

CNC SYSTEMS

OSP7000L Model U

OSP700L Model U

ADDITIONAL FUNCTIONS

INSTRUCTION MANUAL (2nd Edition)

Pub.No.4022-E (EEL1-003-O2) Mar.1996



SAFETY PRECAUTIONS

The machine is equipped with safety devices which serve to protect personnel and the machine itself from hazards arising from unforeseen accidents. However, operators must not rely exclusively on these safety devices: they must also become fully familiar with the safety guidelines presented below to ensure accident-free operation.

This instruction manual and the warning signs attached to the machine cover only those hazards which Okuma can predict. Be aware that they do not cover all possible hazards.

1. PRECAUTIONS RELATING TO MACHINE INSTALLATION

- (1) Install the machine at a site where the following conditions (the conditions for achievement of the guaranteed accuracy) apply.
 - Ambient temperature: 17 to 25°C
 - Factory humidity: 40% to 75% at 20°C (no condensation)
 - Site not subject to direct sunlight or excessive vibration; environment as free of dust, acid, corrosive gases, and salt spray as possible.
- (2) Prepare a primary power supply that complies with the following requirements.
 - Voltage: 200 V
 - Voltage fluctuation: ± 10% max.
 - Power supply frequency: 50/60 Hz
 - Do not draw the primary power supply from a distribution panel that also supplies a major noise source (for example an electric welder or electric discharge machine) since this could cause malfunction of the NC unit.
 - If possible connect the machine to a ground not used by any other equipment. If there is no choice but to use a common ground, the other equipment must not generate a large amount of noise (such as an electric welder or electric discharge machine).
- (3) Installation Environment

Observe the following points when installing the electrical control cabinet.

 - Make sure that the NC unit will not be subject to direct sunlight.
 - Make sure that the electrical control cabinet will not be splashed with chips, water, or oil.
 - Make sure that the electrical control cabinet and operation panel are not subject to excessive vibrations or shock.
 - The permissible ambient temperature range for the electrical control cabinet is 0 to 40°C.
 - The permissible ambient humidity range for the electrical control cabinet is 30 to 95% (no condensation).
 - The maximum altitude at which the electrical control cabinet can be used is 1000 m (3281 ft.).

2. POINTS TO CHECK BEFORE TURNING ON THE POWER

- (1) Close all the doors of the electrical control cabinet and operation panel to prevent the entry of water, chips, and dust.
- (2) Make absolutely sure that there is nobody near the moving parts of the machine, and that there are no obstacles around the machine, before starting machine operation.
- (3) When turning on the power, turn on the main power disconnect switch first, then the CONTROL ON switch on the operation panel.

3. PRECAUTIONS RELATING TO MANUAL AND CONTINUOUS OPERATION

- (1) Always follow the instructions in the operating manual.
- (2) Do not operate the machine with any of the safety covers (front shield, chuck cover, etc.) removed.
- (3) Always close the front shield before starting operation.
- (4) Never run a new program without checking its operation. Run the program with no workpiece in the chuck and make sure that there is no interference, then cut a workpiece in the single block mode. If no problems are discovered, automatic operation may be started.
- (5) Confirm safety before performing operations involving spindle rotation or axis movement.
- (6) Never touch chips or the workpiece while the spindle is rotating.
- (7) Do not attempt to stop rotating parts with your hand or any object.
- (8) Check the jaw mounting conditions, hydraulic pressure, and maximum allowable spindle speed for the power chuck.
- (9) Check the mounting and arrangement of the tools.
- (10) Check the tool offset settings.
- (11) Check the zero offset settings.
- (12) Make sure that the spindle speed and feedrate override settings set on the NC operation panel are 100%.
- (13) Before moving the turret, check the software limit setting and the emergency limit LS (limit switch) dog positions for both the X- and Z-axes to ensure that it will not interfere with the chuck or tailstock.
- (14) Check the turret index/rotation position.
- (15) Check the tailstock body position.
- (16) Make sure the cutting operation is within the allowable transmission power and torque ranges.
- (17) Make sure the workpiece is securely clamped in the chuck or fixture.
- (18) Check that the coolant nozzles are positioned correctly.

4. ON FINISHING WORK

- (1) On finishing work, clean the vicinity of the machine.
- (2) Move the turret to the predetermined retraction position.
- (3) Always turn off the power to the machine before leaving it.
- (4) To turn off the power, turn off the CONTROL ON switch on the operation panel first, then the main power disconnect switch.

5. PRECAUTIONS APPLICABLE DURING MAINTENANCE INSPECTION AND WHEN TROUBLE OCCURS

In order to prevent unforeseen accidents, damage to the machine, etc., it is essential to observe the following points when performing maintenance inspections or during checking when trouble has occurred.

- (1) When trouble occurs, press the emergency stop button on the operation panel to stop the machine.
- (2) Consult the person responsible for maintenance to determine what corrective measures need to be taken.
- (3) If two or more persons must work together, establish signals so that they can communicate to confirm safety before proceeding to each new step.
- (4) Use only the specified replacement parts and fuses.
- (5) Always turn the power off before starting inspection or changing parts.
- (6) When parts are removed during inspection or repair work, always replace them as they were and secure them properly with their screws, etc.
- (7) When carrying out inspections in which measuring instruments are used – for example voltage checks – make sure the instrument is properly calibrated.
- (8) Do not keep combustible materials or metals inside the electrical control cabinet or terminal box.
- (9) Check that cables and wires are free of damage: damaged cables and wires will cause current leakage and electric shocks.

(10) Maintenance inside the electrical control cabinet

- a) Switch the main power disconnect switch OFF before opening the electrical control cabinet door.
- b) Even when the main power disconnect switch is OFF, there may be some residual charge in the servo amplifier and spindle drive unit, and for this reason only service personnel are permitted to perform any work on these units. Even then, they must observe the following precautions.
 - Servo amplifier
Discharge the residual voltage one minute after turning off the breaker inside the unit.
 - Spindle drive unit
Discharge the residual voltage one minute after turning off the main power disconnect switch.
- c) The electrical control cabinet contains the NC unit, and the NC unit has a printed circuit board whose memory stores the machining programs, parameters, etc. In order to ensure that the contents of this memory will be retained even when the power is switched off, the memory is supplied with power by a battery. Depending on how the printed circuit boards are handled, the contents of the memory may be destroyed and for this reason only service personnel should handle these boards.

(11) Periodic inspection of the electrical control cabinet

a) Cleaning the cooling unit

The cooling unit in the door of the electrical control cabinet serves to prevent excessive temperature rise inside the electrical control cabinet and increase the reliability of the NC unit. Inspect the following points every three months.





- Is the fan motor inside the cooling unit working?
The motor is normal if there is a strong draft from the unit.
- Is the external air inlet blocked?
If it is blocked, clean it with compressed air.

6. GENERAL PRECAUTIONS

- (1) Keep the machine and area around it clean and tidy.
- (2) Wear appropriate clothing while working, and follow the instructions of someone with sufficient training.
- (3) Make sure that your clothes and hair cannot become entangled in the machine. Machine operators must wear safety gear such as safety shoes and safety goggles.
- (4) Machine operators must read the instruction manual carefully and make sure of the correct procedure before operating the machine.
- (5) Memorize the position of the emergency stop button so that you can press it immediately at any time and from any position.
- (6) Do not access the inside of the control panel, transformer, motor, etc., since they contain high-voltage terminals and other components which are extremely dangerous.
- (7) If two or more persons must work together, establish signals so that they can communicate to confirm safety before proceeding to each new step.

7. SYMBOLS USED IN THIS MANUAL

The following warning indications are used in this manual to draw attention to information of particular importance. Read the instructions marked with these symbols carefully and follow them.

-  **DANGER** : Indicates an imminent hazard which, if not avoided, will result in death or serious injury.
-  **WARNING** : Indicates hazards which, if not avoided, could result in death or serious injury.
-  **CAUTION** : Indicates hazards which, if not avoided, could result in minor injuries or damage to devices or equipment.
-  **NOTICE** : Indicates precautions relating to operation or use.

FOREWORD

Before reading this manual, please read this Foreword which describes the features of the NC, configuration of the manual and the items to be attended to for reading the manual.

[CONTENTS OF THE MANUAL]

The manual consists of the following chapters.

SECTION 1 PROGRAM SIMULATION BY ANIMATION

SECTION 2 DNC-A

[CAUTIONS ON READING THE MANUAL]

- (1) This manual describes operation and programming of the functions indicated above. For the basics of operation, functions and programming of the NC unit, refer to OSP7000L/700L MODEL U INSTRUCTION MANUAL.
- (2) In this manual, the illustrations of the operation switches on the machine operation panel are taken from the standard machine operation panel. Please note that these illustrations are only for reference purpose and the functions of the switches are representative functions and they could be different from the actual switches used on your machine. For actual switches and the functions of them, refer to the manuals of the machine.
- (3) The M code numbers used in this manual are the numbers assigned as the M code of the NC functions. There may be cases that the actual M code numbers used in specific machine tools differ from those used in this manual. For the actual M code numbers used by your machine, refer to the manuals of the machine.
- (4) Concerning the optional functions, all of them are explained in this manual and, therefore, the functions not available with your machine are included. For the optional functions selected for your machine, refer to the specification documents or other appropriate documents.

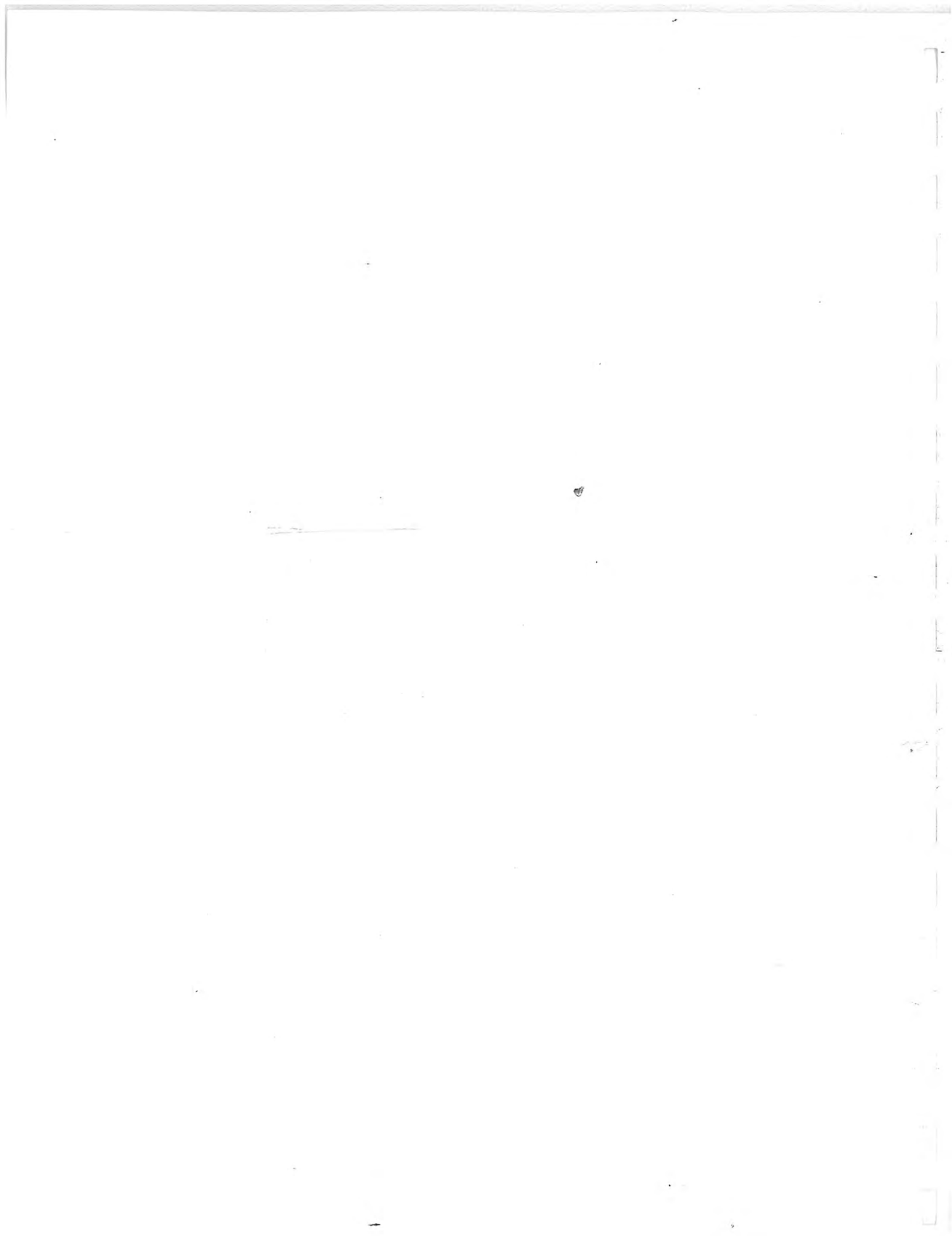
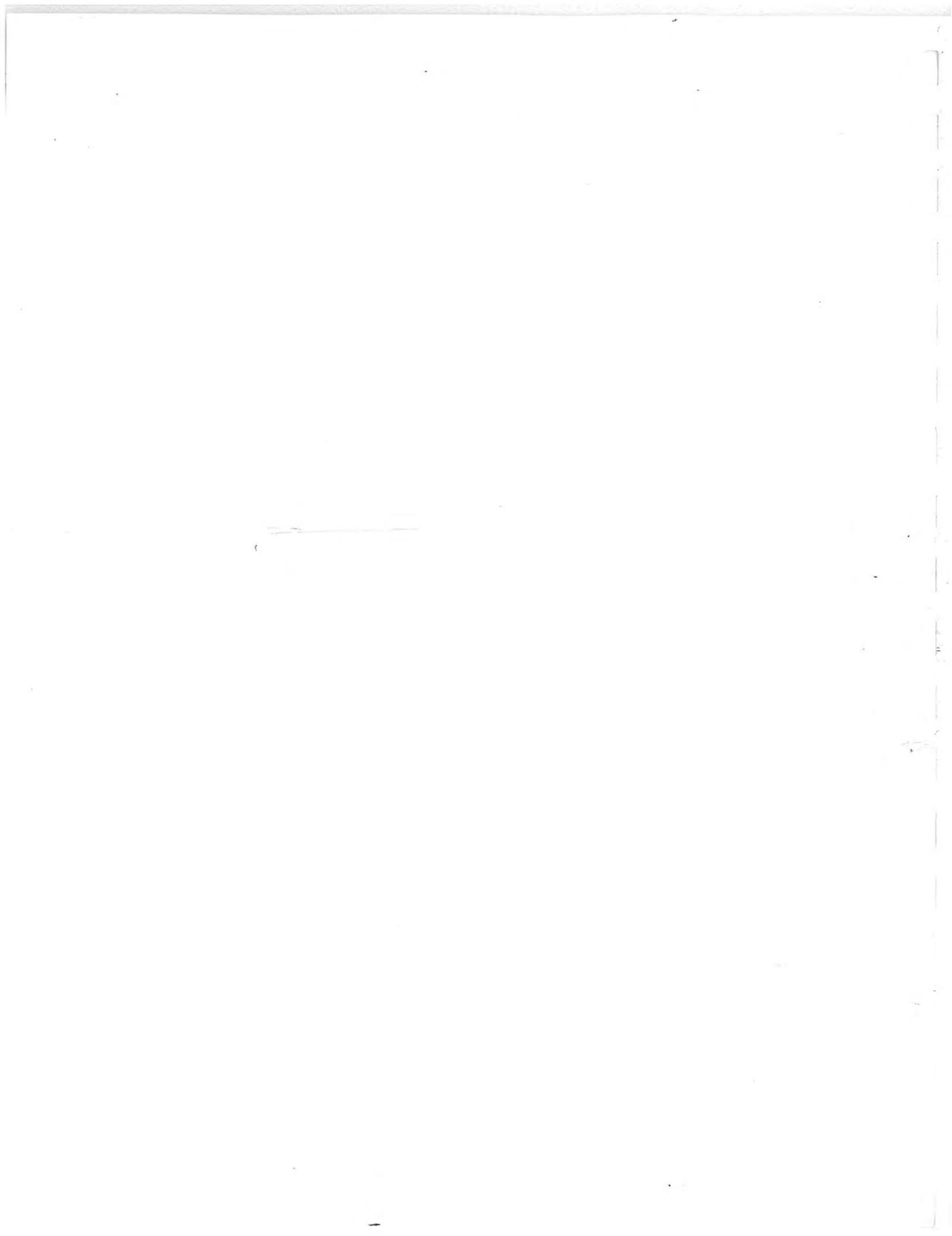


TABLE OF CONTENTS

	<u>PAGE</u>
SECTION 1 PROGRAM SIMULATION BY ANIMATION	1
1. ANIMATION MODE DISPLAY	2
1-1. Function Keys Used for Graphic Display Operation	2
1-2. General Precautions for Animation Mode Display	4
1-3. High Speed Drawing	5
1-4. Display Page	5
1-5. Machine Time Display	6
1-6. Additional Functions for Multi-machining Operation	6
2. TOOL FORM SELECTION	9
3. DRAWING BLANK SHAPE	11
4. HOW TO SET DRAWING POSITIONS OF CHUCK AND TAILSTOCK	24
5. SYSTEM VARIABLES FOR ANIMATION DISPLAY	26
6. CYCLE TIME CALCULATION FUNCTION	29
6-1. Cycle Time Calculation Process	29
6-2. Screen Display of Machine Time Data	30
6-3. Operation Procedure	30
SECTION 2 DNC-A	31
1. OVERVIEW	32
2. OPERATING PROCEDURES	33
2-1. Downloading an NC Program (File)	35
2-2. Uploading an NC Program (File)	36
3. SETTING UP OPTIONAL PARAMETERS	37
4. DATA FORMATS	38
5. EXAMPLE RS232C INTERFACE CONNECTIONS AND TIMING CHARTS	41

SECTION 1
PROGRAM SIMULATION BY ANIMATION



1. ANIMATION MODE DISPLAY

This function displays the progress of the program in animation in addition to the programmed tool paths on display screen.

Depending on the display screen type, display mode varies:

- On the color graphic display screen, workpiece, cutting tools, etc. are differentiated by colors.
- On the monochrome graphic display screen, they are differentiated by patterns, line types, and brightness.

1-1. Function Keys Used for Graphic Display Operation

The graphic display is possible in the auto, MDI and manual operation modes.

(1) F1 (STD/EXT GRAPHIC)

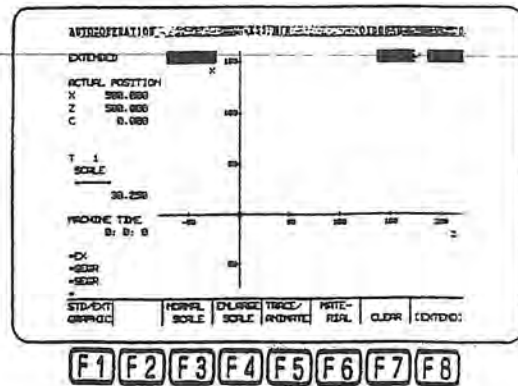
The graphic display mode in the scale set on the NORMAL SCALE function is selected.

Or, the graphic display mode in the scale set on the ENLARGE SCALE function is selected.

Each time this key is pressed, the display mode is switched between normal and enlarged.

NOTICE

: Switching between the standard and enlarged graphic display modes during the execution of a program is impossible.



(2) F3 (NORMAL SCALE)

This function selects the unit length of an axis on the graphic display. On the graphic display, a dotted line with arrow marks at both ends is displayed with SCALE indication and scale value. This represents the scale length.

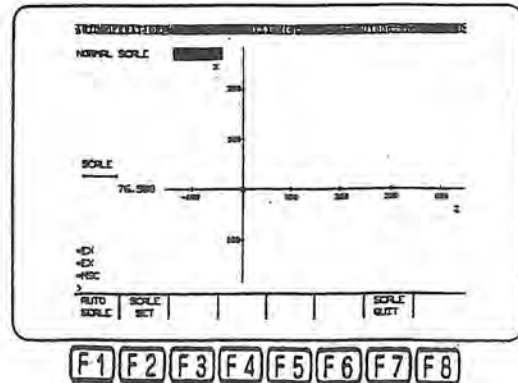
The standard scale is set in two different methods such as

- a) Automatic determination
- b) Arbitrary setting

The procedure for setting the standard scale is explained below. Note that the standard graphic page must be displayed for setting the standard scale.

- a) Automatic determination

The graphic scale is automatically determined by pressing function key [F1] (AUTO SCALE). When this key is pressed, the program is read up to the end of the program (M02) and the scale is determined automatically so that the machining area can be displayed on the display screen.



- NOTICE** :
- (1) Before executing the automatic determination, select the desired program.
 - (2) If following commands are used in a part program, they are executed when the program is read by the pressing of function key [F1] (AUTO SCALE).

READ, WRITE, GET, PUT, DELETE, SAVE and DEF

- (3) If output variables, system variables, and common variables are used in a left member of expression in a part program, they are rewritten by the automatic determination operation.
- (4) If the scheduled operation mode is selected, automatic determination of the scale value is possible only for the program selected by the first PSELECT command.
- (5) If an alarm occurs during the reading of a program for automatic determination, or if the program reading is looped due to the statements GOTO, IF and other program execution order designating commands and automatic determination of the scale is not completed, then escape such state by resetting the control.

- (6) The drawing area automatically determined is calculated from the following formula.

$$(\text{Operating area in the cutting G code mode}) \times (100 + n)\%$$

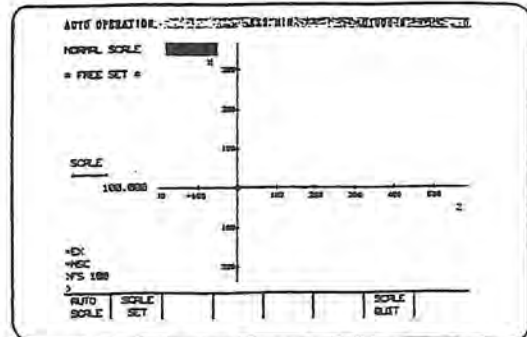
Here n is a factor to allow margin in the tool path drawing operation and set by optional parameter (word) No. 21. ($0 \leq n \leq 100$)

b) Arbitrary setting

The scale value can be directly entered through the keyboard after pressing function key [F2] (SCALE SET). In this scale setting, setting range is from 12.5 mm (0.49 in.) to 1250 mm (49.21 in.).

The position of the coordinate axes can be set at a required position using the cursor after setting the scale value.

The standard scale setting operation ends by pressing function key [F7] (SCALE QUIT).

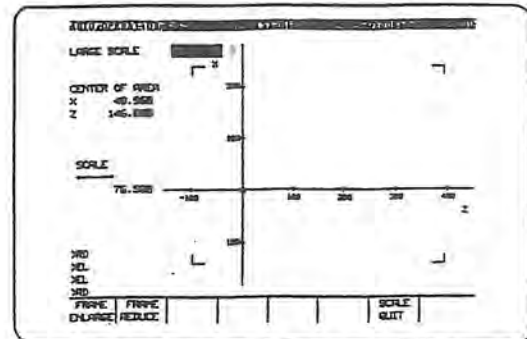


[F1] [F2] [F3] [F4] [F5] [F6] [F7] [F8]

(3) F4 (ENLARGE SCALE)

The display area to be zoomed up from the standard graphic display or enlarged graphic display can be set as needed.

Pressing function key [F1] (FRAME ENLARGE) reduces the frame indicating the display area. Pressing function key [F2] (FRAME REDUCE) enlarges the display area indicating frame. Setting the position of the display area frame is made using the cursor key. The enlarge scale setting function terminates when function key [F7] (SCALE QUIT) is pressed.



[F1] [F2] [F3] [F4] [F5] [F6] [F7] [F8]

(4) F5 (TRACE/ANIMATE)

The graphic display mode is selectable from the three modes indicated below by pressing function key [F5] (TRACE/ANIMATE). Note that selection of the graphic display mode must be made before starting the operation. The selected mode cannot be changed during the operation.

a) TRACE/ANIMATE mode

In this mode, tool shape, chuck shape, blank shape and tailstock spindle shape are displayed in addition to programmed tool paths. The blank shape is actually removed in accordance with the progress of the part program.

b) TRACE mode

In this mode, only the programmed tool paths are drawn.

c) ANIMATE mode

In this mode, tool shape, chuck shape, blank shape and tailstock spindle shape are displayed and blank shape is actually removed in accordance with the progress of the part program.

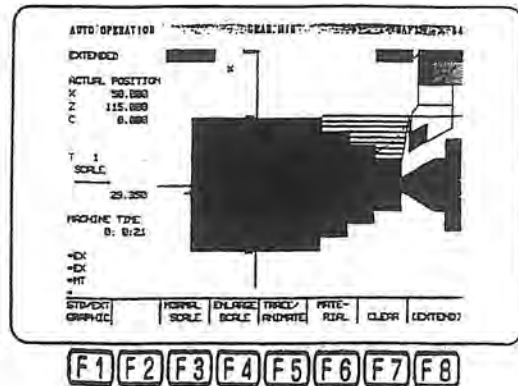
Display of the tool paths is not available.

(5) F6 (MATERIAL)

The blank shape, chuck shape and tailstock spindle shape registered are displayed.

(6) F7 (CLEAR)

Tool paths, blank shape, chuck shape and tailstock spindle shape displayed on the display screen are all cleared.



1-2. General Precautions for Animation Mode Display

(1) Scale Value Setting Range

Setting ranges of the scale value are indicated below:

Normal scale : 12.5 mm (0.49 in.) to 1250 mm (49.21 in.)

Enlarge scale : 0.4 mm (0.02 in.) to 1250 mm (49.21 in.)

(2) Relationship between Animation Display and Scale Value

Available animation display differs depending on the scale value setting and the relationship between the set scale value and animation display available is summarized in the table below.

Function	Tool Shape Display	Blank Removal Display	Tool Path Display
Scale Value			
1250 to 5 mm (49.21 to 0.20 in.)	○	○	○
5 to 2.5 mm (0.20 to 0.10 in.)	×	○	○
2.5 to 0.4 mm (0.10 to 0.02 in.)	×	×	○

(3) Animation Drawing Speed

The animation drawing function has a limit in the drawing speed (feedrate of 1 meter per min. will be the maximum drawing speed at a scale value setting of 25 mm (0.98 in.)).

This means simulation with the animation drawing in the machine lock mode automatically overrides the specified feedrate (animation speed override). In actual machining operation, however, animation speed override is impossible and if program is executed at a feedrate for which animation drawing is impossible, the control displays the message "ANIM SPEED OVER" and erases animation drawing. In this case, only programmed paths are displayed on the display screen.

[Supplement] : To clear the message "ANIM SPEED OVER", press function key [F7] (CLEAR) after the part program has been completed.

(4) Parameter Data for Selecting the Elements of Animation and Tool Paths Drawing

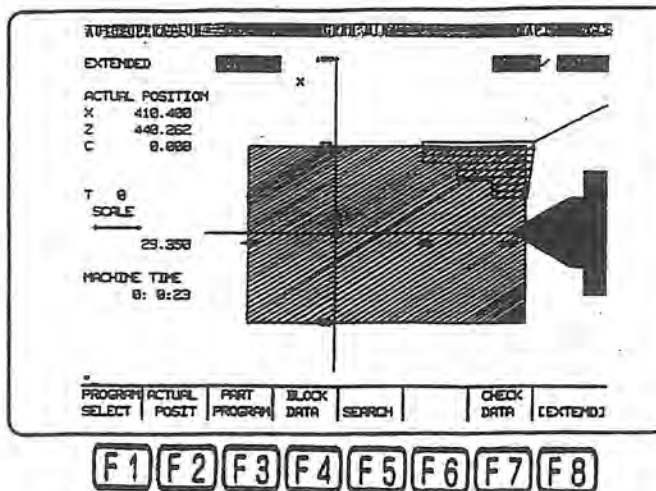
For the display or drawing of animation and tool path, display elements can be selected by a parameter data - optional parameter (bit) No. 10.

<u>Bit</u>	<u>ON/OFF</u>
Bit 0	Jog feed path drawing
Bit 1	Rapid feed path drawing
Bit 2	Cutting feed path drawing
Bit 3	Blank shape drawing
Bit 4	Chuck shape drawing
Bit 5	Tailstock shape drawing
Bit 6	Tool shape drawing
Bit 7	Blank removal drawing

1-3. High Speed Drawing

Programmed tool paths can be drawn at a high speed in the machine lock and dry run on mode. Setting of the single block function is effective. In this programmed path drawing operation, since the tool path in the G00 rapid feed mode is not the same as the actual movements, this must be taken into consideration.

1-4. Display Page



Data in item "C" is available for multi-machining specs.

SECTION 1 PROGRAM SIMULATION BY ANIMATION

1-5. Machine Time Display

Actual program execution time in the automatic and MDI mode operation is counted and displayed. While the control is in the slide hole mode or the program stop mode, such time is not counted.

In the high speed drawing mode (machine lock and dry run on), machine time display is not available. If machine time calculation is required through the execution of the high speed drawing operation, optional function for this operation is necessary.

In the high speed drawing mode (machine lock and dry run on), the machine time calculated in the manner as explained in 6. "CYCLE TIME CALCULATION FUNCTION" is displayed.

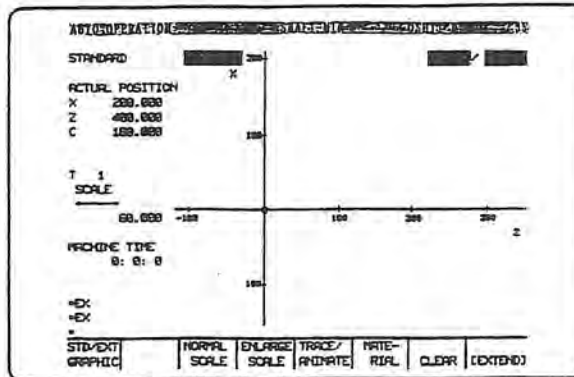
1-6. Additional Functions for Multi-machining Operation

The available function keys are basically the same as used for standard models.

(1) Standard/Enlarged Graphic Display

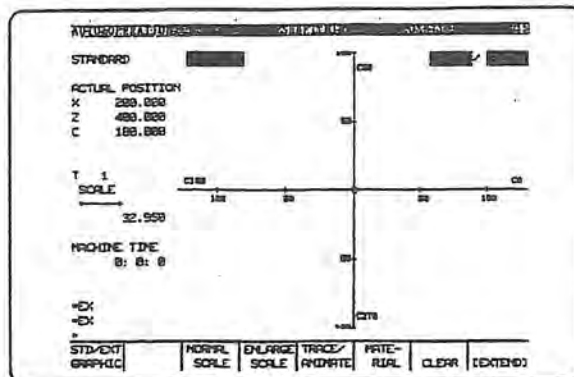
a) Standard graphic display mode

For the blank display, the page key is used for switching the view angle from the side to the front and from the front to the side. This display change is possible even during the progress of cutting operations. Note that the page key is not effective for other than the multi-machining operation.



F1 F2 F3 F4 F5 F6 F7 F8

Side View



F1 F2 F3 F4 F5 F6 F7 F8

Front View

SECTION 1 PROGRAM SIMULATION BY ANIMATION

The front view is displayed in the coordinate system on which the C-axis angle is fixed as shown above. The indications on the scale represent X-axis values (in radius).

b) Enlarged graphic display mode

In the enlarged graphic display mode, switching the view angle between the front and side views is possible.

(2) Standard Scale Setting

Independent scale setting on the side and front views is possible. For setting the scale for these two views, first display the required view. When the same scale setting is used for both of the displays in common, then the setting is necessary only from either of the displays. In this case, specific scale value is set both for the front and side views.

Setting procedure is the same as used with standard models.

(3) Enlarged Scale Setting

In the enlarged graphic display mode, independent scale setting for the different two displays - front and side. As in the scale setting from the standard display mode, display the required view and setting should be done from that display.

(4) Switching between Trace and Animation Displays

As with the standard models, function key [F5] (TRACE/ANIMATE) is used for selecting the three different display modes.

a) Trace/Animate

1) Side View

Tool shape, chuck shape, blank shape and tailstock spindle shape are displayed. Tool paths are also displayed in cyan and the blank is removed as the progress of cutting.

While the C-axis is connected (only for A-turret tools for two-saddle model), the tool paths are displayed in magenta and removal of blank will not occur.

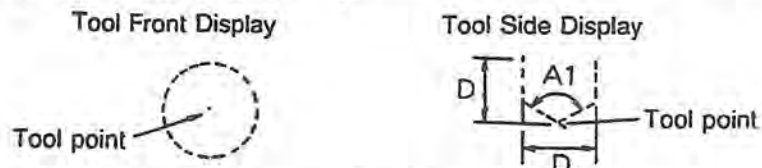
2) Front View

The front view of the blank shape is displayed and the tool tip point is indicated by red marker. Tool path is also displayed in magenta. During the cutting, the tool outline is displayed in the specified interval*1. Removal of blank does not occur.

The marker and tool outline are displayed only while the C-axis is connected.

Display of blank shape, tool path and tool outline is dependent on the setting of parameter (bit) data explained in 1-2. (4).

*1 The tool outline is drawn in dots in magenta in accordance with the tool mounting direction, tool diameter (D) and cutting angle (A1) when the revolving tool (M-tool) is selected (tool classification code: 27-38) as the tool shape.



The interval of the tool outline drawing is the distance the tool point has moved from the previous tool outline display position as indicated below:

$$\text{Drilldiameter} + \frac{n}{100}$$

"n" represents the factor to designate the tool outline drawing interval and is set at optional parameter (word) within a range of 10 to 100.

The tool outline is drawn on the display, in addition to the conditions indicated above, when the feedrate is changed from the rapid traverse to cutting feedrate or the commanded point is reached (with C-axis connected).

b) Trace

1) Side View

The display is only tool paths, chuck shape and tailstock spindle shape. As in case a) above, tool path is drawn in magenta while the C-axis is in connection and in cyan in other cases.

2) Front View

The tool point position is identified by red marker and tool outline is drawn in magenta in the specified.

c) Animate

1) Side View

Tool shape, chuck shape, blank shape and tailstock spindle shape are displayed. Tool path display is not available. Removal of blank occurs in accordance with the progress of cutting. Note that when the C-axis is in connection (only for A-turret for two-saddle model), removal of the blank does not occur.

2) Front View

Same as in case a) on the previous page, but the tool path is not displayed.

(5) Blank Drawing Function Key

a) Side View

Blank shape, chuck shape and tailstock spindle shape registered are displayed.

b) Front View

Blank shape registered is displayed.

This function key is effective only for the page currently displayed. That is, pressing this key while the side view is being displayed displays only the side view of the blank and front view of the blank cannot be display. This is the same for the front view display page.

(6) Delete Function Key

a) Side View

Tool paths, blank shape, chuck shape, the tailstock spindle shape and tool shape displayed on the side view page are all deleted.

b) Front View

The tool outline drawing and the blank shape displayed on the front view page are deleted.

This function key is also effective only for the page currently displayed.

2. TOOL FORM SELECTION

The procedure to set the tool form used in animation display is explained below.

The operation to set the tool form means that the data necessary to select the form pattern appropriate to the tool to be used from the tool form patterns already defined.

Tool form data must be set in advance for all tools that are used in the program. However, when a tool animation data command (commanded using system variables) is designated in a program such as the program made using the IGF function, the tool form data is automatically set when the program is executed. Thus the setting of tool form data is not necessary in this step.

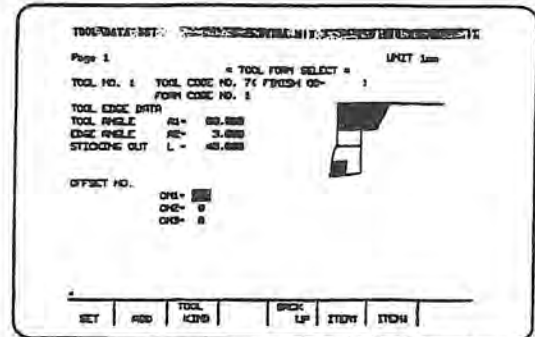
- (1) Select the TOOL DATA SET mode.



Press the TOOL DATA key.

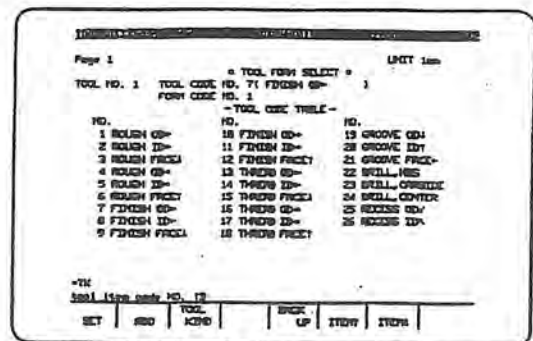
- (2) Press function key [F7] (ITEM↓) to display the TOOL FORM SELECT page.
 (3) Using the PAGE keys (F1) (F2), display the screen for the tool number to be set.

NOTICE : In the initial state, an OD turning tool is set as the tool form.



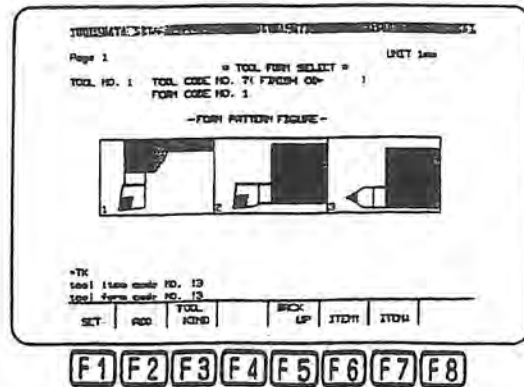
- (4) Press function key [F3] (TOOL KIND) to display the page from which the tool code number can be set.
 (5) Input TOOL CODE NO.

If keys [3] and WRITE are pressed, the display indicated right is displayed.



SECTION 1 PROGRAM SIMULATION BY ANIMATION

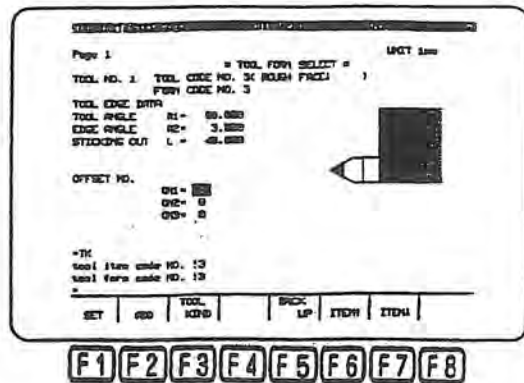
- (6) Input the FORM CODE NO.
 If form code "3" is designated, the display will change into the page as shown right.



- (7) From this page, set the TOOL EDGE DATA by locating the cursor (up/down arrow) at the required data position.

TOOL ANGLE A1
 EDGE ANGLE A2
 STICKING OUT L

NOTICE : The tool interference area is automatically created according to the selected tool form. For the automatic interference area creation, values registered with parameters are used. If required, change these values.



- (8) Input the offset number of this tool by locating the cursor (up/down arrow) at the required OFFSET NO (ON1 - ON3) data position.

This number is used to designate the tool form for which graphic guide is given on the tool offset setting screen. For the system having the tool life management specification, ON1 - ON3 corresponds to the offset group 1 - 3, respectively. On the tool life management table, tool offset numbers identical to those set in the tool life management table are automatically set.

3. DRAWING BLANK SHAPE

The user graphic commands (UGC) are provided so that arbitrary blank shapes may be drawn on the color graphic display screen.

(1) Definition Format

The format used for blank shape (side view) drawing is indicated below.

DEF WORK : Declaration of blank definition

A group of user graphic commands
used for drawing blank shape

END : End of blank shape definition

DRAW : Blank shape defined is drawn.

The format used for blank shape (front view) drawing is indicated below. (This is effective only for multiple machining specification models.)

DEF WORKF : Declaration of blank definition

A group of user graphic commands
used for drawing blank shape

END : End of blank shape definition

DRAW : Blank shape defined is drawn.

(2) User Graphic Commands (UGC)

The user graphic commands are largely classified into four types such as drawing point setting, line drawing, circle drawing and painting.

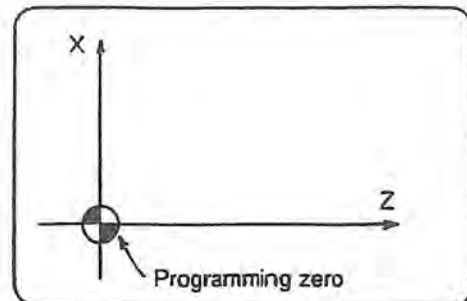
The explanation below provides the format of the representative commands.

a) Coordinate system for drawing and setting unit

The coordinate system used for drawing the blank shape is the Z-X coordinate system having the programming zero as the origin.

The unit system used is:

1 mm for metric system, and 0.1 inches
for inch system



b) Setting drawing point

POINT [Z_0 , X_0]

The command underlined may be used instead of fully giving command characters. POINT, for instance, can be commanded by the underlined characters PO.

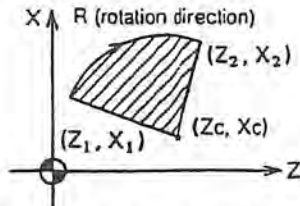
The POINT command simply sets the starting point (Z_0 , X_0) for the drawing and no actual drawing operation occurs.

This sets the last reference point (LP) for the drawing.

Number of vertex = 0

$\theta[Z_c, X_c], [Z_1, X_1], [Z_2, X_2] \langle \text{rotation-direction} \rangle$

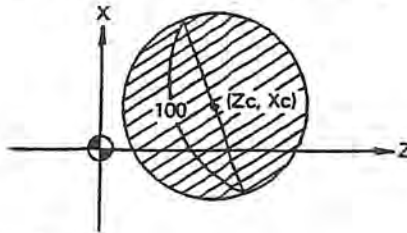
- Z_c, X_c : Center
- Z_1, X_1 : Start point
- Z_2, X_2 : End point



When the number of vertexes is zero (0), designation of diameter is also possible.

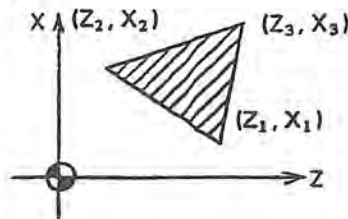
$[Z_c, X_c], 100, D$

- Z_c, X_c : Center
- 100 : Diameter
- D : Code to indicate diameter designation



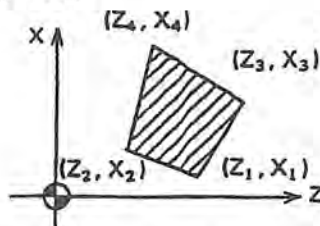
Number of vertexes = 3

$[Z_1, X_1], [Z_2, X_2], [Z_3, X_3]$
 $(X_1 \leq X_2 \leq X_3)$



Number of vertexes = 4

$[Z_1, X_1], [Z_2, X_2], [Z_3, X_3], [Z_4, X_4]$
 $(X_1 \leq X_2 \leq X_3 \leq X_4)$

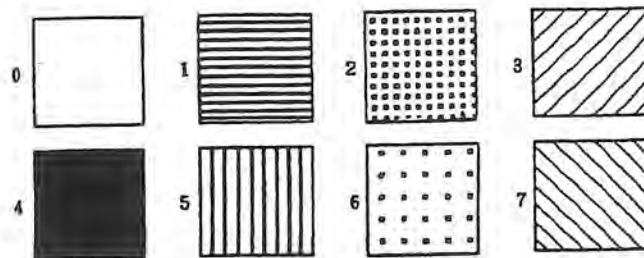


Note that the coordinates of vertexes must be given in absolute values.

SECTION 1 PROGRAM SIMULATION BY ANIMATION

Tile Pattern:

- 0 : No drawing (all dots off)
- 1 : All dots painted; on every other horizontal line
- 2 : Dots alternately on and off; on every other horizontal line
- 3 : Oblique line; from upper right to lower left
- 4 : All dots painted
- 5 : All dots painted; on every other vertical line
- 6 : Dots on/off/off/off; on every third horizontal line
- 7 : Oblique line; from upper left to lower right



Default is "4".

2) Paint – PAINTI

PAINTI <number-of-vertexes> <,reference-point-coordinates>
 <,vertex-coordinates> <,tile-pattern>

The PAINTI command is used for painting triangle, rectangles and circles defined on the incremental coordinate system in reference to the reference point specified.

Number of Vertexes:

- 0 : Circles or sectors
- 3 : Triangles
- 4 : Rectangles

Reference Point Coordinates:

The coordinates of the reference point for defining a shape;

[Z₀, X₀]

The values must be given in absolute values.

Vertex Coordinates:

The designation of coordinates depends on the number of vertexes specified.

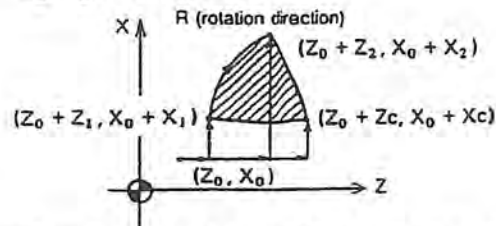
Number of vertexes = 0

$\theta[Z_c, X_c], [Z_1, X_1], [Z_2, X_2] \langle \text{rotation-direction} \rangle$

Z_c, X_c : Center

Z_1, X_1 : Start point

Z_2, X_2 : End point



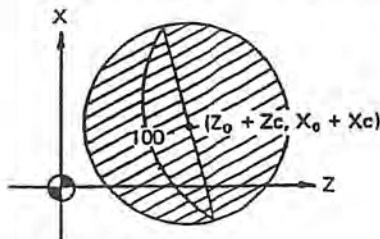
When the number of vertexes is zero (0), designation of diameter is also possible.

$[Z_c, X_c], 100, D$

Z_c, X_c : Center

100 : Diameter

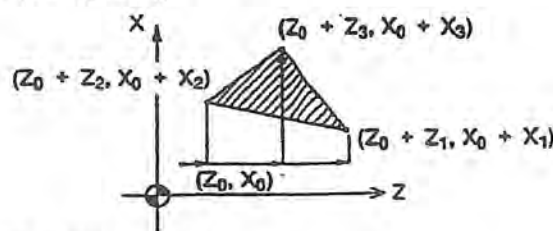
D : Code to indicate diameter designation



Number of vertexes = 3

$[Z_1, X_1], [Z_2, X_2], [Z_3, X_3]$

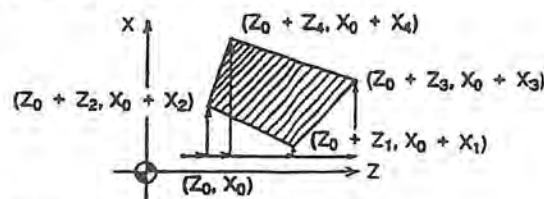
$(X_1 \leq X_2 \leq X_3)$



Number of vertexes = 4

$[Z_1, X_1], [Z_2, X_2], [Z_3, X_3], [Z_4, X_4]$

$(X_1 \leq X_2 \leq X_3 \leq X_4)$



Tile Pattern: Eight patterns, 0 through 7

3) Paint – PAINTS

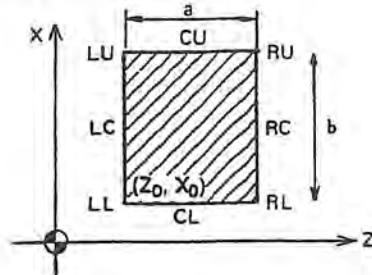
PAINTS <reference-point-position>,[Z₀, X₀],[a, b]
<,tile-pattern>

The PAINTS command is used for painting a rectangle having lengths of a and b.

Reference Point Position:

This specifies the position of the reference point on the rectangle being painted.

- LL : Left lower
- LC : Left center
- LU : Left upper
- CU : Center upper
- RU : Right upper
- RC : Right center
- RL : Right lower
- CL : Center lower



Reference Position [Z₀, X₀]:

The coordinates must be specified in absolute values.

Tile Pattern: Eight patterns, 0 through 7

4) Paint – PAINTP

PAINTP <reference-point-position>,[Z₀, X₀],[a, b]
<,angle-code>,<,tile-pattern>

The PAINTP command is used for painting rectangles and triangles.

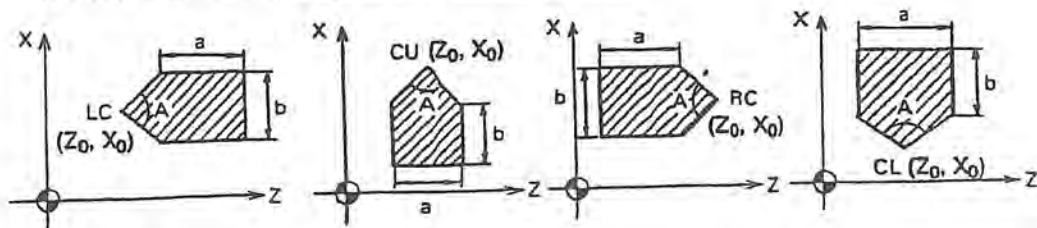
Reference Point Position:

This specifies the position of the reference point on the rectangle and triangle being painted.

- LC : Left center
- CU : Center upper
- RC : Right center
- CL : Center lower

Reference Position [Z₀, X₀]:

The coordinates must be specified in absolute values.



Angle Code:

- 0: Angle A of triangle is 30°
- 1: Angle A of triangle is 60°
- 2: Angle A of triangle is 120°
- Default is "0 = 30°".

Tile Pattern: Eight patterns, 0 through 7

5) Paint – PAINTP

PAINTT <shape-type> <reference-point-position>, [Z0,X0], [a,b], [H,R]
<tile-pattern>

The PAINTT command is used for painting the shape in which the legs of isosceles are either straight or arc.

Shape Type:

SS : The legs are convexed outside; arc in a half-circle or smaller than a half-circle.

LS : The legs are convexed outside; arc in a half-circle or greater than a half-circle.

SD : The legs are convexed inside; arc in a half-circle or smaller than a half-circle.

LF : The legs are straight line.

Reference Point Position:

LC : Left center

CU : Center upper

RC : Right center

CL : Center lower

Reference Position [Z0, X0]:

The coordinates must be specified in absolute values.

a, b : These specify the lengths of upper and lower base.

H : This specifies the height of trapezoid.

R : This specifies the radius of convex arc. It is "0" if the shape type is LF.

Tile Pattern: Eight patterns, 0 through 7

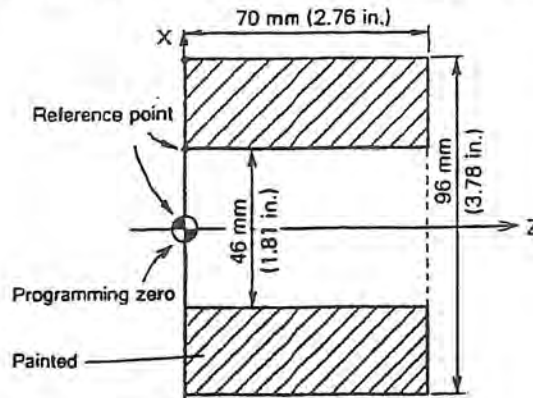
For the reference-point-position, [a, b], and [H, R], refer to the table on next page.

		Shape Type			
		SS	LS	SD	LF
Reference Point Position	LC				
	CU				
	RC				
	CL				

(3) Example of Painting

a) Blank material viewed from side

This item explains the procedure to paint the blank shape indicated below.



This painting operation uses the PAINTS command.

Reference point $[Z_0, X_0] = [0, 0]$
 Dimensions $[a, b] = [70, 96]$
 PAINTS LC, $[0, 0], [70, 96], 4$

The opening in the blank should be defined using the tile pattern "0" which represents all dots off.

Reference point $[Z_0, X_0] = [0, 0]$
 Dimensions $[a, b] = [70, 46]$
 PAINTS LC, $[0, 0], [70, 46], 0$

Therefore, the painting is programmed as indicated below:

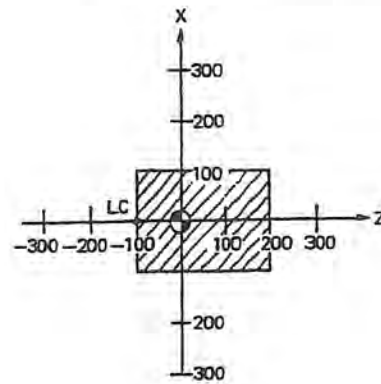
```
DEF WORK
PAINTS LC, [0, 0], [70, 96], 4
PAINTS LC, [0, 0], [70, 46], 0
END
DRAW
```

Using simple commands, the same painting is programmed as indicated below:

```
DEF WORK
PS LC, [0, 0], [70, 96]
PS LC, [0, 0], [70, 46], 0
END
DRAW
```

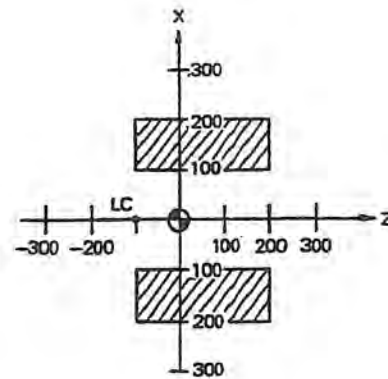
SECTION 1 PROGRAM SIMULATION BY ANIMATION

6) Example Program 1
 Reference Point LC
 DEF WORK[M]
 PS LC, [-100, 0], [300, 200]
 END

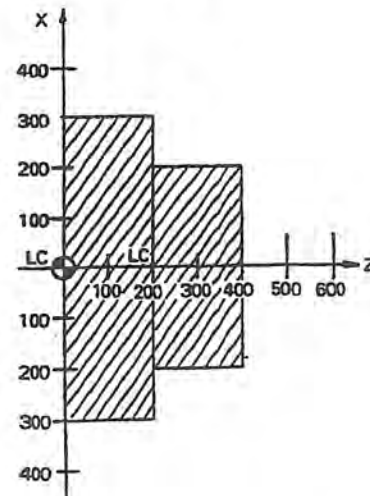


7) Example Program 2
 Reference Point LC
 DEF WORK[M]
 PS LC, [-100, 0], [300, 400]
 PS LC, [-100, 0], [300, 200], 0 *
 END

* 0 indicates drawing not to be done.



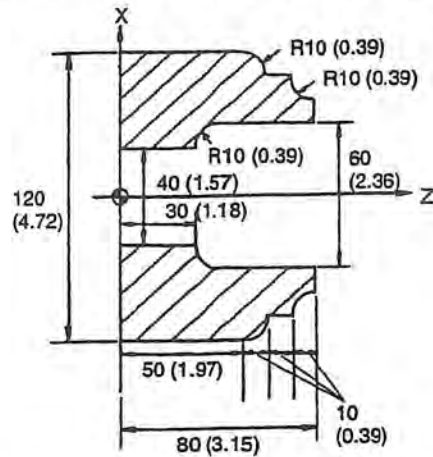
8) Example Program 3
 Reference Point LC
 DEF WORK
 PS LC, [0, 0], [200, 600]
 PS LC, [200, 0], [200, 400]
 END



Tile patterns in the examples 1, 2 and 3 are painting of all dots.

9) Example Program 4

The program to draw the shape as in Fig. 3-1 below, by painting it is explained.



Unit: mm (in.)

Fig. 1-1

The shape is divided into four areas (a, b, c, d) to be painted and three blank areas (A, B, C) as in Fig. 3-2.

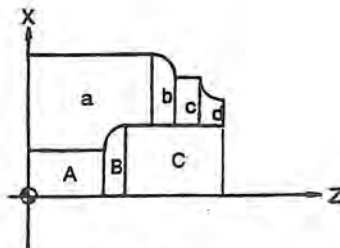


Fig. 1-2

First, define the areas to be painted.

- a PAINTT LF, LC, [0, 0], [120, 120], [50, 0]
- b PAINTT SS, LC, [50, 0], [120, 100], [10, 10]
- c PAINTT LF, LC, [60, 0], [120, 100], [10, 0]
- d PAINTT SD, LC, [70, 0], [120, 80], [10, 10]

Then, define the blank areas (tile pattern = 0).

- A PAINTT LF, RC, [30, 0], [40, 40], [30, 0], 0
- B PAINTT SS, RC, [40, 0], [60, 40], [10, 10], 0
- C PAINTT LF, RC, [80, 0], [60, 60], [40, 0], 0

SECTION 1 PROGRAM SIMULATION BY ANIMATION

Therefore, the user graphic commands to paint the workpiece shape are as indicated below.

```

DEF WORK
PAINTT LF, LC, [0, 0], [120, 120], [50, 0]
PAINTT SS, LC, [50, 0], [120, 100], [10, 10]
PAINTT LF, LC, [60, 0], [120, 100], [10, 0]
PAINTT SD, LC, [70, 0], [120, 80], [10, 10]
PAINTT LF, RC, [30, 0], [40, 40], [30, 0], 0
PAINTT SS, RC, [40, 0], [60, 40], [10, 10], 0
PAINTT LF, RC, [80, 0], [60, 60], [40, 0], 0
END
DRAW
    
```

b) Blank material viewed from front (only for multiple machining specification)

Description of Commands:

```

DEF WORKF ..... Definition statement - Front view of blank
PF 0, [0, 0], 100, D ..... Command to draw blank
    |
    |-----> Command to draw blank
    |-----> Circle diameter
    |-----> Coordinate of circle center (coordinate of apex)
    |-----> Designation of circle
END ..... End statement
    
```



or

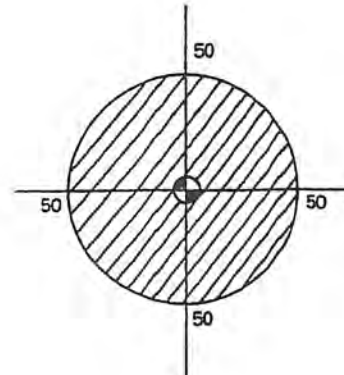
```

DEF WORKF
PI 0, [0, 0], [0, 0], 100, D
    |
    |-----> Designation of diameter of circle to be painted
    |-----> Circle diameter
    |-----> Coordinates of reference point + Coordinates of apex
    |-----> Coordinate of circle center
    |-----> Designation of circle
END
    
```

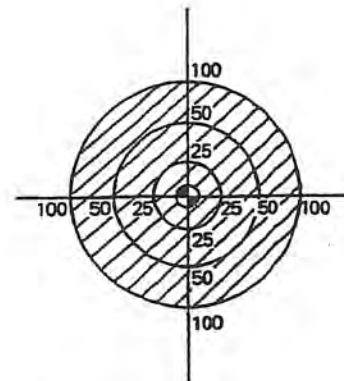
SECTION 1 PROGRAM SIMULATION BY ANIMATION

Example Program

```
DEF WORKF
PF 0, [0, 0], 100, D
END
```

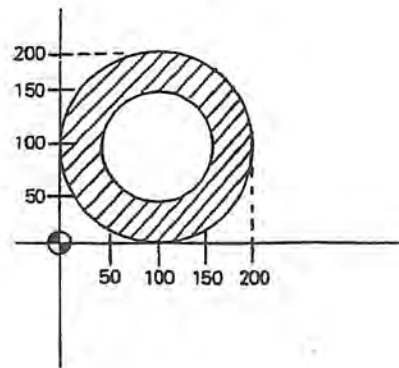


```
DEF WORKF
PF 0, [0, 0], 200, D
PF 0, [0, 0], 100, D
PF 0, [0, 0], 50, D
END
```



```
DEF WORKF
PI 0, [100, 100], [0, 0], 200, D
PI 0, [100, 100], [0, 0], 100, D, 0 *
END
```

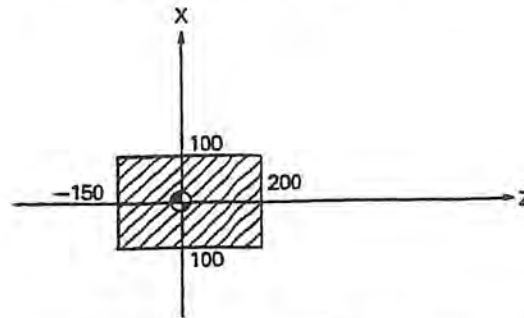
* 0 indicates drawing not to be done.



4. HOW TO SET DRAWING POSITIONS OF CHUCK AND TAILSTOCK

To set the chuck and tailstock positions on the display screen corresponding to the workpiece material, input proper data at JAW SIZE (L1, D1), JAW POSI. (CX, CZ), CENTER (L2, D2), CENTER (D3) and FACE(WR) on the CHUCK/TAILSTOCK page in the PARAMETER SET mode.

Example:



PARAMETER SET

Page 1 UNIT 1mm

= CHUCK/TAILSTOCK =

CHUCK HOLD CHG.

B: 0-DIA./1: I-DIA.

CHUCK/C.WORK CHG. B

B: CHUCK/1: C.WORK

- BARRIER DATA -

JAW SIZE L1= 50.000
D1= 50.000

JAW POSI. CX= 200.000
CZ= -150.000

CENTER L2= 50.000
D2= 50.000

D3= 20.000

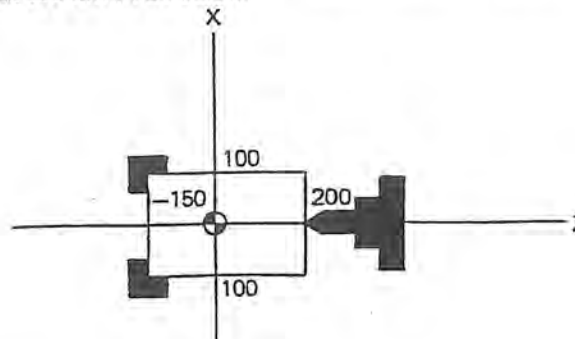
FACE WR= 200.000

SET ADD DEL BACK UP ITEM1 ITEM4

F1 F2 F3 F4 F5 F6 F7 F8

When the following data is input at the CHUCK/TAILSTOCK page in reference to the blank material illustrated above, the chuck and tailstock are drawn as below.

- L1 = 50
- D1 = 50
- CX = 200
- CZ = -150
- L2 = 50
- D2 = 50
- D3 = 20
- WR = 200



NOTICE : If the blank material shape is not symmetric in reference to Z-axis, the chuck and the tailstock cannot hold the material correctly.

SECTION 1 PROGRAM SIMULATION BY ANIMATION

Chuck and tailstock dimensions can be changed by setting required values at JAW SIZE (L1, D1), CENTER (L, D, L1, D1) in the "CHUCK/TAILOCK BARRIER".

PARAMETER SET ABC. MIN
PAGE 2
BC=10 UNIT 1 in
CHUCK/TAILOCK BARRIER

JAW SIZE L= 200.0
D= 30.000
CENTER L= 500.000
D= 200.000
L1= 40.000
D1= 150.000

= IF
= IF
= IF
=

SET ADD C/L BRCK UP ITEM+ ITEM-

F1 F2 F3 F4 F5 F6 F7 F8

5. SYSTEM VARIABLES FOR ANIMATION DISPLAY

The tool shape data, chuck barrier data and tailstock barrier data can be commanded in the same manner as conventional part program using the system variables.

(1) Tool Shape Definition

The seven system variables indicated below are used for defining the tool shape.

Variable Name	Contents	Data Size
VTLIN[I]	Tool classification code	1 to 26
VTLFN[I]	Tool shape code	1 to 4
VTLA1[I]	Tool angle	0 to 360.000
VTLA2[I]	Edge angle	-360.000 to 360.000
VTLL[I]	Holder length/Sticking out length/Drill length	0 to 9999.999
VTLD[I]	Holder diameter/Drill diameter	0 to 9999.999
VTLW[I]	Tool width	0 to 9999.999

The index [I] of the system variable is designated by the tool number.

The tool number indicates the station number of the turret.

For the tool life management specification, the system variable name is assigned in the format VGR**[I]. The index [I] is the tool group number.

Tool Classification Code :

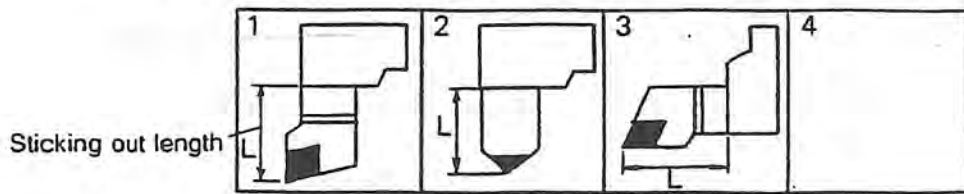
- 1 = ROUGH OD←
- 2 = ROUGH ID←
- 3 = ROUGH FACE↓
- 4 = ROUGH OD→
- 5 = ROUGH ID→
- 6 = ROUGH FACE↑
- 7 = FINISH OD←
- 8 = FINISH ID←
- 9 = FINISH FACE↓
- 10 = FINISH OD→
- 11 = FINISH ID→
- 12 = FINISH FACE↑
- 13 = THREAD OD←
- 14 = THREAD ID←
- 15 = THREAD FACE↓
- 16 = THREAD OD→
- 17 = THREAD ID→
- 18 = THREAD FACE↑
- 19 = GROOVE OD↓
- 20 = GROOVE ID↑
- 21 = GROOVE FACE←
- 22 = DRILL HSS
- 23 = DRILL CARBIDE
- 24 = DRILL CENTER
- 25 = RECESS OD↙
- 26 = RECESS ID↘

SECTION 1 PROGRAM SIMULATION BY ANIMATION

- 27 = M-DRILL↓
- 28 = M-DRILL←
- 29 = BORING↓
- 30 = BORING←
- 31 = TAP↓
- 32 = TAP←
- 33 = REAMER↓
- 34 = REAMER←
- 35 = END MILL↓
- 36 = END MILL←
- 37 = FACE MILL↓
- 38 = FACE MILL←

Tool Shape Code: 1
2
3
4

Tool shape number which corresponds to the tool shape usable for the tool selected by the tool classification code.)



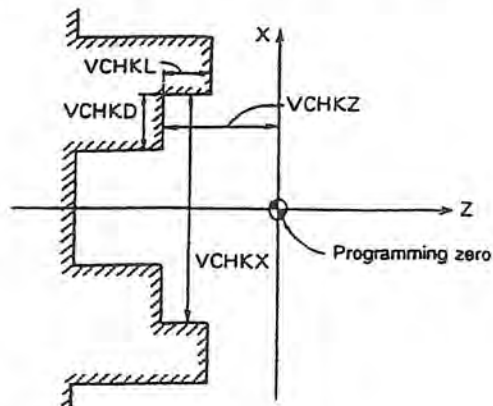
(ROUGH OD←, FINISH OD←)

Example: ROUGH OD
 TOOL NO. TN = 2
 TOOL ANGLE A1 = 80°
 EDGE ANGLE A2 = 3°
 STICKING OUT L = 40 mm (1.57 in.)
 VT LIN[2] = 1
 VT LFN[2] = 1
 VT LA1[2] = 80.000
 VT LA2[2] = 3.000
 VT LL[2] = 40.000

(2) Chuck Barrier Definition

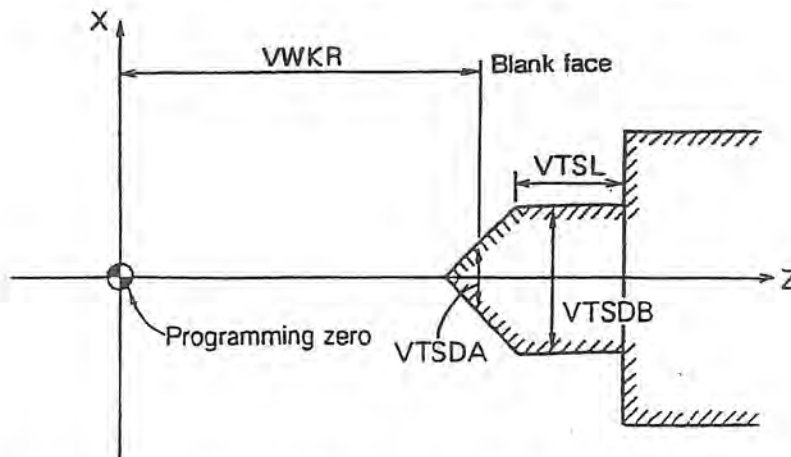
The four system variables indicated below are used for defining the chuck barrier.

Variable Name	Contents	Data Size
VCHKL	Chuck jaw length	0 to 9999.999
VCHKD	Step on chuck jaw	0 to 9999.999
VCHKX	Gripping diameter	-9999.999 to 9999.999
VCHKZ	Distance from program zero	-9999.999 to 9999.999



(3) Tailstock Barrier Definition

Variable Name	Contents	Data Size
VWKR	Blank face position	-9999.999 to 9999.999
VTSL	Sticking out length of tailstock spindle	0 to 9999.999
VTSDA	Center hole diameter	0 to 9999.999
VTSDB	Tailstock spindle diameter	0 to 9999.999



The four system variables indicated below are used for defining the tailstock barrier.

6. CYCLE TIME CALCULATION FUNCTION

This function calculates the length of time required for executing a part program under the specified conditions without actually operating the machine.

6-1. Cycle Time Calculation Process

(1) In High Speed Graphic Drawing Mode

Cycle time is calculated during the control is in the high speed graphic drawing mode. The high speed graphic drawing mode means that both the machining lock and dry run functions are turned on.

(2) Counting Actual Program Execution Time during Automatic or MDI Mode Operations

While the control is operating under either the automatic or the MDI mode, execution time of a part program is calculated (counted) as the program is executed on the graphic display, the final shape is drawn as in the high speed graphic drawing mode.

a) In the automatic mode

The cycle time is calculated as the total of one-block execution time by adding the program execution time for each block. Therefore, this calculation function can be activated independently of the setting of the single block function whether it is on or off. Pressing the CYCLE START pushbutton switch resets the counter to zero and counting the program execution time starts from 0 second.

b) In the MDI mode

Each time the CYCLE START pushbutton switch is pressed after entering the commands of one block, the length of time required for executing the entered block is counted and added to the accumulated count data. This counting occurs when the operation mode is switched to the MDI from other modes. Counter is automatically reset to zero at the instant the operation mode is switched.

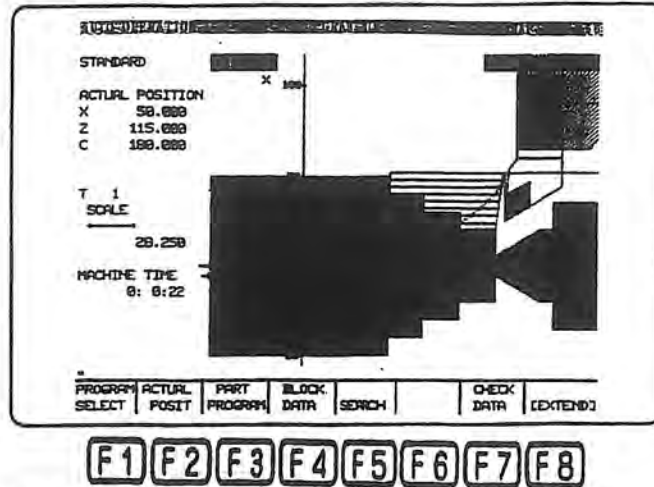
[Supplement] : The MACHINE TIME data displayed before switching the operation mode to the auto or MDI indicates the cycle time having been counted. And this data is automatically cleared to zero when the CYCLE START pushbutton switch is pressed.

(3) Influence of Override Setting

The cycle time is counted taking the setting of the override value into account. In other words, the override function is effective for the cycle time counting function. For the rapid feedrate, the setting of the override is ignored and fixed at 100%.

6-2. Screen Display of Machine Time Data

The calculated (counted) cycle time is displayed on the graphic display.



The data in item "C" is available for multi-machining models.

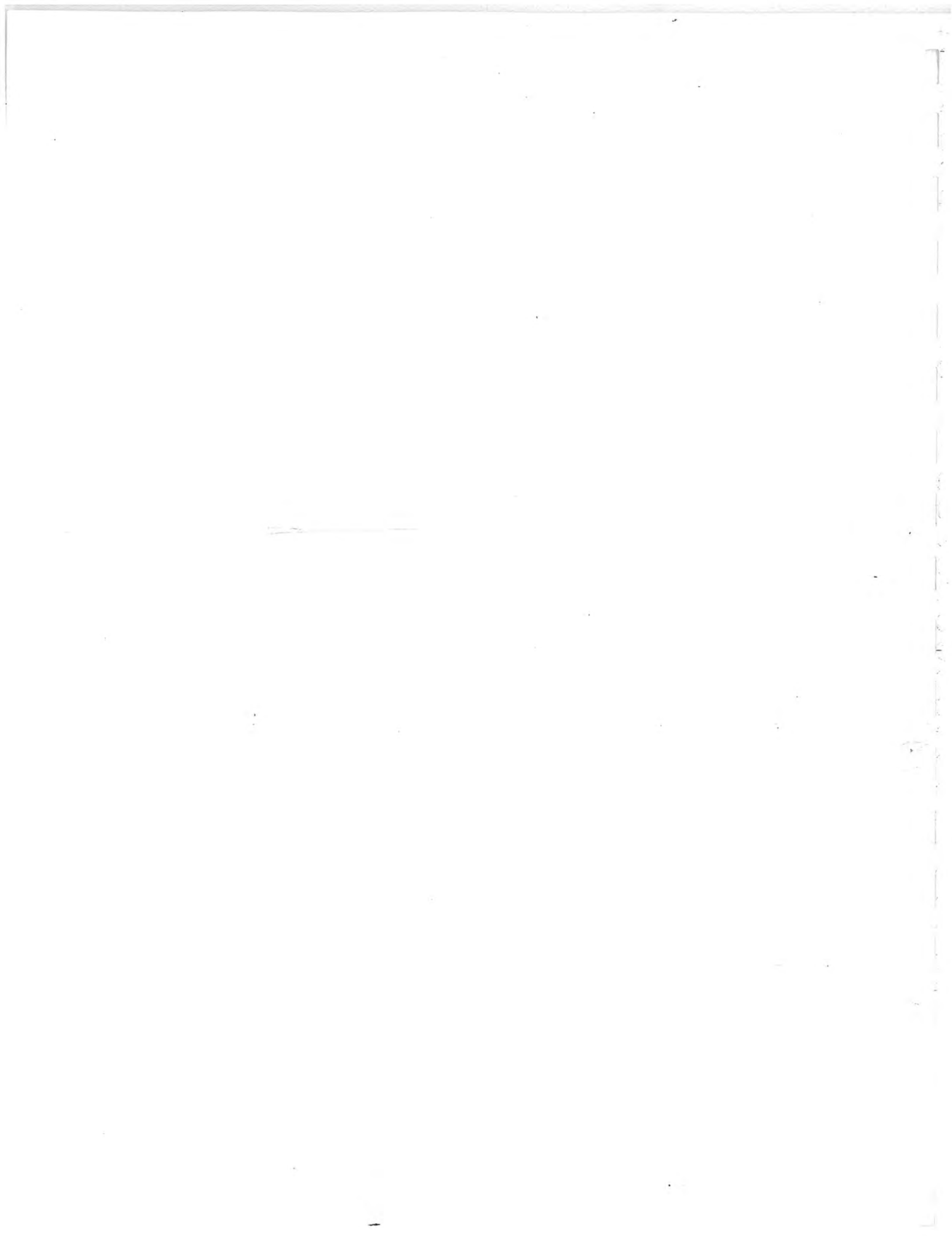
The unit of the MACHINE TIME data is hours, minutes and seconds.

6-3. Operation Procedure

- (1) Select the high speed graphic drawing mode (MACHINE LOCK and DRY RUN ON).
- (2) Select the graphic display mode by pressing an appropriate function key.
- (3) Follow the steps for operating the machine in normal machine operation mode.



SECTION 2
DNC-A



1. OVERVIEW

OKUMA provides the following two major functions as DNC-A.

(1) Downloading
[INPUT]

Receives NC programs (or files) from the host computer.

The CNC machine can also verify a received NC program (file) by matching the received NC program (file) stored in its memory with the NC program (file) that is sent from the host computer for verification.

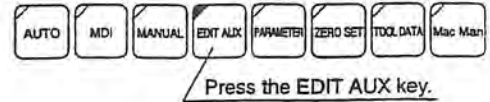
(2) Uploading
[OUTPUT]

Uploads NC programs (or files) to the host computer.

The CNC machine can retransmit the NC programs (files) so that they can be verified at the host computer.

2. OPERATING PROCEDURES

(1) Press the EDIT AUX key.



(2) The display shown in Fig. 2-1 will appear on the screen display.

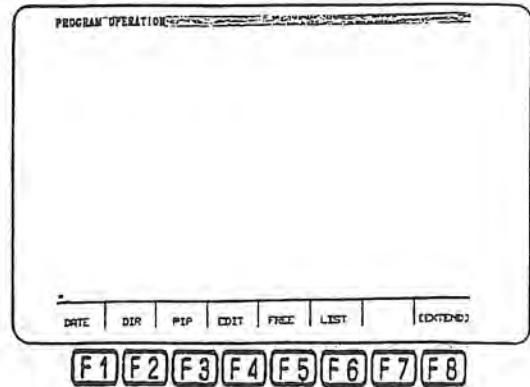


Fig. 2-1

(3) Press function key [F8] (EXTEND) twice to cause "DNC" to be displayed in function key guide area corresponding to the [F4] key.

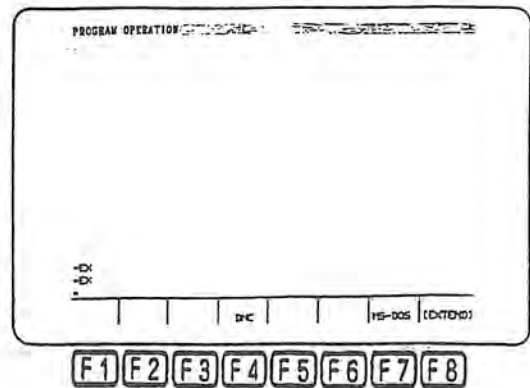


Fig. 2-2

- (4) Press function key [F4] (DNC), and the display shown in Fig. 2-3 will appear.

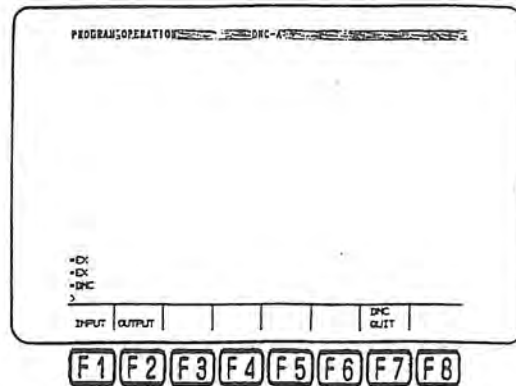


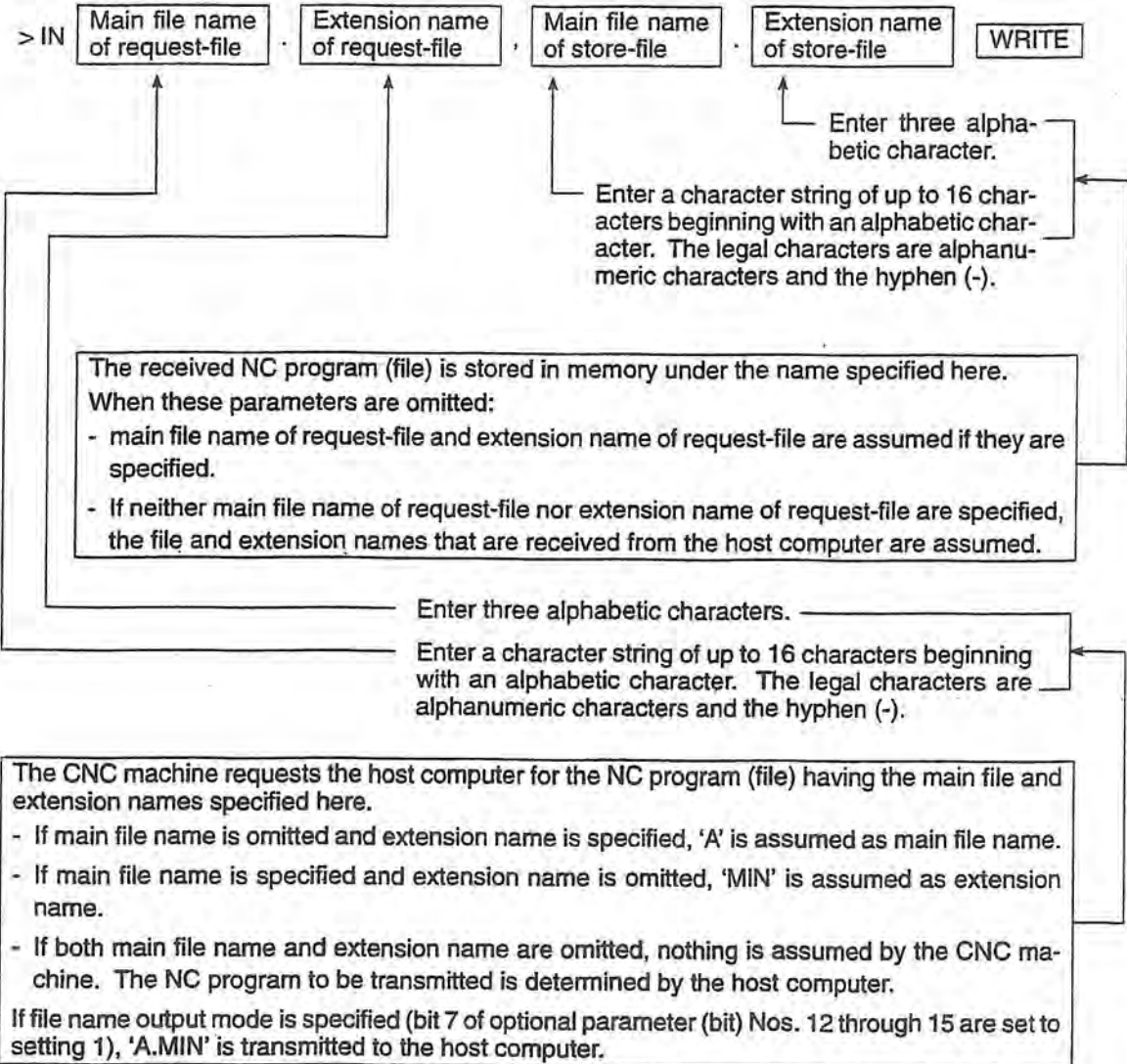
Fig. 2-3

- (5) Pressing function keys [F1] and [F2] at this moment will enable input and output processing, respectively. Press function key [F7] (DNC QUIT) to quit the DNC mode.

2-1. Downloading an NC Program (File)

- Press function key [F1] (Input).
- Enter the name of the NC program (file) to be downloaded.
- Press the WRITE key.

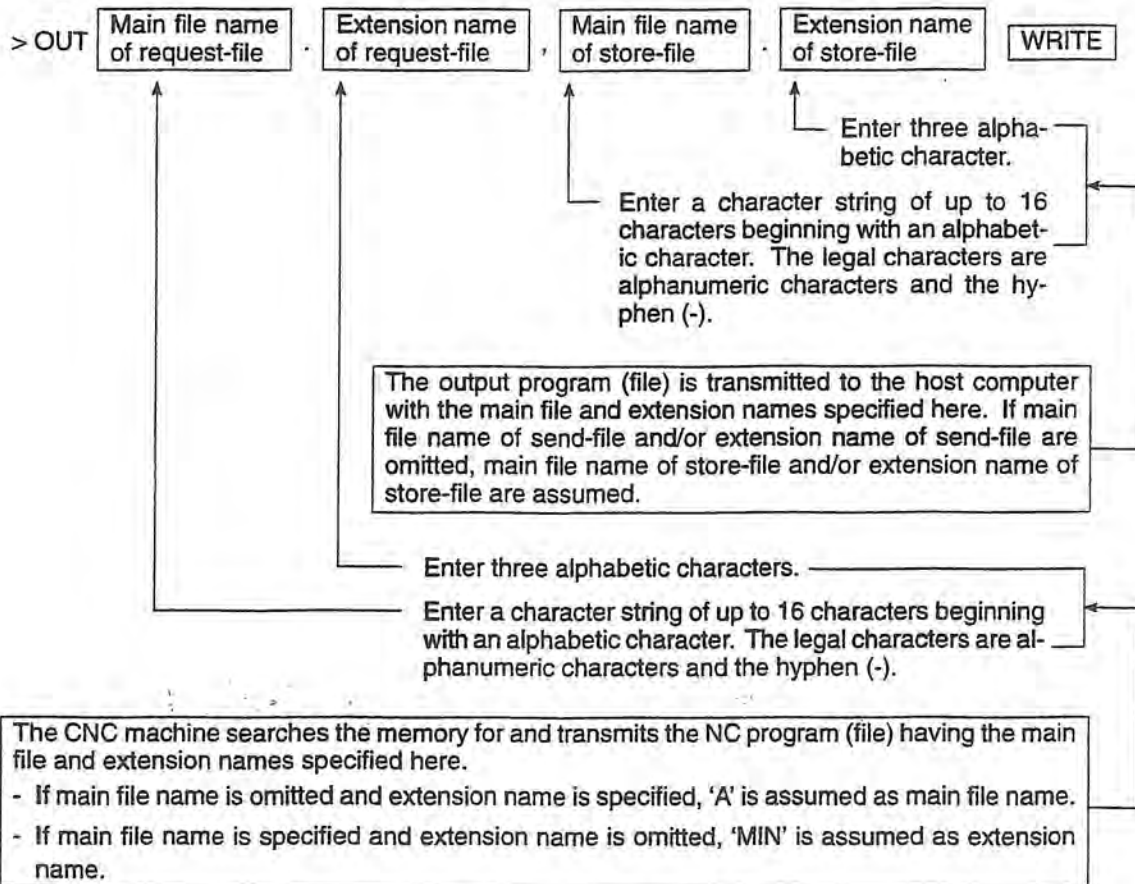
The general format of the IN command is shown below.



2-2. Uploading an NC Program (File)

- Press function key [F2] (Out put).
- Enter the name of the NC program (file) to be uploaded.
- Press the WRITE key.

The general format of the OUT command is shown below.

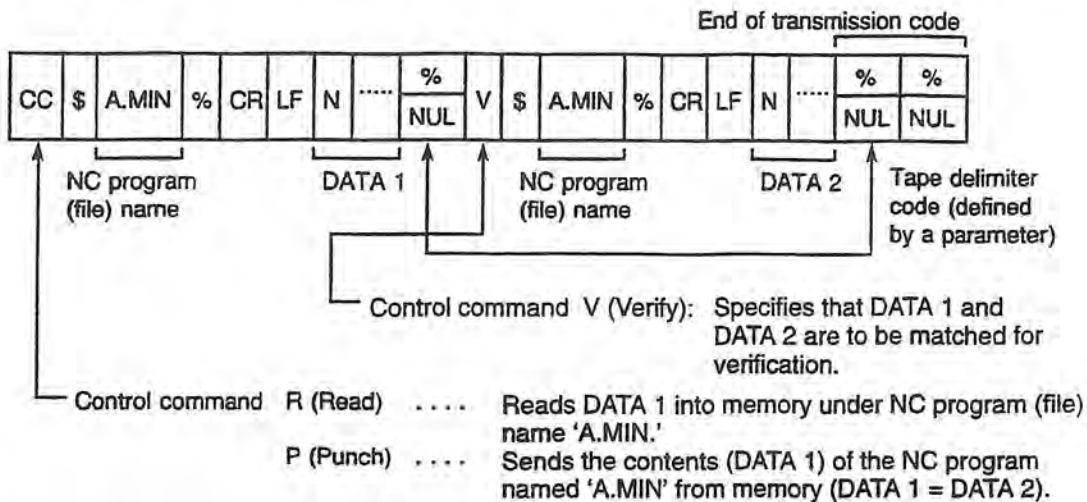


3. SETTING UP OPTIONAL PARAMETERS

- Optional Parameter (Bit) No. 2
Bits 4 and 5 of the optional parameter (bit) No. 2 specifies whether the verify data is to be transmitted in the upload mode and whether the NC program (file) name is to be transmitted.
- Optional Parameter (Word) No. 46
The optional parameter (word) No. 46 selects the DNC-A input/output channel.
- Optional Parameter (Bit) No. 1
Bit 3 of the optional parameter (bit) No. 1 defines the tape delimiter code.
- Optional Parameter (Bit) Nos. 12 – 15, bit 7
Bit 7 of the optional parameter (bit) Nos. 12 through 15 specify whether the request file name is to be transmitted from the host computer in the download mode.
- Optional Parameter (Bit) Nos. 12 – 15, bit 5
Bit 5 of the optional parameter (bit) Nos. 12 – 15 sets whether or not the DC code control is made.

4. DATA FORMATS

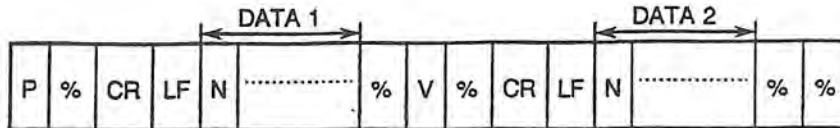
Data is transferred all in ISO code. The end of data is identified by two consecutive NUL (00) or % (A5 in hex) codes.



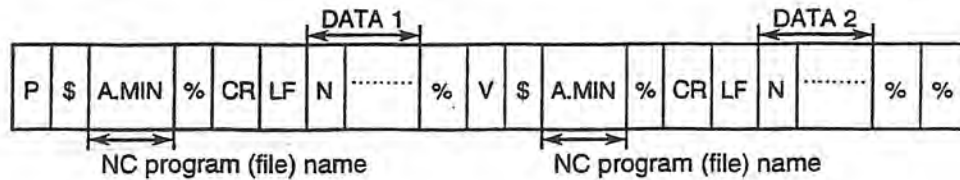
- (1) When transmission of verify data is not specified, the control command V and the subsequent data are not transmitted; instead, two consecutive % or NUL codes are transmitted and transmission terminates (see Examples 1-3 and 1-4).
- (2) When transmission of the NC program (file) name is not specified, the NC program (file) name following the control command is not transmitted (see Examples 1-1 and 1-3).
- (3) The NC program (file) name may be omitted in the download mode. In this case, the program (file) name 'A.MIN' is assumed if it is not specified on the CNC machine side (see Example 2-2).
- (4) Either % or NUL code can be defined in a parameter as the tape delimiter code. The host computer must use the defined tape delimiter code when sending a NC program (file) to the CNC machine.
- (5) The host computer need not transmit the V control command and subsequent data in the download mode if verify processing is not required. In this case, the host computer must send two consecutive % (or NUL) codes instead of the V control command (see Example 2-2).
- (6) Only the data between the LF code and the tape delimiter code (i.e., DATA1) is stored in memory.

(1) Output Data Format Examples

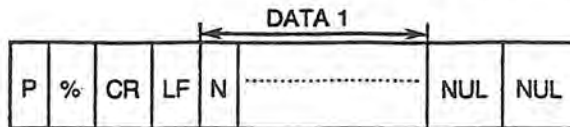
Example 1-1: Optional parameter (bit) No. 2, bit 4 and bit 5: 1
No. 1, bit 3: 1



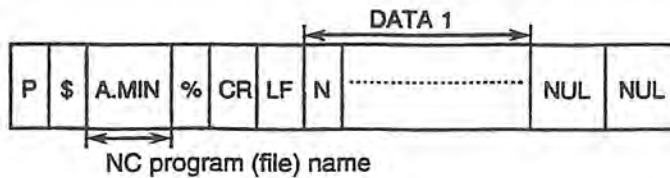
Example 1-2: Optional parameter (bit) No. 2, bit 4 : 0
bit 5: 1
No. 1, bit 3: 1



Example 1-3: Optional parameter (bit) No. 2, bit 4 : 1
bit 5: 0
No. 1, bit 3: 0

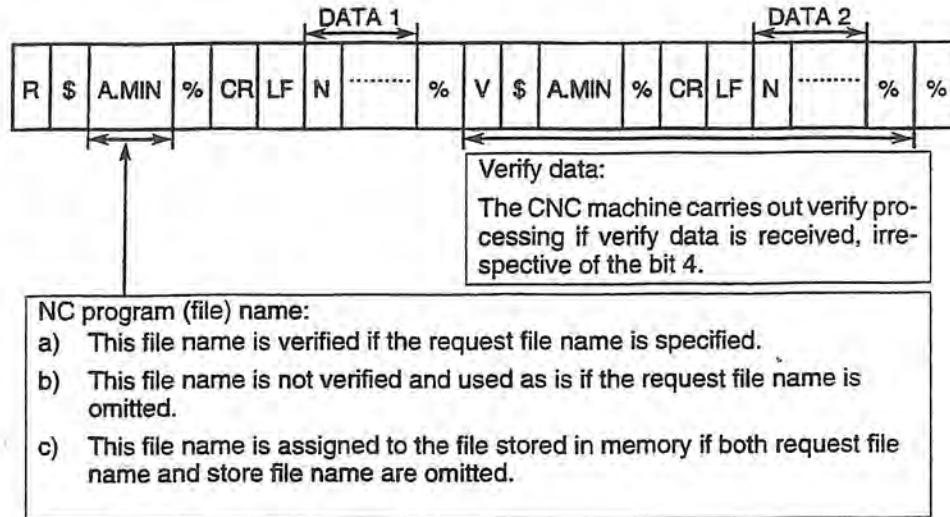


Example 1-4: Optional parameter (bit) No. 2, bit 4 and bit 5: 0
No. 1, bit 3: 0

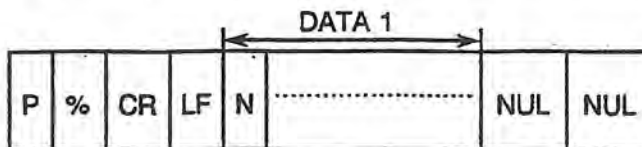


(2) Input Data Format Examples

Example 2-1: Optional parameter (bit) No. 2, bit 4 and bit 5 set to 1 and verify data is present



Example 2-2: Optional parameter (bit) No. 2, bit 4 and bit 5 set to 0 and no verify data is present



When the NC program (file) name is not present:

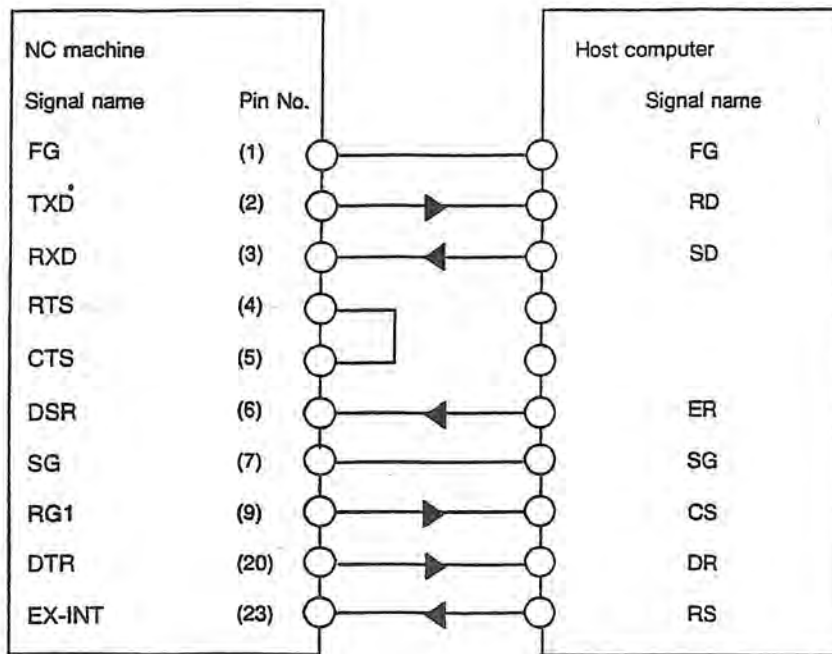
- a) If the store file name is specified, the received data is stored in memory under that name.
- b) If the request file name is specified and the store file name is omitted, the received data is stored under the request file name.
- c) If both the request and store file names are omitted, 'A.MIN' is assumed as the name of the received file.

5. EXAMPLE RS232C INTERFACE CONNECTIONS AND TIMING CHARTS

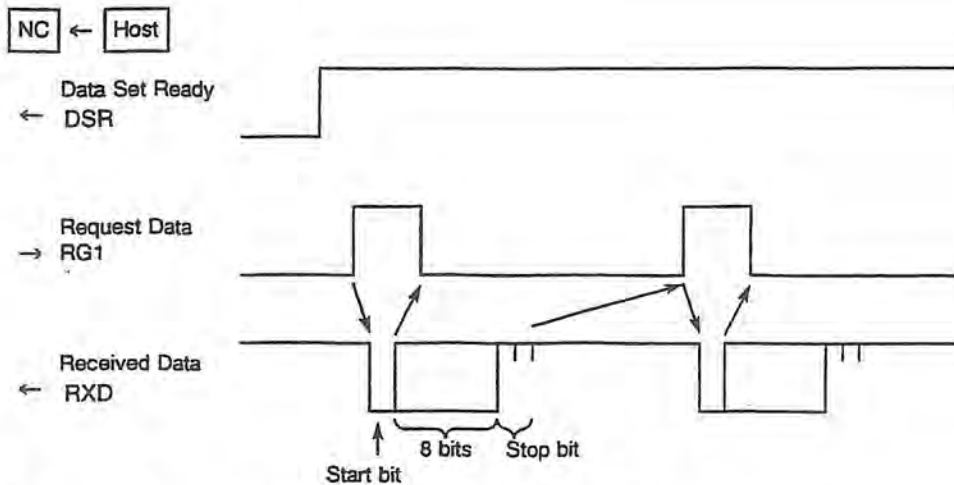
Since the CNC machine and the host computer are likely to use different RS232C interface lines, it is necessary to check the RS232C interface lines used in the host computer system and use an appropriate, dedicated RS232C cable.

(1) Start/Stop Synchronization Mode

Sample Connection Diagram:



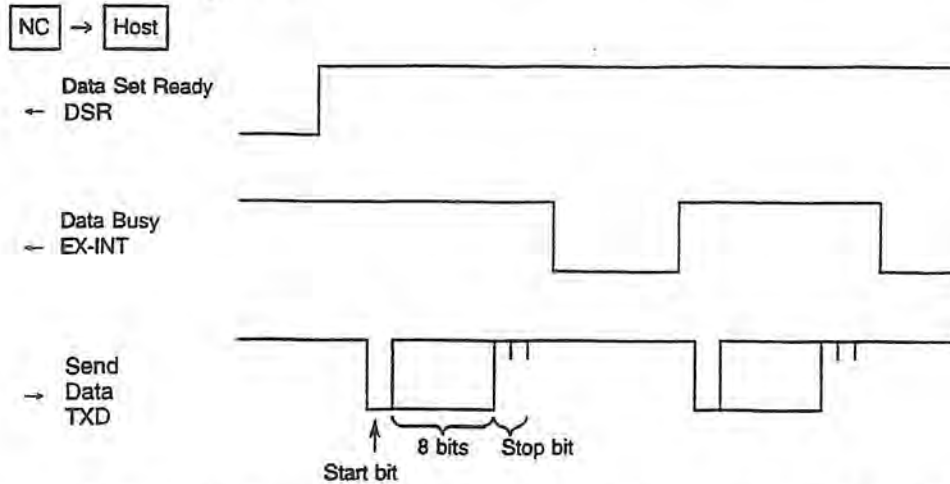
a) Download Mode Timing Chart:



- The CNC machine sends the Data Request signal RG1.
- The host computer, on receiving RG1, starts transmitting a byte of serial data.

- c) The Data Request signal is reset on the start bit of the serial data byte.

Upload Mode Timing Chart:



- The CNC machine sends a byte of transmitted data when the Data Busy signal EX-INT is high.
- The host computer resets the Data Busy signal when it reads the stop bit of the received serial data byte. The Data Busy signal must be reset each time a serial data byte is received.
- The host computer sets the Data Busy signal when it completes processing of the received data byte.

NOTICE : Since this example configuration was the EX-INT signal, bit 1 of optional parameter (bit) No. 12 through 15 for the "no EX-INT signal" mode) must be set to 0.

(2) DC Code Control

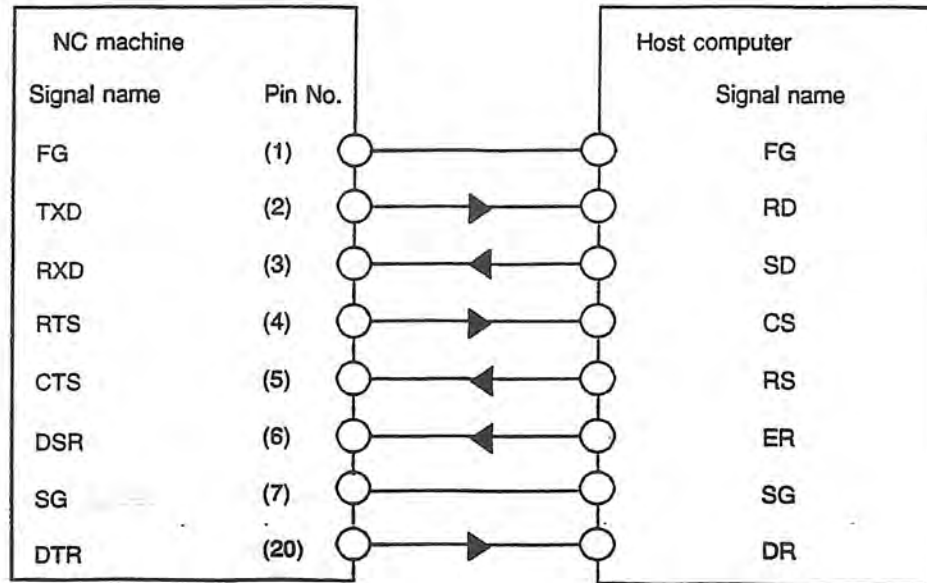
The DC (Device Control) codes are defined as follows irrespective of the code of the NC program data to be transmitted (ISO or EIA):

DC Code	NC Processing	Hexadecimal Expression of Code
DC1	Enables data read. (a) Initiates a read. (b) Resumes a read.	\$11
DC2	Placed before the transmitted data to request the host computer to receive the transmitted data.	\$12
DC3	Requests suspension of data transmission.	\$93
DC4	Identifies the end of data transmission.	\$14

- NOTICE** :
- Bits of the optional parameters (bit) No. 12 to 15 set to 1 to use DC codes.
 - DC codes are automatically generated by the NC machine. The program need not consider the DC codes.

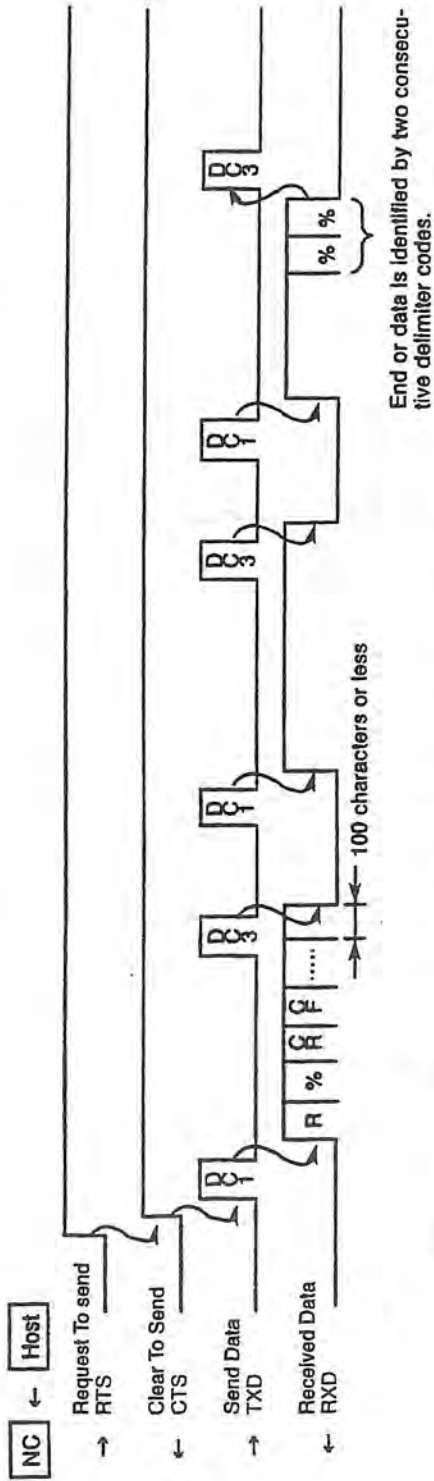
Sample Connection Diagrams

Example 1:

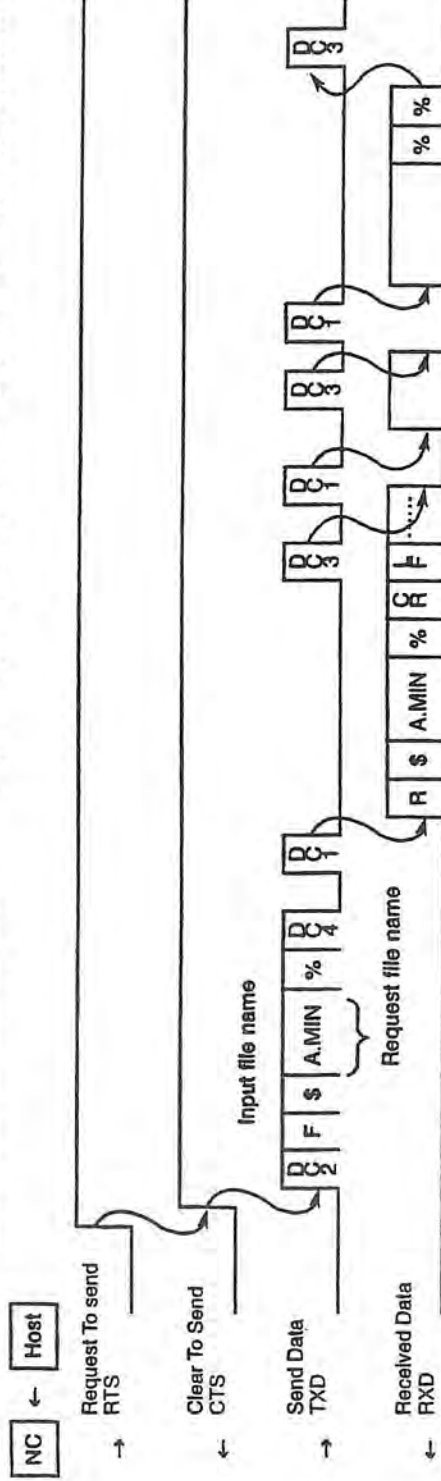


a) Download mode timing charts

1) When request-file name output mode is not specified (the optional parameter (bit) No. 12 through 15, bit 7 set to 0)

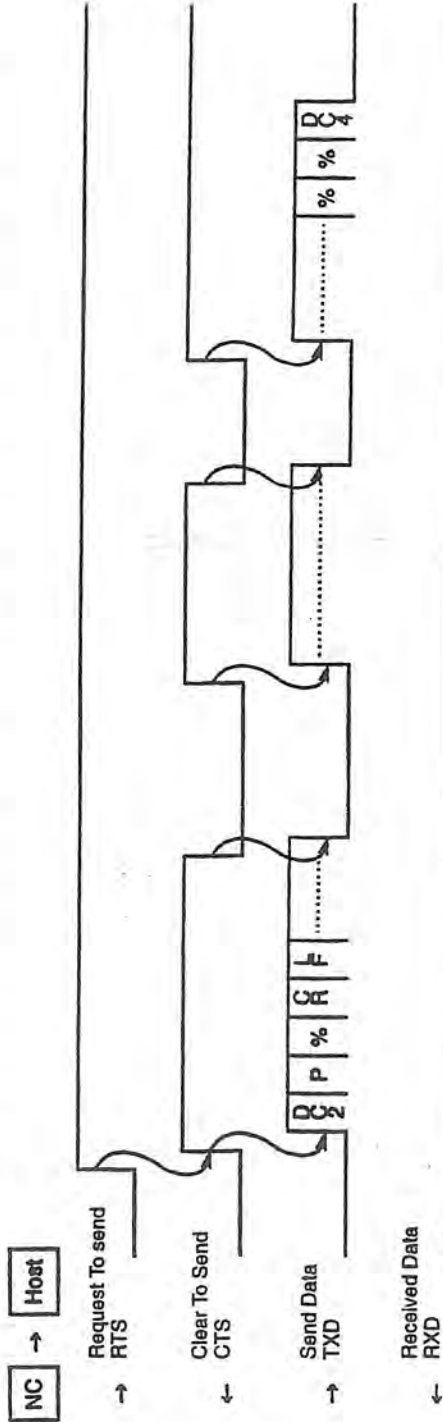


2) When request-file name output mode is not specified (the optional parameter (bit) No. 12 through 15, bit 7 set to 1)

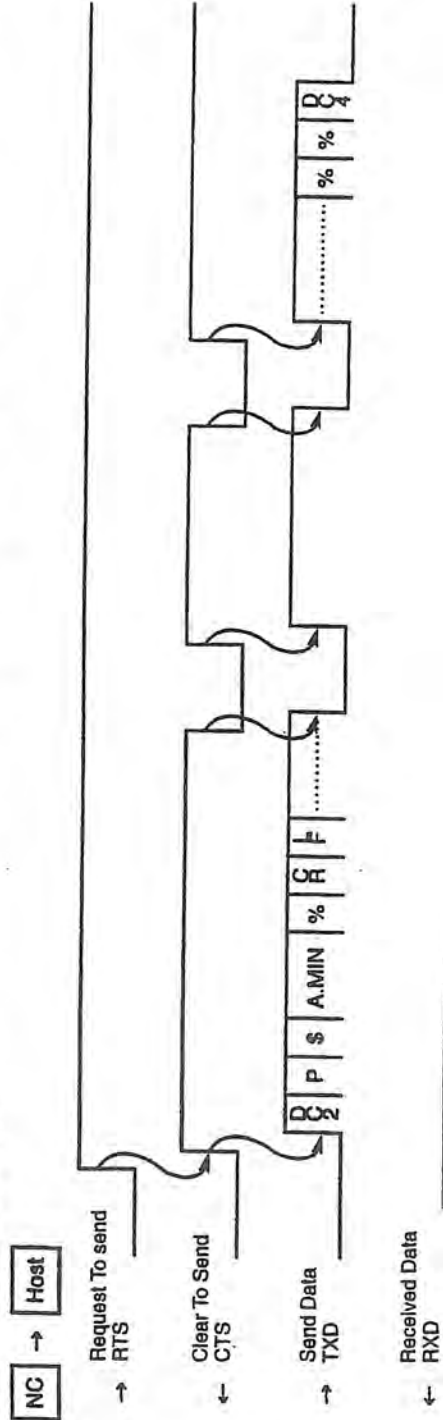


b) Upload mode timing charts

1) When file name output mode is specified (the optional parameter (bit) No. 2, bit 4 and 5 set to 1, or bit 4 sets to 1 and bit 5 sets to 0)

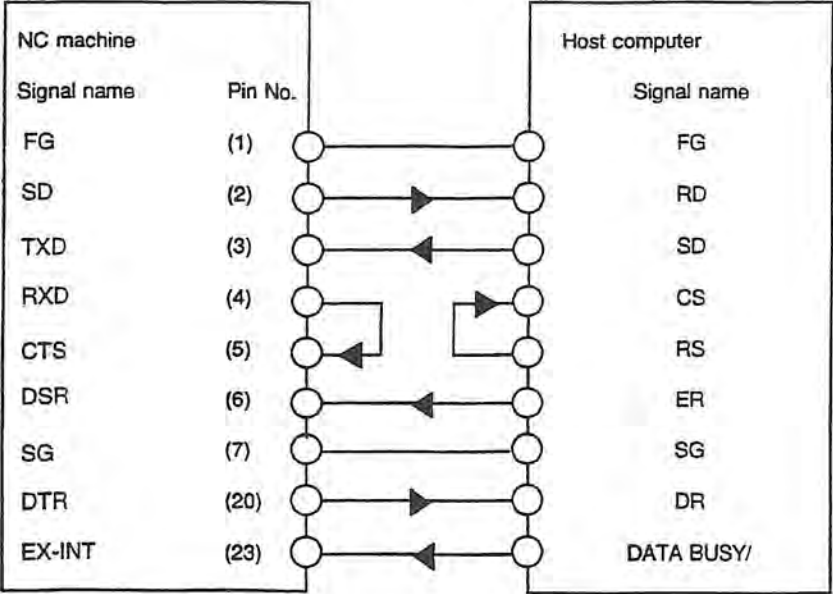


2) When file name output mode is specified (the optional parameter (bit) No. 2, bit 4 sets to 0 and bit 5 sets to 1, or bit 4 and 5 set to 0)



- NOTICE** :
- (1) When CS is set off during data transfer, the data transfer is suspended within two characters.
 - (2) Since this example configuration does not use the EX-INT signal, NC optional parameter bit for the "no EX-INT signal" mode (bit 1 of the optional parameter (bit) Nos. 12 through 15) must be set to 1.

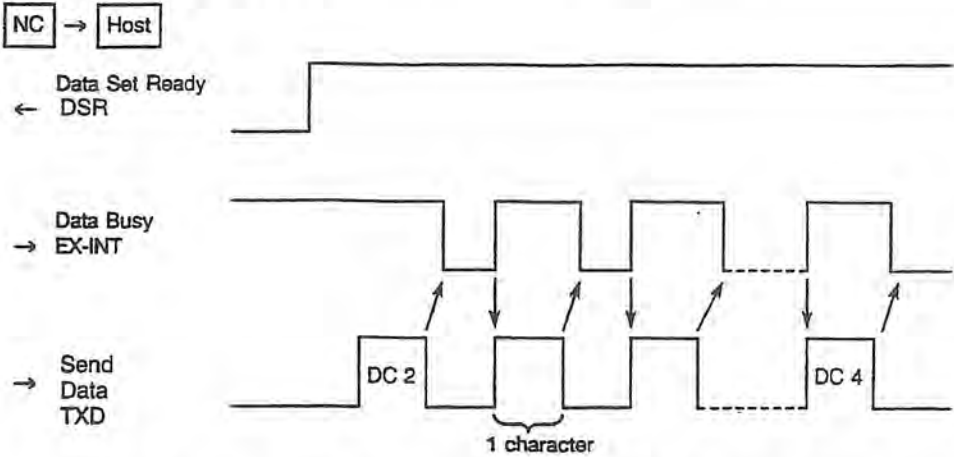
Example 2:



Download Mode Timing Charts:

The timing chart in this mode is identical to that given in Example 1.

Upload Mode Timing Charts



- NOTICE** :
- Since this example configuration uses the EX-INT signal, bit 1 of the optional parameter (bit) Nos. 12 through 15 for the "no EX-INT signal" mode must be set to 0.

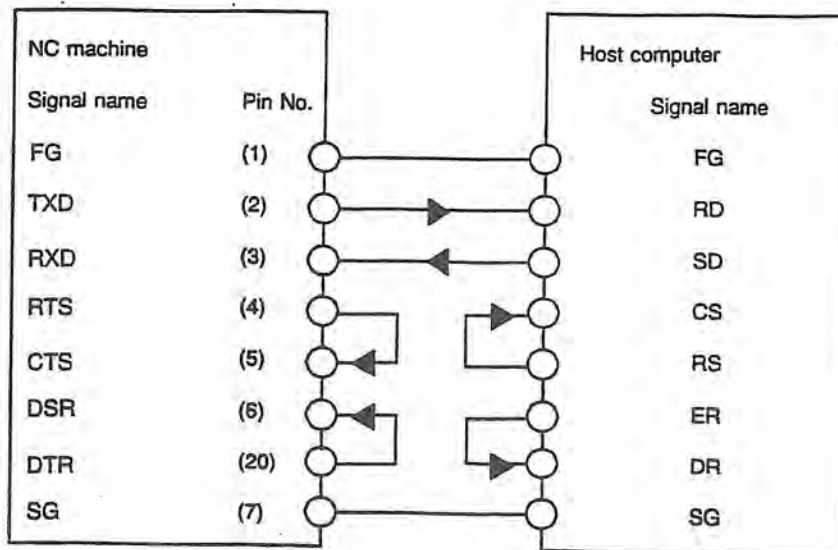
(3) DC Code Control Type 2

The DC code control type 2 configuration uses only DC codes to control data transfer between the host computer and a CNC machine through an RS232C interface. While the standard DC code control configuration allows only the CNC machine to generate DC codes, this configuration also allows the host computer to generate DC codes.

The CNC machine uses four device control codes (DC1, DC2, DC3, and DC4) and the host computer two codes (DC1 and DC3).

DC Code	NC Processing	Host Processing	Hexadecimal Expression of Code
DC1	Enables data read. (a) Initiates a read. (b) Resumes a read.	Enables data read. (a) Responds to DC2. (b) Resumes a read.	\$11
DC2	Placed before the transmitted data to request the host computer to receive the transmitted data.	/	\$12
DC3	Requests suspension of data transmission.	Requests suspension of data transmission.	\$93
DC4	Identifies the end of data transmission.	/	\$14

Sample Connection Diagrams



NOTICE

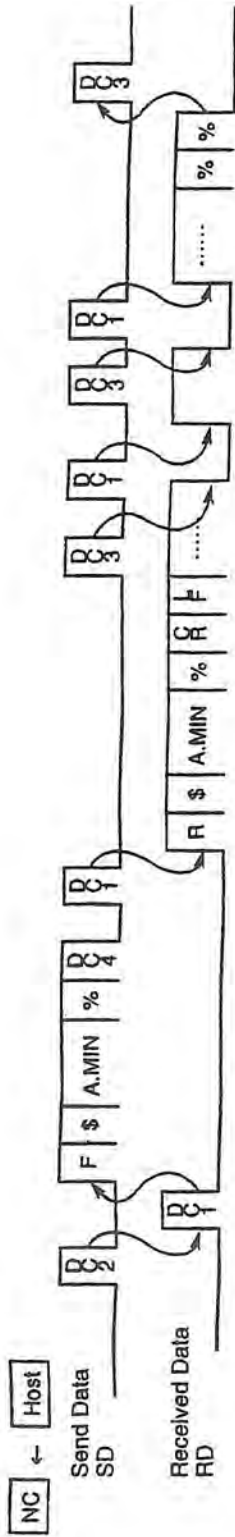
: Since this example configuration does not use the EX-INT signal, bit 1 of the optional parameter (bit) Nos. 12 through 15 for the "no EX-INT signal" mode must be set to 1.

a) Download mode time chart

1) When request filename output is not mode (the optional parameter (bit) No. 12 to 15, bit 7 set to 0)

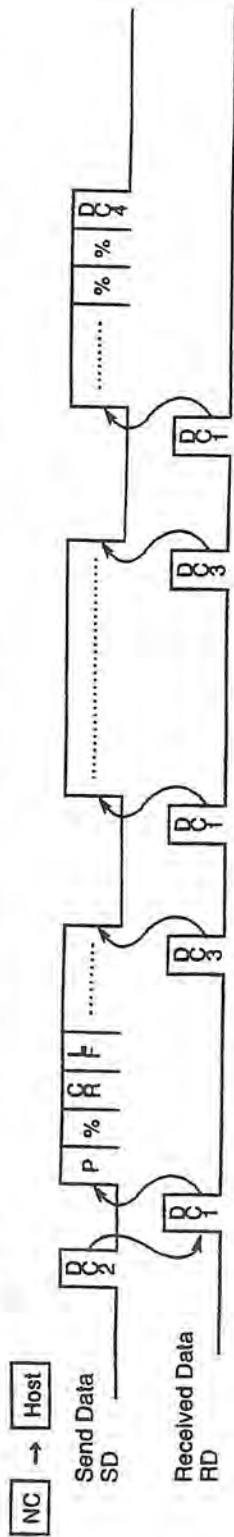
The same as DC code control.

2) When request filename output is mode (the optional parameter (bit) No. 12 to 15, bit 7 set to 1)

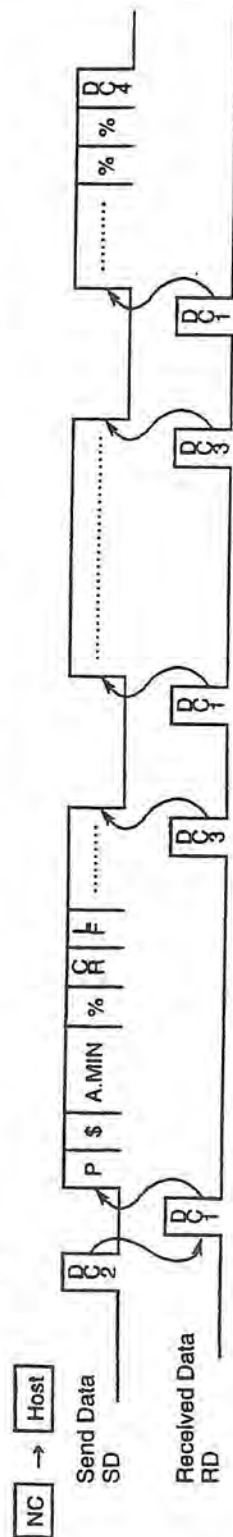


b) Upload mode time chart

1) When filename output is not mode (the optional parameter (bit) No. 2, bit 4 and 5 set to 1, or bit 4 sets to 1 and bit 5 sets to 0)



2) When filename output is mode (the optional parameter (bit) No. 2, bit 4 sets to 0 and bit 5 sets to 1, or bit 4 and 5 set to 0)



REVISION HISTORY

Manual Name : OSP7000L/700L MODEL U
ADDITIONAL FUNCTIONS
INSTRUCTION MANUAL

Manual No. : 4022-E
(EEL1-003-O**)

Edition	Date	Revision
(01)	February '95	First edition (not published)
(02)	March '96	<ul style="list-style-type: none">- Changing the data setting for chuck and tailstock spindle (optional parameter is not used any longer)- Warning sign is added.