OPERATING MANUAL

FOR

Mazak

MAZATROL CAM T-2

Introduction

This manual has been prepared for operators of the MAZATROL CAM T-2.

Initially, the manual provides an understanding of the functions of switches and other components on the operating panel, then it describes the procedures for operating in both manual and automatic operation modes.

First-time operators of NC lathes as well as those already experienced should acquaint themselves with the correct handling methods and procedures to permit full use to be made of the machine.

Observe the safety cautions for preventing injuries and accidents, machine breakdowns and other damage.

The MAZATROL CAM T-2 was developed by updating the advanced electronics of and introducing certain advanced machining know-how to the MAZATROL CAM T-1.

This fully electro-mechanical machine can be operated simply by push buttons.

Even an unskilled person may easily learn to program so that the time required for programming can be reduced to a minimum.

In addition, only simple preparations are required to make the machine ready to operate.

* Discrepancies may arise occasionally between the present Operating Manual and the actual machine because the latter may have been modified without notice.

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1. HANDLING PRECAUTIONS

This machine is provided with safety devices to prevent operators and itself from sustaining accidental damage. However, the operator should not rely too much on these but should read the following safety precautions before operating the machine.

1-1 Operating Precautions

(1) Before turning on the power

1) Clear the area and machine surfaces
2) Close oprating and control panel doors
3) Check smooth operation of levers, switches, etc.

(2) Power

1) Turn on the power by the main breaker and the operating panel switch in that order. When switching off, turn off the operating panel and main breaker in that order.
2) Check that the READY light comes on when the power button on operating panel is pressed.
3) If the power should fail, immediately turn off the main breaker.
4) Always switch off the main breaker when leaving machine after operating.

(3) Lubrication

1) Check that lubricant is provided at all supply poits. (Oil supply points, oil types and quantities are given on the name plate.)

(4) Operation

1) Check all operation controls for proper function according to the Operating Manual.

2) Check all readings.

(5) Stopping

Press the following switches when stopping the machining operation.

a) EMERGENCY STOP button
b) RESET key
c) FEED HOLD key
d) Key for manual operation mode
e) Power off key

(6) Operating safety precautions

1) Always wear safety shoes, working cap, safety glasses, etc.
2) Always use only the recommended operating fluids and lubricating oils or equivalents.
3) Securely chuck the work.
4) Always use the safety covers (cutting chip cover, chuck cover, etc.)
5) Be sure to close front door before operating.
6) Perform a trial operation after setting the tool.
7) Never handle cutting chips, tool tips, etc. with the bare hands.
8) Do not remove cutting chips or touch anything that is turning with the bare hands or anything else when operating the machine.
9) Do not wear gloves when pressing push button switches.
10) Put tools in order and constantly secure foothold and passage.
11) Keep the machine clean.
12) Be careful of high voltage.
13) Do not touch switches with wet hands.
14) Use only the prescribed fuses.

15) Turn off the main breaker when replacing a fuse.
16) Electrical failures must be repaired by a qualified electrical maintenance person.

(7) Safety devices

The machine is equipped with the following safety devices.

1) Front cover, back cover
2) X- and Z-axis overtravel limit switches
3) Chuck, tail and tool barriers
4) Stored stroke limit
5) Emergency stop push button switch

1-2 Precautions when lubricating after a long shutdown

During the first operation after unpacking the machine or after long periods of disuse, be sure to pull the handle of slideway lubrication pump sevral times and see that oil comes out onto the slideway.
Note: Do not push the plunger.

1-3 Precautions for cutting fluids

(1) Clean the oil pan or subtank filter at least once a week.

(2) Replace cutting fluids at proper intervals.

(3) Check the levels of the cutting fluids before operating.

1-4 Precautions when the READY light is off

Positioning is incorrect when the move command is given before the READY light comes on. Deviations can occur in the rapid feed, jog feed, handle feed and zero return. Perform the zero return carefully particularly after turning on the power or after correcting an emergency or overtravel limit stop.

1-5 Warm-up

Abnormal machine wear or trouble such as inaccurate work can occur due for example to insufficient oil on the slideway or due to the thermal expansion of machine sections such as when machining operations are begun immediately after long stoppages. Warm-up prevents trouble such as abnormal slideway wear and stock slippage. Adequate warm-up stabilizes thermal expansion and insures the high-accuracy manufacture of uniform work.

Be sure to warm-up the machine before starting the operation each day. Special care is necessary in low-temperature areas.

Warm-up Specifications:

(1) Time: about 15 min.

(2) Spindle rpms: 500 rpm → 1000 rpm →, ax.

(3) Move stroke: full for all axes

(4) Command is given for turret swing operation, etc. also.

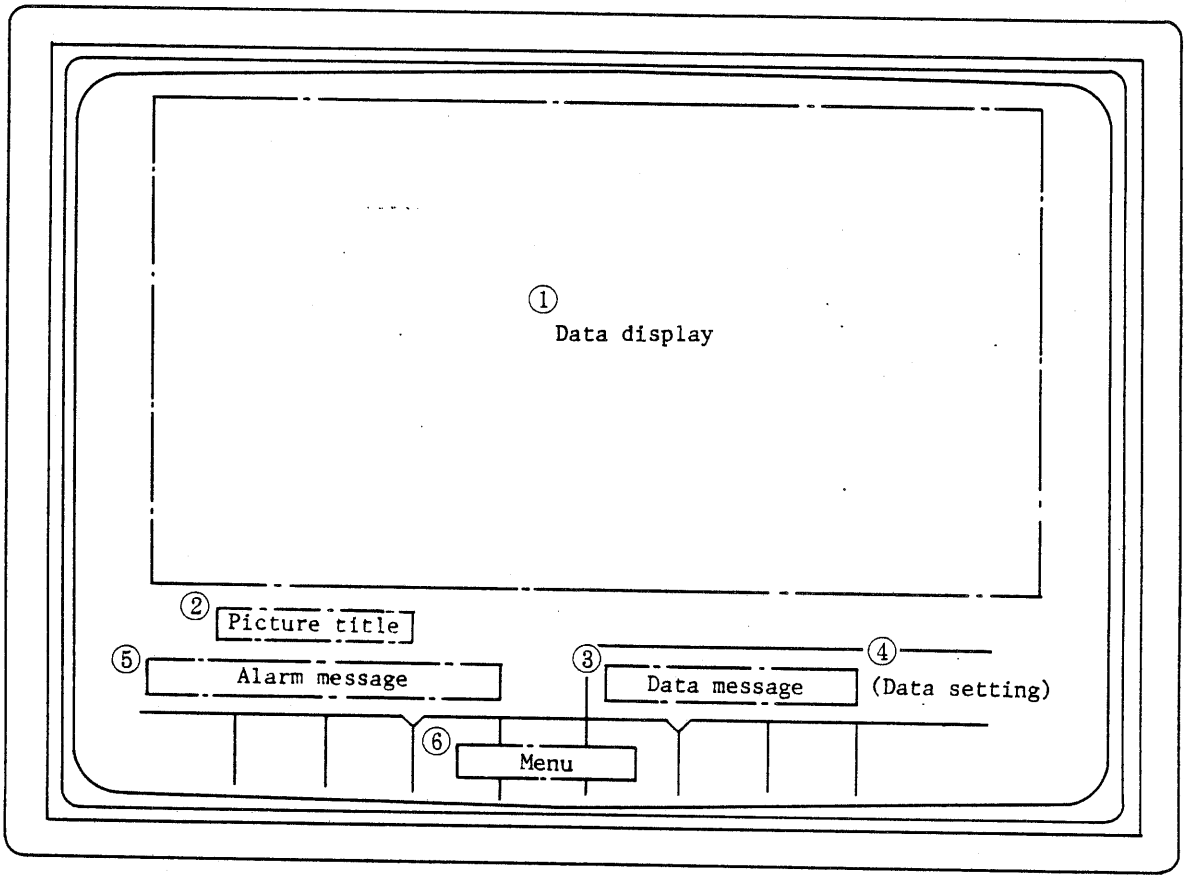
Note: Check the motion of various sections, their lubricating condition during warm-up.

2. OPERATING PANEL

2-1 Front View

For the drawing, see the folded leaf at the end of this manual.

2-2 CRT Screen



(1) Data display

Display of set data and data title.

(2) Picture title

The selected picture title.

(3) Data setting message

Questions to induce the data to be set appear here.

(4) Data setting

The data induced by a message appear here.

(5) Alarm message

The contents of alarm are indicated.

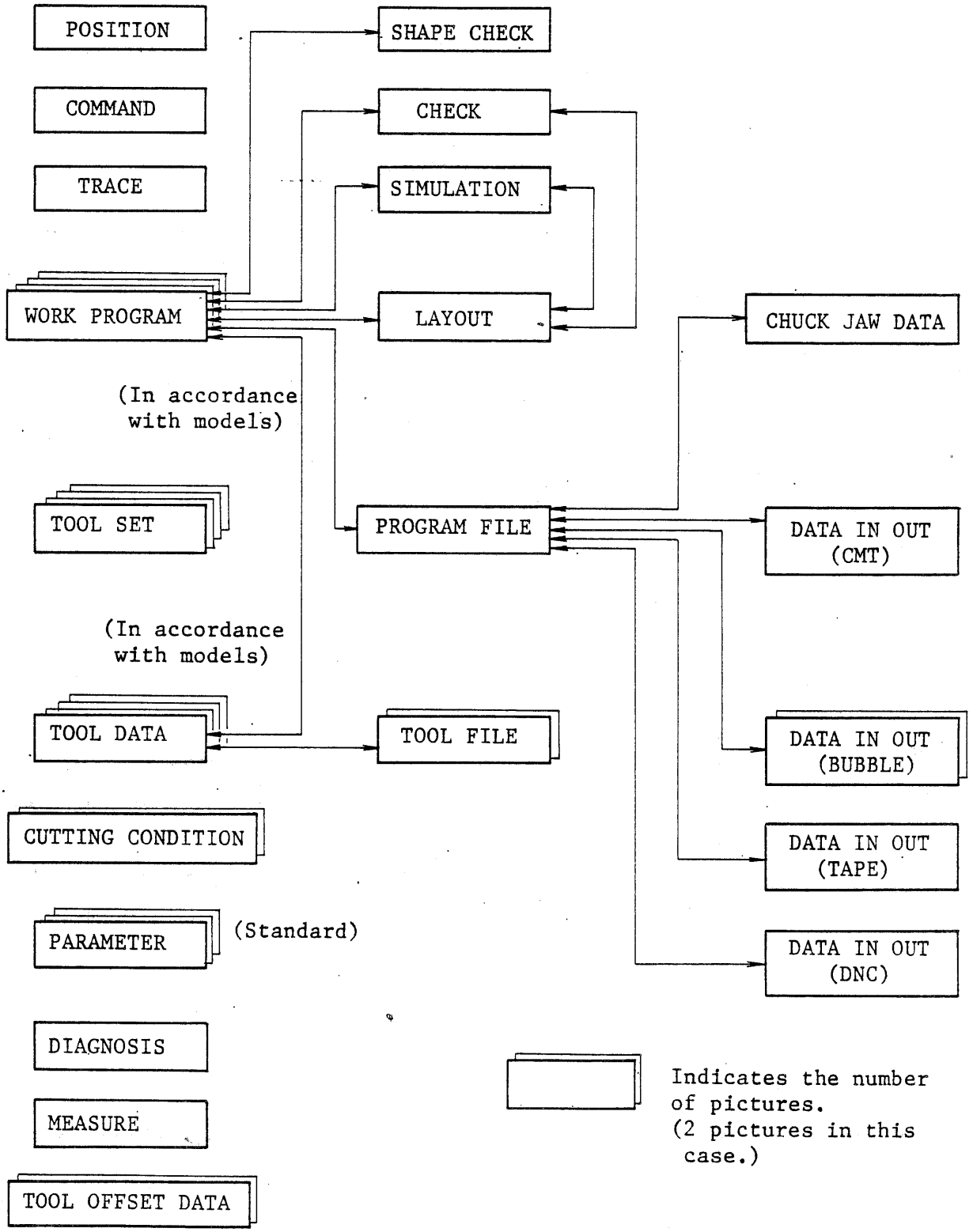
They are indicated at the upper left of screen on the DIAGNOSIS picture.

(6) Menu

The message to select a picture or a function appears here.

2-2-0 A word

Familialize yourself with the respective names of the pictures in use and their relations before entering into detail.



2-2-1 POSITION Picture

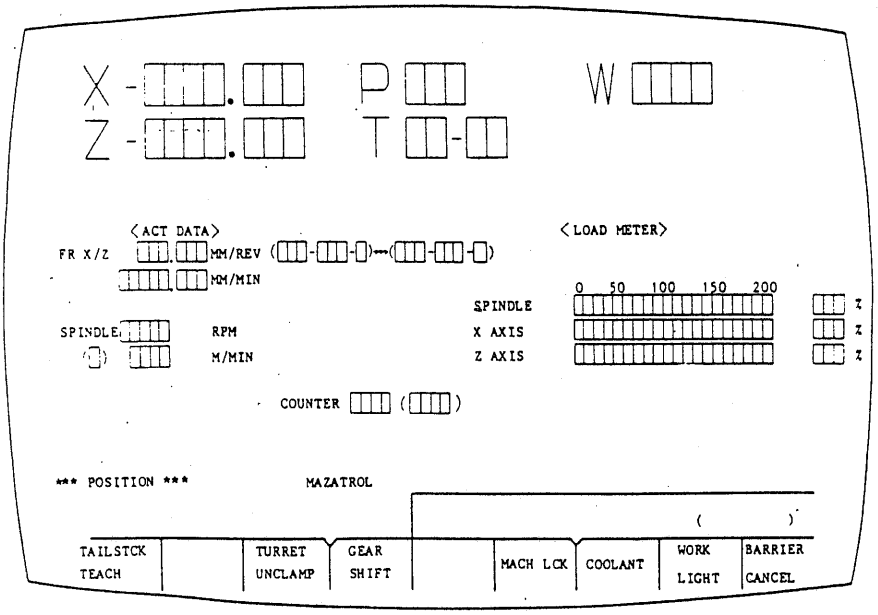
Functions

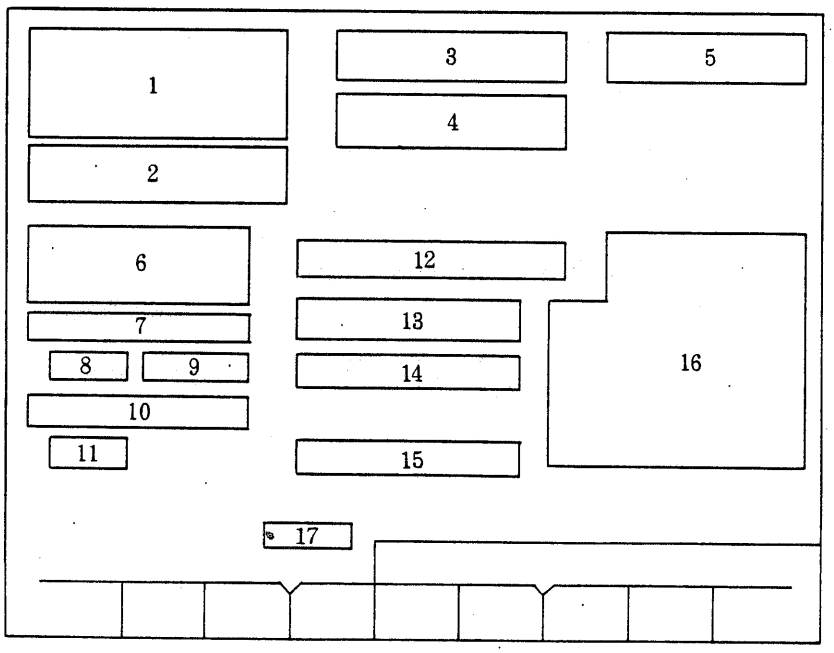
(1) To display operating conditions

(2) To start up the automatic operation

(3) To reset the parts counter and workpiece coodinates

(4) To change the gear





Note: Nos. in ☐ are correspondent to display data Nos. on the following pages.

Display data of POSITION picture

No.	Data Designation	Unit	Description
1	X, Z	mm (inch)	Current position of tool tip in the turret in the workpiece coordinate system
2			
3	P	-	Running machining process number
4	T	-	Indexing tool number and compensation number
5	W	-	Running workpiece number
6	FR X/Z	mm/rev (inch/rev) mm/rev (inch/rev)	Command feedrate (X, Z composite speed)
7	SPINDLE	rpm	Spindle speed
8		—	Selected gear number
9		m/min (ft/min)	Surface speed (=0 when revolutions are commanded)
10			
11		-	Selected gear number
12	PROCESS	-	Machining processes in execution and scheduled to be executed, machining part, and selection of rough/finish machining
13			
14			
15	COUNTER	-	Number of workpieces already machined and set number
16	(LOAD METER) SPINDLE	%	Main spindle drive motor load capacity, with 30 minutes' rating equivalent to 100%
	(LOAD METER) X-AXIS	%	X axis servo motor load capacity, with 30 minutes' rating equivalent to 100%

No.	Data Designation	Unit	Description
	(LOAD METER) Z-AXIS	%	Z-axis servo motor load capacity, with 30 minutes' rating equivalent to 100%
17	MAZATROL ↕ EIA/ISO	-	Distinction of coding system of the program being executed, MAZATROL or EIA/ISO

* 1 ..... ATC specification only.

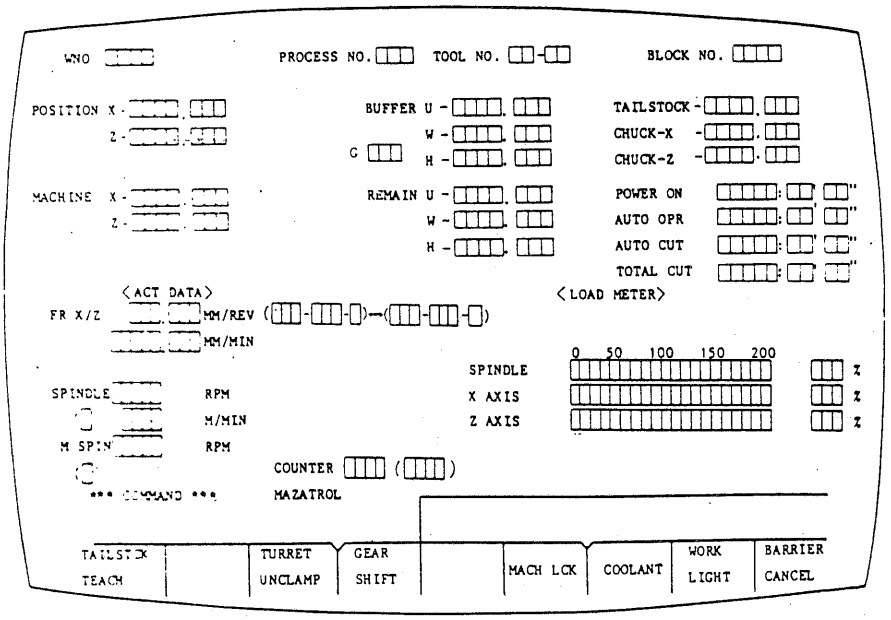
2-2-2 COMMAND Picture

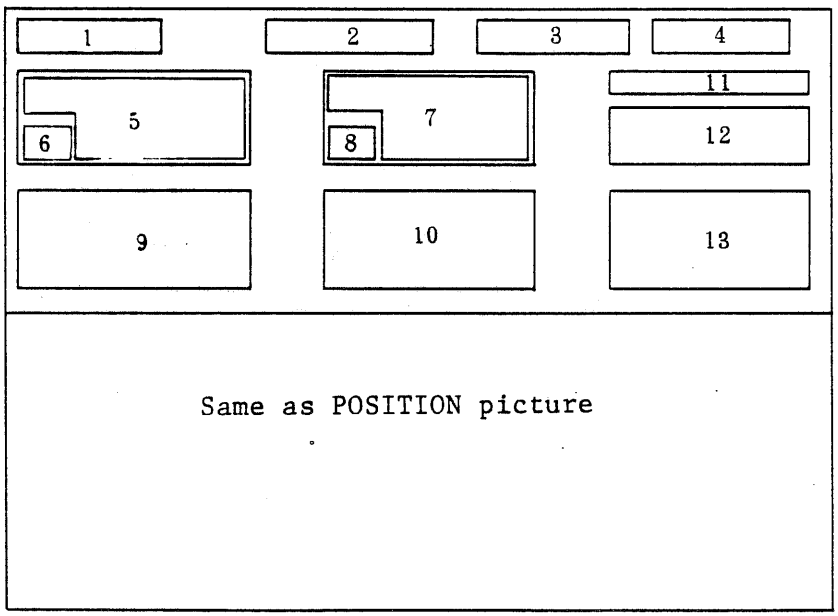
Functions This picture has the following functions in addition to those of the POSITION picture:

(1) To display operating conditions in detail

(2) To notify the tip position of the tailstock and

(3) To reset an accumulated run-hour meter.





Note: Nos. in [ ] are correspondent to display data Nos. on the following pages.

Display data of COMMAND picture

No.	Data Designation	Unit	Description
1	WNO.	-	Same as W on the POSITION picture
2	PROCESS NO.	-	Same as P on the POSITION picture
3	TOOL NO.	-	Same as T on the POSITION picture
4	BLOCK NO.	-	Running block number
5	POSITION X	mm (inch)	Same as X on the POSITION picture
	POSITION Z	mm (inch)	Same as Z on the POSITION picture
6	POSITION G	-	G code currently executed
7	BUFFER U	mm (inch)	X-axis traval in the block to be executed next (incremental)
	BUFFER W	mm (inch)	X-axis travel in the block to be executed next (incremental)
8	BUFFER G	-	G code to be executed in the next block
9	MACHINE X	mm (inch)	Actual position of tool in the machine coordinate system
	MACHINE Z	mm (inch)	Actual position of tool in the machine coordinate system
10	REMAIN U	mm (inch)	Remaining distance of axis movement command presently executed
	REMAIN W	mm (inch)	Remaining distance of axis movement command presently executed
11	TAIL STOCK	mm (inch)	Tailstock reference position from reference program zero

No.	Data Designation	Unit	Description
12	CHUCK-X	mm (inch)	Chuck reference position X from reference program zero
	CHUCK-Z	mm (inch)	Check reference position Z from reference program zero
13	POWER ON	hr/min/ sec.	Accumulated power on time
	AUTO OPR	hr/min/ sec.	Accumulated automatic operation mode time
	AUTO CUT	hr/min/ sec.	Accumulated cycle operation time (CYCLE START light on) (Note 2)
	TOTAL CUT	hr/min/ sec.	Accumulated cutting time (G01, G02, G03, G32)

Note 1: A series of minimum units that can be executed with the single step operation is defined as "one block". M code, etc., which does not appear externally, is also treated as "one block".

Note 2: The time during feed hold stop or single step stop is not counted.

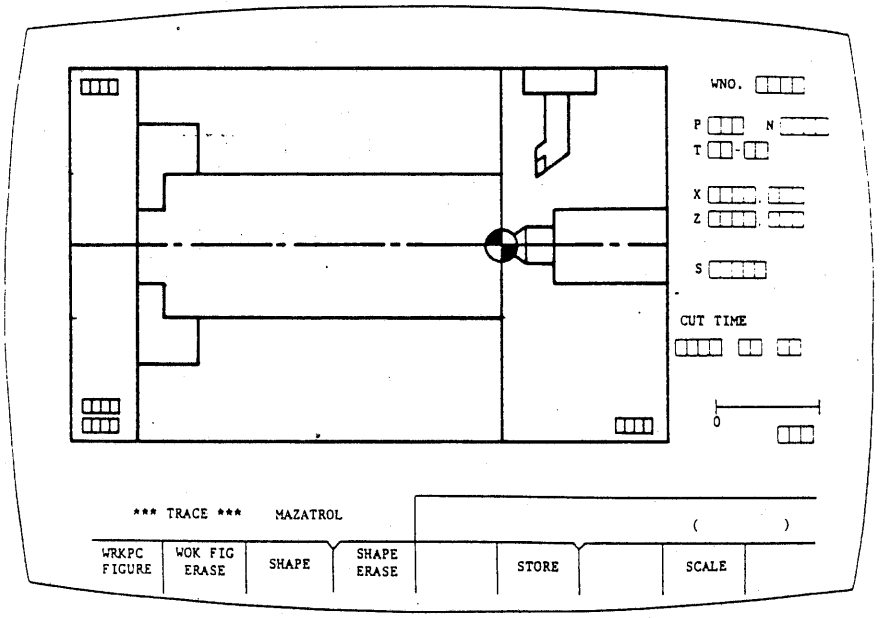
2-2-3 TRACE Picture

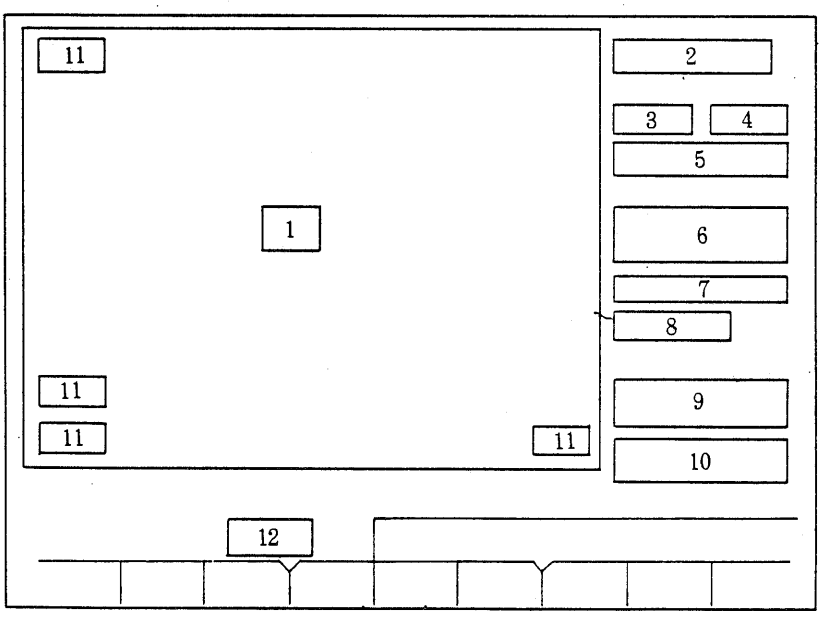
Functions

(1) To provide a synchronous display of operating conditions

(2) To determine the automatic operation hours

(3) To start the automatic operation





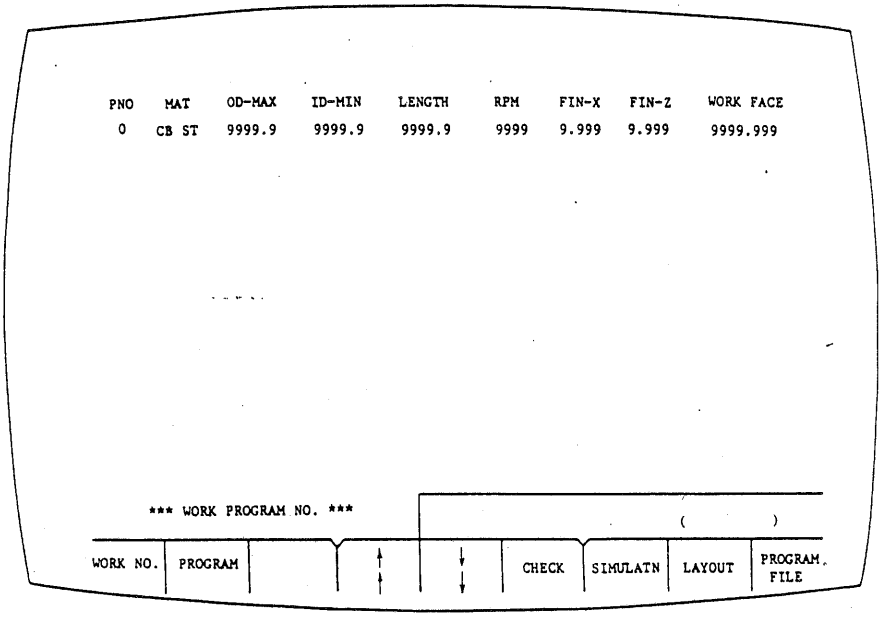
Note: Nos. in [ ] are correspondent to display data Nos. on the next page.

Display data of TRACE picture

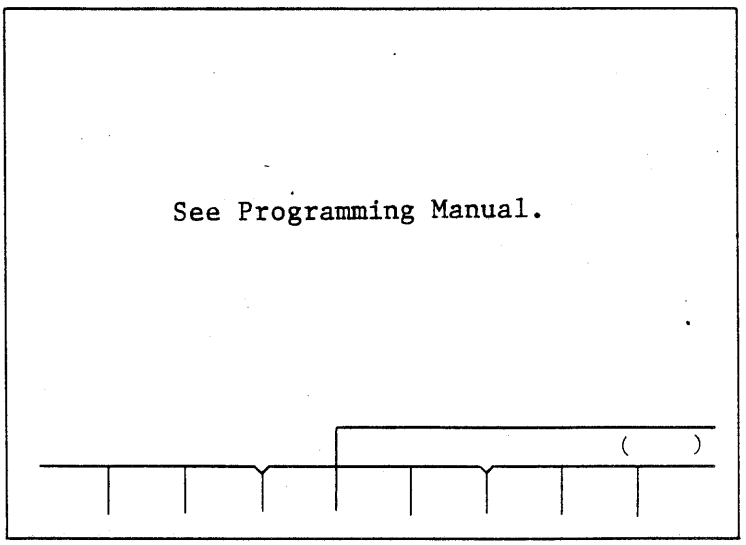
No.	Data Designation	Unit	Description
1	(Chuck)		Chuck shape
	(Blank)		To be displayed depending on a change in the shape with machining in progress
	(Shape)		Machining shape defined in program
	(Tool)		Position changes according to the move of Turrets 1 and 2.
	(Program zero point)		Display pattern zero point (program zero point)
	(Tailstock)		Tailstock shape/position
2	WNO.	-	Running workpiece number
3	P	-	Running machining process number
4	N	-	Running block number
5	T	-	Indexing tool number and compensation number
6	X, Z	mm (inch)	Current position of a tool in the workpiece coordinate system (diameter value for X)
7			
8	S	rpm	Spindle speed
9	CUT TIME	hr/min/sec	Automatic machining time
10		mm (inch)	Value of scale in a display pattern
11		mm (inch)	Display limit value
12	MAZATROL ↕ EIA/ISO	-	Distinction of coding system of the program being executed, MAZATROL or EIA/ISO.

2-2-4 WORK PROGRAM Picture

Function (1) To prepare and edit source programs

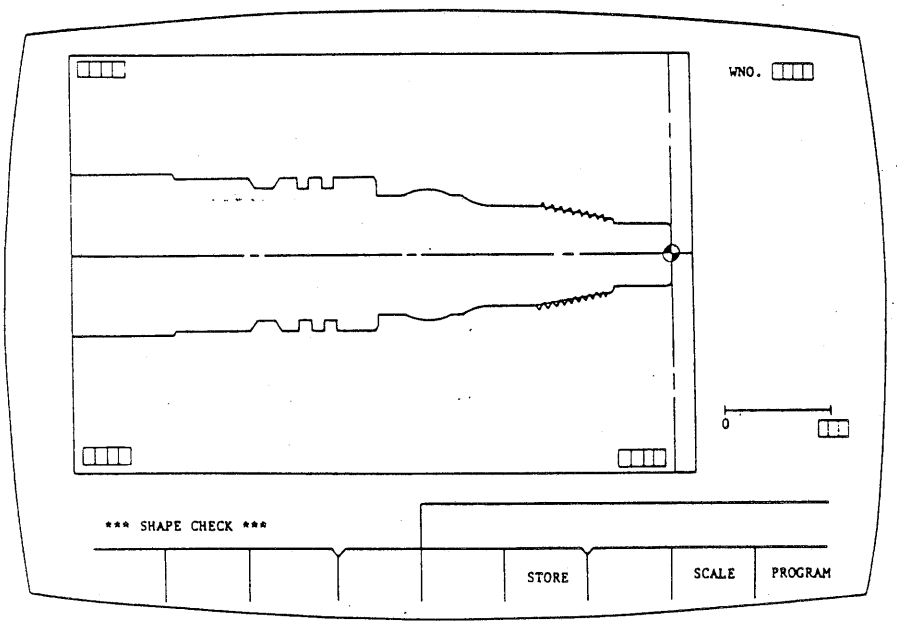


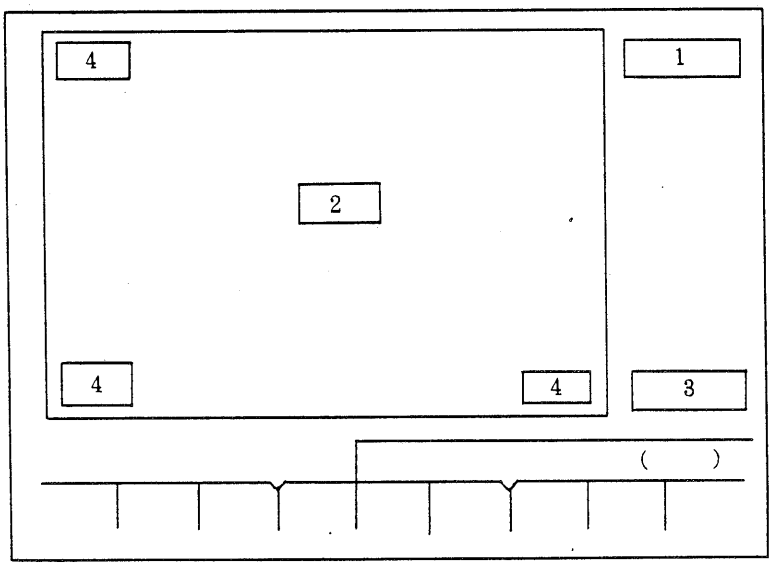
Note: The figures on the picture indicate the maximum values of the setting range (unit: mm).



2-2-5 SHAPE CHECK Picture

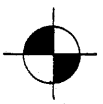
Function (1) To show the shape of a graphic being selected on the PROGRAM picture.





Note: Nos. in ☐ are correspondent to display data Nos. on the next page.

Display data of SHAPE CHECK picture

No.	Data Designation	Unit	Description
1	WNO.	-	Workpiece number of the program to be checked
2	(Blank)		Shape of a blank
	(Shape)		Machining shape defined in a program
	(Program zero point)		 Graphic zero point (program zero point)
3		mm (inch)	Scale value of a graphic displayed
4		mm (inch)	Limit value displayed

2-2-6 PROGRAM FILE Picture

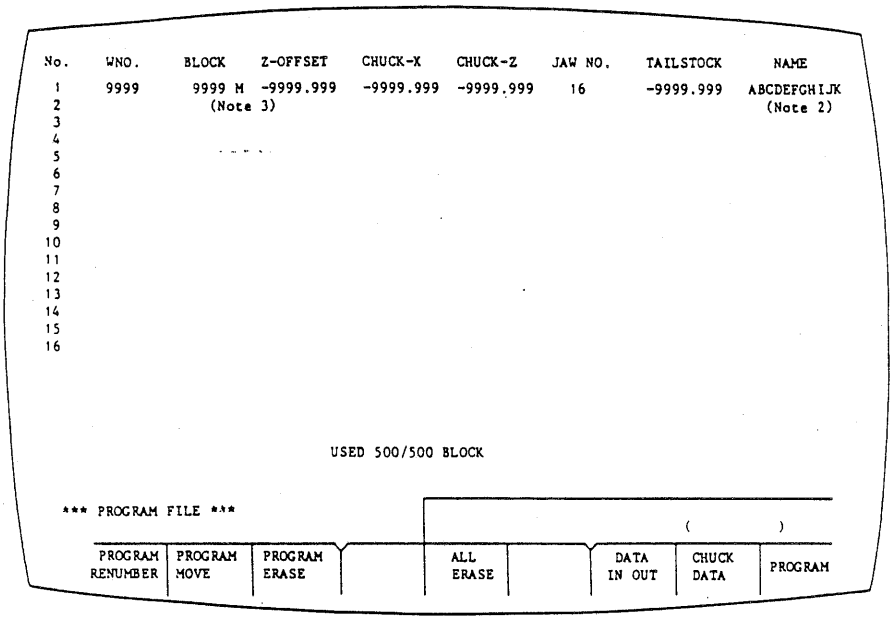
Functions

(1) To display a list of programs stored in memory

(2) To display the registration capacity

(3) To display and set a zero point offset in relation to a reference workpiece

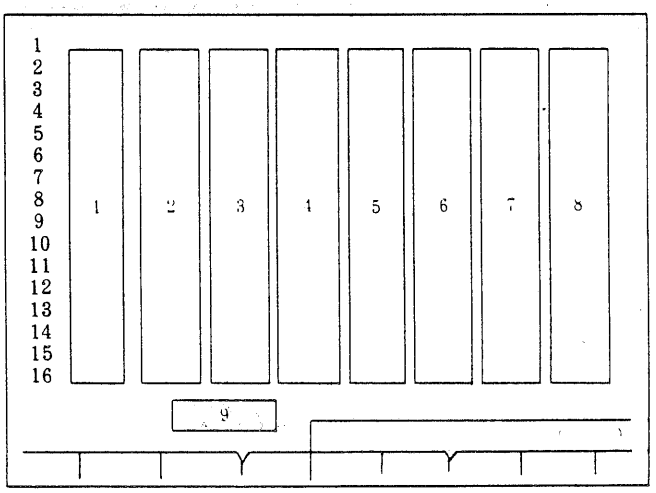
(4) To display and set a chuck barrier reference point



Note: 1. The figures on the picture indicate the maximum values of the setting range (unit: mm).

2. ABCDEFGHIJK indicate the maximum number of characters.

3. M is an abbreviation of MAZATROL program while E is an abbreviation of EIA/ISO program.



Note:

Nos. in ☐ are correspondent to display data Nos. on the next page.

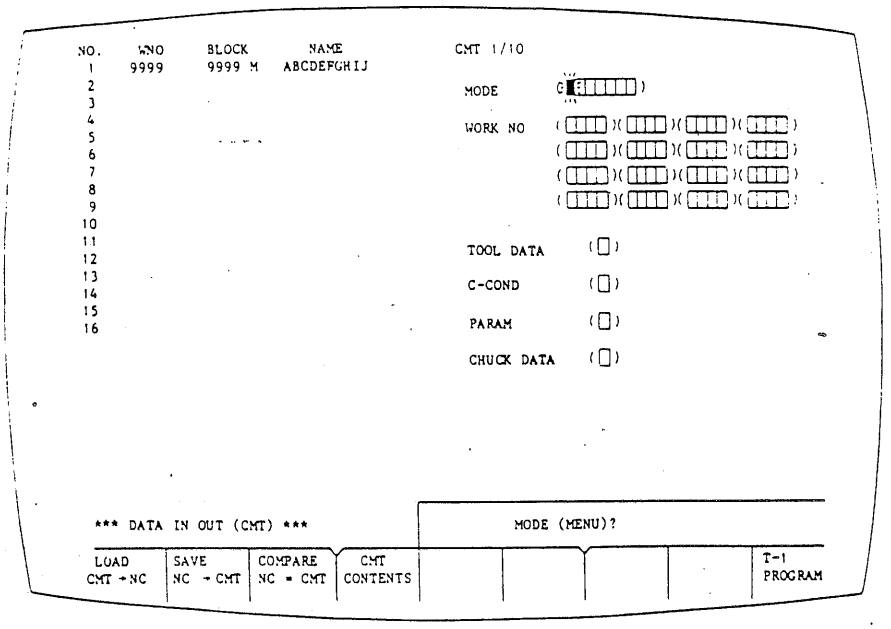
Diaplay data of PROGRAM FILE picture

No.	Data Designation	Unit	Description
1	WNO.	-	A separate number (1 thru 9999) given to each program
2	BLOCK	-	Progrm size applicable to each program
3	Z-OFFSET	mm (inch)	Z-axis difference of zero point between reference workpiece and program
4	CHUCK-X	mm (inch)	Positon -X of chuck jaw reference point, with workpiece in the chuck
5	CHUCK-Z	mm (inch)	Position -Z of jaw reference point, with workpiece in the chuck
6	JAW NO.	-	Working jaw number (with jaws controlled on the CHUCK JAW DATA picture)
7	TAILSTOCK	mm (inch)	Tailstock spindle projection amount
8	NAME	-	When not in use, keep setting at 0. A character string or code arbitrarily defined by the operator to facilitate program identification
9	USED	Block	Total number of blocks in programs registered (Fixed character 500 represents the limit of blocks registered.)

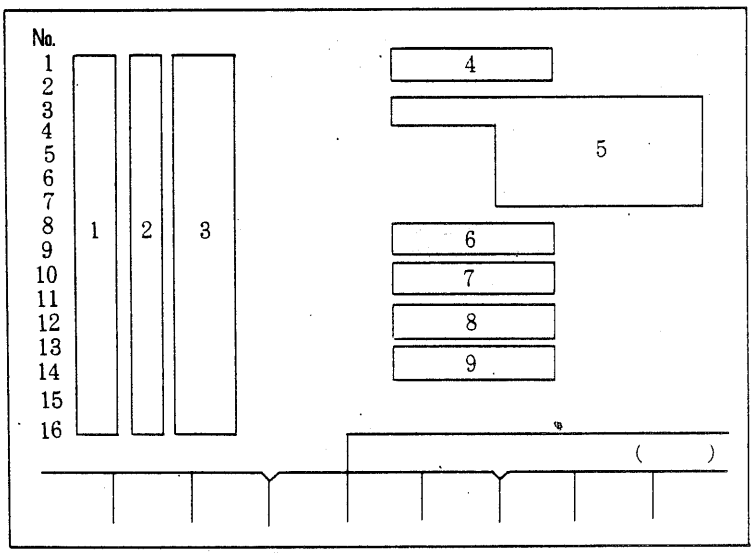
2-2-7 DATA IN OUT (CMT) Picture : Optional

Function (1) To sure and load following information to and from cassette tape.

- Programs stored in memory
- Data necessary for execution and reproduction of programs



Note: The fitures on the picture indicate the maximum values of the setting range.



Note: Nos. in ☐ are correspondent to display data Nos. on the next page.

Display data of DATA IN OUT (CMT) picture

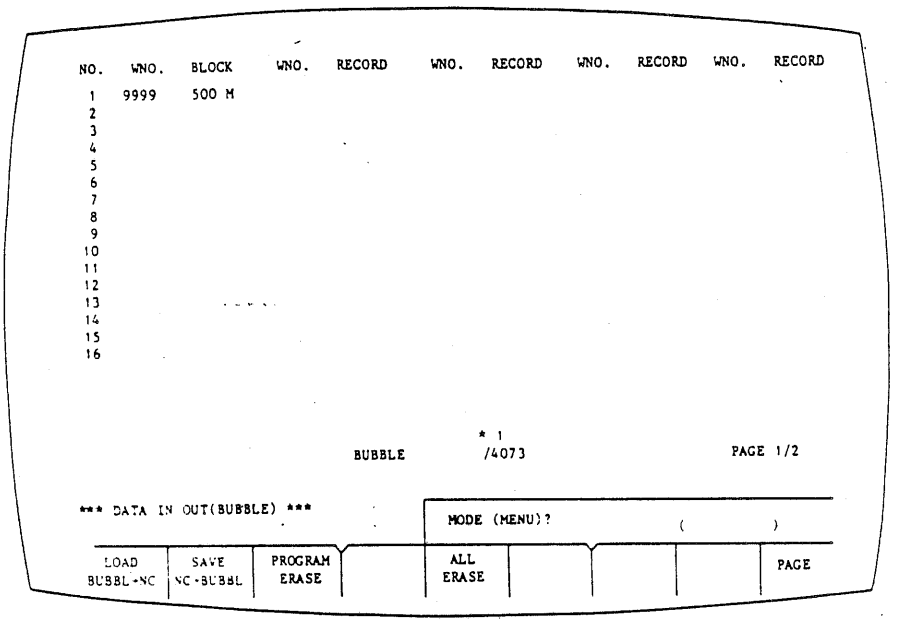
No.	Data Designation	Unit	Description
1	WNO.	-	Individual numbers from 1 to 999999 may be given to programs
2	BLOCK.	-	Program size employed in each program
3	NAME	-	Names assigned to individual programs
4	MODE	-	Data transfer method
5	SOURCE PROGR	-	Workpiece number of the program to be transferred Number of programs entered: 16
6	TOOL DATA	-	Are the data on each of TOOL SET, TOOL DATA, TOOL FILE and TOOL OFFSET DATA pictures to be transferred? (1: YES and 0: No)
7	C-COND	-	Are the data on the CUTTING CONDITION picture to be transferred? (1: YES and 0: NO)
8	PARAM	-	Are the data on four PARAMETER pictures to be transferred? (1: YES and 0: NO)
9	CHUCK DATA	-	Are the data on the CHUCK JAW DATA picture to be transferred? (1: YES and 0: NO)

2-2-8 DATA IN OUT (BUBBLE) Picture: Optional

Functions

(1) To display the programs stored in the bubble memory.

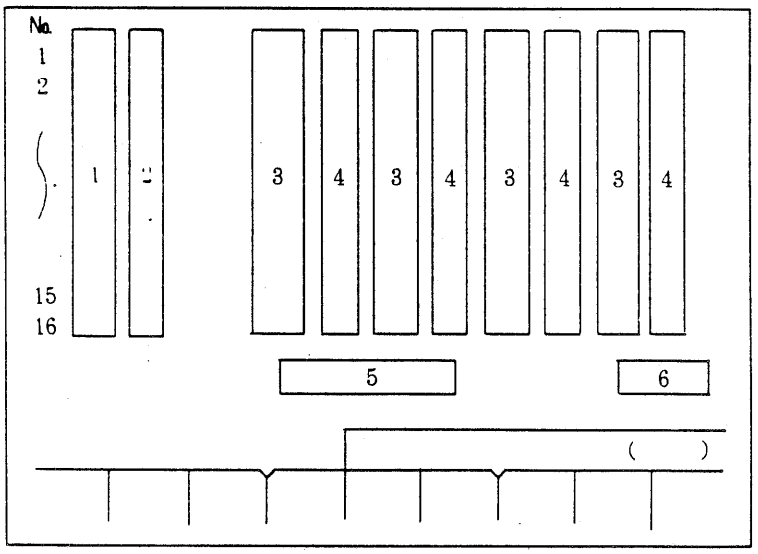
(2) To erase any or all programs in the bubble memory.



Note: The figures on the picture indicate the maximum values of the setting range.

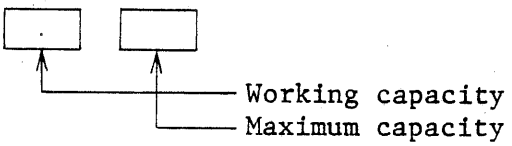
M means a program prepared by MAZATROL.

* 1 : Subject to change depending on the bubble capacity.



Note: Nos. in ☐ are correspondent to display data Nos on the next page.

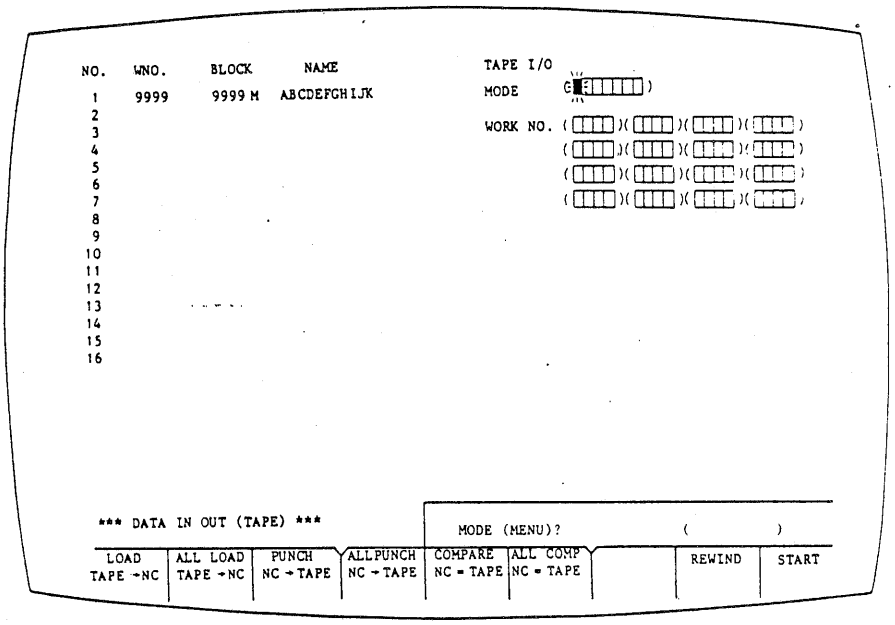
Display data of DATA IN OUT (BUBBLE) picture

No.	Data Designation	Unit	Description
1	WNO.	-	Workpiece numbers for programs stored in the ordinary memory
2	BLOCK	-	Program size employed in each program
3	WNO.	-	Workpiece numbers for the programs stored in the bubble memory
4	RECORD	-	Record number of the bubble memory employed in each program
5	BUBBLE	-	Working condition of bubble memory 
6	PAGE (Note 1)	-	Display page number

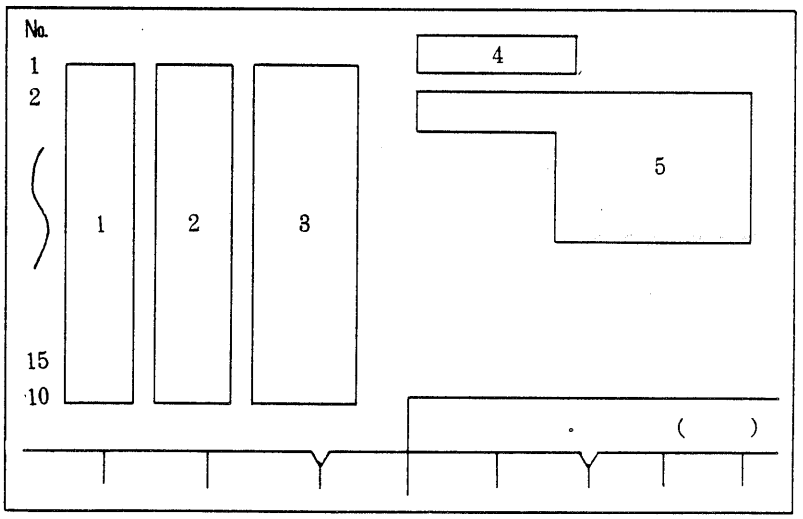
Note 1: The picture has two pages. To display the other page, select the menu PAGE.

2-2-9 DATA IN OUT (TAPE) Picture: Optional

Function (1) Storing in and takeout from the paper tape of EIA/ISO program which is being registered.



Note: The figures on the picture indicate the maximum values of the setting range.

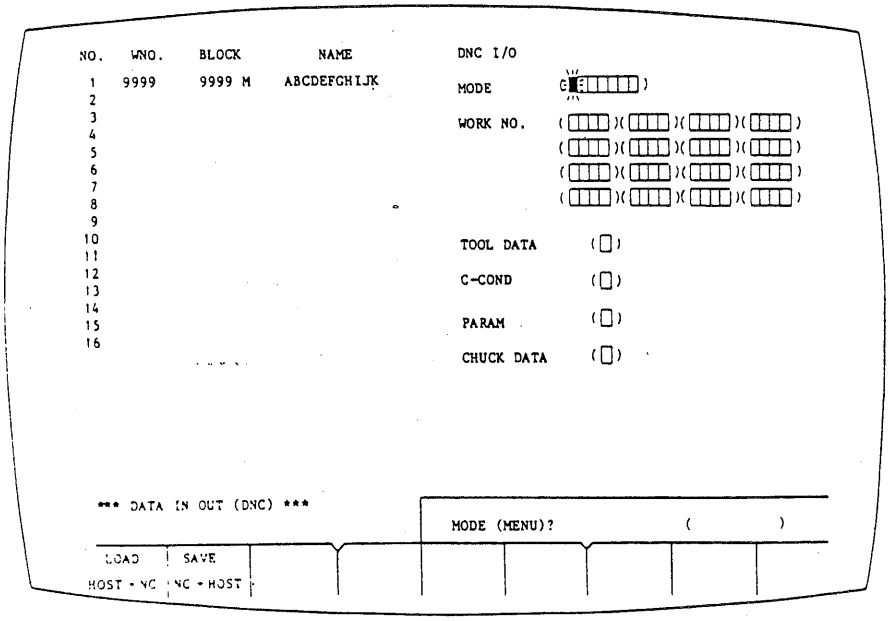


Note: Nos. in ☐ are correspondent to display data Nos. on the next page.

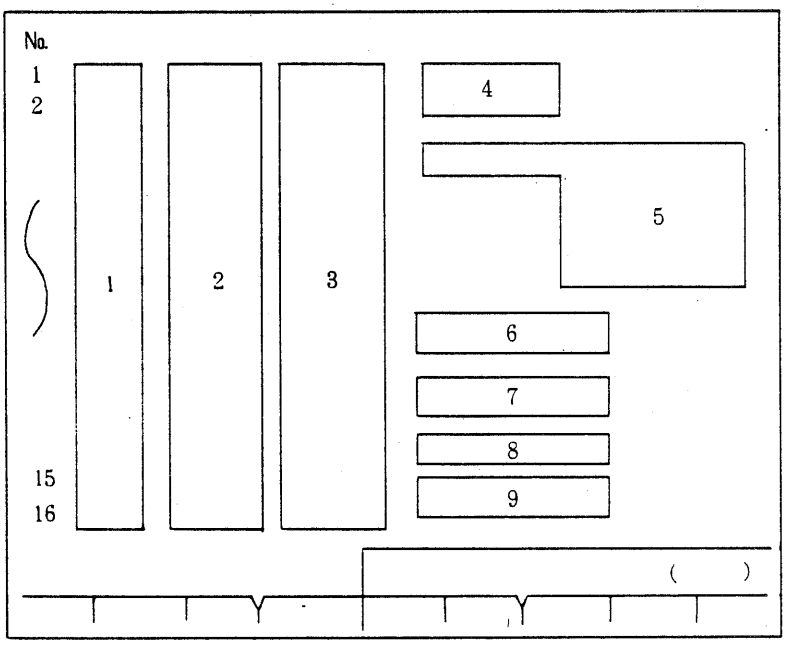
Display data of DATA IN OUT (TAPE) picture

No.	Data Designation	Unit	Description
1	WNO.	-	Individual numbers given to programs
2	BLOCK	-	Program size employed in each program
3	NAME	-	Names assigned to individual programs
4	MDOE	-	Data transfer method
5	SOURCE PROGR	-	Workpiece number of the program to be transferred. Sixteen programs can be set.

2-2-10 DATA IN OUT (DNC) Picture: Optional



Note: The figures on the picture indicate the maximum values of the setting range.



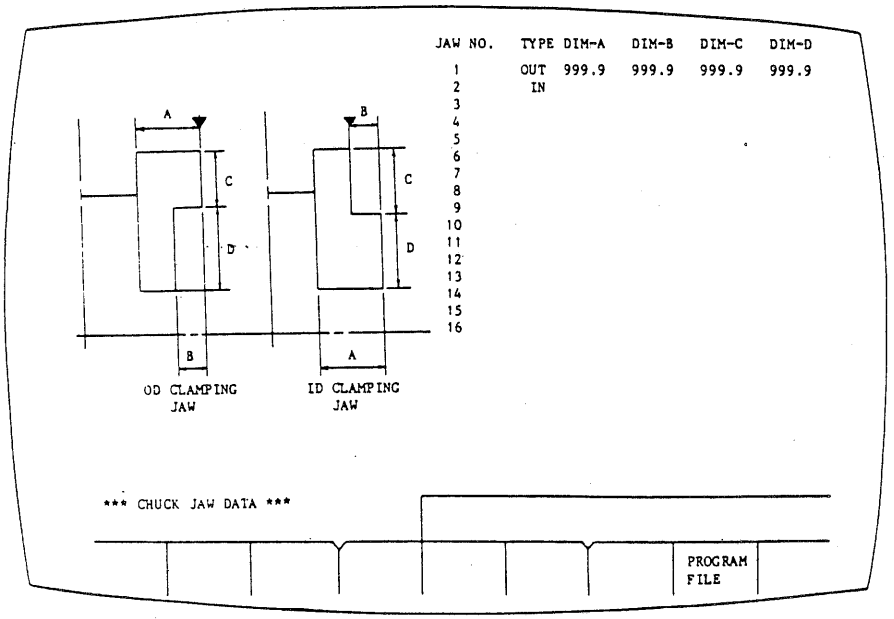
Note: Nos. in ☐ are correspondent to display data Nos. on the next page.

Display data of DATA IN OUT (DNC) picture

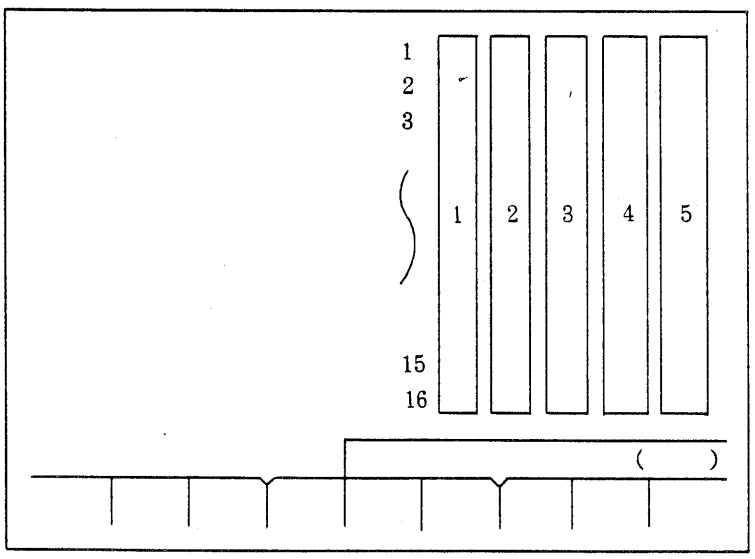
No.	Data Designation	Unit	Description
1	WNO.	-	Individual numbers given to programs
2	BLOCK	-	Program size employed in each program
3	NAME	-	Names assigned to individual programs (display of up to 11 characters possible)
4	MODE	-	Data transfer method
5	SOURCE PROGR	-	Workpiece number of the program to be transferred Number of programs entered: 16
6	TOOL DATA	-	File number of the data on each of TOOL SET, TOOL DATA, TOOL FILE and TOOL OFFSET DATA pictures to be transferred (0 to 99)
7	C-COND	-	File number of the data on the CUTTING CONDITION picture to be transferred (0 to 99)
8	PARAM	-	File number of the data on four PARAMETER pictures to be transferred (0 to 99)
9	CHUCK DATA	-	File number of the data on the CHUCK JAW DATA picture to be transferred (0 to 99)

2-2-11 CHUCK JAW DATA Picture

Function (1) To manage 16 types of chuck (jaw) data.



Note: The figures on picture indicate the maximum values of the setting range (unit: mm).



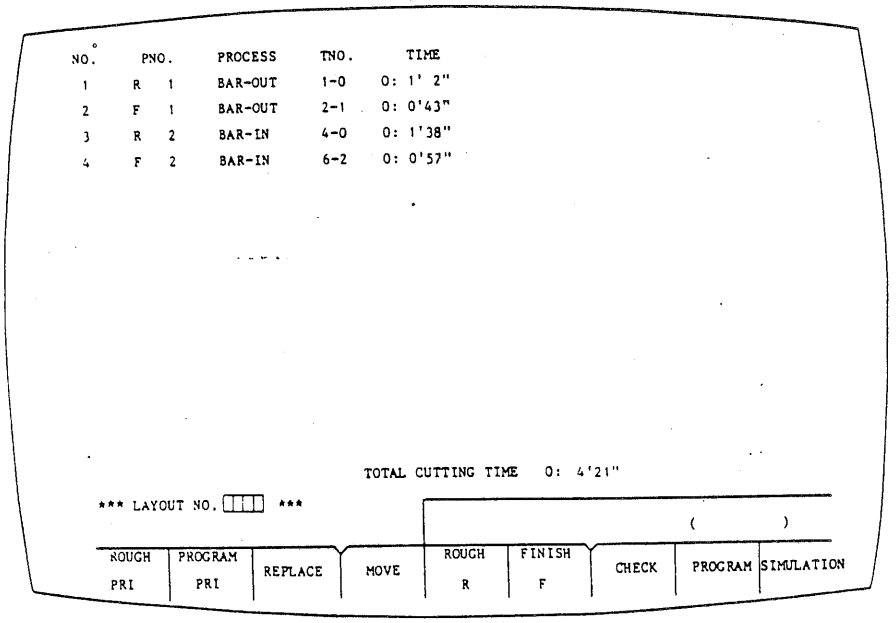
Note: Nos. in ☐ are correspondent to display data Nos. on the next page.

Display data of CHUCK JAW DATA picture

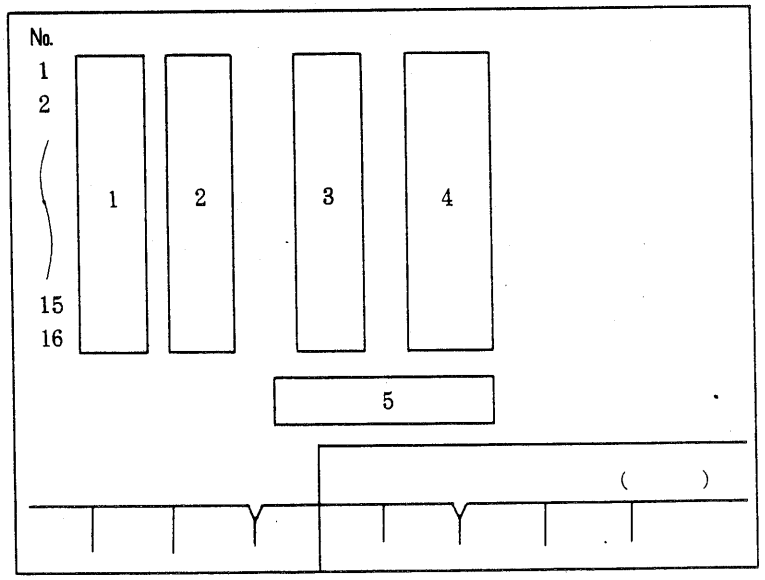
No.	Data Designation	Unit	Description
1	TYPE	-	External jaw (OUT)/Internal jaw (IN)
2	DIM-A	mm (inch)	Jaw length A (See display.)
3	DIM-B	mm (inch)	Jaw length B (See display.)
4	DIM-C	mm (inch)	Jaw length C (See display.)
5	DIM-D	mm (inch)	Jaw length D (See display.)

2-2-12 LAYOUT Picture

Function (1) To edit processes

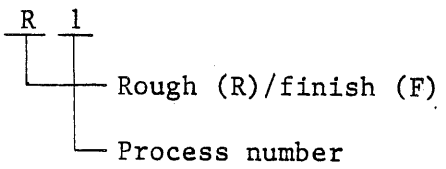
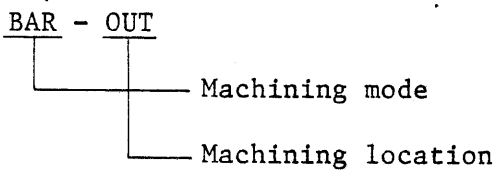


Note: Figures on the above picture are examples.



Note: Nos. in [ ] are correspondent to display data Nos. on the next page.

Display data of LAYOUT picture

No.	Data Designation	Unit	Description
1	PNO.	-	Machining process number 
2	PROCESS	-	Process machining 
3	TNO.	-	Machining tool number and compensation number
4	TIME	hr/min/sec	Cutting time for each process in a program (Note 1)
5	TOTAL CUTTING TIME	hr/min/sec	Cutting time for all processes (Note 1)

Note 1: These data will be displayed by executing simulation. They are not displayed by a mere preparation of a new program.

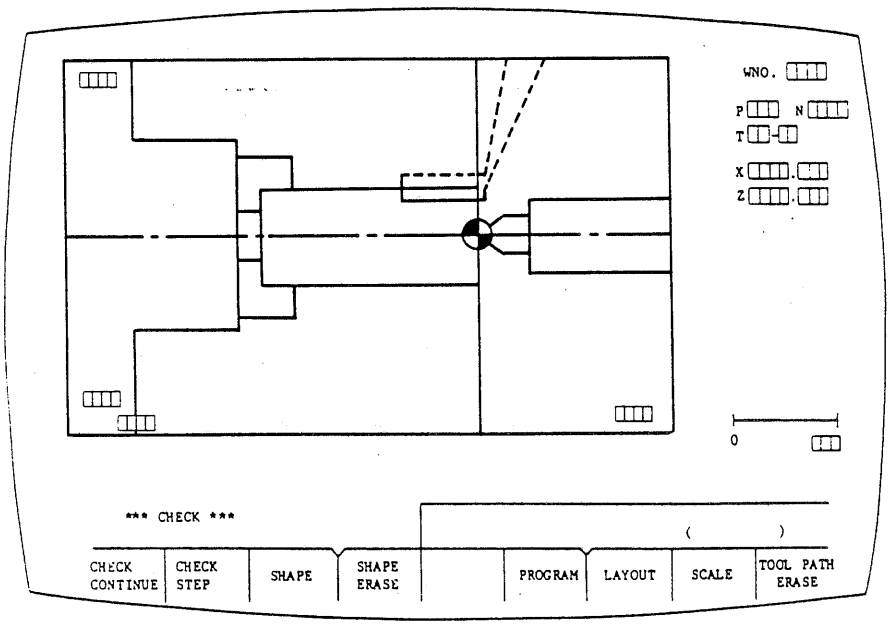
2-2-13 CHECK Picture

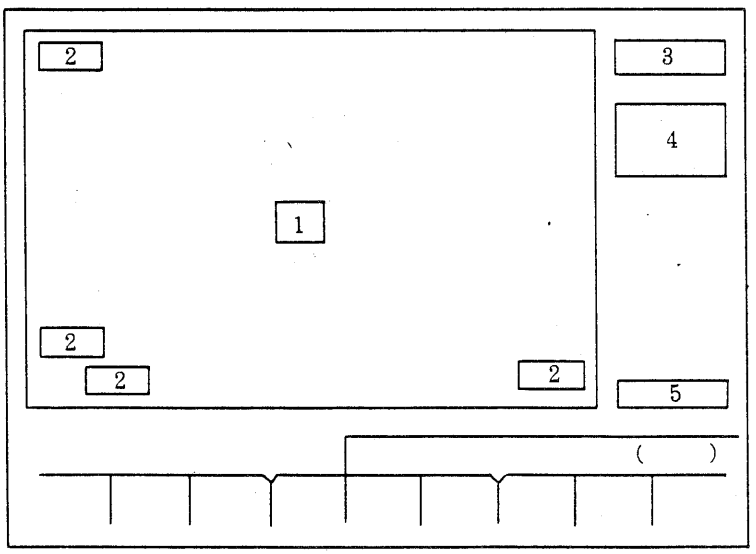
Functions

(1) To display the established tool path (with continuous/intermittent displayed)

(2) To adjust the tool path size to a particular scale.

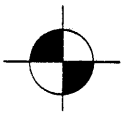
* Programs for the workpiece being selected are checked on the PROGRAM display WORK PROGRAM picture.





Note: Nos. in [ ] are correspondent to display data Nos. on the next page.

Display data of CHECK picture

No.	Data Designation	Unit	Description
1	(Chuck)		Chuck shape
	(Blank)		Blank shape
	(Tool path)		Path along which the tips (nose radius center) of tools in turret pass ——— cutting feed ----- rapid feed
	(◆)		Tips (nose radius center) of tools in turret (Note 1)
	(Program zero point)		 Zero point of graphic to be displayed (program zero point)
	(Tailstock)		Tailstock shape and position
2		mm (inch)	Limit value displayed
3	WNO.		Workpiece number in a displayed program
4	P		Running machining process number
	N		Running block number
	T		Indexing tool number and compensation number
	X, Z	mm (inch)	Current position of tool tip in the workpiece coordinate system (diameter value for X)
5		mm (inch)	Scale value of a graphic displayed

Note 1: This is not applicable to the Z direction of edge machining (EDG), #0 of grooving (GRV) and the measure (MES).

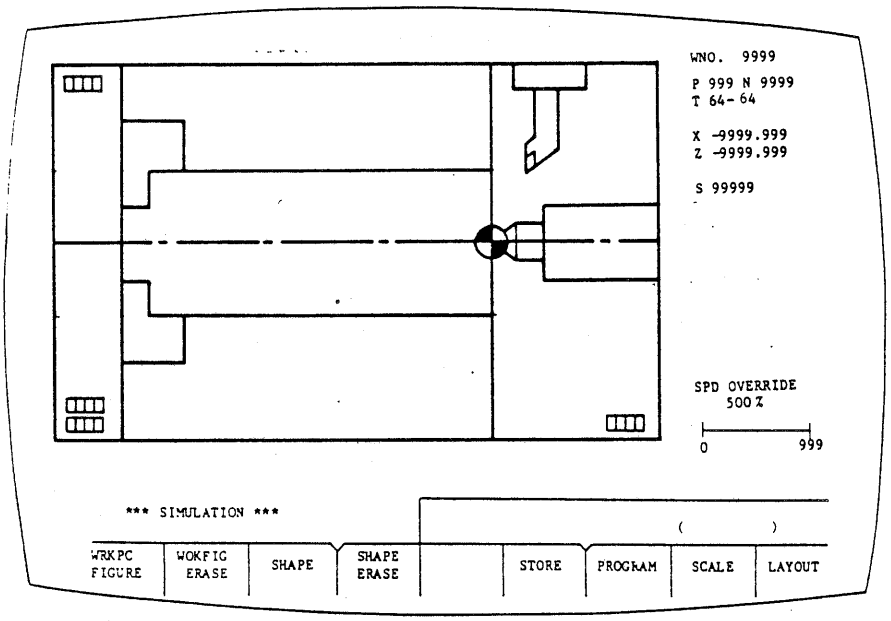
2-2-14 SIMULATION Picture

Function

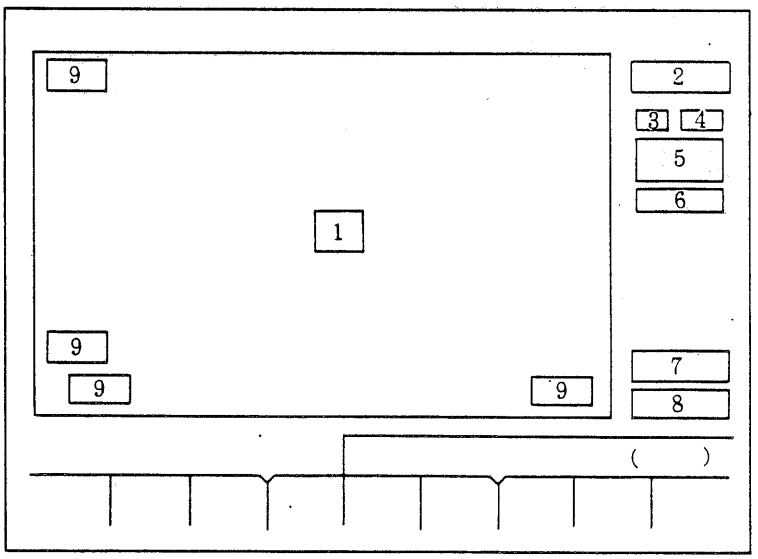
(1) Simulation of a program(execution speed of axis movement command can be chagned as required.)

* Display of this picture is possible after return to the zero point and when the control is not in automatic operation mode.

* Simulation of the program for the workpiece selected on the WORK PROGRAM picture is made.



Note: The figures on the picture indicate the maximum values of the setting (unit: mm).



Note:
Nos. in [ ] are correspondent to display data Nos. on the next page.

Display data of SIMULATION picture

No.	Data Designation	Unit	Description
1		-	See TRACE picture.
2	WNO.	-	Running workpiece number (Note 1)
3	P	-	See TRACE picture
4	N	-	
5	X, Z	mm (inch)	
6	S-	rpm	
7	SPD OVERRIDE	%	Rate of machining speed (feedrate) to intropogram command speed
8		mm (inch)	Displayed graphic scale value
9		mm (inch)	Displayed limit value

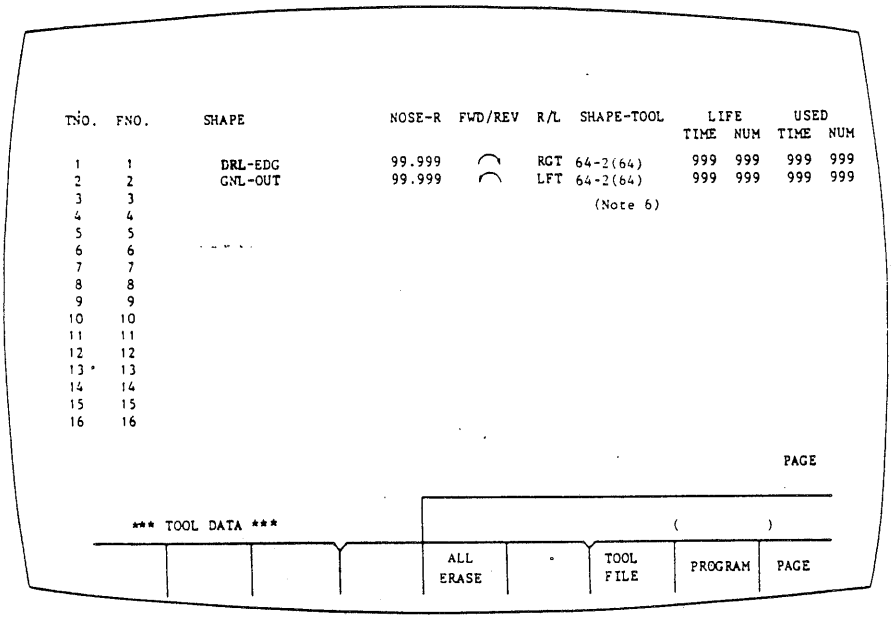
Note 1: The first workpiece number will remain even if other programs are executed continuously.

2-2-15 TOOL DATA Picture

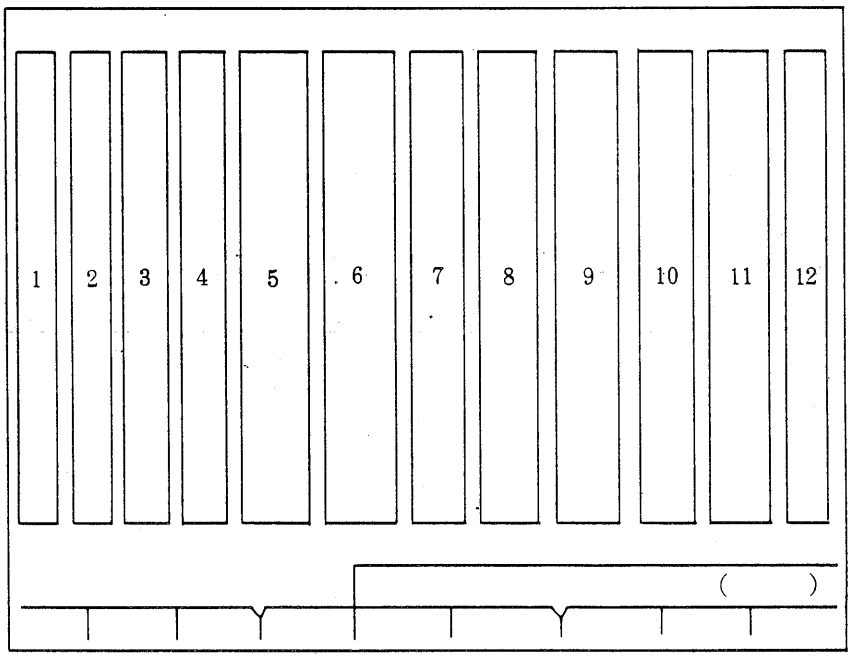
Functions

(1) Registration of specifications of tools to be used.

(2) Setting of the life of the tool to be mounted and setting of the spare tool

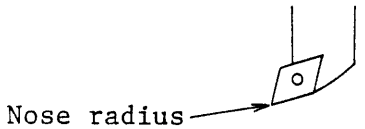


Note: The figures on the picture indicate the maximum values of the setting range (unit: mm).



Note: Nos. in ☐ are correspondent to display data Nos. on the next page.

Display data of TOOL DATA picture

No.	Data Designation	Unit	Description
1	TNO	-	Tool number
2	FNO	-	Corresponding file number
3	SHAPE	-	Tool kind and machined portion
4			
5	NOSE-R	mm (inch)	Nose radius of tool tip  (Note 1)
6	FWD/REV	-	Spindle rotating direction : Forward : Reverse
7	R/L	-	Cutting direction of tool (Note 2)
8	SPARE-TOOL	-	Spare tool No. and offset No. in case life has been reached (Note 5)
9	LIFE (TIME)	min	Maximum time of use (internally measured in terms of seconds) (Note 3)
10	LIFE (NUM)	pcs.	Maximum No. of workpieces cut (Note 3)
11	USED (TIME)	min.	Time of use (internally, measured in terms of seconds) (Note 4)
12	USED (NUM)	pcs.	No. of workpieces cut (Note 4)

Note 1. Not applicable to threading, drilling and tapping tools.

2. Not applicable to drilling and tapping tools.

3. Life check is not performed when this data is "0".

4. When the end of the life has been reached, the background for the data is inversed. This data will not increase thereafter.

5. The kind of the spare tool should be same as the tool mounted.

6. Parenthesized description is applicable to EIA.

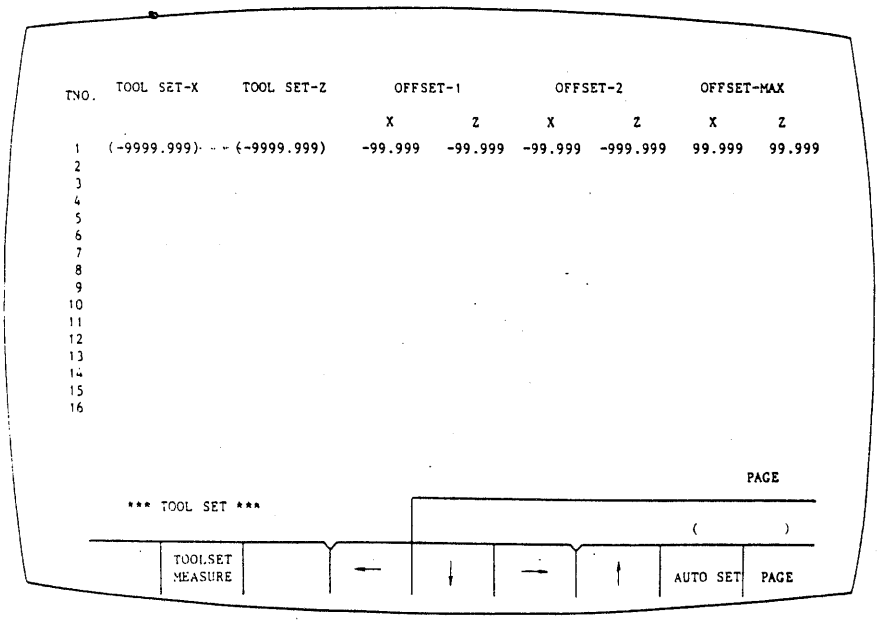
2-2-16 TOOL SET Picture

Before entering automatic operation, always set the tool set value for the mounted tool, using this picture.

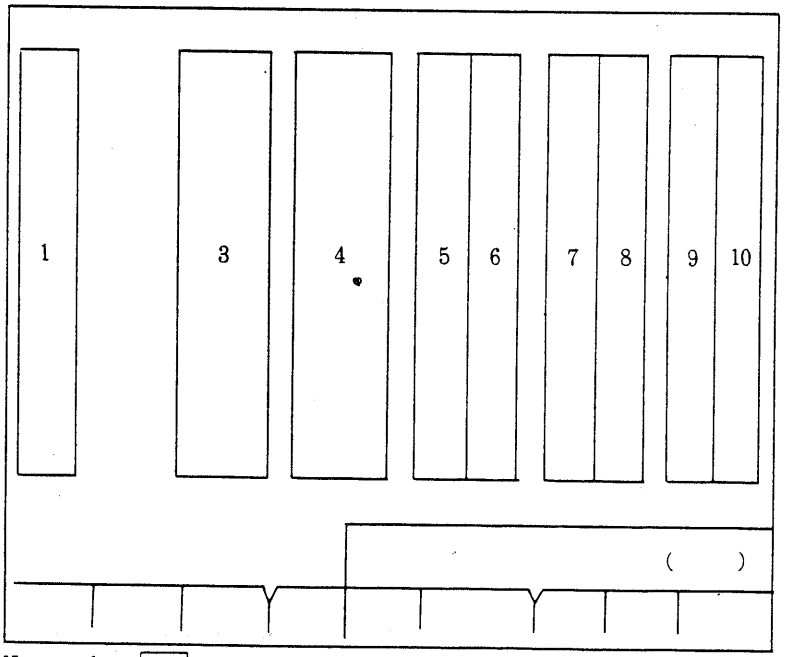
Functions

(1) Definition of tool set value

(2) Management of tool tip position offset



Note: The figures on the picture indicate the maximum values of the setting range (unit: mm).



Note: Nos. in ☐ are correspondent to display data Nos. on the next page.

Data displayed of TOOL SET picture

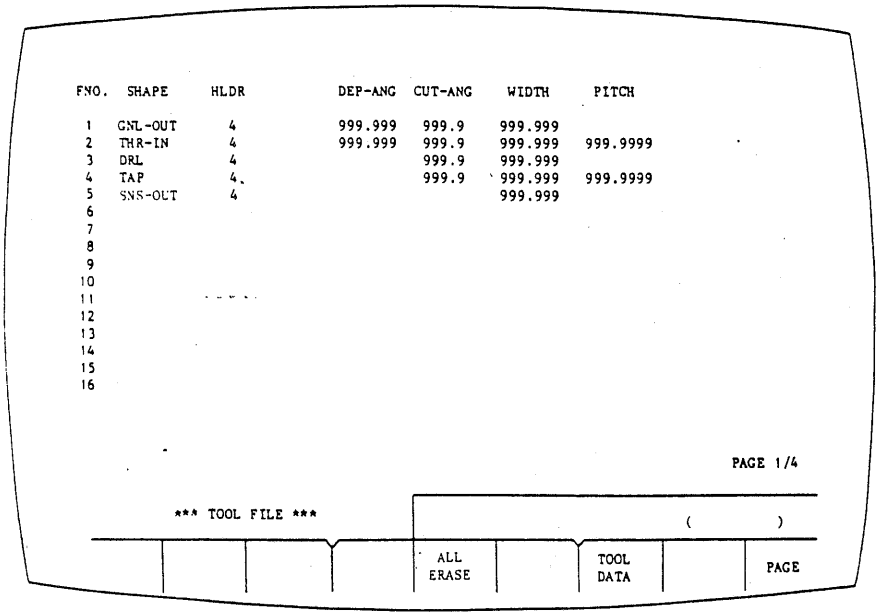
No.	Data Designation	Unit	Description
1	TNO	-	Tool number
2	TOOL SET-X	mm (inch)	Distance between the tool movement command target position in the machine zero point and the zero point of the reference workpiece. (Note 2)
3	TOOL SET-Z	mm (inch)	
4	OFFSET-1 X	mm (inch)	Amount of tool tip position offset for Offset No. 1.
5	OFFSET-1 Z	mm (inch)	
6	OFFSET-2 X	mm (inch)	Amount of tool tip position offset for Offset No. 2
7	OFFSET-2 Z	mm (inch)	
8	OFFSET-MAX X	mm (inch)	Limit (absolute value) of offset
9	OFFSET-MAX Z	mm (inch)	

Note 1. All the X's are expressed in terms of diameters.

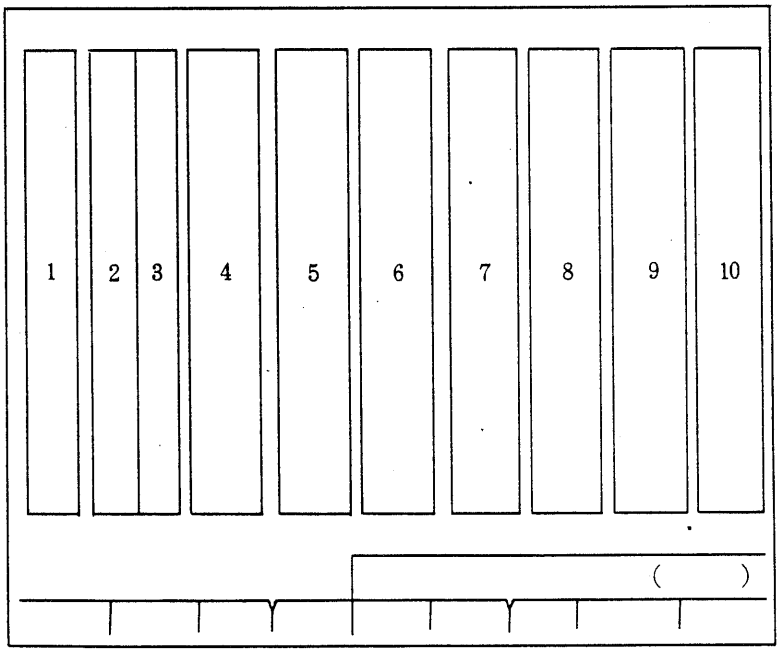
2. It is a quantity to be set when the distance is already known.

2-2-17 TOOL FILE picture

Function (1) Setting of tool shape



Note: The figures on the picture indicate the maximum values of the setting range (unit: mm).



Note: Nos. in ☐ are correspondent to display data Nos. on the next page.

Display data of TOOL FILE picture

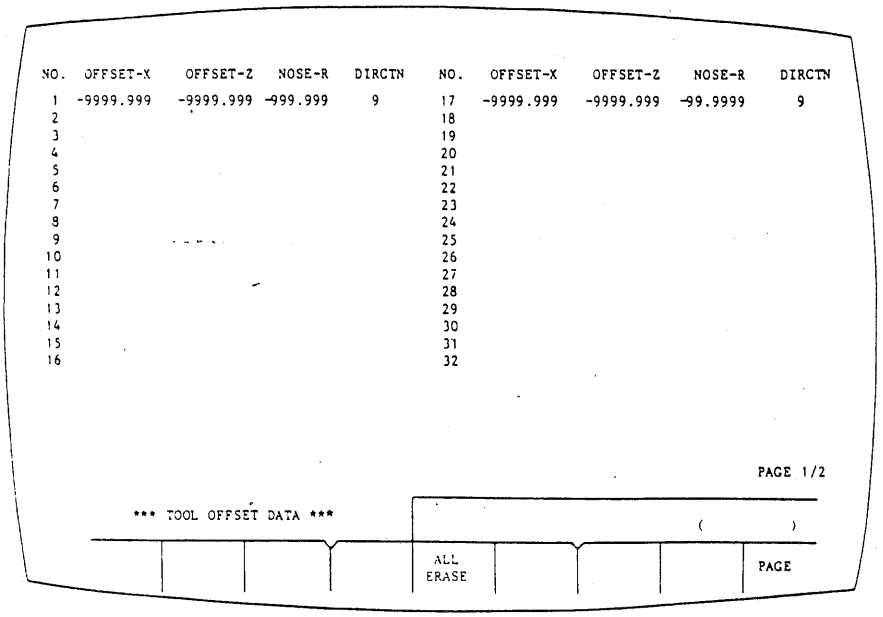
No.	Data Designation	Unit	Description
1	FNO	-	Tool file number
2	SHAPE	-	Tool group and portions of workpiece machined (Note 1)
3	HLDR	-	Type of tool holder
4			
5	DEP-ANG	deg or mm (inch)	Major cutting angle or maximum groove depth
6	CUT-ANG	deg or mm (inch)	Tool tip angle or tool width (grooving tool)
7	WIDTH	mm (inch)	Tool shank width
8	PITCH	mm (inch)	Pitch (thread and tap only) (Note 2)
9			
10			

Note 1. The tool shape determined here is patterned and displayed with the cutting direction and rotating direction taken into account.

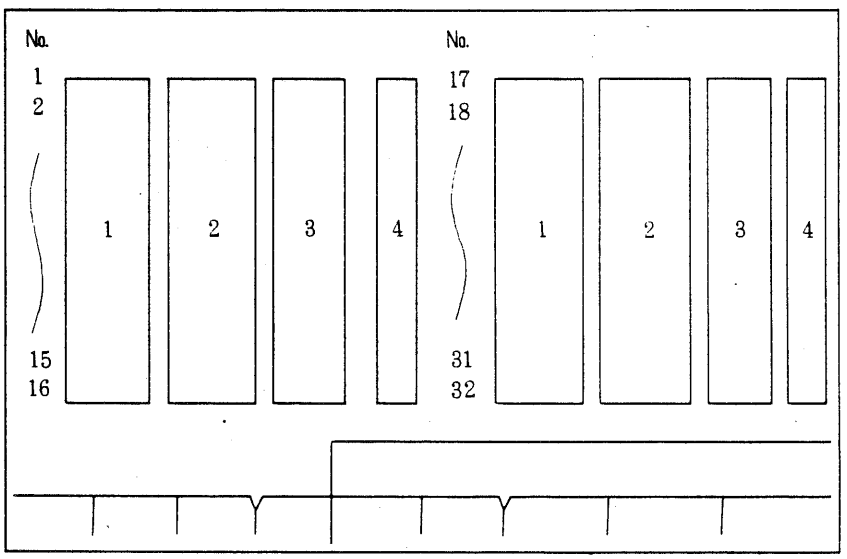
2. Values up to 999.99999 can be set.

2-2-18 TOOL OFFSET Picture (only for model with EIA/ISO specifications) : Optional

Function (1) Tool offset data of tools storable in NC.



Note: The figures on the picture indicate the maximum values of the setting range (unit: mm).



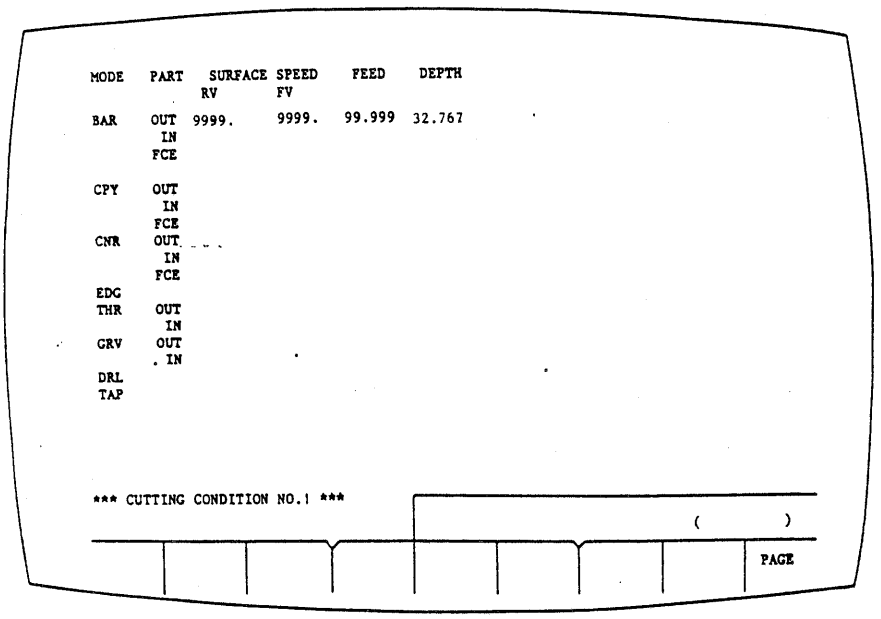
Note: Nos. in ☐ are correspondent to display data Nos. on the next page.

Display data of TOOL OFFSET picture

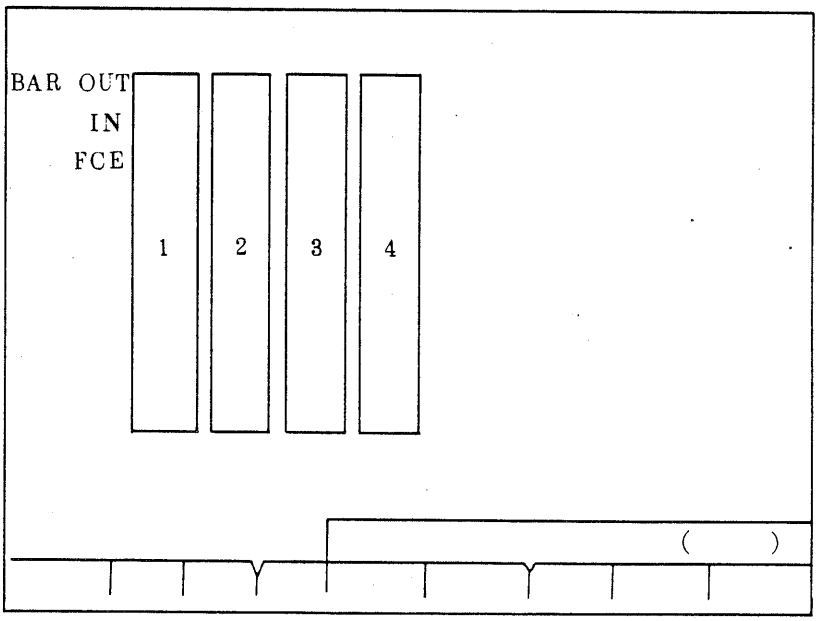
No.	Data Designation	Unit	Description
1	OFFSET-X	mm (inch)	Tool offset amount
2	OFFSET-Z		
3	NOSE-R	mm (inch)	Nose radius of tool tip
4	DIRCTN	-	Direction of cutting tool

2-2-19 CUTTING CONDITION NO. 1 picture

Function (1) Registration of basic data for automatic determination of cutting conditions



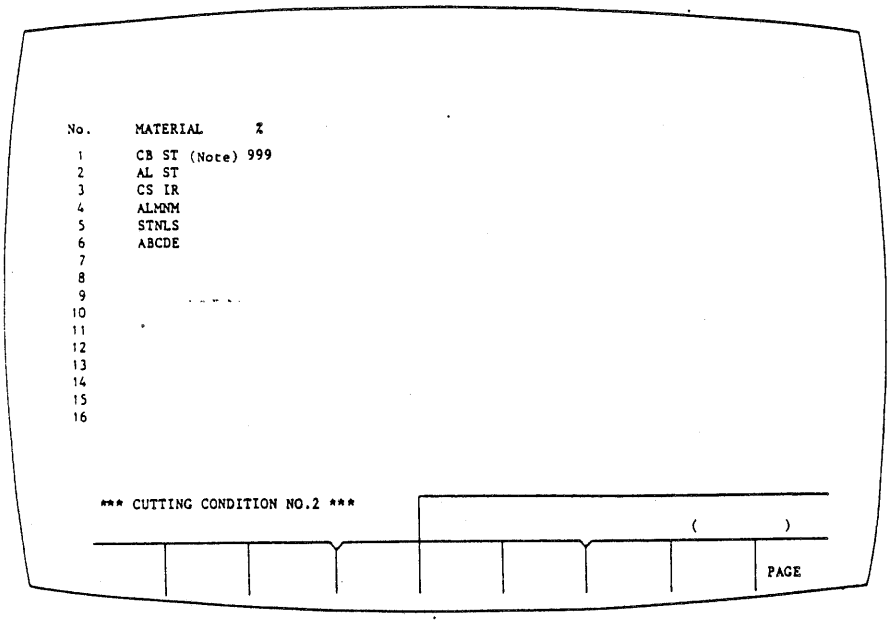
Note: The figures on the picture indicate the maximum values of the setting range (unit: mm).



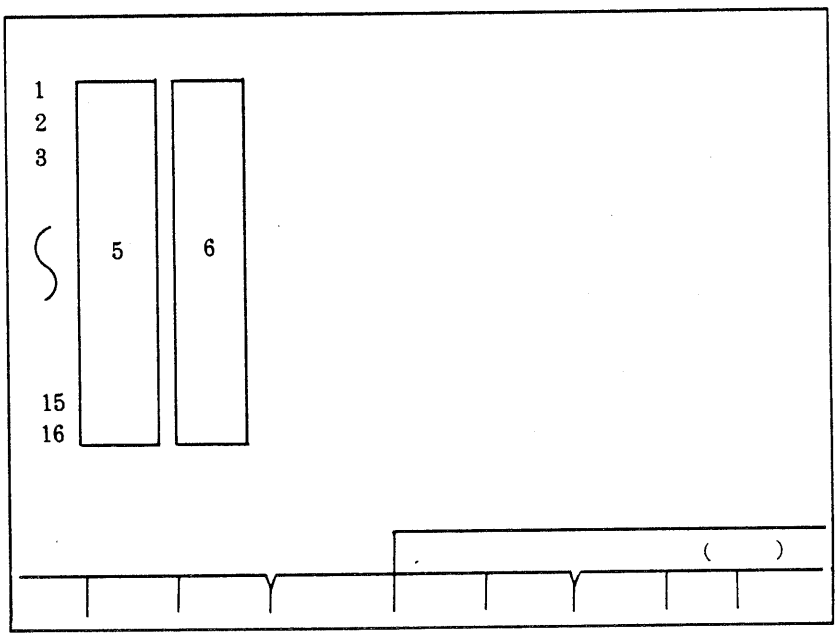
Note: Nos. in ☐ are correspondent to display data Nos. on the next page.

CUTTING CONDITION NO. 2 picture

Function (1) Setting of 16 kinds of materials



Note: Materials for No.1 thru NO.5 were inputted by the manufacturer.
For those for NO.6 and thereafter, use your discretion.



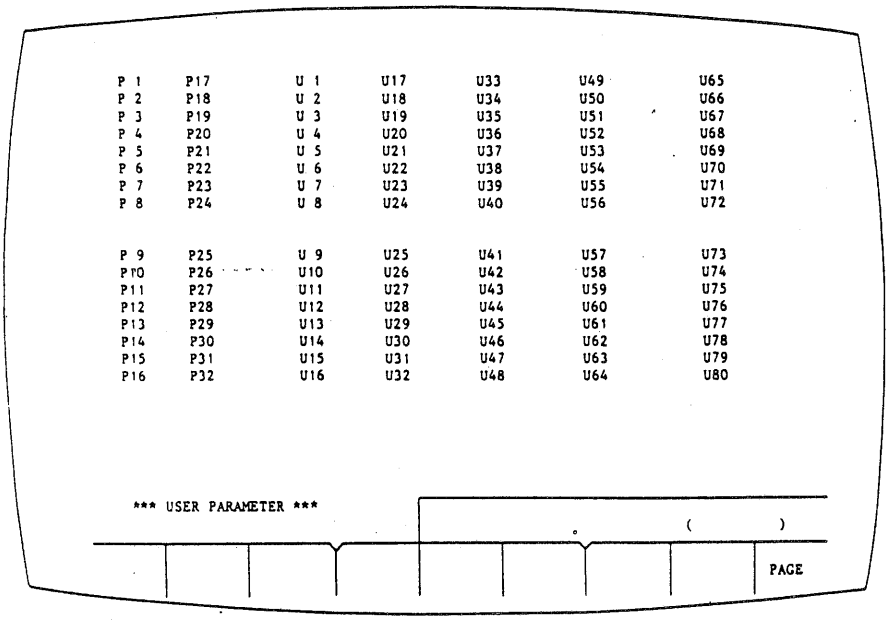
Note: Nos. in ☐ are correspondent to display data Nos. on the next page.

Display data of CUTTING CONDITION picture

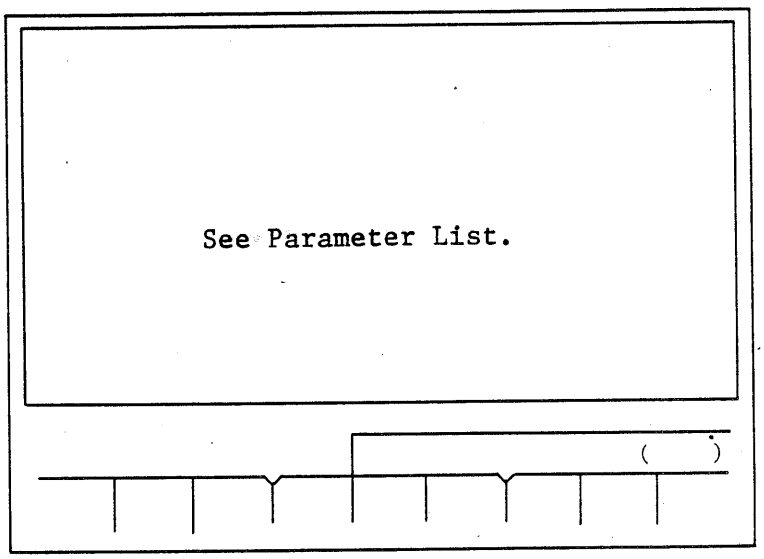
No.	Data Designation	Unit	Description
1	SURFACE SPEED RV	m/min (ft/min)	Surface speed for rough cutting
2	SURFACE SPEED FV	m/min (ft/min)	Surface speed for finish cutting
3	FEED	mm/rev (inch/rev)	Maximum allowable feed rate for rough cutting
4	DEPTH	mm (inch)	Maximum allowable penetration for one pass during rough cutting (Setting is unnecessary for thread (THR), tap (TAP) and drill (DRL).)
5	MATERIAL	-	Materials. Five standard materials of CB ST (carbon steel), AL ST (alloy steel), CS IR (cast iron) ALMNM (light alloy) and STNLS (stainless steel) plus user's special materials
6	%	%	Coefficients for determinining surface speed for individual material types

2-2-20 USER PARAMETER Picture

Function (1) Registration of parameters concerning the machining methods freely utilized by the user



Note: For the scope of parameter setting, see Parameter List.

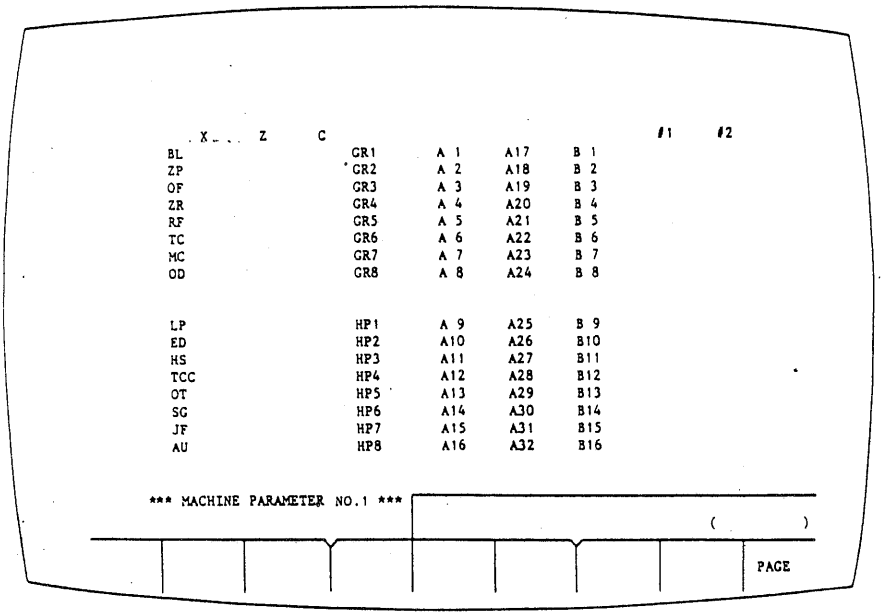


MACHINE PARAMETER No. 1 Picture

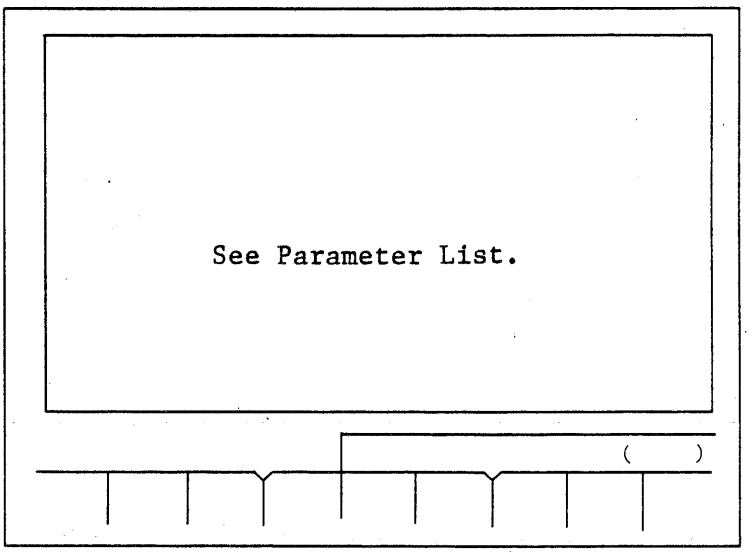
Function

(1) Registration of various machine parameters necessary for NC.

* User should not change data on this picture at his own discretion. If data is changed, normal opration will not be assured.



Note: For the scope of parameter setting, see Parameter List.

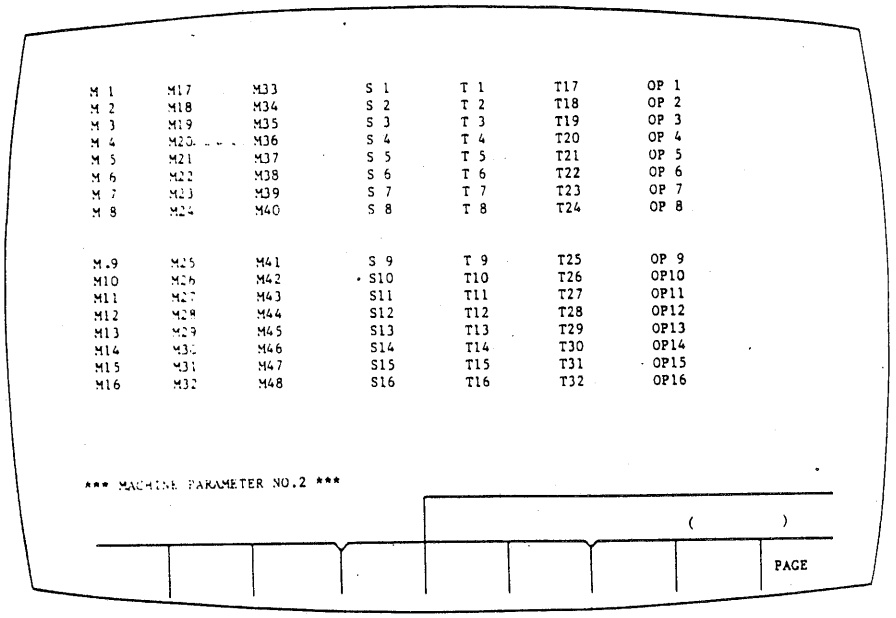


MACHINE PARAMETER No. 2 Picture

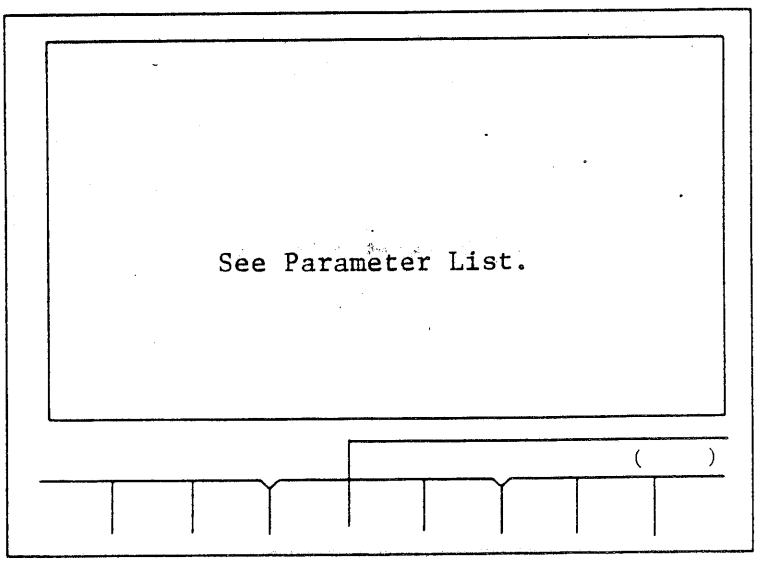
Function

(1) Registration of various machine parameters necessary for NC.

* User should not change data on this picture at his own discretion. If data is changed, normal opration will not be assured.



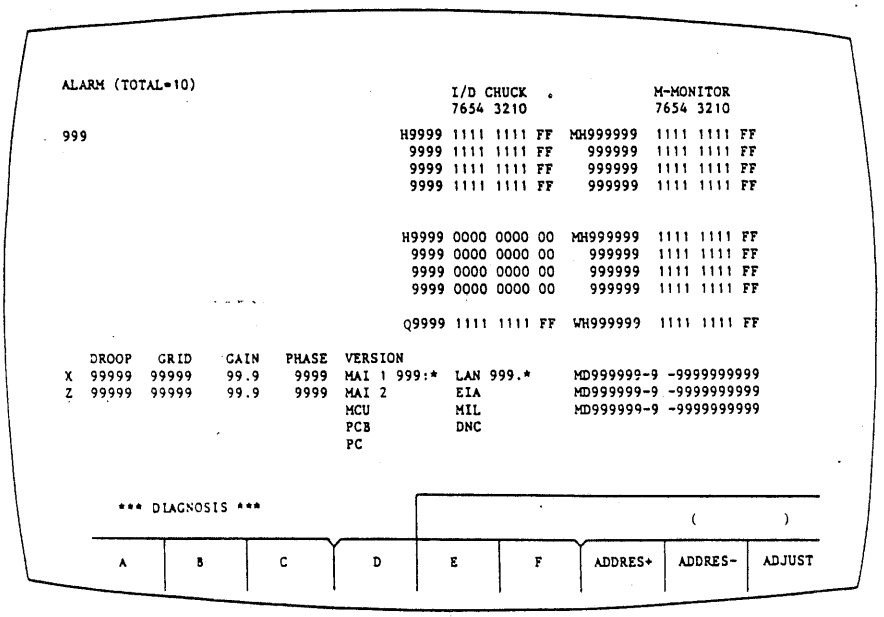
Note: For the scope of parameter setting, see Parameter List.



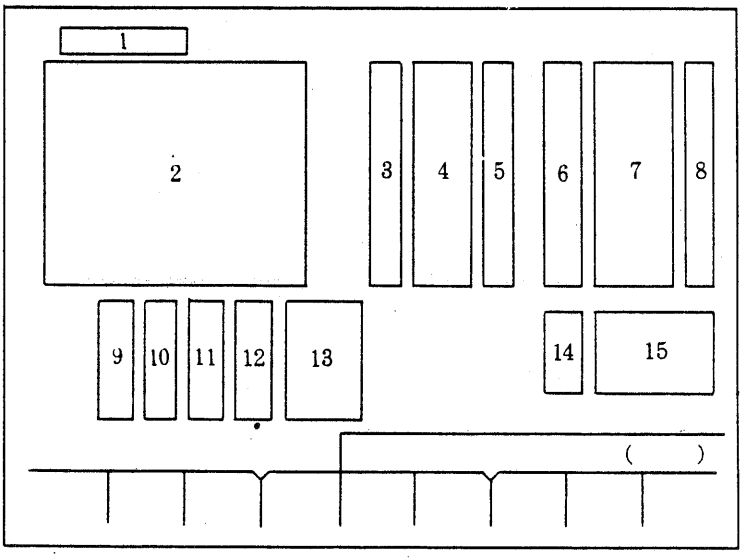
2-2-21 DIAGNOSIS Picture

Function (1) Check and adjustment of status of NC and servo

* This picture should be serviced by YAMAZAKI only.



Note: The figures on the picture indicate the maximum values of the setting range.



Note: Nos. in ☐ are correspondent to display data Nos. on the next page.

Display data of DIAGNOSIS picture

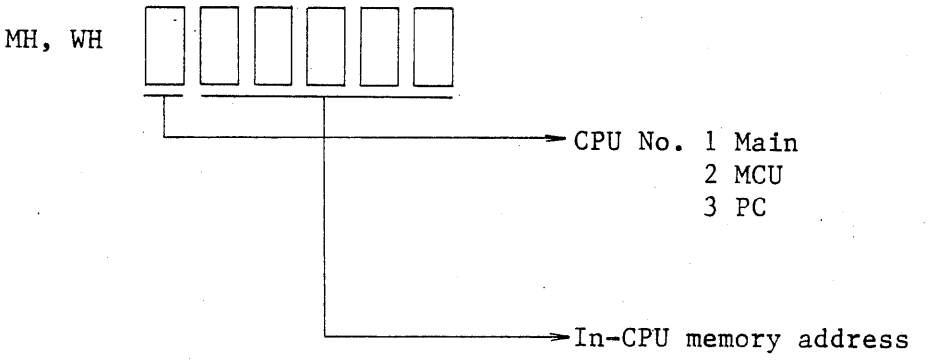
No.	Data Designation	Unit	Description
1	(TOTAL=)	-	Total No. of alarms currently given
2		-	Contents of alarms currently given (MAX10) Red: very serious trouble, Blue: trouble (For details of contents, see Alarm List.)
3	H, Q (Note 1)	Byte	I/O port address (hexadecimal) H: Input, Q: Output (Note 2)
4	(Note 1)		I/O data (binary)
5	(Note 1)		I/O data (hexadecimal) (Note 2)
6	MH, WH (Note 1)	Byte	Memory R/W (read/write) address (special hexadecimal) MH: Read WH: Write (Note 2, 4)
7	(Note 1)	-	R/W data (binary)
8	(Note 1)	-	R/W data (hexadecimal) (Note 2)
9	DROOP (Note 3)	0.5 m	Positon droop. It is zero when the axes are stopped. Reliability value is 1 - 2 m/min.
10	GRID (Note 3)	0.5 m	Distance between end of origin dog to first grid
11	GAIN (Note 3)	-	Position loop gain
12	PHASE (Note 3)	Pulse	Phase difference between reference signal in NC and resolver feedback signal
13	VERSION	-	Quantity of software for each CPU and number of optional versions 1 Main 1 2 Main 2 3 MCU 4 PCB (main) 5 PC (user) 6 Language 7 EIA/ISO 8 Milling 9 DNC
14	MD (Note 1)	Byte	Memory read-out address (secial hexadecimal) (Note 2, 4)
15	(Note 1)	-	Memory read-out data (decimal)

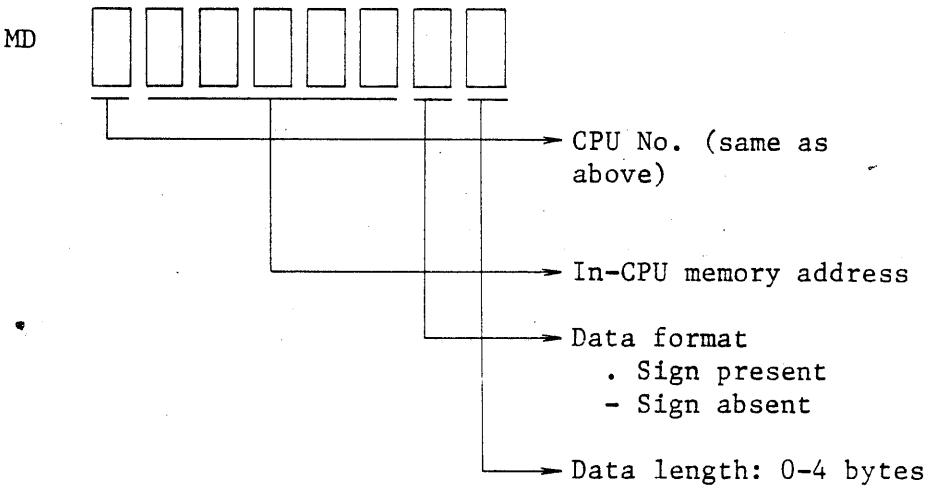
Note 1. Displayed when address is set. (When the power is switched on, address is not set.)

2. Like numerical keys, the menu "A" through "F" can be manipulated.

3. Every time when the menu key ADJUST is pushed, the screen is turned on and off.

4. Address is expressed according to the following format. In setting of the address, use this format.





Specify MCU in even number address 80000 - 80FFF.

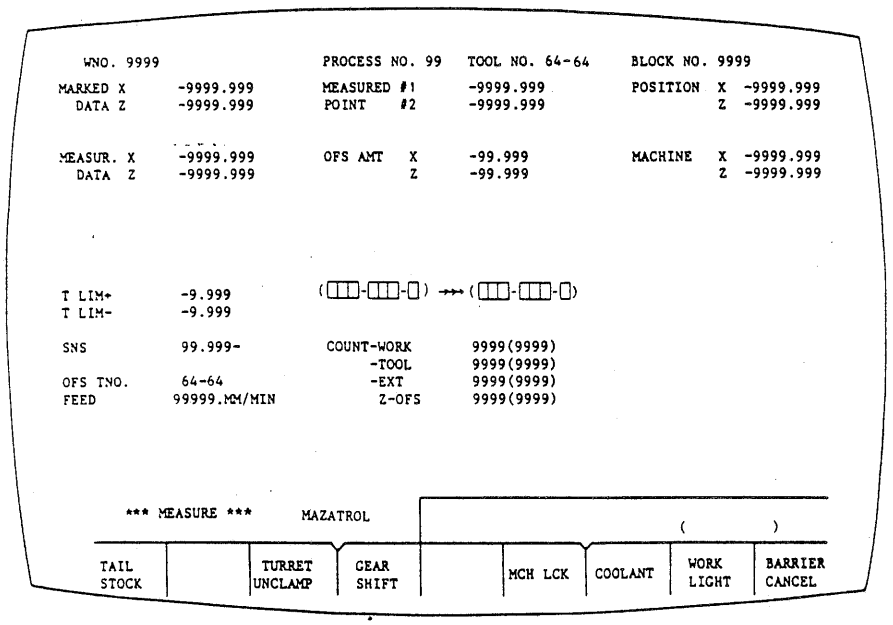
2-2-22 MEASURE Picture : Optional

Functions

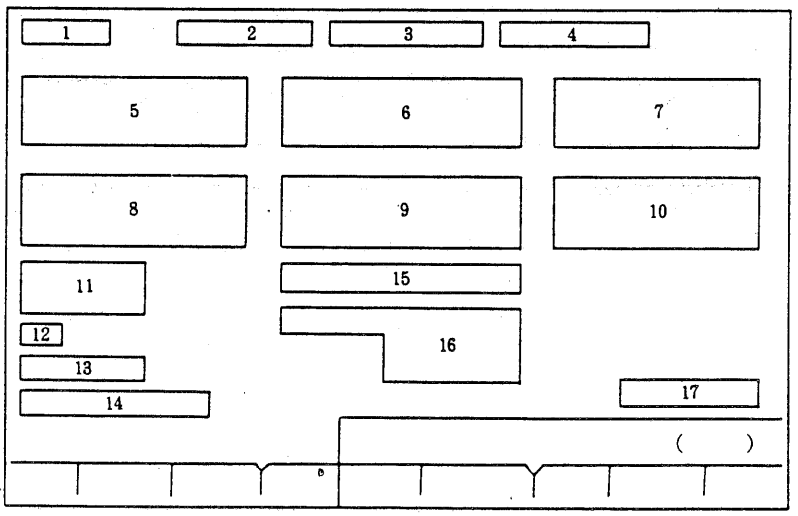
(1) Display of status of operation

(2) Display of items of measurement and results of measurement

* For the measuring method, see another instruction manual.



Note: The figures on the picture indiate the maximum values of the setting range.



Note: Nos. in ☐ are correspondent to display data Nos. on the following pages.

Display data of MESURE picture

No.	Data Designation	Unit	Description
1	WNO. (Note 1)	-	Work No. subjected to execution
2	PROCESS NO. (Note 1)	-	No. of machining process under execution
3	TOOL NO. (Note 1)	-	No. of tool indexed and its offset number
4	BLOCK NO.	-	No. of the block being executed (EIA/ISO)
5	MARKED DATA X, Z (Note 3)	mm (inch)	Target measured value (It is displayed when measurement starts.) (Note 2)
6	MEASURED POINT #1, #2	mm (inch)	Posiion at which the sensor made measurement. #1: First measured value #2: Second measured value
7	POSITION (Note 1)	mm (inch)	Current position of tool in the workpiece coordinate system.
8	MEASUR. DATA X, Z	mm (inch)	Measured value found from measurement
9	OFS AMT X, Z	mm (inch)	Difference between measured value and target value
10	MACHINE (Note 1)	mm (inch)	Current position of tool in the machine coordinate system
11	T LIM+ T LIM- (Note 3)	mm (inch)	Upper and lower limits of tolerances
12	SNS (ON) (Note 3)	mm (inch)	Diameter of sensor probe. The instant the probe is brought into contact with the workpiece, the characters "ON" are inverted. When the probe moves away from the workpiece, these characters reappear.
13	OFS TNO. (Note 3)	-	Tool No. and offset No. necessary for offset

No.	Data Designation	Unit	Description
14	FEED (Note 1)	mm/min (inch/min)	Speed of sending command to tool
15	(Process) (Note 1)	-	Machining process being executed and to be executed
16	COUNT	pcs.	Counter for judgment of execution of measurement. The data within the parentheses are the standard number of workpieces to be sampled. The data outside of the parentheses are the number of workpieces as counted from starting of execution. These values can not be counted unless the parts count data are "1". Data rewrite is valid even when the program is locked.
17		-	When measurement has been started, "MEASURING" is displayed. When measurement has been completed, it disappears.

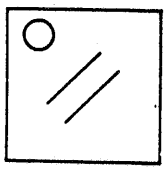
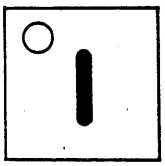
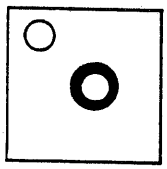
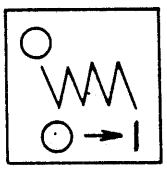
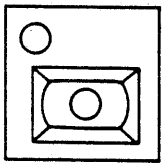
Note 1. Same as the data on the POSITION or COMMAND picture.

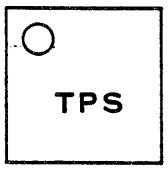
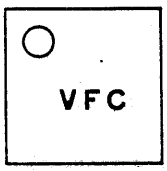
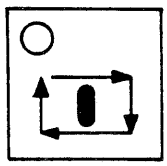
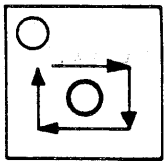
2. The data are not displayed at all in case of external measurement. In other cases, the dimensions (parameters U28 and U29 in case of tool tip measurement) to which tolerances are added are displayed.

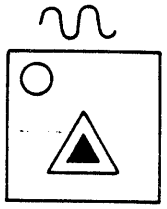
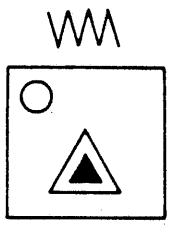
3. Display is made based on the value set in the measurement process within the program.

4. No data are displayed in target value (MARKED DATA), measurement point position (MEASURED POINT), measured value (MEASURE. DATA) and sensor (SNS) in case of external measurment.

2-3 Functions of Operation Panel Buttons

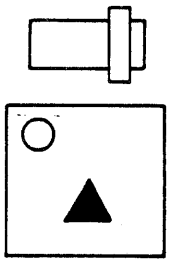
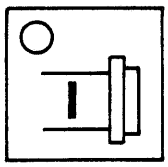
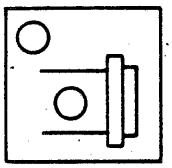
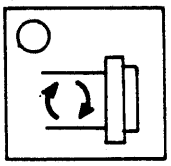
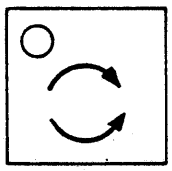
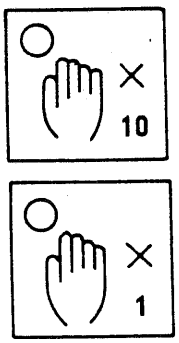
	Names		Purposes
12-A		Resetting	o Sets NC system to initial status. o On alarm, press this button to erase it out of display after eliminating cause. o On the resetting in automatic operation, performs immediate stop and return to the head of run program. o Interrupts shape check operation.
11-A		Power on	o Start and end of NC/machine operation. o Validates changed parameter. (Immediately valid parameters are also available.) Handling 1 Change parameter value 2 Power off 3 Power on End ... Value does not become valid without this operation. o NC/machine alarm resetting
10-A		Power off	
12-B		OT release	o Returns stroke end turret to movable range (refer to "Cancel of Stroke End" as to handling).
11-B		Display erasure	o Erases display to elongate its life when it is not needed. o Erased display can be restored using any push button or any menu key. o On alarm, automatically displays its message.

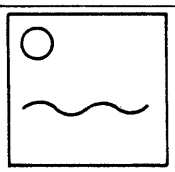
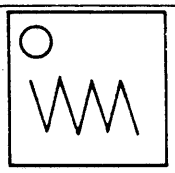
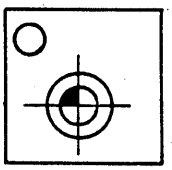
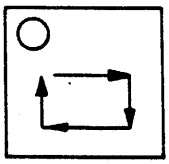
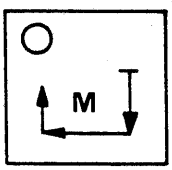
	Names		Purposes
12-D		Tool path storage	o Used to replace tip on its faulure during machining. o Press this key when storing tool relief path points on the manual interrupt in automatic operation. Handling 1 Interrupt automatic operation by the change-over to step mode or feed hold. 2 Change-over to manual operation mode 3 Press TPS - current position stored 4 Manual move of turret 5 Replace tip 6 Return to automatic operation mode 7 Press (cycle start) key - operation restarted after tracing stored points. End Note: Steps 3 and 4 can be repeated until five times.
11-D		Change of machining conditions	o Automatically replaces the programmed conditions stored in numerical controller with the cutting conditions changed by jog feed and spindle override in automatic operation (valide one time per process). However, not valide for EIA/ISO program.
8-A		Cycle start	o Starts and restarts operation in automatic mode.
7-A		Feed hold	o Automatic operation interrupt, axis-move deceleration and stop, dwell interrupt, M,S,T, or GEAR command interrupt after current run completion.

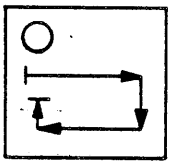
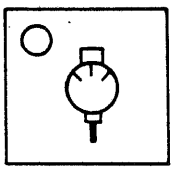
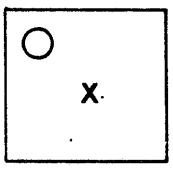
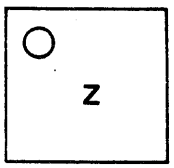
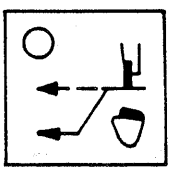
	Names	Purposes
7-B 8-B	 Rapid feed override Increase ... ▲ Decrease ... ▼	o Rapid feedrate varies by 10% each time of press (increases or decreases by 10% for each 0.1 second while press is continued for more than one second).
7-G 8-G	 Jog feed override Increase ... ▲ Decrease ... ▼	o Jog (cutting) feedrate varies by 10% each time of press (increases or decreases by 10% for each 0.1 second while press is continued for more than one second). Manual: 0 - 240% 24-step rate is fixed by mm/min. or deg./m. Automatic: 0 - 200% (including automatic dry-run on)

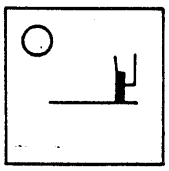
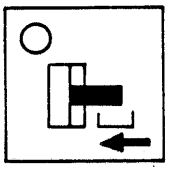
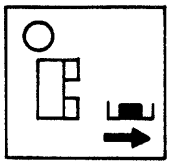
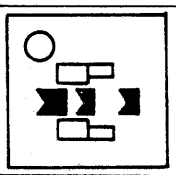
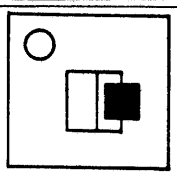
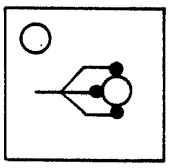
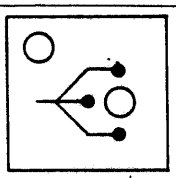
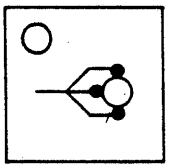
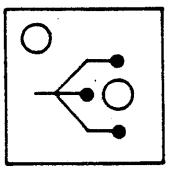
Note: Jog feed override and actual feedrate.

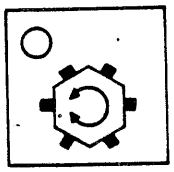
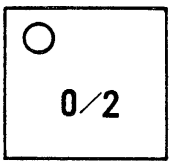
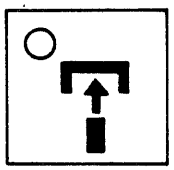
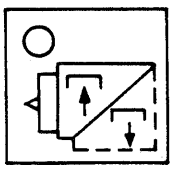
Indication	Feed (mm/min)	Indication	Feed (mm/min)
0	0	130	52
10	1.0	140	72
20	1.4	150	100
30	2.0	160	140
40	2.7	170	200
50	3.7	180	270
60	5.2	190	370
70	7.2	200	520
80	10	210	720
90	14	220	1000
100	20	230	1400
110	27	240	2000
120	37		

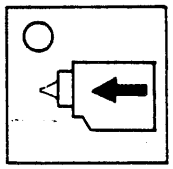
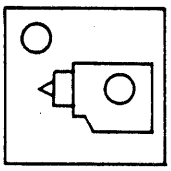
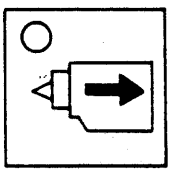
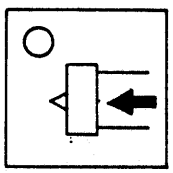
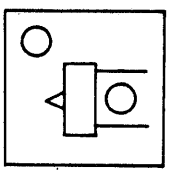
	Names		Purposes
8-F 7-F		Spindle over-ride Increase ... ▲ Decrease ... ▼	o Varies the revolutions of spindle by 10% each time of press. Manual: 0 - (max. revolutions of spindle in selected gear range), unit: 10 rpm Automatic: 0 - 150%
8-D		Spindle starting	o Performs the spindle. revolutions indicated on segment indicator. Note: Valid only in manual operation mode.
7-D		Spindle spindle stop	o Stops spindle. Note: Valid only in manual operation mode.
8-E		Spindle inching	o Performs the parameter fixed revolutions of spindle only while button is pressed. Note: Valid only in manual operation mode.
7-E		Change-over of spindle running direction	o Selects the forward or revers rotation of spindle in manual operation mode. o Former is performed when power supply is on.
8-H 7-H		Manual pulse feed	o Fixes the amount of the pulses generated per graduation of manual handle and at the same time performs the change-over to manual operation mode (refer to "Handling Procedure"). Note: Do not make the change-over from automatic operation mode to manual operation mode while thread ridges are cut. Or, tip will fail in some cases.

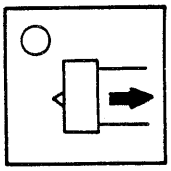
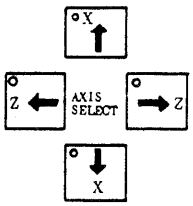
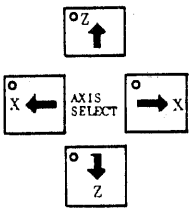
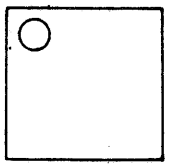
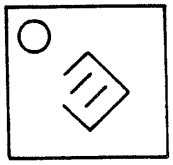
	Names	Purposes
8-I	 Rapid feed	o Move at rapid feedrate.
7-I	 Jog (cutting) feed	o Move at the rate corresponding to the segment value of feed override.
7-J	 Zero-point return	o Performs the change-over to manual operation mode and validates the functions of axis-move keys. Note : After power on and emergency stop, be sure to return the dog to zero-point before operation.
8-L	 Auto	o Change-over to automatic operation mode. Handling 1 Set work number using menu. 2 Press // (reset) key. 3 Press (cycle start) key. End Selected work number program will then be run from beginning. Note : Operation is not valid with WORK PROGRAM, LAYOUT, SIMULATION, SHAPE CHECK and CHECK pictures.
7-L	 Restart	o Used to start the machining interrupted due to circumstances halfway. Notes 1: Workpiece number must be selected when in automatic mode. 2: Valid only with POSITION, COMMAND and TRACE pictures.

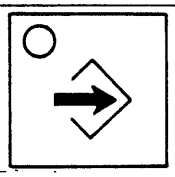
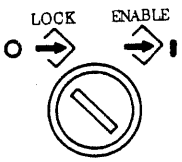
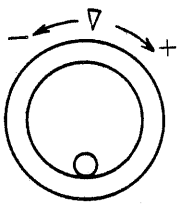
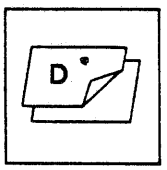
	Names		Purposes
8-K		Single process	o Runs only the selected process in program. Handling 1 Select the process to be run from menu (rough, finish or re-finish machining). 2 Select the number of the process to be run. 3 Press (cycle start) key. End Only selected process will then be run. Notes 1: Select work number in automatic mode. 2: Valid only on POSITON, COMMAND or TRACE display. 3: Re-finish can be selected only for threading process and only its last step is performed.
7-K		Test	o Used for maintenance and test.
6-A		Selection of manual pulse X-axis	o Selects the valid axis of manual pulse generator.
6-Z		Selection of manual pulse Z-axis	o Selects the valid axis of manual pulse generator.
6-D		Handle interrupt on	o Shifts work coordinate system over the distance corresponding to the amount of the pulses generated on the interrupt by manual pulse generator in automatic operation. Note: Use parameter P12 when fixing the shift distance per pulse.

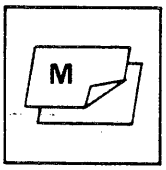
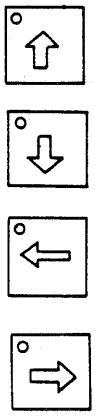
	Names		Purposes
5-D		Handle interrupt off	o Completes handle interrupt function. Note : Pressing this button will protect the duration of the interrupt.
6-E		Parts catcher forward (optional)	o Used to forward parts catcher.
5-E		Parts catcher reverse (optional)	o Used to reverse parts catcher.
6-F		Bar feeder on (optional)	o Used to start bar feeder mode.
5-F		Bar feeder off (optional)	o Used to complete bar feeder mode.
6-G		Steady rest 1 clamp (optional)	o Used to clamp steady rest 1.
5-G		Steady rest 1 unclamp (optional)	o Used to unclamp steady rest 1.
6-H		Steady rest 2 clamp (optional)	o Used to clamp steady rest 2.
5-H		Steady rest 2 unclamp (optional)	o Used to unclamp steady rest 2.

	Names		Purposes
6-I		Tool swing	o Tool number is selected when tool swing button is released in manual mode. o V/H change-over type: V/H turret swings each time of starting.
5-I		Selection of turrets	o Change-over between front and rear turrets in manual mode. o V/H change-over type: select either of 0 ... horizontal type 2 ... vertical type o Change-over between ID and OD cutting tools 0 / 2 Horizontal type / Vertical type Front turret / Rear turret OD cutting / ID cutting Note : Front turret is selected on the start of power supply.
6-J		Tail body connection	o When this key is turned on, joint pin comes out to connect tail body with turret. Notes 1: Invalid when self-move tail body is used. 2: Valid only in manual mode.
5-J		Tail body connection on/off	o Choose the on/off of tail body connection. Notes 1: Invalid when self-move tail body is used. 2: Valid only in manual mode.

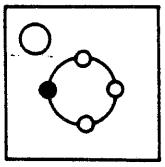
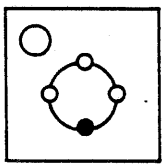
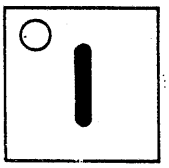
	Names		Purposes
3-H		Tail body forward	o Forwards tail body. Once this button is pressed, it continues forwarding unless tail body stop or reverse button is pressed and stops at stroke end. Notes 1: Invalid for connecting type tail spindle. 2: Valid only in manual mode.
3-I		Tail body stop	o Stops the operation of tail body. Notes 1: Invalid for connecting type tail spindle. 2: Valid only in manual mode.
3-J		Tail body reverse	o Reverses tail body. Once this button is pressed, it continues reversing unless tail body stop or forward button is pressed and stops at stroke end. Notes 1: Invalid for connecting type tail spindle. 2: Valid only in manual mode.
1-H		Tail spindle forward	o Forwards tail spindle. Once this button is pressed, it continues forwarding unless tail spindle stop or reverse button is pressed and stops at stroke end. Note : Valid only in manual mode.
1-I		Tail spindle stop	o Stops the operation of tail spindle. Note : Valid only in manual mode.

	Names		Purposes
1-J		Tail spindle reverse	o Reverses tail spindle. Once this button is pressed, it continues reversing unless tail spindle stop or forwared button is pressed and stops at stroke end. Note : Valid only in manual mode.
No.2 2-F	Lathe 	X-axis move (up and down) Z-axis move (right and left)	o In manual mode, performs the move along pressed key axis only while key is kept pressed. o No move is performed when both up and down or right and left move buttons are turned on at a time. Notes 1: Valid only in manual mode. 2: Axes are independent from each other.
No.1 2-F	Vertical lathe 	X-axis move (right and left) Z-axis move (up and down)	
11-H to 10-K		Numerals	Twenteen numeral keys [0], [1], [2], [3], [4], [5], [6], [7], [8], [9], [.], [-] are provided for the input of numeral data. Distance data are fed with decimal point by millimeter, inch or deg.
11-L		Clear	o Cancels data entered at data setting part. o Press this key to erase the message after removing its cause.

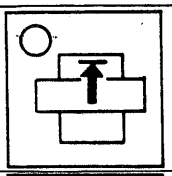
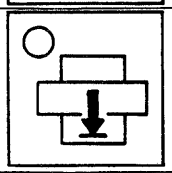
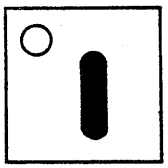
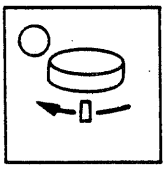
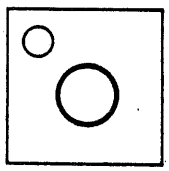
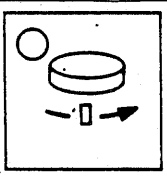
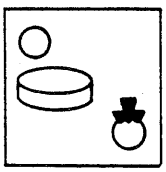
	Names		Purposes
10-L		Input	o Inputs data etered at data setting part into data indicating part.
5-K		Program rewrite lock/enable	o No data rewrite is possible when inserted key is set to LOCK side. See Annex 9-4.
2-L		Emergency stop button	o Used on machine malfunction or abnormality. Note: Be sure to return the dog to zero-point after cancelling emergency stop.
2-3		Manual pulse generator	o Valid when manual mode and handle interrupt are on. Subjects machine to fine feed when its handle is turned. o When the handle is turned in automatic machining operation, coordinates are shifted correspondingly to turned angle from the position fixed by block command. Note: The pulses generated per graduation amount to parameter P12 fixed value.
13-A		Picture selection	o Used for the change-over of a picture to another. Press the menu key for the picture to be displayed after this key. Corresponding picture will then appear.

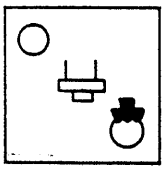
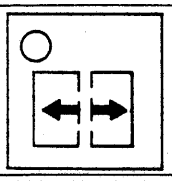
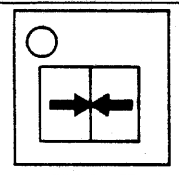
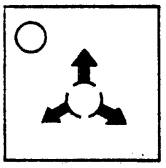
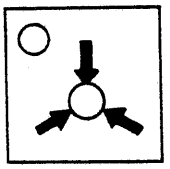
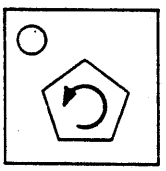
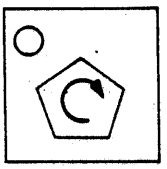
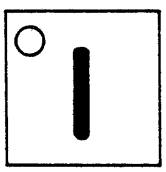
	Name		Purpose
13-L		Menu selection	o Used for the change-over of menu display. Note : Changeable menus are limited to the ones usable in each status. For example no manual operation menu is displayed even if this key is pressed in automatic operation mode.
12-G		Cursor call-up and shift (up, down, right, left)	o Used to set or shift the cursor in the display. Note: The cursor shifts continuously while this key is kept pressed.

Magazine

	Names		Purposes
5-H		Magazine ATC position (ATC type)	o Index a tool selected by operation button (on another board) to ATC position. o Selects magazine swing position in manual operation.
5-I		Magazine tool mounting location (ATC type)	o Index a tool selected by operation button (on another board) to tool mounting location. o Selects magazine swing position in manual operation.
5-J		Magazine swing (ATC type)	o Magazine swing command o Valid only in manual mode.

Vertical lathe operation buttons

		Names	Purposes
Cross rail 3-H		Cross rail up (ATC type)	o Selects cross rail up mode in manual operation.
Cross rail 3-I		Cross rail down (ATC type)	o Selects cross rail down mode in manual operation.
Cross rail 3-J		Cross rail starting (ATC type)	o Shifts cross rail. Five stop positions are provided. One-position shift per press time. Note: Valid only in manual mode.
1-H		Chip scraper forward rotation	o Rotates chip scraper in the reverse direction when viewed from downward to discharge the cutting chip on chip cover into chip pan or chip conveyor.
1-I		Chip scraper stop	o Stops chip scraper.
1-J		Chip scraper reverse rotation	o Rotates chip scraper in the forward direction when viewed from downward.
6-E		Table orientation (optional)	o Orientation of table (spindle). o Valid when selecting C-axis or in manual mode.

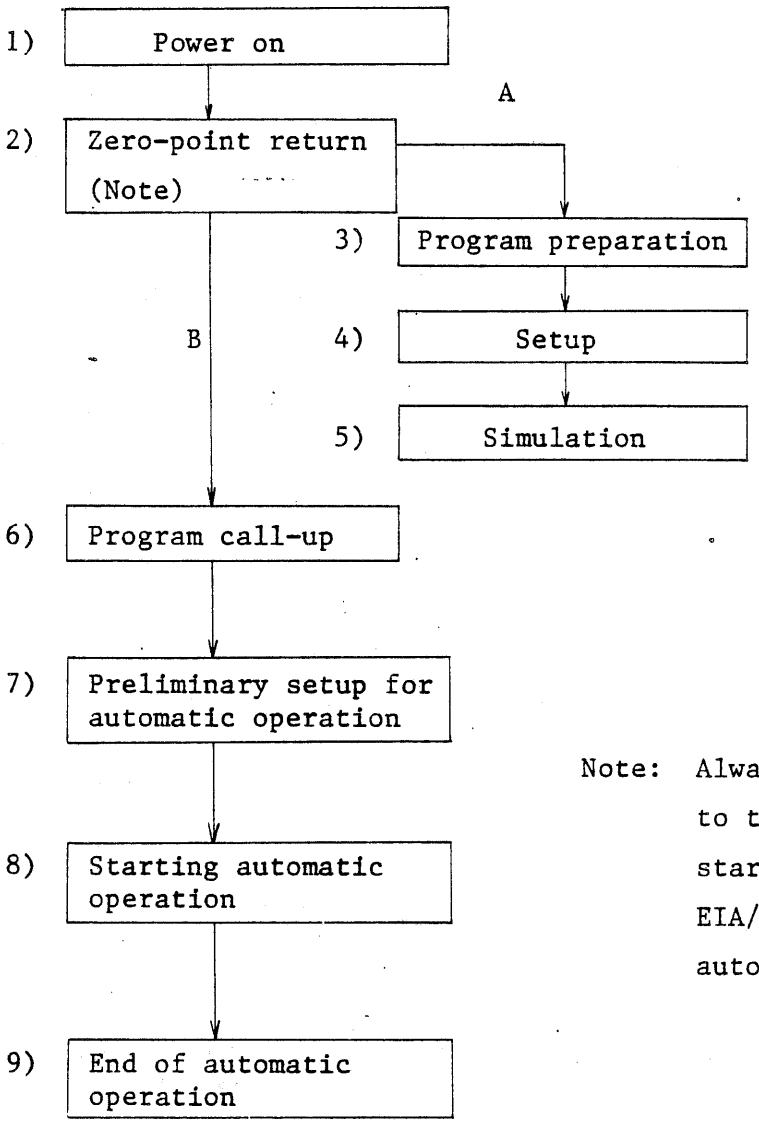
	Names		Purposes
5-E		Mill spindle orientation	o Orientation of mill spindle. o Valid in milling mode or in manual mode.
6-F		Magazine cover open (ATC type)	o Used to open magazine cover during ATC. o Valid only in manual mode.
5-F		Magazine cover close (ATC type)	o Used to close magazine cover on the completion of ATC. o Valid only in manual mode.
6-G		Chuck loosening (optional)	o Loosens hydraulic chuck if any. o Unclamps pallet if pallet changer is provided.
5-G		Chuck tightening (optional)	o Tightens hydraulic chuck if any. o Clamps pallet if pallet changer is provided.
6-H (Turret)		Turret forward rotation (turret type)	o Forward rotation of turret in manual operation.
6-I (Turret)		Turret reverse rotation (turret type)	o Reverse rotation of turret in manual operation.
6-J (Turret)		Turret swing (turret type)	o Turret swing command. o Valid only in manual mode.

Lamps	Functions	Purposes	Remarks
READY	Preliminary setup completed for operation	o On when machine is operable (green). Notes 1: Off on emergency stop. 2: On 4 sec. after power on.	
BUSY	Arithmetic operation underway	o On in machining program arithmetic operation (green).	
% P. HEAD	Program head	o On only when NC system is reset in automatic mode (green). Indicates that run is possible starting from program head.	
P. END	Program end	o On only when program run is completed (green). Note: Instantaneous lighting since program run position is reset to head at same time as completion.	
TURRET	Tool swing	o On while a tool is in the tool swing position in automatic mode (green).	
? MC ALM	Machine alarm	o On upon machine side alarm (red).	
? TOOL ALM	Tool alarm	o On upon tool life alarm (red).	

Lamps	Functions	Purposes	Remarks
? NC ALM	NC alarm	o On upon NC system alarm (red).	
Z HOME	X-axis zero-point	o On when X-axis is at machine zero-point (green).	
X HOME	Z-axis zero-point	o On when Z-axis is at machine zero-point (green).	
COUNT UP	Parts count-up	o On while the work counter that can be set using POSITION or COMMAND picture performs count-up in automatic operation (green).	

3. FOR OPERATION BEGINNERS

A variety of operations are necessary after machine installation and adjustment until the completion of products. Flow-diagrammed below is the main handling steps until starting automatic operation.



Note: Always return the axis to the zero-point before starting the MAZATROL or EIA/ISO program in the automatic operation mode.

A: New work machining

B: Continuous work machining

The diagram roughly shows flow. Refer to the corresponding descriptions made in accordance with the diagram for further details.

1) Power on

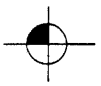
- Main power on — Breaker on.
- NC power on — Press [|] (NC power on) on operation panel.

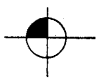
o READY (preliminary setup completed for operation) lamp on.
o POSITION picture appears on display.
o [⊕] (zero-point return) key lamp turns on and the message "HOME RETURN?" is displayed.

2) Zero-point return

- Zero-point return — Refer to "Zero-Point Return"

o Zero-point return lamps (X- and Z-axes) come on.

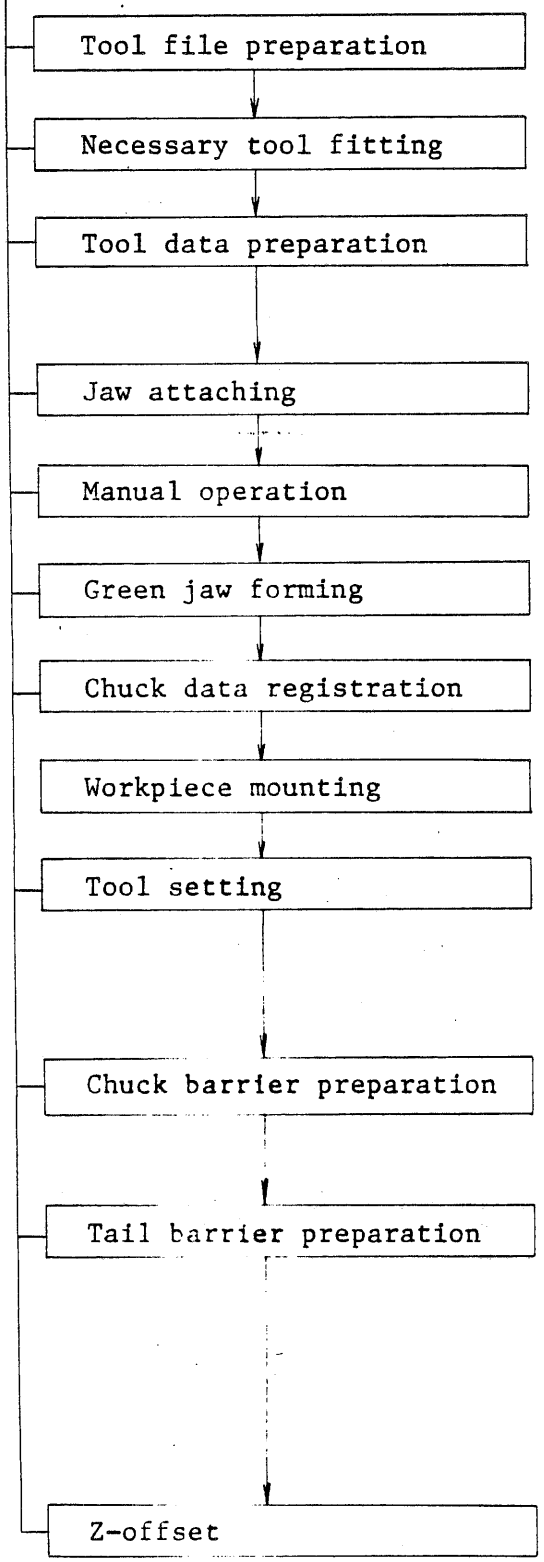

X HOME (X-axis zero-point)


Z HOME (Z-axis zero-point)

3) Program preparation

- Machining program preparation and graphic check — Refer to Programming Manual in separate volume.

4) Setup



Registration of tool shape

Registration of the cutting tools to be used or replaced.

Registration of chuck jaw shapes

Fixing the distance between cutting edge and program zero-point

Registration of CHUCK-X and CHUCK-Z

Registration of the length of tail spindle projection for shaft work and of the position of tail spindle tip for chuck work

Program zero-point shift in Z-axis direction

5) Simulation

- Check of the operating condition of prepared program and tool

6) Program call-up

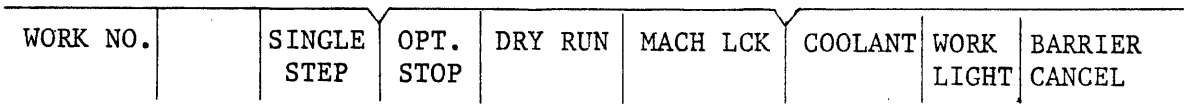
- Selection of automatic operation mode
- Work number setting and data check (process number setting if necessary)

o %P.HEAD (program head) lamp on

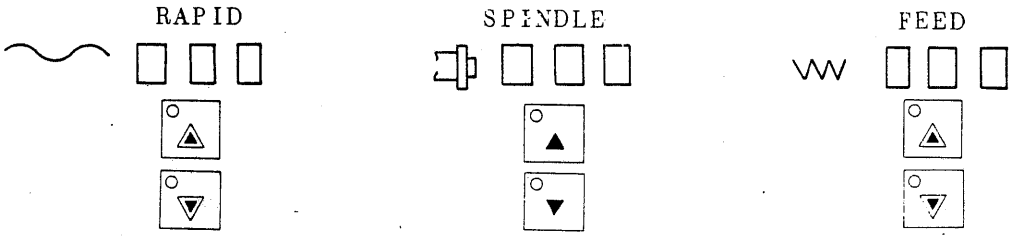
7) Preliminary setup for automatic operation

- Check of run condition — Change and limitation of automatic operation menu and override

Automatic operation menu



Override



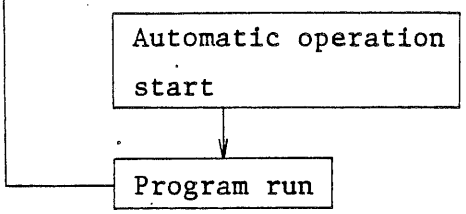
- Re-check of the preliminary setup for machine operation

o Check that ⊕X HOME, Z HOME(zero-point return) lamps, | READY (preliminary setup completed for operation) lamp and % P. HEAD (program head) lamp are on.

o Check tool setting and Z-offset again.

o Press [//] (reset) key.

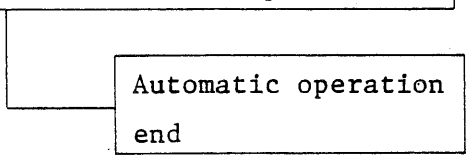
8) Starting automatic operation



(cycle start) on

o (cycle start) key lamp on

9) End of automatic operation



o (cycle start) key lamp off

o |P.END (program end) lamp instantaneously on.
o %P.HEAD (program head) lamp on
o Turret is at tool change position.

* Repeat steps 8) and 9) when continuously machining work.

4. MANUAL OPERATION

4-1 Stop of Machine Operation

Emergency machine stop is necessary in some cases during machine handling or automatic operation.

(1) Emergency stop button
Stops all operating commands in either manual or automatic mode.

Handling
1

Press (emergency stop) button.

Cancel
1

Turn the button in RESET direction (clockwise).

- o The same position as that on power supply is obtained if | READY (preliminary setup completed for operation) lamp on after cancel.
- o The machine is in an alarm condition if | READY (preliminary setup completed for operation) lamp does not come on. In this case use DIAGNOSIS picture for check.

(2) (reset) key

- o All axes and spindle stop in the %P.HEAD (program head) position when this key is pressed in automatic mode operation.
- o Alarm can be cancelled using this key.
- o If alarm occurs again after cancel, press (reset) key after locating the cause once more.

(3) Manual mode change stop

o The axes and spindle stop when changing to manual mode in automatic operation.

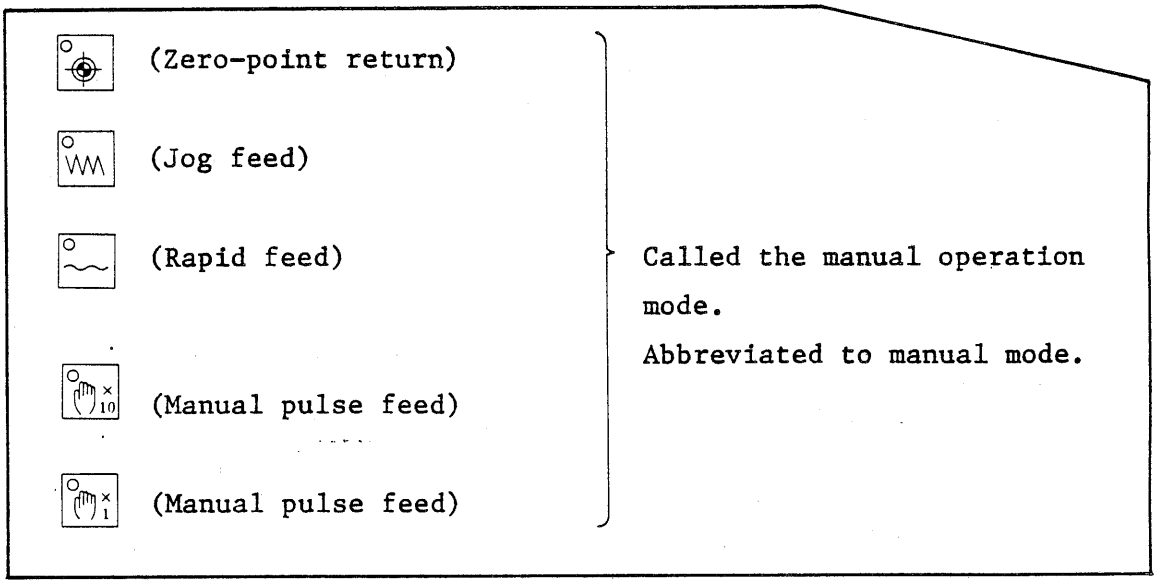
Note 1: Automatic operation continues if the automatic mode is selected and (cycle start) key is pressed.

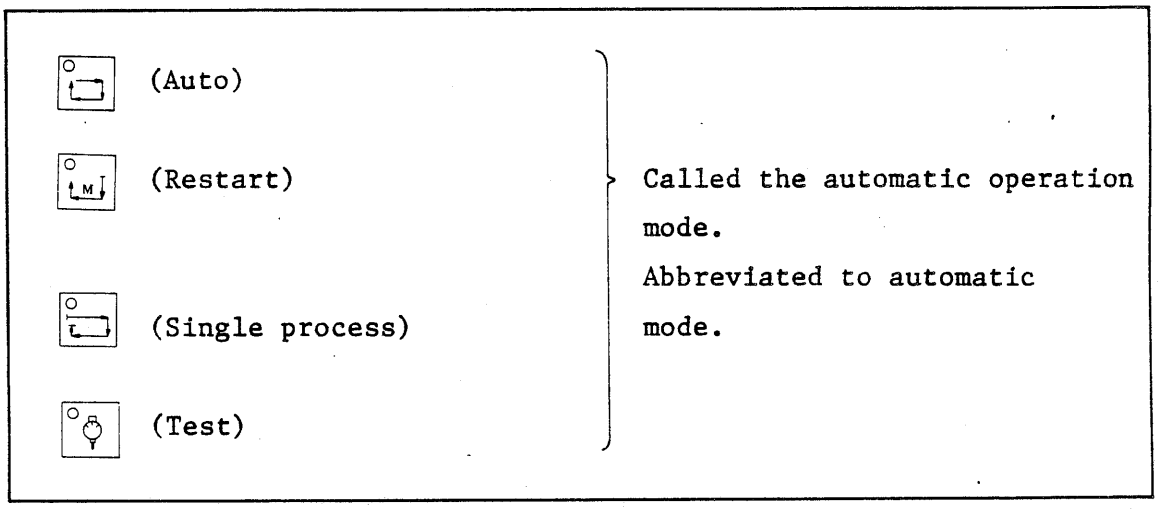
Note 2: Coordinate system deviates when a move is performed along axes after changing to manual mode.

(4) (power on) key stop

Stops the machine by cutting off the NC power in manual or automatic mode. This method however puts the spindle in a free run condition. Therefore, it takes a few moments until the spindle stops.

NOTE:





Indication [MACHINE LOCK] appears when [MACHINE LOCK] menu key is pressed.

Such character highlighting by a key press is named inverting.

Press [MACHINE LOCK] once more. It will then be reset.

Note that for the following description.

4-2 Zero-Point Return

Zero-point return is an important handling for storing the turret (tip) position i.e. machine zero-point in the numerical controller. Perform the following zero-point return steps when the message "HOME RETURN?" is displayed.

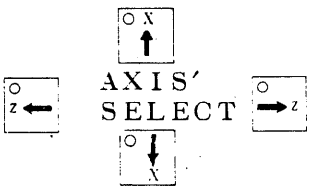
Handling

1. Press (zero-point return) key.

   o Zero-point return mode is automatically selected when the power is turned on.

2. Move the turret to the possible zero-point return range using an axis-move key.

   o Universal type: do not cause the interference between the tail body and the turret.



3. Move the turret in the zero-point return direction using an axis-move key.

4. Return axis zero-point indicator lamp on.

   X HOME (X-axis zero-point)

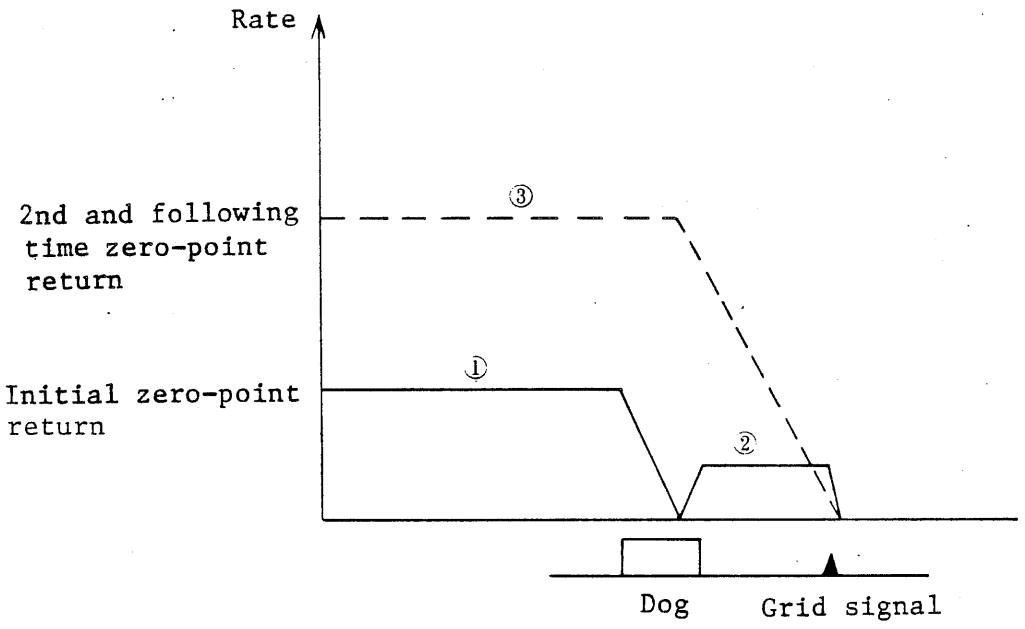
   Z HOME (Z-axis zero-point)

End

Note 1: When the simulation is valid, ⊕ Z HOME and ⊕ X HOME (zero-point) indicator lamps do not come on even if the turret is at the zero-point.

Note 2: When decelerated during zero-point return, the axis will not move in the opposite direction but will continue to return until it reaches the zero-point even though [↓] or [←] (axis move) key is reversed. If the key is pressed again, the axis will move in the commanded direction at the rapid feed.

Note 3: Zero-point return rate pattern:



(1) Rate before reaching the zero-point dog during the initial zero-point return

Initial zero-point return rate = [RF] * [A3] /100

[RF], [A3] are fixed by MACHINE PARAMETER.

(2) Rate after reaching the zero-point dog during the initial zero-point return

Zero-point approach rate = MACHINE PARAMETER [DF]

(3) Rate after the zero-point return

MACHINE PARAMETER [RF]

Rapid feed override will not be valid for the first zero-point return.

Note 4: If the turret is located near the zero-point return position, the zero-point return can also be performed by the cradle method i.e. to return the turret to the zero-point position after moving it opposite to the zero-point return direction using an axis-move key. However, pay much attention in doing this.

4-3 Rapid Feed

Used to move the tool rapidly mainly to obtain an easy access position or to approach the work for simple cutting in the manual operation.

Handling

1 Press [~] (rapid feed) key.

2 Adjust the feedrate per minute by pressing [~ ▲] (rapid feed override) key.

> The percentage to maximum rapid feedrate is indicated as illustrated below.
>
> RAPID
> ~ 0 6 0
> 60%

3 Check that there is no obstacle on the move axis and in the move direction; keep the axis-move key pressed until the target position is reached.

o Step 2 can be performed during the move.

End

Note 1: Refer to the Specifications for the maximum rapid feedrate.

4-4 Jog Feed

Used for standard work skin cutting, simple jig and other machining.

Handling

1. Press (jog feed) key.
2. Adjust feedrate per minute after pressing (jog feed override) key.

   Feedrate is indicated as illustrated below.

   □□□
3. Check that there is no obstacle on the move axis and in the move direction; keep the axis move key pressed until the target position is reached.

   o Step 2 can be performed during the move.

End

Note 1: The following table lists the feedrate codes.

Jog feed override and actual move rate

Indication	Feed (mm/min)	Indication	Feed (mm/min)
0	0	130	52
10	1.0	140	72
20	1.4	150	100
30	2.0	160	140
40	2.7	170	200
50	3.7	180	270
60	5.2	190	370
70	7.2	200	520
80	10	210	720
90	14	220	1000
100	20	230	1400
110	27	240	2000
120	37		

4-5 Manual Pulse Feed

Performed to position the tool edge accurately, and to cut the work while finely varying the feedrate.

Handling

1 Press [X10] and [X1] (manual pulse feed) keys.

o Manual pulse feed keys - [X10] and [X1] - are used to fix the relative magnification of move distance to the graduation value on the manual pulse generator.

[X10] .... 10 times
(= 0.01mm)
(= 0.001 inch)

[X1] .... 1 time
(= 0.001mm)
(= 0.0001 inch)

} 100 times (= 0.1mm) (=0.01 inch) when both are on.

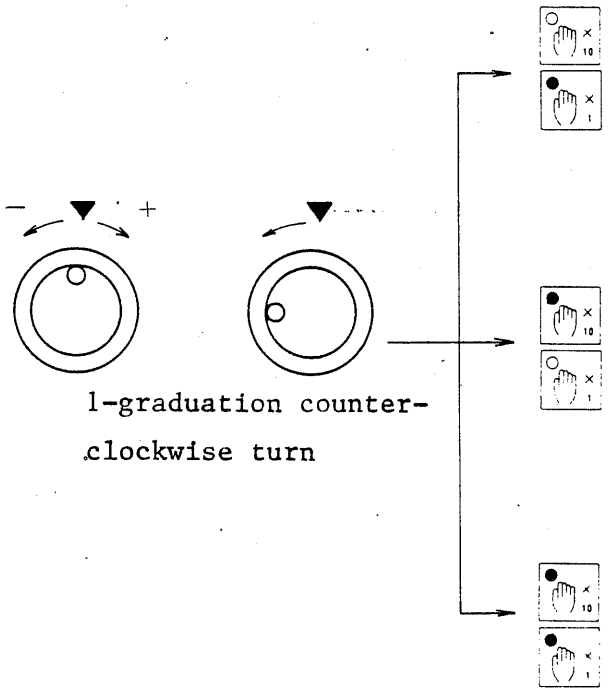
o Press and release both [X10] and [X1] keys when turning them on at the same time. This operation is valid only when both key lamps are on.

2 Select the move axis using [X] and [Z] (axis select) keys.

3 Turn (manual pulse generator) toward the move direction.

End

Relationship between the manual pulse generator magnifications



Note: No pulse feed is possible using the axis move key.

4-6 Stroke End Cancel

Generally, the corresponding axis cannot be moved when the alarm "109 STROKE END XX" is generated by the turret leaving the movable range. The move is made possible and the alarm is cancelled by following handling.

Handling

1. Check that the tool and work can move along the stroke end axis without interference.

2. Keep (OT release) and (reset) keys pressed until READY (preliminary setup completed for operation) lamp comes on. When this lamp comes on, release only (reset) key, and then select (rapid feed), (jog feed) or , (manual pulse feed) mode.

3. Move the stroke end axis to the operating range.

   Example: When the alarm "111 STROKE END + Z" is tiggered move the turret in the (-Z) direction.

4. Release (OT release) key.

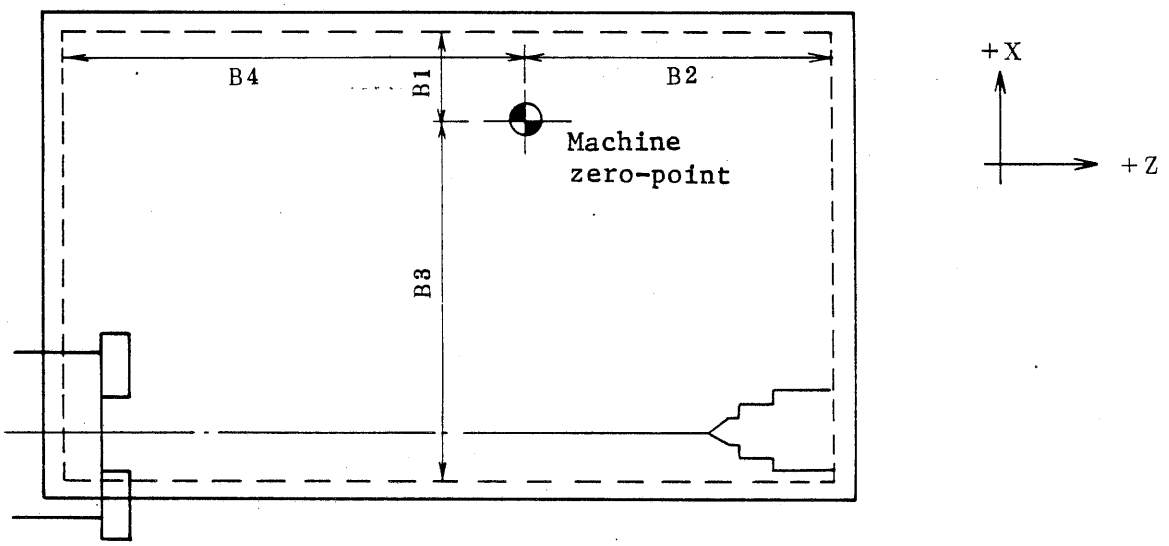
5. Press (reset) key

   o Alarm will then be cancelled.

End

Note 1: The X- and Z-axis stroke end position means that the turret has reached the machine safe operating limit. Normally no stroke end position is obtained since NC supervision (soft) limit is less.

Relationship between the stroke end and the soft limit



Limit fixed using the OT limit switch (stroke end)
Some models do not have this function.

NC supervision (soft) limit fixed in accordance with MACHINE PARAMETER [B1] to [B4].

4-7 Spindle Gear Selection

Used for changing to the desired spindle gear number.
No spindle gear number has been selected so no rotation is possible immediately after turning the power on.
To select the gear number, therefore, perform following handling.

Handling

1 Press (display select) key to select the POSITION or COMMAND picture.

TAILSTCK TEACH		TURRET UNCLAMP	GEAR SHIFT		MACH LCK	COOLANT	.WORK LIGHT	BARRIER CANCEL

2 Press GEAR SHIFT.

The message "GEAR NO.?" will then appear.

3 Select gear number.

o When selecting gear No. 2, for example, press 2 and (input) keys in succession.
o When selecting a gear, note that the spindle may turn.

The gear number selected by the POSITION or COMMAND picture is indicated.

SPINDLE
(2)

End

Note 1: Refer to the Specifications for gear numbers.

4-8 Spindle Start

Used to turn the spindle when jaw forming, tool edge position measuring or machine testing, etc.

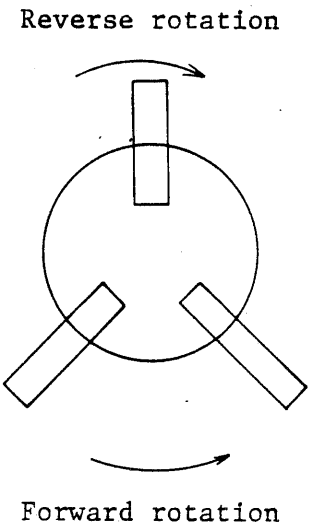
Handling

1 Note the POSITION or COMMAND picture to confirm that the proper gear is selected.

- o The speed varies depending on the selected gear (refer to the Specifications).
- o Refer to Spindle Gear Selection.

2 Select the run direction by pressing the [ ] (run direction change) key.

- o Key lamp off: forward rotation [ ]
- o Key lamp on: reverse rotation [ ]
- o When turning, the spindle stops if this key is pressed.

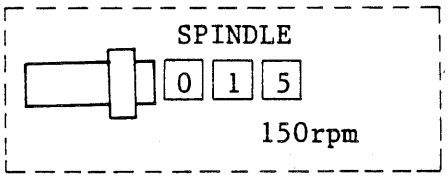


3 Hold ▲ (spindle override) key down until the desired speed appears on the spindle indicator segment.

o Indicator segment numerals correspond to 1/10 of the command revolutions, but not directly to actual revolutions.

o Actual revolutions can be checked with SPINDLE on the POSITION and COMMAND pictures.

SPINDLE ..... RPM
(2)



4 Press (spindle start) key.

End

Note 1: The speed can be increased or decreased by the spindle override key even while the spindle is turning.

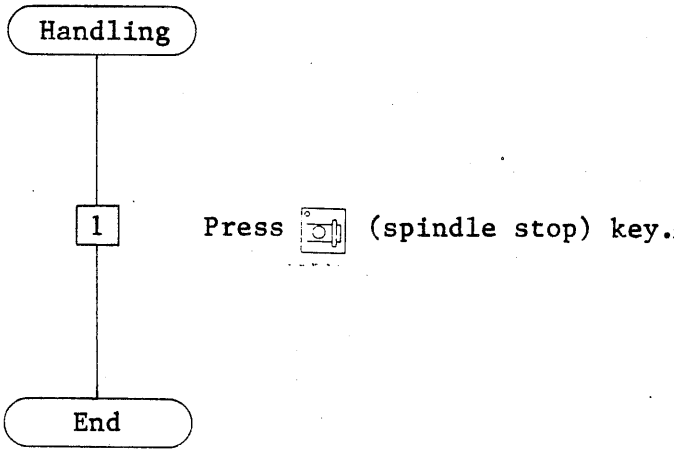
Note 2: The spindle does not turn when the override indication is "0". Note this when the spindle start key has already been pressed.

Note 3: The maximum revolutions vary depending upon the specifications of the machine.

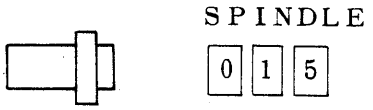
Note 4: Do not press the (spindle inching) key while the spindle is turning. If pressed, the speed will be changed to inching.

4-9 Spindle Stop

Used to stop the spindle rotation.

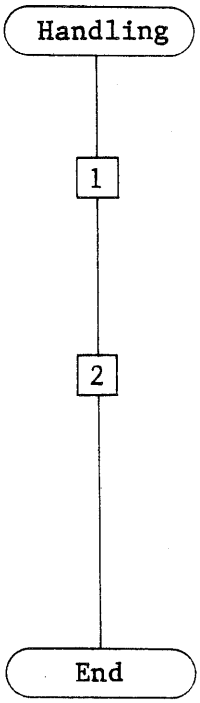


Note 1: The revolutions indicated on the spindle segment do not vary even after it stops.



4-10 Spindle Inching

Performed to turn the jaw to an easy-to-handle position for fitting or removal.



Select the run direction using the (run direction change) key.

The spindle will turn or stop when the (spindle inching) key is held down or released respectively.

Note 1: Spindle stops when the (run direction change) key is pressed during inching.

Note 2: Spindle inching speed is set at approximately 1 percent of the maximum r.p.m. of the selected gear.

4-11 Turret Unclamp

Performed to change the inside parts, alignment, adjustment of the turret and other maintenance.

Handling

1 Check that manual mode is used. Select the POSITION, COMMAND or TRACE picture by pressing the (picture select) key.

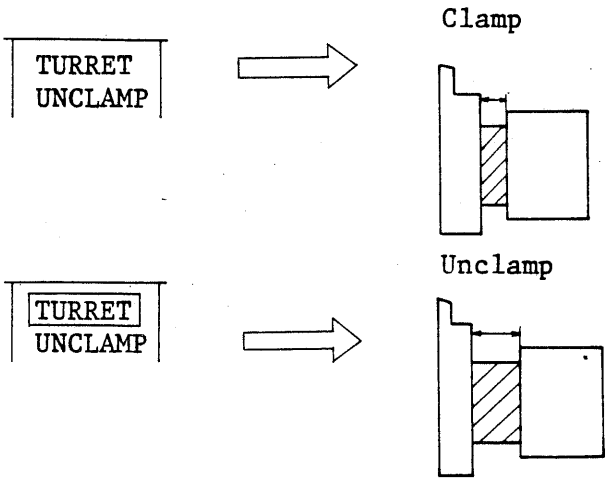
o The following menu then appears.

TAILSTCK TEACH		TURRET UNCLAMP	GEAR SHIFT		MACH LCK	COOLANT	WORK LIGHT	BARRIER CANCEL

If not, press the (menu select) key.

2 Press TURRET UNCLAMP .

o The menu key will then invert so the turret will rise (unclamp).



End

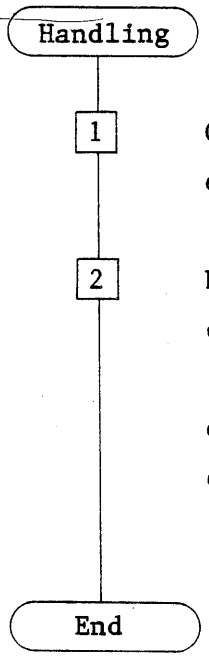
Note 1: This function continues unless the invert is cancelled by pressing this key again.

Note 2: The turret unclamp procedure will vary depending on the model.

4-12 Tool Swing

Used to swing the turret for tool mounting/detaching, tool nose position measurements, etc.

Single turret type:



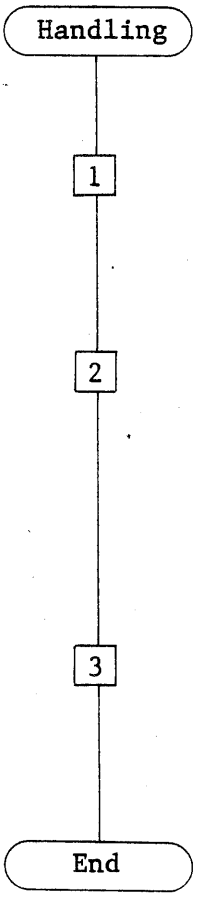
Check that either one of the manual operation modes is effective.

Hold the (tool swing) key down until the desired tool comes to the desired position.

- o The tool does not swing while turret unclamp is underway.
- o The tool swings in one direction only in the manual operation mode.

Note: Be cautious lest the tool should come into collision with the chuck or workpiece while swinging.
It is recommended to move the tool to a safety zone in advance at the rapid feed.

Double turret type:



Check that either one of the manual operation modes is effective.

Press the (turret select) key.

When the light is ON ..... Back turret
When the light is OFF ..... Front turret

Operate the (tool swing) key in the same manner as done in the case of Single turret type.

Note 1: The operation may vary depending on the model.

4-13 Machine Protection

Used to prevent one turret from intefering with another for machine with two turrets.
Applicable models: M4, M5, P.M., etc.

Handling

1 Press (picture select) key to select the POSITION, COMMAND or TRACE picture.

2 Press (menu select) key to display the following menus.

TAILSTCK TEACH		TURRET UNCLAMP	GEAR SHIFT		MACH LCK	COOLANT	WORK LIGHT	BARRIER CANCEL

3 Press [PROTECT] menu key.

[PROTECT]

When "PROTECT" is inverted, the protect function is enabled. Pressing this menu key again will clear the protect function.

End

- For further information on the machine protect function, see the Operating Manual of the respective model.
- The [PROTECT] menu key is provided only for double-turret models.

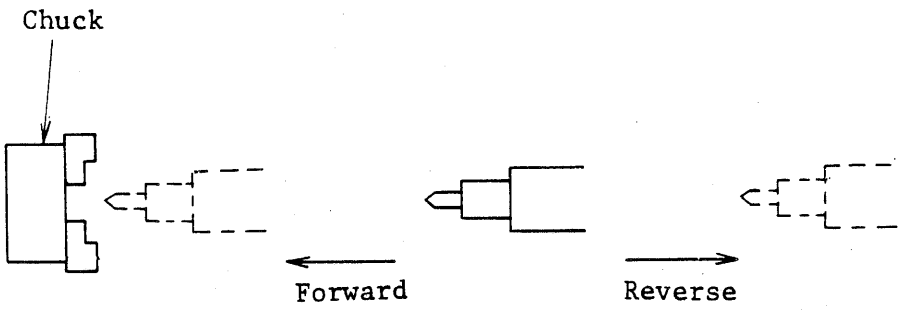
4-14 Tail Stock Move

Tail stock performs self or non-self move.

Self move type - tail body move:

Handling

1 Press the (tail body forward) or (tail body reverse) key depending on the target move direction.



Forward and reverse movement of the tail body

2 Press (tail body stop) key

End

Note 1: Pressing and at the same time will result in the (tail body stop) state.

Note 2: Inching is not possible by either or .

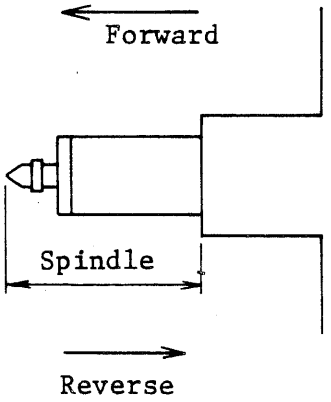
Note 3: When the tail body reaches the forward or reverse end, will be effective automatically even pressing or , and the tail body will stop.

Note 4: For furhter information, see the Operating Manual of the respective model.

Self move type - tail spindle move:

Handling

1 Press the (tail spindle forward) or (tail spindle reverse) key to select the target direction.



Forward and reverse movement of the tail spindle

2 Press the (tail spindle stop) key.

End

Note 1: The (tail spindle stop) state occurs when the (tail spindle forward) and (tail spindle reverse) keys are pressed at the same time.

Note 2: Inching is not possible by either or .

Note 3: For further information, see the Operating Manual of the respective model.

Non-self move type:

Handling

1 X-axis zero-point return is carried out. ⊕X HOME

2 The Z-axis is moved to the tail body joint position at a jog feed of 2000 mm/min.

POSITION

The POSITION light on the control panel will come on.

3 Press the (tail body connection ON/OFF) selection key.

4 Press the (tail body connection) key.

The tail body will be linked with the turret mount crossrail with a pin.

5 Since the (jog feed) is automatically selected, move the tail body in the desired direction using the axis move key (or).

6 Press the (tail body connection) key again.
The joint pin will come off and the tail body will be clamped.

End

Note 1: When moving the Z-axis, pay attention so that the turret will not interfere with the tail body.

Note 2: Tail body move is effective only with the jog feed.

Note 3: For further information, see the Operating Manual of the respective model.

4-15 Lighting

Used to turn the machine work lamp on or off.

Handling

1. Press the (picture select) key.
2. Select the POSITION, COMMAND or TRACE picture.
3. Display the following menus by pressing (menu select) key.

TAILSTCK TEACH		TURRET UNCLAMP	GEAR SHIFT		MACH LCK	COOLANT	WORK LIGHT	BARRIER CANCEL

4. Press the [WORK LIGHT] menu key.

[WORK LIGHT]

When "WORK LIGHT" is inverted, the machine lamp will come on.
To turn off, press the [WORK LIGHT] key again.

End

4-16 Coolant

Used to start or stop the cutting fluid.

Handling

1. Check that the manual operation mode is effective.

2. Press the (picture select) key to select the POSITION COMMAND or TRACE picture.
   During the picture select procedure, the following menu will be displayed. If not displayed, press the (menu select) key.

TAILSTCK TEACH		TURRET UNCLAMP	GEAR SHIFT		MACH LCK	COOLANT	WORK LIGHT	BARRIER CANCEL

3. Press the [COOLANT] menu key.

[COOLANT]

"COOLANT" is inverted and the cutting fluid is supplied from the machine. The supply stops when the key is pressed again.

End

Note 1: Begin this procedure after filling the coolant in the machine.

4-17 Machine Lock

Performed to check a program by running without actual machining for fixing the turret in the current position. Move for ATC operation: once the machine lock is cancelled, the axis move is performed, and after the ATC operation is completed, the machine lock position is selected again.

Handling

1. Select the POSITION, COMMAND or TRACE picture with the (picture select) key.

2. Have the following menu displayed with the (menu select) key.

TAILSTCK TEACH		TURRET UNCLAMP	GEAR SHIFT		MACH LCK	COOLANT	WORK LIGHT	BARRIER CANCEL

3. Press the [MACH LCK] menu key.

[MACH LCK]

Function works when "MACH LCK" is inverted. It is cancelled when the [MACH LCK] key is pressed again.

End

Note 1: The machine lock is a condition made mechanically. Its internal processing does not differ from normal. The coordinate value, tool picture and other display data vary from time to time depending on the control.

Note 2: The operation is interrupted if the procedure is performed. By pressing the (cycle start) key, however, it can be restarted with the machine lock position maintained.

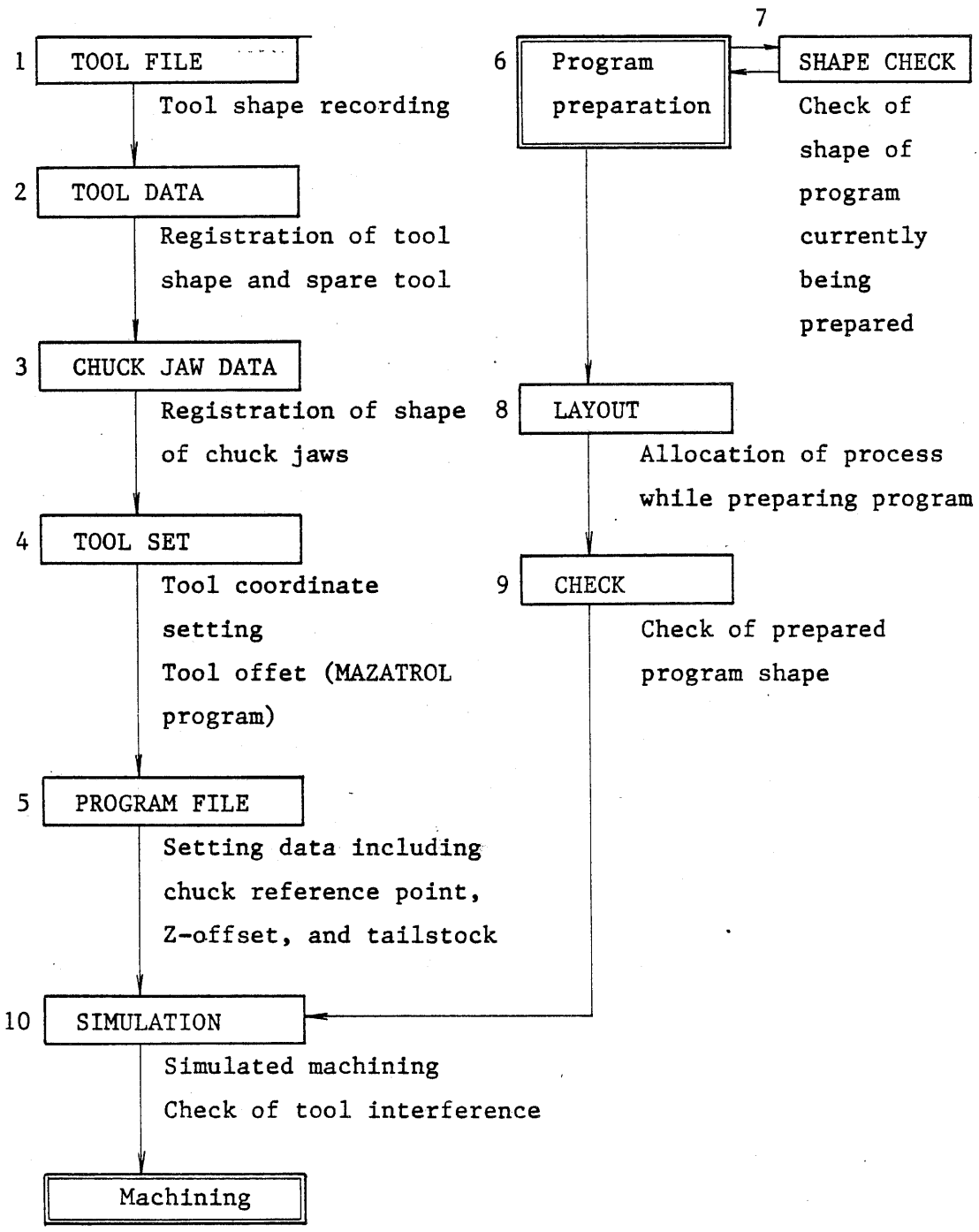
If the machine lock is cancelled during the operation, the turret will start to move as soon as the distribution of moving blocks is completed. At this time, however, the coordinates deviate by the distance corresponding to the shift in the numerical controller during machine lock. Therefore, be sure not to turn the machine lock on/off during operation, otherwise, the machine will jam.

Note 3: If the machine lock is turned on while decelerating during the return to zero point, the machine-lock condition will not occur immediately, but only after returning to zero point.

5. DISPLAY DATA

Outline

When machining materials, it is very important to prepare a suitable program. To execute the program, it is prerequisite beforehand to store the necessary data in the NC. These data include information on the tools, chuck and tailstock. In this Chapter, how to set data is described according to the following sequence:



5-1 TOOL FILE Picture

Performed to set the shape data of the tools to be used for machining work or to be stored in the numerical controller in advance.
A total of 64 tools - 16 x 4 (pictures) - are registrable.
To change displays, press |PAGE| menu key, and the next page will be displayed.
Setting items:

FNO.	SHAPE	HLDR	DEP-ANG	CUT-ANG	WIDTH	PITCH
1	MDL-OUT	4	0	0	0	0
	(a) (b)	(c)	(d)	(e)	(f)	(g)

Call up (cursor) and set above one by one.

(a) TOOL DATA SHAPE (MENU)?: setting should be performed using the general names of the tools to be registered.

When TURNING was selected in response to "WHICH TYPE OF TOOL (MENU)?":

(1)	(2)	(3)	(4)	(5)	(6)			
GENERAL TURNING	GROOVE	THREAD	DRILL	TAP	TOUCH SNS	TOOL DATA		PAGE

One should be selected.

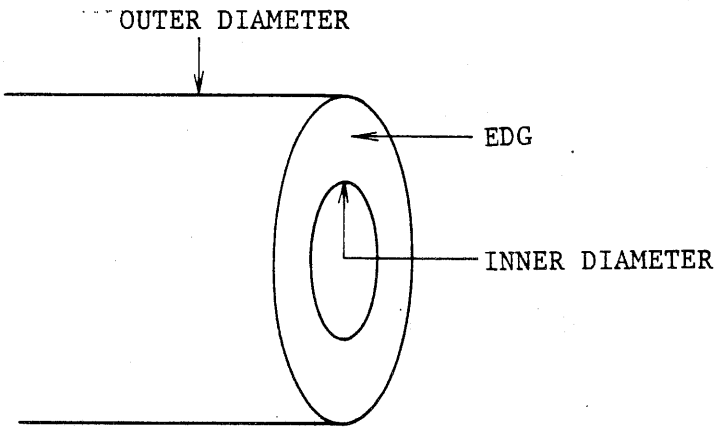
(1) GENERAL TURNING: general machining tool
(2) GROOVE: grooving tool
(3) THREAD: threading tool
(4) DRILL: lead hole cutting drill
(5) TAP: tapping tool
(6) TOUCH SNS: special tool for coordinate measuring

(b) TOOL MACHINING PART (MENU)?: tool cutting range of work is registered.

When TURNING was selected:

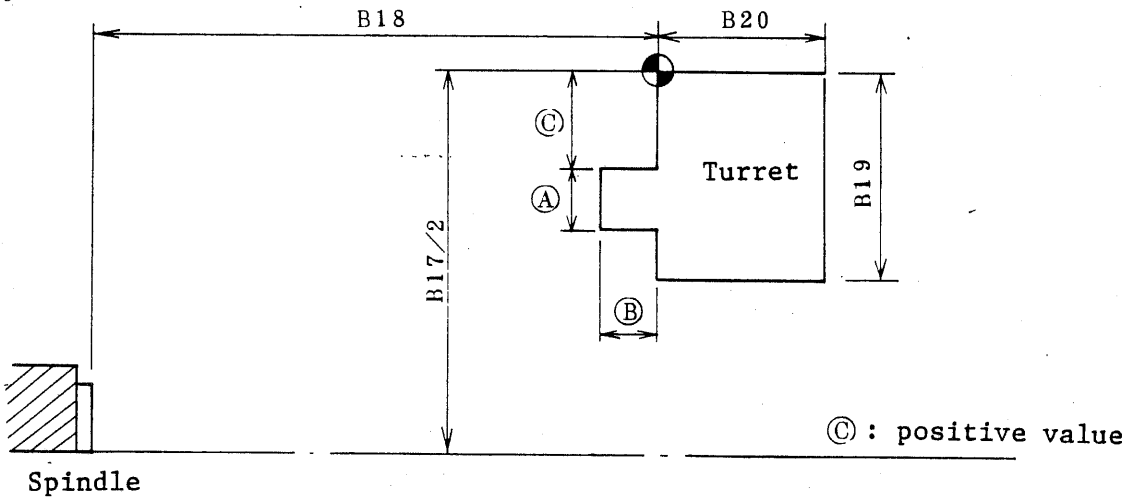
OUTER DIAMETER	INNER DIAMETER	EDG				TOOL DATA		PAGE

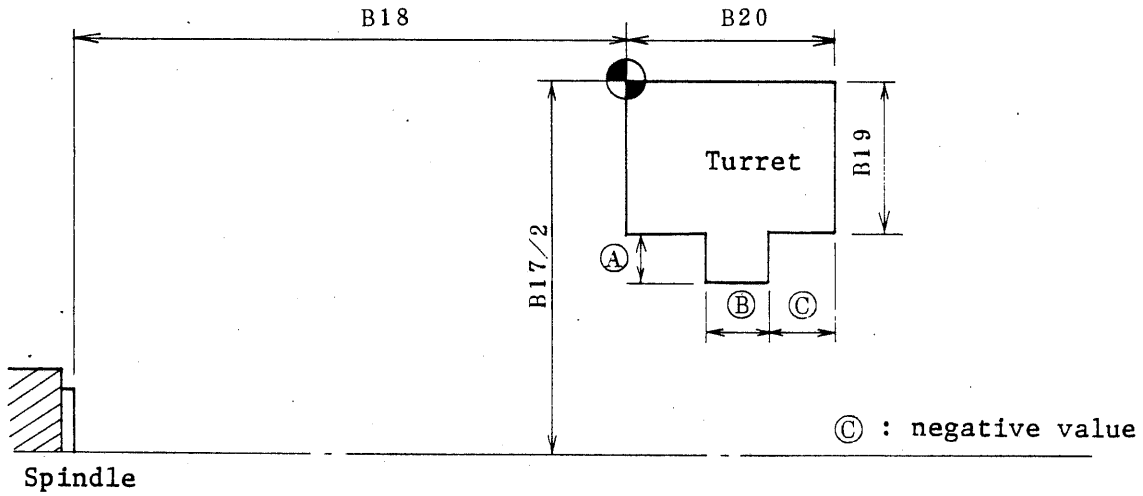
Select one.



(c) TOOL HOLDER TYPE?: 1-digit input of tool holder by using 0 to 4 ten-keys. This registration sets holder barrier.

Barrier setting range:





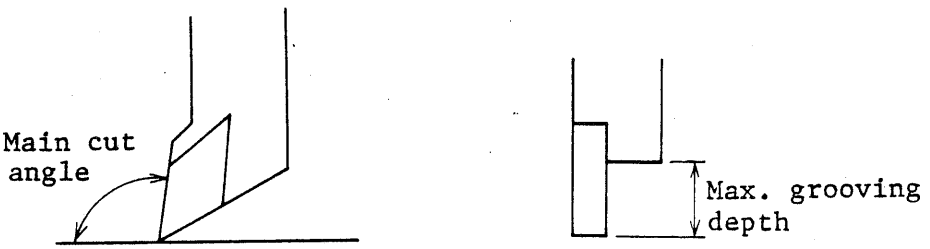
Above case: holder type 1

All B17 to B32 should be set using PARAMETER (MACHINE) (refer to Parameter). Holder types are set as tabulated below using parameters.

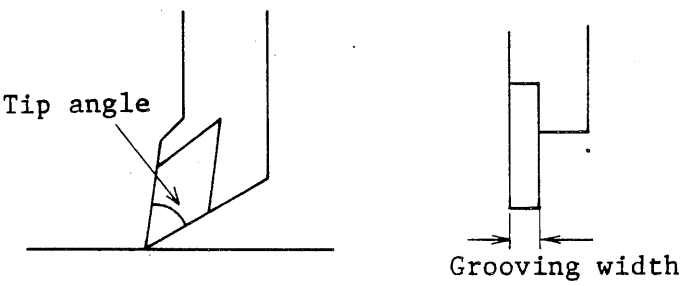
Holder type	PARAMETER (MACHINE) setting points		
	Ⓐ	Ⓑ	Ⓒ
0	Holder absent		
1	B21	B22	B23
2	B24	B25	B26
3	B27	B28	B29
4	B30	B31	B32

(d) CUTTING ANGLE (DEPTH)?: Set the main cut angle, maximum grooving depth or first cutting depth in the milling mode such as GNL, GRV, THR, etc. using ten-keys.

Example

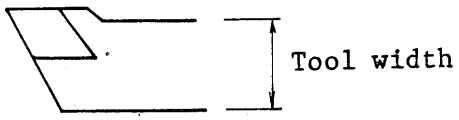


(e) CUTTING ANGLE (WIDTH)?: Set the nose (tip) angle of tool or the nose width of grooving tool such as GNL, GRV, THR, etc. using ten-keys.



Note 1: If this data is not set, alarm "333 ILLEGAL GROOVE WIDTH" occurs.

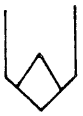
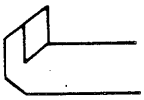
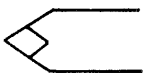
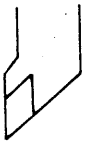
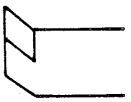
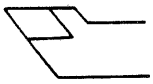
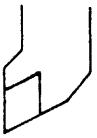
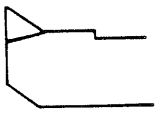
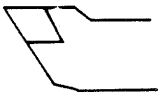
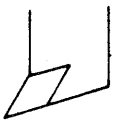
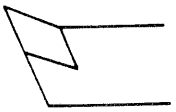
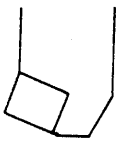
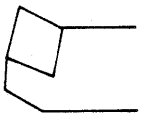
(f) TOOL SHANK WIDTH/DIA.?: Set tool shank width such as GNL, GRV, THR, *TOUCH SNS, *CHIP VACUUM, etc. using ten-keys. (*: optional)

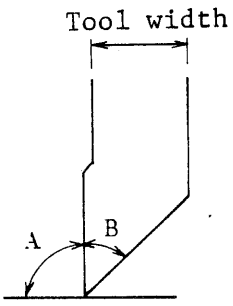


(g) PITCH?: Set the pitch of THR, TAP, MTP and other tools using ten-keys. Setting is possible up to fifth decimal digits.

Note 1: The tool shapes on SIMULATION and TRACE disdplays depends on the cut and nose angles fixed in TOOL FILE display. They are classified into the types tabulated below because they considerably vary.

Example: slant type GNL, reverse rotation left hand cutting.

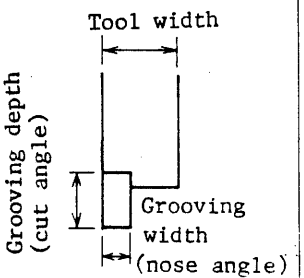
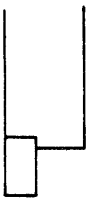
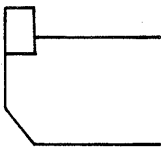
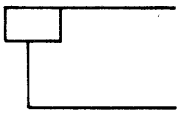
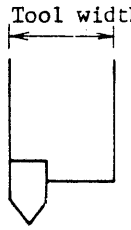
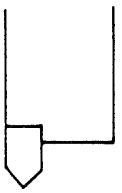
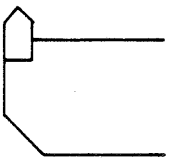
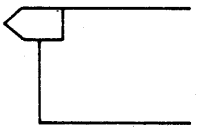
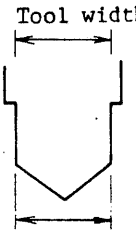
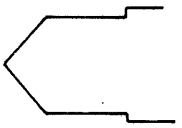
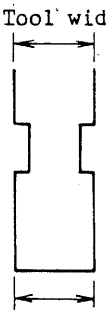
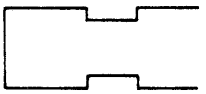
	OUT	IN	EDG
A ≦ 72.5 B ≦ 60			
72.5 < A < 105 B < 60			
72.5 < A < 105 B ≧ 60			
A ≧ 105 B < 60			
A ≧ 105 B < 60			



A: Cut angle

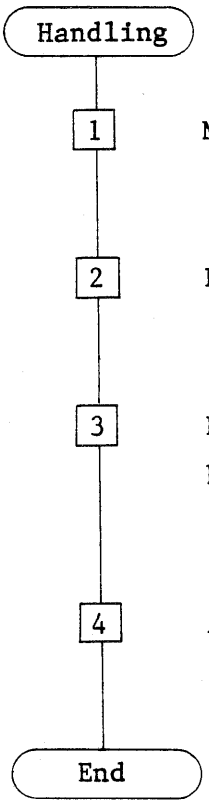
B: Nose angle

Note 2: No chip display is given for forward rotation right hand cutting.

Tool names	OUT	IN	EDG
GRV 			
THR 			
DRL 			
TAP 			

TOOL FILE CANCEL operation

To cancel the already entered tool file number data, use the following procedure.



1 Move the cursor to the tool file portion (Note 1).

2 Press [TOOLFILE CANCEL] menu key.

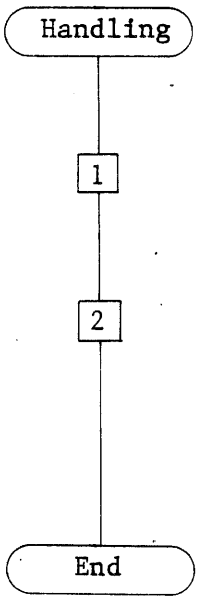
3 Respond to "TOOL FILE CANCEL (INPUT)?" by pressing [→] (input) key.

4 All tool file at the cursor portion is cancelled.

Note 1: For T-2 specification macines: data entered in response to "SHAPE DATA OF TOOL (MENU)?".

ALL ERASE operation

To cancel all tool files, use the following procedure.



Note 1: Entering other number than "-9999" will cause the alarm "401 INPUT FOMAT ERROR" (bleu).

5-2 TOOL DATA Picture

Should be used to set the shape of machine fitting tool, tool control data and spare tool data.
The data of up to 64 tools - 16 tools x 4 (pictures) - can be set although this quantity depends on NC fitting models.
To change displays, press PAGE key, and the next page will be displayed.

Setting items:

TNO.	FNO.	SHAPE	NOSE-R	FWD/REV	R/L	SPARE-TOOL	LIFE		USED	
							TIME	NUM	TIME	NUM
1	14	GNL-OUT	0.4		LEFT	3-1(0)	80	130	4	15
(a)	(b)		(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)

Set the following one by one using cursor:

(a) TOOL DATA MOVE (MENU)?: Perform following handling when replacing all tool number data on TOOL DATA display.

Following menus are displayed.

T DATA MOVE		T DATA V		TOOLDATA CANCEL		TOOL FILE	PROGRAM	PAGE

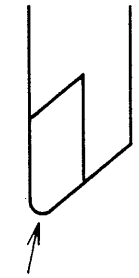
Press [T DATA MOVE].

[T DATA MOVE]		T DATA V		TOOLDATA CANCEL		TOOL FILE	PROGRAM	PAGE

TOOL NO?: Set the number of the tool to be replaced uisng ten-keys.

(b) TOOL FILE NO.?: Set the tool file number registered on TOOL FILE display.

(c) NOSE RADIUS?: Set the radius of the nose of GNL and TOUCH SNS.



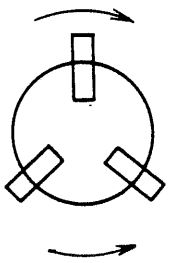
Set data are valid only for MAZATROL programs.

(d) SPNDL ROTATION FWD/REV (MENU)?: After selecting tool, select its spindle running direction from menu.

FWD ↶	REV ↷	CANCEL				TOOL FILE	PROGRAM	PAGE

Select one.

Reverse rotation



Forward rotation

Use [CANCEL] when erasing already set data (↶ FWD or ↷ REV).

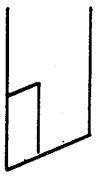
(e) RIGHT/LEFT HAND (CUT) (MENU)?:

Set the cutting hand direction of fitted tool such as GNL, GRV, THR, etc.

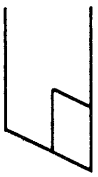
RIGHT HAND	LEFT HAND	CANCEL				TOOL FILE	PROGRAM	PAGE

Select one.

Use CANCEL menu key to cancel RIGHT HAND or LEFT HAND data already entered.



Left



Right

Set data influence simulation tool shape and path data.

(f) SPARE TOOL NO?: Not used.

TOOL OFFSET NO?: Not used.

TOOL OFFSET NO(EIA)?: Not used.

(g) TOOL LIFE TIME (MIN.)?: Set maximum operable time. This setting by minute is internally processed by second. Setting range: 0 - 999. When the setting is "0", lifetime control becomes invalid.

(h) MAX NUMBER OF WORKPIECES?: Set maximum cutting number. Setting range: 0 - 999. When the setting is "0", lifetime control becomes invalid.

(i) TOOL CUTTING TIME (MIN.)?:

The operation time of the tool in cutting feed is measured by second and indicated by minute.
When TOOL DATA picture is selected, internal measuring continues although no count indication is performed.
When lifetime setting data are reached, display is inverted and alarm "152 TOOL LIFE TIME ERROR (TIME)" is generated. (Note 1)

(j) WORKPIECE NO. TO BE COUNTED?:

Displays cutting times.
When TOOL DATA picture is selected, internal count continues although no count display is performed.
When life quantity setting data are reached, display is inverted and alarm "151 TOOL LIFE TIME ERROR (NUMBER)" is generated. (Note 2)

Note 1: Data change is possible only when TOOL LIFE TIME (MIN.) TOOL CUTTING TIME (MIN.) Former can however be set to "0".

Note 2: Data change is possible only when MAX NUMBER OF WORKPIECES > WORKPIECE NO. TO BE COUNTED. Former can however be set to "0".

Automatic Spare Tool Change Function

o There are four methods for changing tools automatically.

(1) Without indexing spare tools:
Input "0" to parameter [P4].

(2) Changing depending on the number of workpieces machined:
Input "1" to parameter [P4].

(3) Indexing by controlling the total operation time:
Input "2" to parameter [P4].

(4) Changing by controlling OFFSET-MAX:
Input "3" to parameter [P4].
However, the method (4) must be used together with the automatic tool measurement (MMS, tool tip measurement).

Note 1: To carry out indexing depending on the number of workpieces machined (P4 = 1):
If the service life has been entered and expires before all workpieces are machined, no spare tool will be indexed and the alarm "152 TOOL LIFE TIME ERROR (TIME)" will be displayed.
This also applies to indexing by controlling the total operation time.
Normally enter "0" to the service life of the tools not used to control the indexing.

Note 2: Up to 8 spare tools can be indexed.

Note 3: If 9 spare tools have been entered in the change depending on the number of workpieces, the eighth tool will be used to machine an additionel workpiece.
Therefore, be sure to index no more than 8 tools.

Example:

o Indexing depending on the number of workpieces machined (P4 = 1)

TOOL DATA picture

TNO.	FNO.	SHAPE	ACT-ϕ	NOSE-R	FWD/REV	R/L	SPARE-TOOL	LIFE		USED	
								TIME	NUM	TIME	NUM
1	14	GNL-OUT	0	0.4	◠	LEFT	7-1(0)	0	5	3	4
⟩											
7	14	GNL-OUT	0	0.4	◠	LEFT	12-1(0)	0	5	0	0

When the number of workpieces machined (USED NUM) of TNO. 1 becomes "5", TNO. 7 is automatically indexed from the next program.

TOOL DATA Picture - Supplement

Tool data exchange

The tool data registered on this picture are easily replaceable with other ones by following handling.

Handling

1 Shift cursor to the tool number to be replaced.

TNO.	FNO.	SHAPE
1	14	GNL-OUT
2	10	GRV-OUT
3	21	GNL-IN
4	6	TAP

2 Press [T DATA MOVE].

3 Set substitute tool number in response to "TOOL NO?" using ten-keys. If substitute tool number is "1" for example, press [1] and [⇨] (input).

4 TNO. 4 data are replaced with TNO. 1 ones.

TNO.	FNO.	SHAPE
1	6	TAP
2	10	GRV-OUT
3	21	GNL-IN
4	14	GNL-OUT

End

Tool data cancel

Carry out following handling when cancelling registered tool data for each TNO.

Handling

1 Shift cursor to TNO. for which tool data are to be cancelled.

TNO.	FNO.	SHAPE
1	14	GNL-OUT
2	10	GRV-OUT
3	21	GNL-IN
4	6	TAP

2 Press TOOL DATA CANCEL.

3 Press (input) in response to "TOOL DATA CANCEL (INPUT)?".

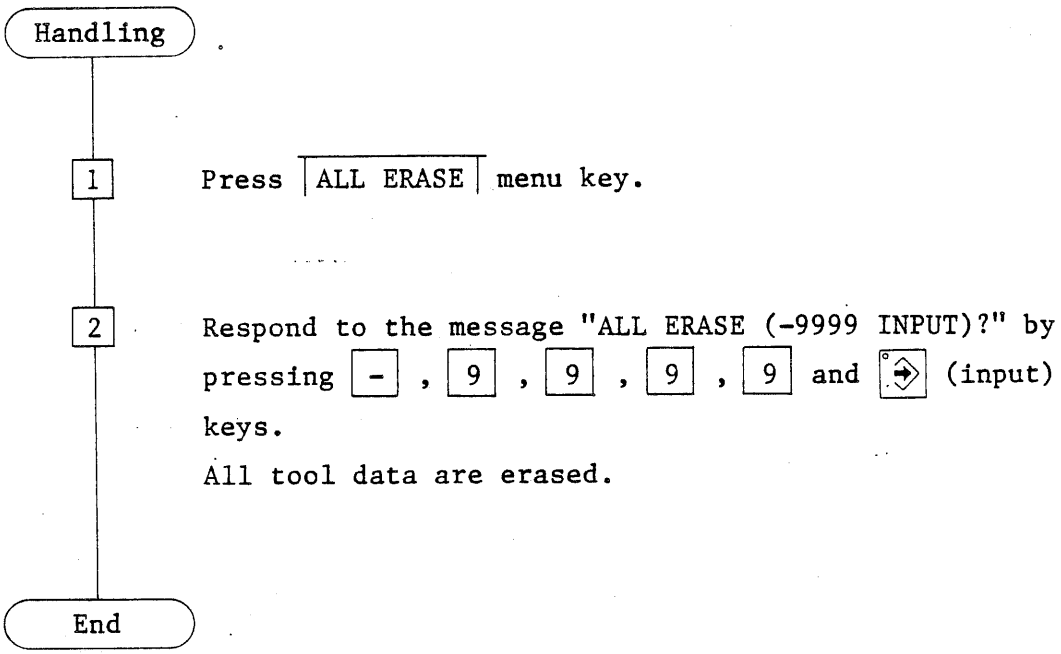
4 All tool data at the cursor position are cancelled.

TNO.	FNO.	SHAPE
1	14	GNL-OUT
2		
3	21	GNL-IN
4	6	TAP

End

All tool data erase

Used to erase all tool data.



Note 1: Entering other number than -9999 will cause the alarm "401 INPUT FORMAT ERROR" (blue).

5-3 CHUCK JAW DATA Picture

Stores 16 kinds of chuck (jaw) shape data.

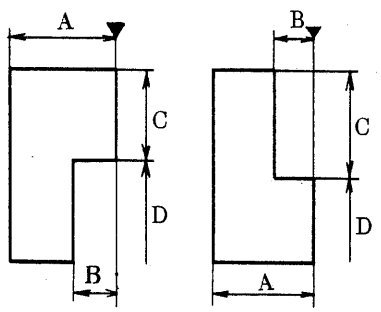
Registered data influence the chuck shape display on CHUCK BARRIER and SIMULATION pictures.

Up to 16 kinds of data can be set.

Picture selection order:

PROGRAM → PROGRAM FILE → CHUCK DATA .

Setting items:



JAW NO	TYPE	DIM-A	DIM-B	DIM-C	DIM-D
1	OUT	40	10	30	35
	(a)	(b)	(c)	(d)	(e)

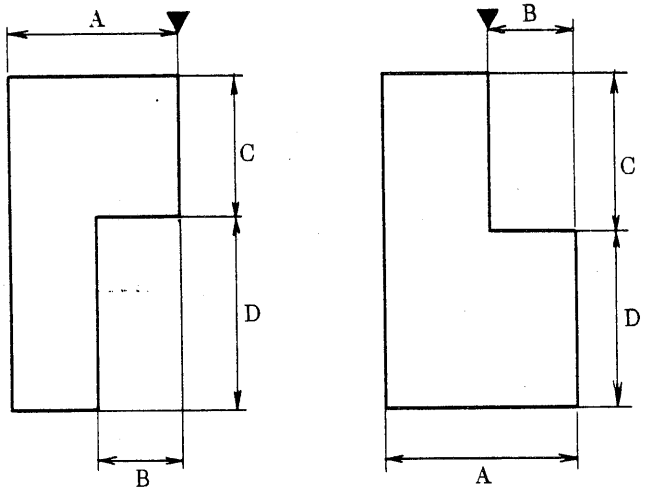
(a) CHUCK JAW TYPE (MENU)?: Chose either outer or inner diameter jaw of chuck from menu.

OD JAW	ID JAW			CHU.DATA CANCEL			PROGRAM FILE	

Select one.

(b) JAW DIMENSION A?
(c) JAW DIMENSION B?
(d) JAW DIMENSION C?
(e) JAW DIMENSION D?

..... Set the length defined on picture using ten-keys.



OD jaw ID jaw

Note 1: Type display data are not erasable. Therein, set DIM-A to DIM-D to "0".

Note 2: Length data are not registered if they are absent. No correct display is performed on the graphic write for example of chuck shape.

Note 3: Second decimal digit cannot be entered (millimeter).

Chuck data cancel

Used to cancel chuck data stored by JAW NO.

Handling

1 Move the cursor to JAW NO. whose chuck data are to be cancelled.

JAW NO.	TYPE	DIM-A	DIM-B	DIM-C	DIM-D
1	OUT	30	15	30	30
2	IN	30	15	30	30
3	OUT	30	15	30	50

2 Press [CHU. DATA CANCEL] menu key.

3 Respond to the message "CHUCK DATA CANCEL (INPUT)?" by pressing [⇨] (input) key.

4 All tool data at the cursor position are cancelled.

JAW NO.	TYPE	DIM-A	DIM-B	DIM-C	DIM-D
1	OUT	30	15	30	30
2					
3	OUT	30	15	30	30

End

5-4 TOOL SET Picture

For the control and setting of machine fitting tool coordinate system data (so called tool setting value and tool offset data (X- and Z-axis independent, two kins can be set)). For tool setter, see the Instruction Manual of Optional Functions.

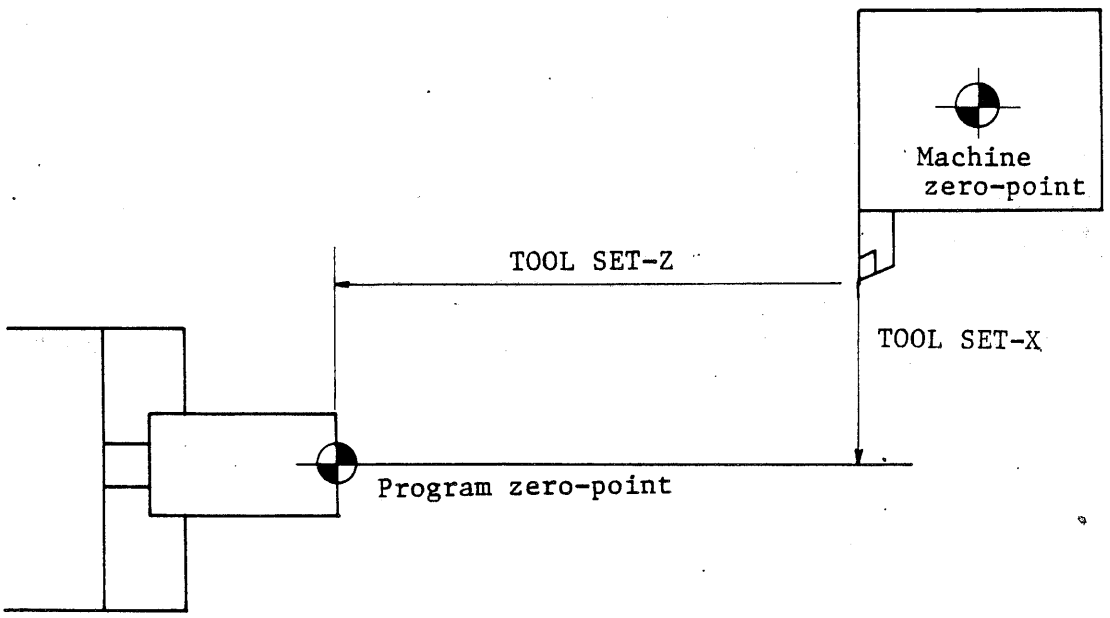
Setting items:

TNO.	TOOL SET-X	TOOL SET-Z	OFFSET-1		OFFSET-2		OFFSET-MAX	
			X	Z	X	Z	X	Z
1	(-325.381)	(-147.145)	0.8	-0.15	-0.05	0	9.9	9.9
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)

(a) TOOL NO?: Set tool number using ten-keys.

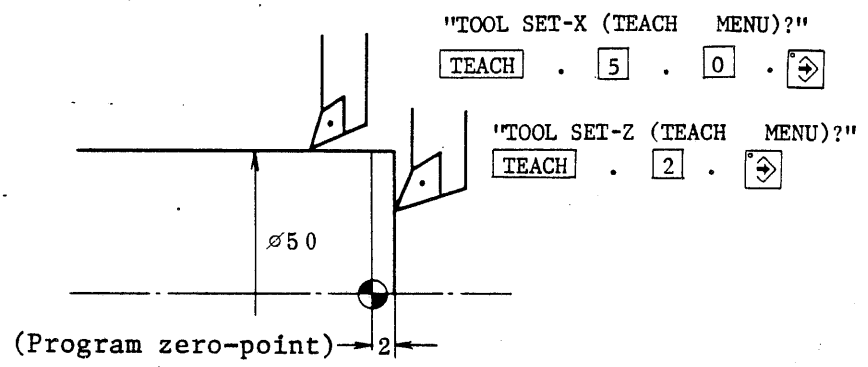
(b) TOOL SET-X (TEACH MENU)?
(c) TOOL SET-Z (TEACH MENU)? } Set TOOL SET-X and -Z.

* Supplement - Tool set and coordinate system



"Tool set" is setting the coordinate system for machine and program zero points by using TEACH function.

Tool setting (turning):



Be sure to confirm that zero-point return is completed. When [→] is pressed, a coordinate system ranging between machine and program zero-points is set up only for selected tool.

When setting tools, observe the tool preconditions given in the following table. Setting tools in positions other than those illustrated will cause improper machining or a displacement of the display or barrier.
The symbol "." denotes the tool setting position.

GNL-OUT	GNL-EDG	GNL-IN
GRV-OUT	GRV-EDG	GRV-IN
THR-OUT	THR-EDG	THR-IN

DRL
TAP
SNS-OUT SNS-EDG

(d) TOOL OFFSET-X?
(e) TOOL OFFSET-Z?
(f) TOOL OFFSET-X?
(g) TOOL OFFSET-Z?

Set tool wear offset value. OFFSET-1 and -2 are valid only for MAZATROL programs. The data of the offset number set in programs are valid.

Note 1: X-axis: diameter input

Note 2: Setting range:
OFFSET-1
< OFFSET-MAX
OFFSET-2

Note 3: Offset data: incremental input
Data will be cleared only when "0" is entered.

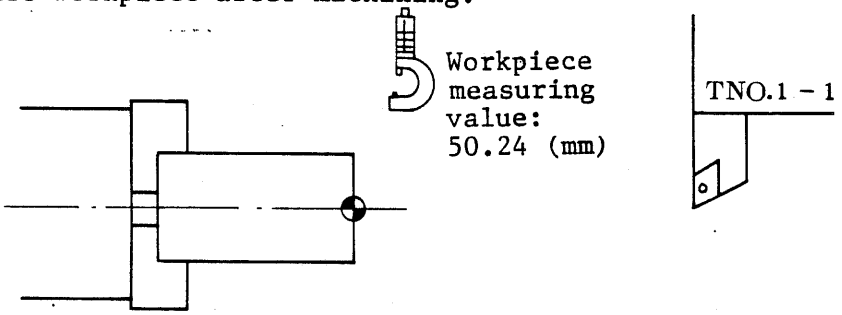
Example of setting OFFSET-1 and TOOL OFFSET-X

TOOL SET picture when machining:

TNO.	TOOL SET-X	TOOL SET-Z	OFFSET-1		OFFSET-2		OFFSET-MAX	
			X	Z	X	Z	X	Z
1	(-348.39)	(-182.185)	0.16	0.14	0	0	1.0	1.0

↓

Measure workpiece after machining.



Program specified value:
50.0 (mm)

↓

The value to be set for "TOOL OFFSET-X?" on TOOL SET picture:

(Program specified value) - (Workpiece measuring value) =
TOOL OFFSET

50.0 - 50.24 = -0.24

Press [-], [.], [2], [4] and [→] .

TNO.	TOOL SET-X	TOOL SET-Z	OFFSET-1		OFFSET-2		OFFSET-MAX	
			X	Z	X	Z	X	Z
1	(-348.39)	(-182.185)	0.16	0.14	0	0	1.0	1.0

↓

-0.08

Note 1: If offset amount has exceeded OFFSET- MAX in case the measuring fonciton (optional) is provided, data background is displayed in purple to indicate that limit value is reached.

Alarm "402 DATA INADEQUATE" is displayed if the data set on OFFSET-1 and -2 have exceeded OFFSET-MAX set value.

When clearing data, press [0] and [⇨] .

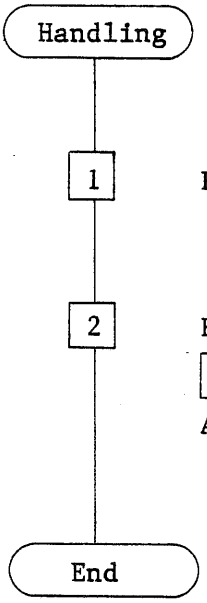
(h)	MAXIMUM X OFFSET VALUE?	Set the absolute limit value of offset amount. Setting range: 0 - 99.999
(i)	MAXIMUM Z OFFSET VALUE?	

Note 1: If OFFSET-MAX is set to "0", OFFSET-1 and -2 data become valid but neither alarm 402 nor limit value reach are displayed.

Note 2: The TOOL SET-X for turning drills and taps should be set using machine stroke value as minus data.

Erasing all tool settings

Used to erase all tool settings.



Note 1: Entering other number than -9999 will cause the alarm "401 INPUT FORMAT ERROR" (blue).

5-5 PROGRAM FILE Picture

Used to set the reference work zero-point offset (Z-OFFSET), chuck barrier reference point (CHUCK-X, CHUCK-Z), jaw number and the length of tailstock projection. Transfer, erase or name of program No. may also be entered.

Setting items:

NO.	WNO.	BLOCK	Z-OFFSET	CHUCK-X	CHUCK-Z	JAW NO.	TAIL STOCK	NAME
1	1234	56M	-10.5	180.	-115.	Z	0	ABCDEF12345
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)

(a) NO.: displays the number in PROGRAM FILE picture.
Sixteen programs Nos. 1 through 16 can be displayed.

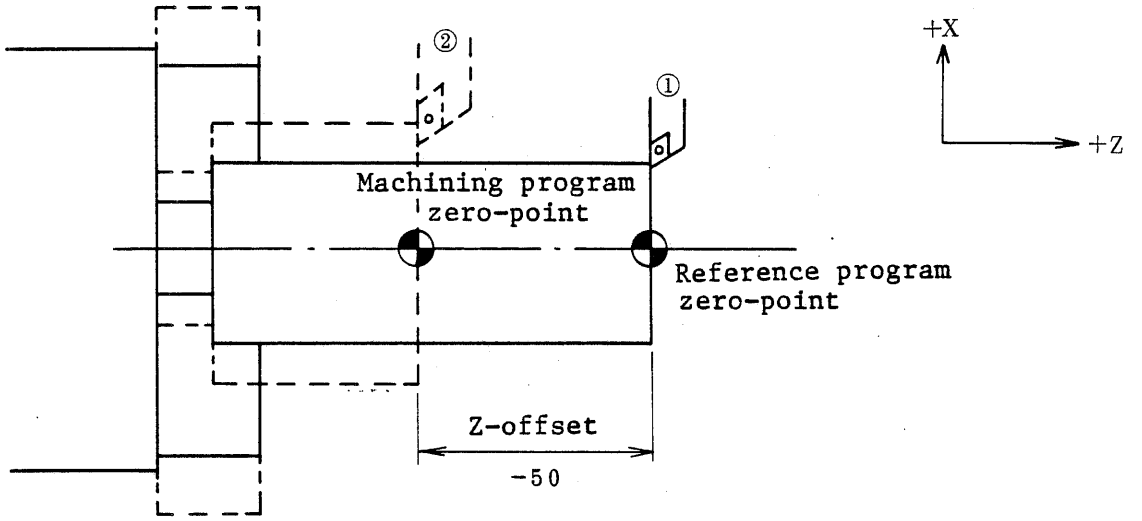
(b) WNO.: displays work number prepared in WORK PROGRAM picture.

(c) BLOCK: displays the quantity of the blocks of prepared program. [M] (blue) is displayed for MAZATROL program, while [E] (red) for EIA program.

When cursor is called up, following messages are displayed and descriptions are made as to setting data.

(d) Z-OFFSET (TEACH)?: Set Z-offset. It is the distance between tool setting reference program zero-point and machining program zero-point. With Z-offset, no tool setting is necessary when program zero-point is changed in the Z-direction.

o Example of setting Z-offset



Handling 1: No Z-offset value is calculated

Move the tool set at reference program zero-point (1) to machining program zero-point (2).

Press [Z-OFFSET TEACH], [0] and [⇨] .

"-50" is set at Z-OFFSET in the picture.

Handling 2: Z-offset value is calculated

Press [-], [5], [0] and [⇨] using ten-keys in response to "Z-OFFSET (TEACH)?". In this case, [Z-OFFSET TEACH] cannot be pressed.

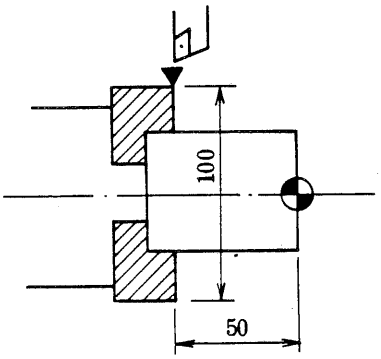
Note 1: No Z-offset is necessary for X-axis direction.

Note 2: Normally Z-offset funciton is not available for EIA/ISO programs, but available in the G53 mode.

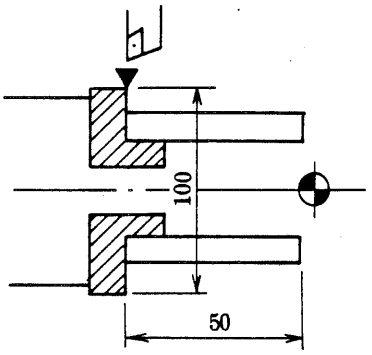
(e) CHUCK BARR REF PT-X (TEACH) ?

(f) CHUCK BARR REF PT-Z (TEACH) ?

Set the reference point of the length data set in CHUCK JAW DATA picture.



Outer jaw



Inner jaw

..... Program zero-point

..... Chuck barrier reference point

Handling 1: No chuck reference point is obtained

Move the tool set at reference program zero-point to the chuck barrier reference point illustrated above.

Press [C-BARRIER TEACH], [0] and [⇨] in response to "CHUCK BARR REF PT-X (TEACH)?". CHUCK-X in picture is set to "100".

Carry out the same input in response to "CHUCK BARR REF PT-Z (TEACH)?". CHUCK-Z in picture is set to "-50".

Handling 2: Chuck reference point is obtained

Press [1], [0], [0] and [⇨] in response to "CHUCK BARR REF PT-X (TEACH)?".

Press [-], [5], [0] and [⇨] in response to "CHUCK BARR REF PT-Z (TEACH)?".

Note 1: Machine stops without entering chuck barrier but its stop position depends on axis move rate. It is desirable to give allowance in setting barrier.

Note 2: Barrier fucntion becomes invalid if [BARRIER] CANCEL is selected in POSITION or COMMAND picture.

Note 3: Barrier function is valid in all modes and pictures.

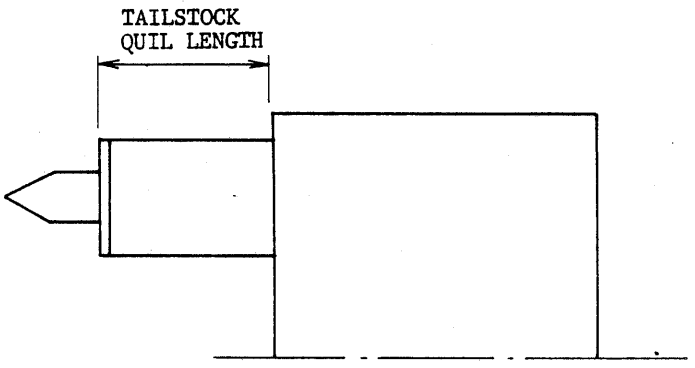
Note 4: Data in X-axis direction is set as diameter value.

(g) JAW DATA NO. (CHUCK DATA)?: Set the jaw number registered in CHUCK JAW DATA picture.

Therein enter numerals using ten-keys.

Reference: Press [CHUCK DATA] when calling up CHUCK JAW DATA picture.

(h) TAILSTOCK QUIL LENGTH?: Set the length of tail spindle projection.



Measure the length of tail spindle projection and set it using ten-keys.

Note 1: Tailstock shapes are set using PARAMETER (MACHINE) B9 to [B15].

Note 2: If minus numeral is set, tailstock shapes are not properly displayed.

(i) PROGRAM TITLE (MENU)?: Register program name using menu alphabet and ten-keys.
Press [SPACE] and [⇨] when erasing registered name.
Up to 11 characters are registrable.

In PROGRAM FILE picture, such handling as renumbering, program transfer and program erasure as well as of data registration is possible. However, it is not possible during automatic operation. If no menu is displayed, shift cursor to left end (number column).

Renumbering: Carry out following handling when changing registered work number.

Handling

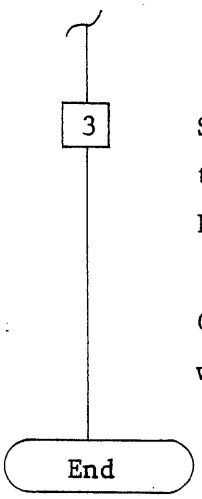
[1] Press [PROGRAM RENUMBER].

Cursor will then flicker at head.

NO.	WNO.	BLOCK
[1]	1234	56M
2	1	134E
3	555	38M
4	1000	25M
5	38	96E

[2] Shift cursor to the number to be changed in response to "WORKPIECE NO.?".
Press [↑] or [↓].

NO.	WNO.	BLOCK
1	1234	56M
2	1	134E
[3]	555	38M
4	1000	25M
5	38	96E



Set changed work number using ten-keys.
Press [7], [0] and [→] .

Change will then be performed to work no. 70.

NO.	WNO.	BLOCK
1	1234	56M
2	1	134E
[3]	70	38M
4	1000	25M
5	38	96E

Note 1: If above handling is carried out in automatic operation, alarm "436 AUTO OPERATION MODE" (blue) is displayed.

Note 2: If registered work number is set, alarm "415 SAME PROGRAM IS DESIGNATED" (blue) is displayed.

Program Transfer:

Should be carried out to prepare and correct programs (optional background programming) after that in automatic operation.

Handling

1 Press PROGRAM MOVE.

Cursor will then disappear.

NO.	WNO.	BLOCK
1	1234	56M
2	1	134E
3	555	38M
4		

2 Set the work number to be transferred to the last using ten-keys in response to "WORKPIECE NO.?".

Press 1, 2, 3, 4 and ⇨.

Set work number will then be registered lastly.

NO.	WNO.	BLOCK
1	1	134E
2	555	38M
3	1234	56M
4		

End

Note 1: If non-registered work number is set, alarm "429 PROGRAM NOT FOUND" (blue) is displayed.

Program Erasure:

Work number or all program erasure is possible.

Handling

1 Press PROGRAM ERASE.

NO.	WNO.	BLOCK
1	1234	56M
2	11	134E
3	555	38M
4	1000	25M

2 Set the work number to be erased using ten-keys in response to "WORK NO. TO ERASE (INPUT)?".

NO.	WNO.	BLOCK
1	1234	56M
2	555	38M
3	1000	25M
4		

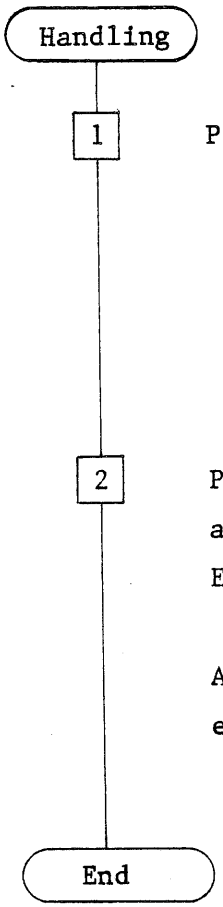
Press 1, 1 and .

Set work no. 11 will then be erased.

End

Note 1: If non-registered work number is set, alarm "429 PROGRAM NOT FOUND" (blue) is displayed.

All Program Erasure:



Press [ALL ERASE].

NO.	WNO.	BLOCK
1	1234	56M
2	11	134E
3	555	38M
4	1000	25M

Press [-], [9], [9], [9], [9], and [⇨] in response to "ALL ERASE (-9999 INPUT)?"

All programs will then be erased.

NO.	WNO.	BLOCK
1		
2		
3		
4		

Note 1: On setting to other than -9999, alarm "401 INPUT FORMAT ERROR" (blue) is generated.

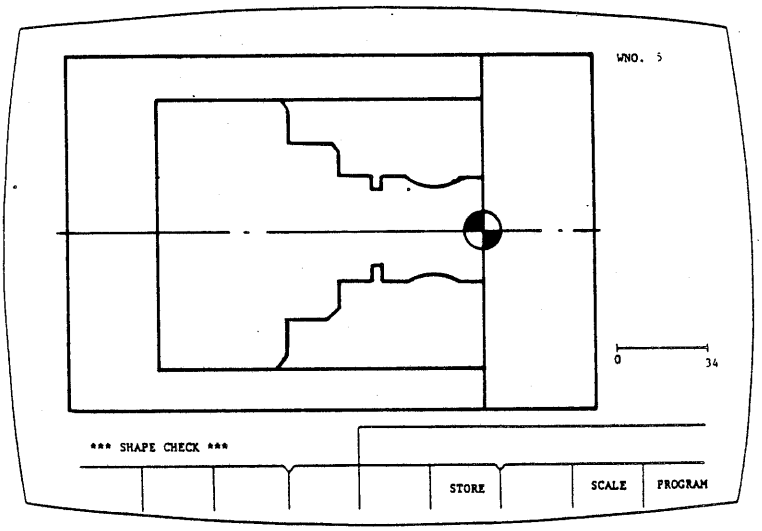
Note 2: At same time as renumbering, program transfer and program erasure handling, Z-offset, chuck reference point (X, Z) and jaw number are changed.

5-6 WORK PROGRAM Picture

Refer to Programming Manual.

5-7 SHAPE CHECK Picture

Used to check the shape of the program in preparation.
Scale function insures partial enlargement and reduction.
For displaying this picture, press [M] and |FIGURE CHECK| in WORK PROGRAM picture (program in preparation).
After displaying picture, work and program shapes are displayed in green and purple respectively.



If |SCALE| is pressed, "SCALE SHIFT (CURSOR)?" is displayed and cursor flickers at the center of side view so it becomes possible to set central point a desired using cursor shift key.

Use ten-keys when setting scale length. Setting range: 1 - 999.

If |STORE| is pressed, graphic is preserved even though other picture is selected.

Press |PROGRAM| when returning to WORK PROGRAM picture.

Note 1: The scale length upon power on is automatically fixed in accordance with the work maximum outer diameter and length set at PNO 0.

Note 2: FIGURE CHECK is displayed only during preparation in WORK PROGRAM picture.

Note 3: Thread and tap shapes: neither actual pitch nor thread ridges are correctly displayed.

Note 4: No grinding escape shape is displayed.

5-8 LAYOUT Picture

In this picture for laying out prepared programs, rough machining or program priority, layout process replacement and transfer edit are possible.
Layout is possible only for MAZATROL programs.

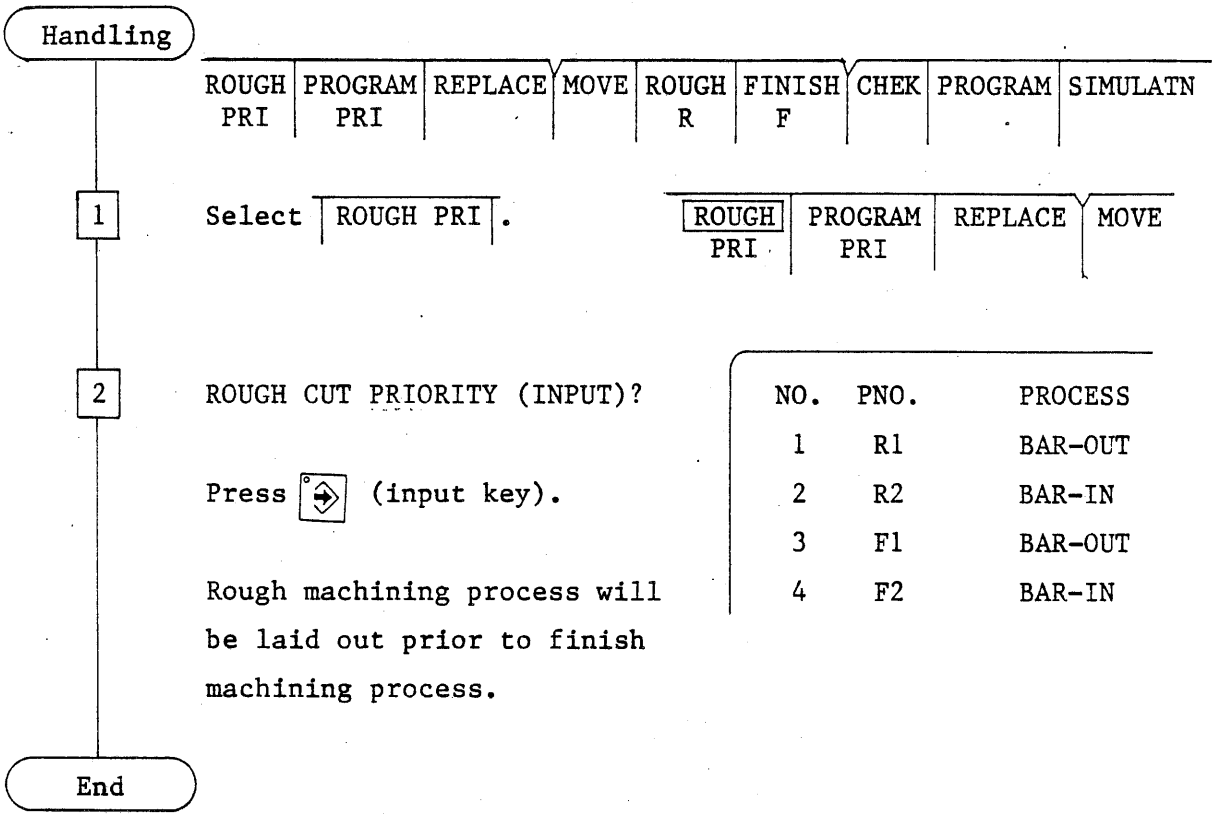
Handling LAYOUT picture:

NO.	PNO.	PROCESS	TNO.	TIME
1	R1	BAR-OUT	1-0	0:1'02"
2	F1	BAR-OUT	2-1	0:0'43"
3	R2	BAR-IN	4-0	0:1'38"
4	F2	BAR-IN	6-2	0:0'57"
		:		
		TOTAL CUTTING TIME		0:13'21"

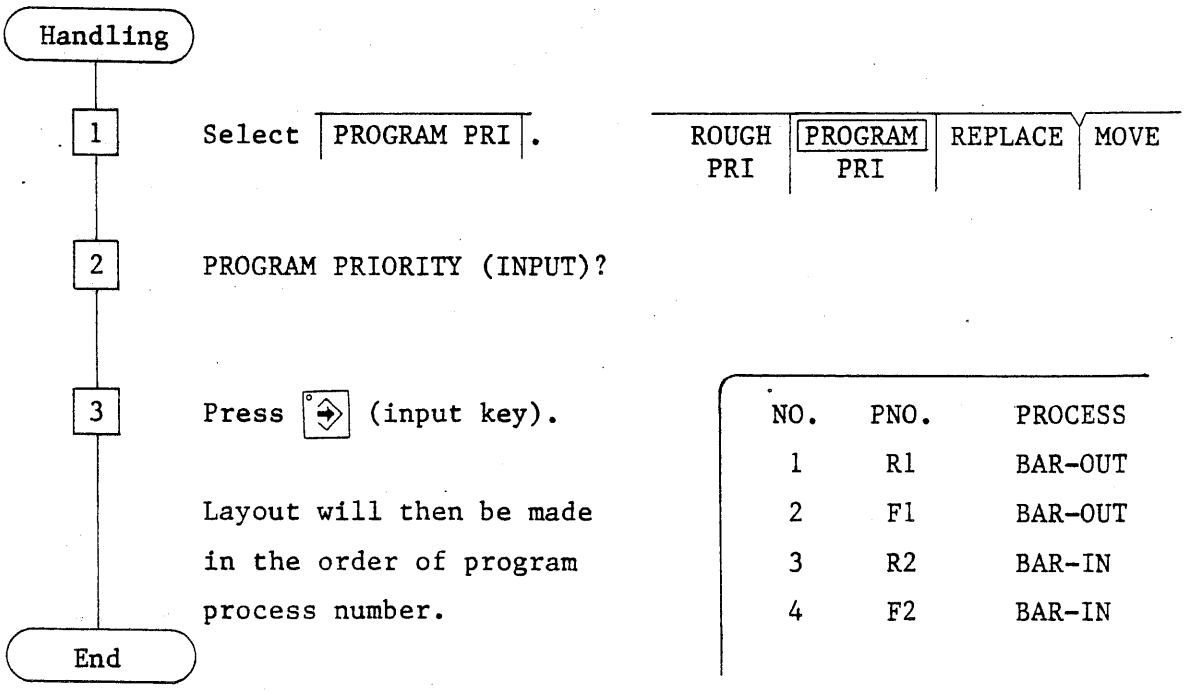
Press (picture select key)→[PROGRAM]→[LAYOUT] when selecting LAYOUT picture.

The layout of the work numbers selected in WORK PROGRAM picture is displayed.

Rough Machining Priority:



Program Priority:



Replacement:

Handling

1 Shift cursor to the process number to be replaced or changed.

2 Select |REPLACE|.

PROGRAM PRI	REPLACE	MOVE	ROUGH R

3 In response to "PROCESS NO. TO CHANGE ?", press |ROUCH R| for rough machining or |FINISH F| for finish machining and set process number using ten-keys.

End

Example

When replacing No. 2 with No. 4, shift cursor to No. 2 and press |FINISH F|, [4] and [⇨] in succession.

NO.	PNO.	PROCESS	
1	R1	BAR-OUT	
[2]	R2	BAR-IN	
3	F3	THR-OUT	Process to be replaced
4	F4	GRV-OUT	

NO.	PNO.	PROCESS	
1	R1	BAR-OUT	
2	F4	GRV-OUT	Process No. R2 will then be replaced
3	F3	THR-OUT	with F2.
4	R2	BAR-IN	

Transfer:

Handling

1 Shift cursor to the number to be transferred or inserted.

2 Select [MOVE].

REPLACE	[MOVE]	ROUGH R

3 In response to "PROCESS NO. TO INSERT?", press ROUGH R for rough machining or FINISH F for finish machining and set process number to be inserted or transferred using ten-keys.

End

Example

When replacing No. 2 with NO. 4, shift cursor to No. 2 and press [FINISH F], [4] and [⇨] in succession.

NO.	PNO.	PROCESS
1	R1	BAR-OUT
2	R2	BAR-IN
3	F3	THR-OUT
4	F4	GRV-OUT

Process to be inserted

NO.	PNO.	PROCESS
1	R1	BAR-OUT
2	F4	GRV-OUT
3	R2	BAR-IN
4	F3	THR-OUT

Note 1: Machining time is displayed after the check in SIMULATION picture.

Note 2: Priority is given to programs in the layout after preparing new programs.

Note 3: Alarm "422 LAYOUT NOT COMPLETE" is generated in some cases after program correction. Therein carry out layout handling.

Note 4: LAYOUT cannot be edited if the program rewrite switch is locked.

5-9 CHECK Picture

Continuously or discontinuously displays the tool path of laid-out programs. Insures partial scale enlargement and reduction.

Handling

1 Select WORK PROGRAM picture and press |CHECK|.

o Picture will then be selected and work profile will be displayed.

2 Press |SHAPE|. Programmed shape will then be drawn in purple.

o Press |CHECK CONTINUE| when continuously checking tool path. Nose position will then be displayed, followed by the solid or dotted line (white) of tool path for cutting or rapid feed respectively.

The characters of menu display invert (|CHECK| CONTINUE) in drawing and return to initial position on its completion.

o Press |CHECK STEP| when step checking tool path. Drawing will then be performed each time of pressing menu key.

o Press |SHAPE ERASE| when erasing only shape.

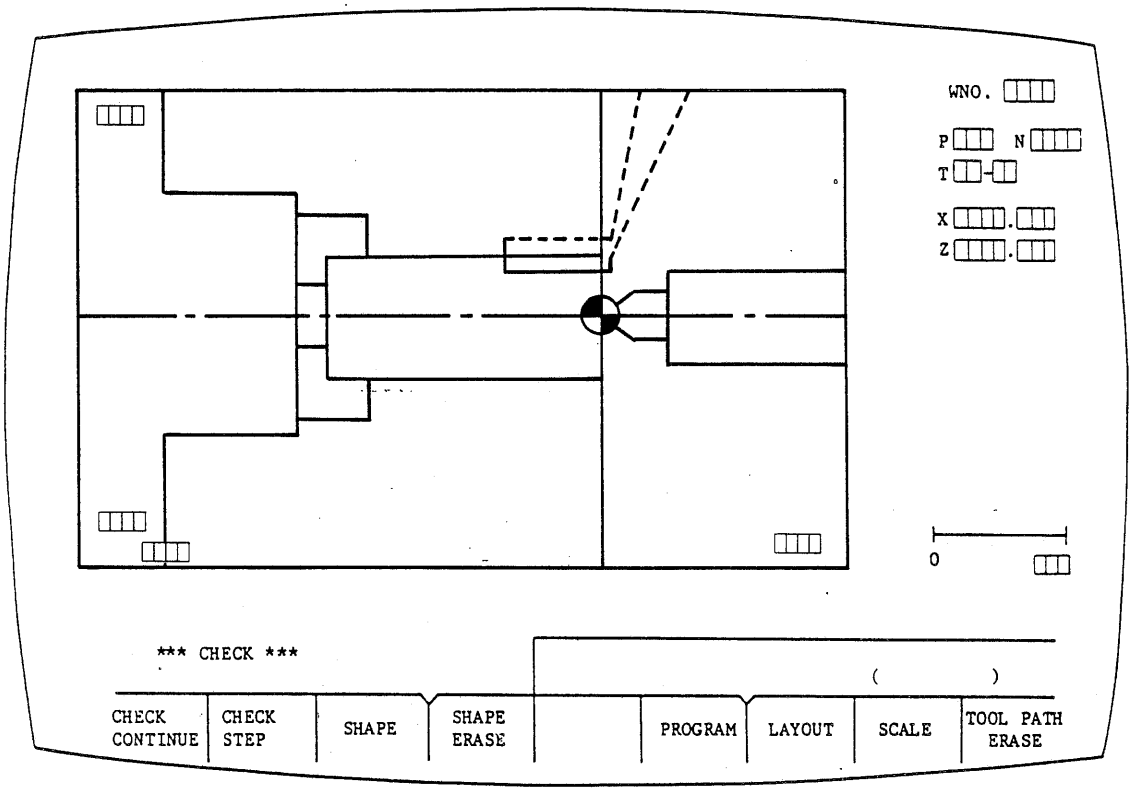
o Press |TOOL PATH ERASE| when erasing only tool path.

o When changing scale length, press |SCALE| and change central point as desired using the cursor flickering at the center of side view coordinates. Set scale length using ten-keys.

If CHECK picture is selected, scale length is automatically fixed in accordance with the work data in program.

End

CHECK Picture Display Items:



SIMULATION Picture Display Items

WNO.: The work number being checked currently is displayed. It is same as the work number in WPRK PROGRAM picture but differs from that in POSITION and COMMAND pictures.

P: The process number being run is displayed.

N: The block number of EIA/ISO programs is displayed. In MAZATROL program, a block number of internal processing data is displayed and this number differs from that in WORK PROGRAM picture.

T: Tool and offset nubmers are displayed.

X,Z : The current tool position in the work coordinate system set up for program zero-point is displayed.

0 50: The scale length being run currently is displayed.

Shape data:

Work: Work profile is automatically drawn in green when picture is selected.

Shape: Program shape is displayed in purple.

Tool path: The white solid or dotted line of tool path is displayed for cutting or rapid feed respectively.

Note 1: No grinding escape is displayed.

Note 2: Thread and tap shapes: neither actual pitch nor thread ridges are displayed.

Note 1: If [CHECK STEP] is pressed in execution of [CHECK CONTINUE], change-over occurs to step drawing. If [CHECK CONTINUE] is pressed in execution of [CHECK STEP], change-over occurs to continuous drawing.

Note 2: If [SHAPE ERASE] is pressed in execution of [SHAPE], completed shape drawings are erased but the drawing then in course continues.

Note 3: If [TOOL PATH ERASE] is pressed in execution of [CHECK CONTINUE] or [CHECK STEP], already drawn tool path is erased but the drawing then in course continues.

Note 4: Shape is neither drawable in execution of [CHECK CONTINUE] nor [CHECK STEP]. For this drawing, press [°//] and [SHAPE].

Note 5: Neither continuous nor step check is possible in execution of [SHAPE]. For continuous or step checking, press [°//] and [CHECK CONTINUE] or [CHECK STEP] respectively.

Note 6: Chuck and tail barriers are displayed if JAW NO. and TAILSTOCK data are set in PROGRAM FILE picture.

Note 7: For tool path drawing, NOSE-R is taken into account in MAZATROL programs.

Note 8: NOSE-R offset entered in EIA/ISO programs will affect the tool path.

Note 9: Pressing [] and [STORE] will cause graphs to be stored even if a different picture is selected.

5-10 SIMULATION Picture

Gives chuck, work and tool shapes to CRT display to simulate cutting operation.

Simulation speed is variable by 10% each time over the range from 0 to 500%. Simulation is possible only for MAZATROL programs.

Handling

1. Select WPRK PROGRAM picture and press |SIMULATN|.
2. Press |WRKPC FIGURE|. Character display will then invert. In returns to initial position on the completion of work figure display (green).
3. Press |SHAPE|. Program command shape (white) will then be drawn. On the completion of drawing, menu character display returns to initial position.
4. Select |AUTO| mode and press |SIMULATN READY| and |SIMULATN START|.
5. Simulation is completed with the character display |SIMULATN START| returning to initial position.
6. Press |SPEED↑| or |SPEED↓| when varying simulation speed. Variation is possible by 10% each time of press. Keeping menu key pressed allows continuous variation. Variation range: 0 - 500%

End

Note 1: Press SIMULATN HOLD when interrupting simulation. When restarting it, press SIMULATN START .

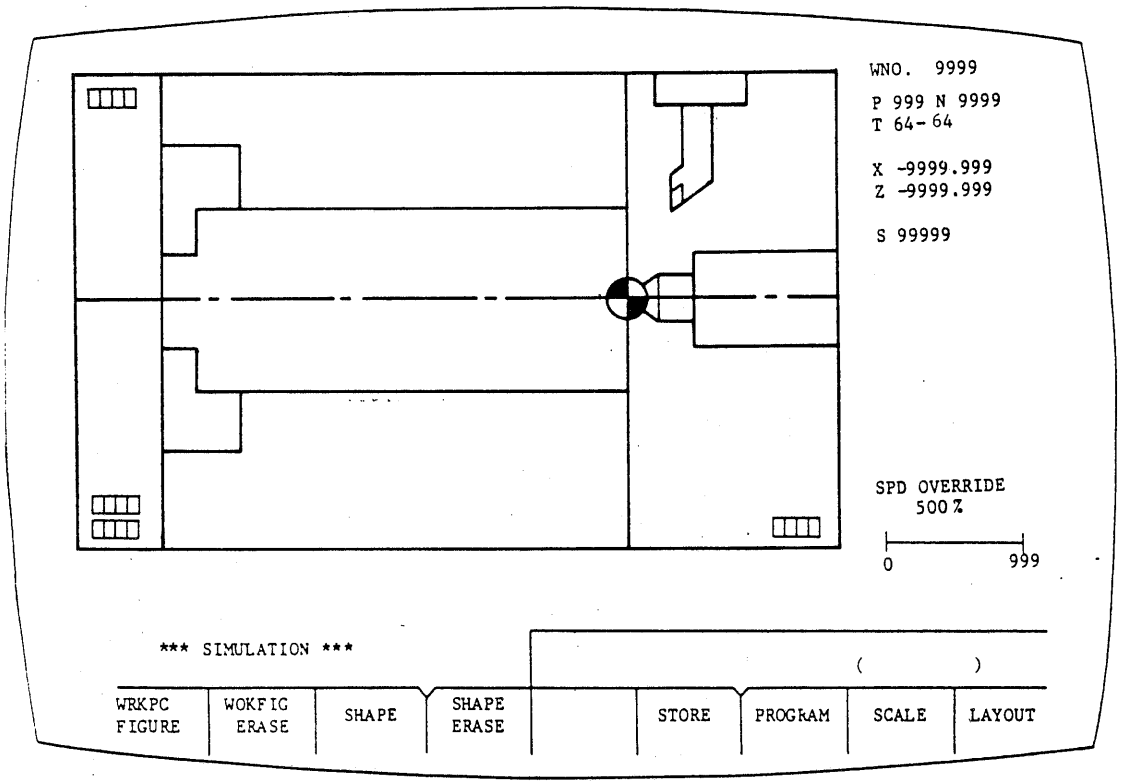
Note 2: Press SIMULATN RESET or [°//] and SIMULATN START in the order when restarting from the begining the simulation stopped halfway.
Tool will then return to tool swing position and restart operation.

Note 3: Press SCALE when changing coordinate scale. Central position is variable as desired using cursor shift key for handling the cursor flickering at the center of side view coordinates.

Set scale length using ten-keys in response to "SCALE SHIFT (CURSOR)?". Setting range: 1 - 999

Note 4: Pressing STORE menu key will cause graphs to be strored even if a differenct picture is selected.

SIMULATION Picture



Display items in SIMULATION picture:

WNO.: The work number being simulated currently is displayed. It is same as the work number in WORK PROGRAM picture but differs from that in POSITION and COMMAND pictures.

P: The process number being run is displayed.

N: The block number of EIA/ISO programs is displayed. In MAZATROL program, a block number of internal processing data is displayed and this number differs from that in WORK PROGRAM picture.

T: Tool and offset numbers are displayed.

X,Z : The current tool position in the work coordinate system set up for program zero-point is displayed.

SPD OVERRIDE: Current simulation speed is indicated by percentage.

0 999: The scale length being run currently is displayed.

Shape data:

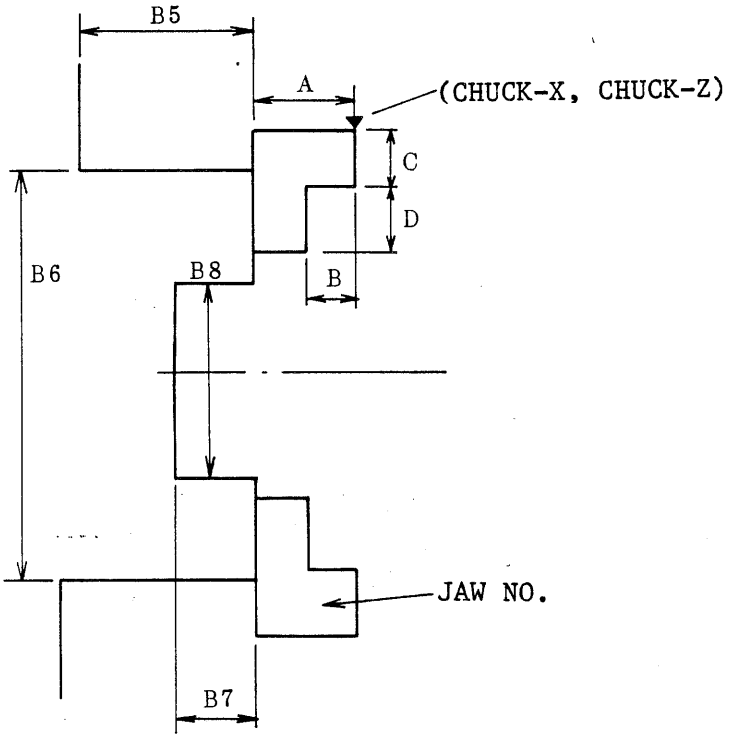
Chuck: Chuck and jaw barrier ranges are displayed in yellow.

Display data determination factors:

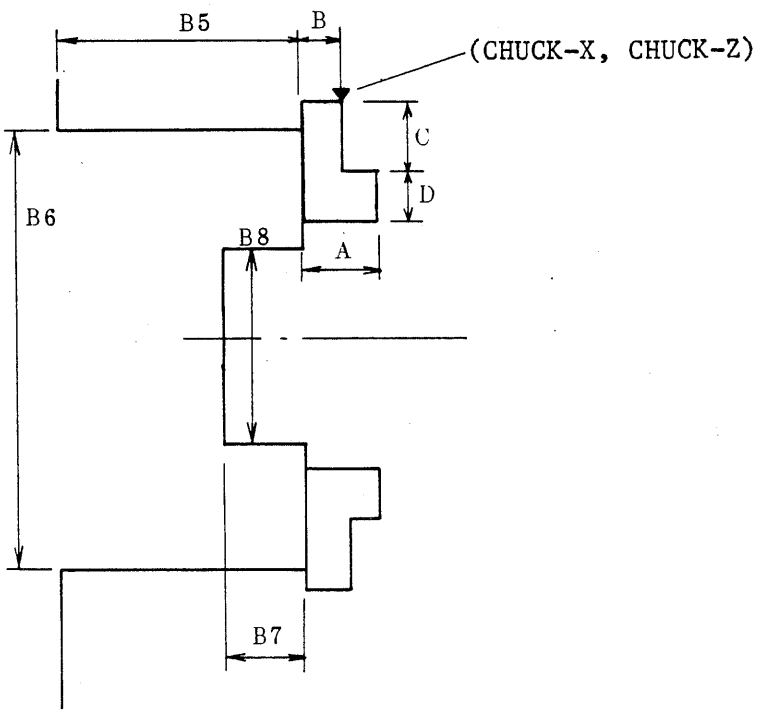
Chuck barrier range: PARAMETER (MACHINE) [B5], [B6], [B7] and [B8]

Jaw barrier range: DIM-A, DIM-B, DIM-C and DIM-D in CHUCK JAW DATA picture

Chuck position: CHUCK-X, CHUCK-Z and JAW NO. in PROGRAM FILE picture



Outer jaw chuck



Inner jaw chuck

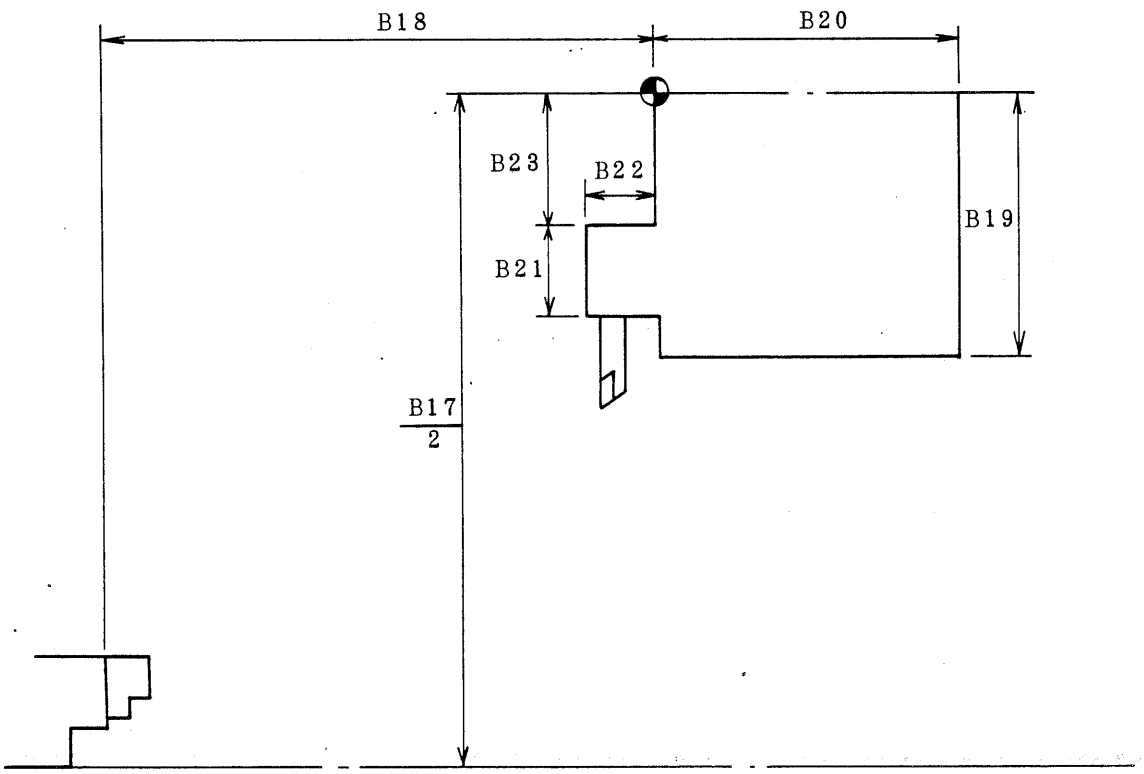
Tool: Turret barier range and tool shape are displayed in red.

Display data determination factors:

Turret barrier range: PARAMETER (MACHINE) B17 to B23

Tool shape: TOOL FILE picture, TOOL DATA picture } All data

Nose position: TOOL SET picture



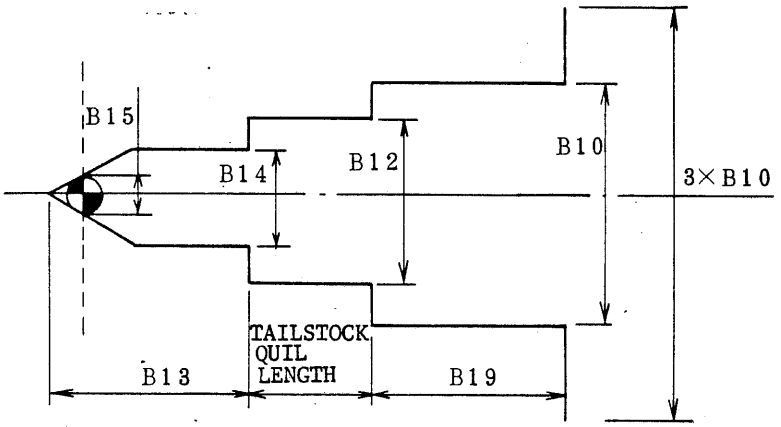
* In case of holder type No. 1

Tailstock: Tailstock barrier range is displayed in yellow.

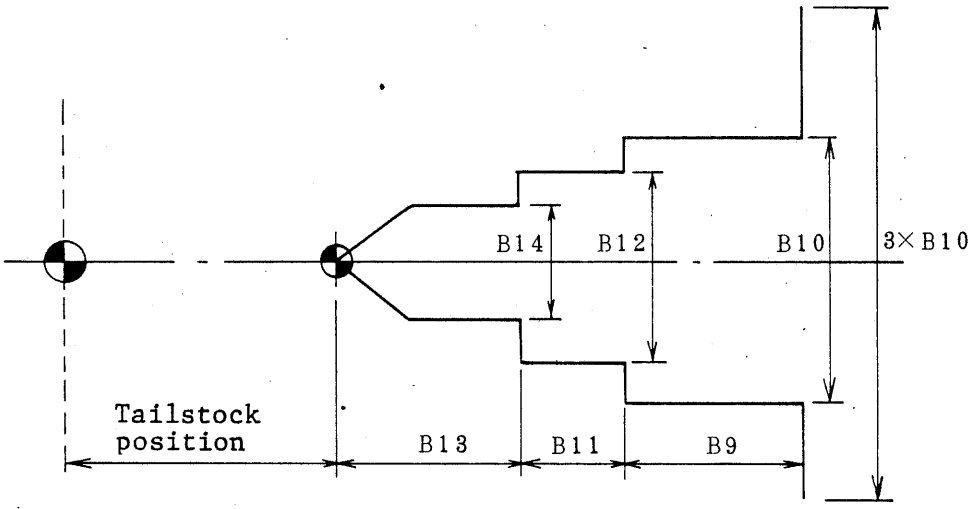
Display data determination factors:

Tailstock barrier range

PARAMETER (MACHINE): B9 to B15
PROGRAM FILE picture (shaft work): TAILSTOCK QUIL LENGTH
COMMAND picture (chuck work): tailstock position



Shaft work



Chuck work ... Program zero-point

Note 1: TAILSTCK TEACH is valid only for COMMAND picture and this fucntion is used to set tailstock position.

Work: Green sectional display is given for side coordinates and work profile only is displayed for front view coordinates. If simulation is performed in turning, work undergoes cutting shape display (real). However it is not performed in milling.

Shape: Prepared program shape is drawn in purple.

Note 2: Thread and tap shapes: neither actual pitch nor thread ridges are displayed.

Note 3: No grinding escape shape is displayed.

Note 4: If [SIMULATN START] is pressed without [AUTO] AUTO selected, alarm "171 AUTO START COND INSUFFICIENT" (red) is generated.

Note 5: [SIMULATN START] does not actuate unless [SIMULATN READY] is selected.

Note 6: Tool path - consideration is given to OFFSET-X and -Z but not to NOSE-R.

Note 7: Simulation stops if its speed is 0%.

Note 8: Simulation does not continue even if setting is made to CONTINUE in program END mode.

Note 9: The scale length upon power on is automatically fixed.

Note 10: No EIA/ISO programs can be simulated.

Note 11: Proper display is not peformed in some cases depending simulation speed.

Note 12: Simulation in threading programs stops when threading is completed.

6. HANDLING FOR AUTOMATIC OPERATION

6-1 What is Automatic Operation?

A series of operation steps are automatically performed one by one to run prepared programs and set data items after pressing starting button until the automatic stop on completion. If programs and data are completed, operator is not required in principle to handle numerical controller but allowed to change cutting conditions and carry out interrupt handling and operation interrupt in machining.

Categories of program operation:

Program operation is divided in three - AUTO , RESTART and SINGLE PROCESS .

1-1 AUTO mode runs all the contents of programs. This mode is capable of running programs in combination with other ones.

1-2 RESTART mode runs the contents after desired machining process of programs.

1-3 SINGLE PROCESS mode runs one machining process in programs. This mode is capable of performing only the last step of threading.

Description will be made as to the procedures of the handling in each mode hereunder.

6-2 Program Operation - AUTO Mode

Used to perform all the steps of machining, starting with the head of programs.

Handling

1. Display one of POSITION, COMMAND and TRACE pictures.

2. Press (AUTO) key.

   - o %P.HEAD (program head) lamp on.
   - o Following menu is displayed. If not, press (menu select) key.

WORK NO.		SINGLE STEP	OPT. STOP	DRY RUN	MACH LCK	COOLANT	WORK LIGHT	BARRIER CANCEL

3. Press WORK NO. .

   "WORKPIECE NO.?" will then appear.

4. Select program No. to be used.

   See that change-over has occurred to selected work No.

Example: On the change-over to work No. 123, press 1, 2, 3 and (input) in succession.

5 Check running conditions.

Before starting, the condition of planned operation can be limited with respect to the items selected from menu or override. Running condition is also variable through examination after starting.

* Run condition menu

WORK NO.		SINGLE STEP	OPT. STOP	DRY RUN	MACH LCK	COOLANT	WORK LIGHT	BARRIER CANCEL
		(1)	(2)	(3)	(4)	(5)	(6)	(7)

Run condition menu include:

o Step run:	(1) SINGLE STEP (2) OPT. STOP
o Change of cutting condition:	(3) DRY RUN
o Mechanical operation:	(4) MACH LCK (5) COOLANT
	(6) WORK LIGHT
o Barrier valid/invalid:	(7) BARRIER CANCEL

(1) SINGLE STEP

Runs blocks one by one. When pressed in axis move, stops after the end of the block being run. Press cycle start button each time cycle start lamp goes off for each block. When automatic operation starts, "BUFFER" in COMMAND picture is convenient for check.

(2) OPT. STOP

Only if M01 of process data is entered in program, the machine stops temporarily with CYCLE START light on after running up to the block where it is present. If this menu is off, however, the contrary takes place even though that entry is performed.

Runs following blocks when cycle start button is pressed again.

Operation does not stop even if M01 is entered in sequence data M.

(3) DRY RUN

Performs the change-over to jog feedrate code, invalidating the feedrate command selected in program.

Use ▲ or ▼ when increasing or decreasing the jog feedrate, respectively. The jog feedrate code number is displayed in FEED □□□.

Jog Feedrate Codes:

Display	Feed (mm/min)	Display	Feed (mm/min)
0	0	130	52
10	1.0	140	72
20	1.4	150	100
30	2.0	160	140
40	2.7	170	200
50	3.7	180	270
60	5.2	190	370
70	7.2	200	520
80	10	210	720
90	14	220	1000
100	20	230	1400
110	27	240	2000
120	37		

Note 1: In threading or tap cutting, either DRY RUN valid or invalid is selectable using parameter U19; 1 - valid and 0 - invalid.

Note 2: When in the rapid feed mode, DRY RUN validity can be selected using parameter U18; 1 - valid and 0 - invalid.

(4) MACH LCK

Counts position displays without axis move on move command. Performs the count of those for POSITION, COMMAND or TRACE as if axis moves. Makes other modes of operation as commanded by programs. If this is pressed as the axis is moving, it will cause the single step stop. The move will continue at the end of the block. Note that this can cause the coordinate system to shift.

(5) COOLANT

Used to supply cutting fluid. In automatic operation mode, works when reading M08 in program (no cutting fluid is supplied by pressing simply this key).

(6) WORK LIGHT

Comes on when manual or automatic operation is underway.

(7) BARRIER CANCEL

Tailstock barrier, chuck barrier and tool barrier become invalid.

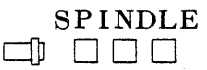
The conditions of (1) to (7) can be set with menu key pressed. On press, menu display inverts to indicate switch-on. On next press, inverted display returns to initial position, indicating switch-off.

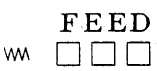
* Override

In automatic operation mode, this function maintains optimum cutting condition for situations by varying surface speed and feedrate without modifying program.

Override is divided in:

(1) Rapid feed override (RAPID)

(2) Spindle override (SPINDLE) 

(3) Jog feed override (FEED) 

The significances of override display differ depending on whether manual or automatic operation mode is selected.

	Manual operation mode	Automatic operation mode
Rapid feed override	Rapid feedrate (%)	Rapid feedrate (%)
Spindle override	Actual revolutions (x 10 rpm)	Ratio to program command revolutions (%)
Jog feed override	Code display (mm/min)	Ratio to program command feedrate (%) (Note)

Note: Dry run on is excluded.

In automatic operation mode, all overrides are fixed in terms of the ratio to program command value.
Vary segment display using UP or DOWN key in accordance with run conditions.

Example: after the start of power supply

(1) When manual operation mode is selected, it is assumed that following display is given.

RAPID	SPINDLE	FEED
070	035	240
70%	350 rpm	2000mm/min

(2) If automatic operation mode is selected with (1) maintained, following display is obtained.

RAPID	SPINDLE	FEED
100	100	100
100%	100%	100%

(3) It is assumed that the run conditions in automatic operation are limited as follows.

RAPID	SPINDLE	FEED
050	110	090
50%	110%	90%

(4) If manual operation mode is selected again, return occurs as follows.

RAPID	SPINDLE	FEED
070	035	240
70%	350 rpm	2000 mm/min

Segment display values are kept stored even if change-over, manual mode automatic mode or automatic mode manual mode, is performed.

(5) If automatic mode is selected and DRY RUN key in run condition menus is pressed, only jog feed override display shows jog feed code.

Dry run ON	RAPID	SPINDLE	FEED
DRY RUN →	050	110	240
	50%	110%	2000mm/min

The run conditions changed by override are rechangeable with the condition of the production of cutting chips, their shape, the loading condition of load meter, the roughness of finish surface checked after the start of machining.

6 Press (reset) key.

o Program will then come to head.
Ascertain that READY (preliminary setup completed for operation) and %P.HEAD (program head) lamps glow.

7 Press (cycle start) key.

o Machining steps will then be taken one by one in accordance with program.
o After starting, change-over is allowable to any picture.

End

6-3 RESTART Mode

Used to restart machining after the interruption under various conditions.

Handling

1 Fix program number and run conditions.

o (Take the handling steps 1 - 5 for automatic operation.)

2 Press [RESTART] (restart) key. %P.HEAD (program head) lamp will then turn on.

o "RESTART DATA (MENU)?" appears and restart data input part is displayed above the picture name.

P M M M M M M

M-code fed to machine before restart.

Restart process number

o Following menu is displayed.

PROCESS NO.					M	INPUT END		

3 Press [PROCESS NO.].

"PROCESS NO. (MENU)?" is displayed and menu changes as follows.

ROUGH R	FINISH F							

4 Select rough or finish machining process for restarting and press menu button.

o Pressed menu display inverts.
o The rough/finish machining selection is the same as the layout on the LAYOUT picture.

5 Select the process number to be restarted.

o Example: process No. 5

5 , (up to two numeral digits can be set.)

o If set process number is found out through search, R or F and process number are entered in restart data input part and menu returns to the status described in 2 (on the contrary, error "PROCESS NOT FOUND" occurs).

6 Press M.

o "M CODE (MENU)?" is displayed and change-over occurs to M-code setting menu.

7 Display the menu of the M code to be set.

o Use at left end for menu change-over.

o M code menus

00	01	03	04	05	08	09		
PROGRAM STOP	OPT. STOP	SPNDL FWD	SPNDL REV	SPNDL STOP	COOLANT ON	COOLANT OFF	CANCEL	——→

The following M codes are displayed by setting parameter [P16].

10	11	31	32	46	47	51	52	
T/S QUIL ONLY	T/S BODY AND QUIL	TAILSTCK FORWARDS	TAILSTCK REVERSE	RANDOM OFF	RANDOM ON	ERR-DETC OFF	ERR-DETC ON	——→

06	07	48	49	55	56	57	58	
CHUCK OPEN	CHUCK CLOSE	FWD PART CATCHER	REV PART CATCHER	PARTS COUNT	FRNT DOR OPEN	FRNT DOR CLOSE	CHUCK AIR BLOW	——→

19	16	17	18	86	87	88	89	
SPINDLE ORIENT	ORIENT 0°	ORIENT 120°	ORIENT 240°	WRK REST 1 OPEN	WRK REST 1 CLOSE	WRK REST 2 OPEN	WRK REST 2 CLOSE	——→

Note: For M codes, see the Operating Manual of the respective model.

[8] Press the menu key for the M code to be set. (1)

If the M code to be set is not displayed or known beforehand, use ten-keys for its direct setting. (2)

Set M code is displayed in restart data input part and menu returns to the status described in [3] .

o At (2), carry out handling as follows.

Example: M80

[8], [0] and [⇨] (input) (up to three numeral digits can be set.)

o Do not select unusalbe M code.

o Repeat steps [6] to [8] for setting other M codes if any.

o Up to six M codes can be selected.

o Press [CANCEL] when cancelling already-set M codes. M code lastly set will then disappear.

9 Press INPUT END. Change-over will then occur to automatic operation menu.

10 Press (reset) key.

Confirm again that %P.HEAD (program head) is on.

11 Call up selected starting picture and press (cycle start) key.

Then, set M codes will be run and machining will start with selected process. When an M code has been run, its dispaly also disappears.

End

6-4 SINGLE PROCESS Mode

Used to repeat a specified step of machining when work finish is not good.

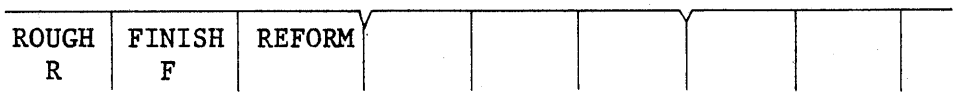
Handling

1 Select program number and run conditions.

o Take the handling steps [1] to [5] of AUTO mode operation.

2 Press [ ] (single process) key.

o "PROCESS NO. (MENU)?" and following menu are displayed.



3 Select [ROUGH R], [FINISH F] or [REFORM] for re-machining process.

o Selected menu display inverts.

o Press [ROUGH R] for SGL, MES or M process.

o Menu REFORM is selectable only for threading process and runs only its last step.

4 Set the process number to be run.

o Example: process No. 4

4 and (input)

5 Press (reset) key.

o Be certain that %P.HEAD (program head) lamp is on.

(cycle start)

6 Call up selected starting picture and press CYCLE START key.

End

Note 1: When the machining is performed in the SINGLE PROCESS mode, the service life of tools is controlled by the time, but not by the number of workpieces machined.

6-5 Stop of Automatic Operation

Performed on an emergency or for check when tool is going to interfere with or run against work or chuck or cutting is examined on its completion to some degree in the automatic operation and trial cutting.

Particularly in former's case, securely carry out this very important handling for safety.

(1) Press EMERGENCY STOP button.

EMERGENCY STOP

- o Alarm "EMERGENCY STOP" is displayed in picture, and the spindle rotation, axis feed and other functions in operation all stop (excluding the machine, unit and pump functions).

(2) Press (reset) key.

- o Operation stops and control informations are all internally reset.

- o Operation object program run position returns to head.

(3) Press (feed hold) key.

Feed stop:

- o Only axis feed stops (spindle and other functions continue operation).

(4) For the change-over to manual operation mode, press one of , , , and keys.

- o The functions in operation stop (spindle rotation and axis feed). In this condition, offset number does not change even if tool swings.

(5) Turn off power supply by pressing . (power off) key.

o The electric circuits and numerical controller of machine are all cut off and hydraulic and pneumatic pressures decrease (spindle is set to free run position (inertia)).

Steps (1) to (5) are available for stopping automatic operation. Besides, axis feed, etc. can be stopped through the change-over to SINGLE STEP, OPT. STOP, MACH LCK or other automatic operation mode in run condition menus.

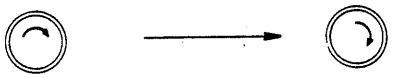
Cancellation of stop status:

Emergency stop (1) to (3) of course come from some causes. Therefore eliminate them before restarting machining.

(1) Turn EMERGENCY STOP button clockwise.

o Alarm "NMI EMERGENCY STOP" disappears and machine is set to initial status (same as that after power on).

EMERGENCY STOP



o READY lamp glows if the initial status that insures operation.

o In this case zero-point is lost. Therefore carry out zero-point return (thereafter carry out operation referring to automatic operation mode).

(2) When RESET key is pressed, run program head is called up. Therefore run is performed from beginning again when CYCLE START button is pressed. Restarting is possible halfway if necessary using RESTART or SINGLE PROCESS.

(3) Press [CYCLE START] (cycle start) key.

Since feed hold is maintained, operation restarts from the current position to run succeeding programs when CYCLE START key is pressed again.

(4) Perform the change-over to automatic operation mode and press CYCLE START key. In the case of AUTO, RESTART or SINGLE PROCESS, run starts from the stop position if CYCLE START key is pressed. Resetting is however necessary if deviation has occurred in manual handling. Otherwise run will start from the deviated position. (This does not apply when parameter [P14] is input as "1".)

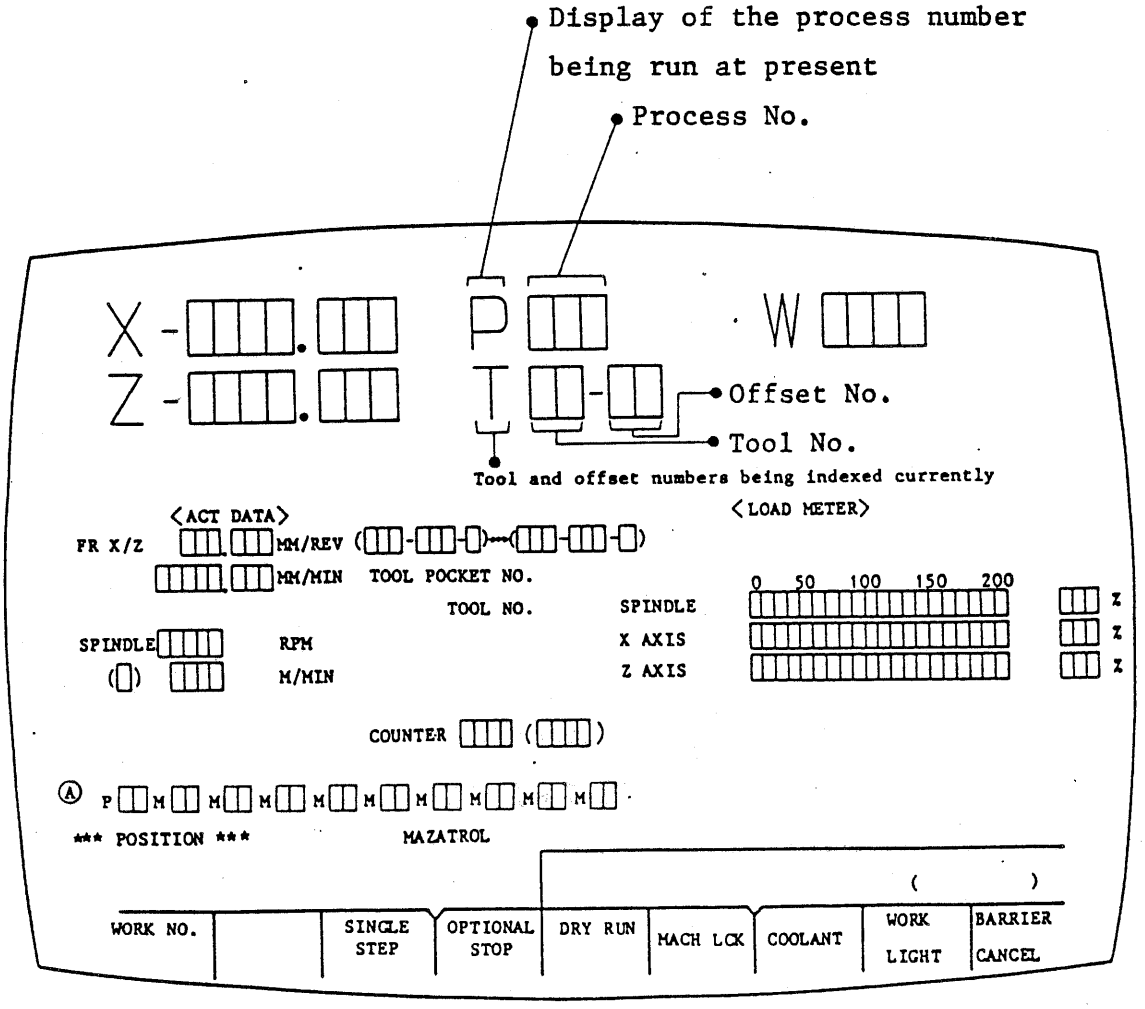
Note 1: If the |READY lamp does not come on, the other alarm-condition cause must exist. In this case, perform a diagnostic check and when the other cause is found, release the EMERGENCY STOP button while pressing the RESET key.

7. DISPLAY IN AUTOMATIC OPERATION

The turret position, feedrate, tool number and so forth in automatic operation can be checked using POSITION and COMMAND pictures. The nose position and path being run can be checked using TRACE picture.

7-1 POSITION Picture: displays running condition.

Press (picture select) key and invert POSITION to display POSITION picture. (Unit: mm in the Fig. illustated below)



Space Ⓐ :

Following restart data input part appears when [IMI] (restart) key is pressed.

P☐ M☐ M☐ M☐ M☐ M☐ M☐

ACT DATA:

FR X/Z ☐ MM/REV: feedrate per revolution of X- and Z-axes
(IN/REV)
☐ MM/MIN: feedrate per minute of X- and Z-axes
(IN/MIN)

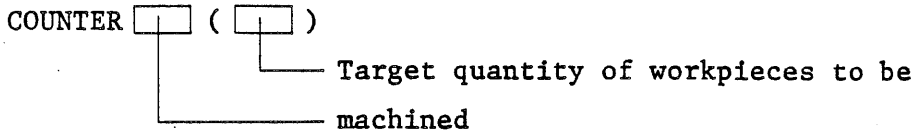
SPINDLE ☐ RPM: spindle revolutions per minute

(☐): selected spindle gear number

Display of the process being run currently — Display to be run next

(a - b - c) ⟶ (a - b - c)

a: machining modes (BAR, CRY, DRL, SGL, etc.)
b: machining part (OUT, IN, FCE, etc.)
c: rough/finish machining selection (R, F)

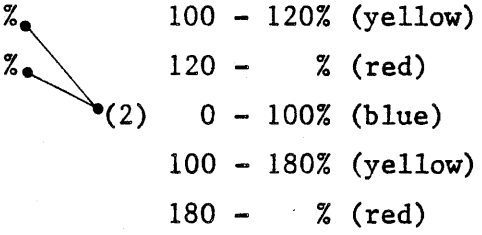


Quantity of machined workpieces

If targe quantity is set in parenthesis, operation stops after the run therefor, provided NUMBER in the program end mode is set to "1".

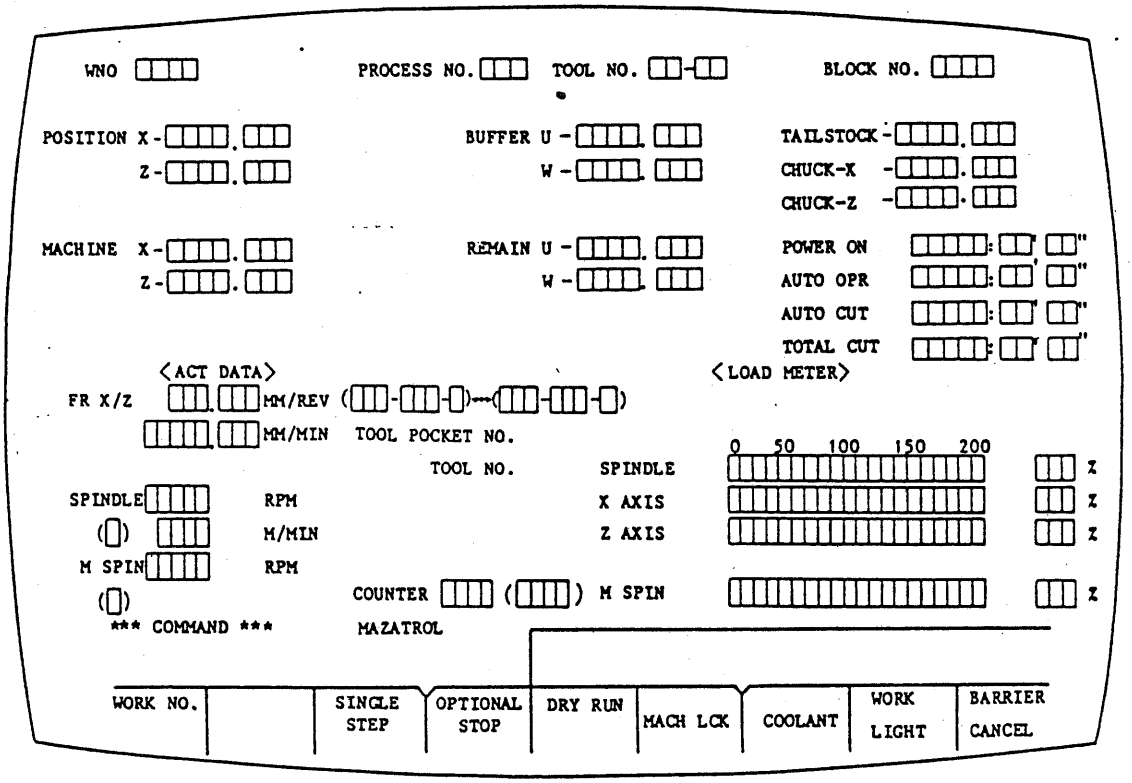
LOAD METER:

SPINDLE: load of spindle motor
X AXIS: load of X-axis servomotor
Z AXIS: load of Z-axis servomotor



7-2 COMMAND Picture: displays running condition in further details than POSITION picture.

Display menus using [picture select] key and COMMAND picture by pressing [COMMAND]. (Unit: mm in the Fig. illustrated below)



WNO.: program number being run currently

PROCESS NO.: process number being run at present

TOOL NO.: tool and offset numbers being indexed currently

BLOCK NO.: block number being run presently

POSITION X ☐.☐ } current tool position in work coordinate
G☐ Z ☐.☐ } system (absolute value)

MACHINE X ☐.☐ } current tool position in machine coordinate
G☐ Z ☐.☐ } system (absolute value)

BUFFER U □.□
W □.□

X- and Z-axis move distance (incremental value) in the block to be run next

REMAIN U □.□
W □.□

remaining distance (incremental value) of the move in the block being run at present

TAILSTOCK □ . □: distance between the zero-point of the reference program and the tailstock reference point (obtained by taking Z-OFFSET into account for TAILSTOCK of PROGRAM FILE picture)

CHUCK-X □ . □: distance between the zero-point of the reference program and the chuck reference point in X-axial direction (CHUCK-X (diameter value) of PROGRAM FILE picture)

CHUCK-Z □ . □: distance between the zero-point of the reference program and the chuck reference point in Z-axil direction (obtained by taking Z-OFFSET into account for CHUCK-Z of PROGRAM FILE picture)

POWER ON □:□ '□": total cumulative time ranging between power on and off

AUTO OPR □:□ '□": total cumulative time of automatic operation (starting - stop) including single step and feed hold stop time

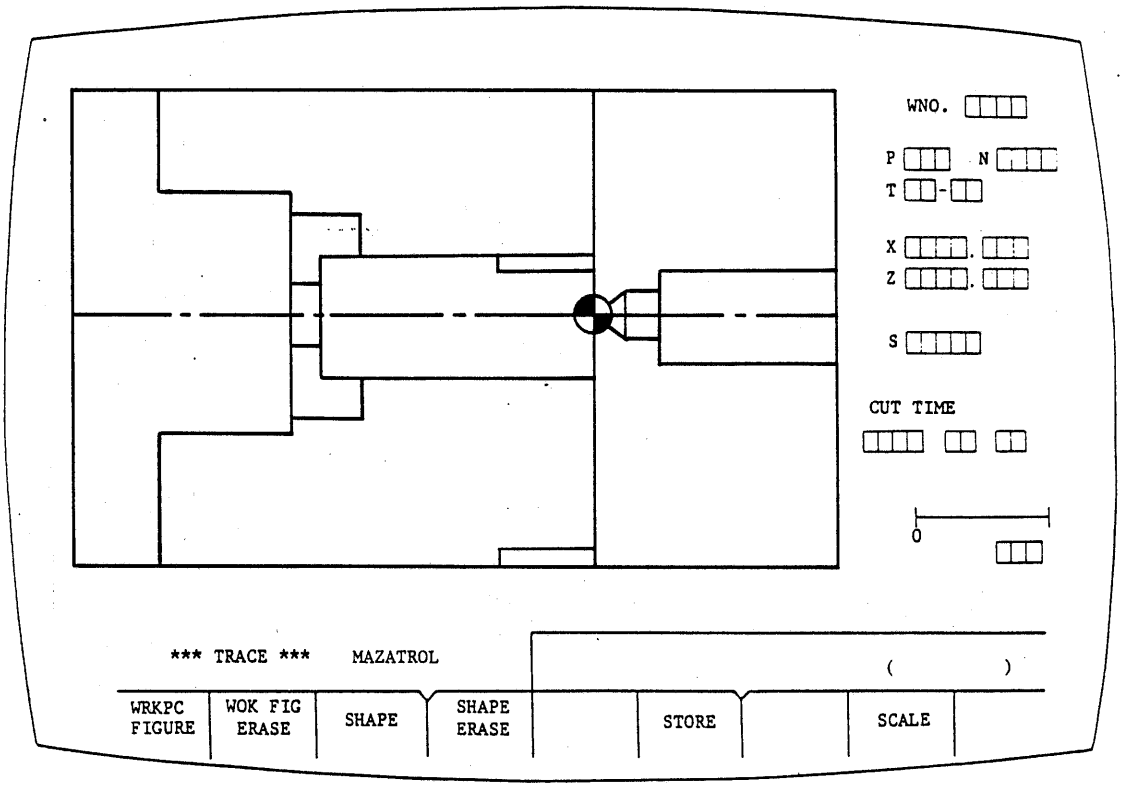
AUTO CUT □:□ '□": total cumulative time of automatic starting (CYCLE START light on)

TOTAL CUT □:□'□": total cumulative time of cutting feed

The lower part of picture that contain ACT DATA and LOAD METER is same as POSITION picture.

7-3 TRACE Picture: displays cutting condition picture

Display menus using [picture select] key and TRACE picture by pressing [TRACE]. (Unit: mm in the Fig. ullustrated below)



WNO. ☐☐☐☐ : program number being run at present (same as W in POSITION picture)

P ☐☐ : process number being run currently (same as P in POSITION picture)

N ☐☐☐ : block number being run currently (same as BLOCK NO. in COMMAND picture)

T ☐☐ : tool and offset numbers being indexed presently (same as T in POSITION picture)

X ☐☐☐☐.☐☐ : current tool position in work coordinate system (X-axis)

Z ☐☐☐☐.☐☐ : current tool position in work coordinate system (Z-axis)

S ☐☐☐☐ : spindle revolutions or command cutting speed (surface speed)

CUT TIME [ ]:[ ]'[ ]": automatic machining time (after starting until stop)

Scale : same reduced scale is displayed as line length (on the start of power supply, automatically fixed reduction scale is displayed.)

0 [ ]

· TRACE picture shape display:

Handling

1 Display following menu using (menu select) key.

WRKPC FIGURE	WOK FIG ERASE	SHAPE	SHAPE ERASE		STORE		SCALE	

o If any of chuck and tailstock shapes is inputted, TRACE picture is displayed when this menu is selected.
o The coordinates viewed from sideward is already displayed in picture.

2 Press [WRK PC FIGURE] and [SHAPE] menu keys in succession.

o When pressing [WRK PC FIGURE] or [SHAPE] menu key, menu display inverts. Inversion disappears when work and graphic shapes are drawn.

[WRKPC FIGURE] → [WRKPC FIGURE] → [WRKPC FIGURE]

o The side view work shape is colored green on display.
o The front view work shape is displayed by green lines.
o Graphic shape is displayed in purple.
The graphic shape in the work shape colored green is however displayed in white.
o Press [WOK FIG ERASE] or [SHAPE ERASE] when erasing work or graphic shape display respectively.
o Scale value and display limit are automatically fixed in accordance with work shape.

3 Press [SCALE] menu key when enlarging or reducing graphic shape or a certain part thereof.

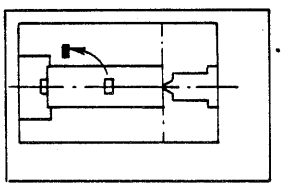
Handling

1 Press [SCALE] menu key.

- o When pressing [SCALE] menu key, menu display inverts. [SCALE] → [SCALE]
- o When only side view coordinates are displayed, cursor flickers at the center of picture.
- o When the 2-division (side and front views) coordinates are displayed, cursor flickers at the center of side view coordinates (left half of picture).
- o Message "SCALE SHIFT (CURSOR)?" is displayed.

2 Shift cursor to new display center position when enlarging or reducing partial display.

- o No cursor shift is necessary for the enlargement or reduction at current position.



3

Set new display scale value.

Setting scale value to 50:

Example: 5 0 (input)——— Scale display

- o Setting range: 1 - 999
- o Setting is made to the scale length display in the lower right part of picture and the work and graphic shape displays in picture are cleared.

End

4

Display work and graphic shapes by pressing |WRKPC FIGURE| and |SHAPE| menu keys again.

- o Start automatic operation. Then red mark or tool will appear and current machining spot will be displayed.
- o Press |STORE| when preserving shape display data. These will then be preserved even after the display changes. The STORE menu display will invert when valid.

End

Displayed shape data:

The TRACE picture is the same as the CHECK and SIMULATION pictures in that the chuck, tailstock and tool barrier shapes as well as graphic shape data can be displayed and checked. Refer to "SIMULATION picture" for the chuck, tailstock and tool shapes as well as workpiece and graphic shapes.

The machining shape displayed by the above operation is accompanied by the tool path display corresponding to the machining condition with the tip radius and compensation taken into account at the start of machining. The machining status, in this way, can be observed.

If the different programs are continuously run during automatic operation, the shape data in the TRACE picture vary when a program has changed to another. When the STORE menu is valid, however, the shape data do not vary.

8. AUTOMATIC OPERATION HANDLING MODES

8-1 Machining Condition Changes

Particularly during trial machining in the automatic mode, it may necessary to alter machining conditions depending on the shape of the chips from the first workpiece, their generation condition, the load indicated by the load meter and the roughness of the finish. In this case machining conditions are variable using override and the menus in same manner as the run conditions in the automatic mode.

In the automatic mode, override is always expressed in terms of the ratio (%) to the value of the run program command. Use the UP or DOWN key when varying the override display.

Limitation of run conditions by the menu: fully understand the significance of menus when changing or blanking them.

8-2 VFC Function

Replaces the feed, revolutions and other cutting conditions set in programs with those obtained by the override change.

VFC is very useful for machining efficiency because it is capable of storing the optimum machining conditions obtained through the override change. Only the rough machining conditions (not the finish machining) are variable using the VFC. The new conditions obtained by the override change are run starting with the next machining step.

Handling

1 Adjust the override to optimum machining conditions using the UP or DOWN key.

2 Press [VFC] (VFC) key.

o VFC is valid only during rough machining and not valid during finish machining. (In finish machining its key light does not come on.)

o VFC is valid at either rapid or jog feed.

o Stored data are registered when key light goes out on the completion of process. (Program data are rewritten.)

End

Note 1: When the [DRY RUN] key is pressed, its light goes out and the VFC function becomes invalid.

Note 2: VFC does not functions during DRY RUN.

Note 3: VFC is valid even during the interruption of automatic operation by FEED HOLD or SINGLE STEP, but not valid if the manual mode is selected.

Note 4: Override displays return to 100% after the conditions have been changed.

Note 5: The VFC function will not be valid if the spindle override or feed override value is changed.

Note 6: The VFC function will not work with EIA/ISO programs.

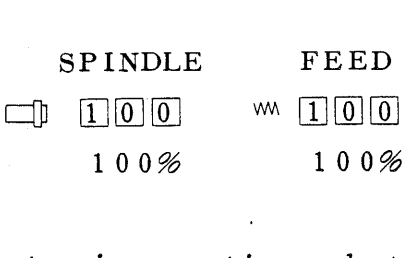
Note 7: The VFC function will not work while the program rewrite switch is locked. Pressing the [VFC] (VFC) key will cause the alarm "406 WRITE PROTECT" to be displayed.

Example: If the surface speed 100m/min and the feed 1mm/rev are registered as rough machining conditions.

(1) Override display

(2) Display in POSITION or COMMAND picture

o Auto mode selection

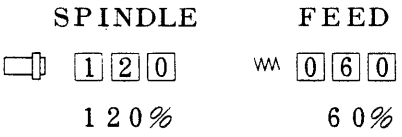


o Start of automaic operation and start of machining

SPINDLE 100M/MIN
FR 1MM/REV

o Change of machining conditions

Change override uisng its UP or DOWN key.



SPINDLE 120M/MIN
FR 0.6MM/REV

Press [VFC] (VFC) key (key light on)

o Completion of rough machining

VFC key light out

To next processing step

Override display does not return to initial condition and the finish machining surface speed and feed are kept as below:

SPINDLE 100% FEED 100%

o After machining

Machining conditions during the rough machining in the program are changed to:

Rough surface speed: 120 m/min
Rough feed: 0.6 mm/rev

Appendix: The following table lists the VFC registration conditions for each process.

Process			Rough machining		Finish machining
			Surface speed	Feed	Surface speed
BAR			o	o	o
CPY			o	o	o
CNR			o	o	o
EDG			o	o	o
THR					o
GRV	#0		x	o	o
	#1	ROUGH	o	o	
		FINISH	x		o
DRL			o	o	
TAP					o
MNP					
MES					
M					
END					

8-3 TPS Function

This so-called tip path store fuction is used in case of a tip failure, etc. in automatic operation. By using it, the axis can be moved while up to five path points are stored through manual handling after automatic operation interruption.

Handling

1 Interrupt the operation.

When TPS is used, this interruption should be performed as described below (1) to (5).

Hold:

(1) Press [feed hold] (feed hold) key.

(2) Select the manual operation mode key.

Stop:

(3) Press the SINGLE STEP menu key (the operation stops after the current block is finished).

(4) Press ohter automatic mode key (the operation stops after the current block is finished).

(5) When OPT. STOP menu is valid (stop occurs when the NC reads M01 in the program).

2 Change to manual operating mode

o Not necessary when the operation is interrupted by pressing the manual operation mode key.

3 Press [TPS] (TPS) key.

o Light on positions are stored in the memory.

o TPS is capable of using up to five path points including the point where the tip stopped at the interruption of operation. If there are more than five points, the light does not come on even when the tool has come to the stop position.

4 Manual handling. TPS key light will go out.

o Repeat steps 3 and 4 until desired axis reaches target position.

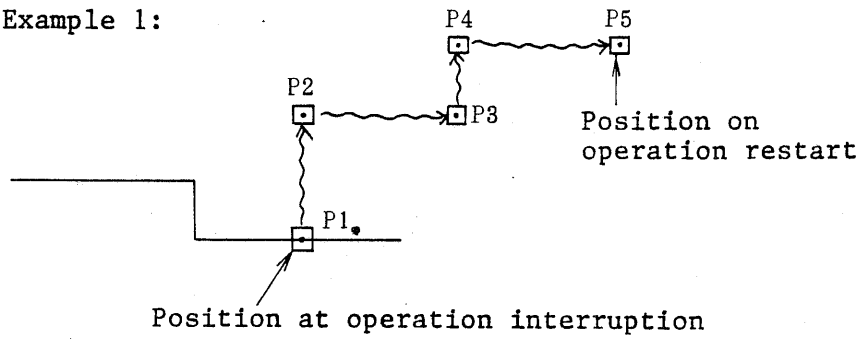
5 Carry out handling requiring interruption such as chip change.

6 Return to the automatic operation mode used before interruption.

7 Press (cycle start) key.

o Tip points stored using TPS function are traced back before restarting. After restarting, machining feed is performed between the point, P1 and path point, P2 used before interruption.

Example 1:



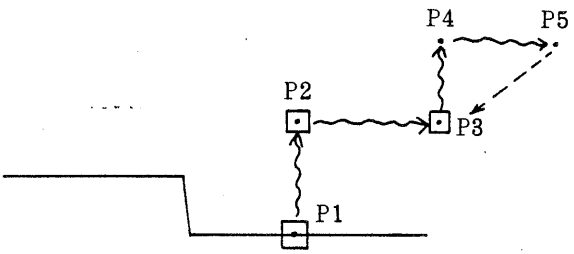
Manual handling path
TPS key on-position
• Path point

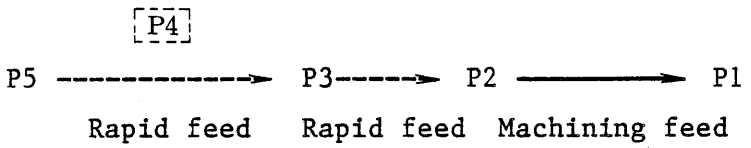
P5 ------ P4 ------ P3 ------ P2 ——— P1
Rapid feed Rapid feed Rapid feed Machining feed

A cutting feedrate may be determined with parameter S15 for cutting feedrate before the TPS or if cutting feed has not been executed at all after switched on.

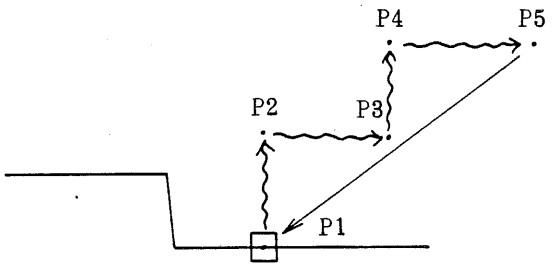
The tip moves, skipping positions not stored in memory, as illustrated below.

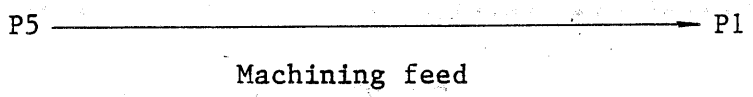
Example 2:



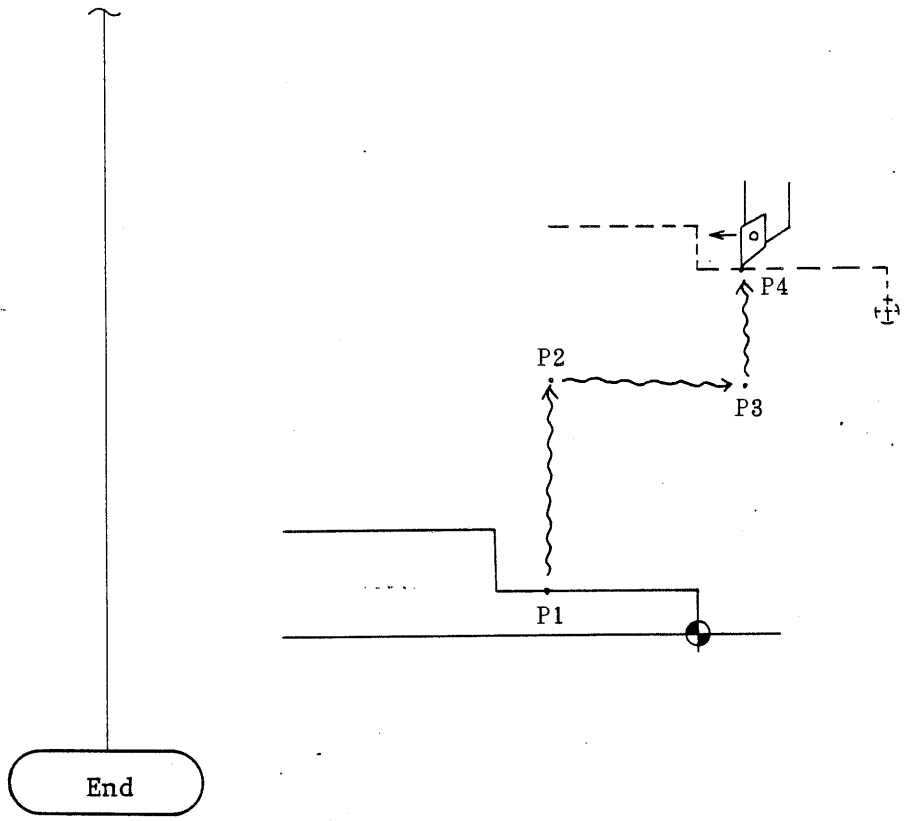


Example 3:





o If no tip positions are stored in the memory, the rest of the process is run starting at the operation restart position without returning to the initial position.



Note 1: Do not use TPS function when interrupting again while returning to the operation interrupt position.

Note 2: If the TPS key is not pressed at the operation interrupt position, the final stage return procedure will depend on the interruption condition.

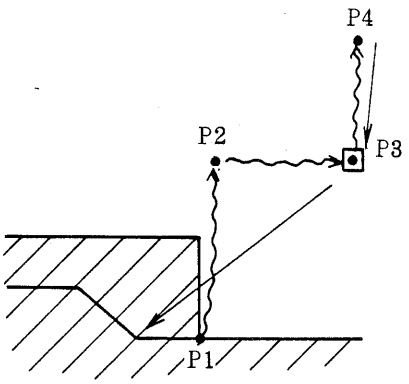
Hold:

(1) Feed hold on

(2) Direct manual handling mode on

. Path point

□ TPS key on-position



Stop:

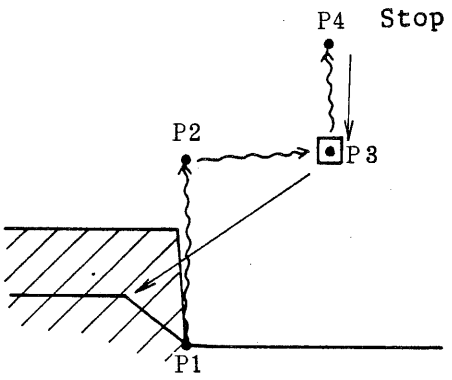
(3) Single step on

(4) Other automatic mode on

(5) Optional stop on

. Path point

□ TPS key on-position



Note 3: Upon approaching, a cutting feedrate is dependent on the feed mode when the TPS interruption is made.

(1) TPS interruption in the cutting feed mode:

Approaching will be made at the feedrate upon interruption.

(2) TPS interruption in the rapid feed mode:

i) When even one cutting feed block should exist between the top of the program and the interrupted block;

Approaching will be made at the feedrate of the block nearest to the interrupted one.

ii) If there is no cutting feed block between the top of the program and the interrupted block;

Approaching will be made at the feedrate selected with parameter S15. Note that no motion is available with this parameter set to "0".

Note 4: With MANUAL ABSOLUTE on (parameter P14 set to "1"), the TPS lamp will go on when a manual interruption is made. In other words, the TPS button is pressed automatically. Even if the axis has been manually moved, approaching is made at the cutting feedrate up to the position just before the interruption. And the coordinate system does not shift.

Note 5: After a tentative stop during the threading process, the TPS stores a maximum of 2 points only.

Note 6: As long as the measurement process is being executed (with "MEASURING" displayed on the MEASURE picture), the TPS function remains invalid.

8-4 Manual Handle Interrupt Function

Performed to move the program zero-point and to change tool path with the manual pulse generator in the automatic operation.

Allows the independent movement of the three axes (X, Z). Valid while the manual handle interruption switch light is on. Note that, until the move is cancelled, its distance remains valid for all programs.

* Movement setting (common for X- and Z-axes)

Handling

1 Press (manual handle interrupt) key.

o Key light on indicates that the movement is valid.

2 Select the move axis using the manual pulse feed axis select key.

X or Z ON

3 Turn the manual pulse generator (handle) through the corresponding angle to the move distance.

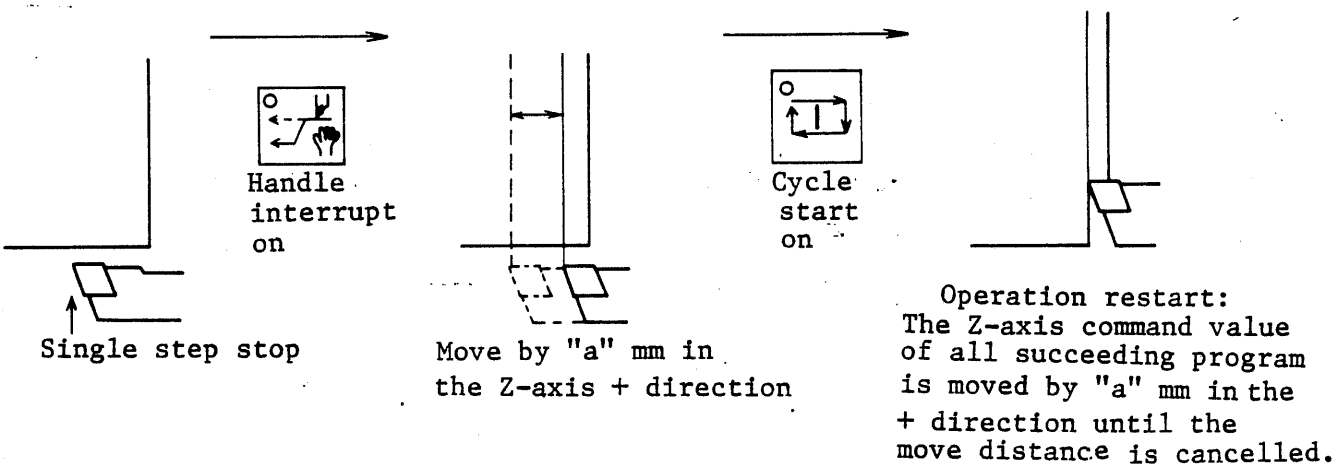
o The run distance per graduation can be set to 0.001mm or 0.01mm (0.0001 inch or 0.001 inch in inch system).
(0: 0.001mm, 1: 0.01mm), (0: 0.0001 inch, 1: 0.001 inch)

o Repeat moving for other axes if necessary.

End

* Operation

Example



* Cancellation of the move distance

Method 1: Pressing the RESET key after activating the manual handle interrupt key.

Method 2: Turning off the power supply.

Method 3: Move the same distance in the opposite direction to the set move.

Note 1: Even if the manual handle interrupt key is off after setting, its switch light will not go out unless all of the axis move distances have been cancelled.

Note 2: The move distance is cancelled when the turret returns to the tool change position or the machine zero-point. When the turret leaves this position by CYCLE START, etc., however, its operation is taken into account.

Note 3: With some models, the handle-interrupt key lamp will continue to flicker even if the move distance is cancelled. Note that if this flickering condition exists, both the handle-interrupt mode has been selected and the mvoe distance has been cancelled.

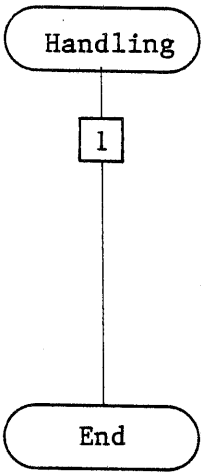
Note 4: Exercise extreme care when using the handle-interrupt during double-turret operation especially when:
- the rear turret continues after the front has stopped.
- the front turret continues after the rear has stopped.

8-5 Background Program (Optional)

Automatic operating time can be utilized for preparing the next machining step program.
Background programs are capable neither of trace nor of simulation checking.
If any erroneous data were entered while preparing the program, cancel them using (clear) key.
Refer to the Programming Manual for the program preparation procedures and methods.

8-6 Picture Erasing Function

The CRT display is blanked during idle times in the automatic operation mode to save energy and extend the CRT life.



Press (picture cancel) key. Key light on

o When displaying a picture again, press any key on the operating panel. The POSITION picture will appear first.

o Even while the display is off, an alarm can be displayed if one exists.

8-7 Data for Rewriting in Automatic Operation

Following data can be rewritten during the automatic operation.

o POSITION picture:	Parts count
o COMMAND picture:	Parts count, time display
o MEASURE picture:	Measuring count
o TOOL SET picture:	Offset value
o TOOL OFFSET DATA picture:	Offset value (X, Z), tip radius, direction
o CUTTING CONDITION picture:	Cutting condition values (surface speed, feed, infeed, etc.) in each mode, cutting condition ratio of each material
o WORK PROGRAM picture:	Background program
o TOOL DATA picture:	Tip radius, service life (time, number), used (time, number)

Note 1: For data change on the WORK PROGRAM picture, see the Operating Manual of Background Program.

Note 2: The data being run in WORK PROGRAM picture are not changeable.

Note 3: Take care when rewriting data during the automatic operation.

9. SUPPLEMENT

9-1 Counter Setting Function

In POSITION or COMMAND picture, the counters:

1. X- and Z-axes
2. Parts count
3. Time display

can be set as desired.

1. X- and Z-axis counter setting methods:

Handling

1 Select manual mode and press the cursor shift key [↓] .
The cursor flickers at the current position coordinates X.

```
X    345.834
Z     -10.14
```

POSITION picture

```
WNO. 1234
POSITION [X]  345.834
          Z   -10.14
```

COMMAND picture

2 Set desired value in response to "X POSITION DISPLAY SET?" using the ten-keys.

(Example)
[1] [5] [0] [→]

```
X    150
Z    -10.14
```

POSITION picture

```
WNO. 1234
POSITION X  150
          [Z] -10.14
```

COMMAND picture

The counter display is changed to the set value.

3 Z-axis can be handled in same manner.

End

Note 1: Resetting each axis counter is possible only in manual mode.

Note 2: If the automatic mode is selected after reset, the counter display will return to the previous position.

Note 3: Any cursor shift key can be used to call up the cursor.

Note 4: The counter cannot be reset in automatic mode. If this is attempted, the alarm "416 OPERATION MODE MALFUNCTION" will be displayed (blue).

9-2 Parts Count Setting

Handling

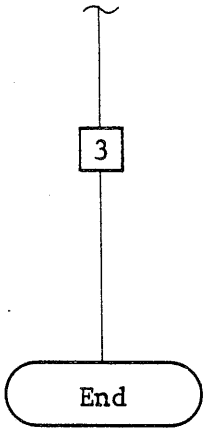
1 Move the cursor to the parts count display using the cursor shift key.

COUNTER 1 2 [4] (200)

2 Select the desired number in response to "PARTS COUNTER SET?" using the ten-key.

COUNTER 0 (20[0])

[0] [→]



Set the desired number with ten-keys in response to "NO. OF PARTS TO BE COUNTED?"

COUNTER 0 (150)

1 5 0 ⇨

Note 1: Parts count can be set in either the manual or automatic operation mode.

9-3 Time Display Setting

Handling

1 Move the cursor to the time display using the cursor shift key.

```
POWER ON   134 : 56' 28"
AUTO OPR    84 : 32' 19"
AUTO CUT    81 : 16' 42"
TOTAL CUT   79 : 54' 18"
```

2 Set the desired data using the ten-keys in response to "AUTO OPERATION (H. MIN. SEC)?".

[0] [.] [0] [.] [0] [⇨]
or [0] [⇨]

```
POWER ON   134 : 56' 33"
AUTO OPR     0 :  0'  0"
AUTO CUT    81 : 16' 42"
TOTAL CUT   79 : 54' 18"
```

3 Set the desired data using the ten-keys in response to "AUTO OPERATION (H. MIN. SEC)?".

[8] [0] [.] [0] [.] [0] [⇨]

```
POWER ON   134 : 56' 38"
AUTO OPR     0 :  0'  0"
AUTO CUT     0 :  0'  0"
TOTAL CUT   79 : 54' 18"
```

4 Set the desired data using the ten-keys in response to "AUTO OPERATION (H. MIN. SEC)?".

[7] [0] [.] [2] [0] [.] [0]

```
POWER ON   134 : 56' 43"
AUTO OPR     0 :  0'  0"
AUTO CUT     0 :  0'  0"
TOTAL CUT    0 :  0'  0"
```

End

Note 1: The time can be set in either automatic or manual mode.

Note 2: Automatic sexagesimal computation is performed for minute and second displays.

9-4 Write-inhibit Conditions

If the data lock button on the control panel is switched to "LOCK", part of the data, which otherwise could be entered, will not be accepted.

This feature is used to prevent the stored programs from inadvertently being erased. Data writability is determined by the following:

Picture		Data rewrite conditions
POSITION/COMMAND	POSITION	o
	COUNTER	o
	Time display	x
	TAILSTOCK	x
MEASURE		o
TRACE		o
WORK PROGRAM		x
PROGRAM FILE		x
LAYOUT		x
SHAPE CHECK		o
CHECK		o
SIMULATION		o
TOOL SET	TOOL SET	x
	OFFSET	o
TOOL DATA		o
TOOL FILE		x
TOOL OFFSET DATA		o
CHUCK JAW DATA		x
CUTTING CONDITION		x
DATA IN OUT (CMT, TAPE, etc.)		o
PARAMETER		x
DIAGNOSIS		o

Inputting data to the parts marked by "x" will cause the alarm "406 WRITE PROTECT" to be displayed.

This alarm can be cleared by pressing (clear) key.

10. PARAMETERS

Set parameters - the constants and data specific for the numerical control of the machine and important information needed for machining - are classified as follows:

(1) User parameters: stored information, principally relating to machining.

(2) Machine parameters No. 1: stored numerical control constants and data.

Machine parameters No. 2: stored numerical control constants and data.

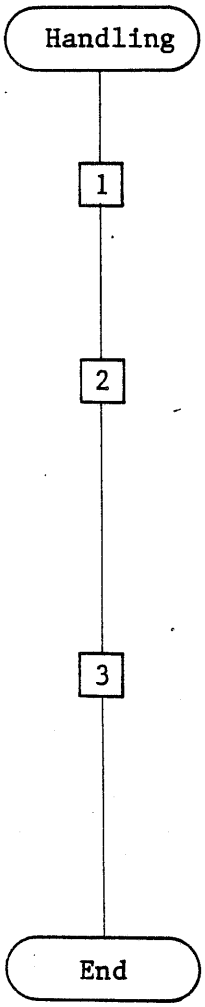
Users can change user parameter (1) depending on the various machining conditions. However, machine parameters (2) are stored data specific to each machine. Therefore, these normally should not be changed, since accidents might result.
Some machine parameters (2) can, however, be changed by the user.

Changeable machine parameters are marked with an "*" in the Parameter List. No other parameters should be changed.
There are two kinds of parameters: one becomes valid after the power is off; the other immediately after rewrite. In the Parameter List, the following two indications are employed:

Immediate: becomes valid immediately after rewrite.
Power on : becomes valid when turning the power on again after turning it off following rewrite.

When changing parameters, select optimum values after fully understanding the contents and meanings of the Parameter List. Incorrect values can cause the machine or numerical controller to fail. Record all changed values and those resulting from such changes.

Parameter change procedure:



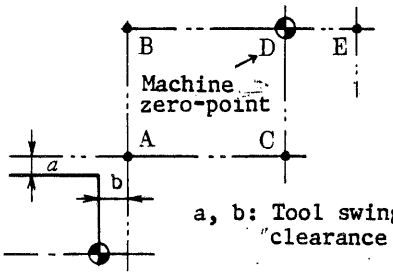
Precautions for parameters:

Note 1: Do not overlook the parameters listed on the sheet attached (in NC electrical control panel) before delivery.

Note 2: Parameter storage protection battery may become discharged during a long shutdown (battery alarm will be given). In this case identify the parameter values using the attached Parameter List. Altered values can cause the machine to fail.

User Parameters

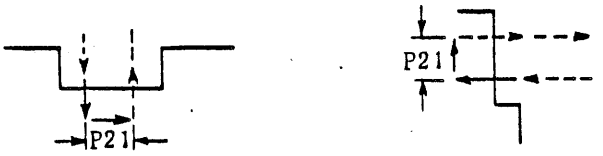
*M : valid only for MAZATROL programs
*E : valid only for EIA/ISO programs
*M, *E: valid for both MAZATROL and EIA/ISO programs

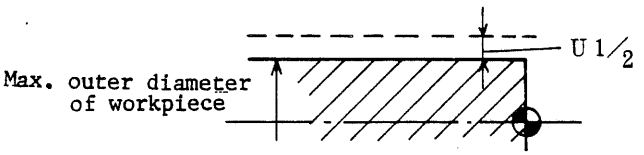
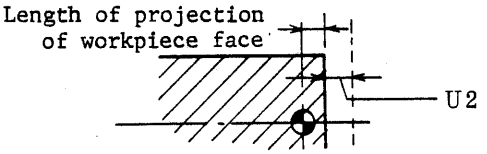
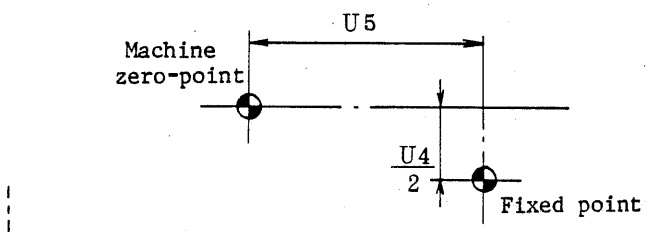
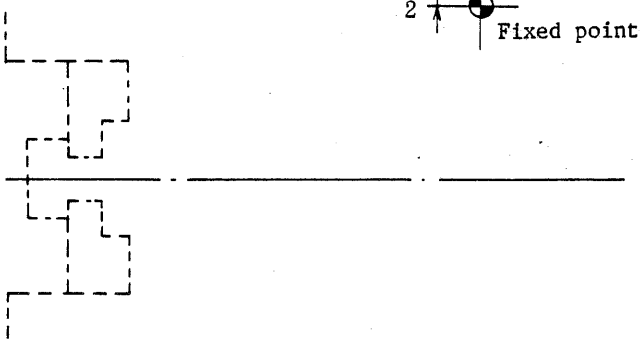
Addresses	Names		Significance & items	
	Unit	Setting range		
P1	Fixed point/machine zero-point return Valid/invalid		Selection of tool return position after machining - return position depends on the combined setting of FIX POS RET and NUMBER in END mode and of parameter P1	*M
Immediate		0 : invalid 1 : valid		
P2	Tool swing position			*M
Immediate		0 : A 3 : D 1 : B 4 : E 2 : C	Tool swing position X Z A: Clearance position Clearance position B: Machine zero-point Clearance position C: Clearance position Machine zero-point D: Machine zero-point Machine zero-point E: Fixed point Fixed point	
P3	Not yet defined.			*M *E
P4	Spare tool indexing		0: No spare tool will be indexed. 1: Specified spare tools will be indexed when the number of workpieces machined reaches the set value. 2: Specified spare tools will be indexed when the tool using time reaches the set value. 3: Specified spare tools will be indexed when the offset amount reaches the max. wear value. Note: Up to 8 spare tools can be indexed.	*M *E
Immediate		0: no indexing 1: number 2: time 3: max. wear		
P5	Not yet defined.			*M *E

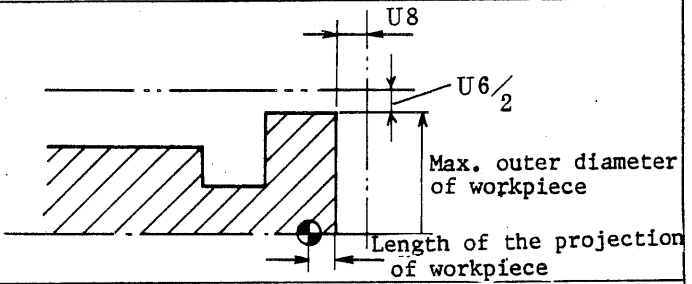
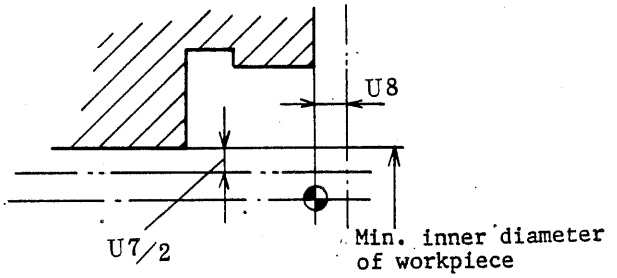
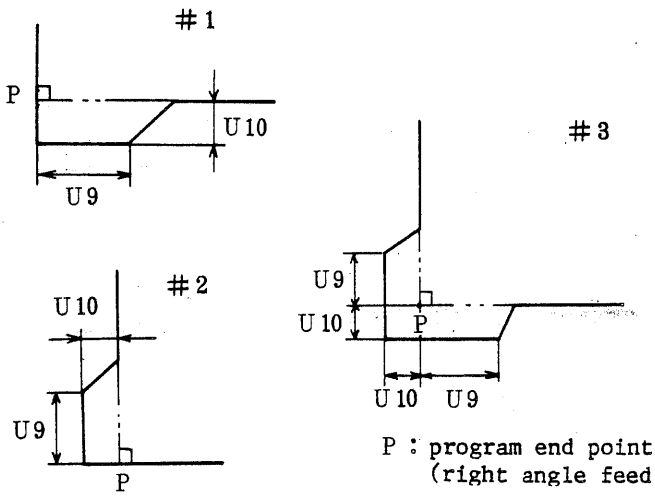
Addresses	Names		Significance & items	
	Unit	Setting range		
P6 Power on	Inch/metric changeover		When this is changed, length parameters will change from millimeters to inches or inches to millimeters. If machining is to be done after this change; 1. Parameter data indicated in both millimeters and inches and 2. Machining condition data must be changed accordingly.	*M *E
		0: metric 1: inch		
P7	Not yet defined.			
P8 Power on	Initial setting when power on		G01: cutting feed G00: rapid feed Available when EIA program is used.	*E
		0: G01 1: G00		
P9 Power on	Initial setting when power on		G99: feed per revolution G98: feed per minute	*E
		0: G99 1: G98		
P10	Not yet defined.			

Addresses	Names		Significance & items	
	Unit	Setting range		
P11 Power on	G53 MAZATROL coordinate system select valid/invalid	0 - 3	In the EIA G53 (MAZATROL coordinate system selected) mode, the G50 coordinate system command is given. In this case, 0: The selected G50 coordinate system is available. 1: The selected G50 coordinate system is is unavailable. 2: The selected G50 coordinate system is available. If resetting or the end of a program has resulted during the G53 mode, the coordinate system immeidately before entering the G53 mode is restored. 3: The selected G50 coordinate system is unavailale. If resetting or the end of a parogram has resulted during the G53 mode, the G50 coordinate system just before entering into the G53 mode is restored.	*E
P12 Immediate	Manual handle interrupt magnification (common for X- and Z-axes)	0: x 1 1: x 10	In automatic operation, 0: 0.001mm (or °), 0.0001 inch 1: 0.01mm (or °), 0.001 inch	*M *E
P13 Immediate	T-1 program judgment	0: standard (YL-2) 1: optional (YL-3)	Set NC to the following when MAZATROL T2/T3 is loaded with T-1 program by the CMT. 0: T-1 program incapable of setting four work number digits. 1: T-1 program capable of setting four work number digits.	*M

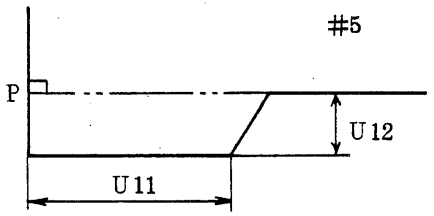
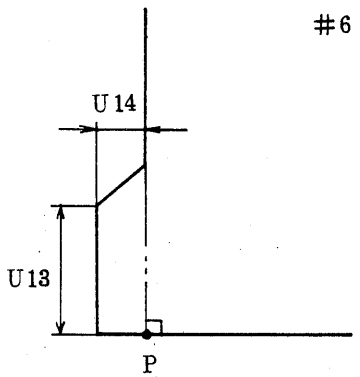
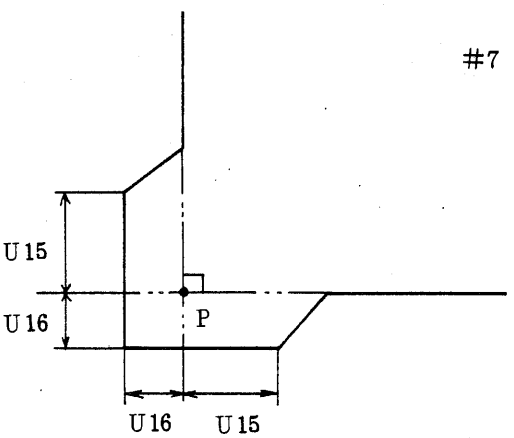
Addresses	Names		Significance & items	
	Unit	Setting range		
P14	Manual absolute select		When an interruption is manually made in the automatic operation mode; 0: The coordinate system shifts by the manual interruption stroke.	*M *E
Immediate		0: invalid 1: valid	1: Approaching is performed up to the position just before the manual interruption. The coordinate system does not sift.	
P15	Not yet defined.			
P16	Number of M code menu pictures		Used to set the number of M code menu pictures. 0; The M codes with 1 digit are displayed on a picture. 1: The M codes with 1 or 2 digits are displayed on four pictures.	*M
Immediate		0: 1 picture 1: 4 pictures		
P17	Not yet defined.			
P18	Grooving bottom dwell		Used to set the dwell times at the groove bottom. Tool stops at the groove bottom while the spindle makes the revolutions set with this parameter.	*M
Immediate	rpm	0-255		
P19	Not yet difined.			
P20	Not yet defined.			

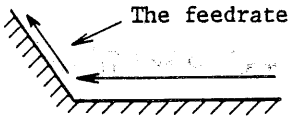
Addresses	Names		Significance & items
	Unit	Setting range	
P21 Immediate	Amount of relief after mill boring cycle orientation mm/1000 inch/10000	±32767	Used to set this at the hole bottom. *M 1) OUT 2) FCE 
P22	Not yet defined.		
P23	Not yet defined.		
P24	Not yet defined.		
P25	Not yet defined.		
P26	Not yet defined.		
P27	Not yet defined.		
P28	Not yet defined.		
P29	Not yet defined.		
P30	Not yet defined.		

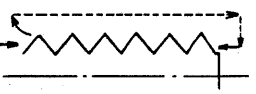
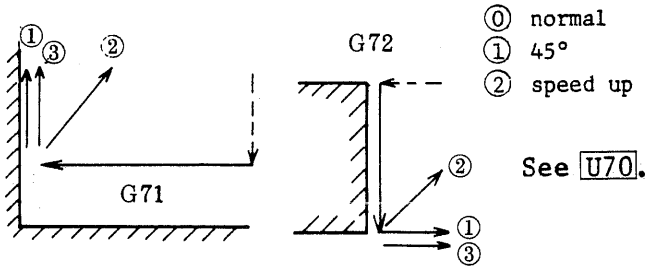
Addresses	Names		Significance & items	
	Unit	Setting range		
U1 Immediate	Tool swing clearance X-axis (diameter) mm/1000 inch/10000	0-65535	Used to the set distance to prevent interference between the workpiece and the tool as the latter swings (X-direction). 	*M
U2 Immediate	Tool swing clearance Z-axis mm/1000 inch/10000	0-65535	Used to the set distance to prevent interference between the workpiece and the tool as the latter swings (Z-direction). 	*M
U3	Not yet defined.			
U4 Immediate	Fixed point return posiiton X-axis mm/1000 inch/10000	±9999999		*M *E
U5 Immediate	Fixed point return position Z-axis mm/1000 inch/10000	±9999999		*M *E

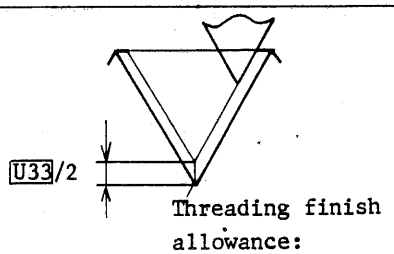
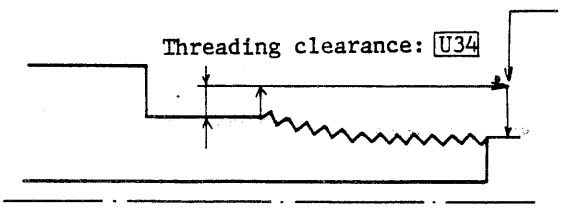
Addresses	Names		Significance & items	
	Unit	Setting range		
U6	Safe profile clearance * Outer dia. (diameter)			*M
Immediate	mm/1000 inch/10000	0-65535		
U7	Safe profile clearance			*M
Immediate	mm/1000 inch/10000	0-65535		
U8	Safe profile clearance Face end		See U6 and U7.	*M
Immediate	mm/1000 inch/10000	0-65535		
U9	Grinding escape pattern (width) #1. #2. #3		Shapes #1, #2 and #3 (X: radius) 	*M
Immediate	mm/1000 inch/10000	0-65535		
U10	Grinding escape pattern (depth) #1. #2. #3			
Immediate	mm/1000 inch/10000	0-65535		

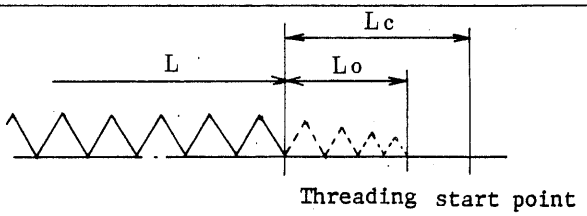
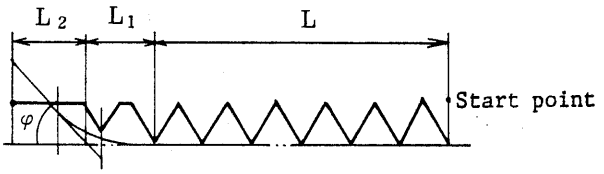
* Safe profile is obtained by adding the values of U6 - U8 clearances to those of the maximum outer diameter, minimum inner diameter and workpiece face projection specified for the approach from tool swing position to the cutting start point.

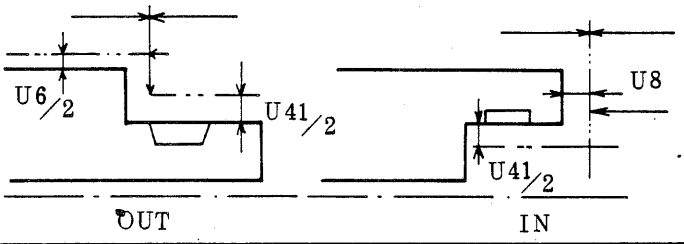
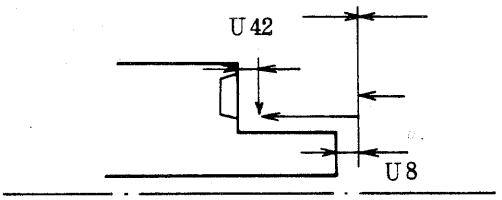
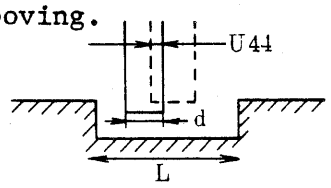
Addresses	Names		Significance & items	
	Unit	Setting range		
U11	Grinding escape pattern (width) #5			*M
U12	Grinding escape pattern (depth) #5			
Immediate	mm/1000 inch/10000	0-65535	Same shape as #1; the size is changed. (X: radius value)	
U13	Grinding escape pattern (width) #6			*M
U14	Grinding escape pattern (depth) #6			
Immediate	mm/1000 inch/10000	0-65535	Same shape as #2, the size is changed. (X: radius value)	
U15	Grinding escape pattern (width) #7			*M
U16	Grinding escape pattern (depth)			
Immediate	mm/1000 inch/10000	0-65535	Same shape as #3, the size is changed. (X: radius value)	

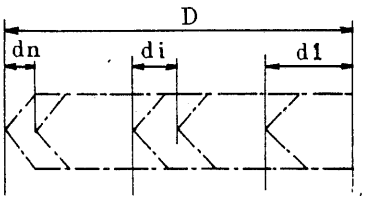
Addresses	Names		Significance & items	
	Unit	Setting range		
U17	EIA/ISO restart, single step stop		When the EIA/ISO program restarts, it is possible to have the tool made a single step stop after having it approached to the machining start point. 0: Single step stop is not made. 1: Single step stop is made.	*E
Immediate		0: invalid 1: valid		
U18	Rapid feed dry run valid/invalid		On rapid feed program command, change is possible to manual mode feedrate code by operating the DRY RUN key.	*M *E
Immediate		0: invalid 1: valid		
U19	Threading or tappint dry run valid/invalid		During threading or tapping, a change is possible to manual mode feedrate by operating the DRY RUN key.	*M *E
Immediate		0: invalid 1: valid		
U20	Not yet defined.			
U21	Threading acceleration distance fixing value valid/invalid		Used to determine the validity of threading acceleration distance fixing value. 0: invalid Run is performed even on its shortage. 1: valid Alarm occurs if shortage exists.	*M
Immediate		0: invalid 1: valid		
U22	Not yet defined.			
U23	Feedrate increase at wall during bar rough machining cycle valid/invalid		The feedrate at the wall is variable during the bar rough machining cycle in the MAZATROL program.  The feedrate here can be increased. Refer to U56 and U57 for further details.	*M
Immediate		0: invalid 1: valid		

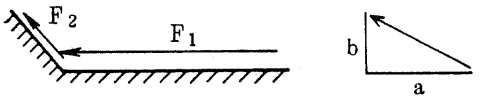
Addresses	Names		Significance & items	
	Unit	Setting range		
U24	Feed hold during threading valid/invlid		Pressing the FEED HOLD button in the threading cycle will cause the tool to escape from the workpiece while chamfering (finishing a thread). As a result, feeding is stopped. Press the CYCLE START button and the tool will start threading again from the identical cut-in position.	*E
Immediate		0: invalid 1: valid	Position at which FEED HOLD has been aplied.  Note: Only G92 and G76 in the EIA program are valid.	
U25	Selection of G80's cycle operation		EIA/ISO G83/G87 cycle type selection and initial point return/R point return selection of G80's cycles. 0: Type of return in the amount same as that of relief (high-speed deep hole drilling cycle) during drilling ..... Return to initial point 1: Type of return up to R point (deep hole drilling cycle) during drilling ..... Return to initial point 2: Type of return in the amount same as that of relief (high-speed deep hole drilling cycle) during drilling ..... Return to R point 3: Type of return up to R point (deep hole drilling cycle) during drilling ..... Return to R point	*E
Immediate		0 - 3		
U26	Return to M-process tool change position valid/invalid		Used to determine whether or not to return the tool to the change position after running the M-process. 0: non-return 1: return	*M
Immediate		0: invalid 1: valid		
U27	Pattern of the escape after G71 or G72 turning cycle		 See U70.	*E
Immediate		0: normal 1: 45° 2: speed up		

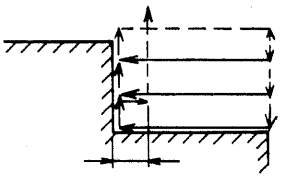
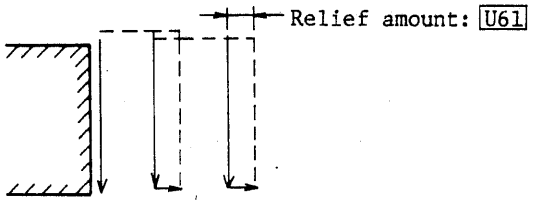
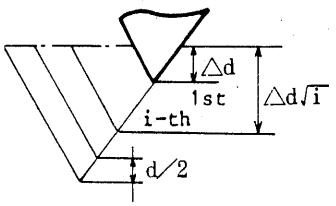
Addresses	Names		Significance & items	
	Unit	Setting range		
U28	Measuring tolerance range 1		T LIM+: upper tolerance limit a_1 } Set in program T LIM−: lower tolerance limit a_2 } Set in program Offset made $\frac{a_1 - a_2}{100} * \boxed{U29} \geqq$ offset data $\geqq \frac{a_1 - a_2}{100} * \boxed{U28}$ $-\frac{a_1 - a_2}{100} * \boxed{U28} \geqq$ offset data $\geqq -\frac{a_1 - a_2}{100} * \boxed{U29}$ No offset made: $\frac{a_1 - a_2}{100} * \boxed{U28} >$ offset data $> -\frac{a_1 - a_2}{100} * \boxed{U29}$	*M *E
Immediate	%	0-100		
U29	Measuring tolerance range 2		Alarm stop offset data $> \frac{a_1 - a_2}{100} * \boxed{U29}$ $-\frac{a_1 - a_2}{100} * \boxed{U29} >$ offset data Offset data are added incrementally to offset amount. This parameter is not valid for tool tip measurement.	
Immediate	%	0-100		
U30	Not yet defined.			
U31	Not yet defined.			
U32	Not yet defined.			
U33	Threading finish allowance (diameter value)			*M *E
Immediate	mm/1000 inch/10000	1-65535		
U34	Threading clearance (radius value)			*M
Immediate	mm/1000 inch/10000	1-65535		

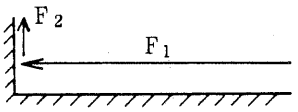
Addresses	Names		Significance & items	
	Unit	Setting range		
U35	Fixing threading acceleration distance		 L: valid thread part Lo: acceleration distance Lc: acceleration distance value U35 When Lo > Lc, acceleration alarm occurs. When U21 = 0, however, no alarm occurs and cutting is performed.	*M
Immediate	lead/10	0-255		
U36	Thread chamfer value		 L: effective thread length L1: even pitch incomplete thread length L2: chamfer value U36 : chamfer angle	*M *E
Immediate	lead/10	0-40		
U37	Threading depth constant Metric (outer dia., face end)		This parameter sets the thread ridge height and is computed using the following equation. Height = pitch x parameter Metric Inch OUT U37 U39 IN U38 U40 FCE U37 U39 Standard settings: U37) 6495(thread angle 60°) U38 h=0.6495P U39) 6403(thread angle 55°) U40 h=0.6403P h: thread ridge height, P: pitch JIS recommended value	*M
Immediate	%/100	0-32767		
U38	Thread chamfer value Metric (inner dia.)			*M
Immediate	%/100	0-32767		
U39	Threading depth constant Inch (outer dia., face end)			
Immeidate	%/100	0-32767		
U40	Threading depth constant Inch (inner dia.)			
Immediate	%/100	0-32767		

Addresses	Names		Significance & items	
	Unit	Setting range		
U41	X-axis grooving clearance (diameter value)			*M
Immediate	mm/1000 inch/10000	0-65535		
U42	Z-axis grooving clearance			*M
Immediate	mm/1000 inch/10000	0-65535		
U43	Grooving relief		Used to set pecking return distance on deep grooving.	*M *E
Immediate	mm/1000 inch/10000	0-65535		
U44	Grooving overlap		Used to set tool width overlap on wide grooving.  L: groove width d: tool width U44 ≧ d: error	*M
Immediate	mm/1000 inch/10000	0-65535		
U45	Grooving retracting rate		Used to set feedrate for retracting from from the groove bottom.	*M
Immediate	mm/1000 rev inch/1000 rev	0-65535		
U46	Not yet defined.			
U47	Not yet defined.			
U48	Not yet defined.			

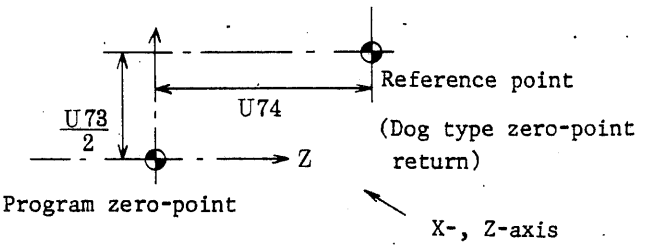
Addresses	Names		Significance & items	
	Unit	Setting range		
U49	Drill feed tolerance			*M
Immediate	mm/1000 inch/10000	0-65535	D: drill feed d1: depth of 1st pass di: depth of n-th pass di = d1 - U49 x (i-1) (when di ≧ b) di = b b: drill feed fixing parameter [U53]	
U50	Drill relief amount		Relief amount in the high-speed deep hole drilling cycle	*M *E
Immediate	mm/1000 inch/10000	0-65535		
U51	Drill feed coefficient		Set to automatically fix the first drill feed.	*M
	%	0-999	d1 = Drill dia. x $\frac{[U51]}{100}$	
U52	Reamer reciprocating rate coefficient		Parameter to determine reamer reciprocating rate	
Immediate	%	0-999	Reciprocating rate = feedrate x $\frac{[U52]}{100}$	
U53	Fixing drill feed (min.)		Feed is determined as follows: First feed - [U49] x (n-1) n: feed times Set the minimum value.	*M
Immediate	mm/1000 inch/10000	0-9999999		

Addresses	Names		Significance & items	
	Unit	Setting range		
U54	Allowing for tap incomplete thread ridge		Used to add the offset value to the tap path value (the value obtained by following computation to final point value). Pitch x $\frac{\boxed{U54}}{10}$	*M
Immediate	pitch/10	0-99	Pitch is fixed by program. ① : $\frac{\boxed{U54}}{10}$ ② : U8 ③ : $\frac{\boxed{U55}}{10}$	
U55	Allowing for tap elongation		Used to compensate tap path with tap elongation taken into account (the value obtained by adding following computation to the value of start point + clearance). Pitch x $\frac{\boxed{U55}}{10}$	*M
Immediate	putch/10	0-99	Pitch is fixed by program.	
U56	Ratio of the feedrate increase at wall during bar rough machining cycle (45°)		Used to set the ratio of the feedrate increase at last wall during bar rough machining.  When a ≠ 0, increase ratio = $\boxed{U56}$ x $\frac{b}{a}$	*M
Immediate	%	100-200		
U57	Ratio of the feedrate increase at wall during bar rough machining cycle (90°)		When a = 0, increase ratio = $\boxed{U57}$ When increase ratio > $\boxed{U57}$, it becomes equal to $\boxed{U57}$. Therefore, when increase ratio < 100, it becomes equal to 100. This function is valid only when $\boxed{U23}$ = 1 and only for the final block at last wall during bar rough machining cycle.	
Immediate	%	100-200		
U58	Ratio of the feedrate increase beyond the workpiece shape in copy (CPY) machining		While part of tool path is beyond the workpiece shape in the rough machining CPY cycle, the machining feedrate can be increased. Feedrate beyond the workpiece shape = feedrate inside workpiece shape x (100 + $\boxed{U58}$)/100	*M
Immediate	%	100-200		

Addresses	Names		Significance & items	
	Unit	Setting range		
U59	Decrease ratio of bar rough machining cycle feed		Specified feed can be decreased as work thickness decrease in O.D. or I.D. rough turning. Object of O.D. or I.D. turning: residual part of the thickness obtained when inner or outer diameter is set at minimum or maximum respectively.	*M
Immediate	%	1-100		
U60	Overlap clearance at wall during rough machining cycle		Used to set the clearance for the final relief in rough machining by MAZATROL program.  Relief amount: U60	*M
Immediate	mm/1000 inch/10000	0-65535		
U61	EDG relief amount		Used to set the return distance after rough machining the face end. 	*M
Immediate	mm/1000 inch/10000	0-65535		
U62	Minimum threading feed		Valid on the threading cycles by EIA/ISO program.  △d: depth of the 1st pass (program-specified) di: depth of the i-th pass di ≦ b: di = b di > b: di = △d x ($\sqrt{i}$ - $\sqrt{i-1}$) b/2 = U62	*E
Immediate	mm/1000 inch/10000	0-65535		

Addresses	Names		Significance & items
	Unit	Setting range	
U63	Not yet defined.		
U64	Not yet defined.		
U65	Not yet defined.		
U66	Not yet defined.		
U67	Not yet defined.		
U68	Not yet defined.		
U69	Not yet defined.		
U70	Coefficient of increasing feedrate when U27 = 2		 *E
Immediate		0-99	$F_2 = F_1 \times \boxed{U70}/10$ Where $\boxed{U70} = 0$, F_2 is regarded as 10.
U71	Not yet defined.		
U72	Not yet defined.		

<table>
<tr><td rowspan="2">Addresses</td><td colspan="2">Names</td><td rowspan="2">Significance & items</td><td rowspan="2"></td></tr>
<tr><td>Unit</td><td>Setting range</td></tr>
<tr><td>U73

Power on</td><td colspan="2">Value for automatically setting work coordinate system on the return to EIA reference point (X-axis)
mm/1000
inch/10000</td><td rowspan="4">Used to set this for the dog type zero-point return during automatic operation by EIA program.
 
</td><td rowspan="4">*E</td></tr>
<tr><td>±9999999</td></tr>
<tr><td>U74

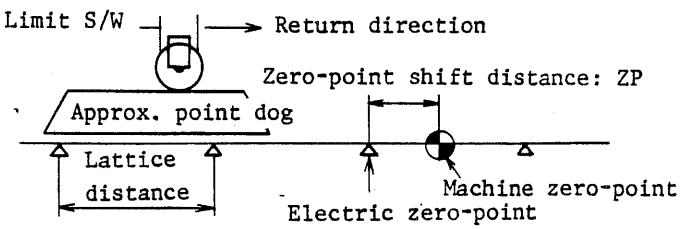
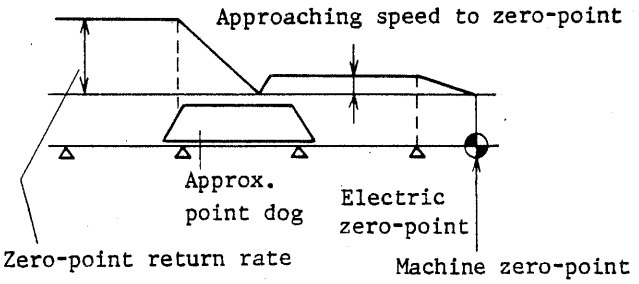
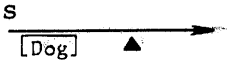
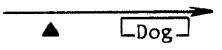
Power on</td><td colspan="2">Value for automatically setting work coordinate system on the return to EIA reference point (Z-axis)
mm/1000
inch/10000</td></tr>
<tr><td>±9999999</td></tr>
<tr><td>U75</td><td colspan="2">Not yet defined.</td><td></td><td></td></tr>
<tr><td>U76

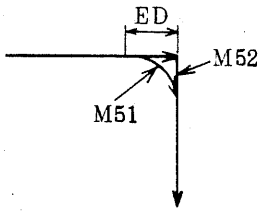
Immediate</td><td colspan="2">Initializing value for display (X-axis: diameter value)
mm/1000
inch/10000</td><td rowspan="2">Used to specify the tool path starting point for checking.</td><td rowspan="2">*M
*E</td></tr>
<tr><td>±9999999</td></tr>
<tr><td>U77

Immediate</td><td colspan="2">Initializing value for display (Z-axis)
mm/1000
inch/10000</td><td rowspan="2">Used to specify the tool path starting point for checking.

Note: Always "0" for C-axis.</td><td rowspan="2">*M
*E</td></tr>
<tr><td>±9999999</td></tr>
<tr><td>U78</td><td colspan="2">Not yet defined.</td><td></td><td></td></tr>
<tr><td>U79</td><td colspan="2">Not yet defined.</td><td></td><td></td></tr>
<tr><td>U80</td><td colspan="2">Not yet defined.</td><td></td><td></td></tr>
</table>

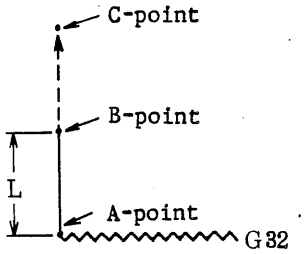
Machine Parameters

Addresses	Names		Significance & items	
	Unit	Setting range		
BL (X.Z)	Backlash compensation		Used to electrically compensate X- and Z-axis move errors with respect to command value (X-axis: radius)	*M *E
Immediate	X.Z mm/1000	0-255		
ZP (X.Z)	Zero-point shift distance			*M *E
Immediate	X.Z mm/1000	0-16383		
DF (X.Z)	Zero-point approach rate			*M *E
Power on	X.Z mm/min	0-500	o Only the zero-point return on the power supply, emergency stop, etc. o After first time, zero-point return is performed at high speed.	
ZR (X.Z)	Zero-point return direction		When viewed from the dog, the machine zero-point is 	*M *E
Power on		0/1	on the + side: ZR=0 on the - side: ZR=1 	
* RF (X.Z)	Rapid feedrate		Used for setting rapid feedrate. If no zero-point return is completed, however, it is performed at a rate set by parameter A3.	*M *E
Power on	X.Z	0-20000		

Addresses	Names		Significance & items	
	Unit	Setting range		
TC (X.Z) Power on	Rapid feed deceleration constant msec	 0-500	Used to set the time constant of the increase to or the stop of rapid feed. Exponential rise between [TC] set values or linear stop between 2 and [TC] set value.	*M *E
MC (X.Z) Power on	Servo constant d1, d2, d3 	 d1: 0-3 d2: 0/1 d3: 1.2.4.8	d1: linear zone d2: polarity d3: τ setting	*M *E
OD (X.Z) Power on	Ratio of decreasing constant on software limit deceleration %	 0-63	Used to determine deceleration constant in deceleration stop mode ([OT]-0) when turret exceeds software limits ([B1] - [B4]). Time constant = [TC] x (1-[OD]/100) TC: rapid feed deceleration constant	*M *E
LP (X.Z) Power on	Constant for computing threading acceleration distance 1/sec	 20-50	Omitted	*M
* ED (X.Z) Power on	Setting cutting feed deceleration (width of error detection) X.Z mm/1000 inch/10000	 0-2000	Used to determine corner roundness.  M51: error detect OFF M52: error detect ON On power supply: M52	*M *E
* HS (X.Z) Immediate	Fixing manual handle interrupt X.Z mm/1000 inch/10000	 0-32767	Used to set the maximum handle interrupt value. No larger interrupt is allowable. (X-axis: diameter setting)	*M *E

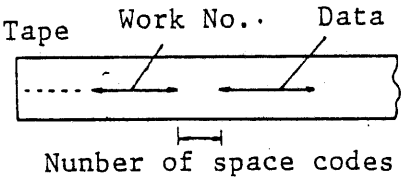
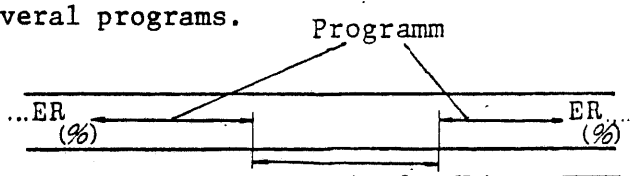
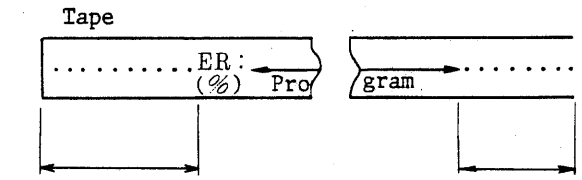
Addresses	Names		Significance & items	
	Unit	Setting range		
TCC (X.Z) Power on	Machining feed constant		Used to set the time constant of the increase to or the stop of machining feed. Both rise and stop are logarithmically performed at the TCC set time value.	*M *E
	msec	0-500		
OT (X.Z) Power on	Software limit stop mode		Used to select the stop mode when software limit is reached. 0: deceleration stop Refer to parameter OD. 1: speed loop step stop 2: servo OFF step stop } Normally, should not be used.	*M *E
		0-2		
SG (X.Z) Power on	Scale specification 3-times gain setting distance		Omitted	*M *E
	pulse	0-500		
JF (X.Z) Power on	Upper machining feed limit		Used for setting the upper feed limit including override during jog cutting. (Not used for X- and Z-axes.)	*M *E
		0-20000		
AU (X.Z)	Not yet defined.			
GR1-GR5 Power on	Maximum spindle revolutions for gears 1 - 5		Used for setting the maximum spindle revolutions for each gear. GR1 - GR5 must not be changed because they are used to automatically select gears. They correspond to gears, depending on machine models.	*M *E
	rpm	0-16000		

Addresses	Names		Significance & items
	Unit	Setting range	
GR6-GR8	Not yet defined.		
HP1-HP5	Not yet defined.		
HP6-HP8	Not yet defined.		

Addresses	Names		Significance & items	
	Unit	Setting range		
A1 Immediate	Specified distance for changing the thread end finish constant	0-2000	 Normally the tool moves from A point to C point according to the rapid feed time constant. In this case, however, it moves as follow: A point → B point: cutting feed time constant B point → C point: rapid feed time constant L = RF/60 x 0.017 x A1	*M
A2 Power on	Thread acceleration pitch error factor	0.1% 1-20	If pitch is P and pitch error is ΔP, A2 = ΔP/P This equation is used to compute thread acceleration distance.	*M
A3 Power on	Deceleration of the rapid feedrate at the dog type zero-point return	% 0-100	Normal feedrate decelerates as set by this parameter at the first zero-point return after turning on the power or cancelling an emergency stop (until stepping the dog). Zero-point return rate = rapid feedrate x rapid feed deceleration/100 = RF x A3/100 DF rate is obtained after stepping the dog (refer to DF).	*M *E
A4 Power on	Zero-point return from the zero-point dog	0-3	When the zero-point return from the zero-point dog occurs; 0: Return to zero can occur. 1: Only the X-axis travel cannot occur. 2: Only the Z-axis travel cannot occur. 3: Neither the X-axis nor the Z-axis travel can occur.	*M *E

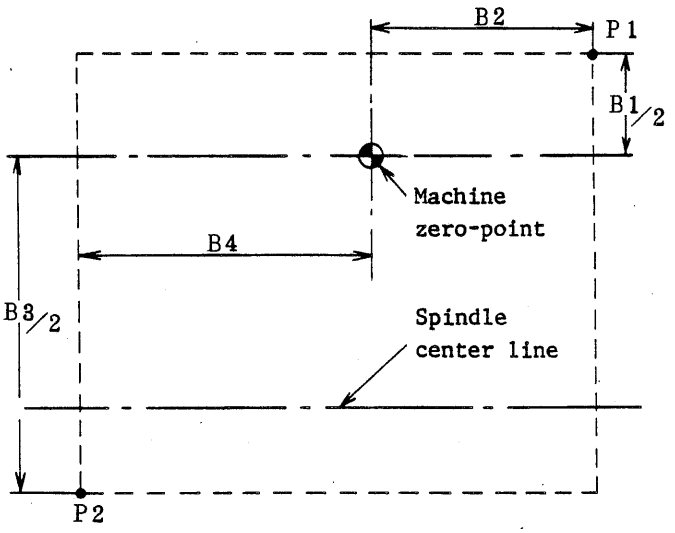
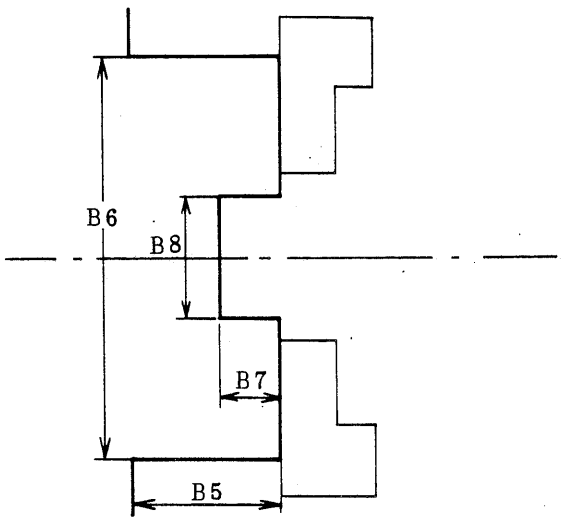
Addresses	Names		Significance & items	
	Unit	Setting range		
A5	EIA/ISO starting conditions		In the EIA/ISO mode, the alarm can be triggered if the X-axis and the Z-aixs zero-point return cannot be accomplished. (except the C-axis). 0: Alarm is triggered when return to zero has not been accomplished. 1: Program can be run even when return to zero has not occurred.	*E
Powwer on		0-1		
A6	Offset-commanded axis move by EIA/ISO		Determine if the axis move occurs with an offset when a single T command is input during the EIA/ISO program. 0: No axis move by the offset command (When the next axis move command comes, there is a displacement with an offset) 1: Axis displacement by offset command.	*E
Power on		0-1		
A7	Selecting the cycle starting conditions		It is possible that starting may not be accomplished with various selected pictures. 0: Cycle start is inhibited with the WORK PROGRAM, LAYOUT, SIMULATION, CHECK and SHAPE CHECK pictures. 1: Cycle start is possible only with the WORK PROGRAM and SHAPE CHECK pictures.	*E
Power on		0: invalid 1: valid		
A8	Not yet defined.			
* A9	Fixing spindle revolutions		Used to set the maximum value of spindle revolutions.	*E *M
Immediate	rpm	0-16000		
* A10	Not yet defined.			

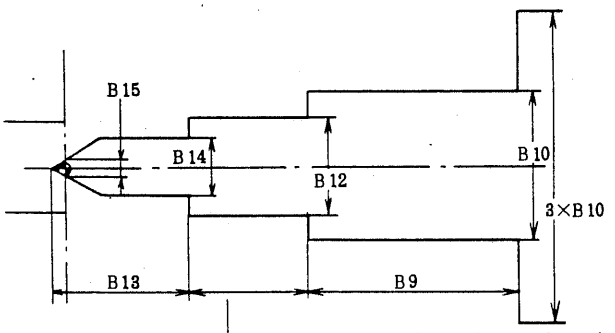
Addresses	Names		Significance & items	
	Unit	Setting range		
A11	Not yet defined.			
A12	Not yet defined.			
A13	Not yet defined.			
A14	Timer for preventing measuring skip signal chatter		Omitted.	*M *E
Power on	2.2msec	0-65535		
A15	RS232C parameter for serial tape reader/puncher (8251 initialize data)		Omitted.	*E
Power on	bit	0/1		
A16	RS232C parameter for serial tape reader/puncher		Omitted.	*E
Power on	bit	0/1		
A17	RS232C baud rate for CMT		Used to set the baud rate for CMT (cassette data) I/O. 1: 100 (bps) 2: 300 3: 600 4: 1200 5: 2400 6: 4800 7: 9600 8: 19200	*E
Power on		1-6		
A18	RS232C baud rate for serial tape reader/puncher		Used to set the baud rate for connecting tape reader/puncher. (The contents are the same as in A17.)	*E
Power on		1-6		

Addresses	Names		Significance & items	
	Unit	Setting range		
A19	Tape reader rewind code		Used to specify the rewind code outputted from the NC when using the tape reader with rewinding feature.	*E
Immediate		0-255		
* A20	N/C tape output code		Used to specify the code for punching the program tape. 0: EIA code 1: ISO code	*E
Immediate		0/1		
* A21	Tape punch output - number of space codes		Used to specify the number of the codes for the spaces between the work numbers and data. 	*E
Immediate	space codes /10	0-5		
* A22	Tape punch output - number of space codes between programs		Used to specify the number of space codes between programs if one tape contains several programs.  Specify the space code by A22.	*E
Immediate	space codes /10	0-5		
* A23	Tape punch output - number of head and tail feed		 The number of head feeds is set to A23. The number of tail feeds is set to A23.	
Immediate	number of feeds/10	0-255		
* A24	T/V check - valid/invalid		Setting the validity of T/V check for input paper tape.	*E
Immediate		0: invalid 1: valid		

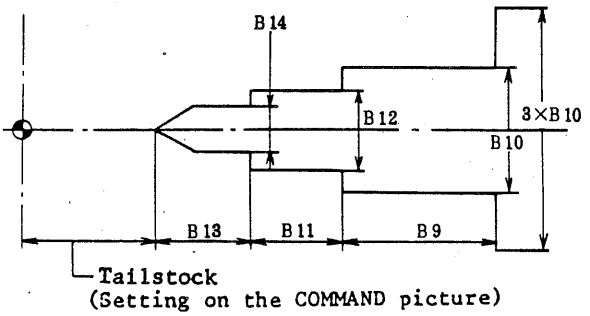
Addresses	Names		Significance & items	
	Unit	Setting range		
A25 Immediate	Spindle gears	0-5	Parameter setting value. No setting is made to "0". 1 .. 1st gear spec. 2 .. 2nd gear spec. 3 .. 3rd gear spec. 4 .. 4th gear spec. 5 .. 5th gear spec.	*M *E
A26	Not yet defined.			
A27 Immediate	Intervals of checking speed reach signal 17.7 msec/ 100 rpm	0-255	Omitted.	*M *E
A28 Power on	Gear ratio between spindle and encoder	0-9	Gear ratio = $\frac{\text{spindle rev.}}{\text{encoder rev.}}$	*M *E
* A29 Immediate	Detection of the tape reader program end	0/1	Used to set the detection point of tape reader program end. 0: Program end when reading M30, M99, M198 and M199 1: Program end when reading M30, M99, M198, M199 or 0-code, ;-code.	*E
* A30 Power on	Serial/parallel change-over bit	0/1	Bits 0 : serial reader 1 : ON, 0 : OFF 1 : serial punch 1 : ON, 0 : OFF 2 : parallel reader 1 : ON, 0 : OFF 3 : parallel punch 1 : ON, 0 : OFF Note: Invalid for both serial and parallel readers when they are on. Invalid for both serial and parallel punchs when they are on.	*E

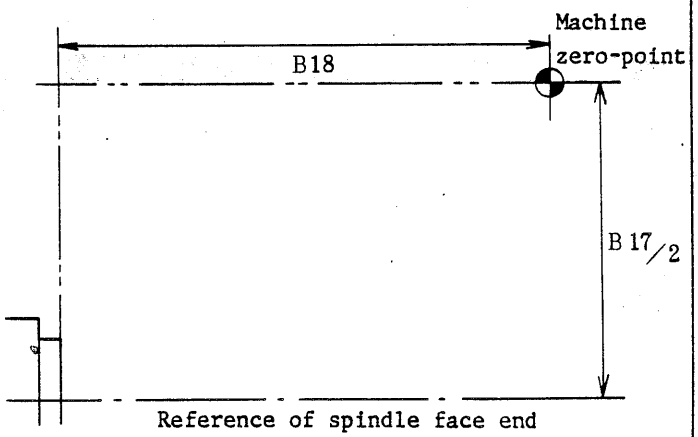
Addresses	Names		Significance & items	
	Unit	Setting range		
* A31	#-code for EIA punch		Used to specify the #-code for EIA punch.	*E
Immediate		0-255		
* A32	:-code for EIA punch		Used to specify the :-code for EIA punch.	*E
Immediate		0-255		

Addresses	Names		Significance & items	
	Unit	Setting range		
* B1 #1	Software limit: +X (diameter)		Used for setting the software limit. 	*M *E
Immediate	mm/1000 inch/10000	±9999999		
* B2 #1	Software limit: +Z			
Immeidate	mm/1000 inch/10000	±9999999		
* B3 #1	Software limit: -X (diameter)			
Immediate	mm/1000 inch/10000	±9999999		
* B4 #1	Software limit: -Z			
Immediate	mm/1000 inch/10000	±9999999		
* B5 #1	Chuck barrier			*M
Immediate	mm/1000 inch/10000	±9999999		
* B6 #1	Chuck barrier			
Immediate	mm/1000 inch/10000	±9999999		

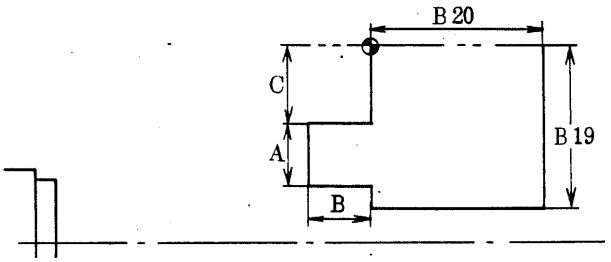
Addresses	Names		Significance & items	
	Unit	Setting range		
* B7 #1 Immediate	Chuck barrier		Refer to B5 and B6.	*M
	mm/1000 inch/10000	±9999999		
* B8 #1 Immediate	Chuck barrier		Refer to B5 and B6.	*M
	mm/1000 inch/10000	±9999999		
* B9 #1 Immediate	Tail barrier		1. For shaft work	*M
	mm/1000 inch/10000	±9999999	 Length of tailstock projection (Setting on the PROGRAM FILE picture)	
* B10 #1 Immediate	Tail barrier			
	mm/1000 inch/10000	±9999999		
* B11 #1 Immediate	Tail barrier			
	mm/1000 inch/10000	±9999999		
* B12 #1 Immediate	Tail barrier			
	mm/1000 inch/10000	±9999999		

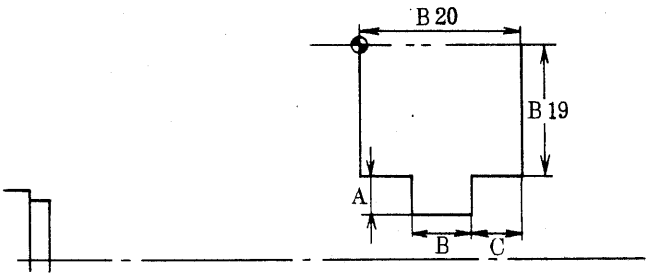
Addresses	Names		Significance & items
	Unit	Setting range	
* B13 #1 Immediate	Tail barrier		2. For chuck work *M
	mm/1000 inch/10000	±9999999	
* B14 #1 Immediate	Tail barrier		
	mm/1000 inch/10000	±9999999	
* B15 #1 Immediate	Tail barrier		
	mm/1000 inch/10000	±9999999	
* B16 #1	Not yet defined.		
* B17 (B1#2) Immediate	Reference tool position (X-direction: diameter)		*M
	mm/1000 inch/10000	±9999999	
* B18 (B2#2) Immediate	Reference tool position (Z-direction)		
	mm/1000 inch/10000	±9999999	





Addresses	Names		Significance & items
	Unit	Setting range	
* B19 (B3#2) Immediate	Width of turret body: X-direction (radius)		Holder type 1: In case that the value of the holder mounting location is positive. *M
	mm/1000 inch/10000	±9999999	
* B20 (B4#2) Immediate	Width of turret body: Z-direction		
	mm/1000 inch/10000	±9999999	
* B21 B24 B27 B30 Immediate	Width of tool holder (tool barrier): X (radius)		In case that the value of the holder mounting location is negative. *M
	mm/1000 inch/10000	+9999999	
* B22 B25 B28 B31 Immediate	Width of tool holder (tool barrier): Z		
	mm/1000 inch/10000	+9999999	
* B23 B26 B29 B32 Immediate	Mounting location of holder (tool barrier)		
	mm/1000 inch/10000	±9999999	



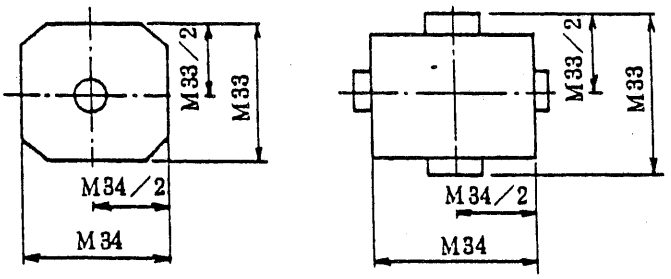


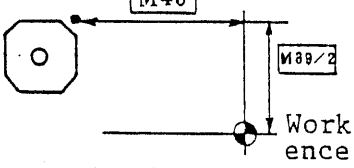
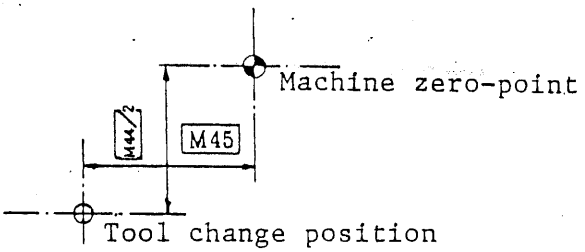
Holder type	A	B	C
1	B21	B22	B23
2	B24	B25	B26
3	B27	B28	B29
4	B30	B31	B32

Stick tool barrier to turret and holder using B19 to B32.

Holder type 0 means no holder.

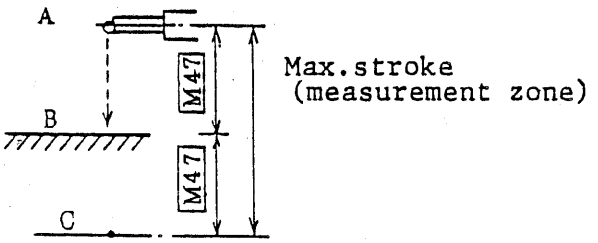
Different turret drawings are obtained for the different mounting locations of holder.

Addresses	Names		Significance & items	
	Unit	Setting range		
* M33	X-axis tool-edge measurement sensor		Used to input sizes with respect to the X- and Z-axes for the tool-edge measurement sensor. (RENISHAW touch sensor) (MT pulse generator) 	*M
Immediate	mm/1000 inch/10000	0-65535		
* M34	Z-axis tool-edge measurement sensor			*M
Immediate	mm/1000 inch/10000	0-65535		
* M35	Correction data for the diameter of the measurement sensor when measuring the outside diameter and the width.		Parameter used to calculate the measurement value Outside diameter $Ax = \left\| \frac{\#1 - \#2}{2} \right\| - 2R + \boxed{M35}$ Width $Az = \|\#1 - \#2\| - 2R + \boxed{M35}$ Ax, Az: Values measured #1, #2: Sensor starting positions R: Contact sensor tip radius	*M
Immediate	mm/1000 inch/10000	-32767 - 32767		
* M36	Correction data for the diameter of the measurement sensor when measuring the inside diameter and the groove.		Inside diameter $Ax = \left\| \frac{\#1 - \#2}{2} \right\| + 2R + \boxed{M36}$ Groove $Az = \|\#1 - \#2\| + 2R + \boxed{M36}$	*M
Immediate	mm/1000 inch/10000	-32767 - 32767		
* M37 Immediate	Measurement speed		Omitted.	*M
* M38 Immediate	Measurement speed		Omitted.	*M

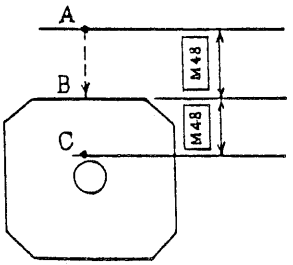
Addresses	Names		Significance & items	
	Unit	Setting range		
* M39	Tool-edge measuremnt sensor position (X-axis: diameter)		Touch sensor reference point Reference point M43 	*E *M
Immediate	mm/1000 inch/10000	±9999999	Used to specify the contact sensor reference point with X and Z coordinates using the workpiece coordinate system.	
M40	Not yet defined.			
* M41	Not yet defined.			
M42	Not yet difined.			
* M43	Tool-edge measurement sensor position (Z-axis)		See Parameter M39.	*E *M
Immediate	mm/1000 inch/10000	±9999999		
* M44	Position for changing the tool whose edge is to be measured (X-axis: diameter)		Used to specify the change position of the tool whose edge is to be measured using the machine coordiange system. 	*M
Immediate	mm/1000 inch/10000	±9999999		

<table>
<tr><td rowspan="2">Addresses</td><td colspan="2">Names</td><td rowspan="2">Significance & items</td><td rowspan="2"></td></tr>
<tr><td>Unit</td><td>Setting range</td></tr>
<tr><td>*
M45

Immediate</td><td colspan="2">Position for changing the tool whose edge is to be measured (Z axis)
mm/1000
inch/10000</td><td>±9999999</td><td>See Parameter M44.</td><td>*M</td></tr>
<tr><td>M46</td><td colspan="3">Not yet defined.</td><td></td></tr>
<tr><td rowspan="2">*
M47

Immediate</td><td colspan="2">Workpiece measurement stroke
mm/1000
inch/10000</td><td>0-65535</td><td> 

Used to specify the distance to the start point A in the measurement zone with respect to he selected point B.
If no sensor signal is given while moving to the final point C in the measurement, an alarm will be given resulting in an immediate stop.</td><td>*M</td></tr>
<tr><td>*
M48

Immediate</td><td colspan="2">Workpiece measurment stroke
mm/1000
inch/10000</td><td>0-65535</td><td>Same as M47, used to specify the tool-edge measurment zone.
 
</td><td>*M</td></tr>
</table>

Addresses	Names		Significance & items	
	Unit	Setting range		
* S13	NC data auxiliary command interval (during simulation)		Parameter for adjusting the time used during simulation. Used to specify the time required for the M codes and the speed range change.	*M
Immediate	0.1 sec	0-65535		
* S14	NC data auxiliary command interval (during simulation)		Parameter for adjusting the time used during simulation. Used to specify the time required for the T commands (tool rotation, ATC).	*M
Immediate	0.1 sec	0-65535		
* S15	Advance speed during TPS, Advance speed of the X-axis during EIA run		Used to specify the final approach rate when the TPS function is being used, when there is no approach interruption after the power is turned on. For the EIA run, used to sepcify the speed of travel towards the machining start point along the X axis.	*M *E
Immediate	mm/min	0-20000		

11. ALARM

If an error occurs, an ALM status indicator lamp on the operating panel will come on and the alarm number and message be displayed below the name of the CRT picture. In this case check, repair and eliminate the cause. Several alarms if displayed should be checked using the DIAGNOSIS picture.

1. Status indicator lights - different lights come on for different error locations.

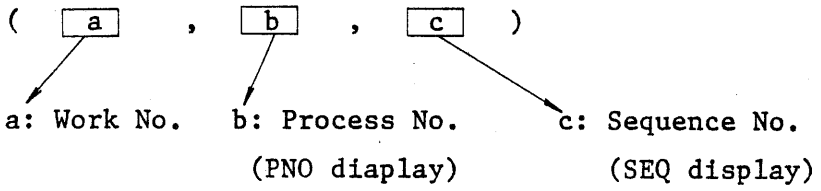
   ? MC ALM ..... Machine alarm
   ? TOOL ALM ... Tool alarm
   ? NC ALM ..... NC alarm

   Several lights turn on in some error conditions.

2. Alarm numbers - different alarm numbers are used to identify different error locations.

Alarm No.		Description
0 - 99	.....	Alarms for the NC printed board and servo-amplifier hardware
100 - 199	.....	Alarms for the operation of X- and Z-axes and spindle
200 - 299	.....	Alarms for electrical control panel and machine
300 - 399	.....	Alarms for program contents (in preparation)
400 - 499	.....	Alarms for key handling
500 - 599	.....	Alarms for MAZATROL program contents (on check and tracing)
600 - 699	.....	Alarms for EIA/ISO program contents (on check and tracing)

o The alarm location is displayed in the program picture for any program content alarm (300, 500 or 600-order alarm). Refer to these when correcting alarm causes.



3. Alarm color display

Alarms are red or blue.
Generally use RESET or CLEAR key when cancelling red or blue alarms, respectively. Do not press the RESET key for a blue alarm while the background program is being prepared in automatic operation, because this will stop the automatic operation.

4. Alarm table

1) Occurrence

Symbol	Contents
A	Machine/Electrical control panel
B	NC unit
C	Servo-amplifier/Sensor
D	Machining program/Operation
E	Key-input

2) Status of stop

Symbol	Contents
F	Emergency stop
G	Reset
H	Single step stop
I	Feed hold
J	Operation continues

3) How to release

Symbol	Contents
K	Release not available (adjustment after power OFF)
L	Power ON after releasing the cause
M	(reset) key ON after releasing the cause
N	(reset) key ON
O	(clear) or (reset)key ON after releasing the cause
P	(clear) key ON

o System alarm

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
1	SERVO LAG EXCESS X AXIS	Red	1) The machine had a time lag in following on the X-axis in excess of a specified value in relation to the motion command.	C	F	L
2	SERVO LAG EXCESS Z AXIS	Red	1) The machine had a time lag in following on the Z-axis in excess of a specified value in relation to the motion command.	C	F	L
3	SERVO LAG EXCESS C AXIS	Red	1) The machine had a time lag in following on the C-axis in excess of a specified value in relation to the motion command.	C	F	L
5	SERVO OSCILLATION X	Red	1) A tool did not stop at a specified position while moving on the X-axis but continues to back and forth.	C	F	L
6	SERVO OSCILLATION Z	Red	1) A tool did not stop at a specified position while moving on the Z-axis but continues to back and forth.	C	F	L
7	SERVO OSCILLATION C	Red	1) A tool did not stop at a specified position while moving on the C-axis but continues to back and forth.	C	F	L
9	DETECTING NO SIGNAL X	Red	1) No feedback signal is returned from the X-axial resolver in response to a NC unit command.	C	F	L

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
10	DETECTING NO SIGNAL Z	Red	1) No feedback signal is returned from the Z-axial resolver in response to a NC unit command.	C	F	L
11	DETECTING NO SIGNAL C	Red	1) No feedback signal is returned from the C-axial resolver in response to a NC unit command.	C	F	L
13	DRIVE ALARM X AXIS	Red	1) The X-axial servo-amplifier thermal relay has tripped or a no-fuse circuit breaker has opened. An error on the X-axis is too large or a feed-back signal is not received from the resolver.	C	F	L
14	DRIVE ALARM Z AXIS	Red	1) The Z-axial servo-amplifier thermal relay has tripped or a no-fuse circuit breaker has opened. An error on the Z-axis is too large or a feed-back signal is not received from the resolver.	C	F	L
15	DRIVE ALARM C AXIS	Red	1) The C-axial servo-amplifier thermal relay has tripped or a no-fuse circuit breaker has opened. An error on the C-axis is too large or a feed-back signal is not received from the resolver.	C	F	L

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
18	NMI POWER OFF	Red	1) With the power turned off, CPUs 1 and 2 operate improperly and the watch dog timer (to detect a hardware error while being normally reset repeatedly) is not reset.	C	F	L
19	NMI EMERGENCY STOP (PROGRAM)	Red	1) With the system stopped for a software emergency, the watch dog timer (to detect a hardware error while being normally reset repeatedly) is not reset.	C	F	L
20	NMI EMERGENCY STOP	Red	1) With the emergency stop button on the operating panel or in the electric control panel depressed, the watch dog timer (as referred to above) is not reset.	C	F	L
21	NMI WATCH DOG ALARM	Red	1) With the main CPU malfunctioning, the watch dog timer (as referred to above) is not reset.	C	F	L
22	NMI MEMORY PARITY	Red	1) As a result of conducting a parity check (to detect an error by arranging to an odd or even number the number of 1s contained in the whole number by adding a bit to a group of 0 and 1 combinations) on the data in the main CPU system memories, an error or errors are found.	B	F	L

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
23	NMI BATTERY ALARM	Red	1) The voltage of the battery connected to the system circuit board dropped below rated value.	B	F	L
24	NMI MEMORY GUARD	Red	1) A CPU malfunction or self-diagnosis function (to write data) has entered data in an address area with no memory.	B	F	L
25	NMI SERVO DRIVE ALARM	Red	1) A thermal relay has tripped or no-fuse circuit breaker has opened to X- and Z-axis servoamplifiers. Certain X- and Z-axis servoamplifiers have an excessively large error but no feedback signal has come from the resolver.	C	F	L
26	SUM CHECK ERROR	Red	1) The optional ROM (language, EIA, MILL, DNC) has not been installed or is installed incorrectly.	B	F	K

o Motion alarm

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
101	STORED STROKE LIMIT +X	Red	1) The limit in the +X direction is reached or a command is given beyond that limit. (The X-axis has reached the area determined by the parameter B1).	D	G	N
102	STORED STROKE LIMIT -X	Red	1) The limit in the -X direction is reached or a command is given beyond that limit. (The X-axis has reached the area determined by the parameter B3.)	D	G	N
103	STORED STROKE LIMIT +Z	Red	1) The limit in the +Z direction is reached or a command is given beyond that limit. (The Z-axis has reached the area ditermined by the parameter B2.)	D	G	N
104	STORED STROKE LIMIT -Z	Red	1) The limit in the -Z direction is reached or a command is given beyond that limit. (The Z-axis has reached the area determined by the parameter B4.)	D	G	N
109	OVER TRAVEL +X	Red	1) The overtravel limit switch in the +X direction has functioned. 2) Continue to press the RESET and O.T. RELEASE buttons until the READY signal begins to operate. When this signal operates, stop pressing the RESET key only, to move the tool in the -X direction.	D	G	N

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occurrence	Status of stop	How to Release
110	OVER TRAVEL -X	Red	1) The overtravel limit switch in the -X direction has functioned. 2) Continue to press the RESET and O.T. RELEASE buttons until the READY signal begins to operate. When this signal operates, stop pressing the RESET key only, to move the tool in the +X direction.	D	G	M
111	OVER TRAVEL +Z	Red	1) The overtravel limit switch in the +Z direction has functioned. 2) Continue to press the RESET and O.T. RELEASE buttons until the READY signal begins to operate. When this signal operates, stop pressing the RESET key only, to move the tool in the -Z direction.	D	G	M
112	OVER TRAVEL -Z	Red	1) The overtravel limit switch in the -Z direction has functioned. 2) Continue to press the RESET and O.T. RELEASE buttons until the READY signal begins to operate. When this signal operates, stop pressing the RESET key only, to move the tool in the +Z direction.	D	G	M
117	CHUCK BARRIER	Red	1) The tool interferes with the chuck barrier.	D	G	N
118	TAIL BARRIER	Red	1) The tool interferes with the tailstock barrier.	D	G	N

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
130	ILLEGAL PARAM. DATA (OP6,15,16)	Red	1) Incorrect input of the OP6 parameter for the PC model machine or the OP15 and OP16 parameters for selecting the machine model for NC.	B	F	M
131	ILLEGAL PARAM. DATA (M1-M12)	Red	1) Incorrect input of the M1 to M12 parameters for the tool number and the number of tools.	B	F	M
140	SELECT C AXIS	Red	1) The NC is trying to execute a C-axis command when the C axis is not connected.	D	G	N
142	MILLING MODE UNFINISHED	Red	1) The angle-indexing command is given but the machine with 1°-orientation feature is not in the milling mode.	D	G	N
143	INTERLOCK AXIS MOVE ALARM	Red	1) A command to move the axis interlocked is given.	D	G	N
145	ILLEGAL PARAM. DATA (GR1-5)	Red	Not used.			
149	ILLEGAL TOOL OFFSET NO.	Red	1) The tool offset number input exceeds the setting range.	D	G	N
150	ILLEGAL POCKET NO.	Red	1) Setting incorrect or double of the pocket number on the mahcine with A.T.C.	D	G	N

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
151	TOOL LIFE TIME ERROR (NUMBER)	Red	1) Machining has exceeded the tool life number of workpieces inputted on the TOOL DATA picture.	D	G	N
152	TOOL LIFE TIME ERROR (TIME)	Red	1) Machining has exceeded the tool life time of workpieces inputted on the TOOL DATA picture.	D	G	N
153	X-MAX OR Z-MAX OFFSET OVER	Red	1) Machining has exceeded the max. tool wear value inputted on the TOOL SET picture.	D	G	N
154	WORKPIECE PROGRAM NOT FOUND	Red	1) While in the automatic mode, the NC attempts to search the number of workpiece in the END process or the number of external workpiece, but the programmed number of workpece does not exist.	D	G	N
155	START CYCLE ON COMMAND DISPLAY	Red	Not used.			
156	LAYOUT NOT COMPLETE	Red	1) The number of the part to be processed has not been laid-out.	D	G	N
157	NO TOOL NUMBER IN PROGRAM	Red	1) Layout is impossible because of the machining program is incorrect.	D	G	N
167	TOOL SELECT ERROR	Blue	Not used.			
170	DATA NOT INPUT	Blue	1) The CYCLE START button was pressed without inputting the data while in the RESTART, SINGLE PROCESS or TEST mode.	D	G	P

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
171	HOME RETURN UNFINISHED	Blue	1) The CYCLE START button was pressed but there was no X-axis or Z-axis return to zero after the power was turned on.	D	G	P
172	SELEC AUTO MODE	Blue	1) The CYCLE START button was pressed in manual mode.	D	G	P
173	AUTO START INSUFFIC. (PROT.)	Blue	1) The CYCLE START button was pressed as the cycle start was blocked (such as by the FEED HOLD button being pressed, while CMT I/O was being performed, or while the shape of the workpiece was being displayed, etc.).	D	G	P
174	AUTO START INSUFFIC. (MODE)	Blue	1) 1. When a restart is made after using manual interruption while in automatic mode, the first mode and the current mode are not the same. 2. the NC attempts to perform the simulation in other automatic modes than the AUTO Mode.	D	G	P
175	AUTO START COND INSUFFIC. (TOOL)	Blue	1) When a restart is made after using manual interruption while in automatic mode, the original tool number and the current tool number are not the same.	D	G	P

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
176	START CYCLE ON COMMAND DISPLAY	Blue	1) The CYCLE START button was pressed with a picture where the CYCLE START function is not available. the CYCLE START function is not available on the WORK PROGRAM, CHECK, LAYOUT and SIMULATION pictures.	D	G	P
177	C AXIS FEED CLAMP EXCEED	Blue	1) While interpolating milling, the C-axis feedrate exceeds the JFC parameter.	D	J	P
178	NC PCB THERMAL SENSOR MALF	Blue	1) Abnormal heating of the PCB inside the NC.	B	J	O
179	HOME RETURN ERROR (ON THE DOG)	Blue	1) The zero-point return command from the dog is given while this return is inhibited (the parameter A1 is operating).	D	G	P
181	MES ALARM (SENSOR NOT ON)	Red	1) When the measurement movement is completed, the measurement sensor is not turned on. No signal is given by the measurement sensor to the NC. (Sensor disconnected(*) or not installed) *: The sensor does not reach the intended position because of a program error.	B D	G	N

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
182	SENSOR ON NOT IN MESURING	Red	1) The sensor has turned on outside the measure-ment area. 2) Program error as the sensor comes in contact with some object. Incorrect installation of the sensor if this does not come in contact with an object.	B D	G	N
183	MES ERROR EX-CEEDED MAX OFFSET	Red	1) A measurement error has exceeded the allowable maximum.	D	G	N
184	MES ERROR OVER 1/2 TOLERANCE	Red	1) A measurement error has exceeded the tolerance range, parameter U29/100.	D	G	N
185	EXTERNAL MES EQUIPMENT ALARM	Red	1) Error data or an error signal are given by external measuring equipment.	D	G	N
186	TOOL LIFE TIME ERROR	Red	1) The wear amount exceeds the max. value while measuring.	D	G	N
187	TOOL OFFSET NO. ERROR.	Red	1) No offset number is specified while measuring.	D	G	N
188	EXTERNAL COMMAND ERROR	Red	1) An incorrect command is input to the NC. Failures of the external I/O and the PC-ROM.	D	G	N

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
190	X AXIS HOME RETURN UN-FINISHED	Red	1) While checking the return to zero (G27), the X-axis is not at the zero-point (EIA). 2) Program revision.	D	G	N
191	Z AXIS HOME RETURN UN-FINISHED	Red	1) While checking the return to zero (G27), the Z-axis is not at the zero-point (EIA). 2) Program revision.	D	G	N
192	C AXIS HOME RETURN UN-FINISHED	Red	1) While checking the return to zero (G27), the C-axis is not at the zero-point (EIA). 2) Program revision.	D	G	N
193	ILLEGAL TOOL OFFSET NO (EIA)	Red	1) An offset number higher than 65 is input to the EIA program.	D	G	N
194	NO FEED DATA	Red	1) While performing the single T command in the G01 mode, no F command is provided before the particular block.	D	G	N

o PC alarm

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
200	THERMAL TRIP (EMERGENCY STOP)	Red	1) Thermal relay for hydraulic unit head lubricating oil feed motor inside electric control panel has tripped.	A	F	L
201	NFB (NO FUSE BREAKER) TRIP	Red	1) No-fuse circuit breaker or circuit protector inside electric control panel has tripped.	A	F	L
202	HYDRAURIC PRESSURE DOWN	Red	1) Hydraulic oil pressure has been low for more than 3 seconds.	A	F	L
203	AIR PRESSURE DOWN	Red	1) Air pressure has been low for more than 3 seconds.	A	F	L
204	SPIDLE CONTROLLER MALFUNCTION	Red	1) Alarm has occured in spindle controller.	A	F	L
205	MILLING CONTROL MALFUCNTION	Red	1) Alarm has occurred in milling spindle controller.	A	F	L
206	OPEN FRONT DOOR (EMERGE. STOP)	Red	1) Cutting tool cover was opened with doors inter-locked in automatic mode.	A	F	L
207	EXT EMERGENCY STOP	Red	1) External emergency stop input signal has been turned off.	A	F	L

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occurrence	Status of stop	How to Release
208	MAGAZINE SHEAR PIN CUT	Red	1) Detection of magazine body misalignment has caused LS to operate.	A	F	L
216	SPINDLE START MISOPERATION	Red	1) I. Alarm results if spindle start command (M3, M4, START SW) is given in any of the following conditions: a. Chuck open signal from external device is on. b. External spindle interlock signal is off. c. Door interlock limit SW is on when door interlocking is effective. d. Gear identification signal is off in manual mode. e. Chuck close confirmation signal is on when bar feed mode is off. f. M command for measurement has been executed. g. Spindle rotation OK signal does not come from automatic jaw changer. II. Alarm No.216 occurs when head lubrication alarm is given.	A	G	L

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occurrence	Status of stop	How to Release
217	MILLING START MISOPERATION	Red	1) Same as alarm No. 216.	A	G	L
218	AXIS MOVE MISOPRATION	Red	1) Only MEGA TURN; When the cross rail is unclamped, the axis move command has been given or CYCLE START push button has been pushed.	A	G	L
219	INVALID ATC PARAMETER	Red	1) Incorrect setting of ATC type select parameter (OP6). 1st bit: V/H type ATC 2nd bit: Standby magazine type ATC 3rd bit: RAM type ATC 6th bit: Vertical lathe specifications a. More than two parameters are entered in each of the 1st, 2nd and 3rd bits. b. 3rd bit is set but not the 6th bit.	A	G	L
220	TOOL SET MISOPERATION	Red	Not used.	A	G	L
221	ORIENT INHIBIT MILSPINDLE	Red	1) Milling spindle orient command is given when the milling tool mounting turret is moved to the V position. (For SLANT TURN 40N ATC MILL CENTER only)	A	G	L

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occurrence	Status of stop	How to Release
232	SLIDEWAY LUBRICATION ALARM	Blue	1) Sliding surface lubricating oil pressure too low for more than 3 minutes.	A	H	O
233	HEAD LUBRICATION ALARM	Blue	1) Head lubricating oil pressure too low for more than 3 seconds. (All machines except vertical lathes) 2) The machine will perform a single step stop and "SPINDLE START MISOPERATION" alarm will be displayed after CYCLE START light goes out.	A	H	O
234	TABLE LUBRICATION ALARM	Blue	1) Same as alarm No.233.	A	H	O
235	TOOL INDEX LS MALFUNCTION	Blue	1) Clamping confirmed but indexing confirmation signal did not come on. 2) Tool change command given but indexing confirmation signal did not come on in seconds.	A	H	O
236	TOOL POSITION LS MALFUNCTION	Blue	1) Malfunction of the limit switch for confirming the tool position.	A	H	O

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
237	TOOL CLAMP LS MALFUNCTION	Blue	1) Clamp confirmation signal went off during axis movement in auto-matic opration. 2) Clamp confirmation signal was not given within seconds of giving the clamp command.	A	I	0
238	TOOL UNCLAMP LS MALFUNCTION	Blue	1) Unclamp confirmation signal seconds of giving the unclamp command.	A	H	0
239	TOOL SELECT ALARM	Blue	1) The T-code command does not match the tool position.	A	H	0
240	COOLING FAN MALFUNCTION	Blue	1) Cooling fan rotation sensor inside electric control panel has triggered an alarm.	A	H	0
241	THERMAL TRIP (SINGLE BLOCK)	Blue	1) Cooling/chip conveyor motor thermal relay inside electric control panel has tripped.	A	H	0
242	FRONT DOOR LS MALFUNCTION	Blue	1) Front door open and close confirmation signals are both on. 2) Neither open or close confirmation signal came on within seconds of giving the front door open or close command.	A	H	0

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occurrence	Status of stop	How to Release
243	TAILBODY LS MALFUNCTION	Blue	1) Tail body forward end and reverse end confirmation signals are both on.	A	H	O
244	TAIL SPINDLE LS MALFUNCTION	Blue	1) Tail spindle forward end and reverse end confirmation signals are both on. 2) Tail spindle forward end signal came on and went off during automatic operation.	A	H,I	O
245	TAIL SPINDLE SW. POS. ERROR	Blue	1) Tail spindle key switch was not moved to the STOP position when automatic tailing is performed using the M command.	A	H	O
246	CHUCK LS MALFUNCTION	Blue	1) Spindle open and closed confirmation signals are both on.	A	I	O
247	CHUCK SYSTEM MALFUNCTION	Blue	1) Chuck closed end confirmation signal came on after the spindle open and closed confirmation.	A	I	O
249	SPINDLE ORIENT MALFUNCTION	Blue	1) Orientation not completed within several seconds of giving the spindle orient command.	A	I	O
250	MILLING SPINDLE ORIENT MALF	Blue	1) Orientation not completed within several seconds of giving the milling spindle orient command.	A	I	O

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occurrence	Status of stop	How to Release
251	ORIENT PIN LS MALFUNCTION	Blue	1) Simultaneous function of more than two limit switches for confirming the 1° orientation of the pin or malfunction of the limit switch.	A	H	0
252	SPINDLE GEAR LS/SHIFT MALF	Blue	1) More than two gear position confirmation signals are on. 2) Gear identification signal did not come on within at least several seconds of giving the gear shift command.	A	I	0
253	MILLING GEAR LS/SHIFT MALF	Blue	1) More than two milling gear position confirmation signals are on. 2) Gear identification signal did not come on within at least several seconds of giving the gear shift command.	A	I	0
254	MEASURING AMPLIFIER MALF	Blue	1) Measuring amplifier did not send the READY signal.	A	I	0
255	EXTERNAL CONTROL MALFUNCTION	Blue	1) Alarm triggered by the external control panel.	A	I	0
256	PALLET CHANGE MALFUNCTION	Blue	1) Alarm triggered on the pallet changer.	A	I	0
257	C-AXIS OR SHIFT LS MALFUNCTION	Blue	1) Position confirmation LS did not come on during C-axis connection or release.	A	I	0

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occurrence	Status of stop	How to Release
258	NC PCB THERMAL SENSOR MALF	Blue	1) Temprature sensor on NC unit printed circuit board operated. 2) Command FEED HOLD when CYCLE START light goes out after single step stop is performed.	A	H,I	O
259	TAIL LUBRICATION ALARM	Blue	1) Tail lubrication pressure decrease detection switch was turned on.	A	H	O
270	START COND. ERR. (DOOR OPEN)	Blue	1) CYCLE START SW was pushed with the front cover open.	A	G	O
271	START COND. ERR. (TUR UNCLAMP)	Blue	1) CYCLE START SW was puched with the turret unclamped (clamp conformation signal off).	A	G	O
272	START COND. ERR. (EXT RESET)	Blue	1) CYCLE START SW was pushed with the external reset signal on.	A	G	O
273	START COND. ERR. (EXT FEED HOLD)	Blue	1) CYCLE START SW was pushed with the external reset signal on.	A	I	O
274	START COND. ERR. (PAL UNCLAMP)	Blue	1) CYCLE START SW was pushed when the pallet was unclamped. (For MEGA TURN)	A	G	O

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
280	CROSS RAIL OVERLOAD	Blue	1) Raising and lowering the cross rail is prevented by the mechanical lock. Alarm occurs if the cross rail clamp current flows for more than 5 seconds after the cross rail has stopped.	A	G	0
281	HOME RETURN NOT COMPLETE	Blue	1) After switching the power or emergency stop on, the rapid feed mode is selected before all axes have returned to the zero point.	A	J	0
282	OPEN FRONT DOOR (FEED HOLD)	Blue	1) Machining with the cover open.	A	I	0
283	ILLEGAL TOOL CHANGE POINT	Blue	1) Tool change at other places than that intended.	A	D	E

o Program preparation alarm

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
301	ILLEGAL PROCESS DATA	Blue	1) Correct process data are not inputted.	D	J	P
302	ILLEGAL SEAUENCE DATA	Blue	1) Correct sequence data are not inputted.	D	J	P
303	NO. OF SEQ data blocks >20	Blue	1) The number of sequence data has exceeded 20 per process (except for a manual program mode process).	D	J	P
304	NO. OF SHAPE SEGMENTS >128	Blue	1) The number of graphically shaped blocks has exceeded 96 per process.	D	J	P
305	CUTTING DIRECTION NOT DEFINED	Blue	1) The cutting direction (forward or reverse) is unknown.	D	J	P
306	REVERSE SHAPE CONTOUR	Blue	1) A graphic shape path is partially inverted. (Outside and inside dia.: Z-axis direction) (Front: X-axis direction)	D	J	P
307	DOUBLE SHAPE CONTOUR	Blue	1) Graphically shaped paths are redundant (A path passes through an identical place twice.)	D	J	P

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
308	REVERSE CIRCLE CONTOUR	Blue	1) A circular path is partially inverted. (In case of the circle which extends over two dimensions.)	D	J	P
309	SHAPE OUT OF MATERIAL LIMIT	Blue	1) A graphic shape partially protrudes out of the blank shape.	D	J	P
310	ILLEGAL CUTTING POINT	Blue	1) A cut-in point exists outside the range of a blank.	D	J	P
311	ILLEGAL SHAPE	Blue	1) A graphic shape is not specified properly.	D	J	P
312	ILLEGAL CORNER DEFINITION	Blue	1) Corner C has a value larger than the linear component of graphic patterns on both sides in which corner C are to be inserted.	D	J	P
313	CALCULATION UNFINISHED	Blue	1) There are sequence data in which the calculation of inter-sectin point has not been accomplished.	D	J	P
314	ILLEGAL NOSE RADIUS	Blue	1) A nose radius is incorrect (negativ).	D	J	P
315	ILLEGAL DEPTH OF CUT	Blue	1) A roughing cut-in stroke is illegal (negative).	D	J	P

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occurrence	Status of stop	How to Release
316	ILLEGAL MATERIAL DATA	Blue	1) Blank shape data are not inputted properly.	D	J	P
317	ILLEGAL MATERIAL ID/OD	Blue	1) A blank has a maximum outside dia. outside a range of (blank max. O.D.) > (blank min. I.D.) ≧ 0.	D	J	P
318	ILLEGAL MATERIAL LENGTH	Blue	1) A blank is outside a length range of (blank length) > (end thrust length) ≧ 0.	D	J	P
319	ILLEGAL MATERIAL SHAPE (O.D.)	Blue	1) A blank has an outside dia. outside a range of (blank max. O.D.) ≧ (X-axis coordinate value) ≧ (blank min. I.D.) 0 ≧ (Z-axis coordinate value) ≧ - (blank length) + (end)	D	J	P
320	ILLEGAL MATERIAL SHAPE (I.D.)	Blue	1) A blank has an outside dia. outside a range of (blank max. O.D.) ≧ (X-axis coordinate value) ≧ (blank min. I.D.) 0 ≧ (Z-axis coordinate value) ≧ - (blank length) + (end)	D	J	P
321	REVERSE MATERIAL SHAPE	Blue	1) A blank path is inverted in the Z-axial direction.	D	J	P

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
322	DWELL TIME NOT INPUT	Blue	1) A manual program mode dwell time is not specified.	D	J	P
323	FIN POINT MISSING IN NML PROG	Blue	1) A manual program mode end point is not specified.	D	J	P
324	ILLGAL 1ST G CODE (G00, G01)	Blue	1) The G command at the top of a manual program mode is other than G0 or G1.	D	J	P
325	G90 IN 1ST BLK OF MNL PROG	Blue	1) In the manual program mode, a relative value command is given initially.	D	J	P
326	RPM IN MANUAL PROG MSSING	Blue	1) In the manual program mode, a speed is not specified.	D	J	P
327	FEEDRATE IN MNL PROG MISSING	Blue	1) In the manual program mode, a feedrate is not specified.	D	J	P
328	CIRCLE R IN MNL PROG MISSING	Blue	1) In an arc specified in the manual program mode, a radius is not specified.	D	J	P
329	ILLEGAL G CODE INPUT	Blue	1) In the manual program mode a G command not referred to in the specification is specified.	D	J	P

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
330	MNP C-AXIS INADEQUATE (G02/G03)	Blue	1) A C-axis move command is given in the manual programming mode in a block for specifying an arc.	D	J	P
331	ILLEGAL THD LEAD/NO. OF PASS	Blue	1) In threading, a lead or number of cycles is not specified properly.	D	J	P
332	ACCELERATION DISTANCE EXCEED	Blue	1) A threading acceleration distance has exceeded a clamp value.	D	J	P
333	ILLEGAL GROOVE WIDTH	Blue	1) During grooving, the relation between the width of the groove and the width of the tool specified is incorrect.	D	J	P
334	DESIGNETED FROM ERROR	Blue	1) During rough machining, there is no part to be machined.	D	J	P
351	C-AXIS OPTION INADEQUATE	Blue	1) Linear machining occurs in the milling mode inspite of a 1° orientation having been specified.	D	J	P
352	ILLEGAL MILLING TOOL DIA.	Blue	1) While milling, the diameter of the tool to be used is not specified.	D	J	P
353	ILLEGAL DEPTH	Blue	1) While milling, the depth of the hole for the point mahcining process is "0".	D	J	P

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
354	ILLEGAL SURF-VELOCITY	Blue	1) While milling, the peripheral speed for the point machining process is "0".	D	J	P
355	ILLEGAL TOOL/HOLE DIA.	Blue	1) While milling, the tool diameter or the hole diameter for the point machining process is "0".	D	J	P
356	ILLEGAL FEED	Blue	1) While milling, the feed for the point machining process is "0".	D	J	P
357	ILLEGAL PITCH	Blue	1) While milling, the milling tap (MTP) pitch for the point machining process is "0".	D	J	P
358	ILLEGAL DEPTH OF CUT	Blue	1) While milling, the cutting depth data for the point machining process is not correct.	D	J	P
359	FEED OVER FLOW	Blue	1) While milling, the feed for the point machining process deviates form that calculated.	D	J	P
360	ILLEGAL CORNER R	Blue	Not used.			
361	ILLEGAL CIRCLE	Blue	1) During linear machining in the milling mode, the distance between the starting point and the end point for the circular command sequence is too close or exceeds 2r.	D	J	P

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
362	ILLEGAL FINISH ALLOW.	Blue	1) During linear machining in the milling mode, there is nothing to machine because the finish allowance is greater than the depth or the finish allowance is greater than the depth of cut entered in tool data.	D	J	P
363	ILLEGAL CUTTING POINT	Blue	Not used.			
364	ILLEGAL C-AXIS GROVE	Blue	1) During milling, the angle command for the groove (GRV) is not given in 1° units inspite of the specification of 1° orientation.	D	J	P
365	ILLEGAL STARTING R	Blue	1) During milling, the radius R for linear machining (OUT, OUT) is set to zero.	D	J	P
366	ILLEGAL RADIUS R	Blue	1) During milling, there is no radius value (R) for the circular command in the linear machining sequence data.	D	J	P
367	ILLEGAL SHAPE OF CIR.	Blue	1) During milling, the structure of the sequential data for linear machining is not correct.	D	J	P

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
368	ILLEGAL SHAPE OF TOOL OFF	Blue	1) During milling, when an offset is made for the tool diameter, the offset shape requires more than 120 blocks.	D	J	P
369	IMPOS. SHAPE OF TOOL OFF	Blue	1) The shape does not permit the offset for the tool diameter to be made in the milling mode.	D	J	P

o Operation alarm

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
400	SYSTEM ERROR	Blue	1) Data have broken and are not serviceable.	D	E	F
401	INPUT FORMAT ERROR	Blue	1) A format inputted differs from the specified one.	E	E	F
402	DATA INADEQUATE	Blue	1) Incorrect data are inputted.	E	E	F
403	GEAR NO. ERROR	Blue	1) Incorrect gear is specified.	E	E	F
404	NO. OF BLOCKS IN A PRGM >500	Blue	1) All programs are tried to be prepared beyond 500 lines.	D	E	F
406	WRITE PROTECT	Blue	1) A PROGRAM switch on the operating panel is placed in LOCK position.	E	E	F
407	DATA NOT FOUND	Blue	1) A specified number or character string does not exist.	D	E	F
408	PROGRAM ERROR	Blue	1) The information stored in a program storage area has broken.	D	E	F

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
410	ILLEGAL DELETION	Blue	1) A condition has not permitted a program to be erased.	D	J	P
412	ILLEGAL PROCESS COPY	Blue	1) A condition has not permitted a program to be copied.	D	J	P
413	NO. OF PROGRAMS > 16	Blue	1) More than 16 types of programs are tried to be prepared.	D	J	P
414	NO. OF SEQUENCES >250	Blue	1) More than 250 sequence data are tried to be prepared in one process.	D	J	P
415	SAME PROGRAM IS DESIGNATED	Blue	1) A program registered is specified.	D	J	P
416	OPRATION MODE MALFUNCTION	Blue	1) The coordinate system is tried to be changed during the automatic operation.	E	J	P
417	PROCESS DATA >99	Blue	1) More than 99 process data are tried to be prepared in one program.	D	J	P
418	EIA PROGRAM IS DISIGNATED	Blue	1) A EIA program is specified.	D	J	P

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
419	NO. OF SEQUENCES > 20	Blue	1) More than 20 sequence data are tried to be prepared in one process.	D	J	P
420	1 BLOCK CHARACTERS >64	Blue	Not used.			
421	INPUT DATA FORMAT ERROR	Blue	Not used.			
422	LAYOUT NOT COMPLETE	Blue	1) The program is deficient as regards layout.	D	J	P
423	LAYOUT IMPOSSIBLE	Blue	1) Condition is such that layout is im-possible.	D	J	P
424	LAYOUT MEMORY FULL	Blue	1) Tried to prepre a program exceeding 1,000 lines for a whole layout.	D	J	P
426	NO. CHUCK DATA REGISTERED	Blue	Not used.			
427	TOOL OFFSET LIMIT EXCEEDED	Blue	Not used.			

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
428	TOOL LIFE LIMIT EXCEEDED	Blue	Not used.			
429	PROGRAM NOT FOUND	Blue	1) A program not yet registered is specified.	D	J	P
430	MAZATROL PROGRAM IS DISIGNATED	Blue	1) A MAZATROL program is specified.	D	J	P
431	DATA NOT FOUND	Blue	1) A wrong process number is specified.	E	J	P
434	TOOL NOT FOUND	Blue	1) A specified tool is unavailable.	E	J	P
436	AUTO OPERATION MODE	Blue	1) A manipulation is tried during automatic operation.	E	J	P
437	M02 STOP MODE	Blue	1) A muniplation is tried during the machine stop by M02.	E	J	P
442	CHUCK BARRIER MALFUNCTION	Blue	1) Requirements to set the chuck barrier are wrong.	D	J	P

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
443	T/S BARRIER MALFUNCTION	Blue	1) Requirements to set the tail barrier are wrong.	D	J	P
444	TOOL BARRIER MALFUNCTION	Blue	1) Requirements to set the tool barrier are wrong.	D	J	P
445	ILLEGAL TOOL NO.	Blue	Not used.			
446	SPARE TOOL IS DESIGNATED	Blue	Not used.			
447	HOME RETURN UNFINISHED	Blue	1) A cutting edge is tried to be stored when a return to the zero point has not been made.	E	J	P
450	LOAD UNABLE (MEMORY PROTECT)	Blue	1) Data are loaded from the exterior in the program LOCK mode.	D	J	P
455	DATA NOT COINCIDENT	Blue	1) The information on a tape does not coincide with that in the RAM.	D	J	P
458	FILE NOT FOUND	Blue	1) No specified file is available.	E	J	P

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
459	CAM MALFUNCTION	Blue	Not used.			
460	TAPE PUNCHER ERROR	Blue	1) An error had occured during tape punching.	D	J	P
461	TAPE READER ERROR	Blue	1) An error has occured during tape read.	D	J	P
462	CMT I/O ERROR	Blue	1) An error has occurred during CMT operation.	D	J	P
463	CMT WRITE PROTECT	Blue	1) CMT is put in write protect state.	D	J	P
464	PARITY H ERROR	Blue	1) Error has been found by horizontal parity check.	D	J	P
465	PARITY V ERROR	Blue	1) Error has been found by vertical parity check.	D	J	P
466	INADEQUATE CHARACTER	Blue	Not used.			
467	PARAMETER ERRRO	Blue	1) Incorrect parameter setting.	D	J	P
468	PROGRAM END NOT FOUND	Blue	1) Loading or comparing a tape containing ER(%) before the end of the M30, M99, M198 or M199 program.	D	J	P

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
470	ILLEGAL THREAD	Blue	1) Nominal diameter and pitch for the specified screw cannot be determined.	D	J	P
475	CURSOR POSITION INADEQUATE	Blue	1) No opration is possible with the cursor at the current position.	D	J	P
476	BACK GROUND EDIT UNABLE	Blue	1) No editing of the background is possible.	D	J	P
477	AUTO DETERMINATION IMPOSSIBLE	Blue	1) Calculations about intersection points cannot be made because the specified unknown coordinates fall out of the setting range.	D	J	P
478	NO INTERSECTION POINT	Blue	1) The results of calculations show that the specified intersection point does not exists.	D	J	P
479	BUBBLE MEMORY FULL	Blue	1) More than 128 kinds of programs were going to be stored in the bubble memory or programs whose size exceeds the bubble memory capacity were going to be stored in the bubble memory.	D	J	P
480	BUBBLE ERROR	Blue	1) I/O error happened during bubble access.	D	J	P

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
485	DNC COMMAND IMPO	Blue	1) Command that DNC received cannot be executed.	D	J	P
486	DNC SEND-RECEIVE ERROR	Blue	1) I/O error happened while DNC was trans-mitting/receiving.	D	J	P
487	RECEIVE ILLEGAL DNC COMMAND	Blue	1) DNC received illegal command.	D	J	P
488	OPRATION NOT ALLOWED	Blue	1) Incorrect operation after searching the EIA proram restart.	E	J	P
489	DNC SYSTEM ERROR	Blue	1) I/O error happened during DNC manipulation.	D	J	P
490	BUBBLE ERROR	Blue	1) I/O error has occurred during preparation of bubble header.	D	J	P
491	BUBBLE ERROR	Blue	Not used.			
492	BUBBLE ERROR	Blue	Not used.			
493	BUBBLE ERROR	Blue	1) I/O error has occurred during bubble formating.	D	J	P
494	BUBBLE ERROR	Blue	1) I/O error has occurred during calculation of bubble size.	D	J	P

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
501	ILLEGAL PROCESS DATA	Red	1) Correct process data are not inputted.	D	G	N
502	ILLEGAL SEAUENCE DATA	Red	1) Correct sequence data are not inputted.	D	G	N
503	NO. OF SEQ data blocks >20	Red	1) The number of sequence data has exceeded 20 per process (except for a manual program mode process).	D	G	N
504	NO. OF SHAPE SEGMENTS >128	Red	1) The number of graphically shaped blocks has exceeded 96 per process.	D	G	N
505	CUTTING DIRECTION NOT DEFINED	Red	1) The cutting direction (forward or reverse) is unknown.	D	G	N
506	REVERSE SHAPE CONTOUR	Red	1) A graphic shape path is partially inverted. (Outside and inside dia.: Z-axis direction) (Front: X-axis direction)	D	G	N
507	DOUBLE SHAPE CONTOUR	Red	1) Graphically shaped paths are redundant (A path passes through an identical place twice.)	D	G	N

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
508	REVERSE CIRCLE CONTOUR	Red	1) A circular path is partially inverted. (In case of the circle which extends over two dimensions.)	D	G	N
509	SHAPE OUT OF MATERIAL LIMIT	Red	1) A graphic shape partially protrudes out of the blank shape.	D	G	N
510	ILLEGAL CUTTING POINT	Red	1) A cut-in point exists outside the range of a blank.	D	G	N
511	ILLEGAL SHAPE	Red	1) A graphic shape is not specified properly.	D	G	N
512	ILLEGAL CORNER DEFINITION	Red	1) Corner C has a value larger than the linear component of graphic patterns on both sides in which corner C are to be inserted.	D	G	N
513	CALCULATION UNFINISHED	Red	1) There are sequence data in which the calculation of intersectin point has not been accomplished.	D	G	N
514	ILLEGAL NOSE RADIUS	Red	1) A nose radius is incorrect (negativ).	D	G	N
515	ILLEGAL DEPTH OF CUT	Red		D	G	N

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
516	ILLEGAL MATERIAL DATA	Red	1) Blank shape data are not inputted properly.	D	G	N
517	ILLEGAL MATERIAL ID/OD	Red	1) A blank has a maximum outside dia. outside a range of (blank max. O.D.) > (blank min. I.D.) ≧ 0.	D	G	N
518	ILLEGAL MATERIAL LENGTH	Red	1) A blank is outside a length range of (blank length) > (end thrust length) ≧0.	D	G	N
519	ILLEGAL MATERIAL SHAPE (O.D.)	Red	1) A blank has an outside dia. outside a range of (blank max. O.D.) ≧ (X-axis coordinate value) ≧ (blank min. I.D.) 0 ≧ (Z-axis coordinate value) ≧ - (blank length) + (end)	D	G	N
520	ILLEGAL MATERIAL SHAPE (I.D.)	Red	1) A blank has an outside dia. outside a range of (blank max. O.D.) ≧ (X-axis coordinate value) ≧ (blank min. I.D.) 0 ≧ (Z-axis coordinate value) ≧ - (blank length) + (end)	D	G	N
521	REVERSE MATERIAL SHAPE	Red	1) A blank path is inverted in the Z-axial direction.	D	G	N

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
522	DWELL TIME NOT INPUT	Red	1) A manual program mode dwell time is not specified.	D	G	N
523	FIN POINT MISSING IN NML PROG	Red	1) A manual program mode end point is not specified.	D	G	N
524	ILLGAL 1ST G CODE (G00, G01)	Red	1) The G command at the top of a manual program mode is other than G0 or G1.	D	G	N
525	G90 IN 1ST BLK OF MNL PROG	Red	1) In the manual program mode, a relative value command is given initially.	D	G	N
526	RPM IN MANUAL PROG MSSING	Red	1) In the manual program mode, a speed is not specified.	D	G	N
527	FEEDRATE IN MNL PROG MISSING	Red	1) In the manual program mode, a feedrate is not specified.	D	G	N
528	CIRCLE R IN MNL PROG MISSING	Red	1) In an arc specified in the manual program mode, a radius is not specified or an incorrect radius is specified.	D	G	N
529	ILLEGAL G CODE INPUT	Red	1) In the manual program mode a G command not referred to in the specification is specified.	D	G	N

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
530	MNP C-AXIS INADEQUATE (G02/G03)	Red	1) A C-axis move command is given in the manual programming mode in a block for specifying an arc.	D	G	N
531	ILLEGAL THD LEAD/NO. OF PASS	Red	1) In threading, a lead or number of cycles is not specified properly.	D	G	N
532	ACCELERATION DISTANCE EXCEED	Red	1) A threading acceleration distance has exceeded a clamp value.	D	G	N
533	ILLEGAL GROOVE WIDTH	Red	1) During grooving, the relation between the width of the groove and the width of the tool specified is incorrect.	D	G	N
534	DESIGNETED FROM ERROR	Red	1) During rough machining, there is no part to be machined.	D	G	N
551	C-AXIS OPTION INADEQUATE	Red	1) Linear machining occurs in the milling mode inspite of a 1° orientation having been specified.	D	G	N
552	ILLEGAL MILLING TOOL DIA.	Red	1) While milling, the diameter of the tool to be used is not specified.	D	G	N
553	ILLEGAL DEPTH	Red	1) While milling, the depth of the hole for the point mahcining process is "0".	D	G	N

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
554	ILLEGAL SURF-VELOCITY	Red	1) While milling, the peripheral speed for the point machining process is "0".	D	G	N
555	ILLEGAL TOOL/HOLE DIA.	Red	1) While milling, the tool diameter or the hole diameter for the point machining process is "0".	D	G	N
556	ILLEGAL FEED	Red	1) While milling, the feed for the point machining process is "0".	D	G	N
557	ILLEGAL PITCH	Red	1) While milling, the milling tap (MTP) pitch for the point machining process is "0".	D	G	N
558	ILLEGAL DEPTH OF CUT	Red	1) While milling, the cutting depth data for the point machining process is not correct.	D	G	N
559	FEED OVER FLOW	Red	1) While milling, the feed for the point machining process deviates form that calculated.	D	G	N
560	ILLEGAL CORNER R	Red	Not used.			
561	ILLEGAL CIRCLE	Red	1) During linear machining in the milling mode, the distance between the starting point and the end point for the circular command sequence is too close or exceeds 2r.	D	G	N

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
562	ILLEGAL FINISH ALLOW.	Red		D	G	N
563	ILLEGAL CUTTING POINT	Red	Not used.			
564	ILLEGAL C-AXIS GROVE	Red	1) During milling, the angle command for the groove (GRV) is not given in 1° units inspite of the specification of 1° orientation.	D	G	N
565	ILLEGAL STARTING R	Red	1) During milling, the radius R for linear machining (OUT, OUT) is set to zero.	D	G	N
566	ILLEGAL RADIUS R	Red	1) During milling, there is no radius value (R) for the circular command in the linear machining sequence data.	D	G	N
567	ILLEGAL SHAPE OF CIR.	Red	1) During milling, the structure of the sequential data for linear machining is not correct.	D	G	N

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
568	ILLEGAL SHAPE OF TOOL OFF	Red	1) During milling, when an offset is made for the tool diameter, the offset shape requires more than 120 blocks.	D	G	N
569	IMPOS. SHAPE OF TOOL OFF	Red	1) The shape does not permit the offset for the tool diameter to be made in the milling mode.	D	G	N

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
601	FIRST CHR. OF BLOCK ERR.	Red	1) First character in block is incorrect (sign, figure or decimal point).	D	G	N
602	AFTER ADDRESS DATA NOTHING	Red	1) There is no data after address.	D	G	N
603	ILLEGAL SIGN DATA	Red	1) Negative sign is put address which does not allow input of signs. More than two negative signs are put in one address.	D	G	N
604	ILLEGAL DATA FORMAT(.)	Red	1) A decimal point is put in address which does not allow input of decimal points. More than two decimal prints are put in one address.	D	G	N
605	ILLEGAL ADDRESS CODE	Red	1) Illegal address code is put between two significant data.	D	G	N
606	ILLEGAL G-CODE	Red	1) Illegal G code is used.	D	G	N
607	ILLEGAL INPUT DATA	Red	1) Input data is illegal. (Maximum/minimum value error, $R \leq 0$ in G2/G3, $U < 21$ in G90/G94, $W < K$ in G92, etc.)	D	G	N
608	ILLEGAL OFFSET NO.	Red	1) T command includes illegal tool No. or offset No.	D	G	N

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
609	ILLEGAL G10 OFFSET NO.	Red	1) G10 includes illegal offset No.	D	G	N
610	ILLEGAL G10 G10 OFFSET DATA	Red	1) G10 includes illegal offset X or Z or nose R.	D	G	N
611	1 BLOCK CHARACTERS >256	Red	1) No. of characters in one block has exceeded 256.	D	G	N
612	PARITY V CHECK ERROR	Red	1) Vertical parity check has found that the number of characters in one block is not even.	D	G	N
620	INSUFF. FEED/THREAD	Red	1) Feedrate F or lead E data for thread is not specified.	D	G	N
621	ILLEGAL NEXT BLOCK	Red	1) Block after chamfered corner R is not block for G01.	D	G	N
622	ILLEGAL NEXT BLOCK	Red	1) Moving direction of amount of movement in block after chamfered corner R is illegal.	D	G	N
623	ILLEGAL G01 DATA	Red	1) More than two among I, K and R are specified in one block for G01.	D	G	N

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
624	ILLEGAL G01 TAPER CHAMFERING	Red	1) Taper command (XZ) for G01 specifies any of I, K and R.	D	G	N
625	ILLEGAL CORNER R BLOCK	Red	1) Amount of movement in block after chamfered corner R is smaller than the amount of chamfered corner R.	D	G	N
626	ILLEGAL AXIS DATA	Red	1) The command for chamfering does not specify the combination of X and L or Z and I.	D	G	N
627	ILLEGAL G34 LEAD DATA	Red		D	G	N
628	G30 START COND. ERROR	Red	1) G30 has been given although return to reference point has not been executed.	D	G	N
630	G31 START COND. ERROR	Red	1) G31 command is entered during offset of nose R.	D	G	N
631	NOSE R OFFSET ERROR	Red	1) Arc command is present in the nose R start-up or nose R cancel command block.	D	G	N
632	NOSE R OFFSET ERROR	Red	1) The amount of nose R larger than the arc radius is set.	D	G	N

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
633	NOSE R OFFSET ERROR	Red	1) Offset mode varies in the command following the nose R start-up command.	D	G	N
634	NOSE R OFFSET ERROR	Red	1) Offset graphic will not appear in the first block during nose R computation.	D	G	N
635	NOSE R OFFSET ERROR	Red	1) Offset graphic will not appear in the next block during nose R computation.	D	G	N
636	NOSE R OFFSET ERROR	Red	1) Nose R interference check has found more than two blocks interfered.	D	G	N
637	NO INTER-SECTION	Red	1) No intersection point is found in nose R computation.	D	G	N
638	NOSE R OFFSET ERROR	Red		D	G	N
639	NOSE R OFFSET ERROR	Red		D	G	N
640	INSUFF. G70 - G73 DATA	Red	1) P or Q is not specified by G70 through G73.	D	G	N

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occurrence	Status of stop	How to Release
641	ILLEGAL G71-G73, G76 DATA	Red	1) Required data in the blocks specified by G71, G72, G73 and G76 is illegal. 2) Specify correct data.	D	G	N
642	ILLEGAL FIRST BLOCK G71-G73	Red	1) The block specified by P in G71, G72 and G73 does not specify G00 or G01. 2) Specify G00 or G01 in the block specified by P.	D	G	N
643	ILLEGAL G CODE G70-G73	Red	1) Illegal code is put between blocks specified by P and Q in G70, G71, G72 and G73. 2) Delete illegal code.	D	G	N
644	ILLEGAL LAST BLOCK G70-G73	Red	1) Illegal command is put in the last block specified by Q in G70 through G73. (Chamfering, corner R, subprogram)	D	G	N
645	G71-G73 NO. OF BLOCK > 120	Red	1) When shape has been developed with use of G71, G72 and G73, the number of sequence blocks exceeded 120.	D	G	N
646	REV. SHAPE CONTOUR G71-G73	Red	1) Tool path is reversed in cutting of contour according to G71, G72 and G73. 2) Make correction so that tool path may not be reversed.	D	G	N

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
647	G71, G72 LAP NO. OF POCKET 32	Red	1) The number of pockets has exceeded 32.	D	G	N
648	G71, G71 LAP DISPOS. IMPOS.	Red	1) Specified shape is improper. 2) Correct the shape.	D	G	N
649	INSUFF. G73-G76 DATA	Red	1) Block specified by G73 through G76 lacks necessary data. 2) Set data correctly.	D	G	N
650	G70-G73 ILLEGAL SEQ. DATA	Red	1) Sequence No. specified by P and Q in G70 through G73 is not found. 2) Specify correct sequence No. For G70, there should be identical sequence No. within the work program. For G71, G72 and G73, there should be identical sequence No. in the block following the current block.	D	G	N
651	M98 PROGRAM NOT FOUND	Red	1) Workpiece No. specified by P in M98 is not found. Sequence No. specified by P in M99 is not found.	D	G	N
652	PROGRAM SEARCH ERROR	Red	1) Contents of workpiece No. searched are not EIA program.	D	G	N

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
653	MEMORY AREA OVER READ	Red	1) The quantity of data to be read exceeds the memory area.	D	G	N
660	M98 P ORDER NOTHING	Red	1) P is not specified in M98.	D	G	N
661	SUB-PROG. NESTING > 16	Red	1) More than 16 sub-programs are called.	D	G	N

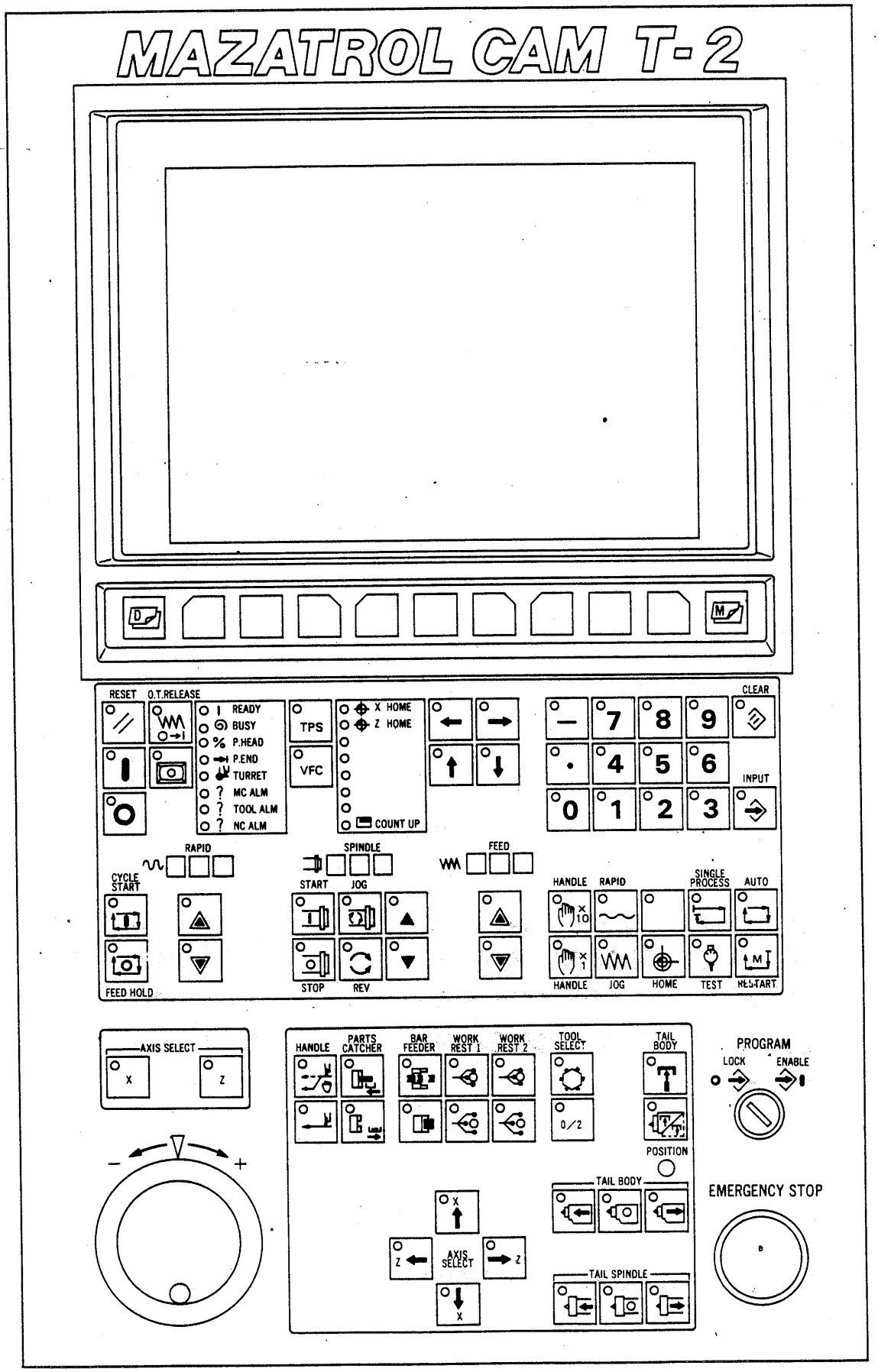
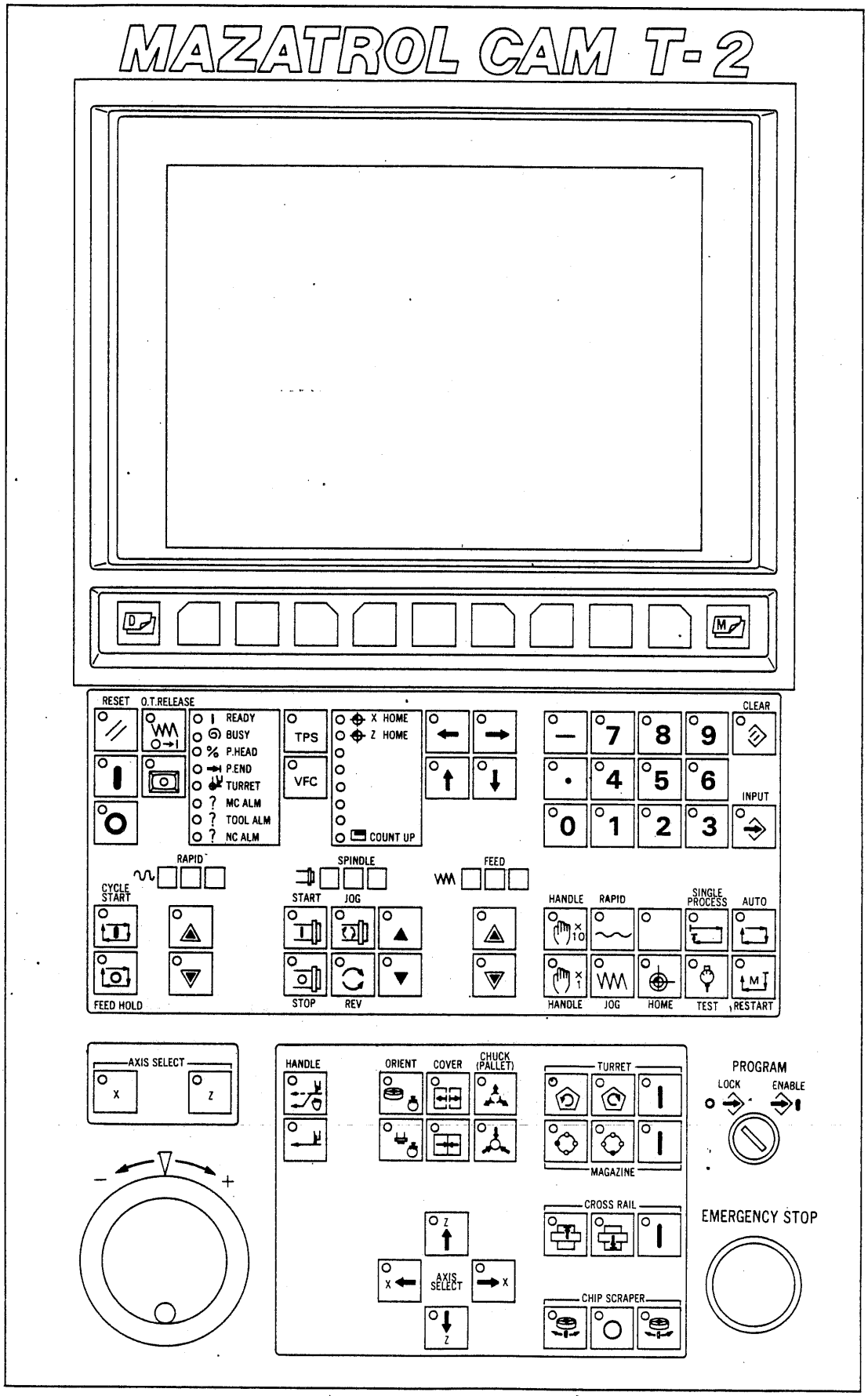
No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
222		Red	1) An attempt has been made to clamp a tool manually while the milling spindle at the milling pocket end is still turning.	A	G	N
261		Red	1) The selected turning/ milling tool will not fit in the indexed magazine pocket.	A	H	M
269		Red	1) The front and rear LSs of the magazine have been turned on at the same time or a confirm light has not come on after a certain interval.	A	I	M
275		Red	1) An attempt has been made to start the cycle when the ATC cover is open.	A	H	O
276		Red	1) A nattempt has been made to start the cycle with the tool unclamped.	A	H	O
277		Red	1) The TURRET UNCLAMP menu has been selected while the milling spindle is still turning.	A	H	O
278		Red	1) The CYCLE START button has been pressed with the measurement table at the forward end, causing the machine to stop without starting a cycle.	A	H	O

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
284		Red	1) After the TOOL SET MEASURE menu has inverted and the measurement axis direction selected, an attempt has been made to select the RAPID FEED or ZERO POINT RETURN mode. It is not possible to switch to the RAPID FEED or ZERO POINT RETURN mode.	A	H	O
285		Red	1) After a tool has been replaced manually following a stop by an M00 (program stop) or M01 (optional stop) command, a restart has been attempted using a tool whose number differs from that of the replaced tool. No M00 or M01 end signal is given.	A	H	O
286		Red	1) After the machine is first switched on or after an emergency stop, an attempt has been made to select a mode other than zero point return. The selection of the automatic operation mode is prevented.	A	H	O

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
287		Red	1) A malfunction has occurred in a limit switch on the tool setter or tip measure-ment device. (More than one limit switch is turned on at once or no confirm limit switch signal is given after a certain interval following the operation command.	A	H	O
288		Red	1) Although 15 seconds have passed after the machine sent an unchuck command to the robot, no unchucking end signal is issued by the robot. The tail spindle is prevented from moving.	A	I	N
289		Red	1) The TOOL SETTER FORWARD command has been given without checking that the tail spindle is at the back end.	A	H	P
291		Red	1) The TAIL SPINDLE FORWARD command (M code, manual switch) has been given, but the tool setter is not at the back end.	A	H	O
292		Red	1) After operating the tail spindle manually in the M00 or M01 optional stop mode, an attempt has been made to program-restart the machine when the tail spindle has not been returned to the same mode as before the optional stop. No M00 or M01 end signal is given.	A	H	O

No.	Message	Display color	Description 1) Status in which error has taken place. 2) Action taken or to be taken.	Occur-rence	Status of stop	How to Release
293		Red	1) An attempt has been made to start the machine other than by issuing the TAIL SPINDLE FORWARD command or the TAIL SPINDLE BACKWARD command with the back end LS activated (coil energized).	A	H	O

MAZATROL CAM T-2



(For MEGATURN)