VERTICAL CNC LATHE

INSTRUCTION MANUAL

OPERATION

SEIKI - SEICOS ∑10L/21L

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Hitachi Seiki Deutschland
Werkzeugmaschinen GmbH

Introduction

Thank you for your having purchased the machine, favoring our product lines for your use.
This manual contains fundamental information on the machine operation. Please read and fully understand the contents for your safe machine operation.
In particular, the contents of the items concerning safety in this manual and the descriptions on the “caution plates” attached to the machine are important. Please follow the instructions contained and keep them always in mind to ensure safe operation.
The reference record papers on adjusting setting values such as a parameter list are attached to the machine unit and enclosed in the packing. These are necessary for maintenance and adjustment of the machine later on. Please keep them safely not to be mislaid.
The design and specifications of this machine may be changed to meet any future improvement. As the result, there may arise some cases where explanations in this manual could become partly inconsistent with the actual machine. Please note this point in advance.
In this manual, items on the standard and optional specifications are handled indiscriminately. Please refer to the “delivery note” for the detailed specification of your machine confirmation.

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1 OPERATION OF MACHINE

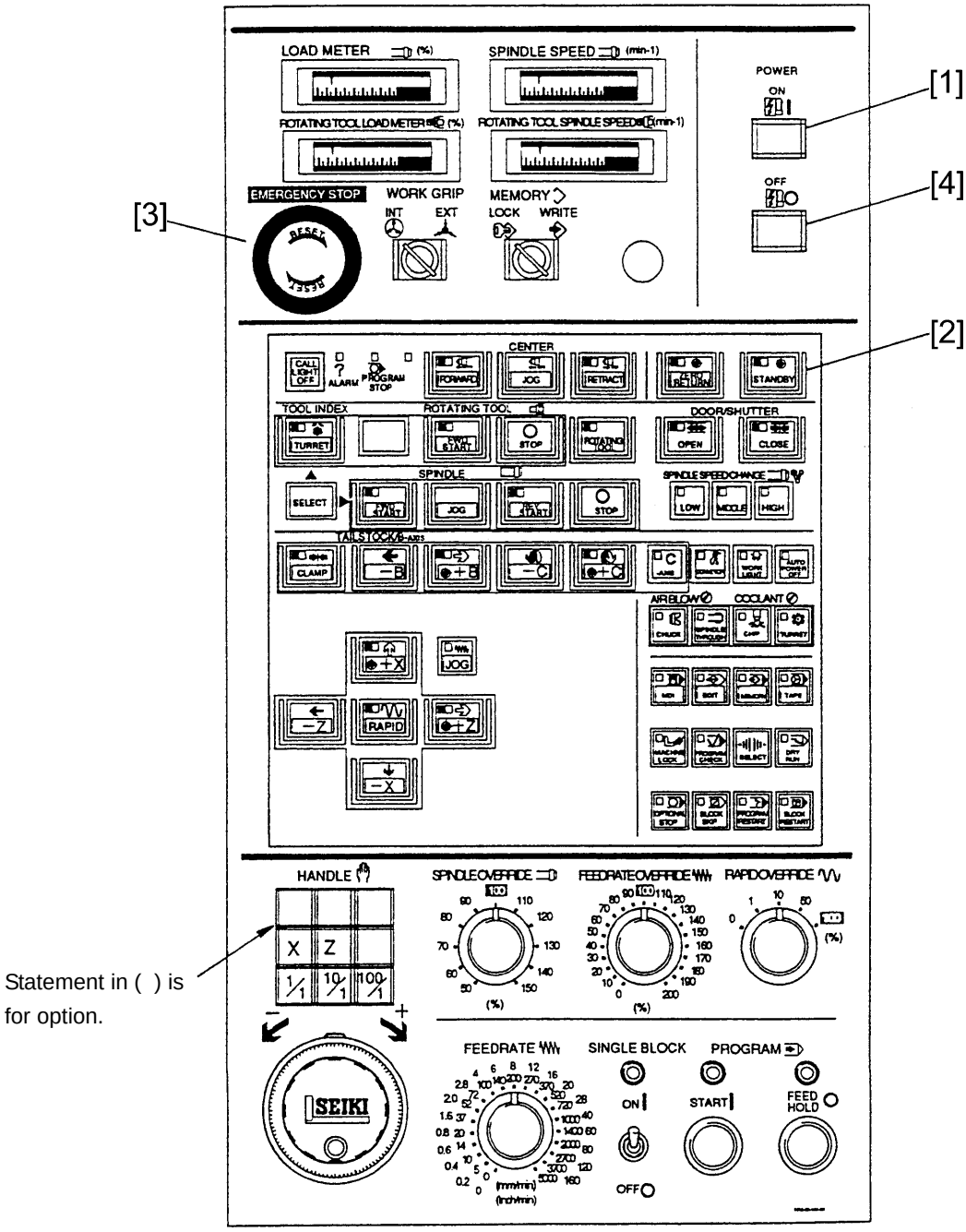
1 Daily Maintenance

To keep the machine in the good condition any time, taking precautions against the machine troubles, it is the most important to maintain and check the machine periodically as well as to check daily.

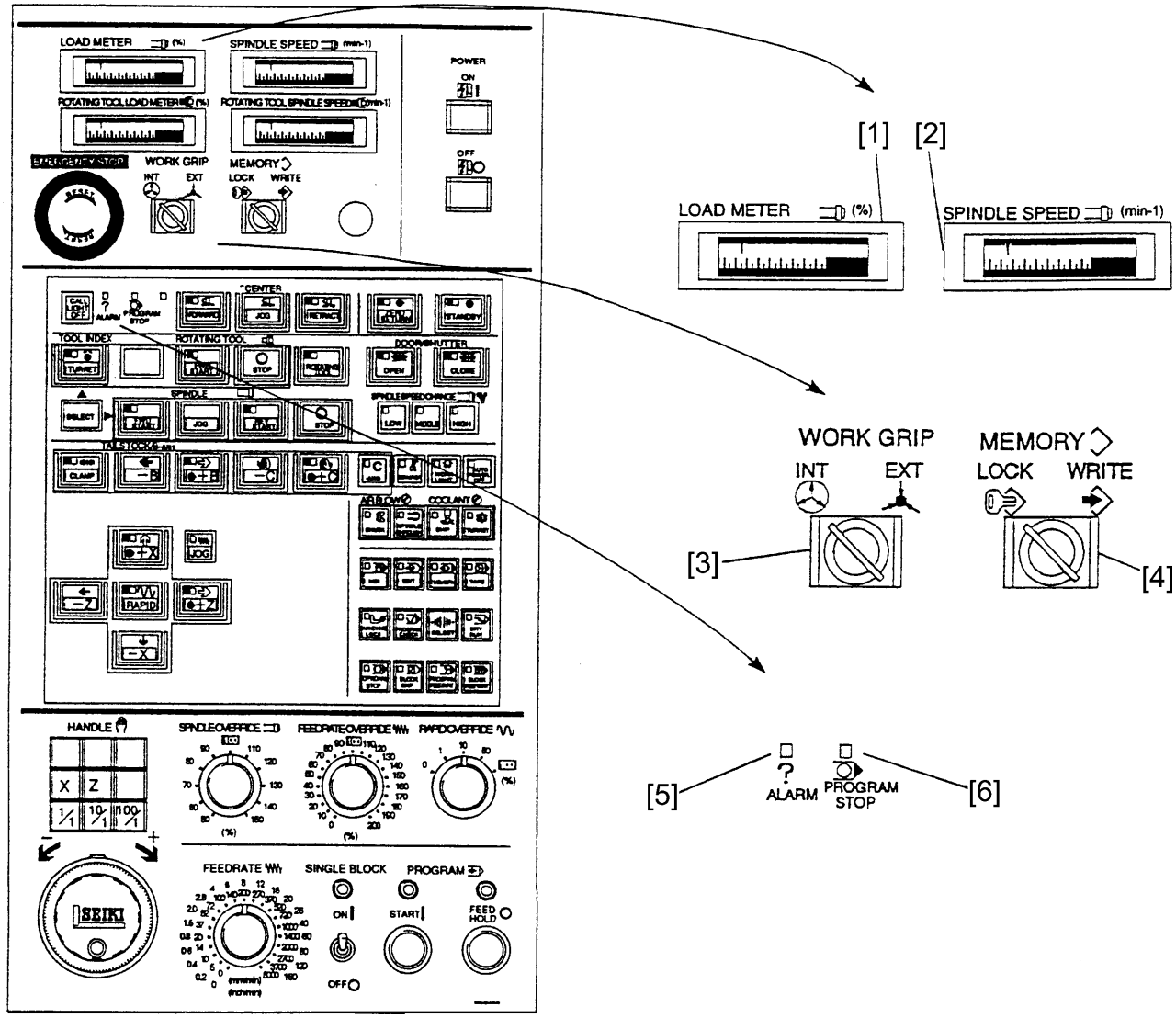
Checking servicing should be done based on the chapter 2 “Daily checking Items List” of “Maintenance Manual”

2 Explanation of Outline of Main and NC Operation Panel

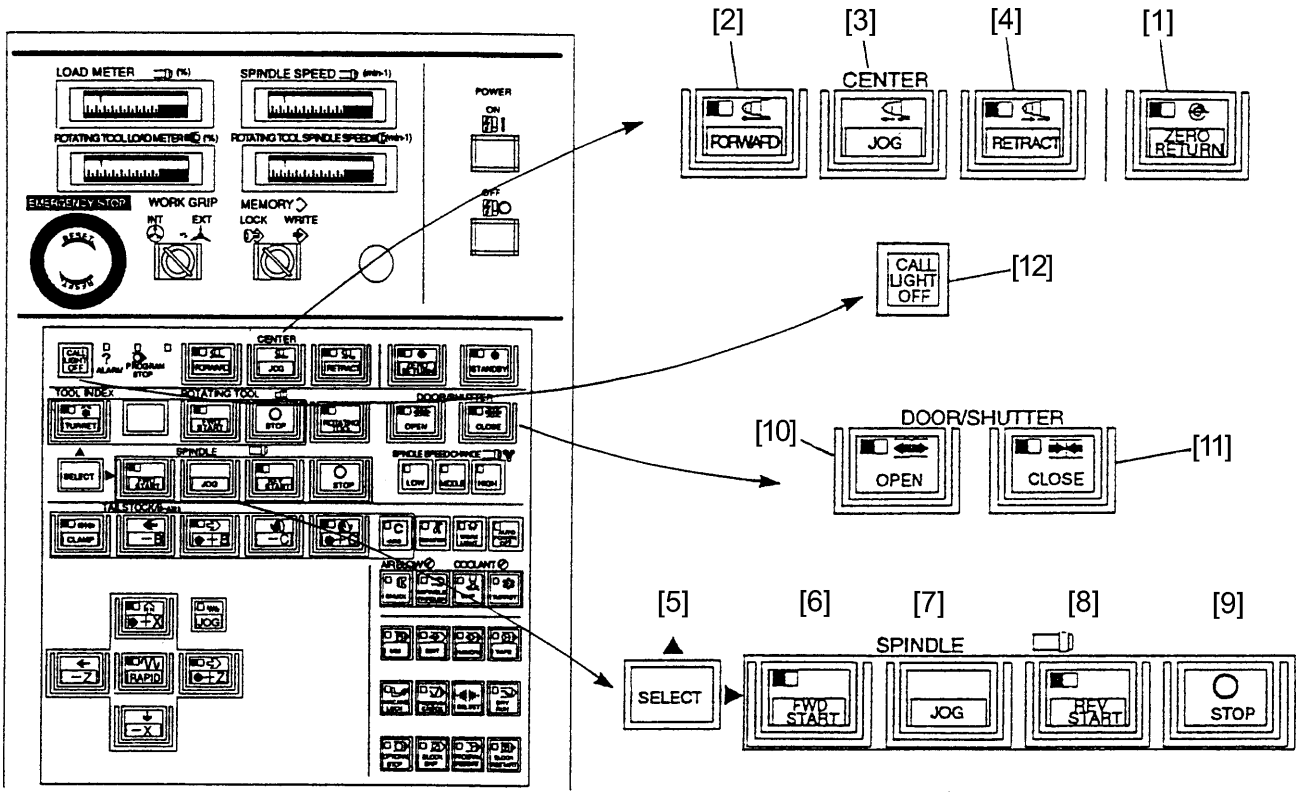
2.1 Main Operation Panel



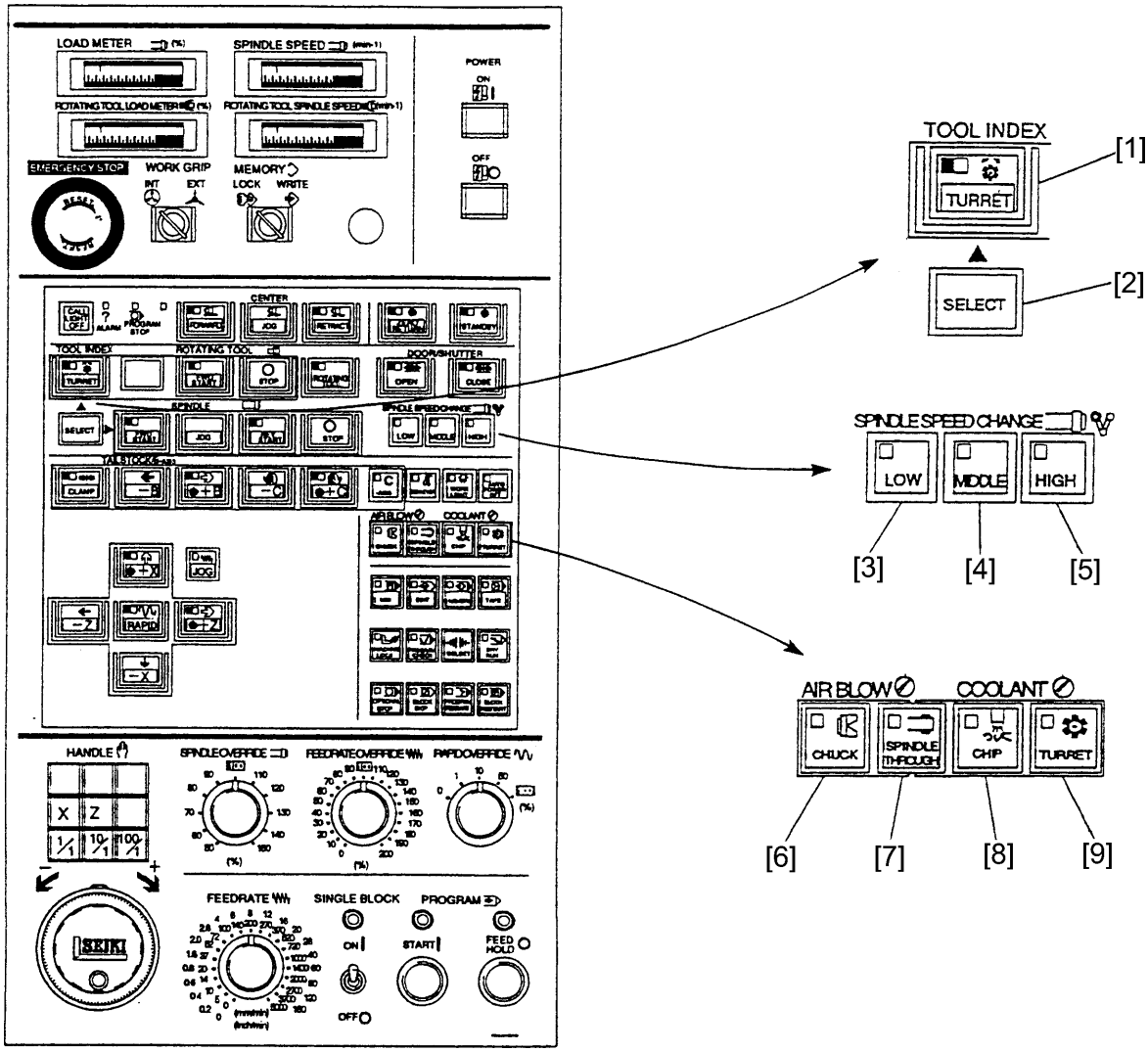
No.	Name	Function	Remarks
[1]	POWER ON	The power of NC unit is ON.	The power ON lamp lights.
[2]	STANDBY	Make the machine condition ready to operate.	The sheet key lamp lights.
[3]	EMERGENCY STOP BUTTON	Make the machine condition impossible to operate. (However, the hydraulic pump does not stopped.) Stop a section under operation. (Clear or discontinue the contents.)	Emergency stop is displayed on the upper left of the screen.
[4]	POWER OFF	The power of NC unit is OFF.	



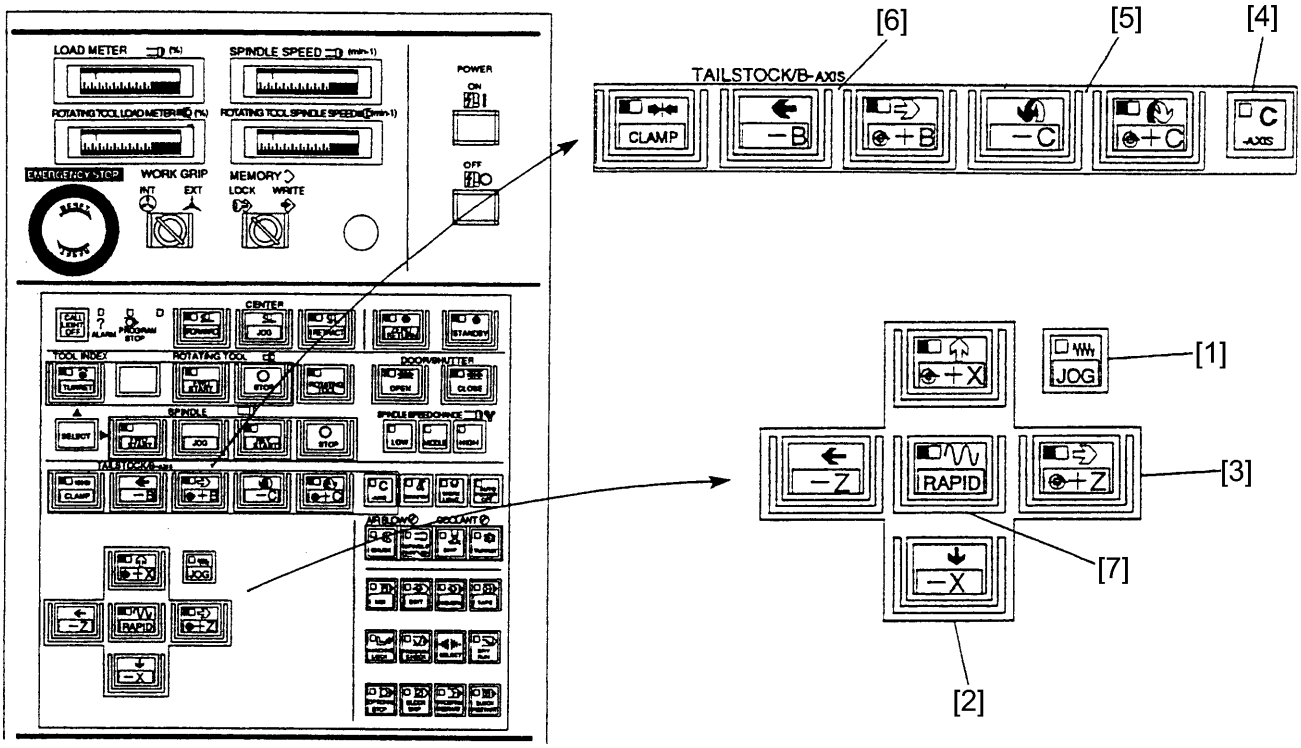
No.	Name	Function	Remarks
[1]	LOAD METEROF SPINDLE	A load condition of the main motor is displayed.	
[2]	Tachometer of Spindle	To indicate RPM of spindle	
[3]	WORK GRIP (INT, EXT) KEY	Select the clamping direction of the spindle for a workpiece to be cut.	Pull out the key selection as a rule.
[4]	MEMORY (LOCK, WRITE) KEY	Select the effective or ineffective of editing operation of program and parametor.	Set to the lock and pullout the key after edition.
[5]	ALARM LAMP	It is lit when occurring abnormality on the NC alarm, motor, lubrication or machine etc.	
[6]	PROGRAM STOP LAMP	It is lit when executing the M00, M01 or M30 by MDI or automatic operation.	



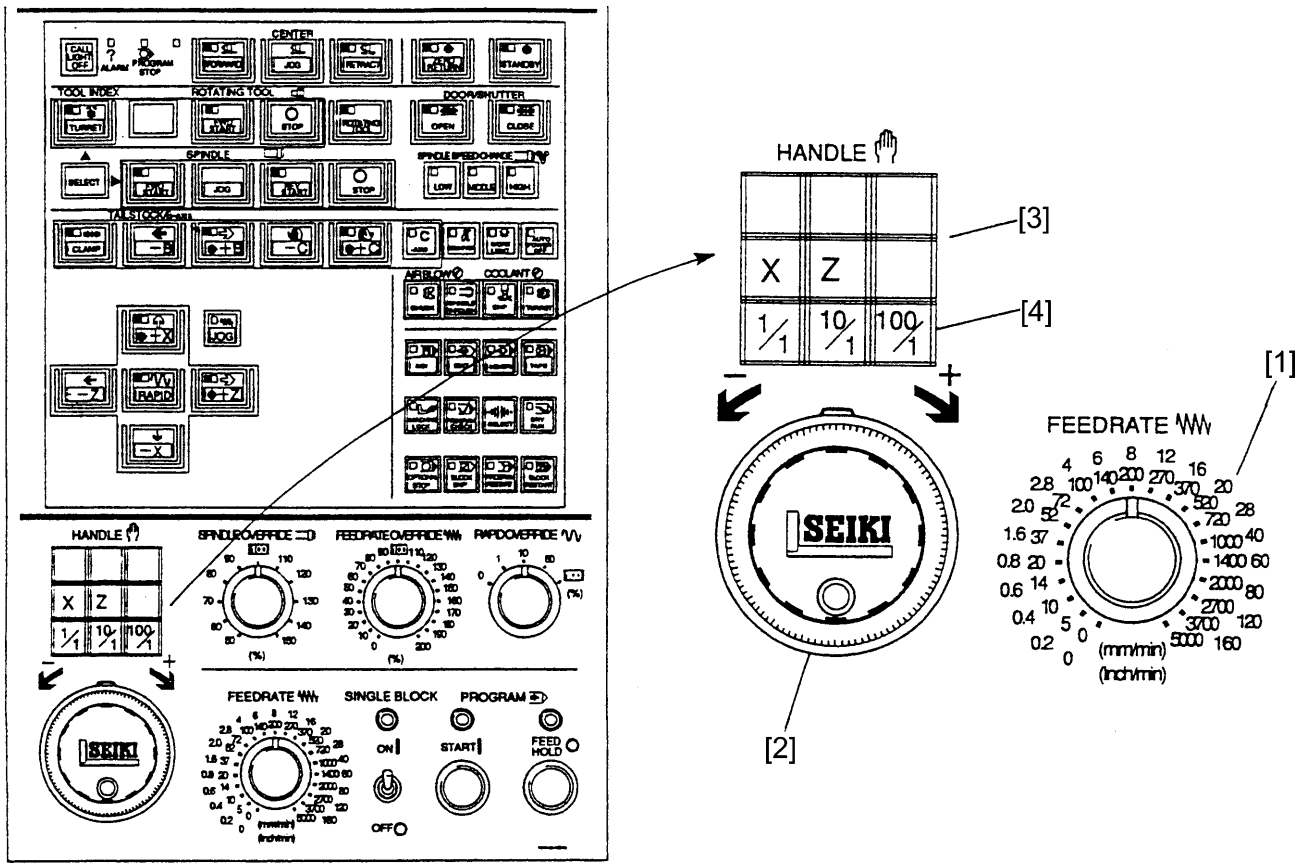
No.	Name	Function	Remarks
[1]	ZERO RETURN KEY	Return to the reference point in the order of X and Z axes.	At the time of power on, each axis zero returns automatically after moves minus side.
[2]	CENTER FORWARD KEY	Advance the tailstock continuously.	Option
[3]	CENTER JOG KEY	Advance the tailstock while pressing.	
[4]	CENTER RETRACT KEY	Retract the tailstock while pressing.	
[5]	SPINDLE SELECT KEY	Press this key simultaneously when forward or reverse the spindle.	
[6]	SPINDLE FWD START KEY	The spindle rotates forward by pressing with the effective key simultaneously when manual mode.	There are interlocks of the door and chuck for the condition of spindle rotation. The lamp is lit when the spindle rotates forward.
[7]	SPINDLE JOG ON KEY	The spindle rotates while pressing.	
[8]	SPINDLE REV START KEY	The spindle rotates reverse by pressing with the effective key simultaneously when manual mode.	There are interlocks of the door and chuck for the condition of spindle rotation. The lamp is lit when the spindle rotates reverse.
[9]	SPINDLE STOP KEY	The spindle stops when manual mode	
[10]	DOOR OPEN KEY	Door open command by manual at the time of the auto door specification.	This lamp is lit when the door is opened. This specification is an option.
[11]	DOOR CLOSE KEY	Door close command by manual at the time of the auto door specification.	This lamp is lit when the door is closed. This specification is an option.
[12]	CALL LIGHT OFF KEY	Turn off the call light.	The call light lights when program stop or alarm condition.



No.	Name	Function	Remarks
[1]	TOOL INDEX START KEY	In the manual mode: By pressing this key and the effective key simultaneously, the tool rest starts rotation.	
[2]	SELECT KEY		
[3]	SPINDLE SPEED CHANGE LOW KEY		
[4]	SPINDLE SPEED CHANGE MIDDLE KEY	Spindle middle speed side range.	
[5]	SPINDLE SPEED CHANGE HIGH KEY	Spindle high speed side range.	
[6]	AIR KEY (CHUCK)	To direct air supply manually (Chuck)	
[7]	AIR KEY (IN SPINDLE)	To direct air supply manually (In Spindle)	
[8]	COOLANT MANUAL KEY	To direct coolant supply manually (Chip sink)	
[9]	COOLANT MANUAL KEY	To direct coolant supply manually (Tool rest)	

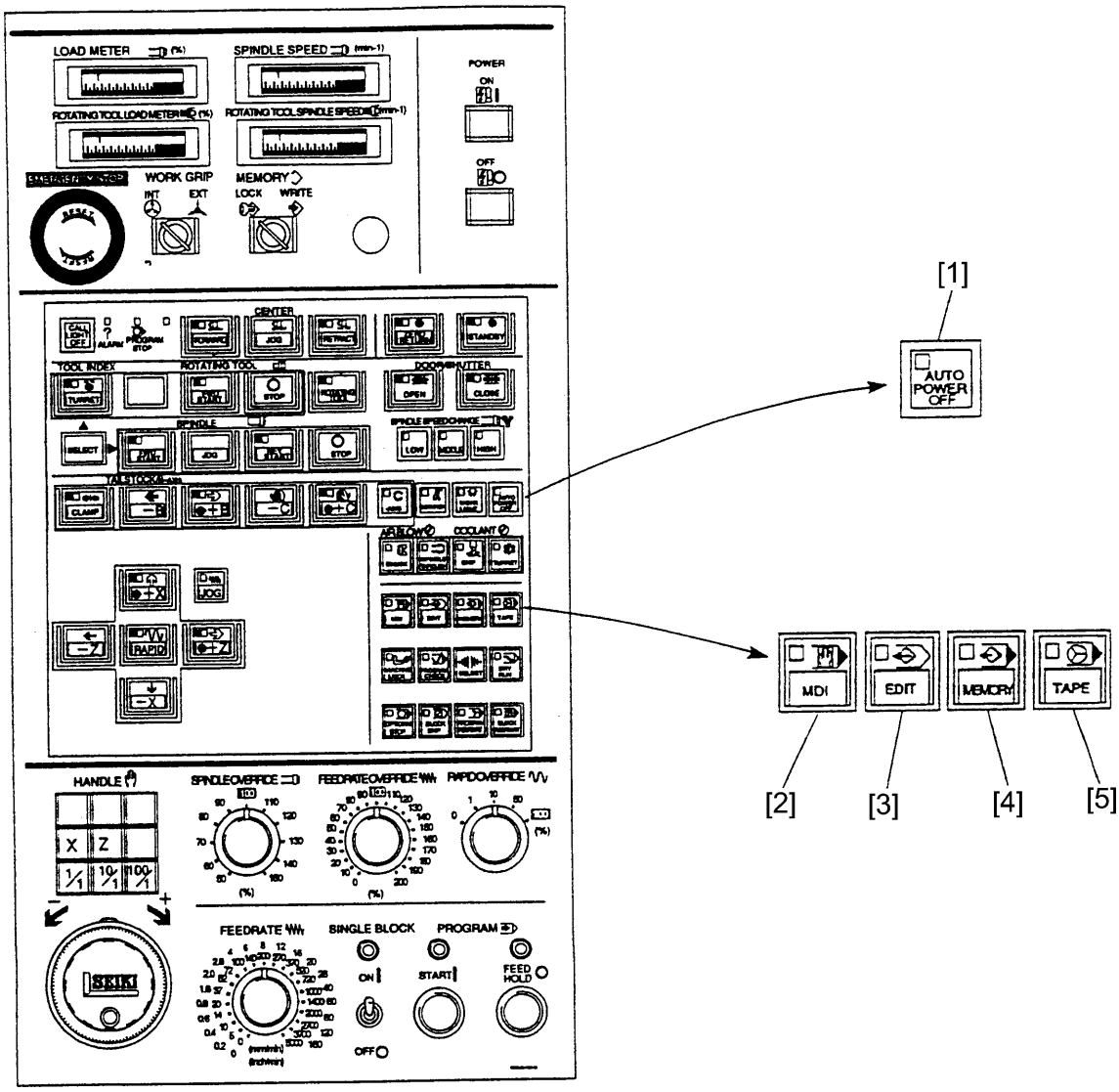


No.	Name	Function	Remarks
[1]	JOG KEY	Select when executing the operation of the manual continuous feed.	Under manual mode.
[2]	+X, -X KEY	The manual continuous feed is available at the mode key is feed. Move continuous in the selected direction by pressing any one of +X or -X key. reference point.	Set the feedrate by the feedrate switch. When the +X key is kept pressing, it is stopped at the machine
[3]	+Z, -Z KEY	The manual continuous feed is available at the mode key is feed.	Set the feedrate by the feedrate switch. When the +Z key is kept pressing, it is stopped at the machine reference point.
[4]	C+AXIS KEY	Select this when execution of the C-axis continuous feed.	
[5]	+C,-C KEY	The manual continuous feed is available at the mode key is feed.	
[6]	+B,-B KEY	The manual continuous feed is available at the mode key is food.	
[7]	RAPID KEY	Move by the rapid traverse with setting % value of override while pressing under the manual continuous feed.	

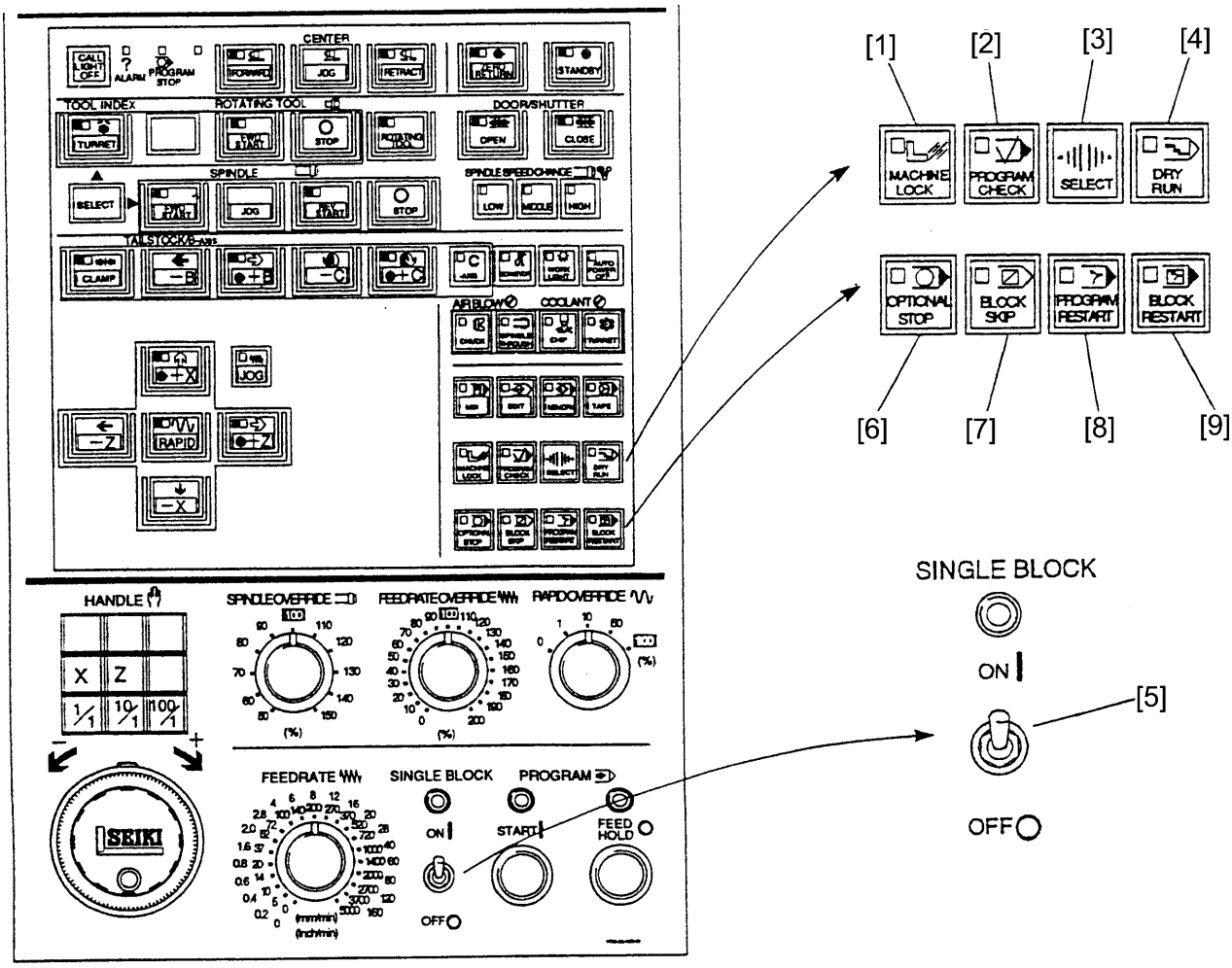


No.	Name	Function	Remarks
[1]	FEDERATE SWITCH	Select the feedrate when execution of the manual continuous feed or program check operation (dry run).	0~5000mm/min 21 steps
[2]	HANDLE	Execute the handle feed (a fine feed of the machine), when one of the X, Z, B or C axes under feed mode.	100div./ rev. A feed amount per division is according to the setting of magnification [3].
[3]	FEED AXIS KEY	Select one of the X, Z, B or C when moving by the handle.	Automatic mode
[4]	HANDLE FEED MAGNIFICATION CHANGE KEY	Select an amount per division of the handle.	

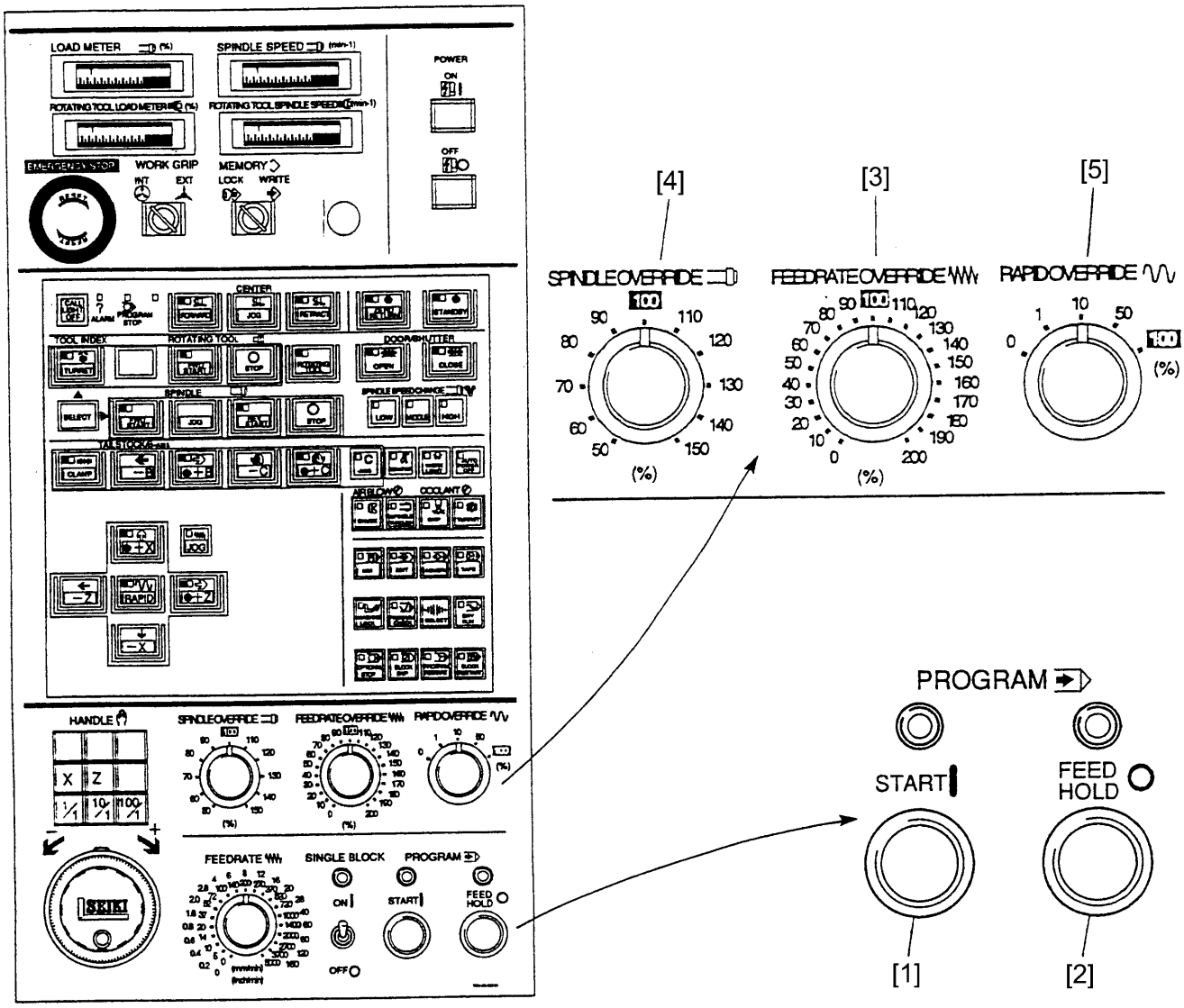
Feed magnification key	Axis	Indication amount μ	Axis	Indication amount
1/1	X	1	B	1μ
	Z	1	C	0.001°
10/1	X	10	B	10μ
	Z	10	C	0.01°
100/1	X	100	B	100μ
	Z	100	C	0.1°



No.	Name	Function	Remarks
[1]	AUTO POWER OFF KEY	Power is cut automatically, when request of power cut off by an alarm or the robot specification.	
[2]	MDI	Select when MDI input by the CRC operation panel of NC unit.	Automatic mode
[3]	EDIT	Select when editing program stored. Select when storing or punching out the program tape.	Automatic mode
[4]	MEMORY	Select when execution of program stored.	Automatic mode
[5]	TAPE	Select when execution of operation by the program tape.	Automatic mode

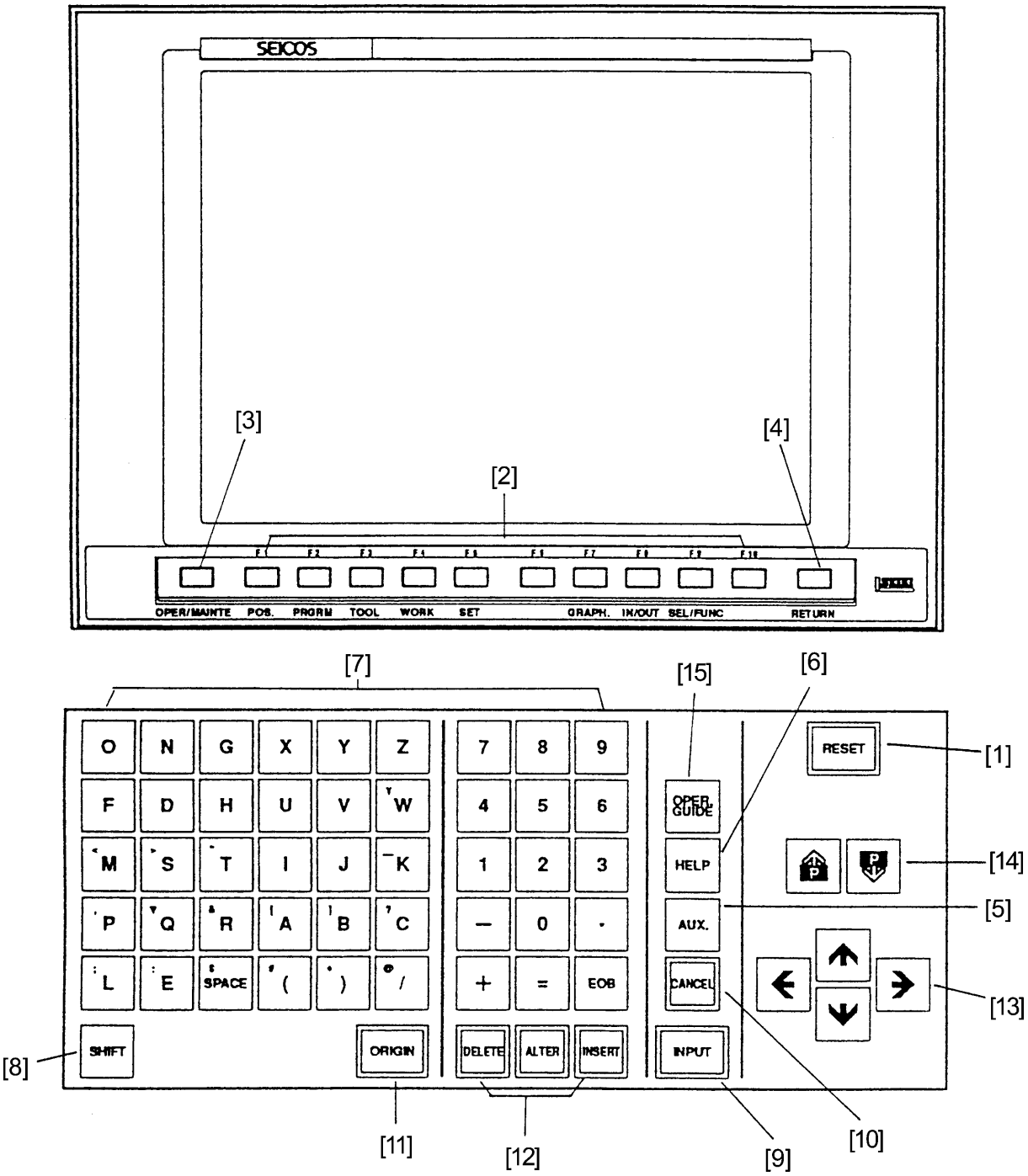


No.	Name	Function	Remarks
[1]	MACHINE LOCK	Each axis is fixed at the current position and does not move.	
[2]	PROGRAM CHECK	Make the stop condition of spindle and coolant besides the dry run function.	
[3]	SELECT KEY	Press this simultaneously when selecting one of the dry run, program check or machine lock.	
[4]	DRY RUN	Ignore the rapid traverse or cutting federate of program and it moves by the setting value of federate switch.	
[5]	SINGLE BLOCK	Stop after execution of one block and move to the execution of next block by the start key.	
[6]	OPTIONAL STOP	Program stops by the M01 on the program. Press the program start key when start again.	
[7]	BLOCK SKIP	Skip a block with slash (/) code in the program.	
[8]	PROGRAM	Restart the program.	
[9]	BLOCK RESTART	Restart the BLOCK.	



No.	Name	Function	Remarks
[1]	PROGRAM START KEY	Start automatic operation. (MDI, Memory, Tape)	
[2]	PROGRAM FEED HOLD KEY	Halts automatic operation. Feeding only decelerates and stops.	Dowel does not halt. MST function is kept on while the work continues, and halts when completed.
[3]	FEDERATE OVERRIDE SWITCH	Feed rate can be changed in the range of 0 to 200% under MDI or automatic operation.	
[4]	SPINDLE OVERRIDE SWITCH	The spindle speed can be changed in the range of 50 to 150%	Ignores while thread cutting (G32, G92, G76)
[5]	RAPID OVERRIDE	The rapid speed can be changed in the range of 0 to 100%	

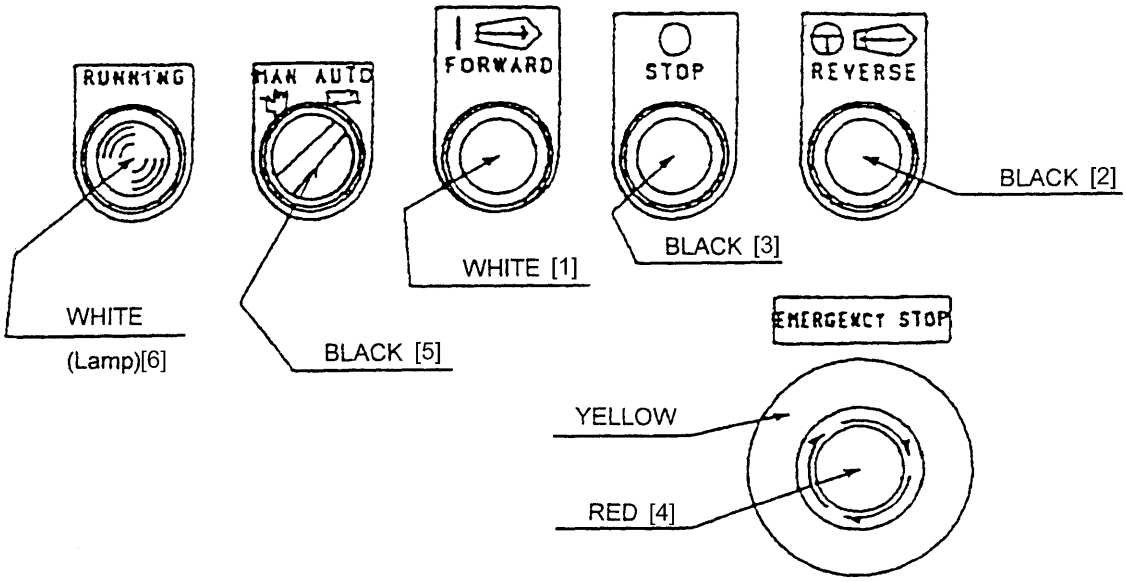
2.2 NC Operation Panel



No.	Name	Use
[1]	RESET KEY	Press this when the CNC is wanted to reset, to release an alarm etc.
[2]	FUNCTION KEY	When function keys are displayed at the bottom of CRT, it becomes the selection key of the menu. When menu is not displayed, it becomes the selection key of screen as the position, program, tool, work coordinate, setting, drawing or in/output. Press the selection/function key when the function menu is displayed at the bottom of CRT.
[3]	OPER/MAINTE KEY	In case of the screen of PC, alarm or maintenance etc. is displayed, press this key. The function menu is displayed at the bottom of the bottom of CRT when pressing the key once and disappears it by pressing again.
[4]	RETURN KEY	Press this key when the screen returns “General screen”.
[5]	AUX KEY	Use this to display the special screen (for maintenance)
[6]	HELP KEY	
[7]	ADDRESS/ NUMERAL KEY	Use this key to input alphabets or numerals.
[8]	SHIFT KEY	Some of address key has two letters in one key. Upper left letter is inputted when address key is pressed with shift key.
[9]	INPUT KEY	When the address or numeral key is pressed, input it in the buffer storage once and displays on the CRT. Press the input key when this data input inputted in the buffer storage want to set actually.
[10]	CANCEL KEY	Press this when the letter or symbol inputted in the buffer storage.
[11]	ORIGIN KEY	Use this to clear the coordinate value or drawing screen etc.
[12]	DELETE, ALTER, INSERT KEY	Use this to delete, alter or insert the editing operation of program.
[13]	CURSOR KEY	There are four cursor moving keys. Use this to move the cursor up and down or left and right.
[14]	PAGE KEY	There are two page turn over keys. Use this to turn over the page advance or reverse direction.
[15]	OPERATION GUIDE	Use this key to get operation guide information on the screen display.

2.3 Chip Conveyor Operation Panel

1) Chip Conveyor Operation Panel



Chip Conveyor Operation Panel Diagram

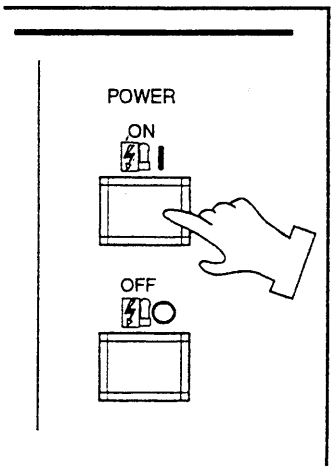
2) Function

No.	Name	Type	Function
[1]	Forward	Push Button	Forward switch is valid in manual mode only. The action is kept on.
[2]	Reverse	Push Button	Reverse switch is valid in manual mode only. Inching operation.
[3]	Stop	Push Button	Stop switch is valid regardless of the mode.
[4]	Emergency Stop	Mushroom Type	Emergency stop switch is valid for stopping both chip conveyor/main machine, regardless of the mode.
[5]	Man/Auto	Switching	In manual mode: Buttons [1] [2] are valid. In auto mode: By command from the main machine, forward operation is stopped. Buttons [1] [2] are invalid. Do not switch man/auto during operation.
[6]	Running	Lamp	Lamp lights while the chip conveyor is is in operation.

3 Procedure of Machine Operation

3.1 At the Time of Start

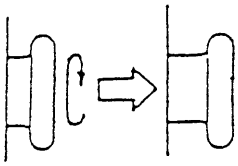
1) Turn on the power source switch.
2) Turn on the power switch of the power control cabinet.
3) Press the push button for NC unit power [ON] on the main control panel.



Caution

Main panel and NC unit is sealed type construction and avoid a mixture of outer air directly. Therefore, don't keep open the door long time of period during power on.

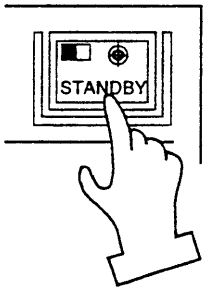
Check a display of CRT and running of cooling fan motor at in/ out side of box.



4) Turn right the emergency stop button.
5) Press the [STANDBY] button on the right corner of the main operation panel.

   (Green lamp lights.)

   Check a setting pressure of hydraulic unit is 3.5Mpa{35kgf/cm^2}as fixed value.



6) Move X and Z axes several times to lubricate each slide way before starting operation.

   (Pay attention to avoid over travel.)
7) Press the [ZERO RETURN] key.

   (Refer to "Procedure of zero return")

   Basic machine coordinate system is set and stored stroke limit becomes effective by executing of zero return.
8) Turn on the switch for chip conveyor.

Caution

Do not operate the machine with plenty of chip in the trough of chip conveyor.

3.2 Warming-up Operation of Spindle

Caution

It is important to keep status of bearing in good condition by lubrication, etc., to make the spindle rotate normally. Sudden rotation of the spindle may cause sticking of the bearings because of shortage of lubricating oil at the bearing section. To get the best performance of the spindle function by correct operation, warming-up operation as below-mentioned is necessary.

Warming-up operation for every starting (30 minutes)

[1] 10 minutes at 30% of the maximum spindle rotation

[2] 10 minutes at 50% of the maximum spindle rotation

[3] 10 minutes at 80% of the maximum spindle rotation

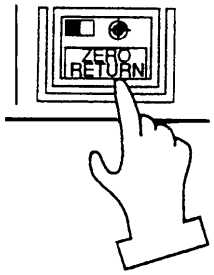
Conduct warming-up operation in the above order, [1], [2], [3]

3.3 Procedure of Zero Return

Manual zero return must be done after power turned on, to initiate the basic machine coordinate system.

Method 1 of zero return

1) Make a mode push button switch to “Feed”.
2) Press the [ZERO RETURN] key.
3) Move a tool head to zero point by rapid traverse (25% override). The tool head stops at zero point and a confirmation lamp of zero point of the axis turns on.



Method 2 of zero return

1) Make a mode to “Feed”.
2) If the X and Z axes locate near the zero point, move it opposite direction (Minus) from zero point about 100mm.
3) Press in the order of “X +” and “Z +” and the lamps of zero point turn on.
4) Release a finger from the switch after the lamp turned on.

Execute zero point return of each axis by the operations above.

Caution

1. Execute zero return of axis one by one for safety.
   (At first, do it from X-axis.)
2. Pay attention of interference with the tailstock at the time of zero return.
3. 100% of rapid traverse override is effective after zero return is performed.

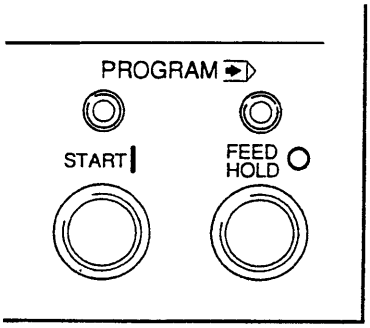
3.4 At the End of Operation

1) Clean up the machine.

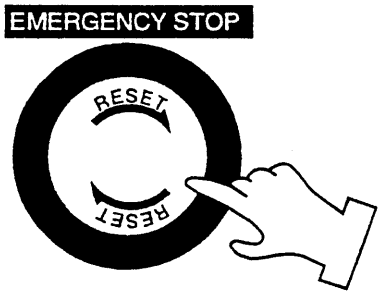
   Stop the chip conveyor after all chips carried out from the conveyor.

2) Confirm the machine stopped completely.

- Spindle rotation
- Program
- X and Z axes
- Coolant
- Chip conveyor



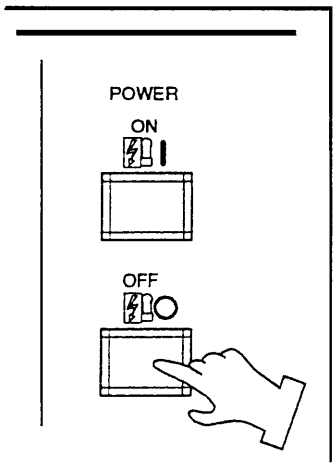
3) Press the [EMERGENCY STOP] button on the main operation panel.



4) Press power [OFF] button at the main operation panel and control power off.

5) Turn off the power switch of the power control cabinet.

6) Set the main power switch [OFF].



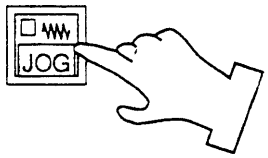
4 Manual Operation

4.1 Feed of Each Axis

— In case of manual feed —

1) Press the FEED for mode select push button switch.

   You may select the “Handle” either.

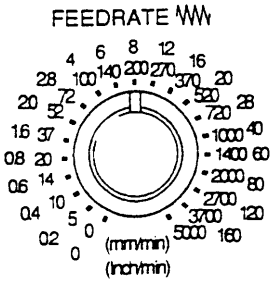


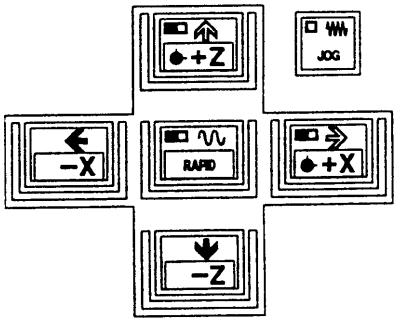
2) Set the manual federate rotary switch to suitable speed.

   Move the machine to desired direction by the manual feed direction push button switch.

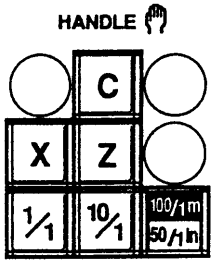
   Take a finger off from the switch when reach to the fixed position.

   (The machine moves only when pressing the switch.)





   In case of a feed by the handle, it can be operated the same about it.



(Example of use)

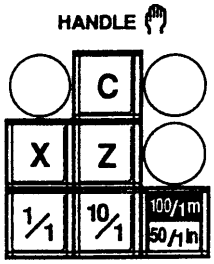
- Warm up running
- In case of approach near the zero position.
- In case of cutting manually
- Setting work

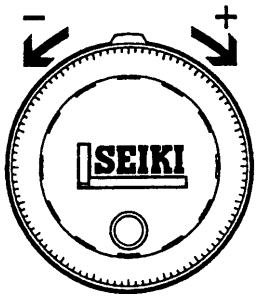
— In case of the handle feed —

1) Select the axis by the axis push button switch.

2) Fine feed can be done by the manual handle.
   - When select 1/1: One division is 0.001mm
   - When select 10/1: One division is 0.01mm
   - When select 100/1: One division is 0.1mm

   In case of the spindle indexing C axis, the unit becomes a degree.





4.2 Operating Method of Q-setter

A tool position compensating value can be get easily, since a tool position compensation is inputted automatically by touching a tool tip to the Q-setter.

In case of the turret rotates, a cursor changes automatically due to a tool face number correspond an offset number.

1) Confirm the zero return condition of the X and Z axes.

   If confirmation lamp is not lit, execute manual zero return.

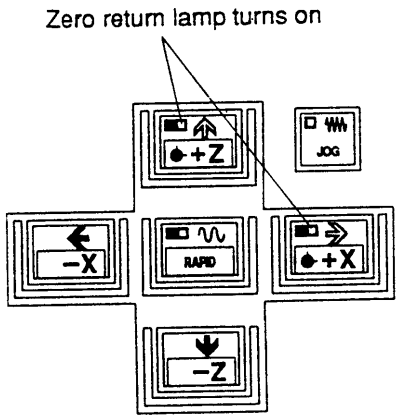
2) Make a mode to manual mode (Handle or feed).

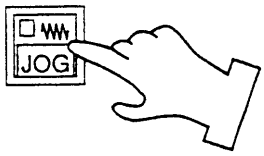
3) Pull out the Q setter

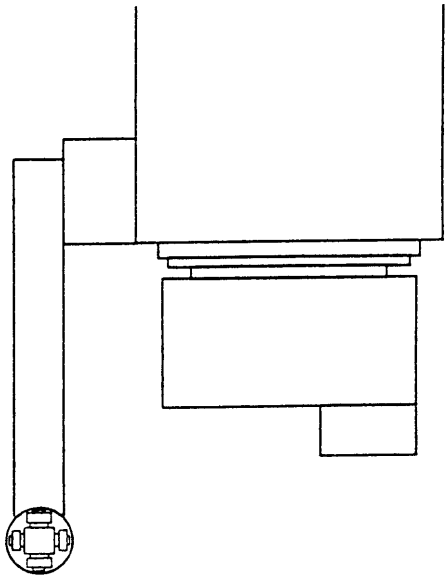
   A screen changes to the offset screen automatically and display the “Q-setter” and inform a ready of complete condition of preparation.

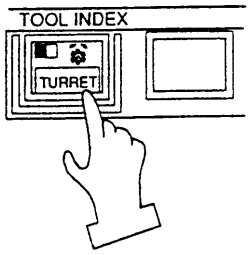
4) Call a tool compensation required.

   Make a mode to “Feed”.









Press the turret indedx key and effective key at the same time.

5) Confirm a tool face on the turret and offset number.

Tool (Compensation)

Cursor

	Sharp		Wears
01			
X	1.000	U	0.000
Z	3.000	W	0.000
R	0.000	Q	0.000
T	3		
H	0.000	J	0.000

A tool face selected at this moment is recognized by a cursor position.

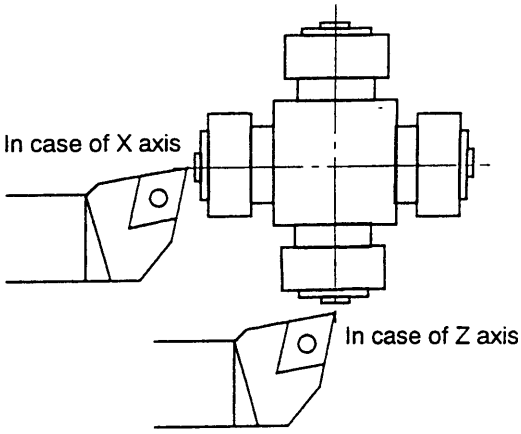
Note) *Set a wear compensating amount zero, if it is not zero.*

6) Approach a tool tip to the tool setter (Q setter)

Procedure (1) Handle magnification key 100/1

(2) Rotate a handle to minus direction.

7) Position a tool tip to the center of the sensor by handle feed.



8) When a tool tip touches the sensor by feed mode, a compensating value is inputted automatically.

Caution

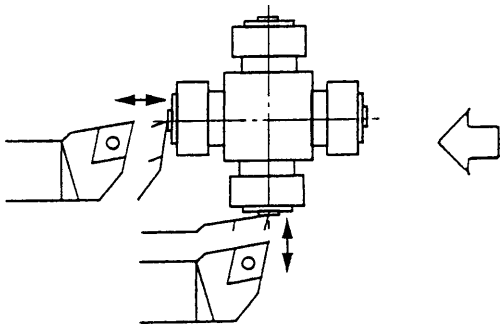
Do not operate at 100/1. It is dangerous as the move amount is too big.

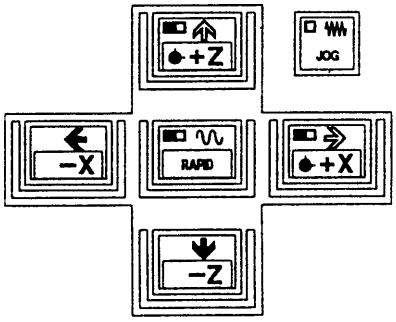
Tool (Compensation)

	Sharp		Wears
01			
X	35.000	U	0.000
Z	0.125	W	0.000
R	0.000	Q	0.000
T	3		
H	0.000	J	0.000

When a tool tip touch to the sensor, sound beep and stop the tool head and input a compensation value.

9) Execute a tool tip measurement by touching a tool tip to the sensor twice or so.





Confirm a tool compensation amount on the screen.

10) Retract a tool tip from the sensor to safety zone by handle feed. A safety zone is a position which is not interfered a tool and sensor even if the turret rotates.

11) Get a compensation amount for the other tool in turn as the same method.

OTHERS

<u>Reference</u> In case of thread cutting tool

In case of thread cutting tool, a tool compensation value of Z value is obtained by the side of insert as described by Fig. 1 and 2, effective length of thread becomes short by “Width T” due to position of cutting edge is different. Therefore, get a tool compensation amount by the Q setter as Fig. 1 then execute incremental compensation input to minus side (In case of Fig. 2, plus side), so correct effective length of thread can be get as Fig. 3.

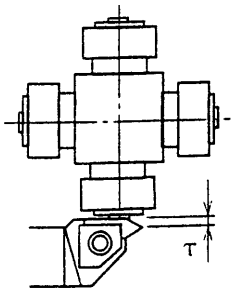


Fig.1(Right hand thread)

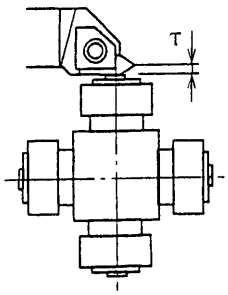


Fig.2(Left hand thread)

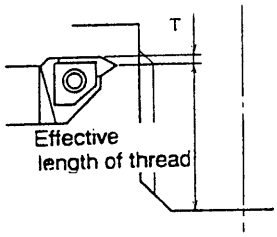
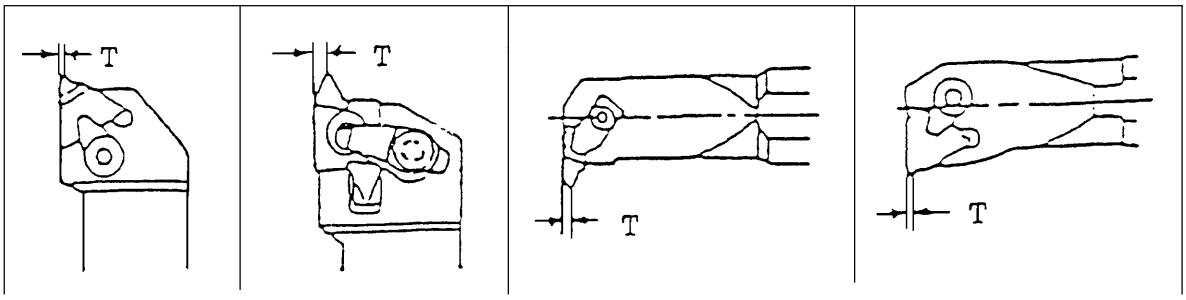


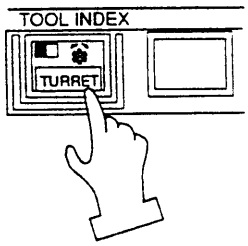
Fig.3



How to get a tool compensating amount for a tool tip may not be touch the Q-setter

A work coordinate system setting should be done before executing this operation.

A correct compensating amount can not be found without a work shift operation.

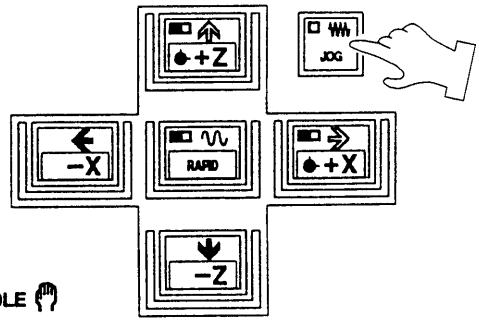


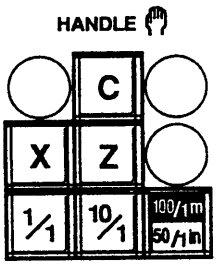
Press the turret index key and effective key at the same time.

I. "How to get a tool compensating amount for a longitudinal direction (Z)"

1. Call a tool by index the turret.

   Select the mode switch either the handle or feed.

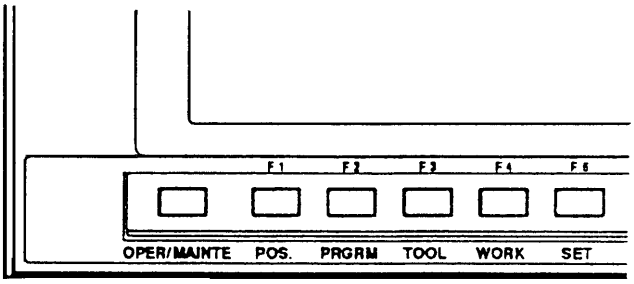




2. Call the tool offset screen and confirm a tool compensating amount is zero.

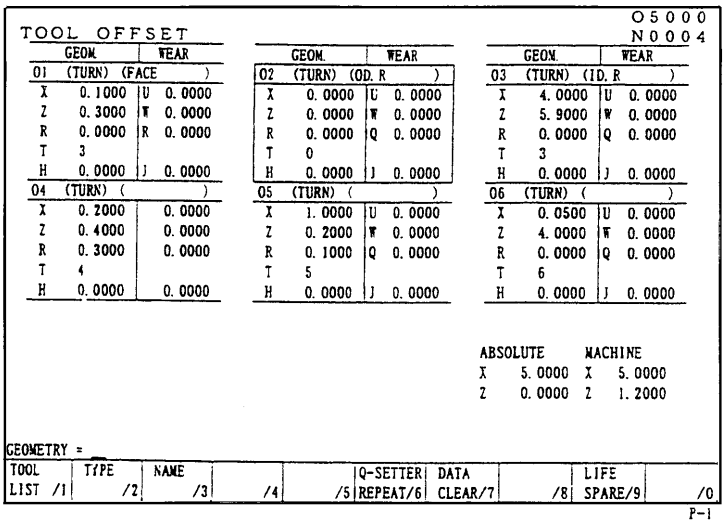
   Set zero if it is not zero.

   Press the function key F3/TOOL.



Example: In case of T0200

Set the tool (offset) No. 02.



TOOL OFFSET

O5000
N0004

	GEOM.		WEAR
01	(TURN) (FACE		)
X	0.1000	U	0.0000
Z	0.3000	W	0.0000
R	0.0000	R	0.0000
T	3		
H	0.0000	J	0.0000
04	(TURN) (		)
X	0.2000		0.0000
Z	0.4000		0.0000
R	0.3000		0.0000
T	4		
H	0.0000		0.0000

	GEOM.		WEAR
02	(TURN) (OD. R		)
X	0.0000	U	0.0000
Z	0.0000	W	0.0000
R	0.0000	Q	0.0000
T	0		
H	0.0000	J	0.0000
05	(TURN) (		)
X	1.0000	U	0.0000
Z	0.2000	W	0.0000
R	0.1000	Q	0.0000
T	5		
H	0.0000	J	0.0000

	GEOM.		WEAR
03	(TURN) (ID. R		)
X	4.0000	U	0.0000
Z	5.9000	W	0.0000
R	0.0000	Q	0.0000
T	3		
H	0.0000	J	0.0000
06	(TURN) (		)
X	0.0500	U	0.0000
Z	4.0000	W	0.0000
R	0.0000	Q	0.0000
T	6		
H	0.0000	J	0.0000

ABSOLUTE		MACHINE	
X	5.0000	X	5.0000
Z	0.0000	Z	1.2000

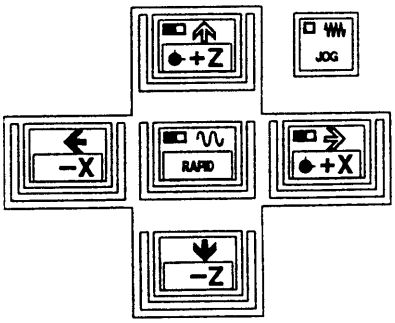
GEOMETRY =

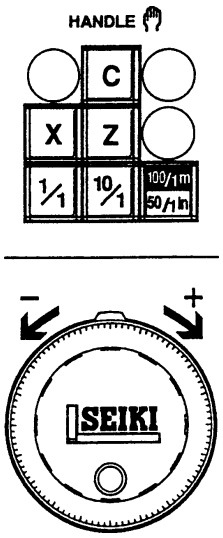
TOOL LIST /1	TYPE /2	NAME /3	/4	/5	Q-SETTER REPEAT/6	DATA CLEAR/7	/8	LIFE SPARE/9	/0

P-1

3. Touch a tool to the end face of workpiece.

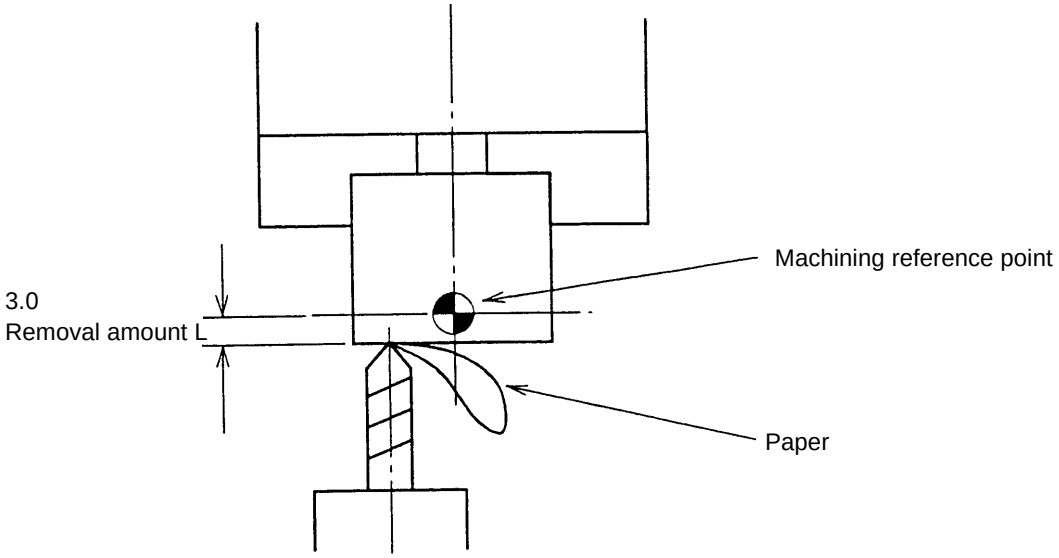
   It the end face is a black skin, execute it after cutting a black skin.



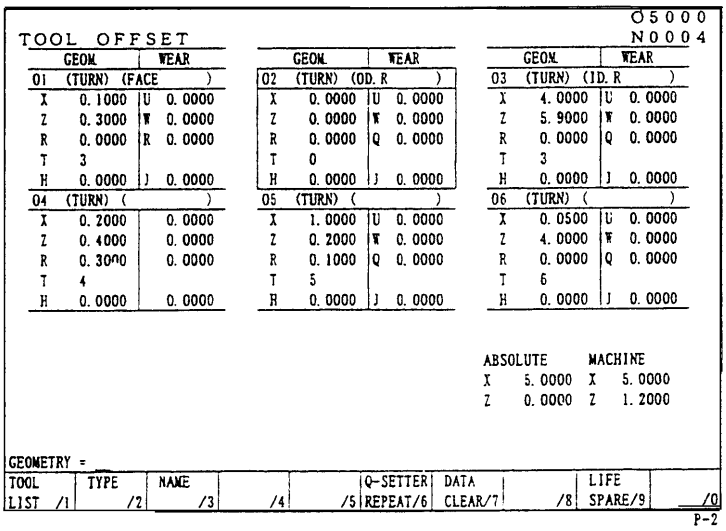


Caution

Reduce a magnification of the handle to avoid a breakage of tool and apply a paper between a workpiece and tool.



4. watch a position “Z” of tool position.



O5000
N0004

TOOL OFFSET

	GEOM.		WEAR
01	(TURN) (FACE		)
X	0.1000	U	0.0000
Z	0.3000	W	0.0000
R	0.0000	R	0.0000
T	3		
H	0.0000	J	0.0000
02	(TURN) (OD. R		)
X	0.0000	U	0.0000
Z	0.0000	W	0.0000
R	0.0000	Q	0.0000
T	0		
H	0.0000	J	0.0000
03	(TURN) (ID. R		)
X	4.0000	U	0.0000
Z	5.9000	W	0.0000
R	0.0000	Q	0.0000
T	3		
H	0.0000	J	0.0000
04	(TURN) (		)
X	0.2000		0.0000
Z	0.4000		0.0000
R	0.3000		0.0000
T	4		
H	0.0000		0.0000
05	(TURN) (		)
X	1.0000	U	0.0000
Z	0.2000	W	0.0000
R	0.1000	Q	0.0000
T	5		
H	0.0000	J	0.0000
06	(TURN) (		)
X	0.0500	U	0.0000
Z	4.0000	W	0.0000
R	0.0000	Q	0.0000
T	6		
H	0.0000	J	0.0000

ABSOLUTE		MACHINE	
X	5.0000	X	5.0000
Z	0.0000	Z	1.2000

GEOMETRY =

TOOL LIST /1	TYPE /2	NAME /3	/4	/5	Q-SETTER REPEAT/6	DATA CLEAR/7	/8	LIFE SPARE/9	/0

P-2

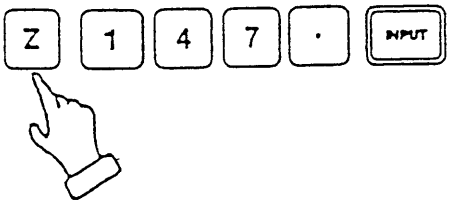
○ Tool compensating amount
A value subtract a removal amount (l) from a tool position (Z).

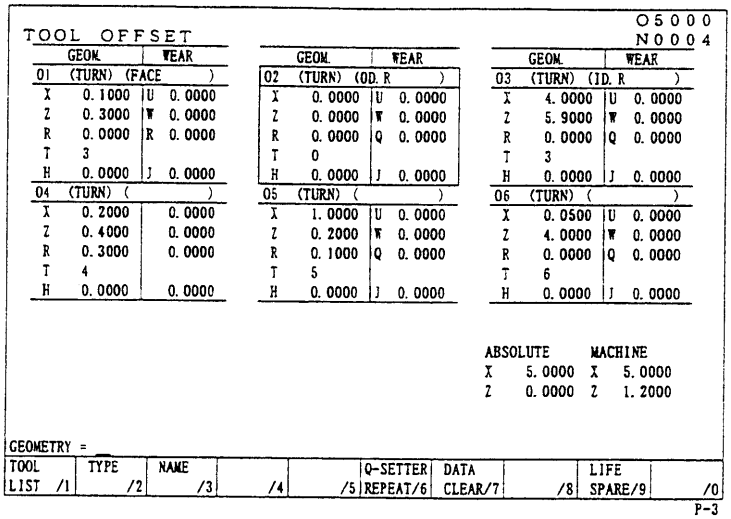
Toll compensating amount (Z) = [Tool position (Z) - Removal amount (ℓ)]

Example: Tool compensating amount
= (150.0) - (3.0) = 147.0

147.0 is a tool compensating amount of the longitudinal direction.

5. Input a tool compensating amount.





Caution

Execute it with confirmation, if the setting of shift amount (machining original position) of Z-axis work coordinate system is correct or not before this

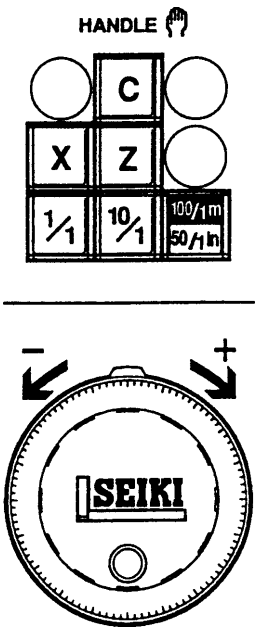
Besides, a tool tip position should be same as a removal amount when a tool touches end face is has touched the Q-setter.

How to get a tool compensating amount for a tool tip may not be touched the Q-setter.

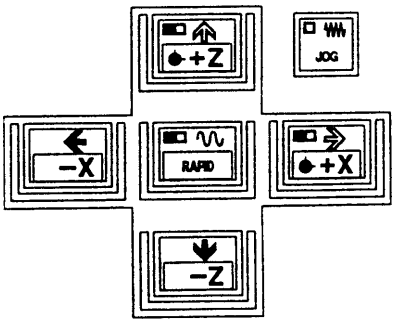
II. "How to get a tool compensating amount for a radial direction (Z-axis) "

It is the same as longitudinal direction from the item 1 to 3.

Refer it to them.

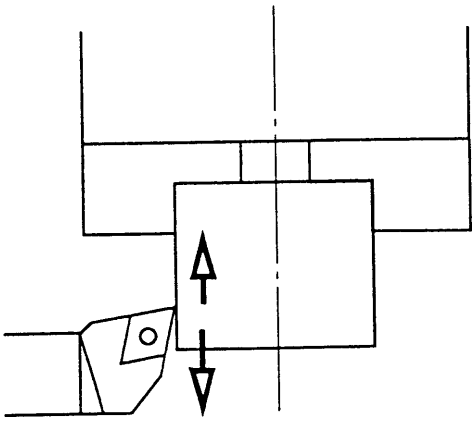


1. Cut a workpiece.



Caution

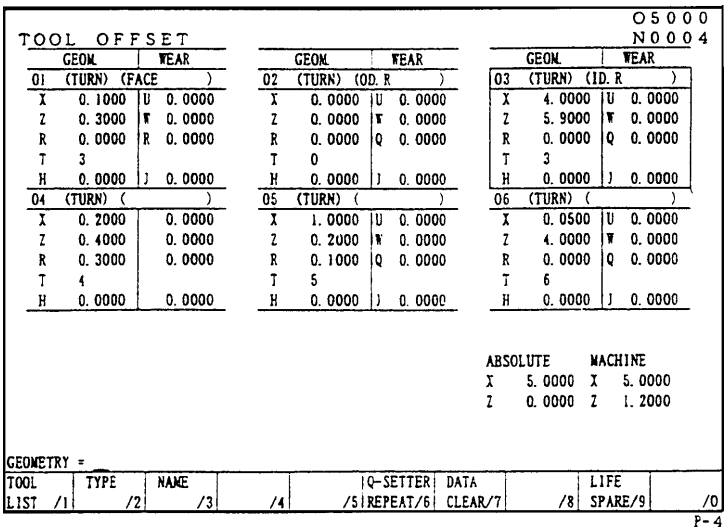
To avoid a defective parts, it is enough a skin cut. Never move on the X-axis after OD turning.



2. Watch a position "X" of tool position.

Example: In case of T0300

Set the tool (offset) No.03.



O5000
N0004

TOOL OFFSET

	GEOM.		WEAR
01	(TURN) (FACE		)
X	0.1000	U	0.0000
Z	0.3000	W	0.0000
R	0.0000	R	0.0000
T	3		
H	0.0000	J	0.0000
04	(TURN) (		)
X	0.2000		0.0000
Z	0.4000		0.0000
R	0.3000		0.0000
T	4		
H	0.0000		0.0000

	GEOM.		WEAR
02	(TURN) (OD. R		)
X	0.0000	U	0.0000
Z	0.0000	W	0.0000
R	0.0000	Q	0.0000
T	0		
H	0.0000	J	0.0000
05	(TURN) (		)
X	1.0000	U	0.0000
Z	0.2000	W	0.0000
R	0.1000	Q	0.0000
T	5		
H	0.0000	J	0.0000

	GEOM.		WEAR
03	(TURN) (ID. R		)
X	4.0000	U	0.0000
Z	5.9000	W	0.0000
R	0.0000	Q	0.0000
T	3		
H	0.0000	J	0.0000
06	(TURN) (		)
X	0.0500	U	0.0000
Z	4.0000	W	0.0000
R	0.0000	Q	0.0000
T	6		
H	0.0000	J	0.0000

ABSOLUTE		MACHINE	
X	5.0000	X	5.0000
Z	0.0000	Z	1.2000

GEOMETRY =

TOOL LIST /1	TYPE /2	NAME /3	/4	/5	Q-SETTER REPEAT/6	DATA CLEAR/7	/8	LIFE SPARE/9	/0

P-4

○ Tool compensating amount

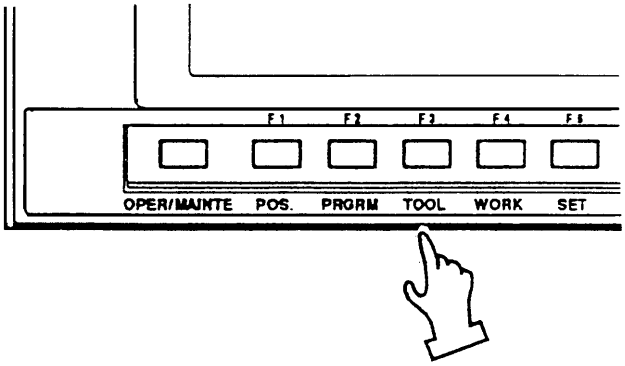
A value subtract a diameter of workpiece (φ D) from a tool position (X).

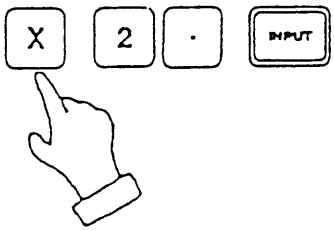
Toll compensating amount (X) = [Tool position (X) - machined diameter of workpiece (φ D)]

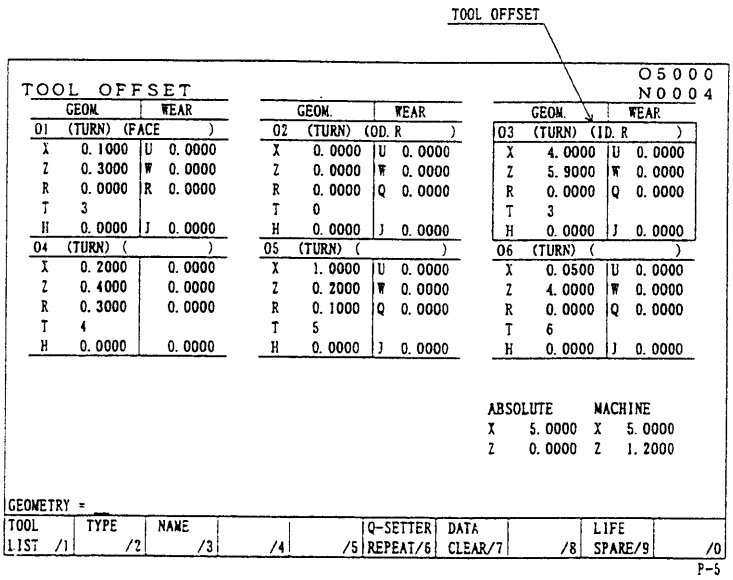
Example: Tool compensating amount
= (65.0) - (63.0) = 2.0

2.0 is a tool compensating amount of the diameter direction.

3. Input a tool compensating amount.







4.3 Q-setter Repeat Function

A tool compensation amount is once measured by Q-setter, the measurement for the replaced tool tip can be repeated in a simplified operation.

4.3.1 Procedures

1) Press F6/Q-SETTER REPEAT on the tool (compensation) screen and get the window screen of the “Q-setter Repeat”.
2) Put the mode into “Manual”.
3) Replace the tool tip and index the turret to the measuring position.

   Then, the cursor position in the turret usage condition on the left of the screen and compensation data on the upper right of the screen change connecting with the turret face.

   Confirm the virtual tool tip position.
4) Get the Q-setter arm.
5) Make positioning of the tip to be measured in an arbitrary position where there is no risk of touching the sensor.
6) Put the mode into “Feed”.
7) Press the F4/REPEAT MEASURE START key.

   Input Y , answering the “Query Y-Yes or N-No”.

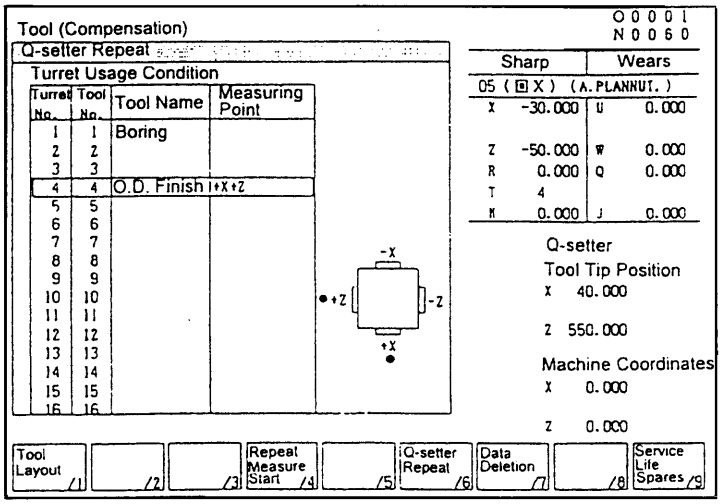
   If it is the tool for which previously measured by Q-setter (when there is measured data on the screen), the “Q-setter Repeat” measuring action will start and the measured data is written in as compensation amount when the tool touches the sensor.

   Also, a touch mark “●” is shown on the illustration of measurement point on the screen. If the tool has previously not been measured by Q-setter, an alarm is issued.

   Press the F5/REPEAT MEASURE STOP key to stop the action.

   Press the F4/REPEAT MEASURE START key again to restart the action.

   Input Y , answering the “Query Y-Yes or N-No”.
8) When the measurement is completed, press the F6/FUNCTION RETURN key to return the “Tool Compensation” screen.
9) Store the Q-setter.



4.3.2 Movement

The movement of the virtual tool tip point is divided into 9 patterns, as shown in Fig.3.

When virtual tip points 1, 2, 3, 4 are designated, measurement is made both on the X and Z axes. The measurement should always be made in the order of Z axis to X axis.

When virtual tip points 0, 5, 6, 7, 8, 9 are designated, measurement is made on either one of the X or Z axis only. In this case, it is necessary to previously input a compensation amount manually for the axis which is not measured.

As for the virtual tip point of the tool, see Fig.1.

As an example, the case of virtual tip point 1 is explained in the following. (See Fig.2)

1) Shift from the start point (P0) to the point 1 (P1) by rapid feed.
2) Shift from P1 to P2 by rapid feed.
3) Shift from P2 to P3 by rapid feed.
4) Move from P3 to the final touch point (P4) by jog speed.
5) Move from the point of touch and stop to P5 by jog speed.
6) Shift from P5 to P6 by rapid feed.
7) Shift from P6 to P7 by rapid feed.
8) Move from P7 to the final touch point (P8) by jog speed.
9) Move from the point of touch and stop to P9 by jog speed.
10) Shift from P9 to P10 by rapid feed.
11) Shift from P10 to the start point (P11) by rapid feed.

Fig.1 Virtual tip point of tool

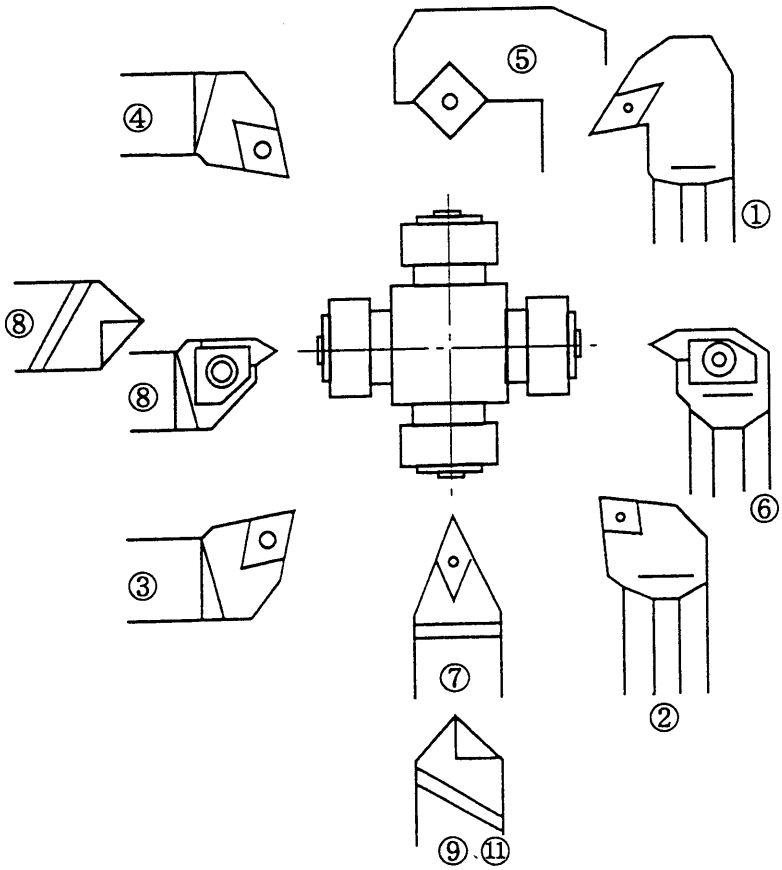


Fig.2 Movement in the case of virtual tip point 1

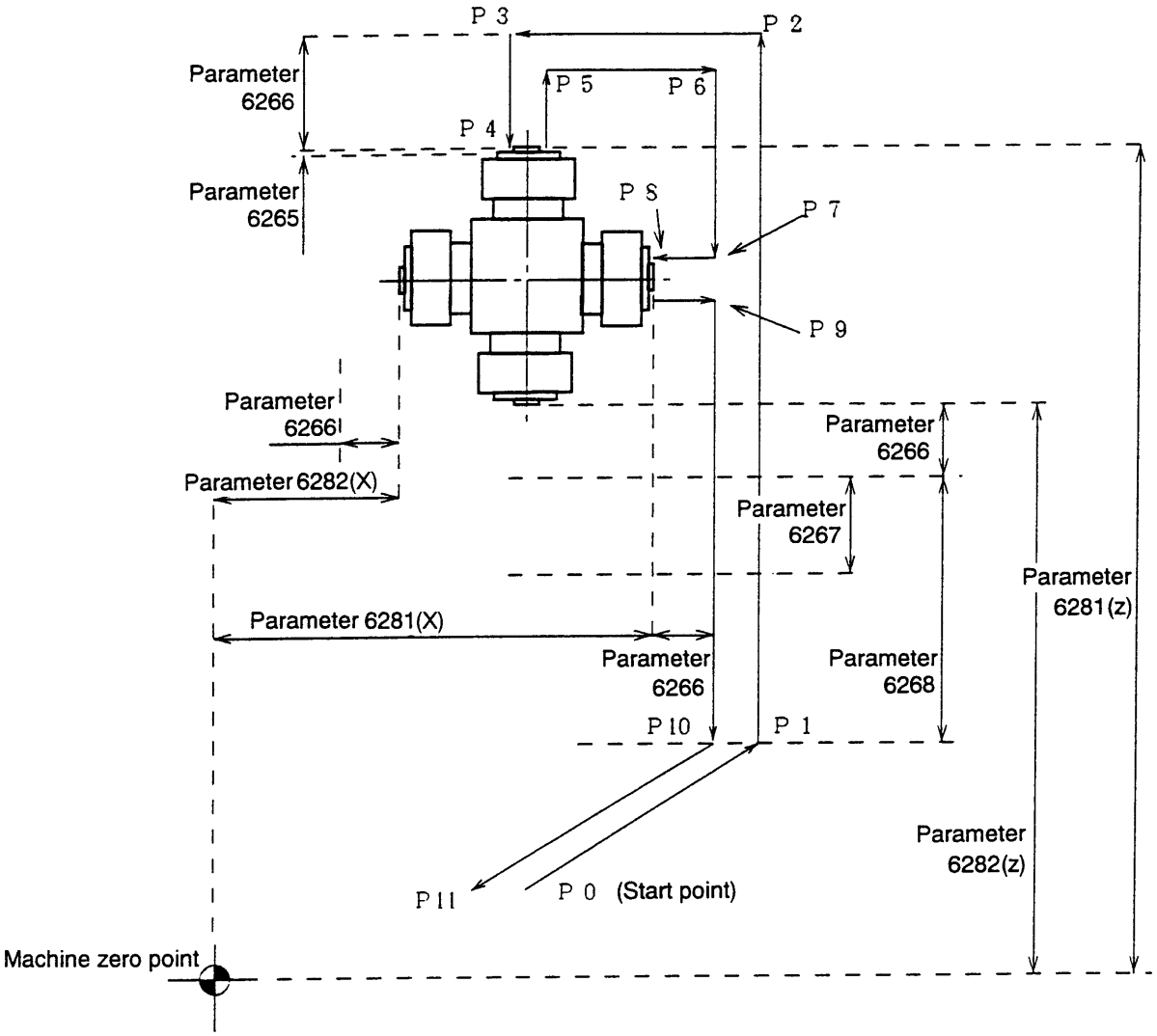
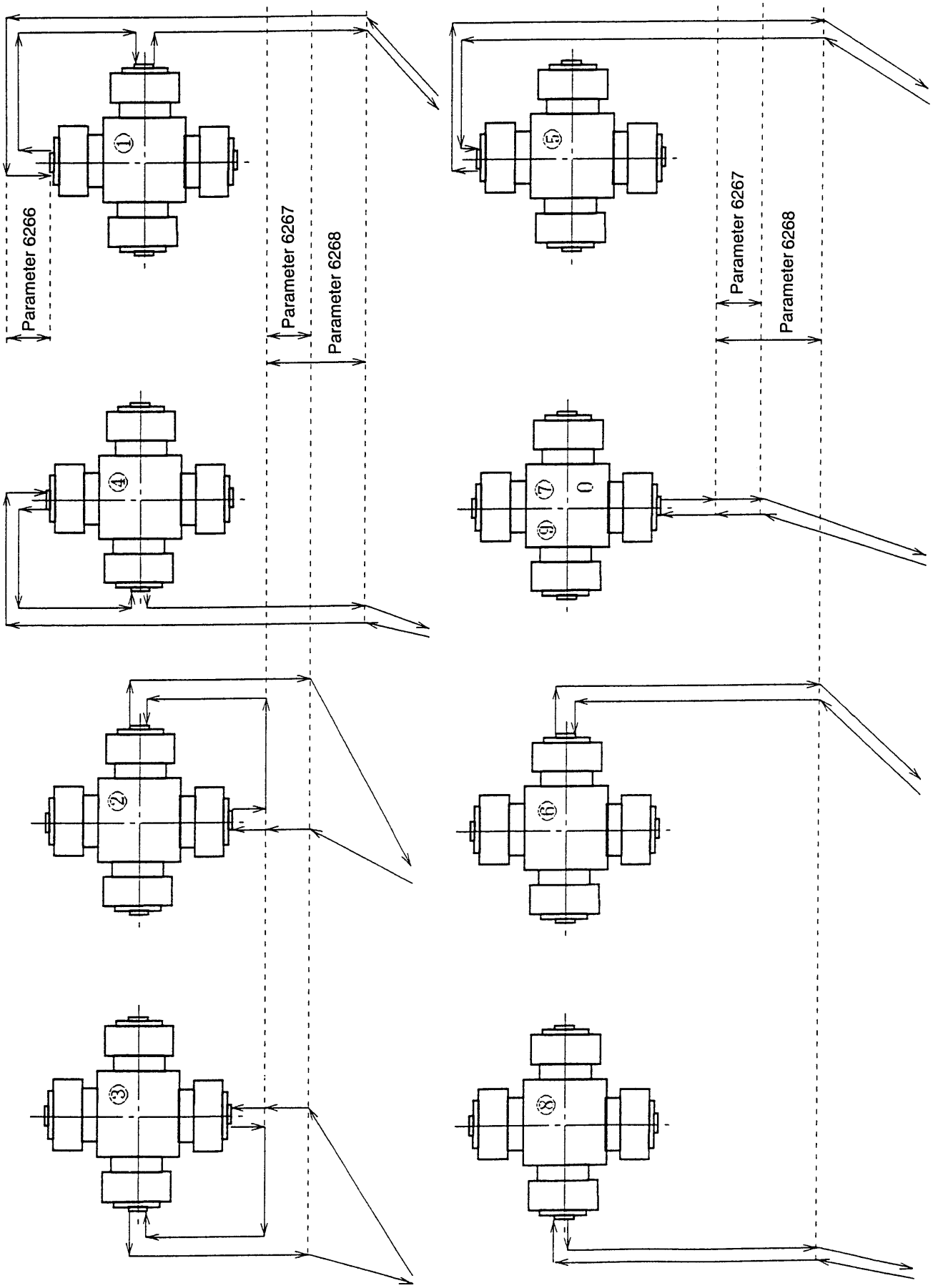


Fig.3 Movement pattern



Caution

1) Whenever a tool is changed, make sure to apply Q-setter in the manual mode.
2) The action of applying Q-setter is one time only.
3) For measurement action, single block is effective. (Restarted by pressing the F4/REPEAT MEASURE START key)
4) If machine-locked in the Q-setter mode, an alarm is issued.
5) In the Q-setter mode, when the selection of compensation No. is changed by moving the cursor position of by page key, the measurement is made on that compensation No.
6) When there is a danger of the start point interfering with the sensor, an alarm is issued.
7) If the tip does no touch the sensor during the measurement movement, an alarm is issued after completion of the action.
8) Measurement is not available for thread cutting tool, tip-change type drill bit, end mill and tools similar to these.
9) Depending on the movement pattern, when there is an interference between the tool and workpiece, detach the workpiece from the chuck.
10) When there is a difference of 0.5 or more between Q-setter measurement andworkpiece measurement, adjust the Q-setter position on the maintenance screen.
11) The Q-setter repeat function is available only when the tool No. to be measured is inputted on the “Tool No.” column of the tool list. Usually, the turret No. and the tool No. should coincide, the screen display of which is not to be changed.

4.3.3 Relevant Alarm

No.715	Machine lock was acted during measurement.
No.724	Q-setter measurement has never been performed.
No.738	Touch signal of Q-setter repeat is abnormal.
No.739	Measurement start point of Q-setter is not proper. Move the tool tip away from Q-setter slightly.

4.4 How to Shape Soft Jaw

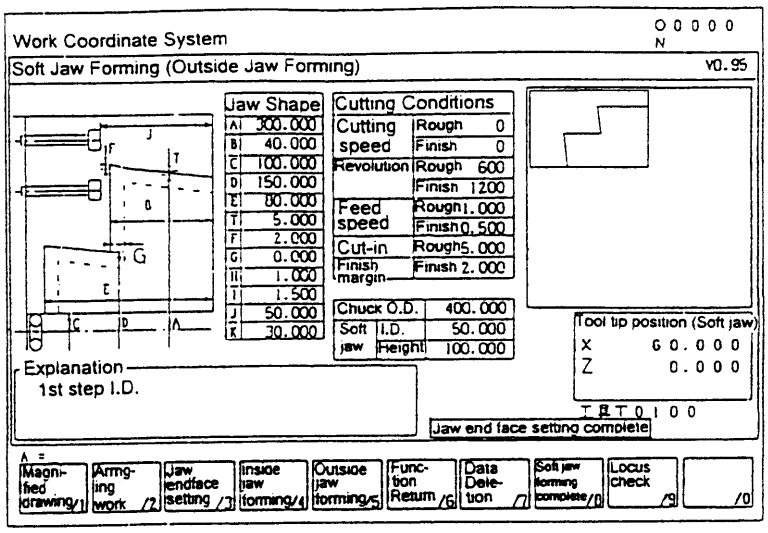
In order to manufacture precision products of high commercial value, without flaws on workpiece, a soft jaw is formed. By forming a soft jaw matching with the chuck, cutting work can be performed safely and steadily thus the accuracy of processed goods will improve. For shaping a soft jaw, there are two methods; one is to utilize the simple soft jaw forming function, the other is to form one by manual operation.

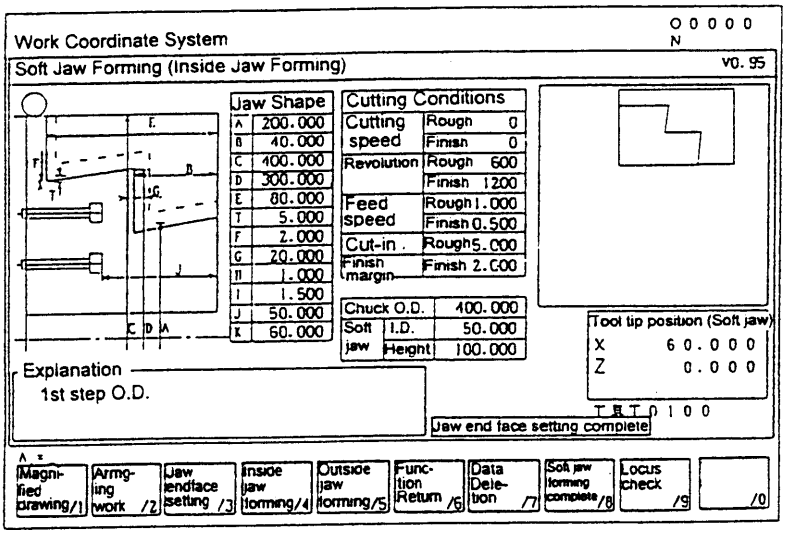
4.4.1 Shaping by utilizing Simple Soft Jaw Forming Function

On the soft jaw forming screen, input necessary data of “Jaw form” and “Cutting conditions” according to the guiding message appears on the screen. By pressing the start button, the forming of a soft jaw is processed automatically.

(1) Operation

1) The part where a ring (core metal) is to be attached is processed and a ring is attached.
2) The tool used for a soft jaw forming is indexed at the cutting position.
3) On the screen of work coordinates system (General→ F4/WORK COORDINATES), press the F6/SOFT JAW FORM key to get the window screen for soft jaw forming.
4) Select either outside jaw forming or inside jaw forming by pressing the corresponding key F4/OUTSIDE JAW FORM or F5/INSIDE JAW FORM .
5) Input the data on the jaw shape and cutting conditions.
   For details, see paragraph (3) of this section.
6) Rotate the spindle in the manual mode and move the tool to the position of the end face of the jaw. Then press the F3/JAW END FACE SETTING key, and answering to a message “Jaw End Face Position Setting? Y-Yes or N-No”, input “Y” to effect the setting.
7) Press the F9/LOCUS CHECK key in the MDI mode and check the locus of the cutting program. When not in the MDI mode, a message is displayed with a request “Change the mode into MDI”.
   During locus check, dry run and machine lock become effective, although the lamp in the operation panel does not light on.
   Also, MST code is not outputted.
   Preset the coordinate system (tool tip position), when locus check is completed, also at time of midway resetting.
   By turning “Single Block” ON, and pressing the PROGRAM [START] button, the locus can be displayed per each block.
   To recheck the movement of the locus, press the F9/LOCUS CHECK key.
8) Move the tool away from the jaw end face in Z direction by about 5mm, and make positioning of the starting point of jaw cutting. For this positioning, the X axis position is arbitrary, but it is safer to set it within the range of the actual cutting diameter. (When moving the tool, take care not to have the tool interfered with other machine parts.)
9) In the MDI mode, press the start button and execute the soft jaw cutting program.
10) Press the SOFT JAW FORMING COMPLETE key, when the soft jaw forming is completed.
    Answering the query whether terminating the process, input Y to complete the soft





jaw shaping work.

(2) Function Key

F1/Magnified Drawing:	Display of magnified jaw cutting portion is available.
F2/Arranging Work:	Window screen for arranging work appears, thereby allowing to make command on the spindle rotation speed.
F3/Jaw End Face Setting:	Message “Jaw End Face Setting? Y-Yes N-No” is displayed. Input F3 for setting.
F4/Outside Jaw Forming:	For selecting outside jaw forming diagram.
F5/Inside Jaw Forming:	For selecting inside jaw forming diagram.
F6/Function Return:	Screen returns to Work Coordinate System display.
F7/Data Deletion:	Message “Jaw Shape/Cutting Conditions Delete? Y-Yes N-No” is displayed. Input F7 for clearing data.
F8/Soft Jaw Forming Complete:	For completing soft jaw forming. This function key is pressed when returning to normal work. Jaw end face setting position is cleared.
F9/Locus Check:	The locus of cutting program is drawn.

(3) Jaw Shape and cutting Conditions

The meaning of each symbol of the jaw shape is as follows:

A: I.D./O.D of the first step

B: Depth of the first step

C: Diameter of the ring (core metal) used

D: I.D./O.D of the second step (If value 0 is set, the shape of jaw formed is a single step jaw.)

E: Depth of the second step (If value 0 is set, the shape of jaw formed is a single step jaw.)

T: Taper amount of the gripping portion

F: Necking depth

G: The maximum amount of cutting margin (If value 0 is set, cutting proceeds to Z direction in rough cutting (See Note 1). If value larger than 0 is set, copy cutting is performed in rough cutting (See Note 1))

I: Setting of necking width (relieving width)

J: Bolt position 1

K: Input the amount of the jaw protruding from the chuck diameter with +/- sign.

(based on the chuck diameter)

Cutting speed, Revolution: The condition relevant to spindle revolution. Input appropriate values either in cutting speed or revolution.

Feed speed: The feed speed for rough an finish cutting.

Cut-in amount: Cut-in amount in the rough cutting.

The cut-in amount in the X axis direction, when rough-cutting is performed in the Z direction.

The cut-in amounts in the X and Z axis directions, when performing copy cutting.

If value 0 is set, will perform finish cutting only.

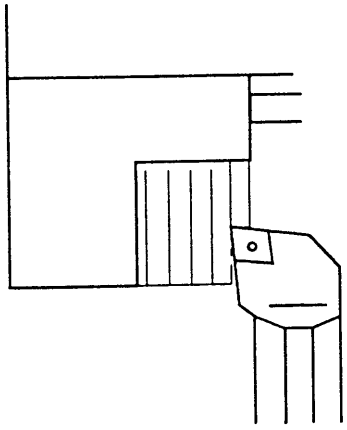
Finish margin: If value 0 is set, will perform rough cutting only.

Chuck O.D.

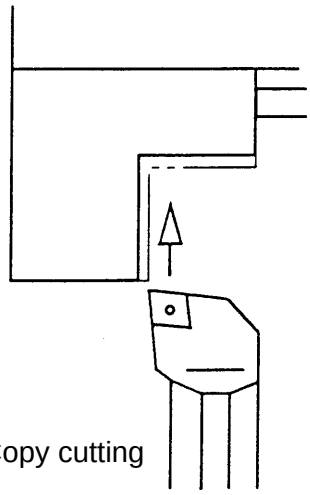
Soft jaw I.D. } The dimension data necessary for jaw locus drawing.

Soft jaw O.D. } These data have no direct connection with the machine action.

(Note 1)



Z direction cutting

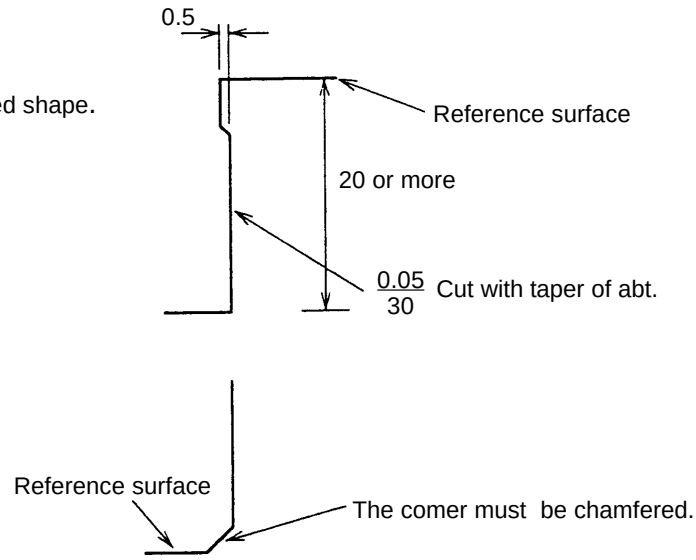


Copy cutting

Caution

1) Before starting soft jaw forming, make jaw end face position setting. A warning is issued, If locus check or soft jaw forming is executing without making the end face position setting.
2) Clamp the maximum spindle revolution during the soft jaw forming with the parameter setting value (No.5156).
3) Attention should be paid to the tool tip shape, when executing copy cutting and necking processing.
4) The maximum value of the margin (G) is the value where the margin is considered to be uniform both directions of diameter and lengthwise. When the margin in two directions are different, the larger value should be taken as the maximum value of the margin for the setting.
5) Use decimal point, for inputting the value of dimensions.
6) When attaching a jaw, make sure that the jaw does not protrude beyond the outside diameter of the chuck.
7) For jaws, always use the standard soft jaw.
8) When processing a thin workpiece, chucking pressure may be lowered for avoiding deformation of the workpiece, In such cases, take care not to set the spindle revolution speed too high.

Refer to right figure finished shape.



(4) Relevant Alarms

The contents of the soft jaw forming error No.270 are as follows.

For example, the following message is given on the screen display.

[270] (#001) Soft Jaw Forming Error

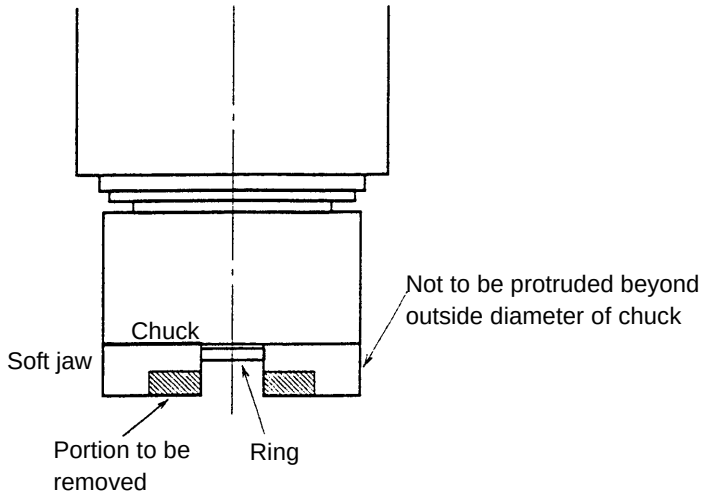
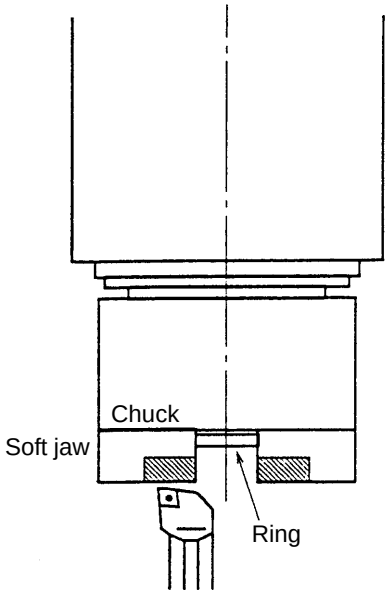
↑

The detail of the alarm can be known by the numeral subsequent to # mark, the meaning of which is as per list below.

#001	A ≦ 0 (1st step O.D./I.D. is smaller than zero)
#002	B ≦ 0 (1st step depth is smaller than zero)
#003	C ≦ 0 (Ring diameter is smaller than zero)
#004	D ≦ 0 (2nd step O.D./I.D. is smaller than zero)
#005	E ≦ 0 (2nd step depth is smaller than zero)
#006	T < 0 (Taper amount is minus value)
#007	F < 0 (Necking depth is minus value)
#008	G < 0 (Maximum margin is minus value)
#009	H < 0 (Chamfering amount is minus value)
#00A	I < 0 (Necking width is minus value)
#010	C ≧ A (Ring diameter is bigger than 1st step I.D. in the outside jaw forming)
#011	C ≦ A (1st step O.D. is bigger than ring diameter in the inside jaw forming)
#012	D ≧ A (2nd step I.D. is bigger than 1st step I.D. in the outside jaw forming)
#013	D ≦ A (1st step I.D. is bigger than 2nd step I.D. in the inside jaw forming)
#014	C ≧ D (Ring diameter is bigger than 2nd step I.D. in the outside jaw forming)
#015	C ≦ D (2nd step I.D. is bigger than ring diameter in the inside jaw forming)
#016	B ≧ E (1st step depth is bigger than 2nd step depth)
#017	Chamfering is excessive.
#018	Necking width is too large.
#019	Interferes with bolt
#020	Cutting speed (roughing) ≦ 0
#021	Cutting speed (finishing) ≦ 0
#022	Feed speed (roughing) ≦ 0
#023	Feed speed (finishing) ≦ 0
#024	Cut-in amount ≦ 0
#OFF	Soft jaw forming screen diagram not on display

No.729 Jaw end face position setting is not completed (Warning)

4.4.2. Soft jaw forming by manual operation

Steps	Operation method	Movement	Display
1	As shown figures in the right, insert a ring (core metal) on the front side of a jaw. Adjust chuck pressure to the same value of the actual operation.		
2	Obtain tool compensation amount of the tool used for soft jaw forming. (Refer Q-setter operation method)	This setting enables boring operation for accurate inside diameter by watching the screen display of “position”, without using a measuring instrument.	
3	Move the too l rest, and apply the soft jaw forming tool to the soft jaw. Have the spindle rotate in advance.		

Steps	Operation method	Movement	Display
4	Set “W” of relative coordinates at 0. (1) Press the key [F1/POSITION] Then, screen displays as shown in the right column.		

```
                                                                    O5000
POSITION                                                            N0004
 ABSOLUTE                                      ABSOLUTE        DIST TO GO
                                             X   -1.0000     X    0.0000
X       -1.0000                              Z   -3.0000     Z    0.0000

Z       -3.0000

                                               RELATIVE         MACHINE
                                            U    0.0000     X    0.0000
                                            W   -1.0000     Z    0.0000

     Tool T0100          (TURN) (FACE      )
     OFST X    0.0500          NOSE R    0.0500                TurnS  1500
          Z    0.1000          WID. H    0.0000
                               POINT T   0                     min. F  0.30

P:ABS    U = __
|     /1|     /2|     /3| COMMAND /4| RESTART /5| FLOATING REF. /6| ZERO SET /7|     /8|     /9|     /0|
                                                                                                  P-6
```

(2) Press [F7/ZERO-SET]

(3) Press [F2/W ZERO-SET] Then, the value of W becomes 0.

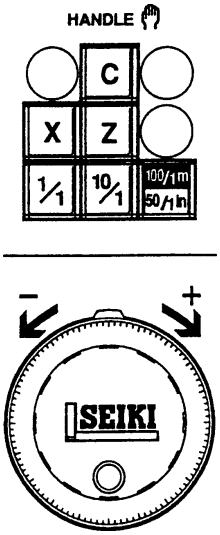
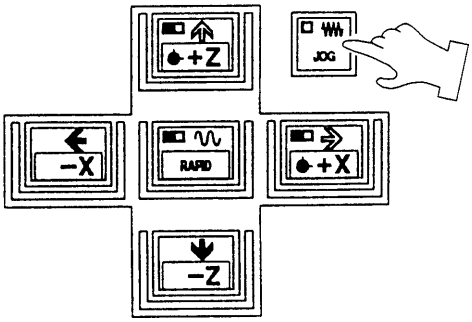
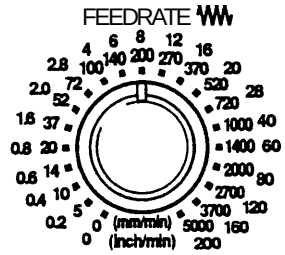
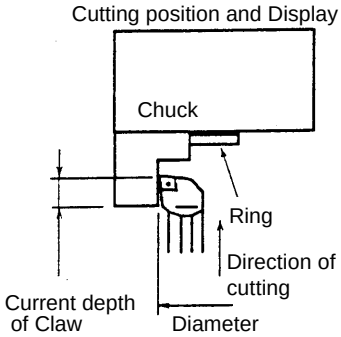
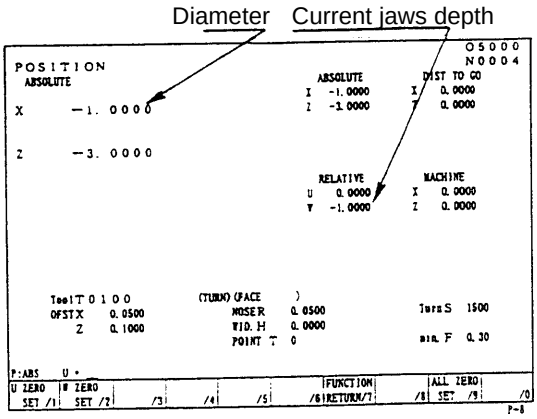
```
                                                                    O5000
POSITION                                                            N0004
 ABSOLUTE                                      ABSOLUTE        DIST TO GO
                                             X   -1.0000     X    0.0000
X       -1.0000                              Z   -3.0000     Z    0.0000

Z       -3.0000

                                               RELATIVE         MACHINE
                                            U    0.0000     X    0.0000
                                            W   -1.0000     Z    0.0000

     Tool T0100          (TURN) (FACE      )
     OFST X    0.0500          NOSE R    0.0500                TurnS  1500
          Z    0.1000          WID. H    0.0000
                               POINT T   0                     min. F  0.30

P:ABS    U = __
| U ZERO SET /1| W ZERO SET /2|     /3|     /4|     /5|     /6| FUNCTION RETURN/7|     /8| ALL ZERO SET /9|     /0|
                                                                                                  P-7
```

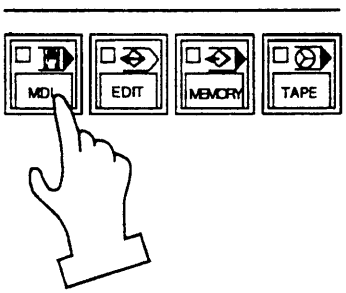
Steps	Operation method	Movement	Display
	Scrape the jaw by “Handle” operation, or in the “Feed” mode. • For this process: Recommend separate stages of course and finish processings, as it improves accuracy of the cutting. • Accuracy improves by cutting the portion chucking the ring before-hand. • When soft jaw is re-attached, make adjust cutting for maintaining chucking accuracy .		   

5 Operation by Manual Data Input (MDI)

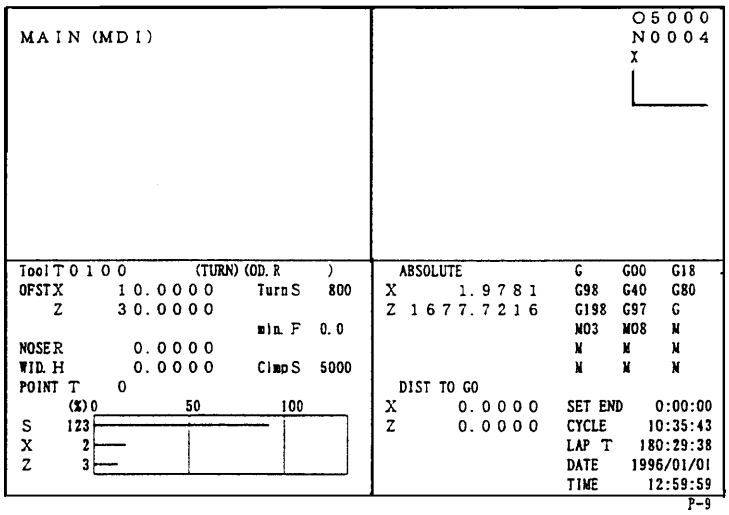
5.1 Program input by MDI

A MDI program can be executed by the following operation.

1. Select [MDI] on the operation panel of the machine.

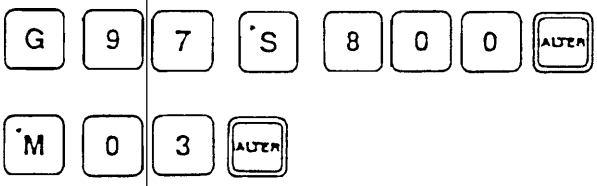


2. Press the [RETURN] key.

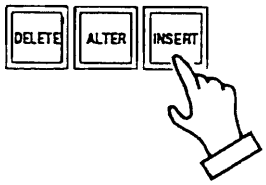


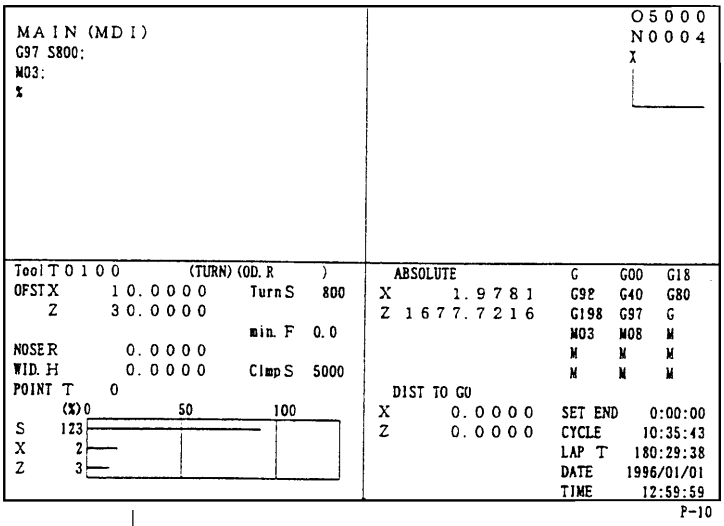
3. Key in a MDI program by the address and the data key.

   Example: When the spindle rotates 800 min^{-1}.

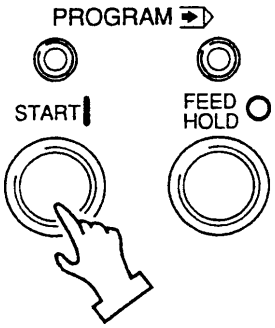


4. When the INSERT key is pressed, a commanded value moves upper section of the screen.





5. A command executes when pressing the PROGRAM [START] key.



※ 1 If wrong key are inputted by mistake, key in again after pressing the CANCEL key required number.

※ 2 When a mistake is found on an inputted command, release a command by pressing the RESET key.

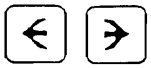
Caution

Pay full attention to the safety, since the machine moves.

5.2 Edition of MDI program

An inputted MDI program can be edited the same as a part program stored in the memory.

1. The cursor moves back or forth at a MDI program by a block unit when the up and down CURSOR key is pressed.
2. The cursor moves back or forth by a word unit when the left and right CURSOR key is pressed.
3. A MDI program moves back or forth by a page unit when the PAGE key is pressed.
4. Insert a data after the current position of cursor by the INSERT key.
5. Alter a word, the cursor located currently, to the inputted one by the ALTER key.
6. A word, the cursor located currently, deletes by the DELETE key.
7. A MDI buffer is cleared by the RESET key. Key in the command value again.



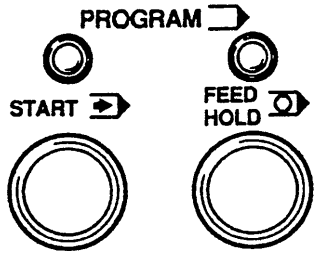
Caution

1. Editing is not available while executing a MDI program, however, it is possible when a condition of the single block stop.

   Execute the cycle start as it is, after editing is finished.
2. In this case, please note that regardless of the cursor position, the program starts running from the beginning.

5.3 Operation of MDI program

1. Keep a mode of operation panel of the machine a MDI, execute an inputted MDI program by pressing the
   [START] button.



Caution

Put the cursor at the head of the program, because it executes from the current position of the cursor.

2. When a MDI program executes sequentially, the cursor moves at the head of the block currently executing.
3. The MDI program is deleted after an operation of MDI program is completed.

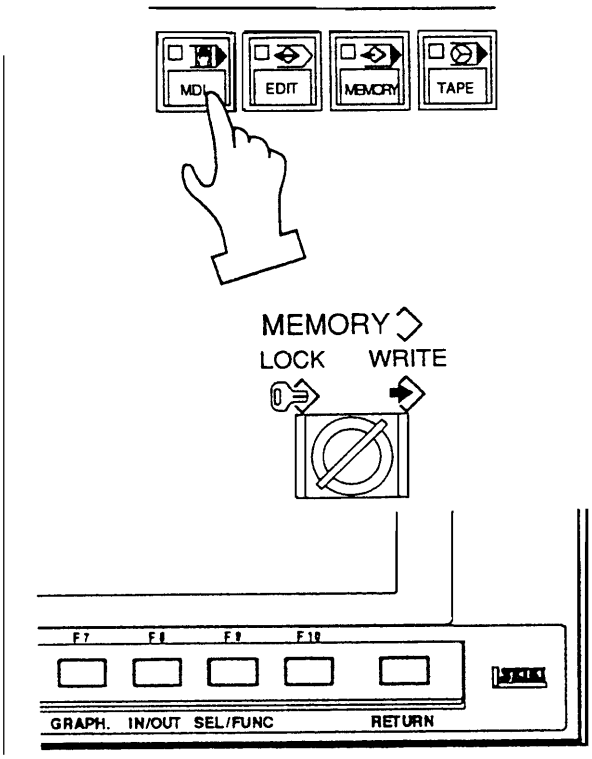
6 Registration of Program

There are following two methods to register a program into the NC unit.

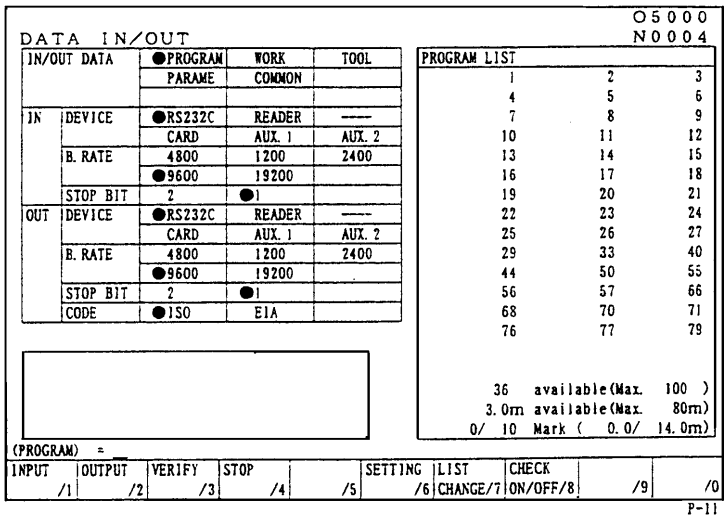
1. Registration from an external input device
2. Manual registration by the address/numeral keys

6.1 Registration from an external device

1) Connect an input device RS-232-C terminal and make a possible condition of transmission.
2) Set a mode to [EDIT].
3) Set the memory key to [WRITE].
4) Press the function key F8/IN-OUTPUT .



Aright sketch is displayed.



5) Press the F1/INPUT key.

- Start reading from the first EOB of the NC program and continue until the % code.
- The program No. is registered the 0 No. registered in the input device.
- Display at the program No. list after completion of reading.
- At the time of input, the ISO/EIA information is recognized automatically.

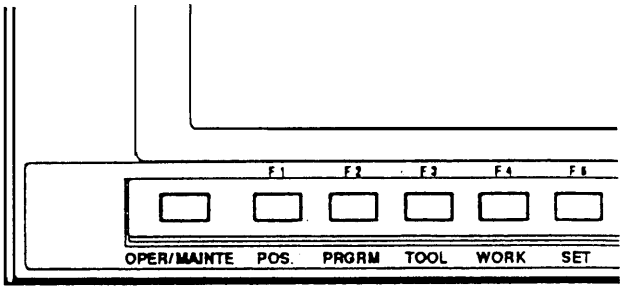
Note) *If the program No. already registered is inputted, it becomes an alarm condition.*
The program numbers in the range of 8000 and of 9000 have operation prohibited/allowed in the setting screen. Then make confirmation before inputting and outputting. (Refer to the section for setting.)

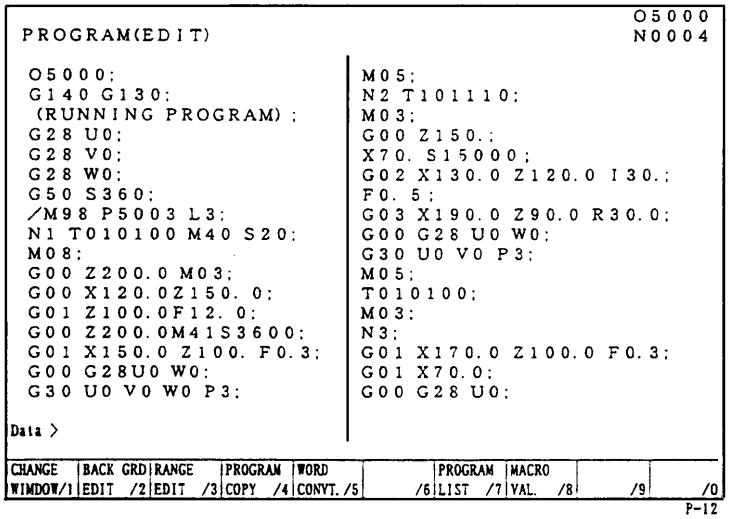
6.2 Manual registration by the address/numeral keys

1) Set a mode [EDIT].

2) Set the memory key to [WRITE].

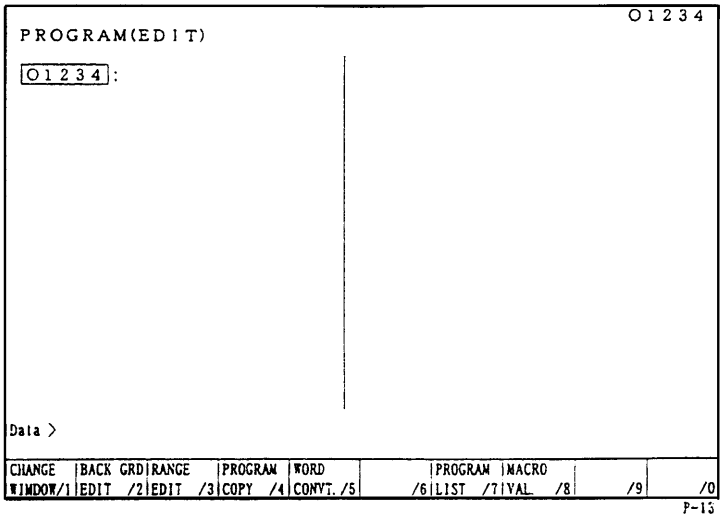
3) Press the [F2/PRGRM] key.





4) Key in a desired program No. and press the [INSERT] key.

Example: [0] [1] [2] [3] [4] [INSERT]



5) Set the cursor to ";" by the cursor key.

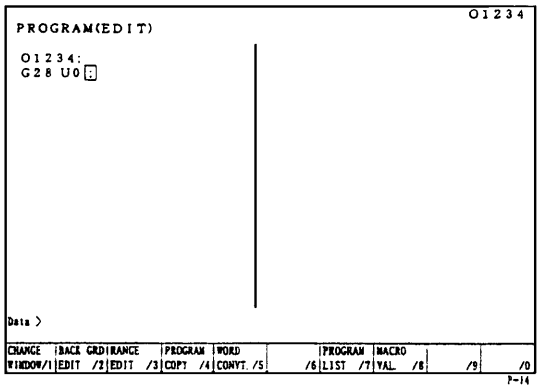
6) Input a program according to the order of the NC program.

Example:

Data>G28U0

G 2 8 U 0

EOB INSERT



- The EOB key must be inputted at the end of one block.
- Press the CANCEL key when the data which has inputted want to be deleted.
  A word deletes one by one.

7) Press the RETURN key and return to the initial screen after input of all program is completed.

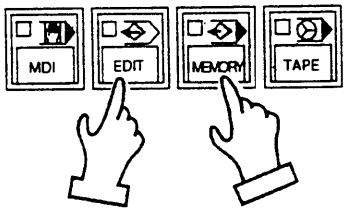
7 Program No. Search

There are following two methods to search a program.

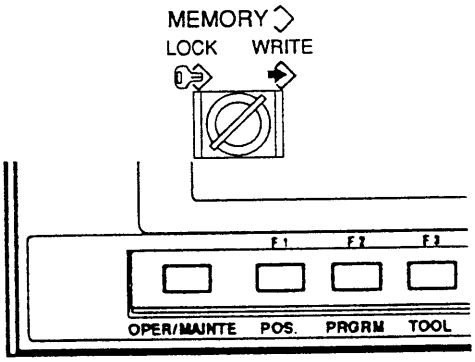
1. Search by key in a program No.
2. Search to utilize the program list.

7.1 Search by key in a program No.

1) Set a mode to the [MEMORY] or [EDIT].



2) Set the memory key to [WRITE].



3) Press the function key [F2/PRGRM] .

```
                                                        O5000
PROGRAM(EDIT)                                           N0004

 O5000;                          M05;
 G140 G130;                      N2 T101110;
  (RUNNING PROGRAM) :            M03;
 G28 U0;                         G00 Z150.;
 G28 V0;                         X70. S15000;
 G28 W0;                         G02 X130.0 Z120.0 I30.;
 G50 S360;                       F0. 5;
 /M98 P5003 L3;                  G03 X190.0 Z90.0 R30.0;
 N1 T010100 M40 S20;             G00 G28 U0 W0;
 M08;                            G30 U0 V0 P3;
 G00 Z200.0 M03;                 M05;
 G00 X120.0Z150. 0;              T010100;
 G01 Z100.0F12. 0;               M03;
 G00 Z200.0M41S3600;             N3;
 G01 X150.0 Z100. F0.3  ;        G01 X170.0 Z100.0 F0.3;
 G00 G28U0 W0;                   G01 X70.0;
 G30 U0 V0 W0 P3;                G00 G28 U0;

Data >

CHANGE WINDOW/1 | BACK GRD EDIT /2 | RANGE EDIT /3 | PROGRAM COPY /4 | WORD CONVT. /5 | /6 | PROGRAM LIST /7 | MACRO VAL. /8 | /9 | /0
                                                                                                                P-15
```

4) key in the program No. to be searched and press the [↓] key.

Example: O 1 2 3 4

[O] [1] [2] [3] [4]

[↓]

Calling up program is displayed.

```
                                                        O1234
PROGRAM(EDIT)
 O1234;                          M30;
 G28 U0;                         %
 G28 W0;
 G30 U0 W0;
 M05;
 N2 T0100;
 M03;
 G00 Z150.0;
 X70.0;
 G01 Z100.0 F0.6;
 X116.0;
 X120.0 Z95.0;
 Z90.0;
 X150.0 Z70.0;
 X180.0
 G28 U0
 G28 W0;

Data >

CHANGE WINDOW/1 | BACK GRD EDIT /2 | RANGE EDIT /3 | PROGRAM COPY /4 | WORD CONVT. /5 | /6 | PROGRAM LIST /7 | MACRO VAL. /8 | /9 | /0
                                                                                                                P-16
```

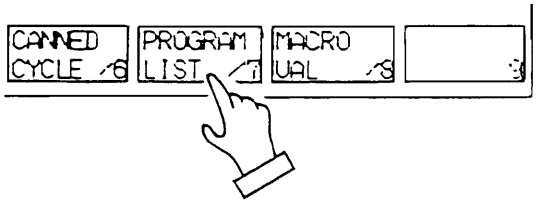
7.2 Search to utilize the program list.

1) Set a mode to the [MEMORY] or [EDIT].

2) Set the memory key to [WRITE].

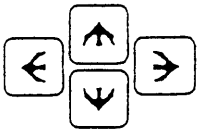
3) Press the function key F2/PRGRM .

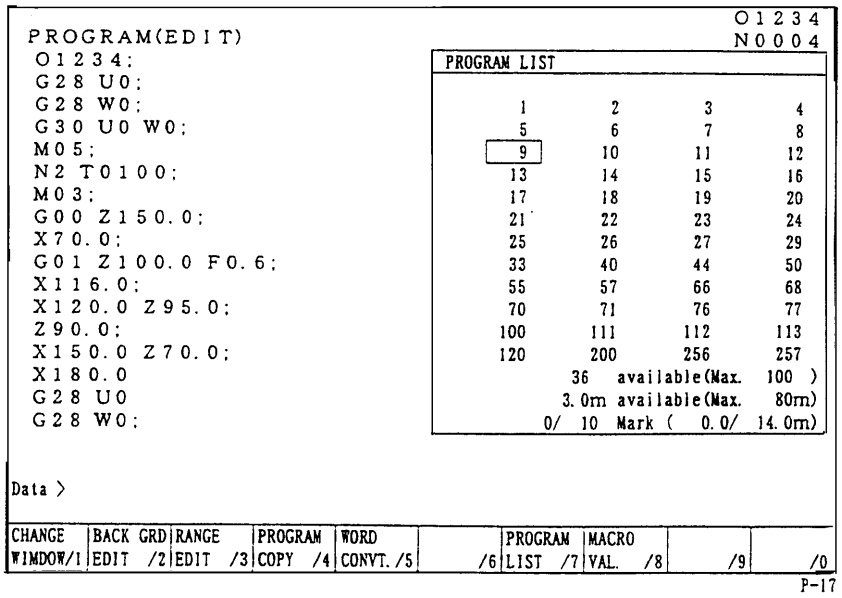
4) Press the F7/PROGRAM LIST key.



5) Set the cursor to the program No. to be searched by the cursor key and press the INPUT key.

Calling up program is displayed.





8 Edition of Program

The keys to edit a program are as follows;

INSERT : Insert a content of key input after the cursor.

ALTER : Alter a content of key input at a section of the cursor.

DELETE : Delete a section of the cursor.

Use it deletion of program as well.

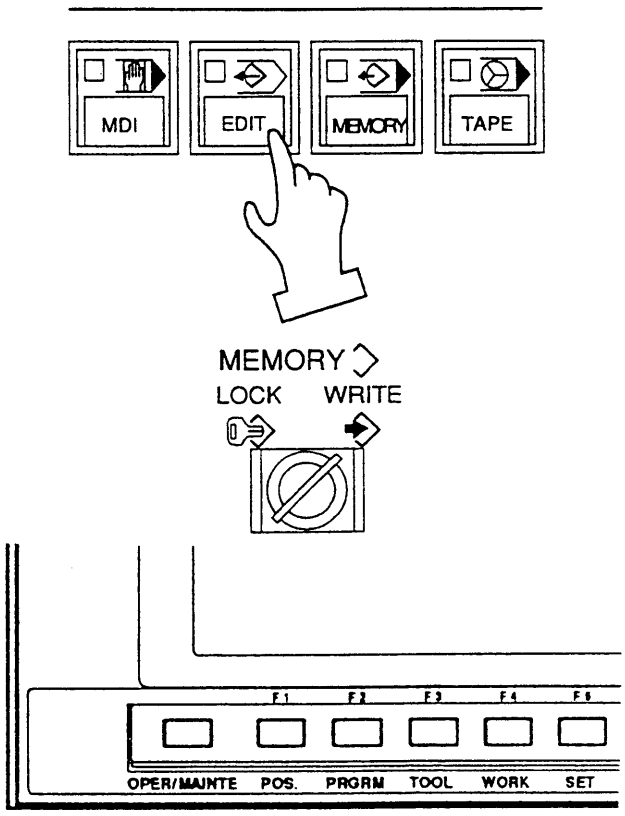
8.1 Preparation in Advance at the Time of the Edition of Program.

To edit a program, the following conditions should be made.

1) Set a mode [EDIT].

2) Set the memory key to [WRITE].

3) Press the function key F2/PRGRM .




```
                                                    O5000
PROGRAM(EDIT)                                       N0004

 O5000;                      | M05;
 G140 G130;                  | N2 T101110;
  (RUNNING PROGRAM) ;        | M03;
 G28 U0;                     | G00 Z150.;
 G28 V0;                     | X70. S15000;
 G28 W0;                     | G02 X130.0 Z120.0 I30.;
 G50 S360;                   | F0. 5;
 /M98 P5003 L3;              | G03 X190.0 Z90.0 R30.0;
 N1 T010100 M40 S20;         | G00 G28 U0 W0;
 M08;                        | G30 U0 V0 P3;
 G00 Z200.0 M03;             | M05;
 G00 X120.0Z150. 0;          | T010100;
 G01 Z100.0F12. 0;           | M03;
 G00 Z200.0M41S3600;         | N3;
 G01 X150.0 Z100. F0.3  ;    | G01 X170.0 Z100.0 F0.3;
 G00 G28U0 W0;               | G01 X70.0;
 G30 U0 V0 W0 P3;            | G00 G28 U0;

Data >

CHANGE  |BACK GRD|RANGE  |PROGRAM |WORD    |        |PROGRAM |MACRO   |        |
WINDOW/1|EDIT  /2|EDIT  /3|COPY  /4|CONVT. /5|     /6|LIST  /7|VAL.  /8|     /9|     /0|
                                                                              P-19
```

8.2 Search of Word

A word can be searched by the following method.

1) A method by means of the page and cursor keys.

[1] Press the page key and display the page to be edited.

[2] Press the cursor key and move the cursor to the word to be edited.

- The cursor moves at a block unit by the ↑ ↓ keys.
- The cursor moves at a word unit by the ← → keys.

2) A method by means of word or address search.

Since a message is displayed as “Not found” if it is not found, try it again.

[1] Word search, No. search

Key in the address and numerals to be searched and press ↓ key.

Example: M08

M 0 8 ↓

```
                                                    O5000
PROGRAM(EDIT)                                       N0004

O5000;                          M05;
G140 G130;                      N2 T101110;
 (RUNNING PROGRAM) :            M03;
G28 U0;                         G00 Z150.;
G28 V0;                         X70. S15000;
G28 W0;                         G02 X130.0 Z120.0 I30.;
G50 S360;                       F0. 5;
/M98 P5003 L3;                  G03 X190.0 Z90.0 R30.0;
N1 T010100 M40 S20;             G00 G28 U0 W0;
M08;                            G30 U0 V0 P3;
G00 Z200.0 M03;                 M05;
G00 X120.0Z150. 0;              T010100;
G01 Z100.0F12. 0;               M03;
G00 Z200.0M41S3600;             N3;
G01 X150.0 Z100. F0.3  :        G01 X170.0 Z100.0 F0.3;
G00 G28U0 W0;                   G01 X70.0;
G30 U0 V0 W0 P3;                G00 G28 U0;

Data >

CHANGE  BACK GRD RANGE   PROGRAM WORD        PROGRAM MACRO
WINDOW/1 EDIT  /2 EDIT  /3 COPY  /4 CONVT. /5  /6 LIST  /7 VAL.  /8  /9  /0
                                                                  P-20
```

Cursor

When searching a section above the current position of cursor, press the ↑ key

[2] Block search

Check a word in a block and search a block which contains a relevant word only.

Key in all address and numerals of one block then press [EOB] and [↓] key.

Example: When searching a block of G02 X130.0 Z120.0 I30.0 F0.5;

[G] [0] [2] [X] [1]
[3] [0] [.] [0] [Z]
[1] [2] [0] [.] [0]
[I] [3] [0] [.] [0]
[F] [0] [.] [5]
[EOB] [↓]

Note) *The [EOB] should be inputted at the end of a block.*

Cursor

```
PROGRAM(EDIT)                                          O5000
                                                       N0004
 O5000;                          M05;
 G140 G130;                      N2 T101110;
  (RUNNING PROGRAM) :            M03;
 G28 U0;                         G00 Z150.;
 G28 V0;                         X70. S15000;
 G28 W0;                         G02 X130.0 Z120.0 I30.;
 G50 S360;                       F0. 5;
 /M98 P5003 L3;                  G03 X190.0 Z90.0 R30.0;
 N1 T010100 M40 S20;             G00 G28 U0 W0;
 M08;                            G30 U0 V0 P3;
 G00 Z200.0 M03;                 M05;
 G00 X120.0Z150. 0;              T010100;
 G01 Z100.0F12. 0;               M03;
 G00 Z200.0M41S3600;             N3;
 G01 X150.0 Z100. F0.3   ;       G01 X170.0 Z100.0 F0.3;
 G00 G28U0 W0;                   G01 X70.0;
 G30 U0 V0 W0 P3;                G00 G28 U0;

Data >

CHANGE WINDOW/1 | BACK GRD EDIT /2 | RANGE EDIT /3 | PROGRAM COPY /4 | WORD CONVT. /5 | /6 | PROGRAM LIST /7 | MACRO VAL. /8 | /9 | /0
                                                                                                                P-21
```

8.3 Edition of Program

(1) Insertion of word, block

New word is inserted just after the word currently located the cursor.

[1] Designate a word immediately before a section to be inserted.

[2] Key in a new data to be inserted then press the [INSERT] key.

Example: when inserting X100.0 after G00

[X] [1] [0] [0] [.]
[0] [INSERT]

Cursor

```
PROGRAM(EDIT)                                                    O5000
                                                                 N0004
 O5000;                          |  M05;
 G140 G130;                      |  N2 T101110;
 (RUNNING PROGRAM);              |  M03;
 G28 U0;                         |  G00 Z150.;
 G28 V0;                         |  X70. S15000;
 G28 W0;                         |  G02 X130.0 Z120.0 I30.;
 G50 S360;                       |  F0. 5;
 /M98 P5003 L3;                  |  G03 X190.0 Z90.0 R30.0;
 N1 T010100 M40 S20;             |  G00 G28 U0 W0;
 M08;                            |  G30 U0 V0 P3;
 G00 Z200.0 M03;                 |  M05;
 G00 X120.0Z150. 0;              |  T010100;
 G01 Z100.0F12. 0;               |  M03;
 G00 Z200.0M41S3600;             |  N3;
 G01 X150.0 Z100. F0.3  ;        |  G01 X170.0 Z100.0 F0.3;
 G00 G28U0 W0;                   |  G01 X70.0;
 G30 U0 V0 W0 P3;                |  G00 G28 U0;

Data >

CHANGE WINDOW/1 | BACK GRD EDIT /2 | RANGE EDIT /3 | PROGRAM COPY /4 | WORD CONVT. /5 | /6 | PROGRAM LIST /7 | MACRO VAL. /8 | /9 | /0
```

P-22

After insertion

Cursor

```
PROGRAM(EDIT)                                                    O5000
                                                                 N0004
 O5000;                          |  M05;
 G140 G130;                      |  N2 T1000;
 (RUNNING PROGRAM);              |  M03;
 G28 U0;                         |  G00 Z150.;
 G28 V0;                         |  X70. S15000;
 G28 W0;                         |  G02 X130.0 Z120.0 I30.;
 G50 S360;                       |  F0. 5;
 /M98 P5003 L3;                  |  G03 X190.0 Z90.0 R30.0;
 N1 T0100 M40 S20;               |  G00 G28 U0 W0;
 M08;                            |  G30 U0 V0 P3;
 G00 X100.0 Z200.0 M03;          |  M05;
 G00 X120.0Z150. 0;              |  T0100;
 G01 Z100.0F12. 0;               |  M03;
 G00 Z200.0M41S3600;             |  N3;
 G01 X150.0 Z100. F0.3  ;        |  G01 X170.0 Z100.0 F0.3;
 G00 G28U0 W0;                   |  G01 X70.0;
 G30 U0 V0 W0 P3;                |  G00 G28 U0;

Data >

CHANGE WINDOW/1 | BACK GRD EDIT /2 | RANGE EDIT /3 | PROGRAM COPY /4 | WORD CONVT. /5 | /6 | PROGRAM LIST /7 | MACRO VAL. /8 | /9 | /0
```

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[3] When inserting one block, key in data of one block and press EOB and INSERT key.

(2) Alteration of word

Alter a word, the cursor located currently, to the new word.

Alteration is done by a word unit.

[1] Set the cursor to the word to be altered.

[2] Key in the new word then press the [ALTER] key.

Example: Alter S1500 to S2000.

[S] [2] [0] [0] [0]
[ALTER]

Cursor

```
PROGRAM(EDIT)                                          O5000
                                                       N0004
 O5000:                          M05:
 G140 G130:                      N2 T101110:
  (RUNNING PROGRAM) :            M03:
 G28 U0:                         G00 Z150.:
 G28 V0:                         X70. S1500 :
 G28 W0:                         G02 X130.0 Z120.0 I30.:
 G50 S360:                       F0. 5 :
 /M98 P5003 L3:                  G03 X190.0 Z90.0 R30.0:
 N1 T010100 M40 S20:             G00 G28 U0 W0:
 M08:                            G30 U0 V0 P3:
 G00 Z200.0 M03:                 M05:
 G00 X120.0Z150. 0:              T010100:
 G01 Z100.0F12. 0:               M03:
 G00 Z200.0M41S3600:             N3:
 G01 X150.0 Z100. F0.3  :        G01 X170.0 Z100.0 F0.3:
 G00 G28U0 W0:                   G01 X70.0:
 G30 U0 V0 W0 P3:                G00 G28 U0:
Data >
CHANGE WINDOW/1 | BACK GRD EDIT /2 | RANGE EDIT /3 | PROGRAM COPY /4 | WORD CONVT. /5 | /6 | PROGRAM LIST /7 | MACRO VAL. /8 | /9 | /0
P-24
```

```
PROGRAM(EDIT)                                          O5000
                                                       N0004
 O5000:                          M05:
 G140 G130:                      N2 T1000:
  (RUNNING PROGRAM) :            M03:
 G28 U0:                         G00 Z150.:
 G28 V0:                         X70. S2000 :
 G28 W0:                         G02 X130.0 Z120.0 I30.:
 G50 S360:                       F0. 5 :
 /M98 P5003 L3:                  G03 X190.0 Z90.0 R30.0:
 N1 T0100 M40 S20:               G00 G28 U0 W0:
 M08:                            G30 U0 V0 P3:
 G00 Z200.0 M03:                 M05:
 G00 X120.0Z150. 0:              T0100:
 G01 Z100.0F12. 0:               M03:
 G00 Z200.0M41S3600:             N3:
 G01 X150.0 Z100. F0.3  :        G01 X170.0 Z100.0 F0.3:
 G00 G28U0 W0:                   G01 X70.0:
 G30 U0 V0 W0 P3:                G00 G28 U0:
Data >
CHANGE WINDOW/1 | BACK GRD EDIT /2 | RANGE EDIT /3 | PROGRAM COPY /4 | WORD CONVT. /5 | /6 | PROGRAM LIST /7 | MACRO VAL. /8 | /9 | /0
P-25
```

After alteration

S1500 replaces S2000.

(3) Deletion of word, block

A word currently located the cursor or a certain boundary of a program can be deleted.

(a) Deletion of word

[1]Set the cursor to a word to be deleted.

[2]Press the DELETE key.

Example: When deleting S3600

Set the cursor to S3600 then press the DELETE key.

Cursor

```
PROGRAM(EDIT)                                          O5000
                                                       N0004
 O5000;                          M05;
 G140 G130;                      N2 T101110;
 (RUNNING PROGRAM) :             M03;
 G28 U0;                         G00 Z150.;
 G28 V0;                         X70. S15000;
 G28 W0;                         G02 X130.0 Z120.0 I30.;
 G50 S360;                       F0. 5;
 /M98 P5003 L3;                  G03 X190.0 Z90.0 R30.0;
 N1 T010100 M40 S20;             G00 G28 U0 W0;
 M08;                            G30 U0 V0 P3;
 G00 Z200.0 M03;                 M05;
 G00 X120.0Z150. 0;              T010100;
 G01 Z100.0F12. 0;               M03;
 G00 Z200.0M41S3600;             N3;
 G01 X150.0 Z100. F0.3 ;         G01 X170.0 Z100.0 F0.3;
 G00 G28U0 W0;                   G01 X70.0;
 G30 U0 V0 W0 P3;                G00 G28 U0;
Data >
CHANGE WINDOW/1 | BACK GRD EDIT /2 | RANGE EDIT /3 | PROGRAM COPY /4 | WORD CONVT. /5 | /6 | PROGRAM LIST /7 | MACRO VAL. /8 | /9 | /0
P-26
```

After deletion

S3600 is deleted.

```
PROGRAM(EDIT)                                          O5000
                                                       N0004
 O5000;                          M05;
 G140 G130;                      N2 T101110;
 (RUNNING PROGRAM) :             M03;
 G28 U0;                         G00 Z150.;
 G28 V0;                         X70. S15000;
 G28 W0;                         G02 X130.0 Z120.0 I30.;
 G50 S360;                       F0. 5;
 /M98 P5003 L3;                  G03 X190.0 Z90.0 R30.0;
 N1 T010100 M40 S20;             G00 G28 U0 W0;
 M08;                            G30 U0 V0 P3;
 G00 Z200.0 M03;                 M05;
 G00 X120.0Z150. 0;              T010100;
 G01 Z100.0F12. 0;               M03;
 G00 Z200.0M41S3600;             N3;
 G01 X150.0 Z100. F0.3 ;         G01 X170.0 Z100.0 F0.3;
 G00 G28U0 W0;                   G01 X70.0;
 G30 U0 V0 W0 P3;                G00 G28 U0;
Data >
CHANGE WINDOW/1 | BACK GRD EDIT /2 | RANGE EDIT /3 | PROGRAM COPY /4 | WORD CONVT. /5 | /6 | PROGRAM LIST /7 | MACRO VAL. /8 | /9 | /0
P-27
```

(b) Deletion of block

It can be deleted one block at a time.

[1] Set the cursor to the head of the block to be deleted.

[2] Press the EOB and DELETE .

Example: When deleting a block

G01 X170.0 Z100.0 F0.3;

Set the cursor to G01 and press the EOB and DELETE key.

Cursor

```
PROGRAM(EDIT)                                                    O5000
                                                                 N0004
 O5000;                          M05;
 G140 G130;                      N2 T101110;
  (RUNNING PROGRAM) :            M03;
 G28 U0;                         G00 Z150.;
 G28 V0;                         X70. S15000;
 G28 W0;                         G02 X130.0 Z120.0 I30.;
 G50 S360;                       F0. 5;
 /M98 P5003 L3;                  G03 X190.0 Z90.0 R30.0;
 N1 T010100 M40 S20;             G00 G28 U0 W0;
 M08;                            G30 U0 V0 P3;
 G00 Z200.0 M03;                 M05;
 G00 X120.0Z150. 0;              T010100;
 G01 Z100.0F12. 0;               M03;
 G00 Z200.0M41S3600;             N3;
 G01 X150.0 Z100. F0.3  :        G01 X170.0 Z100.0 F0.3;
 G00 G28U0 W0;                   G01 X70.0;
 G30 U0 V0 W0 P3;                G00 G28 U0;

Data >

CHANGE  BACK GRD RANGE   PROGRAM WORD        PROGRAM MACRO
WINDOW/1 EDIT /2 EDIT /3 COPY /4 CONVT. /5 /6 LIST /7 VAL. /8 /9 /0
```

P-28

After deletion

The block G01 ... is deleted and program moves upward.

Cursor

```
PROGRAM(EDIT)                                                    O5000
                                                                 N0004
 O5000;                          M05;
 G140 G130;                      N2 T10 00;
  (RUNNING PROGRAM) :            M03;
 G28 U0;                         G00 Z150.;
 G28 V0;                         X70. S15000;
 G28 W0;                         G02 X130.0 Z120.0 I30.;
 G50 S360;                       F0. 5;
 /M98 P5003 L3;                  G03 X190.0 Z90.0 R30.0;
 N1 T0100 M40 S20;               G00 G28 U0 W0;
 M08;                            G30 U0 V0 P3;
 G00 Z200.0 M03;                 M05;
 G00 X120.0Z150. 0;              T0100;
 G01 Z100.0F12. 0;               M03;
 G00 Z200.0M41S3600;             N3;
 G01 X150.0 Z100. F0.3  :        G01 X70.0;
 G00 G28U0 W0;                   G00 G28 U0;
 G30 U0 V0 W0 P3;

Data >

CHANGE  BACK GRD RANGE   PROGRAM WORD        PROGRAM MACRO
WINDOW/1 EDIT /2 EDIT /3 COPY /4 CONVT. /5 /6 LIST /7 VAL. /8 /9 /0
```

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(c) Boundary deletion

Delete blocks after the cursor to before the designated sequence No.

[1] Set the cursor to the head word to be deleted.

[2] Key in the sequence No. just after the last block to be deleted and press the [DELETE] key.

Note) *Search the sequence No. before deletion and check how far is it deleted.*

Example: When deleting

G00 Z150. 0;

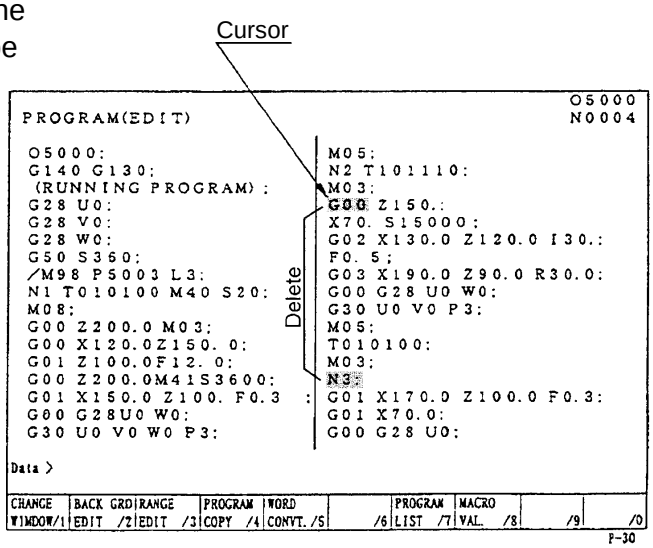
⁀

M03;

Set the cursor to G00 and press [N] [3]

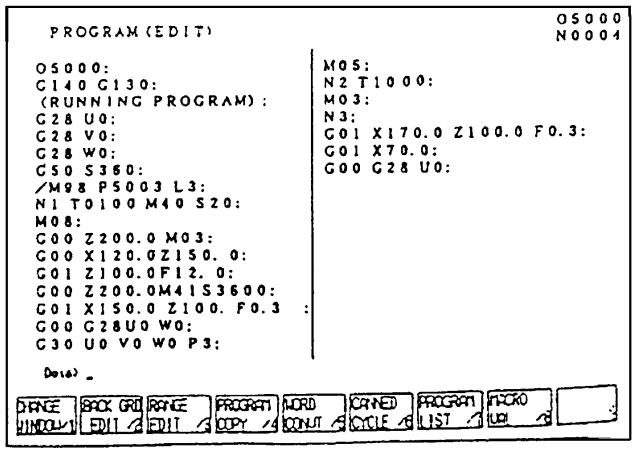
[DELETE] key.

The block from the cursor position to the just before the sequence number N3 will be deleted.



After alteration

The program moves upward.



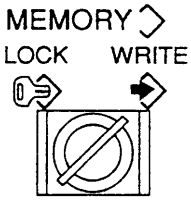
8.4 Back Ground Editing

Generally, “Editing” means front side editing, however this editing could not watch contents of program and also edition is not available while executing a program.

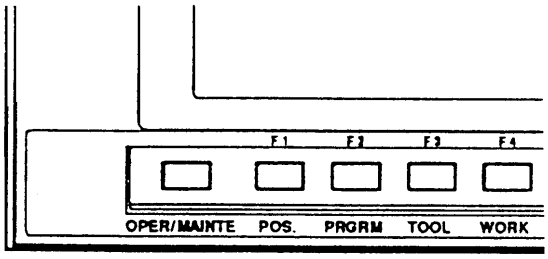
In fact, giving a possibility to edit a program while executing a program is a back ground editing.

- An editing is available to other than currently executing program.
- A program under back ground editing can not execute.
- Editing can be done both manual and automatic mode.

1) Turn the memory key to [WRITE].

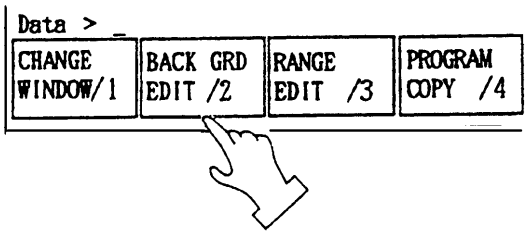


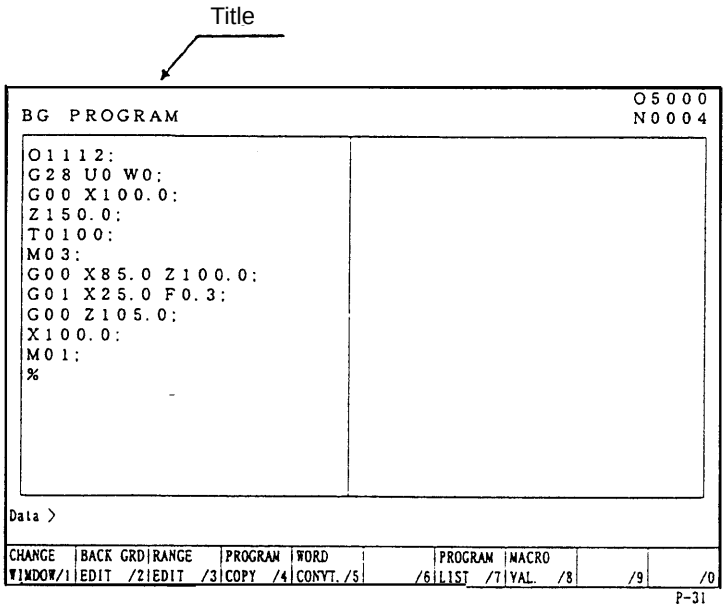
2) Press the F2/PRGRM key.



3) Press the F2/BACK GRD EDIT key.

A title of the screen becomes a “Back ground editing”





4) Search a program wanted to edit.

A procedure of search is exactly same as a (front) editing.

Caution

Never execute a reset operation, since the machine will stops if reset is done during machine operation at the time of back ground editing.

5) Execute edition of program.

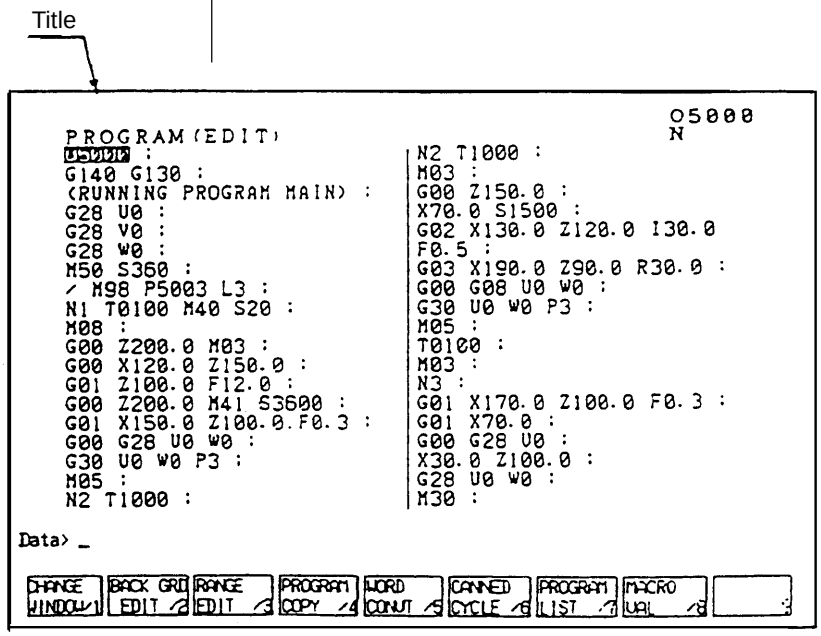
A procedure of edition is exactly same as a (front) editing.

6) End of back ground editing

[1] Press the
BACK GRD EDIT key.

A title of screen becomes a “Program”.

It becomes normal editing screen.



8.5 Copy of Program

A program being displayed can be copied on the other number and displayed.

1) Display a program wanted to be copied.

2) Key in a new program No. and press
INPUT key.

Example: When altering to O2001

O 2 0 0 1 INPUT

8.6 Editing Procedure of Range Designation (Expanded Tape Editing/Option)

Designate a range of program and this “Insertion”, “Deletion” or “Storage” can be done at the program screen.

- Starting of range editing
  Operation..... Press the F3/RANGE EDIT key.
  The function changes into that for range editing.
- Designation of range
  Operation..... Press the F4/RANGE SET key.
  The cursor becomes a frame.
  A cursor range increases by moving this. That is a range.
- Release a designation of range
  Operation..... Press the F4/RANGE SET key and F3/EXIT key.
  It becomes a normal cursor and a range is released.
- Storage of range
  Operation..... Press the F5/RANGE STORE key.
  A part of range is stored.
  If a size of range exceeds 2,048 characters (approx. 5m), “Range exceeds a limit.” is displayed and not stored.
  It can be used by the range insertion at any time, since it is stored until a power turned off.
- Insertion of range
  Operation..... Press the F6/STORE→INSERT key.
  Insert a part of storage after the cursor by storage of range.
- Deletion of range
  Operation..... Press the F7/RANGE DELETE key.
  A part designated by range is deleted.
  If the size of range exceeds 2,048 characters (approx. 5m), a message “Range exceeds limit” is displayed and the storing is ineffective.
  While the source power is kept on, the stored data is maintained and the data is available by F8/DELETE→INSERT whenever desired.
- Inserting deletion
  Operation..... Press the F8/DELETE→INSERT key.
  The portion stored by range deletion is inserted at the cursor position.

8.7 Alteration of Word (Expanded Tape Editing)

At the program screen, search a designated word to be altered in the program and rewrite it to a word to be altered.

There are following two methods for alteration of word.

1) Search one word each and alter if after confirmation.
2) Alter words collectively (or after words continuously with display an altering condition).
   The words to be altered collectively are maximum 400,000 words.

A method to search a word is the same as the word search, words combined one character of alphabet (or “#” mark) and numerals becomes the number search as words showing the numeral value and recognize it with or without a decimal point.

For example, of changing “X.1” to “X.5”, a row of characters such as “X0.1”, “X0.100”, “X00.10”, “X.1” or “X.100” which coincide with “X.1” as numeral value, become the object of alteration and change all to “X.5”.

Also, if adding a “?” mark on the word to be changed as “X.1?” such as changing “X.1?” to “X.5”, a row of characters “X.1” becomes the object of alteration, then “X1” becomes “X.5” and “X.100” becomes “X.500”, however, “X.01”, “X0.100” and “X00.10” does not have the row of character “X.1” so it does not become an object of alteration.

Outline of operation

[1] Start alteration of word by pressing the F5/WORD CONVT. key.
INPUT in the order of a word to search and alter then a word to replace it.
If replacing word is blank, it becomes a deletion.

[2] When searching a word one by one, designate a searching direction by the cursor ↑, ↓ and press the Y key if found a word to be altered.

[3] For altering a word contained in many places of the file collectively, designate the searching direction by the function menu. Confirm that such overall alteration is unmistakable, then press Y key.
Once word alteration starts, it goes on to the beginning or end of the file, depending on the searching direction. For suspending the alteration,
Press the F5/EXIT key.
In case of the alteration of words collectively as mentioned item [3], alter it except a row of characters in the comment. To change inside of comment, alter it by the method [2].

OPERATION MESSAGE

F5/WORD CONVT. ..... “INPUT a word to be altered.”

Input the word to be altered ..... “Input the word to be altered.”

Input the word to be replaced ..... “Alter word from....to....”

The words are to be searched by cursor using ↑, ↓ keys. “Alter word from....to....”

... INPUT as it is blank ..... “Delete a word.....”

...Alteration of word will be completed even if pressing the CANCEL key from ● mark.

...Designate a searching direction of word by ↑, ↓ key.

...If it is not found ..... “Not found”

...“Search by cursor ↑, ↓ .”

...If it is found ..... “Alter a word....to....”

...Alter by Y key.

F1/BLANKET ALL	Regardless of cursor position, searching starts with the program head.
F2/BLANKET BEFORE	Searching takes place in the forward part following the cursor including the word with the cursor.
F3/BLANKET AFTER	Searching takes place in the backward part preceding the cursor including the word with the cursor.

...By operating ↑, ↓ keys collective alteration starts.

...Alteration is executed by pressing Y key.

When alteration has be completed ..... “Word replaced”

When the word is not found ..... “Not found”,

..... “0 word replaced”

Press F5/EXIT key. ..... “Alteration suspended”

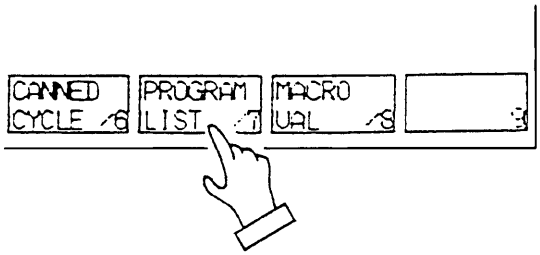
8.8 Deletion of Program

There are following two methods to delete a program.

1. Delete it by the program list screen.
2. Delete it by key input at the program screen.

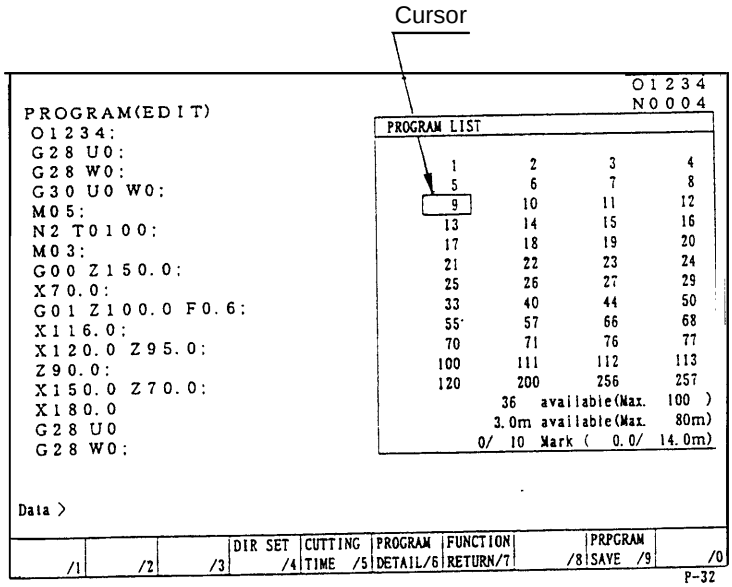
1) Deleting method by the program list screen.

[1] Press the F7/PROGRAM LIST key at the program screen.



[2] Set the cursor at the program to be deleted by the program list.

Press the cursor ↑ ← → ↓ key.



[3] Press the DELETE key.

[4] Against a message “Is it all right to delete ?”, press the Y key if you agree.

A program which is designated by the cursor is deleted.

2) Deleting method by key input

[1] Display the program screen.

[2] Key in the program No. to be deleted and press the [DELETE] key.

Example: In case of deleting O100 — [O] [1] [0] [0] [DELETE]

[3] Against a message “Is it all right to delete?”, press the [Y] key if you agree.

A program keyed in is deleted.

3) Continuous deletion by Program No.

[1] Press [F7/PROGRAM LIST] .

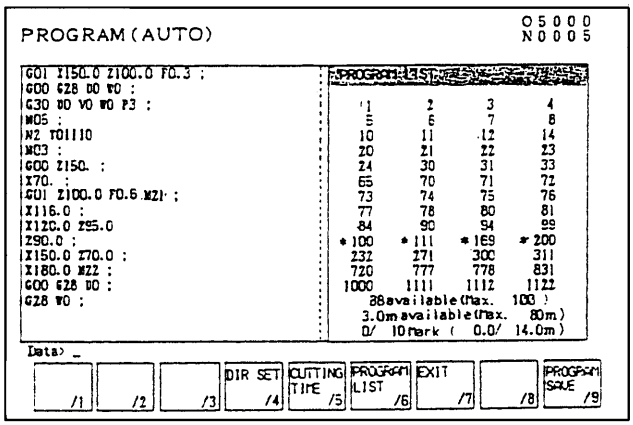
[2] Place the cursor at the Program No. to be deleted then press [SPACE] . An asterisk marked at the head of the Program Nos. selected.

Example: Screen display shown below is the case of deleting Program

Nos.O100, O111, O169, O200.

[3] Press the [DELETE] key.

For deleting the entire program, press [ORIGIN] and [DELETE] keys.



8.9 Arrangement of Program

When editing a program, a size of program becomes larger than actual size occasionally.

In this case, available memory can be increased a little by arrangement of program.

This operation is called “Condensation”.

Operation ••• Confirm that it is in the editing mode, not background editing, and NC is in reset condition. (When there is secondary series or background drawings, it must also be in reset condition.)

Press the [F1/CONDENSE] key.

A message “Condensing” appears on the display, then after a while, it changes to “Condense complete”.

It takes several seconds to several minutes to complete condensation, depending on the size of memory and the condition of memory usage. If any key is touched during condensing, the message “Condensing” disappears and the process is suspended.

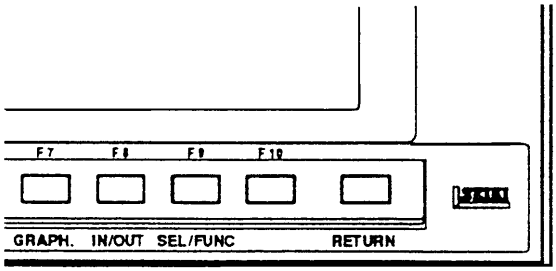
Caution

If source power is switched off during “Condensing”, the program is destroyed. When program is found to be abnormal, initialize the program memory, then arrange program input anew.

8.10 Process After Edition

Press the RETURN key.

Return to the initial screen.



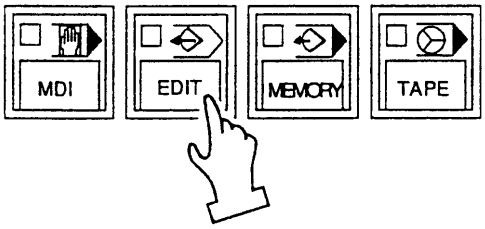
9 Output of Program

NC program can be outputted to the external in/output equipment.

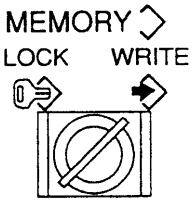
1) Connect an output device to the RS-232-C terminal and make it ready.

Refer to the instruction manual of output device.

2) Make a mode selection to [EDIT] mode.



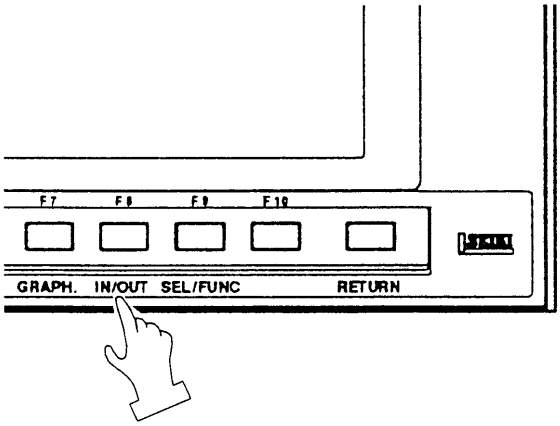
3) Set the memory key to [WRITE].



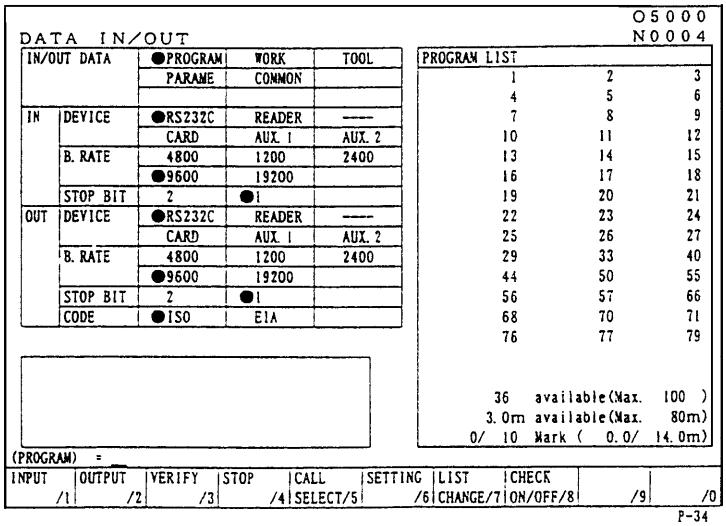
4) Press the function key

F8/IN/OUT .

Note) *When "Dondon FD" is on the screen display, press the* F5/DONDON FD COMPLETE *key, and get the "Data Output" screen.*



A right sketch is displayed.



5) By pressing F7/ LIST CHANGE key, The display of Program No. List is switched over to that of Program No. Detail.

O To select Program No.

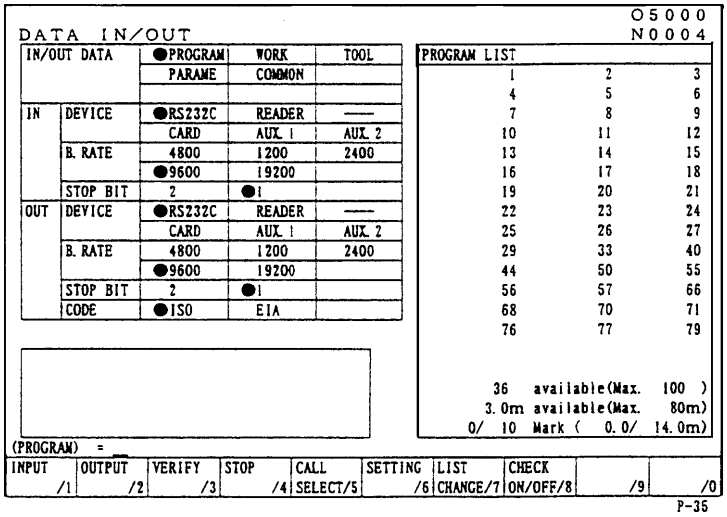
Place the cursor at the Program No. to be selected then press SPACE.

An asterisk is marked at the head of the Program No. selected.

When selecting all programs, repeat pressing ORIGIN several times until the mark "*" is displayed.

Example: O5, O6, O7.

5) Press the F2/IN/OUT , and the selected program is output.



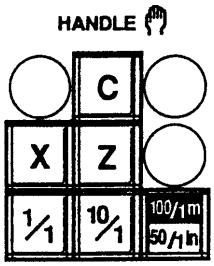
6) Press the RETURN key after completion of output and return to the original screen.

10 Setting of Tool Compensating Amount

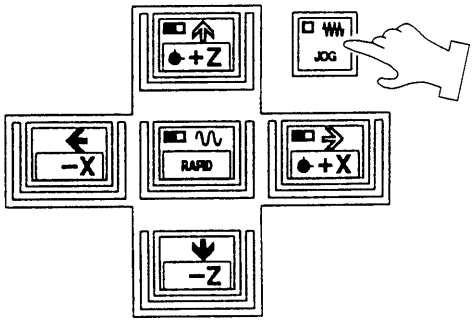
A tool compensating amount is set automatically by touching a tool tip to the sensor of Q-setter. In this chapter explains a setting method of tool compensating amount by manually.

10.1 Setting of Tool Compensating Amount

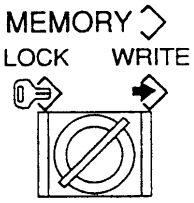
1) Select the manual mode.



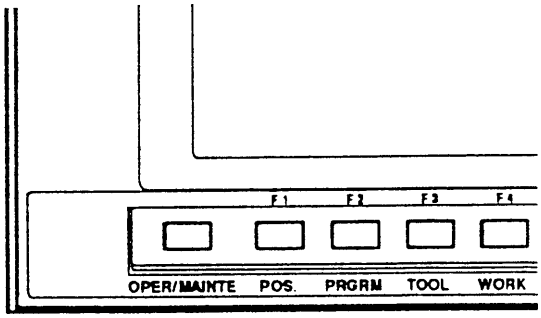
or



2) Set the memory key to [WRITE].

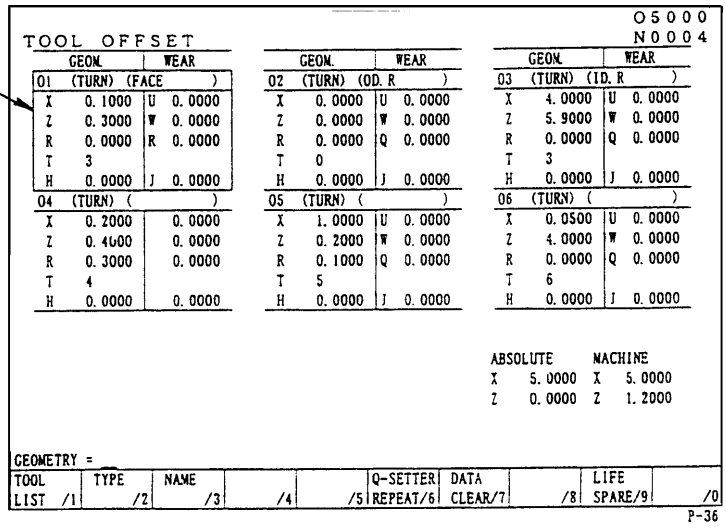


3) Press the function key F3/TOOL at the initial screen.



Cursor

A right sketch is displayed.



O5000
N0004

TOOL OFFSET

	GEOM.		WEAR		GEOM.		WEAR		GEOM.		WEAR
01	(TURN)	(FACE	)	02	(TURN)	(OD. R	)	03	(TURN)	(ID. R	)
X	0. 1000	U	0. 0000	X	0. 0000	U	0. 0000	X	4. 0000	U	0. 0000
Z	0. 3000	W	0. 0000	Z	0. 0000	W	0. 0000	Z	5. 9000	W	0. 0000
R	0. 0000	R	0. 0000	R	0. 0000	Q	0. 0000	R	0. 0000	Q	0. 0000
T	3			T	0			T	3		
H	0. 0000	J	0. 0000	H	0. 0000	J	0. 0000	H	0. 0000	J	0. 0000
04	(TURN)	(	)	05	(TURN)	(	)	06	(TURN)	(	)
X	0. 2000		0. 0000	X	1. 0000	U	0. 0000	X	0. 0500	U	0. 0000
Z	0. 4000		0. 0000	Z	0. 2000	W	0. 0000	Z	4. 0000	W	0. 0000
R	0. 3000		0. 0000	R	0. 1000	Q	0. 0000	R	0. 0000	Q	0. 0000
T	4			T	5			T	6		
H	0. 0000		0. 0000	H	0. 0000	J	0. 0000	H	0. 0000	J	0. 0000

ABSOLUTE		MACHINE	
X	5. 0000	X	5. 0000
Z	0. 0000	Z	1. 2000

GEOMETRY =

TOOL LIST /1	TYPE /2	NAME /3	/4	/5	Q-SETTER REPEAT/6	DATA CLEAR/7	/8	LIFE SPARE/9	/0

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a) Tool offset data has geometry and wear offset for each offset No. respectively.

Tool compensating amount by the Q-setter is inputted in the column of geometry offset.

b) A cursor moves up and down every time of pressing the cursor key.

c) Each address is as follows;

X : Compensating amount of diametrical direction

Z : Compensating amount of longitudinal direction

R : Size of nose R

T : Nose point

H : Compensating amount of groove width

U : Incremental compensating amount of diametrical direction

W: Incremental compensating amount of longitudinal direction

Q : Incremental amount of nose R

J : Incremental compensating amount of groove width

4) Set the cursor to the tool No. to be set a tool compensating amount and address.

5) Key in a compensating amount (setting amount) and press the INPUT key.

Compensating amount (setting amount) has a decimal point and minimum unit is 0.001mm.

If a geometry offset is inputted, a wear offset amount being stored so far becomes zero.

Note *1) A wear offset amount beyond 1mm can not be inputted at one time.*

divide a compensating amount within 1mm and input it by several times.

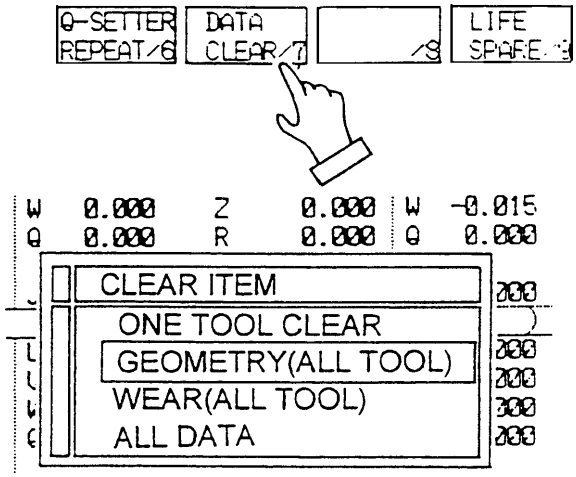
2) Wear compensating amount can be inputted at any mode.

3) Wear compensating amount adds every input.

10.2 Deletion of Tool Compensating (Setting Amount)

1) Select the manual mode.
2) Set the memory key to write.
3) Set the cursor to the offset No. to be deleted.
4) Press the [F7/ DATA CLEAR] key.

Deleting items are displayed on the screen.



- One tool deletion : Delete whole setting amount of offset No. designated by the cursor.
- Geometry (All tools) : Delete geometry setting amount of all offset No.
- Wear (All tools) : Delete wear setting amount of all offset No.
- All data : Delete all setting amount.

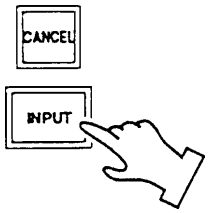
5) Set the cursor any of deleting item.
6) Press the [INPUT] key.

Asking a question whether delete or not.

7) Press the [Y] key when deleting.

(Press the [N] key when not deleting.)

A setting amount to be deleted is deleted.



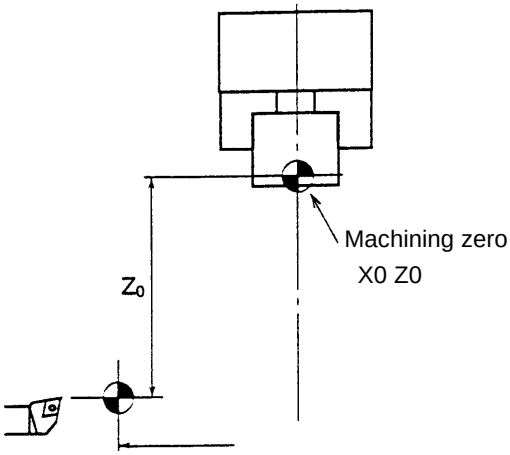
Note) *In case of execution of one tool deletion, it is required to set the cursor to the Offset No. to be deleted before pressing the [F7/DATE CLEAR] key.*

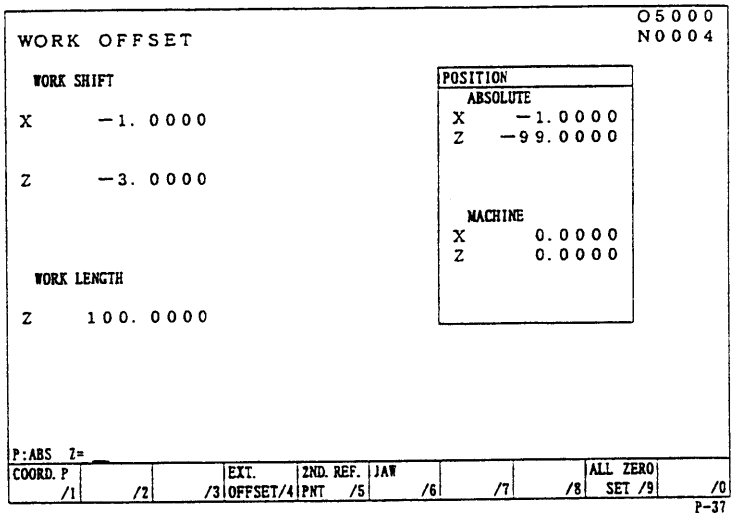
To change an offset No. after display a deleting item, press the [F7/DATA CLEAR] key once and return a previous screen then set the cursor to the No. to be deleted again.

11 Setting of Work Coordinate System Shift Valve

11.1 Tool Tip Position Setting of Standard Tool at Machine Zero Point.

Must be obtained a tool tip position by setting of the X axis work shift amount, how much apart a tool tip position of the standard tool at the machine zero point from machining zero point (X0, Z0) before execute a program check or machining by a program, and input it to the NC unit.





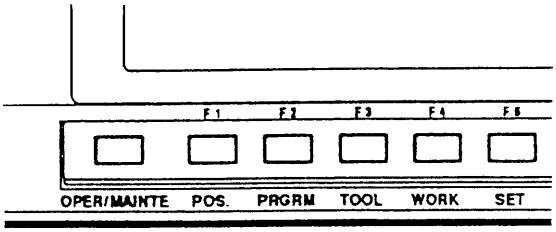
Shift amount setting procedure of Z axis work shift coordinate system.

[1] Chuck a workpiece and turn an end surface of workpiece by manual mode.

Note) *Never move on the Z axis at the time of retracting a tool.*

[2] Stop the spindle.

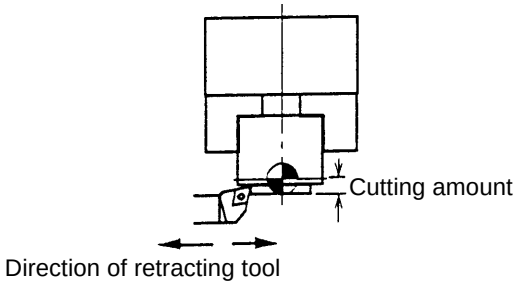
[3] Display a work coordinate system screen.

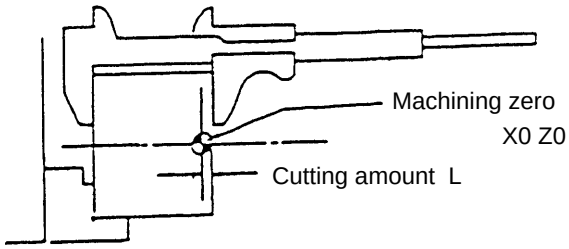


[4] Measure a total length of a work-piece and get a cutting amount ℓ .

Example

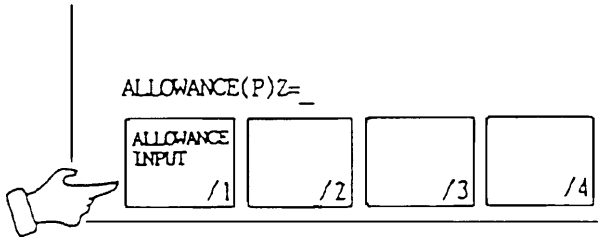
ℓ =1.35





[5] Press the function key
F1/ALLOWANCE INPUT .

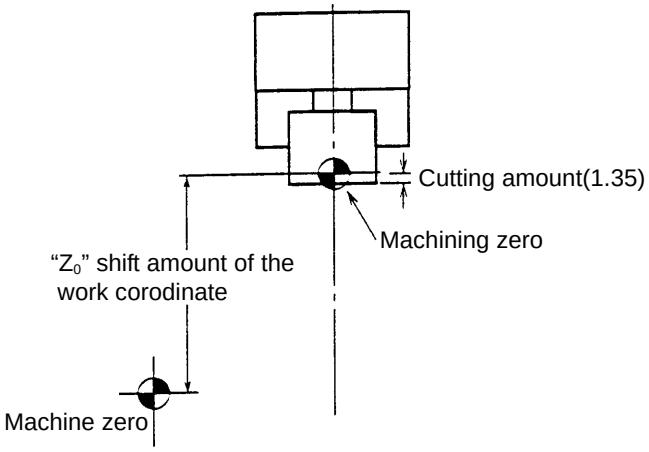
"Allowance (P) Z = " is displayed on the lower left of the screen.



[6] Input the cutting allowance (Allowance).

It is written at the "Z" of the machining reference point shift automatically.

1 . 3 5 INPUT



[7] Execute zero return.

Note *1) The following operation must be executed if execute input or alteration of cutting amount (Measured value).*

Set up is done by executing the following operation, the distance from machine zero to the tool tip point is displayed properly.

a) Manual zero return.

b) Manual index.

c) Command and execution of TΔΔΔΔby a program (MDI is available as well.).

2) Direct input (ZΔΔΔΔ) or addition and reduction (I = Incremental input Z = ΔΔ) are available as usual.

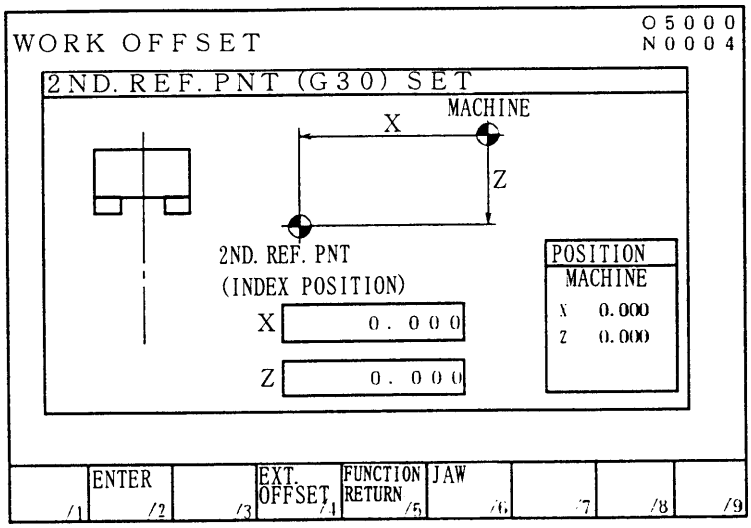
3) A work shift amount of X axis has set by the parameter already.

See the display of the machining reference point of the work coordinate system screen to confirm.

11.2 Setting of 2nd Origin Point

A 2nd Origin Point is easily set as follows.

1) Press the F5/2ND ORIGIN POINT RETURN key.



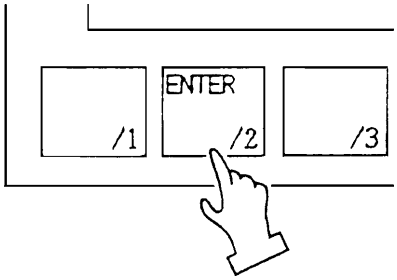
2) Move the tool rest to the position where the 2nd Original Point is to be set, by handle operation or jog feeding.

3) Press the F2/ENTER key.

   Answering the query “YES (Y) OR NO(N)”, if affirmative, press Y key.

   Setting of 2nd Origin Point now completes.

4) Press the F5/WORK (DATA) key to return the initial screen display.

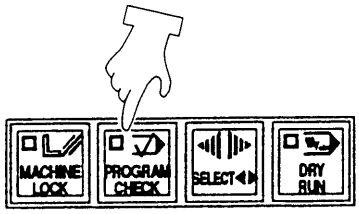


12 Automatic Operation

12.1 In Case of Machining of the First Workpiece with Confirmation of Newly Produced Program

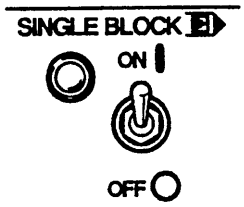
[1] Program Check Operation

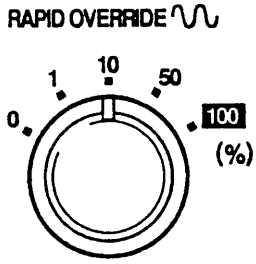
Move the machine by a program without the spindle rotation and check a tool movement, interference of tool and contents of a program.



Preparation before program operation

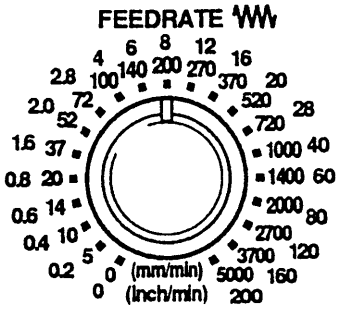
1) Call a program.
2) [LOCK] the memory key.
3) Check the input of tool position offset, tool tip point and tool nose R properly.
4) A workpiece should be off.
5) Set the switch of the operation panel as shown the right sketch.
   - Program check mode
   - Single block
   - Rapid traverse override at 10%





Operation

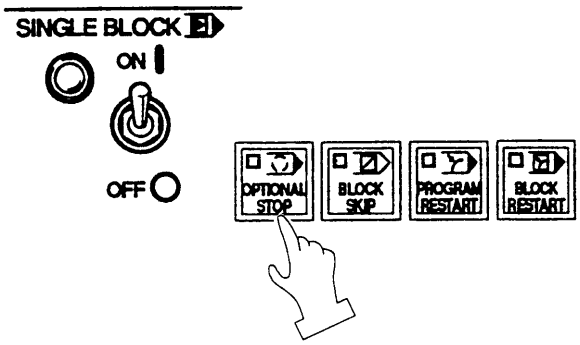
1) Set a mode key to [MEMORY].
2) Press a program screen key.
3) Press a reset key.
4) Program start (After checking of motion of one block, preys the [START] button again and proceed a program consecutively).
5) Adjust a “Feed speed” by a feed speed dial.
6) Check a motion until end of a program.
7) Press a “Program check” and release if all motion is correct.

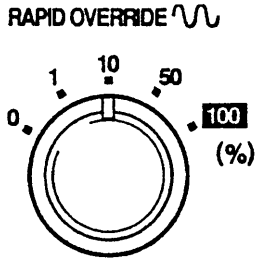


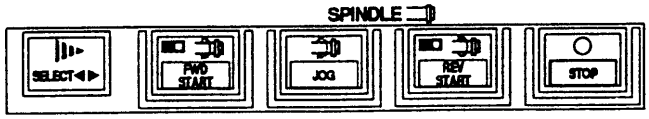
[2] Test Cutting

Cut a workpiece by single block mode if no trouble is found by program check.

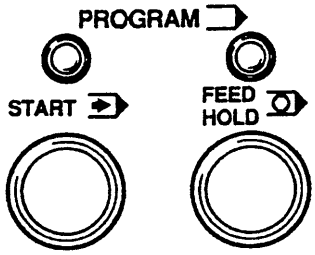
1) Press key set as right sketch.
   - Single Block [ON].
   - Optional stop [ON].
   - Rapid traverse override at 10%
2) Chuck a workpiece and check run out of a workpiece by pressing the spindle inching key.

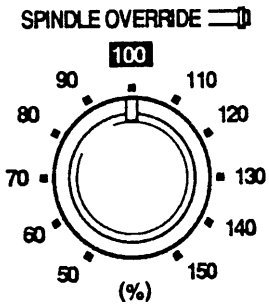


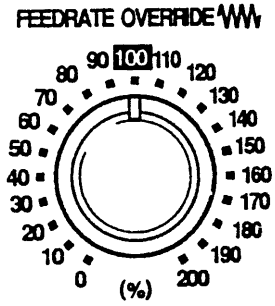




3) Close the door.
4) Press a program automatic operation key. (Press the [START] button again after checking of motion of one block then proceed a program consecutively.)
5) Adjust a spindle override and federate override by watching a cutting condition. (After that modify a program.)
6) In case of motion of axis want to be stopped, press a [HALT] button.
7) At the time of completion of machining of one tool, stop the machine by “M01” then check a dimension.







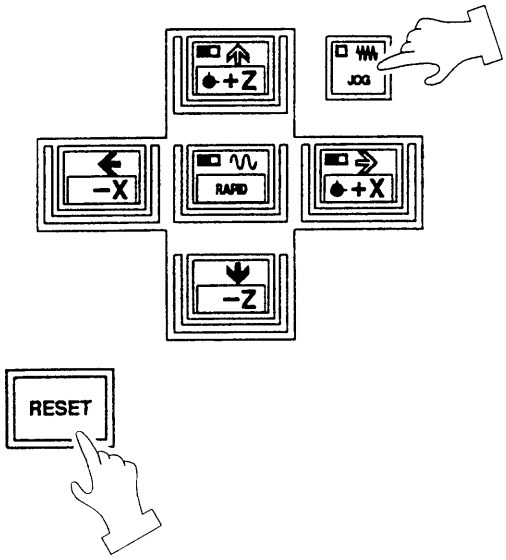
12.2 Start from Middle of a Program

Operation method in case of program edit and restart when a program is stopped by an alarm etc..

1) Retract the tool from the workpiece by handle or feed.
2) Stop spindle rotation and coolant and press RESET button.

   Reset a program.
3) Check a cause of an alarm and treat it.
4) Set a mode to the [MEMORY].
5) Heading the program on the “Program” screen.

   (Press the reset button.)
6) Search a sequence number of a tool to be restarted.



Restart from the beginning of process.

Restart should always be done from the beginning of tool arrangement. Never restart midway of machining process, as it is dangerous.

⚠ WARNING

1. Don’t touch the tool by hand during spindle rotation.
2. Press program [STOP] or [EMERGENCY STOP] button if the machine moves unexpected direction or unexpected condition is occurred.

12.3 Continuous Machining Operation

1) Set each switch on the operation panel.

[1] Turn “OFF” the single block switch.

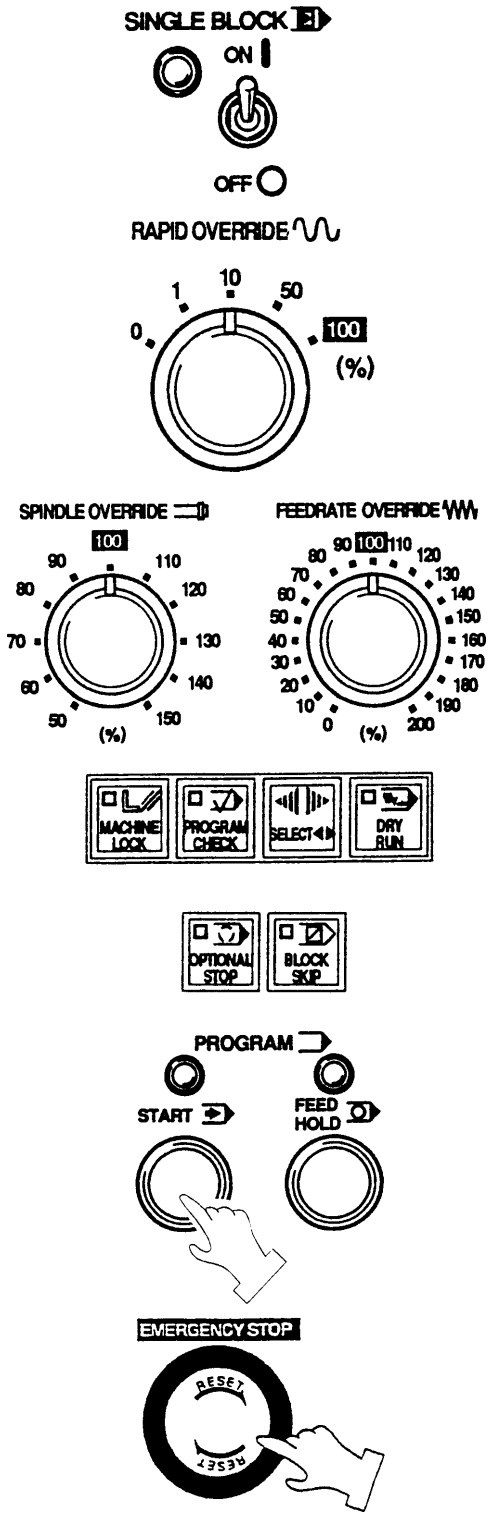
[2] Set the override switch of federate and spindle at 100%.

[3] Set the rapid traverse override at 100%.

[4] Turn off dry run, tape check and machine lock. (Lamp is turned off)

[5] Set the switch of optional stop or block skip if necessary.

2) Press program [START] button.



⚠ WARNING

In case of temporary stop is required during operation, press program

[HALT] button or turn “ON” single block switch.

Also, if unexpected condition occurs, press [EMERGENCY STOP] button and stop the machine immediately.

Caution

1. When rotating the spindle, the command should initially be adjusted at a low speed (rpm abt. 100) and, by operating the inching key, confirm the sway condition of the workpiece.
2. In all circumstances, for safe cutting, the upper limit of spindle rpm is set in the program. Especially when special jaws such as high jaw or some special fixing device are attached to spindle, a safe revolving speed should be programmed for the spindle rotation.

12.4 In Case of Insertion of Manual Operation During Automatic Operation

1) Press program [HALT] button and stop the machine temporarily (Red lamp, upper right of halt button, is it) or stop by turn [ON] single block switch.

2) Shift a mode switch to [HANDLE] or feed and execute manual operation.

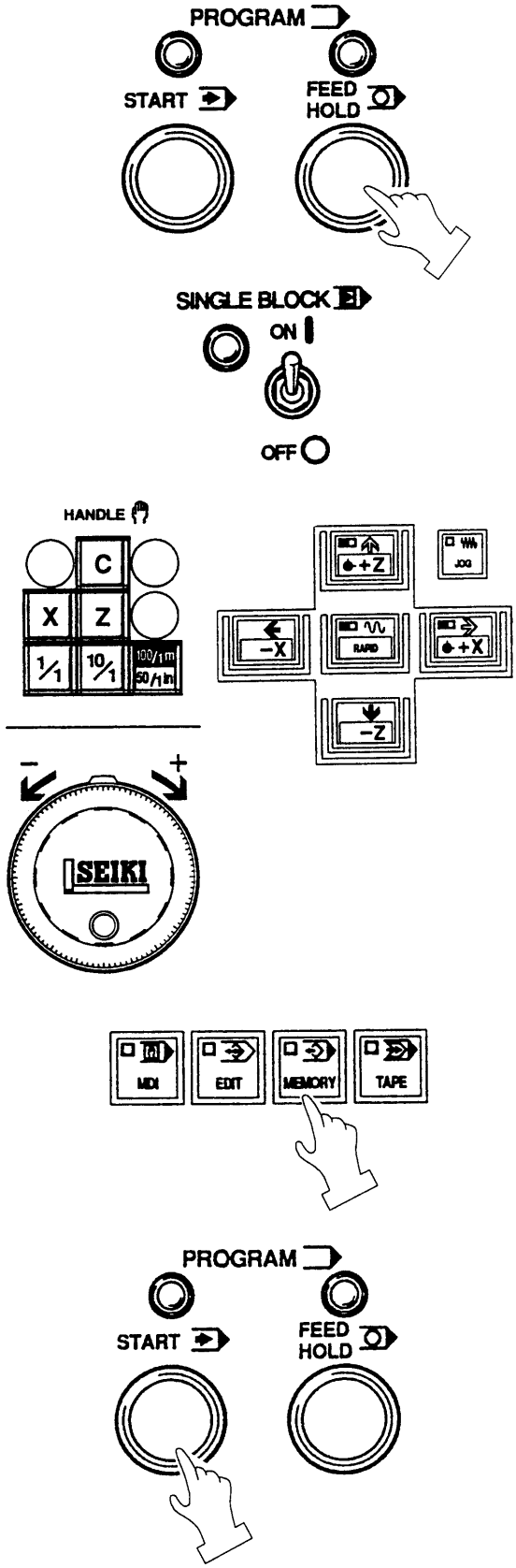
   Start the spindle if spindle stop is executed.

3) Return mode to [MEMORY] after completion of manual operation.

4) If pressing the program [START] button, the program restart.

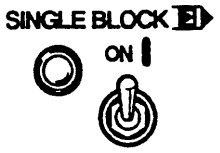
Caution

1. At first, execute an automatic operation by the single block. Enter the continuous operation after confirmation of motion of the tool head etc. are correct.
2. [FEED HOLD] button, action of M, S and T function is continued until end of the motion. If motion is not completed, manual operation is not available.

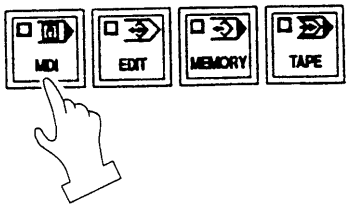


12.5 In Case of MDI Operation in Middle of Automatic Operation

1) Turn [ON] the single block switch on operation panel.

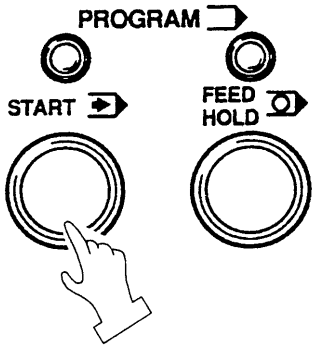


2) Shift a mode to [MDI] after machine motion is stopped.

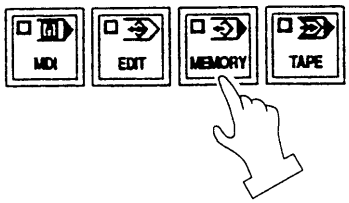


3) Display the program operation screen by pressing the program key.

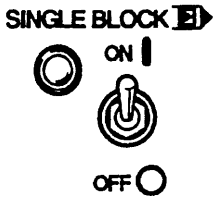
4) Input a required action by address keys and numeral keys and press the INSERT key.



5) Press the program [START] button after confirmation of input data of [MDI].



6) To restart automatic operation, shift a mode to [MEMORY] and turn [ON] single block switch.

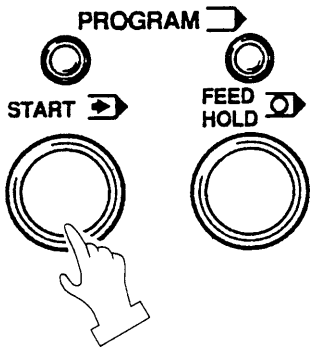


7) Press the program [START] button.

Caution

At first, execute an automatic operation by the single block.

Enter the continuous operation after confirmation of motion of the tool head etc. are correct.



⚠ WARNING

If continue an automatic operation after inputting only by MDI and not executed it, unexpected motion may occur due to contents of buffer by automatic operation is replaced with unexecuted buffer contents of MDI. Pay attention to danger.

13 Setting (Data)

13.1 Outline

Various setting data required to operate the machine can be set.

The setting (Data) screen is displayed by pressing the F5/SET key.

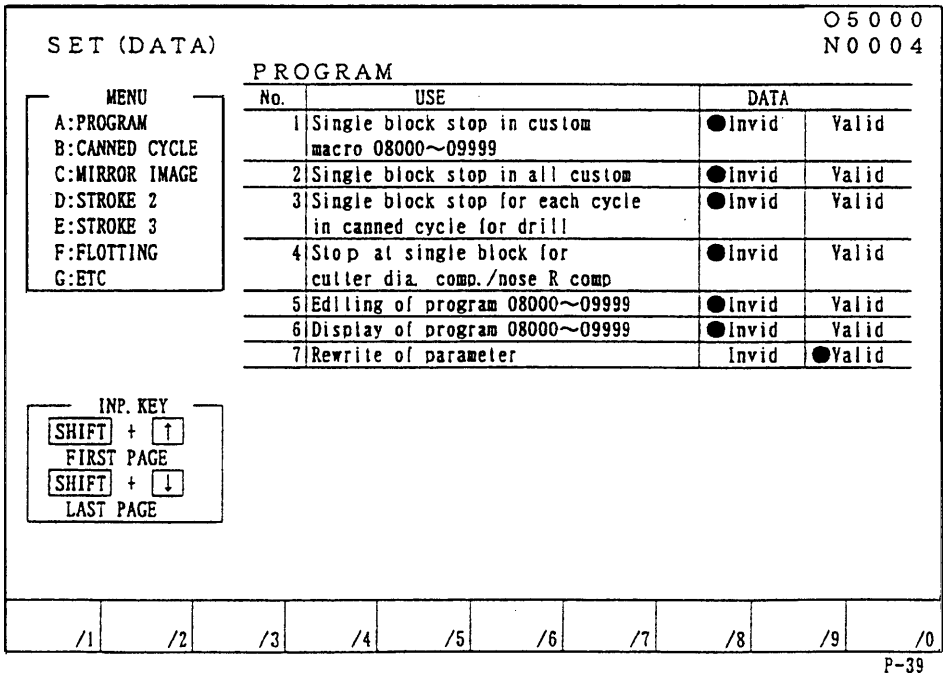
In this screen, parameters frequently used are classified together by item or purpose for easy setting.

An option is not displayed if it is not provided.

Since it consist of several pages, change it by pressing the page key or alphabetical key corresponding a menu at the left side of the screen.

The number search also available.

Setting (Data)



(1) Display and setting

In case of a selection such as “Do/Don’t”, ● makes are on at the side of setting has done if you want.

Set the cursor by the cursor key and press the INPUT key.

Further, when the cursor key is pressed, it moves at the side of ● mark. The HITACHI SEIKI’s standard is the left side.

Numeral data is set through the key input area. Needless to say, calculation and absolute/ increment value input are also available.

Caution

Input limit for writing key etc. is not applied on the setting screen is different from the parameter screen, change it with fully attention by an operator himself.

(2) Number search

Since all pages have serial number, a page or cursor can be moved at once by the number search. A search executes by pressing a cursor key ↑ ↓ → ← after inputting N and following numerals.

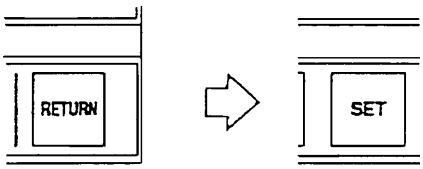
Example N: Number = 12 ↓ (Move to No.12)

N: Number = 1 + 10 ↓ (Move to No.11)

(3) Setting method

1. Set the key switch for writing of memory to write side.
2. Select the setting data screen.
   Press the RETURN key.

   Press the F5/SET key.

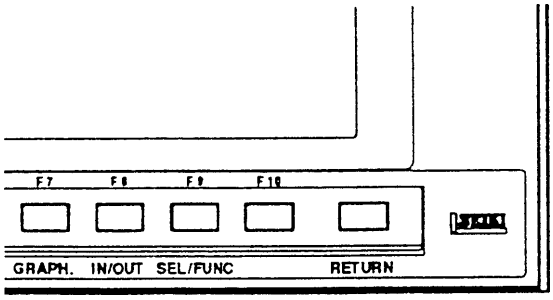


3. Set the cursor to the item to be changed by the page and cursor key or number search.

   Press the page key and display a section to be changed. ↑ ↓ or, input the setting number.

N Δ Δ ↓

4. Key in a desired numeral and press the INPUT key.
5. press the RETURN key and display the initial screen after completion of setting.



13.2 Stored Stroke Limit

This machine has a stored stroke limit which can be set an entry prohibition of a tool in the movable zero of the machine (in the stroke of the machine) for more safety either automatic or manual operation.

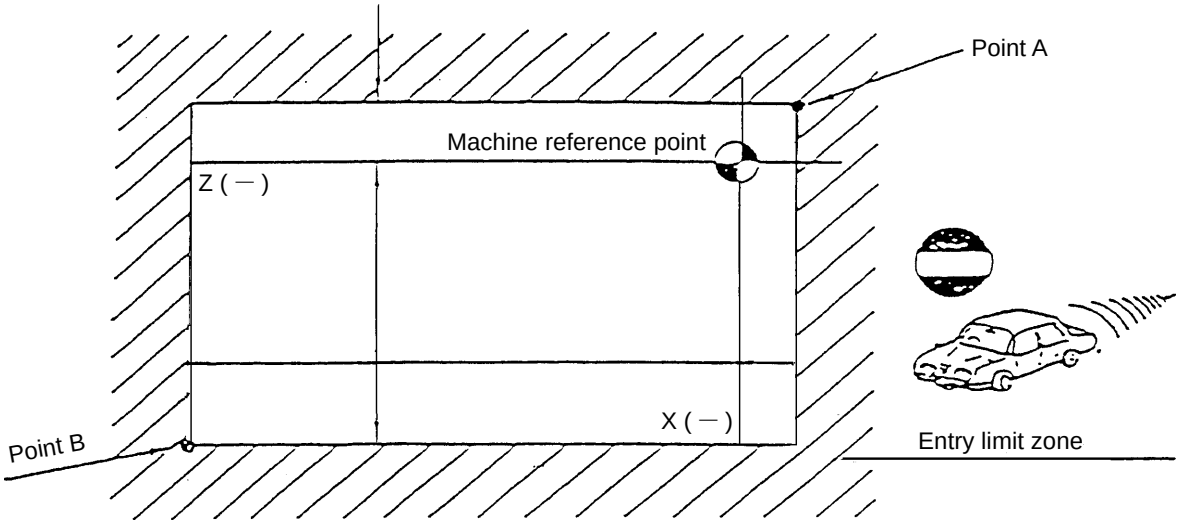
A stored stroke limit function becomes effective on the axis which has executed a zero return of the turret.

This function differ from a mechanical stroke end and there are following three types.

(1) The first stroke limit

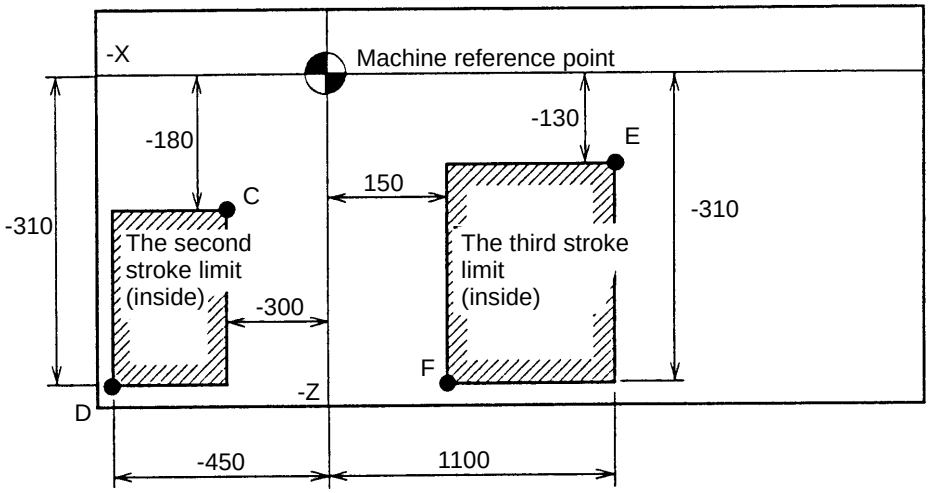
This is set at the maximum stroke of the machine by the parameter and is not changeable.

Outside of rectangular always prohibit an entry by the parameter setting of the point A and B by the distance from the machine reference point as following sketch. Generally, this parameter is not allow an alteration.



(2) The second and third stroke limit

Set the second and third stroke limit at any places without restraint by commanding a distance and direction from the machine reference point. It can be selected either inside or outside as well.



[1] Selection of stroke limit

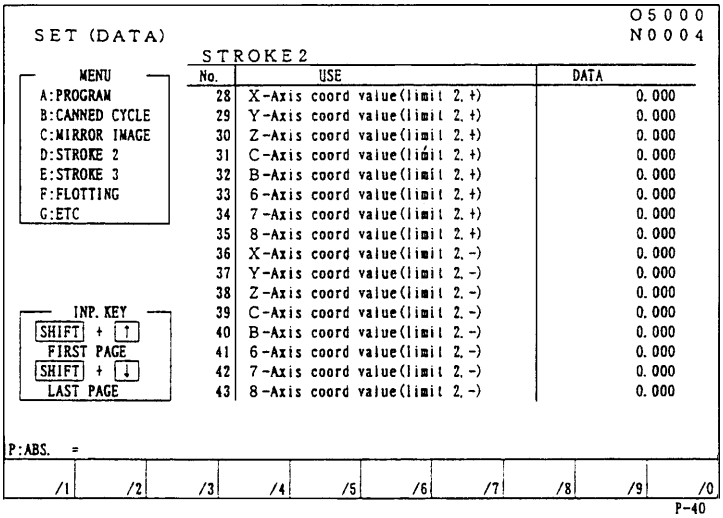
Selection of a stroke limit whether inside or outside of the frame fixed by C, D and E, F can be done by the parameter No.1300~ .

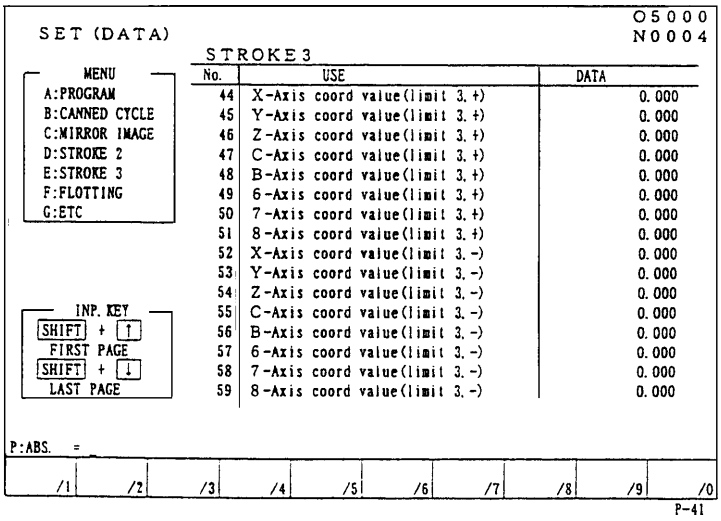
No.1300-0 bit	0	Inside of a frame fixed by the point C and D of the second stroke limit is a prohibited zone.
	1	Outside of a frame fixed by the point C and D of the second stroke limit is a prohibited zone.
No.1310-0 bit	0	Do not check the second stored stroke limit of each axis.
	1	Check the second stored stroke limit of each axis.
No.1310-1 bit	0	Do not check the third stored stroke limit of each axis.
	1	Check the third stored stroke limit of each axis.

[2] Setting of limit by setting data and check

Prohibited zone	No.	Setting position	Setting example
The second limit, + direction	28	X of point C	-5.000
	29		0.000
	30	Z of point C	-310.000
	31		0.000
	32		0.000
The second limit, - direction	36	X of point D	-480.000
	37		0.000
	38	Z of point D	-500.000
	39		0.000
	40		0.000
The third limit, + direction	44	X of point E	-170.000
	45		0.000
	46	Z of point E	-10.000
	47		0.000
	48		0.000
The third limit, - direction	52	X of point F	-490.000
	53		0.000
	54	Z of point F	-120.000
	55		0.000
	56		0.000

Note) *The value of X-axis is diametrical value command.*





[3] The third stroke limit setting by MDI or program command

Example:

G22 X-170.0 Z-10.0 I-490.0 K-120.0

An entry prohibition command into the second and third stroke limit and set the third stroke limit.

Example:

G23

Entry into the second and third stroke limit becomes available.

Refer to the programming manual for for details by program command.

Note) *1. If G23 has commanded, G22 should be commanded in an individual block to make an entry prohibition inside of setting zero zone again.*

2. The value of setting data is automatically altered if G22 X_ Z_ I_ K_ is commanded.

3. When manual reference point return is executed after power on, entry prohibition into a zone becomes effective immediately.

4. If the turret enter into the prohibited zone by manually, move it opposite direction to escape from prohibited zone.

The NC reset key should be Pressed after an escape.

5. During automatic operation, if the end point of travel locates in the prohibited zone, an alarm issues before the movement (According to the NC parameter, an alarm issue after the movement) and stop the automatic operation.

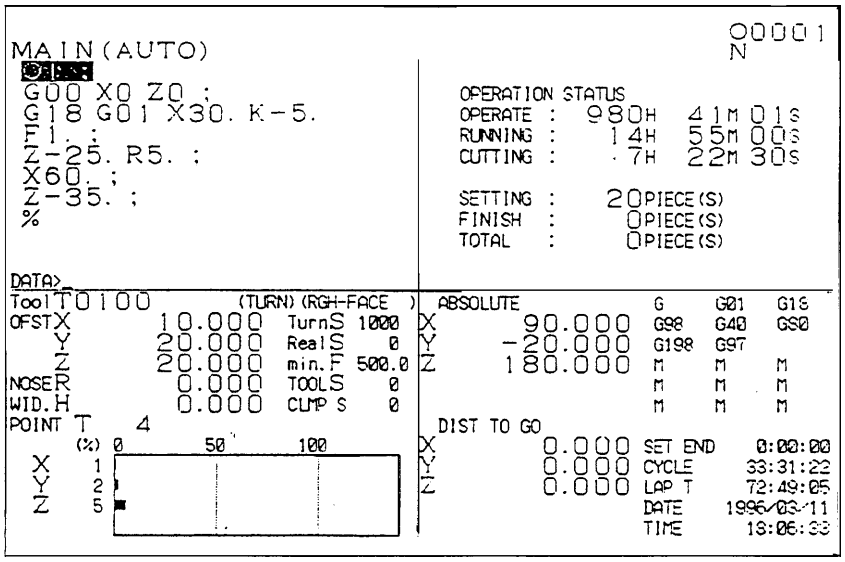
If the turret enter into the prohibited zone, move it opposite direction to escape from prohibited zone.

The NC reset key should be pressed after an escape.

14 Time Measuring, Data

Machining time and cutting time are displayed at the lower right of the general screen.

It can be displayed by pressing the [RETURN] key.



14.1 Time Measuring

Four type of time is measured at the lower right of the screen. It can be measured in the limit of less than 10,000 hours.

Input in here execute by moving the cursor after pressing the [F9/SEL/FUNC] key

Example:	(Hour/Minute/Second) = 0	(Set to zero)
	(Hour/Minute/Second) = 1	(Input as 1:00:00)
	(Hour/Minute/Second) = 1/2	(Input as 1:02:00)
	(Hour/Minute/Second) = 1/2/3	(Input as 1:02:03)

(1) Prearrangement of completion

Advance notice of completion becomes effective at the time of the "SET END TIME" key on the operation panel of the machine is on.

A time of a prearrangement of completion is a time from start to the time of a advance notice of completion at the automatic operation.

If an operator inputs a time of a prearrangement of completion of a program, inform it by call light when a machining time reaches to the prearrangement of completion.

(2) Machining time

Accumulate a time during machining. (A time of the start lamp is being on.)

(3) Cutting time

Accumulate a time during cutting feed. (A time during cutting feed by G01, G02 or G03)

(4) Lap time

Measure a lap time between a tool and tool. At the time of tool change set it to zero automatically. Measurement does not execute while the NC is stand by condition.

14.2 Date and Time

The date and time is displayed by the clock builted in.

The date shows by A.D. and time shows by 24 hours. (1 p.m. is 13 hours.)

Since it is backed up by a battery, it moves even if the power is turned off.

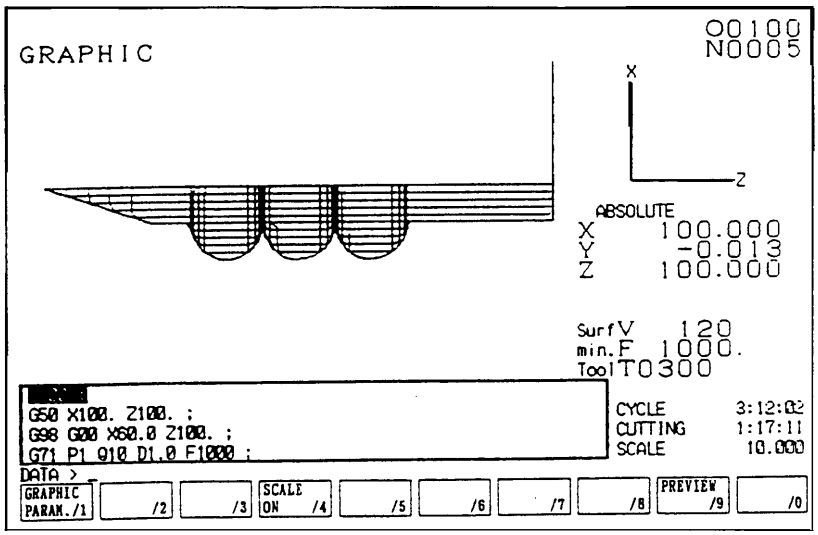
Do not change it unnecessarily, however, if discrepancy of the time has occurred from one cause or another, it should be set correctly because it uses at the time of periodical check.

OPER/MEINTE → F4/SYSTEM → Date/hour screen appears with date/hour setting.

15 Animated Drawing

15.1 Outline

When the F7/ANIMATED DRAWING key is pressed, the animated drawing screen is displayed.



Animated drawing of a locus of a tool is executed here. Also, the following data are displayed for the reference of animated drawing.

O Animated drawing plane of parameter

O Tool tip position

O Rotation S, Feed F, Tool command T

O Machining time, Cutting time

O List of programs currently under execution

A locus is drawn based on a value of the tool tip coordinate system.

Since a moving point becomes unclear if drawing consist of plenty of lines, a tip is expressed by a small point.

Normally, synchronous drawing is displayed. For pre-processing drawing, press the F9/PREPROCESS DRAW key and get the display of the list of function keys for pre-processing drawing. Then, press the F3/DRAWSTART key and pre-processing drawing will start.

Pressing the F2/AUTORANGE DRAW key, pre-processing drawing will start and the drawing range is set in such a way that the locus of the cutting feed is properly shown within the frame of the screen when drawing finishes.

For canceling the display of a drawing, press the ORIGIN key.

Following setting can be done for drawing. Refer to the following item for details.

O Selection of drawing plane

O Indication of rotating angle (Horizontal, Vertical)

O Drawing zone (Maximum, Minimum)

O Indication of drawing for each tool (Color designation)

O Selection of cutting feed line

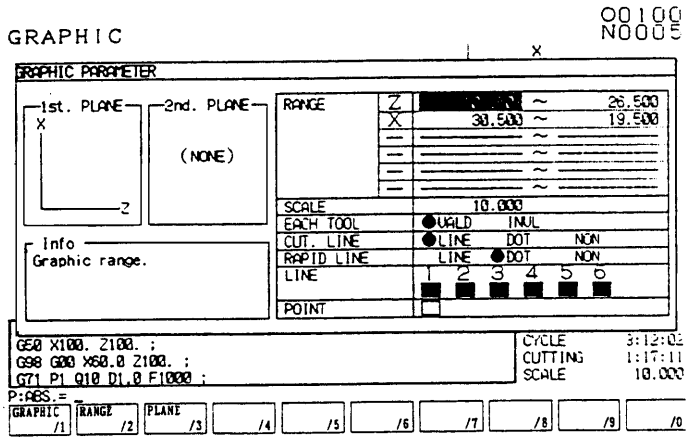
O Selection of rapid traverse line

O Color designation for drawing dot lines.

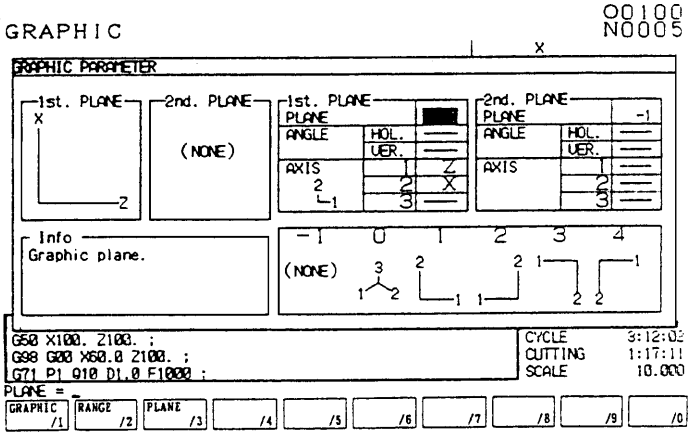
15.2 Drawing Parameter

The drawing parameter screen is overlapped with the drawing screen when pushing the [F1/DRAWING PARAMETER] of the drawing screen ([F7/DRAWING]).

Drawing parameter (Range setting)



Drawing parameter (Plane setting)



By pressing the [F2/RANGESET] key, the display changes into the range setting screen.

By pressing the [F3/PLANESET] key, the display of plane setting screen can be called up.

O Setting parameter for drawing : Move the cursor by cursor keys ↑ ↓ to the parameter column to be set. Brief explanation is displayed on the explanation column.

(1) Drawing zone

Set the maximum or minimum value of each axis to draw.

Center coordinate (mean value of max. or min. value) and magnification (Max. and min. value are shown in the screen.) are decided.

Input a coordinate value (work coordinate) in the key input area and decide it by pressing the [INPUT] key.

In this case the maximum value should be set larger than the minimum value.

(2) Drawing for each tool

Change a drawing color at each time of tool change.

Applicable color are up to six and return to the beginning color beyond it.

Execute the setting by the color designation.

- marks are on at the side of setting has done. Change is decided by pressing the INPUT key after selection by cursor key ➔ 🡐 .

(3) Cutting feed line

Designate the type of the cutting feed line.

- marks are on at the side of setting has done. Change is decided by pressing the INPUT key after selection by cursor key ➔ 🡐 .

(4) Rapid traverse line

Designate the type of the rapid traverse line.

- marks are on at the side of setting has done. Change is decided by pressing the INPUT key after selection by cursor key ➔ 🡐 .

(5) Color designation

Set a color to be changed when the drawing for each tool is effective.

Only this color designation change is available later.

Select a color designation by the cursor key 🡅 🡇 and designate a tool by the cursor key ➔ 🡐 .
Decide it by pressing the INPUT key after inputting a numeral from 0 to 7 according to the instruction.

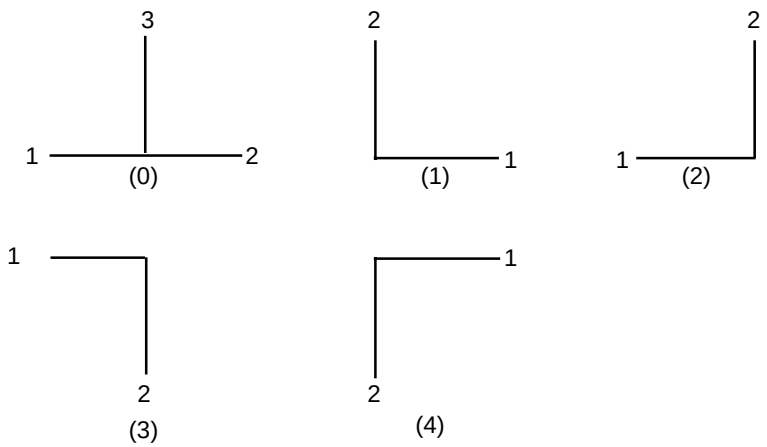
(6) Color of Drawing Point

Designate color of the first point of drawing.

Select color of drawing point by cursor 🡅 🡇 for setting.
Select the figure between 0 and 7 according to the explanation, and press INPUT for deciding.

[Plane Setting]

(1) The drawing plane is designated. A plane is selectable from the following 5 options.



Enter numeral 0-4 (according to the above illustrations), then press the INPUT key.

The selected plane is displayed on the screen.

A numeral with minus sign (e.g. -1) is ineffective, which gives no drawing plane on the screen.

(2) Rotation Angle

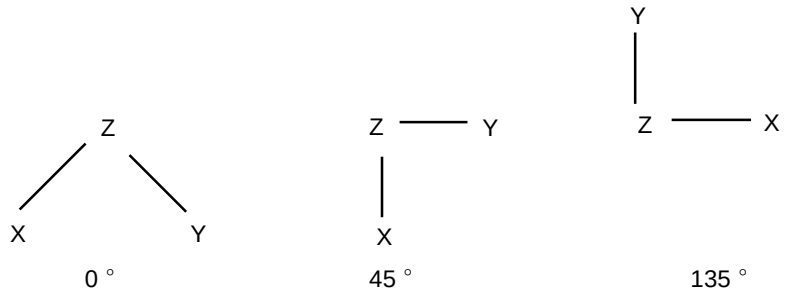
This is effective for drawing plane “0” (3-axis expression) only.

Key in the value of angle in the appropriate area provided for entering, then press the INPUT key.

(a) Horizontal rotation angle

The rotation angle on the horizontal plane is designated within the range of ±180 degrees by step of 1 degree.

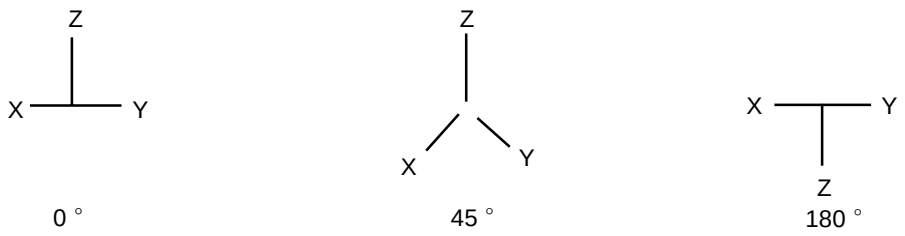
Example: The case of vertical (Z) rotation angle = 90° degrees in (XYZ).



(b) Vertical rotation angle

Angle is adjusted to the inclination of the vertical axis.

Example: The case of horizontal (XY) rotation angle = 0° degrees in (XYZ).



(3) Designation of Axis

The axis used for the drawing is designated.

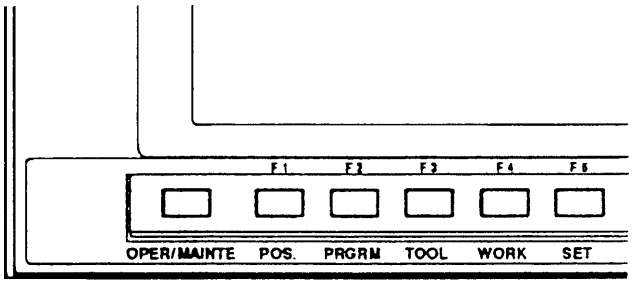
Enter the name of axis desired to be designated. Axis name with minus sign is allowed.

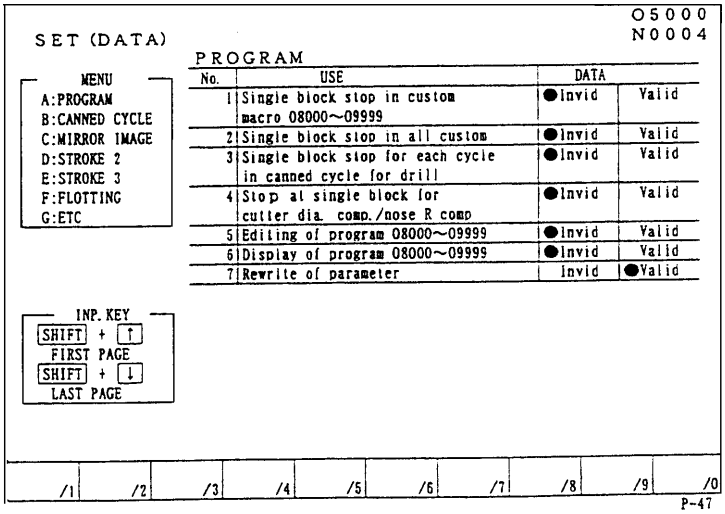
16 Parameter Setting

The parameter setting is executed by the following procedure.

1) Set the mode to the [MDI].
2) Set the memory key to the [Write].
3) Make effective the “Parameter rewriting” of the setting (data).

   [1] Press the F5/SET key.



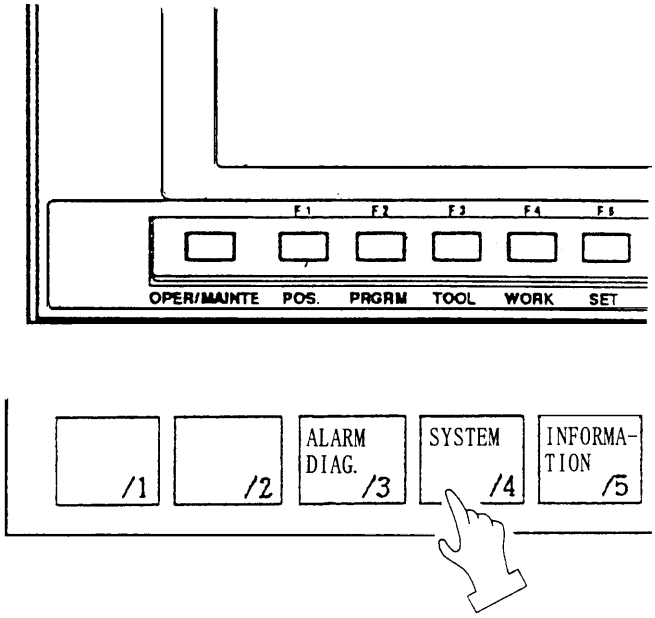


   [2] Set the cursor to “7. The parameter rewriting” by the cursor key ↑ ↓ .
   [3] Move the ● mark to the “Effective” by the cursor key → ← and press the INPUT key.

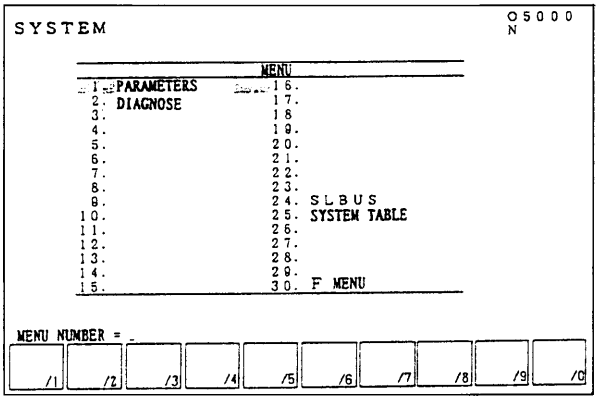
The parameter writing is ready.

4) Press the RETURN key and make the initial screen.

5) Press the OPER/MAINTE key and then the F4/SYSTEM key.

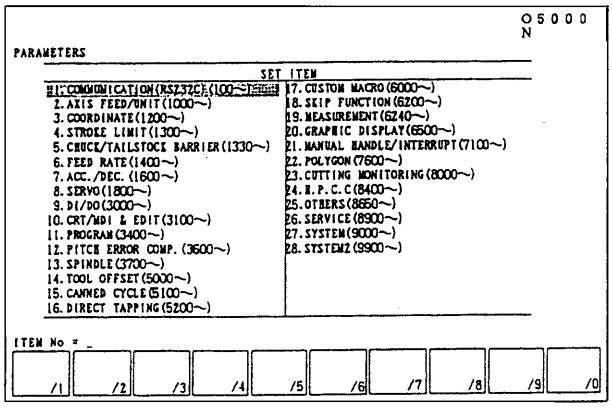


It becomes the menu screen.



6) Set the cursor to “1. The parameter setting” by cursor key ⬆ ⬇ and press the INPUT key.

The screen changes to the parameter setting items.



7) Select an item to be changed by the cursor key ⬆ ⬇ and press the INPUT key.

The parameter list is displayed.

If the setting is “Selected”, it displays as the right side sketch for example.

O5000
N0004

PARAMETERS

No.	7 6 5 4 3 2 1 0	HEX	No.	DATA
0100	0 0 1 0 0 0 0 0	20	0116	15
0101	0 0 1 0 0 1 0 0	24	0117	0
0102	0 0 1 0 0 0 1 1	23	0118	0
0103	0 0 0 0 0 0 0 0	00	0119	0
0104	0 0 0 0 0 0 0 0	00	0120	0
0105	0 0 0 0 0 0 0 0	00	0121	0
0106	0 0 0 0 0 0 0 0	00	0122	0
0107	0 0 0 0 0 0 0 0	00	0123	0
0108	0 0 0 0 0 0 0 0	00	0124	0
0109	0 0 0 0 0 0 0 1	01	0125	0
0110	0 0 0 0 0 0 0 1	01	0126	0
0111	0 0 0 0 0 0 0 1	01	0127	0
0112	0 0 0 0 0 0 0 1	01	0128	0
0113	0 0 0 0 0 0 0 1	01	0129	0
0114	0 0 0 0 0 0 0 0	00	0130	0
0115	0 0 0 0 0 0 0 0	00	0131	0

P:ABS =

/1 /2 /3 /4 /5 /6 /7 /8 /9 /0

P-50

8) Set the cursor to the parameter No. to be changed by the page key ⬆P ⬇P or cursor key ⬆ ⬇ or direct call by N Δ Δ ⬇ etc.

9) Change the parameter.

The parameter has two types as a data indicates by 0 or 1 and numerical data.

(a) A data indicated by 0 or 1.

[1] Set the cursor to a bit to be changed by the cursor key ➔ .

[2] Key in “0” or “1” and press the INPUT key at the condition of display as “P: Absolute=” the lower left of the screen.

Move the cursor display for each bit to set.

[3]Return the cursor display to the “Number” column by the cursor key ⬅ after completion of setting.
The parameter can be changed by direct input of hexadecimal number.

How to change over

P keyin : Input the absolute value of the data.

I keyin : Input the incremental value of the data.

N ⬇ : Call out the parameter number.

(b) A data indicated by numerals.

[1] Key in the new numerals and press the INPUT key at the condition of display as “p: Absolute=” the lower left of the screen.

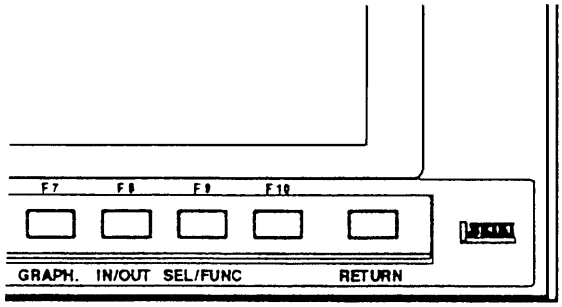
(10) Procedure after setting

[1] Press the RETURN key and make the initial screen.

[2] Press the F5/SET and display the “Setting (Data)” screen.

[3] Make the “Parameter rewriting, Ineffective” by the cursor key ↓ .

[4]Set the memory key to [LOCK].



17 Tool Life Management

17.1 Outline of Tool Life Management

The tool life management count the used value by the setting unit for each tool (cutting time, distance, etc.). Compare the used value and setting value and execute the life management of the tool. Also, it correspond the external tool condition such as measurement, load monitor or skip.

17.2 Action of Tool Life Management

- Count a life according to the life unit of each tool and if used value coincide to the setting value, it determine as the life expired tool but machining continues.
- In the above mentioned case, if the spare tool is provided, spare tool is selected automatically by the T command at the next machining.
- When the wear life is detected by the cutting monitor, it determines as wear life tool but continue the machining and spare tool is selected by the T command at the next machining.
- If the tool life management is not required, control the function by G code.

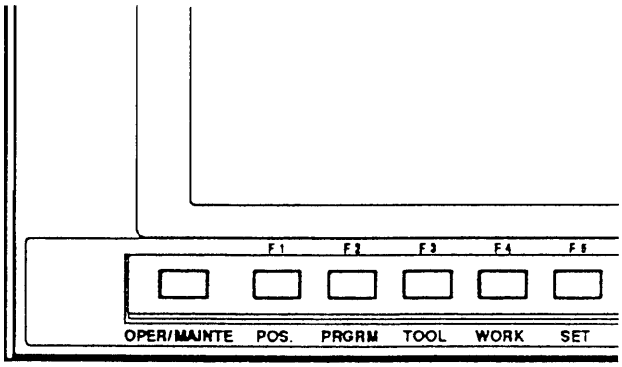
  G131 is selected at the time of power on and reset.

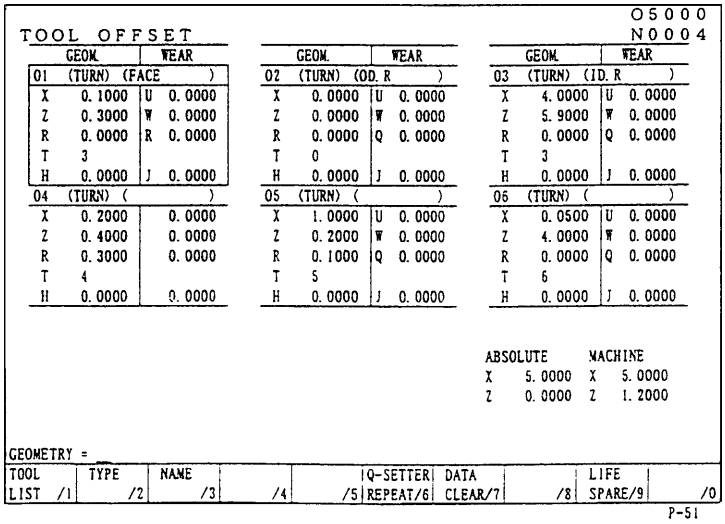
  Tool life management OFF G130

  Tool life management ON G131

17.3 Screen Display

1) Press the [F3/TOOL] key.





2) Press the F9/LIFE SPARE key.

It becomes the setting screen of the tool life.

Tool Life							Spare Tool	
Tool	Type	Tool name	Use	Setting	Units	Status	Reference	Spare
T01			12	20	min.		T0100	T0700 T0900
T02								T1100
T03			43	100	length		T0400	T1200 PT1400
T04			110	80	hole		T0200	

P:ABS. =

TOOL LAYOUT /1 | TYPE /2 | TOOL NAME /3 | UNIT /4 | STATE /5 | REAL GRAPH /6 | DATA CLEAR /7 | REAL STATUS /8 | (OFFSET) /9

(Fig. 1)

- Type ..... Set the classification for each tool. Press the F2/TYPE and decide it by the classification setting window. Select the “Execution” normally for the NC lathe.
- Tool name ..... Display of tool name and setting for each tool. (It is not influence on the tool life management function.) Press the F3/TOOL NAME and decide it by the tool name setting window.
- Setting ..... Set the life setting value for each tool. Move the cursor and key in the numerals then set it by INPUT key.
- Unit ..... Set the unit of life management for each tool.

  Minute : Cutting feed time (min.)

  Number of times : Number of call up

  Length : Cutting distance (mm)

  Hole : Number of fixed cycle for drilling

  Press the F4/UNIT key and decide it by the unit setting window.
- Condition ..... The condition for each tool is displayed.

  Tool condition

  Use ..... A tool being used.

  Monitor is used. ..... Tool is used at the cutting monitor is effective.

  Life ..... Tool life is expired.

Wear life ..... It becomes wear life (with the cutting monitor).

Skip ..... A tool skip by the skip signal.

Tool tip measurement NG ..... A tool becomes NG by the tool tip measurement.

Work measurement NG ..... A tool becomes NG by the work measurement.

Abnormal overload ..... Abnormal overload is detected (with the cutting monitor).

Abnormal no load ..... Abnormal no load is detected (with the cutting monitor).

External abnormality ..... External abnormality occurs (External breakage etc.).

- Standard ..... Standard tool
- Spare ..... The same kind of tool is set as the standard. When the standard tool becomes a defective tool, a tool is selected from this group.
  When a tool becomes a defective tool (A tool life is expired.), an asterisk mark " ＊ " is shown in front of the tool T.
  If a tool is registered as a priority tool, "P" is displayed in front of the tool T.

"Meaning of Use/Setting"

(1) Life by time

Sine the tool 01 in the Fig. 1 has set the tool life unit as min., count a cutting time. When a tool using time becomes 20 min., makes the tool 01 an expired tool condition.

An unit of time is a minute, however, a data less than a minute is memoried internally, so do not omit fractions.

(2) Life by length

Since the tool 03 in the Fig. 1 has set the tool life unit as length (meter), count a cutting length. When a cutting length reaches at 100m, makes the tool 03 an expired tool condition.

An unit of length is a meter, however, a data less than one meter is memoried internally, so do not omit fractions.

(3) Life by number of times

Since the tool 05 in the Fig. 1 has set the tool life unit as number of times, count the number of times by M12 in the program. When the number of times becomes 50, makes the tool 05 an expired tool condition.

(4) Life by number of holes

Since the tool 04 in the Fig. 1 has set the tool life unit as number of holes, count the number of holes. When the number of holes becomes 80, makes the tool 04 an expired tool condition.

17.4 Registration and Deletion of Standard or Spare Tool

- The standard or spare tool uses a tool No. including an offset No.

  Register it including a compensation number only at the time of using compound or multi tool compensation. Generally an offset number is “00”.

- Registration of the first spare tool ·····Set the cursor at the side of the standard tool and key in the [TOOL NO.] and [INPUT] .

- Registration on and after second tool ····· Key in the [TOOL NO.] and [INPUT] at the column of spare tool registration.

  - Registration of spare tool execute continuously.
  - When spare tools are provided 3 pcs. or more, make empty the next standard tool.
  - Registration of priority tool ····· Set the cursor to the tool to be made priority and key in [P] and [INPUT] .
  - The order of priority for the spare tool are as follows;

    1 Using tool

    2 Priority tool

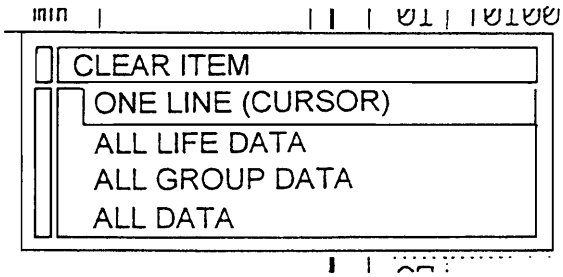
    3 Unused tool in registration with priority
    (Left side tool in spare tool column→Right side tool→Left side tool at lower column →→)

- Deletion of tool ····· Set the cursor to the tool to be deleted and key in [O] and [INPUT] .

- Deletion of priority tool ····· Set the cursor to the priority tool to be deleted and key in [C] and [INPUT] .

- A tool data can be deleted by the [F7/DATA CLEAR] key also available.

[1] Press the [F7/DATA CLEAR] key.



One line deletion ····· Delete only one line displayed by the cursor at the column of “Classification”, “Tool name”, “Use”, “Setting” or “Condition”.

One group deletion ····· Delete only one line displayed by the cursor at the column of “Standard” or “Spare”.

All life data ····· Delete all data at the column of “Classification”, “Tool name”, “Use”, “Setting” or “Condition”.

All spare data ····· Delete all data at the column of “Standard” or “Spare”.

All data ····· Delete all data.

[2] Set the cursor to the “One group deletion” and press the INPUT

[3] Since asking a question as Yes or No, Press YES key.

One line of the column of spare tool is deleted.

17.5 Clear the Condition

There are two methods.

(1) Set the cursor to the “Using value” and key in O and press the INPUT key.

The column of condition is cleared.

(2) Set the cursor to the “One line deletion” or “All life data” at the Fig. 2 in the previous item, and press the INPUT key.

Key in Y and press the INPUT to the inquiry of the screen.

17.6 Procedure After Setting

Press the RETURN key and make the initial screen.

17.7 Procedures to Deal with Tool Life Over

- When the life of a tool becomes timeover during a cutting work, the current work is to be carried on. The tool, the life of which has become timeover, is skipped at the time of the next and subsequent T command. If tool search at the time of T command fails to find a spare tool for the next work, they still try to continue work using the tool that was used last.

  On the “Tool Life” screen display, an asterisk “*” is marked in front of the “T” of the tool that is lifeover.

  When the standard tools registered in the spare tool files and their spares become all lifeover, or not usable, a tool replacement request signal is output. This output signal is mutually

independent with each series, and it becomes OFF at the time of program end (EOP input ON) and when the system is reset.

- To stop the machine operation after tool lifeover, direct M31 command in the program. The machine stops at the time of T command subsequent to the outbreak of the first tool that becomes lifeover.

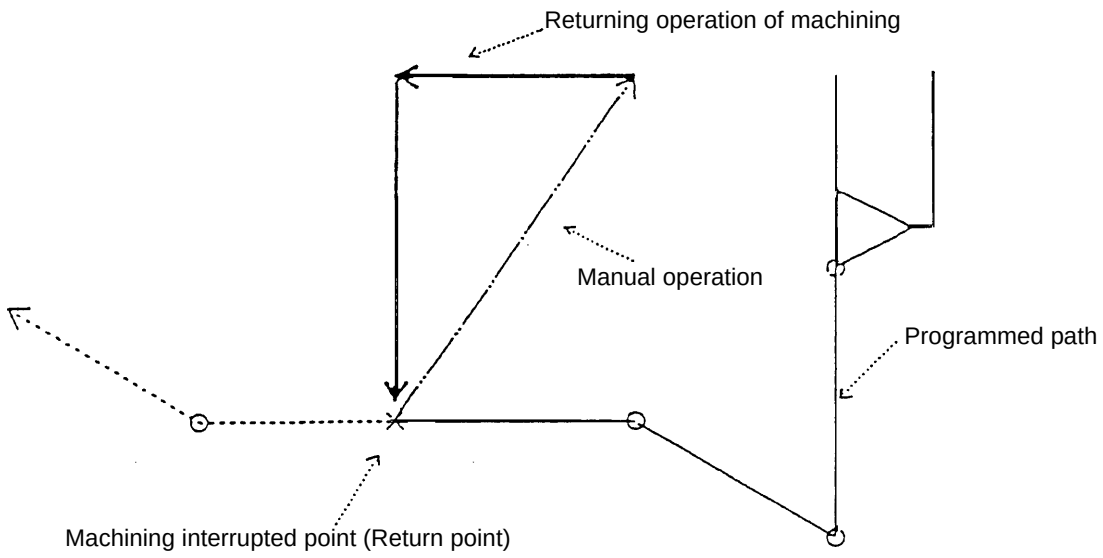
  If the tool usage data on a lifeover tool group is cleared to 0 before starting program, the machine stops at the time of T command subsequent to the outbreak of the second tool that becomes lifeover.

  Machine stop system at the time of T command due to lifeover tools applies to 3rd and later overlife tools in the same way.

18 Return to Machining Interrupted Point (Restart of Block)

18.1 Outline

This is a function to return to interrupted point of operation of automatic mode after execution of travel by manual operation at the middle of automatic mode operation to measure a workpiece or remove chips etc.



18.2 Operation

1) During automatic operation, interrupt an operation by a single block stop or temporary stop (feed hold).
2) Set a manual mode.
3) Retract a tool to an adequate position by execute axis motion by manual mode ([FEED], [HANDLE]) .
4) Execute operations such as work measurement or chip removal etc.
5) Execute each operation of the spindle rotation or coolant discharge etc. to become a condition at the temporary stop.
6) Turn on [BLOCK RESTART] switch. (Enter to machining interrupted point return mode.)
7) Select a manual feed and feed it to the direction of machining interrupted point by [FEED] mode.

   A traveling speed at this time is same as normal manual feed and it becomes selected machine operation panel.

- Since it is not stopped even if reaches to the return point by handle mode, do not attempt a return by [HANDLE] mode.

8) If it reaches to machining interrupted point, it stops automatically even if a [MANUAL FEED] button keep pressing.
9) Turn off a [BLOCK RESTART] switch.
10) Restart an automatic operation by exciting a cycle start after returning an automatic mode.

Caution

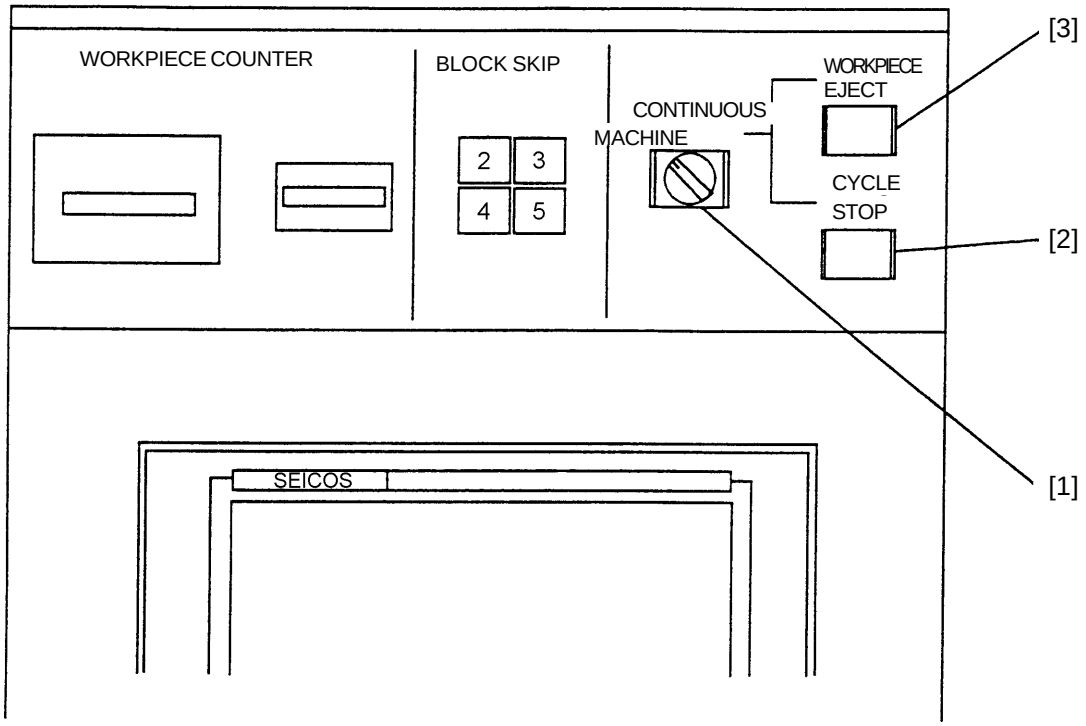
1) The machining interrupted point is the position of the workpiece coordinate system where last automatic operation was interrupted, and is memorized for all the axes.
2) The machining interrupted point will be deleted by resetting.
3) Manual feed under the condition that the machining interrupted point has not been memorized becomes ordinary manual feed, even if [MACHINING INTERRUPTED POINT RETURN] is turned on.
4) With the machining interrupted point return operation, only the travel in the direction of the machining interrupted point is available. Travel in the opposite direction can not be executed.
5) Also, if you stop pressing [MANUAL FEED] during returning action, the machine stops at the position where you stopped. The returning action will be continued if you resume pressing [MANUAL FEED].
6) While the machine is returning to the machining interrupted point after the point is memorized, if axis travel is executed under the machine lock condition, the return to the proper position can not be performed.
7) Even under the condition that [BLOCK RESTART] is on, [ZERO RETURN] mode (one-touch zero point return) has priority, and returns the operation to the machine zero point.
8) When a turret indexes by manual mode, move it to the return point after a turret face returns to original position without fail.
9) Execute a cutting by singlel block within several blocks after block restart for safety.

2 AUTOMATIC OPERATION

1 Operating Panel and Screen, Outline of Feeder

1.1 Operating Panel • Reversing Unit

1.1.1 Operating Panel for Automatic Operation



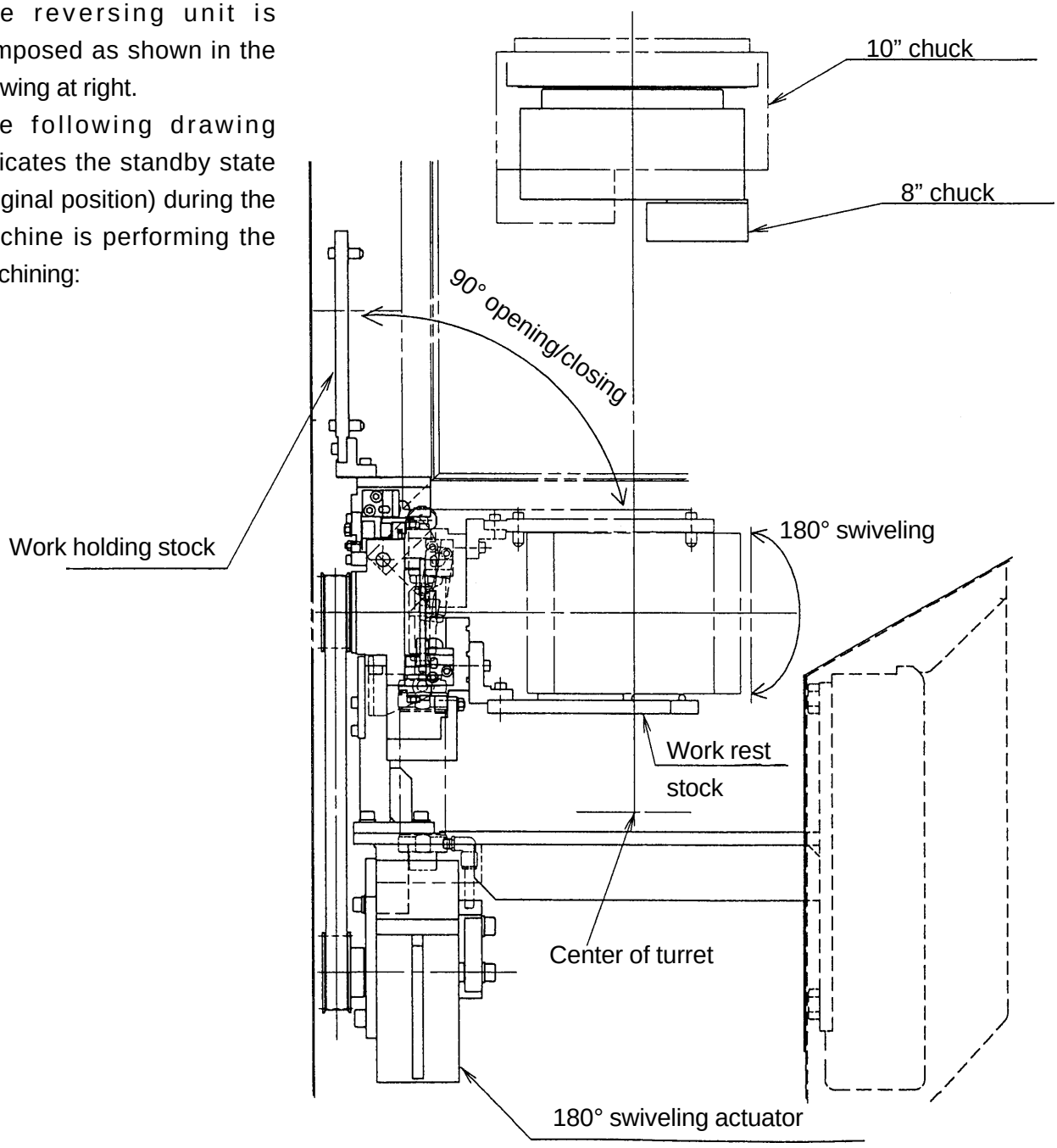
No.	Name	Function	Remarks
[1]	MACHINE/CONT SWITCHING	Switching for selection of milling only or automatic operation by feeder.	OPTIONAL BLOCK SKIP/8
[2]	CYCLE STOP	By pressing this button in continuous operation, the operation stops on completion of the cycle.	When pressed, the lamp starts blinking and it changes to steady light on completion of cutting process. OPTIONAL BLOCK CKIP/9
[3]	EJECT	By pressing this button in continuous operation, material is ejected forcibly even when there remains material.	When pressed, the lamp starts blinking and it changes to steady light on completion of cutting process. OPTIONAL BLOCK SKIP/7

1.1.2 Outline of Reversing Unit

Specifications for Reversing Unit, Model CS20/25 CS20Y/25Y

Diameter	Max ϕ200
Length	15 to 150 mm
Weight	20kg
Time for reversing action	18.0sec (From completion of machining to completion of work reversion)
	[1] Applicable to all the packages A, B, and C [2] Inapplicable to flat turrets

The reversing unit is composed as shown in the drawing at right.
The following drawing indicates the standby state (original position) during the machine is performing the machining:

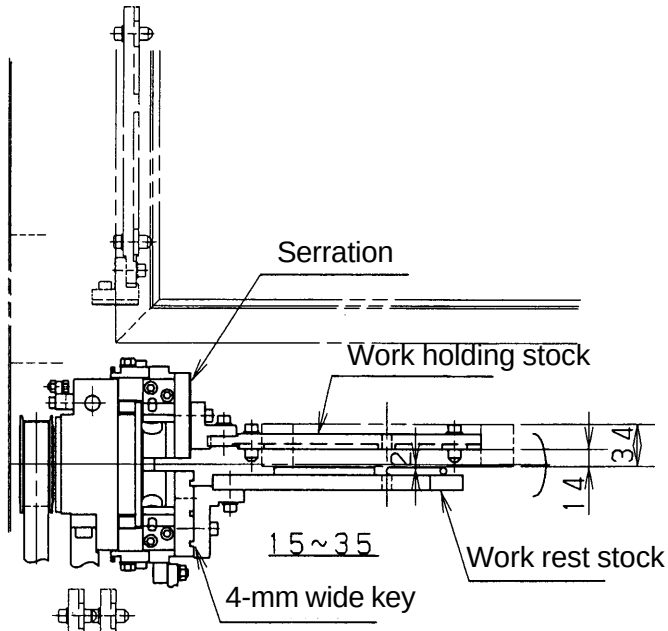


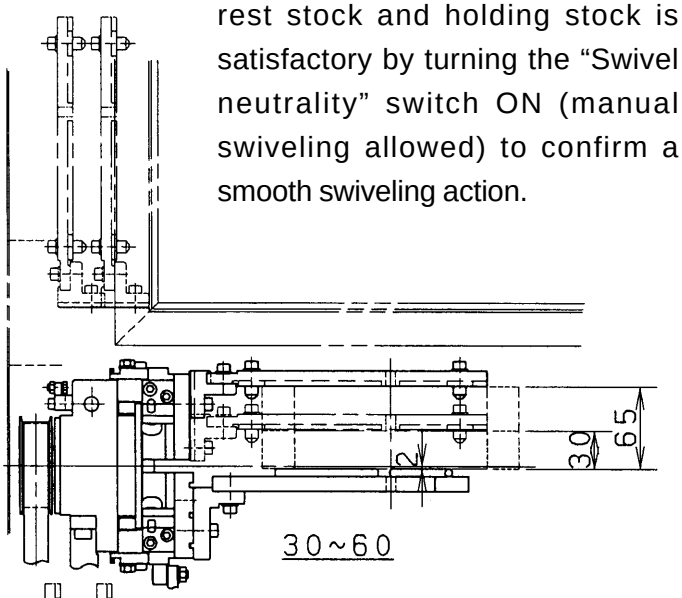
1.1.3 Reversing Unit, Setting Procedure (CS20/25 CS20Y/25Y)

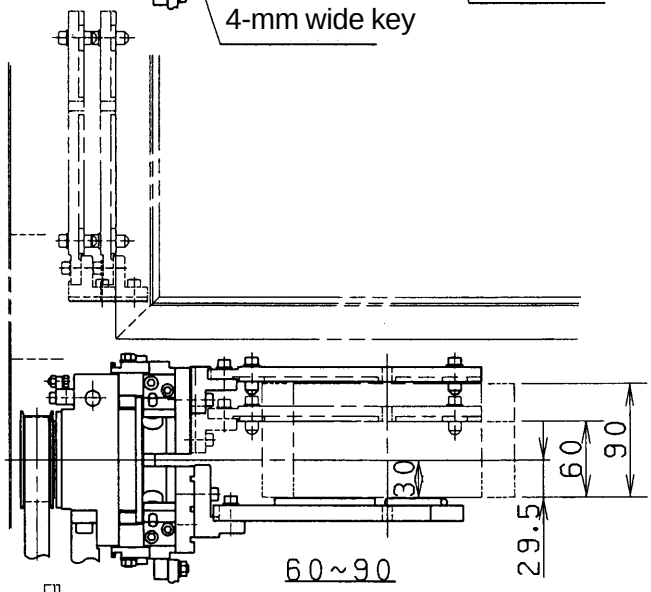
[1] The work rest stock and holding stock require the adjustment shown in the drawing depending on the applied work. Adjust the mounting height of the work rest stock with a 4-mm wide key at 3 spots at intervals of 24 mm and of the work holding stock with 1.5-mm pitch serration. Also, the mounting posture and position should be modified with the work height.

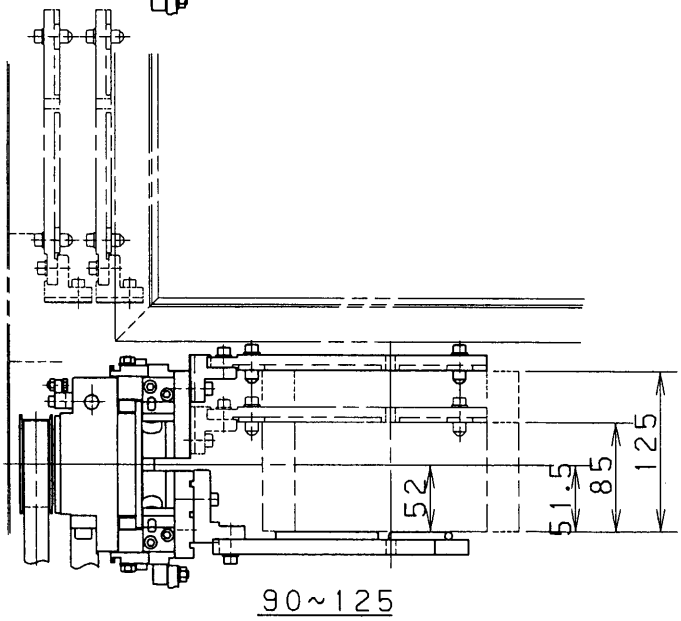
[2] Adjust the clearance between work rest stock and holding stock so that a slight allowance (1 to 1.5 mm) against the work height.

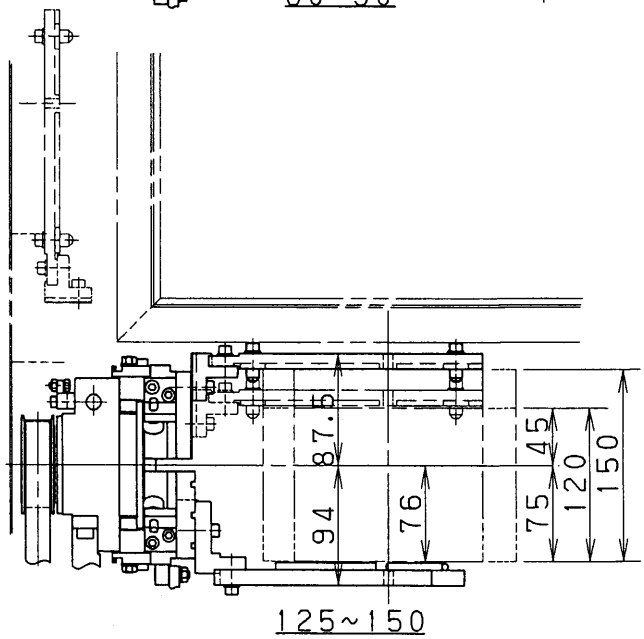
[3] Ensure that the clearance between work rest stock and holding stock is satisfactory by turning the “Swivel neutrality” switch ON (manual swiveling allowed) to confirm a smooth swiveling action.



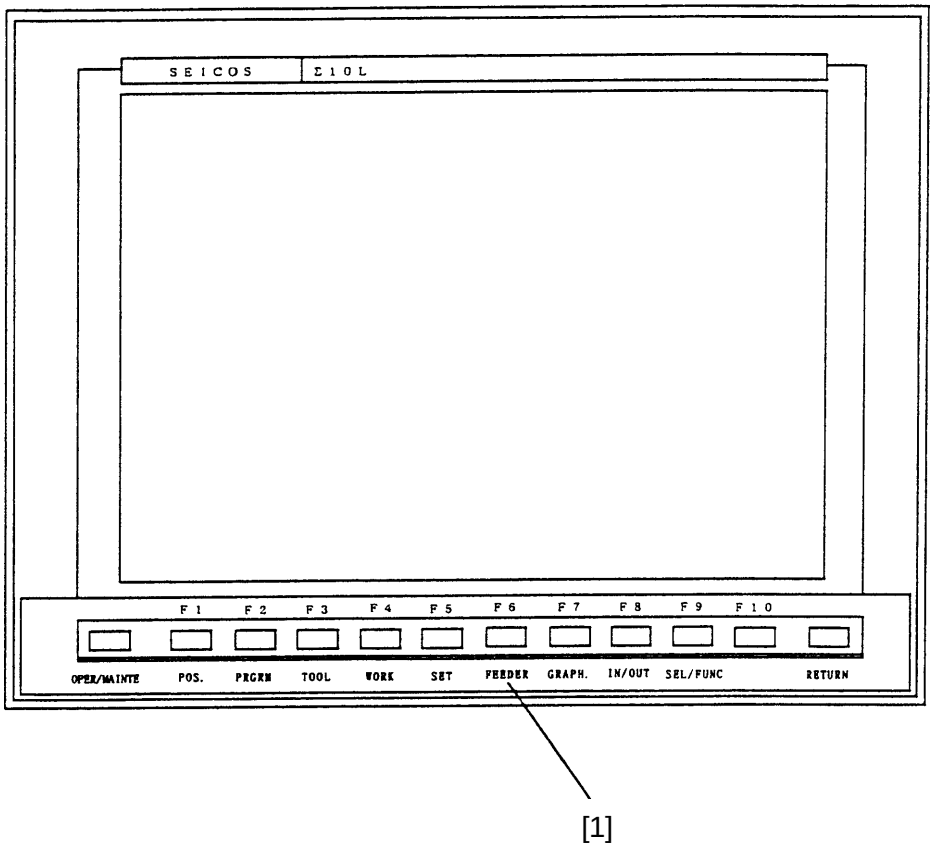






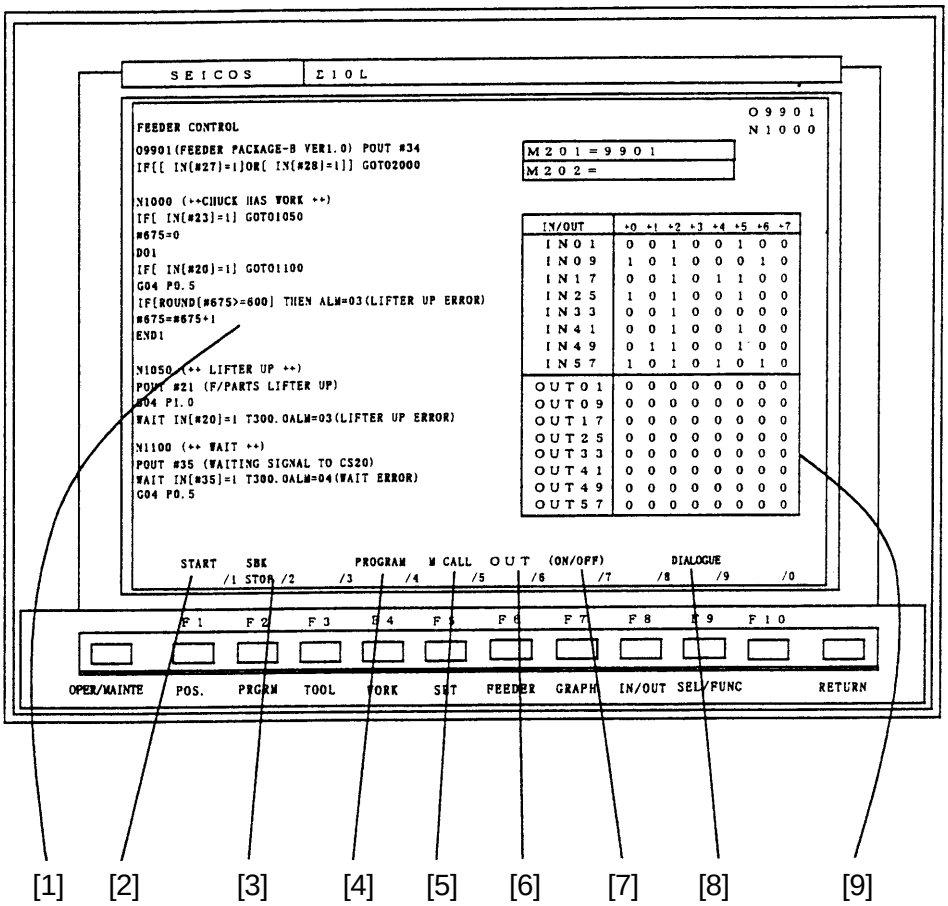


1.2 Screen Call-up



No.	Name	Function	Remarks
[1]	FEEDER	To call up the feeder control screen.	

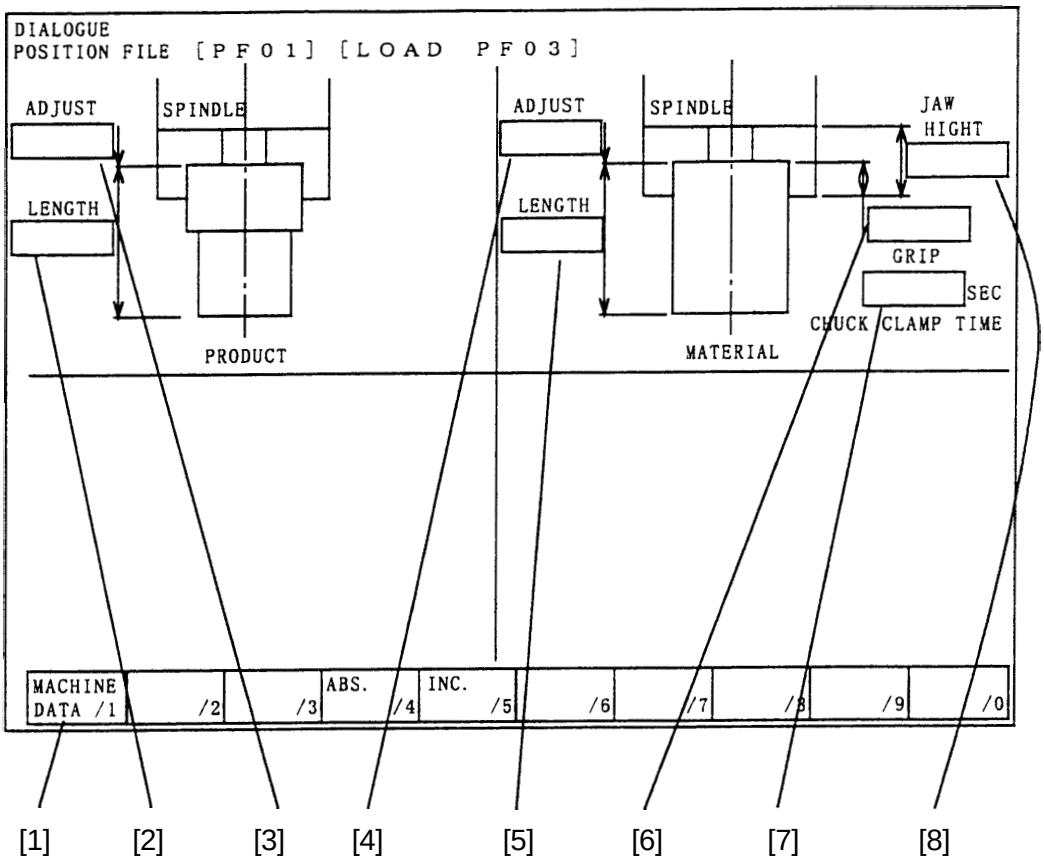
1.3 Feeder Control Screen



[1] [2] [3] [4] [5] [6] [7] [8] [9]

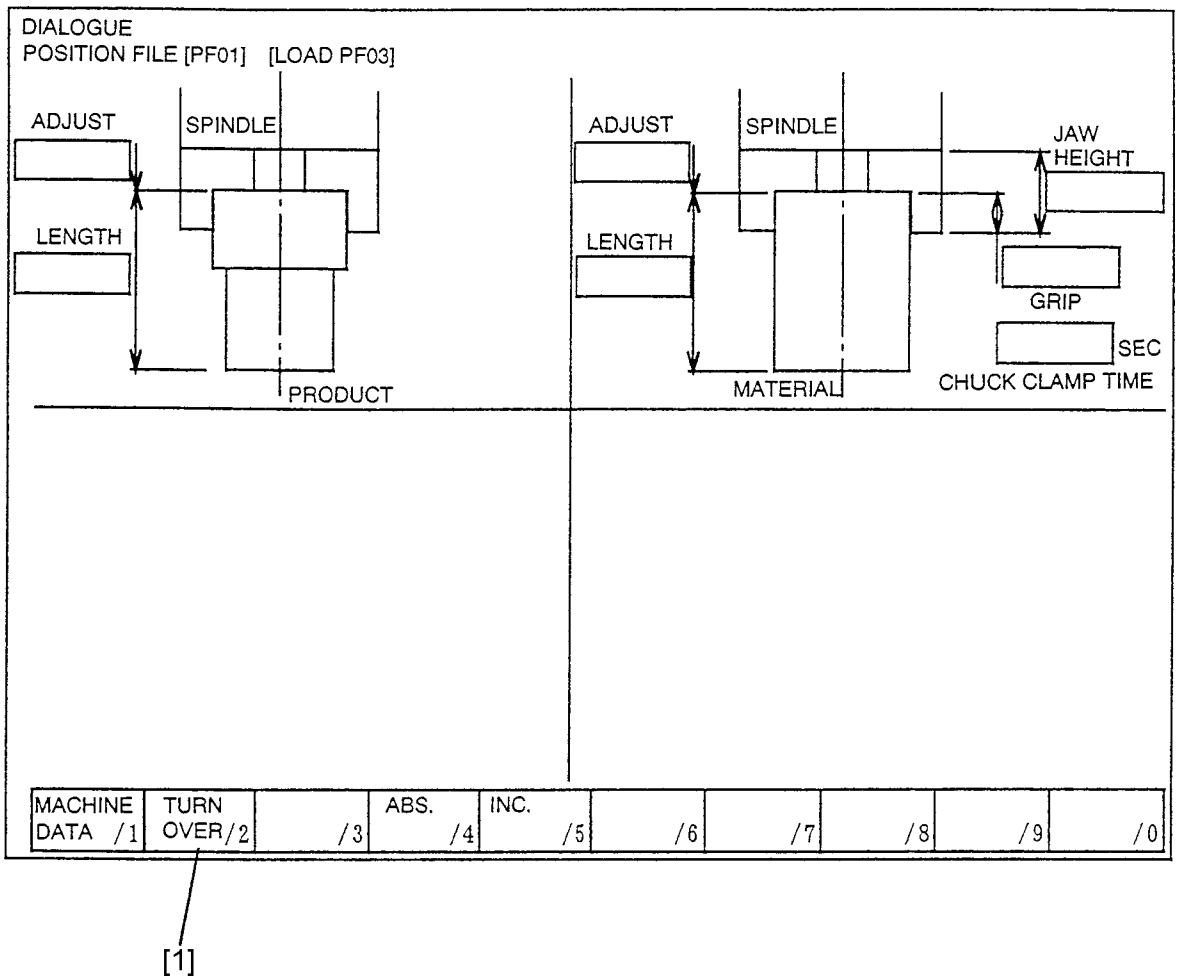
No.	Name	Function	Remarks
[1]	PROG. AREA DISPLAY	Feeder control program is displayed.	
[2]	START	To press for starting the feeder control program.	Start button of machine operating panel is invalid for the starting.
[3]	SBK STOP (SINGLE BLOCK STOP)	To press for stopping single block program. The display changes to black/white reversal pattern.	In black/white reversal display status, SBK STOP becomes ON.
[4]	PROGRAM	The cursor moves to program display area and the edition of program becomes possible.	Modification of program is in editing mode only.
[5]	M CALL	The cursor moves to M201/M202 setting table for changing the program No. to be called.	The cursor moves to the upper right part of the screen.
[6]	OUT	To press when signal output is required.	The cursor moves to the OUT01 side.
[7]	(ON/OFF)	To press when signal is actually output.	
[8]	DIALOGUE	To press when inputting data such as material size.	Screen changes into the dialogue scene.
[9]	IN/OUT SCREEN	The screen part on which IN/OUT signals can be monitored.	In case of OUT, signal output can be done.

1.4 Dialogue Screen (Variable Data)



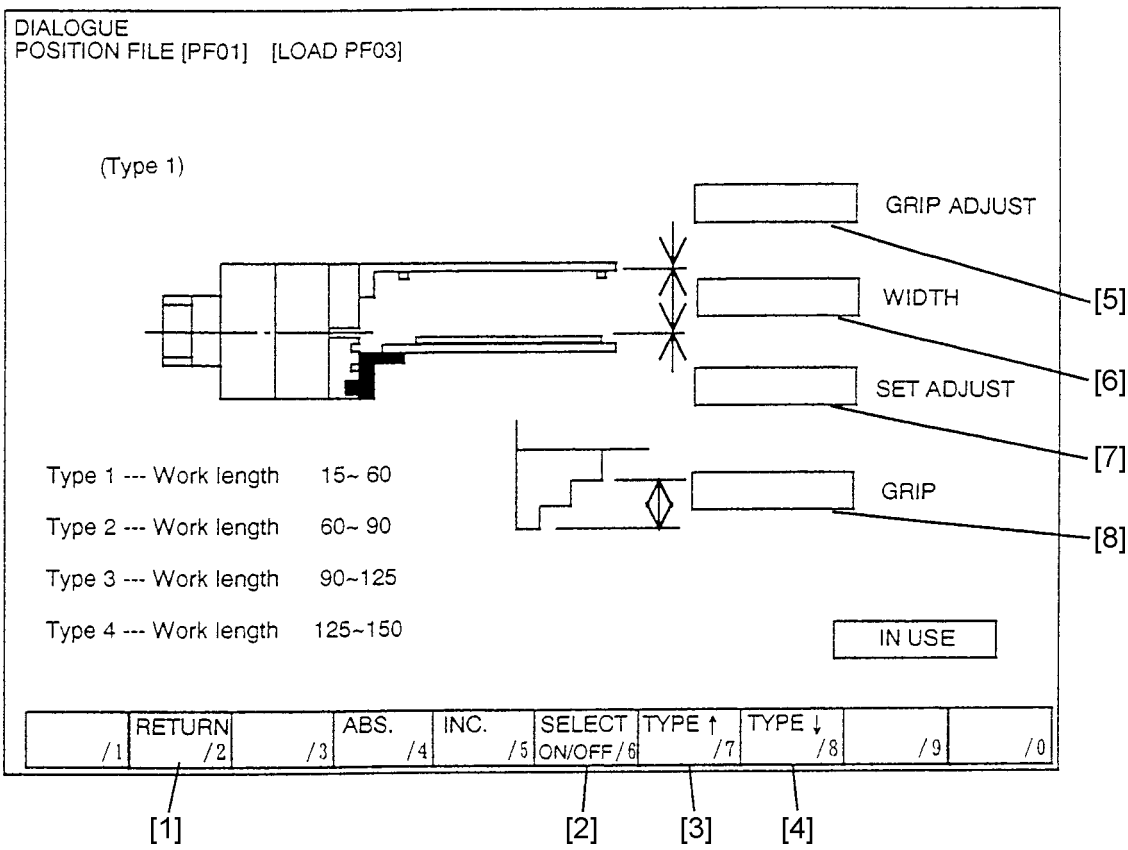
Those data that are required for each item of work piece.

No.	Name	Function	Remarks
[1]	MACHINE DATA	The screen is changed.	Machine data is displayed.
[2]	LENGTH	To input the length of finished product.	
[3]	ADJUST	To input for adjusting the height when putting the finished product.	To raise the height, input positive numeral.
[4]	ADJUST	To use for adjusting the height of gripping the material.	To press harder against the input negative numeral.
[5]	LENGTH	To input the length of material.	
[6]	GRIP	To input the length of jaw grip margin.	
[7]	CHUCK CLAMP TIME	To input the dwell time.	In case of 0, the dwell time is regarded as 10 seconds.
[8]	JAW HIGHT	To input the jaw hight	



To set the data proper to the turnover table

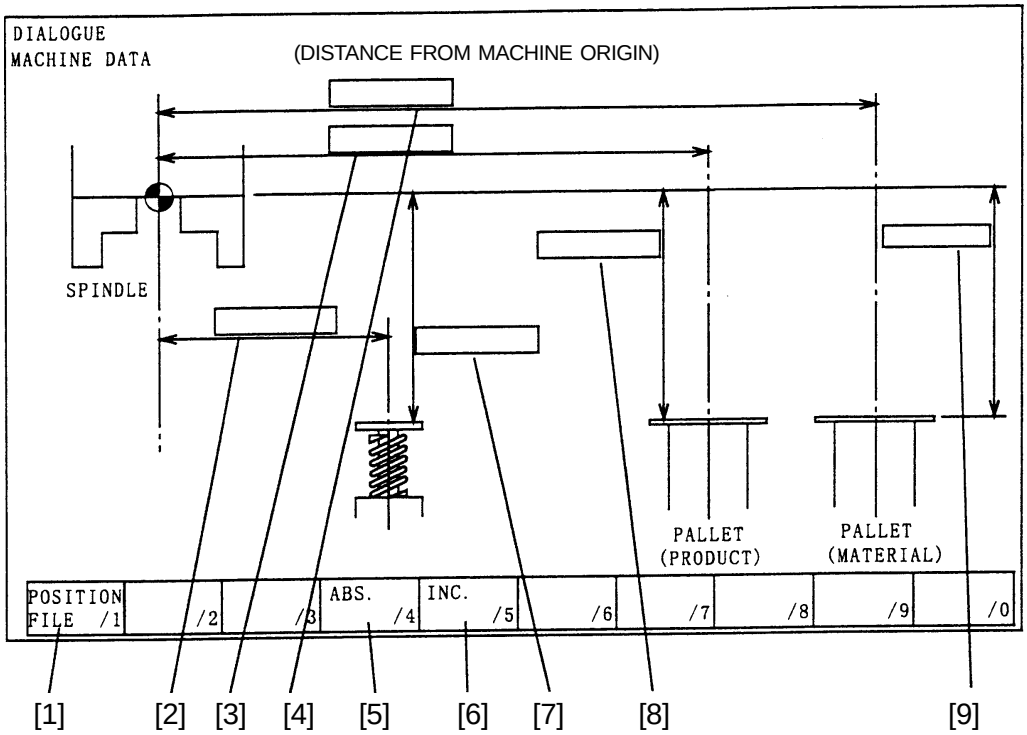
No.	Name	Function	Remarks
[1]	TURN OVER TABLE	The screen is changed.	Turnover table screen is indicated.



Make data setting relevant to the turnover table. Depending on the work length, it is necessary to change the preparation arrangement of the setting table in type 1~4. Select the type by F7/F8 function keys. There are three key grooves on the setting table. When respective type is indicated, the setting method (setting up) is also indicated on the screen, to which please refer.

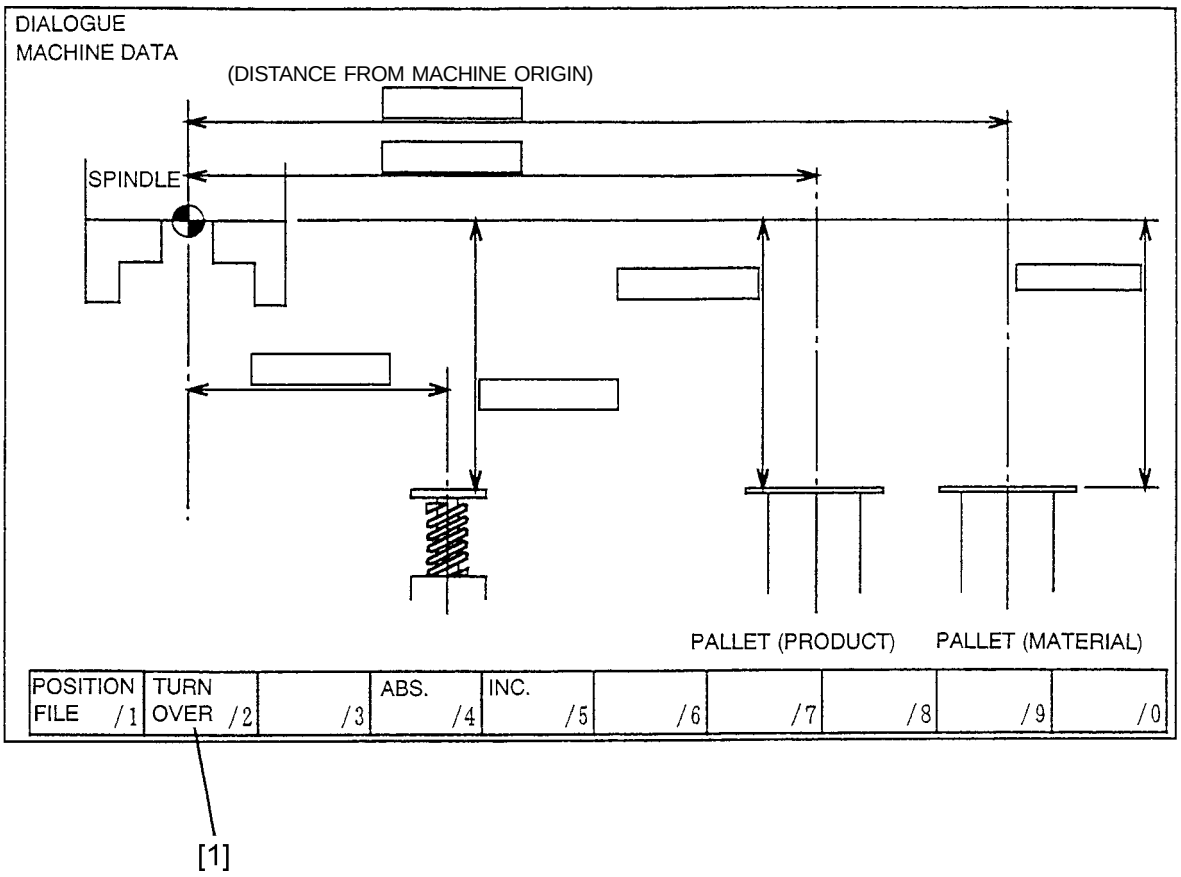
No.	Name	Function	Remarks
[1]	FUNCTION RETURN	The screen is put back to the original scene.	
[2]	SELECT ON/OFF	The type to use is decided.	"In use" and "Not in use" are alternately switched over by pressing this key.
[3]	TYPE ↑	The type to use is decided.	Type No. is changed in the order or 4 → 1.
[4]	TYPE ↓	The type to use is decided.	Type No. is changed in the order or 1 → 4.
[5]	GRIP ADJUSTMENT	Input a value when adjusting the height of gripping the turned-over work.	When adjusting to a higher level, input a positive value.
[6]	WIDTH	(Adjusting value is within ± 3.0.) Input the width of the turnover hand.	Measured by a scale, etc.
[7]	SET ADJUSTMENT	Input a value when adjusting the height of setting the work on the turnover table.	When adjusting to a higher level, input a positive value.
[8]	GRIP ALLOWANCE	Input a value of jaw gripping allowance in the 2nd working process.	

1.5 Dialogue Screen (Machine Data)



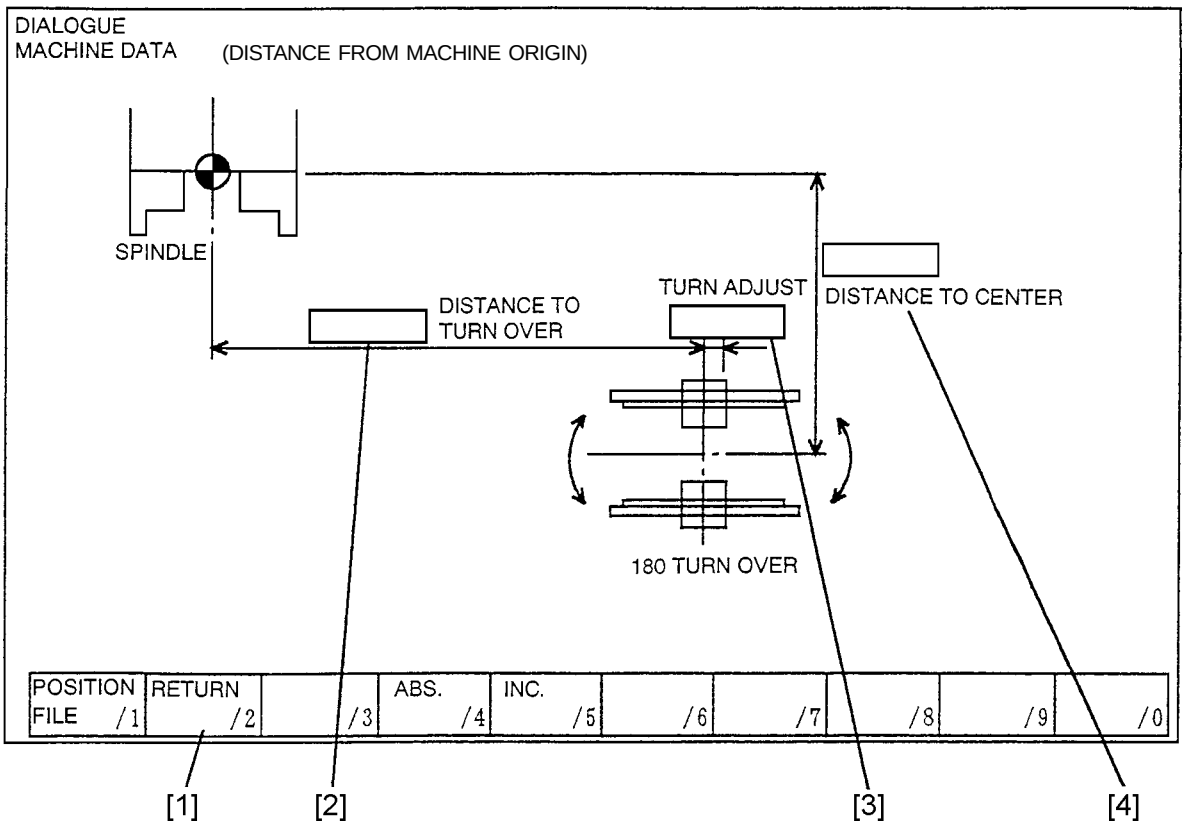
Those data that are set at the time of installation and are characteristic to the machine.

No.	Name	Function	Remarks
[1]	POSITION FILE	The screen is changed.	Variable data is displayed.
[2]	DISTANCE TO PUSHER	To input distance from origin point to pusher. (X-axis)	The value of machine coordinate (Display may be omitted according to parameter setting.)
[3]	DISTANCE TO PRODUCT PAL-LET	To input distance from origin point to finished product pallet. (X-axis)	The value of machine coordinate.
[4]	DISTANCE TO MATERIAL PALLET	To input distance from origin point to material pallet (X-axis)	The value of machine coordinate.
[5]	ABS.	To input absolute value	
[6]	INC.	To input increment value	
[7]	HEIGHT TO PUSHER	To input height from origin point to pusher. (Z-axis)	The value of machine coordinate (Display may be omitted according to parameter setting.)
[8]	HEIGHT TO PRODUCT PAL-LET	To input height from origin point to finished product pallet. (Z-axis)	The value of machine coordinate.
[9]	HEIGHT TO MATERIAL PALLET	To input height from origin point to material pallet (Z-axis)	The value of machine coordinate

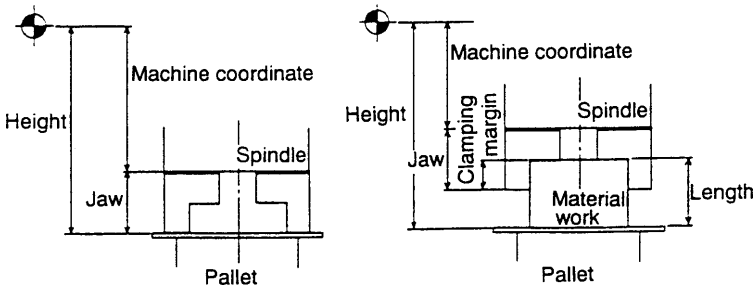


To set the data proper to the turnover table

No.	Name	Function	Remarks
[1]	TURN OVER TABLE	The screen is changed.	Turnover table screen is indicated.



No.	Name	Function	Remarks
[1]	FUNCTION RETURN	The screen is put back to the original scene.	
[2]	DISTANCE TO THE TURNOVER TABLE	Input the distance from the original point to the center of turnover table. (X-axis)	The value of machine coordinate system
[3]	TURN OVER ADJUSTMENT	Input the shift amount in the X-axis direction, when gripping the work turned over.	Input positive value, when shift is to the right ; Negative value when shift is to the left.
[4]	DISTANCE TO THE CENTER OF TURNOVER SWING	Input the height from the original point to the turnover table swing center.	The value of machine coordinate system



As illustrated in the diagrams on the left, bring the end face of the chuck into contact with the pallet (or work) by manual operation. The height of the pallet from the machine coordinate origin is calculated by adding or deducting the height of jaws (clamping margin, work length, etc.) to or from the machine coordinate value, namely:

(In case of left diagram)

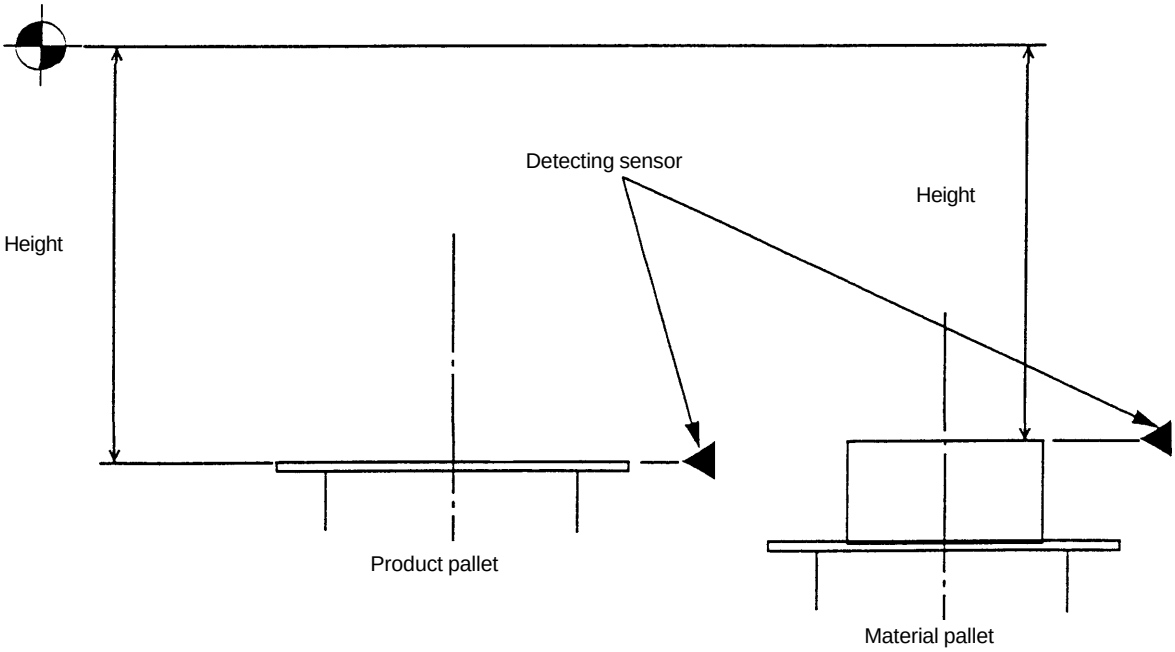
Height = | Machine coordinate value | + Height of jaws

(In case of right diagram)

Height = | Machine coordinate value | + Height of jaws + Work length – Clamping margin

Example 1) Height = | Machine coordinate value | + Height of jaws
= | –205.3 | + 40.0 = 245.3

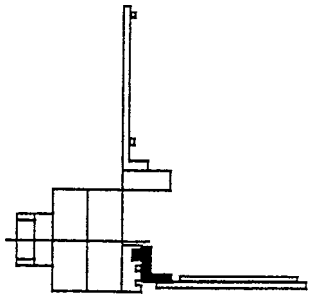
Example 2) Height = | Machine coordinate value | + Height of jaws + Work length – Clamping margin
= | –151.7 | + 40.0 + 50.0 – 15.0 = 226.7



The height in the case of package B (push up system) is obtained by the distance when the pallet is elevated until it touches the sensor and stops.

Setting up of turnover table

(Turnover table original position)



When the turnover table is at the original position, the work setting table is located at the bottom and the work support stands perpendicularly.

“Work setting table” down (Turnover table 0°)

(Turnover table relevant M code)

M184: Turnover table 0°

M185: Turnover table 180°

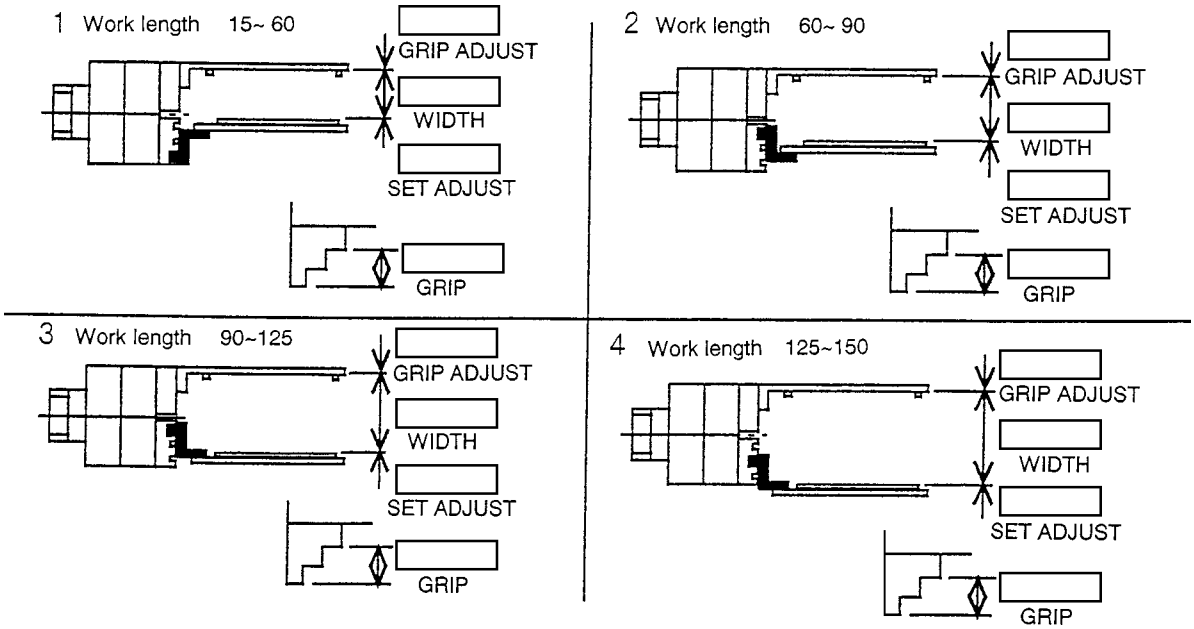
M186: Arm down

M187: Arm up

M188: Air ON

M189: Air OFF

M190: Original position check (M code that issues alarm when the turnover table is not at the original position)



For setting the turnover table, it is necessary to adjust the position of the serration according to the work length.

There are 4 patterns of positioning the work setting table to meet the work length as shown in the above diagram (the part colored black). The dialogue screen will guide the setting method, to which refer and make setup arrangement.

Note) When the work length is 15~30, attach the work setting table upside down to the serration fitting part and the work setting table is also attached underneath the serration fitting part. (For detail, refer to the procedures of CS20/25 turnover unit work supporting table setting up.)

[1] Put the turnover table to the original position. (Usually, the turnover table is at the original position. When it is not at the original position, get the original position by M code.

[2] Adjust the position of the setting table to meet the work length (type 1~4).

[3] Put the work on the setting table.

[4] Retract the spindle to the feeder side.

[5] Loosen the serration on the "work supporting stand" side and shift it toward the front side and tighten it temporarily.

[6] Execute M186 in the MDI mode. (The arm moves down.)

[7] Loosen the serration on the "work supporting stand" side and bring it into contact with the work tightly. From that point, move upward the serration by one or two pitches and fix it tight.

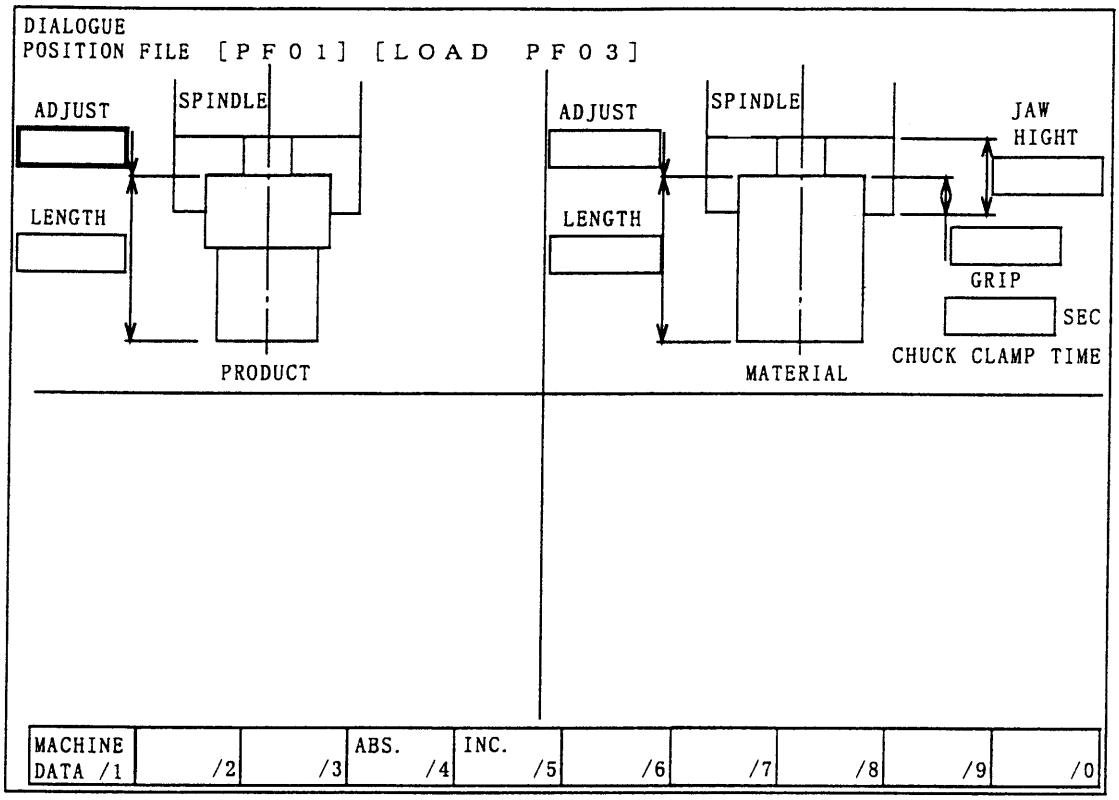
[8] On completion of the adjustment of the "work setting table" and the "work supporting stand", swing around the turnover table by 180° manually and confirm that it swings smoothly. Put the "Swing neutral" button located at the upper part of the machine operating panel to ON position to enable manual swinging operation.

After confirming the smooth manual swinging, return to the original status and switch the ON/OFF selection to OFF.

[9] Move up the arm by executing M187 in the MDI mode. (Put back the turnover table to the original position and remove the work.)

[10] Input each datum relevant to the turnover table on the dialogue screen.

1.6 Setting Method to Dialogue Screen



Call the file number (PF file) that needs setting. (Use page key for selecting the number.)

The indicated value "**" in the message "Setting of variable data [PF**]" at the upper left part of the screen is the file number.

Move the cursor to the item that needs setting by the cursor key.

Input the various data on length and height measured by calipers or scale on the screen.

When entering the measured value as it is.

Example: [8] [7] [.] [0] [F4/ABS]

The value input is registered as entered.

When entering increment or decrement value based on the previous setting value.

Example: [0] [.] [4] [F5/INC]

The new value is registered by reducing the entered value from the previous value.

2 Program Form

2.1 In Case of One Working Process Only

```
O∗∗∗∗
  G28W0
  G28U0
/8M201F1                          < - - Loading (Feeder control) program
      .
      .
      .
      .
  Machining program (1 process)
      .
      .
      .
      .
/8/9M30                           < - - Cycle stop
  /8M99
    M30
    %
```

F1: Variable data file number

With the mashine side (/8) /8 block is skipped and the cycle is stopped.

Pressing the cycle stop button reads /9 M30 and stops the cycle.

2.2 In Case of Continuous 1 - 2 Processes Using Turnover Table

```
O∗∗∗∗
  G28W0
  G28U0
/8M201F1H1                        < - - Loading (Feeder control) program
      .
      .
      .
      .
  Machining program (1 process)
      .
      .
      .
      .
/8M203                            < - - Turnover table action program
      .
      .
      .
      .
  Machining program (2 process)
      .
      .
      .
      .
/8/9M30                           < - - Cycle stop
  /8M99
    M30
    %
```

H1: Using turnover table

2.3 Calling up Form

M201 F__ [S__] [J__] [H__] ; [ ] : Call be omitted

M201 ..... Loading call up M code

F__ ..... Position data number (1 ~ 4) Can not be omitted

S__ ..... Use or non-use of pusher on feeder When used: S1

When not used: No designation

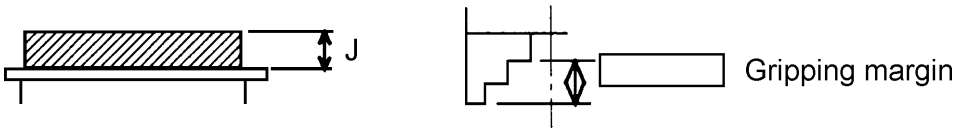
J__ ..... Use or non-use of jig on pallet (for CS40) When omitted: ordinary pallet

When using a jig for increasing the volume on the pallet, set this parameter.

H__ ..... Flag for using turnover table (H1) When omitted: In case of turn-over table is not used (One process only)

When the turnover table is used, designate the flag (H1) without fail.

(By designating this quoting number, the program proceeds to read the value of the gripping margin on the turnover table screen (variable data) and further acts on putting the finished product according to the data.)



When putting down the finished product on the feeder, the above data on the turnover table dialogue screen is used.

M203 [S__] [ ] : Can be omitted

M203 ..... Turnover table action call up M code

S__ ..... Use or non-use of pusher on feeder When used: S1

When not used: No designation

Example 1: File No.2, When pushed on feeder is not used, One process only

/8M201 F2

.

.

.

Machining program

2: File No.1, When pushed on feeder is used, One process only

/8M201 F1 S1

.

.

.

Machining program

3: File No.3, When pushed on feeder is used, 1 - 2 continuous processes

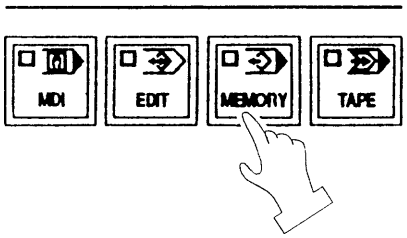
```
/8M201 F3 S1 H1
        .
        .
        .
 Machining program (1st process)
        .
        .
        .
/8M203 S1
        .
        .
        .
 Machining program (2nd process)
        .
        .
        .
```

3 Confirmation of Action

This process is to confirm whether or not the data set on the dialogue screen is correct.

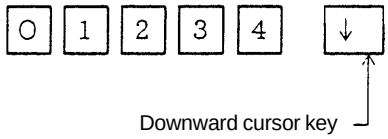
3.1 Preparations

1) To bring the mode into the “Memory” mode

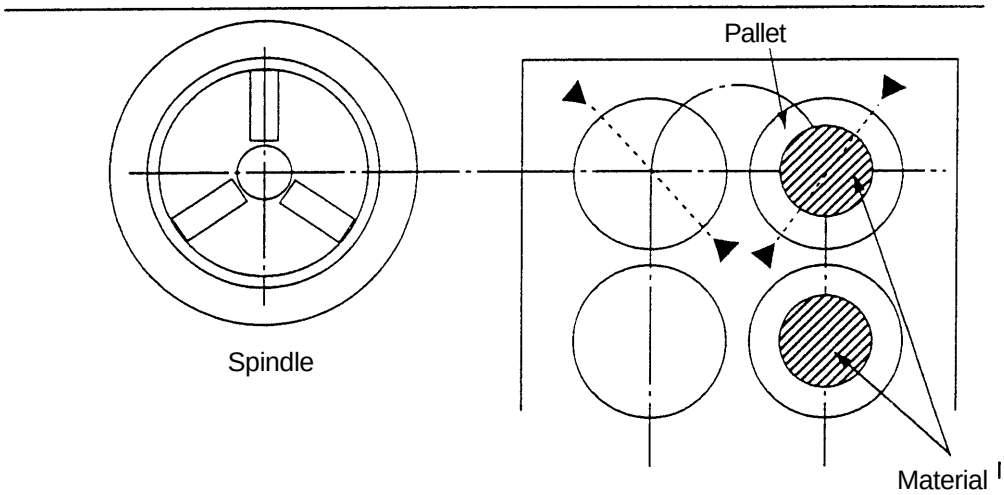


2) To call up the program

Example: In case of O1234



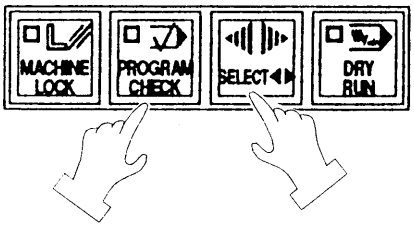
3) To put the material on the feeder and attach the product finished in advance to the chuck.



- The material is put on the pallet on the right side looked at from the machine front.
- To bring the feeder mode into the “AUTOMATIC” mode.
- Select “INTERLOCK” from MACHINE/INTERLOCK in the upper right on the machine operation panel.

4) To make the program check effective

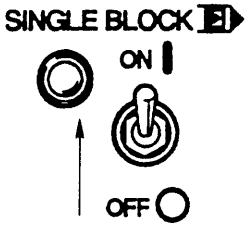
While pressing the select key, press the program check key.



5) To put the single block ON

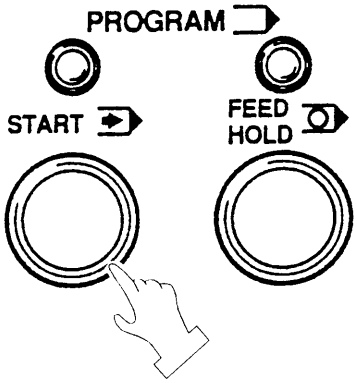
6) Turn off F2/SBK STOP in the feeder control screen.

7) Set “0” to the feedrate.



3.2 Confirmation of Action

1) To start the program



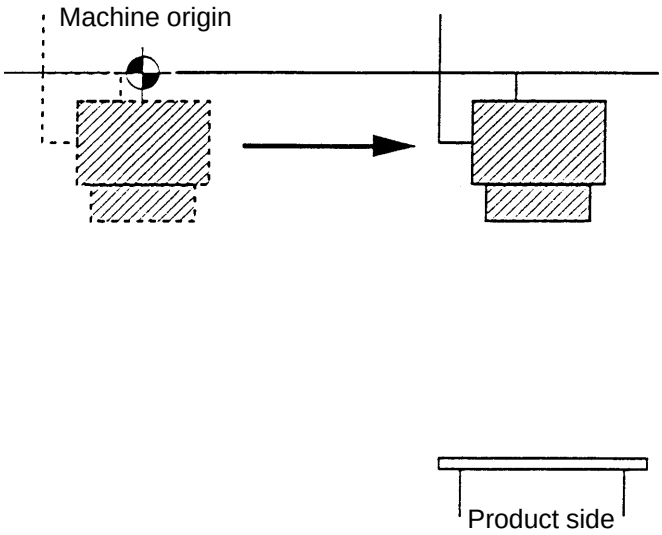
O****
G28W0
G28U0
/8M201F1 ..... [1]

M01

Confirm the action, adjusting the feedrate.

When the program line reaches [1] in the above, it changes to the loading program. In this example, the data of File No.1 is read in (execution of O9020).

2) The product moves to the product placing side.

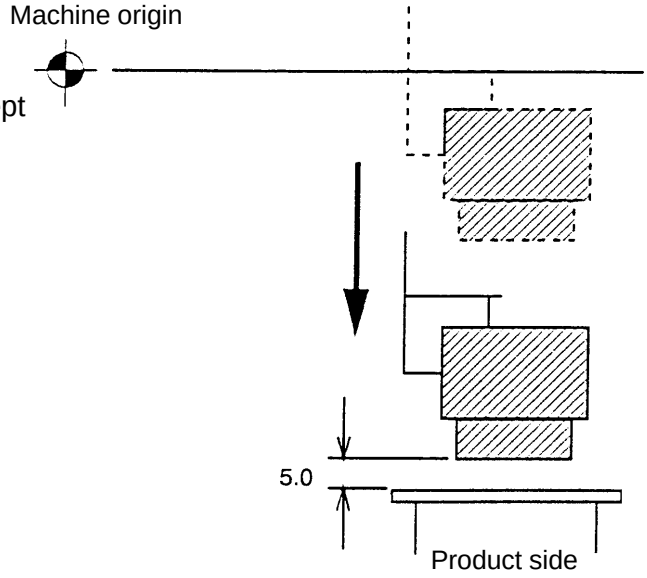


The feed speed is adjusted by “FEEDRATE (mm/min)” setting.

3) The product approaches the product placing pallet.

The approach to the placing pallet continues while the start button is kept pressing (up to 5mm proximity point)

Thereafter, the product is placed on the product pallet.

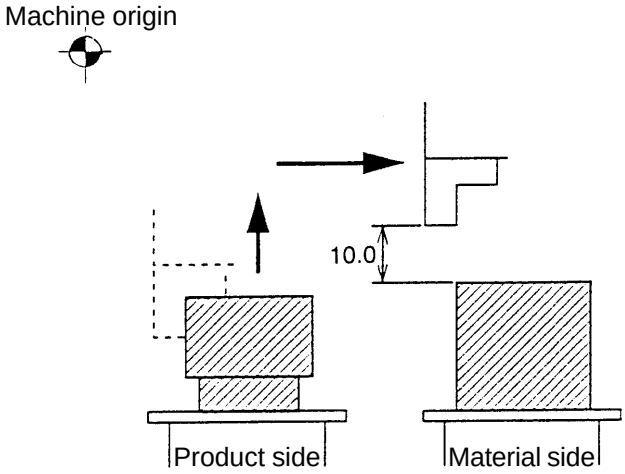


Note) *Even when there is no product attached to the chuck, the product placing action takes place.*

4) The spindle chuck is opened and lifted up then moves to the material gripping position.

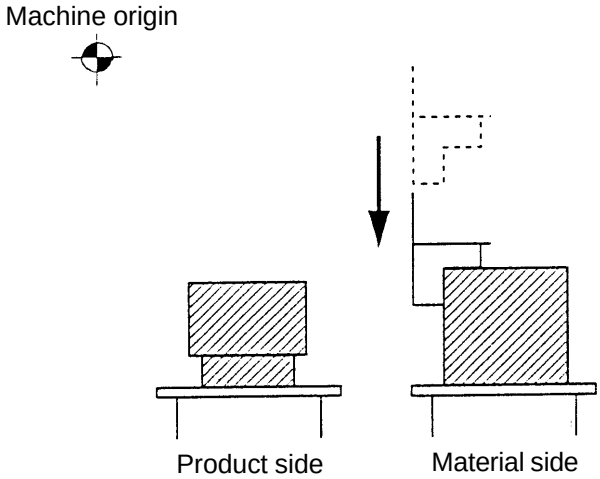
The clearance setting between the material and the end face of the jaws is about 10mm. (This setting can be changed by modifying the loading program.)

In the case of push up type feeder, when the upper face of the material is lower than the upper face of the product, the clearance is counted as 10+α.



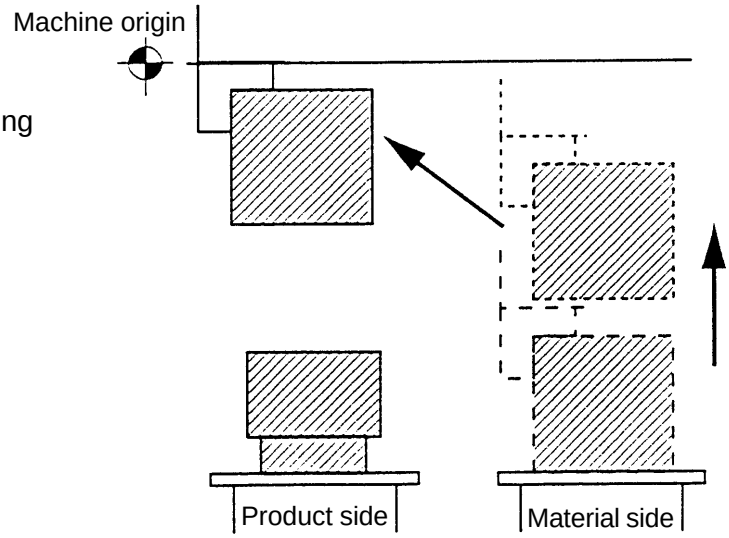
5) The chuck goes to gripping the material.

The chuck comes down to the material gripping position then the chuck is closed.



6) The chuck grips and returns to the original point.

The loading program is thus completed and it returns to the cutting program again.



The process for confirming the action based on the setting data on the dialogue screen is completed with the above.

If there is any modification required, the data setting on the dialogue screen is to be made once again.

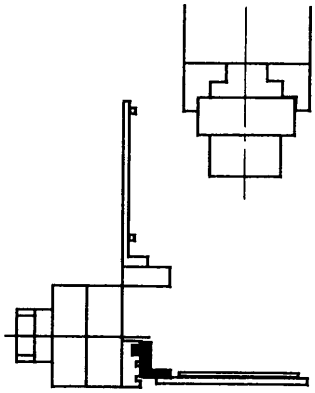
3.3 Checking Actions of Turnover Table

Ensure that the work that has been machined under Process 1 is set on the chuck, and required data have been input and displayed on the interactive screen. Also ensure that the condition of machine is in Mode MDI, single block turned ON, and the program check is enabled.

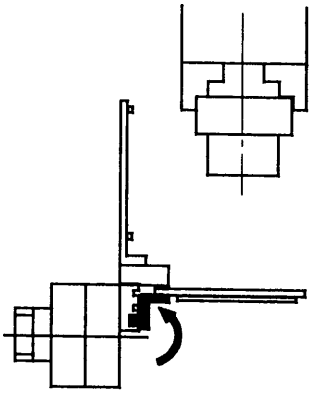
1) In Mode MDI, input LOAD PF** and press the program start button to execute the program. (Note: The asterisks (**) denote the input PF file number.)

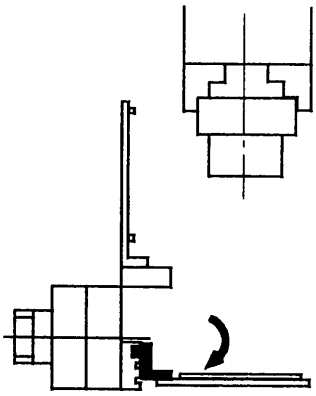
2) In Mode MDI, input M203 and press the program start button. Then O9022 runs to perform the reversing action.

3) The spindle travels to turnover table original position. (If the turnover table is not in the original position, the alarm beeps.)



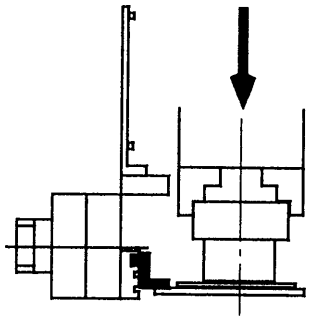
4) While spindle is traveling, the rest stock temporarily swivels to the 180° position and then returns to the 0° position. Cut chips are shaken off by this action



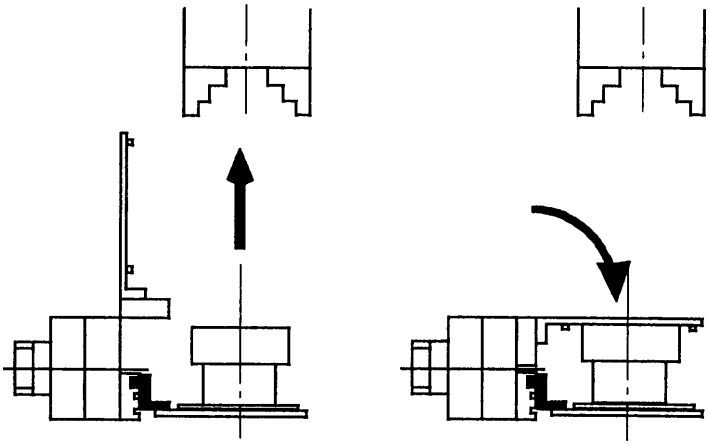


5) Place the work on the turnover table.

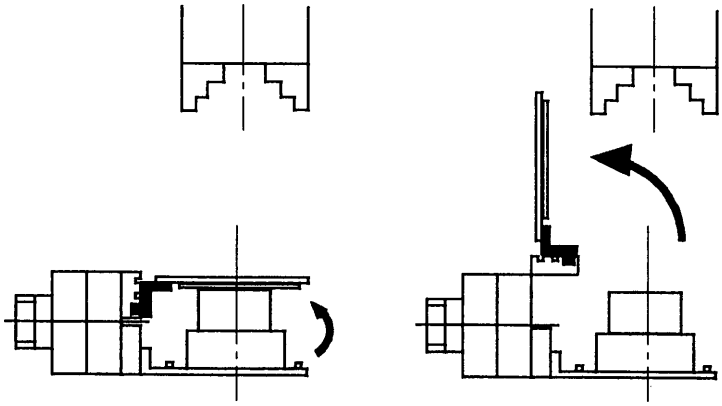
Allow the work to approach to a point 5 mm before the work rest stock, and place the work on the work rest stock.



6) The chuck opens and the main spindle rises to allow the presser plate to go down.

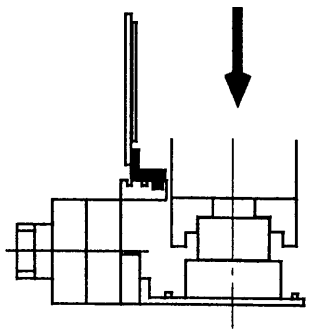


7) The machine allows the turnover table to swivel for 180° and allows the plate on the rest stock side to rise.

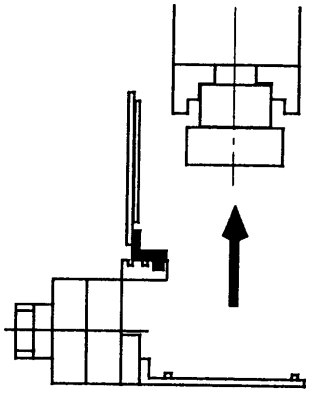


8) The chuck goes to gripping the turnover table.

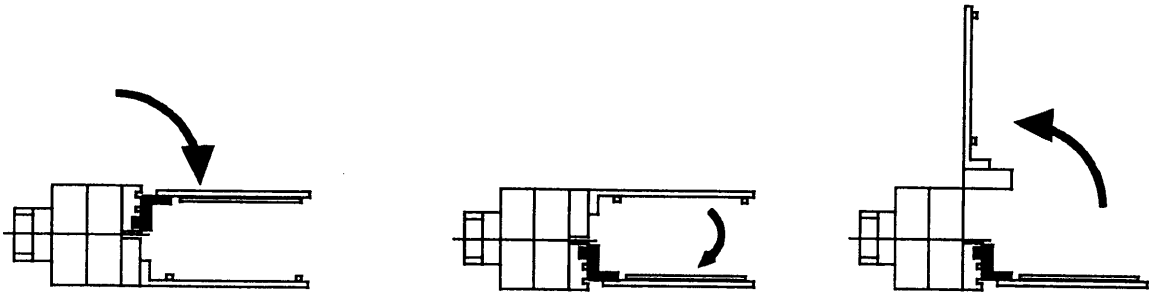
Allow the chuck to approach the work in a rapid travel (to a point 10 mm away from the jaw end surface) and to grip the work.



9) The chuck grips the work and rises to the original position.



10) The main spindle recedes to the feeder side, and the turnover table performs indexing to the original position.



11) Then, the main spindle returns to he original point, and thus the reversing operation is completed.

3.4 Method for recovery from the reversing operation is interrupted

Suppose when the reversing operation is interrupted because of an emergency stop or interference between the machine and a unit. In such a case, execute the recovery operation by paying attention to the following points:

1) Turn ON the power switch of the machine and press the “STANDBY” button.
2) Check the status of main spindle, work, and turnover table.
   Refer to the drawings under the preceding section “3-3. Checking Actions of Reversing Stock”.
3) Apply the “feeding mode and manual pulse” to the spindle movement.
4) Before operating the main spindle under the command with “MDI mode and turnover table related M codes,” ensure that the main spindle has receded to the feeder side.

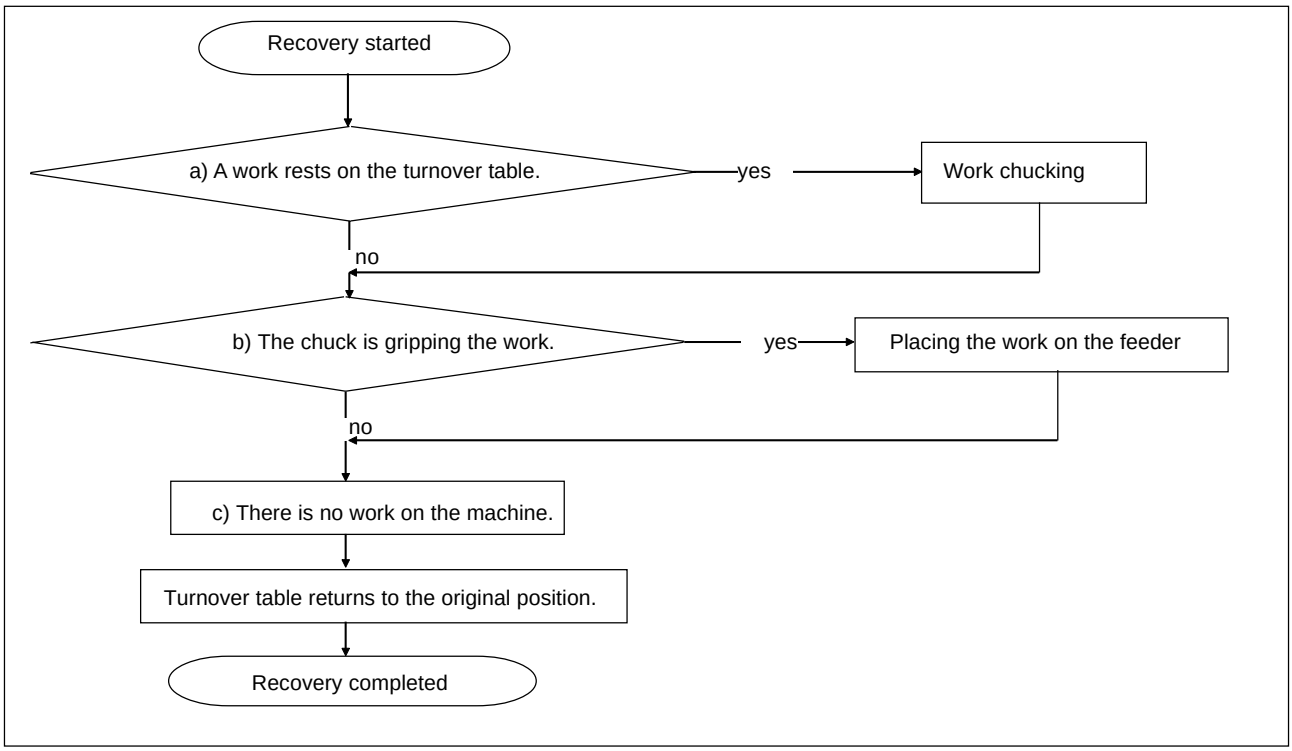
(M codes related to the turnover table)

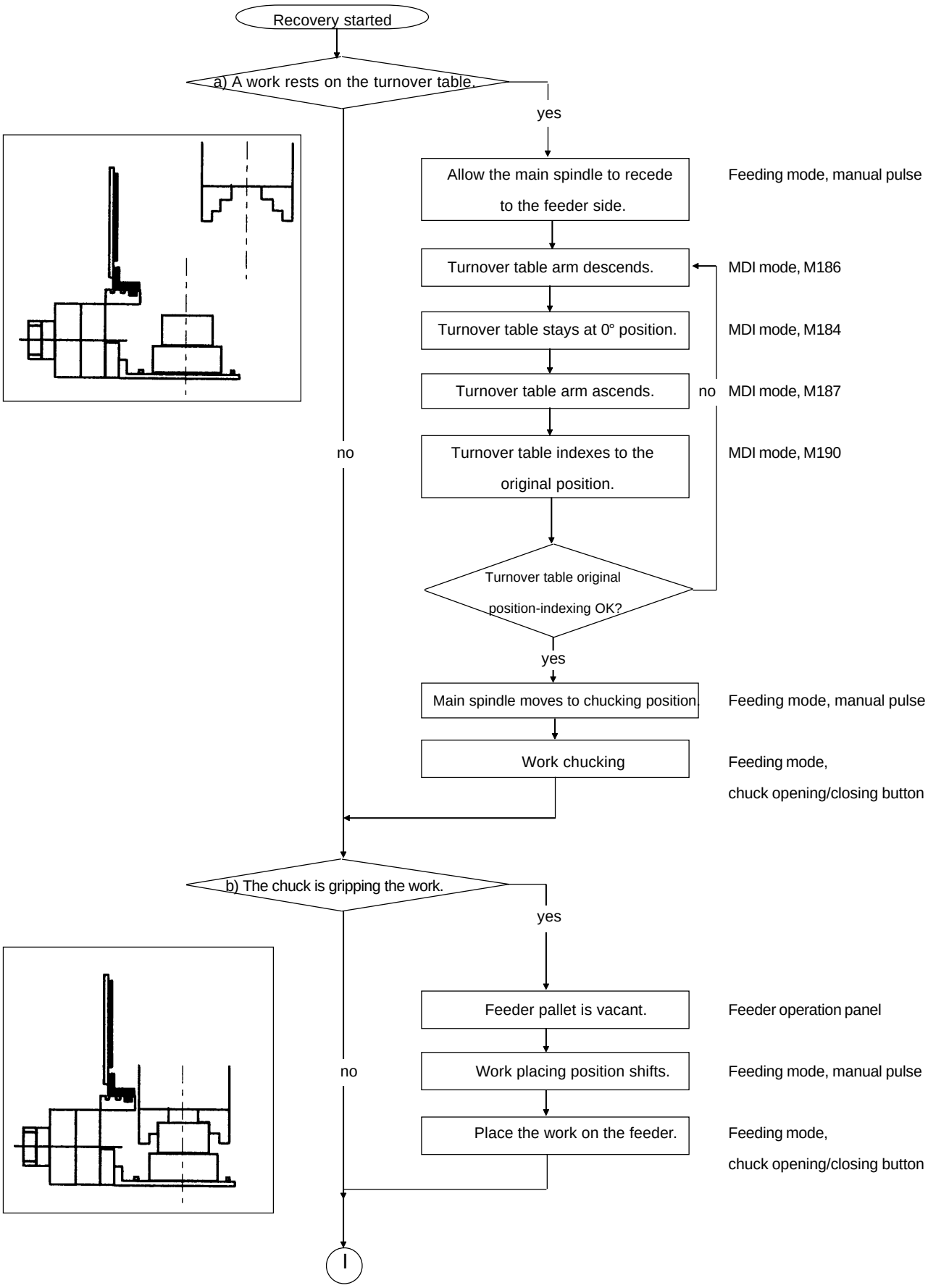
M184: Turnover table 0°
M185: Turnover table 180°
M186: Arm descent
M187: Arm ascent
M188: Air ON
M189: Air OFF
M190: Original position check (The M code for alarming when the turnover table is not in the original position)

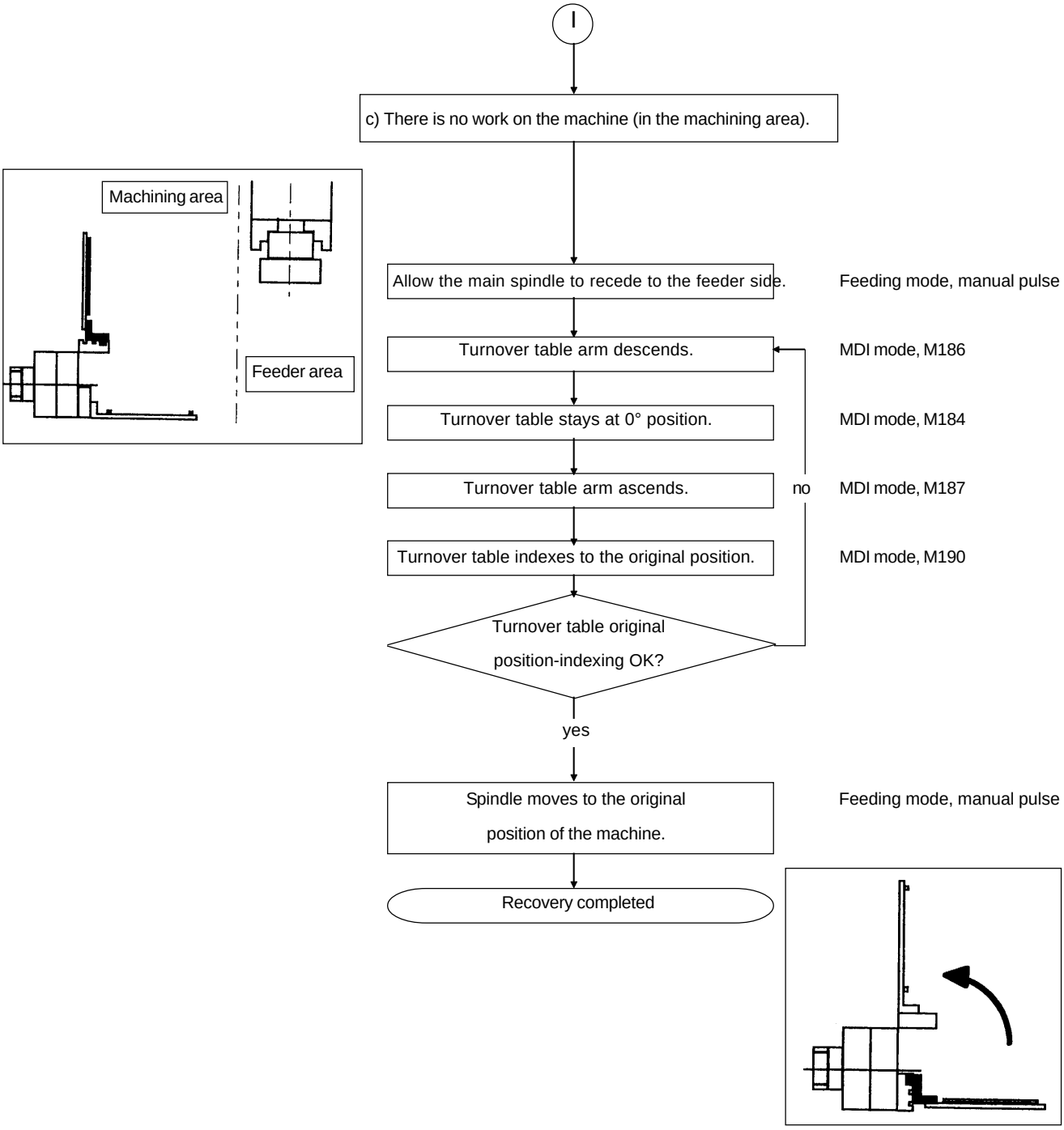
(Flowchart of turnover table recovery operation)

Identify the status a), b), or c) of the following, when the reversing operation is interrupted:

a) A work rests on the turnover table.
b) The chuck is gripping the work.
c) There is no work on the machine (in the machining area).

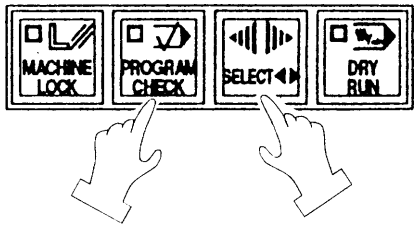



Recovery started
a) A work rests on the turnover table.
yes
no
Allow the main spindle to recede to the feeder side.
Feeding mode, manual pulse
Turnover table arm descends.
MDI mode, M186
Turnover table stays at 0° position.
MDI mode, M184
Turnover table arm ascends.
no
MDI mode, M187
Turnover table indexes to the original position.
MDI mode, M190
Turnover table original position-indexing OK?
yes
Main spindle moves to chucking position.
Feeding mode, manual pulse
Work chucking
Feeding mode, chuck opening/closing button
b) The chuck is gripping the work.
yes
no
Feeder pallet is vacant.
Feeder operation panel
Work placing position shifts.
Feeding mode, manual pulse
Place the work on the feeder.
Feeding mode, chuck opening/closing button
I


I
c) There is no work on the machine (in the machining area).
Machining area
Feeder area
Allow the main spindle to recede to the feeder side.
Feeding mode, manual pulse
Turnover table arm descends.
MDI mode, M186
Turnover table stays at 0° position.
MDI mode, M184
Turnover table arm ascends.
no
MDI mode, M187
Turnover table indexes to the original position.
MDI mode, M190
Turnover table original position-indexing OK?
yes
Spindle moves to the original position of the machine.
Feeding mode, manual pulse
Recovery completed

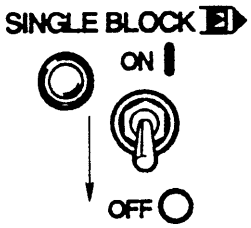
4 Automatic Operation

1) To make the program check ineffective



Once again, press the program check key while pressing the effective key. The light of the lamp on the program check key goes off and the program check function becomes ineffective. (At the same time, dry run and machine lock are also made ineffective.)

2) Put the single block mode OFF.



3) Set the feed rate and the spindle override at 100%.

4) Set the optional stop and the block skip switches as necessary.

5) Set the material on the feeder.

This setting is same as that of section 3-1, 3). (This time, however, the process of attaching product to the chuck is unnecessary.)

6) Call the program and press “START” in the “MEMORY” mode.

The material on the feeder is taken, and the machining starts after return to the machine zero point.

5 Alarm Relevant Matters

5.1 Alarm Screen

In the feeder control program, the system confirms various signal received before it takes the next action. When such confirmation is not available, the program stops and an alarm is issued. The alarm is generated at the time when an “Alarm” command in the control program of the feed is executed.

The alarm message is displayed on the “Alarm diagnosis” screen.

Example: The case of ALM = 1

```
ALARM DIAGNOSIS
-------------------------------------------------------------------------
                                    CNC
-------------------------------------------------------------------------
[548]2      “ALM” COMMAND
            “ALM” command is executed.
-------------------------------------------------------------------------
                                    PMC
-------------------------------------------------------------------------
[1062]      FEEDER ALARM
[1200]      FEEDER CW/CCW Stop Position Is Unconfirmed.      ----------*2
```

The message on the line *2 changes depending on the ALM No.

5.2 Alarm List

PC-No.	ALM No.	MESSAGE	Contents
1200	1	FEEDER CW/CCW STOP POSITION IS UNCONFIRMED.	The pallet stopped midway, or the feeder mode is not in the “AUTO” mode.
1201	2	LIFTER1 (FOR MATERIAL) IS STOPPED IN HALFWAY.	The lifter stopped midway, or the feeder mode is not in the “AUTO” mode.
1202	3	LIFTER2 (FOR MATERIAL) IS STOPPED IN HALFWAY.	The lifter stopped midway, or the feeder mode is not in the “AUTO” mode.
1203	4	WAIT RELEASE SIGNAL FROM NC IS UNCONFIRMED.	M89 has not been executed.
1204	5	THERE IS NO MATERIAL.	No material is on the pallet.
1205	6	THE MATERIAL TOOMUCH ON PALETTE.	Too many works are on the pallet.
1206	7	CHUCK OPEN IS UNCONFIRMED.	The chuck is closed, or the sensor is defective.
1207	8	FEEDER DOOR IS NOT CLOSED.	Close the door on the feeder side.
1210	9	NO SPACE AVAILABLE FOR PUTTING FINISHED PRODUCT	Unable to put finished product because works are placed both on finished product/ material pallets
1211	10		
1212	11		
1213	12		
1214	13		
1215	14		
1216	15		
1217	16		
1220	17		
1221	18		

6 Others

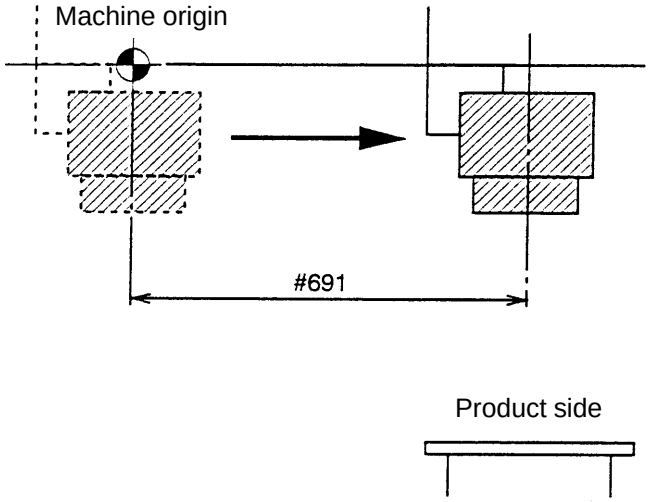
6.1 Data on Loading Position

Detailed explanation on axis traverse in the loading program (O9020)

6.1.1 Package B

1) Traverse to the product pallet

Movement from the machine origin to the product pallet (#691).



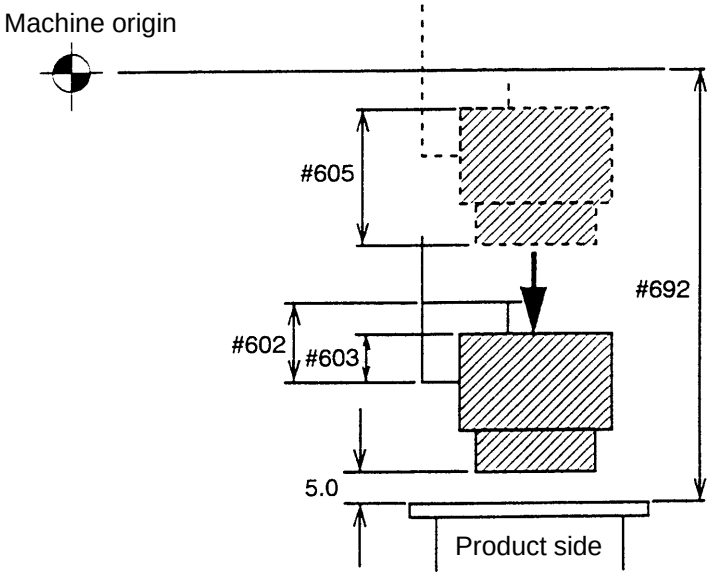
2) Approach to product pallet

Approach from the machine origin to the placing height of product.

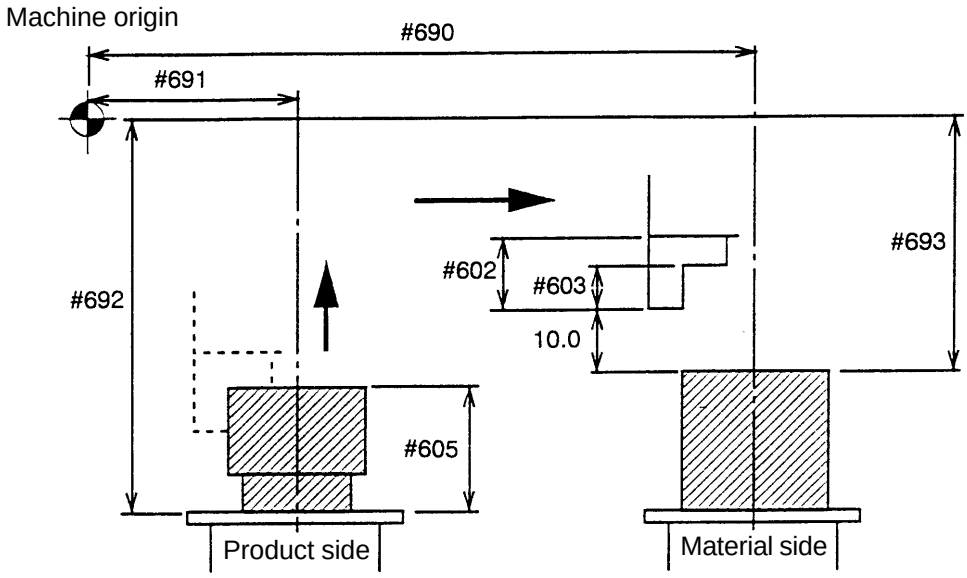
Approach to 5mm high above the pallet.

Next, placement on the finished product pallet.

Input the adjustment of placing height to the variable data adjustment (#604).



3) Traverse to the material pallet

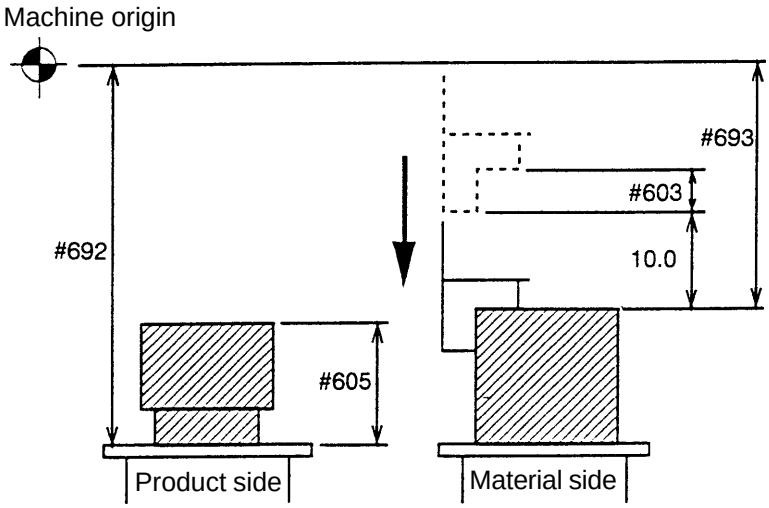


Z axis lifts up 10mm from the top face of the finished product (According to the height of the feeder, it may be the top face of the material).

Move to X axis material position (#690).

The height of the package B may change according to the height of the detection sensor.

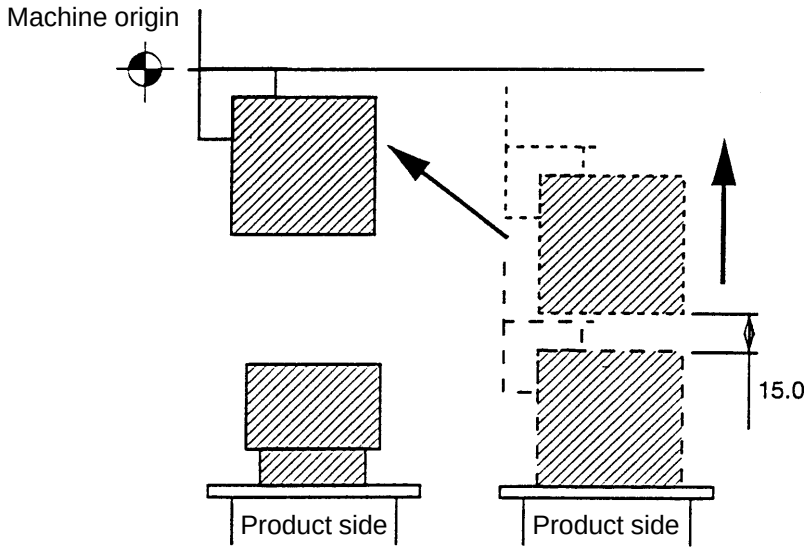
4) Approach to the material gripping position



Z axis approaches to 10mm from the top face of the material (According to the height of the feeder, it may be the top face of the material).

Move to Z axis material chucking height (#693).

5) Lifting up



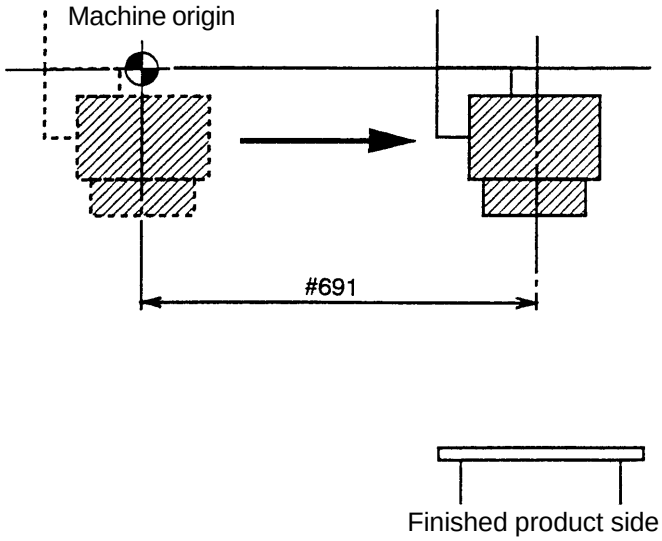
Lifting up 10mm from the material placement height.

Lifting up to Z axis original point.

6.1.2 Package C

1) Movement to the finished product pallet

Movement from the original point to the finished product pallet (#691).



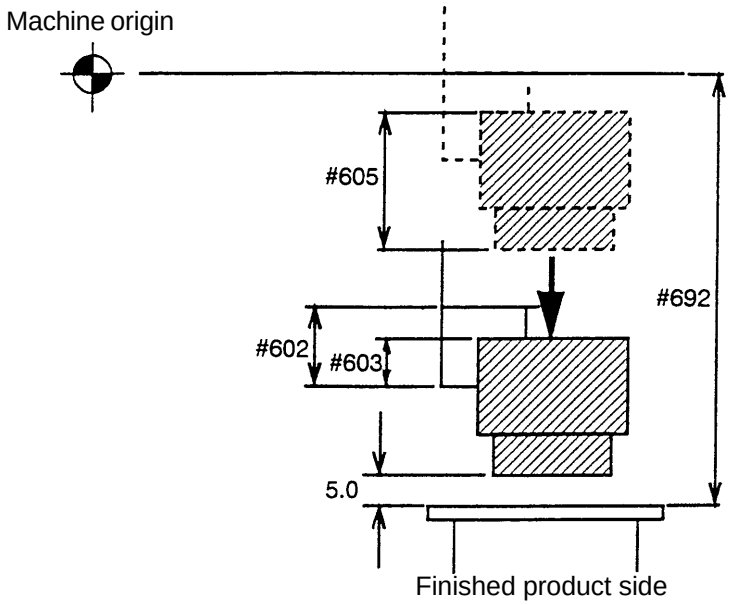
2) Approach to the finished product pallet

Approach from the machine original point to the height of the finished product place.

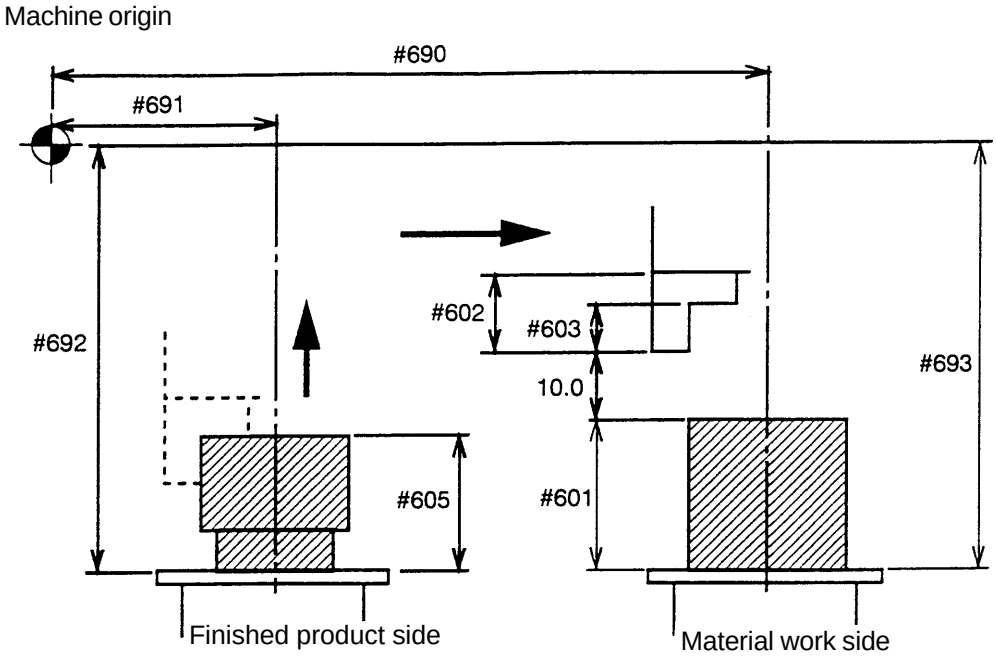
Approach to 5mm high above the pallet.

Next, placement on the finished product pallet.

Input the adjustment of placing height to the variable data adjustment (#604).



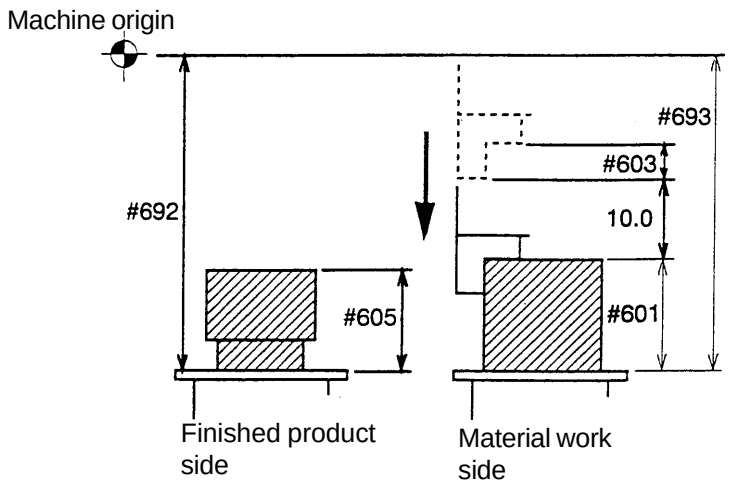
3) Movement to the material work pallet



Z axis lifts up 10mm from the top face of the finished product (According to the height of the feeder, it may be the top face of the material).

Move to X axis material position (#690).

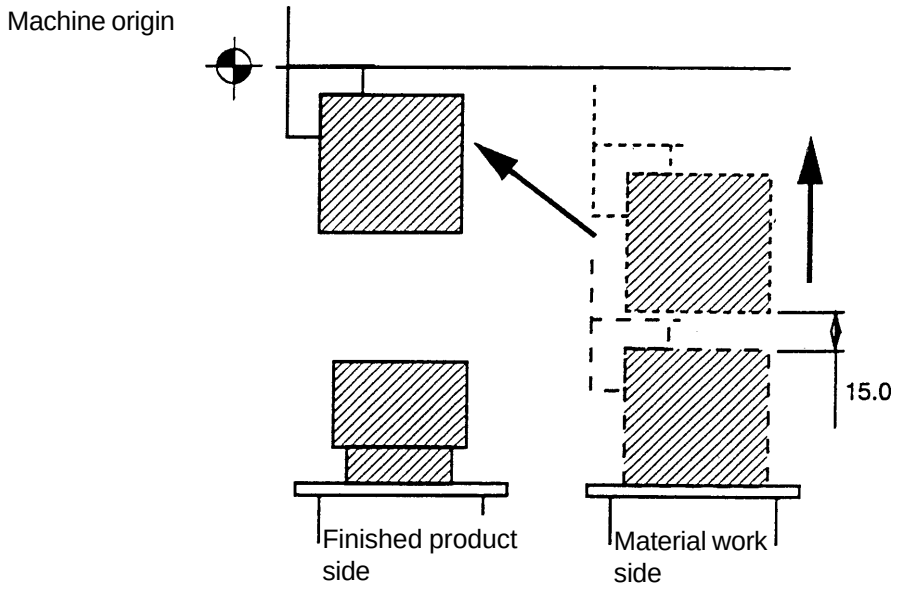
4) Approach for material work clamping



Z axis approaches to 10mm high from the top face of the material.

Move to Z axis material chucking height.

5) Lifting up

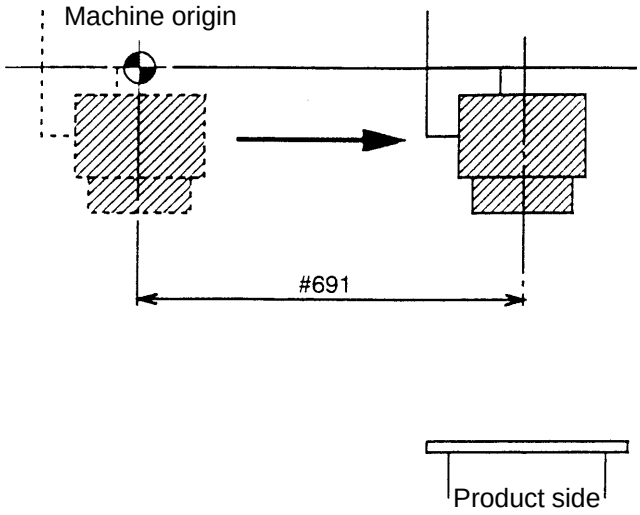


6.1.3 Package B (In case there is a pusher between pallets (material work and finished product))

Also, when there is a pusher between the machine and feeder, this program is applicable for operating actions.

1) Traverse to the product pallet

   Movement from the machine original point to the product pallet (#691).



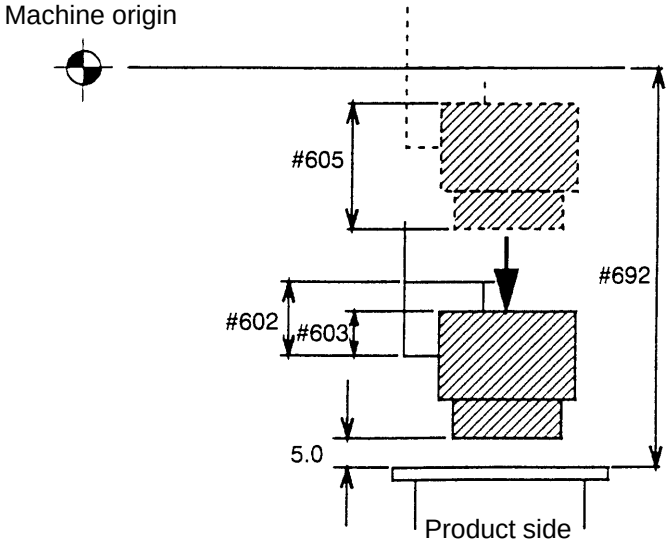
2) Approach to product pallet

   Approach from the machine original point to the placing height of product.

   Approach to 5mm high above the pallet.

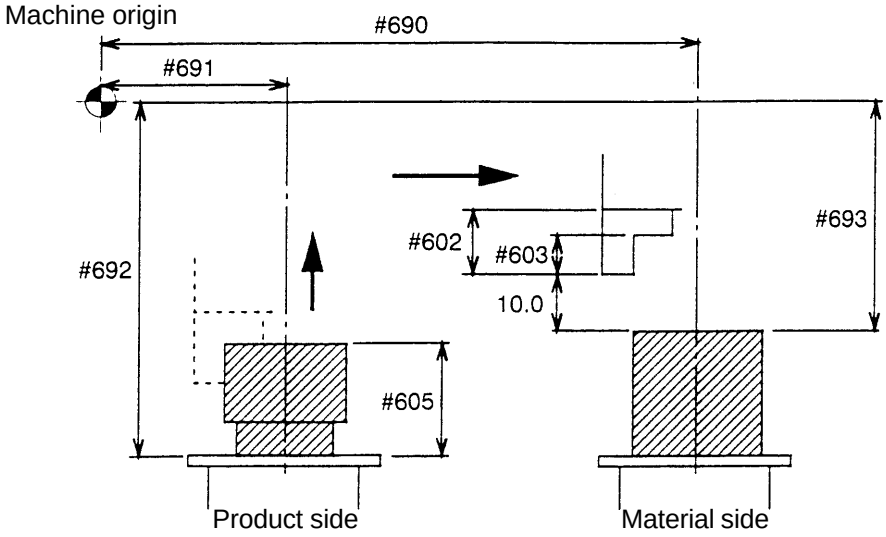
   Next, placement on the finished product pallet.

   Input the adjustment of placing height to the variable data adjustment (#604).



3) Traverse to the material pallet

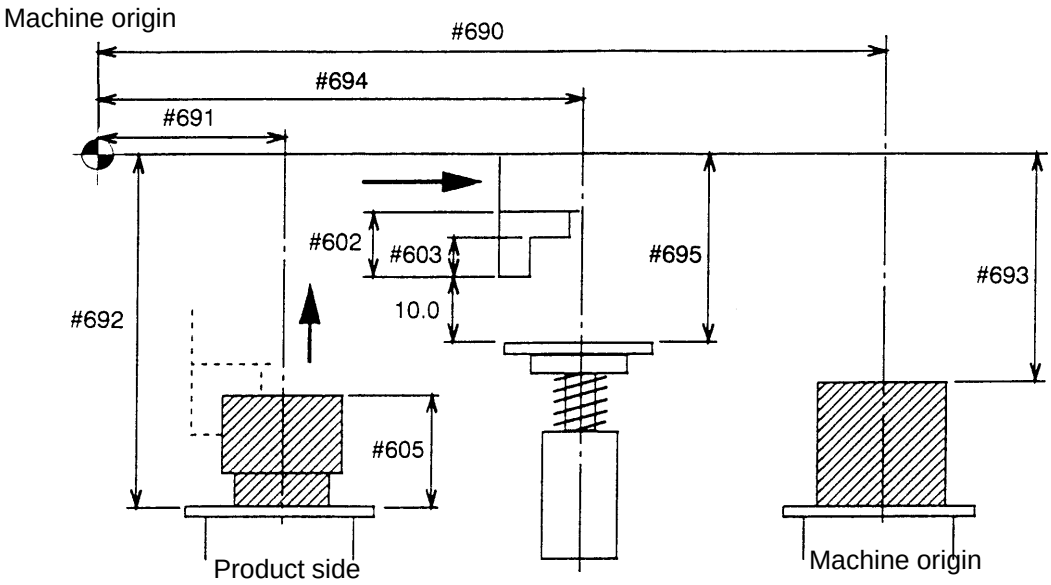
(A) Movement in case of the machine without pusher



Z axis lifts up 10mm from the top face of the finished product (According to the height of the feeder, it may be the top face of the material).

Move to X axis material position (#690).

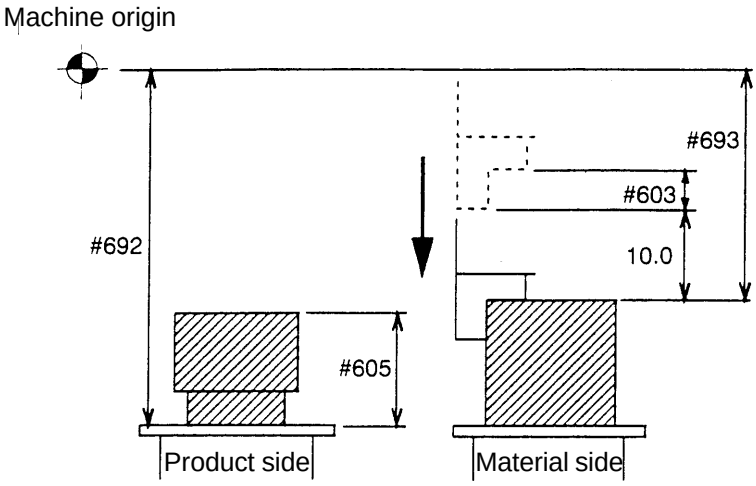
(B) Movement in case of the machine with pusher



Z axis lifts up 10mm from the pusher (According to the height of the feeder, it may be the top face of the material).

Move to X axis material position (#690).

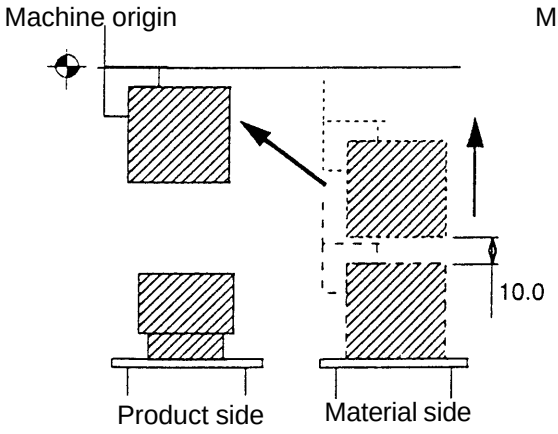
4) Approach to the material gripping position

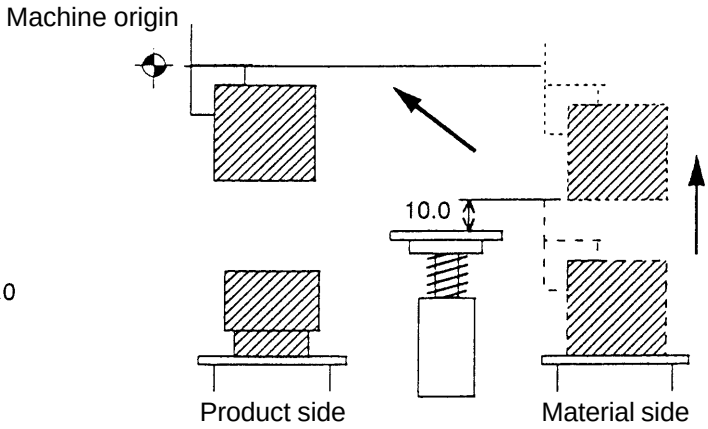


Approach to 10mm high above the pallet.

Move to Z axis material chucking height (#693).

5) Lifting up





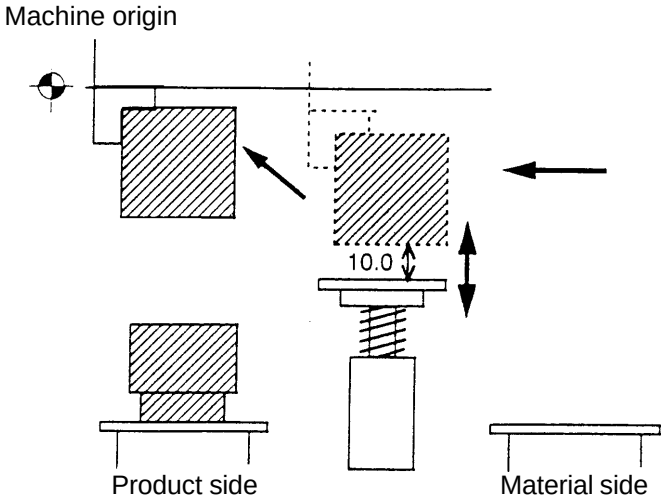
Lifting up 10mm from the material placement height.

Lifting up to Z axis zero point.

6) Press down (gripping over again) action

After moving to the pusher position, performs pressing down action then returns to the machine original point.

When not using the pusher, after gripping the material and directly returns to the machine original point.



6.2 Signal Output

On the feeder control screen, output of various signals is available. By pressing F6/OUT on this screen, the cursor moves to the IN/OUT table part of the screen. (Refer to [6], [9] on page 2-4). Refer to Input/Output Signal Table.

The cursor is placed on the line of OUT01, column+0.

IN/OUT	+0	+1	+2	+3	+4	+5	+6	+7
IN01	0	0	1	0	0	1	0	0
IN09	1	0	1	0	0	0	1	0
IN17	0	0	1	0	1	1	0	0
IN25	1	0	1	0	0	1	0	0
IN33	0	0	1	0	0	0	0	0
IN41	0	0	1	0	0	1	0	0
IN49	0	1	1	0	0	1	0	0
IN57	1	0	1	0	1	0	1	0
OUT01	0	0	0	0	0	0	0	0
OUT09	0	0	0	0	0	0	0	0
OUT17	0	0	0	0	0	0	0	0
OUT25	0	0	0	0	0	0	0	0
OUT33	0	0	0	0	0	0	0	0
OUT41	0	0	0	0	0	0	0	0
OUT49	0	0	0	0	0	0	0	0
OUT57	0	0	0	0	0	0	0	0

For example, when elevating the lifter of the lift feeder (OUT20), move the cursor to the place as shown in the table on the right.

The cursor position for OUT20 is on the crossing point of line OUT17 and column +3. (17 + 3 = 20)

IN/OUT	+0	+1	+2	+3	+4	+5	+6	+7
IN01	0	0	1	0	0	1	0	0
IN09	1	0	1	0	0	0	1	0
IN17	0	0	1	0	1	1	0	0
IN25	1	0	1	0	0	1	0	0
IN33	0	0	1	0	0	0	0	0
IN41	0	0	1	0	0	1	0	0
IN49	0	1	1	0	0	1	0	0
IN57	1	0	1	0	1	0	1	0
OUT01	0	0	0	0	0	0	0	0
OUT09	0	0	0	0	0	0	0	0
OUT17	0	0	0	0	0	0	0	0
OUT25	0	0	0	0	0	0	0	0
OUT33	0	0	0	0	0	0	0	0
OUT41	0	0	0	0	0	0	0	0
OUT49	0	0	0	0	0	0	0	0
OUT57	0	0	0	0	0	0	0	0

After placing the cursor as above, press F7 (ON/OFF) . The numeral on the display changes from “0” to “1” as shown in the table on the right, and the intended signal is output.

Subsequently, press F7 (ON/OFF) again after about 0.5 ~ 1 second to change the numeral back to “0”.

IN/OUT	+0	+1	+2	+3	+4	+5	+6	+7
IN01	0	0	1	0	0	1	0	0
IN09	1	0	1	0	0	0	1	0
IN17	0	0	1	0	1	1	0	0
IN25	1	0	1	0	0	1	0	0
IN33	0	0	1	0	0	0	0	0
IN41	0	0	1	0	0	1	0	0
IN49	0	1	1	0	0	1	0	0
IN57	1	0	1	0	1	0	1	0
OUT01	0	0	0	0	0	0	0	0
OUT09	0	0	0	0	0	0	0	0
OUT17	0	0	0	1	0	0	0	0
OUT25	0	0	0	0	0	0	0	0
OUT33	0	0	0	0	0	0	0	0
OUT41	0	0	0	0	0	0	0	0
OUT49	0	0	0	0	0	0	0	0
OUT57	0	0	0	0	0	0	0	0

Note) *Make sure that the numeral “1” for signal output be put back to “0”.*

If it is left to be “1”, the signal is output continuously which may cause erroneous action in the automatic operation.

Relevant parameter

F7 (ON/OFF) is displayed by setting the parameter.

6.3 IN/OUT Signal

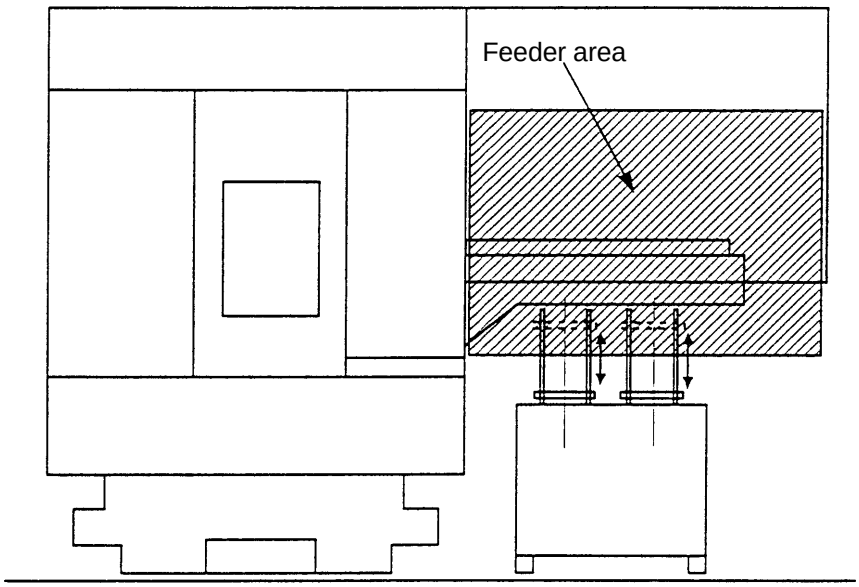
IN	TITLE (INPUT)	OUT	TITLE (OUTPUT)
01		01	
02		02	
03		03	
04		04	
05		05	
06		06	
07		07	
08		08	
09		09	
10		10	
11		11	
12		12	
13		13	
14		14	
15		15	
16	FEEDER UPPER DOOR CLOSE CONFIRMATION	16	
17		17	
18	UPPER FIXED POS. MATERIAL LIFTER	18	FORWARD ROTATION COM. OF FEEDER
19	ORIGINAL POSITION OF FEEDER	19	REVERSE ROTATION COM. FEEDER
20	UPPER FIXED POS. FIN.PART	20	ASCENT COM. OF MATERIAL LIFTER
21	UPPER OT OF MATERIAL LIFTER	21	ASCENT COM. OF FINISH PART LIFTER
22	LOWER POS. OF MATERIAL LIFTER	22	DECENT COM. OF MATERIAL LIFTER
23	LOWER POS. OF FINISH PART LIFTER	23	DECENT COM. OF FINISH PART LIFTER
24		24	
25		25	
26		26	
27	CHUCK OPEN CHECK	27	CHUCK OPEN
28	CHUCK CLOSE CHECK	28	CHUCK CLOSE
29		29	
30		30	
31	SPINDLE STOP CHECK	31	SPINDLE CHUCK AIR BLOW
32		32	
33	MEASURE HEAD RETURN CHECK	33	MACHINE CYCLE START

IN	TITLE (INPUT)	OUT	TITLE (OUTPUT)
34	MACHINE AUTO MODE	34	FEEDER START FIN. SIGNAL
35	FEEDER WAITING RELEASE	35	FEEDER WAITING
36	SPINDLE ORIENTATION FINISH	36	MACHINE WAITING RELEASE
37	WORKPIECE EJECT REQUEST	37	WORKPIECE EJECT FINISH
38		38	
39		39	
40		40	
41		41	
42		42	
43		43	
44		44	
45		45	
46		46	
47		47	
48		48	
49		49	
50		50	
51		51	
52		52	
53		53	BLOCK SKIP 6 OFF
54		54	BLOCK SKIP 6 ON
55		55	
56		56	
57		57	
58		58	
59		59	
60		60	
61		61	
62		62	
63		63	
64		64	

6.4 Axis Movement by Manual Operation

For Package B specification (push up type feeder), some caution is necessary in moving the axis. When the feeder is operated manually to push up the lifter by “JOG”, the lifting could overtravel beyond the material upper limit detecting sensor. If the movement of X-axis goes on further to the plus direction (feeder side), the work intereres with the cover. In order to prevent this, an interlocking device is arranged as shown in the diagram below.

In the manual mode, if the lifter is not on the downward end, the lifter moving operation of X-axis plus direction to the feeder side becomes prohibitive.



Lift up type feeder

The feeder area in the above diagram (right side of machine origin) is the area where the X-axis plus direction moving operation is prohibited when the lifter is not on the downward end. (Alarm is issued.)

Nevertheless, movement in the reverse direction (–X-axis minus direction) is permitted.

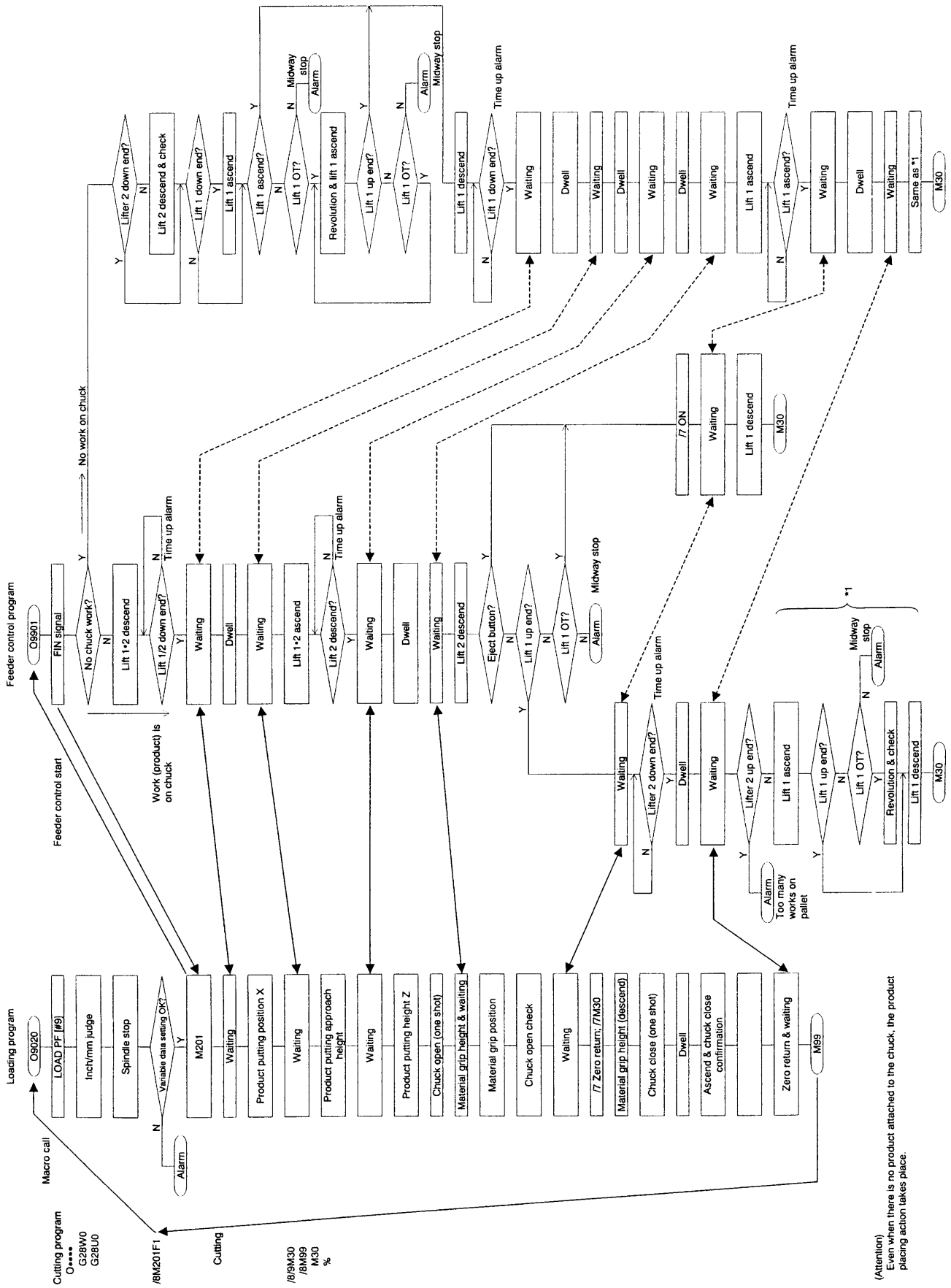
6.5 Door on Feeder Side

In the automatic operation, the door on the feeder side should normally be closed from the safety viewpoint.

If the door accidentally opens during the automatic operation and the X-axis enters the “feeder area”, the operation is suspended with an alarm. In such case, close the door and insert the safety plug then press the “Program start” button again, by which the remaining part of the operation can be continued.

7 Program

7.1 Package B



088899 (CS20-FEEDER DESCRIPTION)	Machine specification summary
N1 (VERSION-NO. = VER1.0)	Version1.0
N2 (MACHINE = ONE-MACHINE)	One-machine
N3 (CARRY TYPE = RETURN-TYPE)	Return carry
N4 (OPERATION = OP1)	1 operation
N5 (TURN OVER-DEVICE = - - - - - - - - - -)	
N6 (ENTRANCE-DEVICE = HRL150∗8P)	Lift up type feeder f150*8P
N7 (EXIT-DEVICE = - - - - - - - - - -)	
N8 (TYPE = PACKAGE-B)	Package-B
N9 (OPTION = - - - - - - - - - -)	
M99	

(Loading program)

09020 (LOADING PACKAGE-B VER1.0) LOAD PF[ROUND[ADP[#9]]]	PF file load
#25 = 505 - 24∗#4006 (INCH/MM)	Inch/mm judge
M05	Spindle stop
IF[[[#690EQ0]+[#691EQ0]+[#692EQ0]]GT0] → → GOTO9000	Various variable data check. Alarm when no setting
G28 G140 W0 M201 (START FEEDER-CONTROL)	Zero return/Feeder control program start
G28 U0 M09	Zero return/Coolant OFF
M89 (WAITING)	Waiting for feeder control program
G00 U[ABS[#691]] (PUT DOWN F/PARTS POS.)	Product placing position X
M89 (WAITING)	Waiting for feeder control program
G00 G98 W-[ABS[#692]-[ABS[#605]+ABS[#603] → → -ABS[#602]-5.0/#25] (APPROACH POS. 1)	Product placing approach height (5mm clearance)
M89 (WAITING)	Waiting for feeder control program
G01 W-[5.0/#25-#604] F[4000/#25] (PUT DOWN F/PATS POS.2)	Product placing height Z
M169 (CHUCK OPEN)	Chuck open (One-shot)
G04 P0.2	Dwell
G00 W[[ABS[#692]-ABS[#605]-ABS[#693]]∗ → → [ABS[#693]LT[ABS[#692]- ABS[#605]]] → → +ABS[#603]-#604+10.0/#25] → → M89 (GO UP POS.3)	Material grip height ascend & waiting for feeder control program
G00 U[ABS[ABS[#690]-ABS[#691]]] (PICK UP MATERIAL POS.)	Material grip position X

M69 (CHUCK OPEN AND CONFIRMED)	Chuck open and confirmed
M89 (WAITING)Waiting for feeder control program	
/7 G28 G143 W0	Zero return (Ejecting time)
/7G28 U0	Zero return (Ejecting time)
/7 M30 (EJECT)	Program end (Ejecting time)
G00 W-[[ABS[#693]-ABS[#692]+ABS[#605]]* → → [ABS[#693]GT [ABS[#692]-ABS[#605]]]] → → (APPROACH POS.)	Material grip approach height Z (The value may become “0” depending on the height of material and product.)
G00 W-[[ABS[#693]-#600+10.0/#25] F[3000/#25] (PICK UP …	Material grip height Z
M168 (CHUCK CLOSE ONE-SHOT)	Chuck close (One-shot)
G04 P[10.0*[#606EQ0]+#606]	Dwell
G00 G99 W[ABS[#601]+15.0/#25] M68(CHUCK CLOSE AND C …	Ascending height Z & chuck close confirmation
G28 U0 W0 M89 (WAITING)	Zero return and waiting for feeder control program
G143	
M99 (RETURN)	Return
N9000	
#3000 = 190 (#690-#693 UNFININED COMMON VAL.)	ALARM

(Feeder control program)

09901 (FEEDER PACKAGE-B VER1.0) POUT #34 (FIN TO CS20)	FIN signal to respond start signal
IF[[IN[#27] =1] OR [IN[#28] =1]] GOTO2000	If no work on spindle, program jumps to N2000.
N1000 (++ CHUCK HAS WORK ++)	
POUT #22 (LIFT1 DOWN)	Lift 1 down command
POUT #23 (LIFT2 DOWN)	Lift 2 down command
G04 P0.2	Dwell
WAIT IN [#22] =1 T300.0ALM =02 (LIFT1 DOWN ERROR)	If not confirmed within 300 seconds, an alarm is issued.
WAIT IN [#23] =1 T300.0ALM =03 (LIFT2 DOWN ERROR)	If not confirmed within 300 seconds, an alarm is issued.
N1050 (++ WAIT ++)	

POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.3	Dwell
N1100 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an an alarm is issued.
N1100 (++ LIFT2 UP ++)	
POUT #21 (LIFT2 UP)	Lift 2 up command
POUT #20 (LIFT1 UP)	Lift 1 up command
G04 P0.2	Dwell
WAIT IN[#20] =1 T300.0ALM =03 (LIFT2 UP ERROR)	If not confirmed within 300 seconds, an alarm is issued.
N1130 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.3	Dwell
N1150 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #23 (LIFT2 DOWN)	Lift 2 down command
N1250 (++ CHECK LIFTER ++)	
IF[IN[#37] =1] GOTO1350	In case of ejection, program jumps to N1350.
#675 =0	Counter
D01	D01 ~ END1 repetition
IF[IN[#18] =1] GOTO1450	If material ascending is OK, program jumps to N1450.

IF[IN[#21] =1] GOTO1350	If material lift is OT, program jumps to N1350.
G04 P0.5	Dwell
IF[ROUND[#675]>=600] THEN ALM =02 (LIFTER UP ERROR)	If the counter counts more than 600, an alarm is issued.
#675 =#675+1	Count up
END1	END1
N1350 (EJECT)	
POUT #37 (/7 ON)	Ejection (/7) ON
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #22 (LIFT1 DOWN)	Lift 1 down command
M30 (END)	Program end
N1450 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
WAIT IN[#23] =1 T300.0ALM =03 (DOWN ERROR)	If not confirmed within 300 seconds, an alarm is issued.
N1500 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
N1550 (++ CHECK F/PARTS LIFTER ++)	
WAIT IN [#20] =0 T1.0ALM =06 (OVER DE-PARE)	Too many works on the pallet
POUT #20 (LIFT1 UP)	Lift 1 up command
#675 =0	Counter
D01	D01 ~ END1 repetition

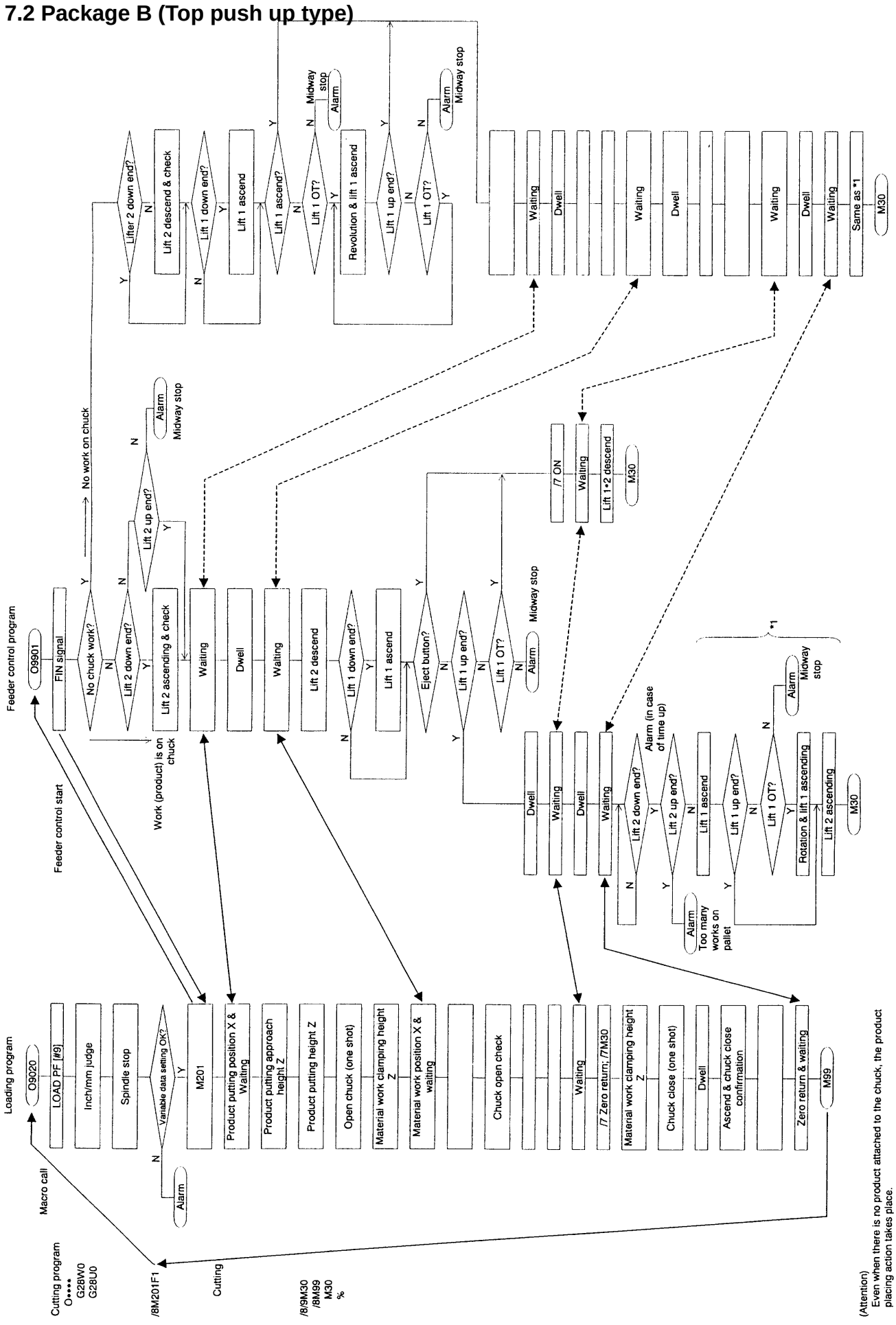
IF[IN[#18] =1] GOTO1650	If material ascending is OK, program jumps to N1650.
IF[IN[#21] =1] GOTO1600	If material lift is OT, program jumps to N1600.
G04 P0.5	Dwell
IF[ROUND[#675]>=600] THEN ALM =02 (LIFTER UP ERROR)	If the counter counts more than 600, an alarm is issued.
#675 =#675+1	Count up
END1	END1
N1600 (++ CCW ++)	
WAIT IN[#16] =1 T300.0ALM =08 (FEEDER WINDOW OPEN ERROR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #19 (CCW)	Feeder reverse move
G04 P2.0	Dwell
WAIT IN[#19] =1 T300.0ALM =01 (FEEDER STOP ERROR)	If not confirmed within 300 seconds, an alarm is issued.
N1650 (++ LIFT DOWN ++)	
POUT #22 (LIFT1 DOWN)	Lift 1 down command
M30 (END)	Program end
N2000 (++ GRIP MATERIAL ++)	
IF[IN[#23] =0] THEN	If lifter 2 is on down end, program jumps to “END IF”.
POUT #23 (LIFT2 DOWN)	Lift 2 down command
G04 P0.5	Dwell
WAIT IN[#23] =1 T300.0ALM =03 (DOWN ERROR)	If not confirmed within 300 seconds, an alarm is issued.
END IF	END IF
N2050 (++ LIFT1 DOWN ++)	
IF[IN[#22] =1] THEN	If lifter 1 is on down end, program jumps to “END IF”.
POUT #20 (LIFT1 UP)	Lift 1 up command
END IF	END IF

N2100 (++ CHECK LIFTER ++)	
#675 =0	Counter
D01	D01 ~ END1 repetition
IF[IN[#18] =1] GOTO2200	If material ascending is OK, program jumps to N2200.
IF[IN[#21] =1] GOTO2150	If material lift is OT, program jumps to N2150.
G04 P0.5	Dwell
IF[ROUND[#675]>=600] THEN ALM =02 (LIFTER UP ERROR)	If the counter counts more than 600, an alarm is issued.
#675 =#675+1	Count up
END1	END1
N2150 (++ CW AND LIFT UP ++)	
#676 =0	Counter
D01	D01 ~ END1 repetition
WAIT IN[#16] =1 T300.0ALM =08 (FEEDER WINDOW OPEN ERROR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #19 (CCW)	Feeder reverse move
G04 P2.0	Dwell
WAIT IN[#19] =1 T300.0ALM =01 (FEEDER STOP ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.2	Dwell
POUT #20 (LIFT1 UP)	Lift 1 up command
G04 P0.2	Dwell
#676 =0	Counter
D02	D02 ~ END2 repetition
IF[IN[#18] =1] GOTO2200	If material ascending is OK, program jumps to N2200.
IF[IN[#21] =1] GOTO2155	If material lift is OT, program jumps to N2155.
G04 P0.5	Dwell
IF[ROUND[#675]>=600] THEN ALM =02 (LIFT1 UP ERROR)	If the counter counts more than 600, an alarm is issued.
#675 =#675+1	Count up
END2	END2
N2155	
IF[ROUND[#675]>=10] THEN ALM =05 (NO WORK PIECE)	If the counter2 counts more than 10, an alarm is issued.

#675 =#675+1	Count up
END1	END1
N2200 (++ WAIT ++)	
POUT #22 (LIFT1 DOWN)	Lift 2 down command
G04 P0.3	Dwell
WAIT IN[#22] =1 T300.0ALM =02 (LIFT1 DOWN ERROR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.3	Dwell
N2250 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.3	Dwell
N2300 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.3	Dwell
N2350 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
N2400 (++ LIFT1 UP ++)	
POUT #20 (LIFT1 UP)	Lift 1 up command
G04 P0.3	Dwell
WAIT IN[#18] =1 T300.0ALM =02 (LIFT1 UP ERROR)	If not confirmed within 300 seconds, an alarm is issued.

N2450 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.3	Dwell
N2500 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
N2550 (++ CHEC LIFTER ++)	
POUT #20 (LIFT1 UP)	Lift 1 up command
#675 =0	Counter
D01	D01 ~ END1 repetition
IF[IN[#18] =1] GOTO2650	If material ascending is OK, program jumps to N2650.
IF[IN[#21] =1] GOTO2600	If material lift is OT, program jumps to N2600.
G04 P0.5	Dwell
IF[ROUND[#675]>=600] THEN ALM =02 (LIFT1 UP ERROR)	If the counter counts more than 600, an alarm is issued.
#675 =#675+1	Count up
END1	END1
N2600 (++ CCW ++)	
WAIT IN[#16] =1 T300.0ALM =08 (FEEDER WINDOW OPEN ERROR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #19 (CCW)	Feeder reverse move
G04 P2.0	Dwell
WAIT IN[#19] =1 T300.0ALM =01 (FEEDER STOP ERROR)	If not confirmed within 300 seconds, an alarm is issued.
N2650 (++ LIFTER DOWN ++)	
POUT #22 (LIFT1 DOWN)	Lift 1 down command
M30 (END)	Program end
%	

7.2 Package B (Top push up type)



08899 (CS20-FEEDER DESCRIPTION)	Machine specification summary
N1 (VERSION-NO.= VER1.0)	Version1.0
N2 (MACHINE= ONE-MACHINE)	One-machine
N3 (CARRY TYPE= RETURN-TYPE)	Return carry
N4 (OPERATION = OP1)	1 operation
N5 (TURN OVER-DEVICE= - - - - - - - - - -)	
N6 (ENTRANCE-DEVICE= HRL150)	Lift up type feeder f150
N7 (EXIT-DEVICE = - - - - - - - - - -)	
N8 (TYPE = PACKAGE-B)	Package-B
N9 (OPTION = - - - - - - - - - -)	
M99	

(Loading program)

09020 (LOADING PACKAGE-B VER1.0) LOAD PF[ROUND[ADP[#9]]]	PF file load
#25 = 505 - 24∗#4006 (INCH/MM)	Inch/mm judge
M05	Spindle stop
IF[[[#690EQ0]+[#691EQ0]+[#692EQ0]+[#693EQ0]] → → GT0] GOTO9000	Various variable data check. Alarm when no setting
G28 G140 W0 M201 (START FEEDER-CONTROL)	Zero return/Feeder control program start
G28 U0 M09	Zero return/Coolant OFF
G00 U[ABS[#691]] M89(PUT DOWN F/PARTS POS.)	Waiting finished product putting position X & feeder control program to meet
G00 G98 W-[ABS[#692]-ABS[#605]+ABS[#603] → → -ABS[#602]-5.0/#25] (APPROACH POS. 1)	Product placing approach height Z (up to 5mm of reach)
G01 W-[5.0/#25-#604] F[4000/#25] (PUT DOWN F/PATS POS.2)	Product placing height Z
M169 (CHUCK OPEN)	Chuck open (One-shot)
G04 P0.2	Dwell
G00 W[[ABS[#692]-ABS[#605]-ABS[#693]]∗ → → [ABS[#693]LT[ABS[#692]- ABS[#605]]] → → +ABS[#603]-#604+10.0/#25] → → M89 (GO UP POS.3)	Ascending to material work clamping height
G00 U[ABS[ABS[#690]-ABS[#691]]] M89 (PICK UP MATERIAL POS.)	Waiting material work clamping position X & feeder control program to meet.
M69 (CHUCK OPEN AND CONFIRMED)	Chuck open and confirmed

M89 (WAITING)	Waiting for feeder control program
/7 G28 G143 W0	Zero return (Ejecting time)
/7G28 U0	Zero return (Ejecting time)
/7 M30 (EJECT)	Program end (Ejecting time)
G00 W-[[ABS[#693]-ABS[#692]+ABS[#605]]* → → [ABS[#693]GT [ABS[#692]-ABS[#605]]]] → → (APPROACH POS.)	Material grip approach height Z (The value may become “0” depending on the height of material and product.)
G00 W-[ABS[#603]-#600+10.0/#25] F[3000/#25] (PICK UP …	Material grip height Z
M168 (CHUCK CLOSE ONE-SHOT)	Chuck close (One-shot)
G04 P[10.0*[#606EQ0]+#606]	Dwell
G00 G99 W[ABS[#601]+15.0/#25] M68(CHUCK CLOSE AND C …	Ascending height Z & chuck close confirmation
G28 U0 W0 M89 (WAITING)	Zero return and waiting for feeder control program
G143	
M99 (RETURN)	Return
N9000	
#3000 = 190 (#690-#693 UNFININED COMMON VAL.)	ALARM

(Feeder control program)

09901 (FEEDER PACKAGE-B VER1.0) POUT #34 (FIN TO CS20)	FIN signal to respond start signal
IF[[IN[#27] =1] OR [IN[#28] =1]] GOTO2000	If no work on spindle, program jumps to N2000.
N1000 (++ CHUCK HAS WORK ++)	
IF[IN[#23] =1] GOTO1050	Jump to N1050, if lifter 2 is at descending end
#675 = 0	Counter
D01	Repeating D01~END1
IF[IN[#20] =1] GOTO1100	Jump to N1100, if liter 2 is at ascending end
G04 P0.5	Dwell
IF [ROUND[#675]>=600] THEN ALM = 03 (LIFTER UP ERROR)	If the counter counts exceeding 600, an alarm is issued.
#675 =#675+1	Count up
END1	END1

N1050 (++ LIFTER UP ++)	
POUT #21 (F/PARTS LIFTER UP)	Lifter 2 ascending command
G04 P0.2	Dwell
WAIT IN [#20] =1 T300.0ALM =03 (LIFTER UP ERROR)	If not confirmed within 300 seconds, an alarm is issued.
N1100 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
N1150 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #23 (LIFTER2 DOWN)	Lifter 2 descending command
N1200 (++ LIFTER UP ++)	
IF[IN[#22] =1] THEN	Execute following program lines, if lifter1 is at descending end
POUT #20 (LIFT1 UP)	Lifter 1 up command
END IF	END IF
N1250 (++ CHECK LIFTER ++)	
#675 =0	Counter
D01	D01 ~ END1 repetition
IF[IN[#37] =1] GOTO1350	In case of ejection, program jumps to N1350.
IF[IN[#18] =1] GOTO1450	If material ascending is OK, program jumps to N1450.
IF[IN[#21] =1] GOTO1350	If material lift is OT, program jumps to N1350.
G04 P0.5	Dwell
IF[ROUND[#675]>=600] THEN ALM =02 (LIFTER UP ERROR)	If the counter counts more than 600, an alarm is issued.
#675 =#675+1	Count up
END1	END1

N1350 (EJECT)	
POUT #37 (/7 ON)	Ejection (/7) ON
POUT #22 (LIFTER1 DOWN)	Lift 1 down command
POUT #23 (LIFTER2 DOWN)	Lift 2 down command
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
M30 (END)	Program end
N1450 (++ WAIT ++)	
G04 P0.3	Dwell
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
N1500 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
N1550 (++ CHECK F/PARTS LIFTER ++)	
WAIT IN [#23] =1 T300.0ALM =03 (LIFT2 DOWN ERROR)	If not confirmed within 300 seconds, an alarm is issued.
WAIT IN [#20] =0 T1.0ALM =06 (OVER DE-PARE)	Too many works on the pallet
POUT #20 (LIFT1 UP)	Lift 1 up command
G04 P0.5	Dwell
N1600 (++ CHECK THE MATERIAL ++)	
#675 =0	Counter
D01	D01 ~ END1 repetition

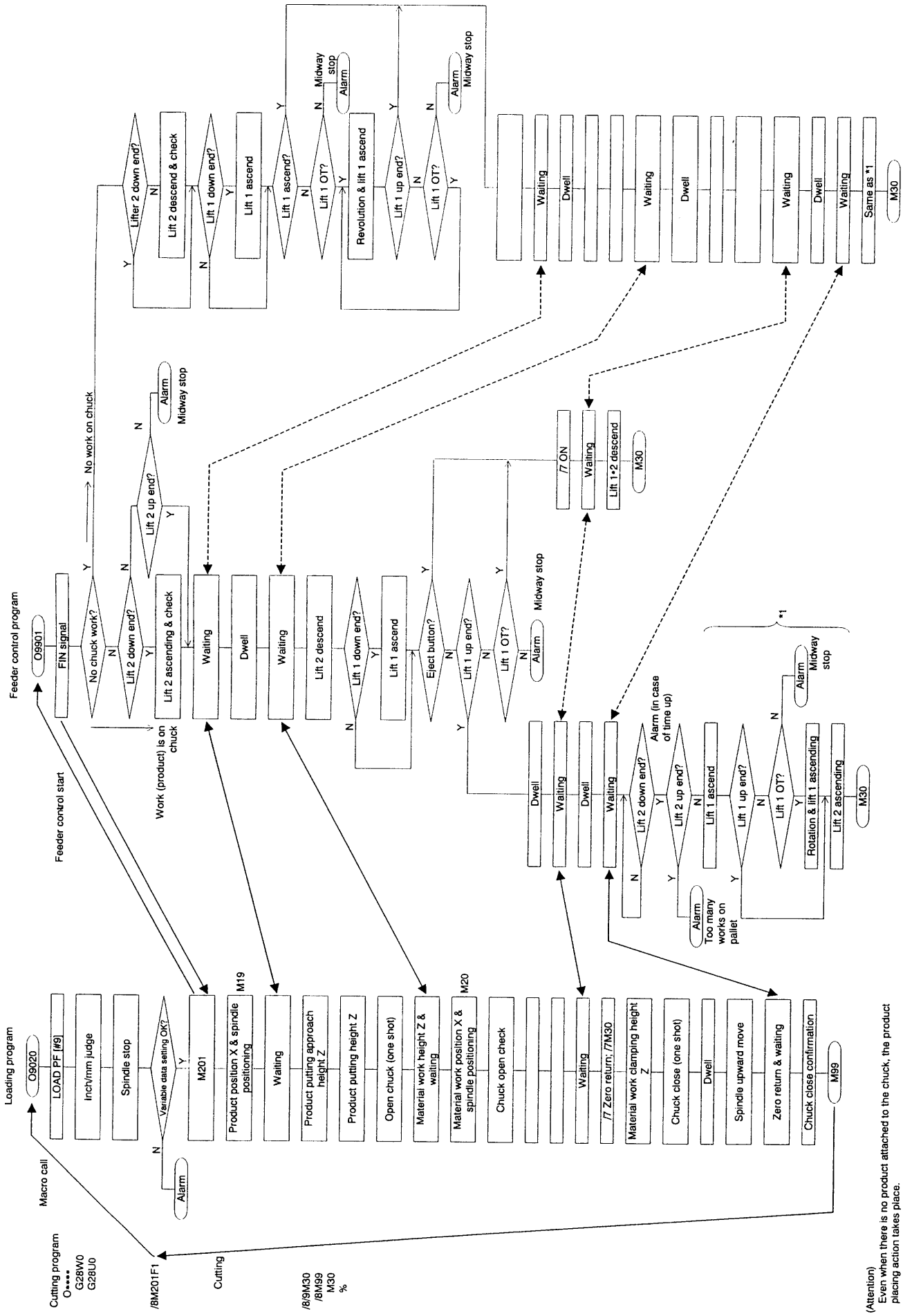
IF[IN[#18] =1] GOTO1700	If material ascending is OK, program jumps to N1700.
IF[IN[#21] =1] GOTO1650	If material lift is OT, program jumps to N1650.
G04 P0.5	Dwell
IF[ROUND[#675]>=600] THEN ALM =02 (LIFTER UP ERROR)	If the counter counts more than 600, an alarm is issued.
#675 =#675+1	Count up
END1	END1
N1650 (++ CCW ++)	
WAIT IN[#16] =1 T7200.0ALM =08 (FEEDER DOOR CLOSE ERROR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #19 (CCW)	Feeder reverse move
G04 P2.0	Dwell
WAIT IN[#19] =1 T300.0ALM =01 (FEEDER STOP ERROR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #20 (LIFT1 UP)	Lift 1 up command
N1700 (++ LIFT UP ++)	
POUT #21 (LIFT2 UP)	Lift 2 up command
M30 (END)	Program end
N2000 (++ GRIP MATERIAL ++)	
IF[IN[#23] =0] THEN	If lifter 2 is on down end, program jumps to “END IF”.
POUT #23 (LIFT2 DOWN)	Lifter 2 down command
G04 P0.5	Dwell
WAIT IN[#23] =1 T300.0ALM =03 (DOWN ERROR)	If not confirmed within 300 seconds, an alarm is issued.
END IF	END IF
N2050 (++ LIFTER DOWN ++)	
IF[IN[#22] =1] THEN	If lifter 1 is on down end, program jumps to “END IF”.
POUT #20 (LIFT1 UP)	Lift 1 up command
END IF	END IF

N2100 (++ CHECK LIFTER ++)	
#675 =0	Counter
D01	D01 ~ END1 repetition
IF[IN[#18] =1] GOTO2200	If material ascending is OK, program jumps to N2200.
IF[IN[#21] =1] GOTO2150	If material lift is OT, program jumps to N2150.
G04 P0.5	Dwell
IF[ROUND[#675]>=600] THEN ALM =02 (LIFTER UP ERROR)	If the counter counts more than 600, an alarm is issued.
#675 =#675+1	Count up
END1	END1
N2150 (++ CCW AND LIFT UP ++)	
#676 =0	Counter2
D01	D01 ~ END1 repetition
WAIT IN[#16] =1 T7200.0ALM =08 (FEEDER DOOR CLOSE ERROR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #19 (CCW)	Feeder reverse move
G04 P2.0	Dwell
WAIT IN[#19] =1 T300.0ALM =01 (FEEDER STOP ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.2	Dwell
POUT #20 (LIFT1 UP)	Lift 1 up command
G04 P0.2	Dwell
#676 =0	Counter
D02	D02 ~ END2 repetition
IF[IN[#18] =1] GOTO2200	If material ascending is OK, program jumps to N2200.
IF[IN[#21] =1] GOTO2155	If material lift is OT, program jumps to N2155.
G04 P0.5	Dwell
IF[ROUND[#675]>=600] THEN ALM =02 (LIFTER1 UP ERROR)	If the counter counts more than 600, an alarm is issued.
#675 =#675+1	Count up
END2	END2
N2155	
IF[ROUND[#676]>=10] THEN ALM =05 (NO WORK PIECE)	If the counter2 counts more than 10, an alarm is issued.

#676 =#676+1	Count up
END1	END1
N2200 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
N2250 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.3	Dwell
N2300 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
N2350 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #20 (LIFT1 UP)	Lift 1 up command
G04 P0.5	Dwell
N2400 (++ CHECK THE MATERIAL ++)	
#675 =0	Counter
D01	D01 ~ END1 repetition
IF[IN[#18] =1] GOTO2500	If material ascending is OK, program jumps to N2500.
IF[IN[#21] =1] GOTO2450	If material lift is OT, program jumps to N2450.
G04 P0.5	Dwell

IF[ROUND[#675]>=600] THEN ALM =02 (LIFTER UP ERROR)	If the counter counts more than 600, an alarm is issued.
#675 =#675+1	Count up
END1	END1
N2450 (++ CCW ++)	
WAIT IN[#16] =1 T7200.0ALM =08 (FEEDER DOOR CLOSE ERROR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #19 (CCW)	Feeder reverse move
G04 P2.0	Dwell
WAIT IN[#19] =1 T300.0ALM =01 (FEEDER STOP ERROR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #20 (LIFT1 UP)	Lift 1 up command
N2500 (++ LIFT UP ++)	
POUT #21 (LIFT2 UP)	Lift 2 up command
M30 (END)	Program end
%	

7.3 Package B (including spindle positioning)



08899 (CS20-FEEDER DESCRIPTION)	Machine specification summary
N1 (VERSION-NO. = VER1.10)	Version1.10
N2 (MACHINE = ONE-MACHINE)	One-machine
N3 (CARRY TYPE = RETURN-TYPE)	Return carry
N4 (OPERATION = OP1)	1 operation
N5 (TURN OVER-DEVICE = - - - - - - - - - -)	
N6 (ENTRANCE-DEVICE = HRL150)	Lift up type feeder ϕ150
N7 (EXIT-DEVICE = - - - - - - - - - -)	
N8 (TYPE = PACKAGE-B)	Package-B
N9 (OPTION = - - - - - - - - - -)	
M99	

	(Loading program)
09020 (LOADING PACKAGE-B VER1.10) LOAD PF[ROUND[ADP[#9]]]	PF file load
#25 = 505 - 24∗#4006 (INCH/MM)	Inch/mm judge
M05	Spindle stop
IF[[[#690EQ0]+[#691EQ0]+[#692EQ0]+[#693EQ0]] → → GT0] GOTO9000	Various variable data check. Alarm when no setting
G28 G140 W0 M201 (START FEEDER-CONTROL)	Zero return/Feeder control program start
G28 U0 M09	Zero return/Coolant OFF
G00 U[ABS[#691]] M19(PUT DOWN F/PARTS POS.)	Finished product putting position X & spindle positioning 1
M89 (WAITING)	Waiting feeder control program to meet.
G00 G98 W-[ABS[#692]-ABS[#605]+ABS[#603] → → -ABS[#602]-5.0/#25] (APPROACH POS. 1)	Product placing approach height Z (up to 5mm of reach)
G01 W-[5.0/#25-#604] F[4000/#25] (PUT DOWN F/PATS POS.2)	Product placing height Z
M169 (CHUCK OPEN)	Chuck open (One-shot)
G04 P0.2	Dwell
G00 W[[ABS[#692]-ABS[#605]-ABS[#693]]∗ → → [ABS[#693]LT[ABS[#692]- ABS[#605]]] → → +ABS[#603]-#604+10.0/#25] → → M89 (GO UP POS.3)	Ascending to material work clamping height & waiting for feeder control program to meet.
G00 U[ABS[ABS[#690]-ABS[#691]]] M20 (PICK UP MATERIAL POS.)	Material work clamping position X & spindle positioning 2

M69 (CHUCK OPEN AND CONFIRMED)	Chuck open and confirmed
M89 (WAITING)	Waiting for feeder control program
/7 G28 G143 W0	Zero return (Ejecting time)
/7 G28 G99 U0 M18	Zero return (Ejecting time)
/7 M30 (EJECT)	Program end (Ejecting time)
G00 W-[[ABS[#693]-ABS[#692]+ABS[#605]]* → → [ABS[#693]GT [ABS[#692]-ABS[#605]]]] → → (APPROACH POS.)	Material grip approach height Z (The value may become “0” depending on the height of material and product.)
G00 W-[ABS[#603]-#600+10.0/#25] F[3000/#25] (PICK UP …	Material grip height Z
M168 (CHUCK CLOSE ONE-SHOT)	Chuck close (One-shot)
G04 P[10.0*[#606EQ0]+#606]	Dwell
G00 G99 W[ABS[#601]+15.0/#25]	Ascending height Z
G28 U0 W0 M89 (WAITING)	Zero return and waiting for feeder control program
G143 M68 (CHUCK CLOSE AND CONFIRMED)	Chuck close and confirmed
M99 (RETURN)	Return
N9000	
#3000 = 190 (#690-#693 UNFININED COMMON VAL.)	ALARM

(Feeder control program)

09901 (FEEDER PACKAGE-B VER1.10) POUT #34 (FIN TO CS20)	FIN signal to respond start signal
IF[[IN[#27] =1] OR [IN[#28] =1]] GOTO2000	If no work on spindle, program jumps to N2000.
N1000 (++ CHUCK HAS WORK ++)	
IF[IN[#23] =1] GOTO1050	Jump to N1050, if lifter 2 is at descending end
#675 = 0	Counter
D01	Repeating D01~END1
IF[IN[#20] =1] GOTO1100	Jump to N1100, if liter 2 is at ascending end
G04 P0.5	Dwell
IF [ROUND[#675]>=600] THEN ALM = 03 (LIFTER UP ERROR)	If the counter counts exceeding 600, an alarm is issued.
#675 =#675+1	Count up

END1	END1
N1050 (++ LIFTER UP ++)	
POUT #21 (F/PARTS LIFTER UP)	Lifter 2 ascending command
G04 P1.0	Dwell
WAIT IN [#20] =1 T300.0ALM =03 (LIFTER UP ERROR)	If not confirmed within 300 seconds, an alarm is issued.
N1100 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
N1150 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #23 (LIFTER2 DOWN)	Lifter 2 descending command
N1200 (++ LIFTER UP ++)	
IF[IN[#22] =1] THEN	Execute following program lines, if lifter1 is at descending end
POUT #20 (LIFT1 UP)	Lifter 1 up command
END IF	END IF
N1250 (++ CHECK LIFTER ++)	
#675 =0	Counter
D01	D01 ~ END1 repetition
IF[IN[#37] =1] GOTO1350	In case of ejection, program jumps to N1350.
IF[IN[#18] =1] GOTO1450	If material ascending is OK, program jumps to N1450.
IF[IN[#21] =1] GOTO1350	If material lift is OT, program jumps to N1350.
G04 P0.5	Dwell

IF[ROUND[#675]>=600] THEN ALM =02 (LIFTER UP ERROR)	If the counter counts more than 600, an alarm is issued.
#675 =#675+1	Count up
END1	END1
N1350 (EJECT)	
POUT #37 (/7 ON)	Ejection (/7) ON
POUT #22 (LIFTER1 DOWN)	Lift 1 down command
POUT #23 (LIFTER2 DOWN)	Lift 2 down command
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
M30 (END)	Program end
N1450 (++ WAIT ++)	
G04 P0.3	Dwell
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
N1500 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
N1550 (++ CHECK F/PARTS LIFTER ++)	
WAIT IN [#23] =1 T300.0ALM =03 (LIFT2 DOWN ERROR)	If not confirmed within 300 seconds, an alarm is issued.
WAIT IN [#20] =0 T1.0ALM =06 (OVER DE-PARE)	Too many works on the pallet
POUT #20 (LIFT1 UP)	Lift 1 up command
G04 P0.5	Dwell
N1600 (++ CHECK THE MATERIAL ++)	
#675 =0	Counter

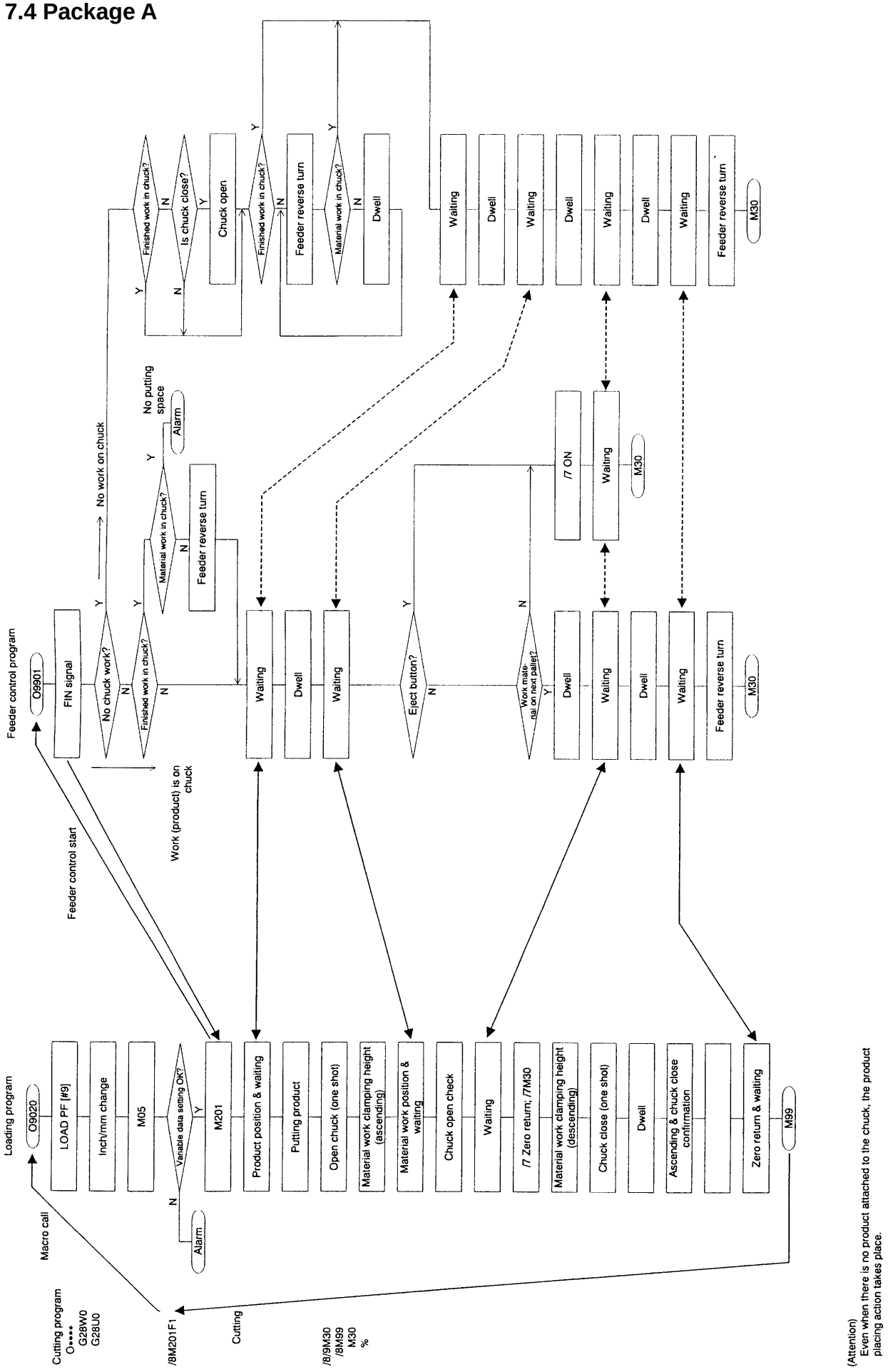
D01 D01 ~ END1 repetition	
IF[IN[#18] =1] GOTO1700	If material ascending is OK, program jumps to N1700.
IF[IN[#21] =1] GOTO1650	If material lift is OT, program jumps to N1650.
G04 P0.5	Dwell
IF[ROUND[#675]>=600] THEN ALM =02 (LIFTER UP ERROR)	If the counter counts more than 600, an alarm is issued.
#675 =#675+1	Count up
END1	END1
N1650 (++ CCW ++)	
WAIT IN[#16] =1 T7200.0ALM =08 (FEEDER DOOR CLOSE ERROR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #19 (CCW)	Feeder reverse move
G04 P2.0	Dwell
WAIT IN[#19] =1 T300.0ALM =01 (FEEDER STOP ERROR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #20 (LIFT1 UP)	Lift 1 up command
N1700 (++ LIFT UP ++)	
POUT #21 (LIFT2 UP)	Lift 2 up command
M30 (END)	Program end
N2000 (++ GRIP MATERIAL ++)	
IF[IN[#23] =0] THEN	If lifter 2 is on down end, program jumps to “END IF”.
POUT #23 (LIFT2 DOWN)	Lifter 2 down command
G04 P0.5	Dwell
WAIT IN[#23] =1 T300.0ALM =03 (DOWN ERROR)	If not confirmed within 300 seconds, an alarm is issued.
END IF	END IF
N2050 (++ LIFTER DOWN ++)	
IF[IN[#22] =1] THEN	If lifter 1 is on down end, program jumps to “END IF”.
POUT #20 (LIFT1 UP)	Lift 1 up command
END IF	END IF

N2100 (++ CHECK LIFTER ++)	
#675 =0	Counter
D01	D01 ~ END1 repetition
IF[IN[#18] =1] GOTO2200	If material ascending is OK, program jumps to N2200.
IF[IN[#21] =1] GOTO2150	If material lift is OT, program jumps to N2150.
G04 P0.5	Dwell
IF[ROUND[#675]>=600] THEN ALM =02 (LIFTER UP ERROR)	If the counter counts more than 600, an alarm is issued.
#675 =#675+1	Count up
END1	END1
N2150 (++ CCW AND LIFT UP ++)	
#676 =0	Counter2
D01	D01 ~ END1 repetition
WAIT IN[#16] =1 T7200.0ALM =08 (FEEDER DOOR CLOSE ERROR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #19 (CCW)	Feeder reverse move
G04 P2.0	Dwell
WAIT IN[#19] =1 T300.0ALM =01 (FEEDER STOP ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.2	Dwell
POUT #20 (LIFT1 UP)	Lift 1 up command
G04 P0.2	Dwell
#676 =0	Counter
D02	D02 ~ END2 repetition
IF[IN[#18] =1] GOTO2200	If material ascending is OK, program jumps to N2200.
IF[IN[#21] =1] GOTO2155	If material lift is OT, program jumps to N2155.
G04 P0.5	Dwell
IF[ROUND[#675]>=600] THEN ALM =02 (LIFTER1 UP ERROR)	If the counter counts more than 600, an alarm is issued.
#675 =#675+1	Count up
END2	END2
N2155	

IF[ROUND[#676]>=10] THEN ALM =05 (NO WORK PIECE)	If the counter2 counts more than 10, an alarm is issued.
#676 =#676+1	Count up
END1	END1
N2200 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
N2250 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.3	Dwell
N2300 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
N2350 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #20 (LIFT1 UP)	Lift 1 up command
G04 P0.5	Dwell
N2400 (++ CHECK THE MATERIAL ++)	
#675 =0	Counter
D01	D01 ~ END1 repetition
IF[IN[#18] =1] GOTO2500	If material ascending is OK, program jumps to N2500.
IF[IN[#21] =1] GOTO2450	If material lift is OT, program jumps to N2450.

G04 P0.5	Dwell
IF[ROUND[#675]>=600] THEN ALM =02 (LIFTER UP ERROR)	If the counter counts more than 600, an alarm is issued.
#675 =#675+1	Count up
END1	END1
N2450 (++ CCW ++)	
WAIT IN[#16] =1 T7200.0ALM =08 (FEEDER DOOR CLOSE ERROR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #19 (CCW)	Feeder reverse move
G04 P2.0	Dwell
WAIT IN[#19] =1 T300.0ALM =01 (FEEDER STOP ERROR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #20 (LIFT1 UP)	Lift 1 up command
N2500 (++ LIFT UP ++)	
POUT #21 (LIFT2 UP)	Lift 2 up command
M30 (END)	Program end
%	

7.4 Package A


Feeder control program
O9901
FIN signal
No chuck work?
Finished work in chuck?
Material work in chuck?
No work on chuck
No putting space
Alarm
Feeder reverse turn
Work (product) is on chuck
Feeder control start
Waiting
Dwell
Eject button?
Work material on next pallet?
/7 ON
M30
Finished work in chuck?
Is chuck close?
Chuck open
Feeder reverse turn
Material work in chuck?
Loading program
O9020
LOAD PF [#9]
Inch/mm change
M05
Variable data setting OK?
M201
Product position & waiting
Putting product
Open chuck (one shot)
Material work clamping height (ascending)
Material work position & waiting
Chuck open check
/7 Zero return; /7M30
Material work clamping height (descending)
Chuck close (one shot)
Ascending & chuck close confirmation
Zero return & waiting
M99
Macro call
Cutting program
O****
G28W0
G28U0
/8M201F1
Cutting
/8/9M30
/8M99
M30
%
(Attention)
Even when there is no product attached to the chuck, the product placing action takes place.

08899 (CS20-FEEDER DESCRIPTION)	Machine specification summary
N1 (VERSION-NO. = VER1.01)	Version1.01
N2 (MACHINE = ONE-MACHINE)	One-machine
N3 (CARRY TYPE = RETURN-TYPE)	Return carry
N4 (OPERATION = OP1)	1 operation
N5 (TURN OVER-DEVICE = _ _ _ _ _ _ _ _ _ _)	
N6 (ENTRANCE-DEVICE = 150∗8P)	Rotary feeder f150
N7 (EXIT-DEVICE = _ _ _ _ _ _ _ _ _ _)	
N8 (TYPE = PACKAGE-A)	Package-A
N9 (OPTION = _ _ _ _ _ _ _ _ _ _)	
M99	
	(Loading program)
09020 (LOADING PACKAGE-A VER1.01) LOAD PF[ROUND[ADP[#9]]]	PF file load
#25 = 505–24∗#4006 (INCH/MM)	Inch/mm judge
M05 Spindle stop	
IF[[[#690EQ0]+[#691EQ0]+[#692EQ0]+[#693EQ0]] → → GT0] GOTO9000	Various variable data check. Alarm when no setting
G28 G140 W0 M201 (START FEEDER-CONTROL)	Zero return/Feeder control program start
G28 U0 M09	Zero return/Coolant OFF
G00 U[ABS[#691]] M89(PUT DOWN F/PARTS POS.)	Waiting finished product putting position X & feeder control program to meet
G00 G98 W-[ABS[#692]-ABS[#605]+ABS[#603] →	Product placing approach height Z
→ -ABS[#602]-5.0/#25] (APPROACH POS. 1)	(up to 5mm of reach)
G01 W-[5.0/#25-#604] F[4000/#25] (PUT DOWN F/PATS POS.2)	Product placing height Z
M169 (CHUCK OPEN)	Chuck open (One-shot)
G04 P0.2	Dwell
G00 W[[ABS[#692]-ABS[#605]-ABS[#693] → → +ABS[#601]]*[[ABS[#693]-ABS[#601]] → → LT[ABS[#692]-ABS[#605]]] +ABS[#603] → → -#604+10.0/#25] (GO UP POS.3)	Ascending to material work clamping height
G00 U[ABS[ABS[#690]-ABS[#691]]] M89 (PICK UP MATERIAL POS.)	Waiting material work clamping position X & feeder control program to meet.
M69 (CHUCK OPEN AND CONFIRMED)	Chuck open and confirmed

M89 (WAITING)	Waiting for feeder control program
/7 G28 G143 W0	Zero return (Ejecting time)
/7 G28 G99 U0	Zero return (Ejecting time)
/7 M30 (EJECT)	Program end (Ejecting time)
G00 W-[[ABS[#693]-ABS[#601]-ABS[#692] → → +ABS[#605]]*[[ABS[#693]-ABS[#601]] → → GT[ABS[#692]-ABS[#605]]]]	Material grip approach height Z (The value may become “0” depending on the height of material and product.)
G00 W-[ABS[#603]-#600+10.0/#25] F[3000/#25] (PICK UP …	Material grip height Z
M168 (CHUCK CLOSE ONE-SHOT)	Chuck close (One-shot)
G04 P[10.0∗[#606EQ0]+#606]	Dwell
G00 G99 W[ABS[#601]+15.0/#25] M68 (CHUCK CLOSE AND C …	Ascending height Z & chuck close and confirmed
G28 U0 W0 M89 (WAITING)	Waiting zero return & feeder control to meet
G143	
M99 (RETURN)	Return
N9000	
#3000 = 190 (#690-#693 UNFININED COMMON VAL.)	ALARM

(Feeder control program)

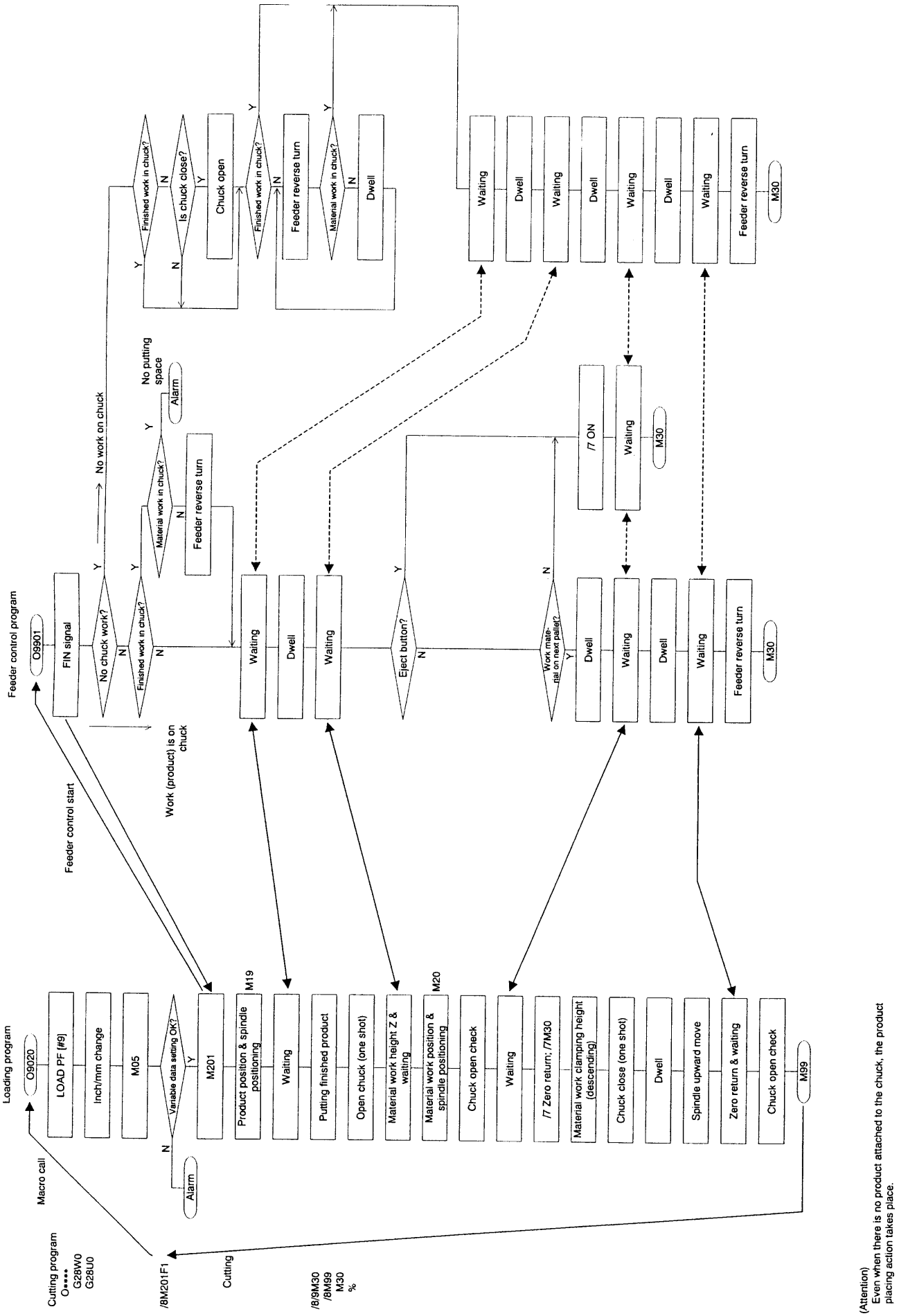
09901 (FEEDER PACKAGE-A VER1.01) POUT #34 (FIN TO CS20)	FIN signal to respond start signal
IF[[IN[#27] =1] OR [IN[#28] =1]] GOTO2000	If no work on spindle, program jumps to N2000.
N1000 (++ CHUCK HAS WORK ++)	
IF[IN[#20] =0] GOTO1050	If no finished product on the pallet, program jumps to N1050.
IF[IN[#18] =1] THEN ALM =09 (NO SPACE PALETTE OF FE)	If material work is on the pallet, an alarm is issued.
WAIT IN[#16] =1 T300.0ALM =08 (FEEDER WINDOW OPEN ERR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #19 (CCW)	Feeder reverse move
G04 P2.0	Dwell
WAIT IN[#19] =1 T300.0ALM =01 (FEEDER STOP ERROR)	If not confirmed within 300 seconds, an alarm is issued.

N1050 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
N1100 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
N1150 (++ WAIT ++)	
IF[IN[#37] =1] GOTO1300	In case of ejection, program jumps to N1300.
IF[IN[#18] =0] GOTO1300	If no material work, program jumps to N1300.
G04 P0.3	Dwell
N1200 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
N1250 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
WAIT IN[#16] =1 T300.0ALM =08 (FEEDER WINDOW OPEN ERR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #19 (CCW)	Feeder reverse move
G04 P2.0	Dwell
WAIT IN[#19] =1 T300.0ALM =01 (FEEDER STOP ERROR)	If not confirmed within 300 seconds, an alarm is issued.
M30 (END)	Program end

N1300	
POUT #37 (/7 ON)	Ejection (/7) ON
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
M30 (END)	Program end
N2000 (++ CHECK CHUCK OPEN/CLOSE ++)	
IF[[IN[#20] =0] GOTO2050	If no finished product on the pallet, program jumps to N2050.
IF[[IN[#27] =1] GOTO2050	If chuck is open, program jumps to N2050.
POUT #27 (OPEN CHUCK)	Chuck open
G04 P0.5	Dwell
WAIT IN[#27] =1 T300.0ALM =7 (CHUCK OPEN ERROR)	If not confirmed within 300 seconds, an alarm is issued.
N2050 (++ CHECK MATERIAL ++)	
IF[IN[#18] =1] GOTO2150	If material work is on the pallet, program jumps to N2150.
#675 =0	Counter
D01	D01
WAIT IN[#16] =1 T300.0ALM =08 (FEEDER WINDOW OPEN ERROR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #19 (CCW)	Feeder reverse move
G04 P2.0	Dwell
WAIT IN[#19] =1 T600.0ALM =01 (FEEDER STOP ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.3	Dwell
IF[IN[#18] =1] GOTO2150	If material work is on the pallet, program jumps to N2150.
#675 =#675+1 (COUNT UP)	Count up
IF[ROUND[#675]>=10] THEN ALM =05 (NO SPACE PALETTE)	If the counter counts more than 10, an alarm is issued.
END1	END1

N2150 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
N2150 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.3	Dwell
N2200 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
N2250 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
N2300 (++ CCW ++)	
WAIT IN[#16] =1 T300.0ALM =08 (FEEDER WINDOW OPEN ERR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #19 (CCW)	Feeder reverse move
G04 P2.0	Dwell
WAIT IN[#19] =1 T300.0ALM =01 (FEEDER STOP ERROR)	If not confirmed within 300 seconds, an alarm is issued.
M30 (END)	Program end
%	

7.5 Package A (including spindle positioning)



08899 (CS20-FEEDER DESCRIPTION)	Machine specification summary
N1 (VERSION-NO. = VER1.10)	Version1.10
N2 (MACHINE = ONE-MACHINE)	One-machine
N3 (CARRY TYPE = RETURN-TYPE)	Return carry
N4 (OPERATION = OP1)	1 operation
N5 (TURN OVER-DEVICE = - - - - - - - - - -)	
N6 (ENTRANCE-DEVICE = 150*8P)	Rotary feeder f150
N7 (EXIT-DEVICE = - - - - - - - - - -)	
N8 (TYPE = PACKAGE-A)	Package-A
N9 (OPTION = - - - - - - - - - -)	
M99	

	(Loading program)
09020 (LOADING PACKAGE-A VER1.10) LOAD PF[ROUND[ADP[#9]]]	PF file load
#25 = 505–24*#4006 (INCH/MM)	Inch/mm judge
M05	Spindle stop
IF[[[#690EQ0]+[#691EQ0]+[#692EQ0]+[#693EQ0]] → → GT0] GOTO9000	Various variable data check. Alarm when no setting
G28 G140 W0 M201 (START FEEDER-CONTROL)	Zero return/Feeder control program start
G28 U0 M09	Zero return/Coolant OFF
G00 U[ABS[#691]] M89(PUT DOWN F/PARTS POS.AND ORI.1)	Finished product putting position X & spindle positioning 1
M89 (WAITING)	Waiting for feeder control program to meet.
G00 G98 W-[ABS[#692]-ABS[#605]+ABS[#603] → → -ABS[#602]-5.0/#25] (APPROACH POS. 1)	Product placing approach height Z (up to 5mm of reach)
G01 W-[5.0/#25-#604] F[4000/#25] (PUT DOWN F/PATS POS.2)	Product placing height Z
M169 (CHUCK OPEN)	Chuck open (One-shot)
G04 P0.2	Dwell
G00 W[[ABS[#692]-ABS[#605]-ABS[#693] → → +ABS[#601]]*[[ABS[#693]-ABS[#601]] → → LT[ABS[#692]-ABS[#605]]]+ABS[#603] → → -#604+10.0/#25] M89 (GO UP POS.3)	Ascending to material work clamping height & waiting for feeder control program to meet.
G00 U[ABS[ABS[#690]-ABS[#691]]] M20 (PICK UP MATERIAL POS.)	Material work clamping position X & spindle positioning 2.

M69 (CHUCK OPEN AND CONFIRMED)	Chuck open and confirmed
M89 (WAITING)	Waiting for feeder control program
/7 G28 G143 W0	Zero return (Ejecting time)
/7 G28 G99 U0 M18	Zero return (Ejecting time)
/7 M30 (EJECT)	Program end (Ejecting time)
G00 W-[[ABS[#693]-ABS[#601]-ABS[#692] → → +ABS[#605]]*[[ABS[#693]-ABS[#601]] → → GT[ABS[#692]-ABS[#605]]]]	Material grip approach height Z (The value may become “0” depending on the height of material and product.)
G00 W-[ABS[#603]-#600+10.0/#25] F[3000/#25] (PICK UP …	Material grip height Z
M168 (CHUCK CLOSE ONE-SHOT)	Chuck close (One-shot)
G04 P[10.0∗[#606EQ0]+#606]	Dwell
G00 G99 W[ABS[#601]+15.0/#25]	Ascending height Z & chuck close and confirmed
G28 U0 W0 M89 (WAITING)	Waiting zero return & feeder control to meet
G143 M68 (CHUCK CLOSE AND CONFIRMED)	Chuck close and confirmed
M99 (RETURN)	Return
N9000	
#3000 = 190 (#690-#693 UNFININED COMMON VAL.)	ALARM

(Feeder control program)

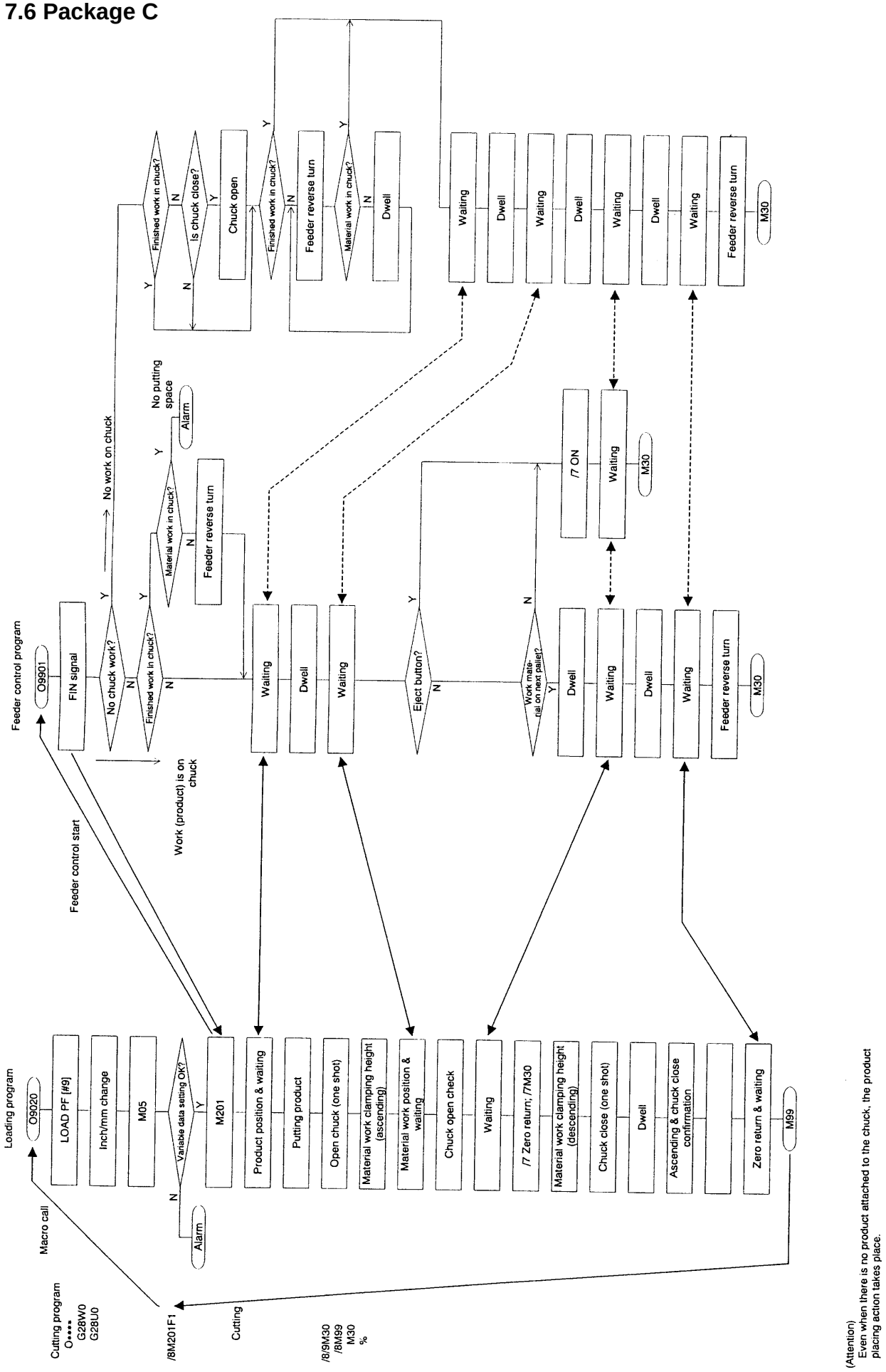
09901 (FEEDER PACKAGE-A VER1.10) POUT #34 (FIN TO CS20)	FIN signal to respond start signal
IF[[IN[#27] =1] OR [IN[#28] =1]] GOTO2000	If no work on spindle, program jumps to N2000.
N1000 (++ CHUCK HAS WORK ++)	
IF[IN[#20] =0] GOTO1050	If no finished product on the pallet, program jumps to N1050.
IF[IN[#18] =1] THEN ALM =09 (NO SPACE PALETTE OF FE)	If material work is on the pallet, an alarm is issued.
WAIT IN[#16] =1 T300.0ALM =08 (FEEDER WINDOW OPEN ERR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #19 (CCW)	Feeder reverse move
G04 P2.0	Dwell
WAIT IN[#19] =1 T300.0ALM =01 (FEEDER STOP ERROR)	If not confirmed within 300 seconds, an alarm is issued.

N1050 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
N1100 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
N1150 (++ CHECK FEEDER ++)	
IF[IN[#37] =1] GOTO1300	In case of ejection, program jumps to N1300.
IF[IN[#18] =0] GOTO1300	If no material work, program jumps to N1300.
G04 P0.3	Dwell
N1200 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
N1250 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
WAIT IN[#16] =1 T300.0ALM =08 (FEEDER WINDOW OPEN ERR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #19 (CCW)	Feeder reverse move
G04 P2.0	Dwell
WAIT IN[#19] =1 T300.0ALM =01 (FEEDER STOP ERROR)	f not confirmed within 300 seconds, Ian alarm is issued.
M30 (END)	Program end

N1300	
POUT #37 (/7 ON)	Ejection (/7) ON
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
M30 (END)	Program end
N2000 (++ CHECK CHUCK OPEN/CLOSE ++)	
IF[[IN[#20] =0] GOTO2050	If no finished product on the pallet, program jumps to N2050.
IF[[IN[#27] =1] GOTO2050	If chuck is open, program jumps to N2050.
POUT #27 (OPEN CHUCK)	Chuck open
G04 P0.5	Dwell
WAIT IN[#27] =1 T300.0ALM =7 (CHUCK OPEN ERROR)	If not confirmed within 300 seconds, an alarm is issued.
N2050 (++ CHECK MATERIAL ++)	
IF[IN[#18] =1] GOTO2150	If material work is on the pallet, program jumps to N2150.
#675 =0	Counter
D01	D01
WAIT IN[#16] =1 T300.0ALM =08 (FEEDER WINDOW OPEN ERR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #19 (CCW)	Feeder reverse move
G04 P2.0	Dwell
WAIT IN[#19] =1 T600.0ALM =01 (FEEDER STOP ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.3	Dwell
IF[IN[#18] =1] GOTO2150	If material work is on the pallet, program jumps to N2150.
#675 =#675+1 (COUNT UP)	Count up
IF[ROUND[#675]>=10] THEN ALM =05 (NO SPACE PALETTE)	If the counter counts more than 10, an alarm is issued.
END1	END1

N2150 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
N2150 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.3	Dwell
N2200 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
N2250 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
N2300 (++ CCW ++)	
WAIT IN[#16] =1 T300.0ALM =08 (FEEDER WINDOW OPEN ERR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #19 (CCW)	Feeder reverse move
G04 P2.0	Dwell
WAIT IN[#19] =1 T300.0ALM =01 (FEEDER STOP ERROR)	If not confirmed within 300 seconds, an alarm is issued.
M30 (END)	Program end
%	

7.6 Package C


Feeder control program
O9901
FIN signal
No chuck work?
Finished work in chuck?
Material work in chuck?
Feeder reverse turn
No putting space
Alarm
No work on chuck
Work (product) is on chuck
Feeder control start
Waiting
Dwell
Eject button?
Work material on next pallet?
/7 ON
M30
Is chuck close?
Chuck open
Feeder reverse turn
Loading program
O9020
LOAD PF [#9]
Inch/mm change
M05
Variable data setting OK?
M201
Product position & waiting
Putting product
Open chuck (one shot)
Material work clamping height (ascending)
Material work position & waiting
Chuck open check
/7 Zero return; /7M30
Material work clamping height (descending)
Chuck close (one shot)
Ascending & chuck close confirmation
Zero return & waiting
M99
Macro call
Cutting program
O****
G28W0
G28U0
/8M201F1
Cutting
/8/9M30
/8M99
M30
%
(Attention)
Even when there is no product attached to the chuck, the product placing action takes place.

08899 (CS20-FEEDER DESCRIPTION)	Machine specification summary
N1 (VERSION-NO. = VER1.01)	Version1.01
N2 (MACHINE = ONE-MACHINE)	One-machine
N3 (CARRY TYPE = RETURN-TYPE)	Return carry
N4 (OPERATION = OP1)	1 operation
N5 (TURN OVER-DEVICE = - - - - - - - - - -)	
N6 (ENTRANCE-DEVICE = TWO-PALETTE)	Rotary feeder f200
N7 (EXIT-DEVICE = - - - - - - - - - -)	
N8 (TYPE = PACKAGE-C)	Package-C
N9 (OPTION = - - - - - - - - - -)	
M99	

(Loading program)

09020 (LOADING PACKAGE-C VER1.01) LOAD PF[ROUND[ADP[#9]]]	PF file load
#25 = 505–24∗#4006 (INCH/MM)	Inch/mm judge
M05 Spindle stop	
IF[[[#690EQ0]+[#691EQ0]+[#692EQ0]+[#693EQ0]] → → GT0] GOTO9000	Various variable data check. Alarm when no setting
G28 G140 W0 M201 (START FEEDER-CONTROL)	Zero return/Feeder control program start
G28 U0 M09	Zero return/Coolant OFF
G00 U[ABS[#691]] M89(PUT DOWN F/PARTS POS.)	Waiting finished product putting position X & feeder control program to meet
G00 G98 W-[ABS[#692]-ABS[#605]+ABS[#603] →	Product placing approach height Z
→ -ABS[#602]-5.0/#25] (APPROACH POS. 1)	(up to 5mm of reach)
G01 W-[5.0/#25-#604] F[4000/#25] (PUT DOWN F/PATS POS.2)	Product placing height Z
M169 (CHUCK OPEN)	Chuck open (One-shot)
G04 P0.2	Dwell
G00 W[[ABS[#692]-ABS[#605]-ABS[#693] → → +ABS[#601]]∗[[ABS[#693]-ABS[#601]] → → LT[ABS[#692]-ABS[#605]]] +ABS[#603] → → -#604+10.0/#25] (GO UP POS.3)	Ascending to material work clamping height
G00 U[ABS[ABS[#690]-ABS[#691]]] M89 (PICK UP MATERIAL POS.)	Waiting material work clamping position X & feeder control program to meet.
M69 (CHUCK OPEN AND CONFIRMED)	Chuck open and confirmed

M89 (WAITING)	Waiting for feeder control program
/7 G28 G143 W0	Zero return (Ejecting time)
/7 G28 G99 U0	Zero return (Ejecting time)
/7 M30 (EJECT)	Program end (Ejecting time)
G00 W-[[ABS[#693]-ABS[#601]-ABS[#692] → → +ABS[#605]]∗[[ABS[#693]-ABS[#601]] → → GT[ABS[#692]-ABS[#605]]]]	Material grip approach height Z (The value may become “0” depending on the height of material and product.)
G00 W-[ABS[#603]-#600+10.0/#25] F[3000/#25] (PICK UP …	Material grip height Z
M168 (CHUCK CLOSE ONE-SHOT)	Chuck close (One-shot)
G04 P[10.0∗[#606EQ0]+#606]	Dwell
G00 G99 W[ABS[#601]+15.0/#25] M68 (CHUCK CLOSE AND C …	Ascending height Z & chuck close and confirmed
G28 U0 W0 M89 (WAITING)	Waiting zero return & feeder control to meet
G143	
M99 (RETURN)	Return
N9000	
#3000 = 190 (#690-#693 UNFININED COMMON VAL.)	ALARM

(Feeder control program)

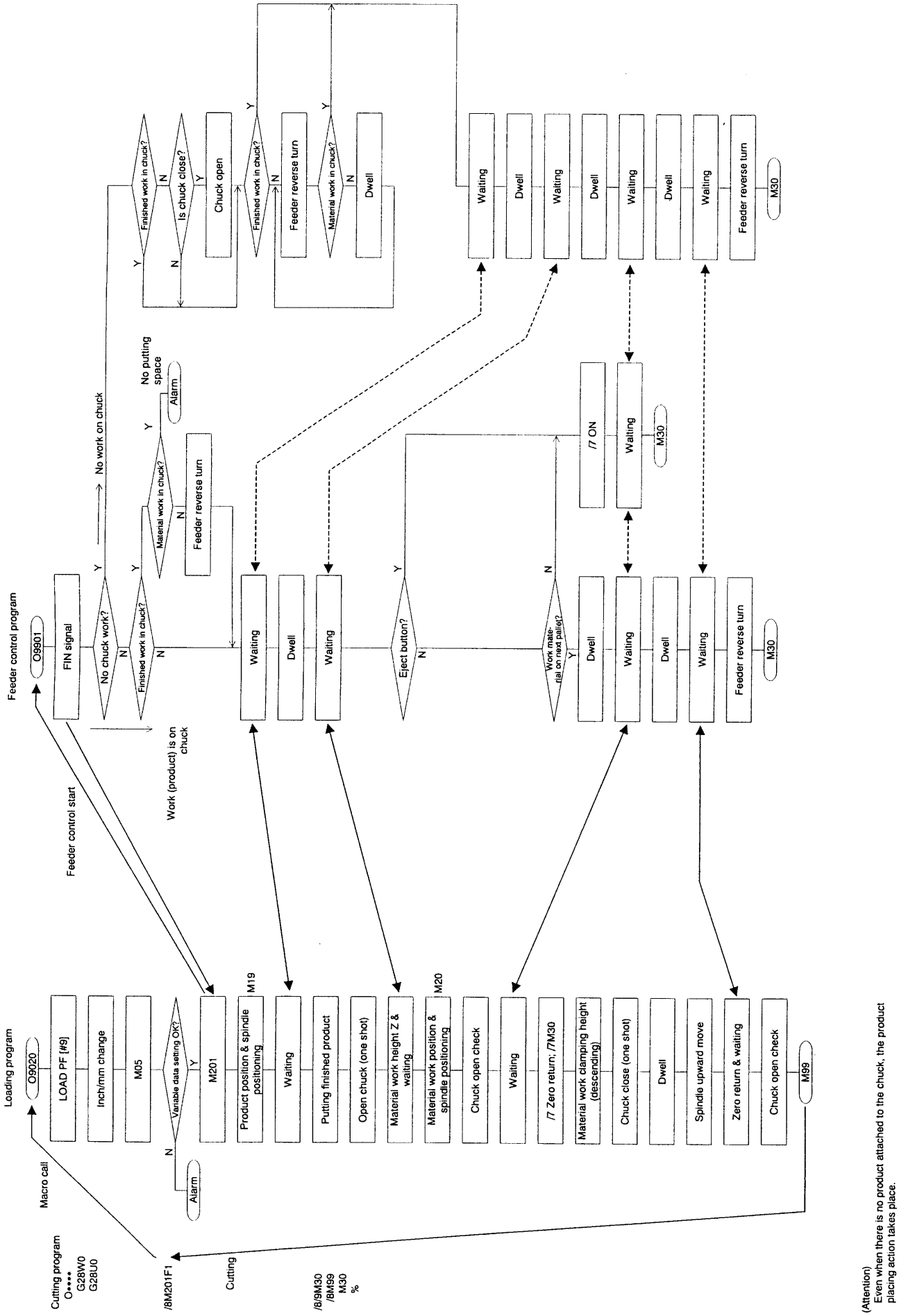
09901 (FEEDER PACKAGE-C VER1.01) POUT #34 (FIN TO CS20)	FIN signal to respond start signal
IF[[IN[#27] =1] OR [IN[#28] =1]] GOTO2000	If no work on spindle, program jumps to N2000.
N1000 (++ CHUCK HAS WORK ++)	
IF[IN[#20] =0] GOTO1050	If no finished product on the pallet, program jumps to N1050.
IF[IN[#18] =1] THEN ALM =09 (NO SPACE PALETTE OF FE)	If material work is on the pallet, an alarm is issued.
WAIT IN[#16] =1 T300.0ALM =08 (FEEDER WINDOW OPEN ERR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #19 (CCW)	Feeder reverse move
G04 P2.0	Dwell
WAIT IN[#19] =1 T300.0ALM =01 (FEEDER STOP ERROR)	If not confirmed within 300 seconds, an alarm is issued.

N1050 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
N1100 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
N1150 (++ CHECK FEEDER ++)	
IF[IN[#37] =1] GOTO1300	In case of ejection, program jumps to N1300.
IF[IN[#18] =0] GOTO1300	If no material work, program jumps to N1300.
G04 P0.3	Dwell
N1200 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
N1250 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
WAIT IN[#16] =1 T300.0ALM =08 (FEEDER WINDOW OPEN ERR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #19 (CCW)	Feeder reverse move
G04 P2.0	Dwell
WAIT IN[#19] =1 T300.0ALM =01 (FEEDER STOP ERROR)	If not confirmed within 300 seconds, an alarm is issued.
M30 (END)	Program end

N1300	
POUT #37 (/7 ON)	Ejection (/7) ON
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
M30 (END)	Program end
N2000 (++ CHECK CHUCK OPEN/CLOSE ++)	
IF[[IN[#20] =0] GOTO2050	If no finished product on the pallet, program jumps to N2050.
IF[[IN[#27] =1] GOTO2050	If chuck is open, program jumps to N2050.
POUT #27 (OPEN CHUCK)	Chuck open
G04 P0.5	Dwell
WAIT IN[#27] =1 T300.0ALM =7 (CHUCK OPEN ERROR)	If not confirmed within 300 seconds, an alarm is issued.
N2050 (++ CHECK MATERIAL ++)	
IF[IN[#18] =1] GOTO2150	If material work is on the pallet, program jumps to N2150.
#675 =0	Counter
D01	D01
WAIT IN[#16] =1 T300.0ALM =08 (FEEDER WINDOW OPEN ERR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #19 (CCW)	Feeder reverse move
G04 P2.0	Dwell
WAIT IN[#19] =1 T600.0ALM =01 (FEEDER STOP ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.3	Dwell
IF[IN[#18] =1] GOTO2150	If material work is on the pallet, program jumps to N2150.
#675 =#675+1 (COUNT UP)	Count up
IF[ROUND[#675]>=10] THEN ALM =05 (NO SPACE PALETTE)	If the counter counts more than 10, an alarm is issued.
END1	END1

N2150 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
N2150 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.3	Dwell
N2200 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
N2250 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR) alarm is issued.	If not confirmed within 300 seconds, an
N2300 (++ CCW ++)	
WAIT IN[#16] =1 T300.0ALM =08 (FEEDER WINDOW OPEN ERR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #19 (CCW)	Feeder reverse move
G04 P2.0	Dwell
WAIT IN[#19] =1 T300.0ALM =01 (FEEDER STOP ERROR)	If not confirmed within 300 seconds, an alarm is issued.
M30 (END)	Program end
%	

7.7 Package C (including spindle positioning)



(Attention)
Even when there is no product attached to the chuck, the product placing action takes place.

08899 (CS20-FEEDER DESCRIPTION)	Machine specification summary
N1 (VERSION-NO. = VER1.10)	Version1.10
N2 (MACHINE = ONE-MACHINE)	One-machine
N3 (CARRY TYPE = RETURN-TYPE)	Return carry
N4 (OPERATION = OP1)	1 operation
N5 (TURN OVER-DEVICE = - - - - - - - - - -)	
N6 (ENTRANCE-DEVICE = TWO-PALETTE)	Rotary feeder f200
N7 (EXIT-DEVICE = _ _ _ _ _ _ _ _ _ _)	
N8 (TYPE = PACKAGE-C)	Package-C
N9 (OPTION = _ _ _ _ _ _ _ _ _ _)	
M99	

	(Loading program)
09020 (LOADING PACKAGE-C VER1.10) LOAD PF[ROUND[ADP[#9]]]	PF file load
#25 = 505–24∗#4006 (INCH/MM)	Inch/mm judge
M05	Spindle stop
IF[[[#690EQ0]+[#691EQ0]+[#692EQ0]+[#693EQ0]] → → GT0] GOTO9000	Various variable data check. Alarm when no setting
G28 G140 W0 M201 (START FEEDER-CONTROL)	Zero return/Feeder control program start
G28 U0 M09	Zero return/Coolant OFF
G00 U[ABS[#691]] M19(PUT DOWN F/PARTS POS. AND ORI.1)	Waiting finished product putting position X & feeder control program to meet
M89 (WAITING)	Waiting for feeder control program to meet
G00 G98 W-[ABS[#692]-ABS[#605]+ABS[#603] → → -ABS[#602]-5.0/#25] (APPROACH POS. 1)	Product placing approach height Z (up to 5mm of reach)
G01 W-[5.0/#25-#604] F[4000/#25] (PUT DOWN F/PATS POS.2)	Product placing height Z
M169 (CHUCK OPEN)	Chuck open (One-shot)
G04 P0.2	Dwell
G00 W[[ABS[#692]-ABS[#605]-ABS[#693] → → +ABS[#601]]∗[[ABS[#693]-ABS[#601]] → → LT[ABS[#692]-ABS[#605]]]+ABS[#603] → → -#604+10.0/#25] M89 (GO UP POS.3)	Ascending to material work clamping height & waiting for feeder control program to meet.
G00 U[ABS[ABS[#690]-ABS[#691]]] M20 (PICK UP MATERIAL POS.)	Material work clamping position X & spindle positioning

M69 (CHUCK OPEN AND CONFIRMED)	Chuck open and confirmed
M89 (WAITING)	Waiting for feeder control program
/7 G28 G143 W0	Zero return (Ejecting time)
/7 G28 G99 U0 M18	Zero return (Ejecting time)
/7 M30 (EJECT)	Program end (Ejecting time)
G00 W-[[ABS[#693]-ABS[#601]-ABS[#692] → → +ABS[#605]]*[[ABS[#693]-ABS[#601]] → → GT[ABS[#692]-ABS[#605]]]]	Material grip approach height Z (The value may become “0” depending on the height of material and product.)
G00 W-[ABS[#603]-#600+10.0/#25] F[3000/#25] (PICK UP …	Material grip height Z
M168 (CHUCK CLOSE ONE-SHOT)	Chuck close (One-shot)
G04 P[10.0*[#606EQ0]+#606]	Dwell
G00 G99 W[ABS[#601]+15.0/#25]	Ascending height Z
G28 U0 W0 M89 (WAITING) meet	Waiting zero return & feeder control to
G143	
M99 (RETURN)	Return
N9000	
#3000 = 190 (#690-#693 UNFININED COMMON VAL.)	ALARM

(Feeder control program)

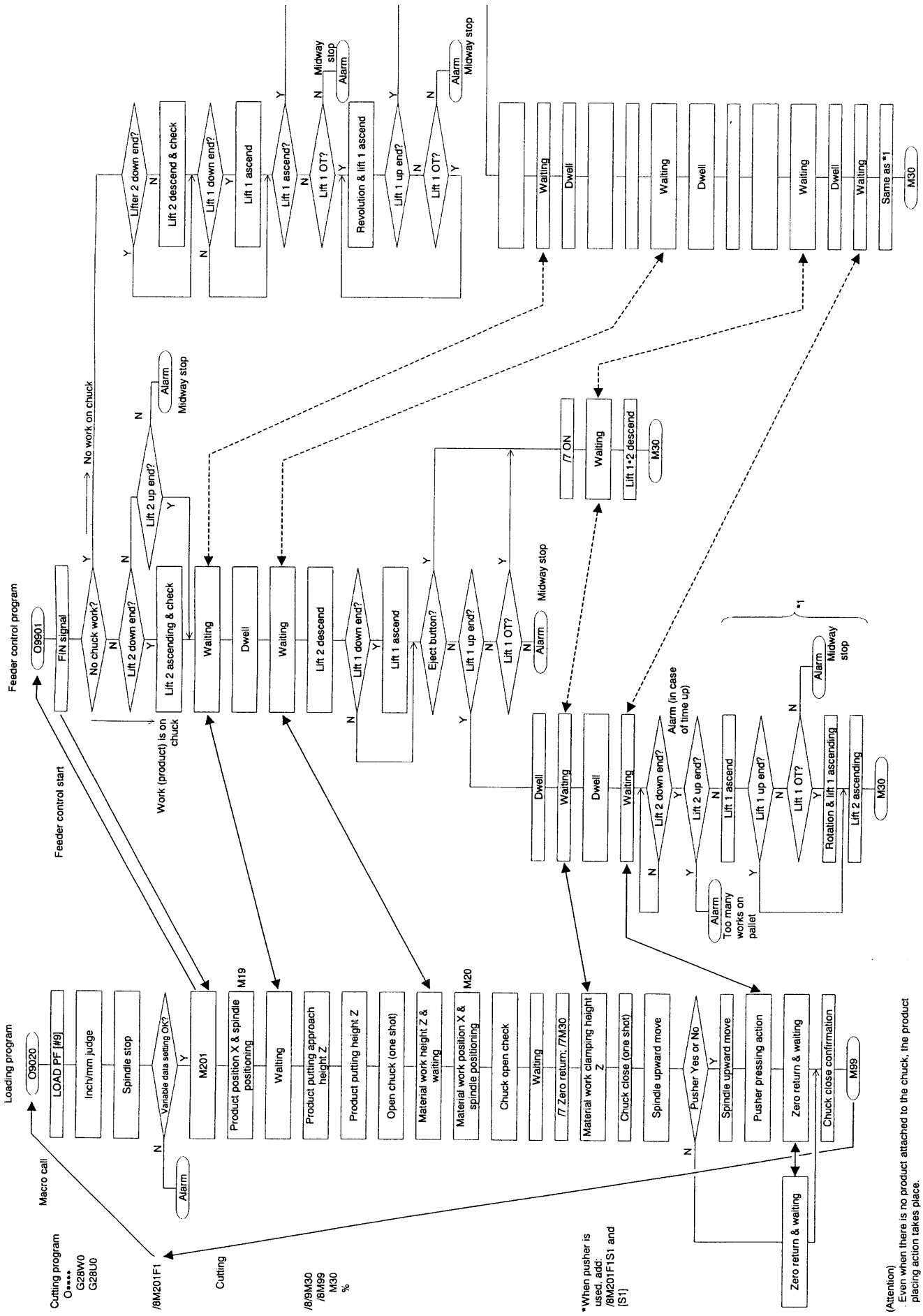
09901 (FEEDER PACKAGE-C VER1.10) POUT #34 (FIN TO CS20)	FIN signal to respond start signal
IF[[IN[#27] =1] OR [IN[#28] =1]] GOTO2000	If no work on spindle, program jumps to N2000.
N1000 (++ CHUCK HAS WORK ++)	
F[IN[#20] =0] GOTO1050	If no finished product on the pallet, program jumps to N1050.
IF[IN[#18] =1] THEN ALM =09 (NO SPACE	If not confirmed within 300 seconds, an alarm is issued.
WAIT IN[#16] =1 T300.0ALM =08 (FEEDER WINDOW OPEN ERR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #19 (CCW)	Feeder reverse move
G04 P2.0	Dwell
WAIT IN[#19] =1 T300.0ALM =01 (FEEDER STOP ERROR)	If not confirmed within 300 seconds, an alarm is issued.

N1050 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
N1100 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
N1150 (++ CHECK FEEDER ++)	
IF[IN[#37] =1] GOTO1300	In case of ejection, program jumps to N1300.
IF[IN[#18] =0] GOTO1300	If no material work, program jumps to N1300.
G04 P0.3	Dwell
N1200 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
N1250 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
WAIT IN[#16] =1 T300.0ALM =08 (FEEDER WINDOW OPEN ERR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #19 (CCW)	Feeder reverse move
G04 P2.0	Dwell
WAIT IN[#19] =1 T300.0ALM =01 (FEEDER STOP ERROR)	If not confirmed within 300 seconds, an alarm is issued.
M30 (END)	Program end

N1300	
POUT #37 (/7 ON)	Ejection (/7) ON
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
M30 (END)	Program end
N2000 (++ CHECK CHUCK OPEN/CLOSE ++)	
IF[[IN[#20] =0] GOTO2050	If no finished product on the pallet, program jumps to N2050.
IF[[IN[#27] =1] GOTO2050	If chuck is open, program jumps to N2050.
POUT #27 (OPEN CHUCK)	Chuck open
G04 P0.5	Dwell
WAIT IN[#27] =1 T300.0ALM =7 (CHUCK OPEN ERROR)	If not confirmed within 300 seconds, an alarm is issued.
N2050 (++ CHECK MATERIAL ++)	
IF[IN[#18] =1] GOTO2150	If material work is on the pallet, program jumps to N2150.
#675 =0	Counter
D01	D01
WAIT IN[#16] =1 T300.0ALM =08 (FEEDER WINDOW OPEN ERR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #19 (CCW)	Feeder reverse move
G04 P2.0	Dwell
WAIT IN[#19] =1 T600.0ALM =01 (FEEDER STOP ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.3	Dwell
IF[IN[#18] =1] GOTO2150	If material work is on the pallet, program jumps to N2150.
#675 =#675+1 (COUNT UP)	Count up
IF[ROUND[#675]>=10] THEN ALM =05 (NO SPACE PALETTE)	If the counter counts more than 10, an alarm is issued.
END1	END1

N2150 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
N2150 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.3	Dwell
N2200 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
N2250 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
N2300 (++ CCW ++)	
WAIT IN[#16] =1 T300.0ALM =08 (FEEDER WINDOW OPEN ERR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #19 (CCW)	Feeder reverse move
G04 P2.0	Dwell
WAIT IN[#19] =1 T300.0ALM =01 (FEEDER STOP ERROR)	If not confirmed within 300 seconds, an alarm is issued.
M30 (END)	Program end
%	

7.8 Package B (including spindle positioning & Feeder horizontal pusher)



08899 (CS20-FEEDER DESCRIPTION)	Machine specification summary
N1 (VERSION-NO. = VER1.20)	Version1.20
N2 (MACHINE = ONE-MACHINE)	One-machine
N3 (CARRY TYPE = RETURN-TYPE)	Return carry
N4 (OPERATION = OP1)	1 operation
N5 (TURN OVER-DEVICE =)	
N6 (ENTRANCE-DEVICE = HRL150)	Lift up type feeder ϕ150
N7 (EXIT-DEVICE =)	
N8 (TYPE = PACKAGE-B)	Package-B
N9 (OPTION =)	
M99	

(Loading program)

09020 (LOADING PACKAGE-B VER1.20) LOAD PF[ROUND[ADP[#9]]]	PF file load
#25 = 505 - 24∗#4006 (INCH/MM)	Inch/mm judge
M05	Spindle stop
IF[[[#690EQ0]+[#691EQ0]+[#692EQ0]+[#693EQ0]] → → GT0] GOTO9000	Various variable data check. Alarm when no setting
G28 G140 W0 M201(START FEEDER-CONTROL)	Zero return/Feeder control program start
G28 U0 M09	Zero return/Coolant OFF
G00 U[ABS[#691]] M19(PUT DOWN F/PARTS POS.)	Finished product putting position X & spindle positioning 1
M89 (WAITING)	Waiting feeder control program to meet.
G00 G98 W-[ABS[#692]-ABS[#605]+ABS[#603]→ → -ABS[#602]-5.0/#25] (APPROACH POS. 1)	Product placing approach height Z (up to 5mm of reach)
G01 W-[5.0/#25-#604] F[4000/#25] (PUT DOWN F/PATS POS.2)	Product placing height Z
M169 (CHUCK OPEN)	Chuck open (One-shot)
G04 P0.2	Dwell
G00 W[[ABS[#692]-ABS[#605]-ABS[#693]]∗ → → [ABS[#693]LT[ABS[#692]-ABS[#605]]] → → +ABS[#603]-#604+10.0/#25] → → M89 (GO UP POS.3)	Ascending to material work clamping height & waiting for feeder control program to meet.
G00 U[ABS[ABS[#690]-ABS[#691]]] M20 (PICK UP MATERIAL POS.)	Material work clamping position X & spindle positioning 2

M69 (CHUCK OPEN AND CONFIRMED)	Chuck open and confirmed
M89 (WAITING)	Waiting for feeder control program
/7 G28 G143 W0	Zero return (Ejecting time)
/7 G28 G99 U0 M18	Zero return (Ejecting time)
/7 M30 (EJECT)	Program end (Ejecting time)
G00 W-[[ABS[#693]-ABS[#692]+ABS[#605]]* → →[ABS[#693]GT [ABS[#692]-ABS[#605]]]]→ →(APPROACH POS.)	Material grip approach height Z (The value may become “0” depending on the height of material and product.)
G00 W-[ABS[#603]-#600+10.0/#25] F[3000/#25] (PICK UP …	Material grip height Z
M168 (CHUCK CLOSE ONE-SHOT)	Chuck close (One-shot)
G04 P[10.0*[#606EQ0]+#606]	Dwell
G00 G99 W[ABS[#601]+15.0/#25]	Ascending height Z
IF[#19EQ#0] THEN	
G28 U0 W0 M89 (WAITING)	
ELSE	ELSE
G28 W0	Original point (Z axis)
G00 U-[ABS[#690]-ABS[#694]]	Feeder horizontal pusher position X
G00 G98 W-[ABS[#695]-ABS[#601]+ABS[#603]→ -ABS[#602]-5.0/#25] (APPROACH POS.)	Putting approach height Z
G01 W-[2.0/#25+5.0/#25] F[4000/#25]	Pusher pressing height Z
M169 (CHUCK OPEN ONE-SHOT)	Chuck open (One-shot)
G04 P0.5	Dwell
M168 (CHUCK CLOSE ONE-SHOT)	Chuck close (One-shot)
G04 P[10.0*[#606EQ0]+#606]	Dwell
G28 U0 W0 M89 (WAITING)	Zero return and waiting for feeder control program
G28 G99 U0	Zero return X
END IF	END IF
G143 M68 (CHUCK CLOSE AND CONFIRMED)	Chuck close confirmation
M99 (RETURN)	Return
N9000	
#3000 =190 (#690-#693 UNDEFINED COMMON VAL.)	Alarm
	(Feeder control program)
09901 (FEEDER PACKAGE-B VER1.10) POUT #34 (FIN TO CS20)	FIN signal to respond start signal

IF[[IN[#27] =1] OR [IN[#28] =1]] GOTO2000	If no work on spindle, program jumps to N2000.
N1000 (++ CHUCK HAS WORK ++)	
IF[IN[#23] =1] GOTO1050	Jump to N1050, if lifter 2 is at descending end
#675 = 0	Counter
D01	Repeating D01~END1
IF[IN[#20] =1] GOTO1100 end	Jump to N1100, if liter 2 is at ascending
G04 P0.5	Dwell
IF [ROUND[#675]>=600] THEN ALM = 03 (LIFTER UP ERROR)	If the counter counts exceeding 600, an alarm is issued.
#675 =#675+1	Count up
END1	END1
N1050 (++ LIFTER UP ++)	
POUT #21 (F/PARTS LIFTER UP)	Lifter 2 ascending command
G04 P1.0	Dwell
WAIT IN [#20] =1 T300.0ALM =03 (LIFTER UP ERROR)	If not confirmed within 300 seconds, an alarm is issued.
N1100 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
N1150 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #23 (LIFTER2 DOWN)	Lifter 2 descending command
N1200 (++ LIFTER UP ++)	
IF[IN[#22] =1] THEN	Execute following program lines, if lifter1 is at descending end

POUT #20 (LIFT1 UP)	Lifter 1 up command
END IF	END IF
N1250 (++ CHECK LIFTER ++)	
#675 =0	Counter
D01	D01 ~ END1 repetition
IF[IN[#37] =1] GOTO1350	In case of ejection, program jumps to N1350.
IF[IN[#18] =1] GOTO1450	If material ascending is OK, program jumps to N1450.
IF[IN[#21] =1] GOTO1350	If material lift is OT, program jumps to N1350.
G04 P0.5	Dwell
IF[ROUND[#675]>=600] THEN ALM =02 (LIFTER UP ERROR)	If the counter counts more than 600, an alarm is issued.
#675 =#675+1	Count up
END1	END1
N1350 (EJECT)	
POUT #37 (/7 ON)	Ejection (/7) ON
POUT #22 (LIFTER1 DOWN)	Lift 1 down command
POUT #23 (LIFTER2 DOWN)	Lift 2 down command
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
M30 (END)	Program end
N1450 (++ WAIT ++)	
G04 P0.3	Dwell
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
N1500 (++ WAIT ++)	

POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
N1550 (++ CHECK F/PARTS LIFTER ++)	
WAIT IN [#23] =1 T300.0ALM =03 (LIFT2 DOWN ERROR)	If not confirmed within 300 seconds, an alarm is issued.
WAIT IN [#20] =0 T1.0ALM =06 (OVER DE-PARE)	Too many works on the pallet
POUT #20 (LIFT1 UP)	Lift 1 up command
G04 P0.5	Dwell
N1600 (++ CHECK THE MATERIAL ++)	
#675 =0	Counter
D01	D01 ~ END1 repetition
IF[IN[#18] =1] GOTO1700	If material ascending is OK, program jumps to N1700.
IF[IN[#21] =1] GOTO1650	If material lift is OT, program jumps to N1650.
G04 P0.5	Dwell
IF[ROUND[#675]>=600] THEN ALM =02 (LIFTER UP ERROR)	If the counter counts more than 600, an alarm is issued.
#675 =#675+1	Count up
END1	END1
N1650 (++ CCW ++)	
WAIT IN[#16] =1 T7200.0ALM =08 (FEEDER DOOR CLOSE ERROR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #19 (CCW)	Feeder reverse move
G04 P2.0	Dwell
WAIT IN[#19] =1 T300.0ALM =01 (FEEDER STOP ERROR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #20 (LIFT1 UP)	Lift 1 up command
N1700 (++ LIFT UP ++)	
POUT #21 (LIFT2 UP)	Lift 2 up command
M30 (END)	Program end
N2000 (++ GRIP MATERIAL ++)	

IF[IN[#23] =0] THEN	If lifter 2 is on down end, program jumps to “END IF”.
POUT #23 (LIFT2 DOWN)	Lifter 2 down command
G04 P0.5	Dwell
WAIT IN[#23] =1 T300.0ALM =03 (DOWN ERROR)	If not confirmed within 300 seconds, an alarm is issued.
END IF	END IF
N2050 (++ LIFTER DOWN ++)	
IF[IN[#22] =1] THEN	If lifter 1 is on down end, program jumps to “END IF”.
POUT #20 (LIFT1 UP)	Lift 1 up command
END IF	END IF
N2100 (++ CHECK LIFTER ++)	
#675 =0	Counter
D01	D01 ~ END1 repetition
IF[IN[#18] =1] GOTO2200	If material ascending is OK, program jumps to N2200.
IF[IN[#21] =1] GOTO2150	If material lift is OT, program jumps to N2150.
G04 P0.5	Dwell
IF[ROUND[#675]>=600] THEN ALM =02 (LIFTER UP ERROR)	If the counter counts more than 600, an alarm is issued.
#675 =#675+1	Count up
END1	END1
N2150 (++ CCW AND LIFT UP ++)	
#676 =0	Counter2
D01	D01 ~ END1 repetition
WAIT IN[#16] =1 T7200.0ALM =08 (FEEDER DOOR CLOSE ERROR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #19 (CCW)	Feeder reverse move
G04 P2.0	Dwell
WAIT IN[#19] =1 T300.0ALM =01 (FEEDER STOP ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.2	Dwell
POUT #20 (LIFT1 UP)	Lift 1 up command
G04 P0.2	Dwell

#675 =0	Counter
D02	D02 ~ END2 repetition
IF[IN[#18] =1] GOTO2200	If material ascending is OK, program jumps to N2200.
IF[IN[#21] =1] GOTO2155	If material lift is OT, program jumps to N2155.
G04 P0.5	Dwell
IF[ROUND[#675]>=600] THEN ALM =02 (LIFTER UP ERROR)	If the counter counts more than 600, an alarm is issued.
#675 =#675+1	Count up
END2	END2
N2155	
IF[ROUND[#676]>=10] THEN ALM =05 (NO WORK PIECE)	If the counter2 counts more than 10, an alarm is issued.
#676 =#676+1	Count up
END1	END1
N2200 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
N2250 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.3	Dwell
N2300 (++ WAIT ++)	
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
G04 P0.5	Dwell
N2350 (++ WAIT ++)	

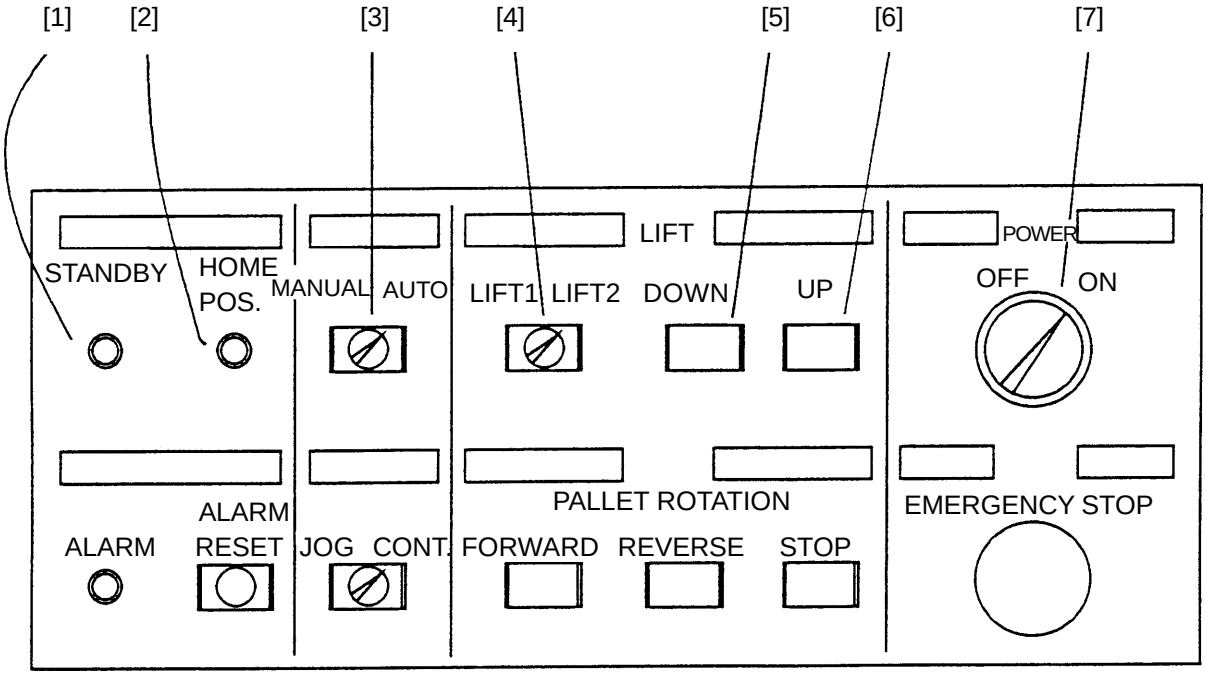
POUT #35 (WAITING SIGNAL TO CS20)	Waiting signal command (to machine proper)
WAIT IN[#35] =1 T300.0ALM =04 (WAIT ERROR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #20 (LIFT1 UP)	Lift 1 up command
G04 P0.5	Dwell
N2400 (++ CHECK THE MATERIAL ++)	
#675 =0	Counter
D01	D01 ~ END1 repetition
IF[IN[#18] =1] GOTO2500	If material ascending is OK, program jumps to N2500.
IF[IN[#21] =1] GOTO2450	If material lift is OT, program jumps to N2450.
G04 P0.5	Dwell
IF[ROUND[#675]>=600] THEN ALM =02 (LIFTER UP ERROR)	If the counter counts more than 600, an alarm is issued.
#675 =#675+1	Count up
END1	END1
N2450 (++ CCW ++)	
WAIT IN[#16] =1 T7200.0ALM =08 (FEEDER DOOR CLOSE ERROR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #19 (CCW)	Feeder reverse move
G04 P2.0	Dwell
WAIT IN[#19] =1 T300.0ALM =01 (FEEDER STOP ERROR)	If not confirmed within 300 seconds, an alarm is issued.
POUT #20 (LIFT1 UP)	Lift 1 up command
N2500 (++ LIFT UP ++)	
POUT #21 (LIFT2 UP)	Lift 2 up command
M30 (END)	Program end
%	

3 FEEDER RELEVANT OPERATION

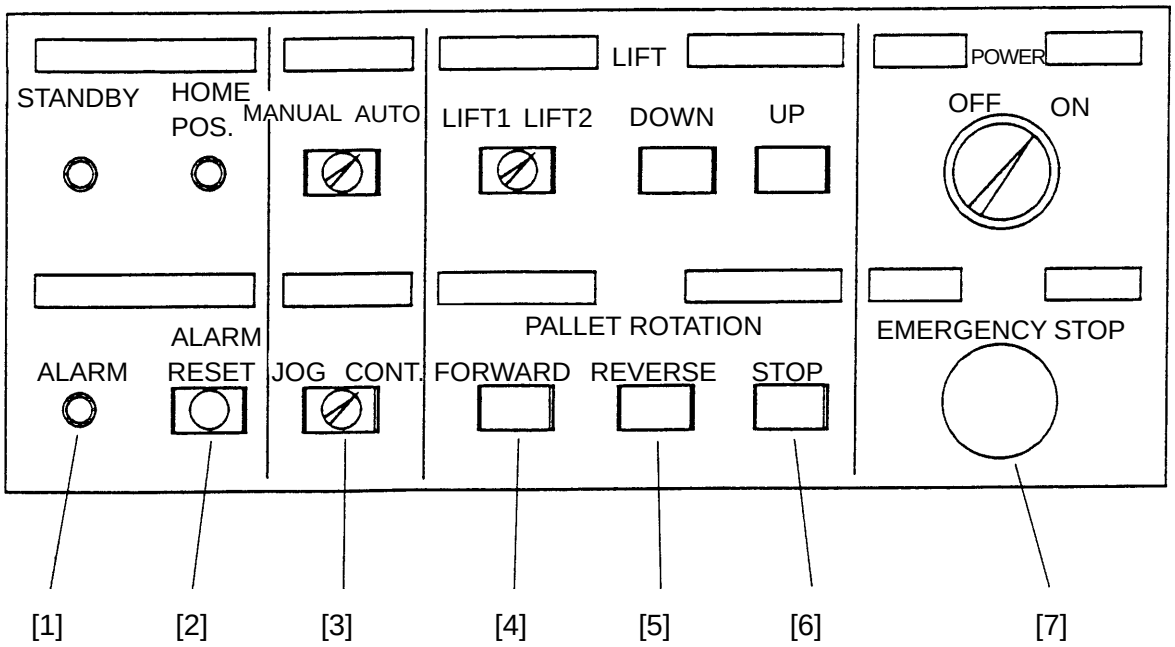
1 Explanation of Feeder Outline

1.1 Package B

1.1.1 Operating Panel (HRL100/HRL150 Type)

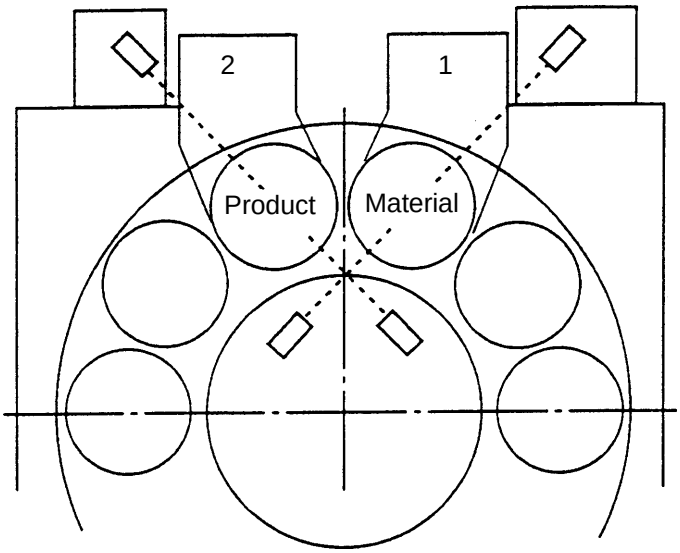


No.	Name	Function	Remarks
[1]	STANDBY	Power “ON”, lamp on by emergency stop.	
[2]	HOME POS.	Lamp on by the treading rotation stop proximity SW.	Lamp off when the lifter is moving up or down.
[3]	MANUAL/AUTO (SELECT SWITCH)	MANUAL: Can be operated on the feeder operation panel AUTO: Used at synchronized operation	Can not execute automatic operation by single only.
[4]	LIFT1/LIFT2 (SELECT SWITCH)	Used when selecting the lifter to be operated.	
[5]	DOWN	The lifter moves down.	
[6]	UP	The lifter moves up.	
[7]	POWER	ON: Power on OFF: Power off	

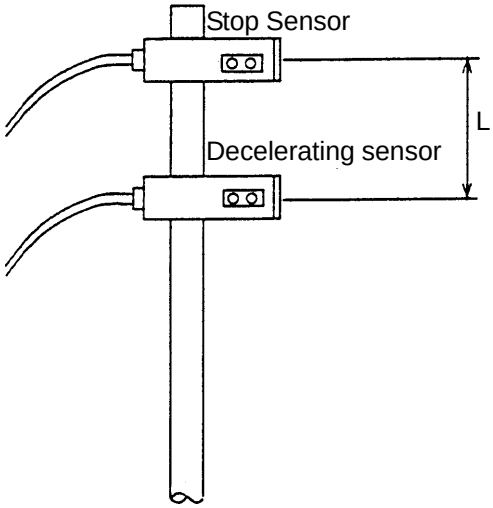


No.	Name	Function	Remarks
[1]	ALARM	Lamp ON with an alarm issuance	
[2]	ALARM RESET	To release an alarm is removed	To press after alarm cause
[3]	JOG/CONT. (SELECT SWITCH)	JOG: Lifter continues to ascend/descend while the button is kept pressed. Revolving is by one pitch per each pressing. CONT.: Lifter ascend/descend stops by the stop sensor. Revolving continues until stop button is pressed.	
[4]	FORWARD	Feeder rotates in normal direction.	
[5]	REVERSE	Feeder rotates in reverse direction	
[6]	STOP	Feeder rotates stop	
[7]	EMERGENCY STOP	Press for emergency stop. Turn the button right for releasing.	

1.1.2 Ascent Detecting Sensor



The ascent detecting sensor is designed as shown in the above. The right side of the pallet is for product and the left for material viewed from the front. The relational positions of the sensors are same with an oval shape feeder.



There are two sensors for material detecting, one for deceleration and the other for stop, as shown in the diagram on the left.

Arrange the distance between the two material detecting sensors as follows.

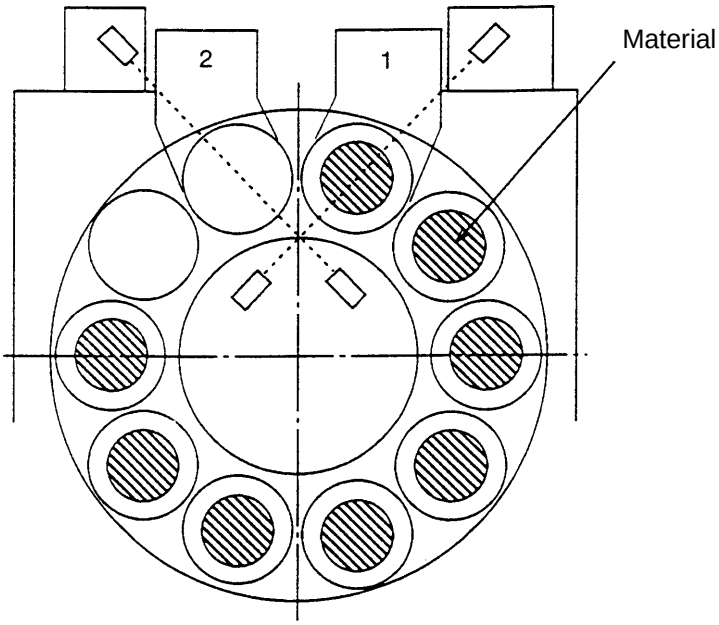
For HRL150 type feeder

L = 50mm or wider

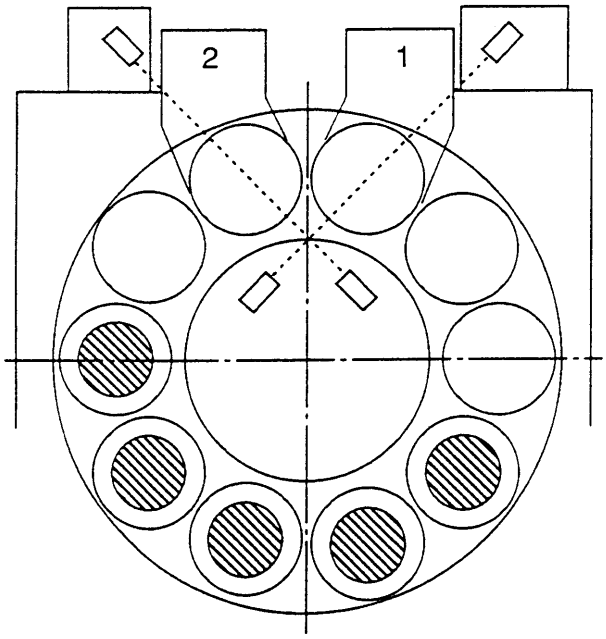
For HRL100 type feeder

L = 30mm or wider

1.1.3 Material on Pallet



Refrain from putting materials on all the pallet. Always keep at least 2 pallets vacant. (Otherwise, when material is used up, ejection becomes impossible.

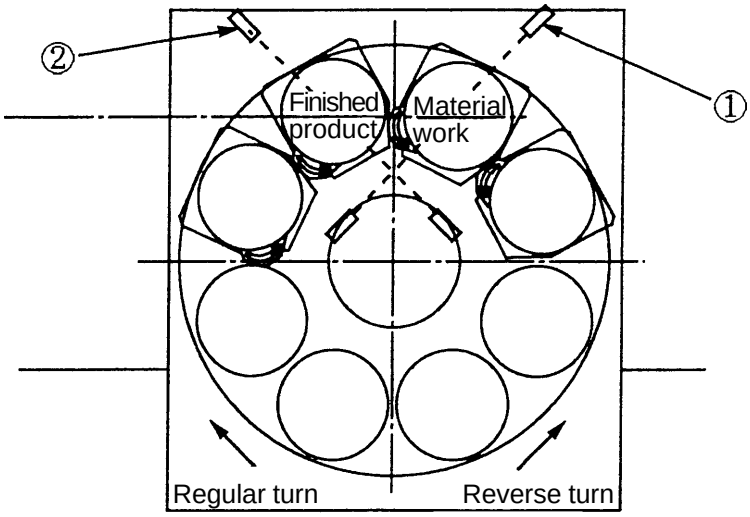


The starting position can be anywhere, not necessarily at the position of lifter 1. The feeder revolves and seeks material. (As this seeking action is limited to maximum 10 pallets, if the vacant pallet is more than 10, an alarm is issued.

When starting automatic operation, the product pallet should be kept vacant. For restarting after a cycle stop or eject button stop, there is no harm even with product on the pallet.

1.1.4 Relational Position of Photoelectric Switch

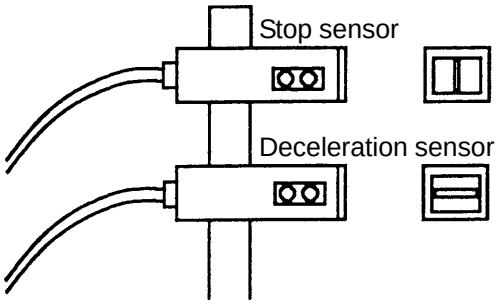
[Use and location of photoelectric switches]



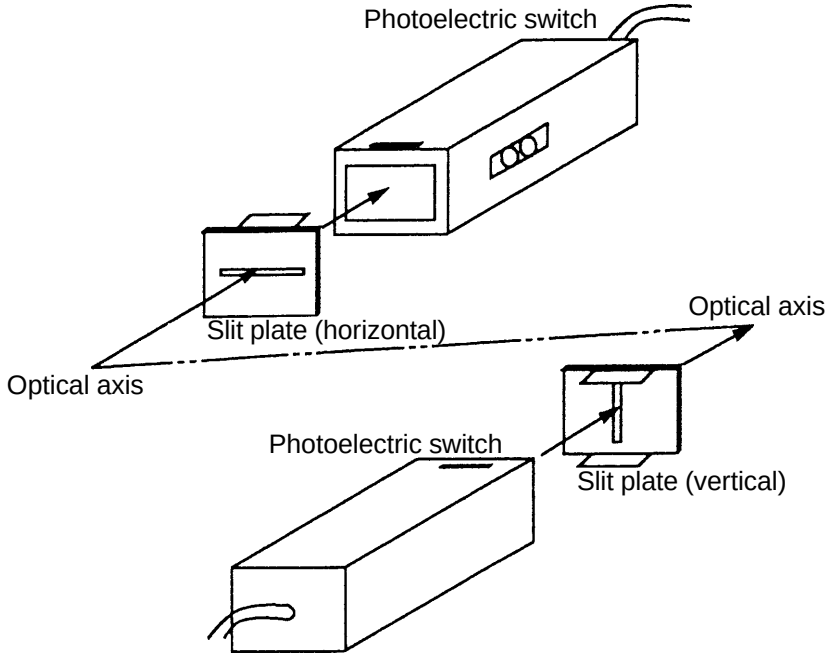
[1] ……Material work position switch (Stop, deceleration)

[2] ……Finished product position switch (Stop, deceleration)

[Photoelectric switch arrangement for [1] / [2]]



1.1.5 Adjustment of Photoelectric Switch

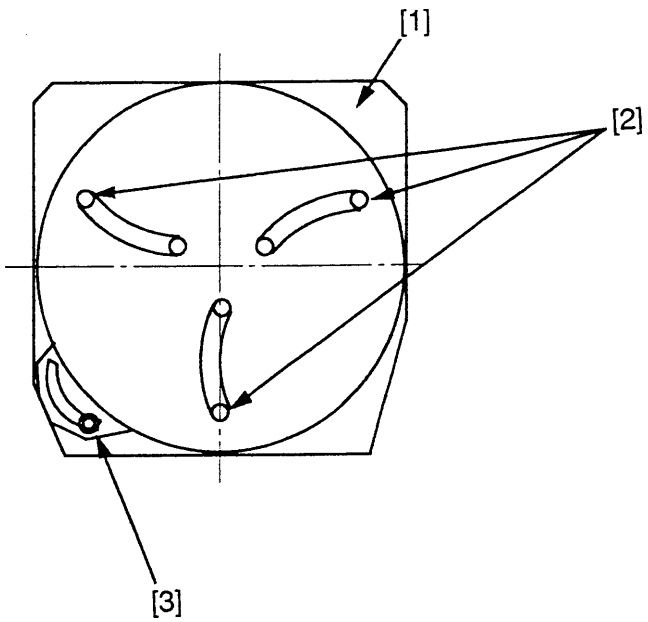


***Note**) Vertical slit plate and horizontal slit plate are to be discriminated for setting each at the light source side and the light receiving side.*

[ON/OFF status of photoelectric switch]

Status		Lamp	
		Red lamp	Green lamp
Light source is obstructed	(Without work)	Light ON	Light ON
Light source not obstructed	(With work)	Light OFF	Light ON

1.1.6 How to Adjust Pallet Jig (3 Guide Bars)



[1] Pallet

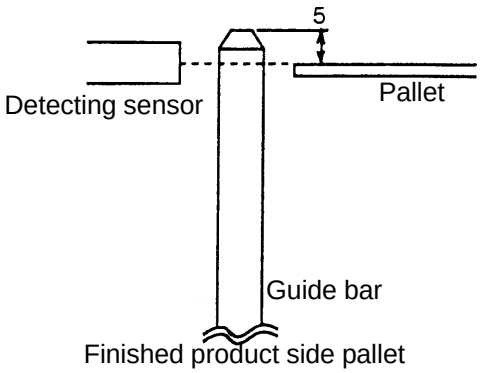
[2] Guide bar

[3] Guide bar clamp bolt

- Loosen the bolt [3].
- Spread wide the guide bars [2] then put them on the center of work manually.
- Adjust the guide bars to cover the diameter of the work + about ϕ1mm manually.
- Tighten the bolt [3] to fix the guide bars.

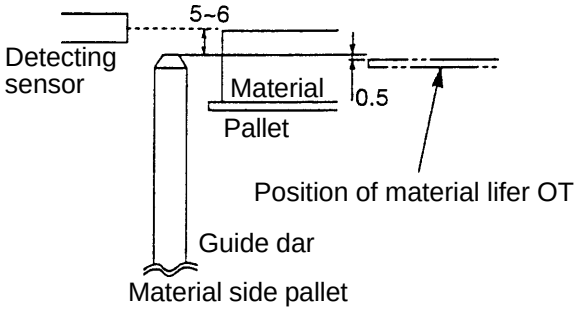
1.1.7 Pallet Ascent Sensor

For finished product putting pallet, the sensor is set at about 5mm below the top end of the guide bar.



For material work putting pallet, the sensor is set in such a way that the upper face of work material extrudes above the guide bar by 5~6mm.

When the clamping margin of the jaws exceeds 5~6mm, it can be adjusted by spindle positioning.



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