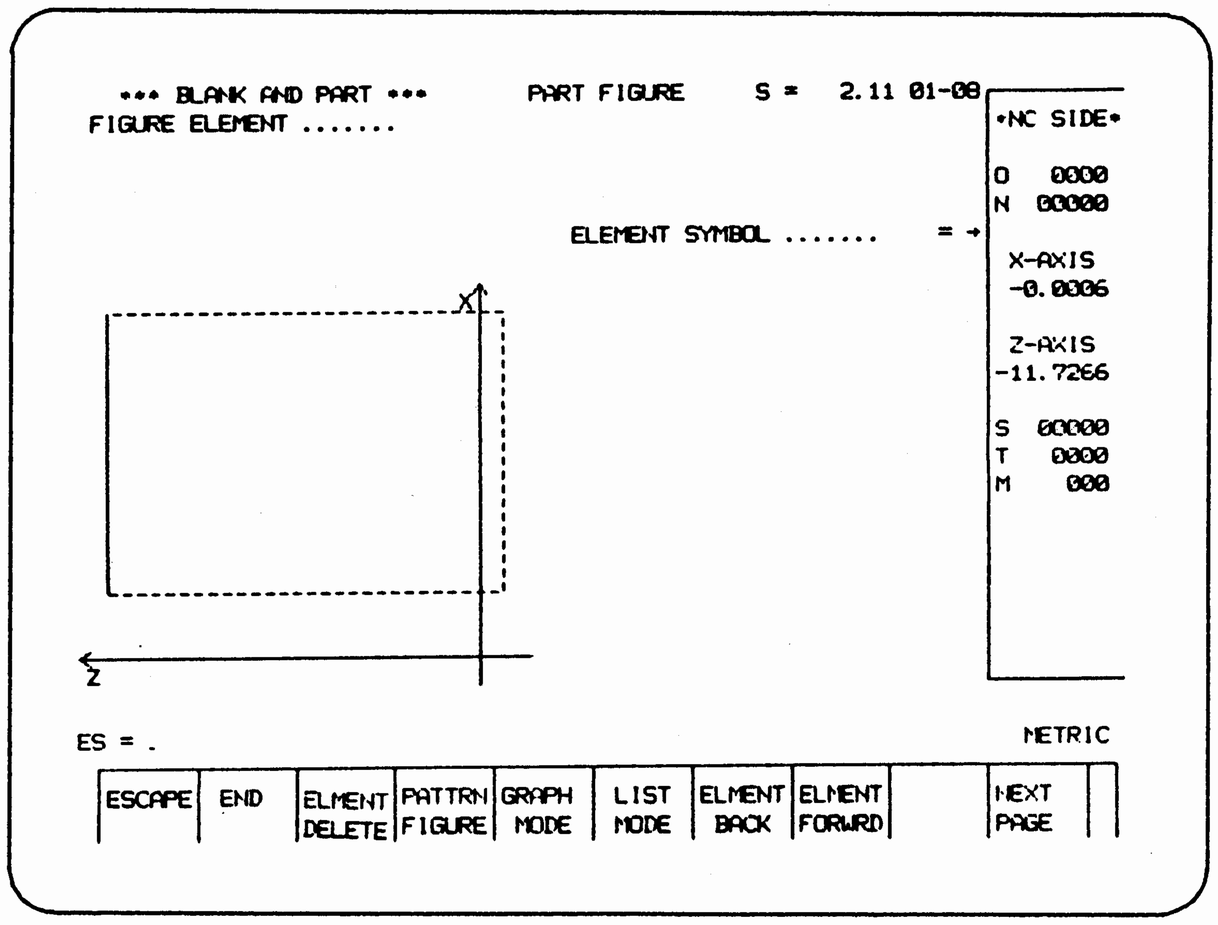


Proceed with input of the figures following the procedure below.

Input the element figures in the order shown at the right.

1) ELEMENT SYMBOL Press the [→] and [**INPUT**] Keys at ES =.

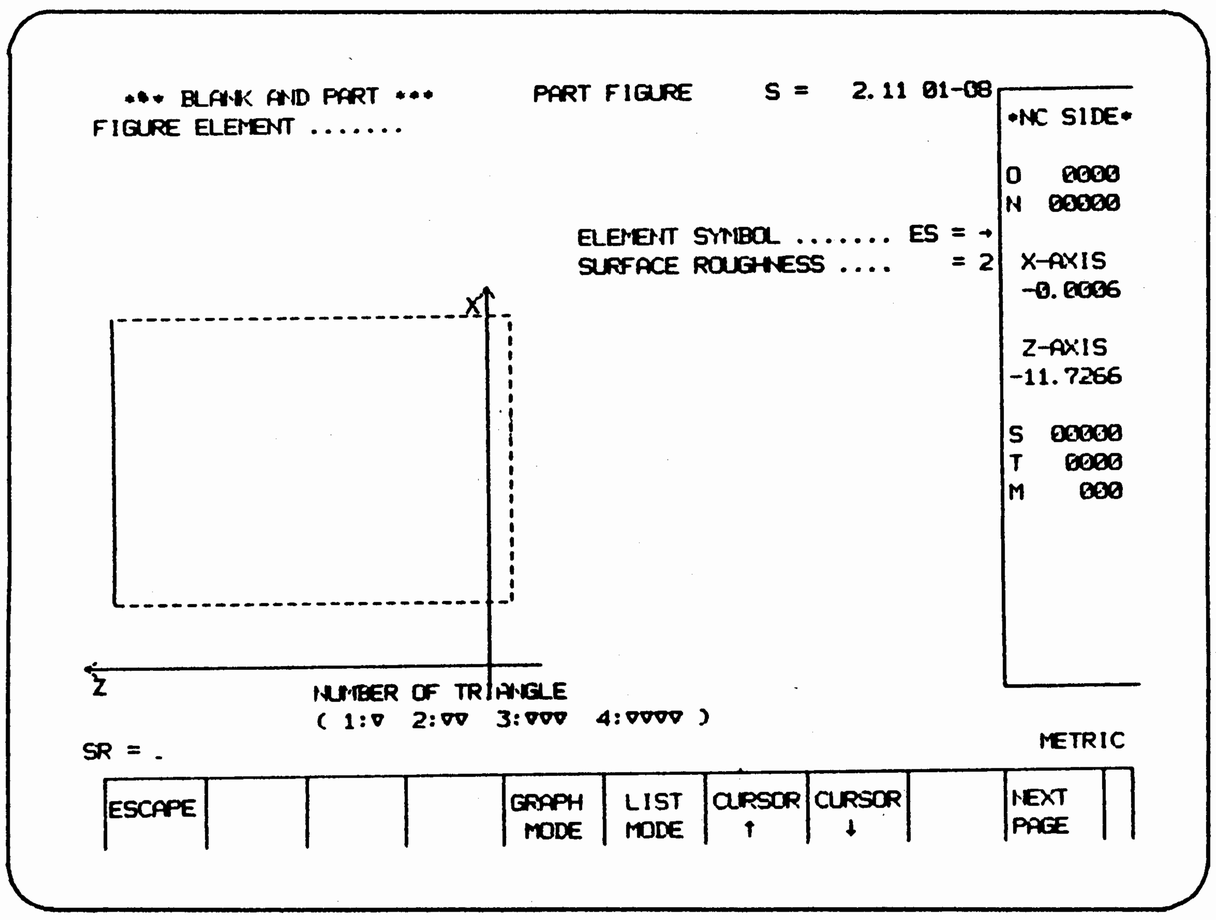




After inputting the above, the system will prompt the surface roughness. Select the number corresponding to the desired surface roughness (1: ▽, 2: ▽▽, 3: ▽▽▽, 4: ▽▽▽▽).

2) SURFACE ROUGHNESS Press the [**2**] and [**INPUT**] Keys at SR =.

Follow the same procedure for all subsequent surface roughness prompts.



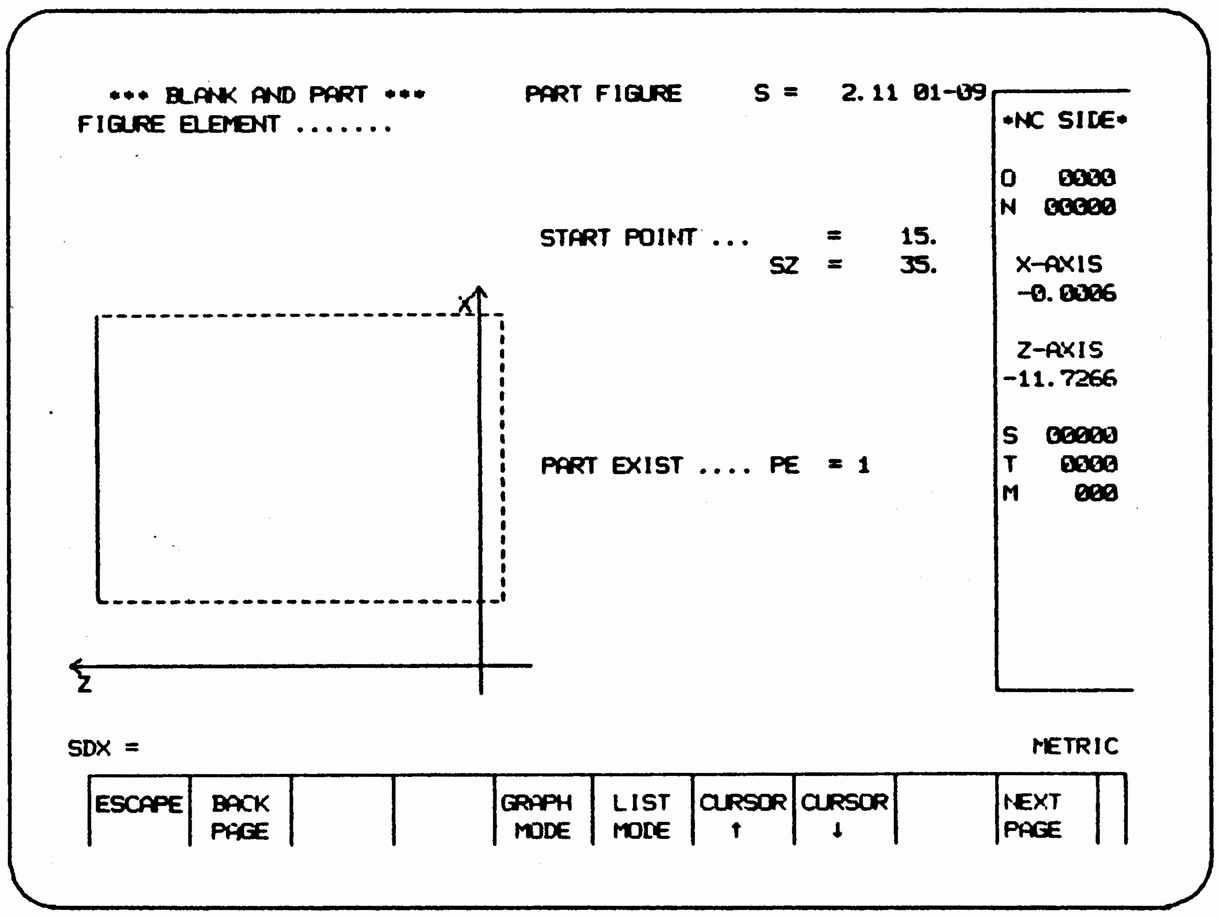
The prompts for the start point and direction of the part will be displayed on screen.

1) START POINT (X axis) Key-in "**15**" and then press the [**INPUT**] Key at SDX = .

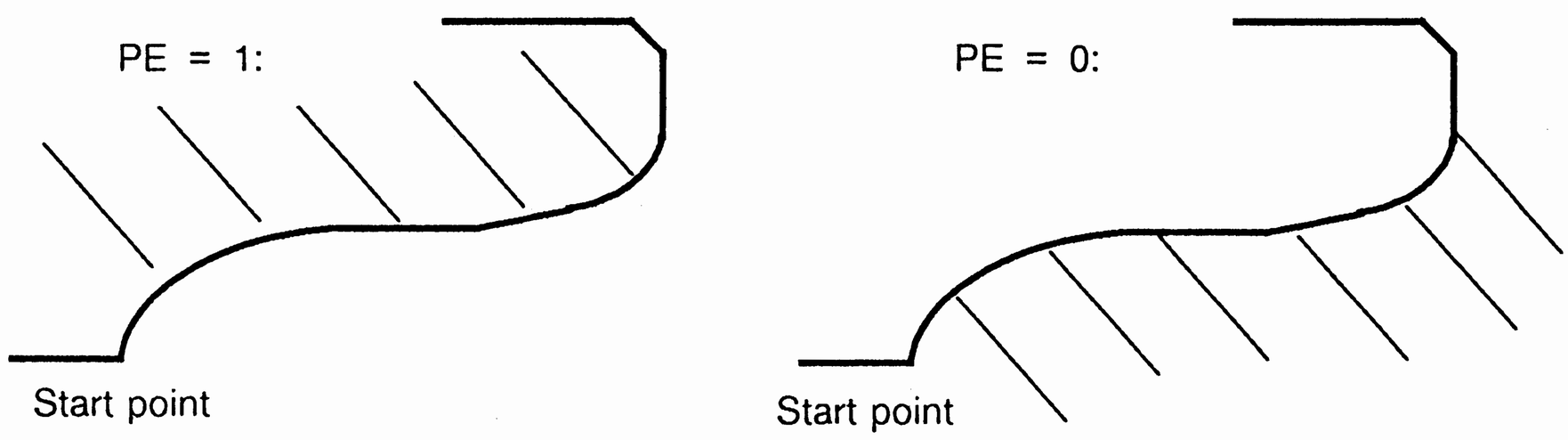
2) START POINT (Z axis) Key-in "**35**" and then press the [**INPUT**] Key at SX = .

Note : The reason for setting start point SZ as 35 is as follows:
This position is set as the virtual position as there is no need to input the dimensions of the entire length of the blank as it has already been machined in the primary machining process.

3) PART EXIST Press the [**1**] and [**INPUT**] Keys at PE = .

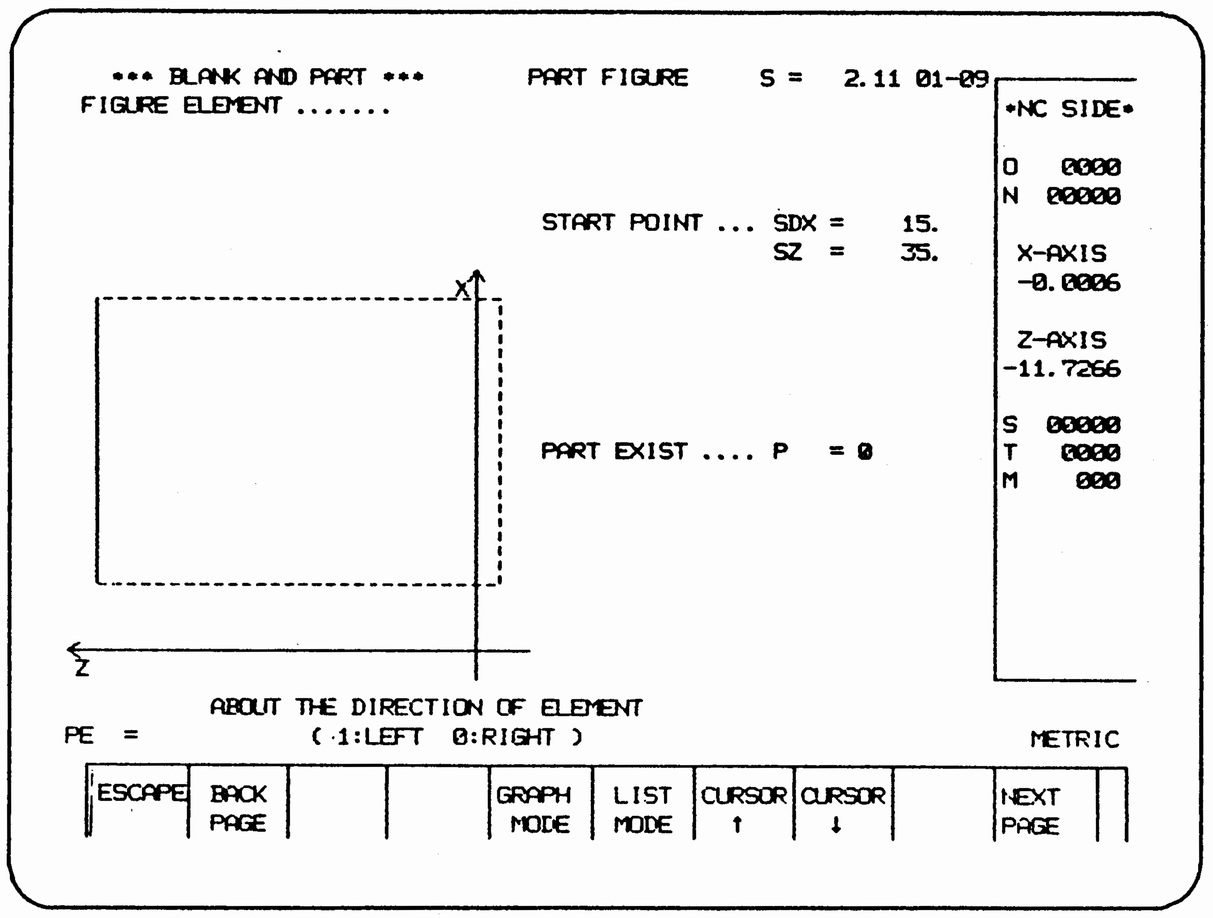


Note : When drawing the part figure by element symbols from the start point, you must specify whether the blank is to the left or right of the element symbol (line).
*In this case, if the [**0**] and [**INPUT**] Keys are input at prompt PE =, the system will judge that the shaded part is to be machined. For this reason, you should take care when selecting the part direction PE.*



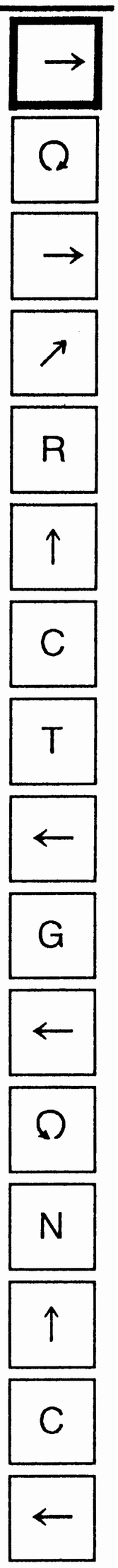
If the [**0**] and [**INPUT**] Keys have been input at PE =, the part will be drawn starting from the O.D.

After inputting the above, the system will ask you where the end point of the [→] element symbol is.



4) END POINT Press the [**INPUT**] Key at Z =.

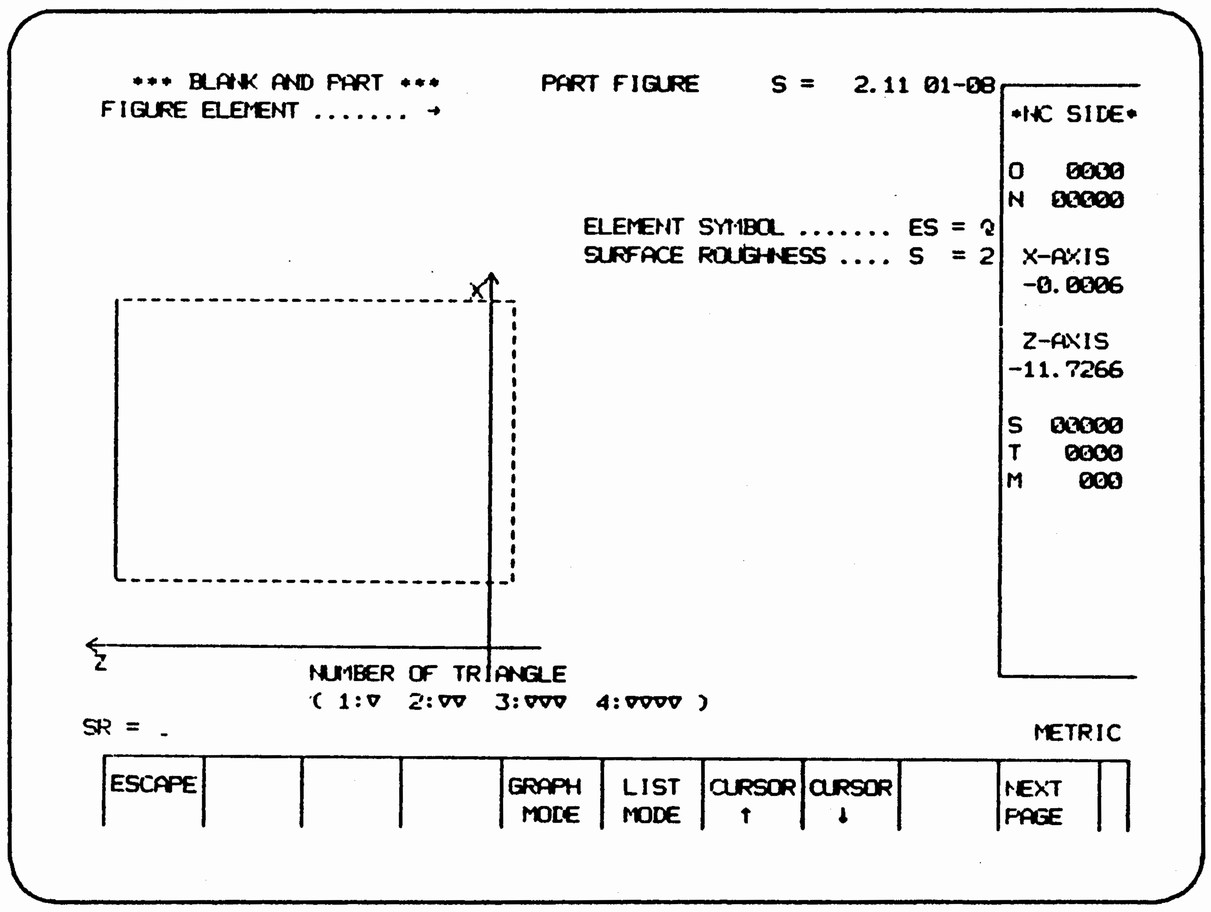
*Note : Press only the [**INPUT**] Key as the end point is unknown in the prepared machining drawing.*



Next input the arc R15.

1) ELEMENT SYMBOL — Press the [Ω] and [**INPUT**] Keys at ES =.

2) SURFACE ROUGHNESS — Press the [**2**] and [**INPUT**] Keys at SR =.



After inputting the above, input the following:

1) END POINT (X axis) — Key-in "**30**" and then press the [**INPUT**] Key at DX =.

2) END POINT (Z axis) — Key-in "**13**" and then press the [**INPUT**] Key at Z =.

Note : The point of intersection of the next element [→] will be the end point.

3) Key-in "**0**" and then press the [**INPUT**] Key at TL = (tangent to the last element).

Note : This is because it intersects the last arrow element [→].

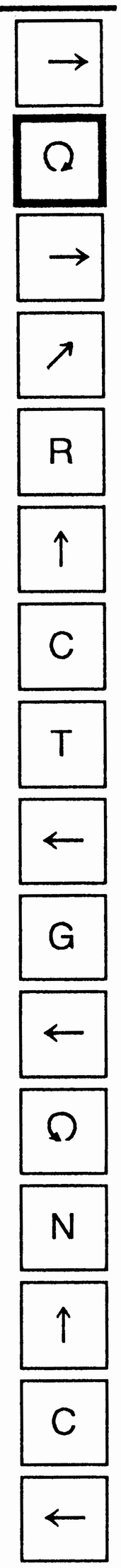
4) Key-in "**1**" and then press the [**INPUT**] Key at TN = (tangent to the next element).

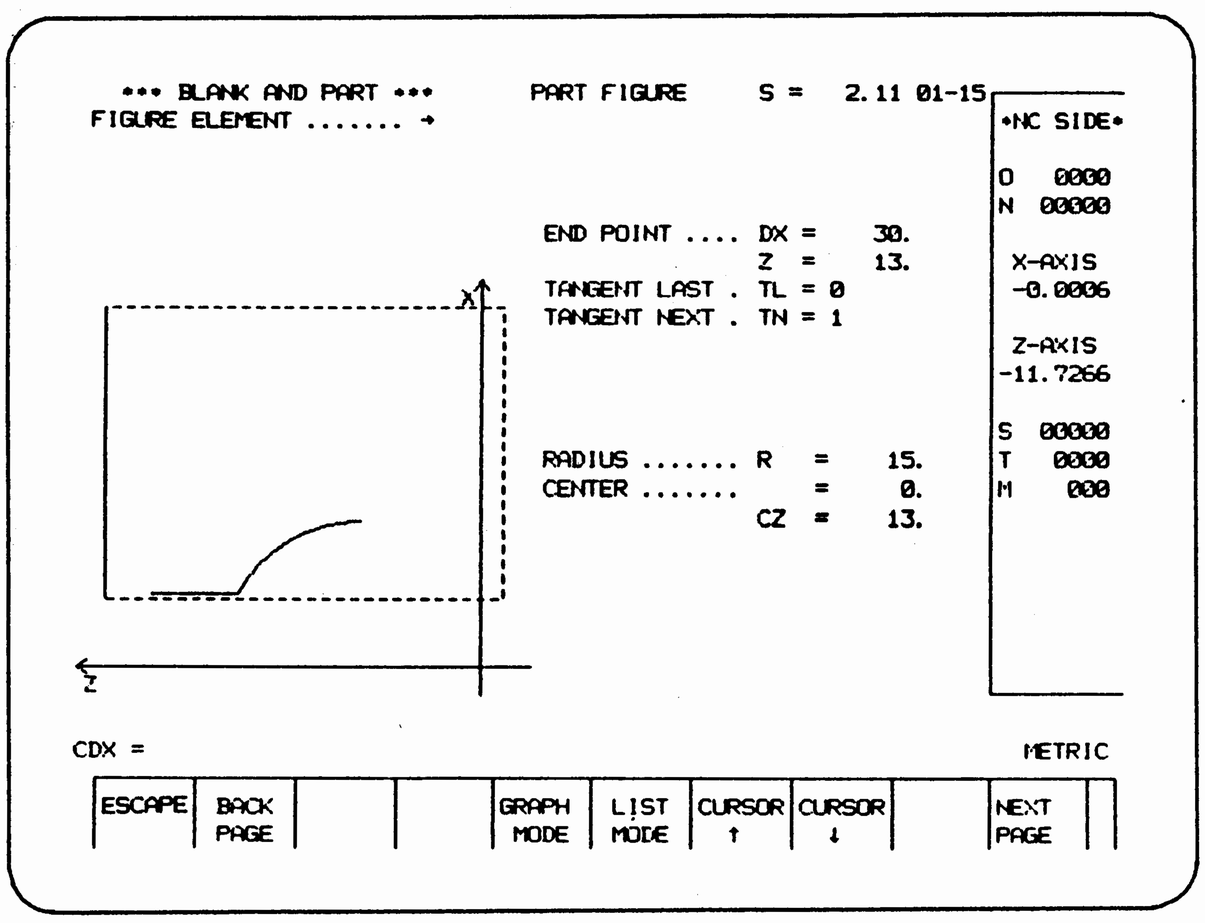
Note : This is because it is tangent to the last element [→].

5) RADIUS — Key-in "**15**"" and then press the [**INPUT**] Key at R =.

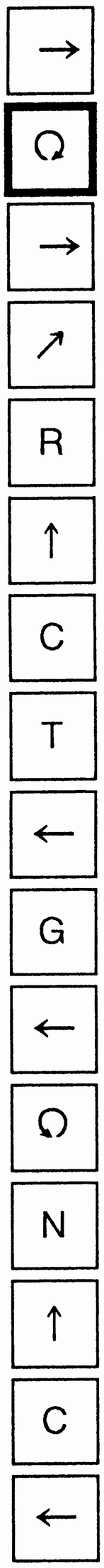
6) CENTER (X aixs) — Key-in "**0**" and then press the [**INPUT**] Key at CDX =.

7) CENTER (X aixs) — Key-in "**13**" and then press the [**INPUT**] Key at CZ =.





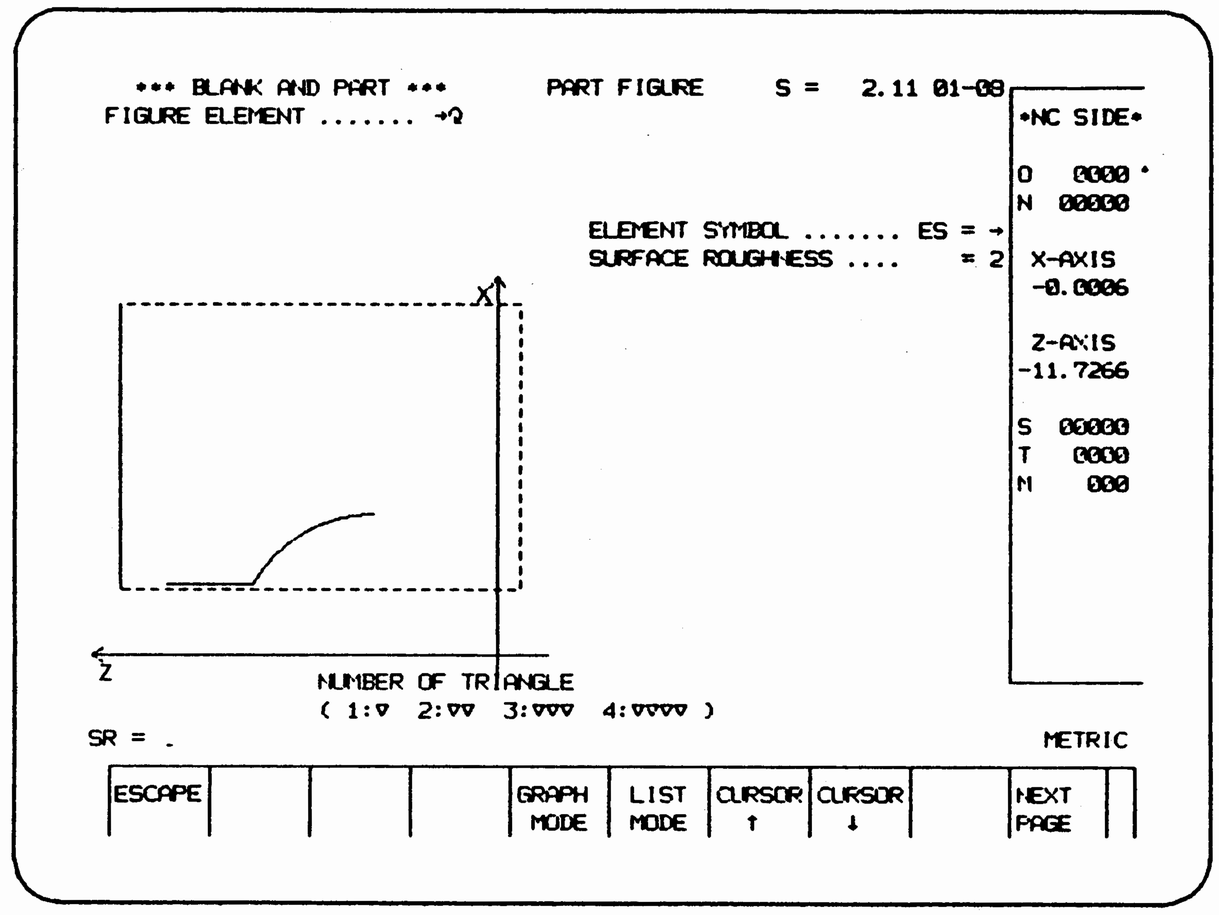
Next Element →

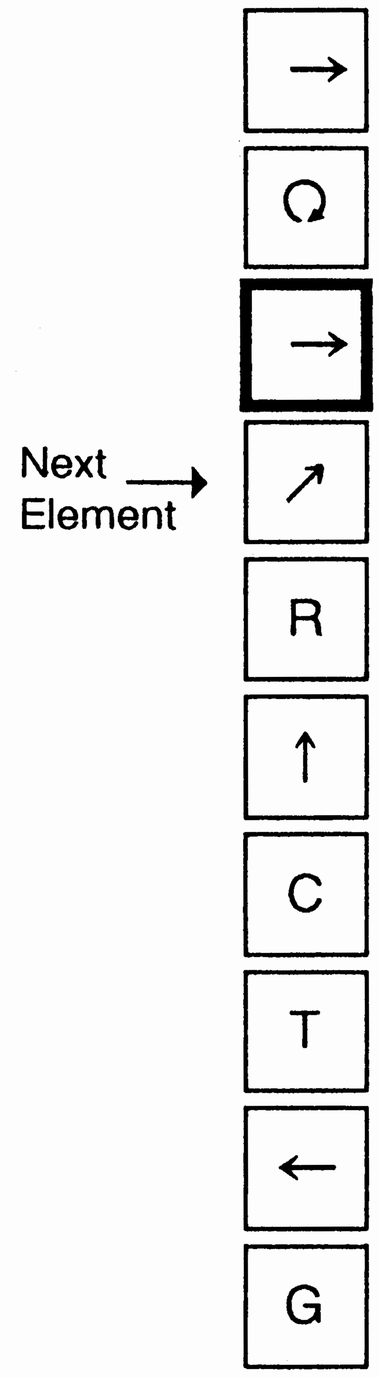


After inputting the above, proceed to the next element.→

1) ELEMENT SYMBOL Press the [→] and [**INPUT**] Keys at ES =.

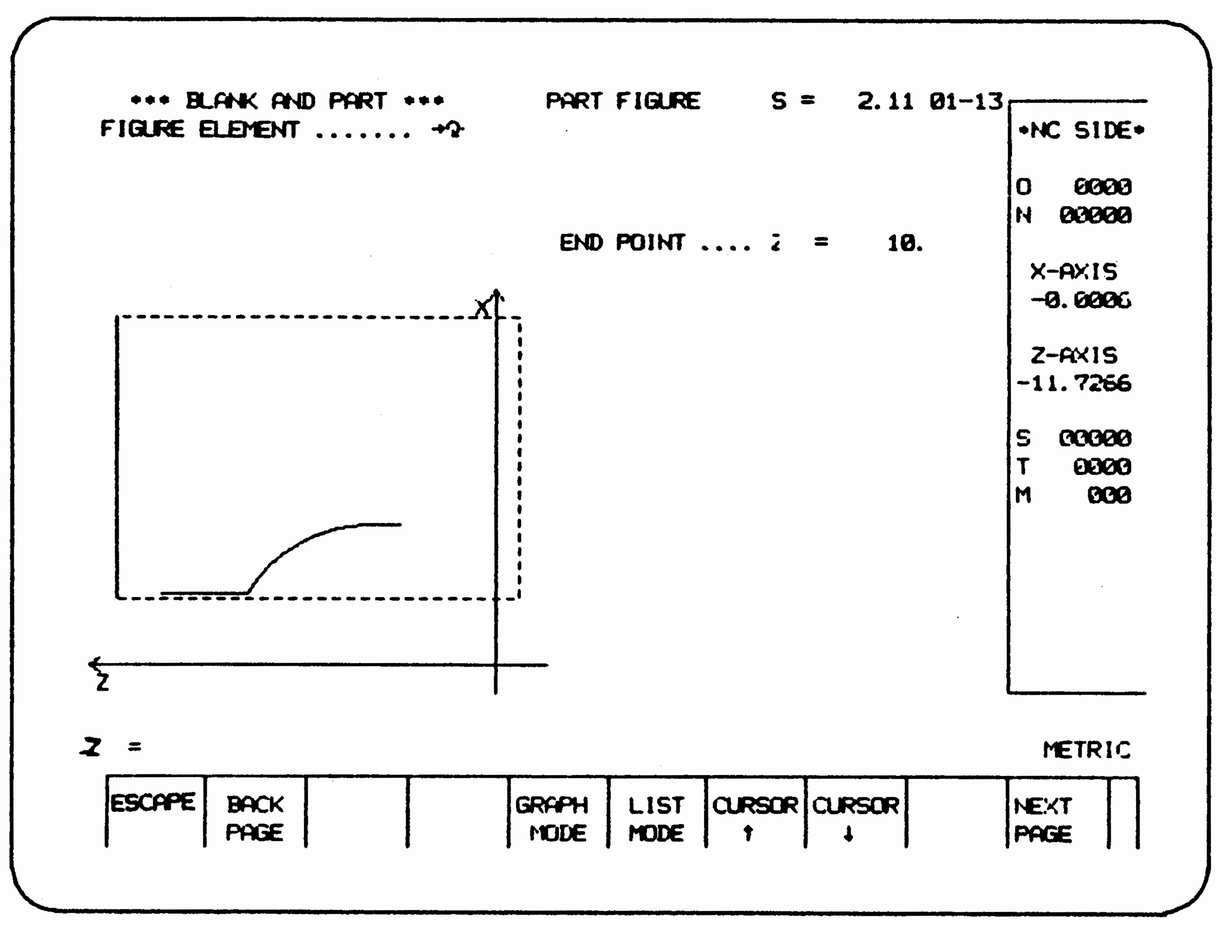
2) SURFACE ROUGHNESS Press the [**2**] and [**INPUT**] Keys at SR =.

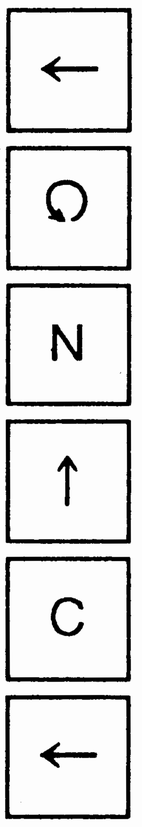




After inputting the above, input the following:

1) END POINT Press the [**10**] and [**INPUT**] Keys at Z =.

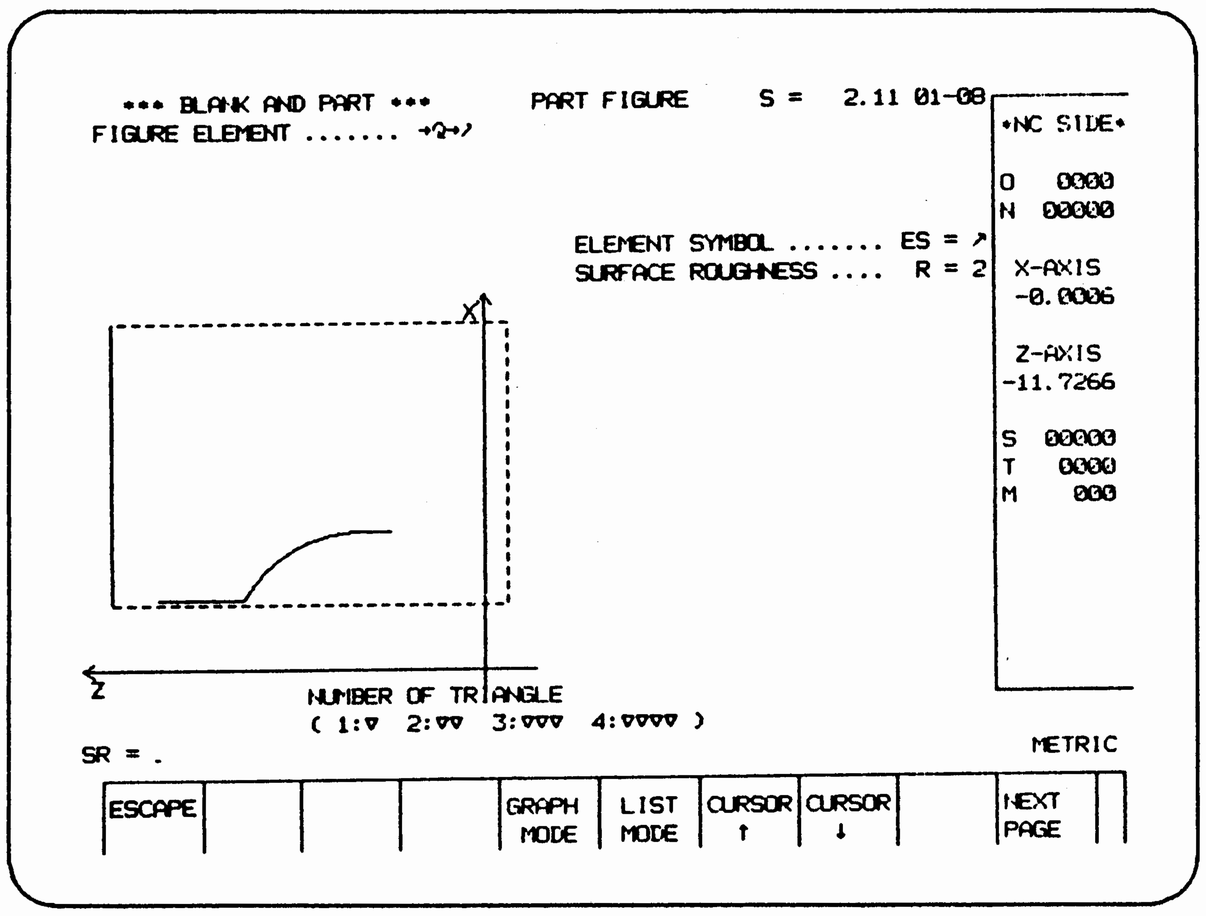


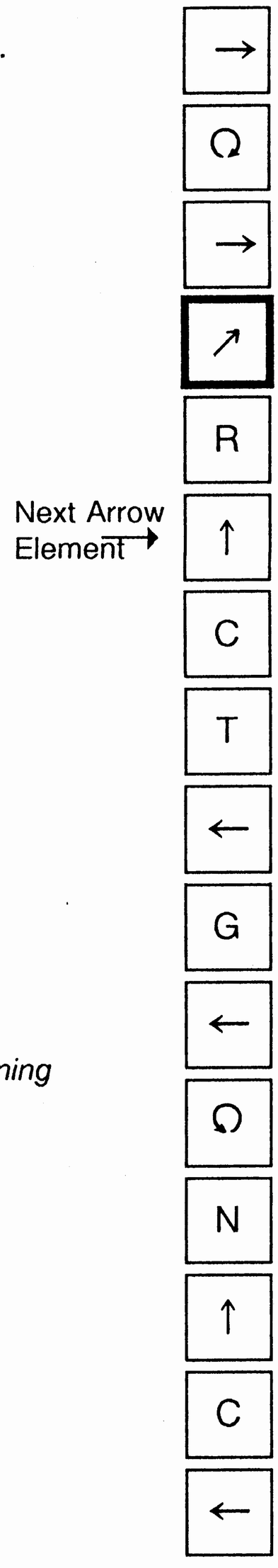


After the above data has been input, proceed to the next element.

1) ELEMENT SYMBOL Press the [↗] and [**INPUT**] Keys at ES =.

2) SURFACE ROUGHNESS Press the [**2**] and [**INPUT**] Keys at SR =.





After inputting the above, input the following:

1) END POINT Press the [**INPUT**] Key at DX =.

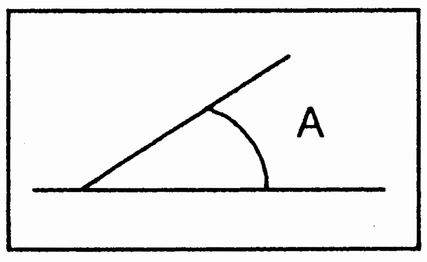
Note : The X-axis coordinates cannot be known in the prepared machining drawing.

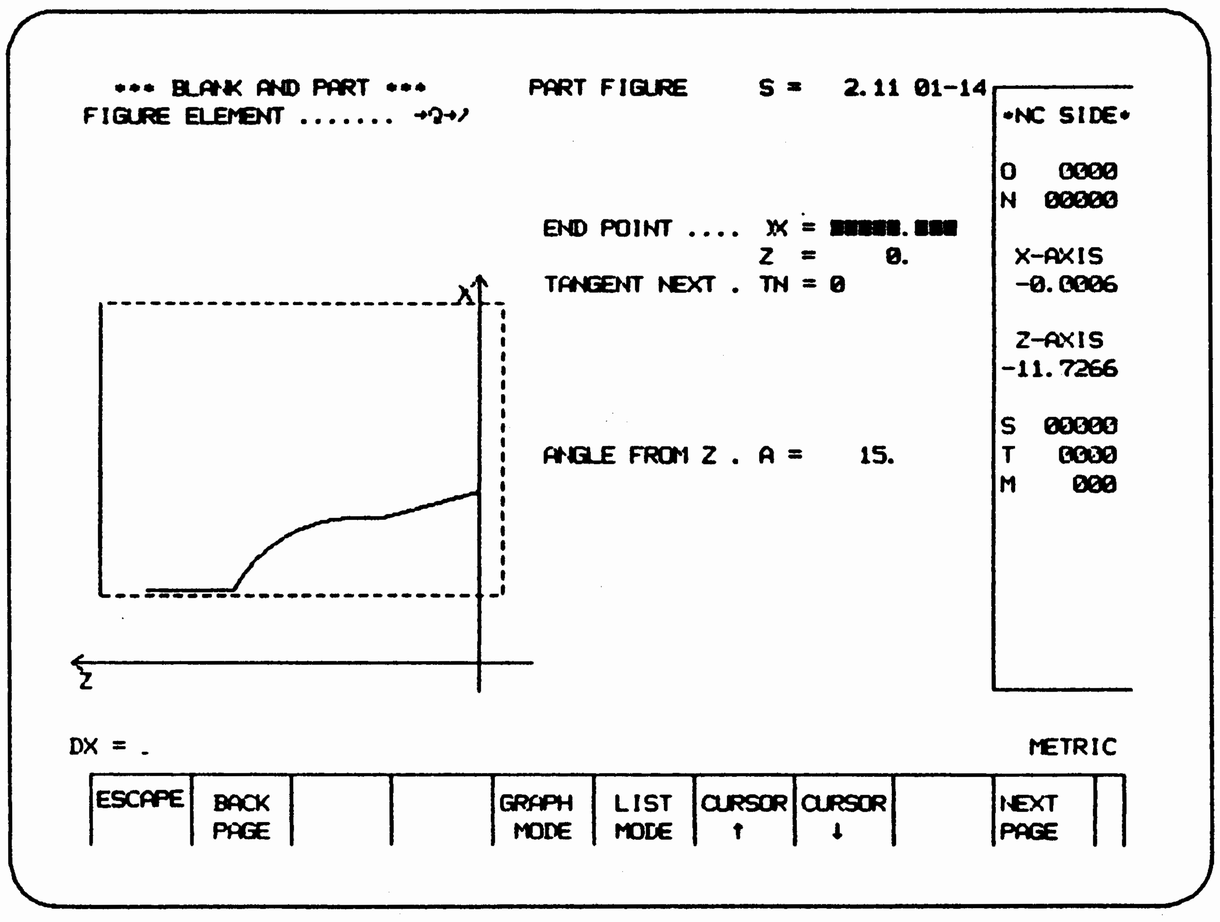
2) END POINT Press the [**0**] and [**INPUT**] Keys at Z =.

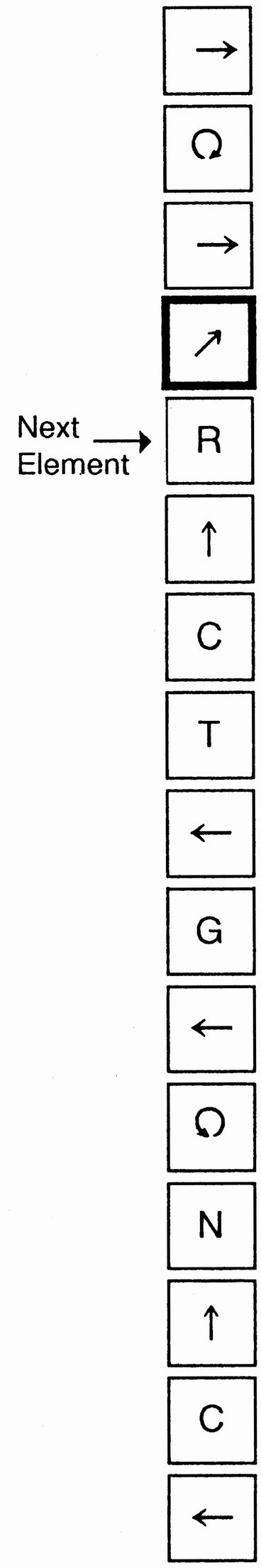
3) TANGENT NEXT Press the [**1**] and [**INPUT**] Keys at TN =.

Note: The next element wil be tangent as it is [↑].

4) ANGLE FROM Z Press the [**15**] and [**INPUT**] Keys at A =.

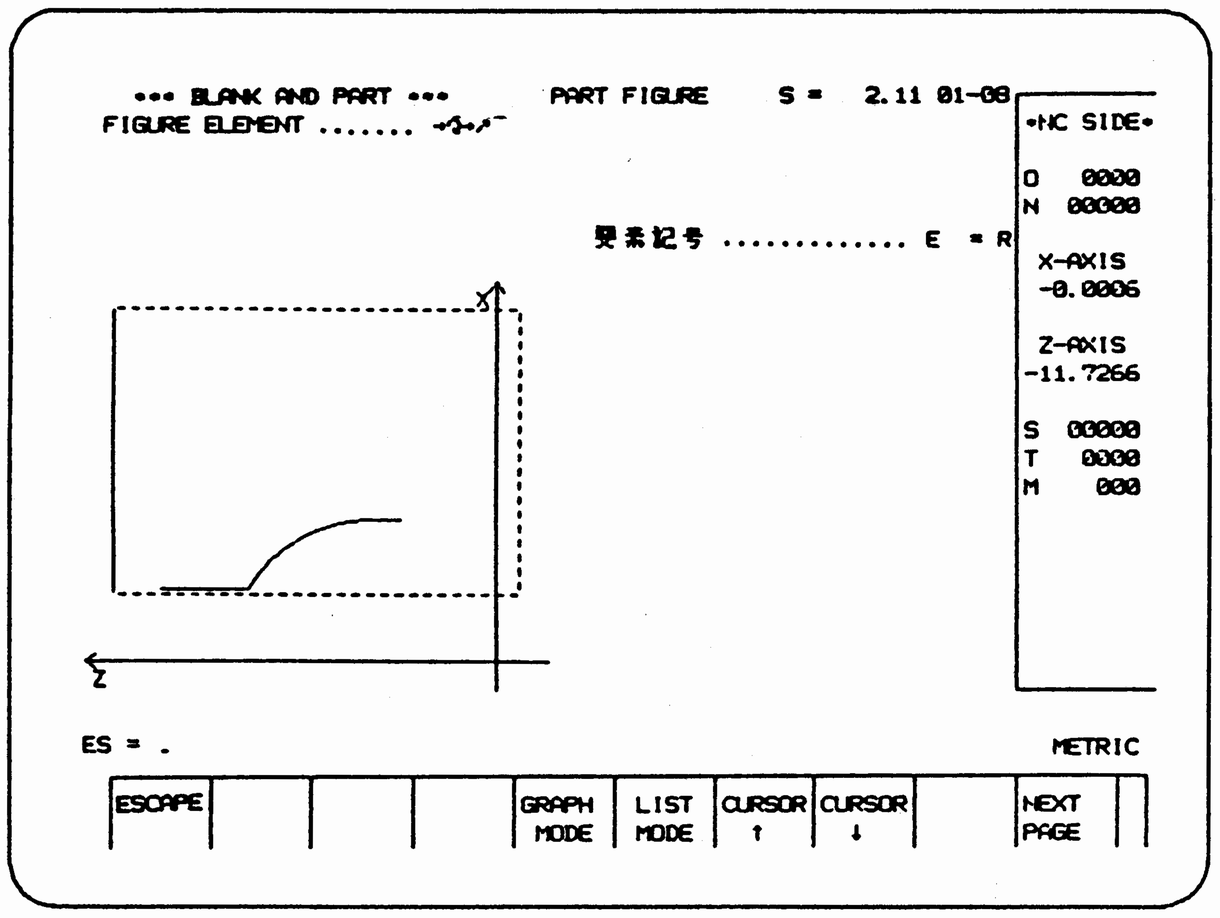


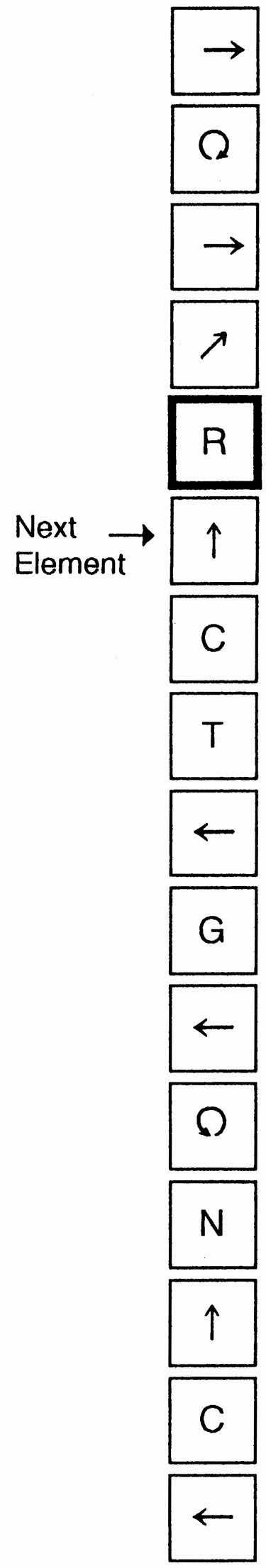




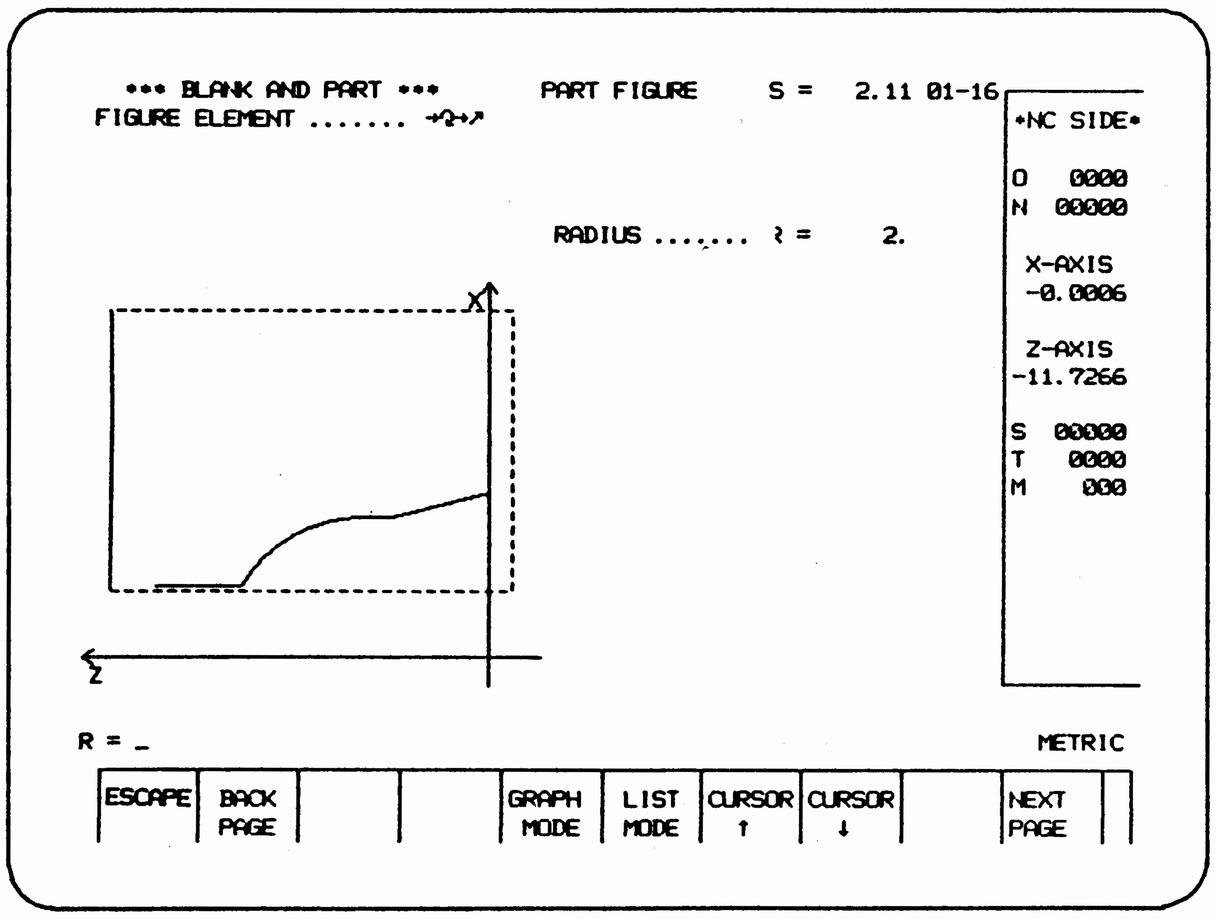
After the above data has been input, proceed to the next element.

1) ELEMENT SYMBOL Press the [R] and [INPUT] Keys at ES =.





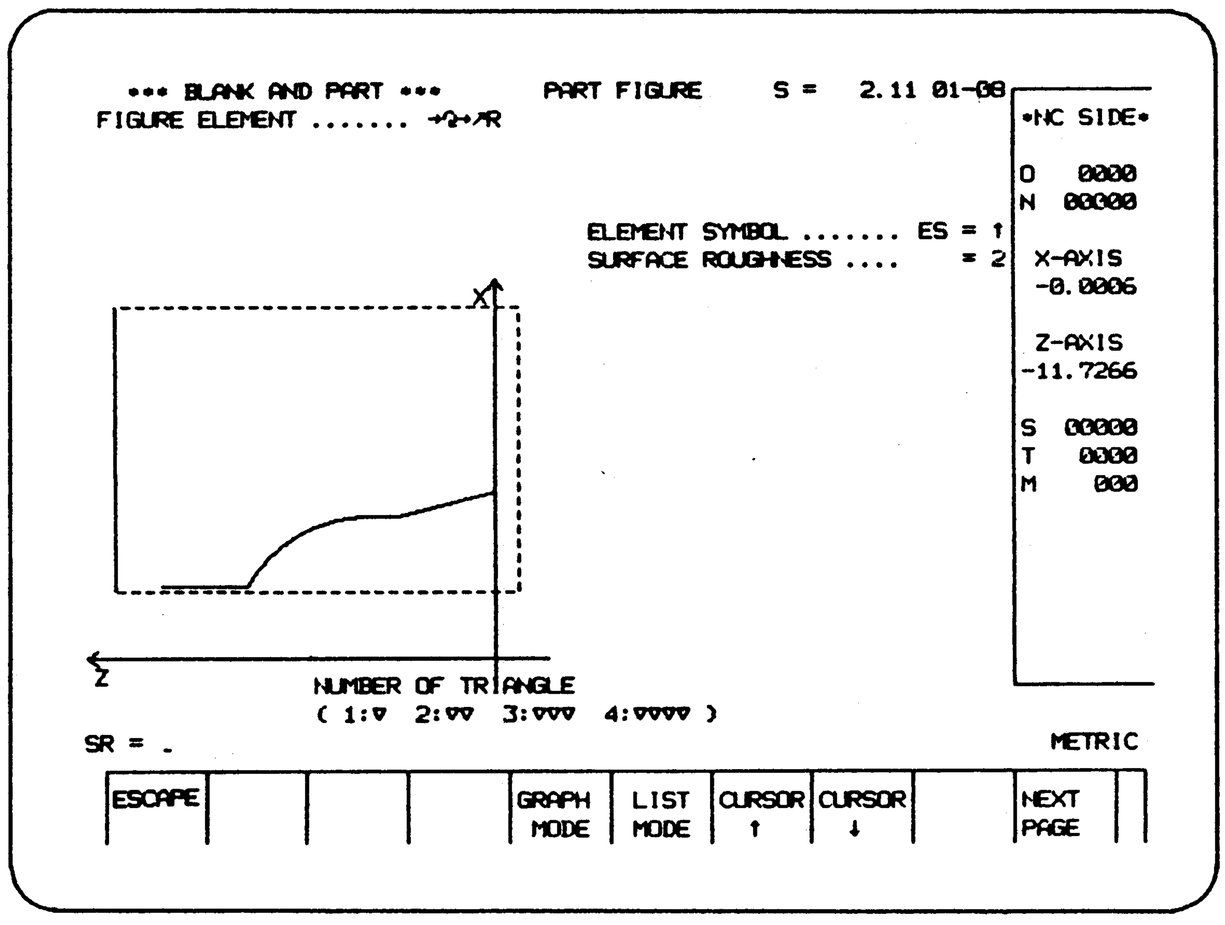
2) RADIUS Press the [2] and [INPUT] Keys at R =.

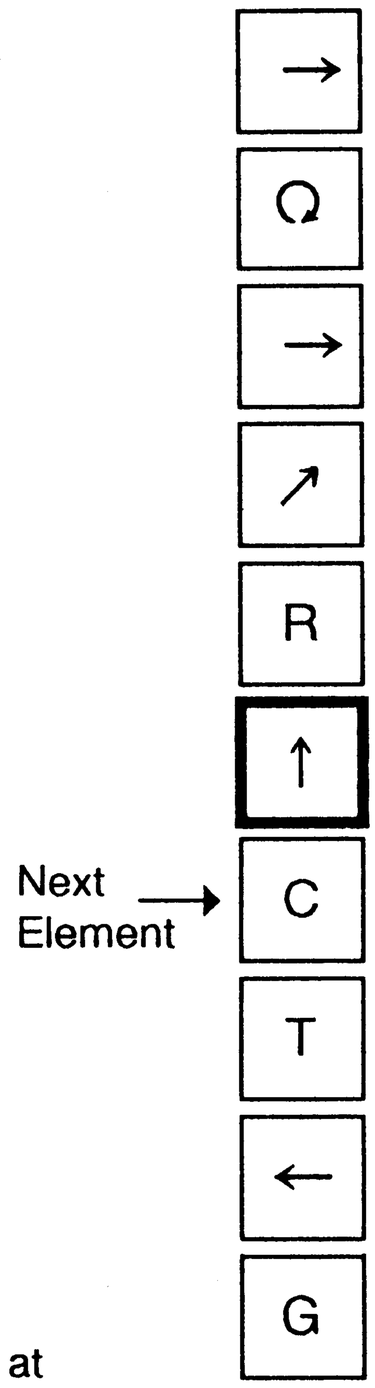


After the alone data has been input, proceed to the next element.

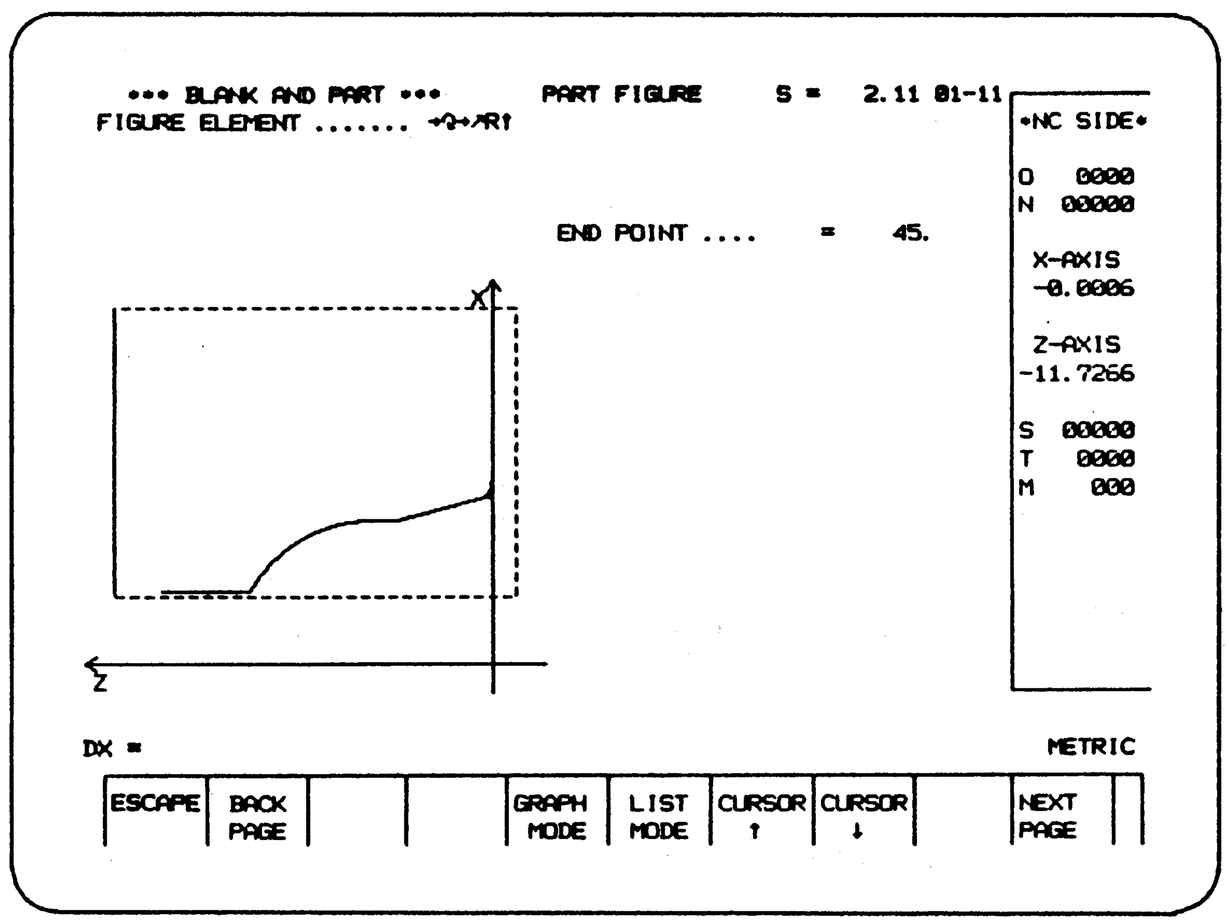
1) ELEMENT SYMBOL — Press the [↑] and [**INPUT**] Keys at ES =.

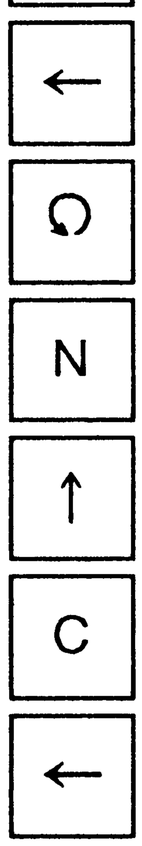
2) SURFACE ROUGHNESS — Press the [**2**] and [**INPUT**] Keys at SR =.





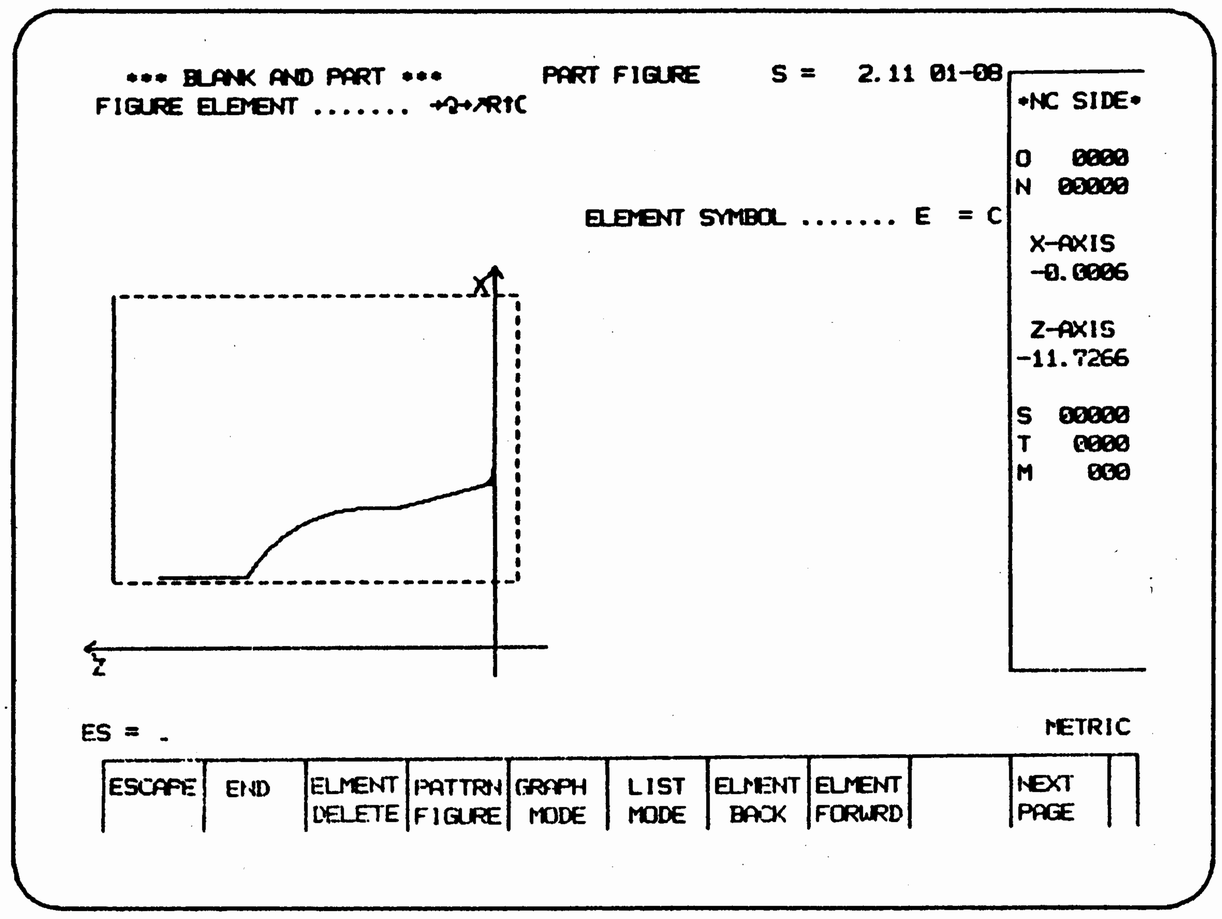
3) END POINT — Key-in "**45**" and then press the [**INPUT**] Key at DX =.

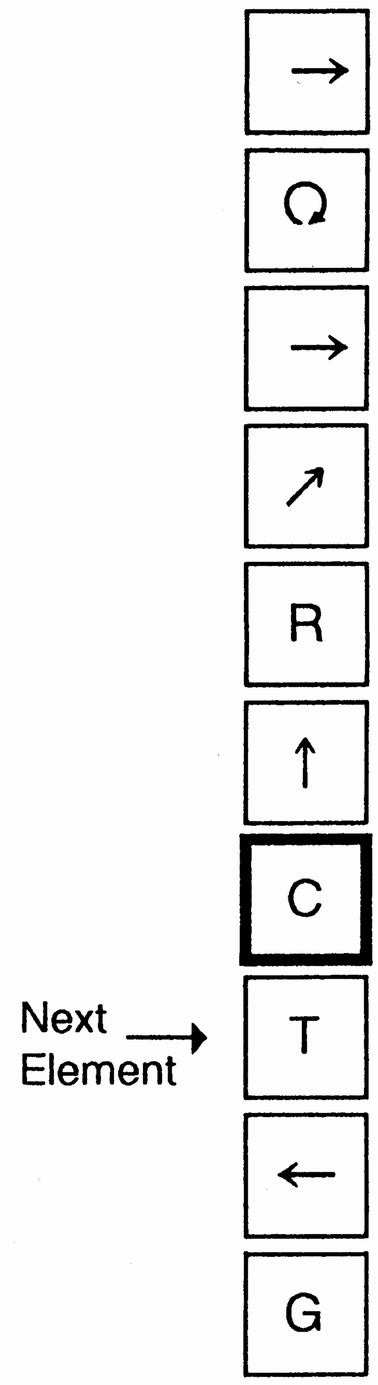




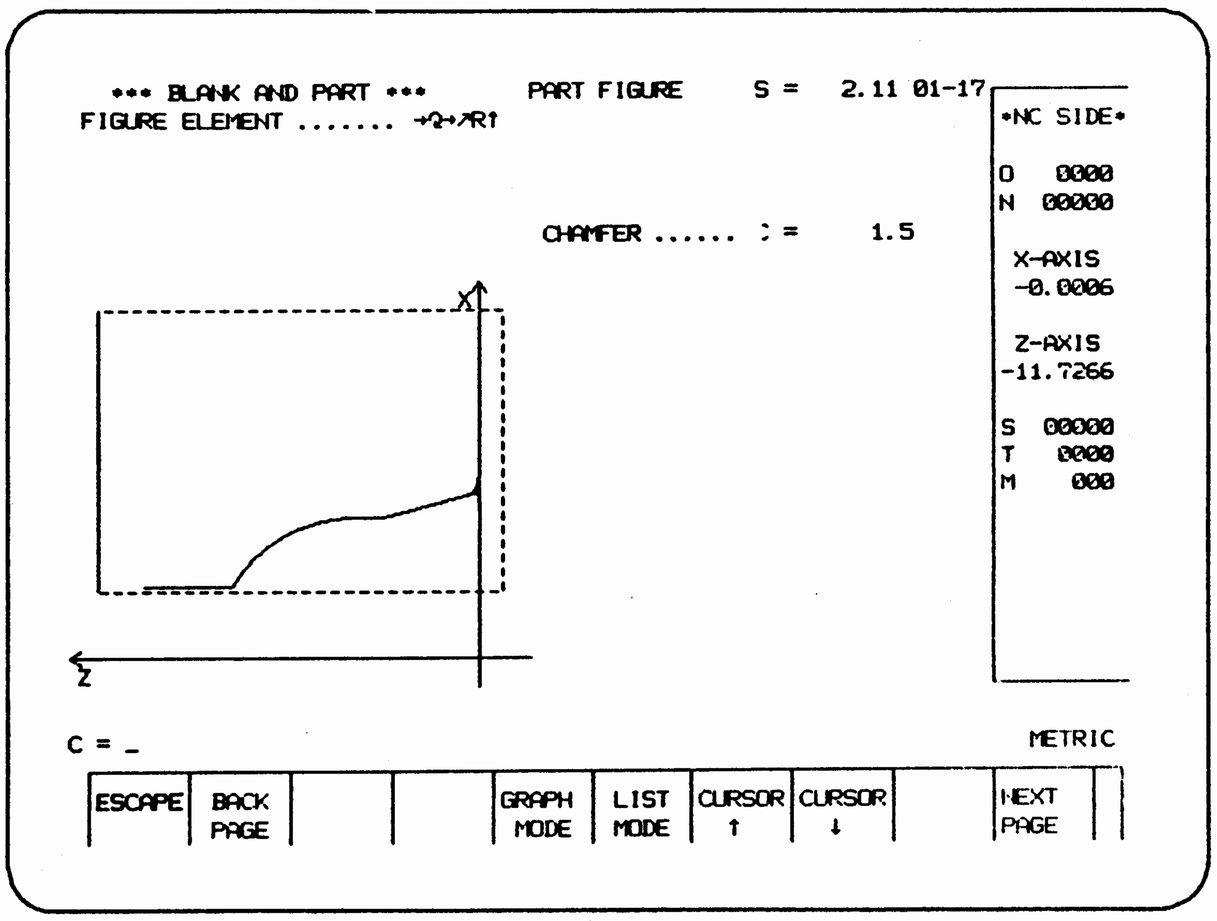
After the above data has been input, proceed to the next element.

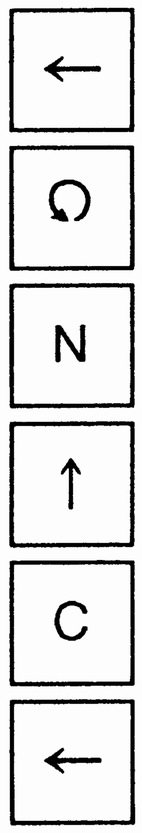
1) ELEMENT SYMBOL Press the [**C**] and [**INPUT**] Keys at ES =.





2) CHAMFER key-in the [**1.5**] and then press the[**INPUT**] Key at C =.

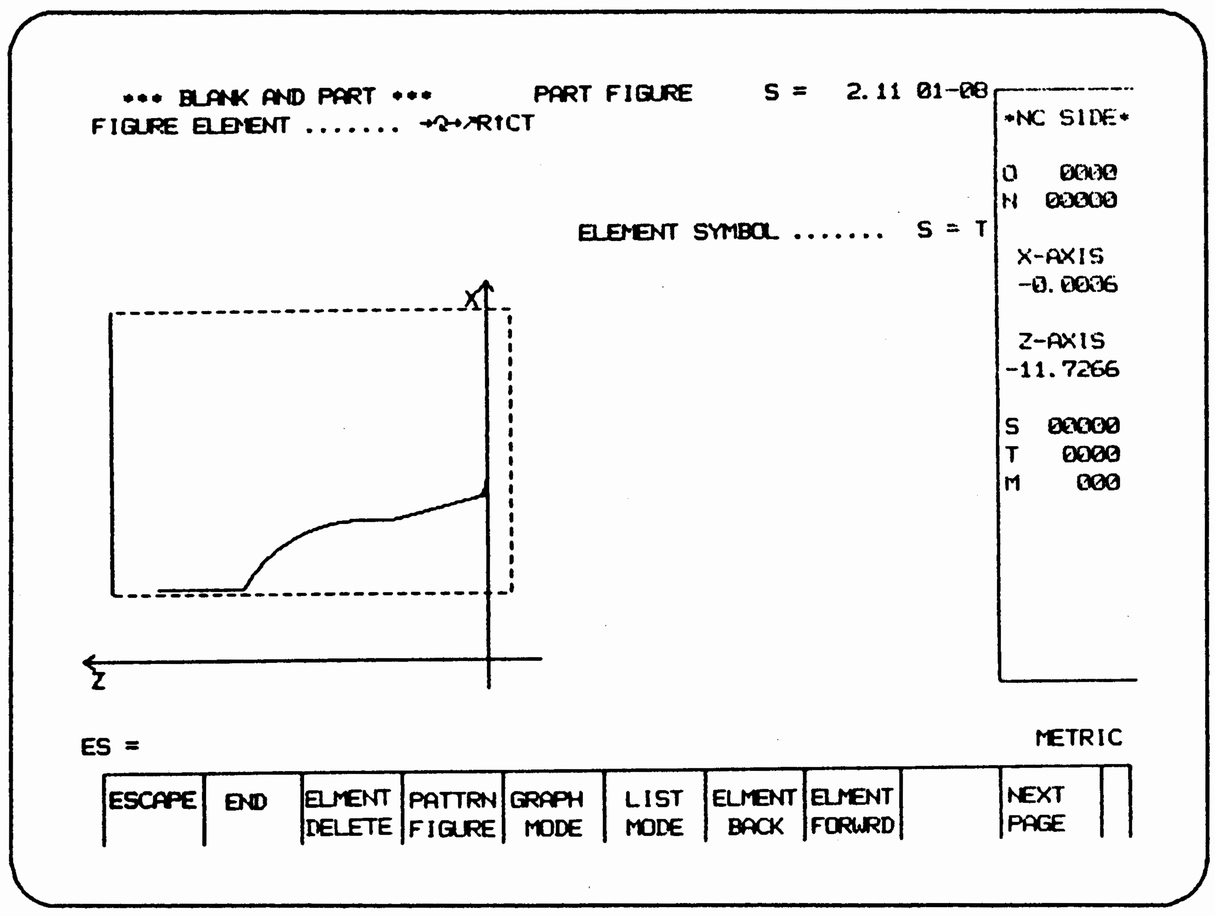


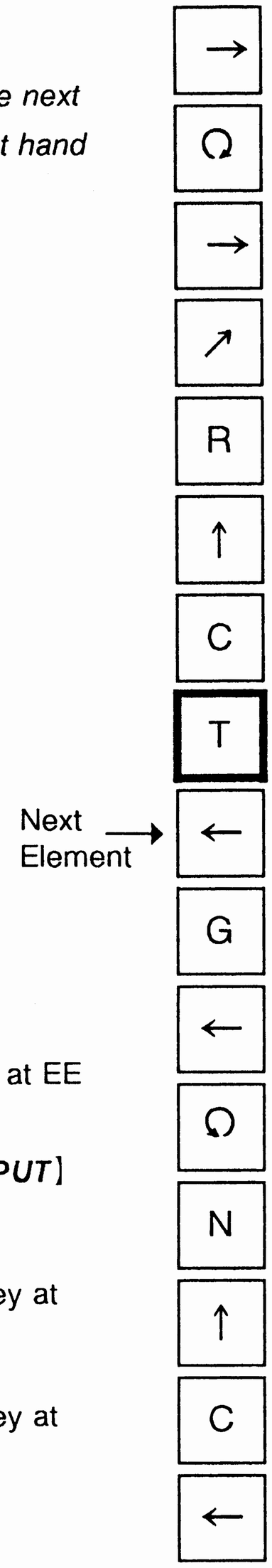


After the above data has been input, proceed to the next element.

1) ELEMENT SYMBOL Press the [T] and [**INPUT**] Keys at ES =.

Note : The thread direction will be set to left hand thread by pressing the next element [←] before [T]. As the thread in this example is a right hand thread, input [T] in advance. (M45 × P1.5, right hand thread).





2) ON WHICH ELEMENT Key-in "**1**" and then press the [**INPUT**] Key at EE =.

*Note : Threading will be carried out on the next element if [**1**] and [**INPUT**] Key are pressed at EE =.*

3) LENGTH Key-in "**8.5**" and then press the [**INPUT**] Key at LT =.

4) LEAD Key-in "**1.5**" and then press the [**INPUT**] Key at LD =.

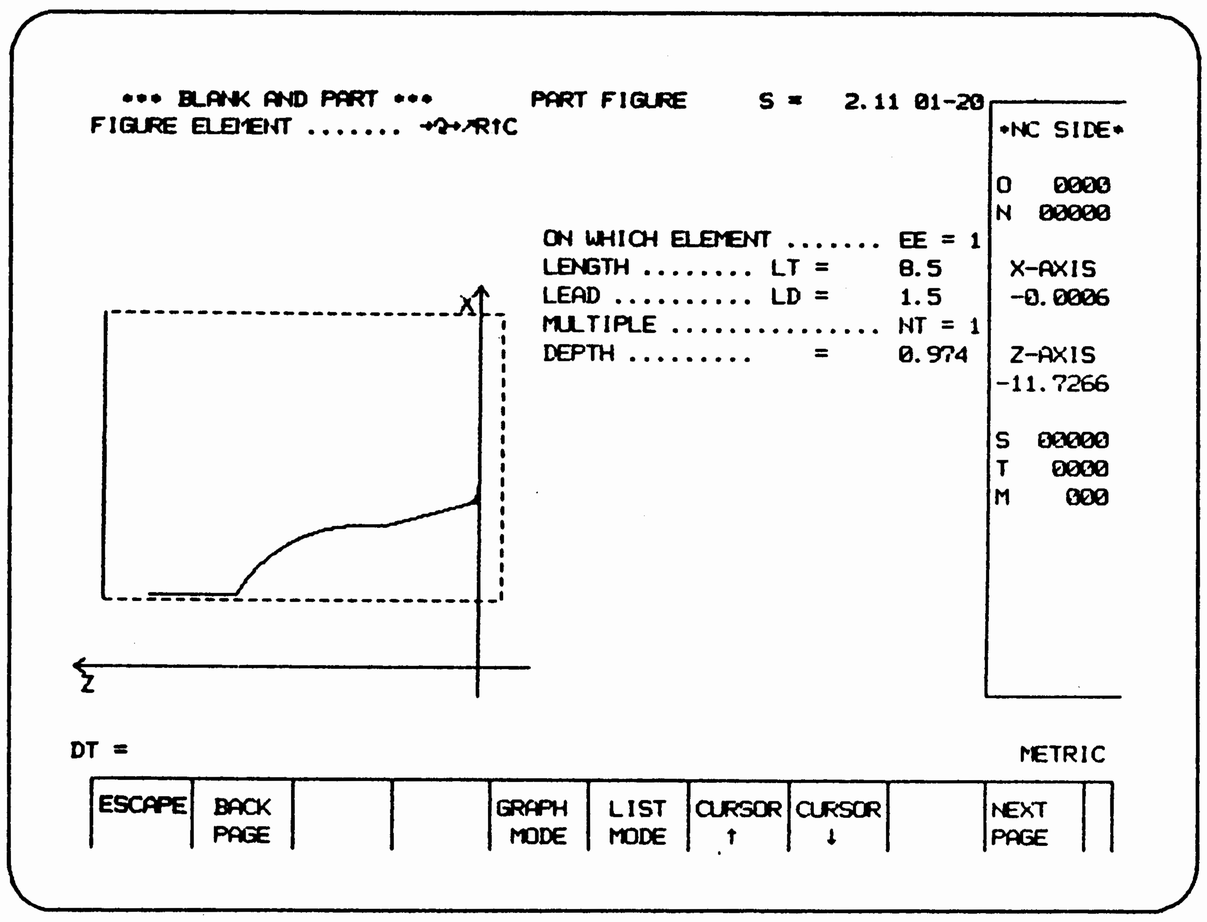
Note : With M45 × P1.5 single threads pitch P will be LD.

5) MULTIPLE Key-in "**1**" and then press the [**INPUT**] Key at NT =.

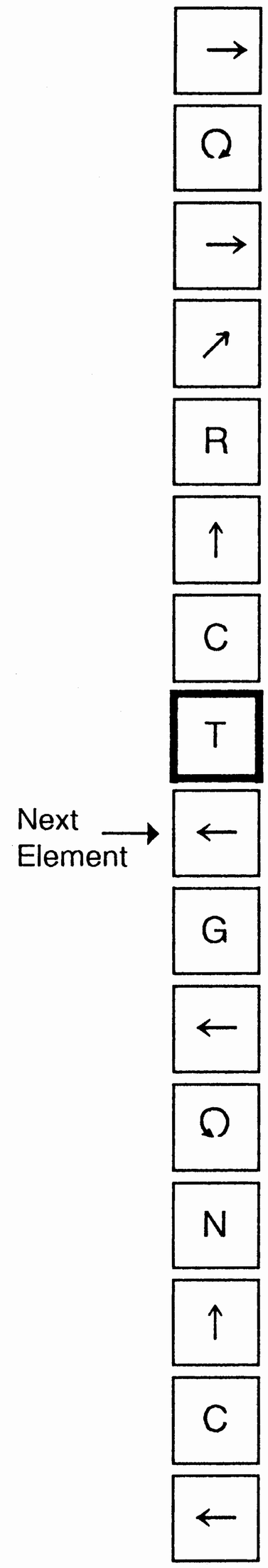
Note : With double-thread screws, set NT to NT = 2.

6) DEPTH Press only the [**INPUT**] Key at DT =.

Note : The system will automatically calculate the thread when the pitch is input. (JIS 60° thread)
Formula: 0.6495 × (LD)
Check the depth of the thread using a thread gauge.
Re-input for square threads and inch threads.

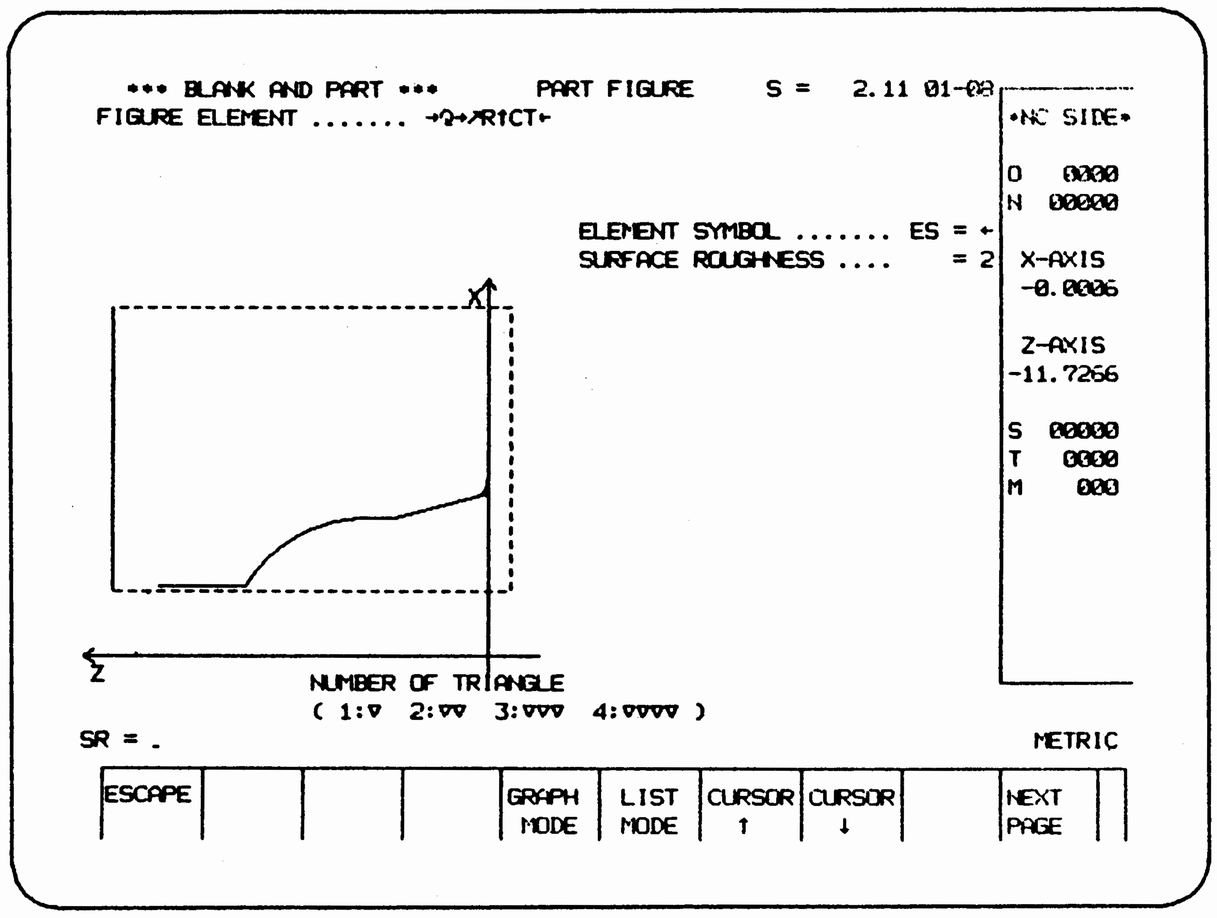


After the above data has been input, proceed to the next element.

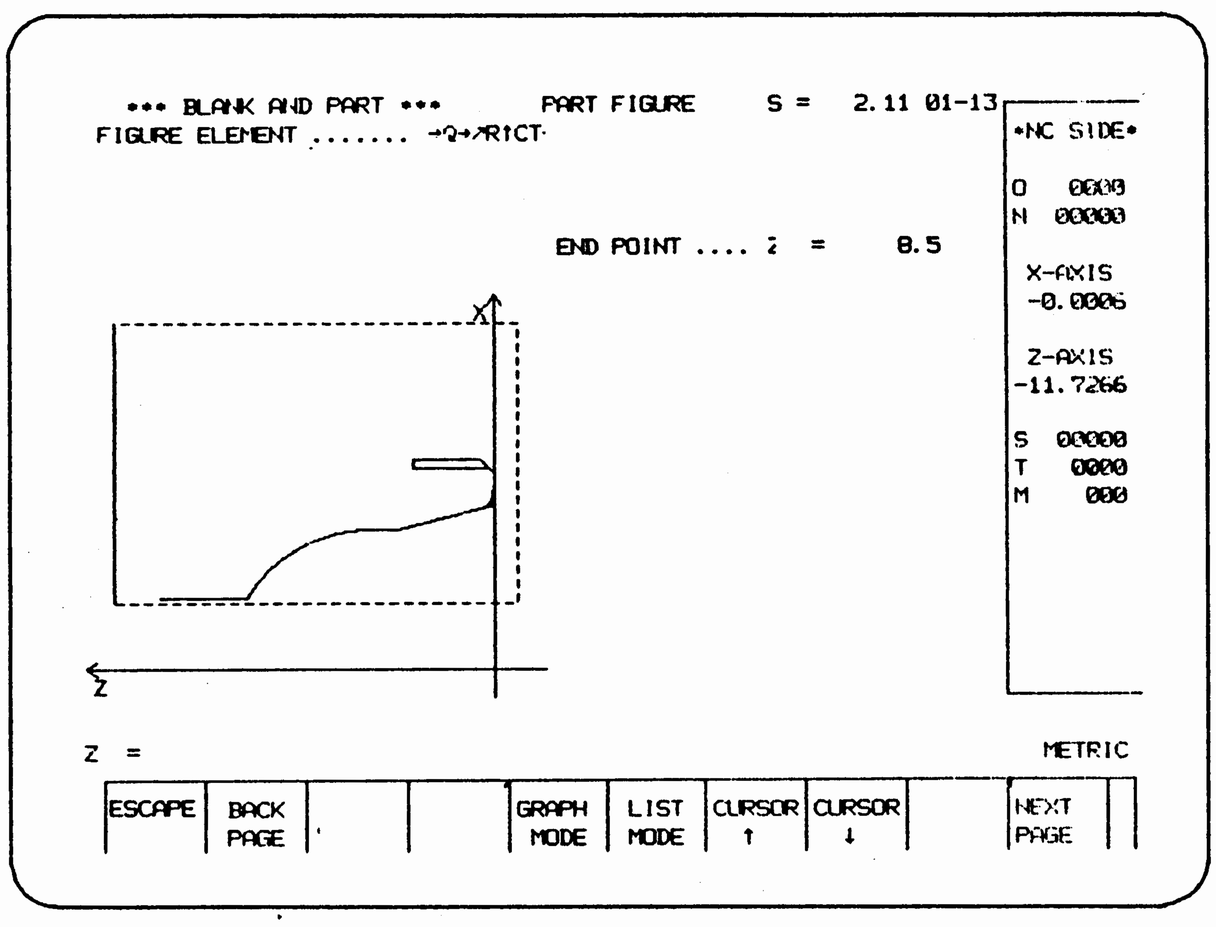


1) ELEMENT SYMBOL — Press the [←] and [**INPUT**] Keys at ES =.

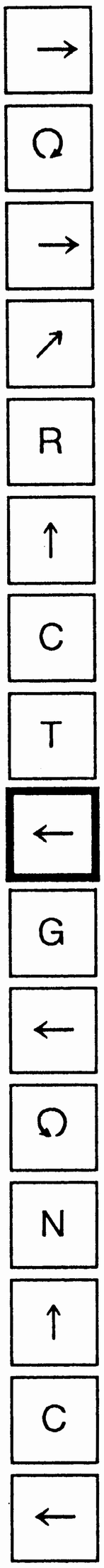
2) SURFACE ROUGHNESS — Press the [**2**] and [**INPUT**] Keys at SR =.



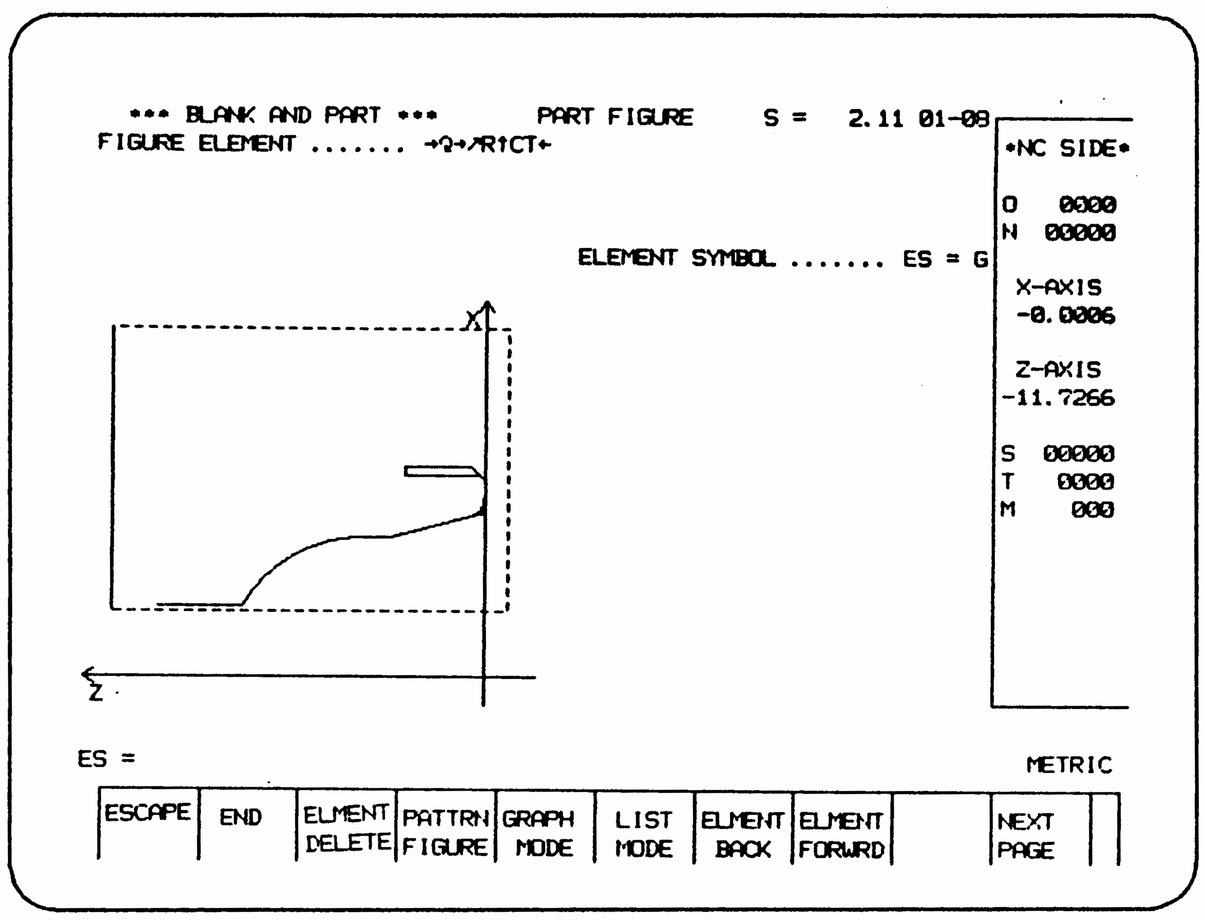
3) END POINT — Key-in "**8.5**" and then press the [**INPUT**] Key at Z =.



After the above data has been input, proceed to the next element.



1) ELEMENT SYMBOL — Press the [**G**] and [**INPUT**] Keys at ES =.



2) ON WHICH ELEMENT — Key-in "**1**" and then press the [**INPUT**] Key at EE =.

3) DIRECTION — Press the [↓] and [**INPUT**] Keys at DN =.
(→: right, ←: left, ↑: top, ↓: bottom)

4) WIDTH — Key-in "**3.5**" and then press the [**INPUT**] Key at WT =.

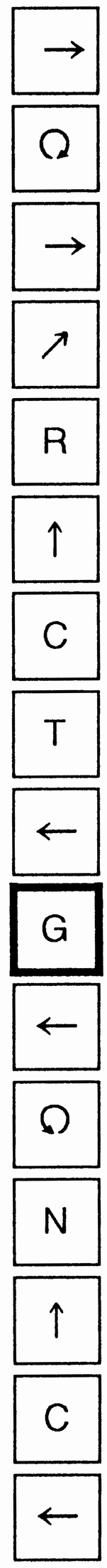
5) DEPTH — Key-in "**1.5**" and then press the [**INPUT**] Key at DT =.[**C**]

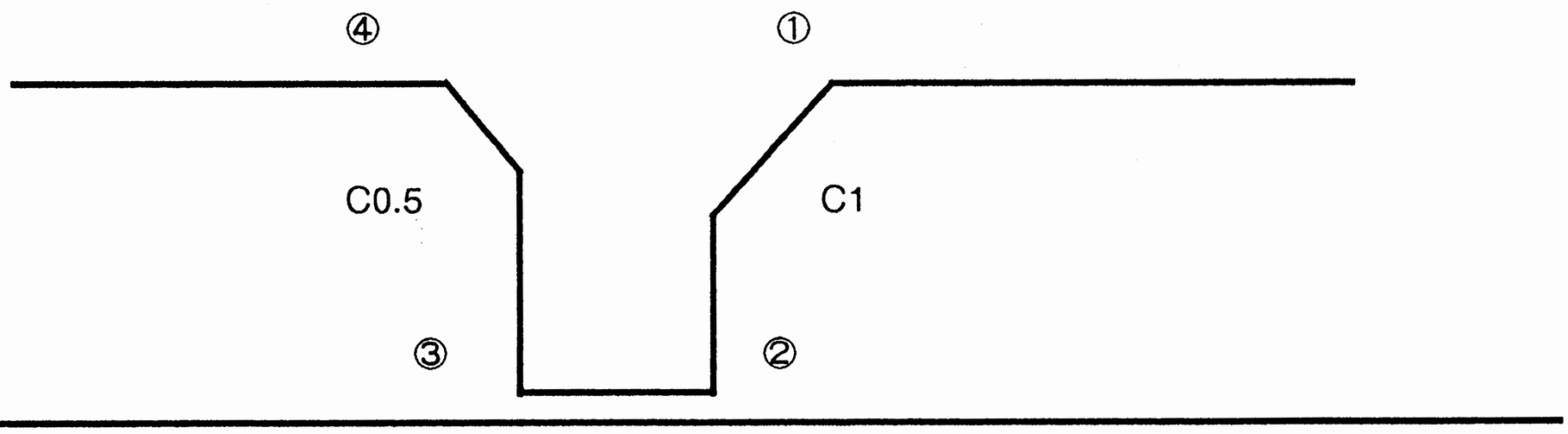
6) 1ST ① — Press the [**C**] and [**INPUT**] Keys at KC=. Key in "**1**" and then press the [**INPUT**] Key at CV=.

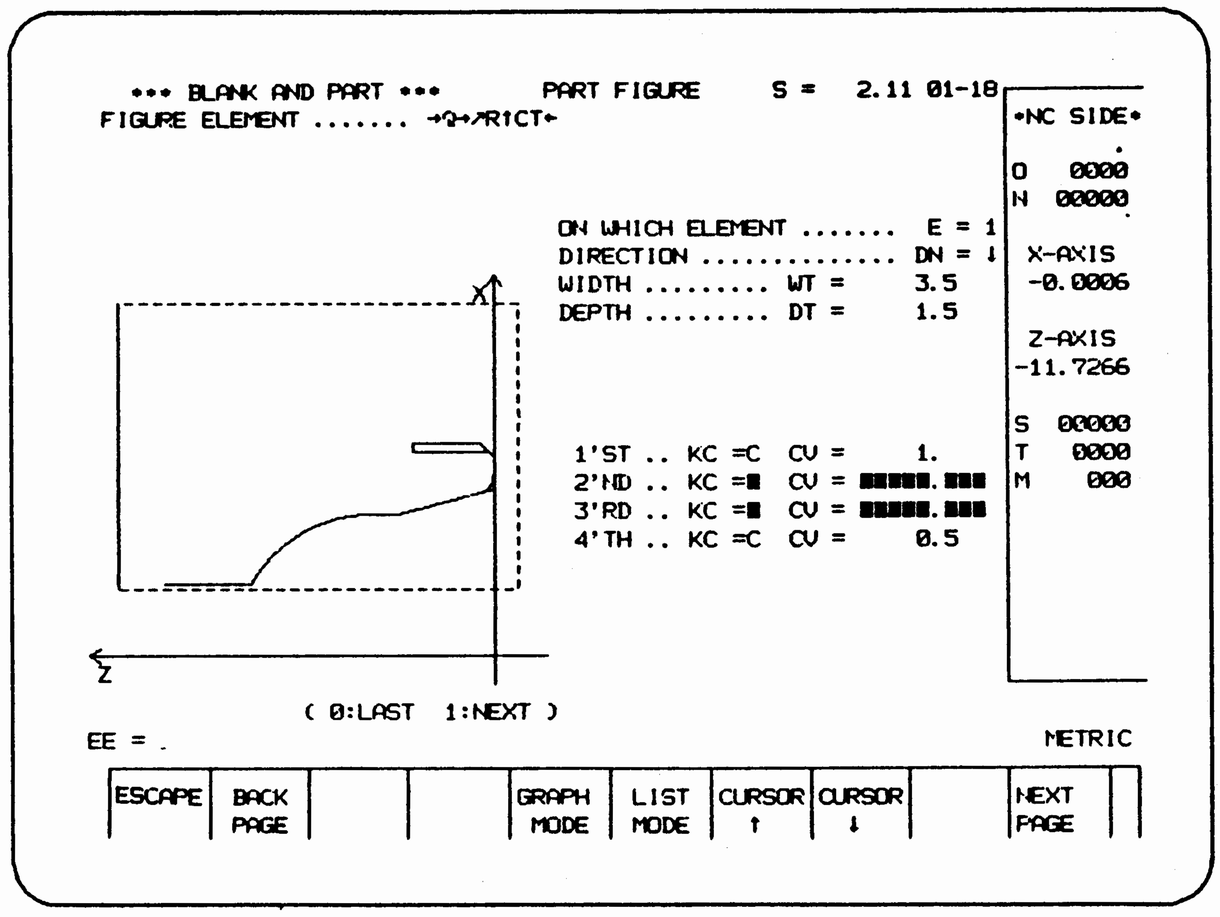
7) 2ND ② — Press the [**INPUT**] Key at KC=.

8) 3RD ③ — Press the [**INPUT**] Key at KC=.

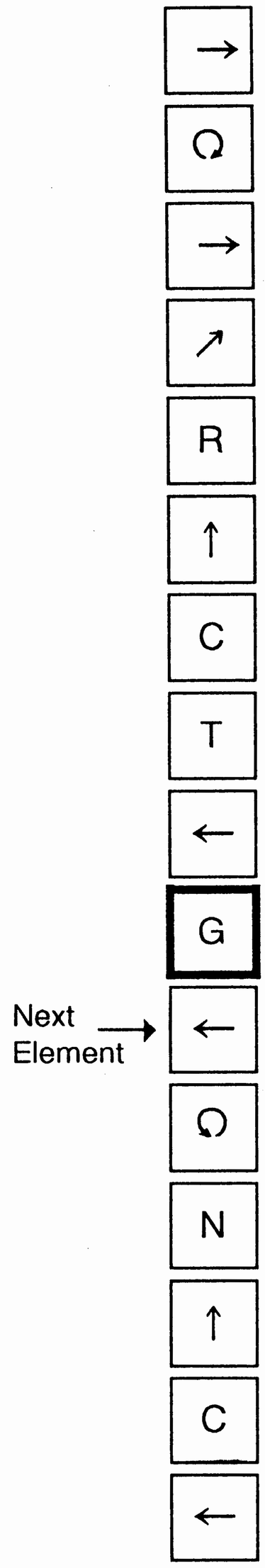
9) 4TH ④ — Press the [**C**] and the [**INPUT**] Keys at KC=. Key in "**0.5**" and then press the [**INPUT**] Key at CV=.





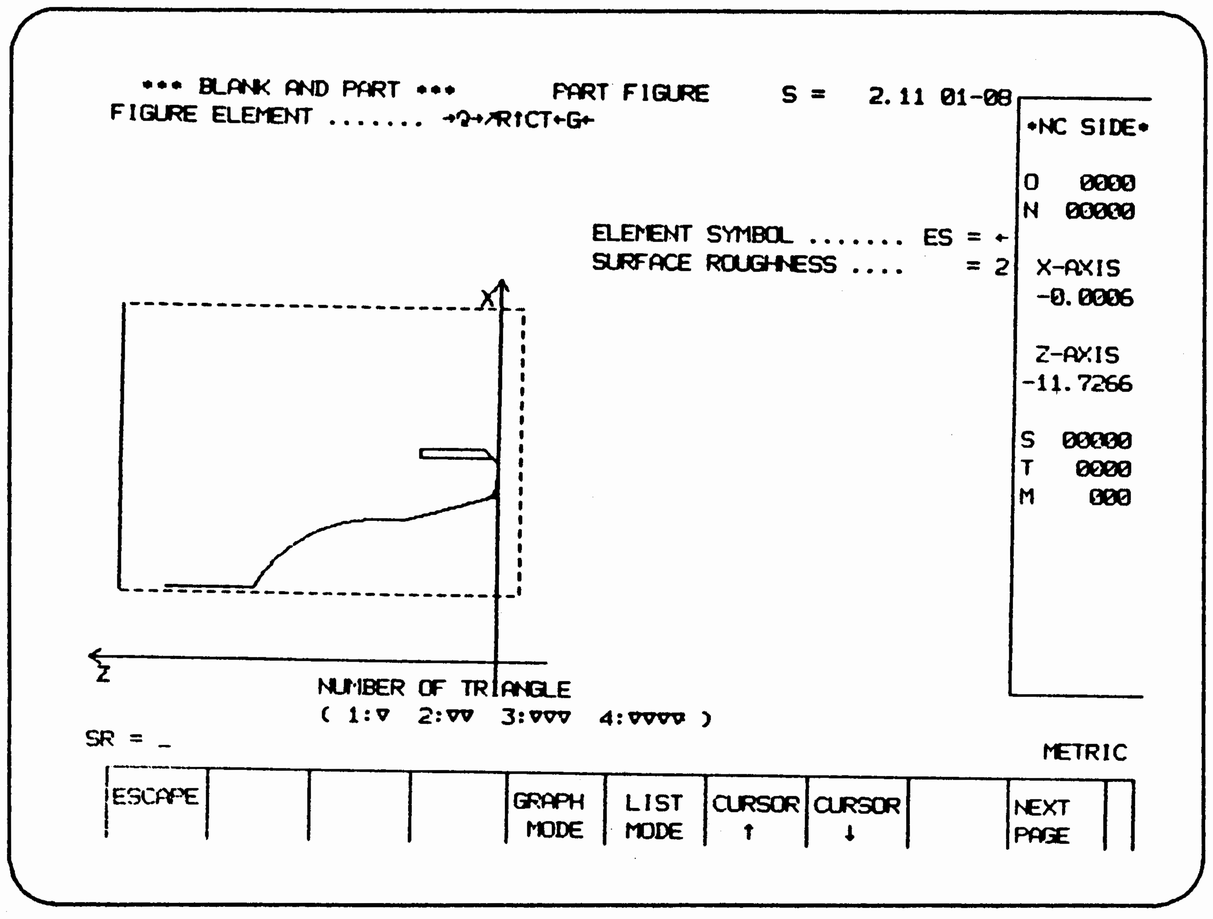


After the above data has been input, proceed to the next element.



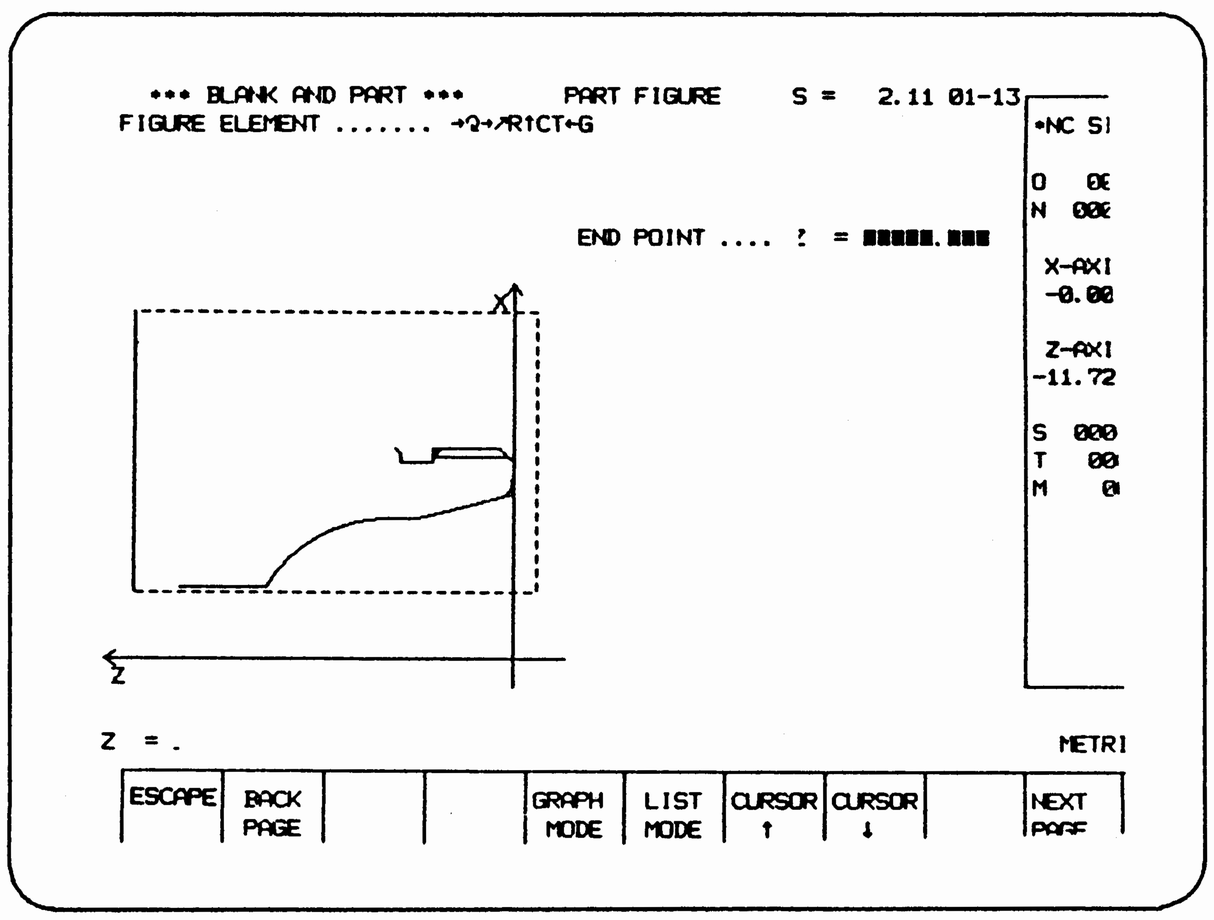
1) ELEMENT SYMBOL — Press the [←] and [**INPUT**] Keys at ES =.

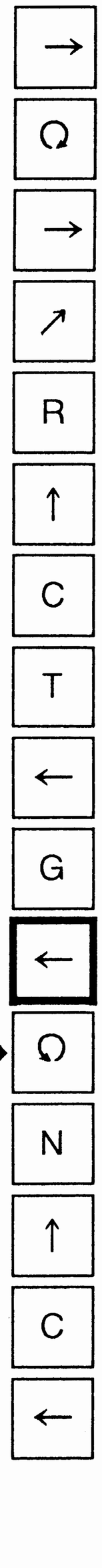
2) SURFACE ROUGHNESS — Press the [**2**] and [**INPUT**] Keys at SR =.



3) END POINT — Press the [**INPUT**] Key at Z =.

*Note : Press only the [**INPUT**] Key as the final coordinate Z on the machining is not displayed.*



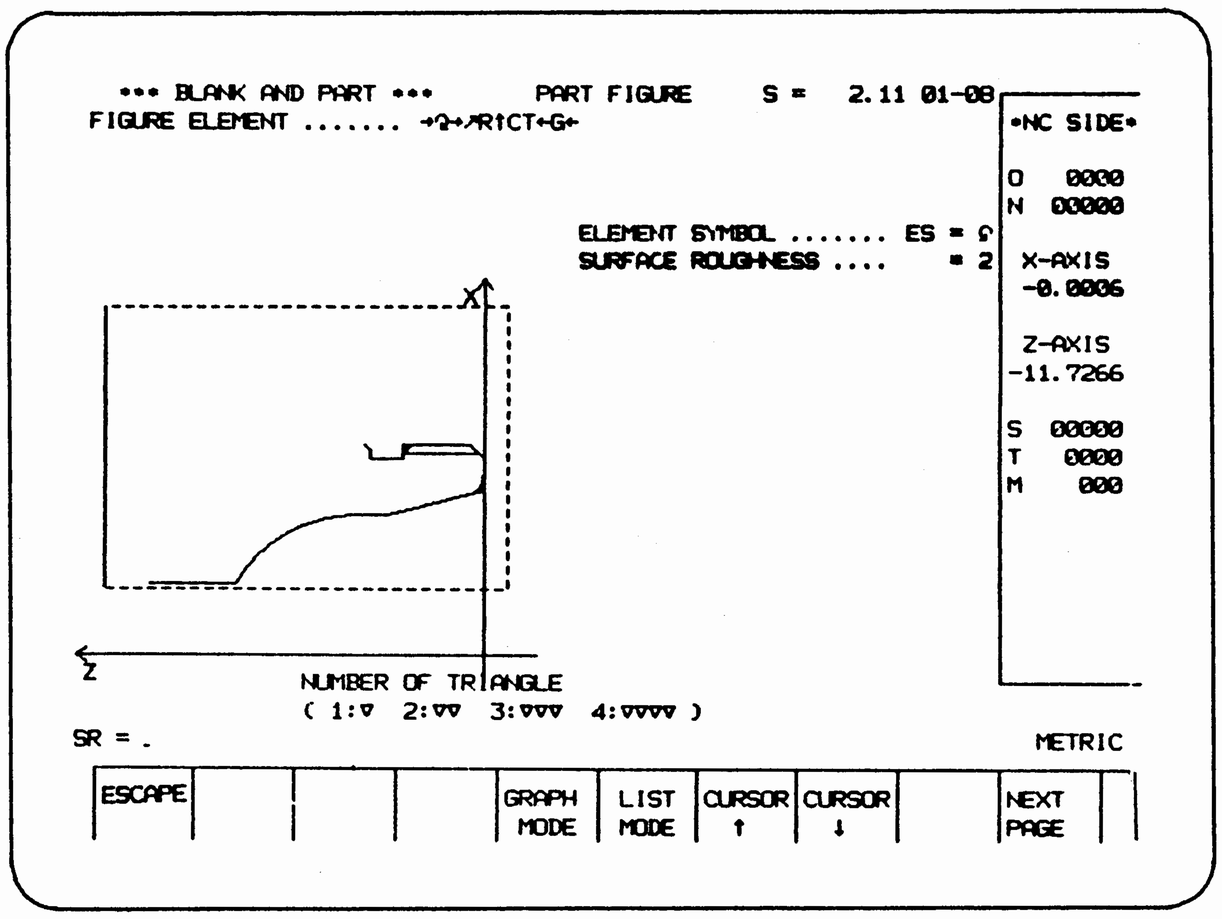


After the above data has been input, proceed to the next element.

1) ELEMENT SYMBOL Press the [Ω] and [**INPUT**] Keys at ES =.

2) SURFACE ROUGHNESS Press the [**3**] and [**INPUT**] Keys at SR =.

The finish of the surface is indicated as ▽▽▽ on the drawing. Input [**3**] only here.



3) END POINT Press the [**INPUT**] Key at DX =.

4) END POINT Press the [**25**] and [**INPUT**] Keys at Z =.

*Note : Press only the [**INPUT**] as coordinates for DX and Z are not indicated on the drawing.*

5) TANGENT LAST Key-in "**0**" and then press the [**INPUT**] Key at TL =.

6) TANGENT NEXT Key-in "**0**" and then press the [**INPUT**] Key at TN =.

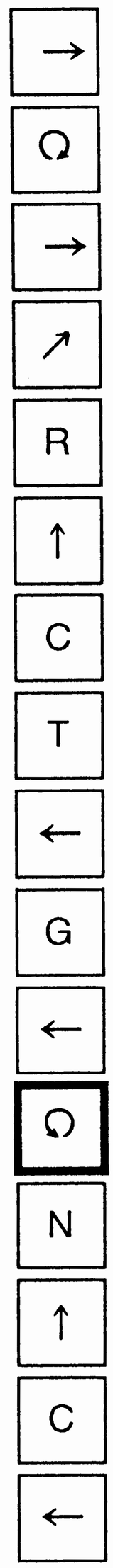
7) RADIUS Key-in "**30**" and then press the [**INPUT**] Key at R =.

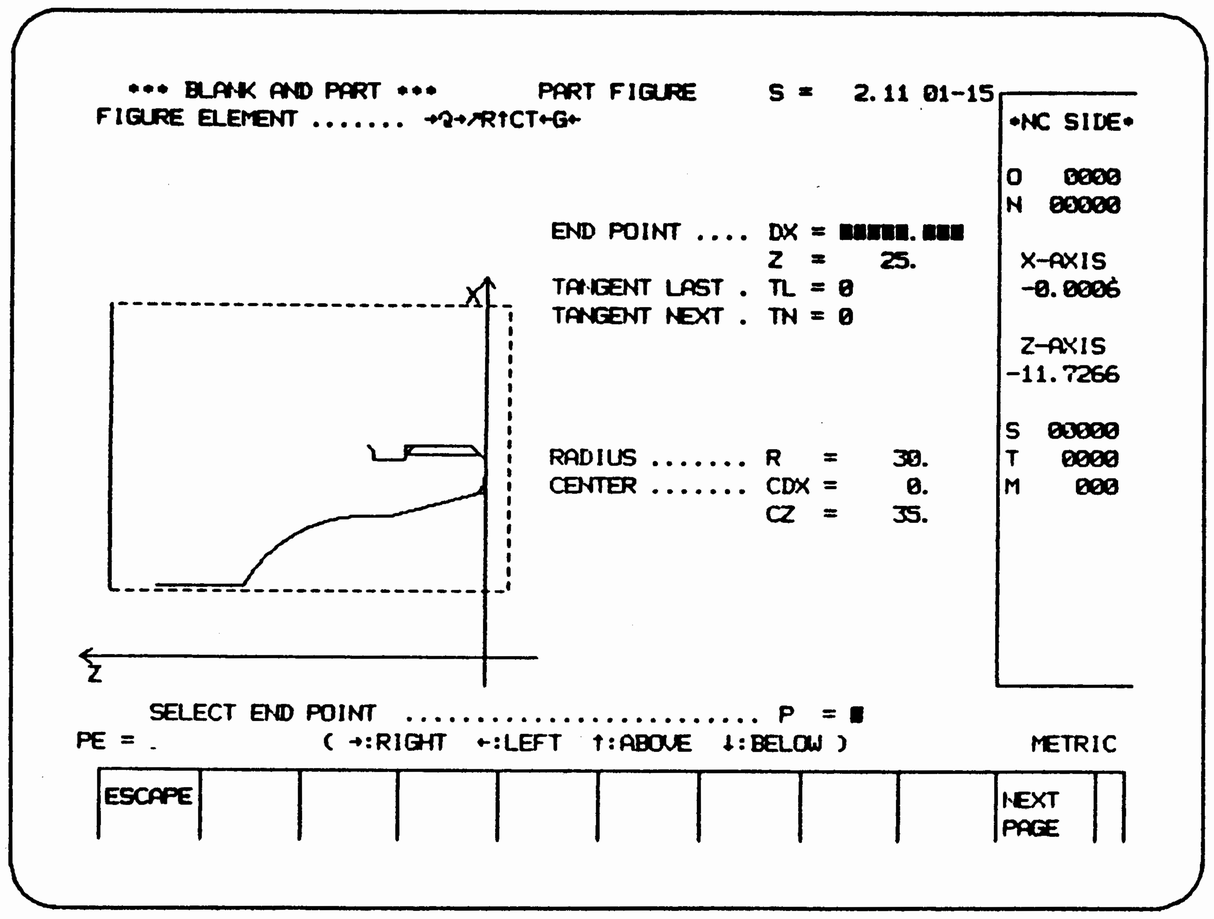
8) CENTER (X axis) Key-in "**0**" and then press the [**INPUT**] Key at CPX =.

9) CENTER (Z axis) Key-in "**35**" and then press the [**INPUT**] Key at CPX =.

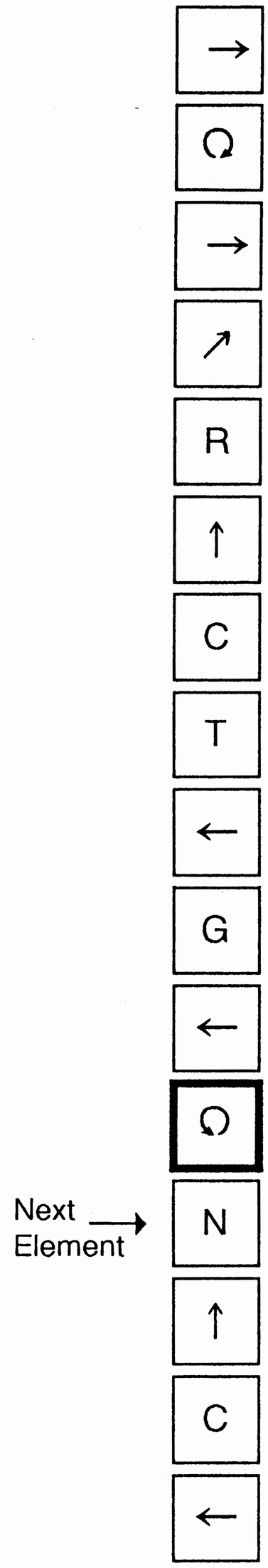
10) START POINT Press [→] and then press the [**INPUT**] Key at PS =.

(→: right, ←: left, ↑: above, ↓: below)

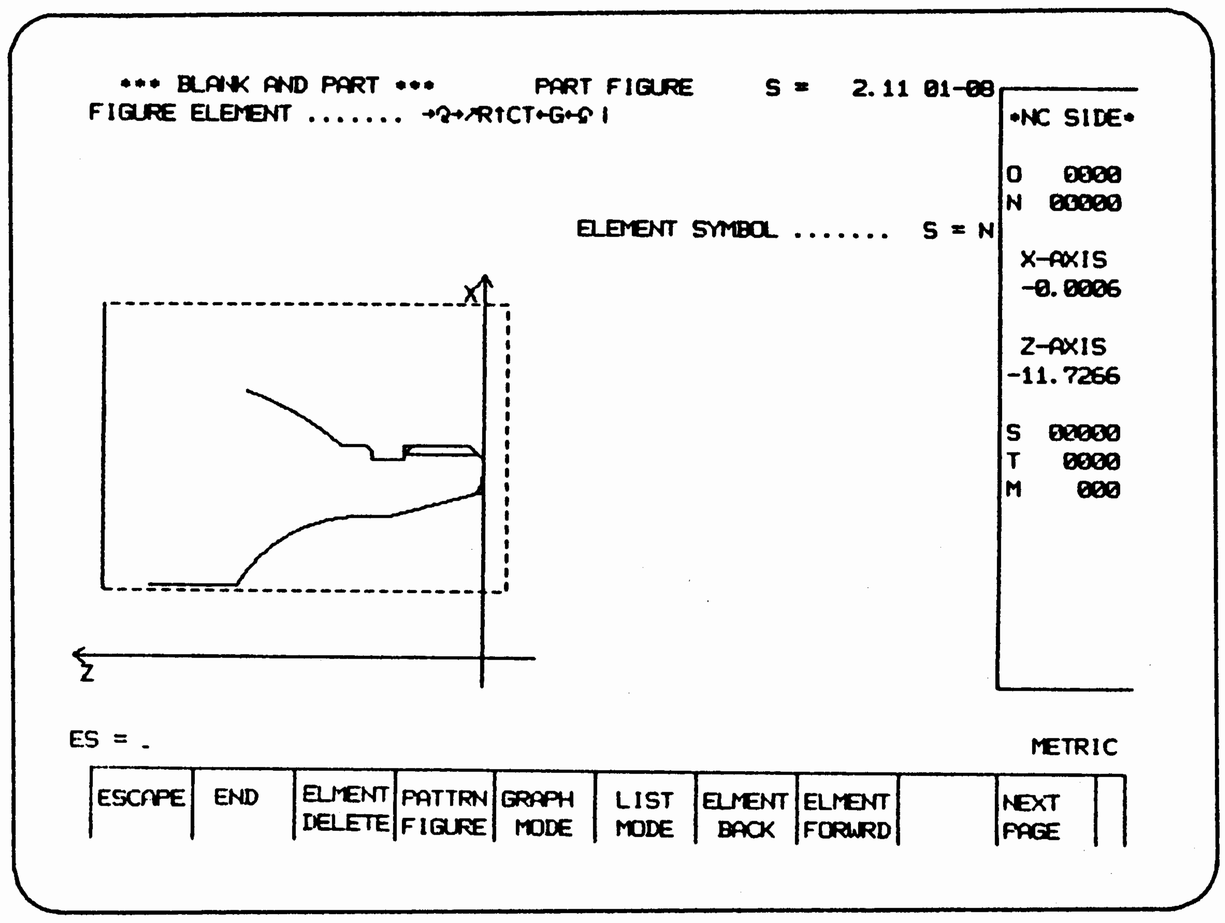




After the above data has been input, proceed to the next element.

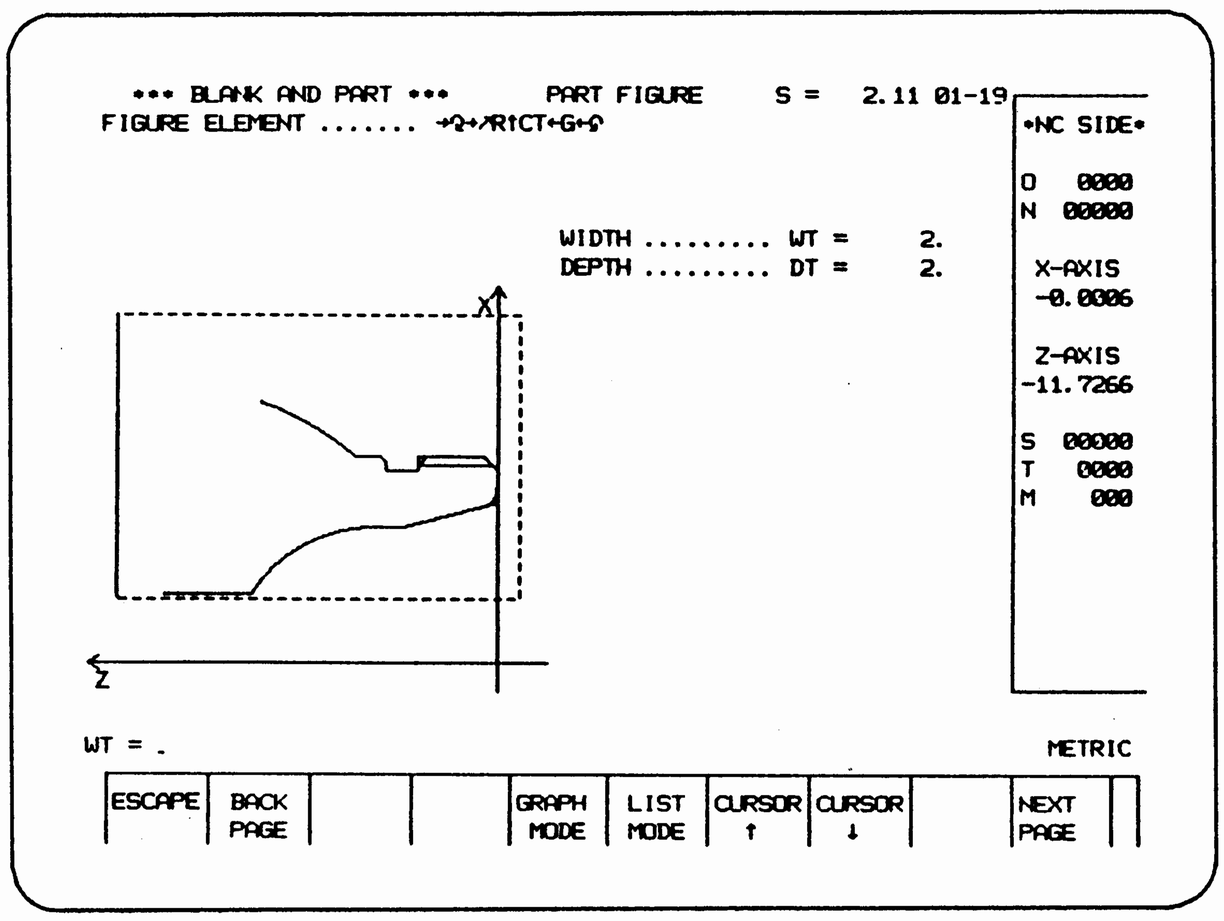


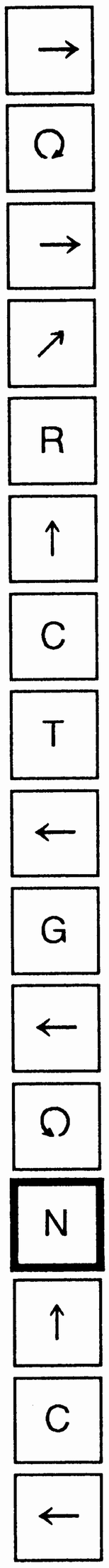
1) ELEMENT SYMBOL Press the [**N**] and [**INPUT**] Keys at ES =.



2) WIDTH Key-in "**2**" and then press the [**INPUT**] Key at WT =.

3) DEPTH Key-in "**2**" and then press the [**INPUT**] Key at DT =.

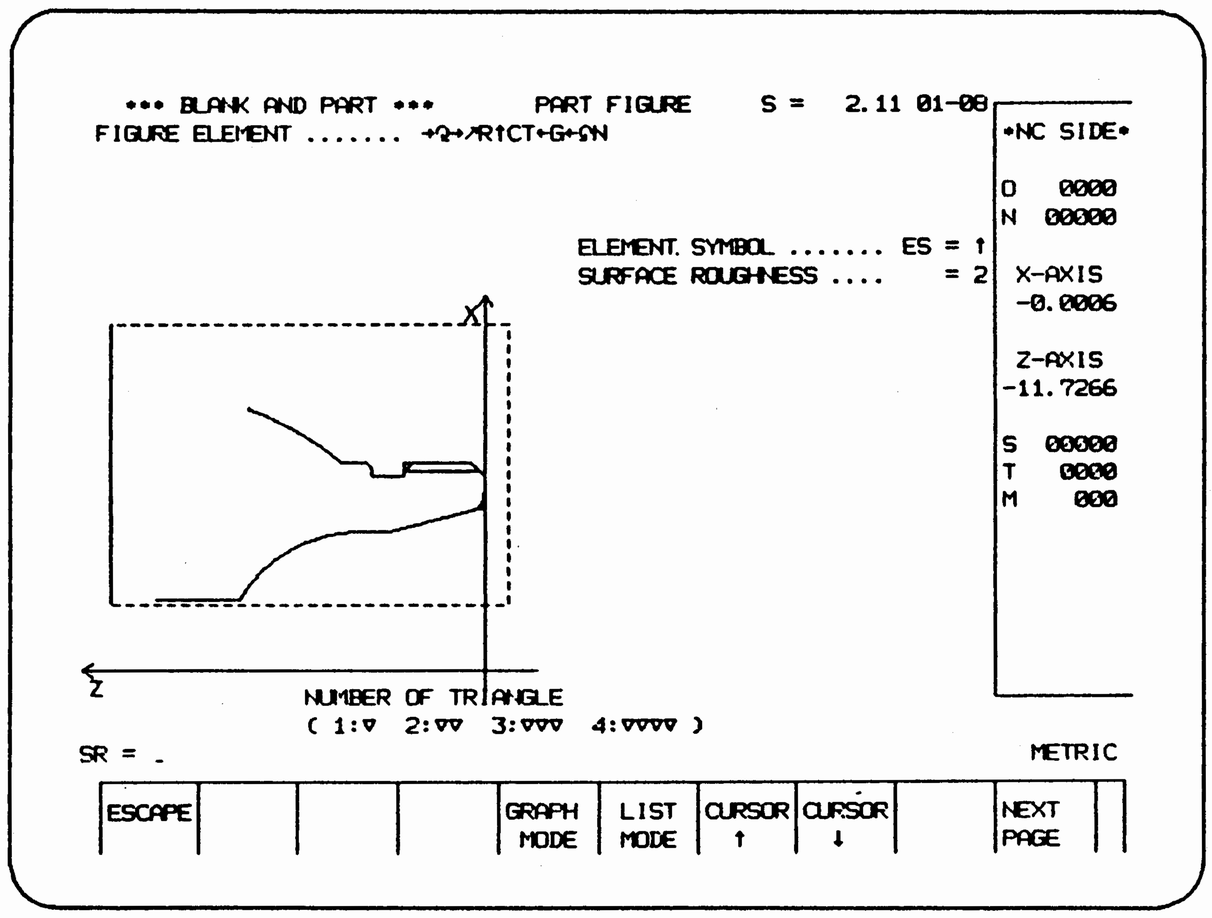


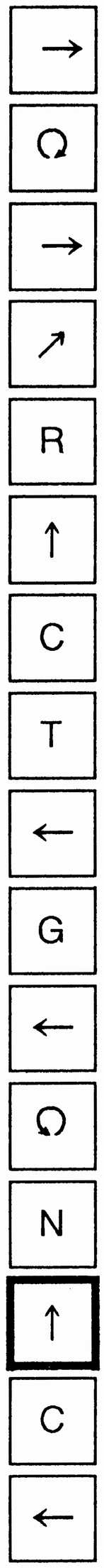


After the above data has been input, proceed to the next element.

1) ELEMENT SYMBOL — Press the [↑] and [**INPUT**] Keys at ES =.

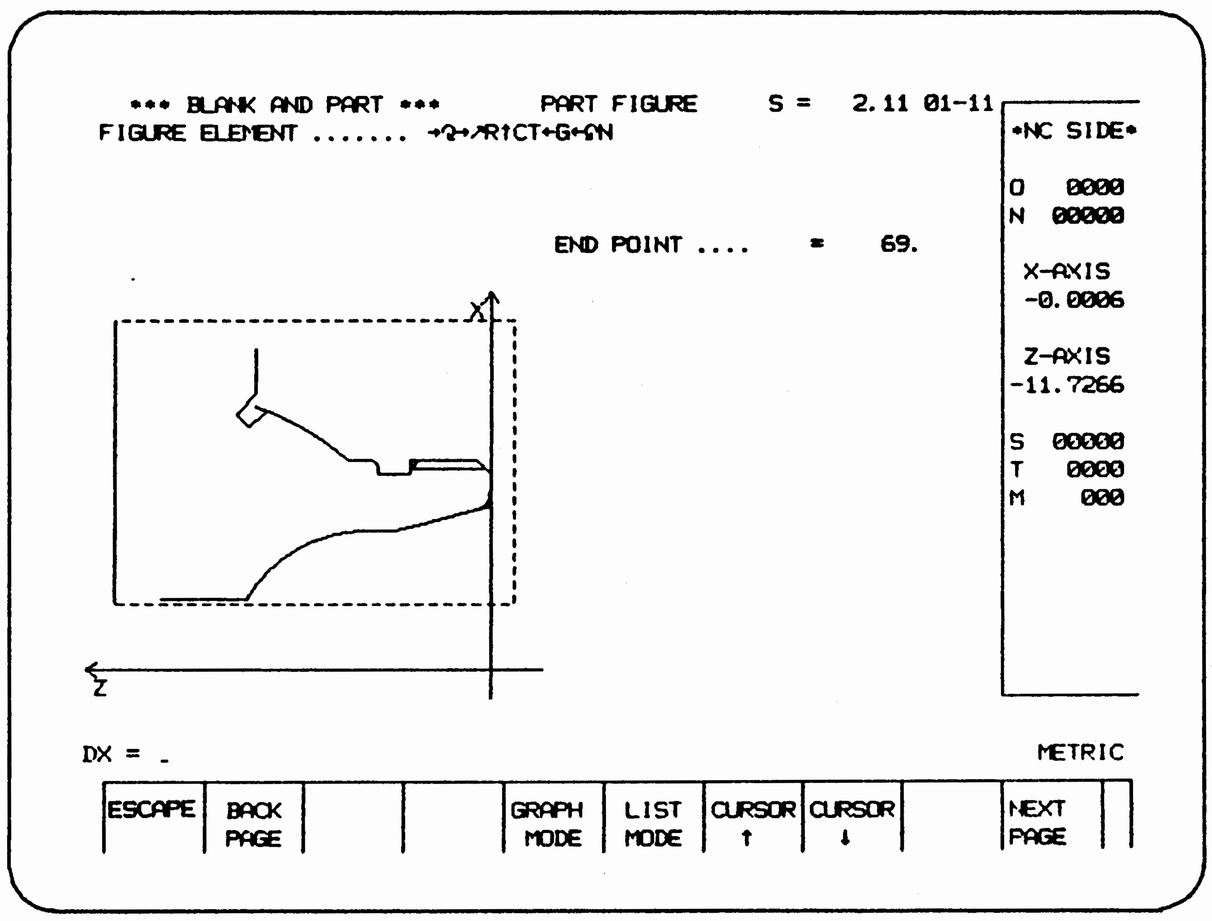
2) SURFACE ROUGHNESS — Press the [**2**] and [**INPUT**] Keys at SR =.





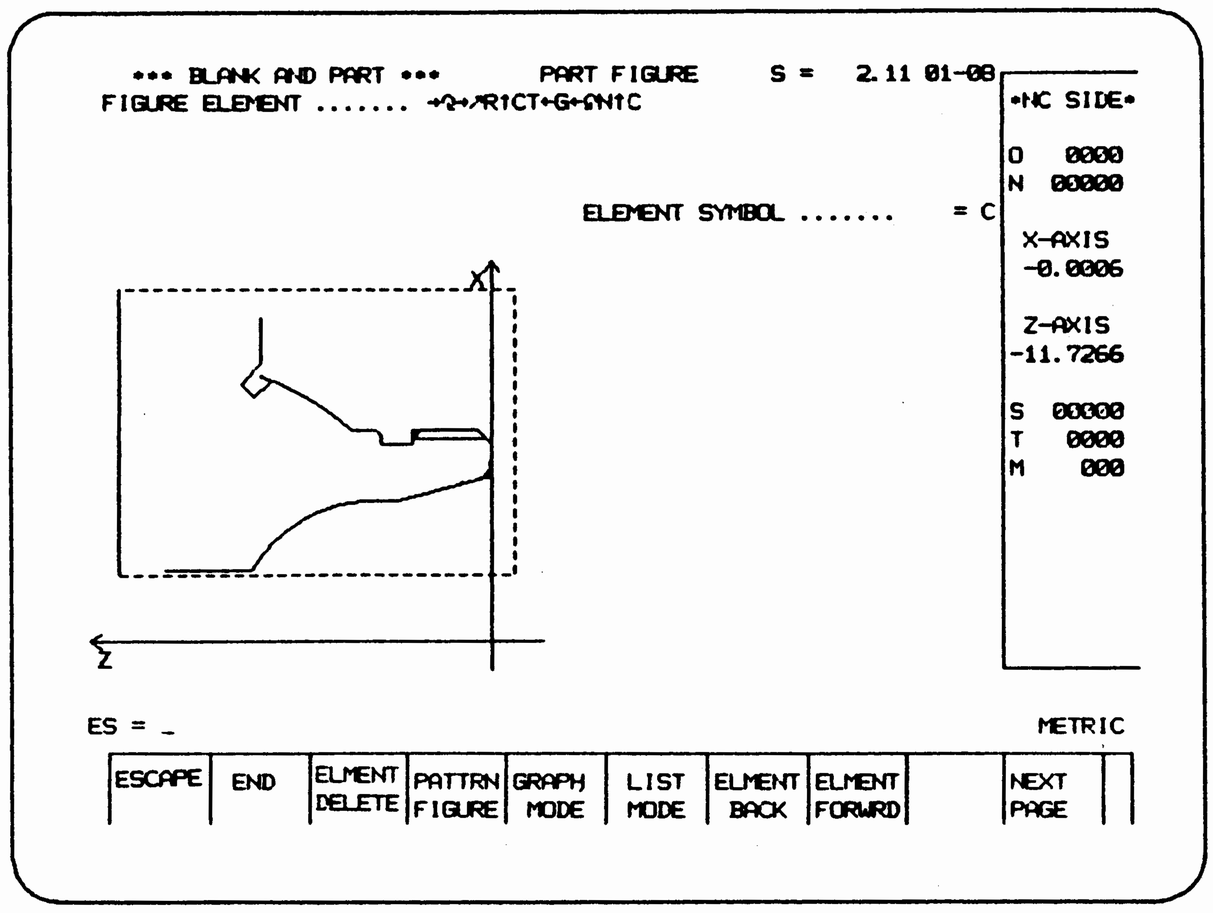
Next Element →

3) END POINT — Key-in "**69**" and then press the [**INPUT**] Key at DX =.

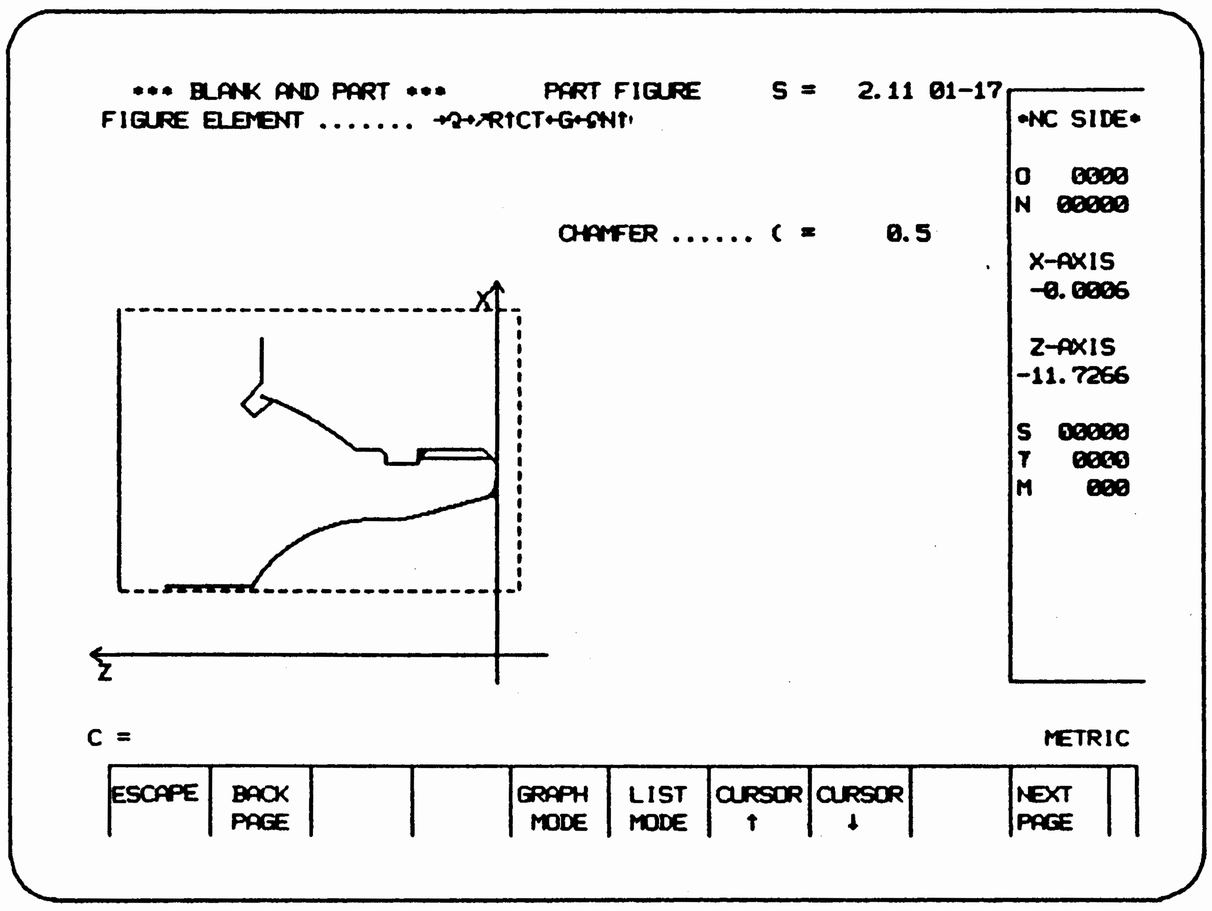


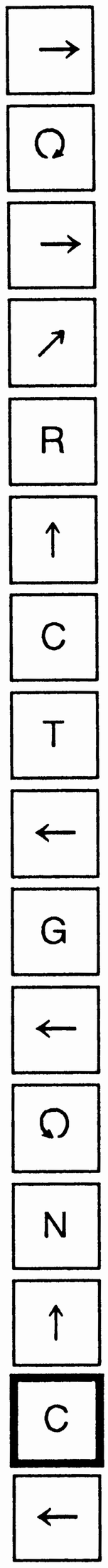
After the above data has been input, proceed to the next element.

1) ELEMENT SYMBOL Press the [**C**] and [**INPUT**] Keys at ES =.



2) CHAMFER Key-in "**0.5**" and then press the [**INPUT**] Key at C =.



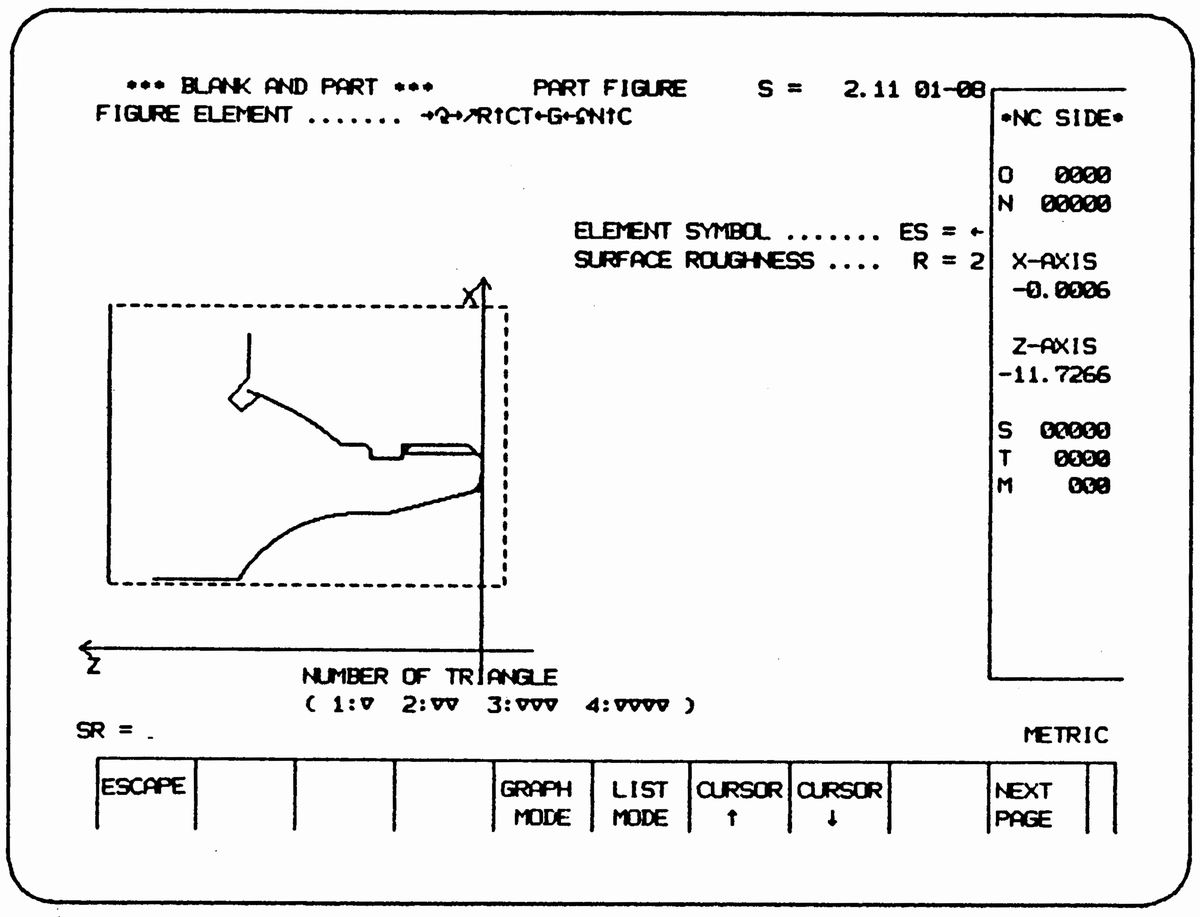


Next Element →

After the above data has been input, proceed to the next element.

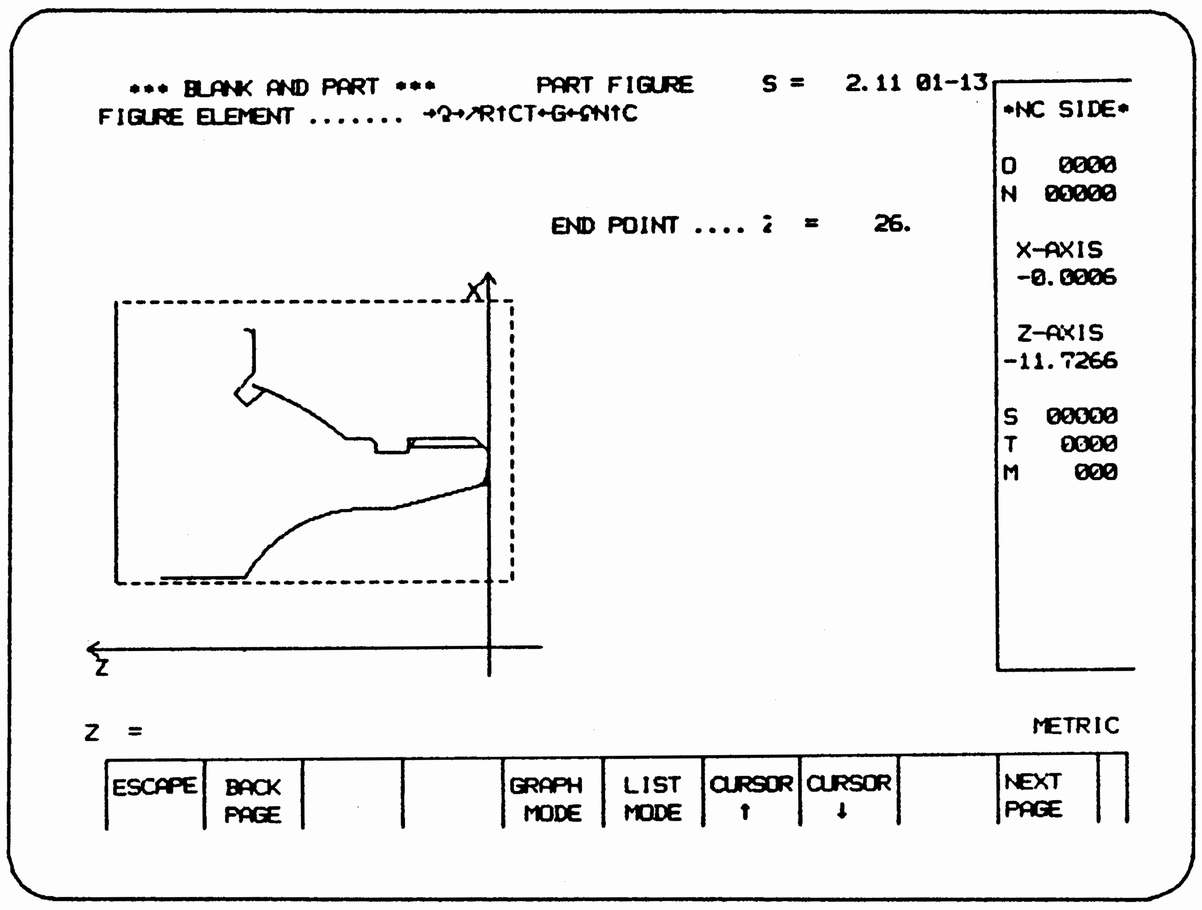
1) ELEMENT SYMBOL — Press the [←] and [**INPUT**] Keys at ES =.

2) SURFACE ROUGHNESS — Press the [**2**] and [**INPUT**] Keys at SR =.

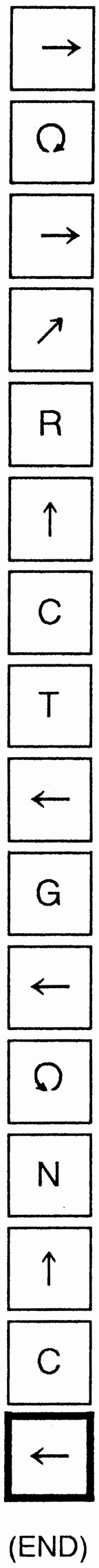


3) END POINT — Key-in "**26**" and then press the [**INPUT**] Key at Z =.

(The chucking depth is calculated as 40 − 14 = 26.)



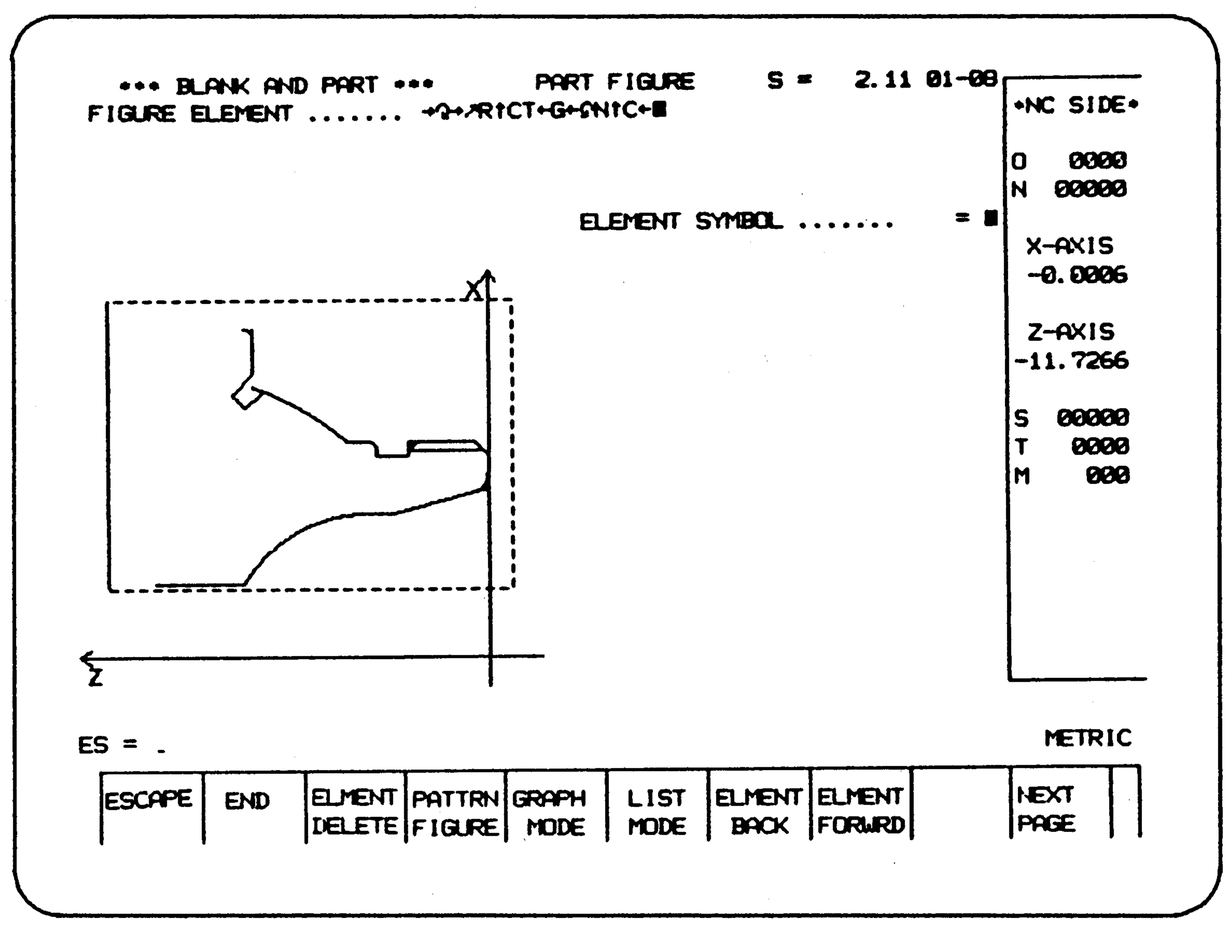
Press the [**NEXT PAGE**] Soft-Key.



(END)

Making Corrections after All Elements Have Been Input

Press the [**CORRECTION**] Soft-key, bring the cursor to the element to be corrected using the [**ELEMENT FORWRD**] and [**ELEMENT BACK**] Soft-keys, and correct the element. Bring the cursor to the data item (value) to be corrected using [**CURSOR ↓**] and [**CURSOR ↑**] Soft-keys and input the correct value.



To erase the part figure and correct the figure while verifying it, press the [**PAGE CORR & ERASE**] Soft-key.
The elements and values that have been input so far can be called up on screen as a list by pressing the [**LIST MODE**] Soft-key.
*Note : Note that pressing the [**NEW**] Soft-key will erase all of the input data in the menu that has been input so far.*

For the purposes of this example, no corrections shall be made.

Press the [**NEXT PAGE**] Soft-key. The following will be displayed:

MENU 2 END

The screen will return to the main menu display.

6.3 Menu 3 :SETTING OF HOME POSITION /INDEX POSITION

1	2	3	4	5	6

1) Press the [3] Soft-key to display the screen for Menu 3

```
*** HOME & INDEX POSITION ***                          02-01
                                                      *NC SIDE*

                                                      O   0000
                                                      N  00000

HOME POSITION                                          X-AXIS
   XH = ■■■■■.■■■                                      -0.0006
   ZH = ■■■■■.■■■

                                                       Z-AXIS
INDEX POSITION                                        -11.7266
   DXI = ■■■■■.■■■
   ZI  = ■■■■■.■■■                                     S  00000
                                                      T   0000
                                                      M    000

DXH = _                                                METRIC
ESCAPE |  |  |  |  |  | CURSOR ↑ | CURSOR ↓ |  | NEXT PAGE | |
```

The "HOME POSITION" (machine zero-point) has not been set. This is set at system parameter No. 9.

Set the "INDEX POSITION" (turret indexing position) between the "HOME POSITION" (zero-return point) and the workpiece face. In this example, set the maximum overhang (I.D. cutting tool) from the turret face to 50mm.

Consequently set ZI as 100.

Note : Set the "INDEX POSITION" taking the overhang at the tool setting position fully into consideration. The X-axis coordinates setting varies according to the CNC lathe. However, for this example, set DX1 as 280.

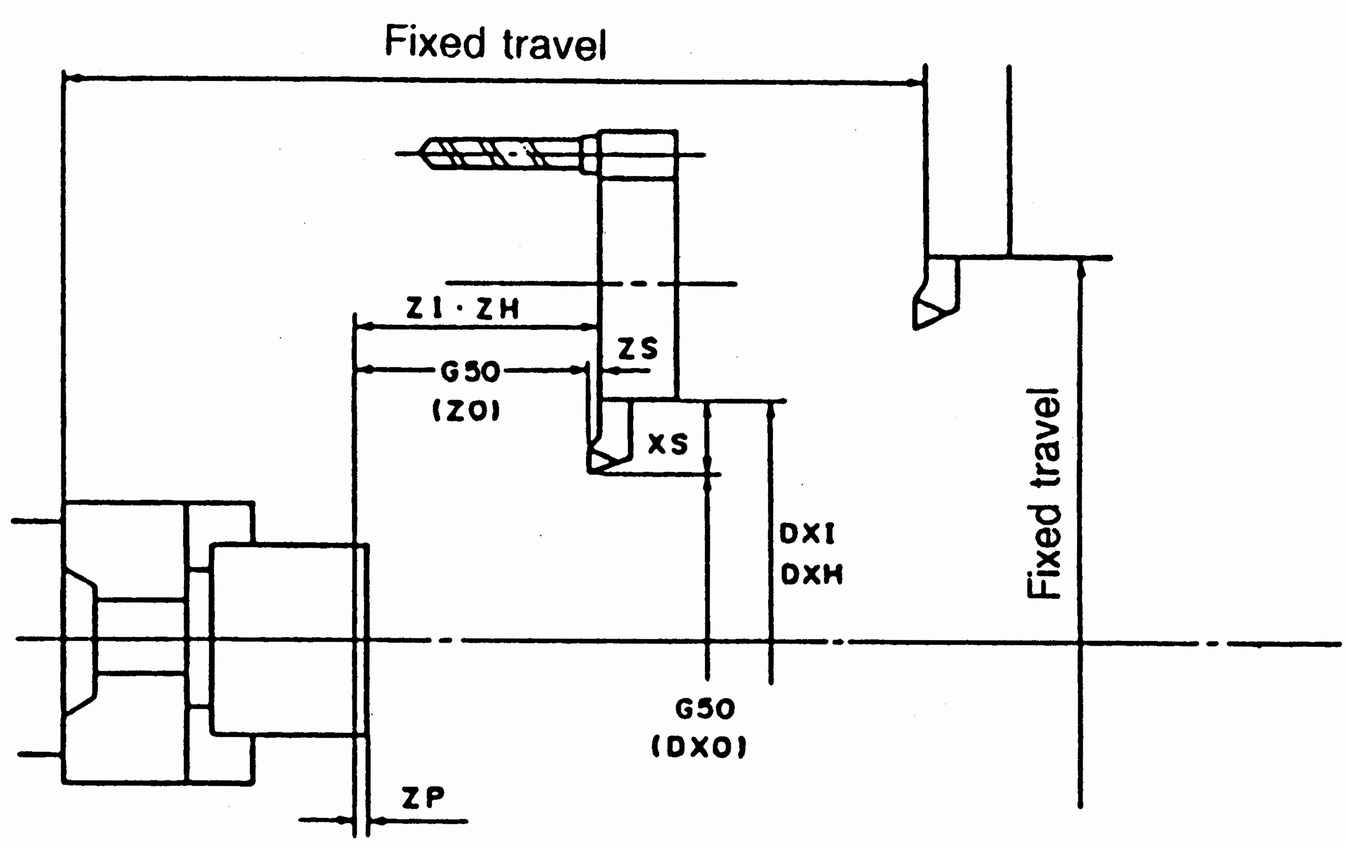
After setting, the display will change as follows:

```
*** HOME & INDEX POSITION ***                          02-01
                                                      *NC SIDE*

                                                      O   0000
                                                      N  00000

HOME POSITION                                          X-AXIS
  DX  = ■■■■■.■■■                                      -0.0006
  ZH  = ■■■■■.■■■

                                                       Z-AXIS
INDEX POSITION                                        -11.7266
  DXI =   280.
  ZI  =   100.                                        S  00000
                                                      T   0000
                                                      M    000

DXH =                                                 METRIC
ESCAPE | | | | | | CURSOR ↑ | CURSOR ↓ | | NEXT PAGE | |
```

Press the **[NEXT PAGE]** Soft-key.

The screen will return to the main menu display.

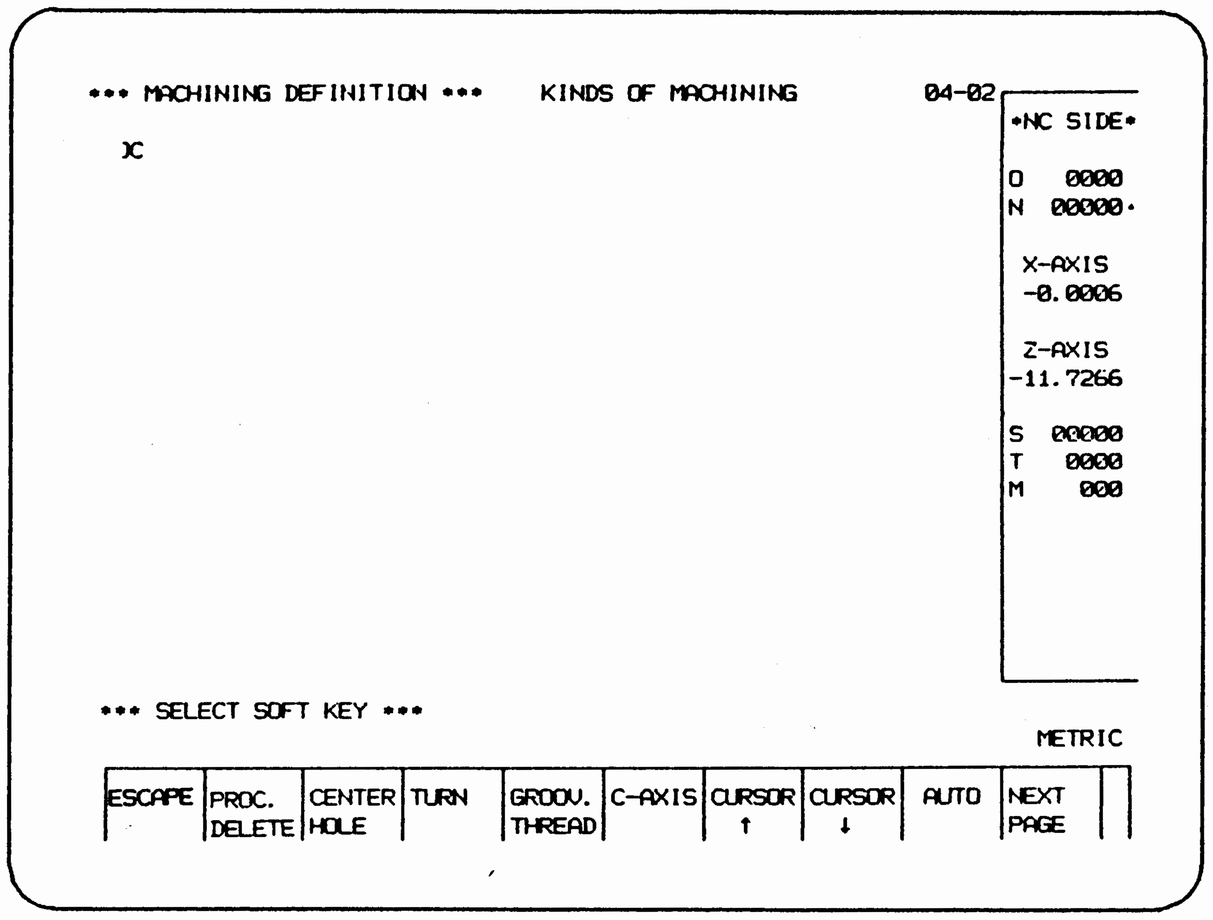
Related Figure



6.4 Menu 4 : MACHINING DEFINITION

1	2	3	4	5	6

1) Press the [4] Soft-key.



Set the items according to the processes including the machining sequence.

Machining Process	Tool Required	Tool ID No.	Nose R	Turret Setting No.	Tool Position Offset No.
1. O.D. (face) roughing	PCLNR2525	301	0.8	2	2
2. I.D. roughing		401	0.8	3	3
3. O.D. finishing	WTKNR2525	708	0.4	4	4
4. I.D finishing		801	0.4	5	5
5. Grooving		931	0.2	6	6
6. Necking	Special	999(931)	0.2	8	8
7. Threading		31	0.2	10	10

6.4.1 O.D. roughing

1) Setting the kind of machining

As O.D. roughing is a process including turning, press the **[TURN]** Soft-key.

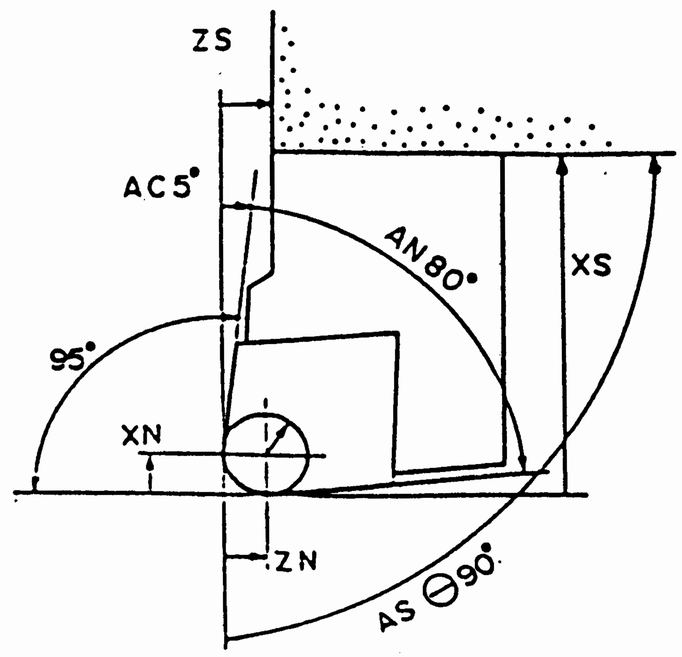
```
*** MACHINING DEFINITION ***    KINDS OF MACHINING          04-02
 XC                                                          *NC SIDE*
                                                             O   0000
                                                             N  00000
                                                              X-AXIS
                                                              -0.0006
                                                              Z-AXIS
                                                             -11.7266
                                                             S  00000
                                                             T   0000
                                                             M    000

*** SELECT SOFT KEY ***
                                                                METRIC
| ESCAPE | PROC. DELETE | CENTER HOLE | TURN | GROOV. THREAD | C-AXIS | CURSOR ↑ | CURSOR ↓ | AUTO | NEXT PAGE |
```

For O.D. roughing, press the **[ROUGH. O.D.]** Soft-key.

```
*** MACHINING DEFINITION ***    KINDS OF MACHINING          04-02
 ROC                                                         *NC SIDE*
                                                             O   0000
                                                             N  00000
                                                              X-AXIS
                                                              -0.0006
                                                              Z-AXIS
                                                             -11.7266
                                                             S  00000
                                                             T   0000
                                                             M    000

*** SELECT SOFT KEY ***
                                                                METRIC
| ESCAPE | ROUGH. O.D. | S-FIN. O.D. | FIN. O.D. |  | ROUGH. I.D. | S-FIN. I.D. | FIN. I.D. |  | SUB CYCLE |
```

2) Setting the tool data

The cutting tool used is (PCNLR 2525) that uses a tip with a tool nose radius R of 0.8.



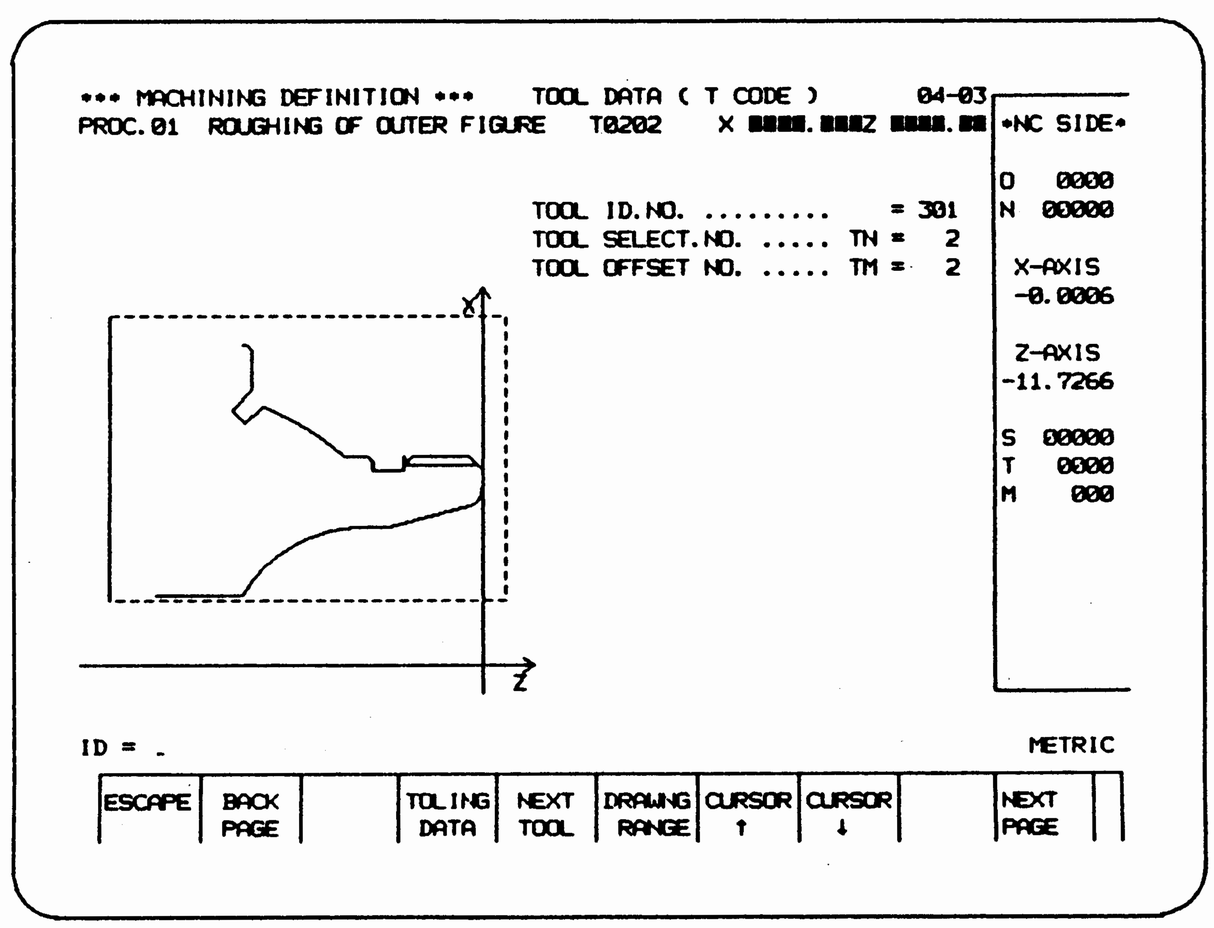
Note: Normally input the tool ID No. to display tool data already stored in memory. The system will prompt the tool ID No., tool No. and tool position offset No.

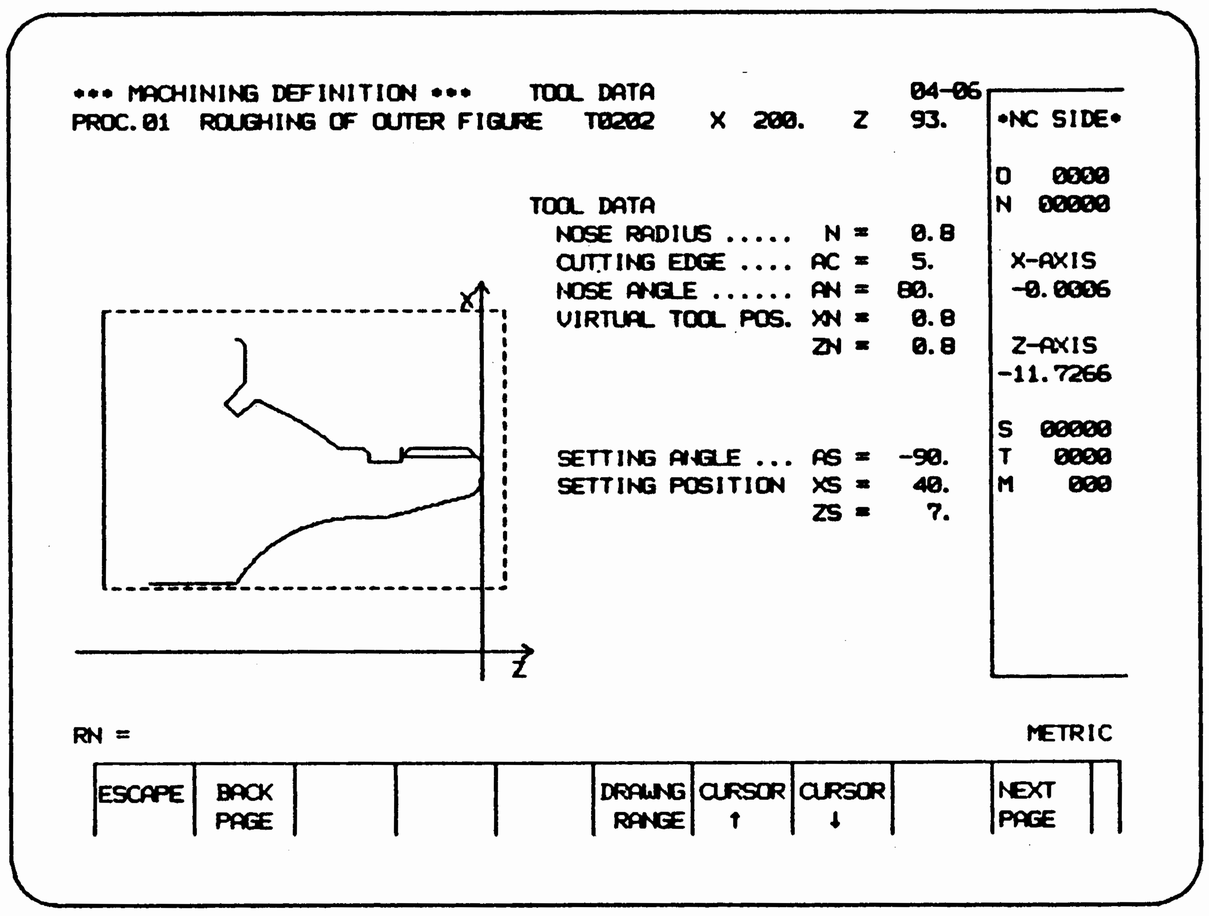
Tool ID No..	ID = 301 (O.D. roughing tool)
Tool SELECT. No.	TN = 2 (Cutting tool is set at turret station 2)
Tool OFFSET No.	TM = 2 (Tool position offset No. 2 is used.)

Note : The tool must be set at the preset turret station before actual cutting.

The system will next prompt you for the tool data.

Input the data relating to the tool shape and how it is mounted on the turret.





Press the 【**NEXT PAGE**】 Soft-key.

3) Machining start position

This machining start position will automatically be calculated from the relationship between the turret indexing position and tool mounting position.

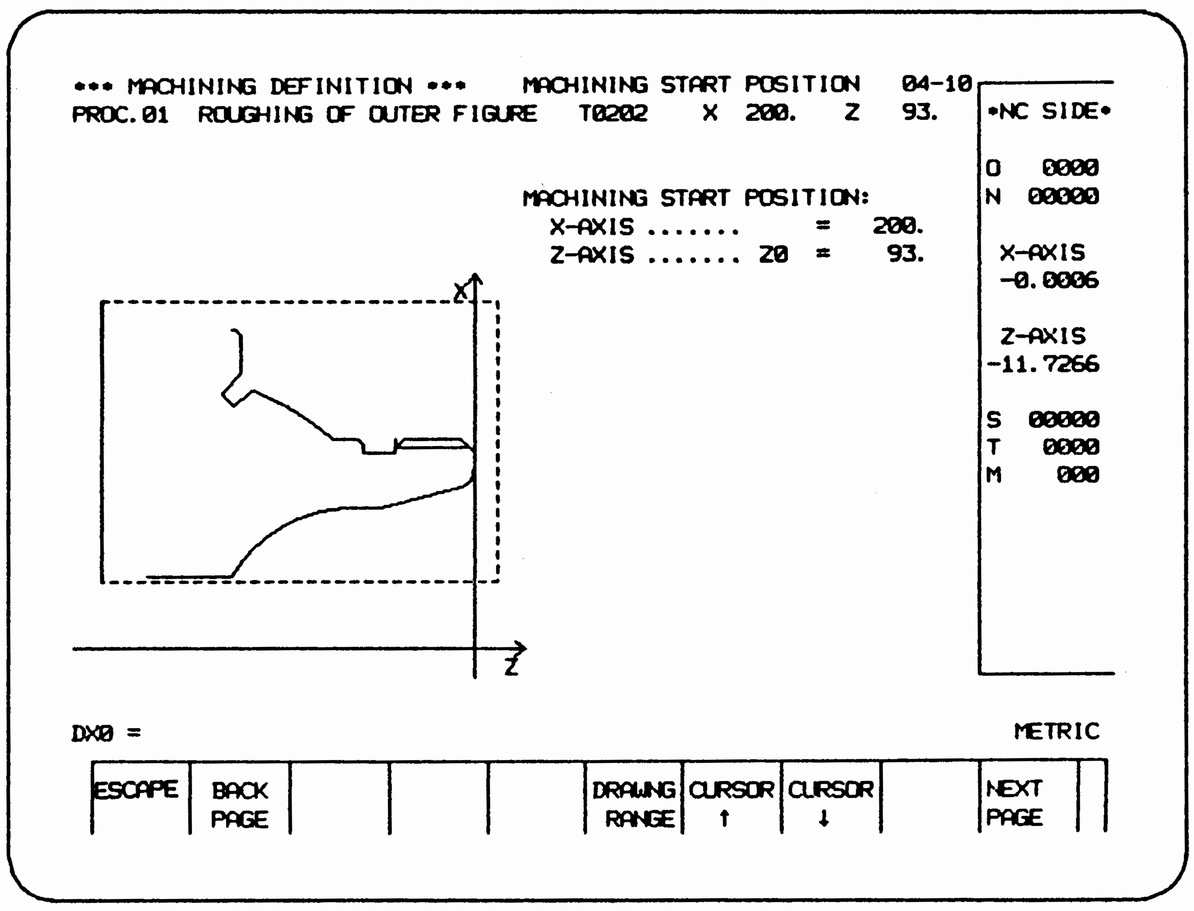
●Calculation

DXI − (2×XS) = machining start position X coordinate value

(280) − (2×XS) = 200

ZI − ZS = machining start position Z coordinate value

(100) − (7) = 93

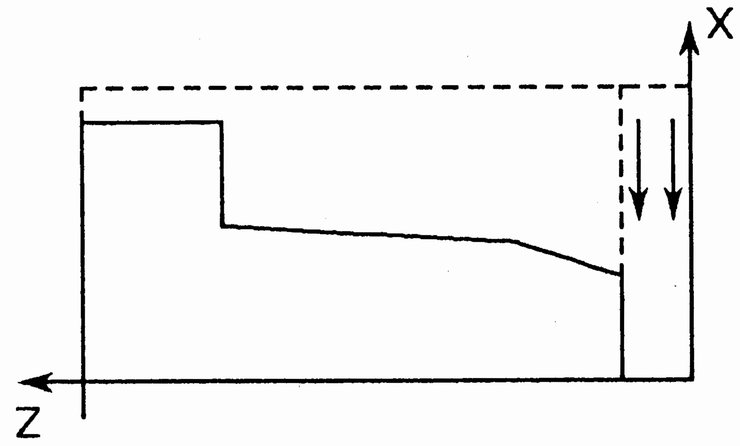


If no corrections are to be made, press the [**NEXT PAGE**] Soft-key.

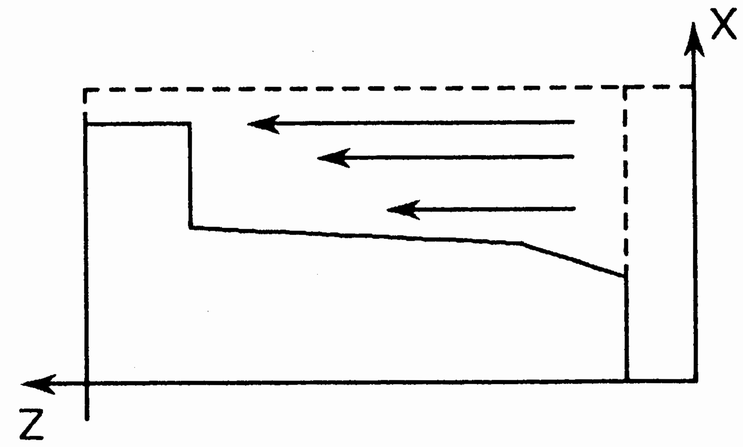
4) Setting the cutting direction

First of all, define the cutting direction so that the face is cut from the O.D. to the I.D. Then define cutting of the O.D.

When changing the cutting direction in facing and O.D. cutting:

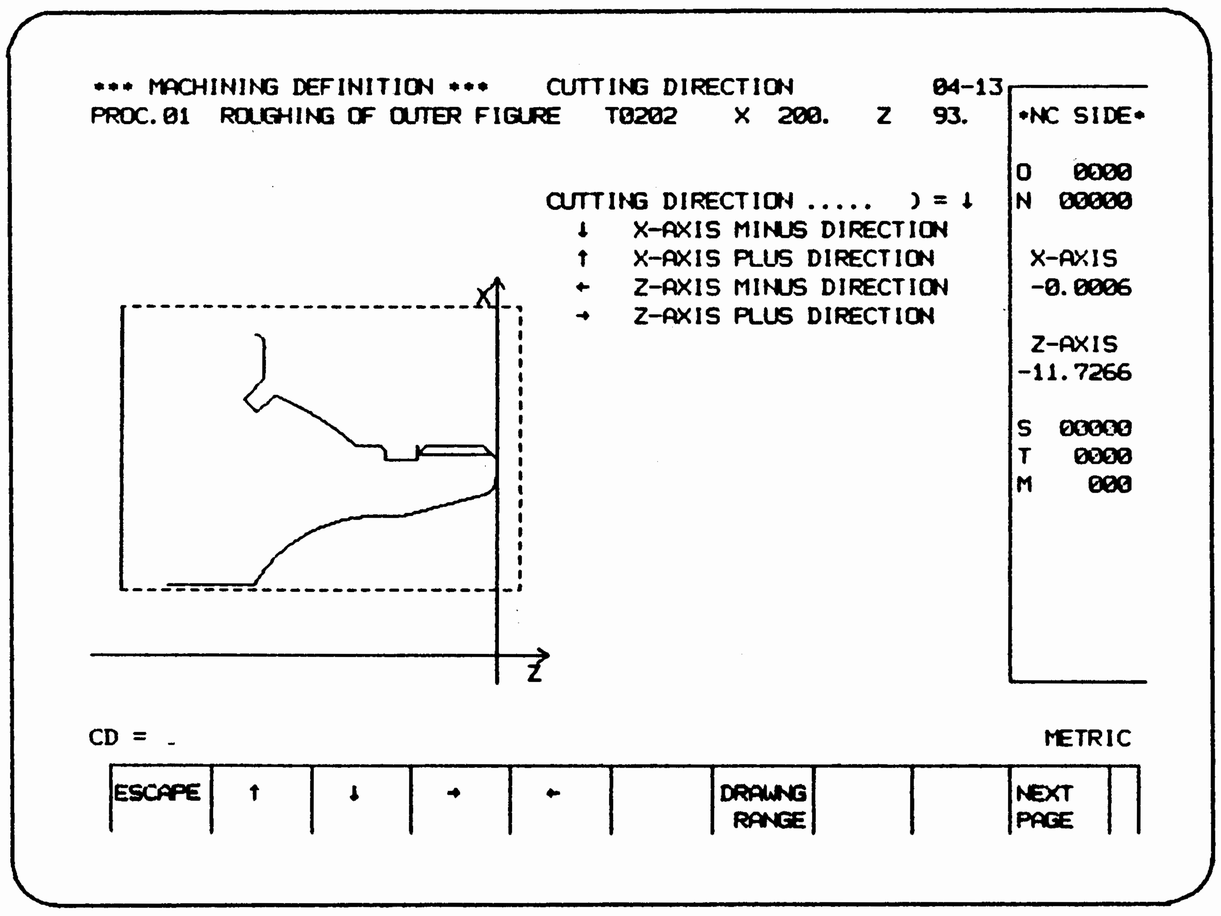


When carrying out facing first, press the [↓] Soft-key.



When following by O.D. cutting, press the [←] Soft-key.

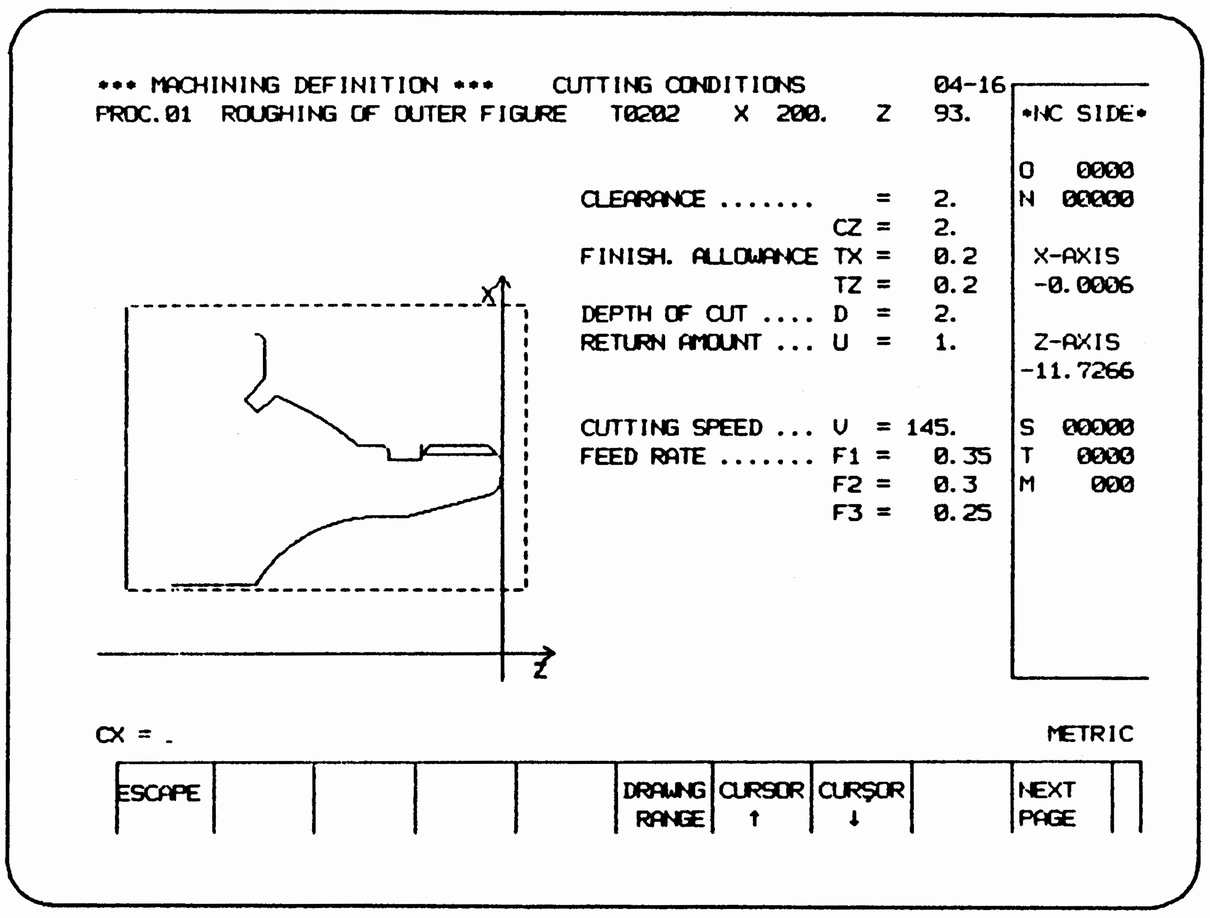
Input the cutting direction by the Soft-key [↓].



5) Setting the cutting conditions

When the material S45C is selected at Menu 1, the cutting conditions preset to the FAPT system will be displayed.

To make corrections, bring the cursor to the data item to be corrected using the [**CURSOR ↓**] and [**CURSOR ↑**] Soft-keys, move the cursor blinking at that location and input the correct values. After correcting the data, press the [**NEXT PAGE**] Soft-key.



6) Setting the cutting area

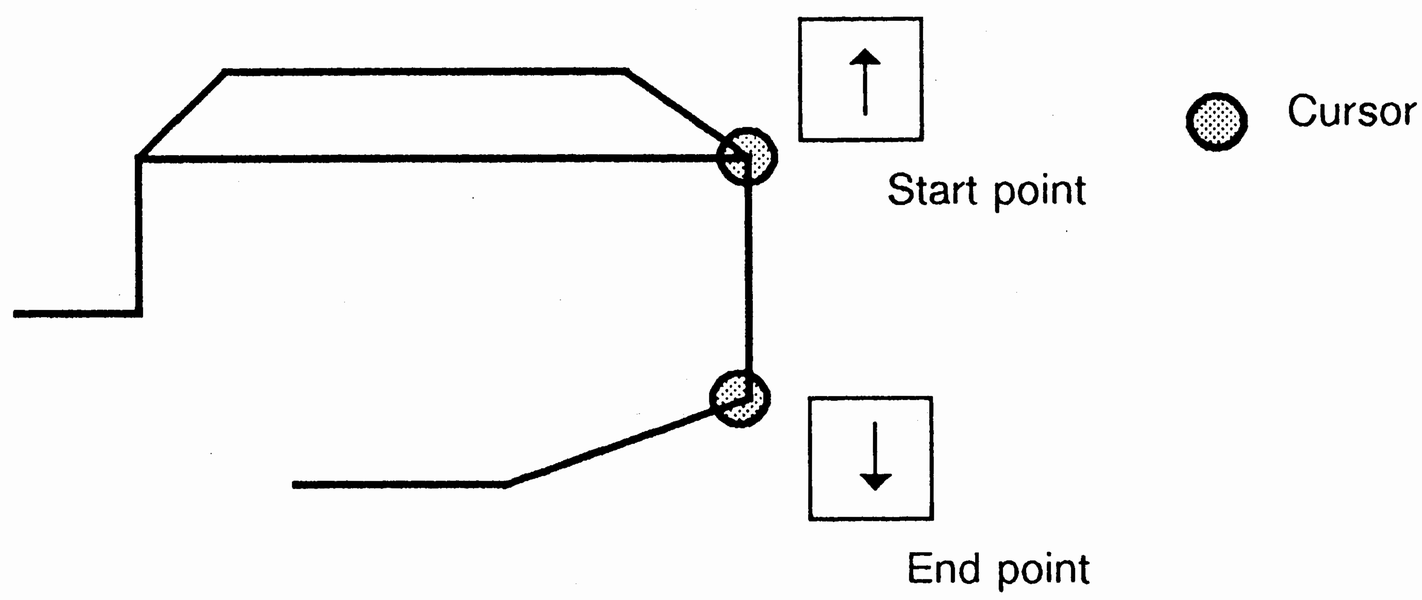
Determine the area of the blank to be cut to obtain the part figure using the tool preset at step 2) above in the cutting direction preset at step 5). Two cursors will be displayed on the part figure.

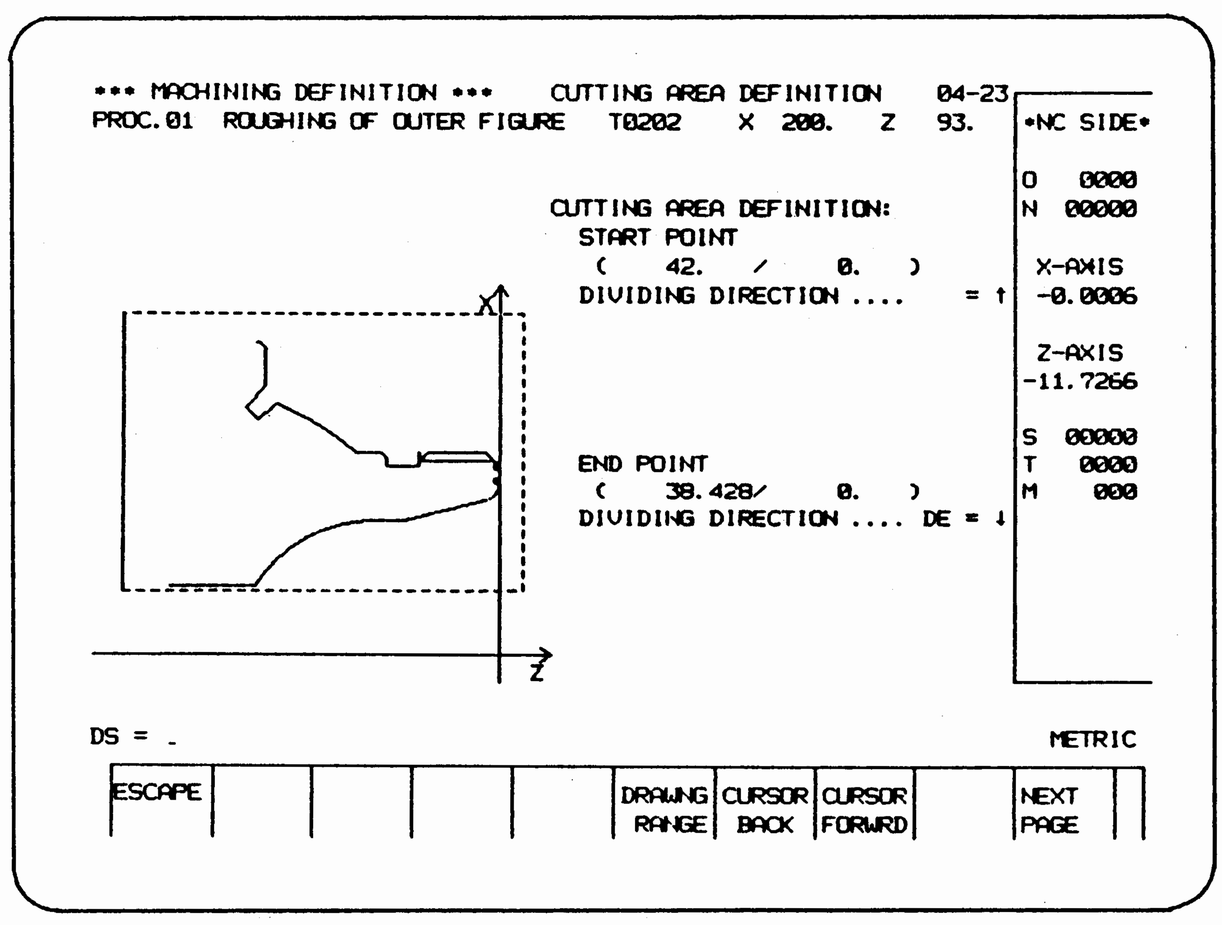
Start Point

Using the [**CURSOR FORWRD**] Soft-key, determine the start point of the cutting area. Stop the cursor at the coordinate point Z = 0. Next, press the [↑] and [**INPUT**] Keys as the dividing direction of the start point.

End Point

Set the end point in the same way as the start point using the [**CURSOR FORWRD**] Soft-key. Stop the cursor at the other Z-axis coordinate value. Then press the [↓] and [**INPUT**] Keys as the dividing direction of the end point.



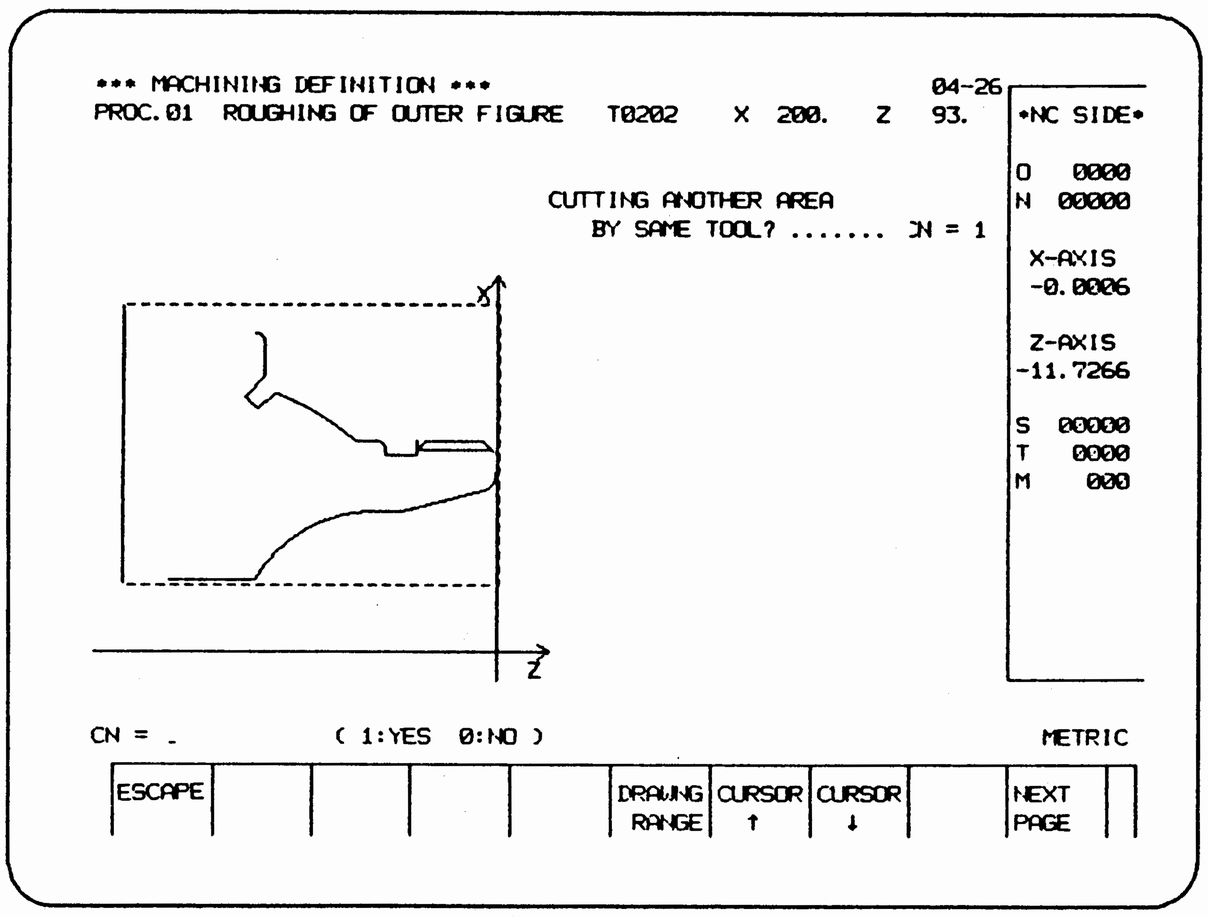


Press the [**NEXT PAGE**] Soft-key.

7) Any other area to be cut using the same cutting tool?

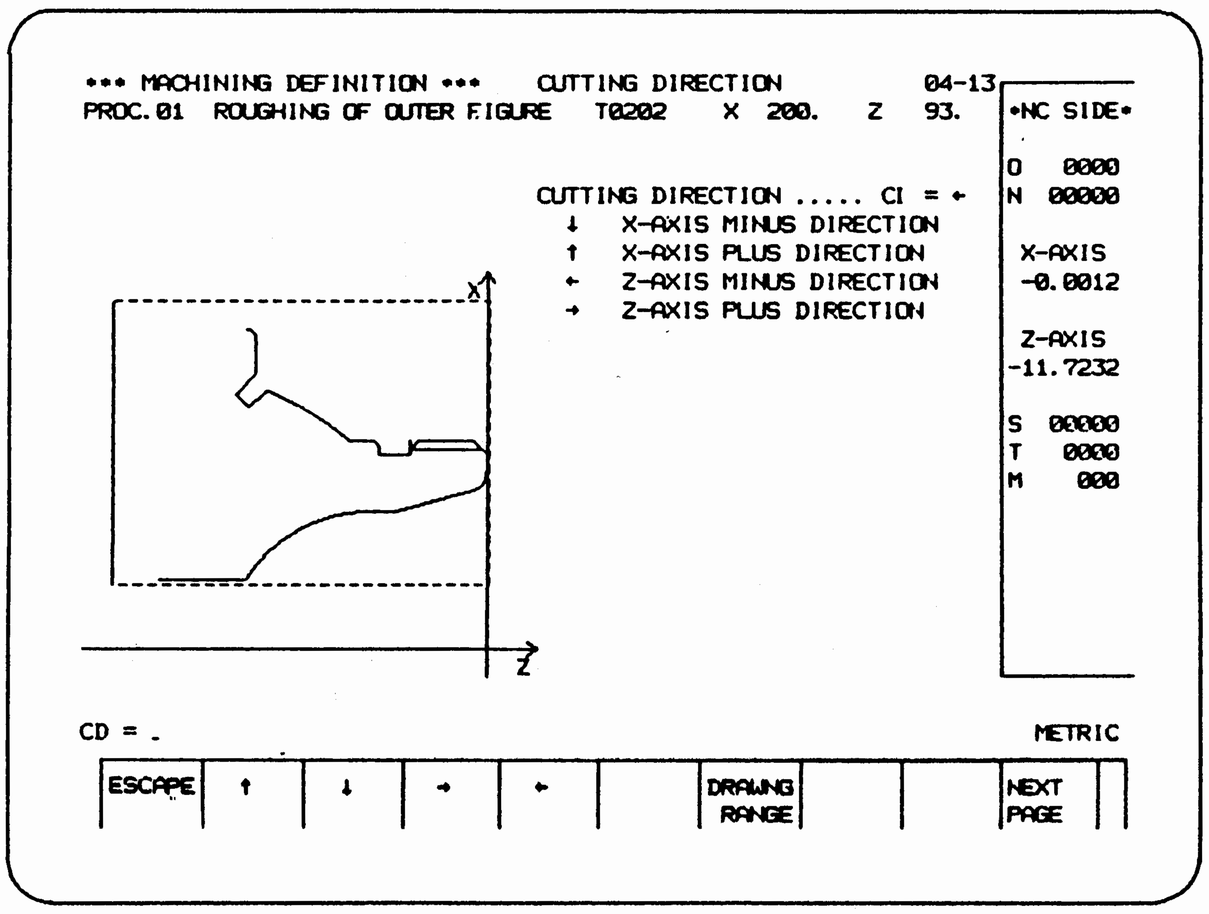
In this example, the same cutting tool will be used to rough cut the O.D. The system will display a prompt asking whether you are to cut a different location using the same cutting tool.

In response to this prompt, press the [1] and [INPUT] Keys at CN =.

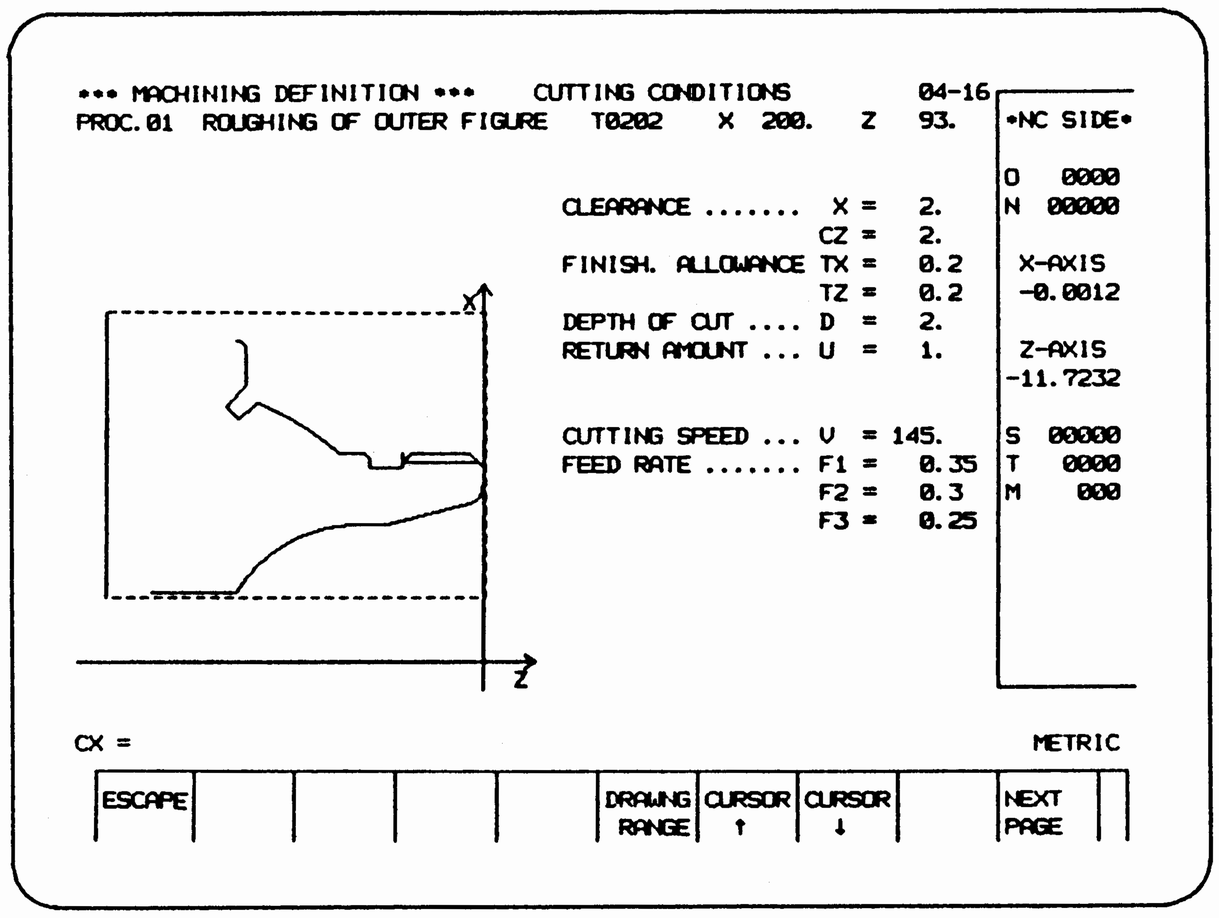


8) Setting the cutting direction

In this example of rough cutting, the cutting tool will cut the O.D. of the workpiece from right to left. Press the [←] Soft-key.

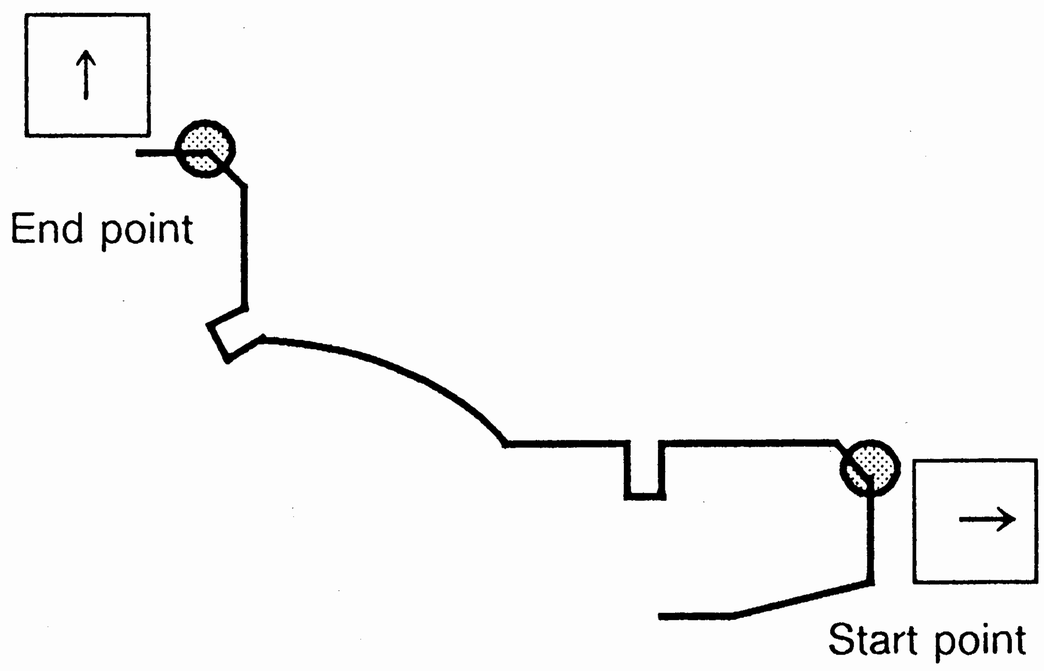


9) Setting the cutting conditions



If no corrections are to be made to the settings, press the **[NEXT PAGE]** Soft-key.

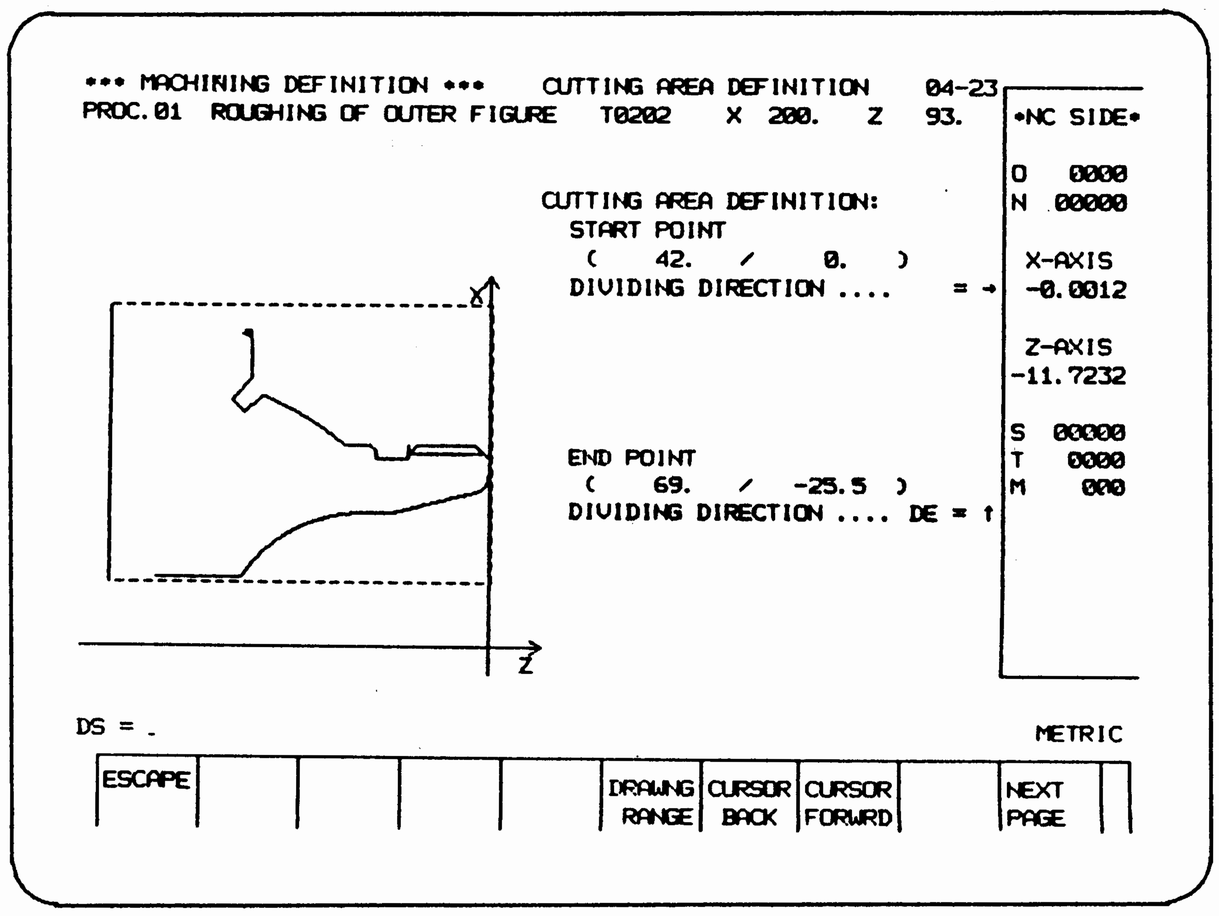
10) Setting the cutting area



Cut an O.D. of 69mm in from the entrance of the face chamfer.

Start point

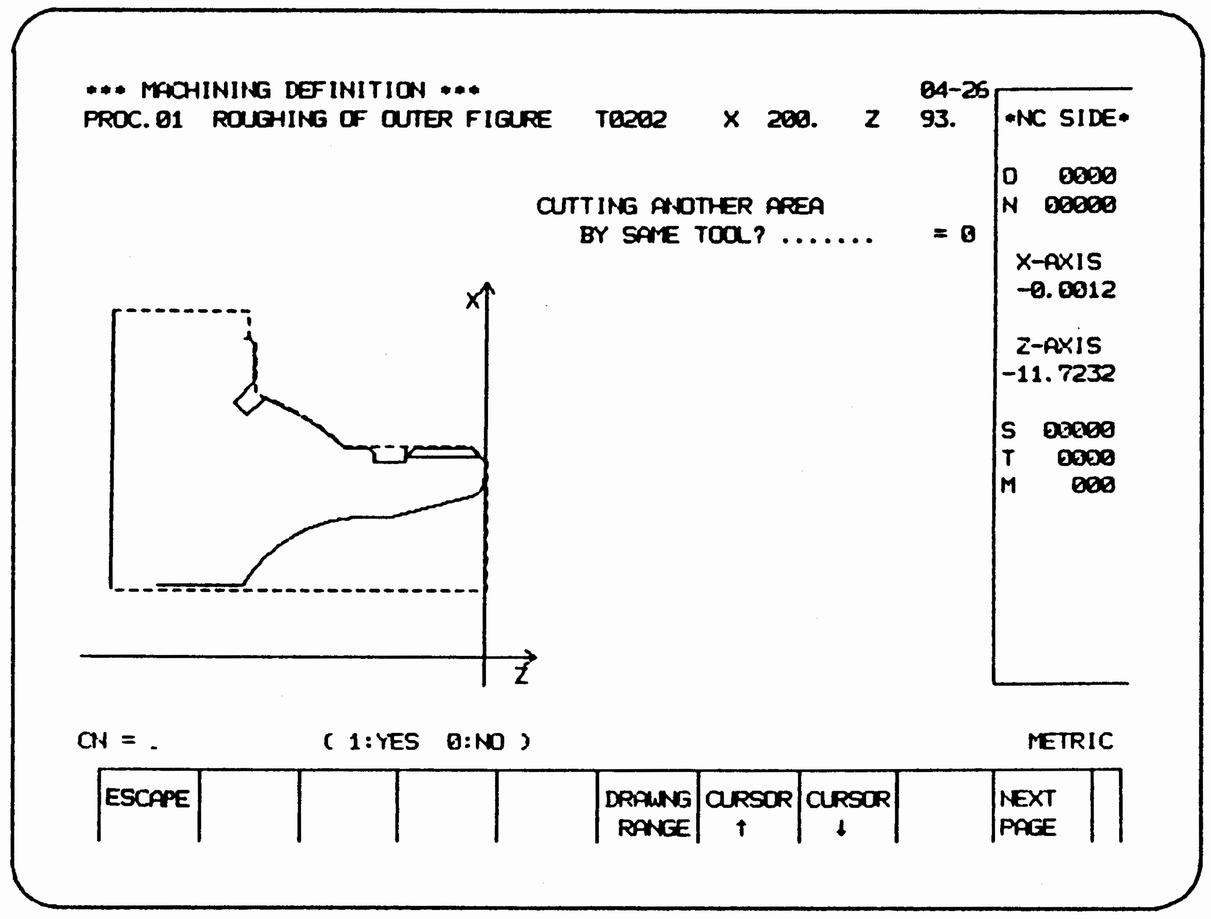
Using the **[CURSOR ↓]** Soft-key bring the cursor to the entrance of the chamfer and press the [→] and **[INPUT]** Keys.



End point

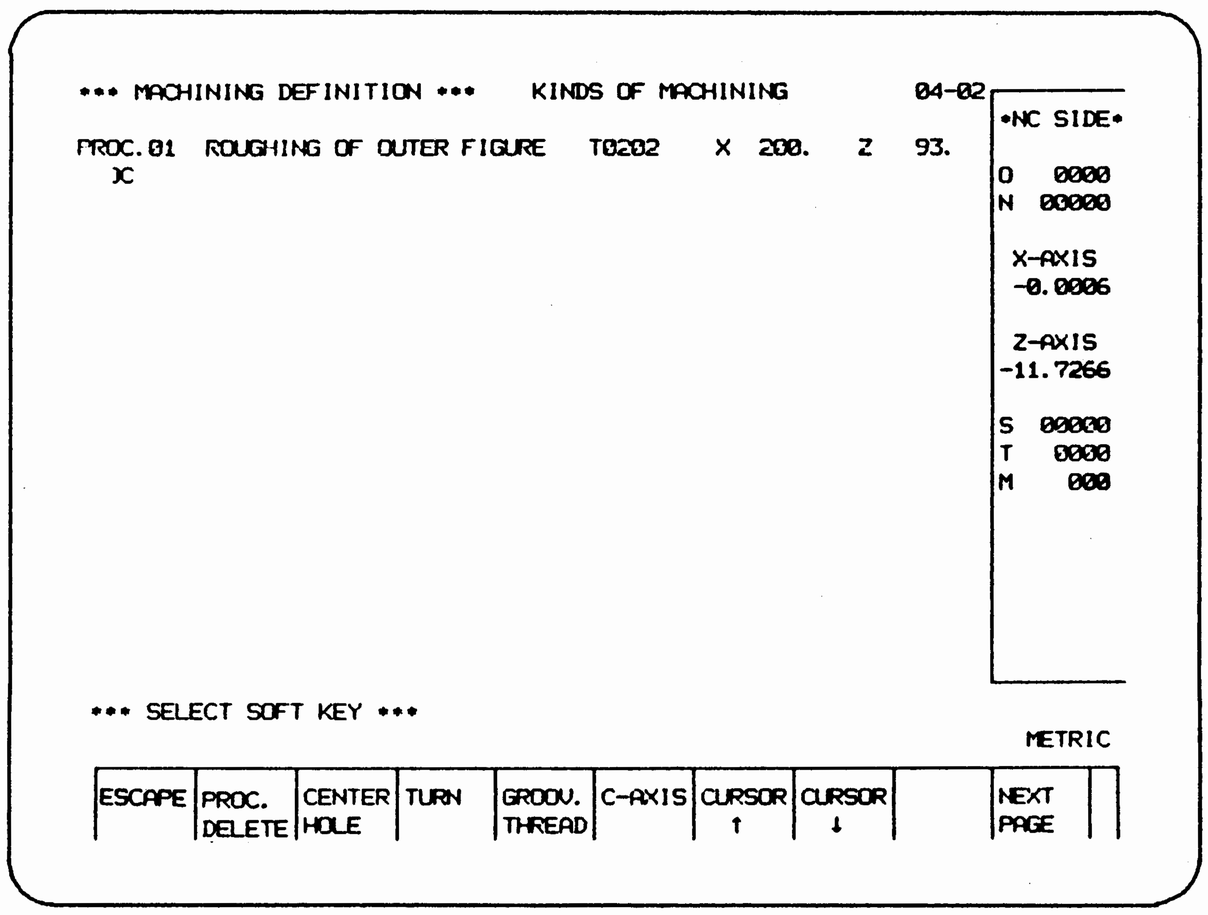
Using the **[CURSOR ↓]** Soft-key bring the cursor to the O.D. 69mm item and press the [↑] and **[INPUT]** Keys. Press the **[NEXT PAGE]** Soft-key.

11) Any other area to be cut using the same cutting tool?
In this example, the same cutting tool will not be used to rough cut the O.D. Therefore, press the [**0**] and [**INPUT**] Keys at CN = in response to this prompt.
This ends settings for O.D. roughing.



6.4.2 I.D. roughing

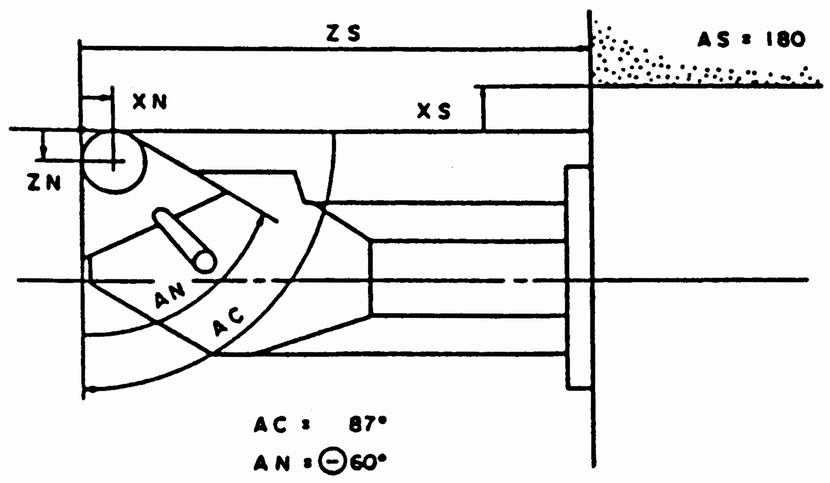
1) Selecting the kind of machining

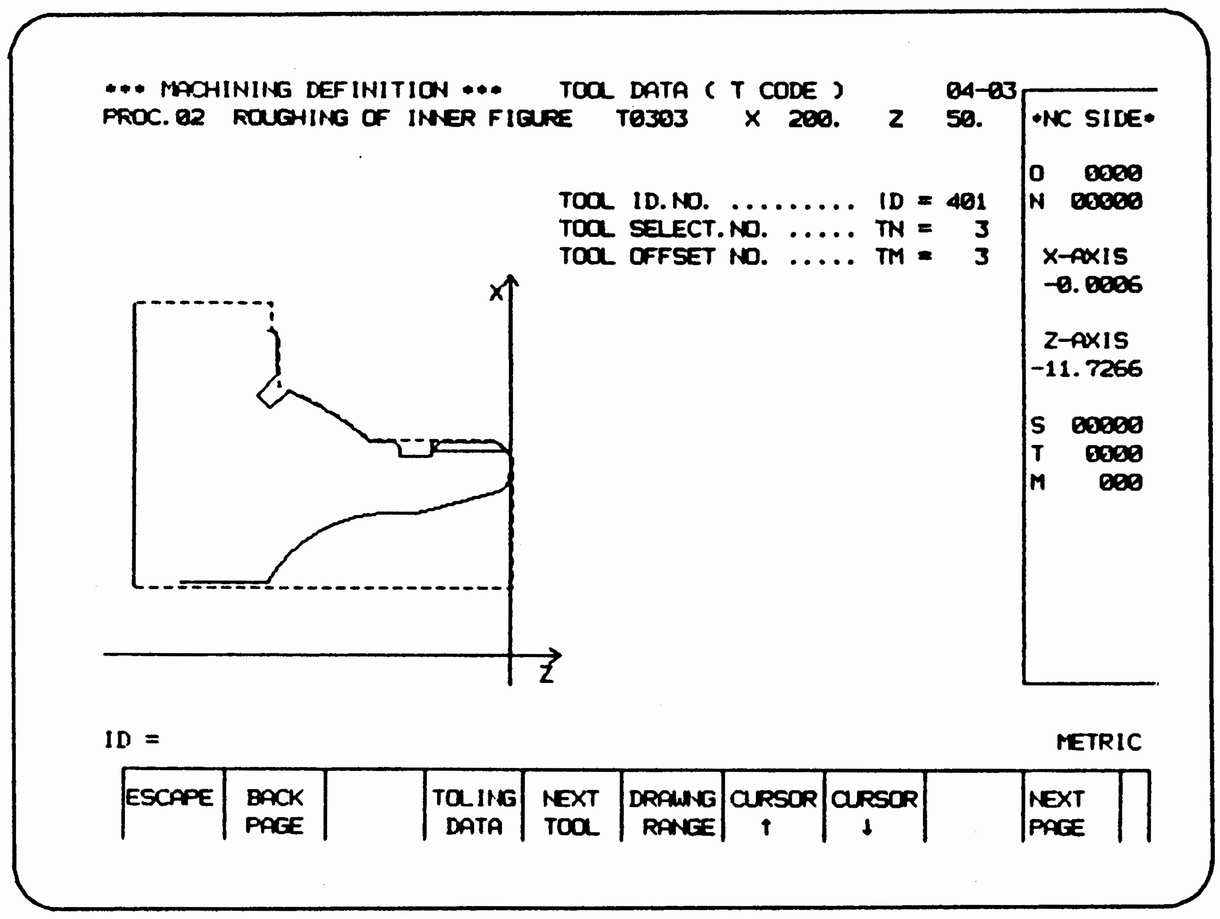


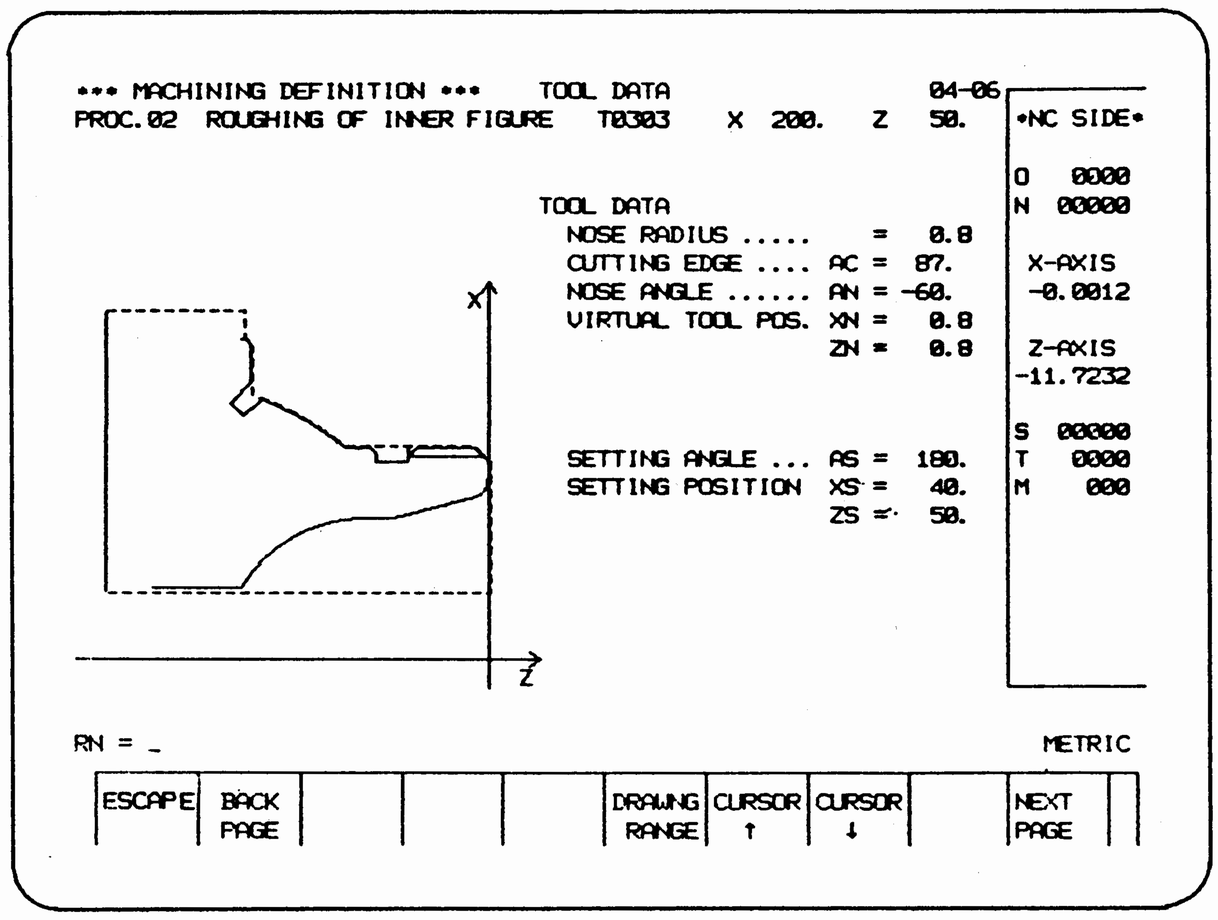
Press the [**TURN**] Soft-key.

Press the [**ROUGH I.D.**] Soft-key.

2) Setting the tool data

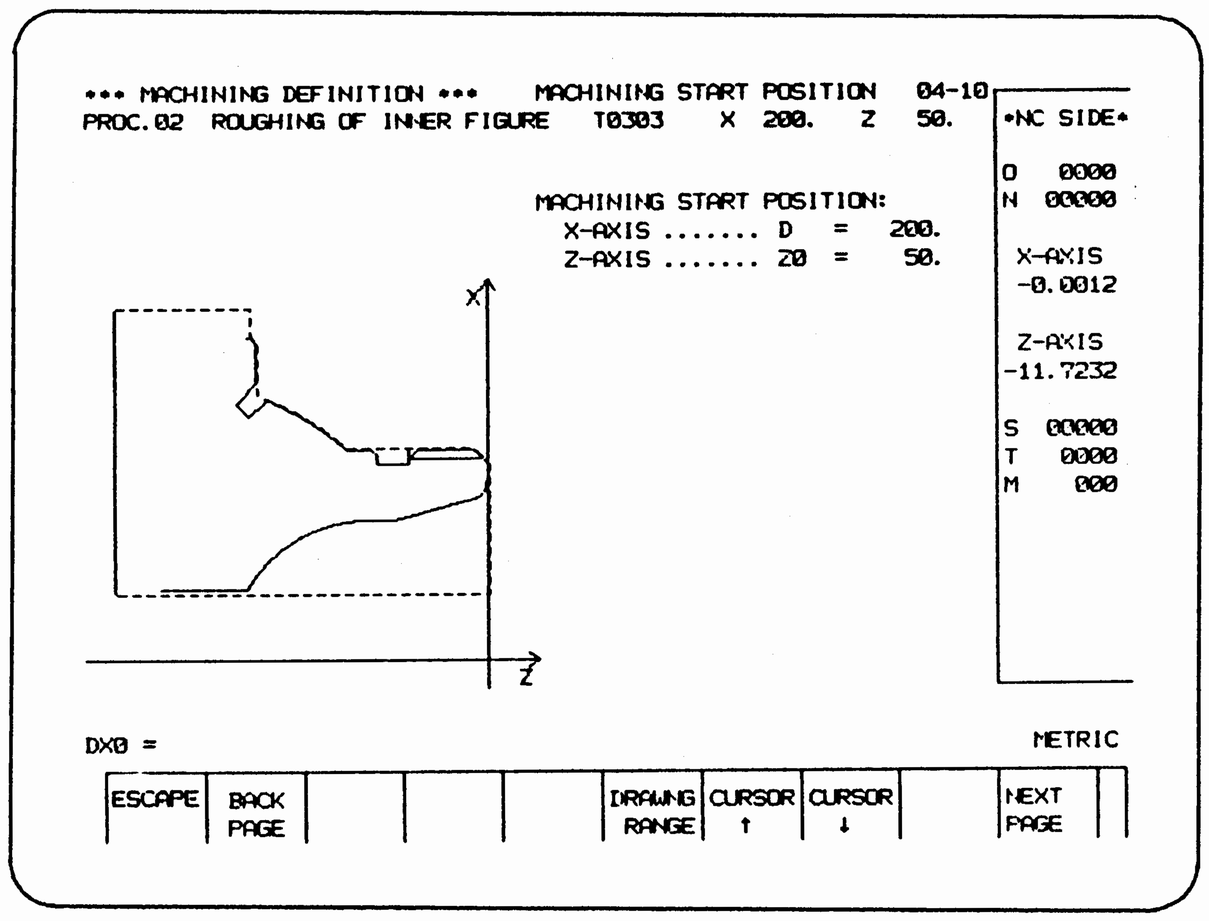






Press the **[NEXT PAGE]** Soft-key.

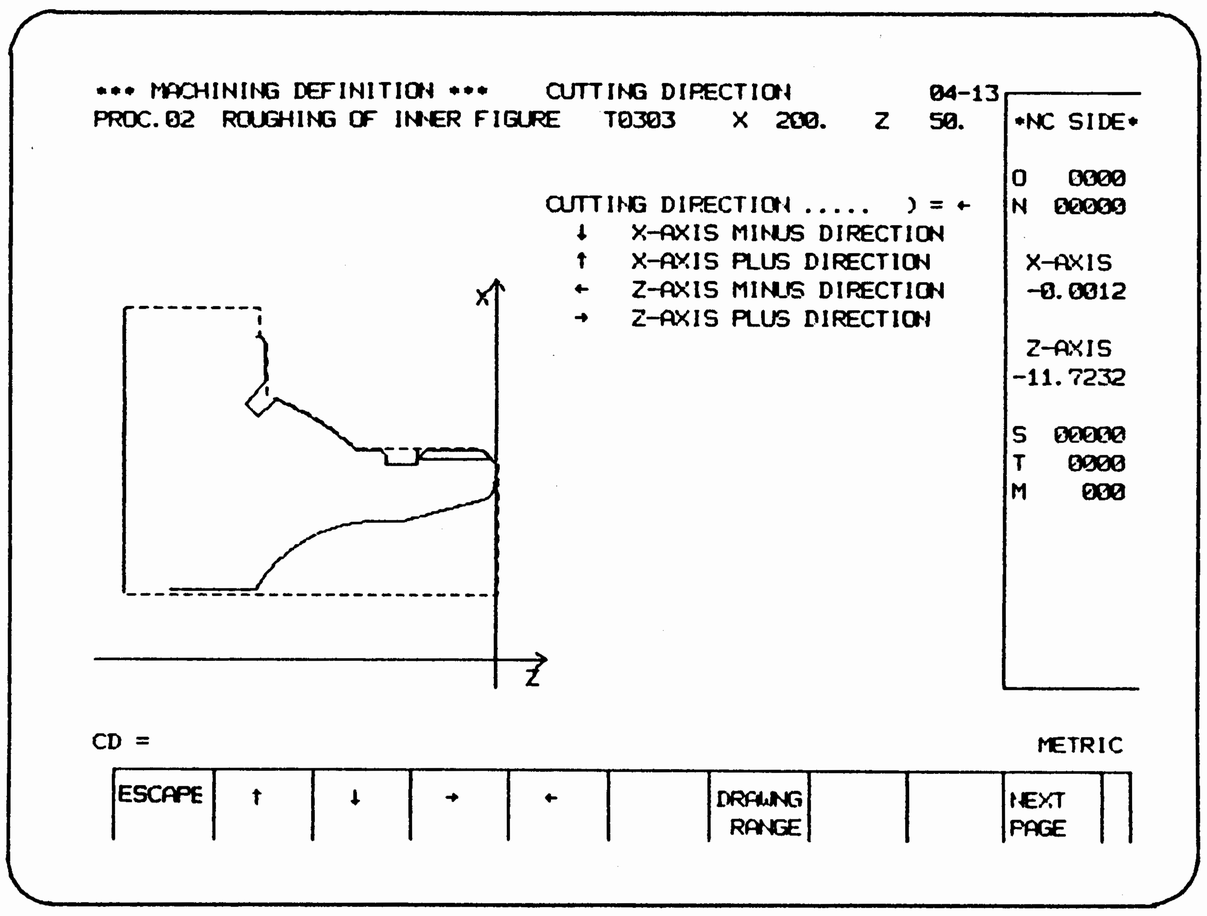
3) Setting the machining start position



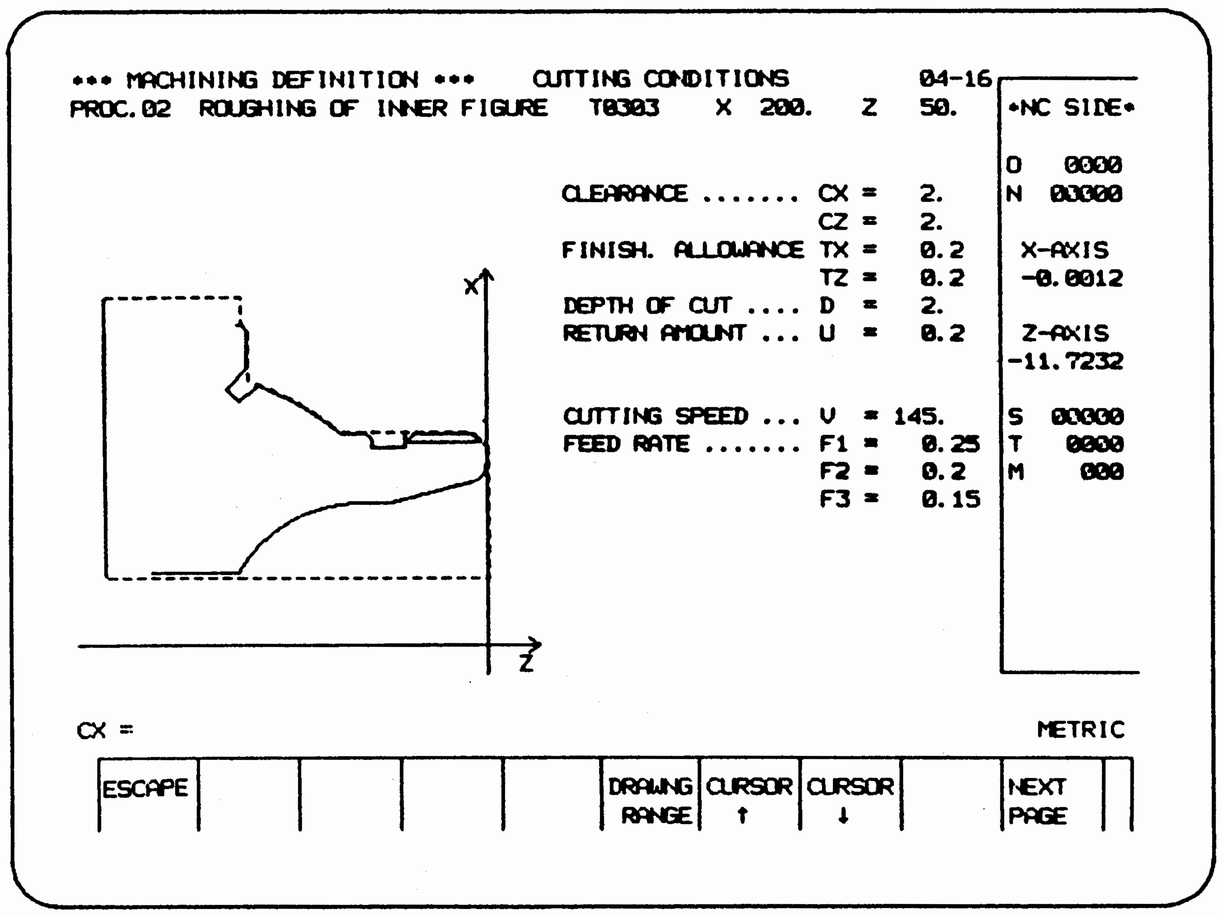
Press the [**NEXT PAGE**] Soft-key.

4) Setting the cutting direction

In this example, I.D. rough cutting is carried out in the [←] Soft-key direction.
Press the [←] Soft-key



5) Setting the cutting conditions



Press the [**NEXT PAGE**] Soft-key.

6) Setting the cutting area

Start Point

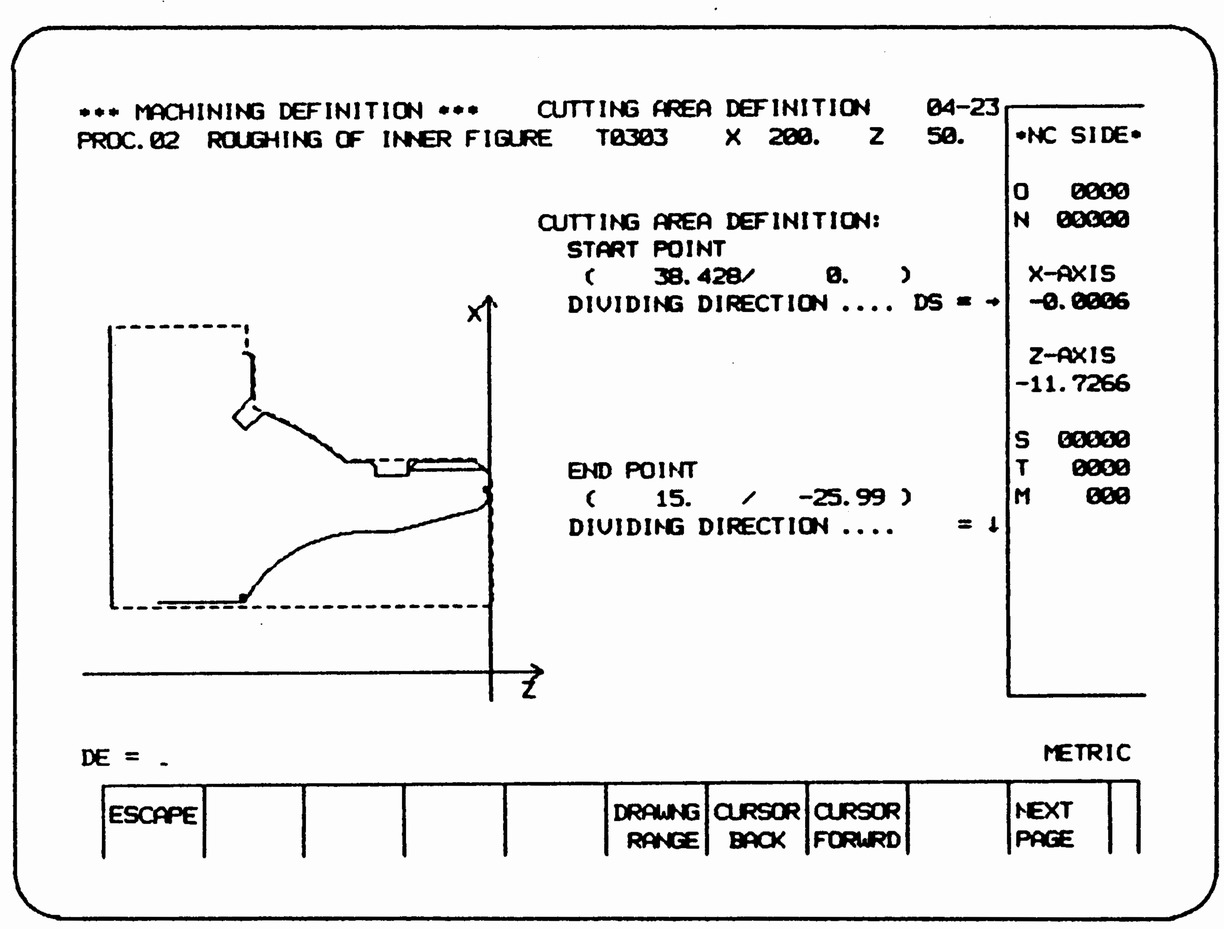
Bring the cursor to the entrance R2 of the I.D. using the [**CURSOR FORWRD**] Soft-key.

To input the dividing direction, press the [→] and [**INPUT**] Keys.

Ent Point

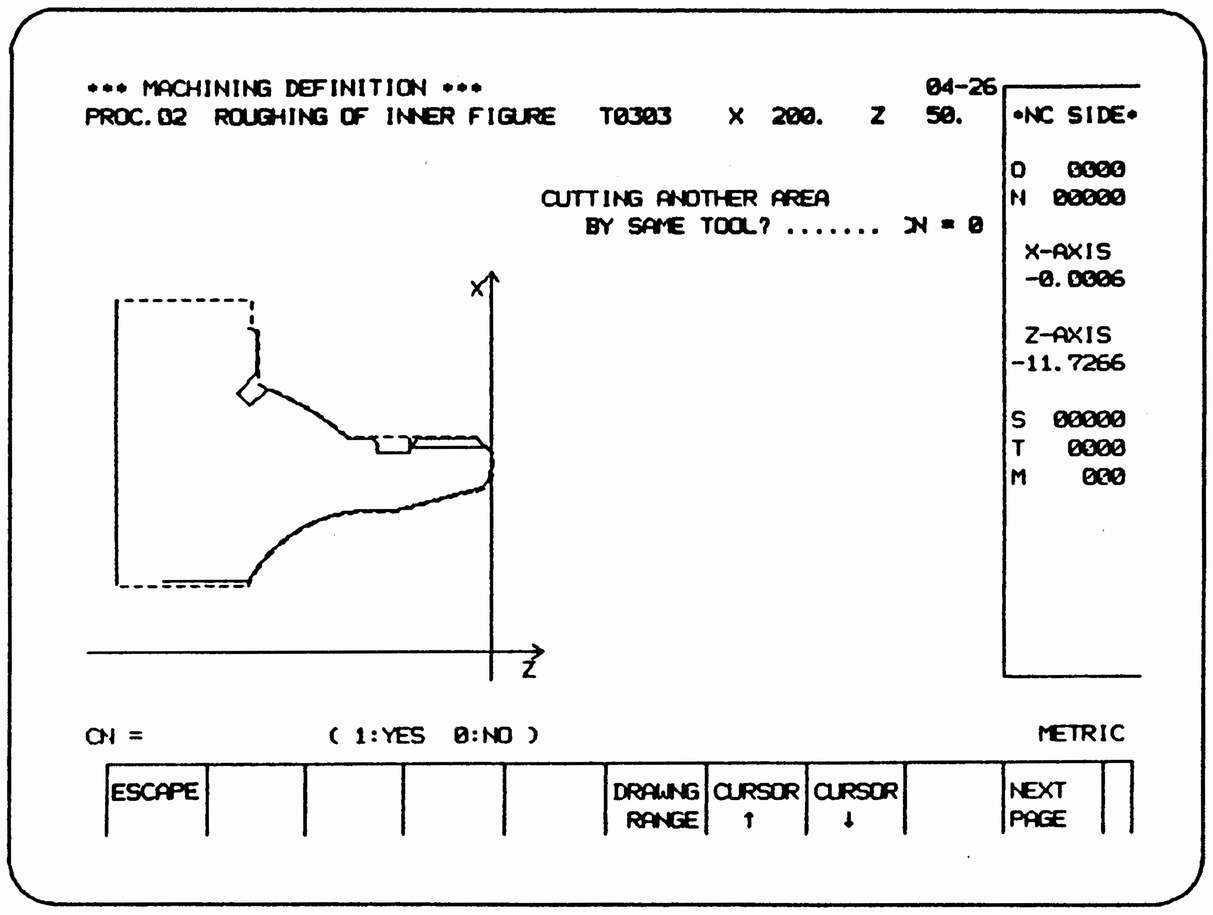
Bring the cursor to the 15mm dia. section using the [**CURSOR FORWRD**] Soft-key.

To input the dividing direction, press the [↓] and [**INPUT**] Keys.



Press the [**NEXT PAGE**] Soft-key.

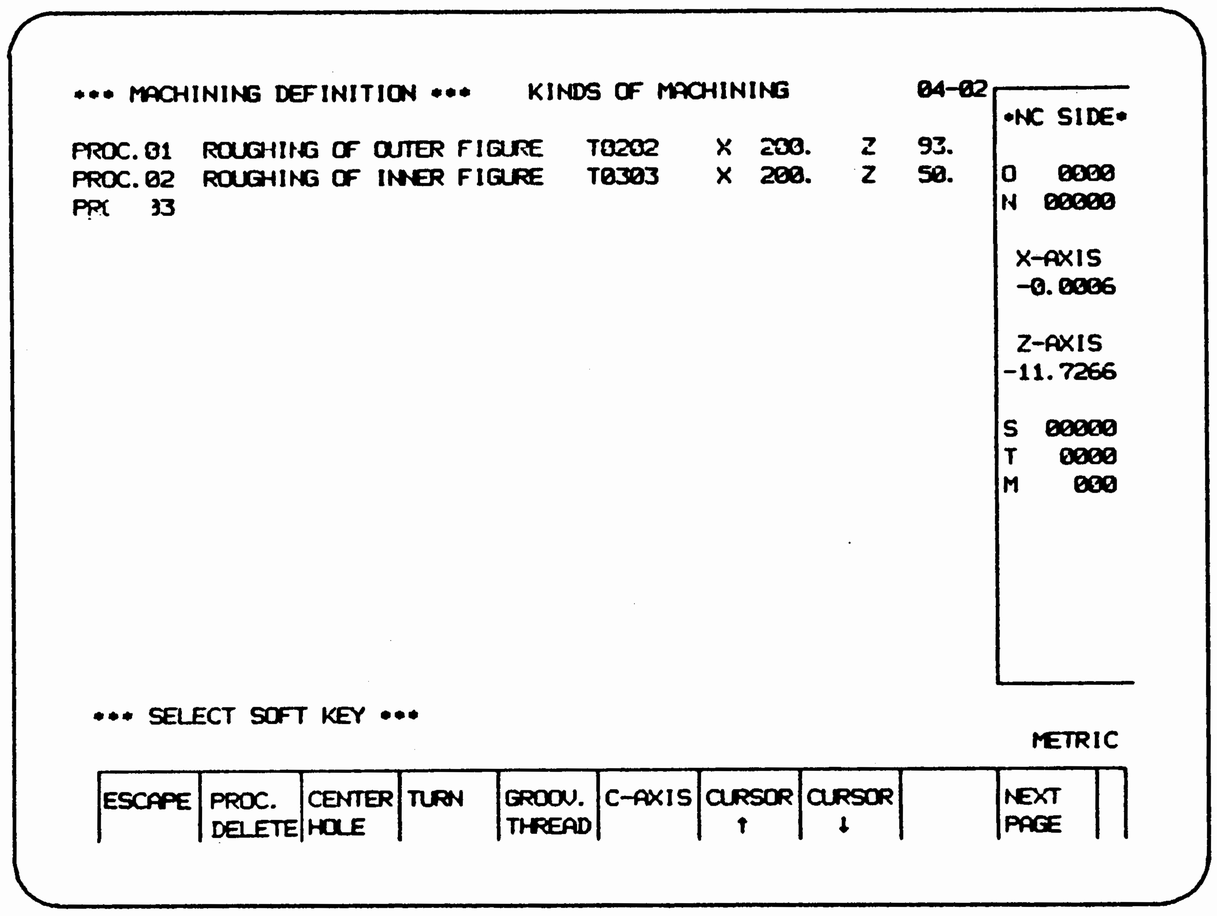
7) Any other area to be cut using the same cutting tool?
In this example, the same cutting tool will not be used to cut another location. Therefore, in response to this prompt, press the [0] and [INPUT] Keys at CN = .



6.4.3 O.D. finishing

1) Setting the kind of machining

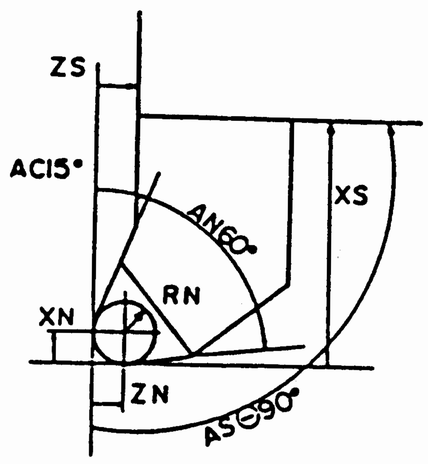
Press the [**TURN**] Soft-key.

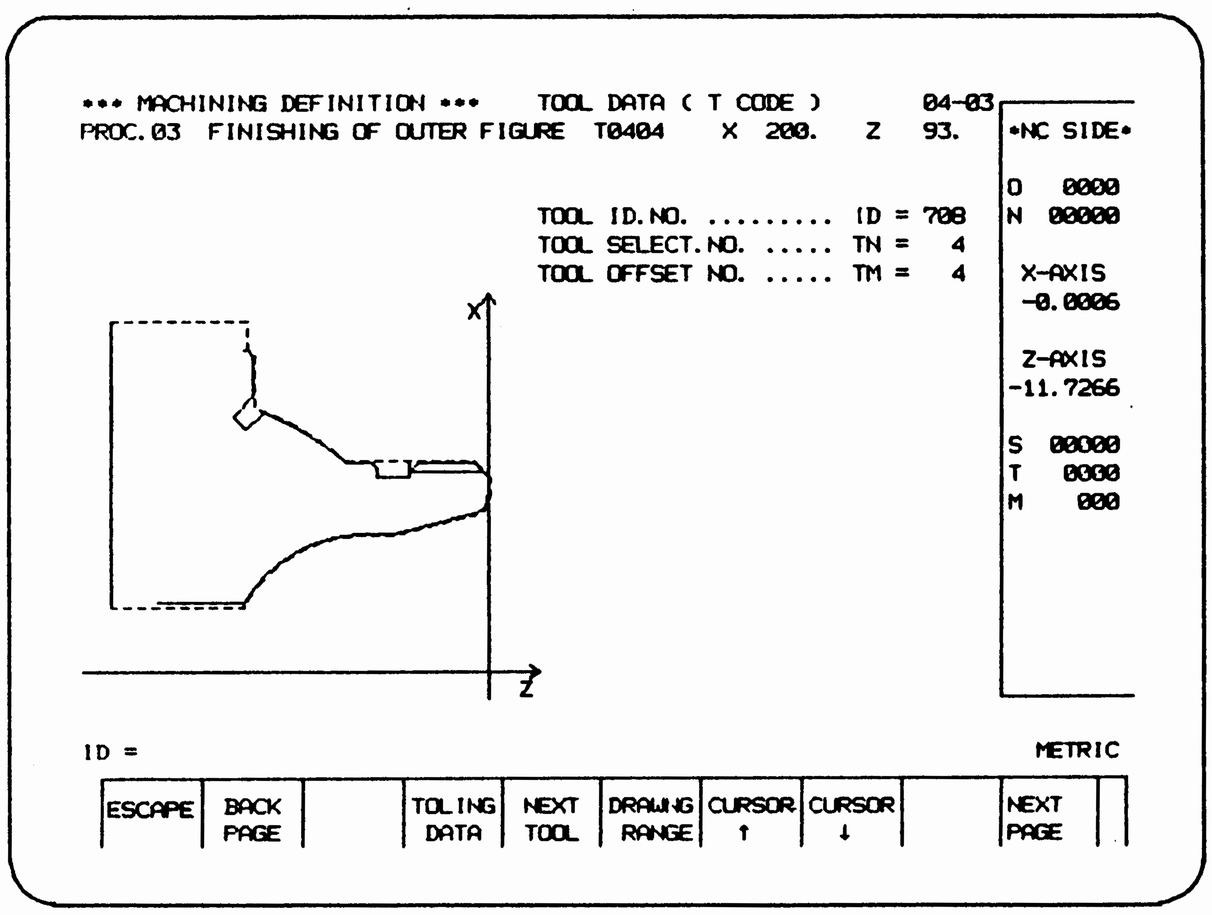


Press the [**FIN. O.D.**] Soft-key.

2) Setting the tool data

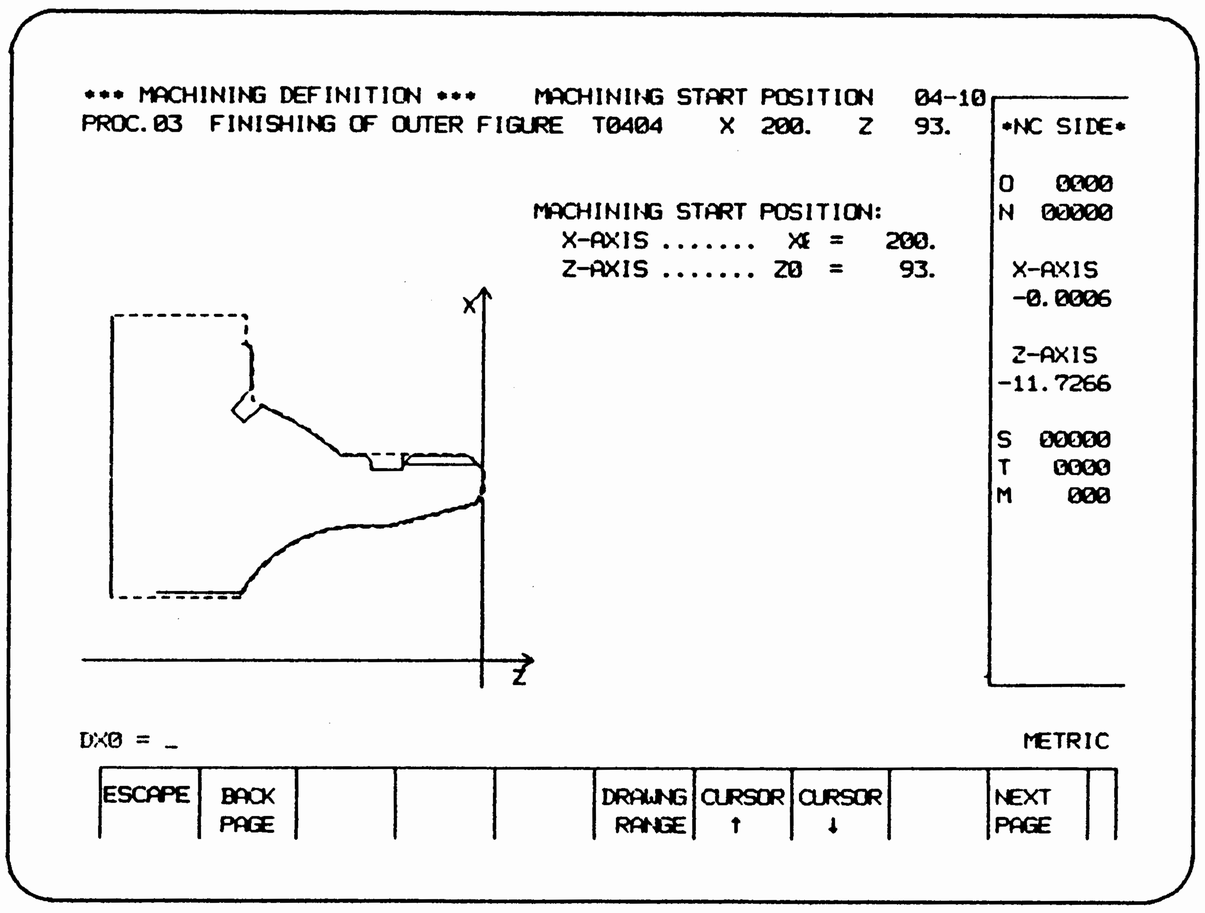
Define the tool data so that the cutting tool cuts into the workpiece from below, and so that the cutting traces along the profile of the rough cut work.





Press the [**NEXT PAGE**] Soft-key.

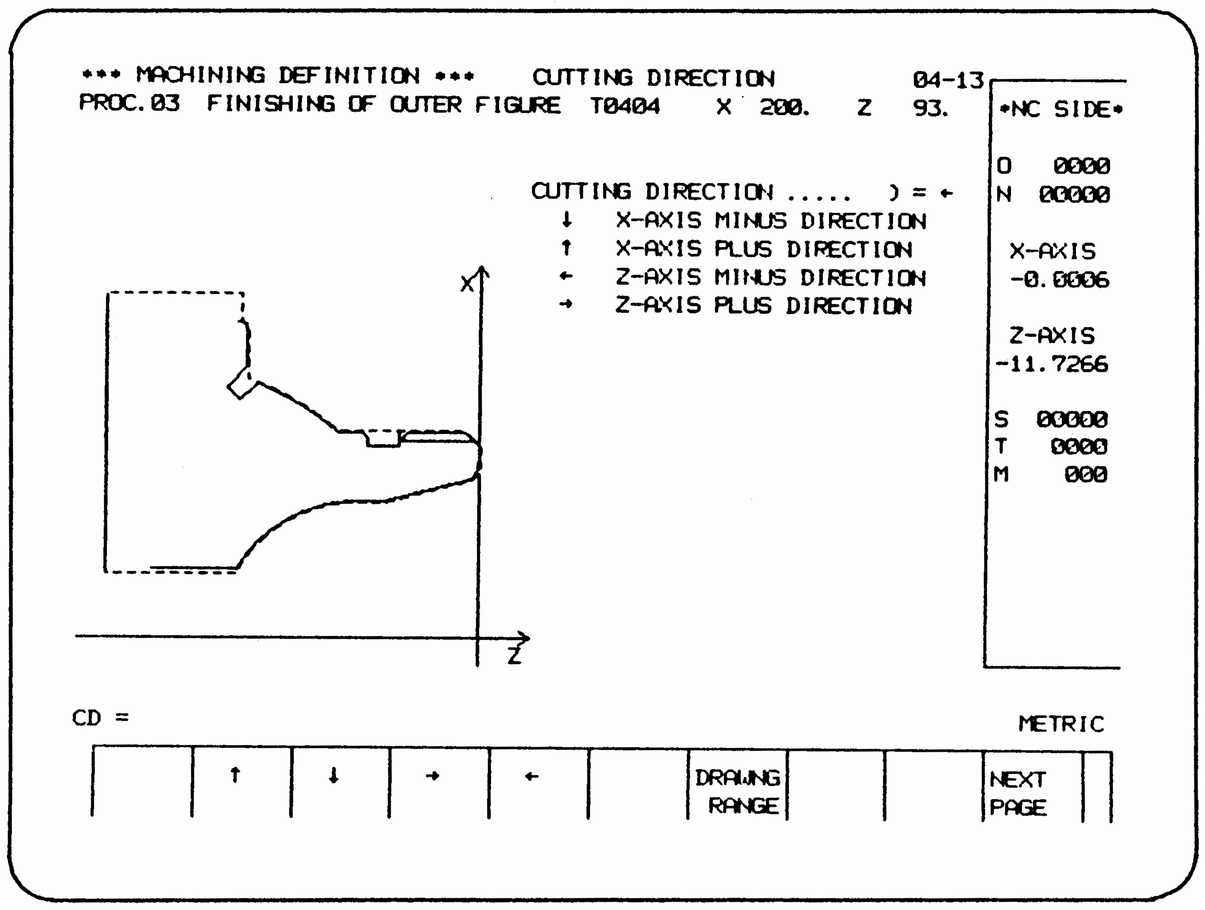
3) Setting the machining start point



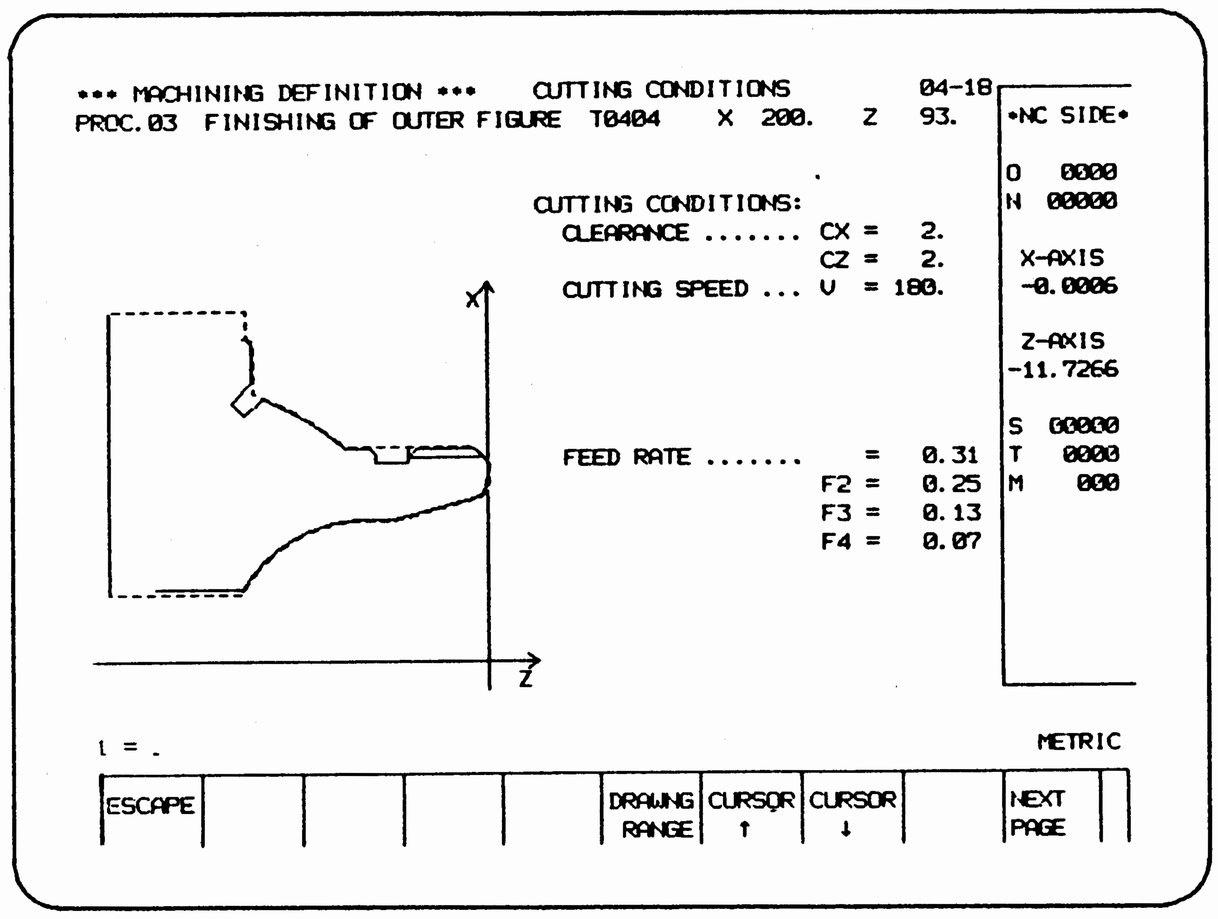
Press the [**NEXT PAGE**] Soft-key.

4) Setting the cutting direction

Press the [←] Soft-key as the cutting tool cuts into the workpiece from below and traces the O.D.



5) Setting the cutting conditions



Press the [**NEXT PAGE**] Soft-key.

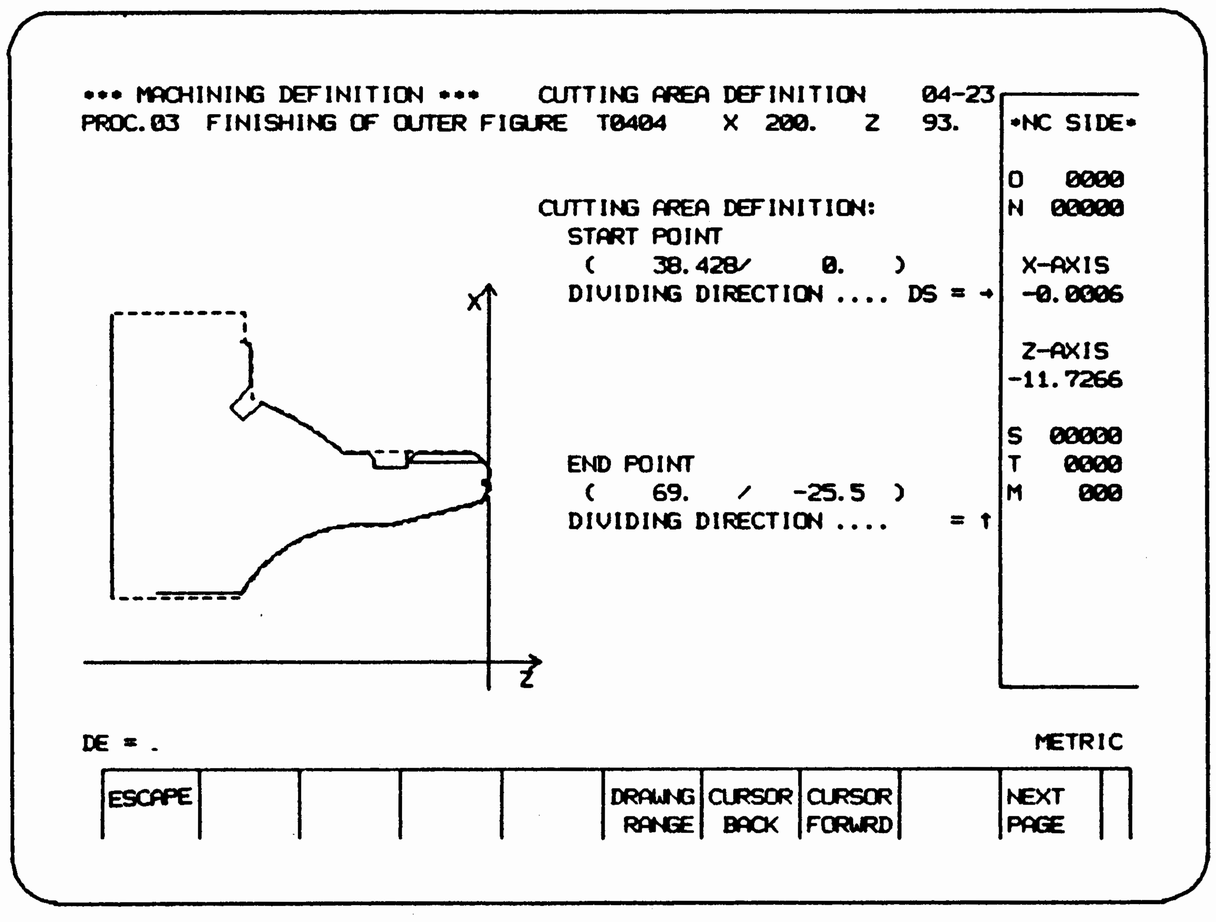
6) Setting the cutting area

Start point

Using the [**CURSOR FORWRD**] Soft-key bring the cursor to the face start point and press the [→] and [**INPUT**] Keys for the dividing direction.

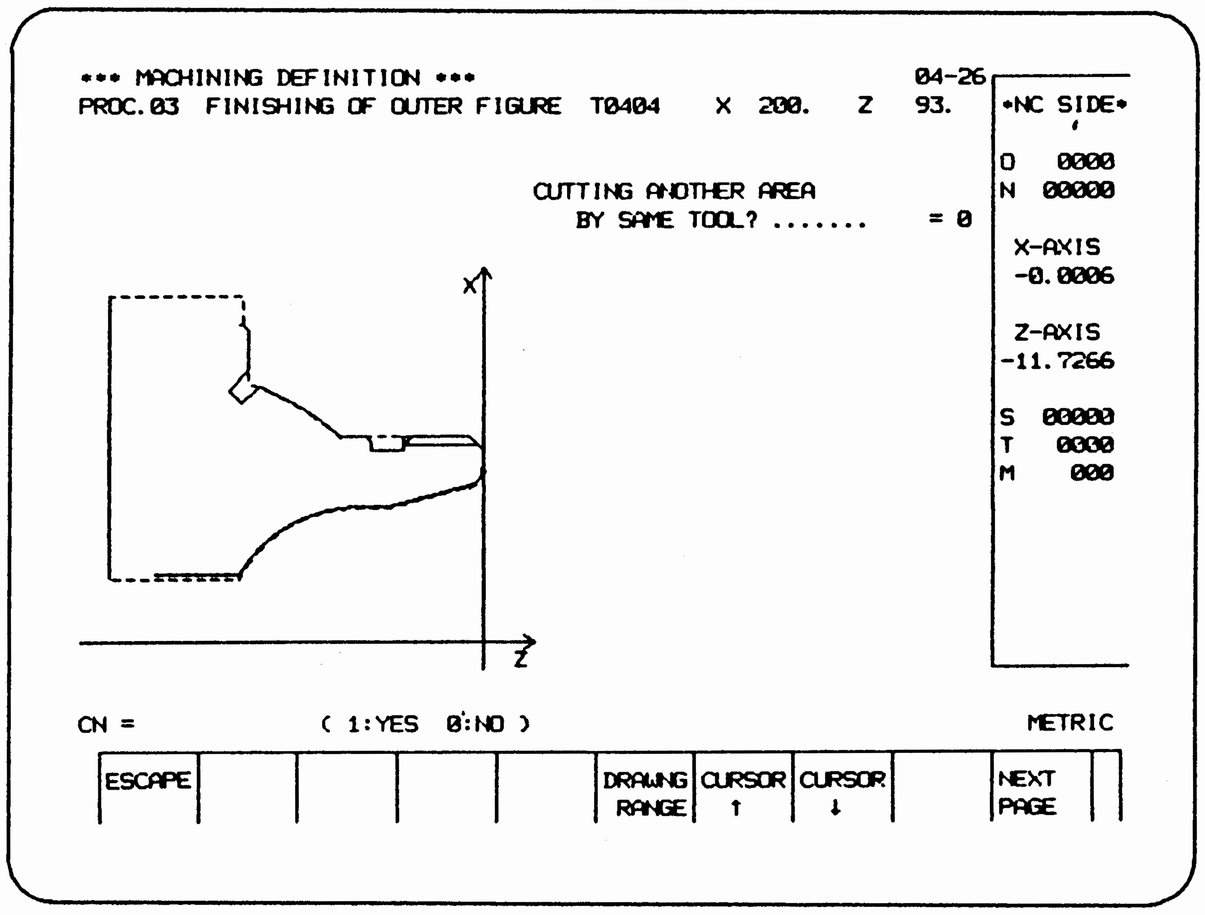
End point

Using the [**CURSOR FORWRD**] Soft-key bring the cursor to the O.D. 69mm section and press the [↑] and [**INPUT**] Keys for the dividing direction.



Press the [**NEXT PAGE**] Soft-key.

7) Any other area to be cut using the same cutting tool?
In this example, the same cutting tool will not be used to cut a different location.
Therefore, press the [0] and [INPUT] Keys at CN = in response to this prompt.



6.4.4 I.D. finishing

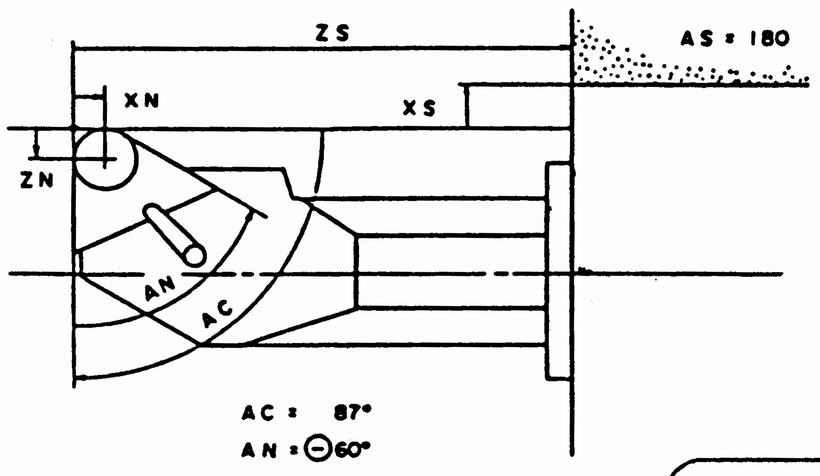
1) Setting the kind of machining

Press the [**TURN**] Soft-key.

```
*** MACHINING DEFINITION ***    KINDS OF MACHINING          04-02
                                                            *NC SIDE*
PROC.01  ROUGHING OF OUTER FIGURE   T0202   X  200.   Z   93.
PROC.02  ROUGHING OF INNER FIGURE   T0303   X  200.   Z   50.   O   0000
PROC.03  FINISHING OF OUTER FIGURE  T0404   X  200.   Z   93.   N  00000
PROC.04  FINISHING OF INNER FIGURE  T0505   X  200.   Z   50.
PRC   35                                                         X-AXIS
                                                                 -0.0006
                                                                 Z-AXIS
                                                                -11.7266
                                                                S  00000
                                                                T   0000
                                                                M    000

*** SELECT SOFT KEY ***                                          METRIC
| ESCAPE | PROC. DELETE | CENTER HOLE | TURN | GROOV. THREAD | C-AXIS | CURSOR ↑ | CURSOR ↓ |  | NEXT PAGE |
```

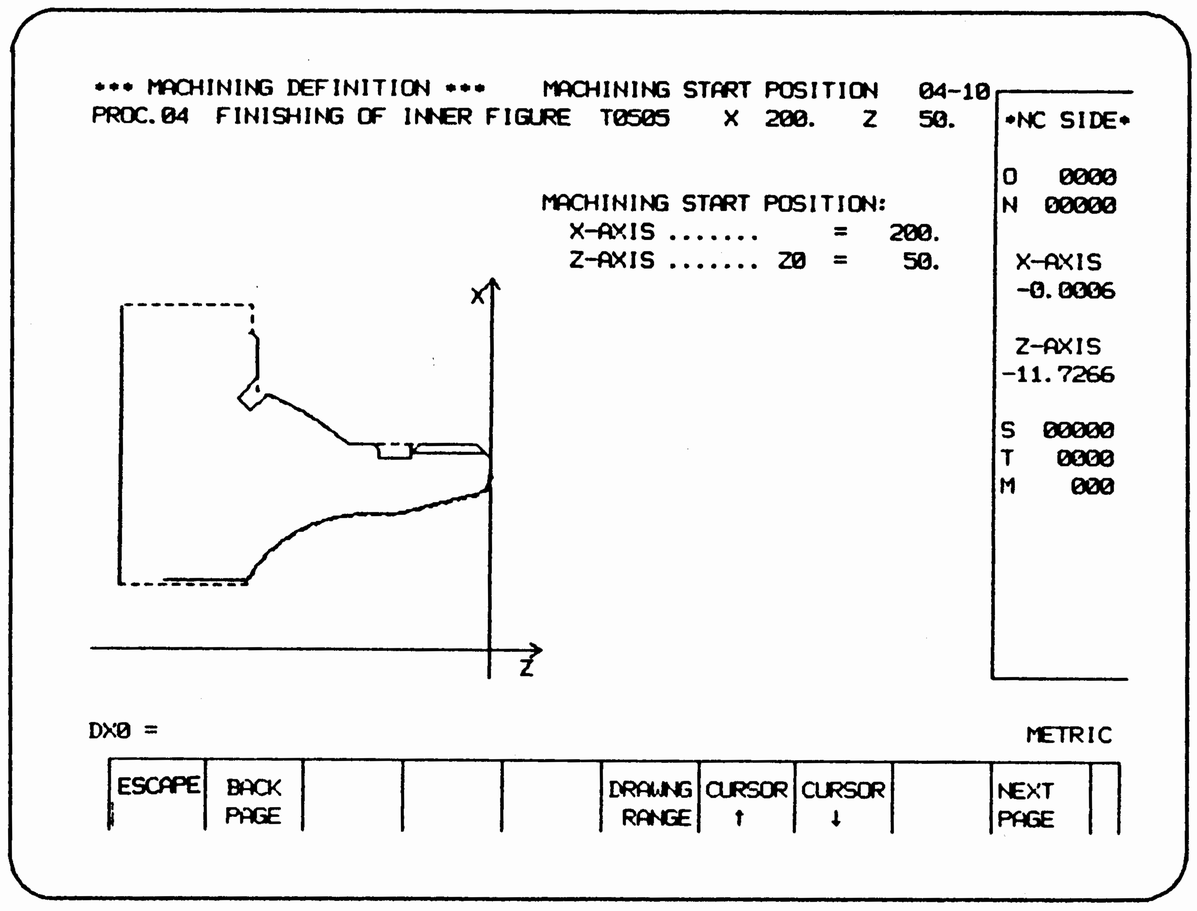
Press the [**FIN. O.D.**] Soft-key.

2) Setting the tool data




```
*** MACHINING DEFINITION ***   TOOL DATA ( T CODE )        04-03
PROC.05  GROOVING OR NECKING      T0606    X  200.   Z   93.   *NC SIDE*
                                                               O   0000
                                 TOOL ID.NO. .........     = 931   N  00000
                                 TOOL SELECT.NO. ..... TN =   6
                                 TOOL OFFSET NO. ..... TM =   6   X-AXIS
                                                                 -0.0006
                                                                 Z-AXIS
                                                                -11.7266
                                                                S  00000
                                                                T   0000
                                                                M    000
                                                                METRIC
ID = .
| ESCAPE | BACK PAGE |  | TOLING DATA | NEXT TOOL | DRAWING RANGE | CURSOR ↑ | CURSOR ↓ |  | NEXT PAGE |
```

3) Setting the machining start position

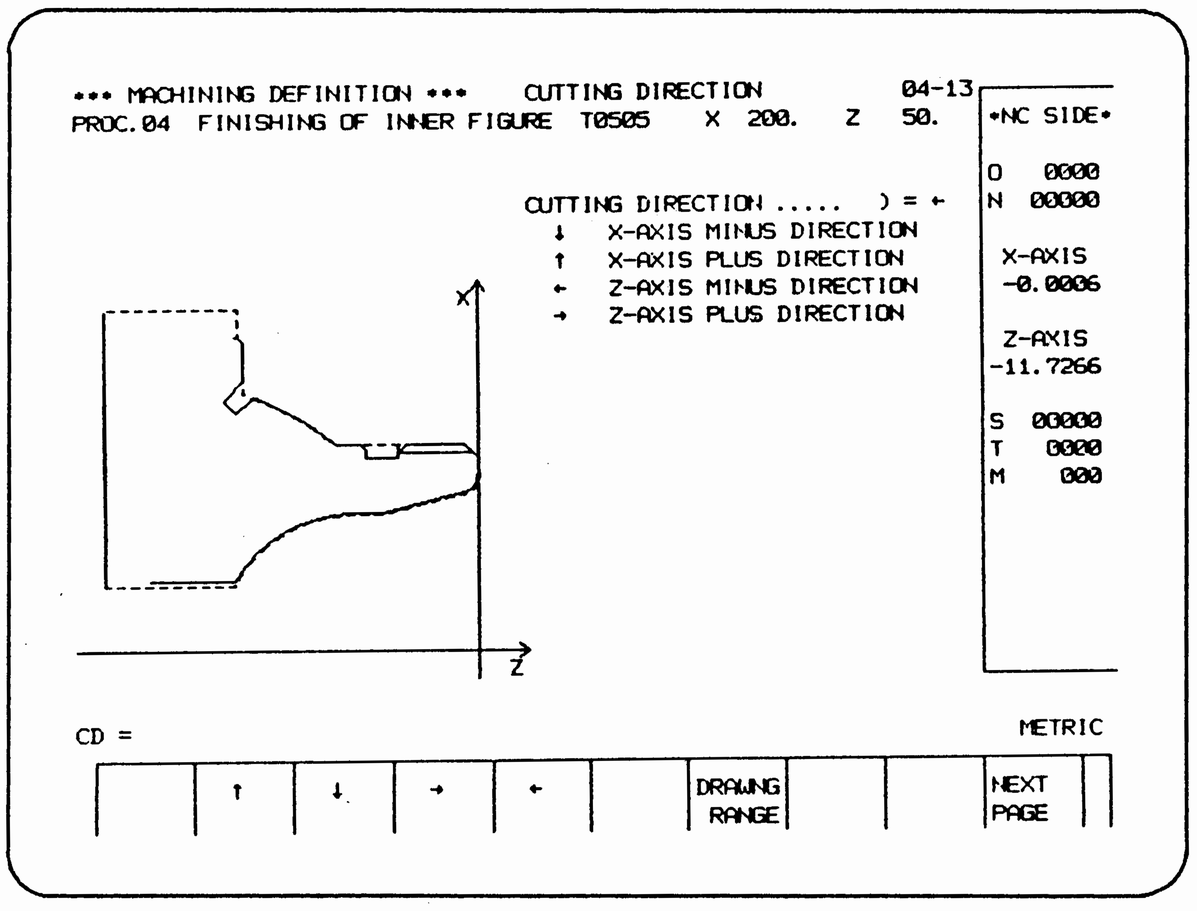


Press the [**NEXT PAGE**] Soft-key.

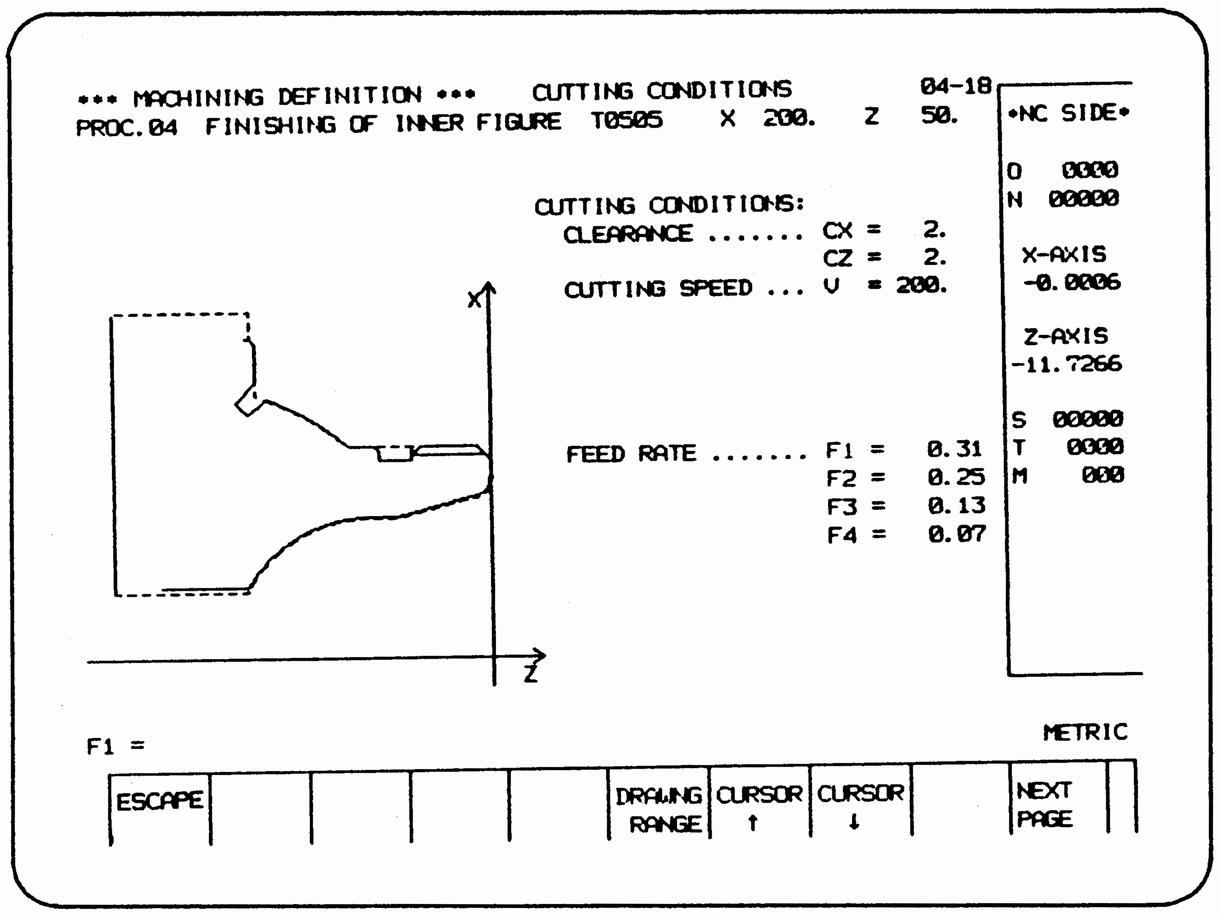
4) Setting the cutting direction

Define the cutting direction so that the tool traces the I.D.

Press the [←] Soft-key.



5) Setting the cutting conditions



Press the [**NEXT PAGE**] Soft-key.

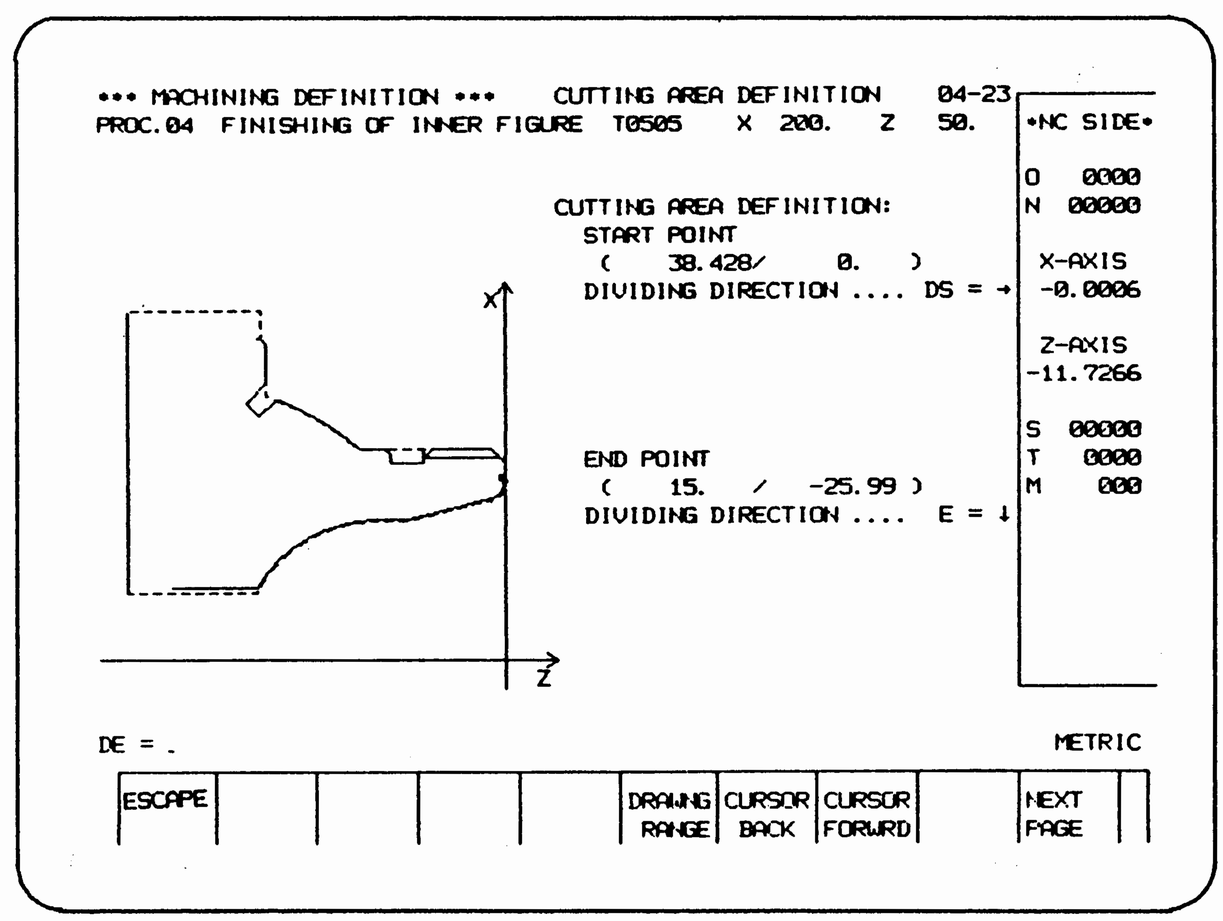
6) Setting the cutting area

Start point

Using the [**CURSOR FORWRD**] Soft-key bring the cursor to the entrance of the I.D. and press the [→] and [**INPUT**] Keys for the dividing direction.

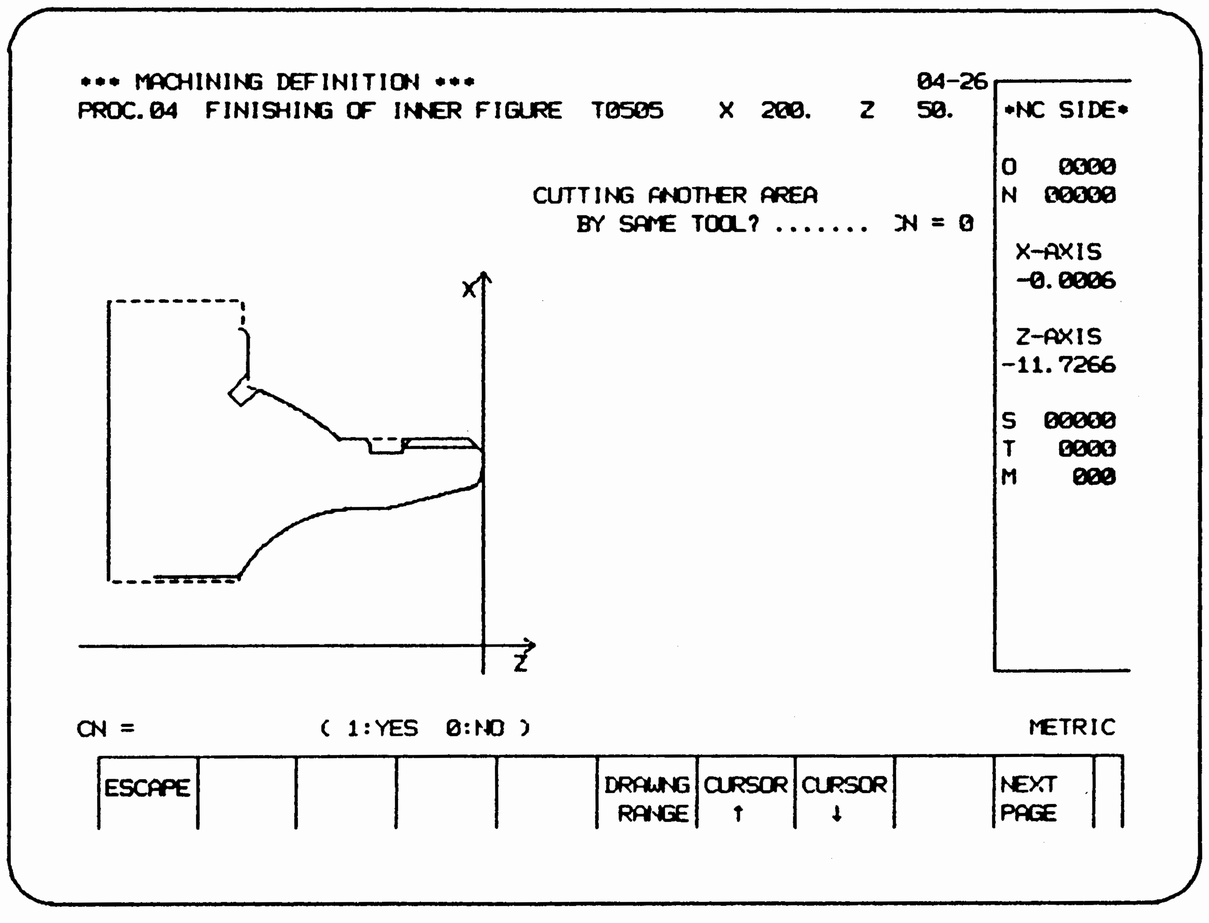
End point

Using the [**CURSOR FORWRD**] Soft-key bring the cursor to the I.D. 15mm section and press the [↓] and [**INPUT**] Keys for the dividing direction.



Press the [**NEXT PAGE**] Soft-key.

7) Any other area to be cut using the same cutting tool?
In this example, the same cutting tool will not be used to cut another location. Therefore, press the [**0**] and [**INPUT**] Keys at CN = in response to this prompt.



6.4.5 Grooving

1) Setting the kind of machining

Press the [**GROOV. THREAD**] Soft-key.

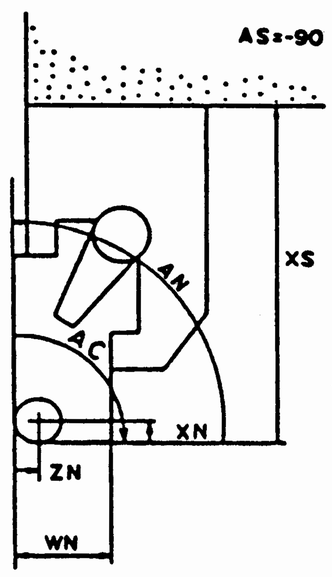
```
*** MACHINING DEFINITION ***    KINDS OF MACHINING          04-02
                                                            *NC SIDE*
PROC.01  ROUGHING OF OUTER FIGURE   T0202   X  200.   Z   93.
PROC.02  ROUGHING OF INNER FIGURE   T0303   X  200.   Z   50.   O   0000
PROC.03  FINISHING OF OUTER FIGURE  T0404   X  200.   Z   93.   N  00000
PROC.04  FINISHING OF INNER FIGURE  T0505   X  200.   Z   50.
PR(   35                                                         X-AXIS
                                                                 -0.0006
                                                                 Z-AXIS
                                                                -11.7266
                                                                S  00000
                                                                T   0000
                                                                M    000

*** SELECT SOFT KEY ***                                          METRIC
ESCAPE | GROOV. NECK. | ROUGH. GROOVE | FIN. GROOVE | | | | THREAD ING | | SUB CYCLE
```

Press the [**GROOV. NECK**] Soft-key.

2) Setting the tool data

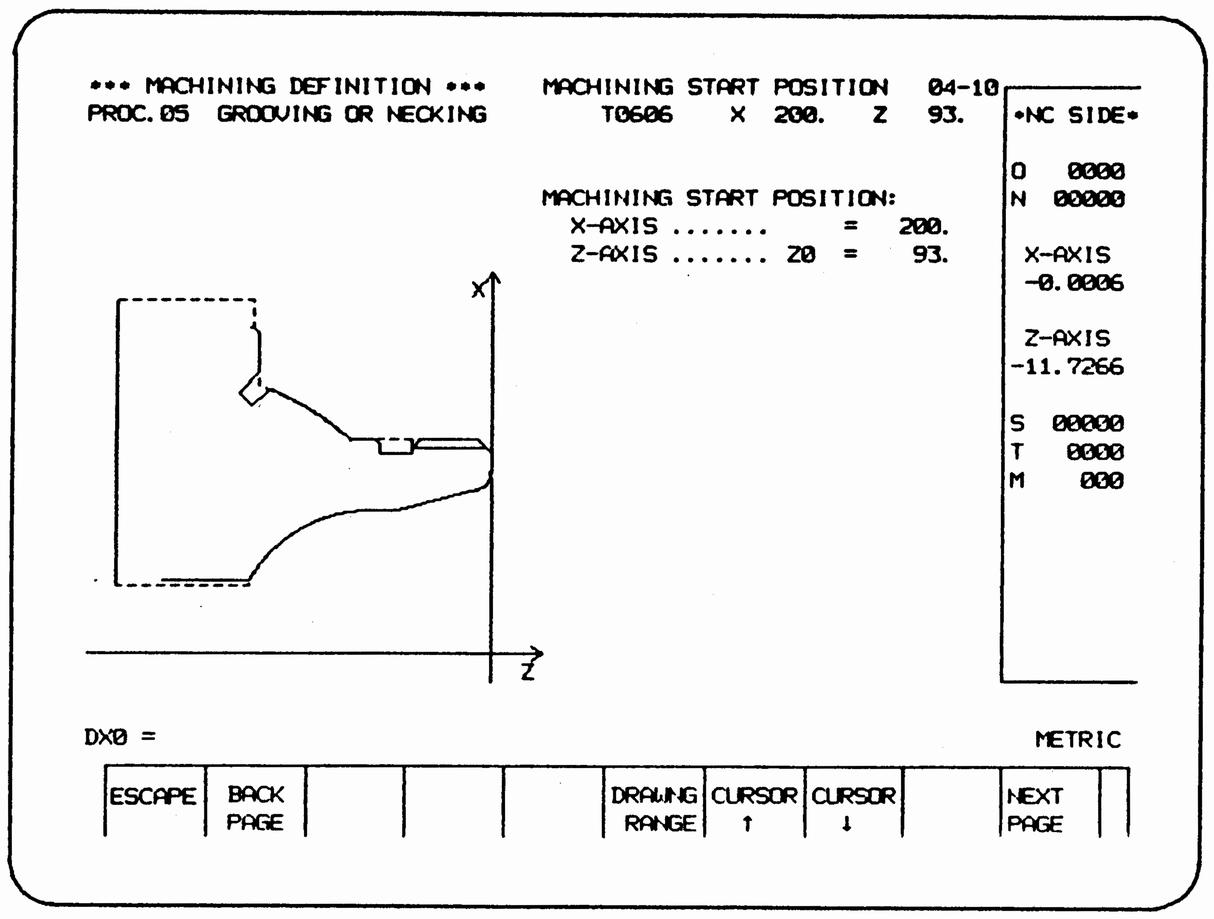
Cut a groove for retraction in threading.

The tool of tip width 3mm will cut a groove of width 3.5mm.



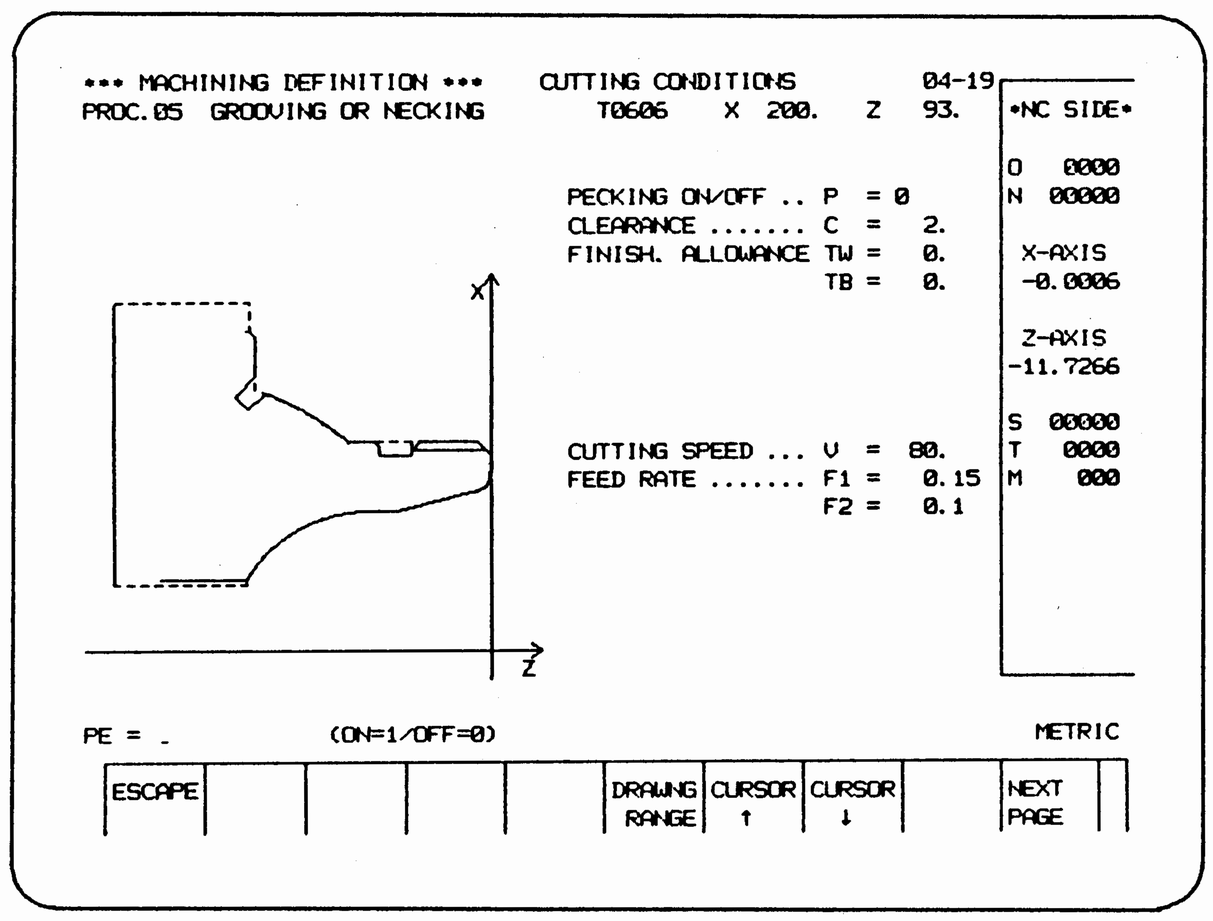

```
*** MACHINING DEFINITION ***   TOOL DATA                  04-08
PROC.05  GROOVING OR NECKING       T0606   X  200.   Z   93.   *NC SIDE*
                                                                O   0000
                               TOOL DATA                        N  00000
                                 NOSE RADIUS .....     =   0.2
                                 CUTTING EDGE .... AC =   90.    X-AXIS
                                 NOSE ANGLE ...... AN = -90.     -0.0006
                                 VIRTUAL TOOL POS. XN =   0.2
                                                   ZN =   0.2    Z-AXIS
                                                                -11.7266
                                                                S  00000
                                 NOSE WIDTH ...... WN =    3.    T   0000
                                                                M    000
                                 SETTING ANGLE ... AS =  -90.
                                 SETTING POSITION  XS =   40.
                                                   ZS =    7.
RN = _                                                          METRIC
ESCAPE | BACK PAGE | | | | DRAWING RANGE | CURSOR ↑ | CURSOR ↓ | | NEXT PAGE
```

3) Setting the machining start position



Press the [**NEXT PAGE**] Soft-key.

4) Setting the cutting conditions



5) Setting the cutting area

Start Point

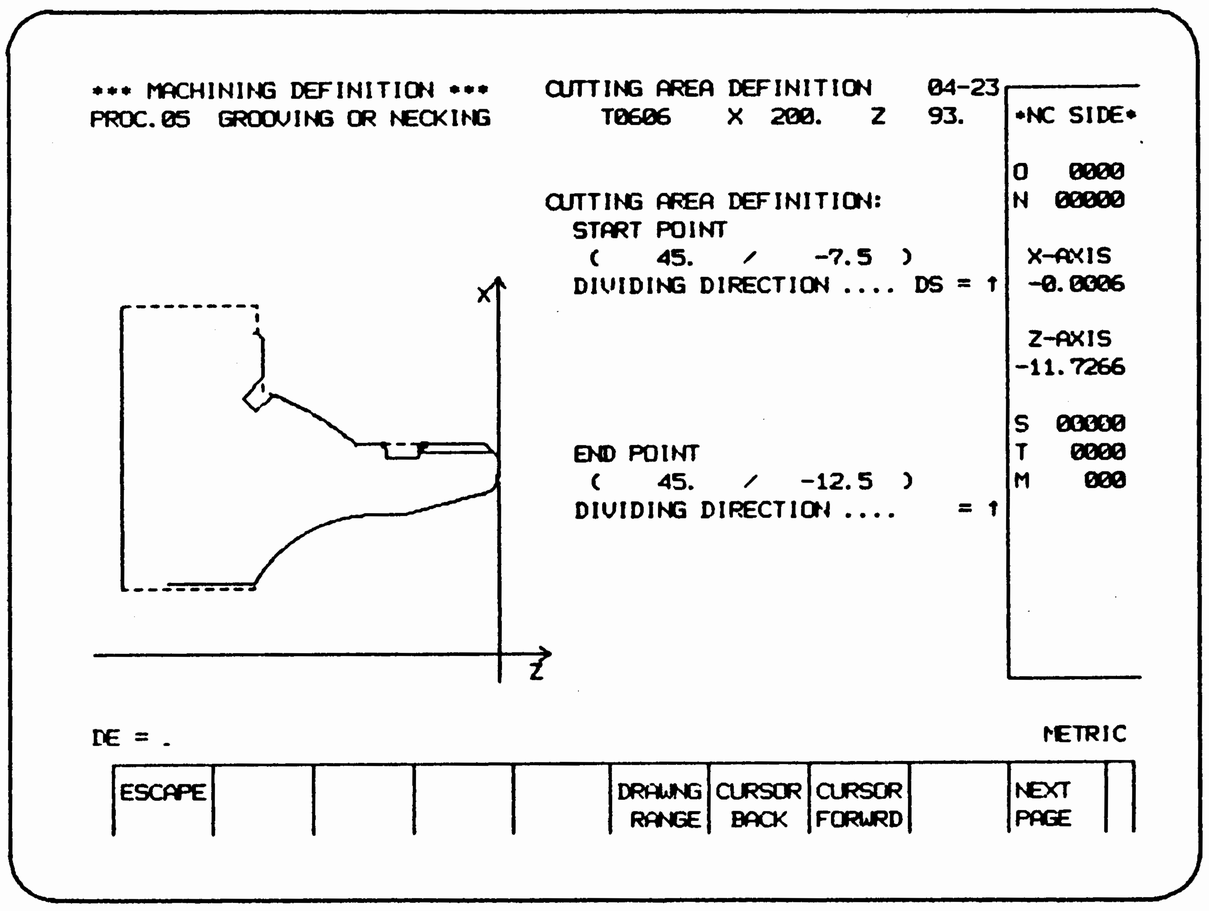
Bring the cursor to the chamfer immediately to the rear of the thread using the [**CURSOR FORWRD**] Soft-key.

To input the dividing direction, press the [↑] and [**INPUT**] Keys.

End Point

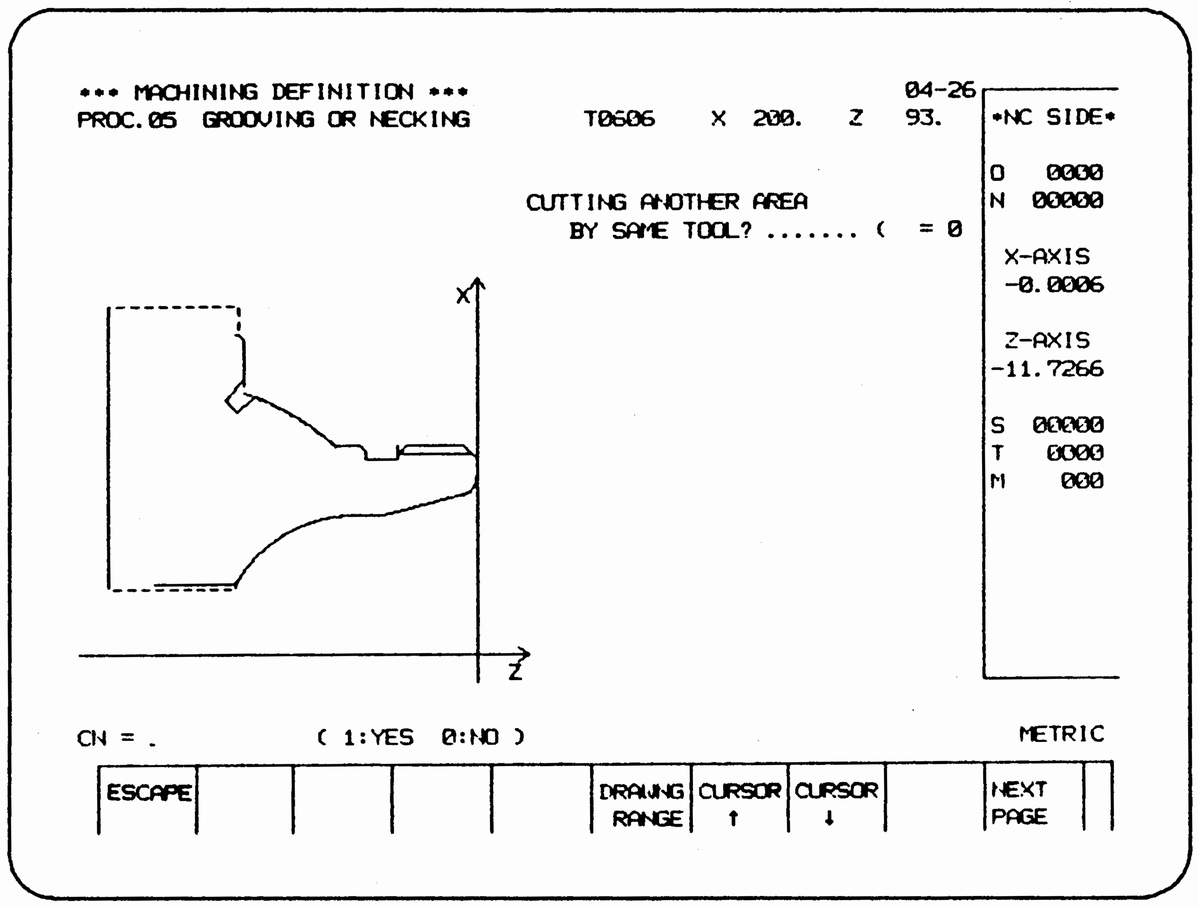
Bring the cursor to one of the chamfering entrances to the groove using the [**CURSOR FORWRD**] Soft-key.

To input the dividing direction, press the [↑] and [**INPUT**] Keys.



After setting the data, press the [**NEXT PAGE**] Soft-key.

6) Any other area to be cut using the same cutting tool?
In this example, the same cutting tool will not be used to cut another location. Therefore, press the [0] and [INPUT] Keys at CN = in response to the prompt.



6.4.6 Necking

1) Setting the kind of machining

Press the [**GROOV. THREAD**] Soft-key.

```
*** MACHINING DEFINITION ***    KINDS OF MACHINING          04-02
                                                            *NC SIDE*
PROC.01  ROUGHING OF OUTER FIGURE   T0202   X  200.   Z   93.
PROC.02  ROUGHING OF INNER FIGURE   T0303   X  200.   Z   50.   O   0000
PROC.03  FINISHING OF OUTER FIGURE  T0404   X  200.   Z   93.   N  00000
PROC.04  FINISHING OF INNER FIGURE  T0505   X  200.   Z   50.
PROC.05  GROOVING OR NECKING        T0606   X  200.   Z   93.    X-AXIS
    .(                                                           -0.0006

                                                                 Z-AXIS
                                                                -11.7266

                                                                S  00000
                                                                T   0000
                                                                M    000

*** SELECT SOFT KEY ***
                                                                METRIC
| ESCAPE | | CENTER HOLE | TURN | GROOV. THREAD | C-AXIS | CURSOR ↑ | CUREAD G | | SUB CYCLE | |
```

Press the [**GROOV. NECK.**] Soft-key.

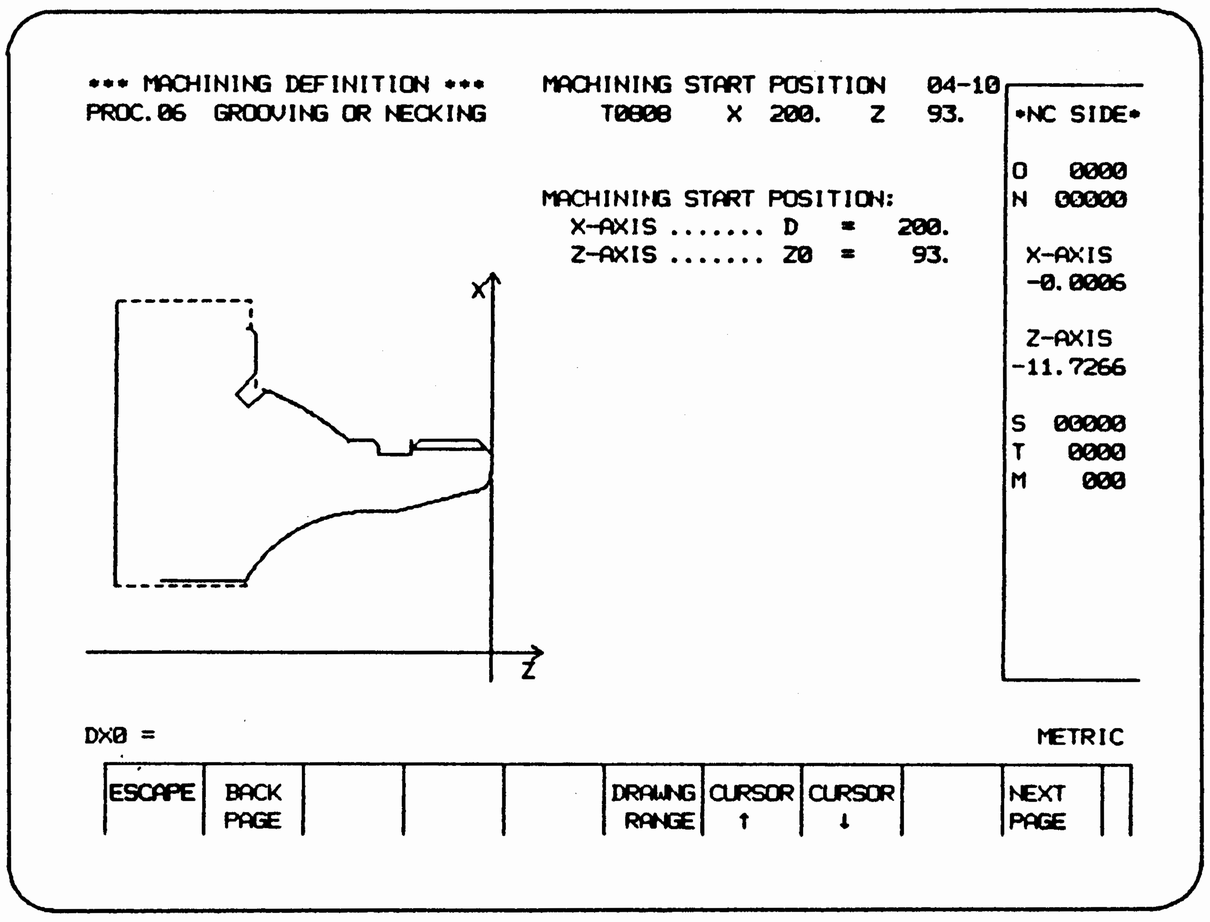
2) Setting the tool data

Input the tool ID No.

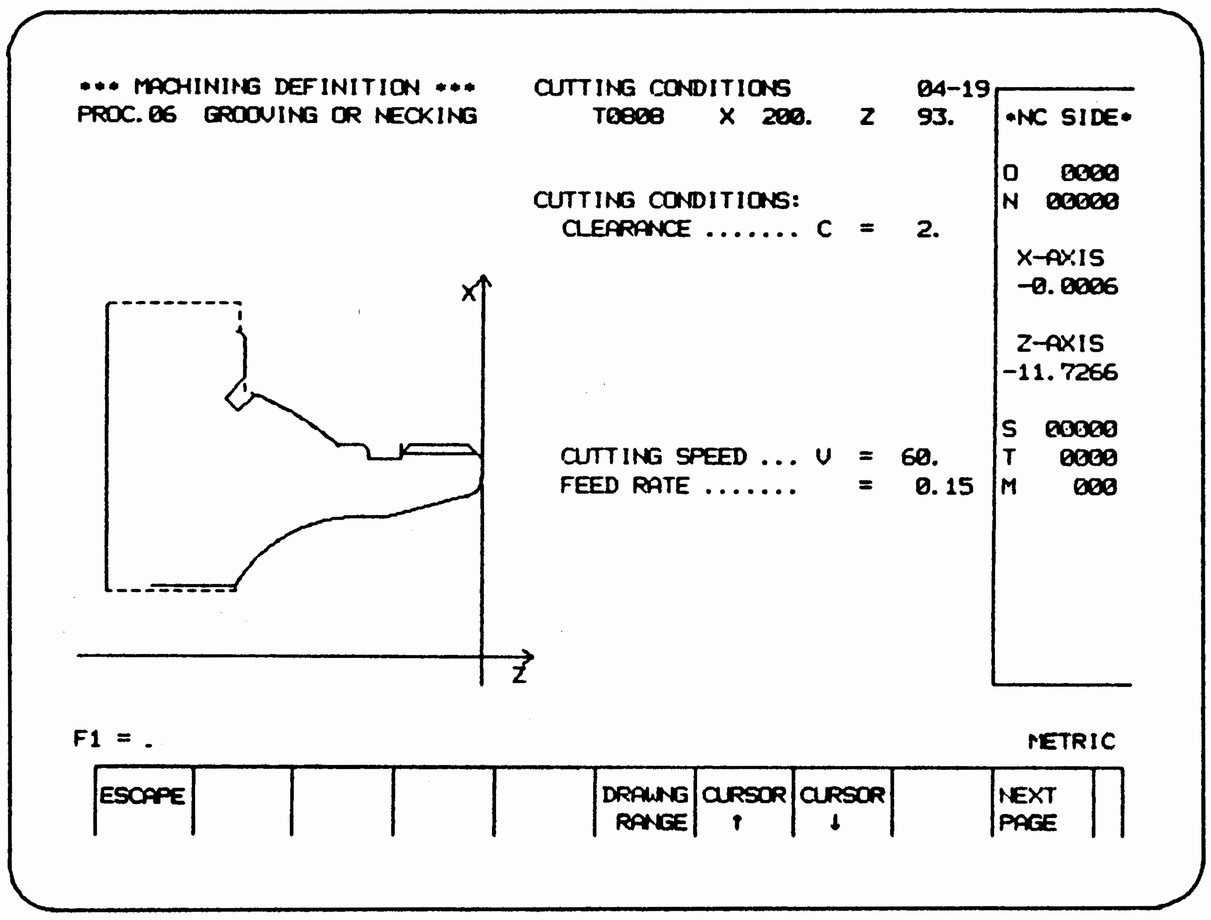
Key-in "**999**" and then press the [**INPUT**] Key at ID =.
Key-in "**8**" and then press the [**INPUT**] Key at TN =.
Key-in "**8**" and then press the [**INPUT**] Key at TM =.

```
*** MACHINING DEFINITION ***   TOOL DATA ( T CODE )        04-03
PROC.06  GROOVING OR NECKING      T0808   X  200.   Z   93.   *NC SIDE*

                                                               O   0000
                               TOOL ID.NO. ......... i  = 999  N  00000
                               TOOL SELECT.NO. ..... TN =   8
                               TOOL OFFSET NO. ..... TM =   8   X-AXIS
                                                                -0.0006
                                  X↑
                                                                Z-AXIS
                                                               -11.7266
                                                               S  00000
                                                               T   0000
                                                               M    000
                                  Z→
ID =                                                           METRIC
| ESCAPE | BACK PAGE | | TOLING DATA | NEXT TOOL | DRAWING RANGE | CURSOR ↑ | CURSOR ↓ | | NEXT PAGE | |
```

3) Setting the machining start position



4) Setting the cutting conditions



Press the 【**NEXT PAGE**】 Soft-key.

6.4.7 Threading

1) Setting the kind of machining

Press the [**GROOV. THREAD**] Soft-key.

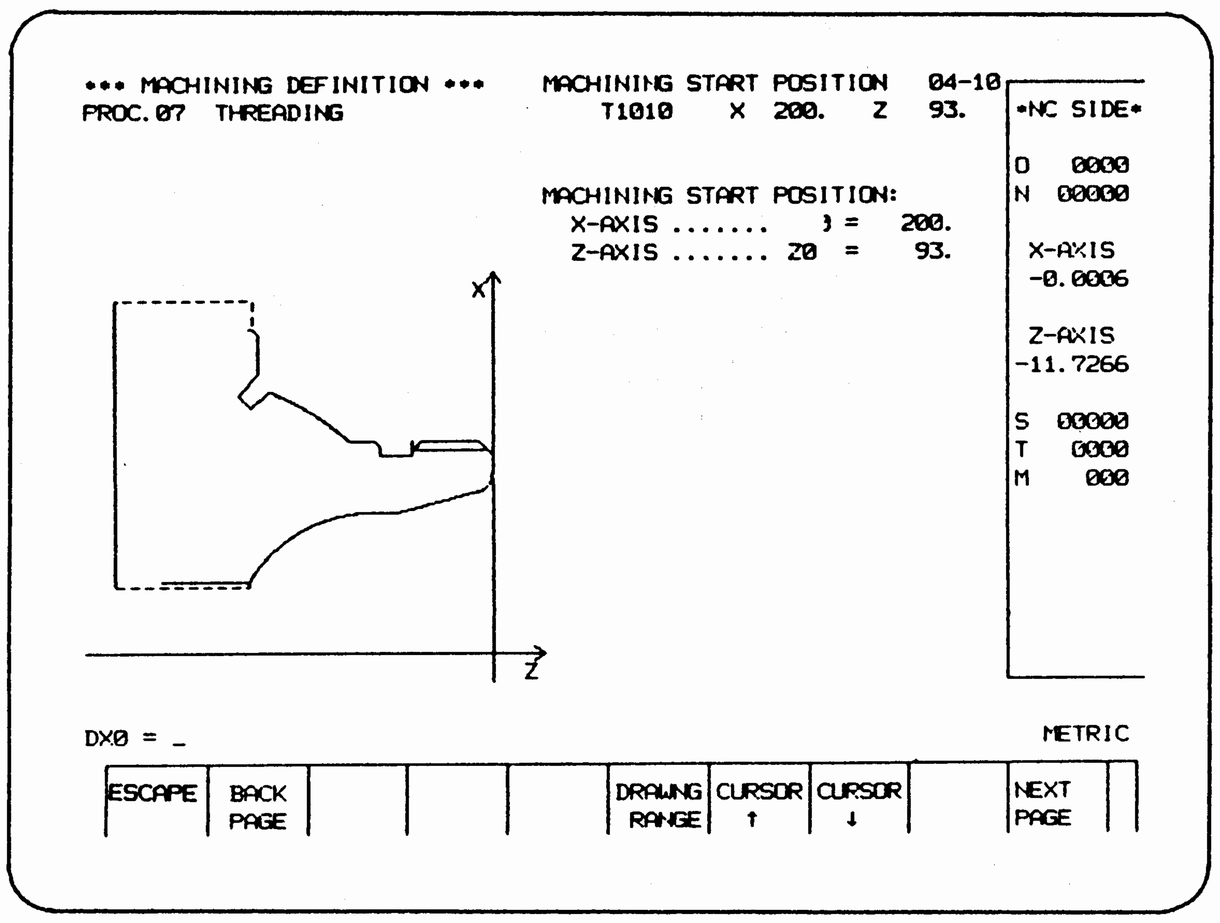
```
*** MACHINING DEFINITION ***    KINDS OF MACHINING          04-02
                                                            *NC SIDE*
PROC.01  ROUGHING OF OUTER FIGURE   T0202   X  200.  Z  93.
PROC.02  ROUGHING OF INNER FIGURE   T0303   X  200.  Z  50.  O   0000
PROC.03  FINISHING OF OUTER FIGURE  T0404   X  200.  Z  93.  N  00000
PROC.04  FINISHING OF INNER FIGURE  T0505   X  200.  Z  50.
PROC.05  GROOVING OR NECKING        T0606   X  200.  Z  93.   X-AXIS
PROC.06  GROOVING OR NECKING        T0808   X  200.  Z  93.   -0.0006
  >C
                                                             Z-AXIS
                                                            -11.7266
                                                            S  00000
                                                            T   0000
                                                            M    000

*** SELECT SOFT KEY ***
                                                            METRIC
| ESCAPE | PROC. DELETE | CENTER HOLE | TURN | GROOV. THREAD | C-AXIS | CURSOR ↑ | CURSOR ↓ |  | NEXT PAGE |
```

Press the [**THREAD**] Soft-key.

2) Setting tool data

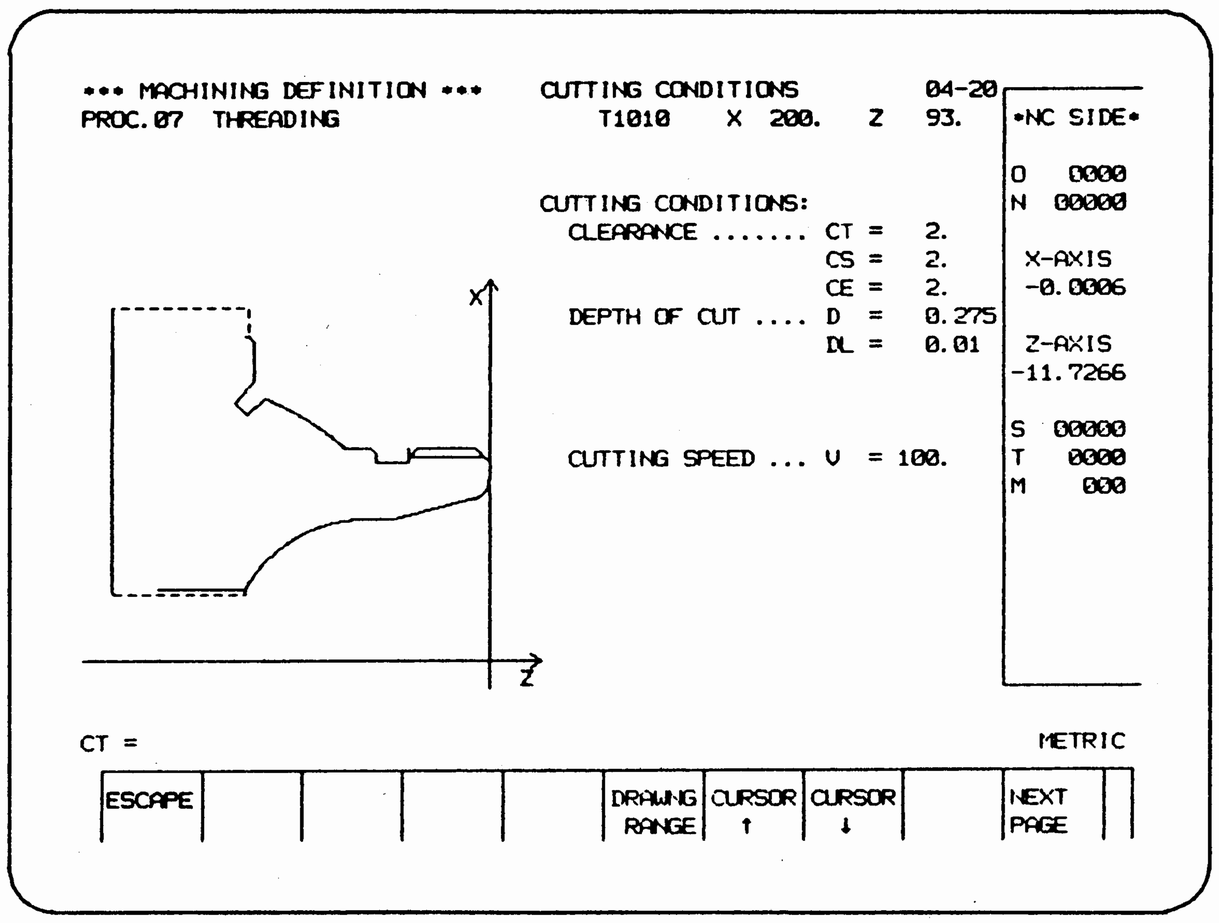
```
*** MACHINING DEFINITION ***   TOOL DATA ( T CODE )        04-03
PROC.07  THREADING                T1010   X  200.  Z  93.  *NC SIDE*
                                                            O   0000
                                TOOL ID.NO. .........   =  31  N  00000
                                TOOL SELECT.NO. ..... TN =  10
                                TOOL OFFSET NO. ..... TM =  10  X-AXIS
                                                             -0.0006
                                                             Z-AXIS
                                                            -11.7266
                                                            S  00000
                                                            T   0000
                                                            M    000
ID = _                                                      METRIC
| ESCAPE | BACK PAGE |  | TOLING DATA | NEXT TOOL | DRAWNG RANGE | CURSOR ↑ | CURSOR ↓ |  | NEXT PAGE |
```

3) Setting the machining start position



Press the **[NEXT PAGE]** Soft-key.

4) Setting the cutting conditions



```
*** MACHINING DEFINITION ***    KINDS OF MACHINING          04-02
                                                            *NC SIDE*
PROC.01  ROUGHING OF OUTER FIGURE   T0202   X  200.   Z   93.
PROC.02  ROUGHING OF INNER FIGURE   T0303   X  200.   Z   50.   O   0000
PROC.03  FINISHING OF OUTER FIGURE  T0404   X  200.   Z   93.   N  00000
PROC.04  FINISHING OF INNER FIGURE  T0505   X  200.   Z   50.
PROC.05  GROOVING OR NECKING        T0606   X  200.   Z   93.    X-AXIS
PROC.06  GROOVING OR NECKING        T0808   X  200.   Z   93.    -0.0006
PROC.07  THREADING                  T1010   X  200.   Z   93.
    .E                                                           Z-AXIS
                                                                -11.7266
                                                                S  00000
                                                                T   0000
                                                                M    000

*** SELECT SOFT KEY ***
                                                                METRIC
| ESCAPE | PROC. DELETE | CENTER HOLE | TURN | GROOV. THREAD | C-AXIS | CURSOR ↑ | CURSOR ↓ |  | NEXT PAGE |
```

Press the [**NEXT PAGE**] Soft-key to return to the main menu display.

```
=*= FAPT EXECUTION PROCESS =*=
                                                                *NC SIDE*
  SELECTION OF MATERIAL & SETTING OF BLANK SIZE                 O   0000
                                                                N  00000
    INPUT OF PART FIGURE (INPUT OF BLANK FIGURE)                 X-AXIS
                                                                 -0.0006
      SETTING OF HOME POSITION/INDEX POSITION                    Z-AXIS
                                                                -11.7266
        MACHINING DEFINITION                                    S  00000
                                                                T   0000
          NC DATA PREPARATION                                   M    000
                                                                
            MACHINING SIMULA-
            TION
                                                                METRIC
| END | 1 | 2 | 3 | 4 | 5 | 6 |  |  | EXEC |
```

To correct data that has been set, select Menu 4 again.

Press the [**CORRECTION**] Soft-key.

```
*** MACHINING DEFINITION ***    MACHINING PLAN                 04-01
                                                              *NC SIDE*
PROC.01  ROUGHING OF OUTER FIGURE   T0202   X  200.   Z   93.
PROC.02  ROUGHING OF INNER FIGURE   T0303   X  200.   Z   50.   O   0000
PROC.03  FINISHING OF OUTER FIGURE  T0404   X  200.   Z   93.   N  00000
PROC.04  FINISHING OF INNER FIGURE  T0505   X  200.   Z   50.
PROC.05  GROOVING OR NECKING        T0606   X  200.   Z   93.    X-AXIS
PROC.06  GROOVING OR NECKING        T0808   X  200.   Z   93.    -0.0006
PROC.07  THREADING                  T1010   X  200.   Z   93.
PROC.08                                                           Z-AXIS
                                                                 -11.7266
                                                                 S  00000
                                                                 T   0000
                                                                 M    000

*** SELECT SOFT KEY ***
                                                                METRIC
| ESCAPE | CORR. & OUT |  |  |  |  |  | NEW | CORRE-CTION | NEXT PAGE |  |
```

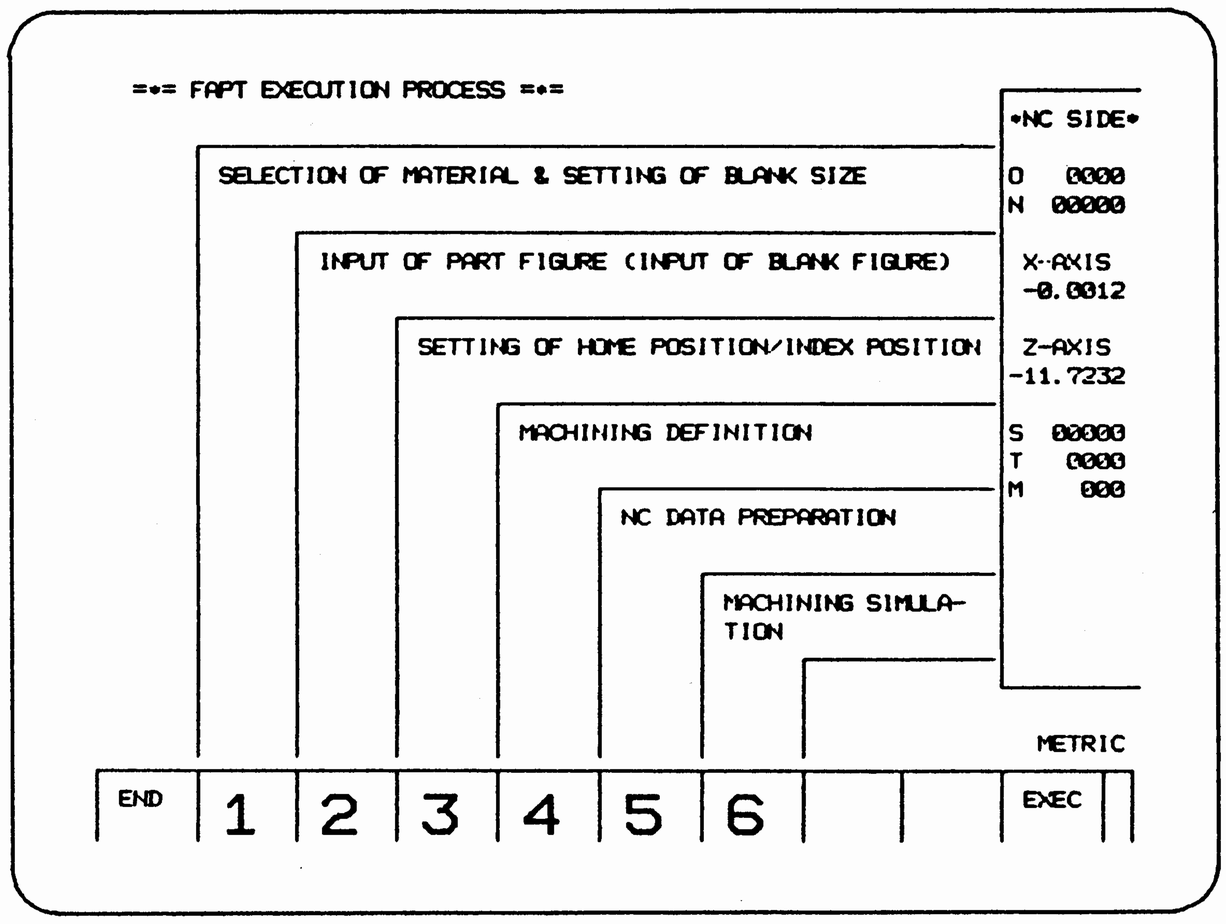
Re-arrange the machining sequence by erasing and interchanging the machining processes.

6.5 Menu 5 : NC DATA PREPARATION

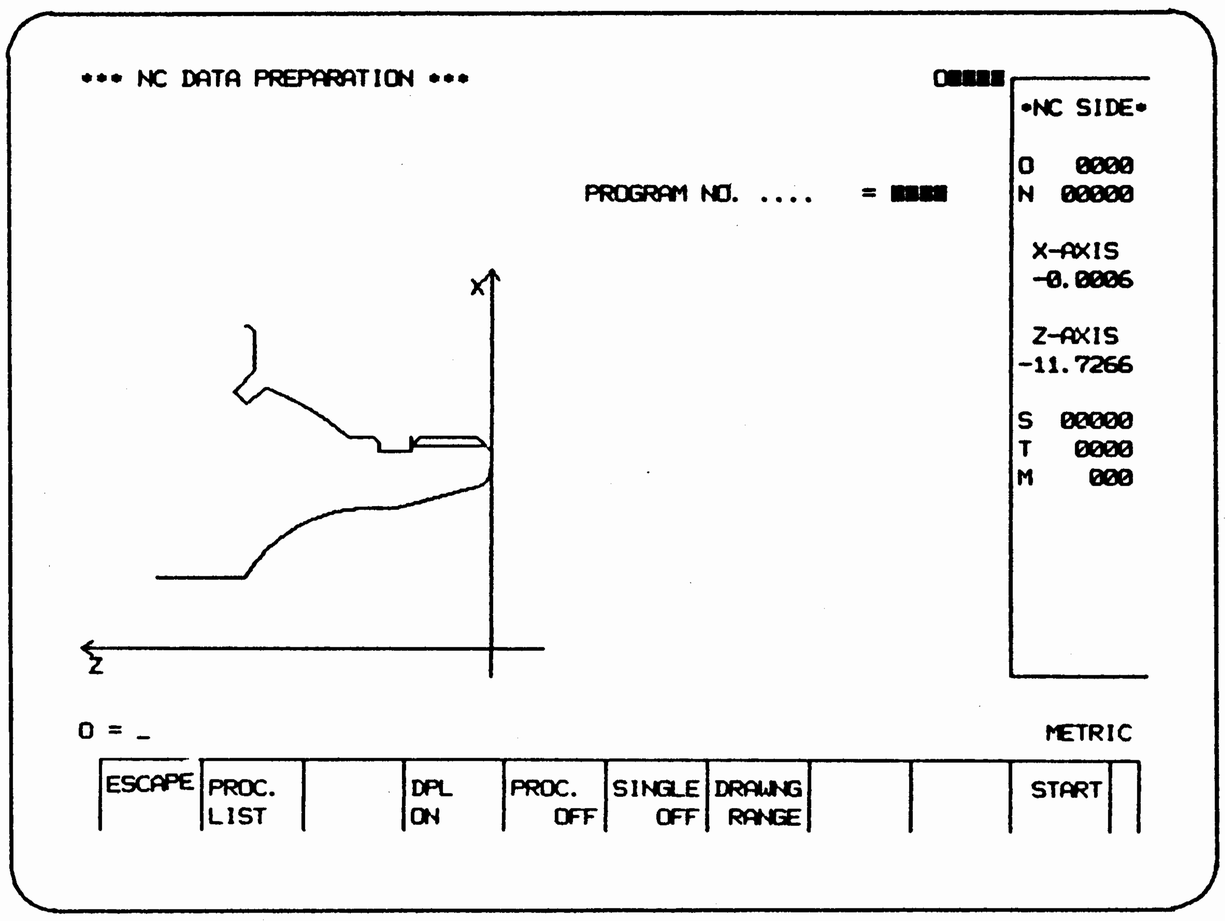
Visually check the tool path on screen before storing the data to CNC memory.

1	2	3	4	5	6

6.5.1 Initial display



Press the [5] Soft-key.

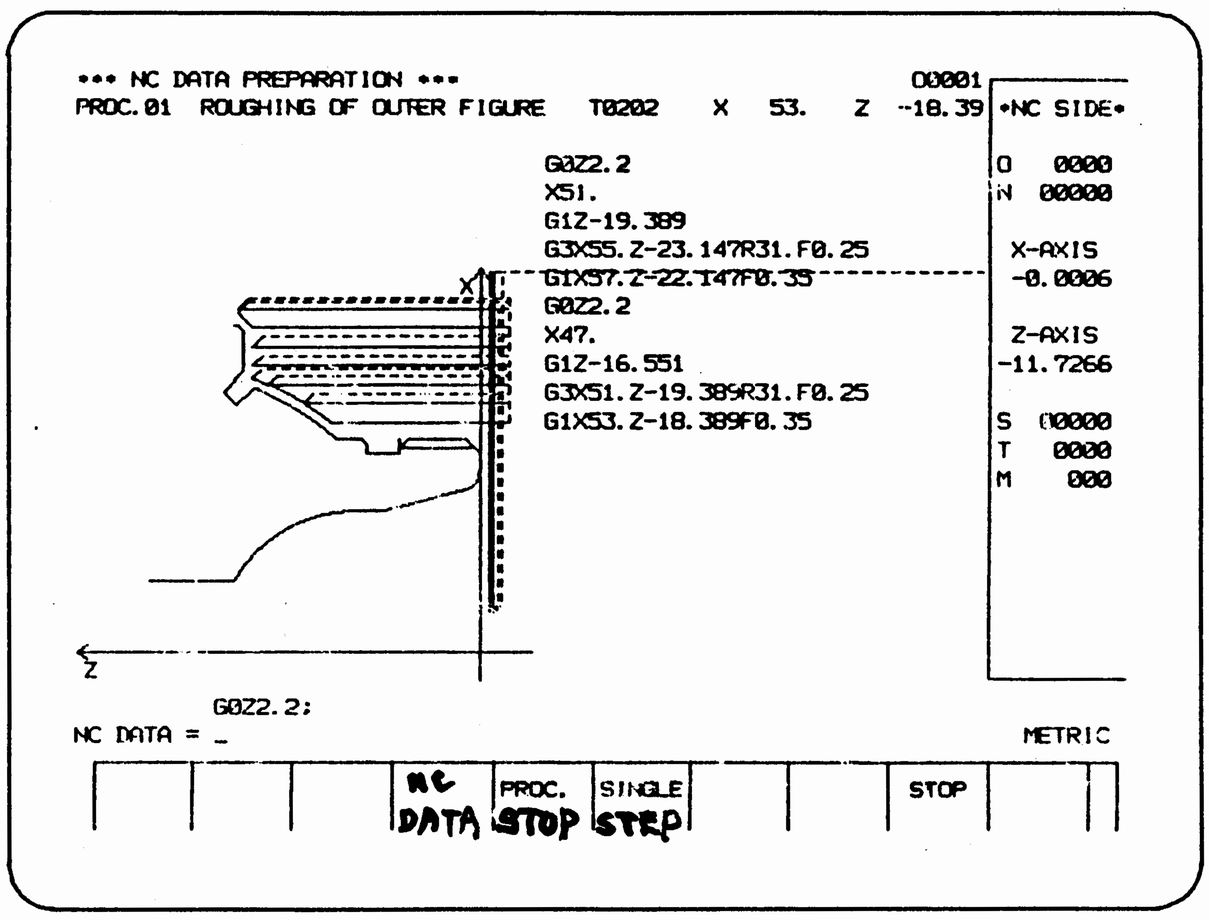


Input the program No.

6.5.2 Checking the tool path

The [**START**] Soft-key use to check the CNC program on screen before it is stored to the CNC memory.

Do not forget to verify the CNC program.



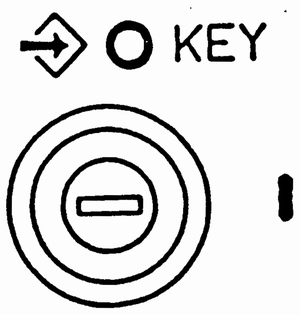
When the [**NC DATA**] Soft-key pressed, this key will be changed the shaded [**NC DATA**] Soft-key and the NC data will be displayed. Press again the shaded [**NC DATA**] Soft-key to return the [**NC DATA**] Soft-key .

When the [**PROC. STOP**] Soft-key pressed, will be changed the shaded [**PROC.STOP**] Soft-key and display of NC data will stop at the end of each machining process.
To display the data of the next machining process, press the [**INPUT**] Key. Press again the shaded [**PROC.STOP**] Soft-key to return the [**PROC. STOP**] Soft-key .

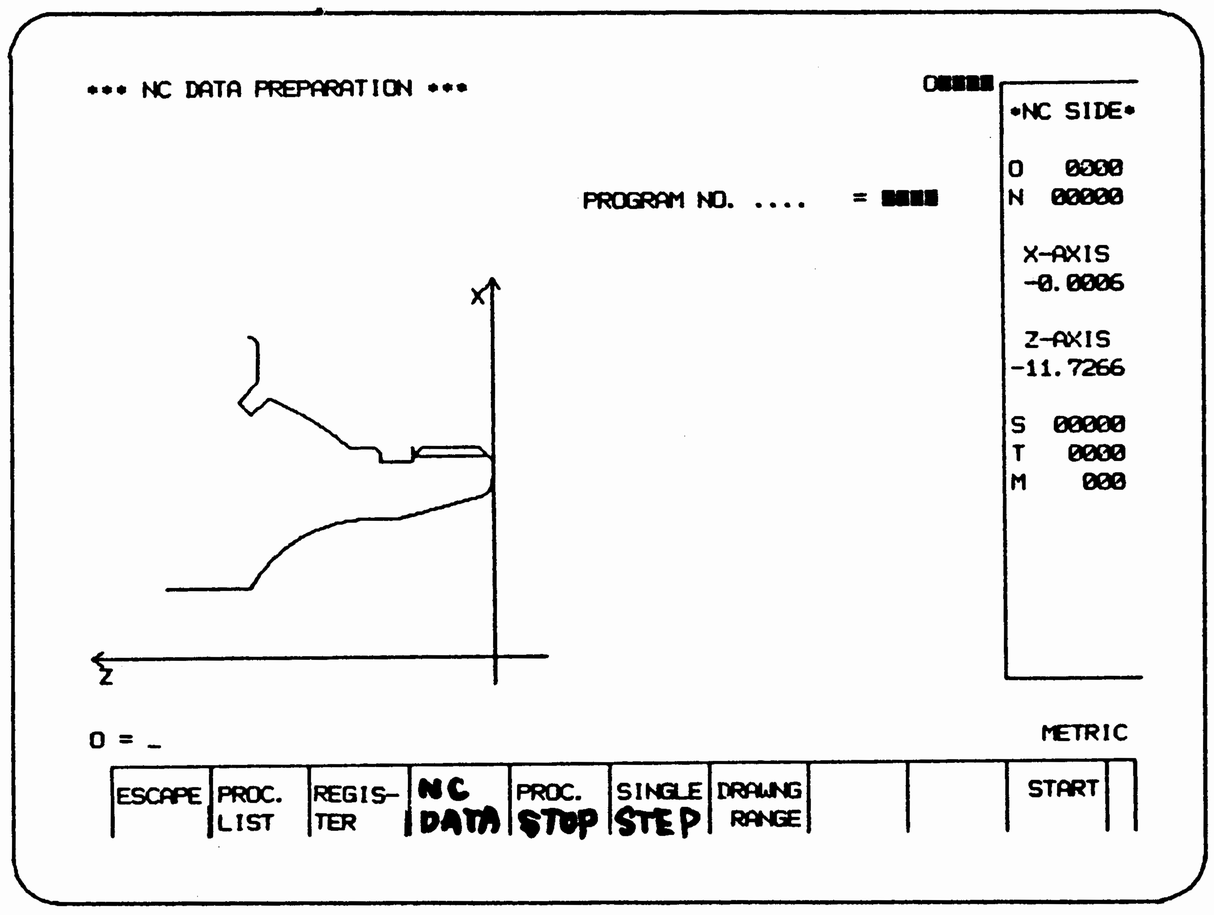
When the [**SINGLE STEP**] Soft-key pressed, this key will be changed the shaded [**SINGLE STEP**] Soft-key and the program will stop at each block in the NC program. Press the [**INPUT**] Key to feed the program forward one block at a time. Press again the shaded [**SINGLE STEP**] Soft-key to cancel the single block stop function, and then press the [**INPUT**] Key.

6.5.3 Storing data to the CNC memory

1) Set the CNC unit so that data can be stored to its memory. Set the EDIT key to ON.



2) In this state, display the screen for setting the program No. in Menu 5.



3) Key-in "**0001**" and then press the [**INPUT**] Key at O =.

Though 0001 is used in this example, any 4-digit numeral can be specified.

Note : This data cannot be stored if data is already stored to that O No. in CNC memory.

4) Press the [**STORE**] Soft-key.

5) After the CNC data has been stored, press the [**CNC/PMC**] button, and check whether the program (PROGRAM) has been stored in the CNC mode.

6.5.4 Process list

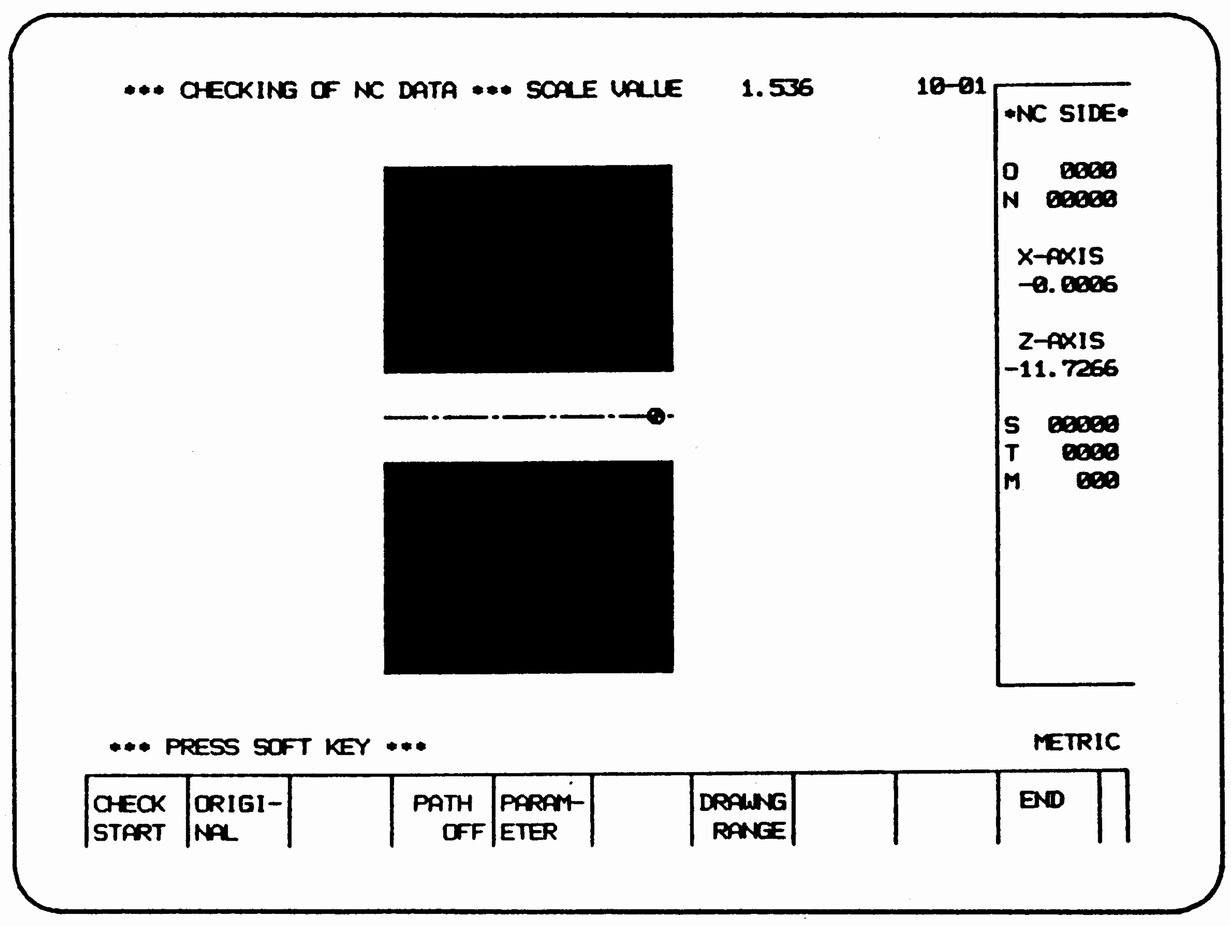
Press the [**PROC LIST**] Soft-key to display the process list.
This list will display the machining time of each process and the total machining time.
If the machining times do not all fit on the screen, press the [**NEXT PAGE**] Soft-key to display the rest of the list.

```
*** NC DATA PREPARATION ***      PROCESS LIST                 04-52
                                                              *NC SIDE*
    <——>  0MIN 17SEC                                          O   0000
NO.                              CUTTING RAPID                N  00000
01  ROUGHING OF OUTER FIGURE       1'01   0'09                 X-AXIS
02  ROUGHING OF INNER FIGURE       0'21   0'06                 -0.0006
03  FINISHING OF OUTER FIGURE      0'09   0'05
04  FINISHING OF INNER FIGURE      0'05   0'05                 Z-AXIS
05  GROOVING OR NECKING            0'08   0'06                -11.7266
06  GROOVING OR NECKING            0'08   0'06
07  THREADING                      0'10   0'08                S  00000
                                                              T   0000
    TOTAL MACHINING TIME           2'02   0'45                M    000

  *** PRESS SOFT KEY ***
                                                              METRIC
                                                   PAGE
                                                   EJECT
```

6.6 Menu 6 : MACHINING SIMULATION

1	2	3	4	5	6

1. Prepare the following conditions at the CNC lathe.
   (1) Move the tool to a position where it will not collide with the work or other parts even if the turret is indexed.
   (2) Set the CNC lathe to the machine lock mode.
   (3) Search the beginning of the CNC program.
2. Set the NC unit to the Symbolic FAPT mode.
3. Press the [**6**] Soft-key.



4. Press the [**ORIGINAL**] Soft-key.
5. Press the [**CHECK START**] Soft-key. "START" will be displayed at the bottom right of the screen.
6. Press the CYCLE START switch.

Note : Drawing of chuck, tailstock and tool shapes will not be displayed unless it has been enabled at the system parameter.

Display of the tool path can be turned ON and OFF by pressing the **[PATH ON]** or **[PATH OFF]** Soft-key .

When the **[PARAMETER]** Soft-key is pressed, the following will be displayed.

```
*** CHECKING OF NC DATA *** PARAMETER SET                    10-02
                                                            *NC SIDE*
DRAWING CENTER                    X          Z              O   0000
                            (     0.       -18.75    )      N  00000
CHUCK NO.                     ) =      0                     X-AXIS
                                                             -0.0006
DEPTH OF CHUCKING            ZC =     13.                    Z-AXIS
X-POSITION OF CHUCK          XC =      0.                   -11.7266
TAILSTOCK NO.                NT =      0                    S  00000
                                                            T   0000
POSITION OF TAIL-STOCK       ZT =      0.                   M    000

DRAWING TYPE                 C  =      0

ND = .                                                       METRIC
 MENU SCREEN | | CHUCK | TAIL-STOCK | TOOL HOLDER | | CURSOR ↑ | CURSOR ↓ | | END | |
```

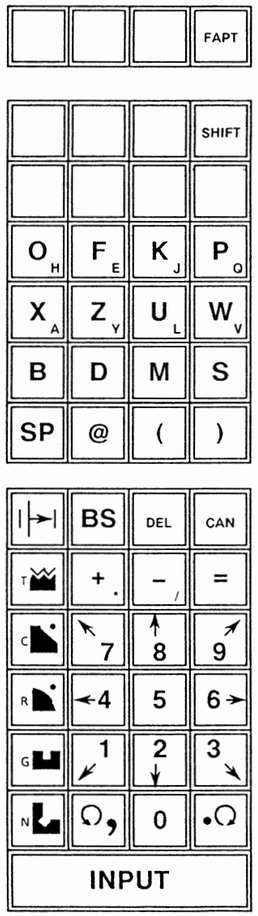
Chuck

Tailstock

Tool holder

Each of these items has its own display. For details, see Setting the Drawing Data.

KEYS OPERABLE IN THE FAPT MODE

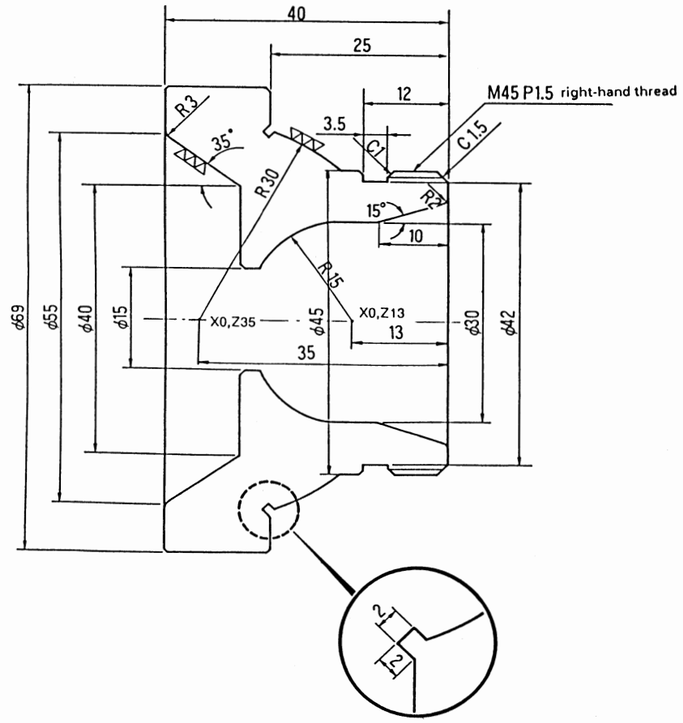


Press the [**FAPT**] Key to call up the FAPT display on the CRT and enter the FAPT mode.
The FAPT display will be entered when the power is turned ON.

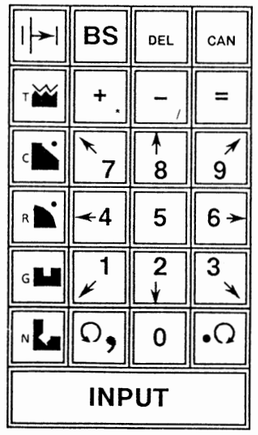
The figure on the left shows only the keys that can be used for Symbolic FAPT operations.
Blank keys do not apply to the FAPT mode.

Note : About switching displays

1) The FAPT display cannot be switched over to the CNC display while FAPT is being executed and CNC data is being stored to CNC machining memory from FAPT.



- All surface roughness on ▽▽ unless otherwise specified.
- All corner chamfer C0.5 unless otherwise specified.



1990.3.200