HITEC-TURN

15SII, 20SII

CNC LATHE
INSTRUCTION MANUAL

SEIKI MULTI

(L8804E-2) Edition 1 8-1989

SEIKI Hitachi Seiki Co., Ltd.

C O N T E N T S

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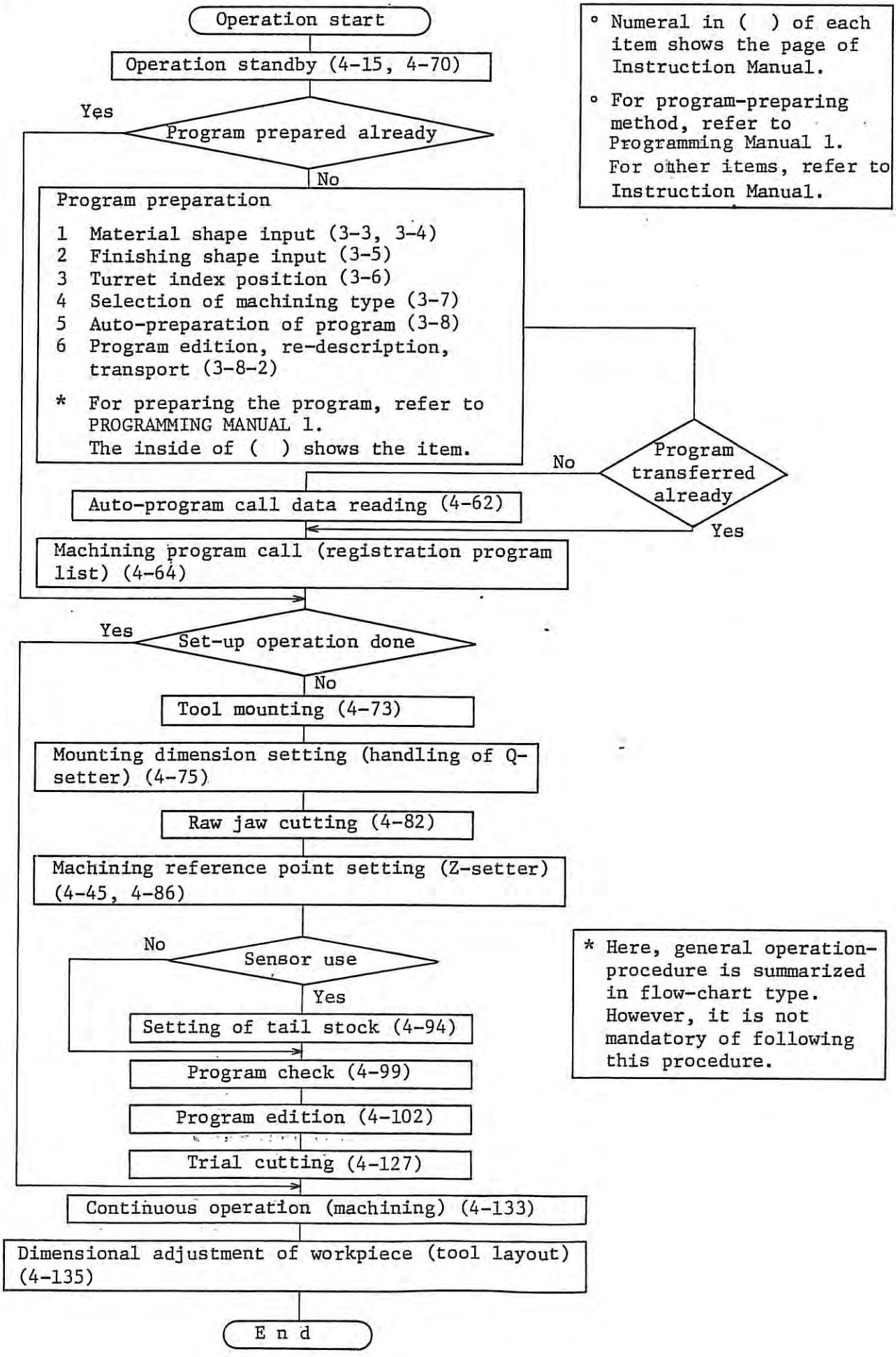
INTRODUCTION

We are obliged for your using our HITEC-TURN CNC lathe.
To make full use of this machine, it is necessary to make perfect installation, understand its mechanisms and optimumly program for workpieces.
In addition, the user should standardize setups by using standard accessory tools as a CNC machine so as to minimize setup changes for all types of workpieces.
CNC lathes HITEC-TURN 15SII, 20SII and 20SII(BIG CHUCK) can cope with both chuck work and center work. They are full-scale CNC lathes which enjoys wider range of workability and higher economy.
The safety precautions mentioned in this manual and the caution plate stuck to the machine are important. Follow their instructions for your safety operation.
For general understanding of this machine, the following documents are provided in addition to this instruction mannal. Refer to them as required.

1. Programming Manual
2. Parts List
3. NC Unit Instruction Manual and Maintenance Manual
4. Electric Circuit Diagrams
5. Each Optional Function Instruction Manual

Carefully handle and keep record lists/tables, such as "Parameters List", etc., provided for and packed together with this machine so that you will not lose them, because they are necessary for adjustment.
A design is subject to change due to remodeling of this machine, and as a result, the contents of these documents may partly mismatch the machine.

Operation Procedure Flow Chart
(From Program Preparation Up to Machining)



1. SAFETY PRECAUTIONS

Safety precautions are important to protect the operator and the machine from accidents and damages respectively. These precautions apply not only to this machine but also to the settings and operations of almost all machines. Always observe these precautions.

1-1 General Precautions

Observing general precautions is greatly instrumental in creating an accident-free working environment and improving productivity.

1. Always wear safety eye glasses.
2. Always wear safety shoes.
3. Wear a working cap properly and tighten the sleeves and cuffs of a working suit. Keep the working suit in good order when operating the machine.
4. Do not operate the machine with gloves put on.
5. Provide sufficient light around the machine and maintain a clean environment.
6. Do not use compressed air to clean and remove dust and cutting chips from the machine proper, power control cabinet, NC unit and the floor around them.
7. Work platform, which are placed around the machine, must be strong enough and have antislip surfaces.
8. Do not place a tool, workpiece and other things not only on the moving sections of the machine but also on any section of the machine.
9. Do not remodel the machine without our permission.

1-2 Precaution When Operating the Machine

Before operating this machine, full understand this manual. Perform a test run in the presence of our operation instructor as much as possible.

(Maintenance)

1. The operator and the personnel in charge of maintenance must fully observe the instructions on a caution plate. Take care not to stain, damage or remove the caution plate. When it cannot be read easily, contact Hitachi Seiki.
2. Keep all doors and cover closed, except when adjusting. Exercise extreme care concerning the doors of the NC unit and the power control cabinet.
3. Do not remove or modify mechanisms and electric circuits installed for safety, such as limit switches for the stroke ends of travel axes, limit switches for the interlocking of a sliding cover, and so on.
4. For adjustment and repair, use the specified wrenches, and so on.

(Operation)

1. Remember the positions of the EMERGENCY STOP buttons so that you can push them immediately.
2. When starting the machine, follow the procedures mentioned later.
3. When the machine is in operation, never put your hand close to a rotating or moving section.
4. When desposing of cutting chips which wrapped around a tool or dropped on a chip flow or other areas, do not pull them with your hand. Be sure to stop the machine when disposing of the cutting chips.
5. Stop the machine when adjusting the position of a coolant nozzle.

(Tool Setting)

1. When setting up tools, stop a spindle as well as the feed in each axis.
2. Be very careful of tool noses when setting them up. Do not set the tools over their specified lengths because their tool noses may interfere with a bed, carriage, cover, tailstock, etc. when indexing a turret head.
3. Mount tools in a well balance condition. Due to high-speed turret indexing (0.1 sec.) when their mounting is unbalanced, it may lead to improper turret indexing.

(Workpiece Chucking)

1. When chucking a workpiece, be careful of its balance. Do not turn the spindle if the mounting of the workpiece is unbalanced.
2. Use standard soft jaws. Mount the jaws so that they may stay within the outer diameter of the chuck.
3. For a chuck cylinder set pressure, determine it referring to 4-6-4 "Soft Jaw Cutting".
   Take note that the chuck gripping force will be suddenly reduced due to a centrifugal force when the spindle runs at a high speed.
4. When forming the soft jaws, pay full attention to a forming ring gripping position and a shape to which the jaws are to be formed. After forming, check that the jaws properly grip the workpiece and that a chucking pressure is adequate.
5. When chucking and centering a center workpiece, take special note of a workpiece weight, a center hole and a thrust force applied to the center hole. If a heavy workpiece is centered with a small center hole and a load is applied, the tip of the center may be damaged, allowing the workpiece to jump out.

(Completion of Daily Work)

1. After finishing daily work, be sure to turn off the power, clear the machine and apply rust preventing oil on slideways, etc. in accordance with the specified procedures. Carefully perform these operations when a water-soluble coolant is used.

1-3 Precautions for Electric Equipment and NC Unit

When operating the machine or carrying out maintenance checks, pay special attention to the following points, concerning the electric equipments and NC unit.

1. Do not give shocks to the NC unit, power control cabinet, and so on.
2. For the primary wiring of the machine, use a wire with a thickness specified in the operation manual. Do not use an unnecessarily load cord. When the primary wiring has to be put on the floor, protect it with a cover lest it should be damaged by cutting chips, and so on.
3. When performing a test run, check that the parameters of the NC unit have been correctly set in the presence of our operation instructor. Do not change parameters other than that for backlash.
4. Do not change the current set value of the thermal relay of the power control cabinet and the set values of various control knobs.
5. Do not apply an excessive force (bending, etc.) to the connectors of cannon plugs, flexible tubes and cubtyre cords.
6. When carrying out maintenance checks on the electric equipments, turn off the EMERGENCY STOP button on the operation panel, the power of the NC unit, the main switch of the power control cabinet and the power switch installed in your factory, in this order. Start maintenance work after making sure that these switches are turned off. Lock the power switches in the OFF state as much as possible or put up warning signs. In additions, place "DO NOT TOUCH !" cards near the operation buttons of the machine to forbid other personnel to operate the machine.
7. Handle with particular care to electric equipments of the machine proper and exercise extreme caution not to allow the machine to get wet.
8. For equipments insdie the power control cabinet, use those specified by Hitachi Seiki. Particularly, use specified fuses. Never the fuses with higher capacity or copper wires.
9. Never leave the door of the NC unit open, because the direct sunshine or camera's strobo flash rays may enter the cabinet and damage internal devices.

2. SPECIFICATIONS

2-1 Machine Outline

This is a CNC lathe with a drum type turret head. It is designed to be able to control two axes simultaneously.
The following are the features of this machine.

1. The machine can perform chuck work and center work.
2. Spindle speeds can be steplessly changed in a wide range due to the employment of an AC inverter motor.
3. With a permanent tool setting as a basis, various kinds of workpieces can be machined without modification.
4. As a standard feature, the machine has a constant surface speed control function.
5. The machine also has a diagnostic function.
6. Due to the combined structure of electric and mechanical systems. A required floor area is reduced.

In addition, the turret head is positioned in the rear of the machine in order to improve accessibility to the spindle and the operatability of the machine.
If optional accessories are attached, the working range of the machine can be extended further.

Construction of Machine Proper

1. Head stock
   Spindle speeds are automatically changed in a wide range by the AC motor. The AC inverter motor makes it possible to perform constant surface speed control.

HT15SII	35 ∿ 6,000 r.p.m
HT20SII	30 ∿ 5,000 r.p.m
HT20SII-- (BIG CHUCK)	20 ∿ 3,600 r.p.m

2. Turret head

An indexing mechanism with a superhigh-accuracy cam assures high-speed indexing (0.1 sec./turret face) and high indexing accuracy.

3. Tailstock

The taper of the tailstock is MT No. 4 (HT15SII) or MT No. 5 (HT20SII,HT20SII-BIG CHUCK) and any live center available on the market can be mounted. The tailstock can be set at an arbitrary position by key operation. A push force can be adjusted by hydraulic adjustment within a range of 50 to 450 kg (110 to 990 lb.).

2-2 Machine Proper Specifications

	Unit	HT15SII	
Capacity			
Swing	mm(inch)	300(11.8)	
Chuck Size	mm(inch)	165(6.5)	
Max. Turning Dia.	mm(inch)	165(6.5)	
Max. Shaft Length	mm(inch)	300(11.8)	
Bar Capacity	mm(inch)	38(1.5)	
Travel			
X Axis	mm(inch)	180(7.1)	
Z Axis	mm(inch)	340(13.4)	
Spindle			
Spindle Speed	rpm	35 ∿ 6000	
Spindle Speed Range	Range	1, Stepless	
Spindle Nose		A2-5	
Hole Through Spindle	mm(inch)	46(1.8)	
Bearing Dia. of Spindle	mm(inch)	80(3.2)	
Tool Head			
Type of Turret		10 POS.KV TOOL IN/12 pos.convent. tooling/12 POS VDI TOOLING	
No. of Tool Position		10/12	
Tool Size : OD Tool	mm(inch)	25(1)	
Tool Size : ID Tool	mm(inch)	25(1)	
Turret Index Time	Sec.	0.1/Face	
Feed			
Rapid Traverse X Axis	m/min(IPM)	20(787)	
Z Axis	m/min(IPM)	24(945)	
Cutting Feed	mm/rev (in/rev)	0.01 ∿ 500 (0.0001∿19.685)	
Jog Feed	mm/min (in/min)	0 ∿ 2000 (0 ∿ 80)	
Tailstock			
Stroke	mm(inch)	340(13.4)	
Spindle Inside Taper		MT4	

	Unit	HT15SII	
Motor			
Spindle Motor 50% ED	AC kW (HP)	7.5 (10)	
Feed Motor X Axis	AC kW (HP)	0.75(1)	
Z Axis	AC kW (HP)	0.75(1)	
Coolant Unit	kW (HP)	0.18(1/4)	
Power Capacity	kVA	15	
Weight	kg (lbs)	3800(8360)	

Note: All illustrations and specifications are subject to change without prior notice for improvement and development.

2-2 Machine Proper Specifications

	Unit	HT20SII	
		STANDARD	BIG CHUCK
Capacity			
Swing	mm(inch)	380(15)	380(15)
Chuck Size	mm(inch)	210(8 1/4)	255(10)
Max. Turning Dia.	mm(inch)	210(8 1/4)	255(10)
Max. Shaft Length	mm(inch)	380(15)	380/600(15/23.6)
Bar Capacity	mm(inch)	51(2)	64(2 1/2)
Travel			
X Axis	mm(inch)	200(7.9)	200(7.9)
Z Axis	mm(inch)	400(15 3/4)	400/630(15 3/4/24.8)
Spindle			
Spindle Speed	rpm	30 ∿ 5000	20 ∿ 3600
Spindle Speed Range	Range	1, Stepless	1, Stepless
Spindle Nose		A2-6	A2-8
Hole Through Spindle	mm(inch)	59(2.3)	78(3.0)
Bearing Dia. of Spindle	mm(inch)	90(3.5)	110(4.3)
Tool Head			
Type of Turret		10 POS.KV TOOL IN/12 pos.convent. tooling/12 POS VDI TOOLING	
No. of Tool Position		10/12	10/12
Tool Size : OD Tool	mm(inch)	25(1)	25(1)
Tool Size : ID Tool	mm(inch)	32(1 1/4)	32(1 1/4)
Turret Index Time	Sec.	0.1/Face	0.1/Face
Feed			
Rapid Traverse X Axis	m/min(IPM)	20(787)	20(787)
Z Axis	m/min(IPM)	24(945)	24(945)
Cutting Feed	mm/rev (in/rev)	0.01 ∿ 500 (0.0001∿19.685)	0.01 ∿ 500 (0.0001∿19.685)
Jog Feed	mm/min (in/min)	0 ∿ 2000 (0 ∿ 80)	0 ∿ 2000 (0 ∿ 80)
Tailstock			
Stroke	mm(inch)	400(15 3/4)	400/630(15 3/4/24.8)
Spindle Inside Taper		MT5	MT5

	Unit	HT20SII	
		STNDARD	BIG CHUCK
Motor			
Spindle Motor 50% ED	AC kW (HP)	11 (15)	11 (15)
Feed Motor X Axis	AC kW (HP)	1.03(1.4)	1.03(1.4)
Z Axis	AC kW (HP)	1.03(1.4)	1.03(1.4)
Coolant Unit	kW (HP)	0.18(1/4)	0.18(1/4)
Power Capacity	kVA	18	22
Weight	kg (lbs)	4100(9020)	4300(9460)

Note: All illustrations and specifications are subject to change without prior notice for improvement and development.

Standard Accessories

Quick tool setter	1 set
ϕ165 hollow chuck (HT15SII)	1 set
ϕ210 hollow chuck (HT20SII)	1 set
ϕ254 hollow chuck (HT20SII BIG CHUCK)	1 set
Soft jaw for the above	3 sets
Standard combination tools	1 set
ID tool base holder	5 pcs.
Lighting apparatus	1 set
Tailstock	1 set
Coolant unit	1 set
Leveling sheet	1 set
Spanners and wrenches	1 set
Spindle override	1 set
Call light	1 pc.
Spindle load meter	1 set

Optional Accessories

- Selected tools
- Work counter
- Run hour meter
- Ammeter and voltmeter
- Spindle tachometer
- Automatic power cutoff unit
- Tail spindle tape command
- Chip conveyor right discharge
- Chip conveyor rear discharge

2-3 NC-system Specifications (SEICOS-L MULTI)

Standard Specifications

Submemory	Tool data 100 pcs. film area standard 10.1 KB (dialogue program data keeping)
Control axes	2 axes (X, Z)
Simultaneous controllable axes	2 axes
Interpolation	Linear/circular
Designation system	Incremental/absolute
Tape code	EIA/ISO 840, Automatic recognition
Functions	G2, G3, M2, T4
Feed rate override	0 ∿ 200% (10% step)
Spindle speed override	50 ∿ 200% (10% step)
Rapid override	1, 5, 25, 100%
Manual feed function	Rapid, Jog, Manual pulse generator.
Manual pulse generator	× 1, × 10, × 100 (× 50)
Dwell	
Reference point return	Manual/automatic G27 ∿ G29
Max. r.p.m. setting	G50 S××××
Automatic coordinate system setting	T code
Work coordinate system setting	Direct increase/decrease measuring value (work-length)
Incremental offset	U, W
Decimal point input	
Program No. search	
Sequence No. search	
Label skip	
Block skip	
Fixed cycle	G90, G92, G94
Multiple repetitive cycle	G70 ∿ G76
Radius programming on arc.	
Chamfering/corner R	
Memory lock key	
No. of tool offset amount memory	50
Automatic tool nose radius compensation	

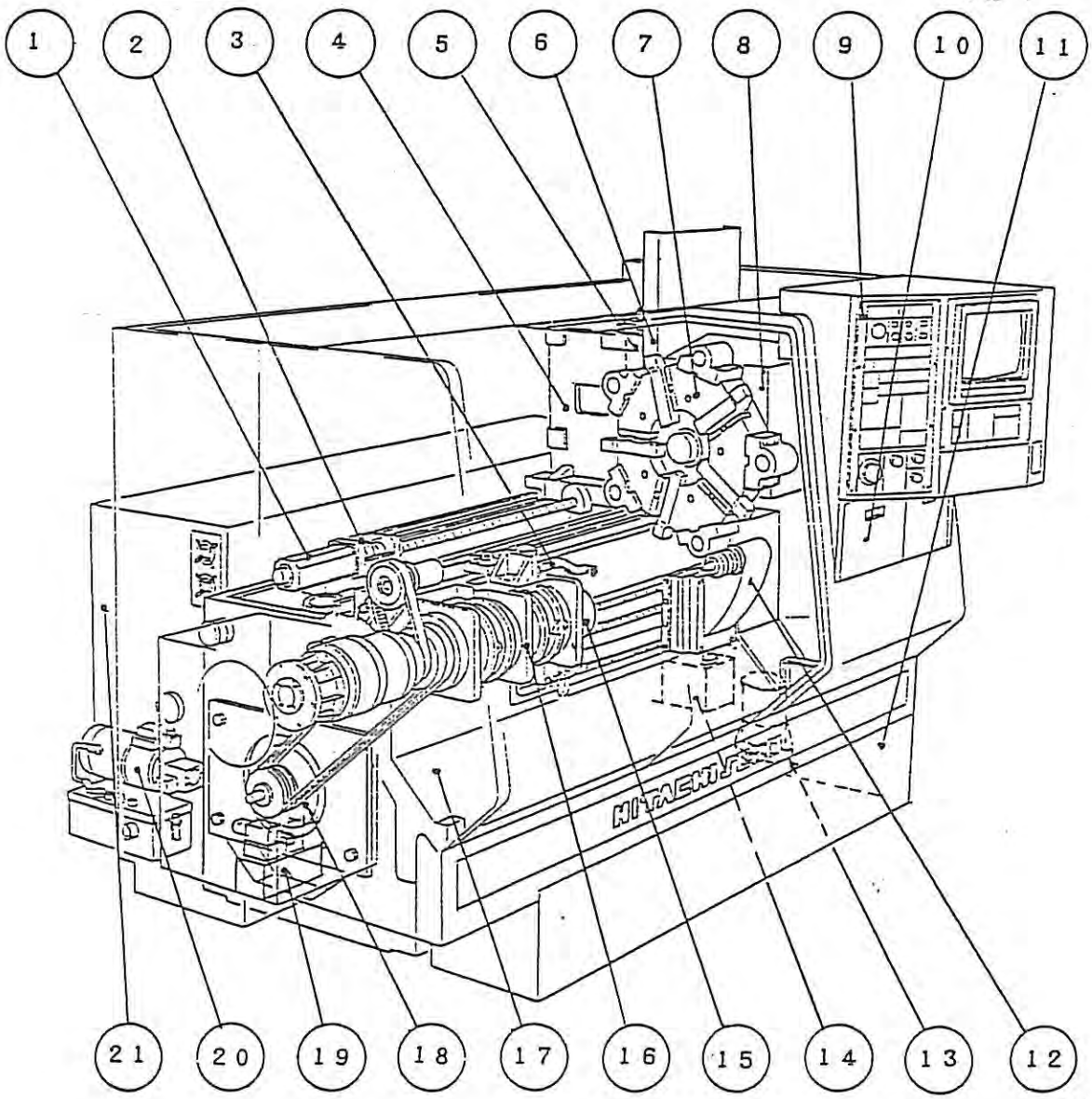
Buffer storage	
Optional stop	
Machine lock	
Dry run	
Tape check function	Dry run + no spindle rotation
Single block	
CRT display	14" color
Part program storage & editing	40 m
Back ground editing	
No. of registerable programs	99
Self diagnosis	
Stored stroke limit	#1, #2, #3, G36 ∿ G39
Manual absolute	ON fixed
Constant surface speed	
Inch/metric conversion	
Tape punch interface	
Run hour display	
Grooving width offset (ID, OD, End face)	G150, G151
Resetless over travel function	

Option

Submemory	Film area 50.1 KB (dialogue program data keeping)
Tape reader	
Programmable data inpu	
Thread cutting cycle retract	G92, G76
Variable lead threading	G34
Multiple start thread cutting	
2nd reference point return	G30
Part program storage	Total 80 m
Part program storage	Total 150 m
Part program storage	Total 320 m
Additional No. of registerable	Total 199 pcs. (Using part program storage 2 m)
Additional No. of registerable	Total 999 pcs. (Using part program storage 18 m)
Program restart	
User macro	Needed for reviewing the specifications in case of DI/DO credit
Block skip	Total 4 pcs.
Block skip	Total 9 pcs.
Skip function	G31
Tool life management	G122, G123
Run hour display	N/C display
External data inpu	
External work number search	20-step shifting switch type

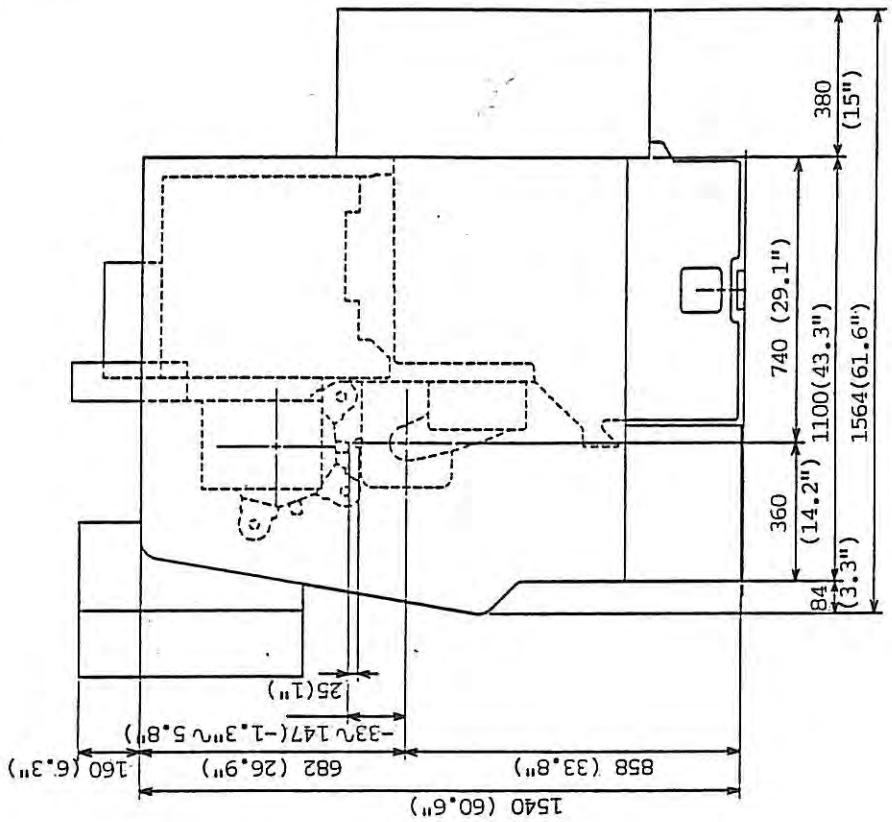
2-4 Component Units

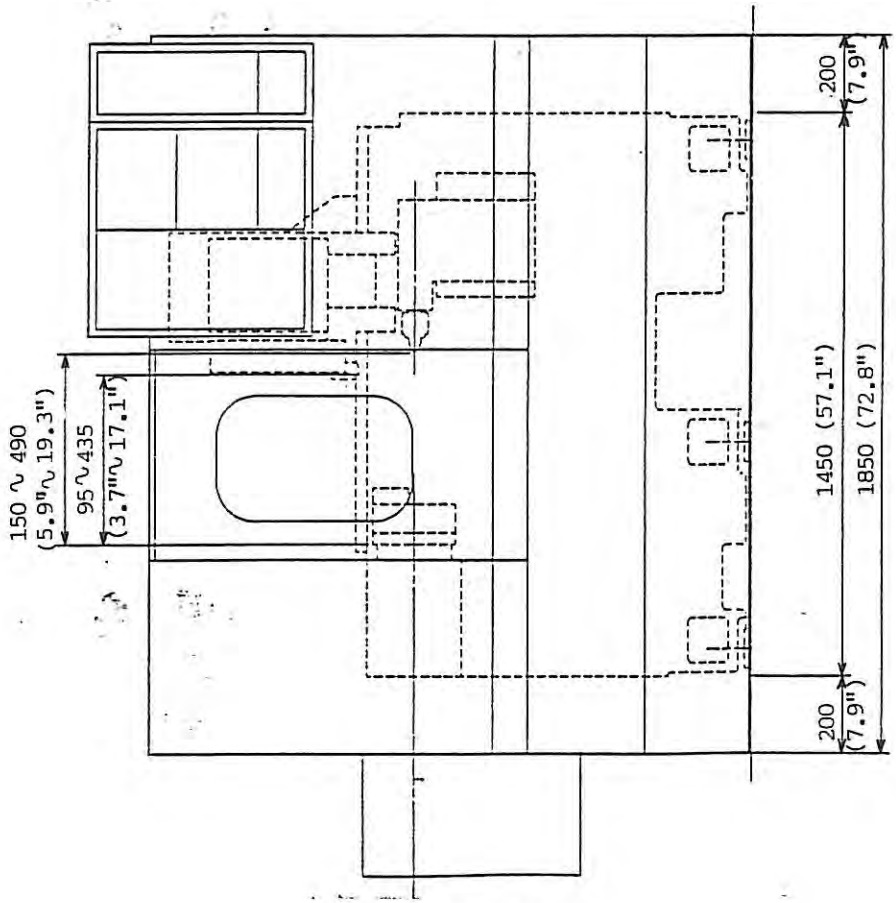
1. Z-axis servo motor
2. Z-axis feed box
3. Q setter
4. Saddle
5. X-axis servo motor (inside the saddle)
6. Cross slide
7. Turret
8. Tool rest
9. Operation panel
10. Pocket
11. Coolant tank
12. Tailstock
13. Coolant pump
14. Lubricating unit
15. Spindle
16. Head stock
17. Bed
18. Spindle motor
19. Manifold
20. Hydraulic unit
21. Power control cabinet



2-5 Major Dimensions

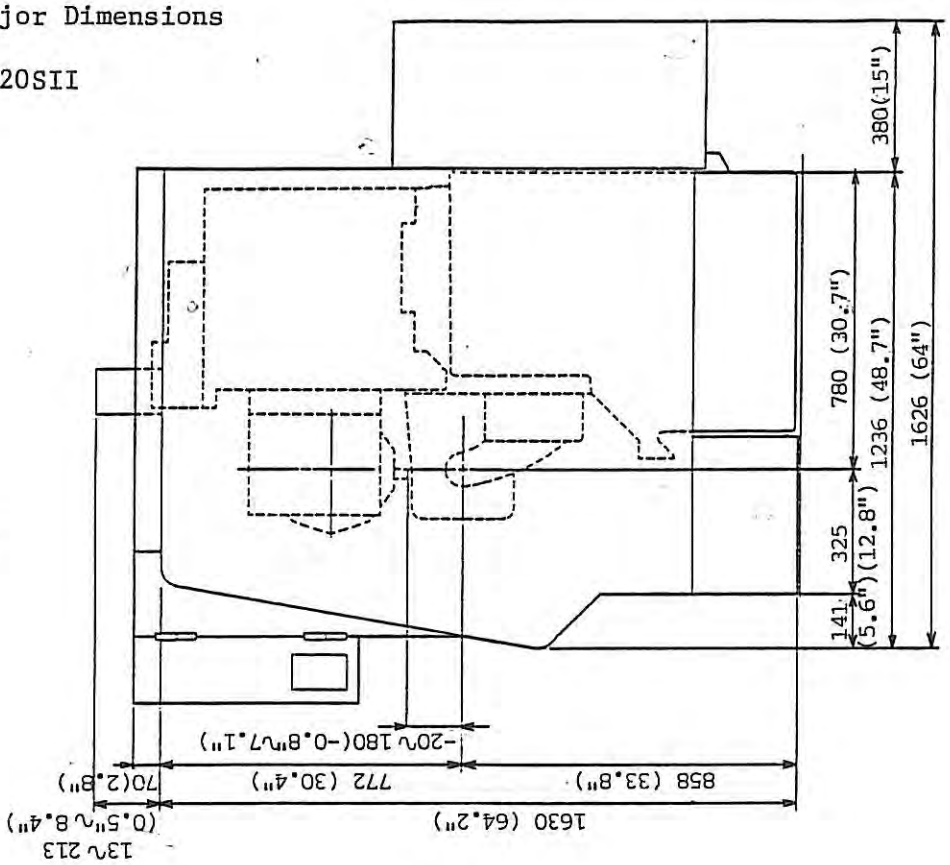
HT15SII,

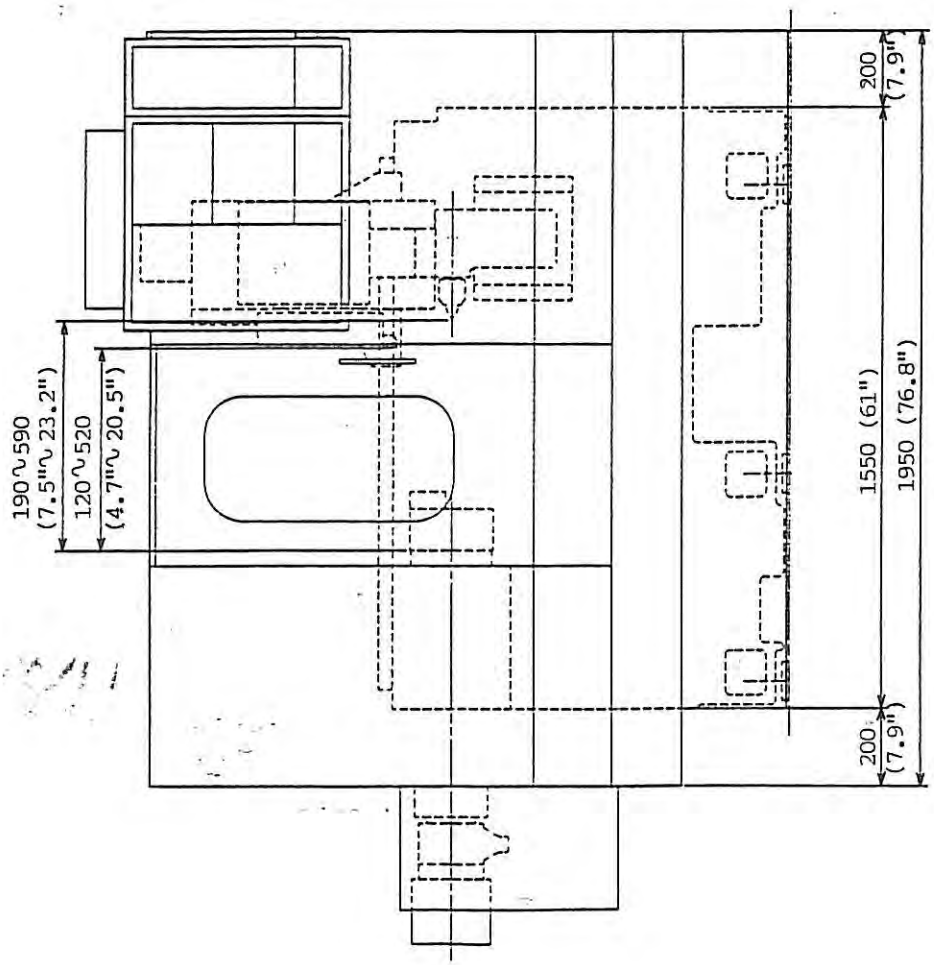




Major Dimensions

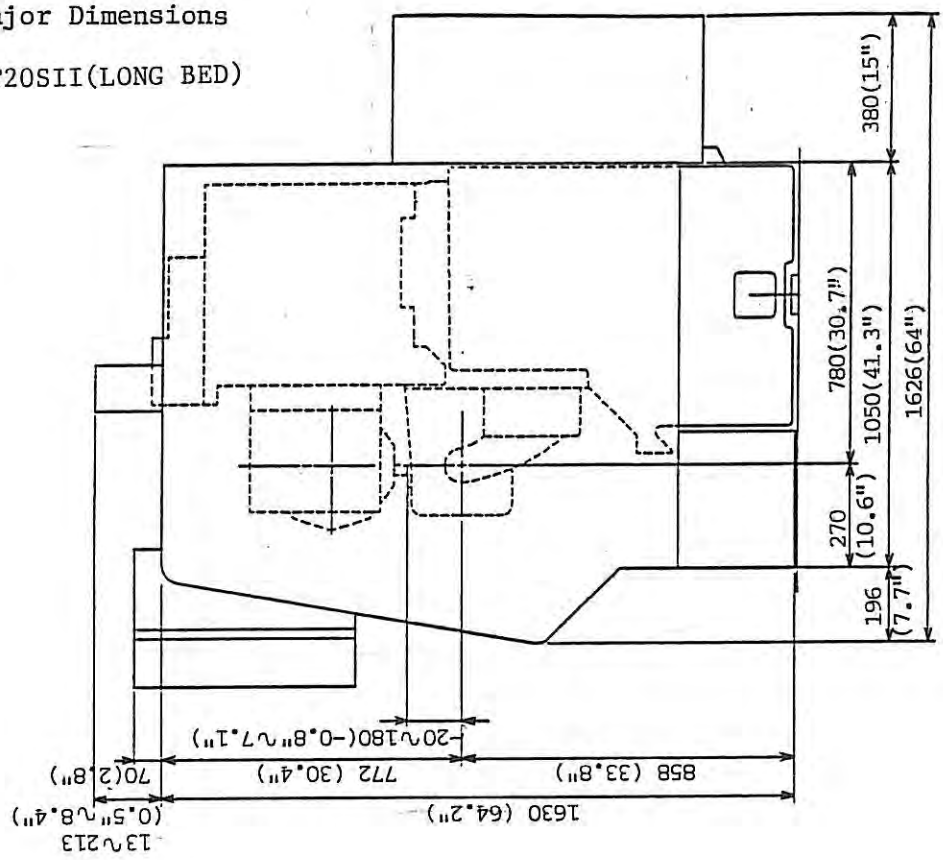
HT20SII

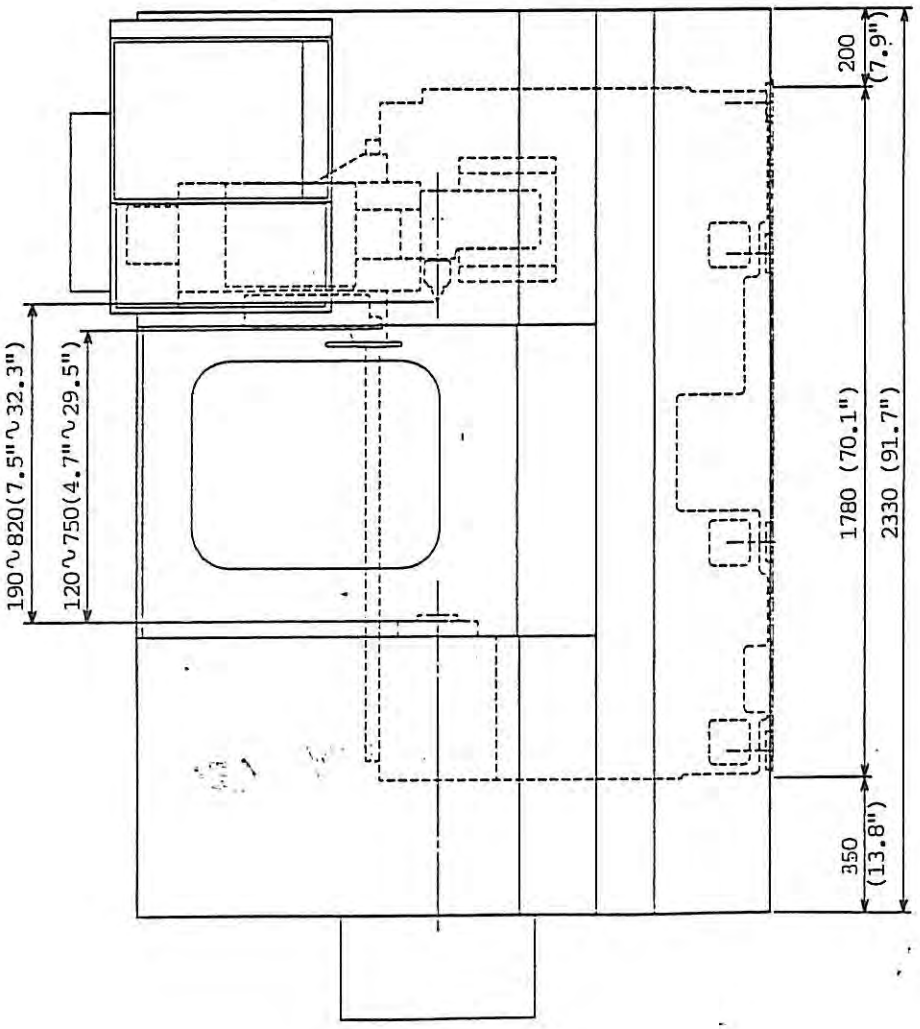


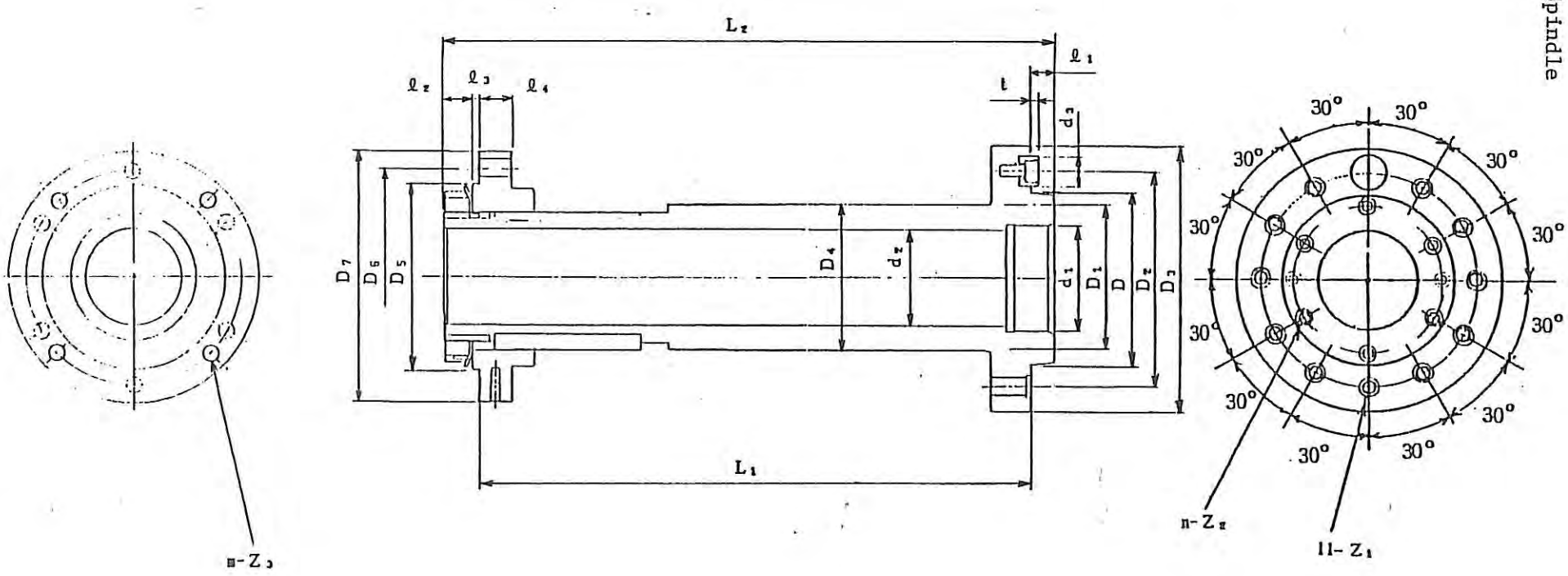


Major Dimensions

HT20SII(LONG BED)



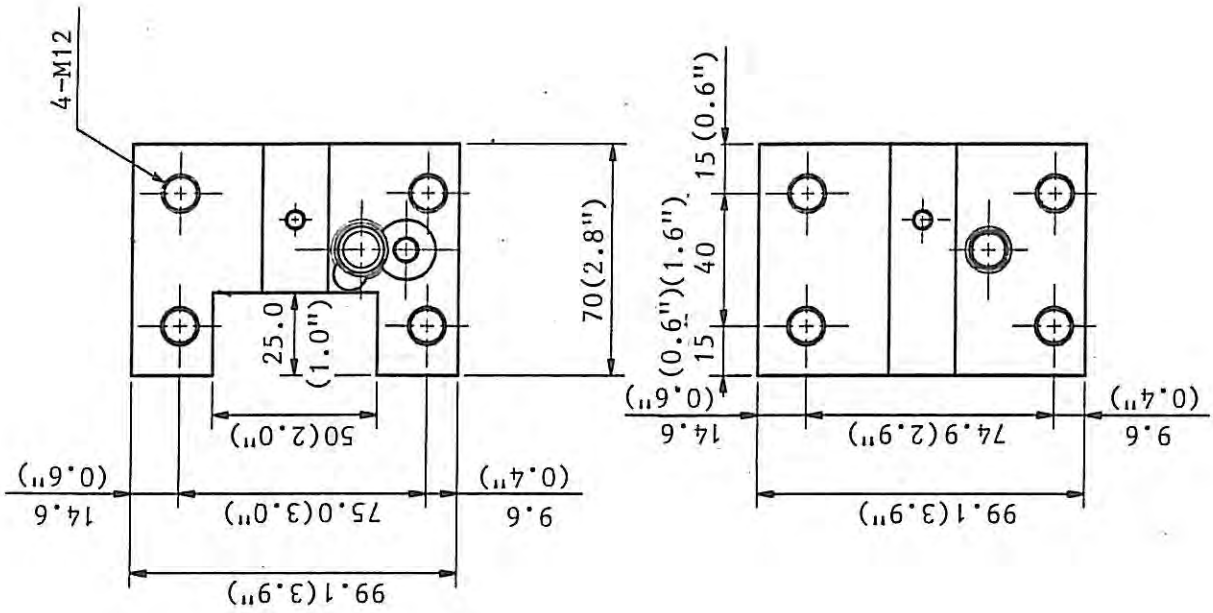


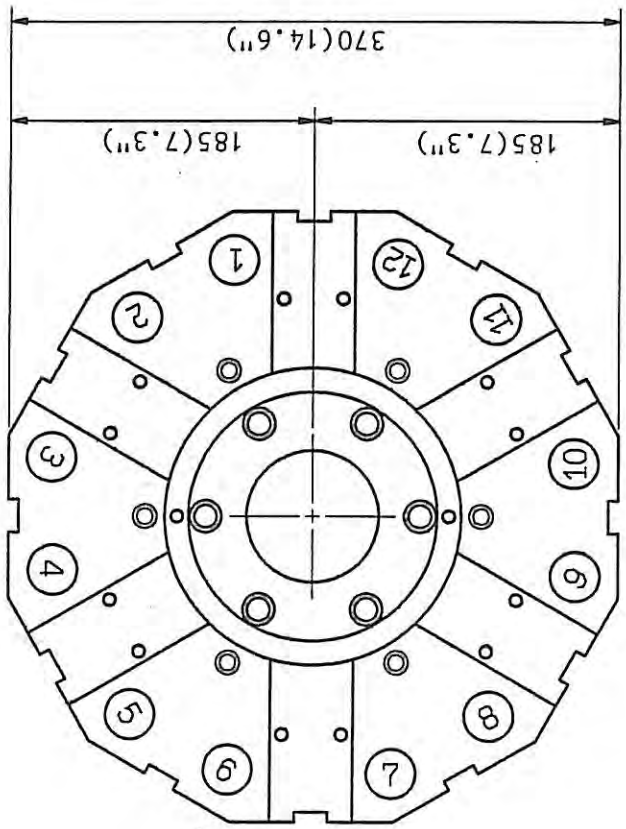


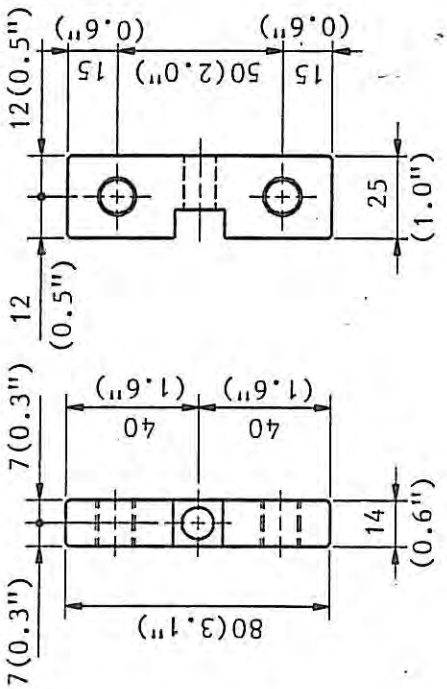
Model	Spindle nose	D	D_1	D_2	D_3	D_4	D_5	D_6	D_7	d_1	d_2	d_3	t	ℓ_1	ℓ_2	ℓ_3	ℓ_4	L_1	L_2	Z_1	$n-Z_2$	$n-Z_3$
HT15SII	A2-5	82.563	65	104.8	135	80	100	140	160	52	46	15.88	4.7	12.7	15	5	19	480	512.7	M10	4-M8	4-11.5
HT20SII	A2-6	106.375	88	133.4	165	90	115	135	155	65	59	19.05	4.8	14.3	21.5	4	20	553	589.3	M12	6-M8	4-11.5
	A2-8	139.719	116	171.4	210	110	145	165	185	86	78	23.81	6.4	15.9	21	5	22	558	600.0	M16	6-M8	6-11.5

Tool Rest

HT20SII

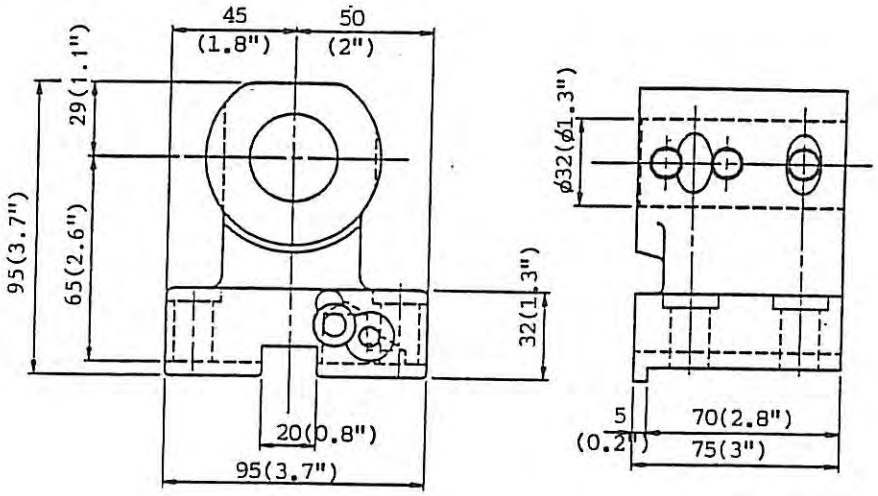




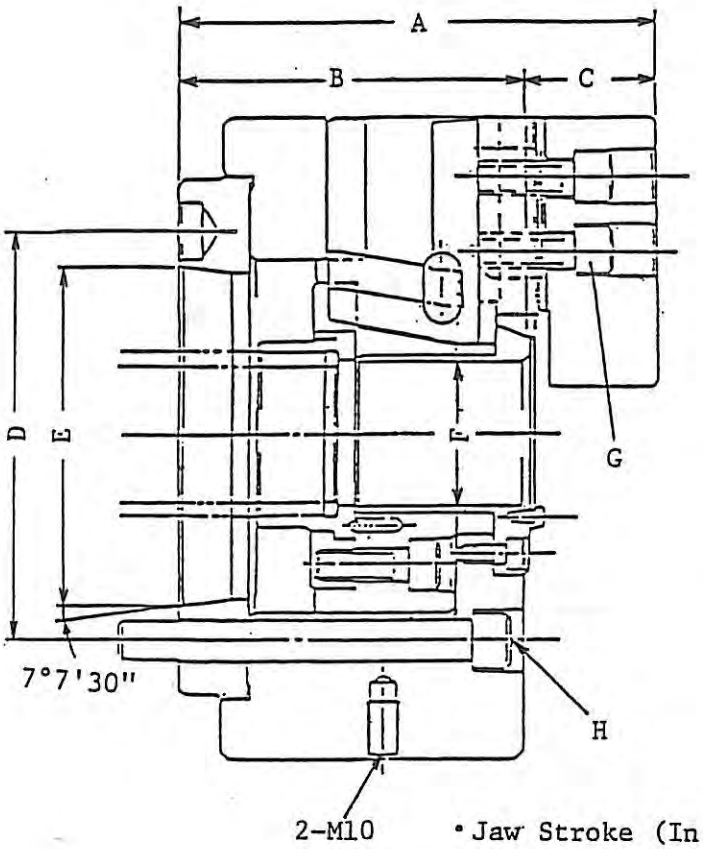


Boring Base Holder

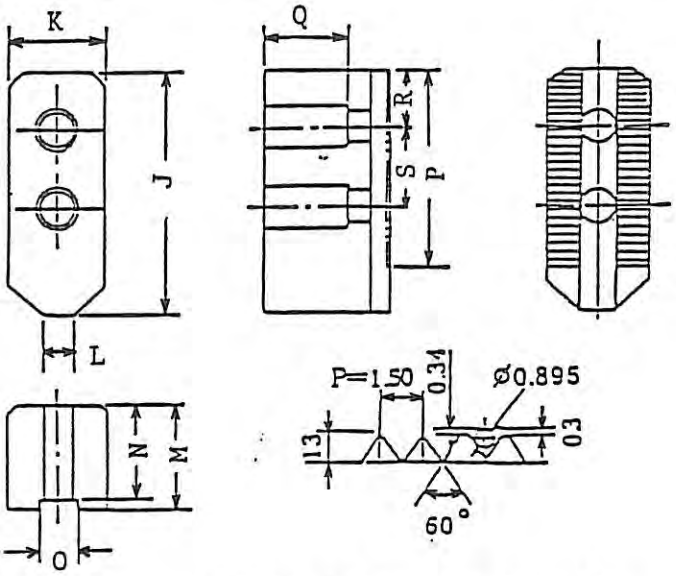
HT20SII



Hollow Chuck



Soft Jaw

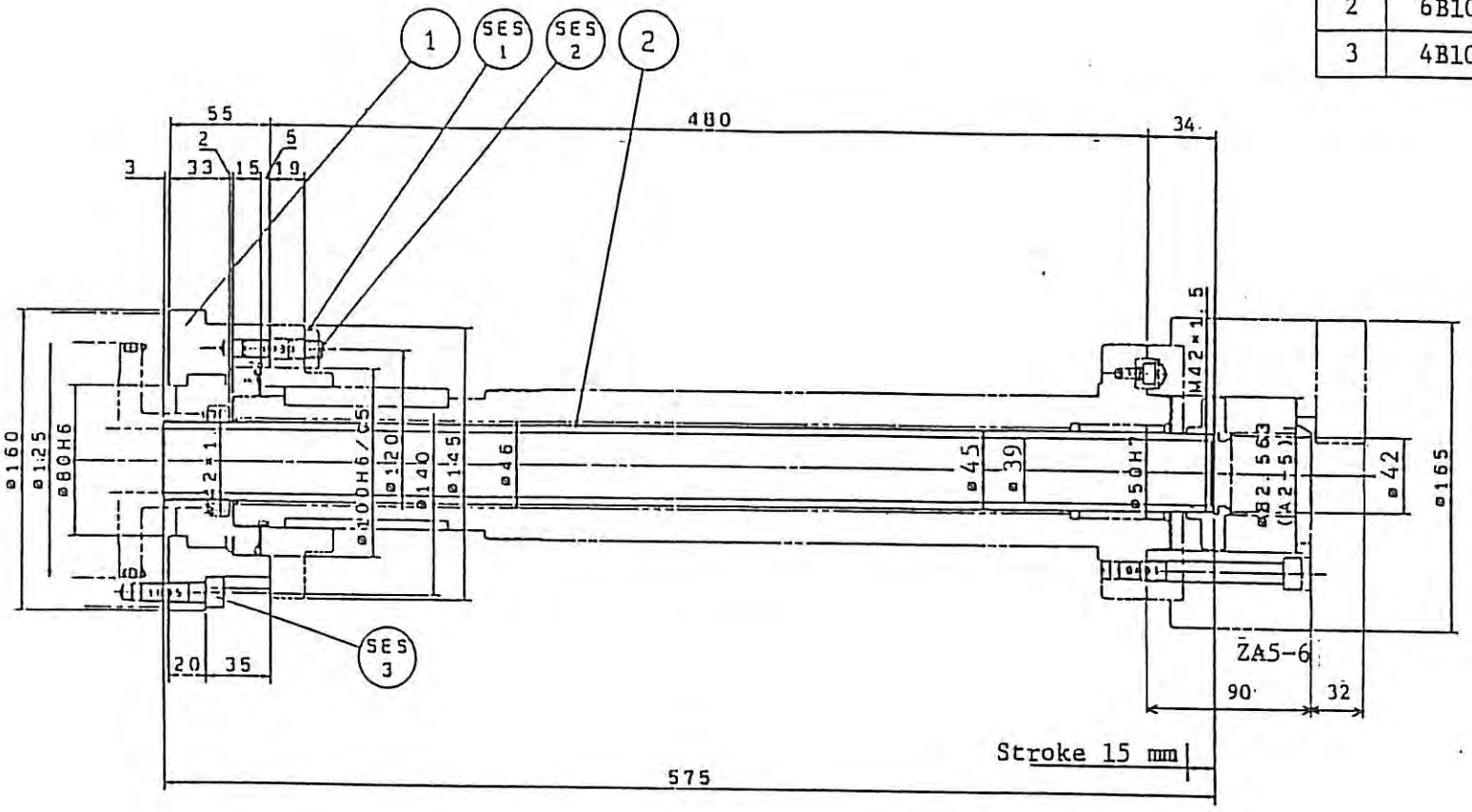


Details of Serrated Section

• Jaw Stroke (In diameter): I

	HT15SII	HT20SII	
A	120 (4.7)	146 (5.7)	175 (6.9)
B	88 (3.5)	104 (4.1)	123 (4.8)
C	32 (1.3)	42 (1.7)	52 (2.1)
D	ϕ104.8 (4.1)	ϕ133.4 (5.3)	ϕ171.46 (6.8)
E	ϕ82.56 (3.3)	ϕ106.375 (4.2)	ϕ139.720 (5.5)
F	ϕ42 (1.7)	ϕ52 (2)	ϕ66 (2.6)
G	M8 × 25	M12 × 32	M12 × 32
H	M10 × 90	M12 × 110	M16 × 125
I	ϕ5.8 (0.2)	ϕ7.6 (0.3)	ϕ8.0 (0.3)
J	70 (2.8)	79 (3.1)	103 (4.1)
K	27 (1.1)	34 (1.3)	40 (1.6)
L	6 (0.2)	15 (0.6)	25 (1)
M	30 (1.2)	40 (1.6)	48 (1.9)
N	26.5 (1)	35 (1.4)	42 (1.7)
O	11 (0.4)	14 (0.6)	16 (0.6)
P	50 (2)	58 (2.3)	88 (3.5)
Q	21 (0.8)	25 (1)	31 (1.2)
R	12 (0.5)	15 (0.6)	21 (0.8)
S	25 (1)	25 (1)	32 (1.3)

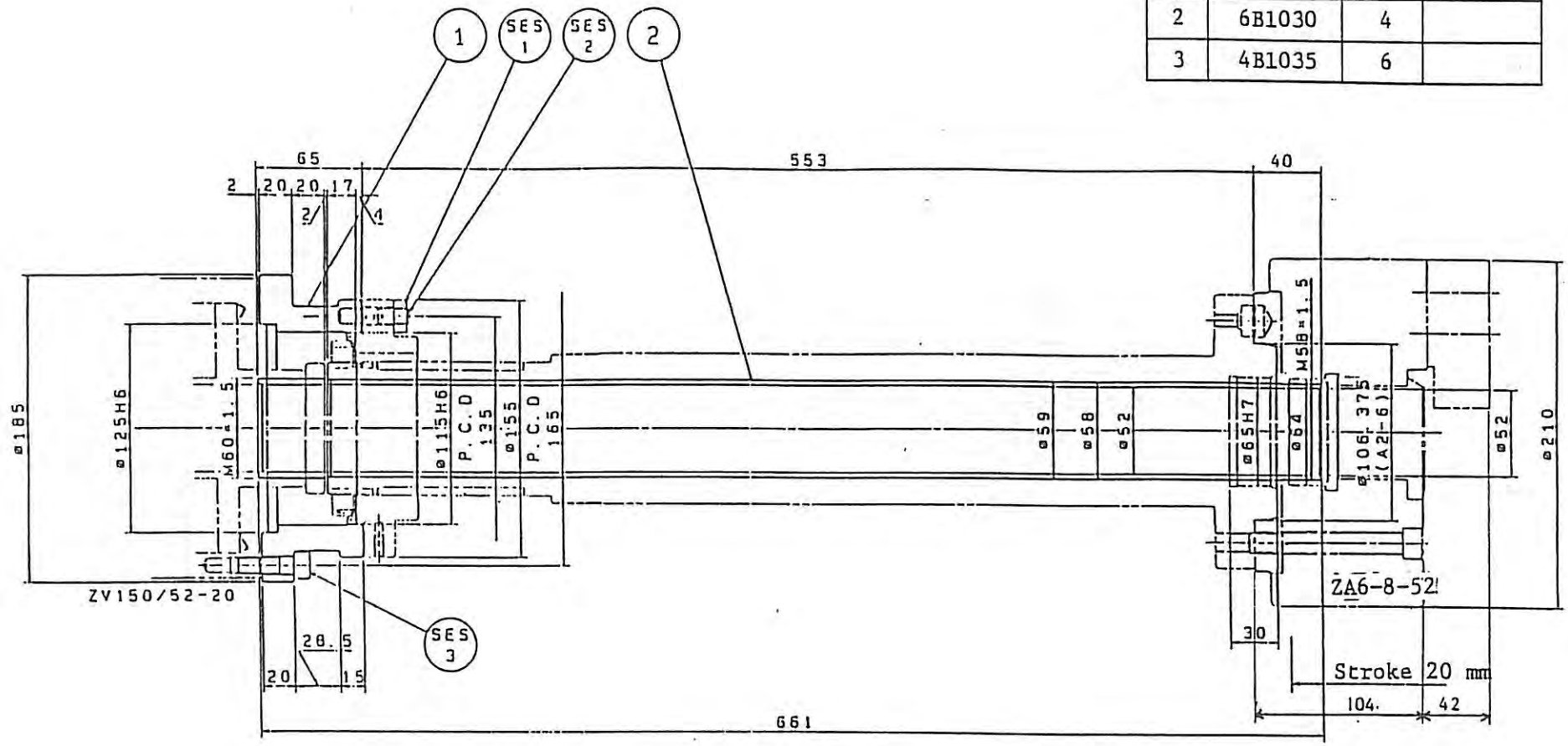
Standard parts (SES)			
No.	Part No.	Q'ty	Remarks
1	1N10	4	
2	6B1030	4	
3	4B1035	6	



Connecting Parts for ϕ165 Hollow Chuck Cylinder HT15SII

No.	Drawing No. or type	Name	Q'ty	Maker	Remarks
1	1901-49-122-00(3T)	Adapter	1		
2	1901-49-121-00(4S)	Tube	1		

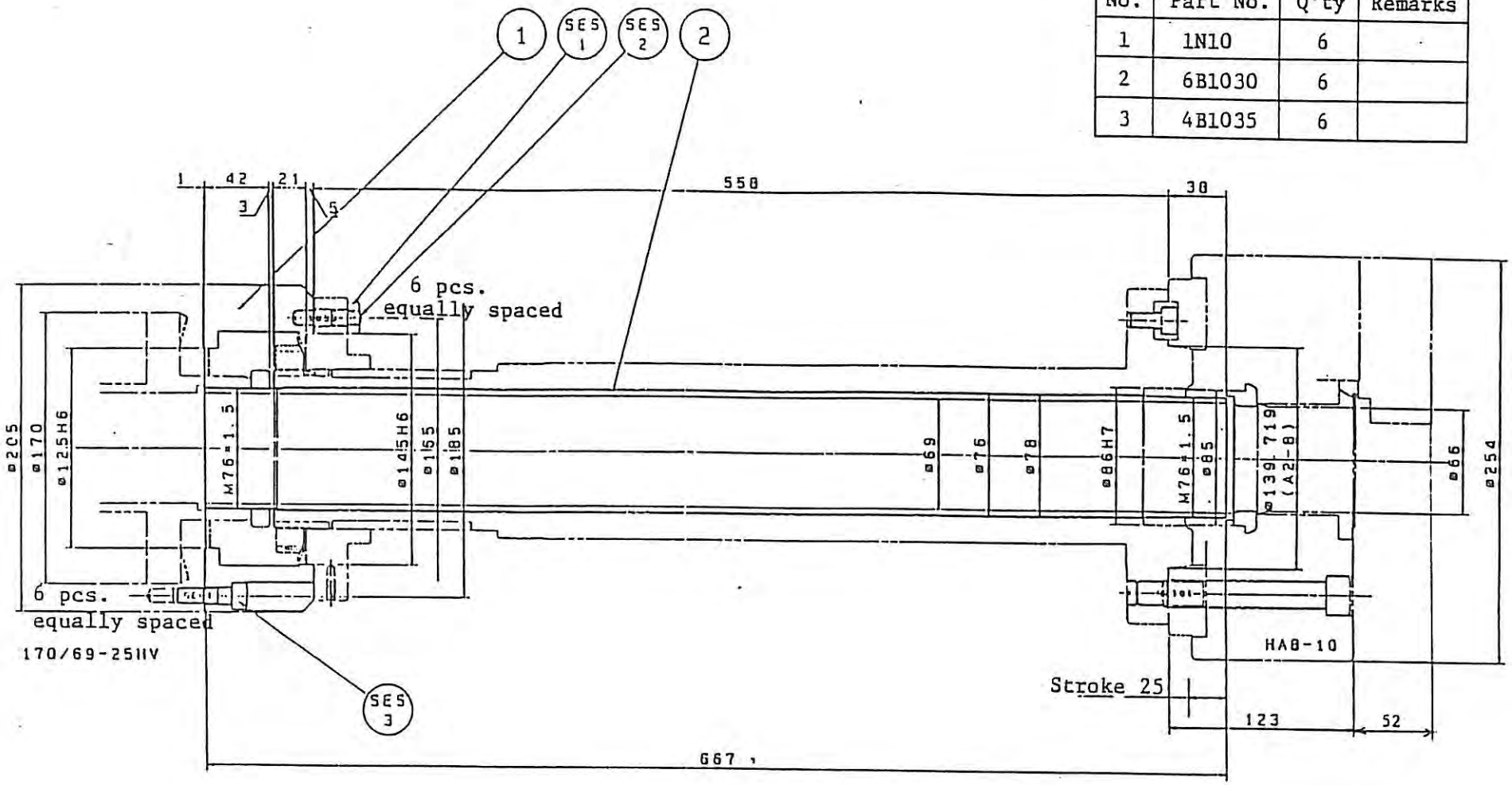
Standard parts (SES)			
No.	Part No.	Q'ty	Remarks
1	1N10	4	
2	6B1030	4	
3	4B1035	6	



No.	Drawing No. or type	Name	Q'ty	Maker	Remarks
1	1901-49-116-00(3T)	Adapter	1		
2	1901-49-117-11(4S)	Tube	1		

Connecting Parts for ϕ210 Hollow Chuck Cylinder HT20SII

Standard parts (SES)			
No.	Part No.	Q'ty	Remarks
1	1N10	6	
2	6B1030	6	
3	4B1035	6	



No.	Drawing No. or type	Name	Q'ty	Maker	Remarks
1	1901-49-124-00(4S)	Tube	1		
2	1901-49-123-00(3T)	Adapter	1		

Connecting Parts for ϕ254 Hollow Chuck
Cylinder HT20SII(BIG CHUCK)

3. INSTALLATION

3-1 Machine Installation

Foundation (Fig. 3-1 and Fig. 3-2)

When installing a machine tool, its foundation must be rigid and stable. This is the most important factor in order to obtain the best machining accuracy at any time. The machining accuracy is greatly affected by the properties of the ground where your factory is located, such whether it is a rock bed or reclaimed land. Due consideration should be given upon selecting the foundation, based on the general basic knowledge of the machine tool.
Take note of the following points when installing this machine.

1. A bearing capacity of soil should be 5 tons/m^2 or more and a thickness of foundation should be 300 mm or more.
2. A foundation range should be 300 mm or more from the bed.
3. When preparing an antivibration ditch, do so around the perimeter of the foundation.
4. It is by no means permissible to set concrete blocks of a certain size under each leg of the machine. This kind of foundation has no effect.

This machine generates a large amount of cutting chips during operation. Therefore, select a machine installation position, considering that a worker can move around without touching other machines when moving a chips transport vehicle or removing covers for maintenance.

Machine Installation Environment

To fully exhibit the original performance of the machine, pay utmost attention to a room temperature, dust and vibrations. Although high machining accuracy cannot be naturally obtained when the room temperature greatly changes, just a slight change of it partly affects the machine. To avoid this, be fully careful of the direct sunshine, ventilation port, heat transfer from a heating unit, etc.
Under the environment where the air is highly polluted with dust, etc., note that machine's slideways or electric devices are damaged more.

Install the machine in as clean as possible an environment because electronic devices for control are particularly susceptible to dust and moisture.
In addition, the machine must be installed at a place free from vibrations.

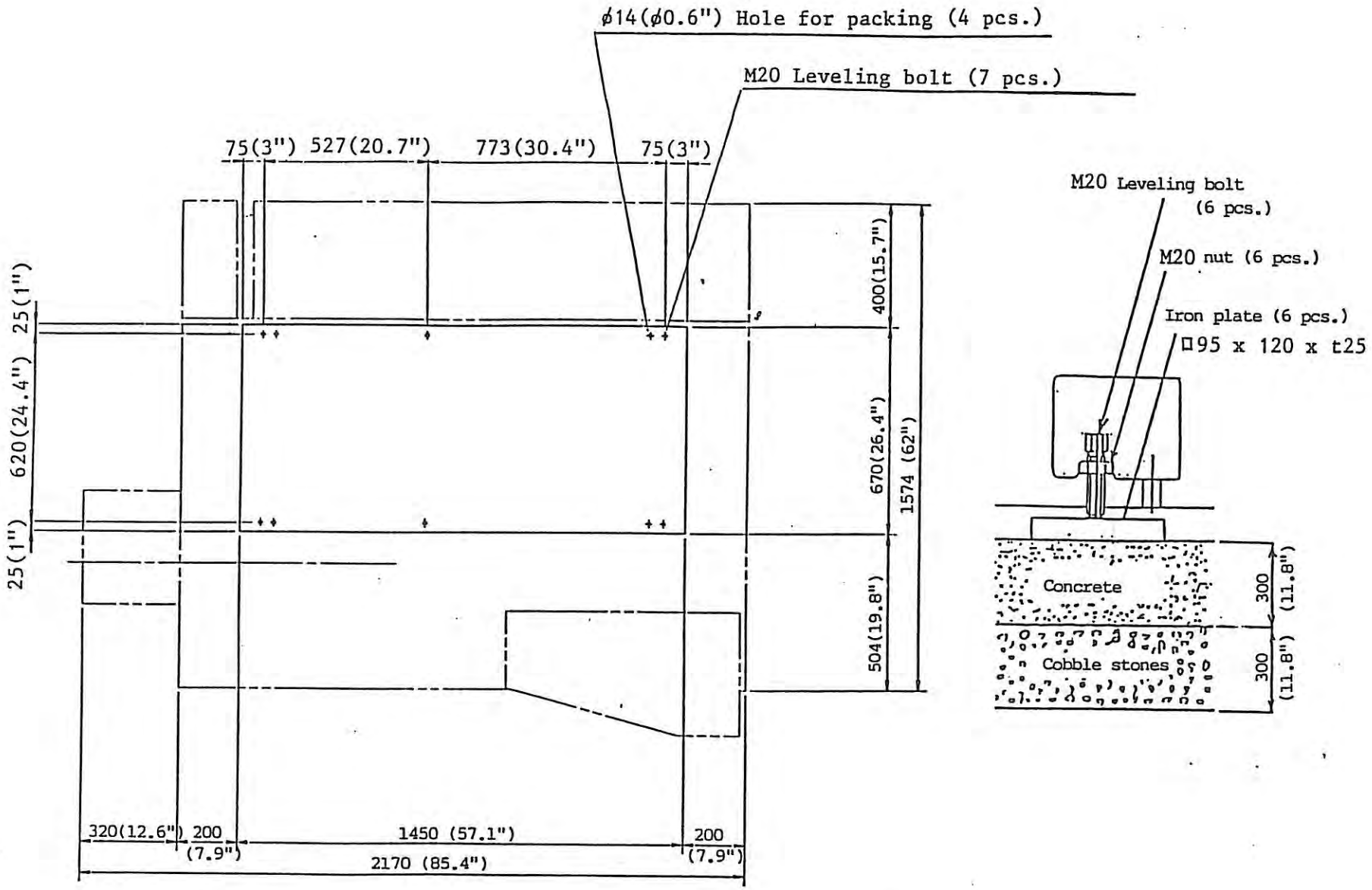


Fig. 3-1(a) Foundation Plan
(HT15SII)

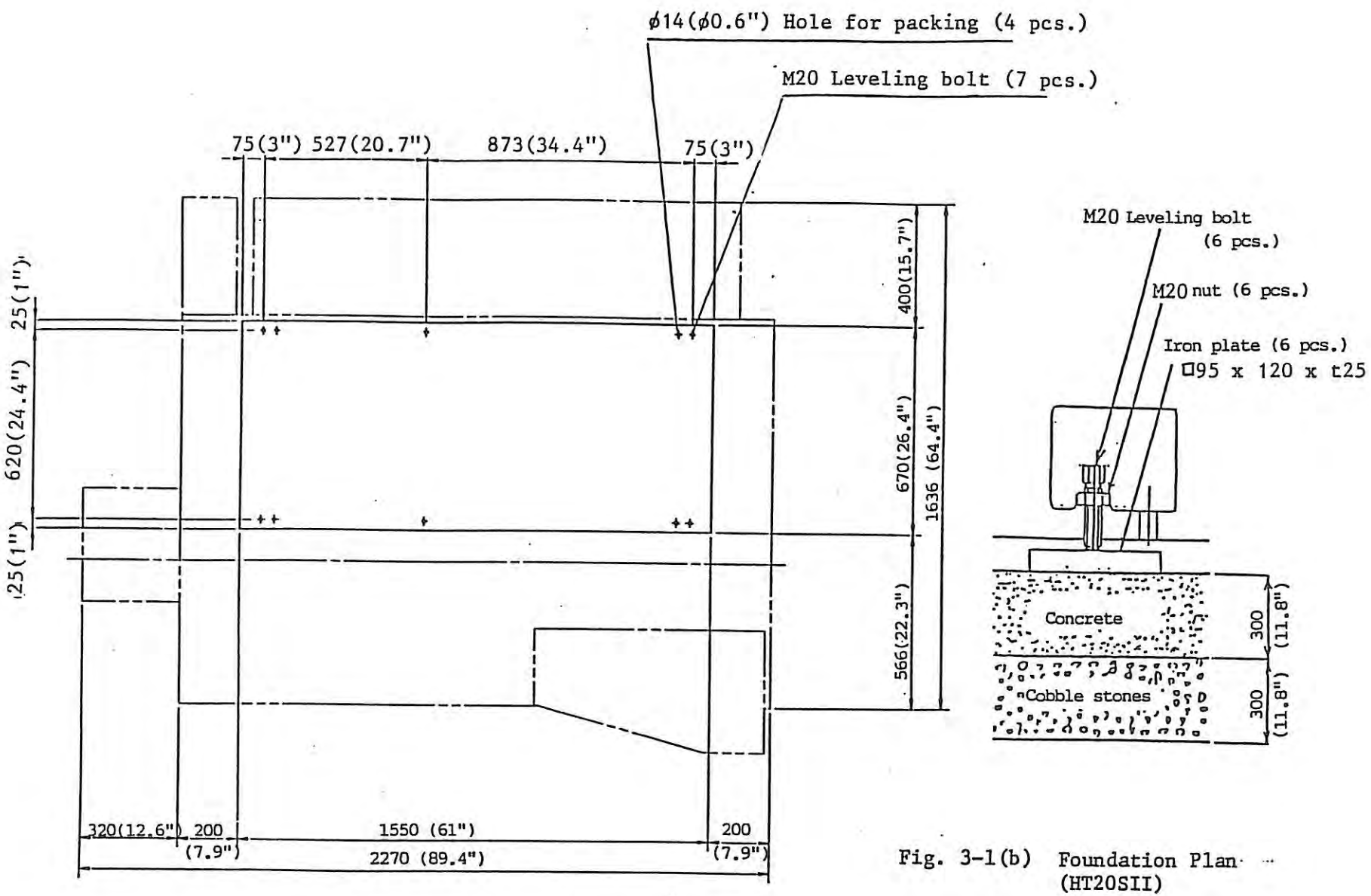


Fig. 3-1(b) Foundation Plan (HT20SII)

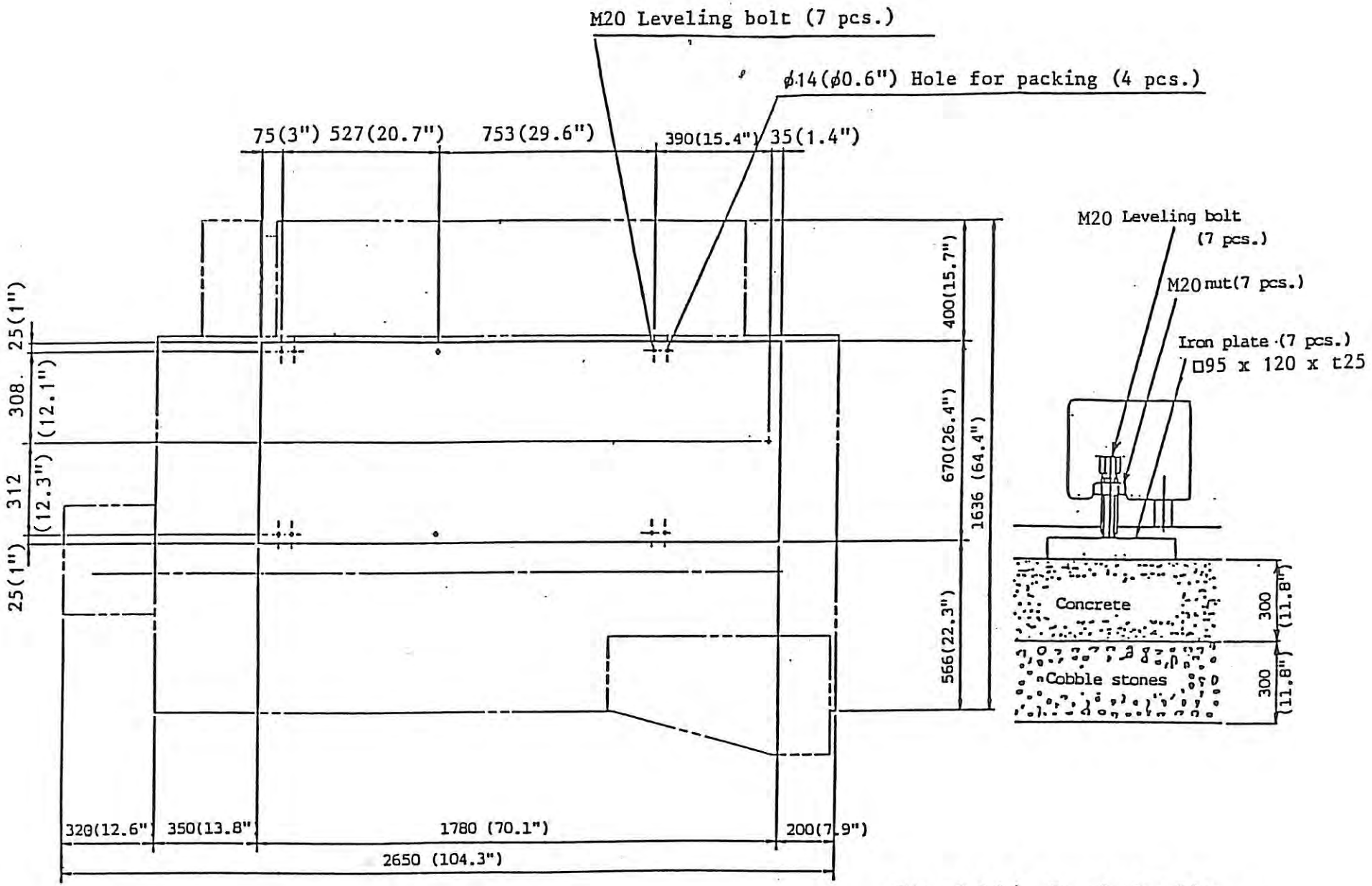


Fig. 3-1(c) Foundation Plan
(HT20SII LONG BED)

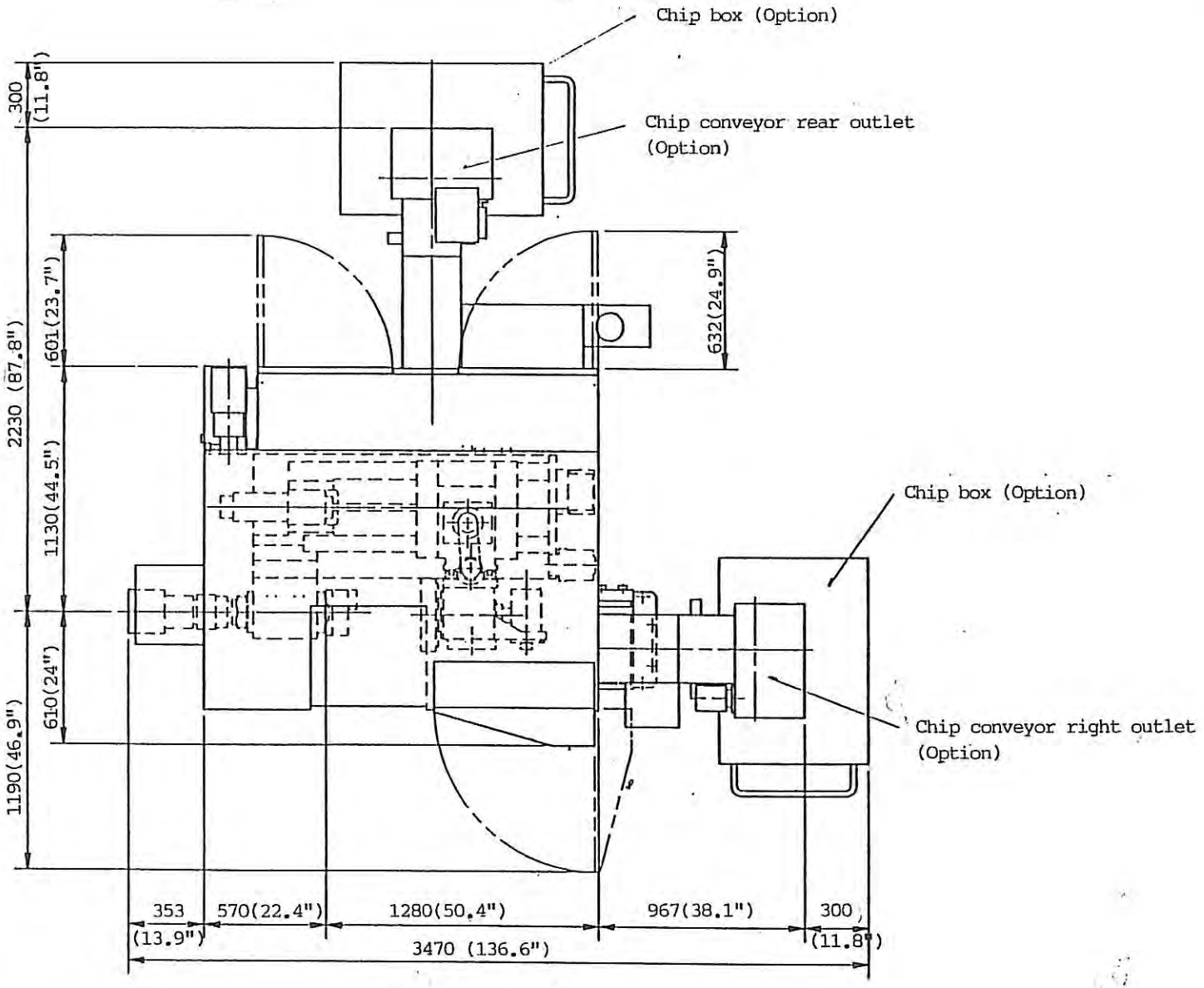


Fig. 3-2(a) Machine Diagram
(HT15SII)

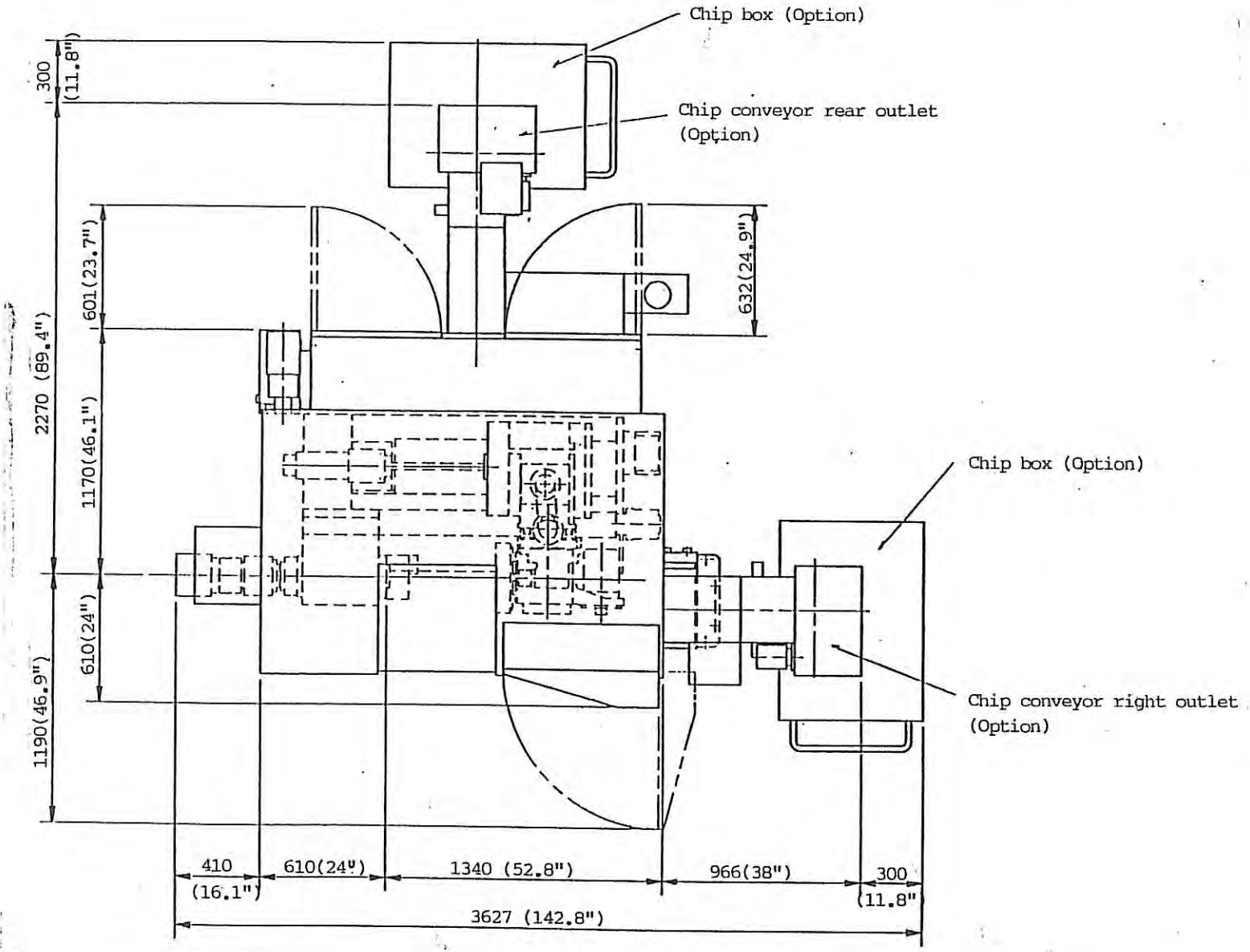


Fig. 3-2(b) Machine Diagram (HT20SII)

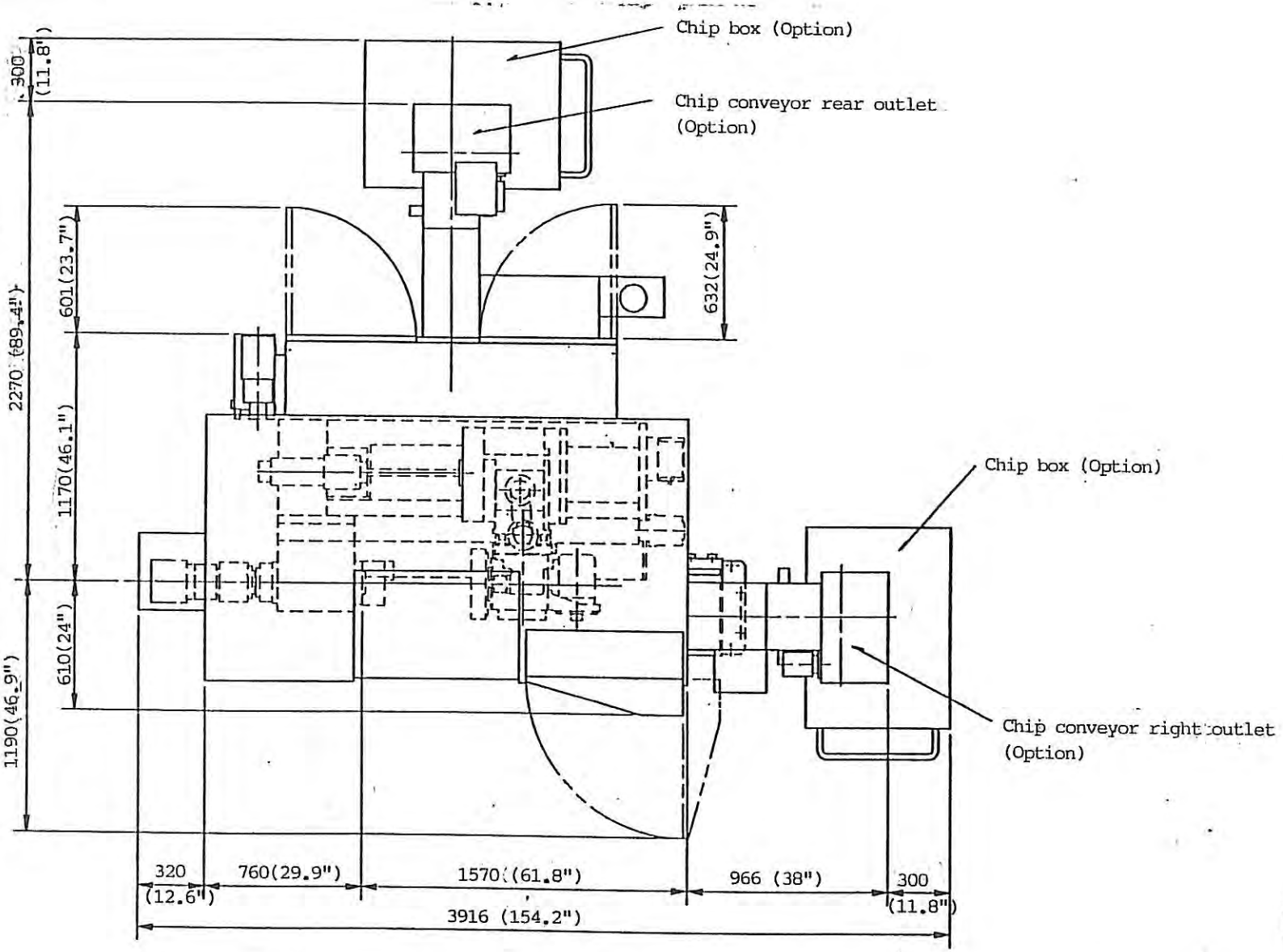


Fig. 3-2(c) Machine Diagram
(HT20SII LONG BED)

Lifting Work (Fig. 3-3)

Lifting work is one of the important steps when transporting the machine. Normally, this work is carried out by using a crane or chain block. The following are precautions for the lifting work.

1. The weight of the machine proper is about;
   3,800 kg/8,360 lbs. (HT15SII)

   4,100 kg/9,020 lbs. (HT20SII)
   4,300 kg/9,460 lbs. (HT20SII LONG BED)
   Use a lifting cable whose diameter is 14 mm (0.55 in.) or more.
2. Draw out the coolant tank and open the left front door.
3. Prepare sleepers shown in Fig. 3-3.
4. In order for the center of the gravity of a load to be located on the center line of a lifting angle, adjust the position of the center of gravity by moving the saddle and cross slide.
5. The lifting angle should be within 90°, preferably 60°.
6. Do not use a rusted lifting cable, one which has been untwisted, or one whose core wire is broken.
7. Lift the machine gradually. When the lifting cable becomes tense, stop lifting and check that the lifting cable has been tied up properly. Thereafter, when the machine is lifted up from the floor, check again a lifting condition, and then, lift the machine to a required height. When lowering the machine as well, lower the machine slowly and stop lowering immediately before the machine reaches the floor. Then, check its position and place the machine on the floor.

Fork Lift Work

Observe the following points in fork lift work:

1. Select a fork lift which can sufficiently endure a machine weight.
2. Fork lift work should be cooperatively done by two persons, that is, an operator and a watchman, not to damage projections on the machine perimeter.
3. To put in the fork, use the fork inserting case grooves located on the right and left of the base of the machine proper.
4. When lifting the machine, lift it temporarily first, and then, lift to the last at a position where the machine's center of gravity is most stabilized in the longitudinal and traverse directions.

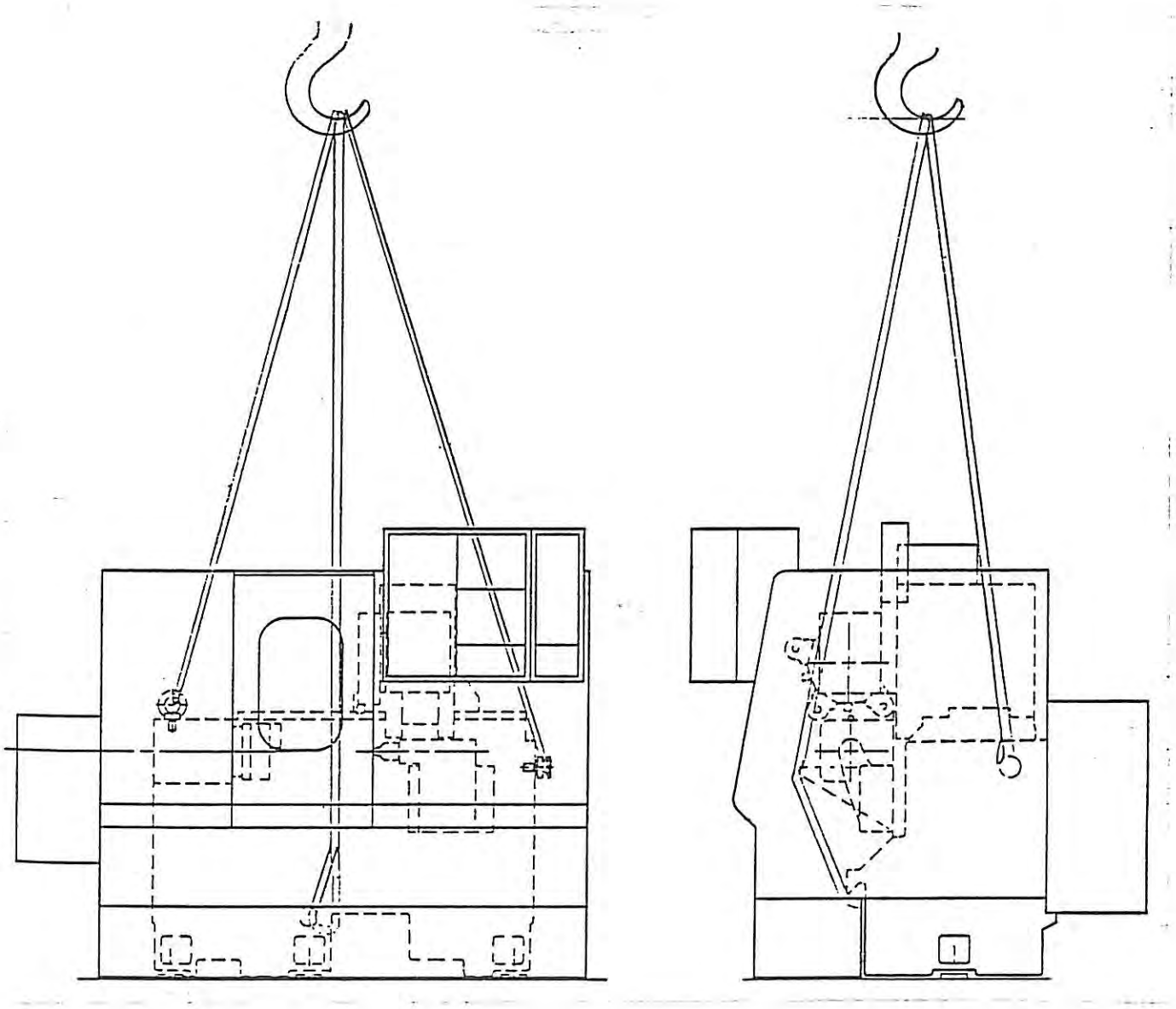


Fig. 3-3 Lifting Work

Cleaning the Machine

The rust preventing paint applied to some parts of the machine tends to be exposed to dust and soil during transportation. Accordingly, do not move the saddle or cross slide before cleaning the machine. Upon shipment from our factory, each section of the machine has been tightened. Before cleaning the machine, loosen respective sections. Use a piece of cloth soaked in choice kerosene (neutral) and wipe off thoroughly the rust preventing paint from the pulley of the spindle motor without fail. Do not use compressed air to clean the machine. If used, foreign substances around the clearance of each joint may be driven into there by the pressure of compressed air and joint surfaces may be damaged.

After cleaning the machine, apply a slight amount of choice lubricating oil specified in Table 3-1 to slideways.

Power Source and Wiring

1. Power switch

   Install the power switch separately from other machines so that the machine operator can access it easily. For a fuse capacity, see the table below.

2. Wiring from the power switch to the machine

   Connect the power source to the machine as shown in the figure below:

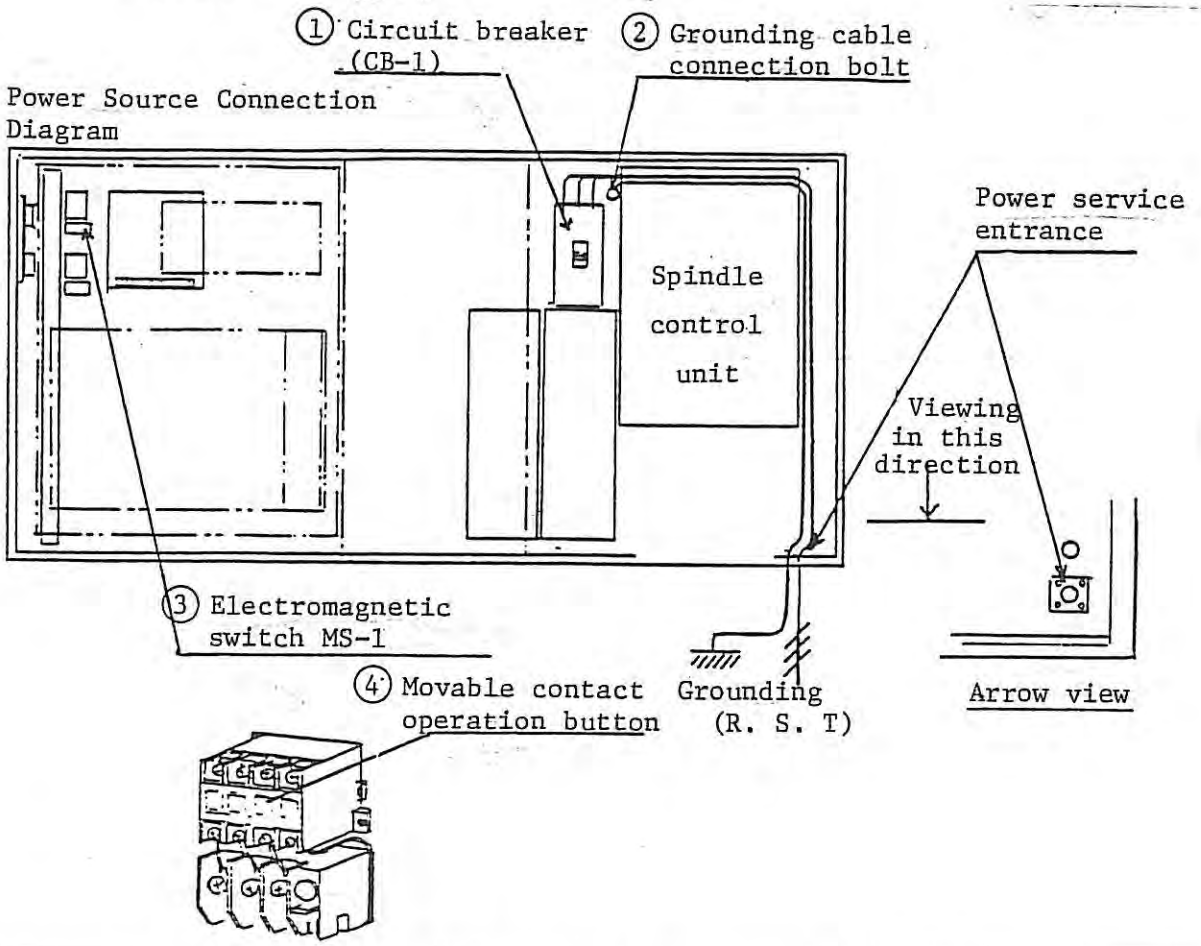


Fig. 3-4 Power Supply Connection

When installing the machine, the user is kindly requested to wire to the primary side of the circuit breaker CB-1 ①. For the power cable and grounding cable, see the right table. Connect the grounding cable to the grounding bolt ②.

Model	Total capacity	Cable thickness		Fuse capacity
		R.S.T	Grounding	
HT15SII	15 KVA	8 □	3.5 □	50 A
HT20SII	18	14	5.5	75
HT20SII BIG CHUCK	22	22	8	75

Switching of Electric Device by Supply Voltage and Frequency

Depending on the supply voltage and frequency, it is necessary to change setting of the following electric device. Check the voltage and frequency before setting.

Supply voltage	200/220 V	±10%
Supply frequency	50/60 Hz	±1 Hz

Switching the tap of the power control power transformer ⑤

A mounting position of each device is inside the power control cabinet.
(For the position of the power control cabinet to the machine, see the Electric Device Layout.)

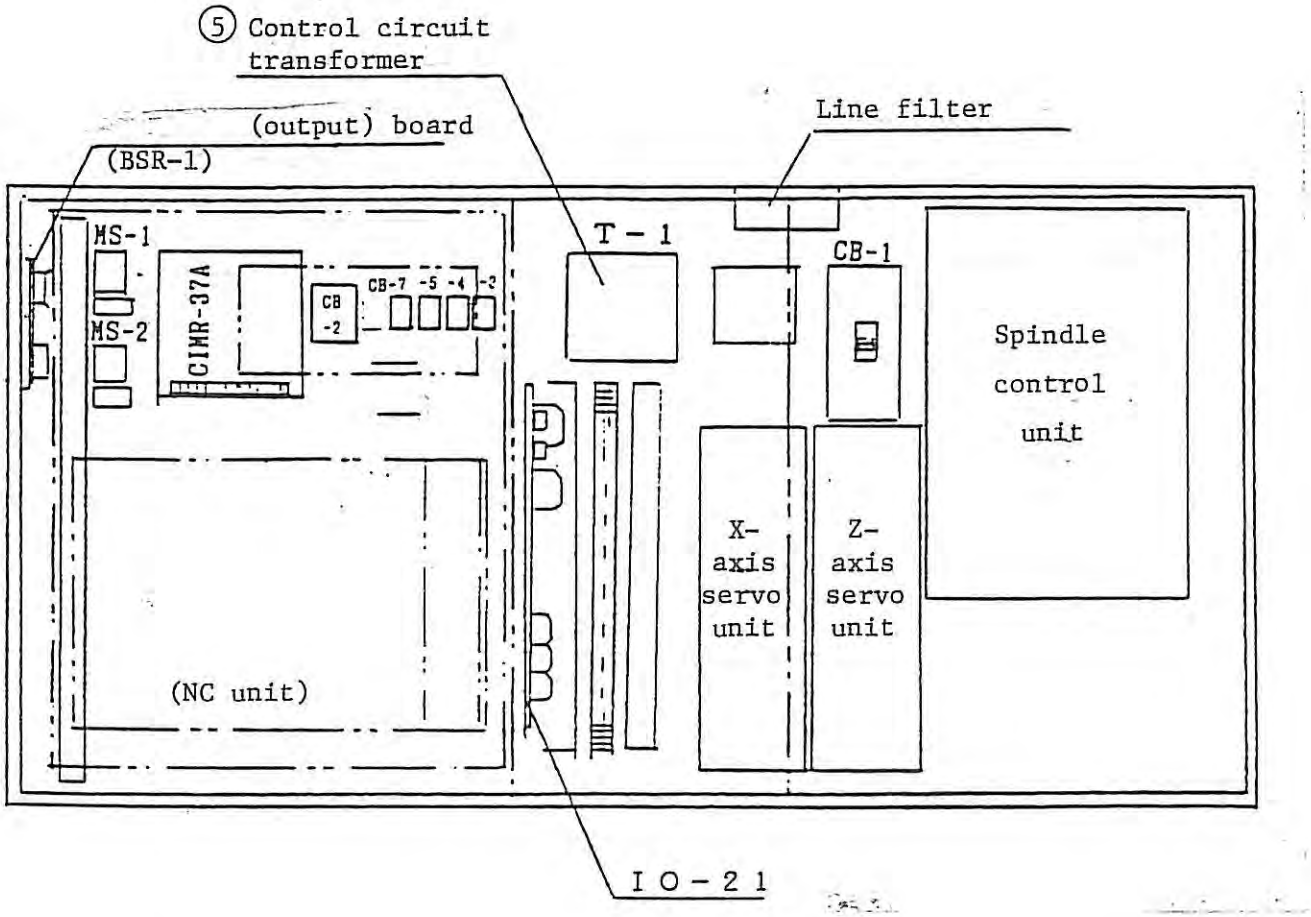


Fig. 3-5 Front Layout Diagram

Open the door of the control cabinet, remove the plastic cover of the switching transformer ⑤, and connect wires T2 and S2 to the screw indicated with specified voltages on the INPUT side.
(Select the screw, depending on the supply voltage.)

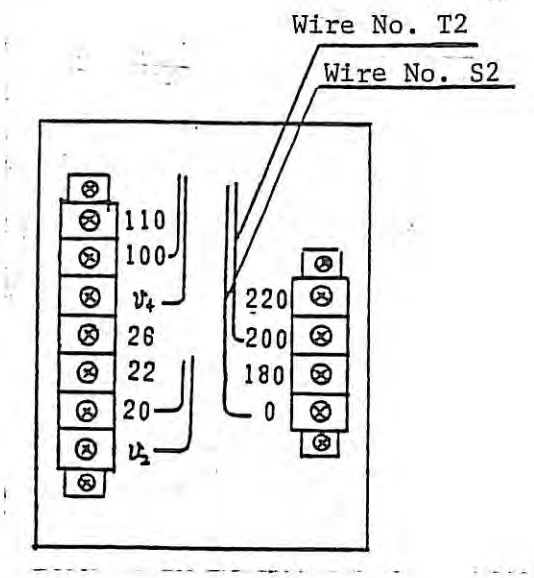


Fig. 3-6

Supply Voltage	Wire No. S2	Wire No. T2
180 ∿ 190 V	Tap screw 0	Tap screw 180 V
191 ∿ 210 V	Tap screw 0	Tap screw 200 V
211 ∿ 240 V	Tap screw 0	Tap screw 220 V

Installation and Levelling (Fig. 3-7)

Levelling is one of the important factors which determines the accuracy of the machine. The levelling of the machine is the most foundamental step and have effects on the accuracy of workpieces and service life of the machine. Therefore, level the machine according to the following procedures. First, set the iron plates (Fig. 3-1) on the foundation and adjust their positions so that they may be located where the levelling bolts (jack bolts) can be set on them. Next, place a level on the OD tool mounting area of the turret head as shown in Fig. 3-7. Move the Z axis by a full stroke.

HT15SII	..... 340 mm/13.4 in.
HT20SII	..... 400 mm/15.7 in.
HT20SII (LONG BED)	..... 630 mm/24.8 in.

(Do not cause any interference with the chuck or tailstock.)
And make adjustment so that the difference between readings of the level may be within 0.04 mm/m/0.0005" per ft. in the longitudinal direction. The accuracy of the lvel to be used should be 0.02 mm/m/ 0.00025" per ft.
Place the same end of the level in the same direction.
Always clean the surface on which the level is to be placed lest dust or dirt should be caught under the level upon measurement.
Lock the levelling bolts carefully lest they should turn. In order to control the level of the machine, avoid using mortar to fix the machine. Instead, fix the machine with anchor bolts when the machine is vibrated by unbalanced workpieces.
Check the level of the machine every day for two or three days after its installation, then once every month for the following 6 months, and thereafter, once every 3 months.

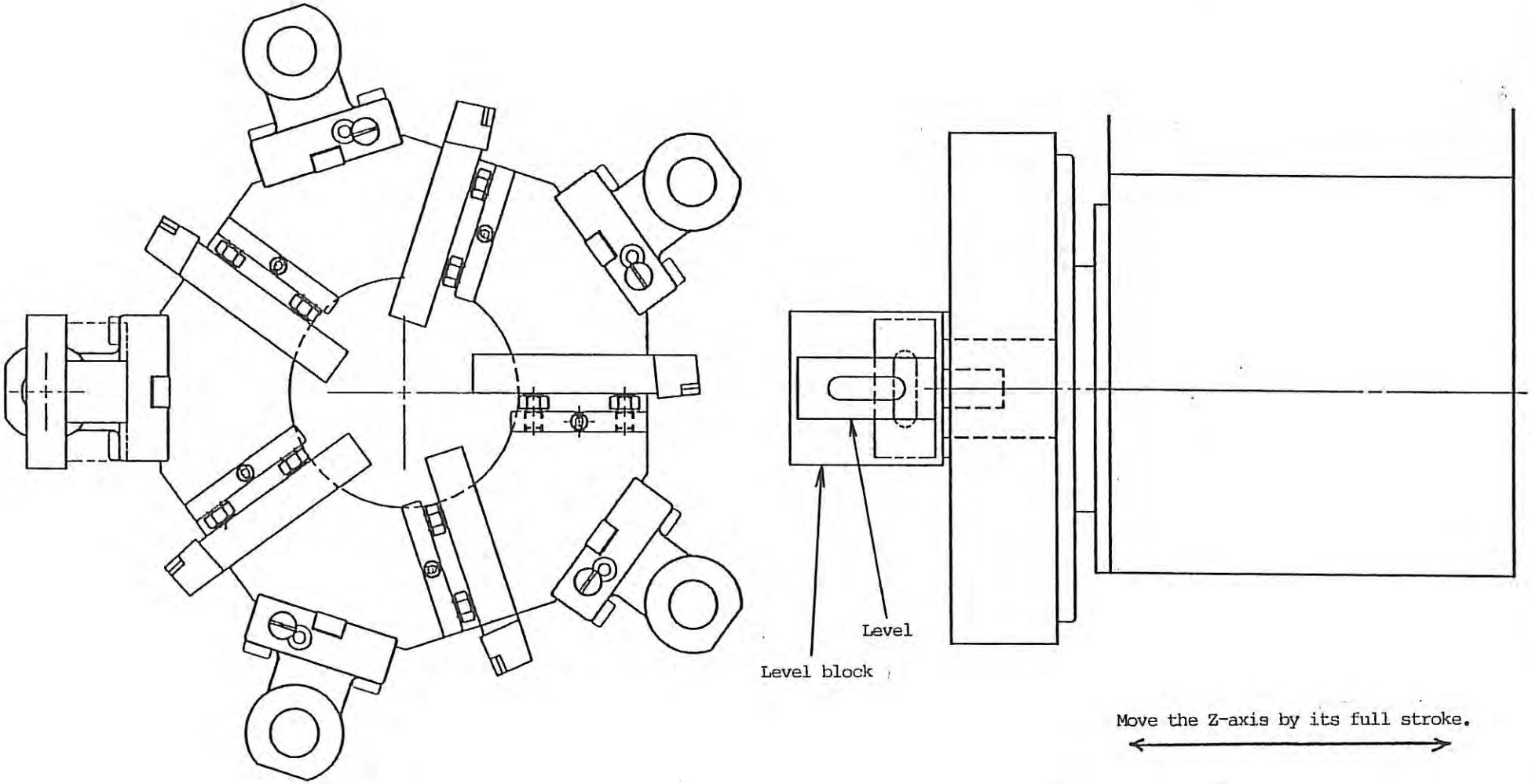


Fig. 3-7 Levelling

3-2 Lubrication and Oil Supply

Before operating the machine, supply lubricating oils the spots shown in Fig. 3-8 according to the specified methods. It is recommended to use the lubricating oils listed in Table 3-1.

o Hydraulic Working Oil

Be sure to supply oil slightly over the center line of an oil gauge located on the front of a reservoir.
(It is desirable for an oil level to come to the center line of the oil gauge after a hydraulic circuit was filled with oil.)
A required quantity of oil is approximately 5.5 ℓ/1.5 gal.

o Lubrication of the Slideways of the X and Z Axes

Supply oil in the lubricating oil tank located on the right end of the machine. A required oil quantity is about 2 ℓ/0.5 gal. If an oil level in the tank is reduced to a certain level, the red lamp on the operation panel will light up. In this case, replenish oil.

o Lubrication of the Hydraulic Chuck

Lubricate the chuck fully with an accessory grease gun, opening and closing the chuck. (Daily)

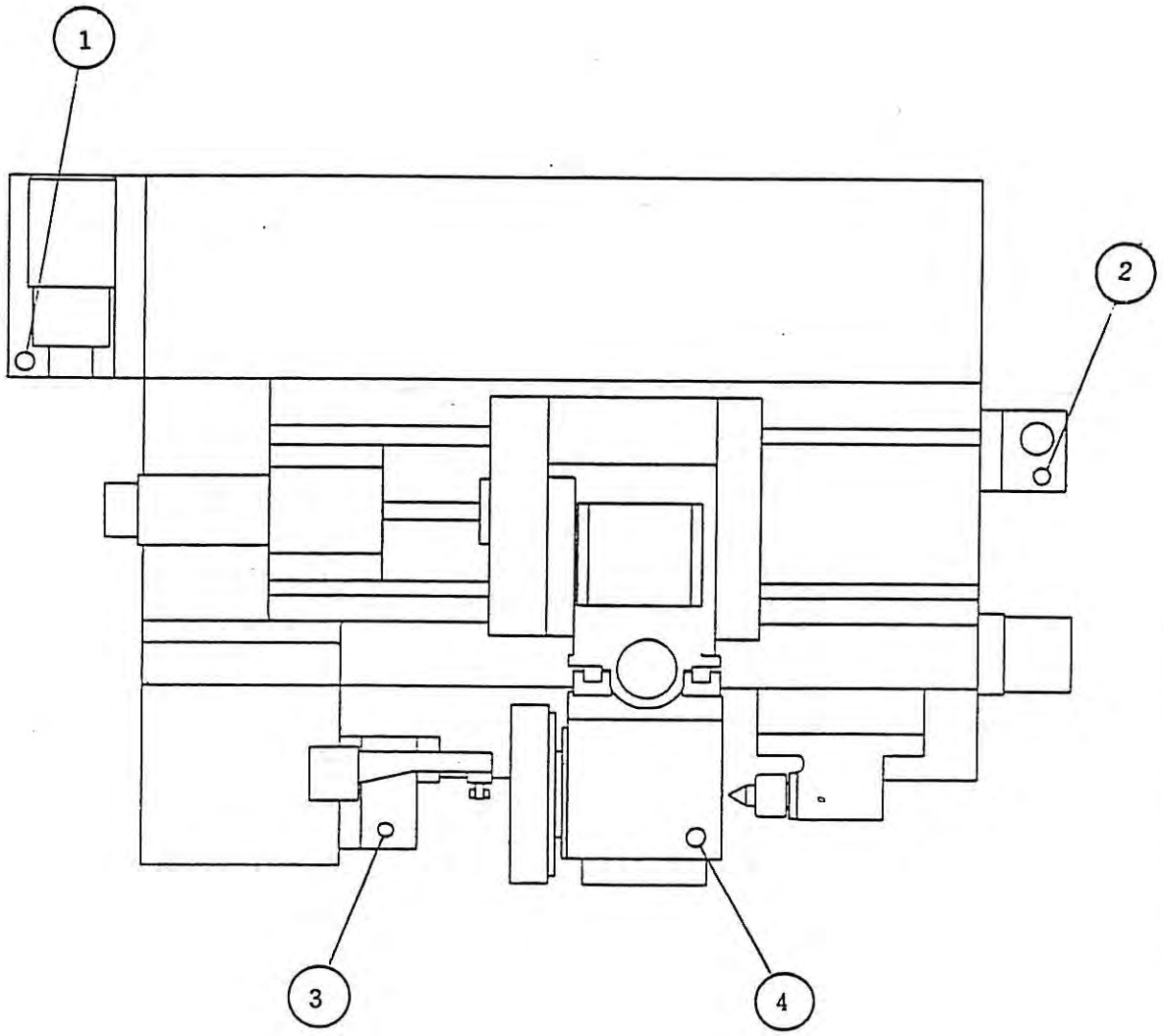


Fig. 3-8 Where to Supply Lubricating Oils

Table 3-1 List of Lubricating Oils (Refer to Fig. 3-8)

Lubricating spot	Method	Oil quantity and frequency	Oils used
1 Hydraulic tank		Up to an oil gauge (5.5 ℓ/ 1.5 gal. Replace it every 6 months.	ISO Standard CB32 or HL32 • Shell Oil: Shell Tellus Oil C32 • Esso Oil: Teresso 32 • Mobil Oil: Mobil DTE Oil light
2 Slideway	Forced lubrication	2 ℓ/0.5 gal. Supply oil when the LUBE ALARM. lamp light up.	ISO Standard G68 • Shell Oil: Shell Tona Oil T68 • Esso Oil: Febis K68 • Mobil Oil: Mobil Vactora Oil No.2
3 Hydraulic chuck	Manual lubrication	Fill up with grease once a day.	Grease • Dow Corning: Molykote (R) BR2-S Grease
4 Tool rest	Oil bath	HT15SII 2.5 ℓ/ 0.65 gal. HT20SII 3 ℓ/ 0.8 gal.	ISO Standard CC460 • Shell Oil: Shell Omala Oil 460 • Esso Oil: Spartan Ep 460 • Mobil Oil: Mobilgear 634

3-3 Coolant

There are two different types of coolants available; one is water-soluble and the other is non-water soluble. At present, any coolants of different trade names are available on the market. Therefore, no indication is given for each of them. Instead, the following notes are presented here as an aid in selecting the coolant suitable for use with this machine.

1. Supply the coolant in the coolant box located on the front of the bed.

2. A required quantity of coolant is;

HT15SII	.....	approx. 95 ℓ/25 gal.
HT20SII	.....	100 ℓ/26 gal.
HT20SII (LONG BED)	.....	120 ℓ/31 gal.

3. After installing the machine, upon operating it as a trial, or when it has not been used for a long time, prime the pump sufficiently.

4. Notes for using water-soluble coolant:

1) When use of water-soluble coolant is inevitable, select one with lubrication, soagage, rust prevention, oil separability and stability taken into account.

2) Before and after operating the machine, be sure to not only remove cutting chips but also wipe off water-soluble coolant from each slideway, swivel section of the turret head and cross slide. Therefore, apply a slight amount of lubricating oil without fail.

3) Replace water-soluble coolant immediately when deteriorated.

4) Remove the cover once every three months and clean the slideway, X- and Z-axis ball screws, limit switches, feed motors, and so on.

5) When using water-soluble coolant, it is recommended to apply rust preventing oil to the machine while it is wetted with the coolant after finishing daily work. This is because rust is easily caused when the machine gets dry.

6) Water-soluble coolant is alkaline. Therefore, it has a strong degreasing property. If it is splashed on the skin, the operator is liable to suffer from inflamed skin. Handle it with full care for your health.

7) A diluting method of water-soluble coolant and a diluent used depend of a kind of coolant. Follow the instructions provided by each coolant maker.

3-4 Check Prior to Test Run

Before initially operating this machine, be sure to check for each item in the following order:

1. Check for the supply voltage. When checking, measure a voltage between each wire of 3 phases and their unbalance must be within several volts.
2. Turn on the circuit breaker of the power control cabinet, reset the "EMERGENCY STOP" button, press the "NC POWER" button and "STANDBY" button, and check that the STANDBY lamp is lit up.
3. Shift the mode selector key to a manual mode (JOG, X or Z).
4. Checking the rotating direction of each motor
   Rotate each motor with its switch and check for its rotating direction in accordance with its indicated rotating direction. When the motor is rotating in a reverse direction, replace any two of three power wires.

   (1) Cooling fan motor : Started and stopped by the circuit breaker of the power control cabinet.

   (2) Lubricating oil motor: Started by the STANDBY button and stopped by turning off the POWER button.

   (3) Hydraulic motor : Started by the STANDBY button and stopped by turning off the POWER button.

   (4) Spindle motor : Inched by spindle inching.

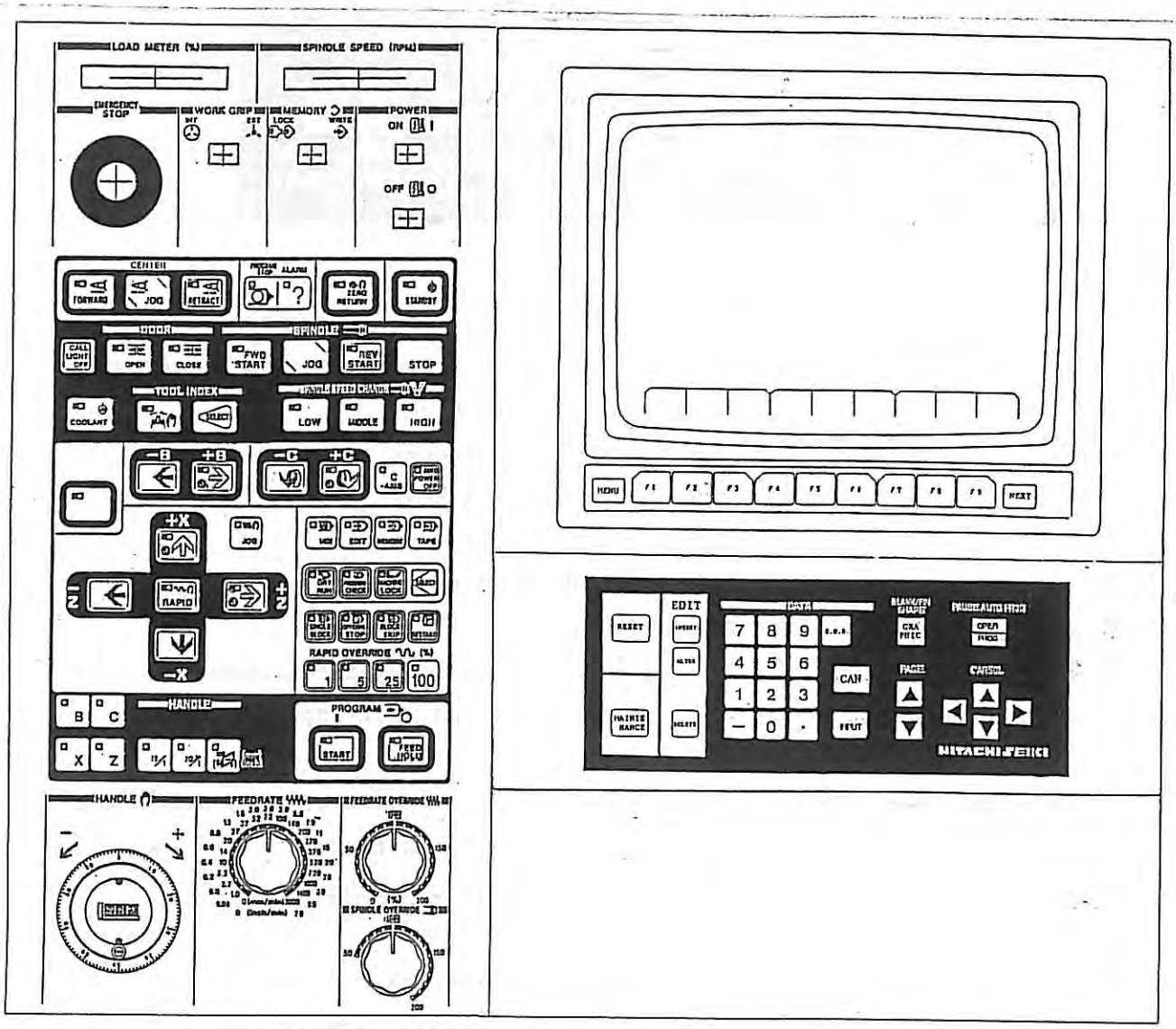
   (5) Coolant motor : Started and stopped by the COOLANT key.

5. Adjust the hydraulic pressure of the hydraulic unit to 3.5 kg/cm^2.

4. OPERATION

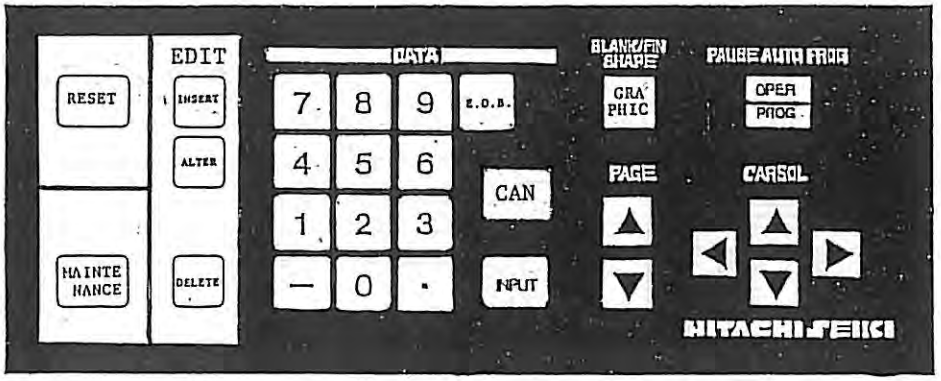
4-1 Operation Panel

4-1-1 Outline for Operation Panel



Auto door close/open button is option.

4-1-2 Outline Explanation of NC Operation Panel



Menu key		: Operation-selecting screen is displayed.
Function key F1 ∿ F9		: Function name is displayed on each screen at lower side of screen.
Next key		: Screen item and alphabet (English data) display of function key. Shifting with display.
Page key		: Each page advances/recedes.
Cursor key		: Cursor moves.
Maintenance key		: It displays maintenance-guide screen.
Blank/fin shape graphic		: With symbol input and list input, press it after input of all elements.
Pause auto prog. oper. prog.		: It is used for shifting the program-preparing screen with operation screen.
Editing key	INSERT	: It is used for inserting the data.
	ALTER	: It is used for changing.
	DELETE	: It is used for deleting.
Data key	0 ∿ 9, -, •	: It is used for inputting the numeral.
	E.O.B	: After inputting one line (1 block), line is changed.
Reset key		: Alarm is deleted.
Can key		: Input data is deleted for one word each.
Input key		: Data is input.

(1) The following functions are performed by pressing [RESET] (Reset) key.

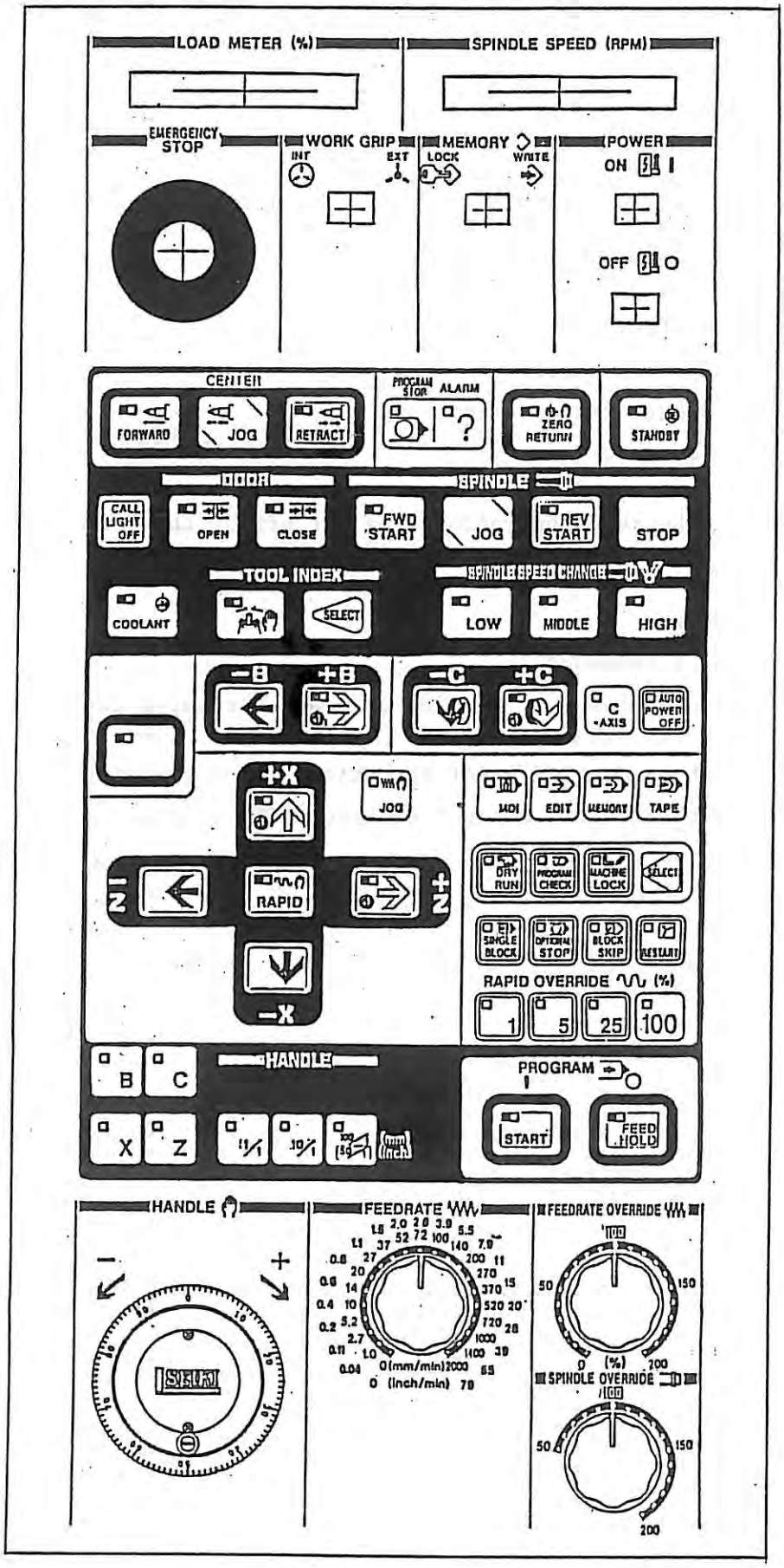
a. Travel command cancel
b. Buffer clear
c. Resetting of alarm, if cause is eliminated
d. Auxiliary function cancel
e. Label skip function ON
f. Memory rewind
g. Sequence No. reset
h. RST signal transmission
i. G code reset

(2) However, the reset operation does not affect the following items.

a. Current value in each axis
b. F command
c. S and T commands
d. Tool offset value, setting data and parameter data

(Note) In this manual, "Reset operation" means pressing of this RESET key or External Reset Pushbutton (ERS input).

4-1-3 Outline Explanation of Machine Operation Panel



Load Meter	: Indicates a spindle motor overload (%).
Spindle Speed	: Indicates a spindle speed. (option)
Emergency Stop Button	: Disables machine operation. (However, the hydraulic pump and lubricating pump do not stop.)
Work Grip Int./Ext. Clamp Selector Switch	: Selects the chuck clamping direction of the workpiece to be cut.
Memory Lock Key	: Program editing enable/disable selector key switch
Power ON	: Turns on the power for the NC unit.
Power OFF	: Turns off the power for the NC unit.
Center Forward Key	: Advances the center continuously when the spindle stops. Advances the center continuously and hydraulic system is turned on when the workpiece is pressed on.
Center Forward Lamp	: Lights up when the center advances continuously.
Center Jog Key	: The center advances only while this key is pressed. (The hydraulic system is not turned on even when the workpiece is pressed on.)
Center Retract Key	: The center retracts only while this key is pressed.
Program Stop	: Lights up when the program stops. (when stopped by M00 or M01)
Alarm Lamp	: Lights up in case of NC, motor or lubrication alarm.
Zero Return Key	: Performs zero return in the order of X and Z axes.
Standby Key	: Makes the machine ready for operation.
Standby Lamp	: Lights up when the machine is made ready for operation.
Call Light OFF Key	: Stops lighting up the call light.
Door Open Key	: Opens the door. (option)
Door Close Key	: Closes the door. (option)
Spindle Fwd./Rev. Start Key	: Starts the spindle in the forward/reverse direction.

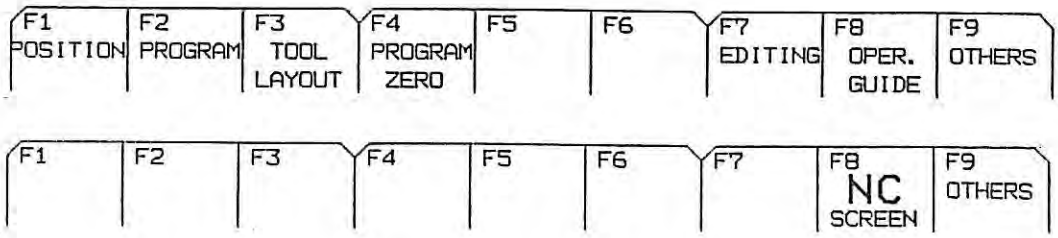
Spindle Jog Key	: Regardless of the mode, the spindle rotates only while this key is pressed.
Spindle Stop Key	: Stops the spindle in the manual mode.
Coolant Key	: Turns on/off coolant manually.
Spindle Speed Change Low Key	: The spindle rotates in a low speed range.
Spindle Speed Change Middle Key	: The spindle rotates in a middle speed range. (for other models)
Spindle Speed Change High Key	: The spindle rotates in a high speed range.
Spindle Speed Change Lamp	
High	: Lights up when the spindle speed high range is selected.
Middle	: Lights up when the spindle speed middle range is selected. (for other models)
Low	: Lights up when the spindle speed low range is selected.
Tool Index Key	: The tool rest is indexed in the manual mode. (slowed down when the door is opened) Press this key together with the SELECT key on the right.
Jog Key	: Puts manual continuous feed in effect.
+X, -X, +Z and -Z Keys	: When the Jog key is effective, a relevant axis is continuously moved in a selected direction.
C-Axis Key	: Puts C-axis continuous feed in effect. (option)
+C and -C Keys	: When the Jog key is effective, the C-axis is continuously moved in a selected direction. (option)
+B and -B Keys	: When the Jog key is effective, the B-axis is continuously moved in a selected direction. (option)

Rapid Key		: When puts manual continuous feed, the machine operates at the "%" value set by Rapid Override only while this key is pressed, if pressed during manual continuous feed. (However, it operates at 50% when Rapid Override is set to 100%.)
Zero Return Lamp	X	: Lights up when the X axis is at the machine zero point.
	Z	: Lights up when the Z axis is at the machine zero point.
Auto Power OFF Key		: The power is automatically turned off when an alarm or a power cutoff request command is issued due to robot specifications. (option)
MDI Key		: Used when manually inputting data and operating the machine.
Edit Key		: Used when editing a stored program or punching out and reading a program.
Memory Key		: Used when operating the machine with a stored program.
Tape Key		: Used when operating the machine with a paper tape. (for other models)
Select Key		: Press this key simultaneously when selecting dry run, program check or machine lock operation.
Dry Run		: The machine operates at the set value of the Feedrate switch, ignoring rapid traverse or cutting feed specified by a program.
Program Check		: Ignores spindle rotation and coolant ON specified by a program, in addition to the dry run function.
Machine Lock		: The tool rest does not work. Other operations are executed.
Single Block		: The machine stops after executing one block, and then, proceeds to execution of the next block by pressing the Start key.

Optional Stop	: The machine stops at M01 specified by a program. To restart, press the Program Start key.
Block Skip	: Skips the block which contains "/" (slash) specified by a program.
Restart	: Restarts a program. (option)
Program Start Key	: Starts MDI or automatic operation.
Program Feedhold Key	: Suspends MDI or automatic operation.
Feedrate Override Switch	: During MDI or automatic operation, a feed rate can be changed within a range of 0 to 200%.
Spindle Override Switch	: A spindle speed can be changed within a range of 50 to 200%.
Rapid Override Switch	: A rapid traverse rate can be changed to 1%, 5%, 25% or 100%.
Handle	: Performs handle feed when X, Z, B or C is selected. (optional for B and C)
Handle Feed Magnification Selector Switch	: Selects a feed amount per handle graduation; 1/1 = 0.001, 10/1 = 0.01 and 100/1 = 0.1.
Feedrate Switch	: Selects a feed rate for manual continuous feed, program check and dry run operation.

4-1-4 Function Key and State Display Item

1. Common function key

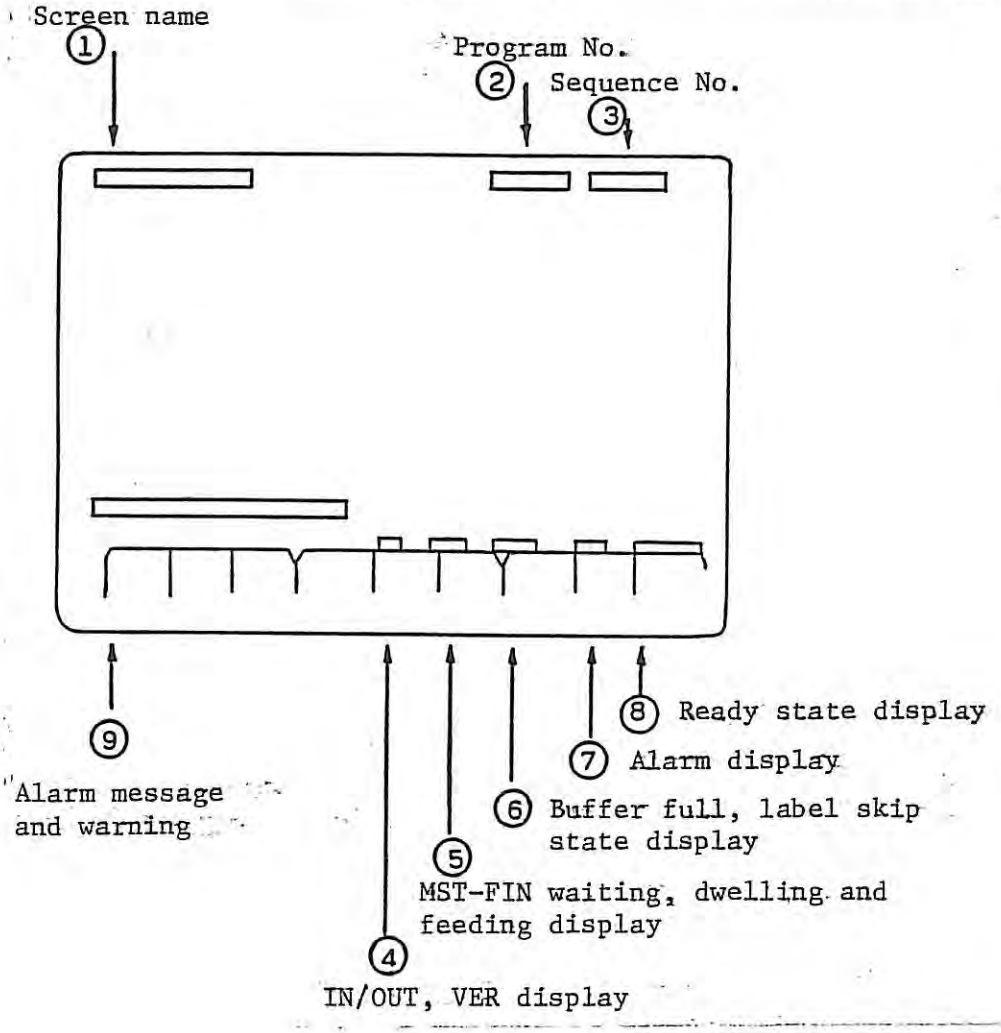


Common function key means soft key for common display on the screen of operation/driving guide. By [F9] (others) key, moving is made to Page 1, 2. The item of common function key is displayed with white character. Also, the vacant [F5] and [F6] keys are used as function keys at each screen. Display content is different by each screen. In this case, item is displayed by yellow character.

* By the selected screen, common function key disappears, and unique function key for each screen may appear.
* With [OPER./PROG.] key, when shifting on the operation screen from program-preparing screen, [F8] (NC-screen) is not displayed. For the display of [F8] (NC-screen), display the screen of select-operation by [MENU] key, and press [F3] (operation) key, then, press [F9] (others) key.

2. State display item (usual display item)

Any screen displays the following diagram at the top and button parts of CRT-screen.



(1) Screen name

Name of each screen is displayed on the highest state of CRT-screen.

(2) Program No.

Program No. during present execution is displayed with 4-digit value following O at the highest stage on CRT-screen.

(3) Sequence No.

Sequence No. during present execution is displayed with 4-digit value following N at the highest stage on CRT-screen.

(4) IN/OUT. VER display

During input/output of punching tape, address-searching or editing, the following message is displayed with flicker.

"During data-input" ..... in tape reading

"VER" ..... in tape collation

"During data-output" ..... in tape-punching out

(5) MST-FIN waiting, in dwelling and feeding display

"M" ..... FIN-waiting of M-command

"S" ..... FIN-waiting of S-command

"T" ..... FIN-waiting of T-command

"F" ..... in cutting feed, "R" display in rapid traverse

"P" ..... in tape reading

"DWELL" ..... in dwelling

M, S, T, F, P is each independently displayed.

(6) Buffer full, label skip state display

"Buffer" ..... display after completing the advance reading.

"Label skip" ..... display at label skip ON.

(7) Alarm display

Alarm display shows flicker until reset operation is done after the cause is removed.

"Alarm" ..... It shows the occurring alarm.

"Battery" ..... It shows the occurring battery alarm.

"A/B" ..... It shows that both alarm and battery alarm are occurring.

(8) Ready state display

"Ready" ..... It shows that the system is normal and operable.

(9) Alarm message and warning

It displays the occurrence of alarm of warning.

At maximum, 5 lines can be displayed once.

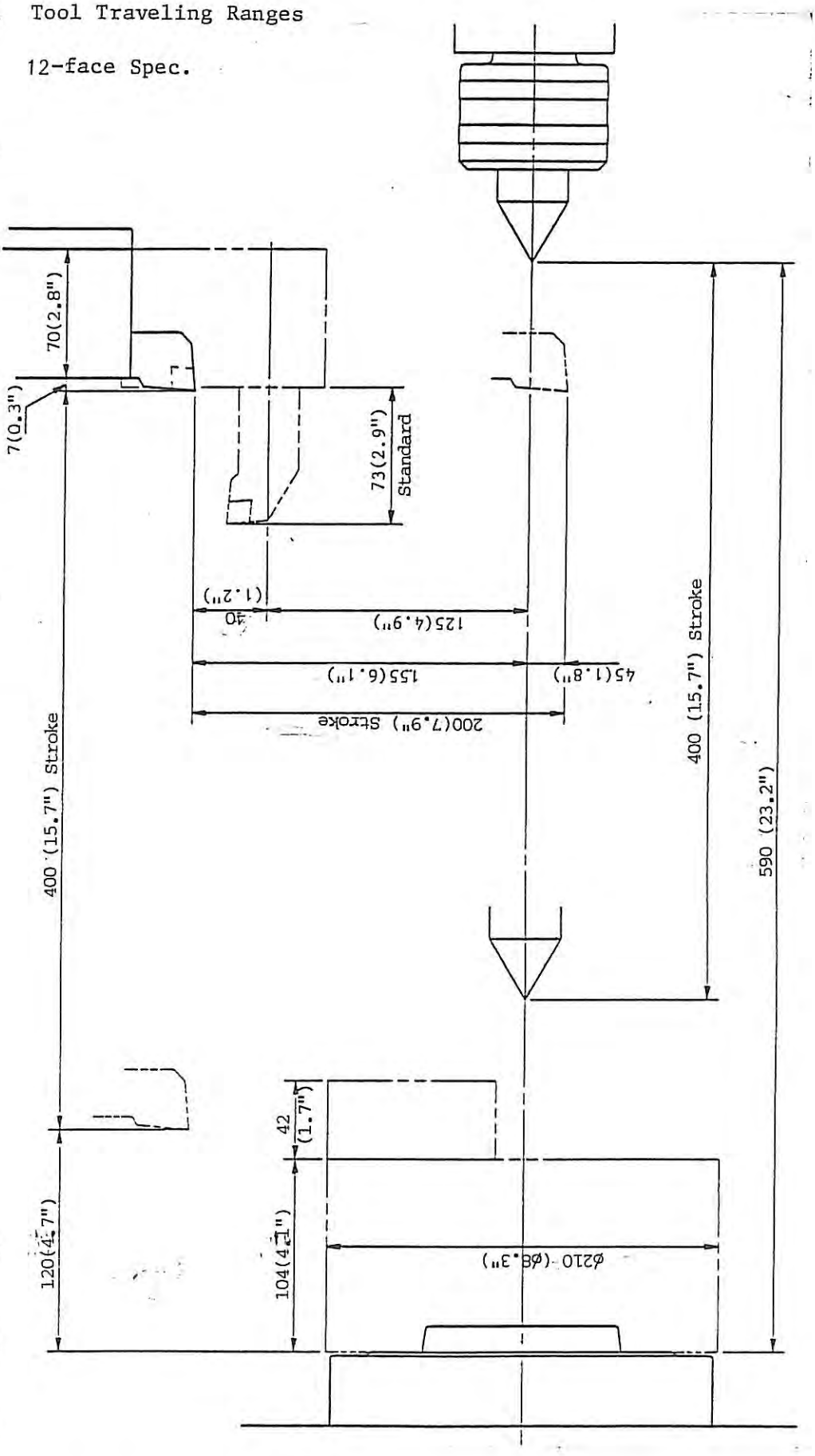
(CAUTION)

1. On the screen in program preparation, usually displayed items are not displayed.
2. The screen of program editing (for both fore, back grounds) shows the state of screen-selected time, while in selecting the screen, display does not change even when the content of usual displaying item changes.
3. On NC-screen, O and N are not displayed.

4-2 Preparation for Machining

4-2-1 Tool Traveling Ranges

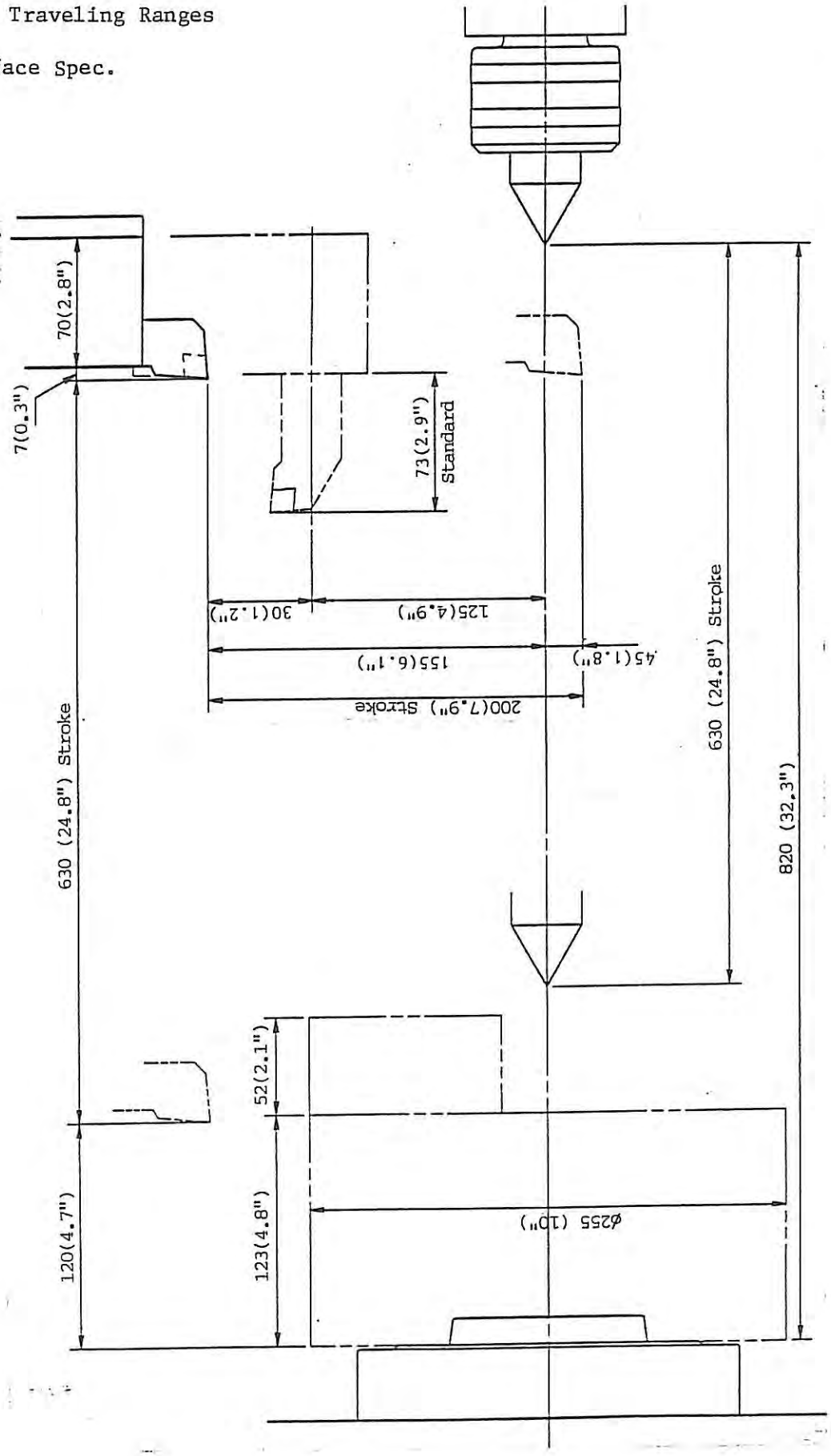
12-face Spec.



HT20SII Strokes (12-face)

Tool Traveling Ranges

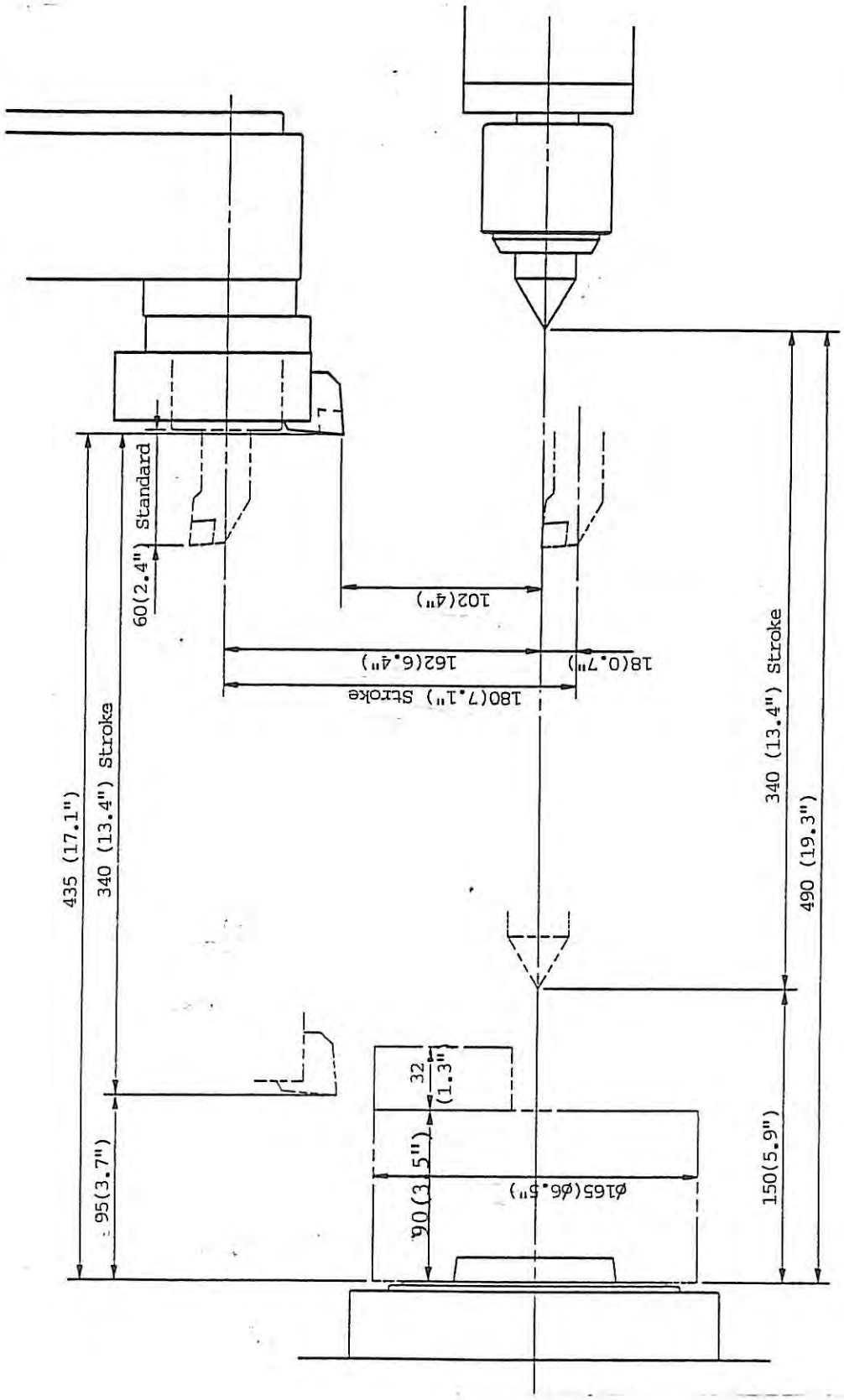
12-face Spec.



HT20SII (LONG BED) Strokes (12-faces)

Tool Traveling Ranges

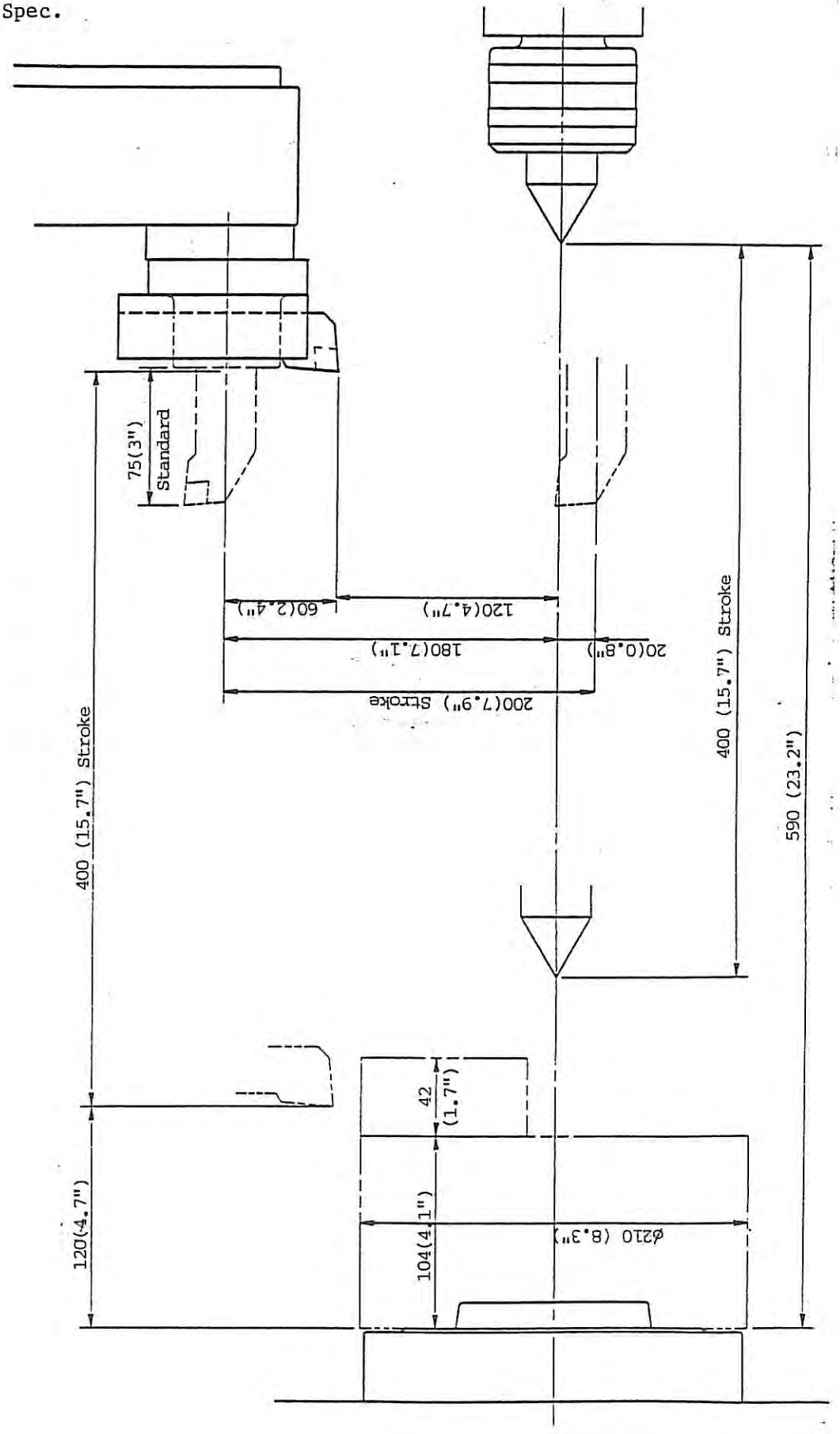
KV Spec.



HT15SII Strokes (KV TOOLING)

Tool Traveling Ranges

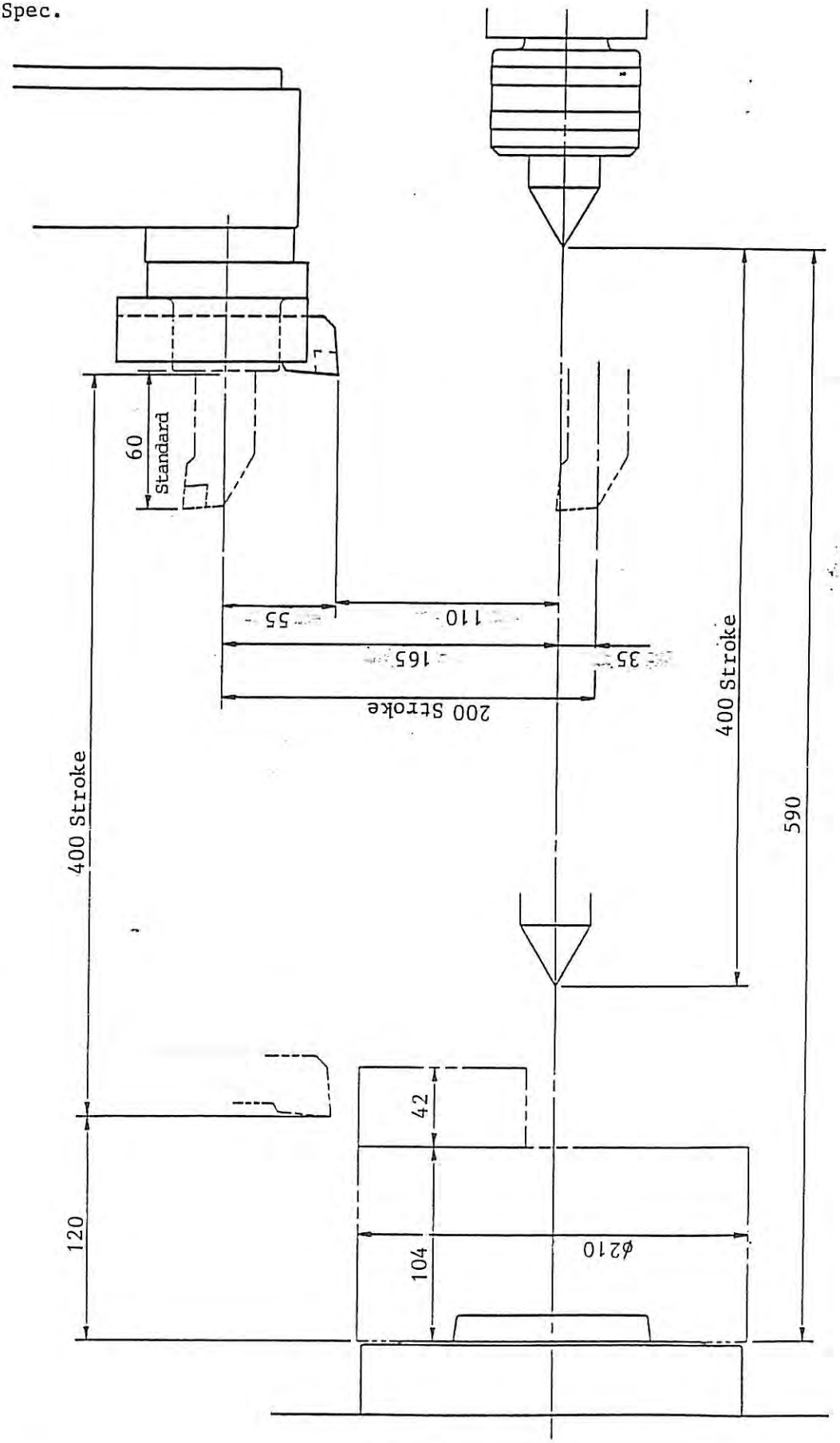
KV Spec.



HT20SII Strokes (KV TOOLING)

Tool Traveling Ranges

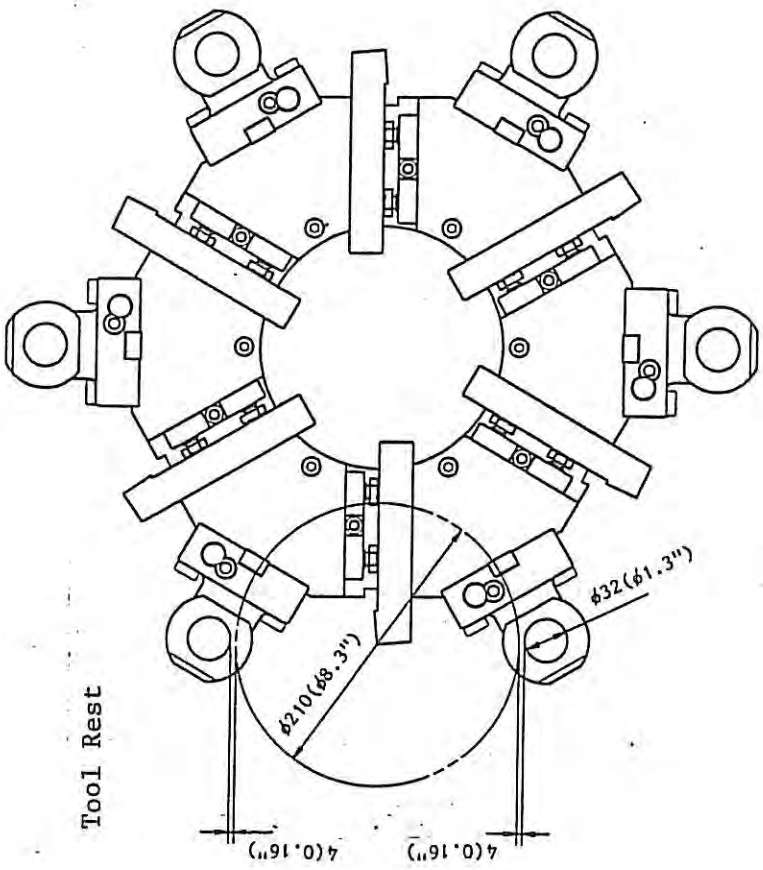
VDI Spec.

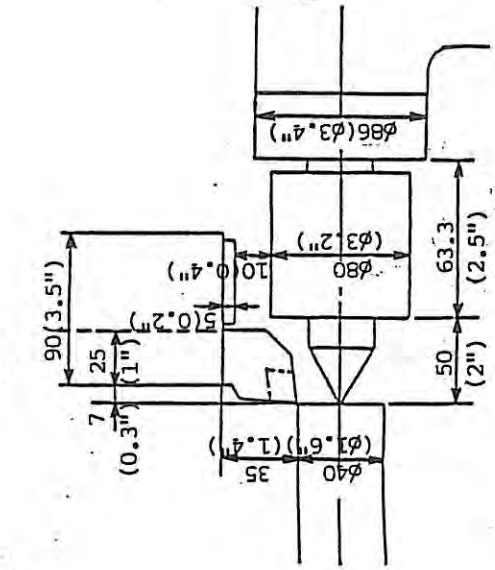


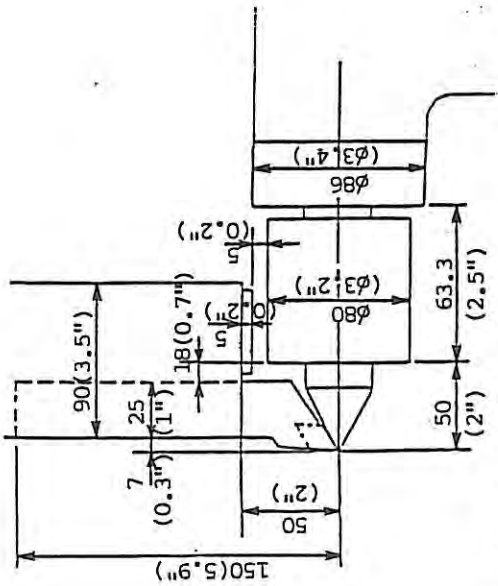
HT20SII Strokes (VDI TOOLING)

4-2-2 Tool Interference Drawing for HT20SII

12-face Spec.







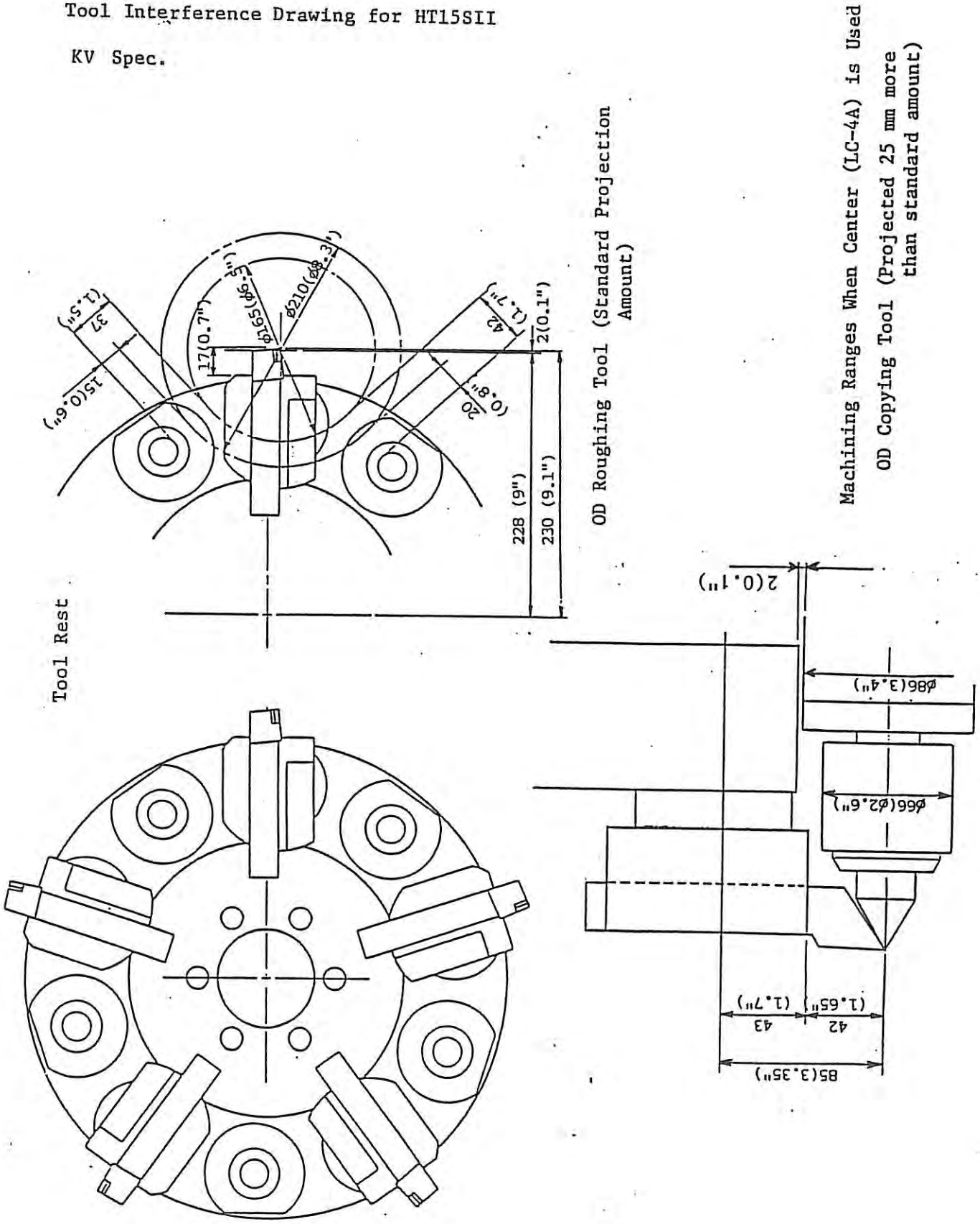
Copying Tool Note) Project a tool 15 mm more than a standard amount.

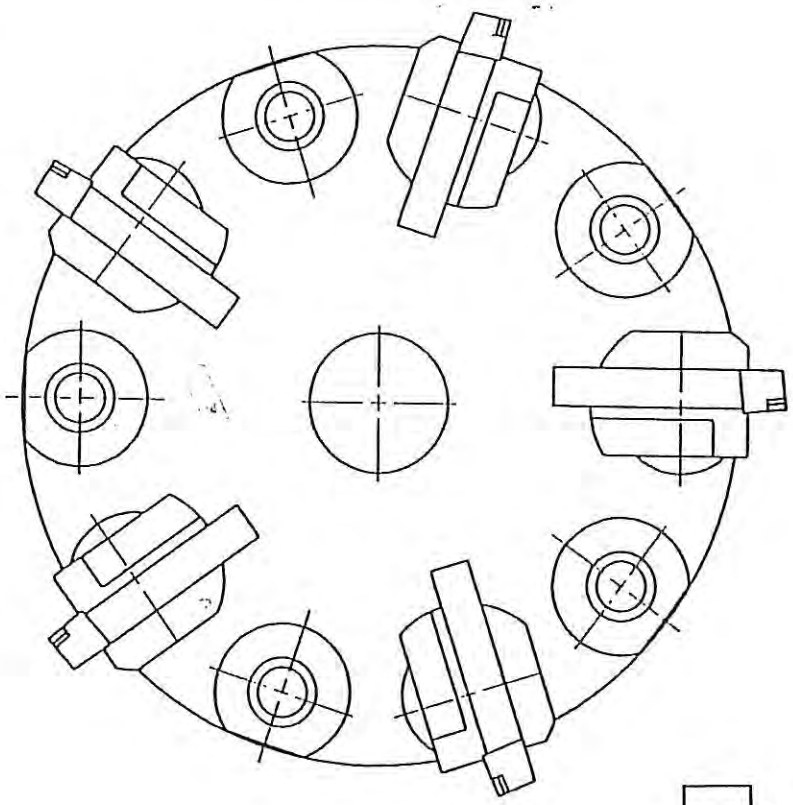
OD Roughing Tool (Standard Projection Amount)

Machine Ranges When Center (LC-5F-6) is Used

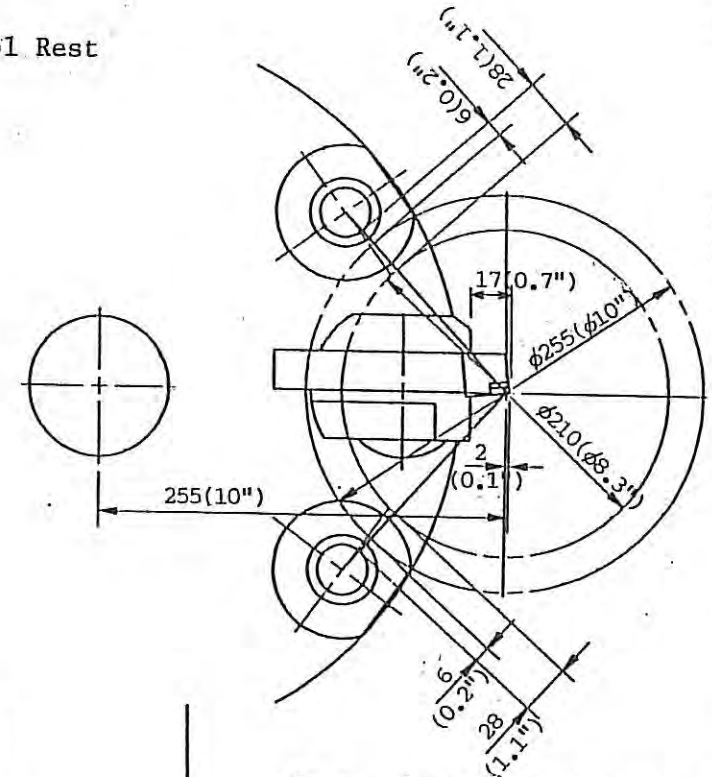
Tool Interference Drawing for HT15SII

KV Spec.

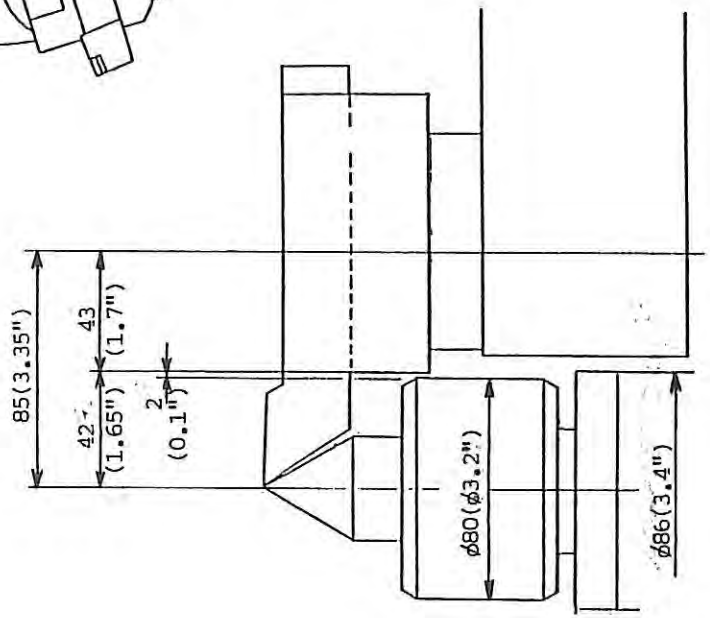




Tool Rest



OD Roughing Tool (Standard Projection Amount)

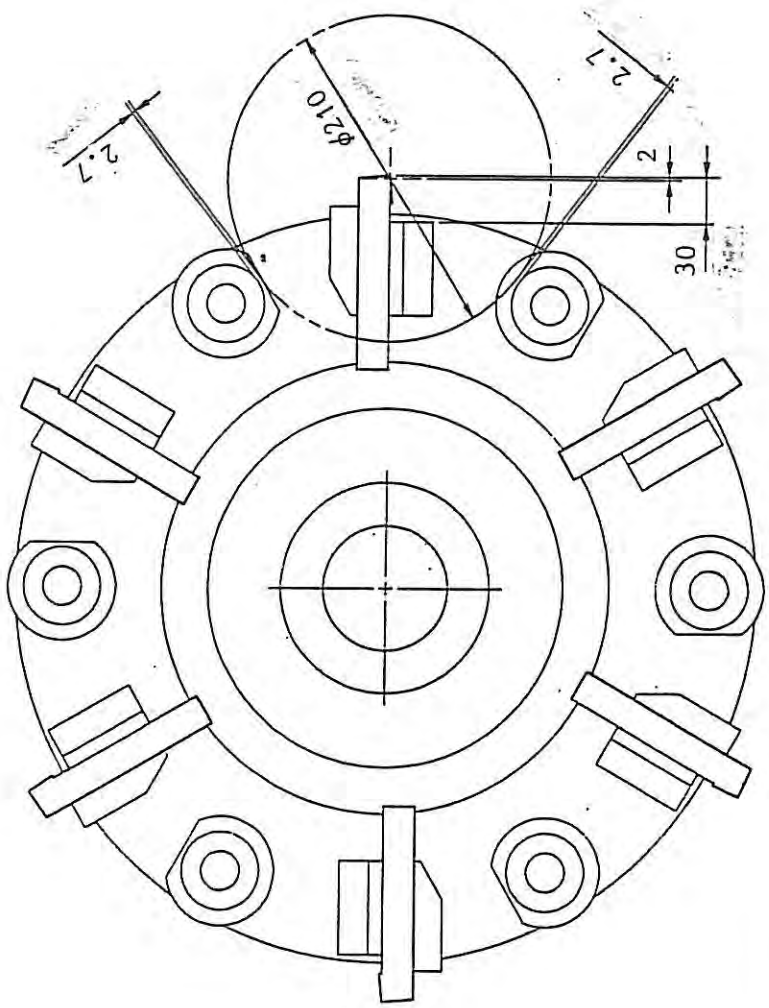


Machining Ranges When Center (LC-5F-6) is Used

OD Copying Tool (Projected 25 mm more than standard amount)

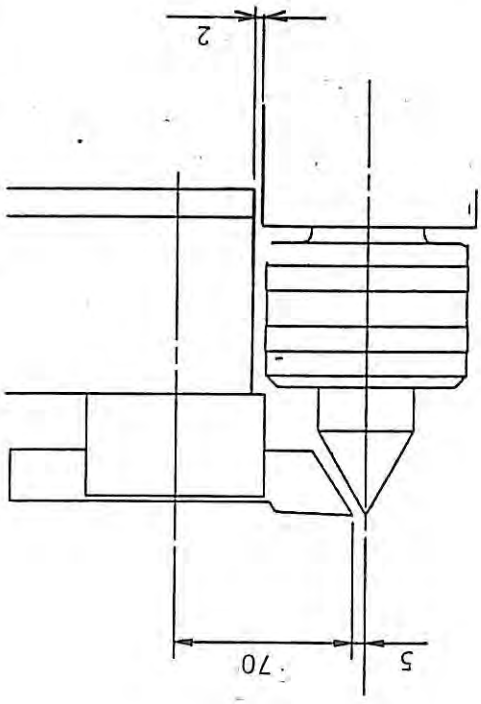
Tool Interference Drawing for HT20SII

VDI Spec.



Machining Ranges When Center (LC-5F-6) is Used

OD Copying Tool (Projected 25 mm more than standard amount)

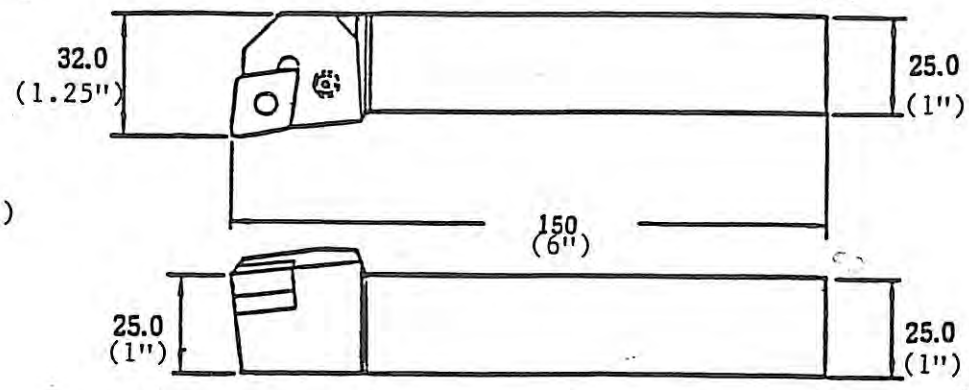


4-2-3 How to Obtain Tool Center Height

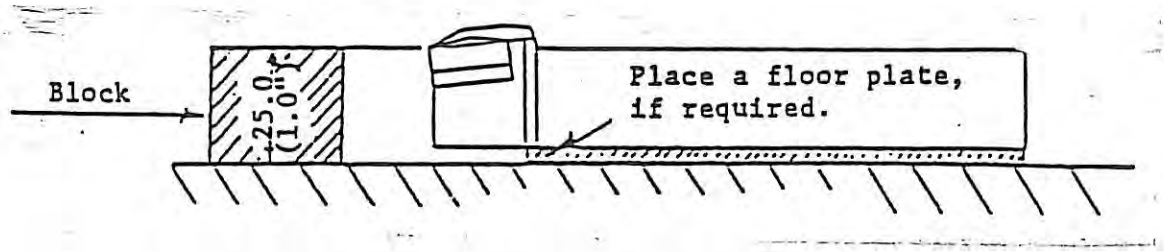
Center height adjustment is not necessary when using a standard tool and a selected tool.

(Example)

Size of the standard tool and selected tool (for an OD tool)



1. When center height adjustment of the OD tool is required ..... (Example: Brazed tool)



Flat place such as surface plate, etc.
After adjusting center height outside the machine by using a 25 mm/1 in. block, mount the tool to the turret head.

4-3 Operation Preparation

4-3-1 Starting Operation

Procedure 1

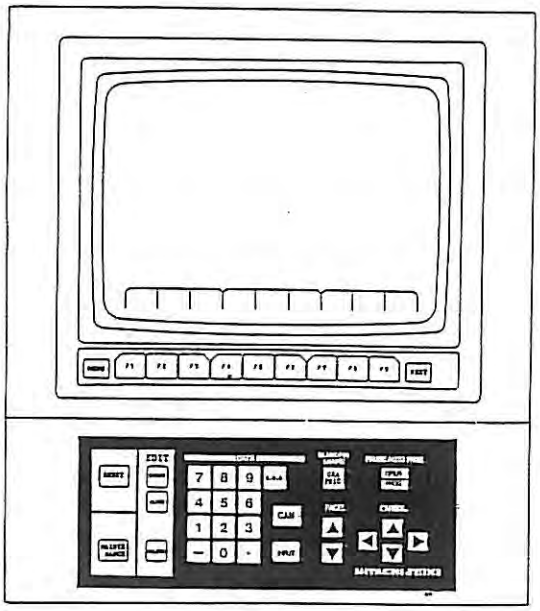
High voltage panel main breaker ON

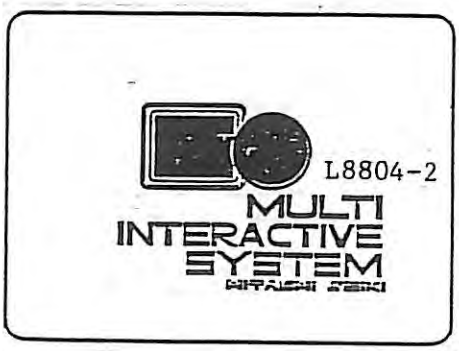
⟶ Rotation of ventilating fan in panel
Lighting of fluorescent lamp in machine

Procedure 2

NC Power ON

⟶

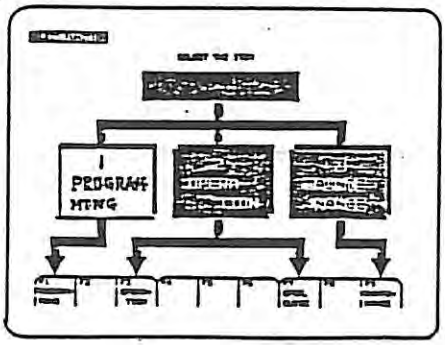




Procedure 3

Press [F3] (operation) key.

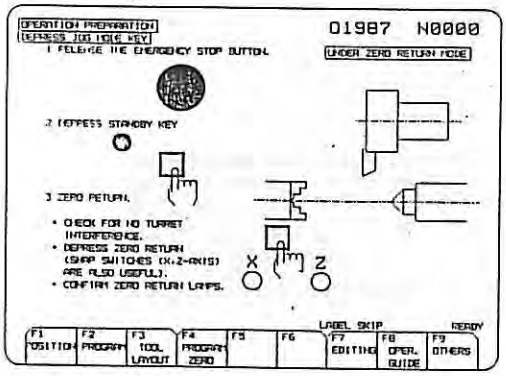
⟶ Automatic operation-selecting screen is displayed.



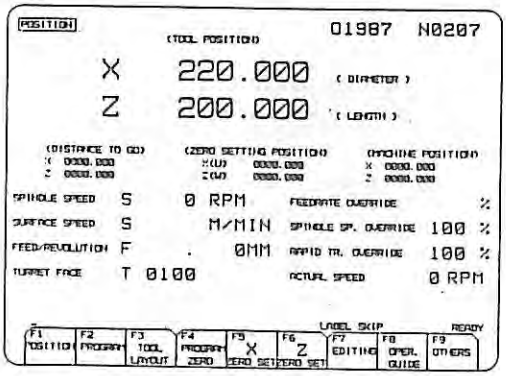
Procedure 4

Make operation by following the indication of screen

⟶ Operation-ready screen is displayed.



⟶ After the end of operation ready, it moves to screen of position.



Procedure 5

Check for each gage pressure

⟶ Check the chuck-pressure and pump-pressure gage.

* Upon selecting [F3] (operation) by operation-selecting, the screen shows the zero-point return for the first time after setting the power to ON or operation ready.
  While at time of no completion, screen shows the operation ready before going to the screen of position.

* Upon making zero-point return once, there is no need to make zero-point return until NC-power is set to OFF.

Conditions Possible of Spindle Rotation

After the end starting operation of 4-3-1, spindle can be turned by the following conditions.

(1) Door should be at its closed state.

(2) Chuck should be clamped. (Opening/closing state will be changed by inside clamp or outside clamp of key switch.)

(3) Tailstock should be at its advancing position or retracting end.

(4) Range should be at its high-speed or low-speed side.

(5) Q-setter or Z-setter shall be at its retreating position.

* For (3) and (4), the state of previous set off time of power supply is kept, then, if spindle is rotatable at time of power OFF, no operation is necessary for command or operation again.
(For tailstock, it is unnecessary if it is at the receding end.)

* Rotation number is fixed at 100 rpm under the state without command of rotation number. Next, after command of rotation number spindle rotates by the indicated number of rotation.

4-3-2 Emergency Stop and Restart of Operation

An emergency stop is caused in the following cases:

1. When the EMERGENCY STOP switch on the operation panel is pressed.
2. When clutch of X-axis or Z-axis is disconnected.
3. When the condition of the spindle motor is abnormal.
   a. When the temperature in the spindle motor rises abnormally.
   b. When the spindle motor runs at an excessive speed.
   c. When the field inside the spindle motor is lost.
   d. When an overcurrent flows instantaneously through the spindle motor.
   e. When the fuse inside the spindle motor control unit is blown.

If an emergency stop is applied.

1. All machine operations, except the hydraulic unit will be stopped.
2. "ALARM 280 NOT READY * RESET EMERGENCY, THEN DEPRESS STANDBY SWITCH (6-1)" will be displayed on the screen.
3. Check the cause of the emergency stop.
4. After removing the cause, reset the emergency-stop button, and press standby key.

4-3-3 When Ending Daily Operation

1. Move the turret head far way enough from the spindle chuck.
2. Stop each operation of the machine.
3. Press the EMERGENCY STOP button on the operation panel.
4. Press the POWER OFF button of the NC unit.
5. Turn off the main circuit breaker of the power control cabinet of the machine.
6. Turn off the power switch in the user's factory.

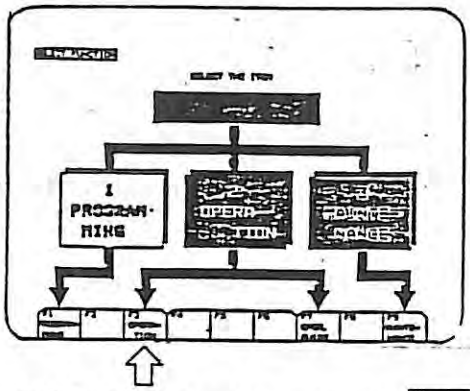
4-4 Operation Screen

4-4-1 Position Display

Procedure 1

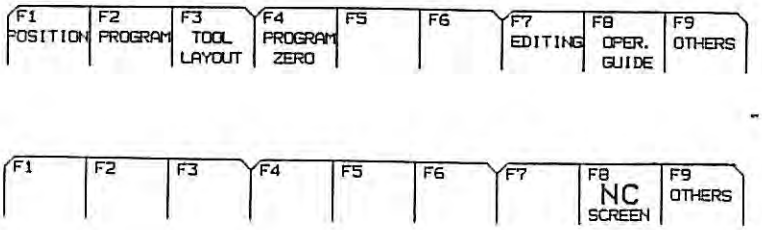
Press [F3] (operation) key.

⟶ Selected screen



In case of other than selecting screen, press [F1] (position) key.
When there is no [F1] (position) key, press [F9] (others) key.

⟶ For function key, there are 2 items.

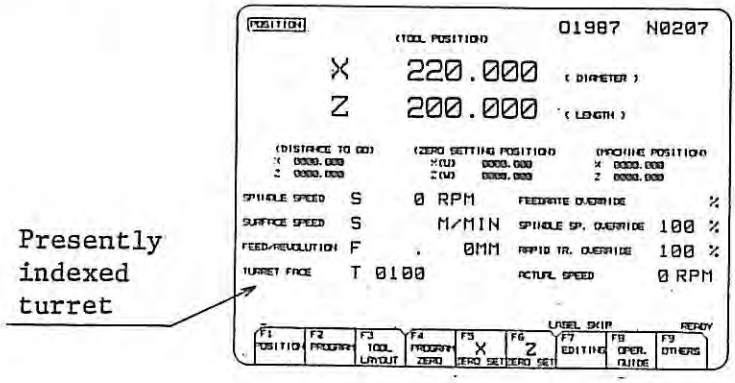


F5, F6 are changed by screen display.

Procedure 2

It is changed to position screen.

⟶ On this screen, present tool nose position, zero-set position, remaining moving amount and machine position are shown.

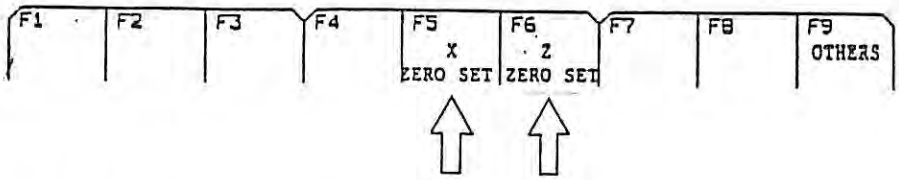


1. Rotation number, cutting speed, feed are read at present.
2. Spindle and feed override can be changed only during execution.

Procedure 3

Press [F5] (X zero-set) key and [F6] (Z zero-set) key.

⟶



With this screen, diameter and longitudinal position can be set to X(U) 0, Z(W) 0.

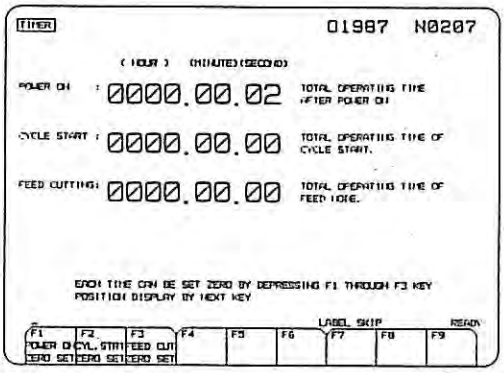
- Distance to go:
  During operation, the following moving amount is displayed. The distance up to the command value is displayed.
- Machine position:
  The distance from machine-zero point to the present tool can be shown.

(TIMER)

Procedure 1

Press the [NEXT] key.

⟶ If the [NEXT] key is pressed when the Position screen is displayed, the Run Hour screen will appear.



POWER ON

Total integrated time after power-on

CYCLE START .

Total integrated time during automatic operation

FEED CUTTING

Total integrated time during automatic cutting

- Pressing the keys [F1] through [F3] resets each time above to zero, respectively.
- Pressing the [NEXT] key returns you to the Position screen.

Setting of Coordinate System (Tool Nose Position)

When tool is indexed at the cutting position by turret index, the display position of tool nose changes, however, it is due to the setting-up of coordinate system in order to display the distance from machining zero point and tool nose position exactly at the tool-nose position at any time.

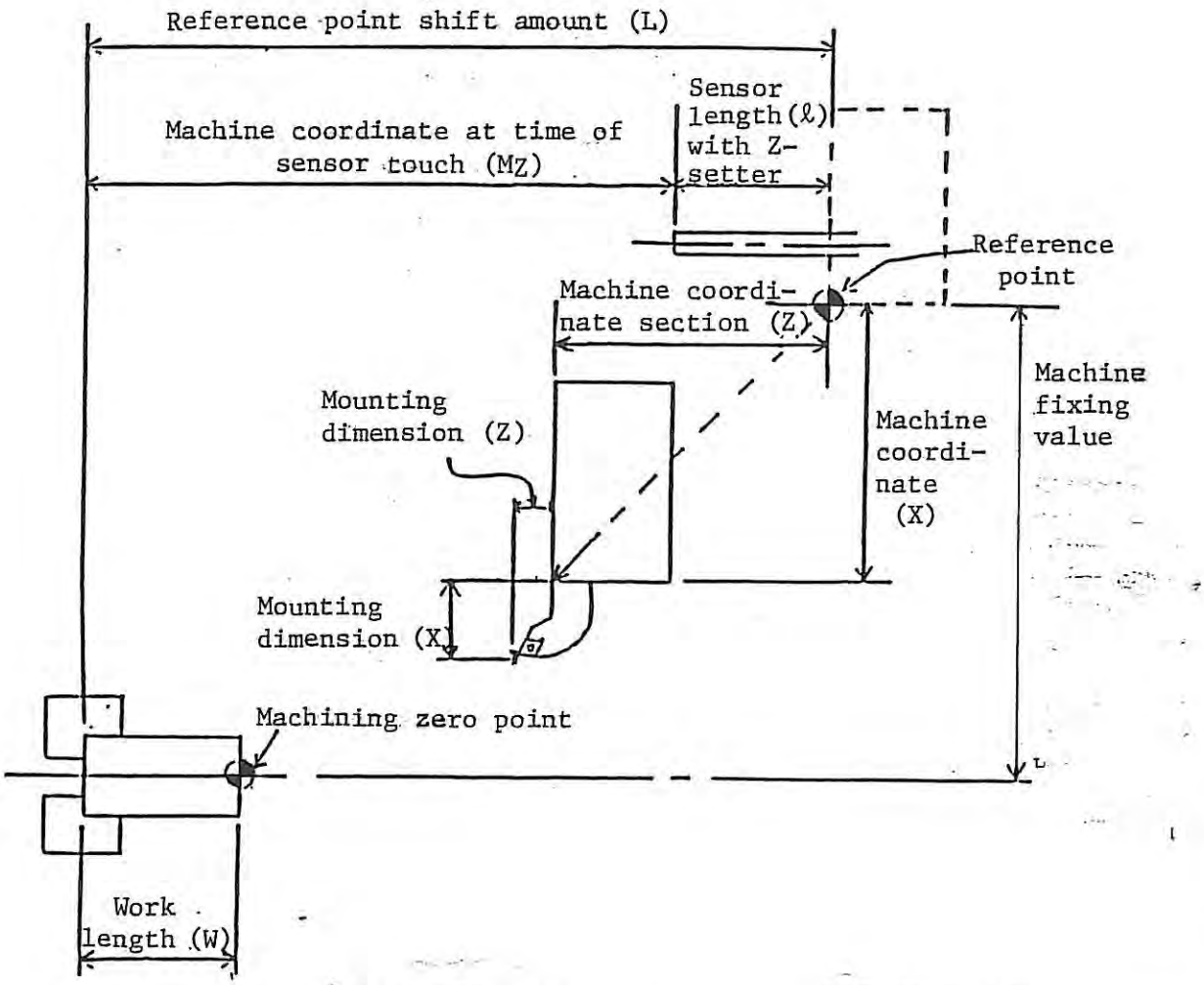
The coordinate system can be set up at the following time.

1. Indexing time of tool by T-command of program
2. At manual mode, tool stand is rotated by pressing turret-index key. (JOG and HANDLE)
3. Zero-point returning time of feeding key or zero-point return key.
4. Time using Q-setter
5. Time changing the work-length by tool-layout screen.
6. Time changing in setting the standard shifting amount by the screen for setting the machining standard point.

(CAUTION)

- Even at the command of G50 of NC-code, coordinate system can be set up, but in this case, no exact display is made for the distance from the machining zero-point and the position of tool nose. By the operation of the above 1 ∿ 6 Items exactly, tool-nose position can be reset.
- When the dimensions adjusting amount is set, it only inputs the dimensions adjusting amount and the tool-nose position is not changed. In this case, the above operations 1 through 6 newly re-set the tool-nose position.

∘ Composition of coordinate system (tool nose position)



* 1. With Z-setter (option), there is no need of machine coordinate (Mz) sensor length (ℓ) and work-length (W). At this time, the shift-amount (L) of reference point becomes the distance up to the machining zero-point from the reference point at machine-zero point.

2. Mounting dimensions (X) and (Z) mean the stored value in tool layout by obtaining with Q-setter.

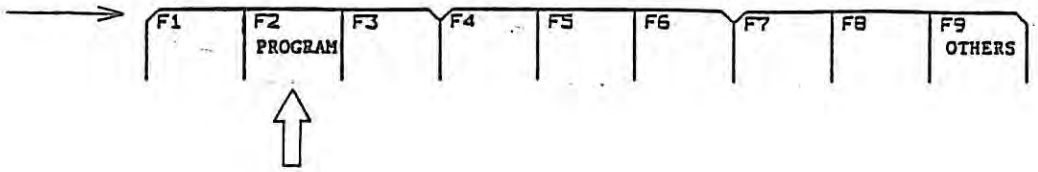
4-4-2 Program

(Operation)

Procedure 1

Press [F2] (program) key.

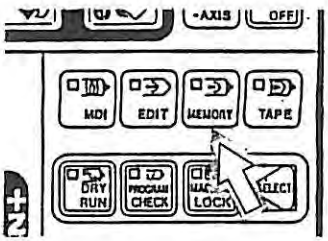
When there is no key of [F2] (program) key, press [F9] (others) key.

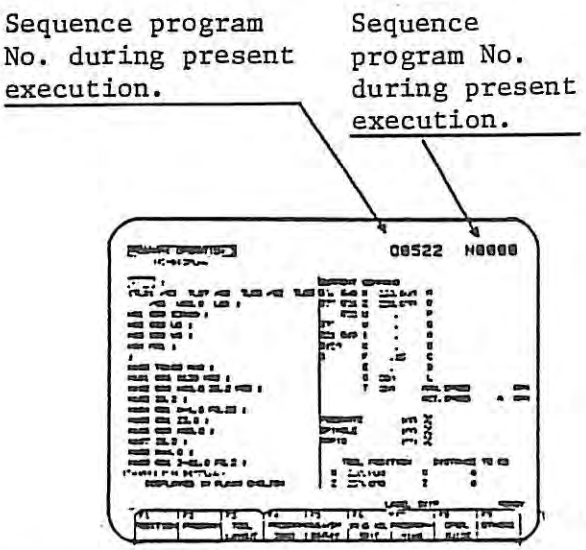


Procedure 2

It shows program screen

Press [MEMORY] key.



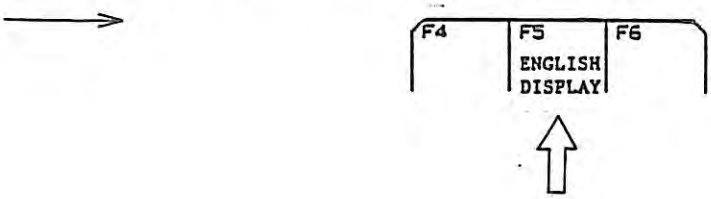


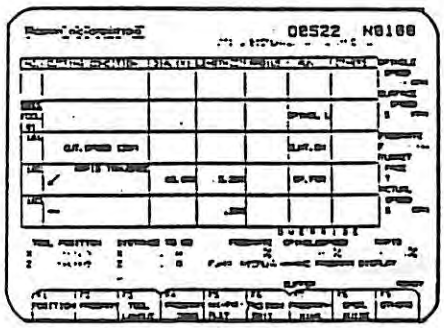
Present command value shows the reading program content.

There are 2 types of program screen, the one is NC-display, other is English display.

Procedure 3

Press [F5] (English display) key.



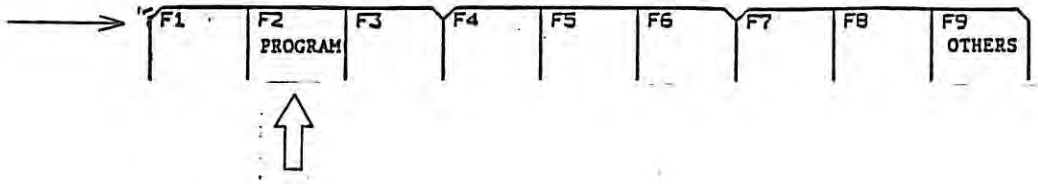


(Edition)

Procedure 1

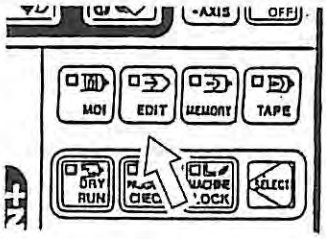
Press [F2] (program) key.

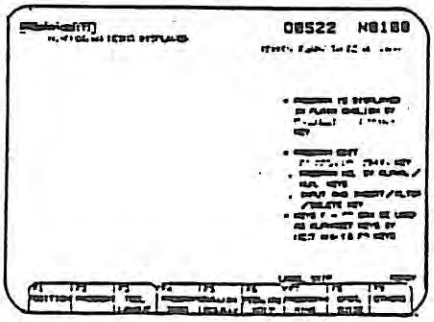
When there is no key of [F2] (program) key, press [F9] (others) key.



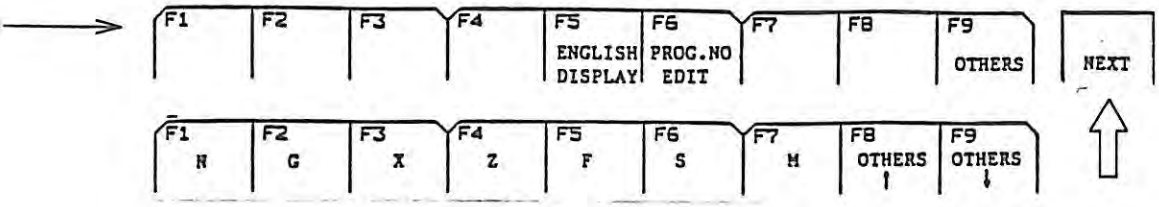
Procedure 2

Press [EDIT] key.





Press [NEXT] key, then function key change into alphabet.

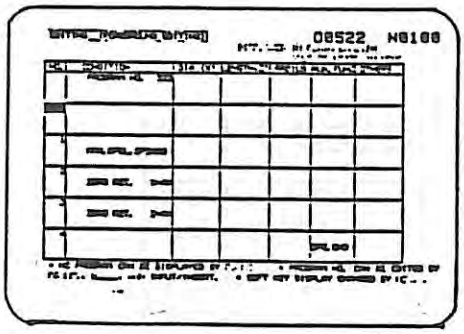


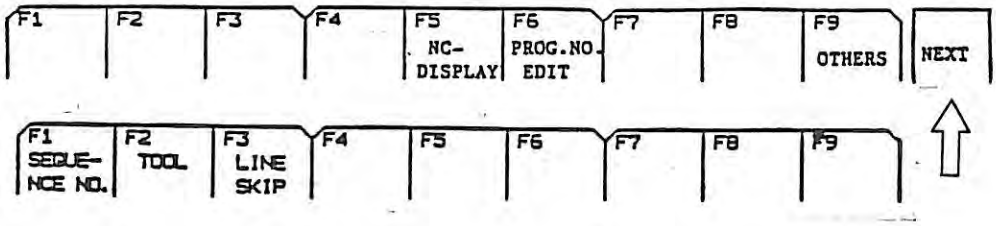
On program-editing screen, there are 2 types of display, the one is NC-display and the other is English word display.

For editing procedure, refer to "4-6-8 Program Edition (NC-display)".

Procedure 3

Press [F5] (English display) key.





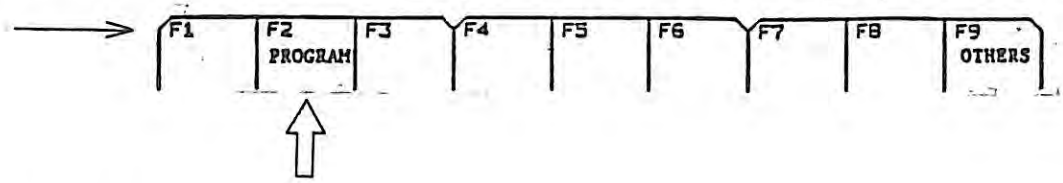
For editing procedure, refer to "4-6-8 Program Edition (English display)".

(MDI Operation)

Procedure 1

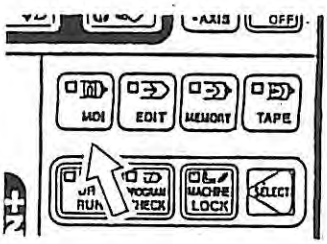
Press [F2] (program) key.

When there is no key of [F2] (program) key, press [F9] (others) key.

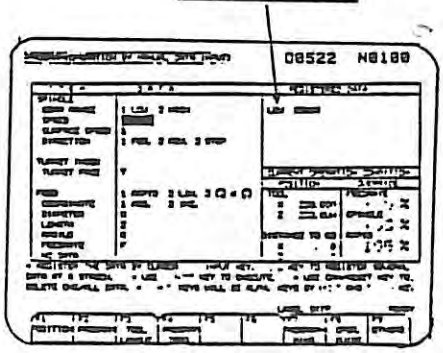


Procedure 2

Press [M.D.I] key.



Display of input data.



Note) If the MDI mode is specified while the "Position", "Program" or "Tool Layout" screen is displayed, the screen above will appear.

Example 1: 300 rpm at low speed, forward rotation

Procedure 1

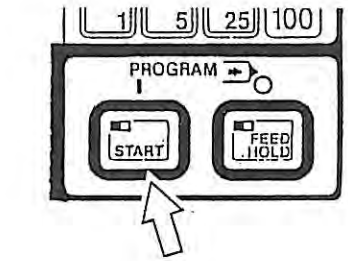
Move the cursor to the lower speed, and press the [INPUT] key.

Procedure 2

Move cursor to S, and input 300.

Procedure 3

Press [START] key.



Item	Data
Spindle Range Speed Surface speed	1 low 2 high

Procedure 4

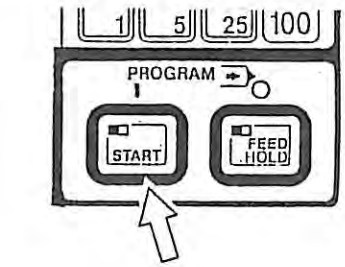
Move cursor to the forward and press [INPUT] key.

Procedure 5

Confirm the spindle-rotating of machine.

Procedure 6

Press [START] key.



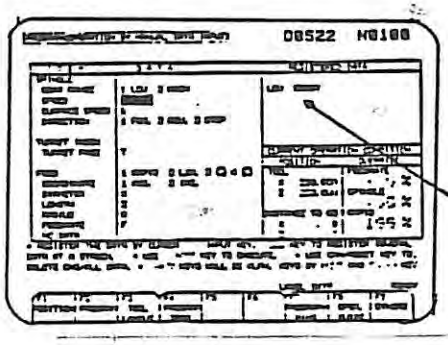
Item	Data
Spindle Range Speed Direction	1. For. 2. Rev. 3. Stop

Note) It is impossible to make simultaneous input and start the rotation of range and spindle.

Example 2: Axial movement by moving amount method

Procedure 1

Move cursor linearly. input it.



Procedure 2

Move cursor to the Inc. and input it.

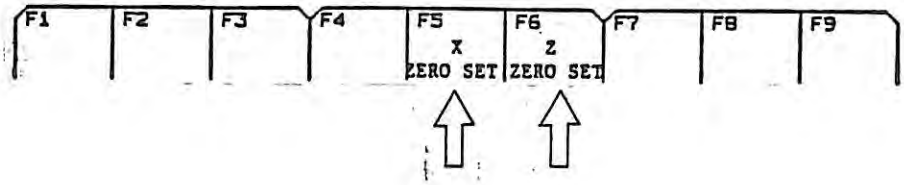
Procedure 3

Press [F5] (X zero set) key and [F6] (Z zero set) key.

Feed 1in. [INPUT]

Coordinate Inc. [INPUT]

By input of Inc., function key and screen change.



Procedure 4

Input the data of diameter, lingitudinal feed.

Procedure 5

Check the condition of machine.

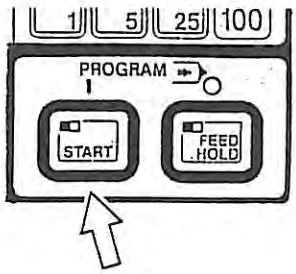
Procedure 6

Press the [START] key.

→

Diameter	U-10.0	[INPUT]
Longitudinal	W-10.0	[INPUT]
Feed	F 0.2	[INPUT]

Check the door closed, chuck closed, center retract, spindle rotation.



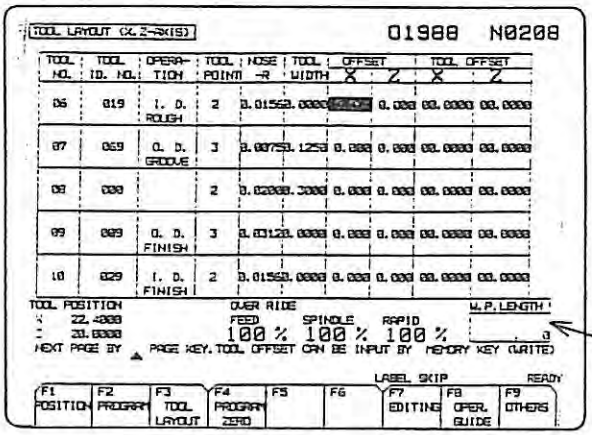
4-4-3 Tool Layout

In case of program made previously or machining program setting, tool-layout can be displayed by calling the program. Usually, tool is set while looking at this screen.
However, values of a tool setting position (diameter, length) are not changed. When the number of tool mounting faces is changed or the tool is replaced, obtain the values with the Q setter.

Procedure 1

Press [F3] (tool layout) key.

⟶ It is possible to change the work-length and dimensional adjustment for tool-nose point, nose R, tool width.
Dimensional adjustment can be made up to the maximum 1 mm, 0.1 inch through one time input.



Input the finished whole length of work in case setting Z-setter to the pawl-end face with Z-setter (position).

Procedure 2

Move cursor to nose R, and input it.

⟶ Nose-R changing method

Nose R	Tool width	Offset	
		X	Z

[1] [.] [2] [INPUT]

When inputting data, move the cursor to a specified position with the PAGE and CURSOR keys. When this is done, you can key in a tool mounting position number (01 ∿ 30) and directly move the cursor to the specified position, using the CURSOR key [▲] or [▼].

Tool Layout (mounting position)

This screen stores the information related to tools such as tool shapes, mounting dimensions, etc. (Only mounting positions can be altered, with the MEMORY LOCK/WRITE key shifted to "WRITE".)
A value by the Q setter is inputted to the tool mounting position. (When using the Q setter, operate in this screen or the "Q SETTER HANDLING" screen of OPERATION GUIDE.)

Procedure 1

——→ In hoping to set the value of tool-mounting position at setting and "0", set the mode to JOG, and index the tool intended to set to "0" and setting to the cutting position by [TURRET-INDEX] key.
Next, set the [MEMORY] key to the writing side, white cursor appears, then, set the data to the setting and "0".

* It is impossible to set to "0" and setting except for the JOG or HANDLE mode.

Note) If the Q setter is lowered when the "Position", "Program" (except English display)", "Tool Layout" or "Machining Reference Point Setting" screen is displayed and the X and Z keys are effective, the "Tool Layout" screen will automatically appears.

Input of Tool Width Data for Groove Tool

When a grooving process is displayed in the Process field, input in the same manner as the other data. When inputting data in Tool Width in the line of Tool File No. (no process), however, the following operation is required. Input tool width data as well when creating a program with the grooving tool of Shape 4 in the OD roughing, ID roughing or end face indenting process in program check and creation. In this case, data can be input by operating as in (1) and (4).

Operations:

(1) Set the cursor to the tool width.

(2) Press [INPUT] key.

(3) It requests whether it is end-face groove (F5) or in/out diameter groove (F6), then, press the function-key for selecting the process.

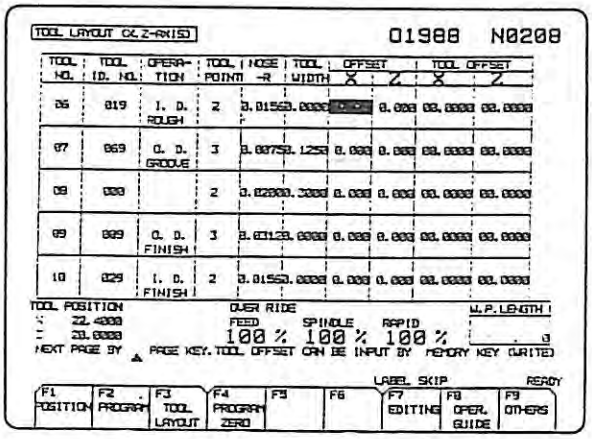
(4) Input data (tool width).

(5) For changing the process, repeat the operation form (2). At this time, clear the previously input data of tool width.

(6) For deleting the input process name (end-face groove or inner/outer diameter groove), press [DELETE] key by setting the cursor to the process.

Tool Layout (Multiple offset)

It is used in need of compensation for over 2 pieces by one tool (for instance, taper adjustment, etc.).



Procedure 1

Set the cursor to the diameter/length of Offset No. (21∿30) used for composite compensation. Press [INPUT] key with key-in of compensation amount.

Input-possible value once is 1.000 mm (0.1 inch) or less.

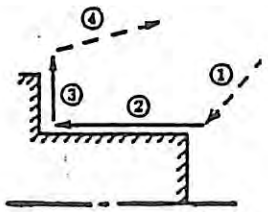
Notes) ◦ Inputting value for Nose R results in an alarm.

◦ The multi-tool coordinate system is set by inputting values for Tool Nose point and Nose R.

Program example:

Input the offset amount to the diameter of composite compensation No. 27.

N700 T0700 M41;
G96 S120 M08;
(1) G00 X100.0 Z10.0 M03;
(2) G01 [G142] Z-100.0 T0727 F0.15
(3) X150.0 T0700;
(4) G97 G00 X200.0 Z150.0;
M01;



Movement of 2-line shows taper-form.

Note: In case of minus-direction of compensation, "↙" movement is shown, then, indicate the direction of tool-nose R-offset to the right side.

Preparation of Tool-layout

1. What is preparation of tool-layout ?

In calling out the program, information in ( ) of program is read, and data is set on screen of tool layout.

Example)

```
O××××  ;
(TL 01/03    TL 03/05 ..... W50.0  D100.0  H2.0  L253.23) ;
```

Turret No. — Tool life No. — Work length — Work diameter — Face removal — Machining reference point, Shift amount

① Setting of set-up information

1) Set the tool layout by reading the information of Tool No. corresponding the Turret No. from tool file. Whereas, there is no change in the value of tool-mounting position.
After the change of tool-mounting face number or in replacing the tool, obtain the value by Q-setter.

2) Set W-information to work length of tool-layout screen.
(Simultaneously, set to Setting No. 6570 or NC-screen.)
⟹ only at time with Z-setter (option).

3) Set L-information to the shift-amount on machining reference point. (Set to Z of NC-screen OFF of set No. 00.)
No setting is made at time when L is 0. (Program prepared by auto-program is prepared by LO.)

② Other functions

1) In changing the shift amount on setting screen on working reference point and work-length of tool-layout screen, it is reflected on setting offset.

2) In operation of 1) Item, simultaneously set up (coordinate system setting).

(Note) Even in the change and setting of shift amount of machining reference point and work-length, no feedback is made into ( ) of program. At this time, edit the program. For the content of tool file, see Programming Manual 1.
During operation, even the program-calling will not produce any tool layout.

2. Tool-layout preparing procedure

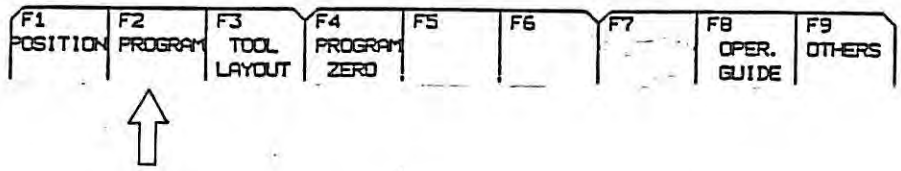
Procedure 1

Operating method

→ O 1 2 3 4 ;
(TL01/03 TL02/36 TL04/15 TL05/55
W50.0 D100.0 H2.0 L250.0) ;
⋮

Procedure 2

Set to EDIT mode or MEMORY mode then, select [F2] (program) screen.

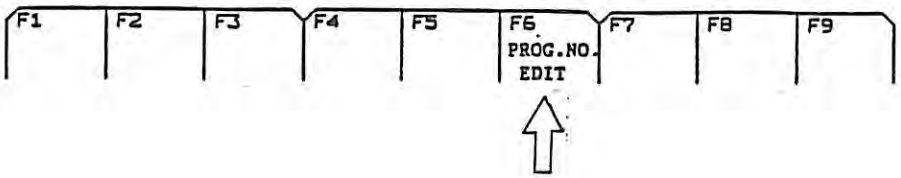
→ 

Procedure 3

Press [F6] (PROG. NO. EDIT) key.

→ Registered program Nos. are displayed on the right side of the screen. (except English display)

Note) When 25 or more programs have been registered, display them with the Page key.



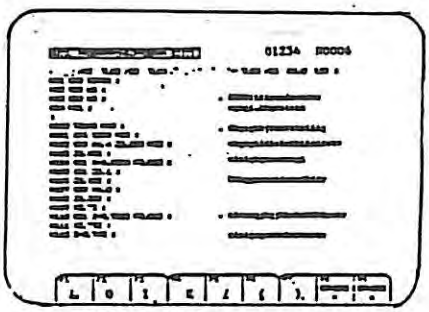
Procedure 4

Input the program No. you want to call.

→ [1] [2] [3] [4] [INPUT]

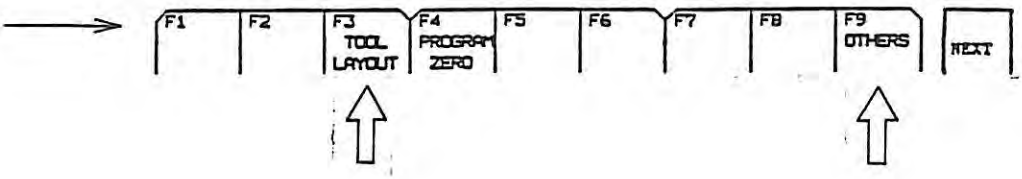
The program is called.

Check program contents.



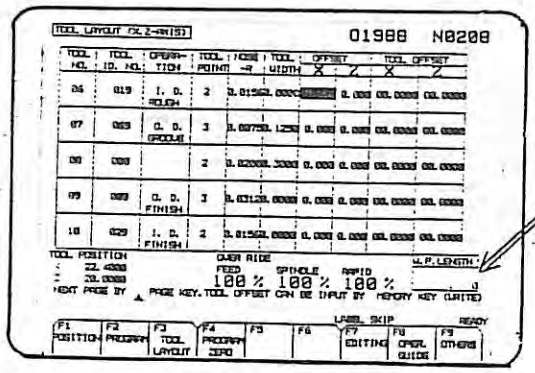
Procedure 5

Press [F3] (tool layout) key.



1) Tool file data (TOOL POINT, NOSE-R, TOOL-WIDTH) is put into the mounting.
2) Work-length (W) is input.
   ⇨only at the time with Z-setter (option).
3) Mounting position (X)(Z) at tool file can be seen.

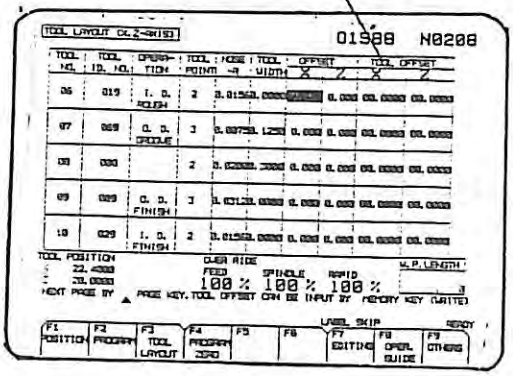
(TL01/03 TL02/36 TL04/15 TL05/55 W50.0 L250.0



Input is made only at time of Z-setter (option).

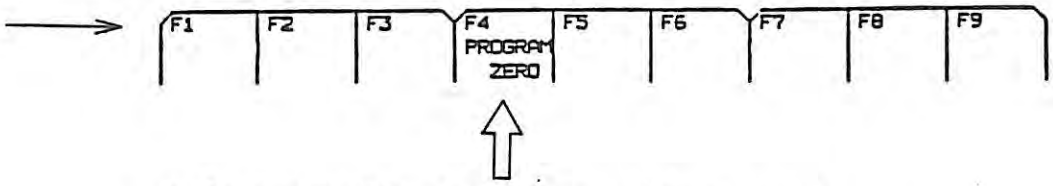
F5 ON ⇩

There is no change in the value of tool-mounting position (diameter, length). In changing the tool-mounting position or in replacing the tool, obtain the value by Q-setter.



Procedure 6

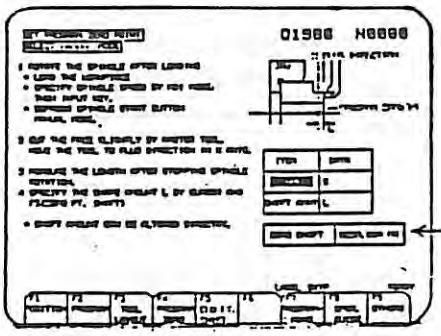
Press [F4] (PROGRAM ZERO) key.



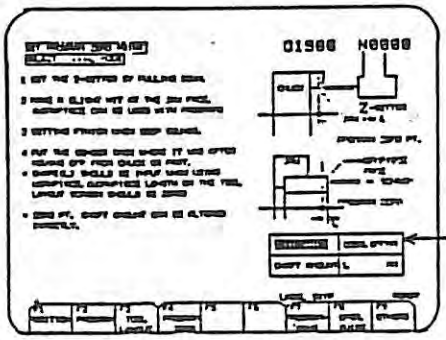
Reference point shift amount (L) is input.

(TL01/03 TL02/36 TL04/15 TL05/55 W50.0 L250.0)

No Z-setter



Z-setter (option)



* At time of L0, no input is made. (Previously set value is kept.)

Upon calling the program, before calling program, tool information of currently called program is feedbacked to the tool file, then, program call and new tool preparation can be made.
Whereas, there is no change in the value of tool-mounting position (diameter, length). In changing the tool-mounting position or in replacing the tool, obtain the value by Q-setter.

3. Restricing items

① Designating range .....
- Turret face No. 01∿20 *1
- Tool 00∿100 *2

}
- Decimal point input impossible — e.g.) 0.1 ... error
- Digit-max. 3 digits — e.g.) 0002 ... error

- Work length -9999.999 ∿ 9999.999 mm (-999.9999 ∿ 999.9999 inch)
- Reference point shift amount -9999.999 ∿ 9999.999 mm (-999.9999 ∿ 999.9999 inch)

② Impossible of insertion and renewal of line (EOB) from control IN*3 to control OUT*4
⇩ ⇩
(Hereinafter fererred to as IN/OUT.)

③ Space in set-up information is neglected.

Example) T○L○01○/0○3 ⟺ TL01/03
↑ ↑ ↑ ↑
Space (same meaning)

④ When there is no information of W__ and L__, there is no change in work-length and shift amount.
(being kept at the previous values).

⑤ The set-up inforamtion shall be up to OUT from the initial IN of the OFF-state of label ship for the program. Accordingly, in case of the set-information by IN/OUT before the set-up information, it is regarded as inforamtion error. When there is no set-up information, and there is message by IN/OUT, the set situation is the same.

⑥ When there is no information in the set-up information IN/OUT, tool-layout is no produced. (Tool information and mounting methods are the saem as before.) It is also similar when there is no IN/OUT in the program.

⑦ When there is even one TL information, the information on tool of turret-surface without designation, tool-file No. and process name as well as tool shape can be cleared from the screen.
Tool-mounting method, nose-R, tool width and control point remain as they are.

⑧ At time of only information of W and L without TL-information, set work-length and shift-amount. Tool information in tool layout is the same as ⑥ item.

⑨ Information in tool layout at NC-ower ON is feedbacked to tool-file (100 pcs). Whereas, there is no change in the value or tool-mounting position. After the change of tool-mounting face number or in replacing the tool, obtain the value by Q-setter.

⑩ In the following cases, set-up information error occurs.

i) Designation of same turret face No. or Tool file No. overlappingly in the same program.

ii) Overlapped time of W and L

iii) Case other than format based on ① ∿ ⑨ items.

iv) When inputting data (names, etc.) to the line below the set-up information "(TL01/03 ---- L0);", be sure to insert the new-line (;).

Example) 0 1 2 3 4 ;
(TL01/03 ---- L0);
; ← Insert newline (;)
(ABC); ← Data such as a name
⋮

v) Do not input data (names, etc.) on the same line as "0 x x x x;".

Example) 0 1 2 3 4 (ABC); ←No good

*1: No alarm is given even by indicating the turret face 13 ∿ 20, however, no data is set to tool layout. (When exceeding the turret-face number by auto-program, bigger turret face then 13-face may be output.

*2: When Tool-file No. is 00, it is the output time in the use of special tool upon preparing auto-program.

*3, *4

Control-in/out means ( ) in the program.

(xxxx --------)

↗ Control-in ↖ Control out

Note) When calling the program created with the grooving tool of Shape 4 in the OD roughing, ID roughing or end face indenting process in program check and creation, input a tool width because no tool width is input in Tool Layout. When calling the same program as well, this tool width data is not input. So, re-input it. Or, if □ □ of TL××/□ □ within parentheses of the program is changed to the tool file No. with the same tool width as one used and the program is called, process name will also become "grooving" and the tool width will be also input.

4-4-4 Machine Reference Setting

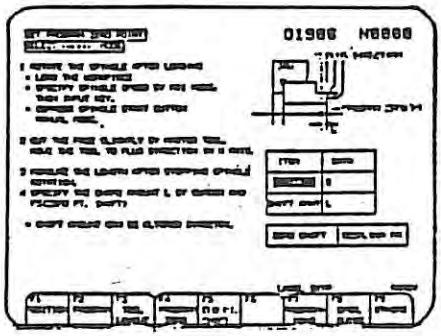
Under program operation, in performing program check, trial shaving or continuous operation, instruct the machining reference point form machine-zero point, so-called the distance up to the finishing and surface to NC-system.

For details of operation procedure, refer to Operation Guide 4-6-5: Machining standard setting.

Procedure 1

Press [F4] (PROGRAM ZERO) key.

⟶ Make operation by the designation of screen.



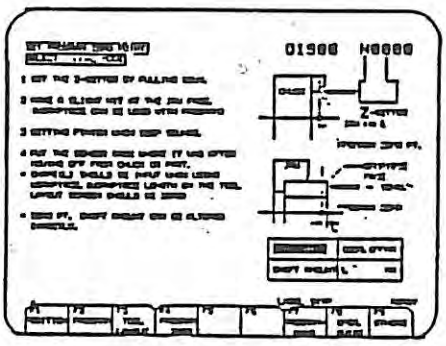
For standard point shift amount, press [F5] (ZERO PT. SHIFT) key, then it is set automatically.

Procedure 2

Press [F4] (PROGRAM ZERO) key.

⟶ Case with Z-setter (option)

Make operation by the designation of screen.



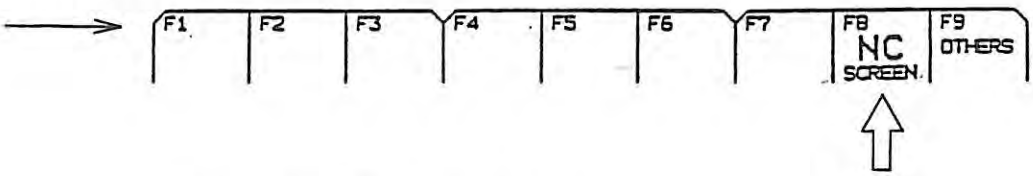
In applying jaw-end face, input should be made for the work-length with screen of tool layout. (Usually, it is automatically set by the set-up information of program.) Standard shift amount is automatically set at time applying Z-setter.

4-4-5 NC Screen

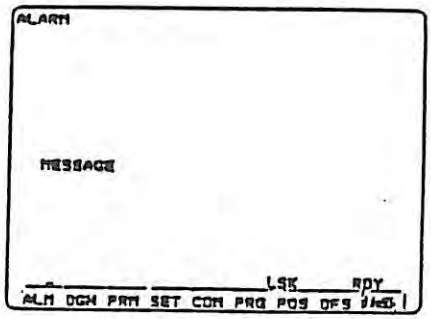
NC-screen is displayed.

Procedure 1

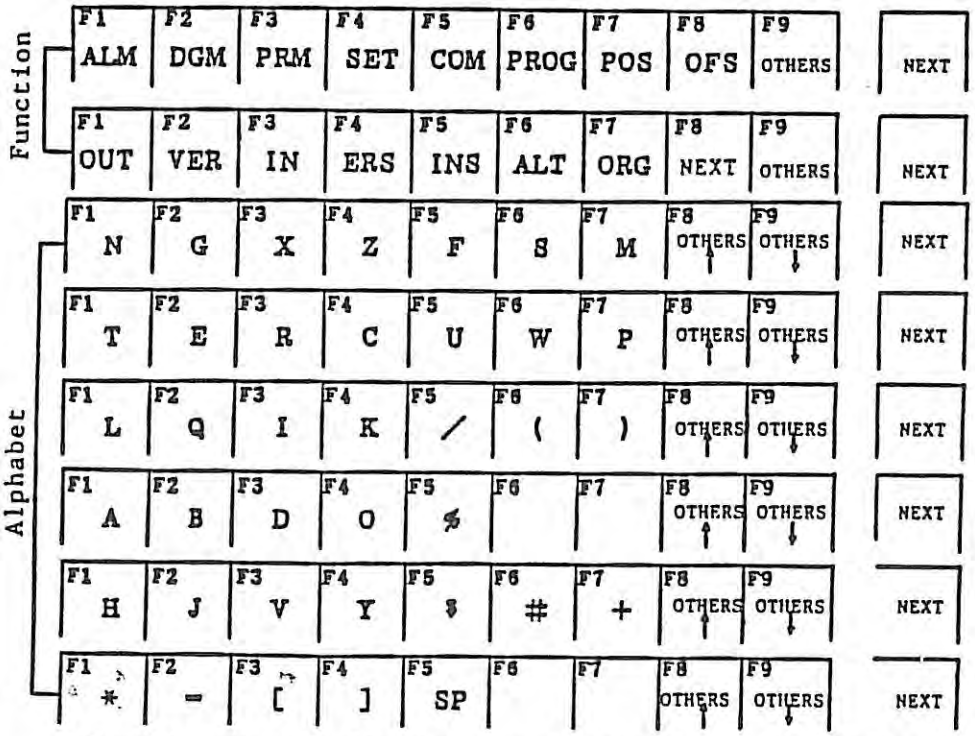
Press [F8] (NC-screen) key.



Alarm screen is displayed.



Function-key shown in NC-screen is as follows.



Function key is divided into 2 groups. By pressing the next key, shifting is made.

For the display-shifting in the same group, press [F9] (others) key.

Case with multi screen display

Procedure 1

Press [MENU] key.

Each key for display has the following meanings.

(a) [ALM] (alarm) key:

It selected for disply of alarm code.
In case of input, automatically this function key is set.

(b) [DGN] (diagnosis) key:

It is selected for displaying the state of INPUT/OUTPUT signal.

(c) [PRM] (parameter) key:

It is selected for display and writing of parameter.

(d) [SET] (setting) key:

It is selected for display and writing of setting key.

(e) [COM] (command) key:

It is selected for display of auto-operation commands.

(f) [PROG] (program) key:

It is used for selecting the display and writing of per program.

(g) [POS] (position) key:

It is selected for display of tool-compensation amount.

(h) [OFS] (offset) key:

It is selected for display and writing of tool-compensation amount.

(i) [OUT] (out) key:

It is start-key for output of various data in memory to the outside through data input/output interface.

(j) [IN] (IN) key:

This is start-key for storing various data in memory through tape reader or data input/output interface.

(k) [VER] (verify) key:

It is start-key for verifying the data in memory and punched tape data. The following 3 keys are used for editing the part program stored in memory.

(l) [ERS] (erase) key:

It is used for erasing the data in memory.

(m) [INS] (insert) key:

It is used for inserting the data into memory.

(n) [ALT] (alter) key:

It is used for correcting the data in memory.

(o) [ORG] (origin: zero set) key:

It is used for cleaning the value of U and W of position external.

(p) [NEXT] (next) key:

When additionally inserting an NC program, press [RESET], [NEXT] and [IN] in that order.

State Display

(1) Ready state display

RDY : It shows the normal system and operable state.

(2) Alarm display (flicker)

Alarm display shows flickering until the cause is removed and reset-operation is made.

"ALM" : Alarm is occurring.
"BAT" : Battery alarm is generated.
"A/B" : Both alarm and battery are generated.

(3) Light error display (flicker)

The following error display is different from the original alarm display, and it shows the display for the error in the generating degree as in key-in or search operation.
When this type of error occurs, press some key (generally CAN-key), then the display is errased.

"INPUT ERROR !"	:	In reading the key-in data, format error is shown.
"ALREADY IN !"	:	Already storing the part program of the same number.
"EDIT LOCK ON !"	:	EDIT LOCK is being ON, editing operation is made.
"MEMORY OVER !"	:	Exceeding memory capacity in part program.
"PROGRAM OVER !"	:	Exceeding 99 pcs of registeration of part program (basic), or 199 pcs (option)
"NOT FOUND !"	:	No intended data is found as a result of search.

These above displays are shown by flashlight.

(4) MST FIN waiting, dwelling and feeding display (flicker)

"M" ..... ready of M-command.
"S" ..... ready of S-command.
"T" ..... ready of T-command.
"F" ..... Under cutting feed. "R" is displayed in case of rapid traverse.
"P" ..... in tape reading.
"DWELL" ..... In dwelling.

M, S, T, F, P are shown each independently.
Display of buffer-full, label skip.
Display at the completion of forward reading.

"BUF" ..... Display at the completion of forward reading.
"LSK" ..... Display at time of lavel skip ON.

(5) IN/OUT, editing display (flicker)

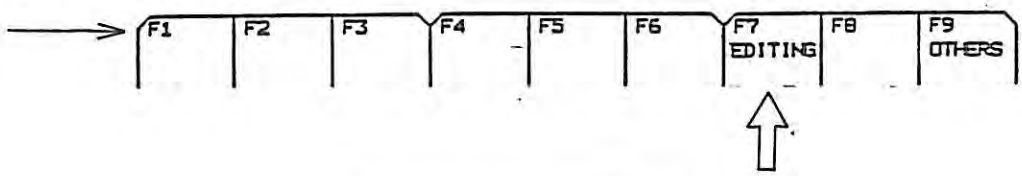
During punching tape input/output, address searching, or editing, the following message is flickered and shown.

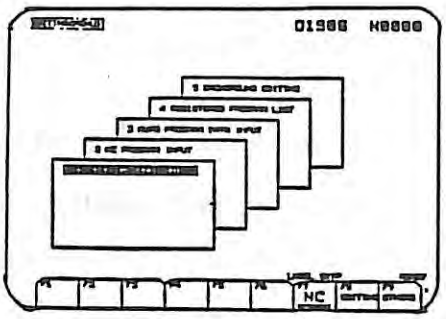
"IN" ..... in tape reading.
"VER" ..... in tape verifying.
"OUT" ..... in tape-punch out.
"AS" ..... in address searching.
"ALT" ..... in data changing at edition mode.
"INS" ..... in data inserting at edition mode.
"ERS" ..... in data erasing at edition mode.

4-5 Editing Operation

Procedure 1

Press [F7] (EDITING) key.





Procedure 2

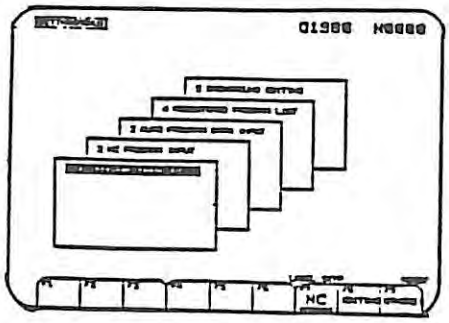
Move the cursor, and select the menu, and input it.

4-5-1 NC Program Punch Out

Stored programs can be outputted to the FA card, floppy disk, paper tape, etc. by connecting an external device.

Procedure 1

Display the edition operating screen.



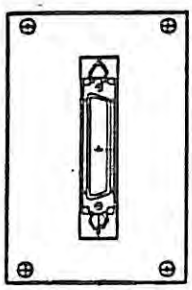
Procedure 2

Input the menu of NC-program punched-out by moving the cursor.

⟶ It changes the screen of NC-program punchout.

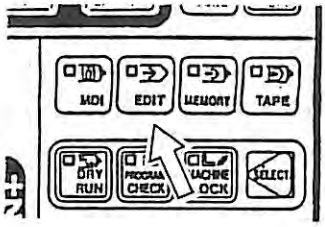
Procedure 3

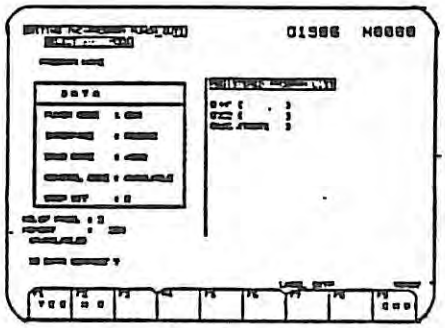
Connect the connector under the state of power OFF of puncher.



Procedure 4

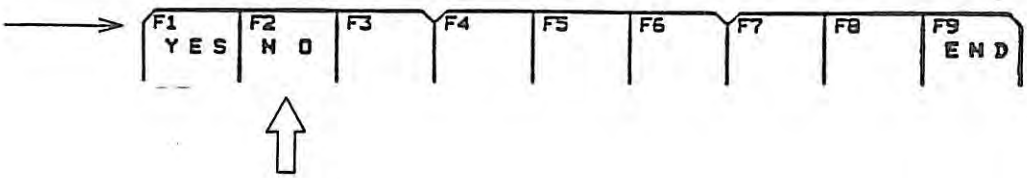
Press [EDIT] key.





In case without satisfaction, by the data-setting content, press [F2] (no) key.

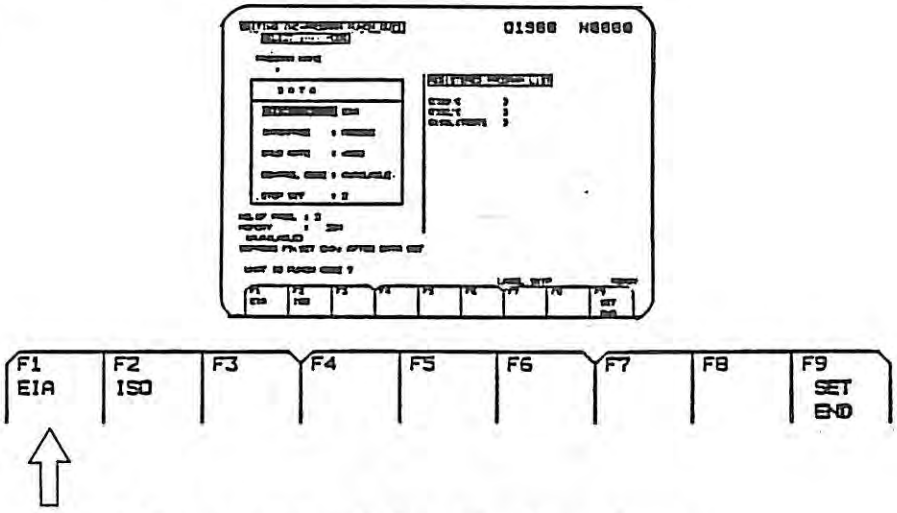
Press [F9] (end) key, then, editing operation (menu) is returned.



Screen and function key change.

Procedure 5

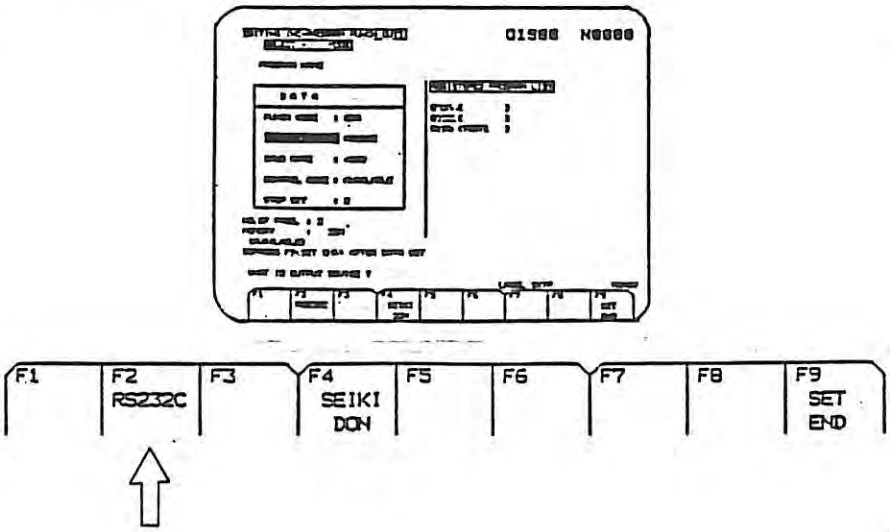
Press [F1] (EIA) key, [F2] (ISO) key of punch code.



Request for screen and function key change.

Procedure 6

Select the type of interface

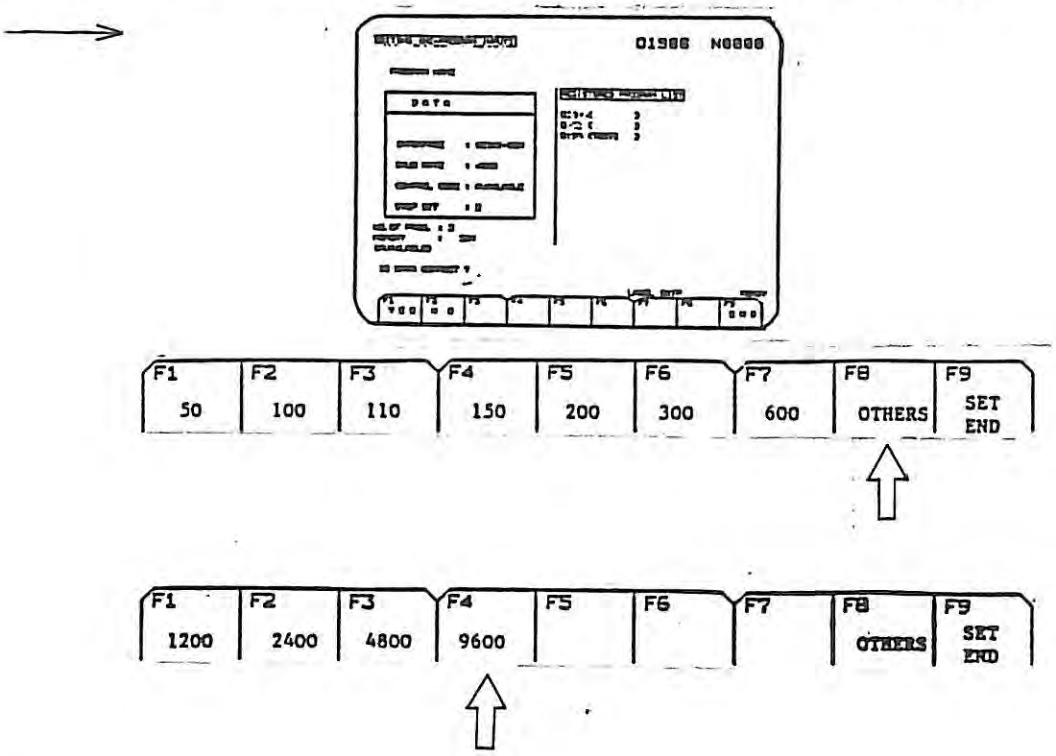


Request for screen and function key change.

Procedure 7

Select the type of baudrate.

When there is no selecting baudrate, press [F8] (OTHERS) key.



Procedure 8

Select the stop-bit and control code if any.

Procedure 9

After the end of complete setting, press [F9] (SET END) key.

⟶ Screen and function key change.

Procedure 10

Input the power of puncher.

Procedure 11

Set the key for writing.

Procedure 12

Input O-No.

⟶ Program is output.

[1] [2] [3] [4] [INPUT]

Note) ∘ A program can be erased by pressing [1], [2], [3], [4] and [ERS] in that order.

∘ All programs in the NC memory are outputted by pressing [-] [9] [9] [9] [9] and [INPUT].

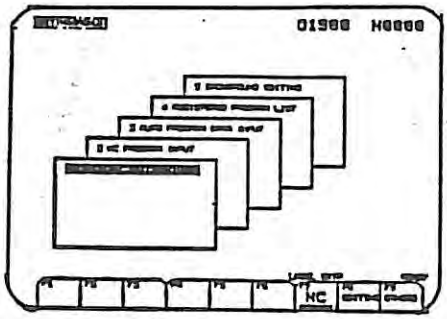
∘ All programs in the NC memory can be deleted by pressing [-] [9] [9] [9] [9] and [DELETE].

4-5-2 NC Program Reading

By the use of outside instruments, program tape can be memorized.

Procedure 1

Display the power of screen.



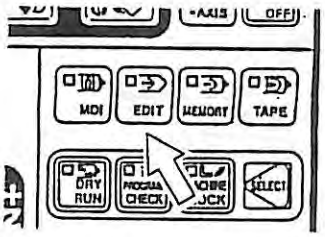
Procedure 2

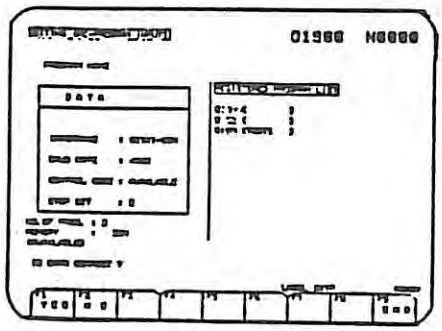
Move the cursor to the menu for NC-program reading.

⟶ NC-program reading screen changes.

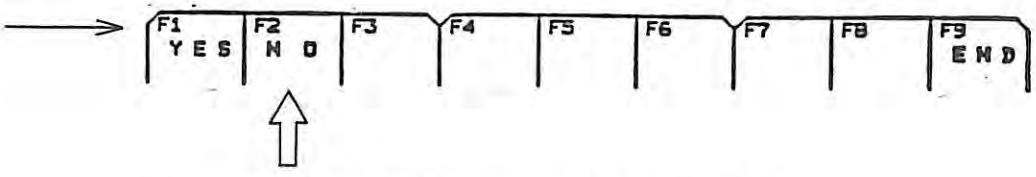
Procedure 3

Press [EDIT] key.





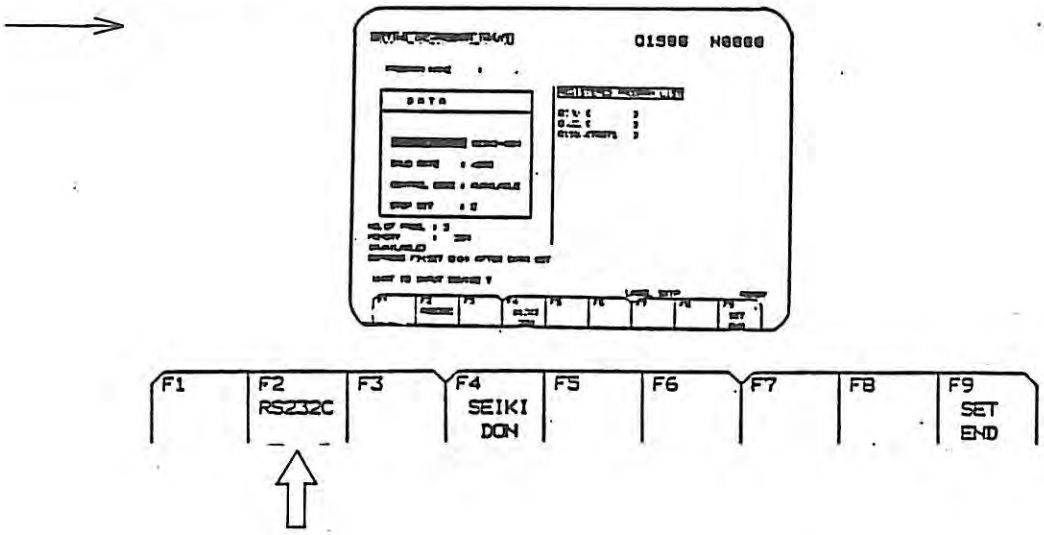
In case no setting of data-setting content, press [F2] (no) key.



Function key and request for screen change.

Procedure 4

Select the type of input interface.

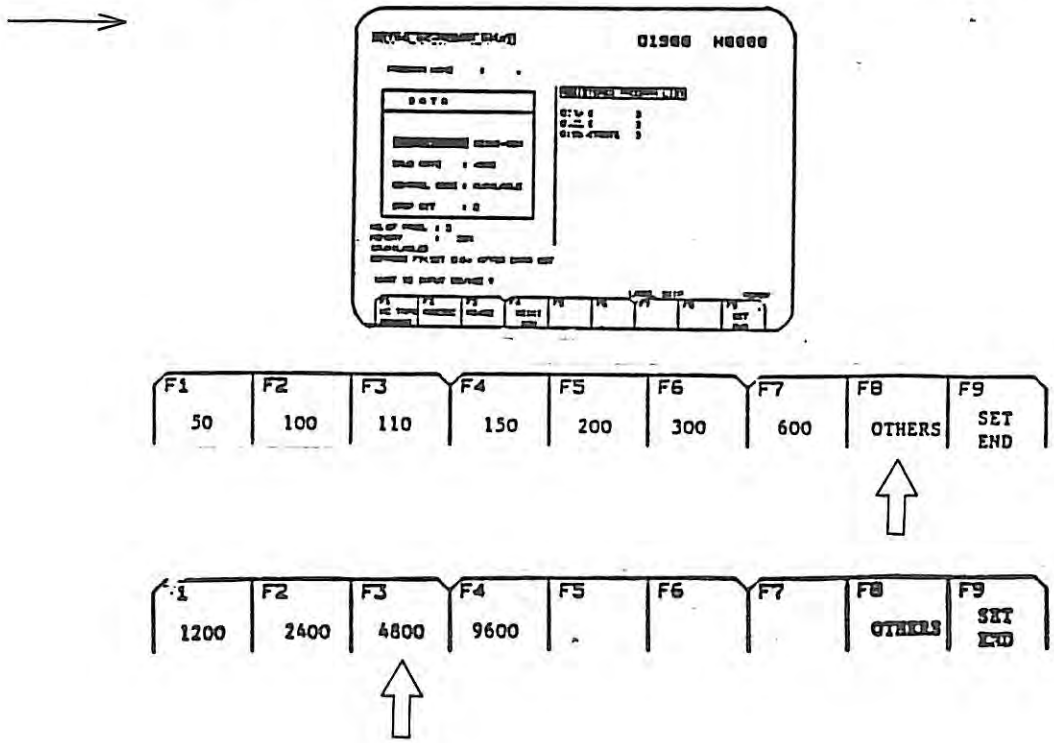


Request for screen and function key change.

Procedure 5

Select the type of baudrate.

When there is no selecting baudrate, press the key for others.



Procedure 6

Select the stop-bit and control code if any.

Procedure 7

After the end of complete setting, press [F9] (SET END) key.

Procedure 8

Input the power of puncher.

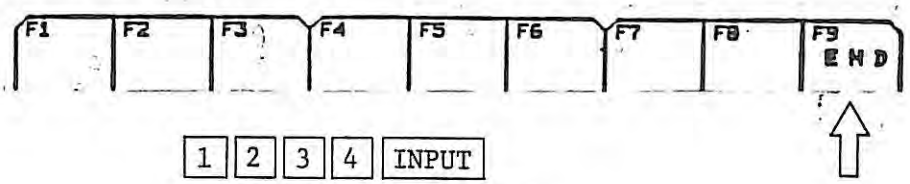
Procedure 9

Set the key for writing.

Procedure 10

Input O No., and after end of registration, reading starts.

⟶ Upon completing the program-reading, read program No. is displayed.



[1] [2] [3] [4] [INPUT]

[M] [O] [D] [E] [L] [INPUT]

Note) ∘ A program can be erased by pressing [1], [2], [3], [4] and [ERS] in that order.

∘ Multiple programs can be inputted by pressing [-] [9] [9] [9] [9] and [INPUT].

∘ All programs in the NC memory can be deleted by pressing [-] [9] [9] [9] [9] and [DELETE].

Naming (name-putting of program)

(1) By inputting Program No., and pressing [INPUT] key, ( ) is automatically generated in following program No.
⟹ 0 1 2 3 4 ( ).

(2) The display of function key becomes alphabetical.

(3) Name input is possible up to the maximum 8 letters.
(alphabet, numeral, -, .)

(4) By pressing [INPUT] key, program reading starts.

(5) By omitting the naming of (3), it is possible to make program reading without name. (In NC-program reading, Program No. can be omitted.)

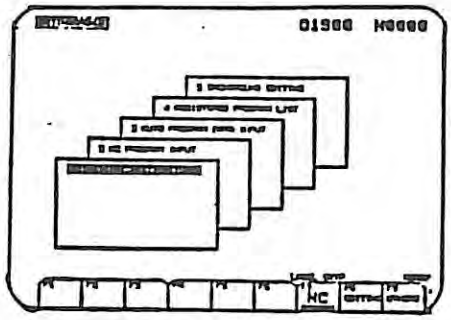
* Maximum 95 programs possible of naming can be made.
Upon registering more than 96 programs, there may be a case without matching of program No. with name. Program itself can be registered up to 99 as standard.
Upon changing Program No. with name-registration, the indicated name can be cleared (erased).
When altering, newly registering or deleting a program name, operate in the REGISTERED PROGRAMS LIST screen.

4-5-3 Auto-program Data Reading

Conversation-produced program data can be memorized.

Procedure 1

Display the editing operation screen.



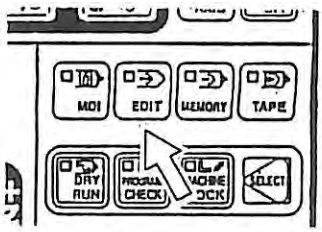
Procedure 2

Press [INPUT] after moving the cursor to the menu of auto-program data reading.

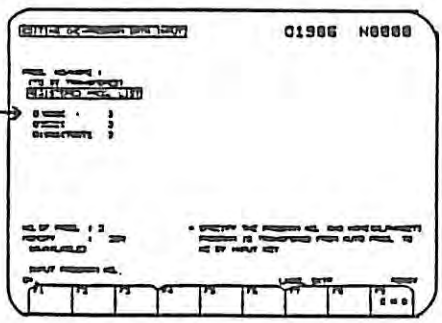
⟶ It is shown on the screen of auto-program data reading.

Procedure 3

Press the [EDIT] key.



Presently memorized program No.



Procedure 4

Set the key for writing

→

Procedure 5

Input O No., and after the end of name-registration, reading starts.

→ [1] [2] [3] [4] [INPUT]

Note) ◦ A program can be erased by pressing [1], [2], [3], [4] and [ERS] in that order.

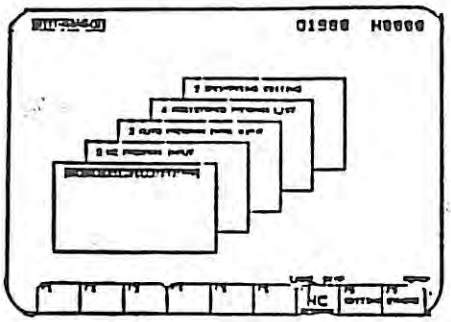
◦ When a program longer than the remaining capacity of the NC memory, a message "PROGRAM IS LONGER THAN REMAINING MEMORY CAPACITY" appears, and its program length(M) and number of characters(CH) are displayed. That program is not read in.

4-5-4 List for Registration Program

A list of stored program numbers is displayed to allow you to change the program number, delete/call the program, edit the program name and copy the program.

Procedure 1

Display the editing operation screen.



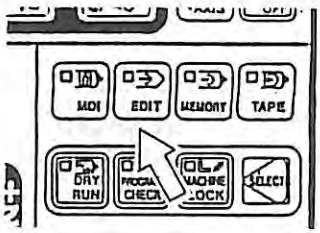
Procedure 2

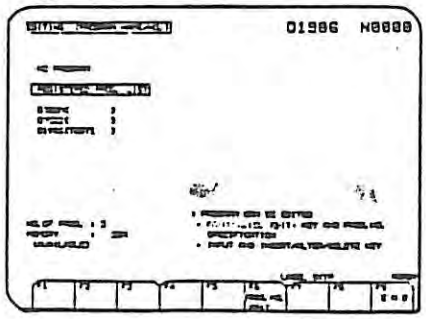
Press [INPUT] key after moving the cursor to the menu of list for registration program.

(Program Calling Out)

Procedure 1

Press the [EDIT] key.

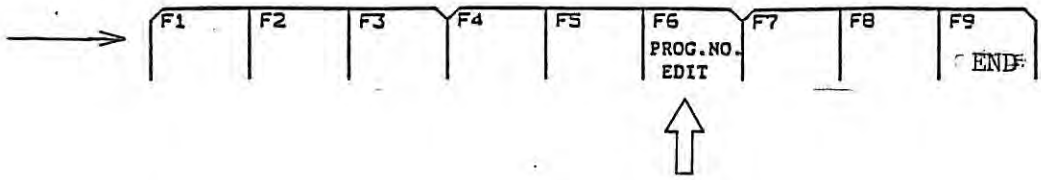




Calling O No. is displayed.

Procedure 2

Press [F6] (PROG. NO. EDIT) key.



Procedure 3

Input Program No.

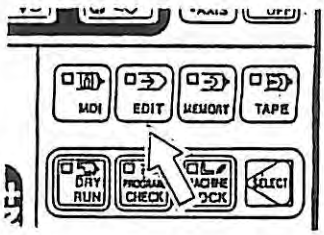
→ [1] [2] [0] [0] [INPUT]

(Program Edition)

Procedure 1

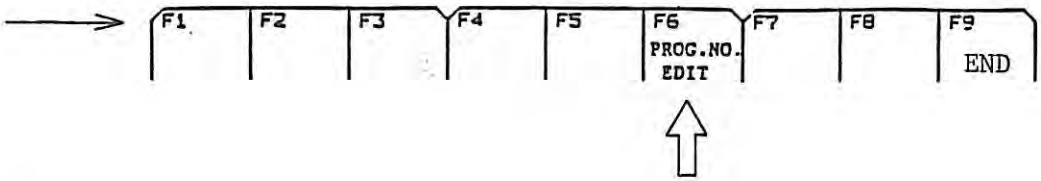
Press the [EDIT] key.

→



Procedure 2

Press [F6] (PROG. NO. EDIT) key.



Procedure 3

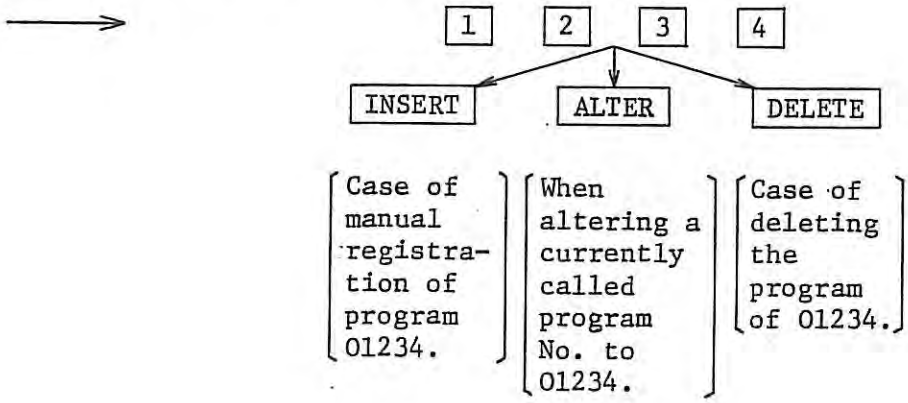
Set the key for writing.

→

Procedure 4

Input Program No.

Press editing key to meet the purpose.

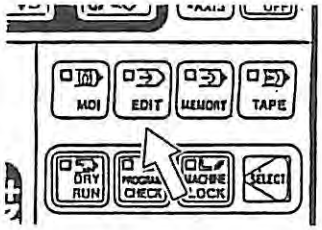


Note) With [-][9][9][9][9][DELETE], all memorized program disappear.

(Editing the Program Name)

Procedure 1

Press the EDIT key.

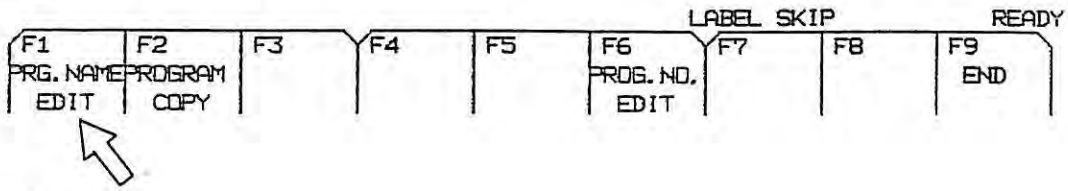


Procedure 2

Shift the MEMORY LOCK/WRITE key to "WRITE"

Procedure 3

Press the [F1] (PROG. NAME EDIT) key.



Procedure 4

Key in the program No. whose name is to be edited, and press the [INPUT] key.

→ [1] [2] [3] [4] [INPUT]

Procedure 5

Key in the name and press the [INPUT] key.

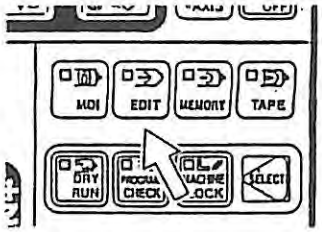
→ [M] [O] [D] [E] [L] [INPUT]

Note) When deleting a registered program name, press the [INPUT] key only.

(Copying the Program)

Procedure 1

Press the EDIT key.

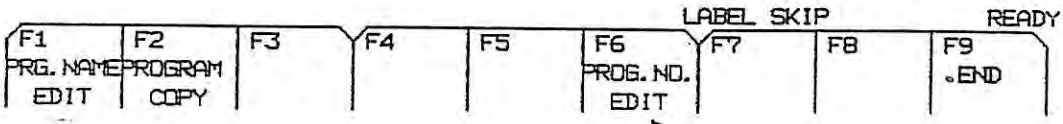


Procedure 2

Shift the MEMORY LOCK/WRITE to "WRITE".

Procedure 3

Press the [F6] (PROG. NO. EDIT) key to call the program No. to be copied.



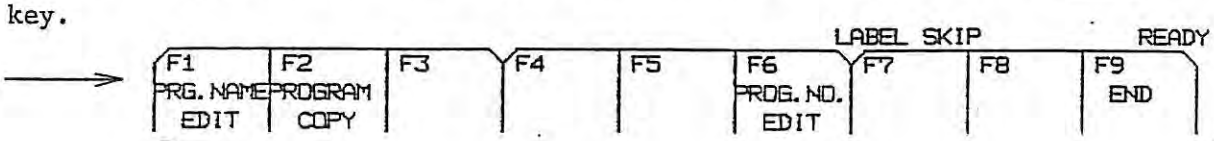
[1] [2] [3] [4] [INPUT]

The program No. currently called is displayed on the upper right part of the screen. When the program has been already called, this operation is unnecessary.
After calling the program, press the [F6] (PROG. NO. EDIT) key again to change a display of the function keys.

Procedure 4

Press the [F2] (PROGRAM COPY).

Key in the program No. to be copied and created, and press the [INPUT] key.



[4] [3] [2] [1] [INPUT]

Note) ∘ The contents of the program [1] [2] [3] [4] are registered as the program No. [4] [3] [2] [1] as they are. When the program O4321 is called, the O-number is 1234. Press the [O] [4] [3] [2] [1] and [ALTER] in editing operation. Then, edit the program as required.

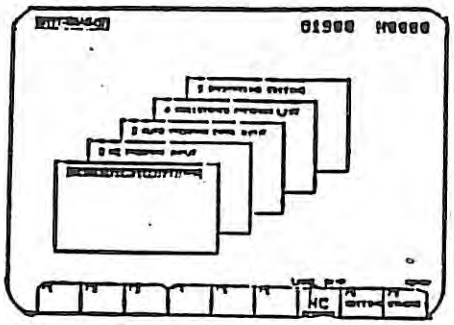
4-5-5 Background Edition

Features and restricted items of background edition

1. Edition can be made regardless of mode, except for the program under present machining.
2. During the display of screen for background edition, reset key does not function. This used only when returning the program to its beginning. (Operation does not stop even if this key is pressed during operation.)
3. Program transfer is impossible during the display of BUFFER in operation screen.
4. After program edition, be sure to press program-transfer key.

Procedure 1

Display the editing operation screen.

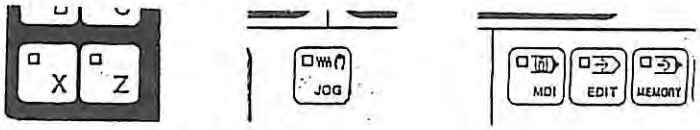


Procedure 2

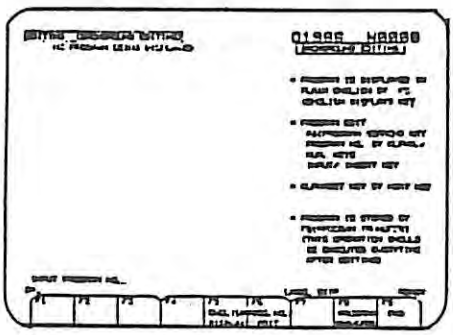
Press [INPUT] key after moving the cursor to menu of background editing.

⟶ It change into background screen.

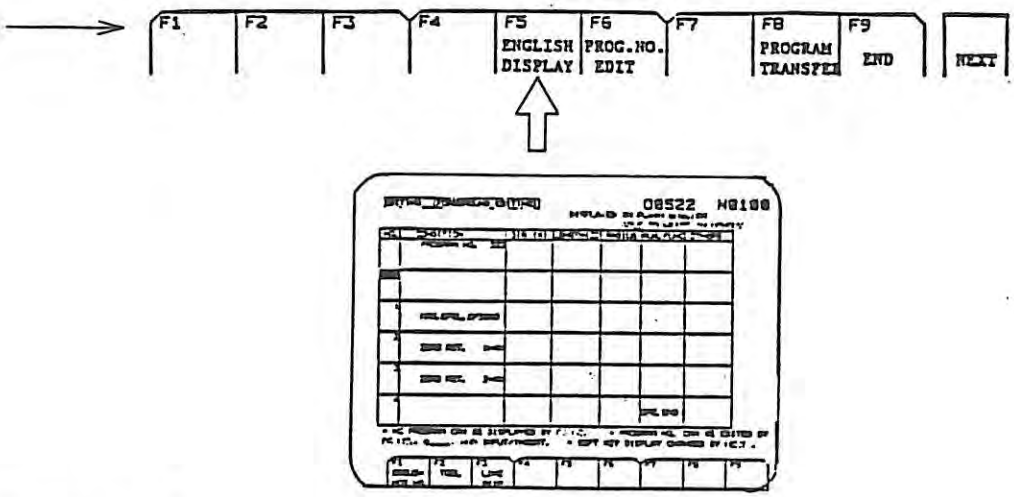
Program can be shown.



Editing can be made by all modes.



For edition of English word program, press [F5] (English display) key.



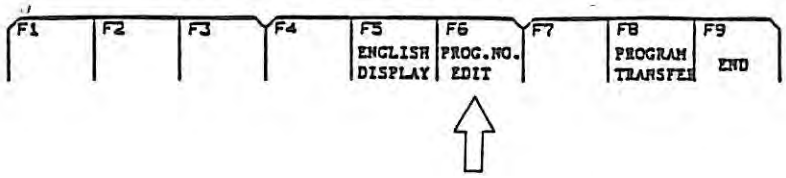
Procedure 3

Set the key for writing.

Procedure 4

Press the [F6] (PROG. NO. EDIT) key.

⟶ Registered program Nos. are displayed on the right side of the screen (except English display).



Note) When 25 or more programs have been registered, display them, with the Page key [▼].

Procedure 5

Input O No.

⟶ Program is called out.

[1] [2] [0] [0] [INPUT]

Procedure 6

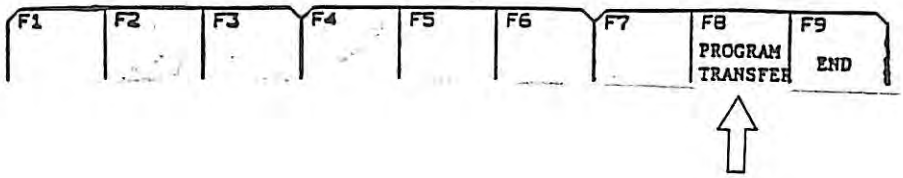
Program edition can be done.

⟶ For editing method, refer to "4-6-8 Program Edition".

Procedure 7

After the end of edition, press [F8] (program transfer) key.

⟶ Program is stored in memory.



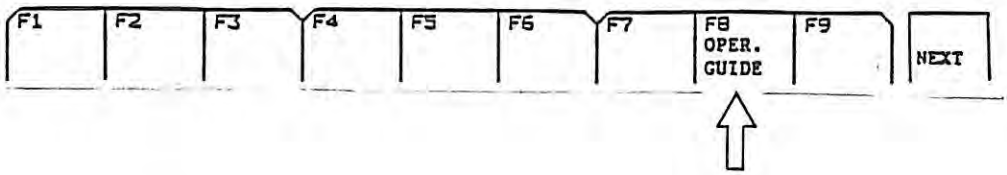
4-6 Operation Guide

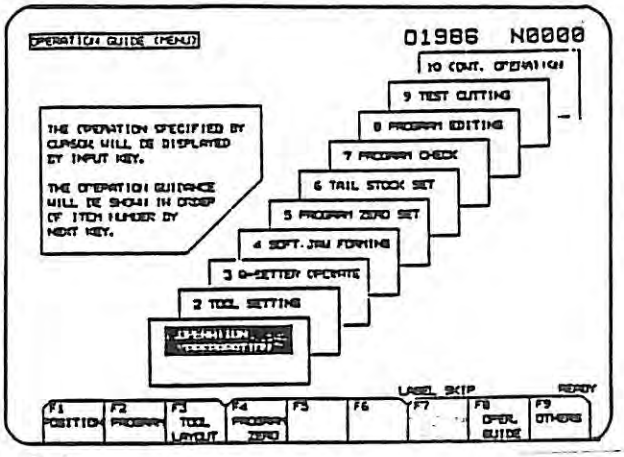
When you find no operation method, proceed with the operation by looking at the operation guide.

Procedure 1

Press [F8] (OPER. GUIDE) key.

⟶ Operation guide menu screen is displayed.





Procedure 2

Display cursor key, move menu, press [INPUT] key.

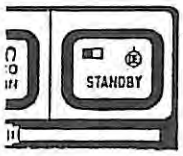
⟶ When there are some page in each menu, renew the page by the page key.

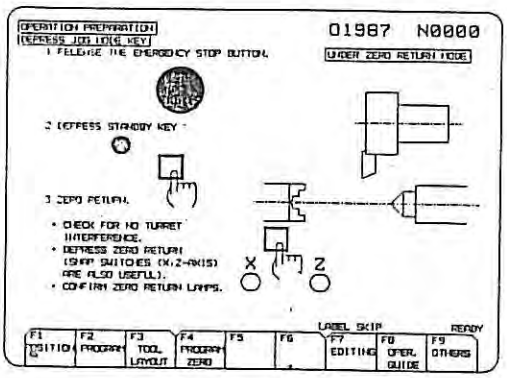
4-6-1 Preparation for Operation

Guide the machine from the power input up to the operable state.

Procedure 1

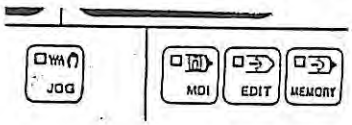
Reset the [EMERGENCY STOP] button.
Press the [STANDBY] key.





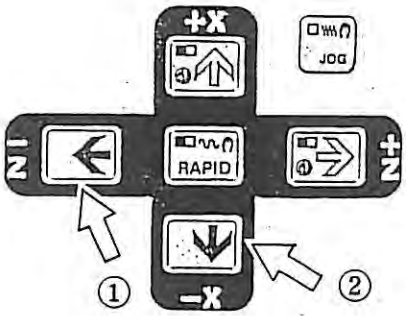
Operation guide

JOG operation is made at the time for power input.



Procedure 2

In the sequence of Z-axis and X-axis, move the tool base to the check side. (It is unnecessary without interference.)



Procedure 3

Press the key for zero-return.

Note) For axial movement, pay attention to the interference with tail stock.

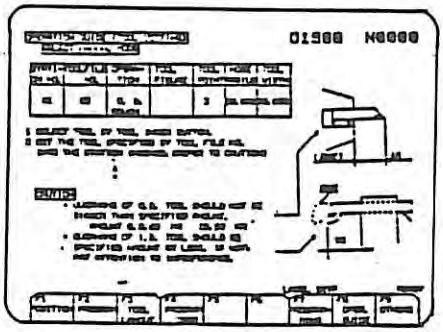
4-6-2 Mounting of Tool

Tool layout and tool-mounting cautions are displayed, tool for turret face is guided.

Procedure 1

Check if hereafter-machining program is called out.

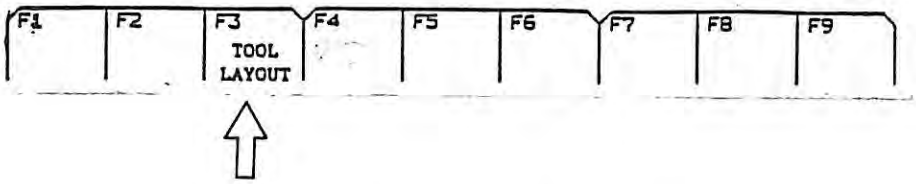
→ Operation guide

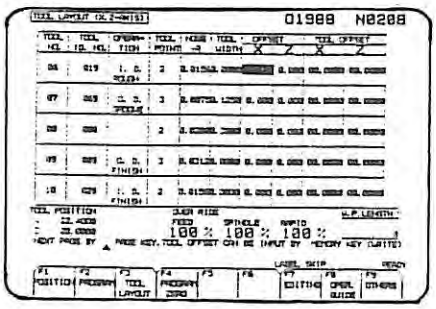


Procedure 2

In setting with list of tool layout, press [F3] (tool layout) key. Press PAGE key, then, screen is renewed.

→

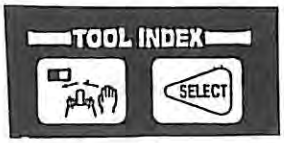




Procedure 3

Index the turret, and mount the tool while observing the tool-layout screen.

→



1. Nose-R and tool width can be changed by tool layout.

Procedure 1

Move the cursor to the changing position.

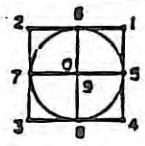
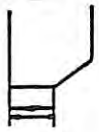
Procedure 2

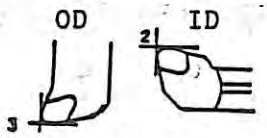
Set the data-key in.

Procedure 3

Press [INPUT] key.

→

Tool nose point	Nose R	Nose Width	Offset	
			X	Z
3	[1.2]			
				

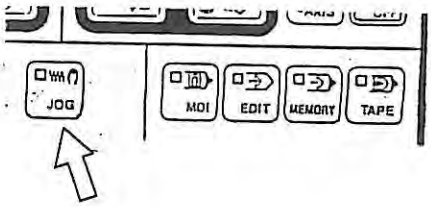


4-6-3 Handling of Q-setter

In applying the tool nose at the sensor (measuring part) for Q-setter, tool-projecting amount (mounting dimension) can be automatically input into tool file.
Tool file is displayed, and mounting dimensional procedure is guided. (When using the Q-setter, operate in this screen or the TOOL LAYOUT screen.

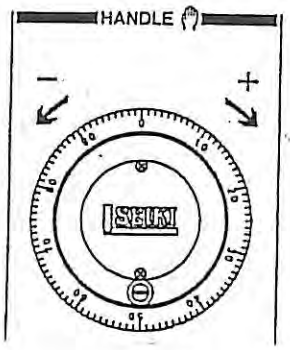
Procedure 1

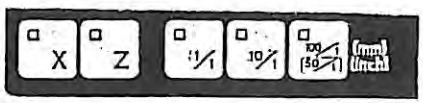
Press [JOG] key.



Procedure 2

Lower Q-setter to move the position not to interfere with tools stand.

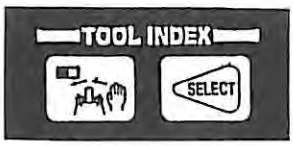


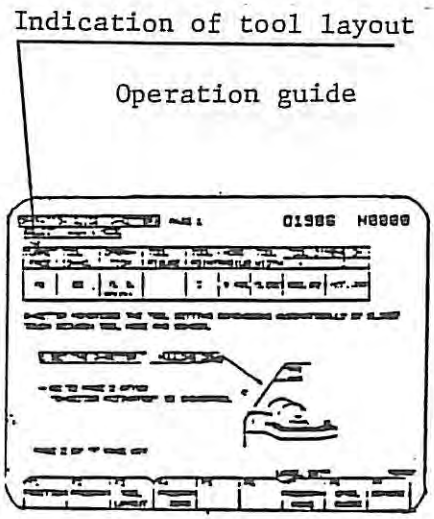


Procedure 3

Call out the tool to apply it to Q-setter.

→ On the surface of the present indexed turret, No. is changed to the tool-mounting position.





Procedure 4

Lower Q-setter

⟶ At this time, turret head may be at any position unless it does not interfere with Q-setter.

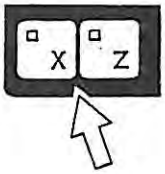
There is no need to return it to zero point !

With page key, operation-guide screen changed.

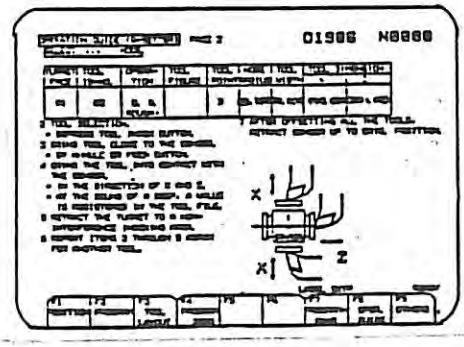
Procedure 5

Press the feed axis [X] or [Z] key.

⟶



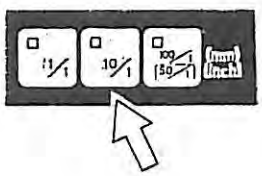
Operation guide



Procedure 6

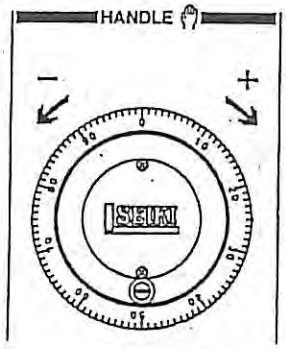
Press handle-magnifying [10/1] key.

⟶



Procedure 7

Turn the handle to one side, and position the tool nose at the sensor-center part.



Procedure 8

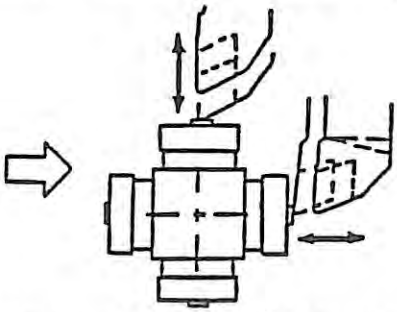
Apply tool nose at the sensor.

Mounting dimension is input.

Tool dimension	
X	Z
13.500	76.564

Procedure 9

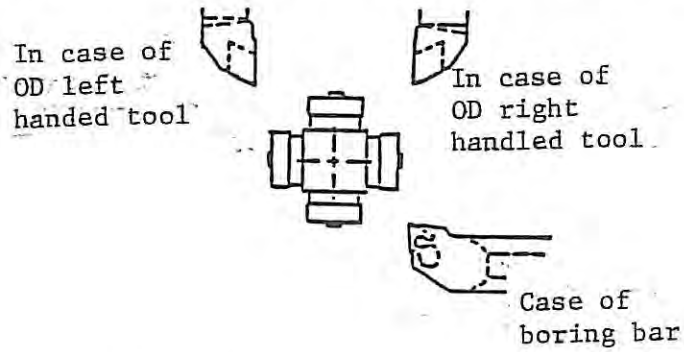
Apply the tool nose at sensor repeatedly several times.



Procedure 10

By handle feed, release the tool nose to a safe position from the sensor.

→ Safe position means the position without tool interference.

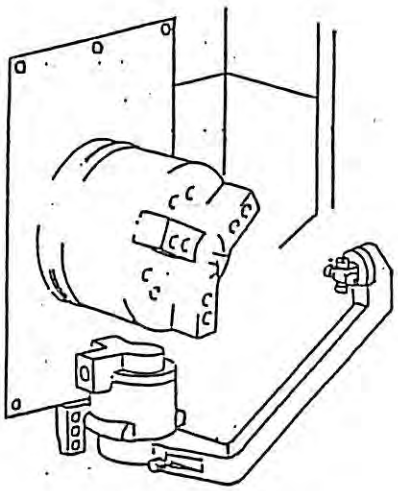


Request the mounting dimension of the next tool.

Repeat Procedure 3 to 10, and demand the mounting dimension of each tool one by one.

Procedure 11

Store the tool setter.



(Caution)
- When storing a Q-setter, the mounting dimensions will change if you touch a sensor. Store it after setting the mode to other than feed, X, Z, B (option) or C (option).
- Message is put out when the measured value by Q-setter exceeds the maximum projected amount of the tool shown in operation guide (tool mounting).

Reference: In the case of threading tool

The tool offset value for Z is obtained with the side of the tool as shown in Fig. 1.2 in threading tools. However, due to the difference in cutting blade position, the effective length of thread will be made short by the width "T".

Therefore, in order to thread to the correct effective length as shown in Fig. 3, first obtain the tool offset value with a tool setter as in Fig. 1 below and then input to the dimension adjustment (length) the width T for "-" side ("+" side in Fig. 2 below).

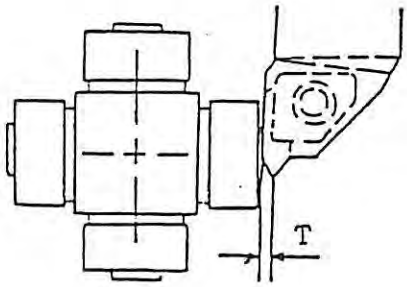


Fig. 1
(Right-threaded)

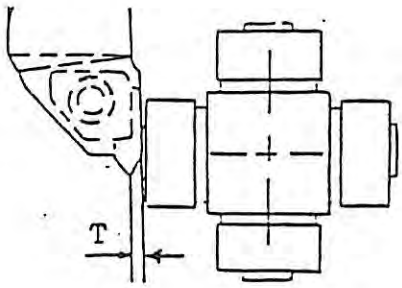


Fig. 2
(Left-threaded)

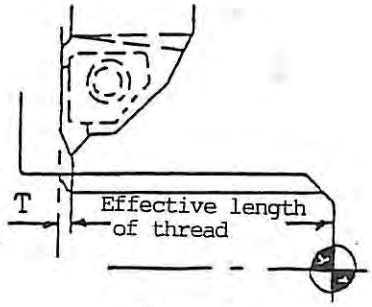
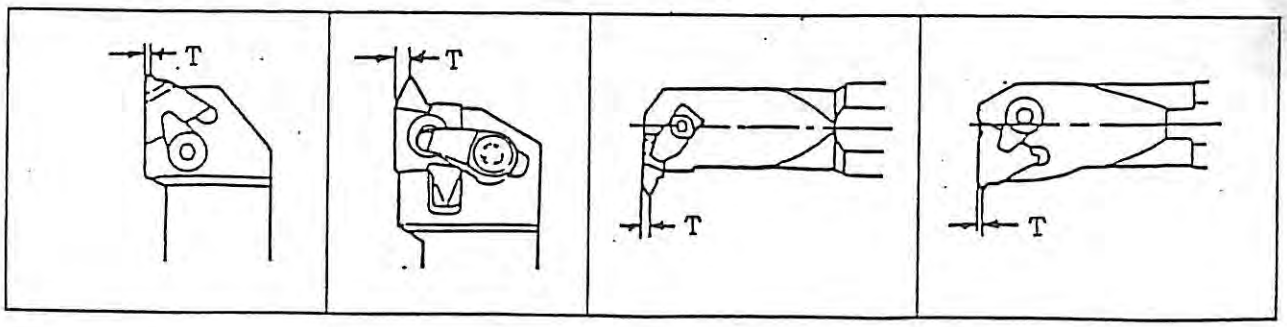


Fig. 3



How to obtain the mounting dimension of tool not to be applied to Q-setter.

Note) Operate after setting the machining reference point.

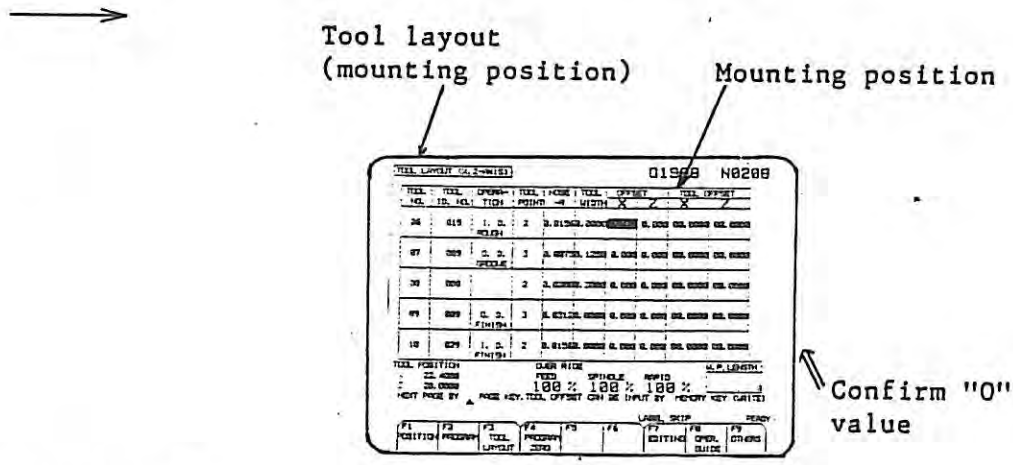
1. How to obtain the mounting dimension of longitudinal direction (Z-axis)

Procedure 1

Turret is indexed. Thus, tool is indexed.

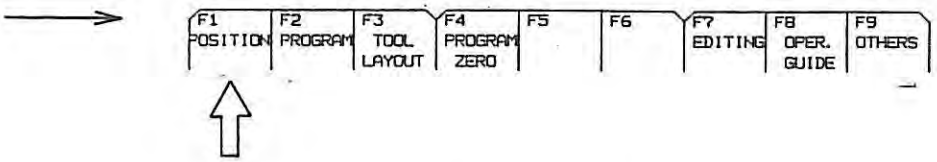
Procedure 2

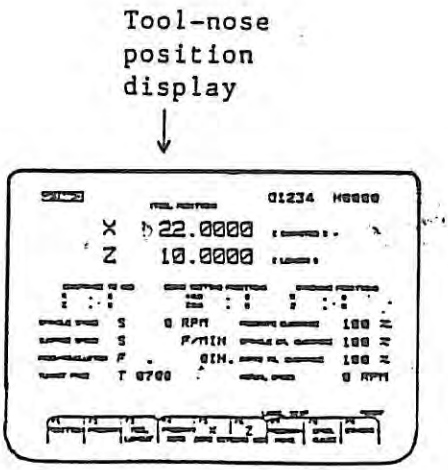
Confirm "0" value of mounting dimension (longitudinal direction)
(If it is not set to "0", set it to "0".)
Setting method is refer to "4-4-3 Tool Layout".



Procedure 3

Select the positional screen for observing the tool nose position.





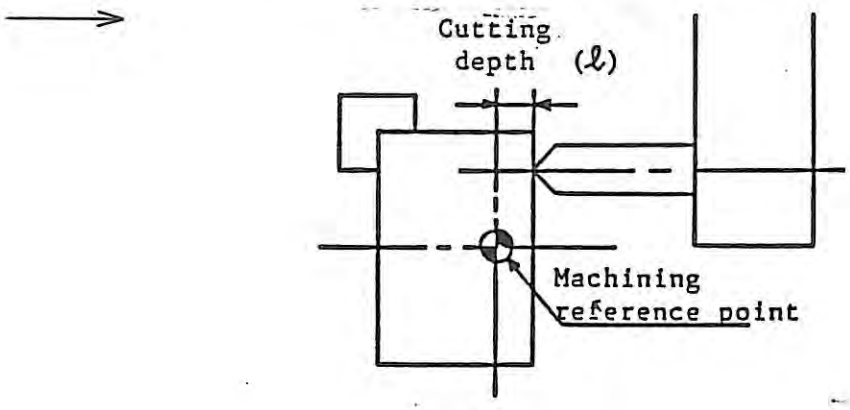
Procedure 4

i) Apply the tool at work end.

ii) At this time, observe tool nose position (Z).

iii) Set the value taken cutting depth (ℓ) from tool nose position (Z) to tool layout (mounting position).

Setting method is refer to "4-4-3 Tool Layout"



Mounting dimension(Z) = Tool-nose position(Z) - Cutting depth(ℓ)

(Caution) Before this operation, check if the setting position of machining standard point is correct. (If it is a tool applied to Q-setter, when it is applied on work-end face, tool-nose position should be at the same position as that of cutting depth.)

2. How to obtain the mounting dimension of diameter direction (X-axis)

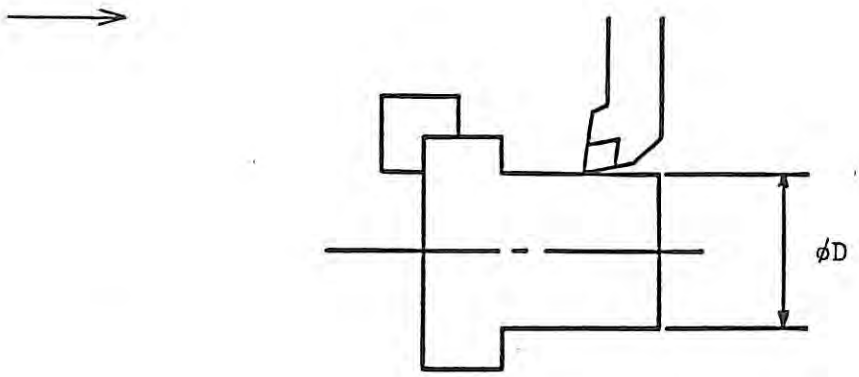
Procedure 1 ∿ 3

Same at longitudinal direction

Procedure 4

i) Turn the workpiece, and observe the value of tool nose position (X).
ii) Measure the diameter ϕD of actual cut workpiece.
iii) Set the value taken work diameter ϕD from tool nose position (X) to tool layout (mounting position).

Setting method is refer to "4-4-3 Tool Layout".



Mounting dimension(X) = Tool-nose position(X) - Work diameter(ϕD)

(Caution) Before this operation, check if the setting position of machining standard point is correct. (If it is a tool applied to Q-setter, when it is applied on work-end face, tool-nose position should be at the same position as that of cutting depth.)

4-6-4 Soft Jaw Cutting

SOFT JAW

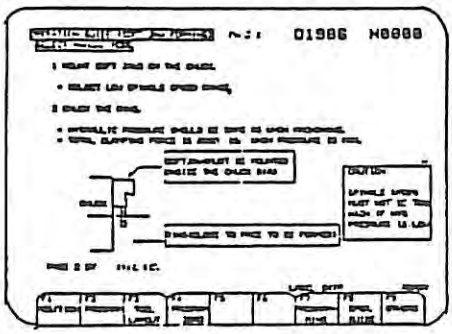
For chucking the cutting face, soft jaw is used for producing highly accurate product without damage the workpiece. Also, by forming the soft jaw on its diameter to match the chucking part, safer and stable cutting can be made, thus the precision of workpiece can be elevated. Soft-jaw forming method is guided, and range change selection and rpm input can be made.

Procedure 1

Select the MDI mode and specify the spindle speed low range.
Input a spindle speed.
After setting, select the JOG mode.

→ [3] [0] [0] [INPUT]

Cutting condition		
Speed	. S [300]	
Range	[Low]	High



Operation guide

Procedure 2

Mount the soft jaw, and set the chuck pressure to the actual using pressure.

Procedure 3

Chuk the ring.

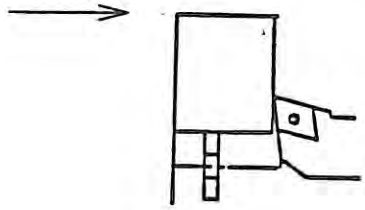
Procedure 4

Attach the using tool to Q-setter.

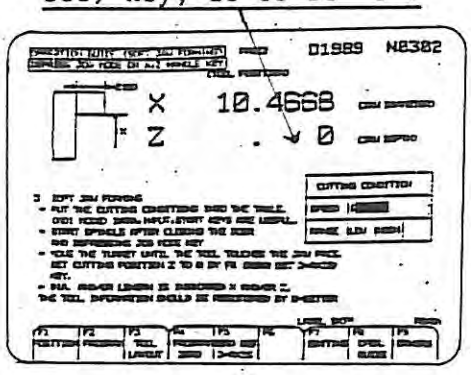
⟶ Refer to Handling of Q-setter (4-6-3)

Procedure 5

Press the [F6] (Z-ZERO SET) key while attaching the tool to jaw-end.



When press F6 (Z zero set) key, it to be "0".

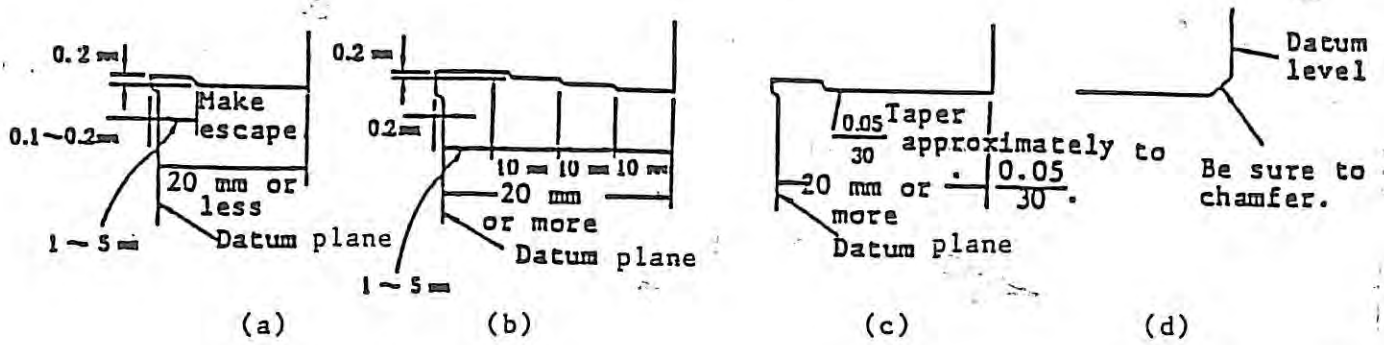


Operation guide

Procedure 6

Cut the jaw while watching the tool nose position.

Refer to the below Figure.



If the soft jaws with higher accuracy are required, cut also a part chucking the ring. When the soft jaws are mounted again, cut them again about 0.2 mm in order to maintain chucking accuracy.

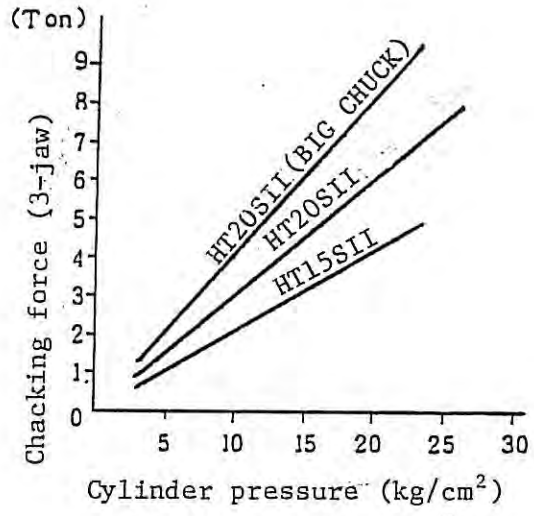
Precautions

1. Be sure to mount the jaws lest they should be projected from the chuck outer diameter. (Refer to Fig. 2 and Fig. 3)
2. Use standard soft jaws.
3. When machining a thin workpiece, if it is chucked with a cylinder pressure lowered in order to avoid the deformation of the workpiece due to chucking, see to it that a spindle speed is not too high. (Refer to the below-mentioned Fig. 1 and Fig. 2)
   A cylinder pressure control valve is located on the left side of the spindle motor.
   A cylinder pressure control valve is located on the lower left side of the spindle motor.

Cylinder Pressure and Chucking Force

Diameter of the chucking area : ϕ70 (2.76")

Jaws used : Standard Soft jaws



Note) Although the maximum set pressure slightly differs depending on each chuck, it has been adjusted so that a chucking force can be obtained with it.

HT15SII ..... 4.8 tons

HT20SII ..... 8 tons

HT20SII ..... 9.6 tons
(BIG CHUCK)

4-6-5 Machining Reference Point

With program operation, in performing program check, trial cutting or continuous operation, instruct the distance from machine-zero point to the so-called finishing end.

The procedure to obtain the distance from machine-zero point to machining reference point is guided, and rpm input can be made.

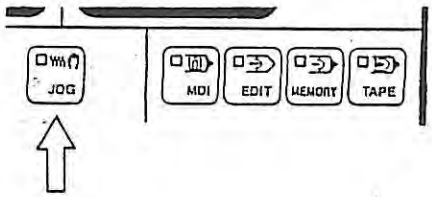
(1) Machining reference point setting

Procedure 1

Display the screen for setting the machining reference point.

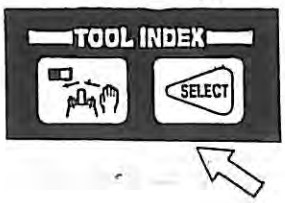
Procedure 2

Press the [JOG] key.



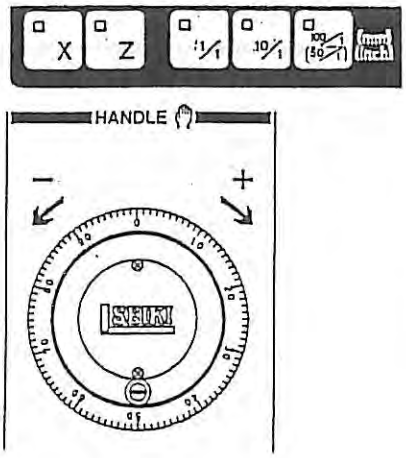
Procedure 3

Call out the standard bite (outside roughing tool).

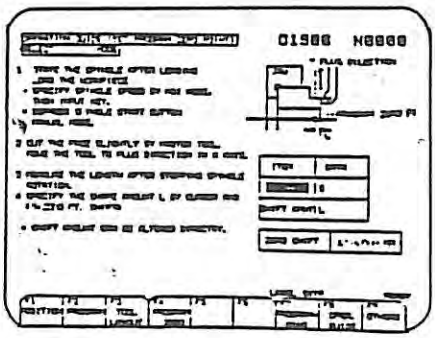


Procedure 4

Chuck the work, and approach to the cutter.



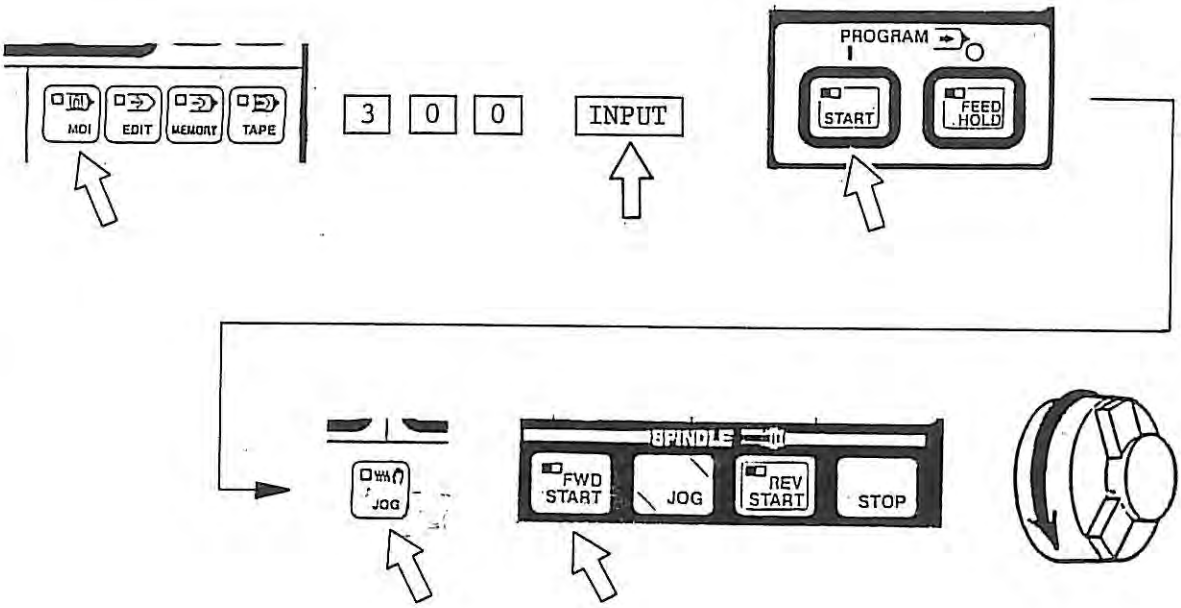
Operation guide



Procedure 5

Turn the spindle.

1) Press the [M.D.I] key.
2) Press the [INPUT] key by pressing the data-key.
3) Press the [START] key.
4) Press the [JOG] key.
5) Press the [SPINDLE-FWD START] key.



Note 1) On spindle range (M40, 41)

When spindle rpm is less than 1000, command low-speed range M40.
When spindle rpm is more than 1000, command high-speed range M41.

2) When data command is mistaken, press reset key or cancel key, then, again make key-in.

Note) When the spindle does not turn, either one of the following items is not prepared.

(1) Interlock of spindle rotation is not released.

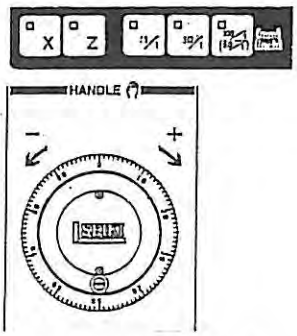
(2) The clamping direction of chuck key is not the same as the opening/closing direction of chuck.

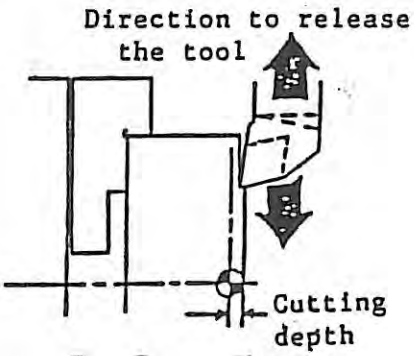
(3) Door opens.

(4) Q-setter or Z-setter (option) is not at its escape-position.

Procedure 6

Cut the work-stock face up to the degree to take out the black skin within the cutting margin, and release the tool to + direction of X-axis.





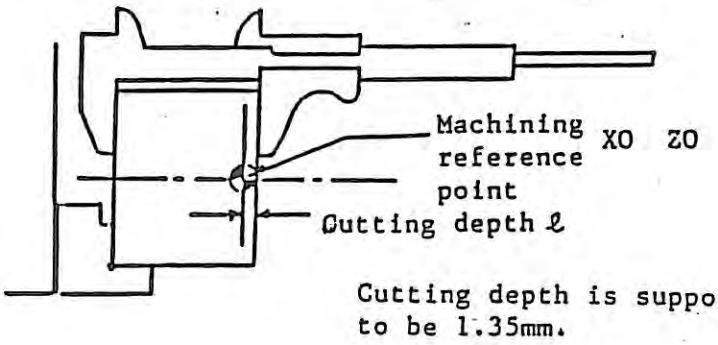
* Do not move Z-axis.

Procedure 7

Press spindle-stop key for stopping the rotation of spindle.

Procedure 8

Obtain the cutting depth of work. * Note 2



Cutting depth is supposed to be 1.35mm.

Procedure 9

Move the cursor to input value of cutting allowance, and press the key for the cutting allowance.

Press the [F5] (ZERO PT. SHIFT) key.

(At this time, work-length of tool-layout is "0".)

Item	Data
Sp. speed	S300
Shift amnt	L1.35

Zero shift	mm

[1] [.] [3] [5]

Note 1) Before pressing the shift key of reference point, hereafter-machining program should have been called out.

2) In obtaining the cutting depth of workpiece, if the tool stand should be moved toward the Z-axis plus direction, before its moving, press the [F5] (ZERO PT. SHIFT) key. (Without considering the cutting depth, set reference-point shift amount)
After movement, by inputting cutting allowance only, shift amount is deviated as much as the cutting allowance amount.

3) Even when shift amount is obtained, if program is called out, the value is renewed. Thus, for taking (keeping) this value, edit L-value in the setup information ( ) in the program to the same amount as that of L-value.

(2) Setting of machining reference point (Z-setter) ..... Option

Procedure 1

Take the setting screen on the machining reference point.

Procedure 2

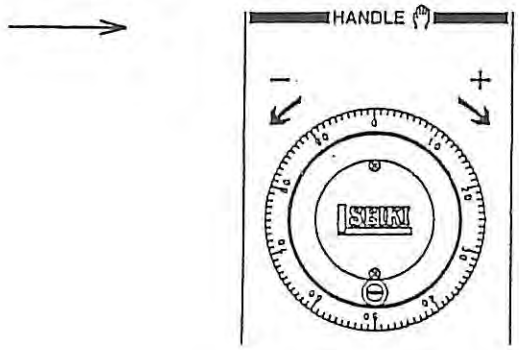
Press the [JOG] key.

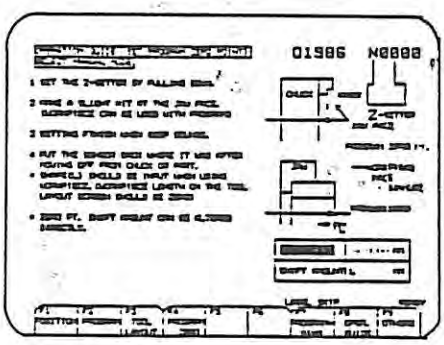
Procedure 3

Lower the Z-setter.
(At this time, for safety, interlock is set to the spindle rotation or tail spindle.)

Procedure 4

Bring the sensor of Z-setter into contact with the end face of the jaw. The time sounding of pee means the end of setting for reference point shift amount.





Procedure 5

Bring the sensor of Z-setter into contact with the end face of the work, and then input the amount of cutting depth.
(In this case, work length on the screen of tool layout becomes "0".)

Note 1) Even after shift amount is obtained, if program is called out, the value is renewed. Thus, for keeping this value, edit L-value in the setup information ( ) in the program to the same amount as that of L-value. In some cases, edit W-value to the same value as that of work length on the screen of tool-layout.

Relation between machining reference point and set-up information

The relation between the machining reference point shift-amount (L) by machining reference point setting and set-up inforamtion (information in ( ) of program) within the program is as follows:
Firstly, the set-up information of program prepared by auto-program shows the following shape.

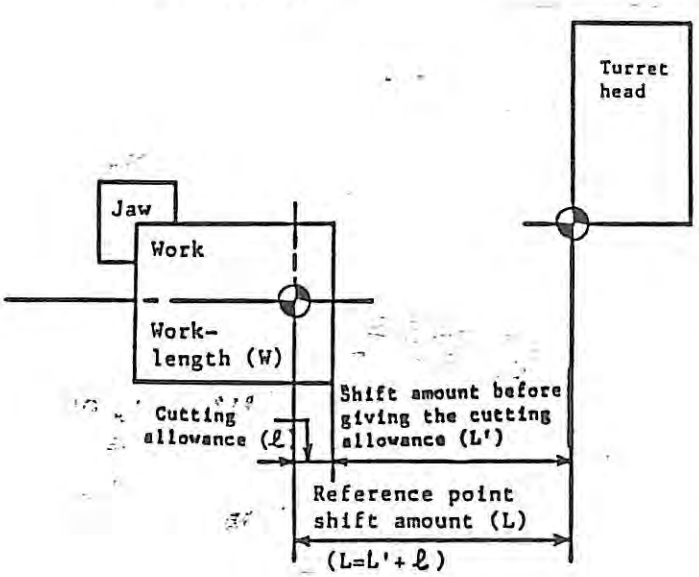
(Example) O××× ;

(TL01/03 TL02/36 TL04/15 W50.0 L0) ;

- (TL01/03 TL02/36 TL04/15): Indication of using Turret No. and Tool No.
- W50.0: Work-finish length
- L0): Machining reference shift amount

(1) Case without Z-setter

Upon calling the program shown in the above example, tool layout is prepared based on TL. Also, L-value is set to the reference-point shift amount of F4 (PROGRAM ZERO) screen.
(No setting is made when L is 0.)
In preparing the program by auto-program, output is made by L0, then, the previously set value is kept as it is.
Work-length W is not necessary at the time without Z-setter, thus, W-value is not set to the work-length of F3 (TOOL-LAYOUT) screen.
(Usually, it is used with work-length (W) = 0.)
The following shows the relation between the machining reference point shift amount and set-up information. (Obtained shift amount is 250.0.)



∘ Tool layout
Work-length (W) 0
(Ignore the set-up information W in the program.)

∘ Machining reference point setting
Reference point shift amount (L) 250.0

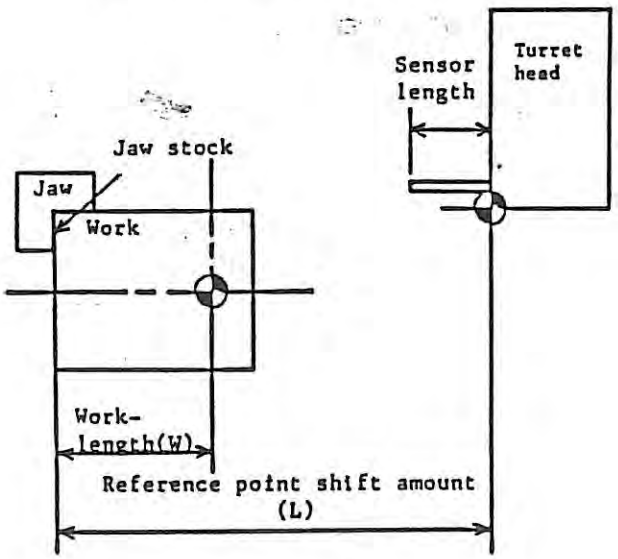
(When set-up information "L" in the program is "0", 250.0 is kept as it is.
If necessary, edit L in ( ) as 250.0)

O×××× ;
(TL01/03..... W50.0 L250.0);

(2) Case with Z-setter

Upon calling the program as in the example on previous page, tool-layout is prepared based on TL-information. Also, W-value is set to work-length of F3 (TOOL LAYOUT) screen, and L-value is set to the reference point shift amount of F4 (machining reference point setting). (No setting is made when L is 0.)
In preparing auto-program, output is made with L = 0, then, the previously set value is kept as it is.
In case of the machine with Z-setter, setting of the machining reference point is performed by bringing Z-setter into contact with the end face of the jaw as standard and with the end face of the work as well. The following shows these 2 examples.

① Case of bringing Z-setter into contact with the end face of jaw.



° Tool layout
Work-length (W) 50.0

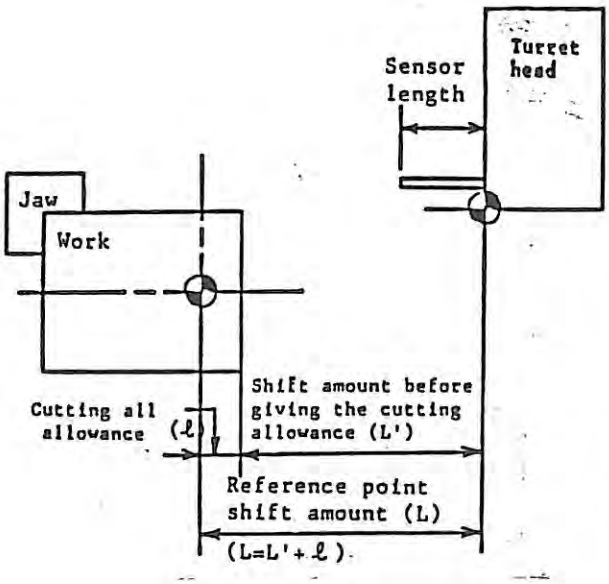
(Set W-value of set-up information in program.)

° Machining reference point setting
Reference point shift amount (L)
300.0

(When set-up information "L" in the program is "0", 300.0 is kept at it is. If necessary, edit L in ( ) as 300.0.)

O×××× ;
(TL01/03 ..... W50.0 L300.0);

② Case of bringing Z-setter into contact with the end face of work



∘ Tool layout

Work length (W) [0]

Upon inputting the cutting allowance (ℓ) with machining-reference point setting screen, judgement is made as in bringing Z-setter into contact with the work-end fa face, and work-length of tool layout is set to "0".
In the use of this system, edit the work-length in the program into W = 0.

∘ Reference shift amount (L)

[250.0]

When the set-up information L in the program is "0", it remains as 250.0.
If necessary, edit L in ( ) as 250.0.

```
O ××××;
(TL01/03 ..... W0 L250.0) ;
```

4-6-6 Setting of Tail Stock

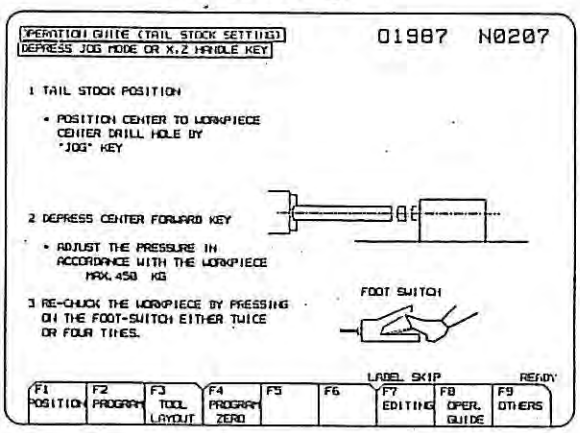
Operating of tail stock and cautions are as follows:
When the center is not used for chuck work etc., retract the tail stock to the retract end.
Never use the fixing center for the tail stock.
When the center drill hole is small such as in machining small-diameter workpiece, use a rotary center for low-load.

Procedure 1

Set the hydraulic pressure of the tail stock.

⟶ Jog the tail stock forward.

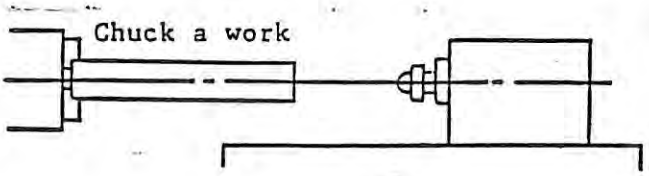
Operation guide



Procedure 2

Chuck a workpiece.

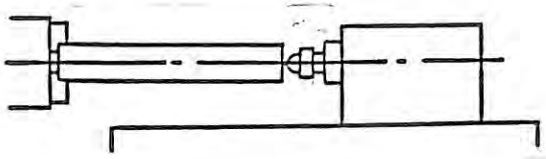
⟶



Procedure 3

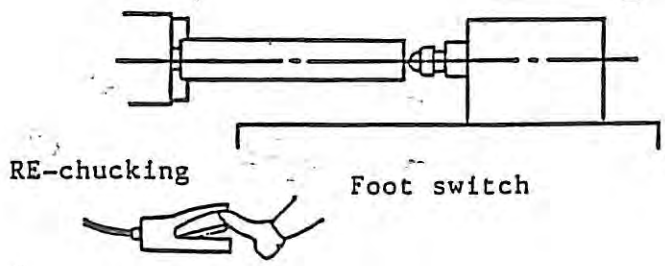
Press the Center Advance Inch key to advance the center until it enters a center hole.

⟶



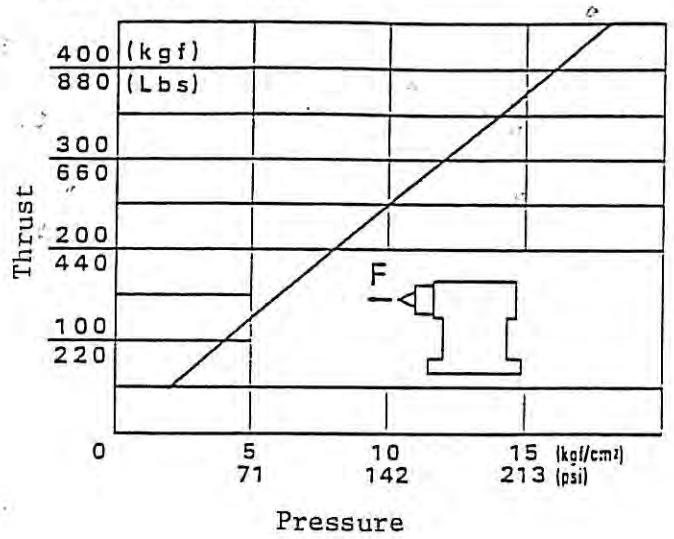
Procedure 4

Advance the tail stock (press the Center Advance key).
Rechuck the workpiece by mincingly pressing the chuck opening/closing foot switch twice.



◦ The following figure shows relations between a tail stock pressure and a thrust.

Max. 450 kgf (990 Lbs)
(HT15SII,HT20SII)

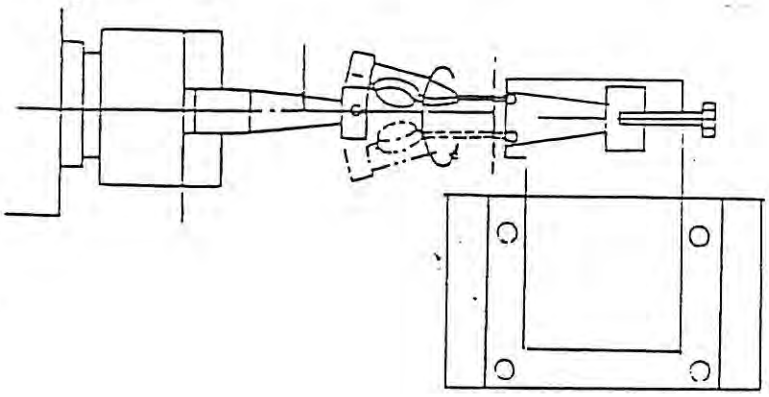


AAthrust reference value is about 200 kgf (440 Lbs) when a material is equivalent to S45C and its size is ϕ100 × 300 (ϕ3.9" × 11.8").

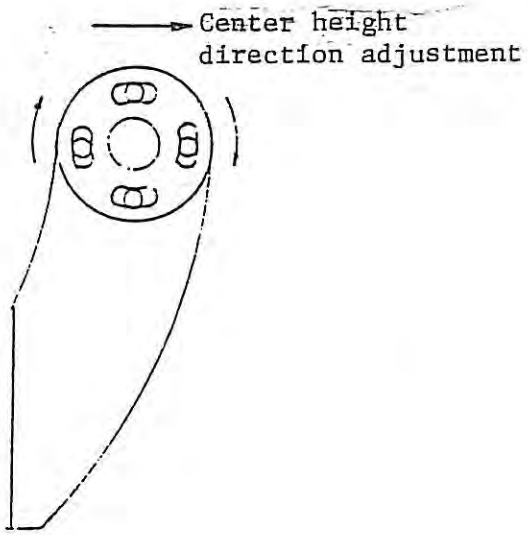
Tail Stock Centering Method

The chuck and tail stock has been centered with each other upon shipment. However, when tail stock center adjustment is required in center work machining, adjust as follows:

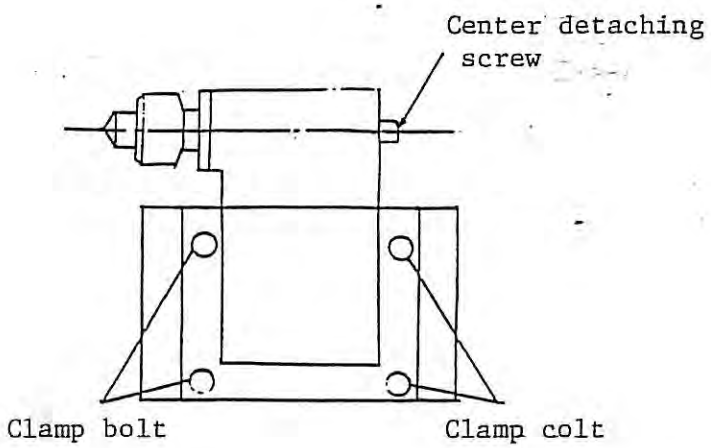
1. Mount a dial gauge to the chuck as shown in the figure below, swing around the tail spindle ID, loosen the bolt located at a tail spindle nose and adjust a center height direction, rotating a flange.



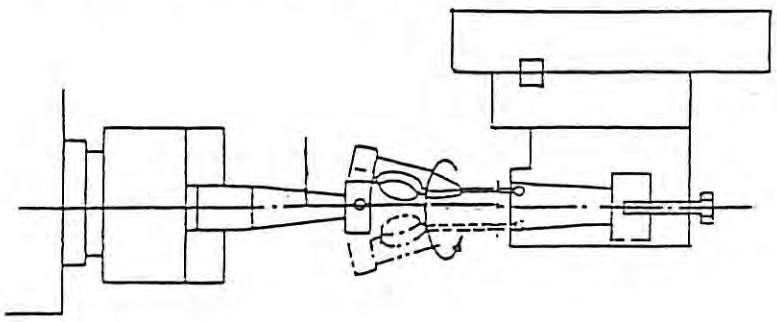
2. Swing around the dial gauge, adjust the center height direction and tighten the bolt. After locking it, recheck the center height direction.



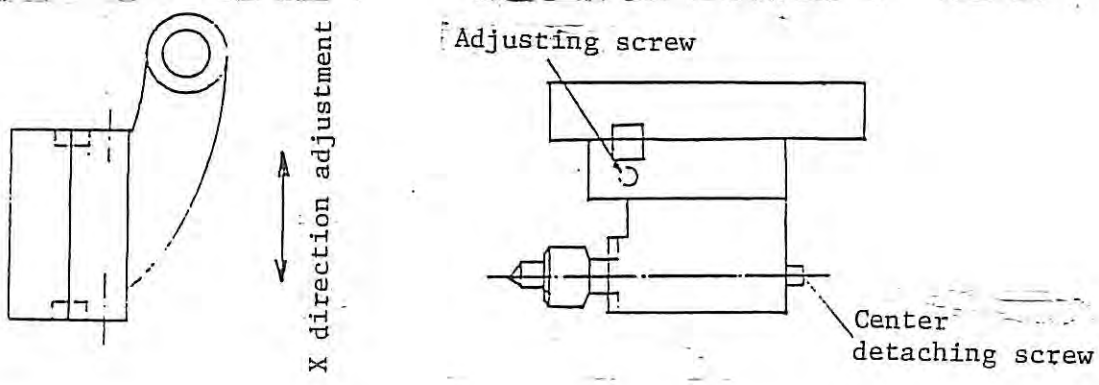
3. Loosen tail stock clamp bolts and adjust the X direction.



4. Swing around the dial gauge and check X directivity.



5. Viewing the dial gauge, turn slowly an X direction adjusting screw to set to 0.



6. After adjustment is completed, tighten the tail stock clamp bolts, checking with the dial gauge.

7. After clamping the bolts, recheck with the dial guage.

Note) The steps 1 and 2 above are not necessary when the tail stock is collided against by a program miss or wrong operation.

One-touch Tailstock for HT

<<Operation>>

1) Manual Key

⟶ Forward Key	Advances continuously to the advance end. When the workpiece is pressed on during advance, hydraulic system will be turned on. (Press RETRACT key to interrupt advancing.)
Forward Jog Key	Advances while the key is pressed. The hydraulic system will not be turned on even when the workpiece is pressed on.
Retract Jog Key	Retracts while the key is pressed.

2) M Functions (optional)

⟶ M25 (Forward)	Advances for the time of the timer set by the parameter (#7059). The workpiece is pressed on for the time set in the timer and operation completes with the hydraulic system turned on.
M26 (Retract I)	Operation completes with the retraction for the time of the timer set by the parameter (#7060).
M28 (Retract II)	Operation completes with the retraction to the retract end.

3) Setting of Advance and Retract Timers

Advance timer	3 sec. (approx. 120 mm)
Retract timer	2 sec. (approx. 80 mm)

NC Unit	M Function	Parameter No.	Standard Setting Value
MULTI	M25 (Advance)	#7059	30 (3 sec.)
	M26 (Retract)	#7060	20 (2 sec.)

* Setting of these timers should be changed according to the condition.
However, #7059 should be larger than #7060 by more than 10 (1 sec.).

Setting Timers for Advance and Retract

- Press [F9] (Others) and then [F8] (NC Screen) key. When NC Screen is not on [F8], display [F9] (Others) by pressing [MENU] key and then [F3] (Operation) key.
- Press [F4] (SET) key.
- Key in "6219" and press cursor [▼] or [▲].
- Key in "1" and press [INPUT] key. (This enable parameter change.)
- Press [F3] (PRM) key.
- Key in "7059 (or 7060)" and press cursor [▼] or [▲].
- When [INSERT] key is pressed, the cursor moves from "#7059 (#7060)" to the bits.
- Press cursor [▶] and place the cursor on 30 (or 20).

  Sample setting value: 10 seconds

  Key in "100" and press [INPUT] key.

  Sample setting value: 1 second

  Key in "10" and press [INPUT] key.
- When the setting is completed, press [INSERT] key.
- Press [F4] (SET) key.
- Make sure that the cursor is on "#6219" and key in "0" (Zero). Then, press [INPUT] key.
- Press [RESET] key.
- Press [MENU] key.

4-6-7 Program Check

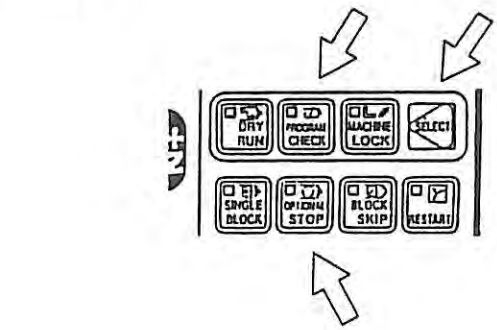
While stopping the rotation of spindle, move the machine with program operation, and check the movement of tool, tool-interference if any, and program content.

° Operation by program check is guided.

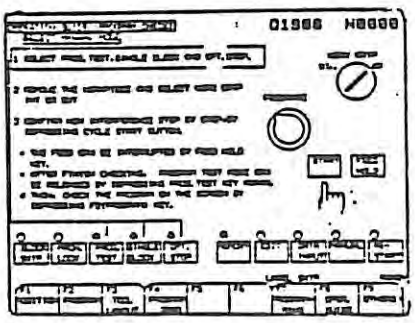
1) If program is changed, edit the program.
2) Lock the writing key of memory for preventing the rewriting of program.
3) Check if tool nose R or tool width is input exactly.
4) Check if the PROGRAM ZERO is set.
5) Remove the workpiece.
6) Match the chuck state to the selection of in/out clamp of chuck on operation panel.
7) Set the key on operation panel as follows:

Procedure 1

Press the Program Check key together with the Select key.
Press the Single Block key and Optional Stop key.



Operation guide



	Lit up	Lit off
Dry Run (Press together with the Select key.)	All feed rates are set by the Feedrate switch on the operation panel.	The machine operates as programmed.
Program Check (Press together with the Select key.)	All feed rates are set by the Feed switch on the operation panel, skipping spindle forward/reverse rotation and coolant ON.	The machine operates as programmed.
Machine Lock (Press together with the Select key.)	The tool rest is fixed at a current position and does not move.	The turret head moves as programmed.
Single Block	The machine stops after executing the program by 1 line. Pressing the Start key proceeds to execution of the next line.	Continuous operation
Optional Stop	The machine executes the M01 key (spindle stop, coolant OFF) function in the program. To restart, press the Start key.	Skips M01 in the program.
Block Skip	Skips the line containing "/"(slash).	Executes the line containing "/"(slash).
Restart (option)	A program restart function is enabled.	A program restart function is disabled.

Procedure 2

Press the [MEMORY] key.

Procedure 3

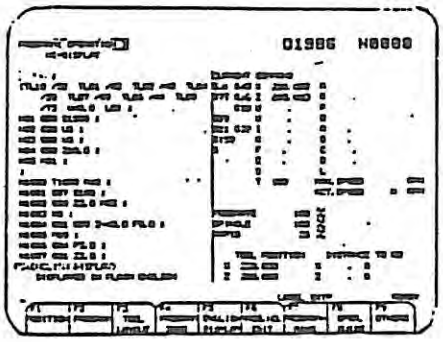
Press the [F2] (PROGRAM) key.

Without this key, press the [F9] (OTHERS) key.

Procedure 4

Press the [RESET] key.

⟶ Program-heading is done.



Procedure 5

Press the [PROGRAM-START] key, and make advance while checking the one line to another.

When a danger is felt during the movement of tool, press program-stopping button.

FEED HOLD Instant feed stop, Red lamp light ⟶ Start

FEED HOLD lamp release, Red lamp is out. ⟶ Residual distance execution

In the case of program check, the feed on command is neglected, and the feed of manual operation panel becomes effective, thus movement can be checked while adjusting the feed.

4-6-8 Program Edition

It is possible to display, check and correct the already stored program.

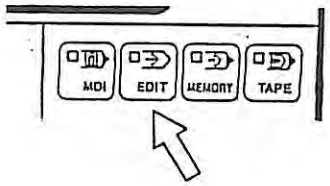
1. Insert (NC display)

Procedure 1

Press the [F2] (PROGRAM) key.

Procedure 2

Press the [EDIT] key.



Press the [NEXT] key.

NC-display function key is as follows:

It is renewed by pressing the key for other items.

F1	F2	F3	F4	F5	F6	F7	F8	F9	
N	G	X	Z	F	S	M	OTHERS ↑	OTHERS ↓	NEXT
T	E	R	C	U	W	P	OTHERS ↑	OTHERS ↓	NEXT
L	Q	I	K	/	(	)	OTHERS ↑	OTHERS ↓	NEXT
A	B	D	O	$			OTHERS ↑	OTHERS ↓	NEXT
H	J	V	Y	%	#	+	OTHERS ↑	OTHERS ↓	NEXT
*	=	[	]	SP			OTHERS ↑	OTHERS ↓	NEXT

Procedure 3

Set the key for writing.

Page key at editing time of NC-program and movement of cursor key

At editing time of NC-program, page key and cursor movement by cursor key can be operated as follows:

Page key	▲	..... 1 page retracts.
Page key	▼	..... 1 page advances.
Cursor key	▲	..... 1 line retracts.
Cursor key	▼	..... 1 line advances.
Cursor key	◀	..... 1 word retracts.
Cursor key	▶	..... 1 word advances.
RESET key		..... Returning to top of program. (Be resetting)

(Caution at editing time of NC-program)

- After editing the program, if power supply is set to OFF under the state without changing the screen even one, program returns to the state before edition. When the screen and mode would be changed even once, if power supply is set to OFF, the previous state before changing the screen and mode is memorized.
- Do not input 30 or more alphabets(A∿Z) and symbols continuously.

(Data Instruction)

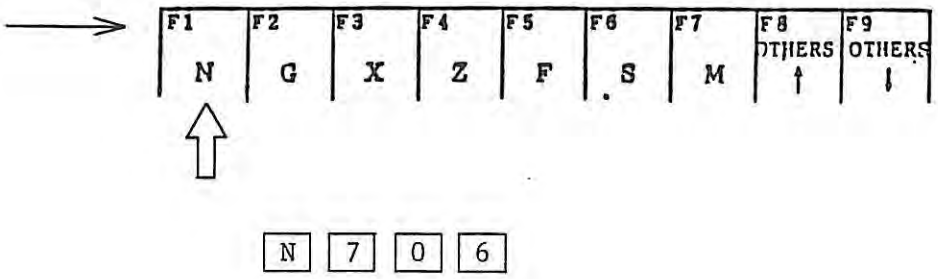
Procedure 1

When there is no display of alphabet at function key, press the [NEXT] key.

Procedure 2

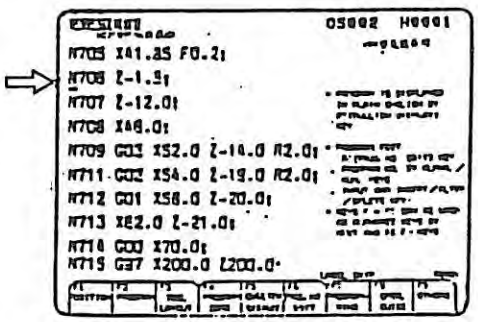
Call out the Sequence No. of the intending line.

After inputting Sequence No. intended to call, press the cursor key [▼].



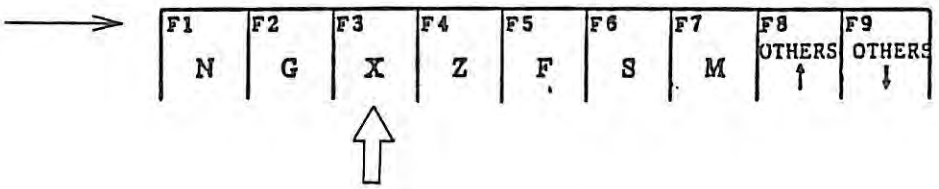
[N] [7] [0] [6]

· Program edition

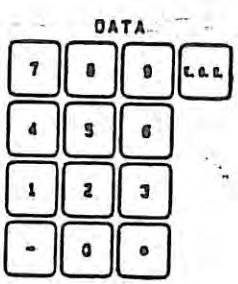


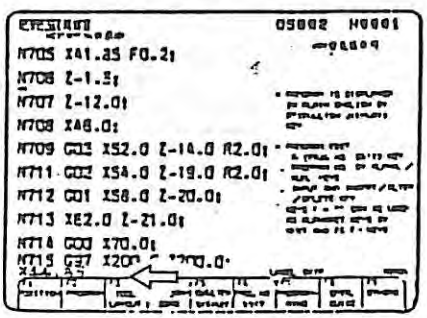
Procedure 3

Set the key of data desired to insert.



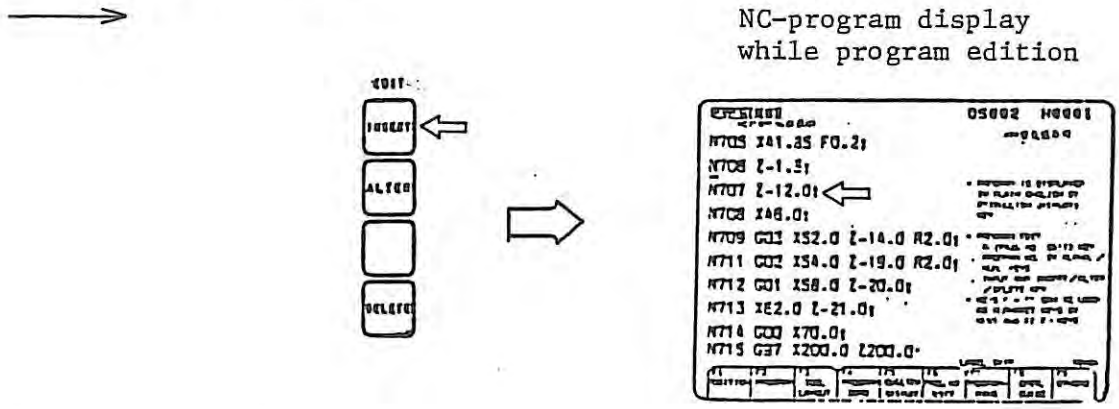
Program edition





Procedure 4

Press the [INSERT] key.



(One Line Insertion)

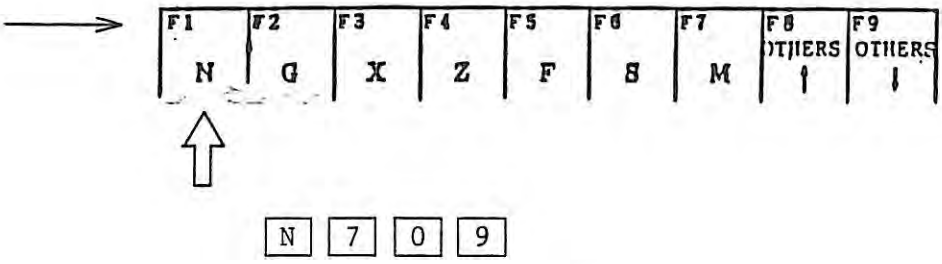
Procedure 1

When there is no display of alphabet at function key, press the [NEXT] key.

Procedure 2

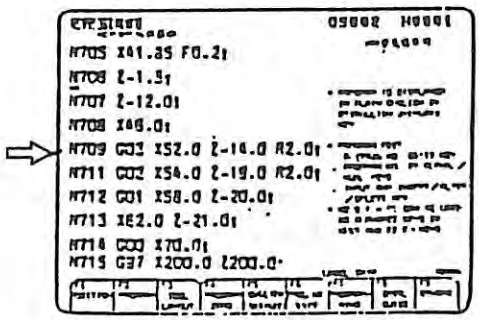
Call out the Sequence No. of the intending line.

After inputting Sequence No. intended to call, press the cursor key [▼].



[N] [7] [0] [9]

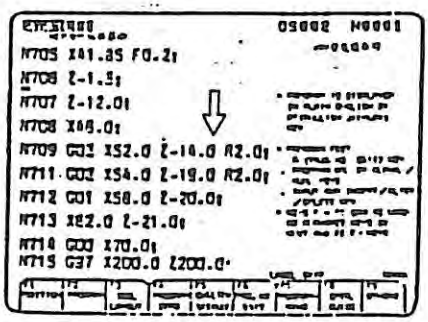
Program edition



Procedure 3

Set the cursor to the new line just one before inserting desired.

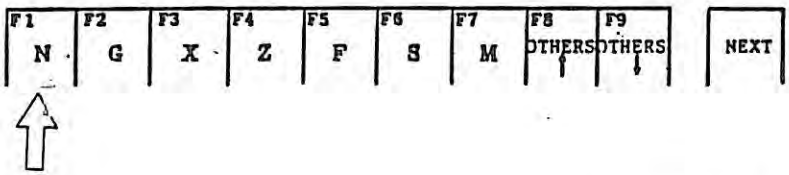
→ Program edition

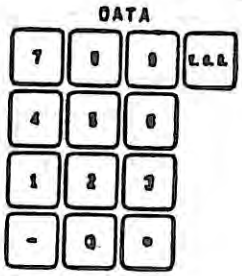


Procedure 4

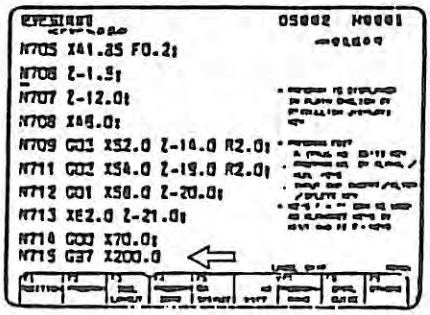
Press the key for one line.

→





Program edition

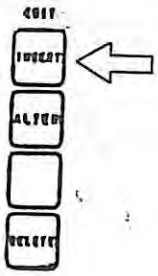


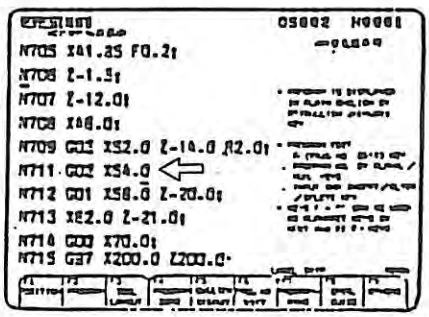
Procedure 5

Press the key in sequence of [E.O.B.] and [INSERT].

→

Program edition





2. Change (NC-display)

Make change after execution of the following operation.

Procedure 1

Press the [F2] (PROGRAM) key.

Procedure 2

Press the [EDIT] key.

Procedure 3

Set the key for writing.

(Change of Data)

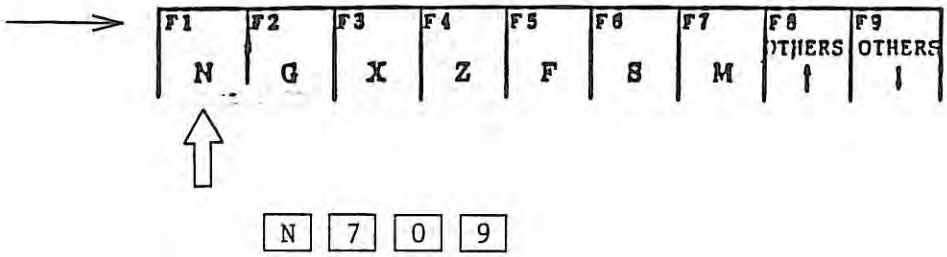
Procedure 1

When there is display of alphabet at function key, press the [NEXT] key.

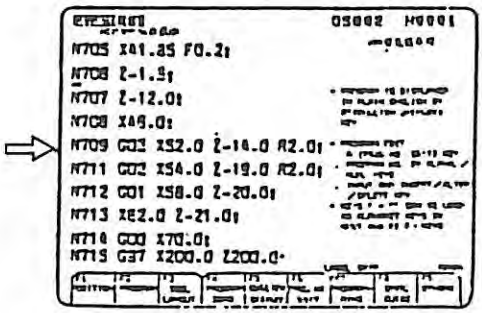
Procedure 2

Call Sequence No. of desired line to change.

After the input of Sequence No. desired to call, press the cursor key [▼].



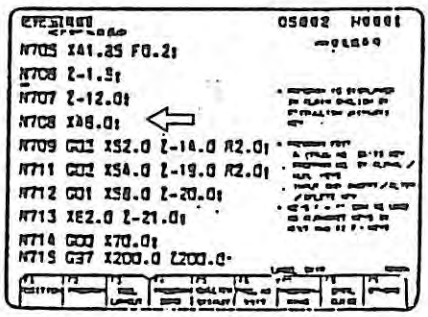
Program edition



Procedure 3

Move the cursor to the data desired to change.

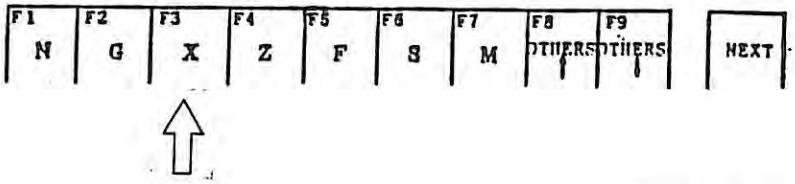
⟶ Program edition



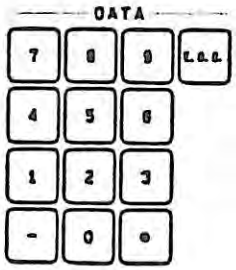
Procedure 4

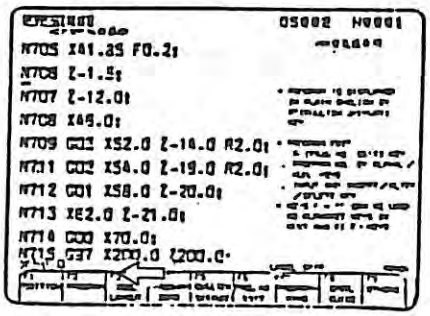
Press the key for the data desired to change.

⟶



Program edition



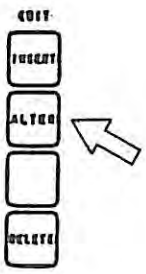


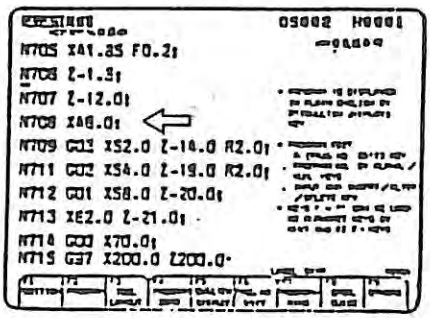
Procedure 5

Press the ALTER key.

⟶

Program edition





3. Deletion (NC-display)

Make deletion after execution of the following operation.

Procedure 1

Press the [F2] (PROGRAM) key.

Procedure 2

Press the [EDIT] key.

Procedure 3

Set the key for writing.

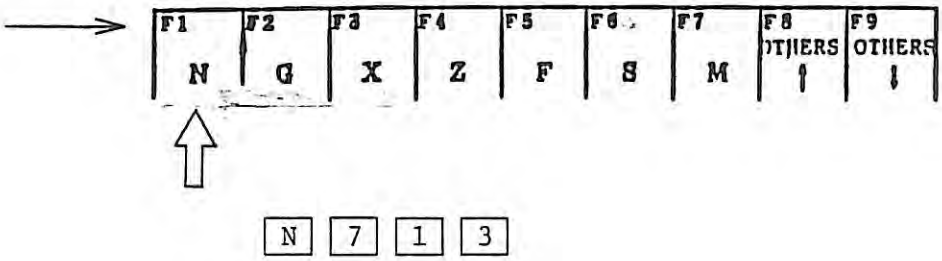
(Deletion of Data)

Procedure 1

When there is no display of alphabet at function key, press the [NEXT] key.

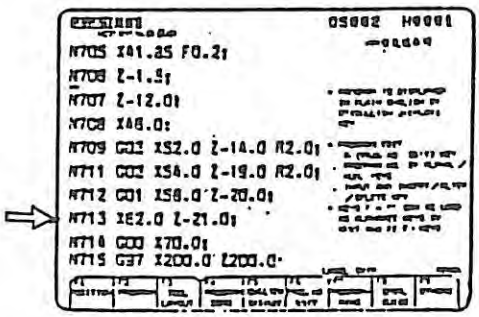
Procedure 2

Call Sequence No. of line desired to delete.
After the input of Sequence No. desired to call, press the cursor key [▼].



[N] [7] [1] [3]

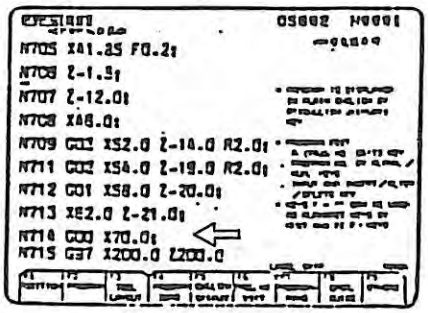
Program edition



Procedure 3

Move the cursor to the data desired to delete.

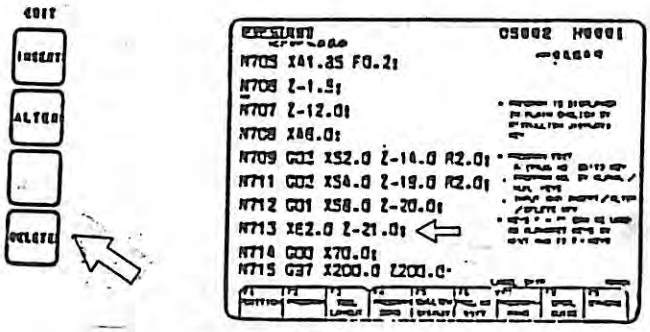
⟶ Program edition



Procedure 4

Press the [DELETE] key.

⟶ Program edition



(One Line Deletion)

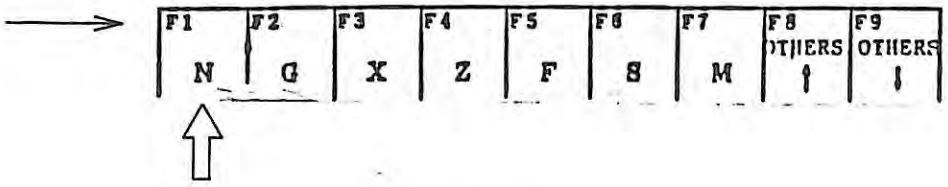
Procedure 1

When there is no display of alphabet at function key, press the [NEXT] key.

Procedure 2

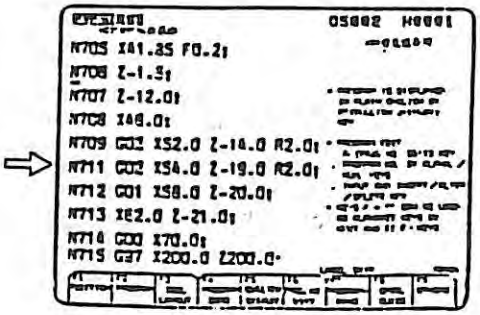
Call Sequence No. of desired line to delete.

After the input of Sequence No. desired to call, press the cursor key [▼].



[N] [7] [1] [1]

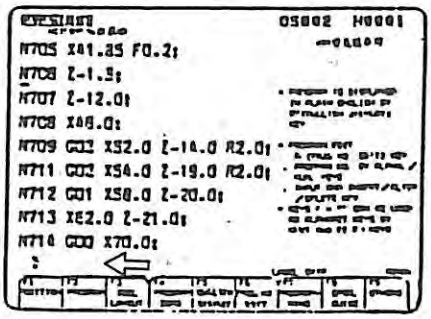
Program edition



Procedure 3

Press the [E.O.B.] key.

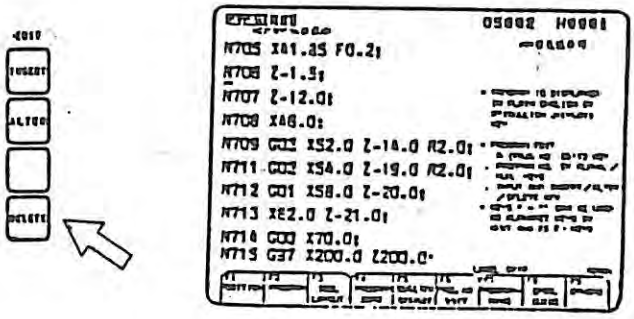
Program edition



Procedure 4

Press the [DELETE] key.

⟶ Program edition



(Program Deletion)

Procedure 1

When there is no Program No. edition at function key F6, press the [F9] (OTHERS) key.

⟶ When the function keys are alphabetically displayed, press the [NEXT] key.

Procedure 2

Call out the deleting Program No.

1) Press the [F6] (PROG. NO. EDIT) key.
2) Input the No. desired to delete, and press the [INPUT] key.

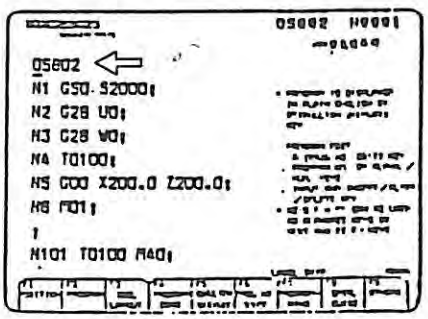
⟶ Registered program Nos. are displayed on the right side of the screen. (except for English display)

Note) When 25 or more programs are registered, display them with the Page key.

Program is called. Confirm the program content.

INPUT

Program edition



Procedure 3

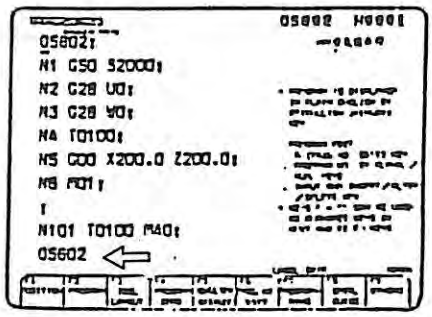
1) Press the [F6] (PROG. NO. EDIT.) key.
2) Set Program No. key to delete.

⟶ Registered program Nos. are displayed on the right side of the screen. (except English display)

Note) ∘ When 25 or more programs are displayed, display them with the Page key.

∘ All programs in the NC memory can be deleted by pressing [-] [9] [9] [9] [9] and [DELETE].

Program edition

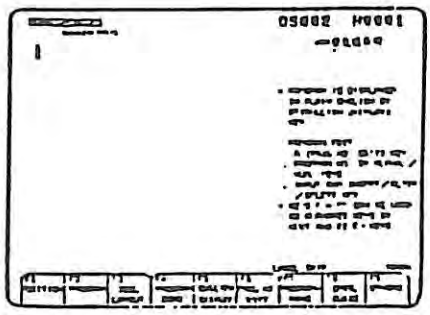


Procedure 4

Press the [DELETE] key.
(The above 2-operation may be omitted.)

⟶

Program edition



° Other program edition

By setting [DELETE] key in 4-item of previous page to [INSERT] key or [ALTER] key, it is possible make program insertion or Program No. edition.

When making program by manual,

1. Press editing key of MODE, press [F2] (PROGRAM) key and display the program (edition) screen.
2. Press [F6] (PROG. NO. EDIT) key after setting Lock key to "WRITE".
3. Press "INSERT" key after the input of program number.

Program No. are registered by the above-mentioned procedure.

To input NC data, proceed the operation of 4-104 to 4-112.

(Caution)

In editing the program unit, if alphabet "O" is used without using [F6] (PROG. NO. EDIT), the following operation is made.

1. O×××× [INPUT] — No function is made.
2. O×××× [INSERT] — At next position of cursor, O×××× is inserted. Display alone on screen is made, and no registration of program is made.
3. O×××× [ALTER] — Set the letter of cursor position to O××××. It is only the display on screen, and no change is made on Registration Program No.
4. O×××× [DELETE] — It deletes the letter of cursor position. Program is not deleted.

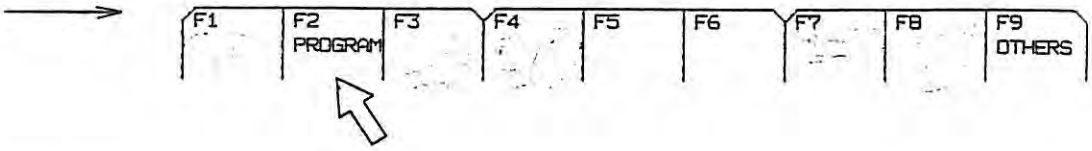
° Area Editing

A certain area of data can be stored to delete or insert them into somewhere else.

1. How to Display the Function Keys (NC Display)

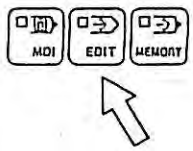
Procedure 1

Press the [F2] (PROGRAM) key.

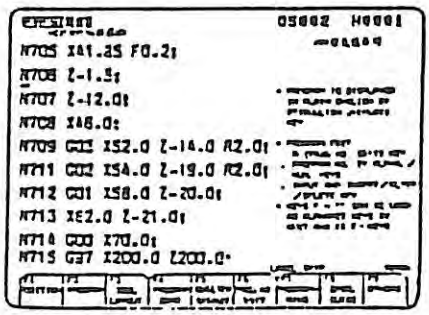


Procedure 2

Press the [EDIT] key.



Program edition



Procedure 3

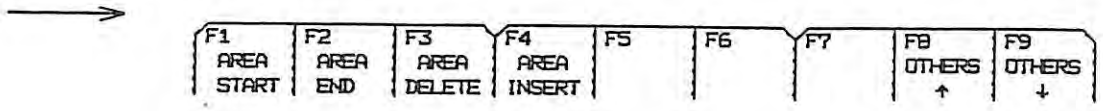
Press the [NEXT] key.

The function keys for NC display are as follows:
Pressing the [OTHERS] key updates them.

F1	F2	F3	F4	F5	F6	F7	F8	F9	
N	G	X	Z	F	S	M	OTHERS	OTHERS	NEXT
T	E	R	C	U	W	P	OTHERS	OTHERS	NEXT
L	Q	I	K	/	(	)	OTHERS	OTHERS	NEXT
A	B	D	O	⌀			OTHERS	OTHERS	NEXT
H	J	V	Y	$	#	+	OTHERS	OTHERS	NEXT
*	=	[	]	SP			OTHERS	OTHERS	NEXT

Procedure 4

Press the F8 (OTHERS ↑) key to display the function keys of this row.



Procedure 5

Shift the MEMORY LOCK/WRITE key to "WRITE".

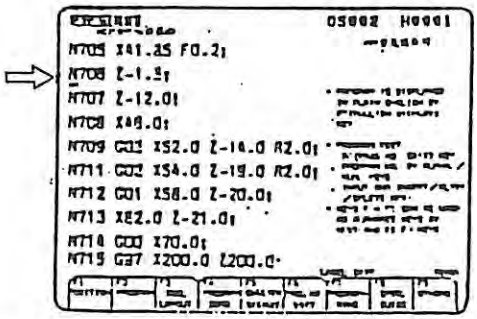
2. Area Storage

Use this function when storing a certain area of data.

Procedure 1

Move the cursor to the first word you want to store.
The page is scrolled by the PAGE keys.

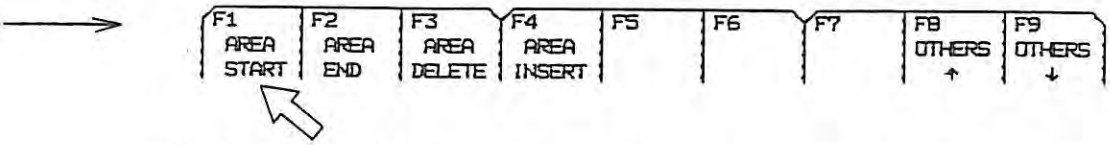
Program edition



Note) Do not include O××××; at the beginning of the program in the range.

Procedure 2

Press the F1 (AREA START) key.

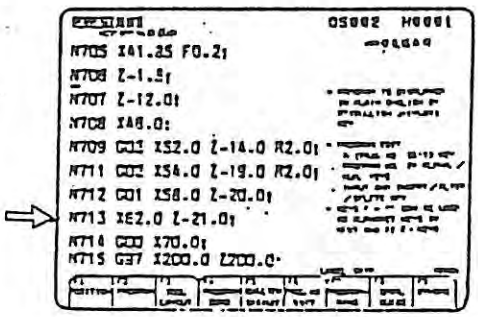


Note) When altering a area start position, press the F1 key again, and then, move with the CURSOR and PAGE keys.

Procedure 3

Move the cursor to the last word you want to store.
The page is scrolled by the PAGE keys. (The characters in the very portion are turned yellow.)

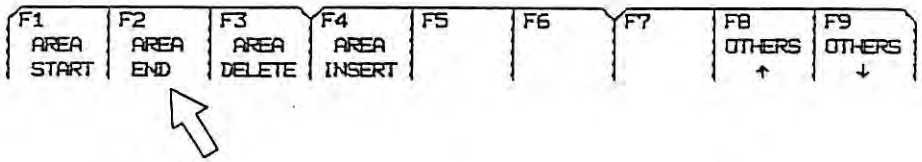
→ Program edition



Procedure 4

Pressing the [F2] (AREA END) stores a specified area.

→



Notes) ◦ Data of up to 1,000 characters can be stored. When a area exceeding 1,000 characters is specified and the [F2] (AREA END) key is pressed, it is not stored. All data cannot be stored even if they are within 1,000 characters.

◦ The data of the last stored area are saved.

◦ When the power is turned off, the stored data are lost. When the power is turned on, there is no stored data.

◦ When deleting the area, do not press the [F2] (AREA END) key.

◦ Switching to the Auto Programming screen may cause the stored data to be lost.

3. Area Deletion

Use this function when deleting a certain area of data.

Procedure 1

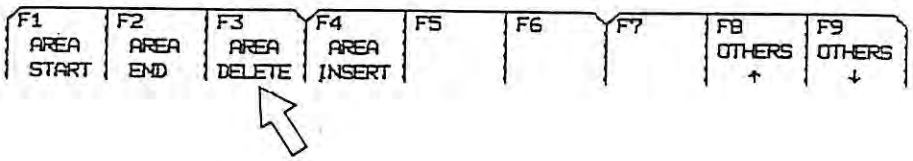
Specify the area to be deleted by taking Procedure 1 through 3 on a previous page.

→ Note) If the [F2] (AREA END) key in previous Procedure 4 is pressed after Procedures 1 through 3 on the previous page, the area cannot be deleted.

Procedure 2

Pressing the [F3] (AREA DELETE) key deleted the specified area.

→



4. Area Insertion

Use this function when inserting a certain area of data into somewhere else.

Procedure 1

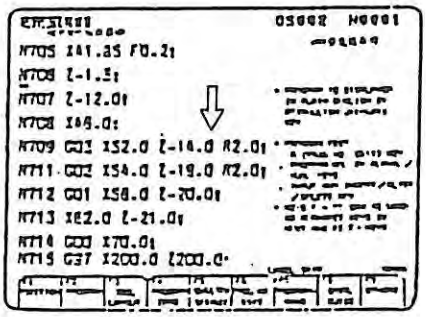
Executing the area storage operation in Procedures 1 through 4 on the previous page, store the area to be inserted.

Note) Executing the area storage operation in Procedure 1 through 4 will erase the program in that part.
If you want to keep the program in the same part, move the cursor to the previous line with cursor [◀] key and press [F4] (Area Insert) key.

Procedure 2

Move the cursor to the word immediately before where you want to insert. The page is scrolled by the PAGE keys.

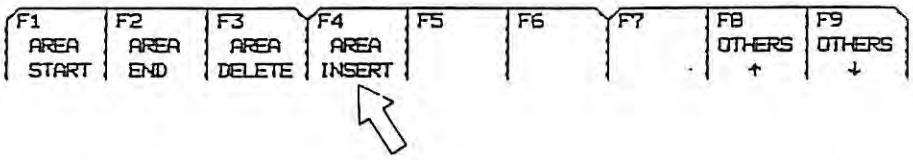
⟶ Program edition



Procedure 3

Pressing the [F4] (AREA INSERT) inserts the specified area into next to the cursor.

⟶



Note) Up to 16,000 characters can be inserted.

Program Edition English Program Display

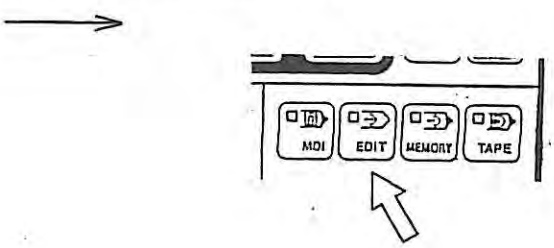
1. Data insertion (English display)

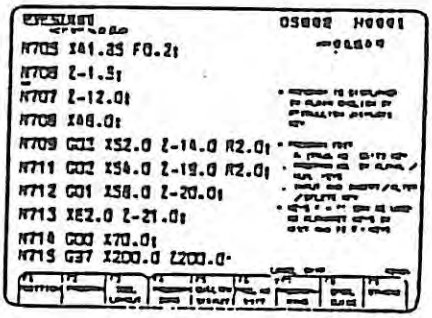
Procedure 1

Press the [F2] (PROGRAM) key.

Procedure 2

Press the [EDIT] key.



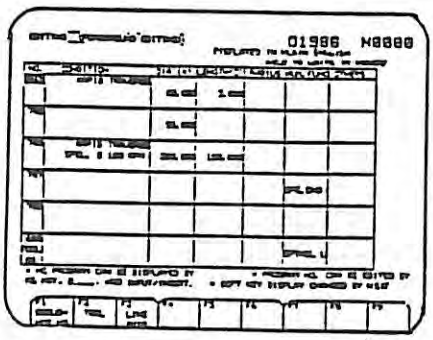


Procedure 3

Press the [F5] (ENGLISH DISPLAY) key.

Program edition

English program



Procedure 4

Set the key for writing.

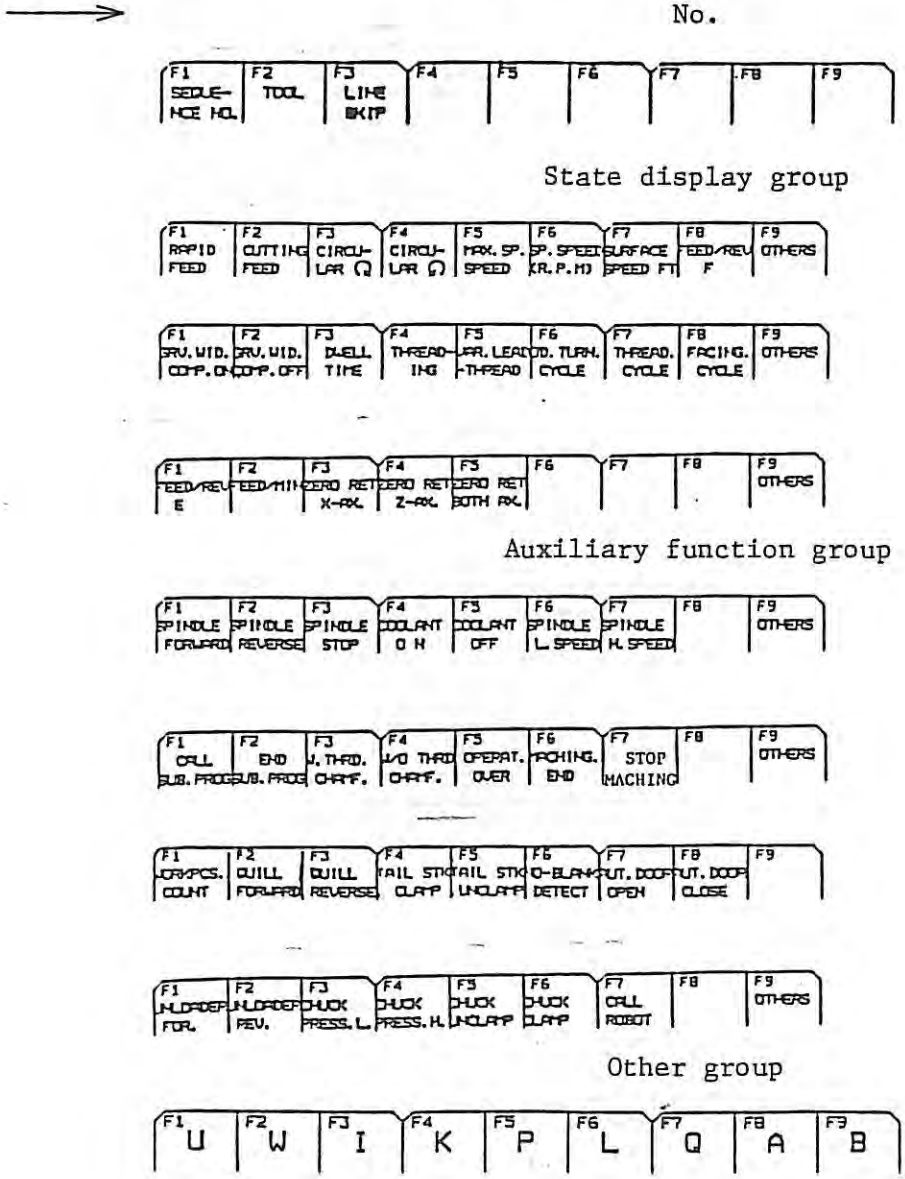
Function Key for English Display

Procedure 1

When there is no display of English word on function key, press the NEXT key.

Procedure 2

Program key is devided into 4 groups.
Group-display can be automatically selected by cursor-position of program.
For the shift in the same group, press the key of OTHERS.



Page key at time for edition English program and movement of cursor key.

At editing time of English program, movement of cursor by cursor key and page key is as follows.

Page key	▲	Returns to the top of program (no reset is made).
Page key	▼	One page advances.
Cursor key	▲	One line retracts. (only in the same page)
Cursor key	▼	One line advances.
Cursor key	◀	One word retracts.
Cursor key	▶	One word advances.

(Caution at editing time of English program)

After editing the program, if power supply is stopped under the state without change in the screen even once, program returns to the state before edition. When change is made for screen and mode even once, the previous state before changing the mode and screen is memorized even if the power supply is stopped.

(Data Insertion)

Procedure 1

When function key does not display English word, press the [NEXT] key.

Procedure 2

Move the cursor to the position of No.

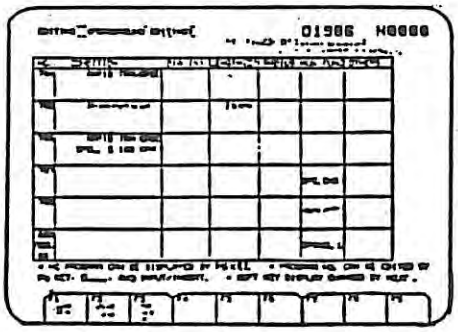
——→ Call Sequence No. desired to insert.

Procedure 3

Press the [F1] (SEQUENCE NO.) key.

Set No. key and press the cursor key [▲].

——→ Program edition

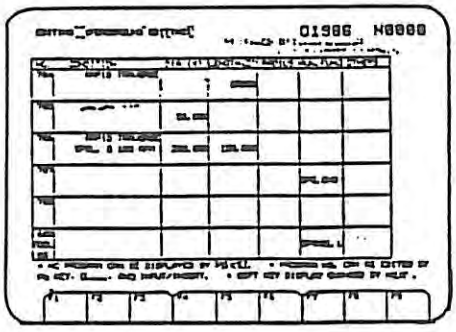


Procedure 4

Move cursor to the position intended to insert.

Set the inserting data-key ON.

——→ Program edition

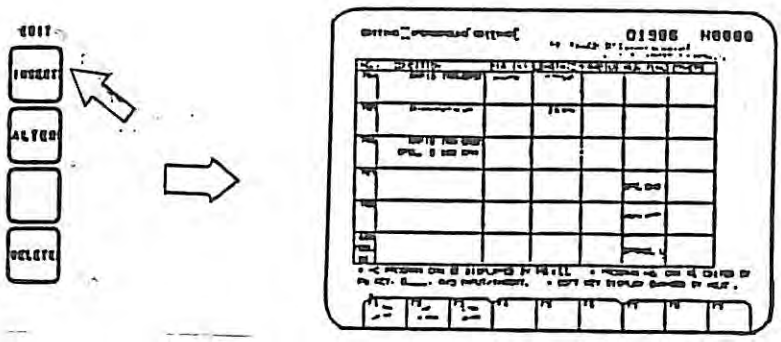


Procedure 5

Press the [INSERT] key.

⟶

Program edition



(One Line Insertion)

Procedure 1

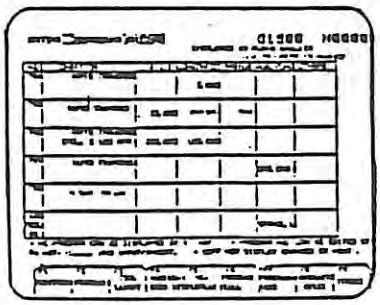
When there is no display of English word on function key, press the [NEXT] key.

Procedure 2

Move the cursor to the position of previous line No. desired to insert.
Press the [E.O.B.] key.
Press the [INSERT] key.

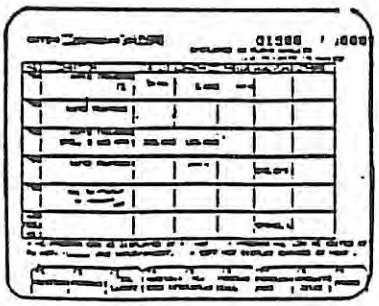
⟶

Program edition



There is one vacant line.

Program edition



Procedure 3

In the following, perform data-inserting Procedures 2 to 5.

2. Data change (English display)

Make changing after execution of the following operations.

Procedure 1

Press the [F2] (PROGRAM) key.

Procedure 2

Press the [EDIT] key.

Procedure 3

Press the [F5] (ENGLISH DISPLAY) key.

Procedure 4

Set the key for writing.

(Change of Data)

Procedure 1

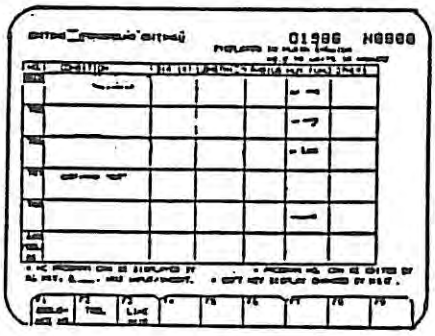
When there is no display of English word on function key, press the [NEXT] key.

Procedure 2

Move the cursor to the position of No.
Press the [F1] (SEQUENCE NO.) key. Press cursor after setting No. ON.

⟶ Call Sequence No. desired to change.

Program edition

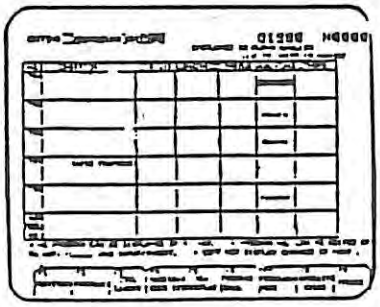


Procedure 3

Move the cursor to the position desired to change.
Set the data key desired to change.

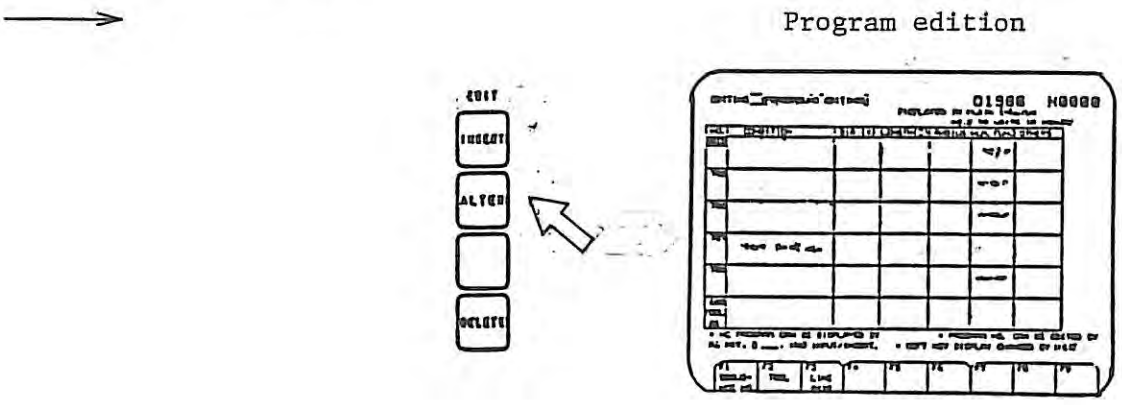
⟶

Program edition



Procedure 4

Press the [ALTER] key.



3. Delete (English display)

Procedure 1

Press the [F2] (PROGRAM)key.

Procedure 2

Press the [EDIT] key.

Procedure 3

Press the [F5] (ENGLISH DISPLAY) key.

Procedure 4

Set the key for writing.

Procedure 1

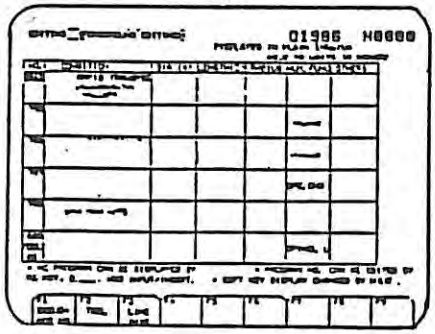
When there is no display of English word on function key, press the NEXT key.

Procedure 2

Move the cursor to the position of No.
Press the [F1] (SEQUENCE NO.) key.
Press cursor after setting No. ON.

⟶ Call Sequence No. desired to delete.

Program edition

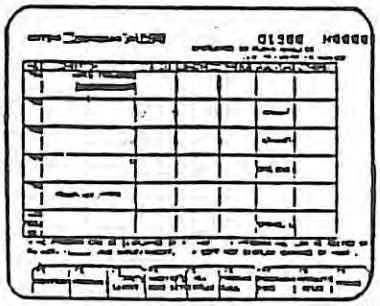


Procedure 3

Move the cursor to the position desired to delete.
Select the desired data to delete.

⟶

Program edition

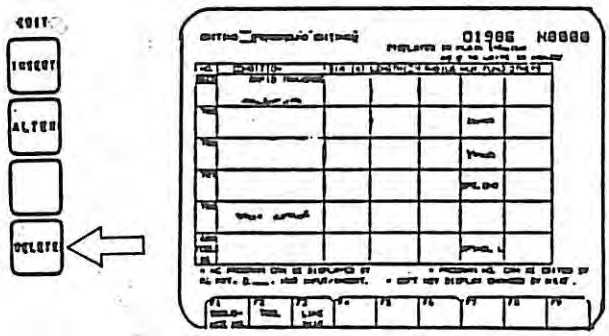


Procedure 4

Press the [DELETE] key.

⟶

Program edition



(One Line Deletion)

Procedure 1

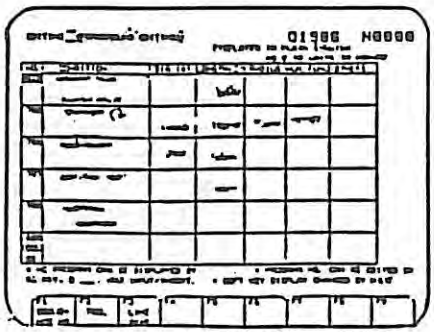
When there is no display of English word on function key, press the [NEXT] key.

Procedure 2

Move the cursor to the position desired to delete.
Press the [E.O.B.] key.

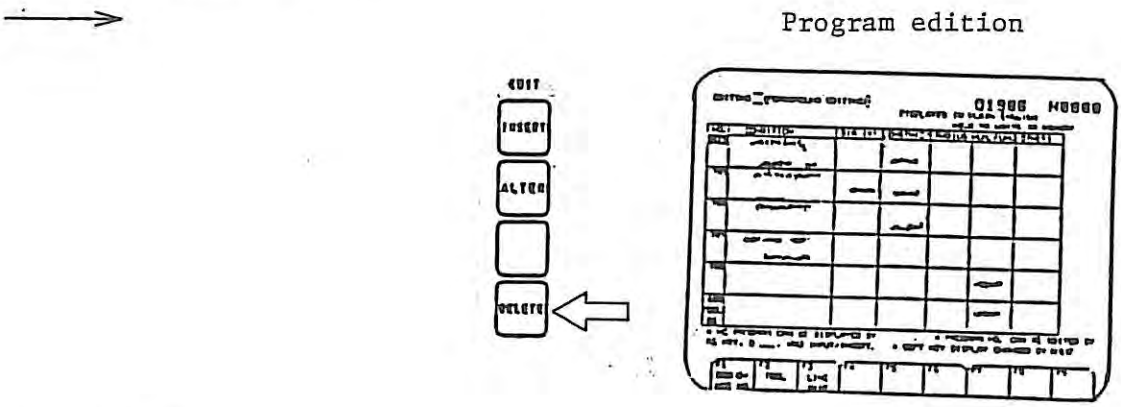
⟶ Call Sequence No. desired to delete.

Program edition



Procedure 3

Press the [DELETE] key.



Procedure 4

One-line data is deleted.

(Caution)

1. English data can be shown by red-letter at time of rapid traverse any by white display at time of cutting feed. (Character color is continued on its same color display until shifting time of command for rapid traverse cutting feed.)

2. During operation, axial moving direction is shown with arrow mark on the item of state display.
(↓ ↑ ← → ↖ ↙ ↘ ↗)

   Note: In case of less moving amount than with nose-R, arrow-mark direction may be different. In such a case, check the moving distance to go.

3. At editing operation time, the data in the line between rapid traverse (red) and cutting feed command (white) may change in the color by moving method of cursor and page-turning method.

4. At input-time of data, when exceeding the data amount in the next range, data cannot be assured.

Diameter (X)	±9999.999
Diameter (Z)	±9999.999
Radius	±9999.99
Others	
U.W.I.K.A.B	±9999.999
P.L.Q	0 ∿ 9999 (Decimal fraction is ignored.)

   By setting the data-digit number of less than decimal point (place), automatic omission is made.

   (e.g.): 123.56789 ⇨ 123.567 (case of diameter (X))

4-6-9 Trial Cutting

As a result of program check, if there is no disturbance, make cutting with one-line execution for the first work.

Procedure 1

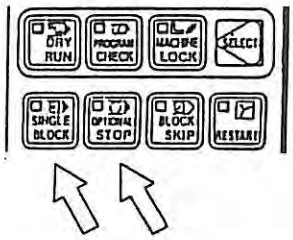
Set the key on operation panel.

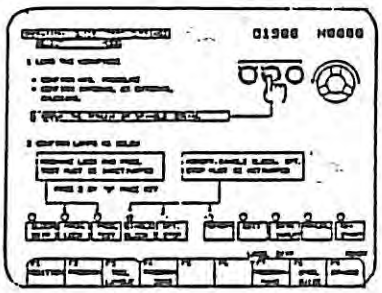
Procedure 2

Confirm the check pressure.

→

Operation guide

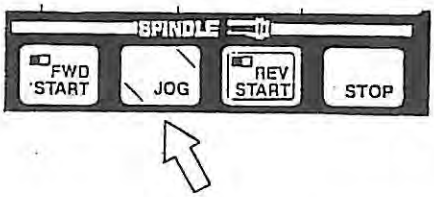


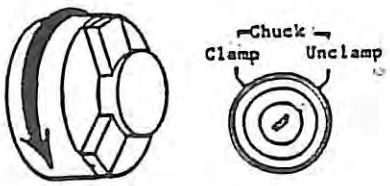


Procedure 3

Match chuck inside-outside clamp key to the chucking state.
Make chucking for the work, and press the key for single-inching, thus observing the swinging state.

→



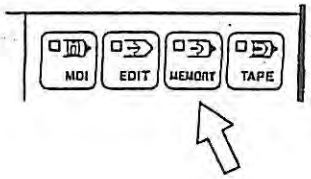


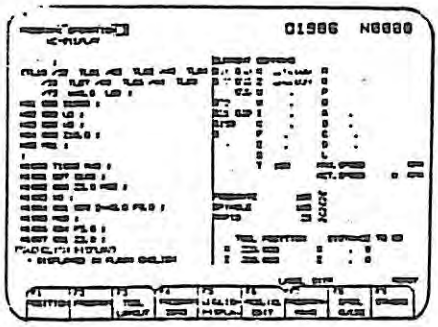
Procedure 4

Close the door.

Procedure 5

Press the [F2] (PROGRAM) key.
Press the [MEMORY] key.

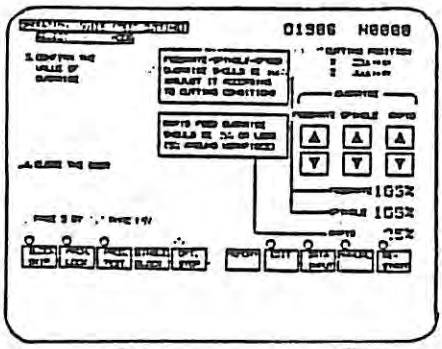




Procedure 6

Spindle override: Set the feed-override to 100%.
Set the RAPID override to 25%.

Operation guide



Procedure 7

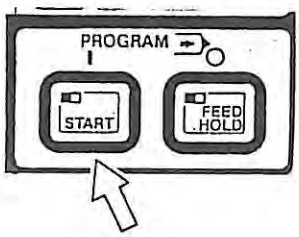
Press the [RESET] key.

→ Program heading is made.

Procedure 8

Press the [START] key. While watching the cutting state, execute one digit by digit.

→ Press the RESET-button, the movement stops.

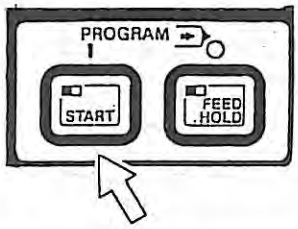


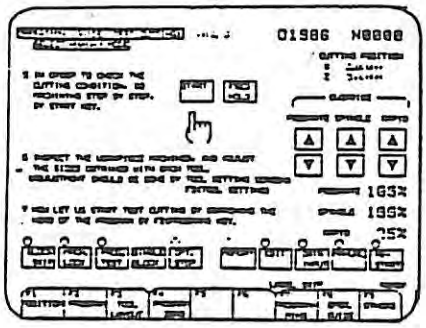
Procedure 9

With program M01, operation stops.

Measure the work, and adjust the dimensions.

For re-start, press the [START] key.



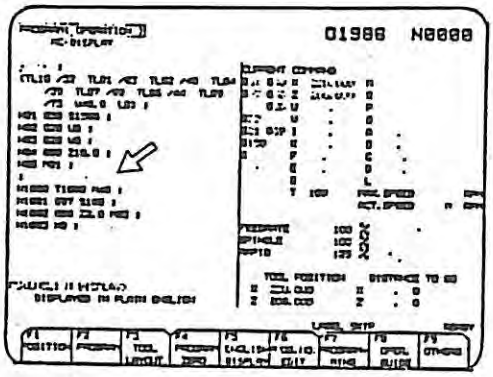


Even by machining with tool-mounting position obtained by Q-setter, work may not be within the machining tolerance by the work-material, cutting conditions and finishing margin.

1) Machining from optional tools

Example: Case wishing to make re-machining of the 7th tool

The desired re-machining tool



Procedure 1

Set the key on operation panel.

Procedure 2

Set the tool stand to the position without interference to the tail stock or workpiece.

Procedure 3

Press the [MEMORY] key.

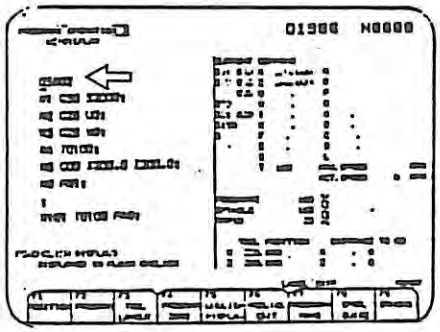
Procedure 4

Press the [F2] (PROGRAM) key.

Procedure 5

Program is displayed.
Spindle override: Set the feedrate override to 100%.
Set the rapid override to 25%.

→



Procedure 6

Press the [RESET] key.

Procedure 7

Close the door.

Procedure 8

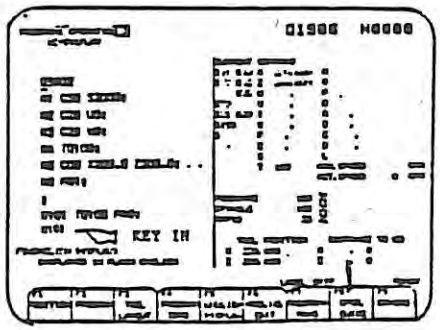
Move the turret head index-point.

Procedure 9

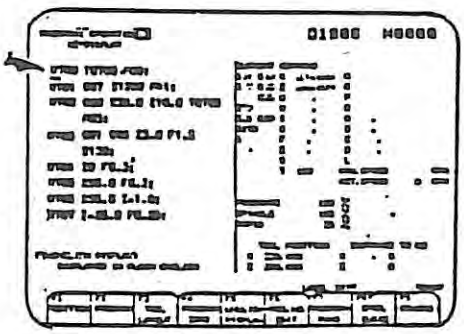
Press the [RESET] key.

Procedure 10

Press the [F1] (N) key.
Set the key for Sequence No. at the top of reprocess machining.
Press the cursor key [▼].



At auto-program, the forefront sequence No. can be output as using Tool No. 100. Using tool outputs the mounting face-number × 100 after T. (4-digits fixing)
(e.g.); At time of using Tool No. 5, N500 is shown.



Procedure 11

Press the [START] key.

Procedure 12

Up to the starting position for machining, make movement by SINGLE BLOCK execution.
If there is no mistake, cut single block and press the [START] key for continuous operation.

4-6-10 Continuous Operation

With the favorable cutting state and trial dimensions of trial cutting, continuous operation is made.

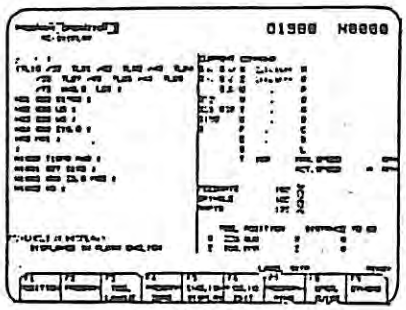
Procedure 1

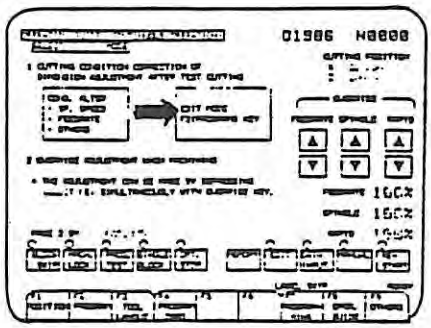
Press the [MEMORY] key.

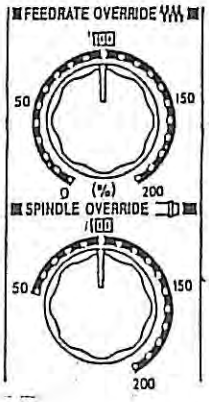
Procedure 2

Press the [F2] (PROGRAM) key.

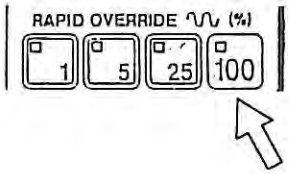
⟶ Operation guide







Spindle override	100%
Feedrate override	100%
Rapid traverse override	100%



Procedure 3

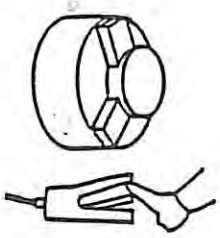
Press the [RESET] key.

⟶ Program-heading is done.

Procedure 4

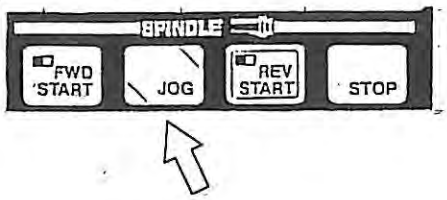
Make work-chucking.

⟶

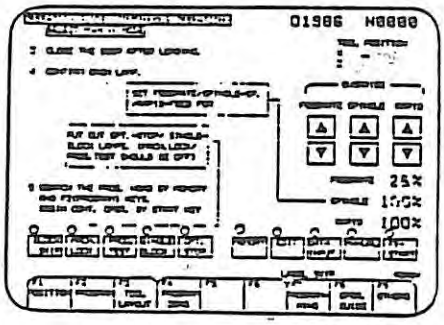


Procedure 5

Check the swing of work by spindle-inching key.



Operation guide



Procedure 6

Close the coor.

Procedure 7

Make machining by pressing-program [START] key.

Procedure 8

Measure the workpiece for adjusting the dimension.

Dimension-adjusting Method

For correct machining dimension, when adjusting the dimensions, perform the following operation.

Procedure 1

Set the machine to its stopped state of process-ending state.

Procedure 2

Press the [F3] (TOOL LAYOUT) key.

Procedure 3

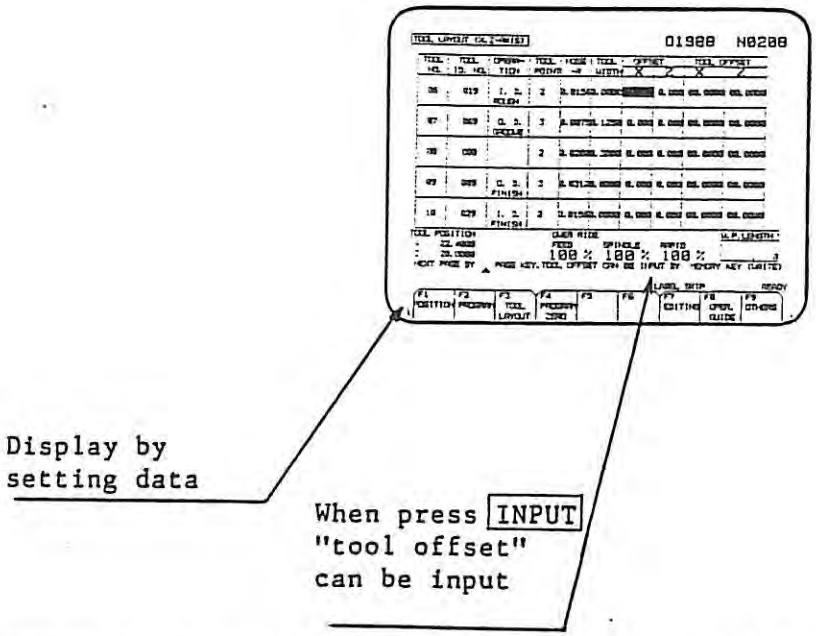
Screen is changed for its tool layout.

Case to make T05 tool diameter smaller by 0.05.

1) Set the cursor at the position of diameter of T05.

2) Press the [INPUT] key after setting data.

→ [-] [0] [.] [0] [5] [INPUT]



For the dimension adjustment display of Tool Layout, a previously stored data value is added to/subtracted from and displayed. This value is held even if the power is turend off. It is set to 0 when applying a tool nose to the Q setter or when directly inputting a value on the Tool Mounting Position by manual operation.

Note) When the "Tool Layout" screen or the "Q Setter Handling" screen of Operation Guide is not displayed, this dimension adjustment value display remains unchanged when the tool nose is applied to the Q setter.

Continuous machining for 1, 2-process

Some times, make the workpiece reverse turn by jaw and the same set-up, and continuous machining is made for 1, 2-process. The following is one example for program-preparing method in continuous machining for 1, 2-process.

(Example 1)

Prepare the program for 1-process, and regard it as 00001, also, regard that for 2-process as 00002. Next, prepare the main program for continuous machining for 1, 2-process.

***** Main program *****

```
O1111
(TL01/03 .......)
M98 P0001     (Program for 1-process)
M02
M98 P0002     (Program for 2-process)
M30
%
```

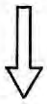
The program prepared by auto-program contains each using tool, mounting position, work-length and shift amount of machining reference point in ( ) as each set-up information. In continuous machining for 1, 2-process, these operations should be performed by the same setup, therefore, make preparation of setup information collective of 00001 and 00002 into 00111 (main program). (For safety, delete the setup information of 00001 and 00002.)

◦ Before adjusting the setup information

```
***** Main program *****

   O1111
   M98 P0001

   M02
   M98 P0002
   M30
   %
```

```
***** Sub-program *****

O0001
(TL01/03 TL02/33 TL04/15 TL07/09 TL08/25
   TL09/46 W80.0  L0)
          :
          :
        M30;
O0002
(TL01/03 TL04/15 TL05/52 TL07/09 TL08/25
   W75.0 L0)
          :
          :
        M30;
```

◦ After adjusting the setup infomration



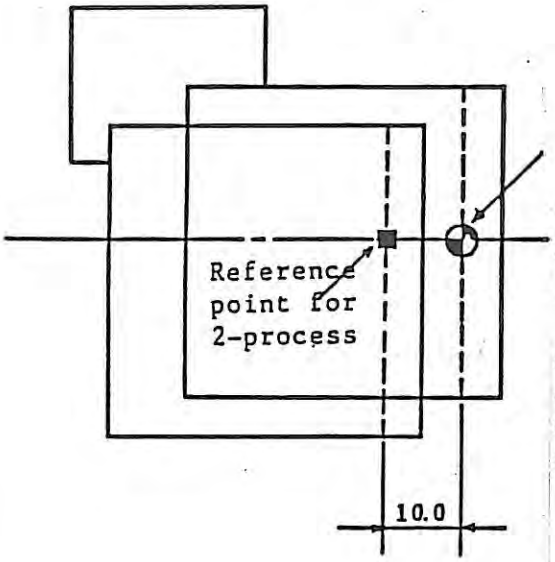
```
   O1111
  (TL01/03 TL02/33 TL04/15
   TL05/52 TL07/09 TL08/25
   TL09/46  L0)
   M98 P0001
   M02
   M98 P0002
   M30
   %
```

```
O0001
  :
  :
M99;

O0002
  :
  :
M99;
```

* • L0-shift amount may be edited and set.
• Delete W (work-length).

For sub-program, use the following command of G54 W_ for shifting the machining reference point or work-length. The following is an example in taking the reference of work-finishing end face for 1-process.

***** No Z-setter *****



Machining reference point (L)
Reference point for 1-process.

```
00001
G54 W0
```
Work-finishing end face for 1-process(⊕) ⇨ Same position as that of the machining reference point(L)

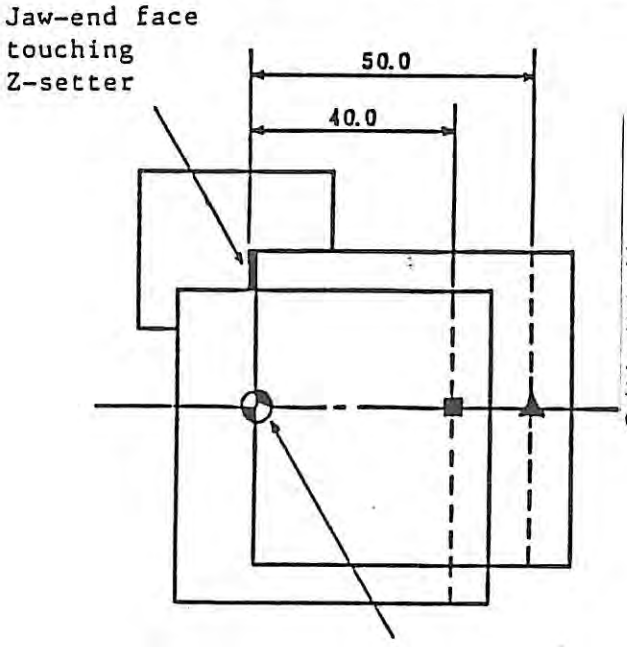
```
:
G54 W0
M99
%
```
Cancel of shift amount of reference point

```
00002
G54 W-10.0
```
Work-fhinshing end face for 2-process (■) (Difference with work-finishing end face for 1-process)

```
:
G54 W0
M99
%
```

***** With Z-setter (optional) *****

(Note) With Z-setter, when the Z-setter is touched on the workpiece end, program as the same as above.




```
00001
G54 W50.0
```
Length from the end face (machining reference point) of jaw up to the work-finishing end face (▲) for 1-process.

```
:
G54 W0
M99
%
```
Cancel of shift amount of reference point

```
00002
G54 W40.0
```
Length from the end face of jaw up to the length of work-finishing end face (■) for 2 process.

```
:
G54 W0
M99
%
```

* • In continuous machining of 1- and 2-process G54W__ command is made for each process, therefore, delete W_ (work-length) in ( ).

• Even in calling the sub-program during operation, tool-layout is not prepared.

(Example 2)

As shown in Example 1, it is possible to prepare the program for 2-process as sub-program with the program of 1-process as main program without preparing main program.

```
O0001
(TL01/03 .......)  <=  Set-up information for 1-, 2-process.
G54 W__            <=  Reference point setting for 1-process.
   )               <=  Machining program for 1-process.
G50 W0             <=  Cancel of reference point shift amount
                       for 1-process.
M02                <=  End of program for 1-process.
M98 P0002          <=  Call of program for 2-process.
M30                <=  End of continuous program of 1, 2-
                       process
%

O0002
G54 W__            <=  Reference point setting for 2-process
   )               <=  Machining program for 2-process.
G54 W0             <=  Cancel of reference point shift amount
                       for 2-process.
M99                <=  End of program for 2-process
                       (return to main program)
%
```

4-7 Others

4-7-1 List of G Functions (Preparatory Functions)

Standard G code	Group	Function	Class.
G00	01	Positioning (Rapid traverse)	B
G01		Linear interpolation (option)	B, O
G02		Circular interpolation (Radius R indication) CW	B
G03		Circular interpolation (Radius R indication) CCW	B
G04	*	Dwell	B
G06		Error detect OFF positioning	B
G10		Tool offset amount setting	B
G20	05	Inch input indication	B
G21		Metric input indication	B
G27	*	Reference point return check	B
G28		Return to 1st reference point	B
G29		Return from reference point	B
G30		Return to 2nd reference point	B
G31		Skip function	O
G32	01	Threading, continuous threading, multiple threading (option)	B, O
G34		Variable lead threading	O
G35	*	Tool set difference compensation	O
G36	07	Stored stroke limit 2nd area ON	B
G37		Stored stroke limit 2nd area OFF	B
G38	08	Stored stroke limit 3rd area ON	B
G39		Stored stroke limit 3rd area OFF	B
G50	*	Coordinates setting	B
		Spindle maximum speed setting, work-coordinates setting	B
G51	*	Present value display zero point return	O
G65		User macro-simple call	O
G66	09	User macro-modal call	O
G67		User macro modal call cancel	O
G68	10	Program mirror image ON	O
G69		Program mirror image OFF	O

Standard G code	Group	Function		Class.
G70	*	Finishing cycle	Complex shape Fixed cycle	B
G71		Outside roughing cycle		B
G72		Stock roughing cycle		B
G73		Close-loop cutting cycle		B
G74		Stock cutting cycle		B
G75		Outer diameter cycle		B
G76		Auto-threading cycle		B
G90	01	Cutting cycle A		B
G92		Threading cycle		B
G94		Cutting cycle B		B
G96	02	Constant surface speed control		B
G97		Constant surface speed control cancel		B
G98	04	Feed per minute (mm/min)		B
G99		Feed per revolution (mm/min)		B
G122	11	Tool-registration start	Tool life control	O
G123		Tool-registration end		O
G111	*	Taper-complex chamfering, rounding		O
G112		Circular complex chamfering, rounding		O
G141	*	Tool nose R offset direction left side indication		B
G142		Tool nose R offset direction right side indication		B
G150	13	Slot-width compensation OFF		B
G151		Slot-width compensation ON		B

G code of 01 ∿ 03 of the left group is called modal, and when it is commanded once, it is kept until the other G-code of the same group is commanded.

01 group : Control function of tool-motion.
02 group : Control function of spindle command method.
04 group : Control function of tool-nose moving method.
07, 08 group : Setting function of yes/no area of tool-invasion.
13 group : Control fucntion slot-compensation.

G code of * group is called non-modal G-code, and it disappear when it is executed once.

Thus, it is effective with commanded block alone. G-code with sym symbol (mark) ◤ shows its state after power input or by pressing the reset key.

G01 G97 G99

Notes: (1) G-code of 07, 08 group is displayed at input time of power supply for the last commanded G-code.

(2) G-code is commanded in the same block duplicatedly with different group of G-code.

(3) In duplicating G-code of the same group, later command became effective.

(e.g.) Upon commanding G01 G96 G00, G96 G00 can be executed.

(4) B is standard specification.
O is option.

4-7-2 List of M Functions (Miscellaneous Functions)

M code	Function (*: option)
M00	Program stop
M01	Optional stop
M02	End of program
M03	Spindle forward start
M04	Spindle reverse start
M05	Spindle stop
M08	Coolant ON
M09	Coolant OFF
M12	* Work count
M18	* Spindle positioning reset
M19	* Spindle positioning
M21	Error detect ON
M22	Error detect OFF
M23	Chamfering ON
M24	Chamfering OFF
M25	Tail stock forward
M26	Tail stock retract
M28	Tail stock to retract end
M30	End of program
M31	* No-blank detection
M36	* Power shut-off valid at program stop
M37	* Power shut-off invalid at program stop
M38	* Center air blow ON
M39	* Center air blow OFF
M40	Spindle low-speed range HT15SII : 35 ∿ 6,000 r.p.m HT20SII : 30 ∿ 5,000 r.p.m HT20SII : 20 ∿ 3,000 r.p.m (BIG CHUCK)
M41	Spindle high-speed range HT15SII : 145 ∿ 6,000 r.p.m HT20SII : 120 ∿ 5,000 r.p.m HT20SII- : 80 ∿ 3,600 r.p.m (BIG CHUCK)
M48	* Feed rate override cancel OFF
M49	* Feed rate override cancel ON
M51	* Spindle air blow ON
M52	* Spindle air blow OFF

M code	Function (*: option)
M61	* Auto door open
M62	* Auto door close
M63	* Unloader OUT
M64	* Unloader IN
M66	* Chuck clamp pressure low
M67	* Chuck clamp pressure high
M68	Chuck close
M69	Chuck open
M81	* Robot service 1
M82	* Robot service 2
M88	* Main unit standby
M89	* Robot standby
M90	* Program interrupt function OFF
M91	* Program interrupt function ON
M92	1-block buffering
M93	4-block buffering
M94	* X-axis outside tool compensation
M95	* Z-axis outside tool compensation
M96	Tool-nose R-compensation circular mode
M97	Tool-nose R compensation cross-point calculation mode (State at input time of power supply)
M98	Subprogram call
M99	End of subprogram

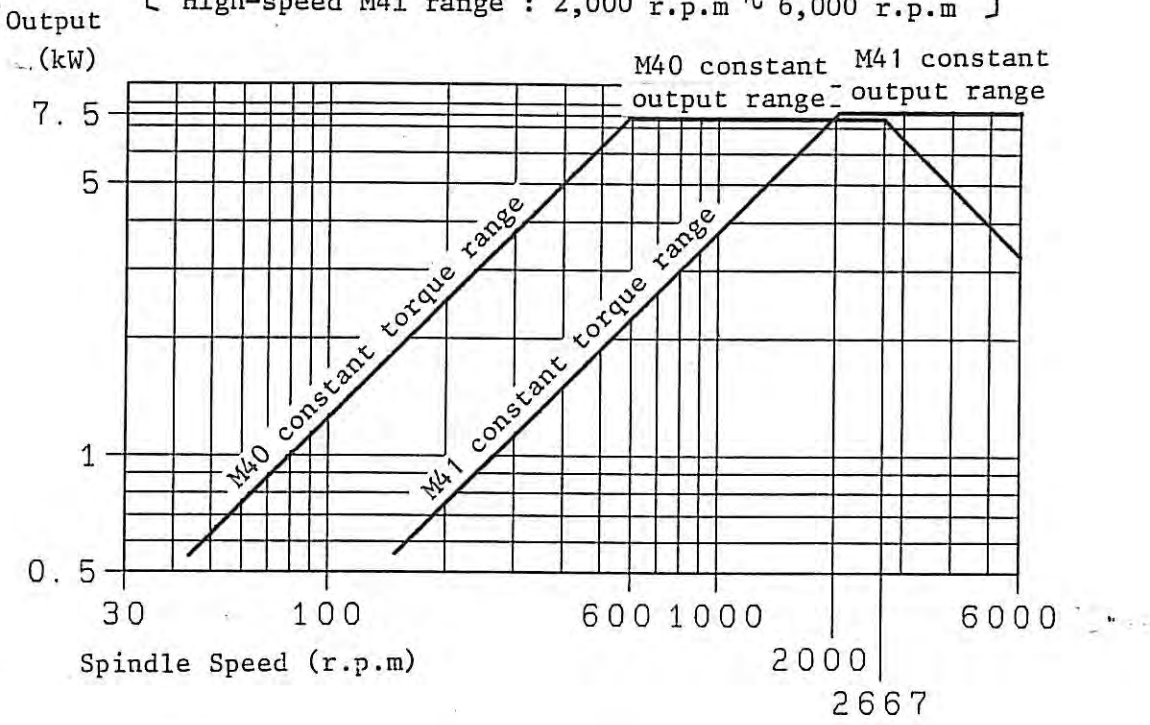
M79 FLAP UP

M80 FLAP DOWN

Spindle Output Chart

For HT15SII, an output constant range, which assures machine's rated output (7.5 kW) is as shown in the figure below:

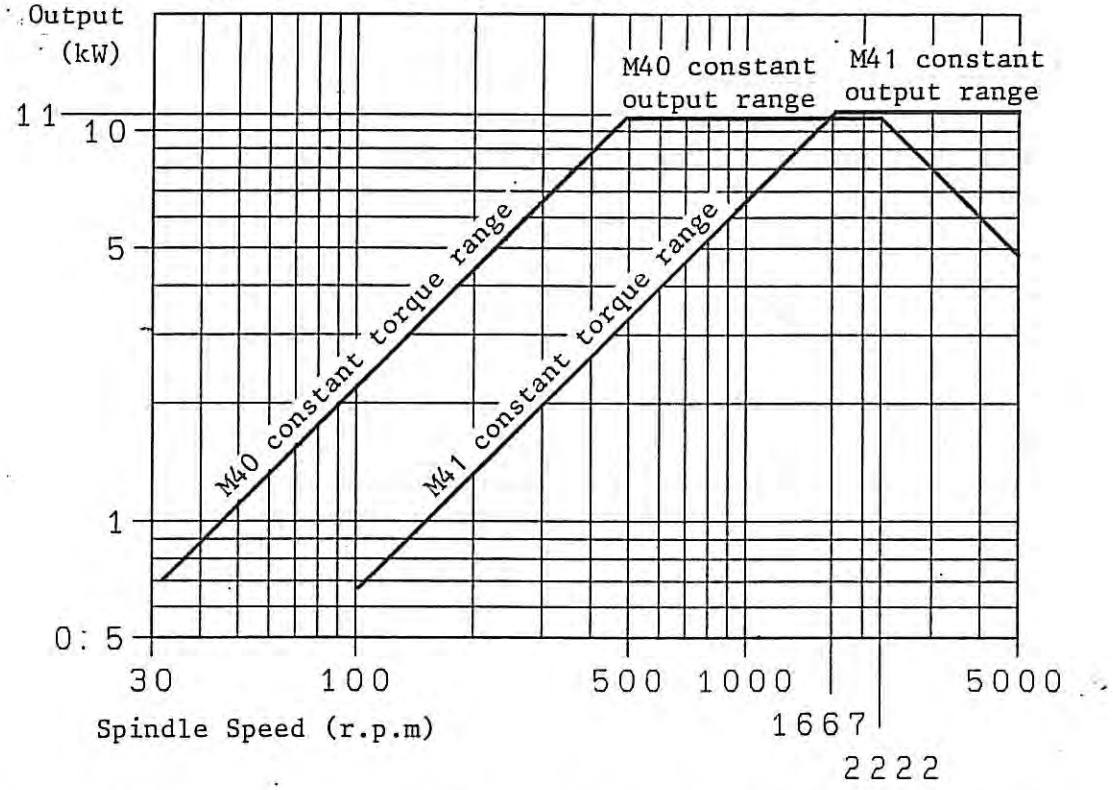
[Low-speed M40 range : 600 r.p.m ∿ 2,667 r.p.m
  High-speed M41 range : 2,000 r.p.m ∿ 6,000 r.p.m]



Spindle Output Chart

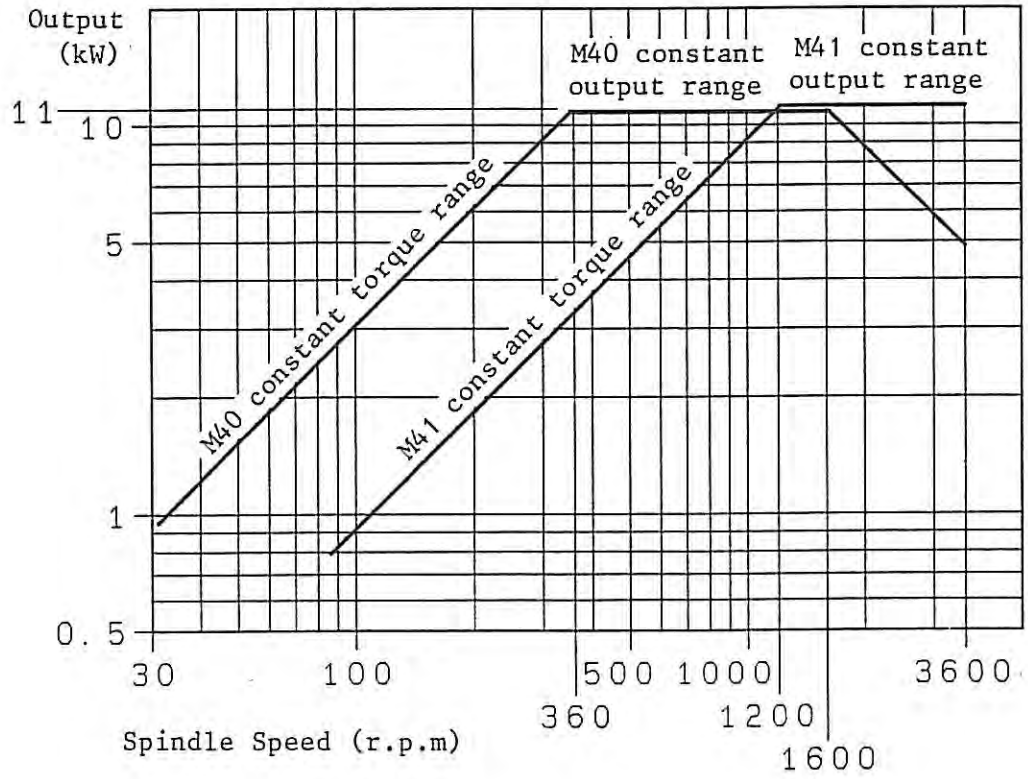
For HT20SII, an output constant range, which assures machine's rated output (11 kW) is as shown in the figure below:

[Low-speed M40 range : 500 r.p.m ∿ 2,222 r.p.m
High-speed M41 range : 1,667 r.p.m ∿ 5,000 r.p.m]



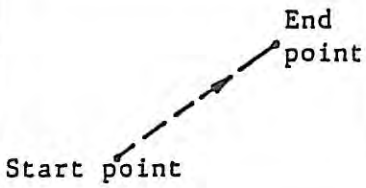
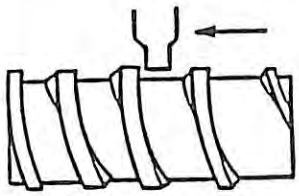
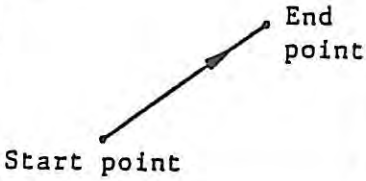
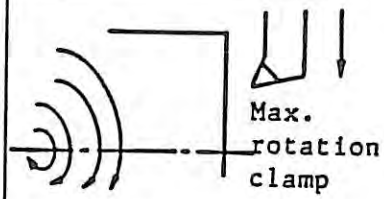
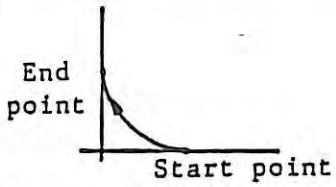
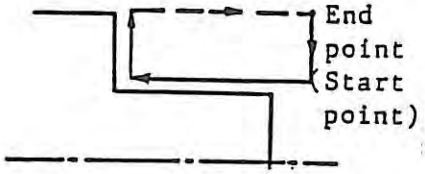
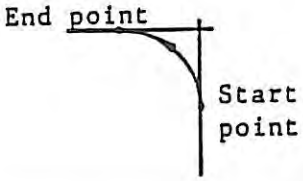
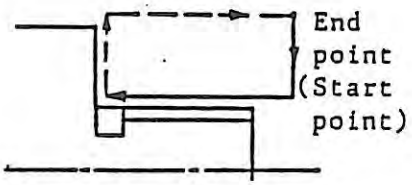
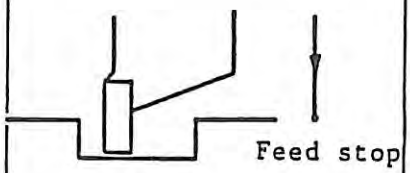
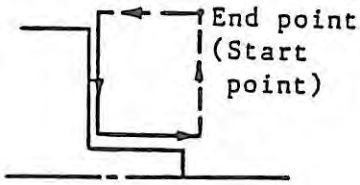
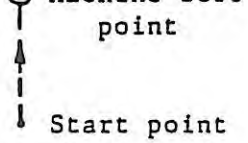
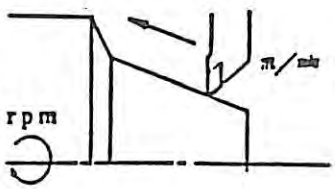
For HT20SII(BIG CHUCK), an output constant range, which assures machine's rated output (11 kW) is as shown in the figure below:

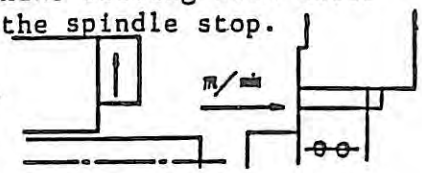
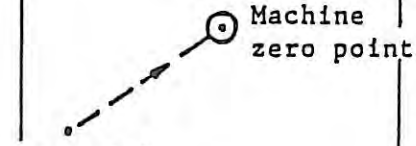
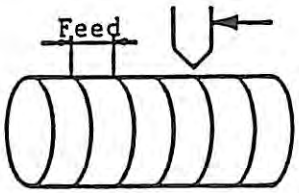
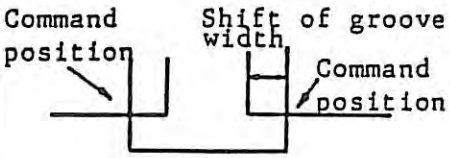
[Low-speed M40 range : 360 r.p.m ∿ 1,600 r.p.m
High-speed M41 range : 1,200 r.p.m ∿ 3,600 r.p.m]



4-7-3 List for English Word Program

1. List for state display

State display	Explanation	State display	Explanation
Rapid traverse		Variable lead threading	
Cutting feed		Max. rpm	
Circular ↻		Outer diameter cutting cycle	
Circular ↺		Threading cycle	
Stop time		End face cutting cycle	
Zero-point return X-axis		Peripheral speed command / Rotation command	

State display	Explanation	State display	Explanation
Zero-point return Z-axis		Feed per minute	Make cutting feed under the spindle stop. 
Zero point return Both axes		Feed per revolution F Feed per revolution F	Max. 0.01mm/rev Min. 0.0001mm/rev
Threading		Groove-width compen-sation OFF Groove-width compen-sation ON	

For details, refer to Program Manual 2.

2. List for auxiliary functions

F1	F2	F3	F4	F5	F6	F7	F8	F9
SPINDLE FORWARD	SPINDLE REVERSE	SPINDLE STOP	COOLANT O N	COOLANT OFF	SPINDLE L. SPEED	SPINDLE H. SPEED		OTHERS

F1	F2	F3	F4	F5	F6	F7	F8	F9
CALL SUB. PROG	END SUB. PROG	W. THREAD CHAMFER	W/O THRD CHAMFER	OPERAT. OVER	MACHING. END	STOP MACHING.		OTHERS

F1	F2	F3	F4	F5	F6	F7	F8	F9
WORKPCS. COUNT	QUILL FORWARD	QUILL REVERSE	TAIL STK CLAMP	TAIL STK UNCLAMP	NO-BLANK DETECT	AUT. DOOR OPEN	AUT. DOOR CLOSE	OTHERS

F1	F2	F3	F4	F5	F6	F7	F8	F9
UNLOADER FORWARD	UNLOADER REVERSE	CHUCK PRESS. L.	CHUCK PRESS. H.	CHUCK CLAMP	CHUCK UNCLAMP	CALL ROBOT		OTHERS

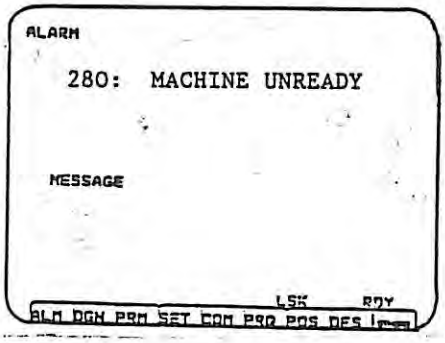
4-7-4 Display and Setting of Setting Data

(Display of Setting Data)

Procedure 1

Press the [F8] (NC SCREEN) key.

⟶ Screen shows "alarm".



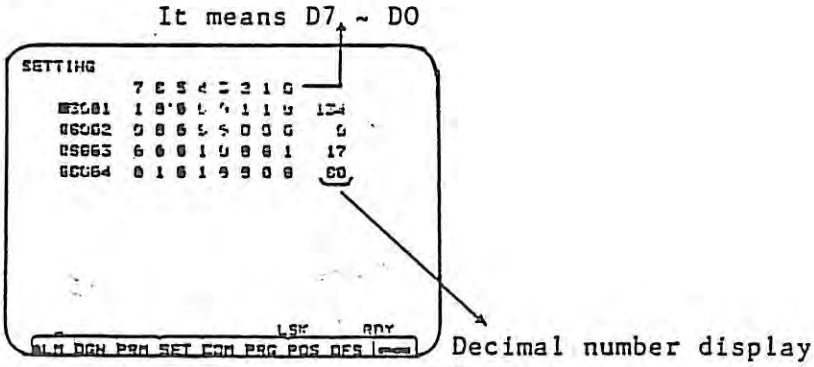
Procedure 2

Press the [F4] (SET) key.

⟶ Screen shows SETTING.

By page key, screen is renewed.

By cursor key, Setting No. can be renewed.



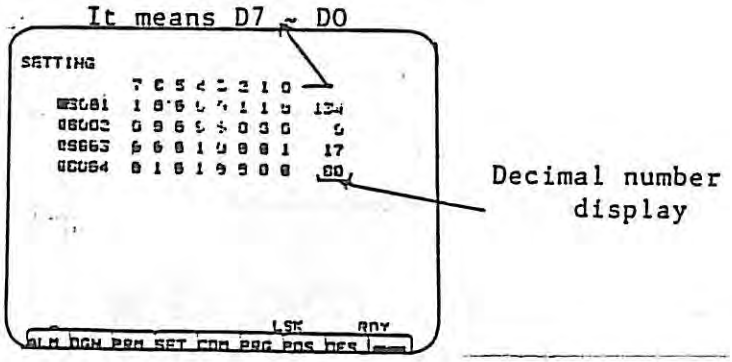
Display example of setting data of bit-display type.

(Setting of Setting Data)

Procedure 1

Press the key for setting No., and press cursor key.

⟶ Cursor moves to Setting No.



Procedure 2

Cursor moves to No. 6004.

Press the insert key, then, cursor moves to data-position.

Move the cursor to the bit intended to change.

⟶

	7	6	5	4	3	2	1	0
#6001	1	1	0	0	0	0	0	0
#6002	0	0	0	0	1	0	0	0
#6003	0	0	0	0	0	0	1	1
#6004	**0**	0	1	0	1	0	0	0

Procedure 3

Press the [INPUT] key.

⟶ Data reverse in the manner "0 ⇄ 1".

Procedure 4

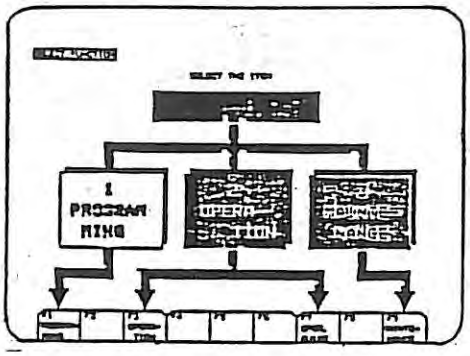
Press the [INSERT] key.

⟶ Cursor moves to Setting No.

Procedure 5

Press the [MENU] key.

⟶ Screen shows the initial screen.



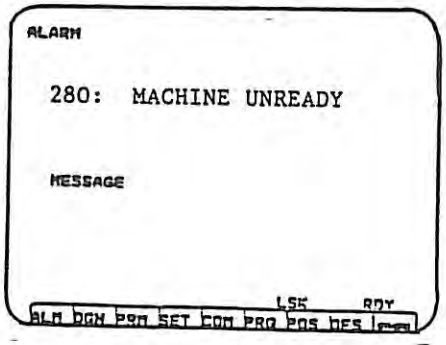
4-7-5 Display and Setting of Parameter

(Display of Parameter)

Procedure 1

Press the [F8] (NC SCREEN) key.

⟶ Screen shows "alarm".



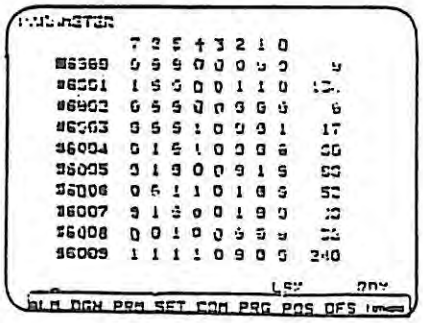
Procedure 2

Press the [F3] (PRM) key.

⟶ Screen shows PARAMETER.

By page key, screen is renewed.

By cursor key, Setting Parameter No. can be renewed.

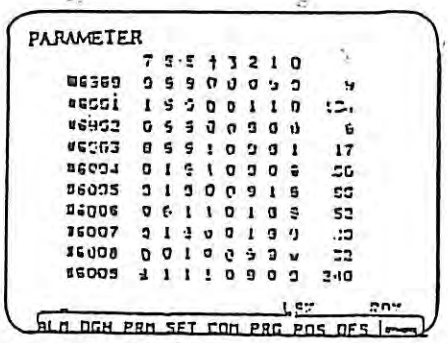


(Setting of Parameter)

Procedure 1

Press the key for setting No., and press cursor key.

⟶ Cursor moves to Setting No.



Note) 1. To set a parameter, input "1" to the setting parameter #6219.

2. After parameter setting, input "0" to the setting parameter #6219 and then turn off the POWER.

Procedure 2

The following is the same as the setting of data. See 4-7-4.

4-7-6 Output of Various Data (Setting Data, Parameter, Offset)

1. Setting data, parameter

Procedure 1

Connect the external-instruments such as tape-puncher, etc. to NC-unit through data-input/output interface (set off puncher-power).

Procedure 2

Prepare for the operation of outside-instruments.

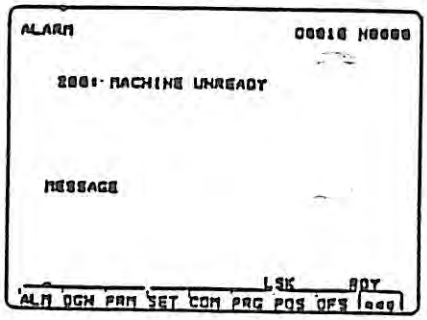
Procedure 3

Press the [EDIT] key.

Procedure 4

Press the [F8] (NC SCREEN) key.

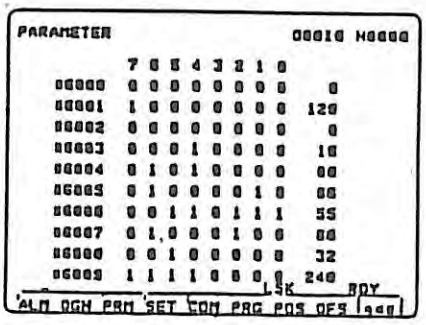
⟶ Screen shows "alarm".



Procedure 5

Press the [F3] (PRM) key.

⟶ Screen shows PARAMETER.



Procedure 6

Press the [RESET] key.

Procedure 7

Press the [F1] (OUT) key.

2. Offset data

Procedure 1

Connect the external-instruments such as tape-puncher, etc. to NC-unit through data-input/output interface (set off puncher power).

Procedure 2

Prepare for the operation of outside-instruments.

Procedure 3

Press the [EDIT] key.

Procedure 4

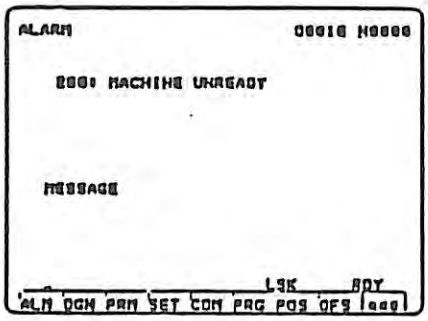
Press the [F8] (NC SCREEN) key.

⟶ Screen shows "alarm".

Procedure 5

Press the [F8] (OFS) key.

⟶ Screen shows OFFSET.

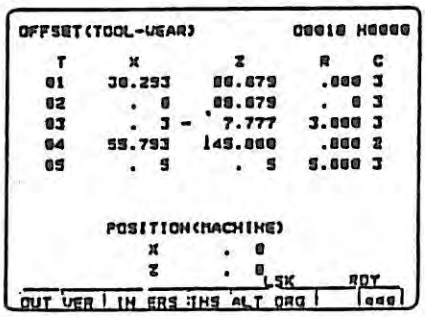


Procedure 6

Press the [RESET] key.

Procedure 7

Press the [F1] (OUT) key.

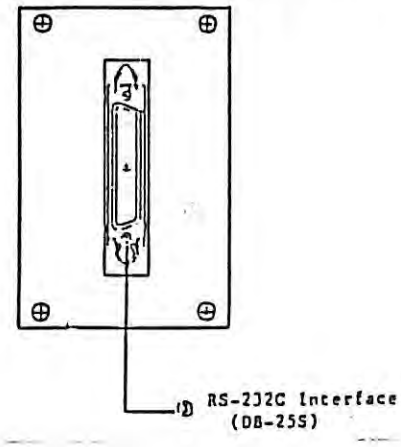


4-7-7 Explanation for Various Data on Input/Output Instruments

Type and Function of Interface

Interface name	RS-232C interace
Type of interface	Serial voltage interface
Data transmission speed	Input : #6026 Output : #6028
Connecting connector (note)	DB-25S
Maximum cable length	15 m (50 feet)
Objective external instruments	RS-232C instrument having I/F
Function	• Storage or collation of the above NC amount to NC-memory. • Output of the above NC amount to outer instrument (punch-out) • Auto-operation by tape mode (instead of tape-reader)

Connector on NC-side Data Input/Output Interface



Setting of Using Data Input/Output Interface

In the use of data input/output interface, it is necessary to set the using interface to the setting.

Setting of Using Data Interface

Input instrument ⟶ NC

IDVCE 1 (#6003 DI)	IDVCE 0 (#6003 DO)	Using data input interface
0	1	No. 1 RS-232C
1	0	No. 2 RS-232C

Output NC ⟶ Instrument

ODVCE 1 (#6003 D5)	ODVCE 0 (#6003 D4)	Interface name
0	1	No. 1 RS-232C
1	0	No. 2 RS-232C

Band and Other Setting of Serial Interface:

In the use of serial interface (current loop RS-232C) the sending-out of "band" stop bit control need should be set to parameter. Setting value is different by input/output instrument. For details, refer to Instruction Manual for Maker's Machine.

RS-232C Interface

a. Setting bandrate

1. In case of No. 1 RS-232C interface

Bandrate Value	For input	#6026 D3	#6026 D2	#6025 D1	#6026 D0
	For output	#6028 D3	#6028 D2	#6028 D1	#6028 D0
	50	0	0	0	0
	100	0	0	0	1
	110	0	0	1	0
	150	0	0	1	1
	200	0	1	0	0
	300	0	1	0	1
	600	0	1	1	0
	1200	0	1	1	1
	2400	1	0	0	0
	4800	1	0	0	1
	9600	1	0	1	0

2. In case of No. 2 RS-232C interface

Bandrate Value	For input	#6027 D3	#6027 D2	#6027 D1	#6027 D0
	For output	#6029 D3	#6029 D2	#6029 D1	#6029 D0
	50	0	0	0	0
	100	0	0	0	1
	110	0	0	1	0
	150	0	0	1	1
	200	0	1	0	0
	300	0	1	0	1
	600	0	1	1	0
	1200	0	1	1	1
	2400	1	0	0	0
	4800	1	0	0	1
	9600	1	0	1	0

b. Setting of control code sending out indication

1. In case of No. 1 RS-232C interface

For input:	#6026 D5	= 1 : No sending-out of control code.
For output:	#6028 D5	= 0 : Sending-output of control code.

2. In case of No. 2 RS-232C interface

For input:	#6027 D5	= 1 : No sending-out of control code.
For output:	#6029 D5	= 0 : Sending-output of control code.

c. Setting of stop bit length

1. In case of No. 1 RS-232C interface

For input:	#6026 D4	= 1 : 2-stop bit
For output:	#6028 D4	= 0 : 1-stop bit

2. In case of No. 2 RS-232C interface

For input:	#6027 D4	= 1 : 2-stop bit
For output:	#6029 D4	= 0 : 1-stop bit

#6026 shows Parameter No. and Setting No.

D5 shows Bit No.

For setting change, refer to 4-7-4: Display and Setting of Setting Data, 4-7-5: Display and Setting of Parameter.

4-7-8 Summary Storage and Editing Operation

	Operation			Edit lock	System No. SW	Mode	Function	Procedure
Parameter	Storage from NC-operation panel key				1	/	PRM	Parameter No. – [CURSOR] – Data – [WR]
	Storage from tape (Note 6)				1	EDIT		[RESET] – [IN]
	Punch-out (Note 3)							[RESET] – [OUT]
	Collation with tape (Note 4)							[RESET] – [VER]
Setting	Storage from NC-operation key					/	SET	Setting No. – [CURSOR] – Data – [WR]
	Storage from tape				1	EDIT		[RESET] – [IN]
	Punch-out							[RESET] – [OUT]
	Collation with tape							[RESET] – [VER]
Offset	Storage from NC-panel key					/	OFS	Offset No. – [CURSOR] – Address data – [WR]
	Storage from tape					EDIT		[RESET] – [IN]
	Punch-out							[RESET] – [OUT]
	Collation with tape							[RESET] – [VER]
	Clear of total-offset					/		[O] – –9999– [ORG]
Part program	Storage from NC-operation panel key			OFF				[O] – Program No – [WR] – Repetition of editing operation "address-data insert"
	Storage from tape	One part program	O-No. at tape	OFF				[RESET] – [IN]
			No O-No. at tape	OFF				[RESET] – [O] – Program No.– [IN]
		Total part program No.		OFF				[RESET] – [O] – –9999 – [IN]
		Additional storage to already registered part program		OFF				[RESET] – [NEXT] – [IN]

		Operation		Edit lock	System No. SW	Mode	Function	Procedure
Part program	Punch-out	Indicated part program				EDIT	PROG	RESET - 0 - Program No.- OUT
		Total part program						RESET - 0 - -9999 - OUT
	Collation with tape	One part program	O-No.at tape					RESET - VER
			No O-No. at tape (Note 1)					RESET - 0 - Program No.- VER
		Total part program						RESET - VER
	Edit	Change of address data (Note 2)		OFF				CURSOR (Change address data set) - Address data - ALTER
		Insert of address data (Note 2)		OFF				CURSOR - (Set to address data just before insert.)- address data - INSRT
		Delete of 1-address data		OFF				CURSOR (Set to delete-address data.) - ERASE
		Delete of 1-block (Note 5)		OFF				CURSOR (Set to address data at top of delete block.) - EOB - ERASE
	Address search					TAPE MEM EDIT		Search address data CURSOR
	Clear	Indicating part program		OFF		EDIT		0 - Clearing Program No. - ERASE
		Whole program		OFF				0 - -9999 - ERASE

(Note) 1. Make same operation for storing the part-operation as Program No. different from O-No. at tape as with "no O No. at tape".

2. Within 32 characters, it is possible to change to one address data with insertion of plural address data.

3. Simultaneous punch-out is made for setting.

4. When tape has setting-information, storing and collation can be done simultaneously.

5. Set CURSOR to address data on the way of block for EOB → ERASE, then, after-address set with CURSOR can be erased.

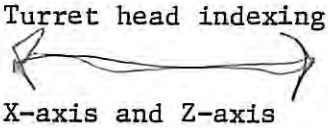
6. After storage from parameter-tape, make input/output operation for power.

5. MAINTENANCE AND ADJUSTMENT

5-1 Periodic Check List

Note: Before and after operating the machine, be sure to check and clean the machine. Also, check the machine periodically according to the following items.

Where to check and clean	Checking and cleaning method	Frequency
Power control cabinet		
Cooling fan rotation	Check the following cooling fans; two outside the door of the power control cabinet and two inside the power control cabinet.	Daily
Air filter	Remove the door of the power control cabinet and clean with a compressor.	Monthly
Terminal board and relays	Check whether or not screws are loosened.	Semi-annually
NC unit		
Cooling fan rotation	Check the following cooling fans; two inside the door of the NC unit and one on the upper left part in the NC unit.	Daily
Tape guide	Clean with gauze dipped in absolute alcohol.	Daily
Surface of the reading head	Clean with gauze dipped in absolute alcohol.	Daily
Bottom of the tape box	Clean with a piece of cloth, brush or vacuum cleaner.	Weekly
Tape retainer magnet	When iron power is stuck to the magnet, clean with adhesive tape.	Weekly
Tape path	Clean with gauze dipped in absolute alcohol.	Weekly
Pilot lamps	Check each pilot lamp whether if normally function.	Monthly

Where to check and clean	Checking and cleaning method	Frequency
Lubricating/hydraulic oil reservoirs		
Lubricating oil reservoir	Supply oil (2 ℓ/0.5 gal) when the LUBE ALARM (No. 503)	Daily
Oil level in the hydraulic reservoir	Check before starting daily operation. (Replace semiannually.) 5.5 ℓ/1.5 gal	Weekly
Pressure gauge	Check before starting daily operation.	Weekly
Piping joints	Check each piping joint for oil leakage and clean with a piece of cloth.	Semi-annually
Machine proper		
Turret head indexing 	Check the turret head for its indexing and positioning.	Semi-annually
X-axis and Z-axis feed per pulse	5 μ for the X axis and 10 μ for the Z axis with magnification of 10/1 selected. Measure with a dial indicator.	Semi-annually
X-axis zero point	Shift the mode selector switch to ZERO POINT and check its zero point by performing zero return several times.	Daily
Z-axis zero return	Shift the mode selector switch to ZERO RETURN and check its zero point by performing zero return several times.	Daily
Limit switches	Check whether each limit switch normally function.	Monthly
Push button selector switches	Check whether each push button selector switch normally functions.	Monthly
Lamps	Check whether each lamp works normally.	Monthly

Where to check and clean	Checking and cleaning method	Frequency
Coolant collecting port	Remove cutting chips from the coo coolant collecting port located at the back of the chuck cylinder.	Daily
Chuck	Fill fully with grease before starting daily operation.	Daily
Sliding cover	Remove cutting chips after completing daily operation.	Daily

5-2 Adjusting Method for X, Z-axis Backlash

Procedure 1

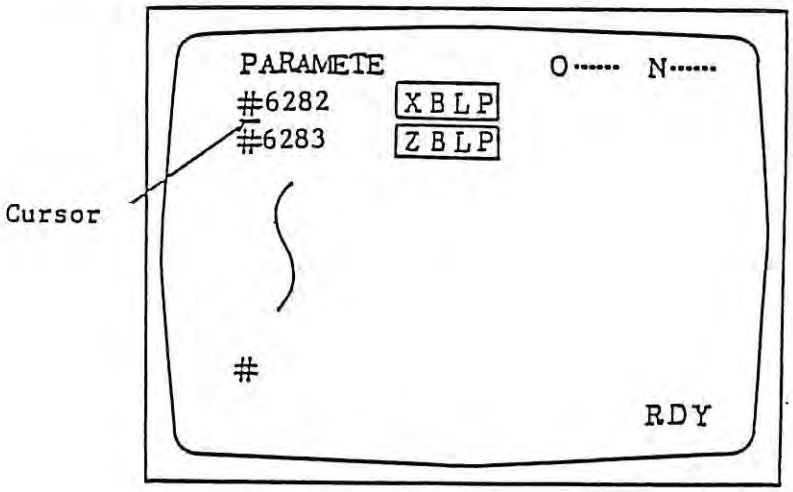
Cancel of the compensation amount input previously.

Cancel the compensation input previously before measuring the backlash.

1) Input "1" to the setting parameter #6219.

2) Select the function key [PRM] in NC-screen.

3) On DATA key, input X-axis [6][2][8][2] (Z-axis [6][2][8][3]), and press cursor key [▼] or [▶].



On screen, previously input backlash compensation amount is displayed.

4) With DATA key, press "0" for #6282, and press [INPUT] key.
Similarly, key in for "0" #6283, and press [INPUT] key.
Thereby, compensation amount is cancelled.

5) Input "0" to the setting parameter #6219.

6) Once, set the power OFF, and again, set the power ON.
(If it is not performed, exact operation is not made.)

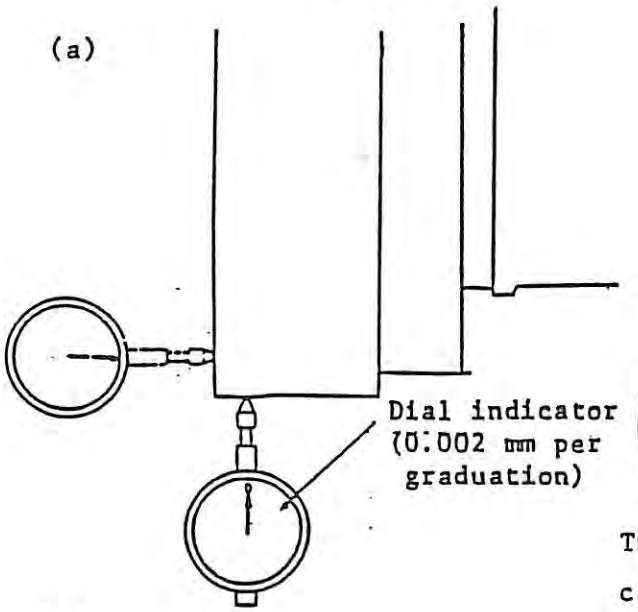
Procedure 2

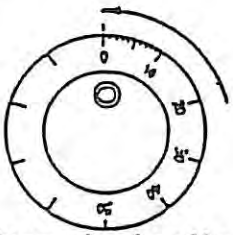
Measuring the backlash amount:

1) Put the dial indicator into contact with the turret head from the tail stock side.

2) Measure a backlash amount with an X-axis or Z-axis handle in the order of (a) through (c)

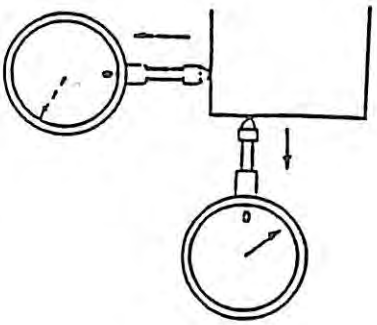
(a)

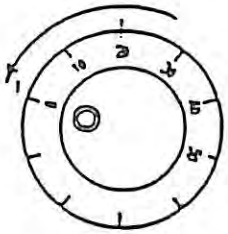




Turn the handle counter-clockwise and set the handle and indicator to 0.

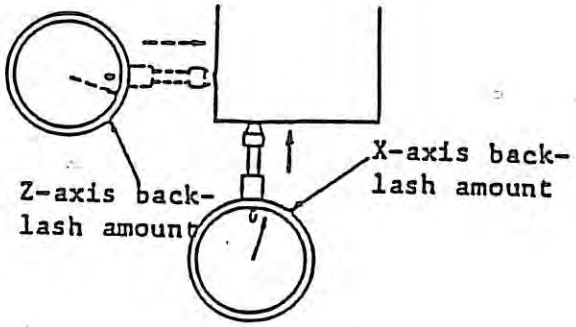
(b)

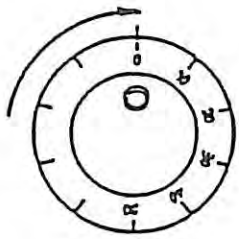




Turn the handle further counterclockwise by another 20 ~ 30 graduations.

(c)





Turn the handle clockwise until a pointer points to 0. At this time, the difference of the indicator represents the backlash amount.

Note) Under the state in cancelling the compensation, when backlash-amount is excessive, pay attention to the fact that there may be a disorder on the clamping of the gib.

Procedure 3

How to set the backlash amount

1) Following the Procedure 1, display X-axis [6][2][8][2] of Z-axis [6][2][8][3] on the screen by the parameter.

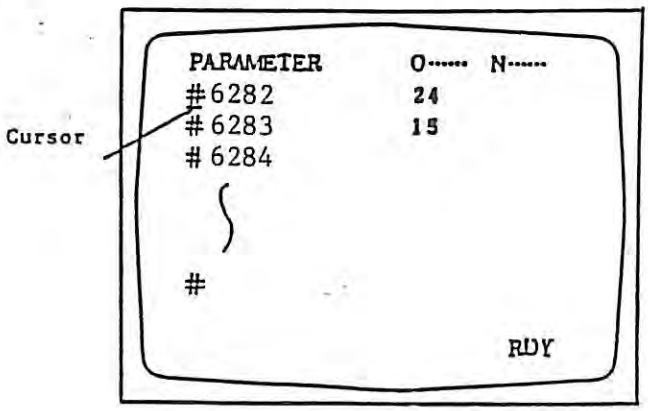
2) Make sure that the cursor is located at the parameter No. to be corrected. Input the compensation value by the DATA keys and press the INPUT button.
Thereby, compensation is input.

Example 1. Input of the X-axis backlash compensation value case in compensating the backlash amount "0.012 mm";

$$\text{Compensation value} = \frac{\text{Backlash amount}}{\text{Compensation unit (0.0005)}} = \frac{0.012}{0.0005} = 24$$

Example 2. Input of the Z-axis backlash compensation value case in compensating the backlash amount "0.015 mm";

$$\text{Compensation value} = \frac{\text{Backlash amount}}{\text{Compensation unit (0.0001)}} = \frac{0.015}{0.001} = 15$$



3) Input "0" to the setting parameter #6219.

4) Once set the power OFF, and again, set ON. (Without making it, no exact operation is made.)

5-3 Confirmation of Lubrication Oil Delivery

1. Supply lubricating oils in according with the instructions given on the name plate.

2. Lubricating pump type

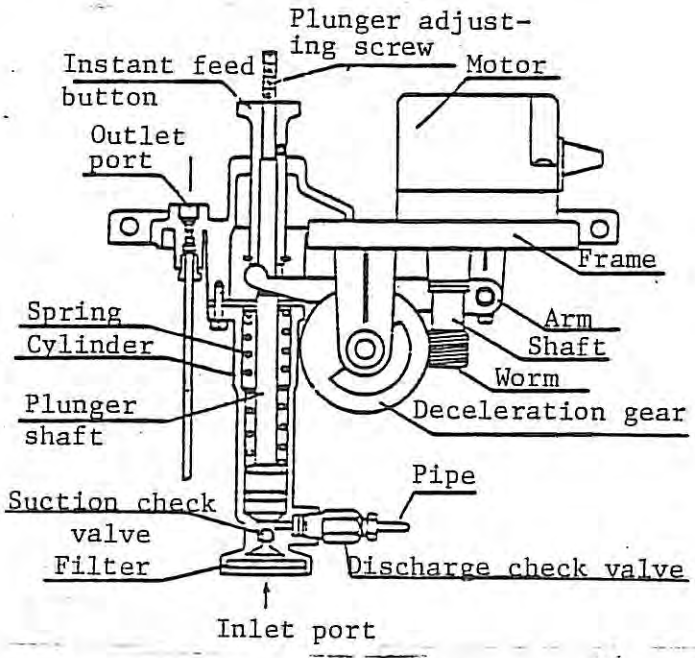
SMA-610 oil quantity:	2 ℓ (0.44 gal)
Pump delivery quantity:	5 cc/cy (5 scales)(0.001 gal/cy)
Lubricating ports:	19 positions, max. 3 kg/cm^2 (6.6 lb/cm^2)
Interval:	10 min.

Note 1) Insufficient lubrication of the saddle, cross-side and turret head induces an ill effect on the machine.
Pay attention to the consumption of lubricating oil.

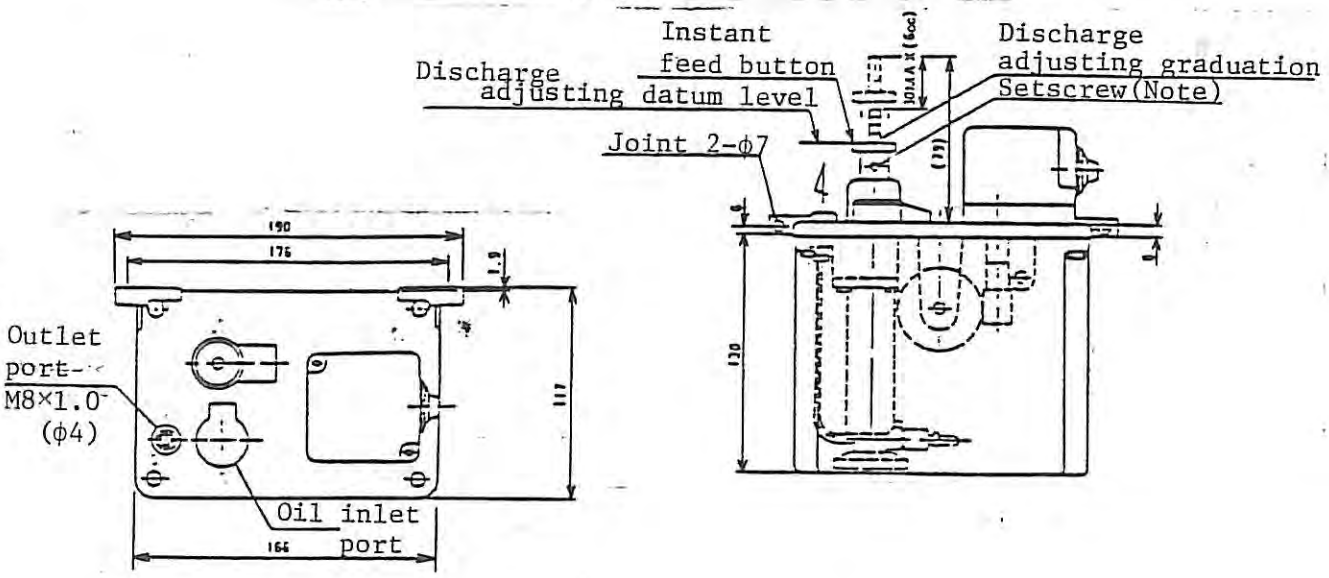
Note 2) Assuming that the machine is operated for 8 hours daily, the oil level of the lubricating pump will be lowered about 20 mm.
(There may be some variations.)

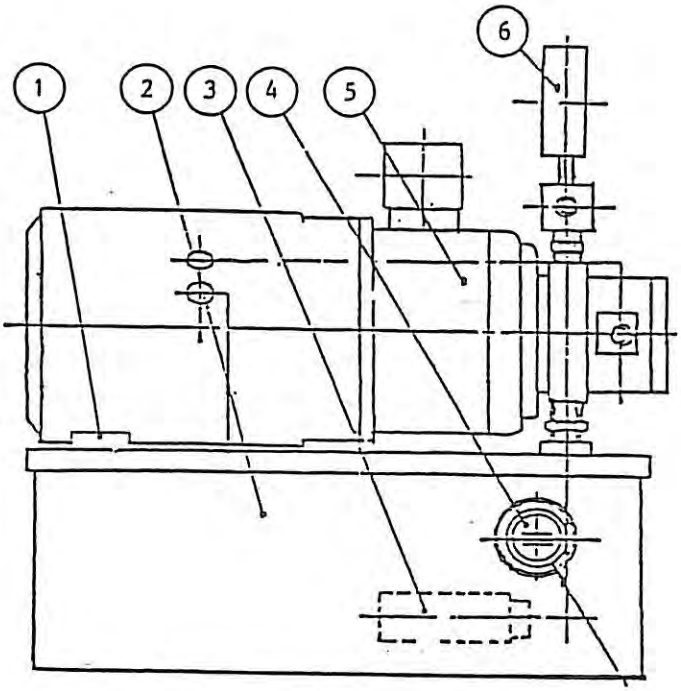
Functioning

As the motor rotates, the gear engaged with the drive worm is rotated. Then, the cam transmitted to the coaxial cam pushes up the arm at a speed decelerated to a specified cycle time. Simultaneously when the arm is pushed up, the plunger is pulled up to compress the spring. When the plunger is pulled up, oil pushes up the suction check valve through the suction head, its specified amount for stroke is sucked in the cylinder in preparation for discharge. Next, when the gear rotates and the cam is disengaged, the retaining pressure of the compressed spring causes the oil inside the cylinder makes the suction check valve blind by means of the plunger, and at the same time, the oil is forcibly fed out to the main pipe.

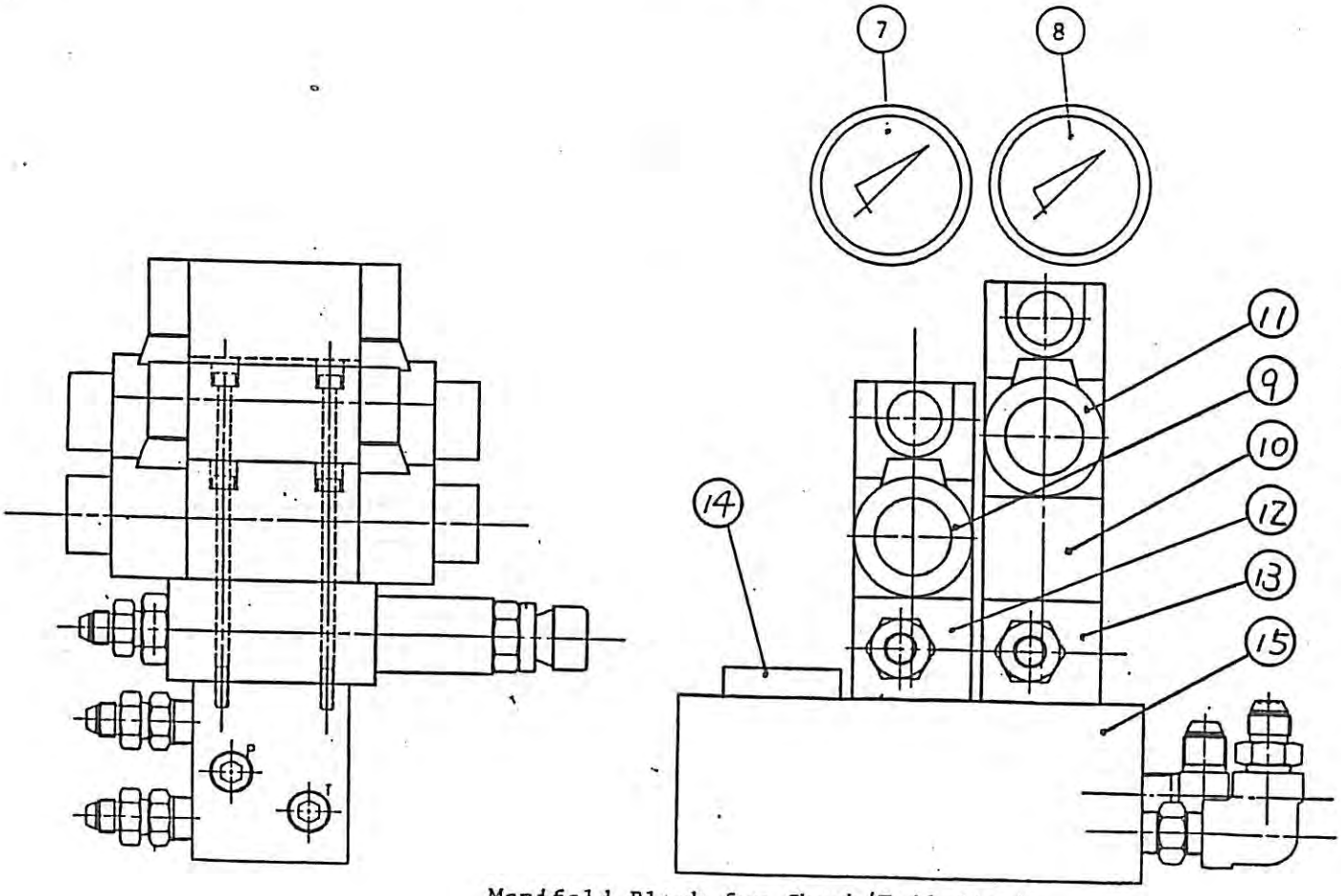


External Dimensions





Hydraulic Tank Unit



Manifold Block for Chuck/Tail Stock

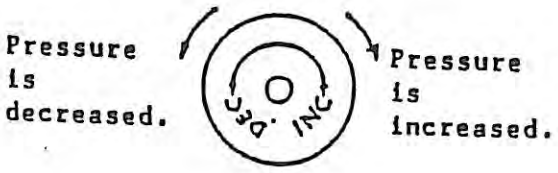
Hydraulic

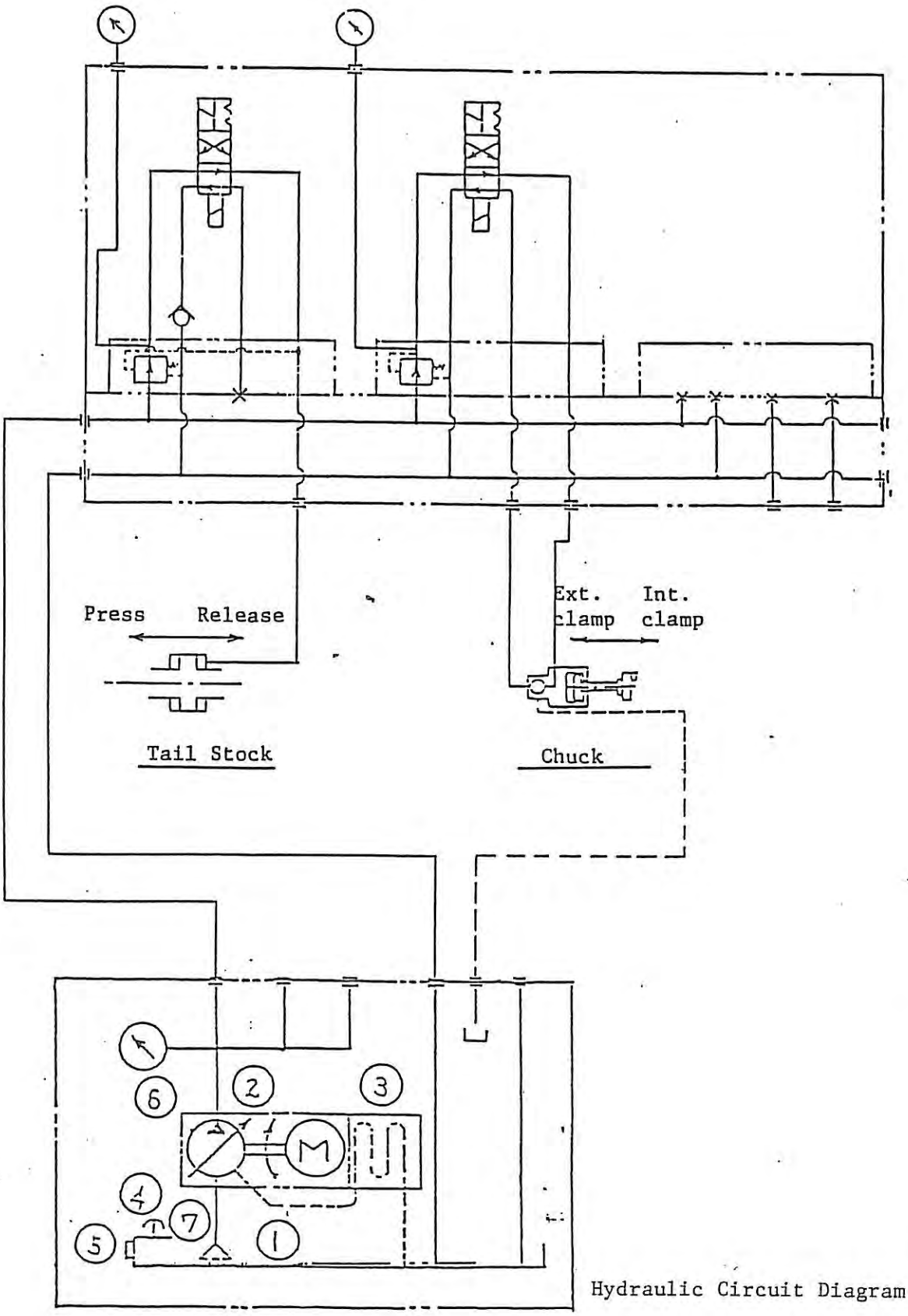
No.	Part name	Q'ty	Part No.	Maker
1	Oil inlet port	1	KRM-A4	KYOWA
2	Oil tank	1	5.5 ℓ	FUJIKOSHI
3	Strainer	1	MSN-03 150 meshes	MASUDA
4	Level gauge	1	KDS-20	TOYO
5	Unipump	1	USV-OA-A2-a4-4-10	FUJIKOSHI
6	Pressure gauge	1	SPA-PT1/4*ϕ60*70k (34 to 35 kg/cm^2, green colored)	TOYO
7	Pressure gauge	1	OPG-DF-T-PT1/4-60*70k (HT15SII) (23 kg/cm^2 or more, red colored) OPG-DF-T-PT1/4-60*70k (HT20SII) (27 kg/cm^2 or more, red colored) OPG-DF-T-PT1/4-60*70k (HT20SII BIG CHUCK)(23 kg/cm^2 or more, red colored)	
8	Pressure gauge	1	OPG-DF-T-PT1/4-60*70k (20 kg/cm^2 or more, red colored)	ASAMI KIKI
9	Solenoid valve	1	SL-G01-E3X-GR-C1-10	FUJIKOSHI
10	T port check valve	1	OC-G01-T2-20	FUJIKOSHI
11	Solenoid valve	1	SL-G01-E3X-GR-C1-10	FUJIKOSHI
12	Reducing valve	1	OG-G01-PC-K-20	FUJIKOSHI
13	Reducing valve	1	OG-G01-AC-K-20	FUJIKOSHI
14	Blind plate	1	MOB-G01-10	FUJIKOSHI
15	Manifold	1	MBL-212	HITACHI SEIKI

Pressure Adjustment

The following are the pressure adjusting methods of various sections of the machine. Since the pressure of the turret head has been adjusted upon shipment, it is generally not required to be adjusted.

1. Adjusting the hydraulic chuck pressure
   a. The method is described in paragraph 5-5 "Hydraulic Chuck".
2. Adjusting the hydraulic tail stock pressure
   a. Adjust with the reducing valve (13) on the manifold.
   b. It can be used in a range of 4 ∿ 20 kg/cm^2 (8.8 ∿ 44 lb/cm^2)

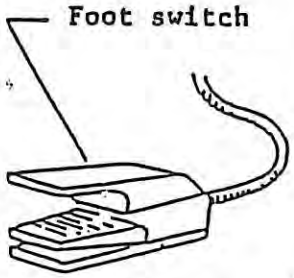




Hydraulic Circuit Diagram

5-5 Hydraulic Chuck

This chuck is hydraulically opened and closed. With this chuck employed, a workpiece setup time can be reduced, manpower can be also saved and the workpiece can be powerfully and equally gripped. This chuck is opened and closed by means of the foot switch. Therefore, the operator can use both hands when setting up the workpiece. Thus, the operatability of the machine can be improved.



Specifications

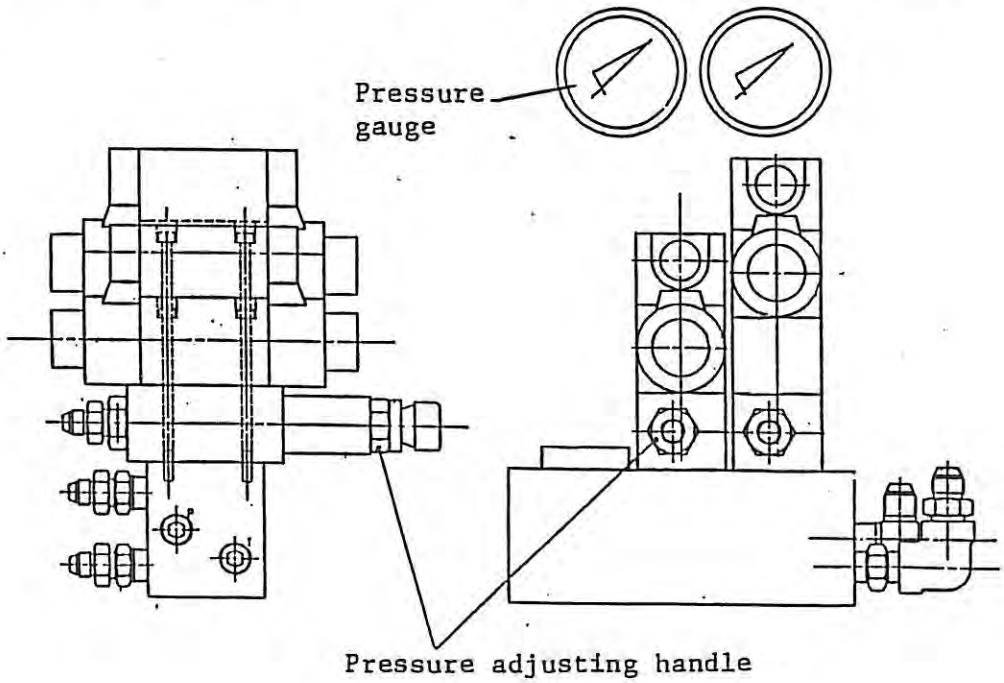
Hydraulic chuck diameter	:	ϕ165 (6") HT15SII
		ϕ210 (8") HT20SII
		ϕ254 (10") ..... HT20SII(BIG CHUCK)
Hydraulic unit	:	Commonly used for the machine proper

Operation

1. Select a chuck gripping direction by using the WORK GRIP INT/EXT selector switch located on the main operation panel.
2. If the foot switch located in the front of the bed is pressed once, the jaws of the chuck will grip the workpiece, and if it is pressed again, they will ungrip the workpiece.
3. Adjusting the chuck pressure

   Adjust the pressure of the hydraulic chuck by using the pressure control knob of the manifold located inside the cover on the left side of the machine.

   - Turning the knob clockwise (direction of INC) increases the pressure.
   - Turning the knob counterclockwise (direction of DEC) decreases the pressure.
   - Adjust the chuck pressure within a range of a pressure gauge.



Notes: 1. Due to an interlocking mechanism, the chuck cannot be opened or closed while the spindle is rotating.

2. While the spindle is stopped, if the foot switch is pressed, the chuck will immediately ungrips the workpiece. Therefore, be careful not to press the switch except when the workpiece is mounted or dismounted, or the gripping directions of the chuck are changed.

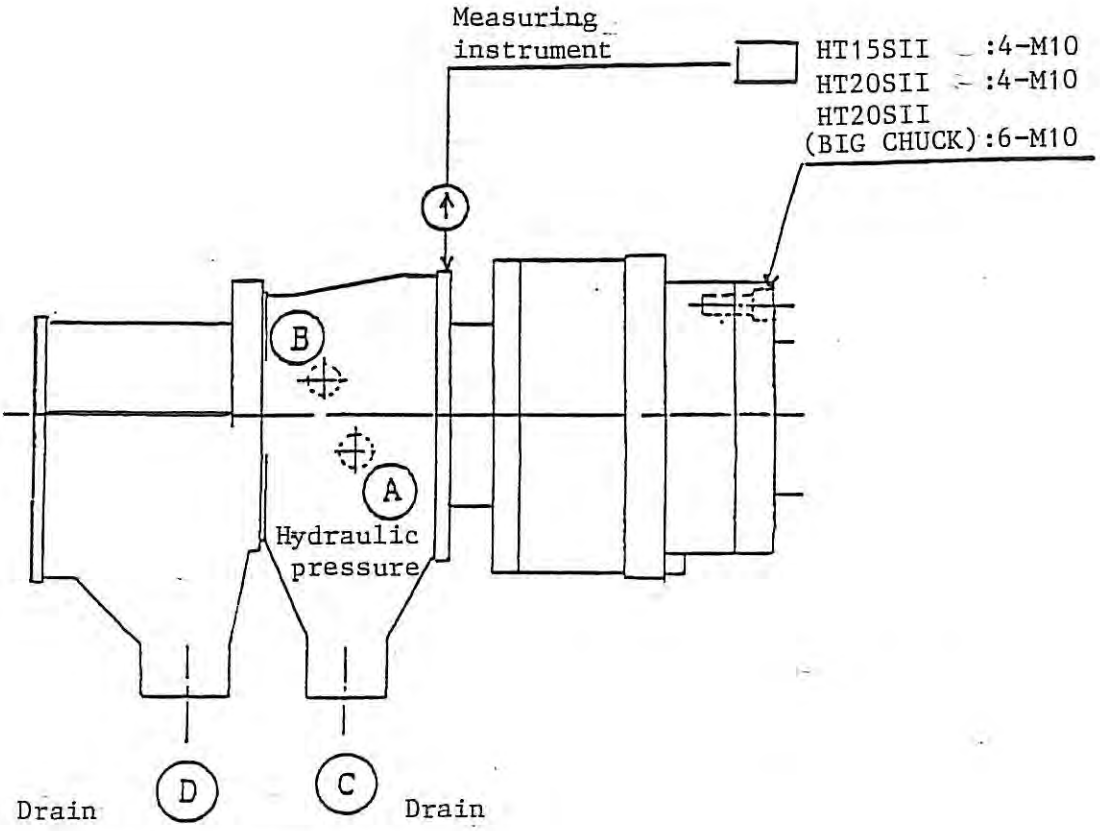
3. When changing the gripping directions of the chuck, be sure to dismount the workpiece from the chuck without fail.

Hydraulic Chuck and Cylinder

Hollow Chuck made by MATSUMOTO MACHINERY

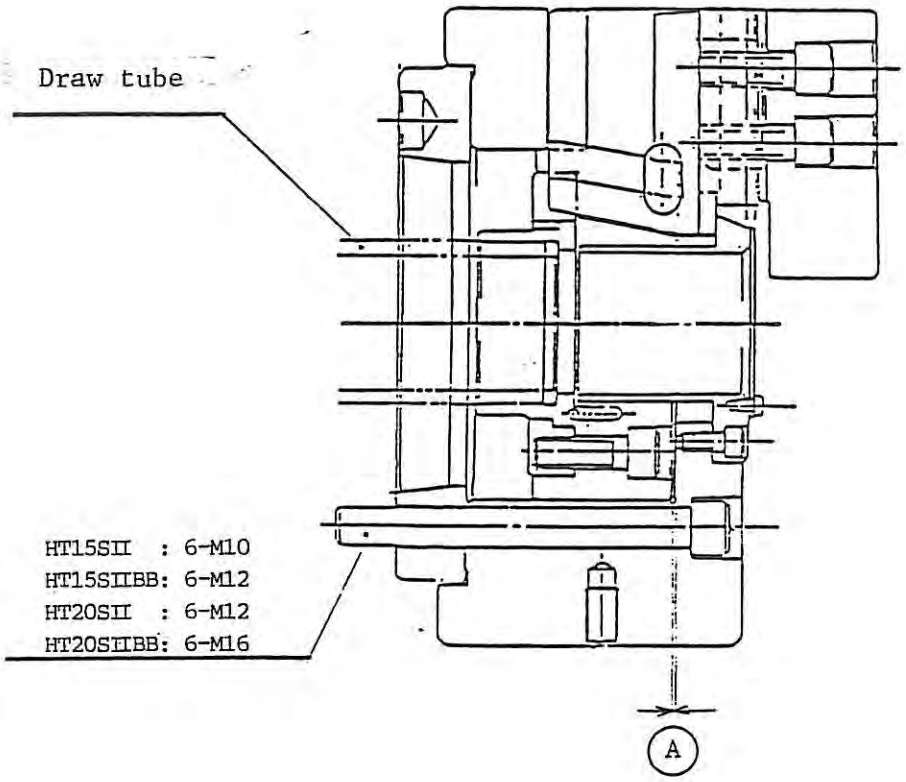
	HT15SII	HT20SII	HT20SII (BIG CHUCK)
Hydraulic chuck	ZA5-6-42	ZA6-8-52	HA8-10-66
Hydraulic cylinder	ZV125/42-15	ZV150/52-29	170/69-25HV

With cylinder mounting adapter



Mounting of Hydraulic Cylinder

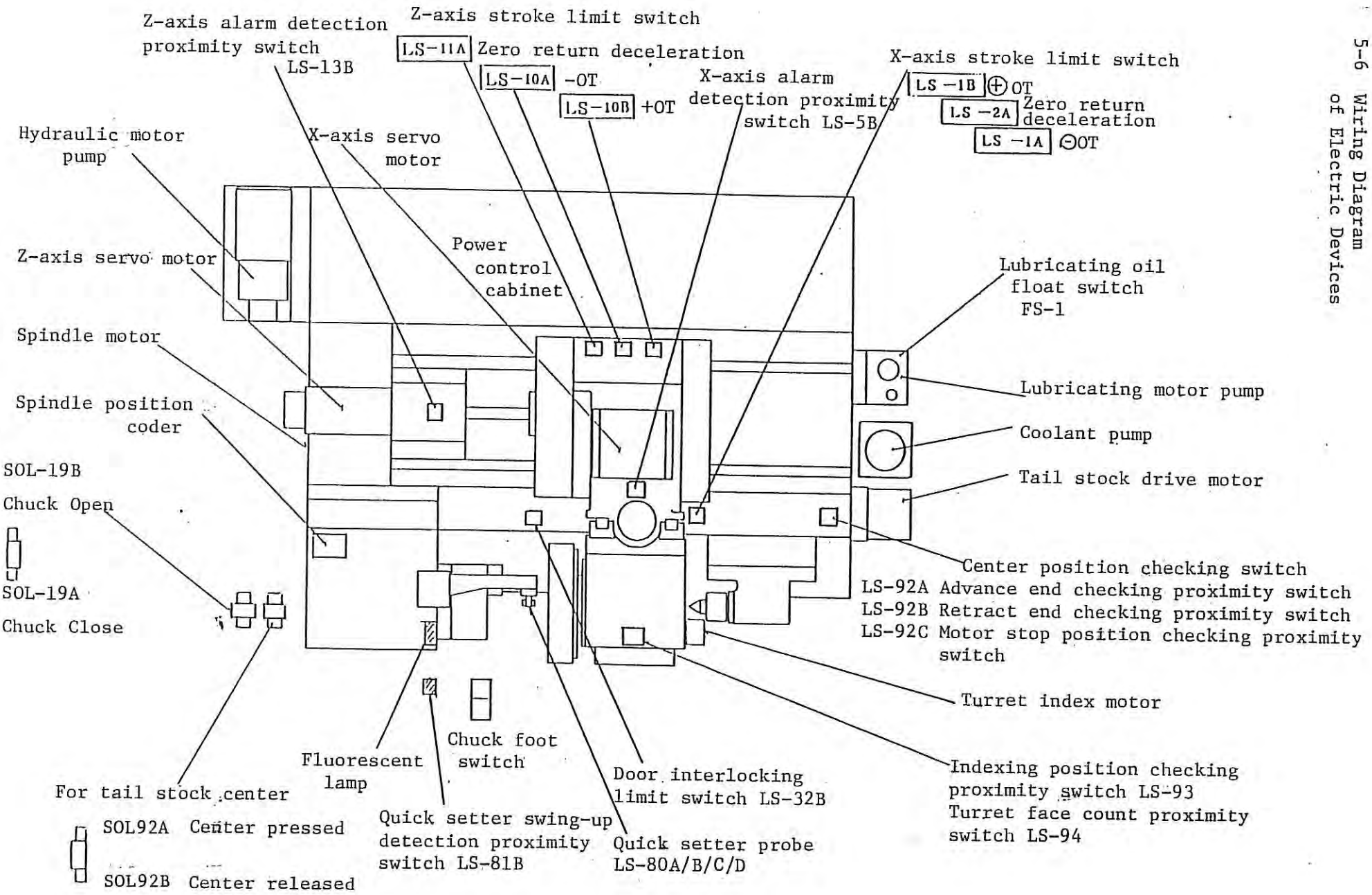
1. Mount the hydraulic cylinder to the adapter of the spindle by using 4 M10 × 25 bolts.
2. Set a measuring instrument to the rear of the cylinder. With the rear of the cylinder fixed, rotate the spindle (about 50 rpm) and check the runout of the cylinder.
   Note 1) Fix a part to which the measuring instrument is set.
3. Adjust the runout of the cylinder within 0.02 mm and tighten each bolt.
4. Provide piping to (A), (B) and (D).



Mounting the Hydraulic Chuck

1. Turn on the power and move a draw bar forward by means of the hydraulic chuck foot switch.
   (The hydraulic pressure should be set at 5 kg/cm^2/70 PSI or less.)
2. Turn a draw bolt and mount the hydraulic chuck to the draw bar.
3. Set six chuck locking bolts.
   Locking bolt: M14 × 120
4. After mounting the chuck, adjust the draw bolt so that the clearance (A) may come to approximately 1 mm (0.04"), with the chuck opened.
5. Mount a cover with three M5 × 12 pan head cap screws.

Note) When the chuck does not use a draw tube, remove the draw tube.


Z-axis alarm detection proximity switch LS-13B
Z-axis stroke limit switch
LS-11A Zero return deceleration
LS-10A -OT
LS-10B +OT
X-axis alarm detection proximity switch LS-5B
X-axis stroke limit switch
LS-1B ⊕OT
LS-2A Zero return deceleration
LS-1A ⊖OT
Hydraulic motor pump
X-axis servo motor
Z-axis servo motor
Power control cabinet
Lubricating oil float switch FS-1
Spindle motor
Spindle position coder
Lubricating motor pump
Coolant pump
Tail stock drive motor
SOL-19B
Chuck Open
SOL-19A
Chuck Close
Center position checking switch
LS-92A Advance end checking proximity switch
LS-92B Retract end checking proximity switch
LS-92C Motor stop position checking proximity switch
Turret index motor
Chuck foot switch
Fluorescent lamp
Door interlocking limit switch LS-32B
Indexing position checking proximity switch LS-93
Turret face count proximity switch LS-94
For tail stock center
SOL92A Center pressed
SOL92B Center released
Quick setter swing-up detection proximity switch LS-81B
Quick setter probe LS-80A/B/C/D

5-7 Diagnostic Function

N/C related function diagnosis (For detail, refer to N/C Instruction Manual.)

1. Select function/key [DGN] in NC-screen.
2. Simultaneous display is made for #1000 ∿ #1019 of diagnosis No. on CRT.
3. In display of the next diagnosis (up to "1010 ∿ #1019 in case) press page key [▼].
4. For display of specific Diagnose No., press [DGN], and then, press key of DATA for Diag. No.
5. Press cursor key [▼] or [▶], then, screen-display is made for group including the Diag. No.
6. Display shows the signal state at the bit corresponding to each output signal.
   Right side of screen shows hexadecimal number of data of each line.
   In opening of signal contact, "0" is shown, while in closing, "1" is shown.
   For signal function and number-bit corresponding to the signal, refer to Function Diagnose Table.

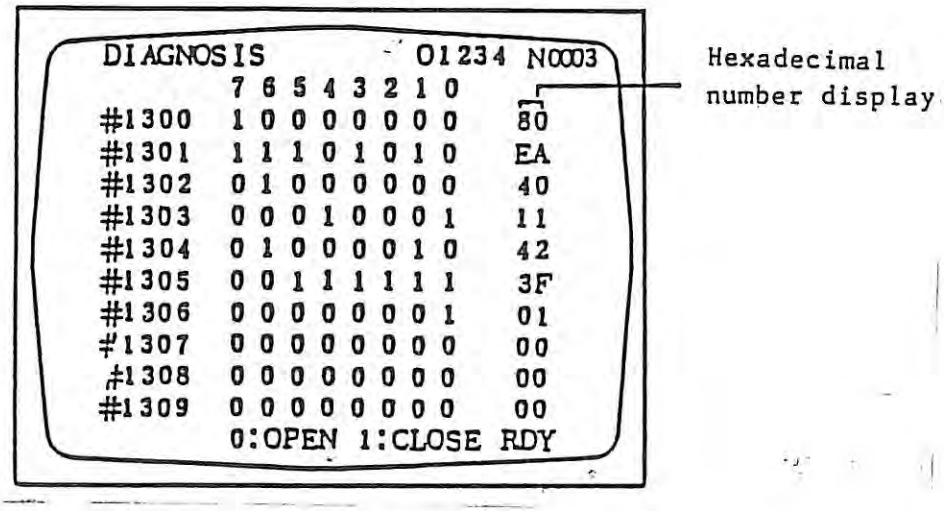


Fig. 5-24 Example of INPUT/OUTPUT Signal Display

List of CNC Input Signals

	7	6	5	4	3	2	1	0
#1000	LS PIN OUT	LS PIN IN	LS CUKOP	LS CUKCP				
	Spindle Positioning Pin OUT LS	Spindle Positioning Pin IN LS	Chuck Unclamp LS	Chuck Clamp LS				
#1001	LS DOP	PS AIR	PS HYD	FS LUB	LS DORCLS	LS DORCLS	LS DORCLS	LS DORCLS
	Door Open LS	Air Pressure Check PS	Hydraulic Pressure Short PS	Lubricant Pressure. Short FS	Door Close Safety LS(N.C.)	Door Close Safety LS(N.O.)	VDE Door Close LS(N.O.)	Door Close LS(N.O.)
#1002	LS AR DWN			LSUNL DWN	LSUNL UP		LS TS REV	
	Auto Presetter Arm Swing-in LS			Unloader OUT LS	Unloader Return LS		Tail Stock Retract LS	
#1003	LS NO WORK	FTS2 CHUK	FTS CHUK	LS Q RET	LS Q-Z	LS Q+Z	LS Q-X	LS Q+X
	No-work Detection LS	Chuck Clamp FTS2(VDE)	Chuck Clamp/ Unclamp (Unclamp) FTS1	Q Setter Arm Return LS	Q Setter -Z Contact LS	Q Setter +Z Contact LS	Q Setter -X Contact LS	Q Setter +X Contact LS
#1004	PB FH2	PB ST2		CB ALM	LSTS FOR2	MC DRY	LSTS FOR1	LS Z TRQ
	External Program Feed Hold PB	External Program Start PB		CB Trip	Tail Stock Advance 2 LS	Machine Ready	Tail Stock Advance 1 LS	Z-axis Torque Alarm LS
#1005	TL CUT	TL STP					FTS TS RET	FTS TS FOR
	Turret Count	Turret Stop Control					Tail Stock Retract FTS	Tail Stock Advance FTS
#1006	LS Z DEC	LS Z -OT	LS Z +OT	LS X DEC		LS X -OT	LS X +OT	LS X TRQ
	Z-axis Zero Return Decelera-tion LS	Z-axis -OT LS	Z-axis +OT LS	Z-Axis Zero Return Decelera-tion LS		X-axis -OT LS(OD)	X-axis +OT LS	X-axis Torque Alarm LS
#1007	JC THTR	TS THTR	TP THTR		WC THTR	HY THTR	LS ARM DWN	LS ARM RET
	Jet Coolant Motor Overload	Tail Stock Motor Overload	Turret Motor Overload		Coolant Motor Overload	Hydraulic Motor Overload	Work Measure-ment Arm Swing-in LS	Work Measurement Arm Return LS
#1008								EXTM FIN
								External M Function Complete

	7	6	5	4	3	2	1	0
#1009						TP ALM	LS SHT CLS	SL SHT OPN
						Turret Inverter Alarm	Shutter Close LS	Shutter Open LS
#1010	CEN RET	CUK CL MP	CUK UC LP	RBT DOR CL	BRT DOR OP	RBT RDY	RBT ARM	RBT AUTO
	Center Retract Command (RBT)	Chuck Clamp Command (RBT)	Chuck Unclamp Command (RBT)	Robot Door Close Command	Robot Door Open Command	Robot Ready Command	Robot Alarm	Robot Full Auto Mode
#1011	M22 RBT	POF COM	WAIT CAN	AIR BLOW	RBT WAIT	RBT ST	ST COM	CEN FOR
	Robot Spare M22(RBT)	Auto Power-off Request (RBT)	Machine Wait Cancel (RBT)	Spindle Air Blow (RBT)	Robot Wait (RBT)	Robot Start Complete (RBT)	Machine Cycle Start Command (RBT)	Center Advance Command (RBT)
#1012	BER SP ROT	BER TOP	BER AUTO	BER SPLY	BER USED	LS FENCE	RBT PS	M23 RBT
	Spindle Rotation Enable Signal	Bar Feeder Top Cut	Bar Feeder in Automatic Operation	Bar Feeder Feed Complete	Bar Feeder out of Material	Safety Fence Close LS	Robot Pressure Check (RBT)	Robot Spare (RBT)
#1013			ARALM	SP CHG FIN	ORT FIN	AGREE	NDET	ZS PD
			Spindle Alarm Signal	Spindle Winding Select Complete Signal	Spindle Orientation Complete Signal	Spindle Speed Match Signal	Spindle Speed Detection Signal	Spindle Zero Speed Signal
#1032	PB DOR CLS	PB DOR OPN	PB CAL OFF	PB STND BY	PB ZRN	PB CEN RET	PB CEN IN	PB CEN FOR
	Door Close PB	Door Open PB	Call Light OFF PB	Standby PB	Zero Return PB	Center Retract PB	Center Forward Inching PB	Center Forward PB
#1033	PB SP LOW			PB COL ON	PB SP STP	PB SP REV	PB SP IN	PB SP FOR
	Spindle Low Speed PB	Spare 2	Spare 1	Coolant PB	Spindle Stop PB	Spindle Reverse Start PB	Spindle Forward Inching PB	Spindle Forward Start PB
#1034	PB-W	PB TP IDX	PB POW OFF	PB C SEL	PB+C	PB-C	PB SP HIG	PB SP MID
	W axis Feed PB	Turret Index PB	Power-off PB	C Axis Select PB	+C Axis Feed PB	-C Axis Feed PB	Spindle High Speed PB	Spindle Middle Speed PB

	7	6	5	4	3	2	1	0
#1035	PB MDI	PB JOG	PB RT	PB +Z	PB -Z	PB +X	PB -X	PB +W
	MDI PB	Jog PB	Rapid PB	+Z Axis Feed PB	-Z Axis Feed PB	+X Axis Feed PB	-X Axis Feed PB	+W Axis Feed PB
#1036	PB MOI	PB SBK	PB MLK	PB TPCK	PB DRN	PB TP	PB AUT	PB EDIT
	Optional Stop PB	Single Block PB	Machine Lock PB	Tape Check PB	Dry Run PB	Tape Mode PB	Auto Mode PB	Edit mode PB
#1037	PB Z SEL	PB X SEL	PB 100%	PB 25%	PB 5%	PB 1%	PB SEL	PB BDT
	Feed Axis Select Z PB	Feed Axis Select X PB	Rapid Override 100% PB	Rapid Override 25% PB	Rapid Override 5% PB	Rapid Override 1% PB	Select PB	Block Skip PB
#1038			PB PGR RST	PB SP	PB ST	PB 100/1	PB 10/1	PB 1/1
	Spare 4	Spare 3	Program Restart PB	Program Stop PB	Program Start PB	Handle Magnification 100/1 PB	Handle Magnification 10/1 PB	Handle Magnification 1/1 PB
#1039	RS JOG4	RS JOG2	RS JOG1	RS FOV 16	RS FOV 8	RS FOV 4	RS FOV 2	RS FOV 1
	Feed Rate 4 RS	Feed Rate 2 RS	Feed Rate 1 RS	Feedrate Override 16 RS	Feedrate Override 8 RS	Feedrate Override 4 RS	Feedrate Override 2 RS	Feedrate Override 1 RS
1040	SS MEM LK	RS SOV 16	RS SOV 8	RS SOV 4	RS SOV 2	RS SOV 1	RS JOG 16	RS JOG 8
	Memory Lock SS	Spindle Override 16 RS	Spindle Override 8 RS	Spindle Override 4 RS	Spindle Override 2 RS	Spindle Override 1 RS	Feedrate 16 RS	Feedrate 8 RS
1041				PB QCT UCL	PB QCT CL	SS VDE MAN	SS VDE AT	SS CUK OUT
	Input Spare	Input Spare	Input Spare	QCT Unclamp PB	QCT Clamp PB	VDE Adjustment SS	VDE Auto SS	Chuck External Clamp SS
1100	MG COL ON	M LUB ON	SL CEN FOR	SL CEN RET	SL CUK CLS	SL CUK OPN	SL TL UCL	SL TL CLP
	Coolant ON MG	Lubrication Start M	Center Forward SOL	Center Retract SOL	Chuck Close SOL	Chuck Open SOL	Tool Unclamp SOL	Tool Clamp SOL

	7	6	5	4	3	2	1	0
#1101	MG JC ON	SL SP AIR	SL DR CLS	SL DE OPN	CTR	PL YEL	SL TS PSB	SL TS PSA
	Jet Coolant MG	Spindle Air Blow SOL	Door Close SOL	Door Open SOL	Counter	Pilot light (Yellow)	Tail Stock Work Pusher B SOL	Tail Stock Work Pusher A SOL
#1102	SL PIN OUT	SL PIN IN					SL UNL RET	SL UNL FOR
	Spindle Positioning Pin OUT SOL	Spindle Positioning Pin IN SOL					Unloader Return SOL	Unloader OUT SOL
#1103	SL CUK LOW	SL CUK HIG	H MTR	PL RED	SL STP AIR	SL SEN AIR	SL ARM DWN	SL ARM UP
	Chuck Pressure Low SOL	Chuck Pressure High SOL	Integrating Hour Meter	Pilot Light (Red)	Measurement Stopper Air Blow SOL	Measurement Sensor Air Blow SOL	Measurement Arm Swing-in SOL	Measurement Arm Return SOL
#1104	TP REV	TP LOW ROT	EM 155	EM 154	EM 153	TP ST		
	Turret Reverse Start	Turret Low-speed Rotation	External M Output M155	External M Output M154	External M Output M153	Turret Start		
#1105	CR POF	ORT	L GR	M GR	REV RN	FOR RN	EN STP	SP CHG LOW
	Aut Power-off	Spindle Orienta-tion Command	Spindle Low Gear Select	Spindle Middle Gear Select	Spindle Reverse	Spindle Forward	Spindle Emergency Stop	Winding Select Low Speed Command
#1106								
	Center Retract Check	Chuck Close Check	Chuck Open Check	Door Close Check	Door Open Check	Machine Auto Mode	Robot Cycle Start	Robot Emergency Stop
#1107								
	Measurement Head Return Check	Robot Service Request 2	Robot Service Request 1	Robot Wait Cancel	Turret Zero Point Check	Spindle Stop Check	Spindle Position Complete Check	Center Forward Check
#1108						BE SPM	SERV ON	X BRK
						Machine Ready	Servo ON	X-axis Fall Preventive Brake

	7	6	5	4	3	2	1	0
#1132	LP DOR OPN	LP STD BY	LP ZP	LP ALM	LP SPL	LP CEN RET	LP CEN IN	LP CEN FOR
	Door Open Indication	Ready Indication	Zero Return Indication	Alarm Indication	Program Stop Indication	Center Retract Inching Indication	Center Forward Inching Indication	Center Forward Indication
#1133			LP COL ON		LP SP REV		LP SP FOR	LP DOR CLS
	Spare	Spare	Coolant OUT Indication		Spindle Reverse Start Indication		Spindle Forward Start Indication	Door Close Indication
#1134	LP TP IDX	LP POW OFF	LP C SEL	LP ZPC		LP SP HIG	LP SP MID	LP SP LOW
	Turret Index Indication	Power-off Indication	C Axis Select Indication	C Axis Zero Point Indication		Spindle High Speed Indication	Spindle Middle Speed Indication	Spindle Low Speed Indication
#1135	LP JOG	LP RTM	LP ZPZ		LP ZPX		LP ZPW	
	Jog Indication	Rapid Traverse Indication	Z Axis Zero Point Indication		X Axis Zero Point Indication		W Axis Zero Point Indication	
#1136	LP SBK	LP MLK	LP TP CHK	LP DRN	LP TP	LP AUT	LP EDIT	LP MDI
	Single Block Indication	Machine Lock Indication	Tape Check Indication	Dry Run Indication	Tape Mode Indication	Auto Mode Indication	Edit Mode Indication	MDI Mode Indication
#1137						LP CL UNC	BZ	LP POW ON
						Tool Unclamp Indication	Q Setter Buzzer	Power-on Indication
#1138	LP Z SEL	LP X SEL	LP 100%	LP 25%	LP 5%	LP 1%	LP BK SKIP	LP OPT STP
	Feed Axis Select Z Indication	Feed Axis Select Indication	Rapid Override 100% Indication	Rapid Override 25% Indication	Rapid Override 5% Indication	Rapid Override 1% Indication	Block Skip Indication	Optional Stop Indication
#1139	LP C SEL	LP W SEL	LP RST	LP SP	LP ST	LP 100/1	LP 10/1	LP 1/1
	Feed Axis Select C Indication	Feed Axis Select W Indication	Program Restart	Program Feedhold Indication	Program Start Indication	Handle Magnification 100/1 Indication	Handle Magnification 10/1 Indication	Handle Magnification 1/1 Indication

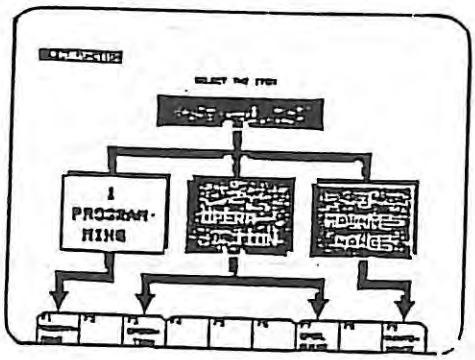
5-8 Maintenance Guide

Procedure 1

Make display for selection-screen.

This screen is shown by the [MENU] key.

⟶ Screen selection

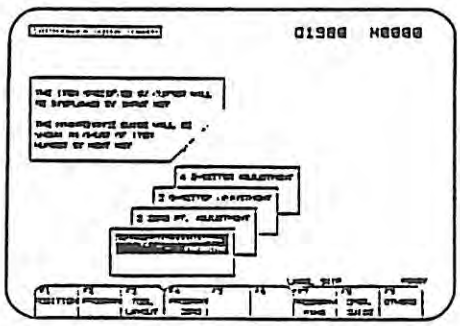


Procedure 2

Press the [F9] (MAINTENANCE) key.

⟶ Screen shows maintenance-guide menu.

It is possible to make direct display of this screen by the [MAINTE-NANCE] key.



Note) The maintenance guide key is invalid while the Selection screen above is displayed.

Procedure 3

Move the cursor, select the menu and press the [INPUT] key.

There are several pages in the menu, and renew it by page key.

5-8-1 X-axis, Z-axis Clutch Engaging

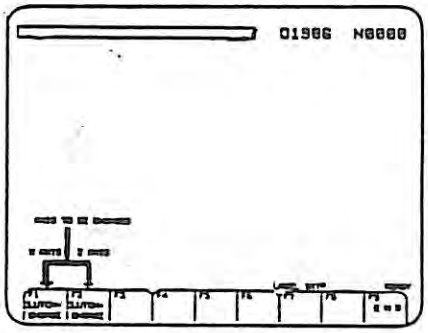
1. X-axis clutch engaging

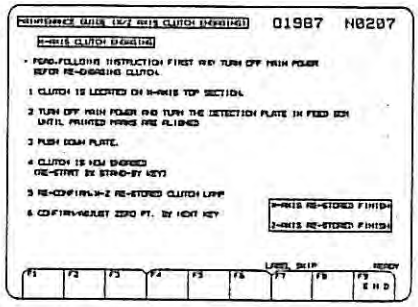
Procedure 1

Unclamping side of clutch is shown.

Press the [F1] (CLUTCH-X ENGAGE) key.

Make operation by indication of screen.





Procedure 2

After completing the operation, input the power, and confirm the lighting of proximate lamp.

⟶ If the clutch is recovered, "Complete" appears at X Clutch Recover in the screen.
There are 2 marks by paint at clutch part, if this mark is not in line with the straight form, no restoration is made.

Procedure 3

Press the [F9] (END) key.

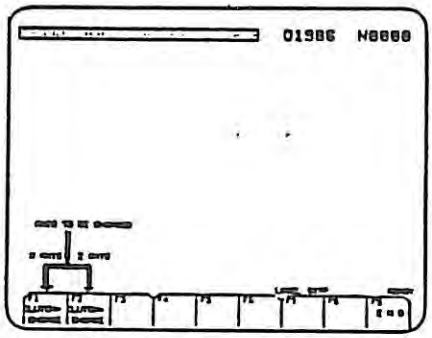
2. Z-axis clutch engaging

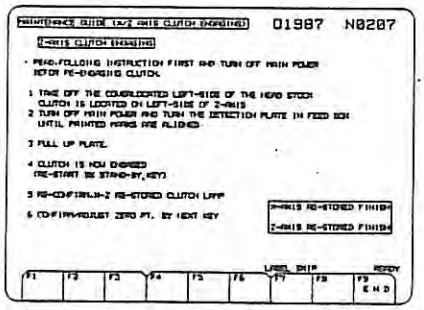
Procedure 1

Unclamped clutch is shown.

Press the [F2] (CLUTCH-Z ENGAGE) key.

Make operation by the indication in screen. There are 5 pieces of pages.





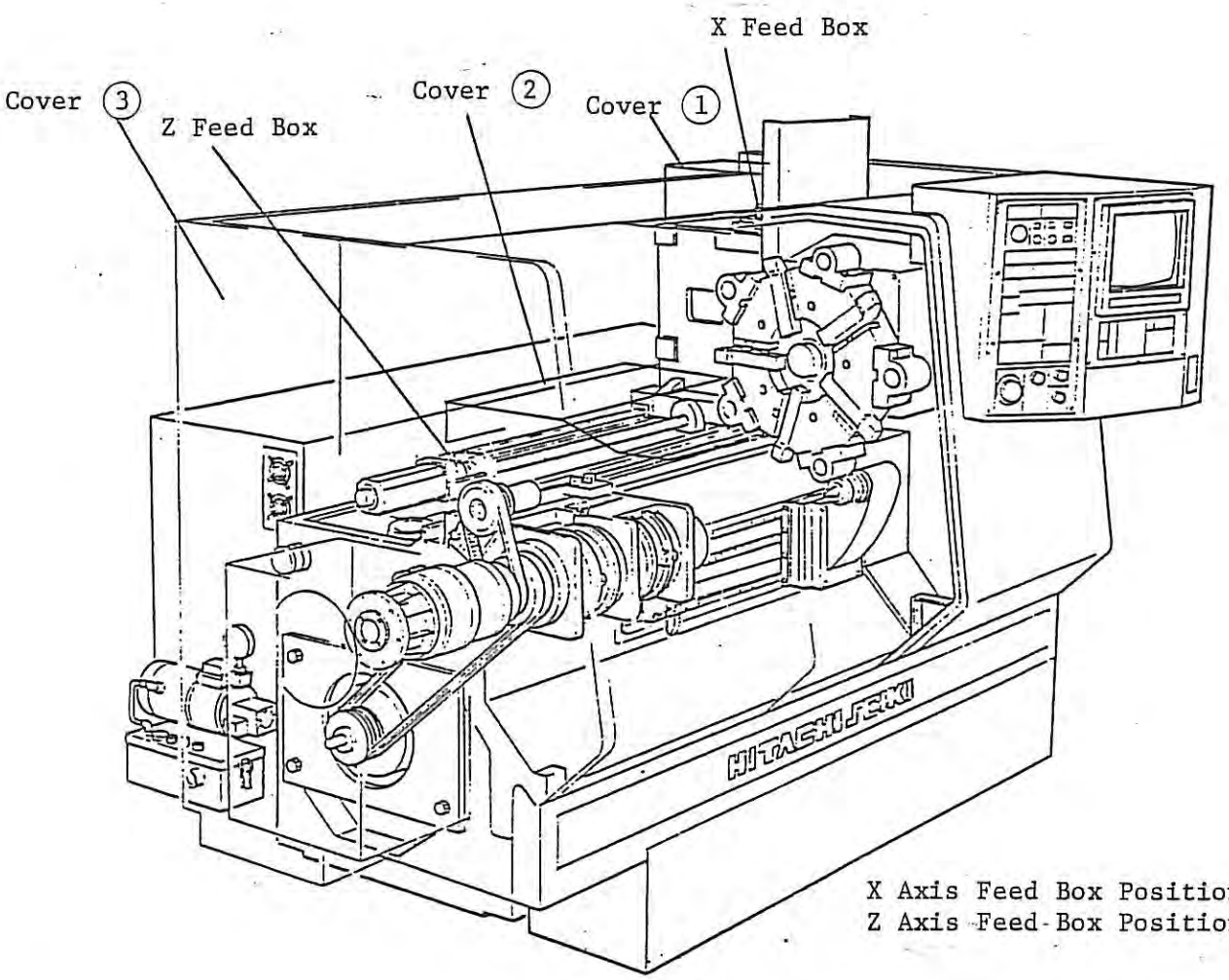
Procedure 2

After the end of operation, input the power supply, and confirm the lighting of the lamp.

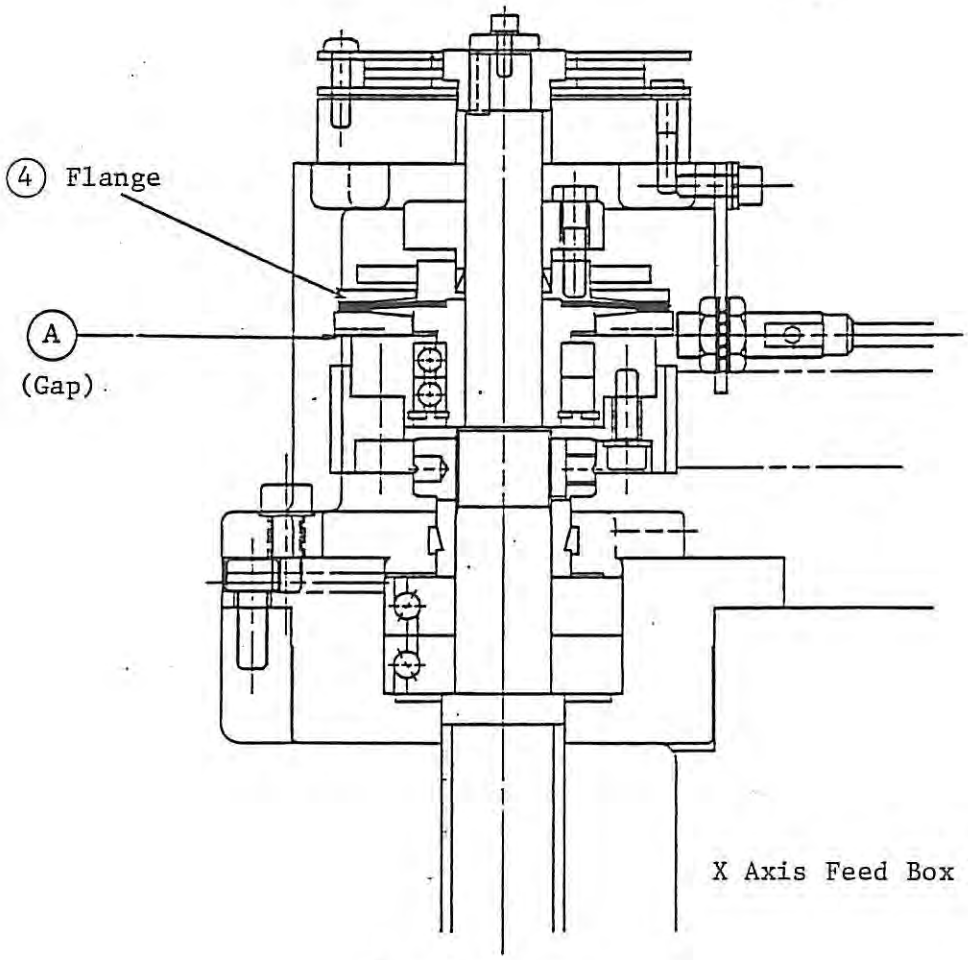
→ If the clutch is recovered, "Complete" appears at Z Clutch Recover in the screen.
Paint mark is given at Z-axis feed box unit on 2 positions, namely, nut and clutch.

Procedure 3

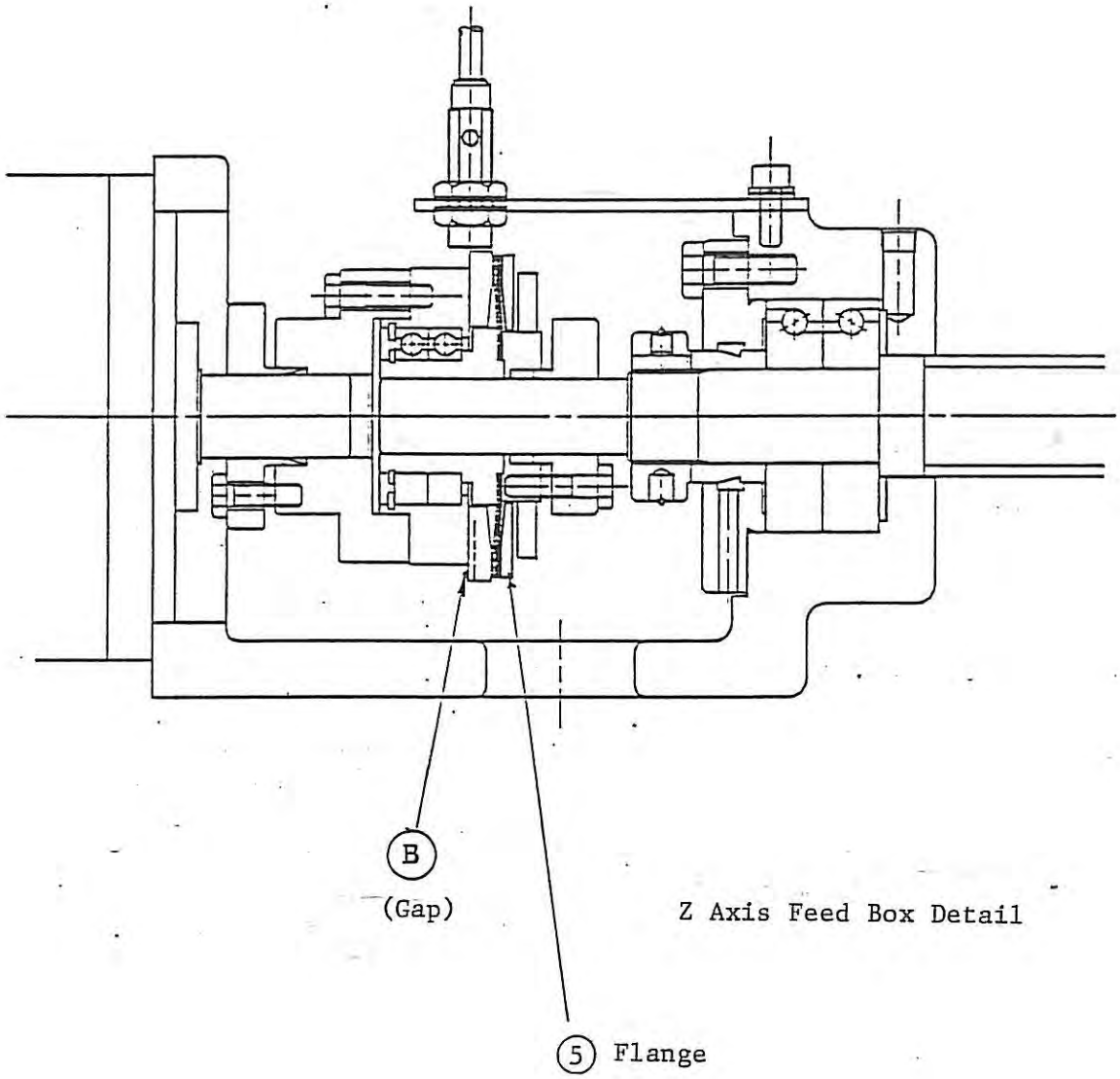
Press the [F9] (END) key.



X Axis Feed Box Position
Z Axis Feed Box Position



X Axis Feed Box Detail

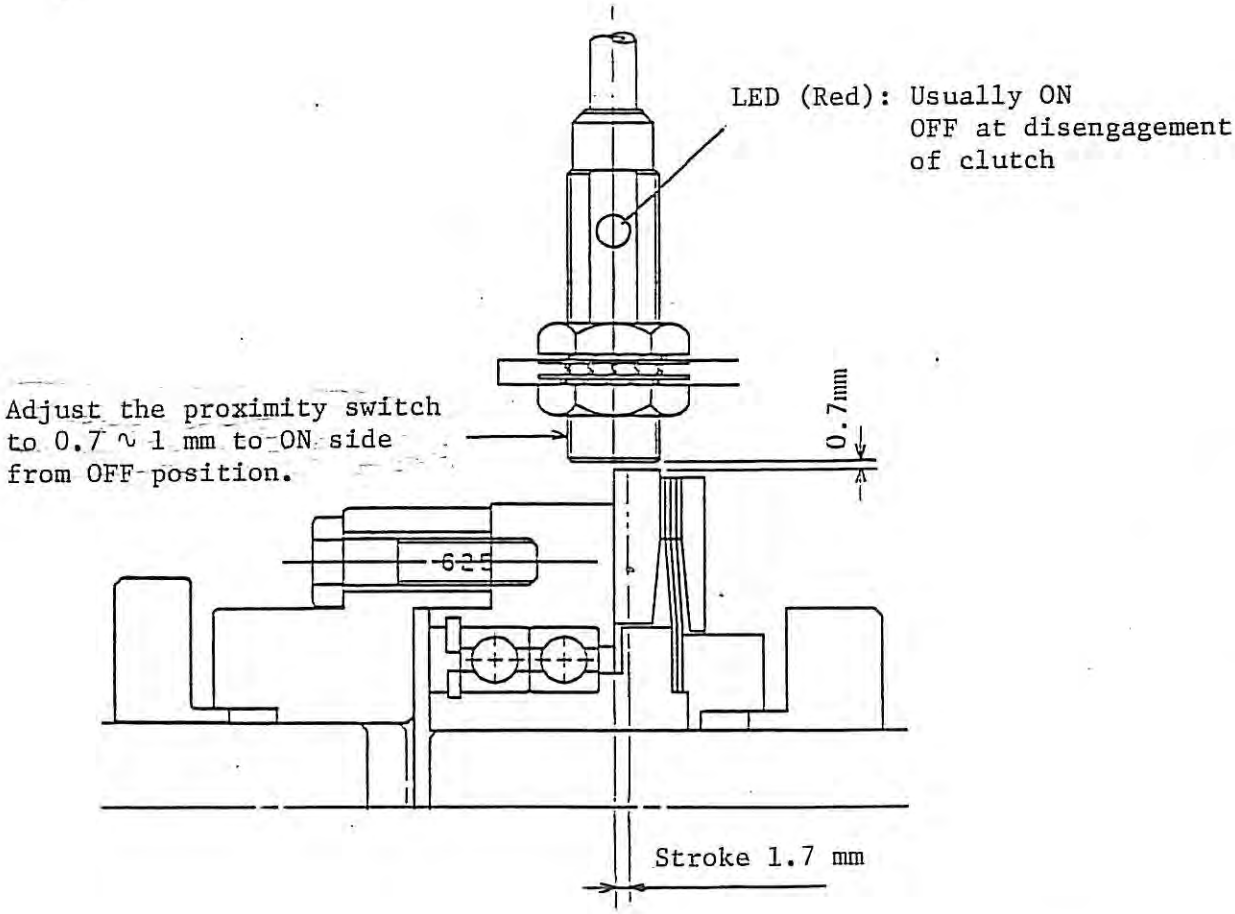


Z Axis Feed Box Detail

Mounting Adjustment of Proximity Switch

Checking of disengagement of clutch is made by a proximity switch. Usually, it is not necessary to make adjustment of mounting of the switch, so adjust only when a trouble occurs.

Adjustment of Detecting Distance



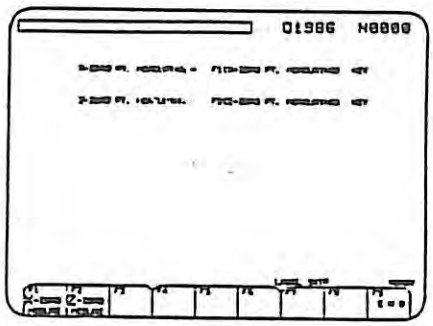
5-8-2 Confirmation Adjustment of Zero Point

1. Confirmation and adjustment of X-axis zero point

Procedure 1

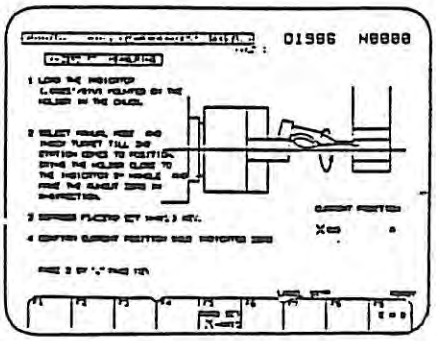
Press the [F1] (X-ZERO MEASURE) key.

Make operation by the indication in screen. There are 3 pieces of pages.



Procedure 2

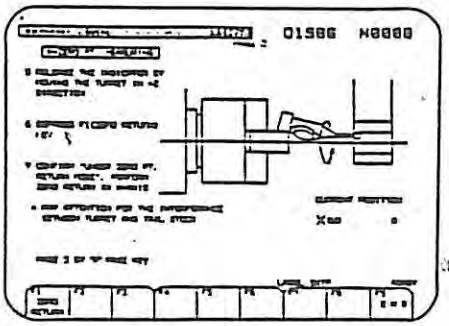
Fix the last word at check, and swing the internal-diameter No. 2 base holder to move it to make X-direction "0".



Procedure 3

At its position press the [F5] (ZERO SET X-AXIS) key. Release the tool stand, and make zero-point return.

⟶ There is message on the screen.



Procedure 4

Press the [F5] (SYSTEM SWITCH) key.

Procedure 5

Press the [F1] (X-ZERO PT.SHIFT) key.

⟶ Process result is shown.

Procedure 6

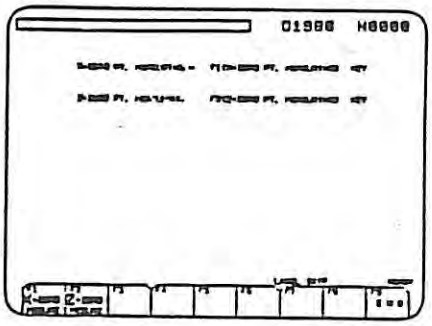
Press the [F9] (END) key.

2. Confirmation and adjustment of Z-axis zero point

Procedure 1

Press the [F2] (Z-ZERO MEASURE) key.
Make operation by the indication in screen.
There are 2 pieces of pages.

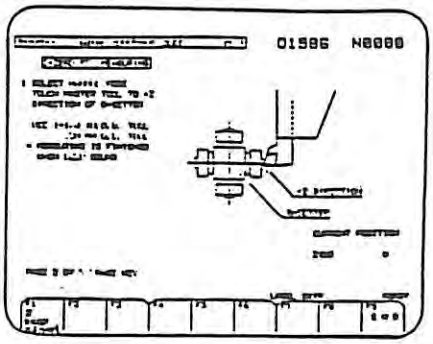
⟶



Procedure 2

Apply (attach) the standard tool at the sensor of + Z-side.

⟶



Procedure 3

Press the [F5] (SYSTEM SWITCH) key.

Procedure 4

Press the [F1] (Z-ZERO PT.SHIFT) key.

Procedure 5

Press the [F9] (END) key.

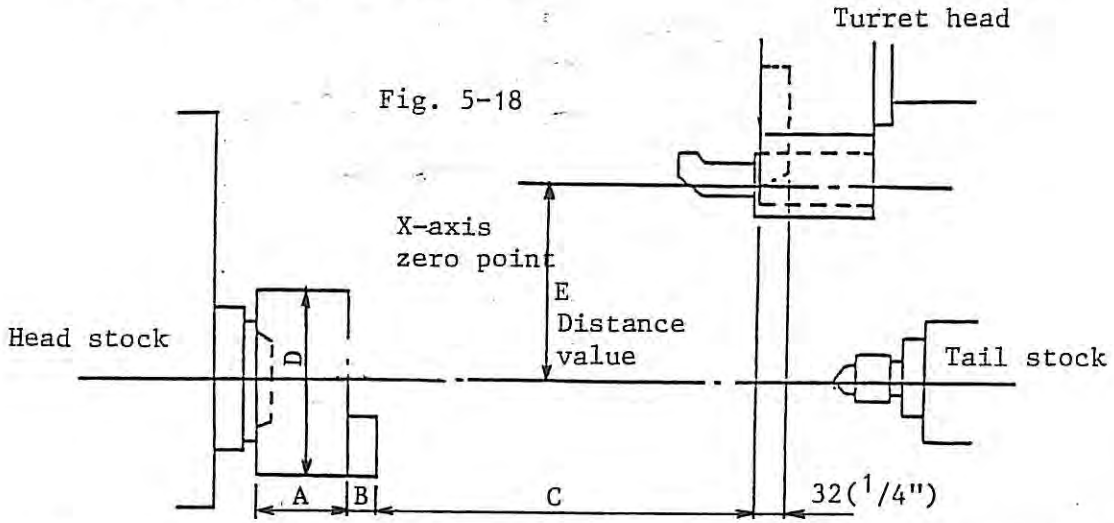
Zero-point adjustment of X, Z-axes

* When the deviation of the reference point position is too big to adjust for correcting on the screen of maintenance guide (correction of reference point position), make adjustment by reading the following procedures 1 to 5 and "control of reference-point dog".

Procedure 1

Check for zero-point dimension

Fig. 5-18



	HT15SII	HT20SII			
	KV TOOLING	KV TOOLING	VDI TOOLING	CONVENT TOOLING	BIG CHUCK LONG BED CONVENT.
A	90(3.5")	104(4.1")	104	104(4.1")	123(4.8")
B	32(1.3")	42(1.7")	42	42(1.7")	52(2.1")
C	313(12.3")	374(14.7")	374	374(14.7")	575(22.6")
D	165(6.5")	210(8.3")	210	210(8.3")	255(10.0")
E	162(6.4")	180(7.1")	165	125(4.9")	125(4.9")

Upon restoring the clutch by collision accident of turret head, zero-point may be changed, then, it is necessary to check the dimensions of zero point.

In adjusting the zero-point, take the following procedures.

Procedure 2

Set the running distance of zero-point return input previously to the initial value.

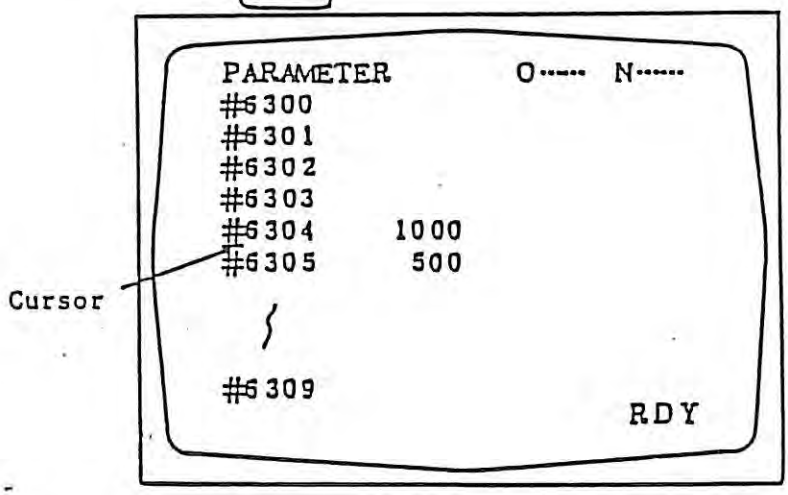
Before zero-point adjustment, initialize the running distance input previously.

1) Input "1" to the setting parameter #6219.

2) Select the function key "PRM" in NC-screen.

3) By data-key, input X-axis [6] [3] [0] [4] (Z-axis [6] [3] [0] [5]).
Then, press

[▼] or [▶].



Screen shows the running distance input previously.

4) With data-key, make key-in for 1000 to #6304, and push [INPUT].
Similarly, make key-in for 500 to #6305, and press [INPUT].
Thereby, the running distance becomes the initial value.

5) Input "0" to the setting parameter #6219.

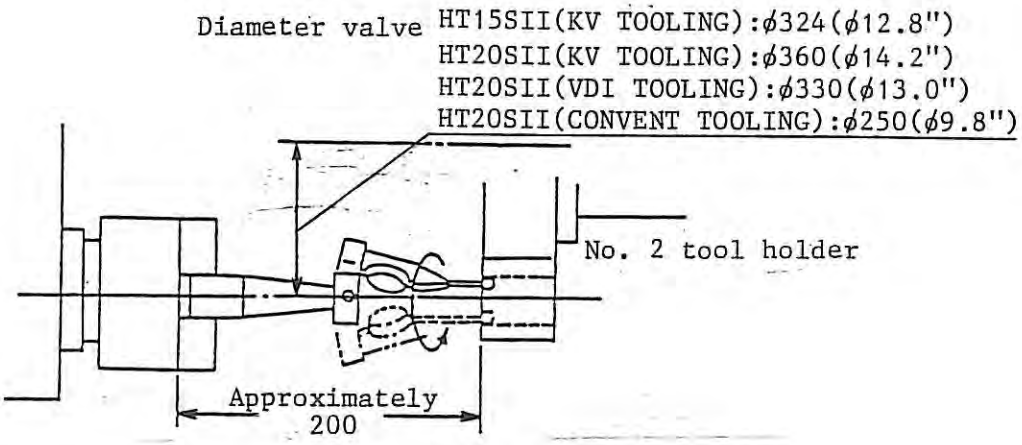
6) Once, drop (set off) the power supply, and make re-input.
(Without this operation, no correct operation is made.)

Procedure 3

Measuring the X-axis Zero Point Position

1) Mount and fix a test indicator (graduation increment: 1/100 mm) set to the holder to the chuck.

2) Move by HANDLE FEED the No. 2 ID tool holder close to the indicator and make the reading in the X-axis direction "0".



3) Set the zero set position read out of the X axis to "0".

4) Shift the mode selector key to JOG. Move the turret head in the +Z direction to release the indicator from the holder.

5) Perform X-axis zero point return.

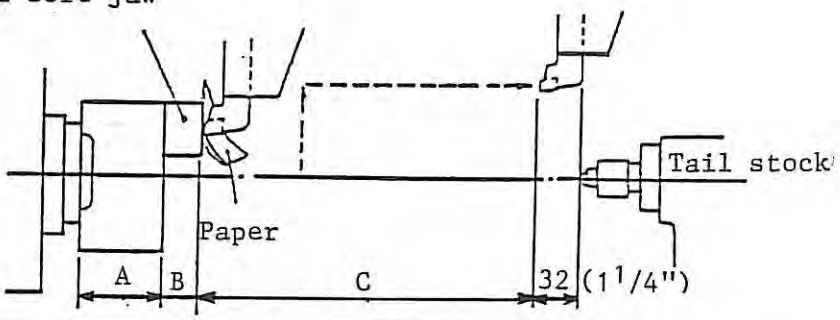
6) It is necessary to adjust the difference between the X-axis zero point and the X zero set position.

Procedure 4

Measuring the Z-axis Zero Point Position

1) Move the OD finishing tool (No. 7 turret face) close to the chuck. Bring by HANDLE FEED a tool nose to slight contact with the end of the soft jaw. When this is done, use thin paper to protect the tool nose.

Standard soft jaw



	HT15SII	HT20SII	
		STANDARD	BIG CHUCK LONG BED
A	90(3.5")	104(4.1")	123(4.8")
B	32(1.3")	42(1.7")	52(2.1")
C	313(12.3")	374(14.7")	575(22.6")

2) Set the zero set position read out of the Z axis to "0".

3) Shift the mode selector key to JOG. Move the turret head in the +X direction lest the tail stock shoudl be interfered.

4) Perform Z-axis zero point return.

5) It is necessary to adjust the difference between the Z-axis zero point position and the Z zero set position.

Procedure 5

Input of Running Distance of Zero-point Return

1) By the Procedure 2, display X-axis [6][3][0][4] or Z-axis [6][3][0][5] on the screen by parameter.

2) Input the running distance by data-key, and press [INPUT] key.
At this time, when counter-value is higher than zero-point dimension, it is necessary to make low-speed dog adjustment.
In case that it is less than zero-point dimension;

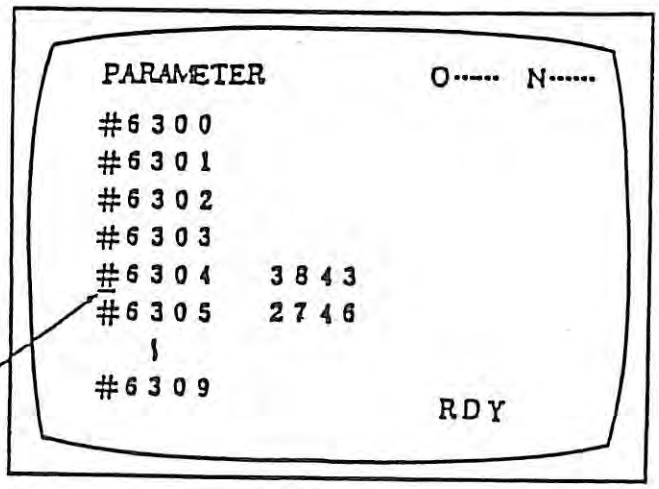
Input the running distance = Initial value + Lower value

Example

Case X-axis stops at 321.157 against 324.000, and Z-axis stops at 310.754 against 313.000. (follow chcuk).

X-axis running distance = Initial value + (324.000 - 321.157) × 1000 = 1000 + 2843 = 3843

Z-axis running distance = Initial value + (313.000 - 310.754) × 1000 = 500 + 2246 = 2746



3) Input "0" to the setting parameter #6219.

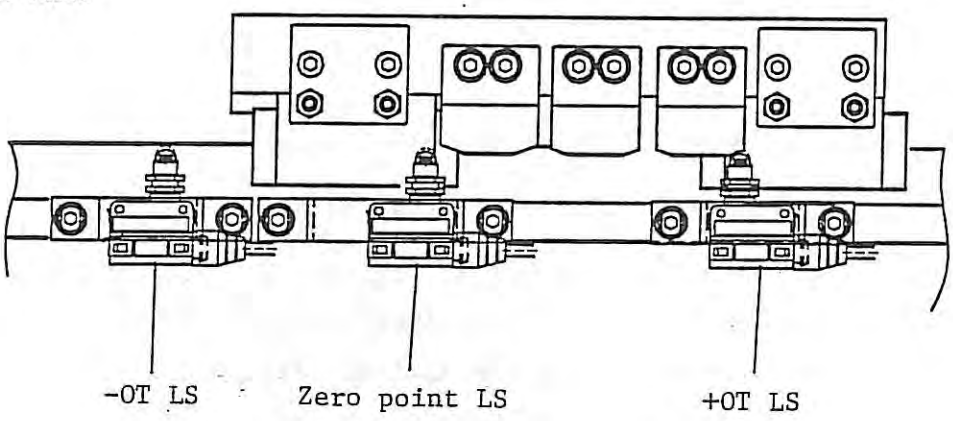
4) Once set OFF the power, and again, set ON.
(Without this operation, no exact operation is made.)

(Reference)

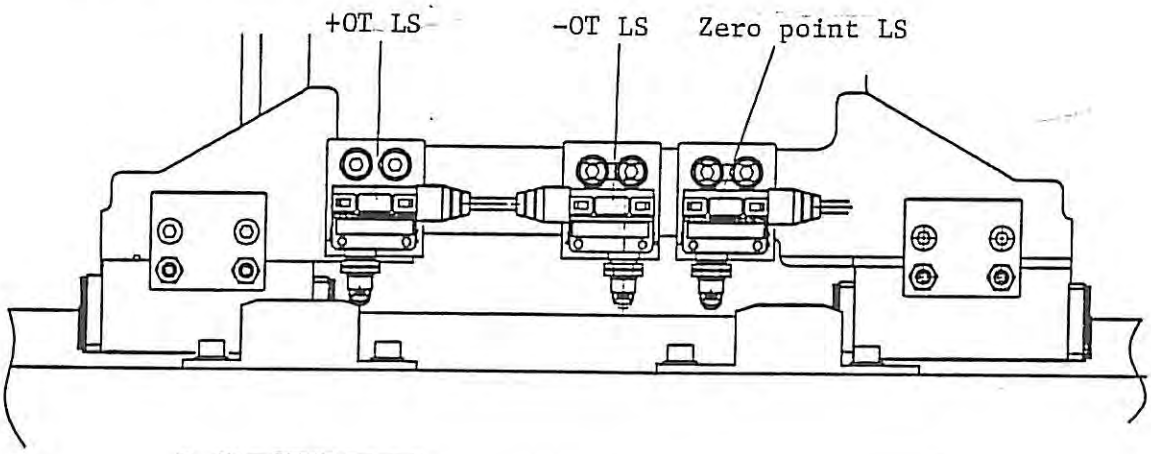
Zero Point Dog Adjustment

(1) Zero point limit switch positions

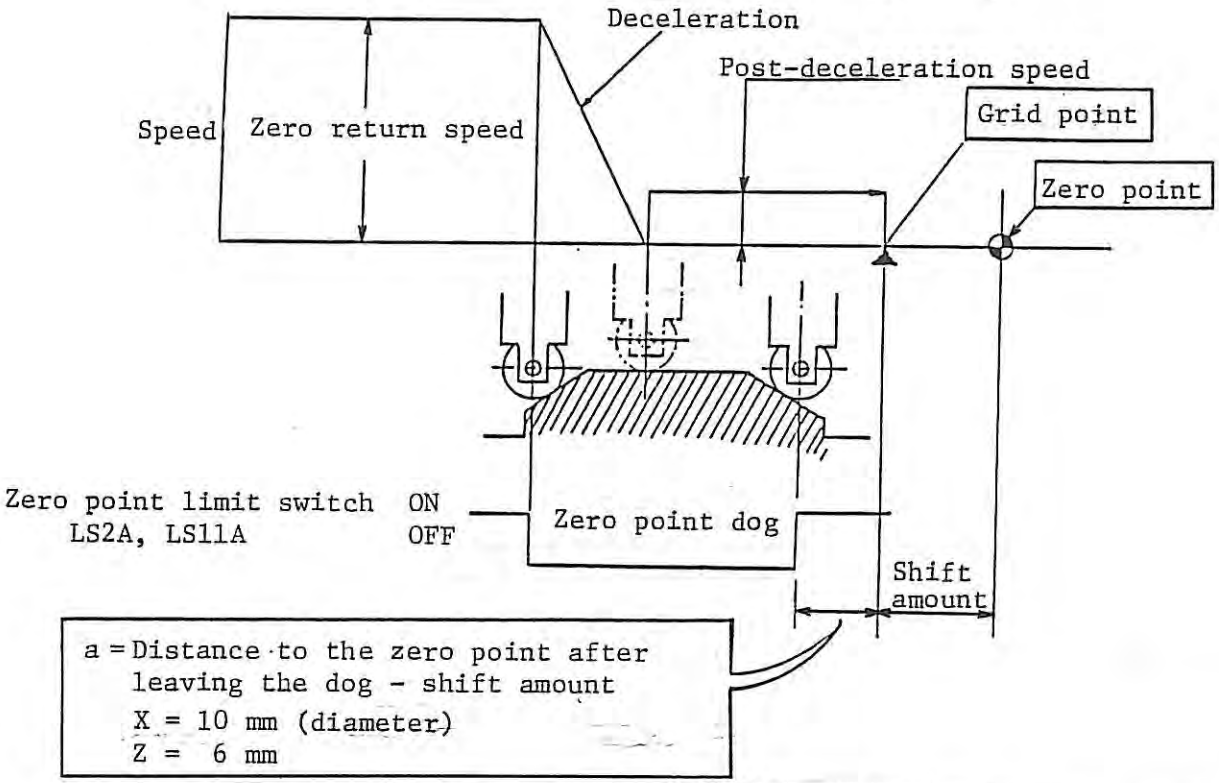
X Axis



Z Axis



(2) Relations between the zero point dog and zero point position



(3) Confirmation of the zero point dog position by means of the diagnostic function

Confirm the NC signals of the limit switches (LS2A, LS11A) by means of the diagnostic function.

Dog position DGN (DCK) (DCZ) #1306

No.	7	6	5	4	3	2	1	0
			0/1	0/1				
			Z axis	X axis				

When the limit switch is pressed : 0
When the limit switch is released : 1

Applying zero return, set to 0 the X and Z zero set position values at the zero point position.
Move the turret head to the minus(-) side again, and then, move it in the zero point direction by handle feed. Stop the handle at the position where a bit display is turned from 0 to 1.
At this time, a value obtained by subtracting the shift amount from the zero set position displayed on the screen is the dimension "a". When the dimension "a" is outside a specified range, adjust a zero point dog position.

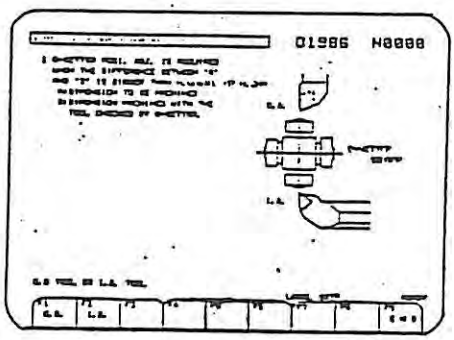
5-8-3 Adjustment of Q-Setter Position

Procedure 1

Make operation by the indication in screen.

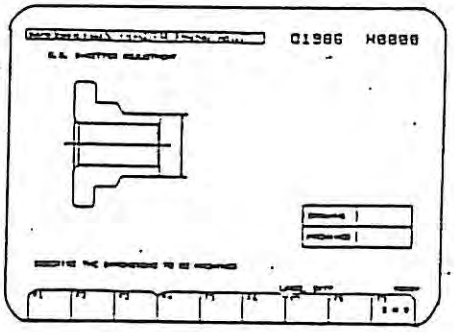
There are 6 pieces of pages.

Select the adjusting position.



Procedure 2

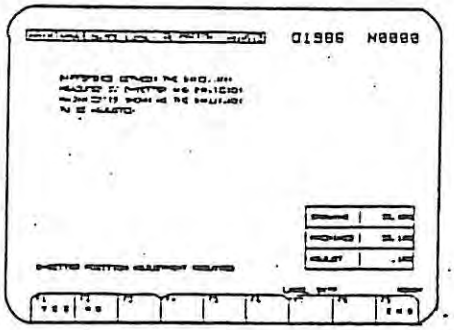
Input the diagram dimension of outer (inner) diameter.



Procedure 3

Input the actually machined dimension.

⟶ Q-setter adjusting position is displayed.



Procedure 4

Press the [F1] (YES) key.

Procedure 5

Press the [F5] (SYSTEM SWITCH) key, and press the [F1] (Q-SETTER PO. AD.) key.

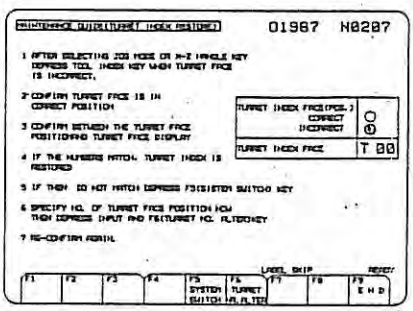
Procedure 6

Press the [F9] (END) key.

5-8-4 Engaging of Turret Index Fault

Procedure 1

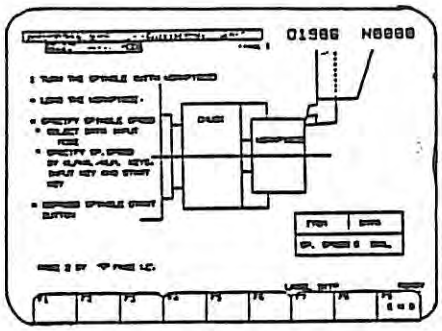
Follow the instructions given on the screen.
Execute when a called turret face does not coincide with an indexed turret face.



5-8-5 Adjustment of Z-setter Position (Option)

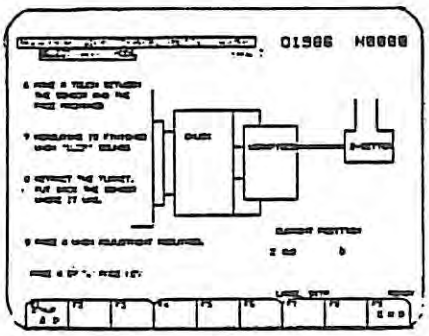
Procedure 1

Make operation by the indication in screen.
There are 4 pieces of pages.
Mount the work, and release it to X-axial direction by cutting up to the degree to take black skin.
Apply the tool at Q-setter before cutting.



Procedure 2

Press the [F6] (ZERO-SET) key.
Apply Z-setter to the cut work end. It is finished with "Pee" sound.



Procedure 3

Press the [F5] (SYSTEM SWITCH) key, and press the [F1] (Z-SETTER AD.) key.

Procedure 4

Press the [F9] (END) key.

6. Alarm

6-1 Alarm of English words

Alarm can be briefly classified into the following 3 types. In this Instruction Manual, contents are clarified, but in some cases, the contents become huge, thus, for insufficient items, refer to various books for special techniques.

1. Alarm generated by NC-unit
2. Alarm generated by sequencer
3. Alarm generated by user macro system

Alarm No.	Alarm message	Contents
001	X-ZERO RETURN NOT COMPLETED * EXECUTE ZERO RETURN	After power input, no return is made for zero-point of X-axis. Make zero-point return.
002	Z-ZERO RETURN NOT COMPLETED * EXECUTE ZERO RETURN	After power input, no return is made for zero-point of Z-axis. Make zero-point return.
005	RESET AFTER EDITING UNFINISHED * DPRESS RESET KEY	After editing operation, it is intended to start the cycle without pressing the reset key.
010	TH PARITY ERROR * CHECK TAPE FORMAT	Letter without matching the parity is input. Adjust the tape.
011	TV PARITY ERROR * CHECK TAPE FORMAT	Latter-number is one line is odd. TV-check generates at time of ON alone. Adjust the tape.
012	TOO MUCH DATA IN ONE LINE * DIVIDE INTO TWO LINES OR DELETE DATA	Letter-number is one line exceeds 128 letters. Make it within 128 letters.

Alarm No.	Alarm message	Contents
013	NO NUMERAL OR NUMERAL ONLY IN NC DATA	NC-data consist of English letter (ADDRESS) of the specified type and value (DATA). Adjust the program.
014	"-(MINUS)" OR ".(DECIMAL PT.)" INCORRECT USAGE	"-" (minus) and "." (decimal point) are not correctly used. Adjust the program.
015	IMPROPER NC ADDRESS * CHECK AND EDIT PROGRAM	Adjust the program.
017	TOO MANY DIGITS * DIGITS MUST BE EIGHT OR LESS	Value (data)-digit number exceed 8. Make it within 8 digits.
020	IMPROPER G-CODE * CHECK AND EDIT G-CODE	Command of unusable G-code and non-added G-code.
021	USED SAME GROUP G-CODE IN ONE BLOCK * SEE OPE. MANUAL (6-1)	Command of G-code of *group and modal group within one line (See Instruction Manual 4-7-1.)
022	M 3-DIGIT COMMAND ERR. (W/O OPTION)	Command of M 3-digit without M 3-digit option
024	NOSE-R COMPENSATION ERR. (IMPROPER G-CODE) * SEE OPE. MANUAL (6-1)	Command of unusable G-code in nose-R compensation start.
026	NOSE-R COMPENSATION ERR. (CUTTER COMP. START ERR.) * SEE O.M. (6-1)	Error at time of nose-R compensation cancel.
027	NOSE-R COMPENSATION ERR. (CUTTER COMP. CANCEL ERR.) * SEE O.M(6-1)	To be cancelled with circular mode.

Alarm No.	Alarm message	Contents
030	FEEDRATE UNDEFINED * F(E)-CODE FOR LINEAR/ CIRCULAR INTERPOLATION	No command of F or E at command time of cutting feed. A command of E given in feed per minute command (G98) mode. A command of F given below the decimal point in feed per minute command (G98) mode.
031	RADIUS FOR CIRCULAR INT. UNDEFINED (REGARDED AS ZERO)	Command of circle of command "0" at circular command. (G02, G03)
034	IMPROPER COMMAND FOR RADIUS	Mistake indication of circular R.
035	IMPROPER TOOL OFFSET NO. * SEE OPERATION MANUAL (6-1)	Contact Hitachi Seiki servicemen.
036	OFFSET INPUT ERROR * SEE OPERATION MANUAL (6-1)	Too big P of No. indication by program-input of offset. No indication of P.
037	OFFSET INPUT ERROR * SEE OPERATION MANAUL (6-1)	Too big offset amount by program input of offset. Error in data type within one line.
040	P/Q-CODE UNDEFINED * SEE OPERATION MANUAL (6-1)	P is not indicated for the block of G65, G66. P or Q is not indicated for the block of M98.
041	UNDIFINED PROGRAM NO. SEARCHED * SEE OPERATION MANAUL (6-1)	Program No. and Sequence No. cannot be found by program calling command (M98, M99, G65, G66, G, M, T).
042	TOO MANY LAYERS FOR SUB-PROGRAM LAYERS MUST BE FOUR OR LESS.	By program calling command (M98, G65, G68), subprogram and macro-calling showed 5-overlapping.
043	UNDEFINED PROGRAM NUMBER SEARCH * SEE OPERATION MANUAL (6-1)	By the program interrupt command (M91), there is no indication of Program No. (P).

Alarm No.	Alarm message	Contents
044	COMPOUND COMPENSATION ERROR * DATA OF R&C SHOULD BE "Ø"	Make the value "0" of R and C set to the compensation No. used for composite compensation.
045	IMPROPER CIRCULAR INTERPOLATION(TOO LARGE NOSE-R) * SEE O.M. (6-1)	Command is given for the arc of (radius r of command-circle +5 = tool radius d) by inside-compensation of circular command.
046	MACRO ERROR(TOOL NOSE RADIUS COMPENSATION) * SEE O.M. (6-1)	The variable impossible of advanced rading in nose-R offset is used by user-macroprogram.
047	NOSE-R COMPENSATION ERROR(OVER CUT) * SEE OPE. MANUAL(6-1)	As a result of cross-point calculation at time indicating the smaller moving command than nose-R by program, excessive notching may liably occur.
048	NOSE-R COMPENSATION ERROR(NO INTERSECTION) * SEE OPE.MANUAL(6-1)	No dicision of cross point as a result of cross-point calculation.
049	NOSE-R COMP.ERR. (A-CODE IS CLOSE TO Ø OR 18Ø) * SEE OPE.MA.(6-1)	A command given to retrogress or nearly the same in the state of nose-R compensation circular rotation OFF (M97).
050	AUTO CHAMFER/CORNER RADIUS ERROR (I,K,R) * SEE OPE. MANUAL (6-1)	At chamfering and rounding command (G11, G12) there is error for the command method of I, K, R. Also, the value of I, K, R. is too big.
051	AUTO CHAMFER/CORNER-R ERROR (TAPER COMMAND) * SEE OPE. MA. (6-1)	The line of chamfering and rounding command (G11, G12) becomes the taper-command.
052	INCORRECT A-CODE WHEN GØ1 * SEE OPERATION MANUAL (6-1)	In G01 angle indication linear inter-polation, there is comtradication in command of angle command.

Alarm No.	Alarm message	Contents
053	WORK COORDINATE ERROR (G5Ø T) * SEE OPERATION MANUAL (6-1)	Ar work-coordinate system setting tool-coordinate memory values are 51 ~ 80.
055	PROGRAM ERROR (M,S,T) * SEE OPERATION MANUAL (6-1)	Command is given on auxiliary function (M), rotation-number and cutting speed turret No. (S), turret No. (T) for those impossible line of command.
056	PROGRAM ERROR (G2Ø,G21, G04,G36~G38) * SEE OPERATION MANUAL (6-1)	There are axial command in line of G20, G21, at G04, G36, G37, G38, there is erroneous actual command.
057	WORK LENGTH SETTING ERROR (OTHER THAN W-CODE IN G54). * CHECK PROG.	
059	IMPROPER ZERO RETURN (G28,G29,G3Ø) * EXECUTE ZERO RETURN	G29 or G30 command axial origin return is not completed. Make origin return.
060	VARIABLE LEAD THREAD ERROR (G34) * SEE OPERATION MANUAL (6-1)	With variable lead threading, lead increase/decrease value exceeds the maximum command value, but command is made for lead as real value.
061	AUTO CHAMFER/CORNER-RADIUS ERROR UNDER THREADING * SEE O.M. (6-1)	Command is given for chamfering (G11), and rounding (G12) in line of threading command.
062	THREADING BY FEED PER MIN. (G98) * MUST BE PER REV. (G99)	A command to thread given in G98 mode. A command of B to thread multiply is off the limit (0∿360,000).

Alarm No.	Alarm message	Contents
063	END CHAMFER ERROR FOR THREADING * SEE OPERATION MANUAL (6-1)	At the threading with chamfering, cutting raise of Z-axis (diameter) direction is smaller than chamfering amount set by parameter. (#6080)
064	END CHAMFER ERROR FOR THREADING * SEE OPERATION MANAUL (6-1)	At the threading with chamfering, cutting raise of Z-axis (longitudinal) direction is smaller than chamfering amount set by parameter. The chamfering amount is "0" (#6080 = 0) in 092.
066	CONT. THREADING ERR (CUTTING TIEM TOO SHORT FOR 1 BLOCK)	
067	POWER SHUT OFF WHILE ALTERING MEMORY * SEE OPERATION MANUAL (6-1)	At the alarm occurrence, file content is not assured. After checking program, tool-layout, tool file and parameter, if abnormality is observed, contact our servicemen.
068	TRYING TO EDIT INHIBITED AREA * DEPRESS RESET KEY	
069	G151 GROOVE SHIFT ERR. (SHIFTED IN BOTH X, Z AXES) * ONLY ONE AXIS	At G151, execution, groove-width data are designated for both X- and Y-axes. (OFSET NO. 31 ~)
070	NO PROGRAM ENDING COMMAND (MØ2, M3Ø, M99)	
071	G151 GROOVE SHIFT ERROR (DIRECTION UNDEFINED) * SPECIFY TOOL PT.	Shift direction is not decided for tool nose control point in G151 mode. (Indicate Point 0, 1, 2, 3, 4, 9.)
075	PROGRAM INPUT/OUTPUT ERROR * SEE OPERATION MANUAL (6-1)	RS-232C interface does not match bit-number/borate.
076	PROGRAM INPUT/OUTPUT ERROR * SEE OPERATION MANUAL (6-1)	RS-232C interface transmission abnormal.

Alarm No.	Alarm message	Contents
077	PROGRAM INPUT/OUTPUT ERROR * SEE OPERATION MANUAL (6-1)	RS-232C interface After giving stop-code, more than 10 letters were written.
080	TOOL GEOMETRY OFFSET ERROR (G35) * SEE OPERATION MANUAL (6-1)	T-code command is not given in front of G35 block. G98 command is not given before G35 block.
081	TOOL GEOMETRY OFFSET(X), PARAMETER INPUT ERR.	
082	TOOL GEOMETRY OFFSET(Z), PARAMETER INPUT ERR.	
083	TOOL WEAR OFFSET ERROR * SEE OPERATION MANUAL (6-1)	Compensation No. at time of tool-wear compensation is other than 01 ~ 19.
084	TOOL WEAR OFFSET ERROR * SEE OPERATION MANUAL (6-1)	Tool wear compensation inputs (WOM, WOP) are simultaneously set.
085	EXTERNAL TOOL OFFSET ERROR * SEE OPERATION MANUAL (6-1)	Over 11 of parameter to set magnification for compensation of outside tool.
086	EXTERNAL TOOL OFFSET ERROR * SEE OPERATION MANUAL (6-1)	Error input is set to ON by outside tool compensation.
087	TOOL GEOMETRY OFFSET ERROR * SEE OPERATION MANUAL (6-1)	No touch SW set to ON even in execution with error compensation (G31, G35) for skip-tool set.
088	TOOL WEAR COMPENSATION ERROR	T90ΔΔ has been specified, but there is no option for tool wear compensation (T90ΔΔ).

Alarm No.	Alarm message	Contents
089	CANNED CYCLE ERROR (G90, G92, G94 PROGRAM ERROR)	There is an unnecessary command in the program specified by G90, G92 or G94. R, B, C, P, Q and L are not available.
090	CANNED CYCLE ERROR (NO P, Q-CODE IN Q70 ∿ G73) * SEE O.M. (6-1)	At line of G70, G72, G73, there is no command P, Q.
091	CANNED CYCLE ERR. (UNDEFINED NO. SEARCH WHEN G70) * SEE O.M. (6-1)	There is no Sequence No. of G70P, Q command.
092	CANNED CYCLE ERR. (OVER 46 BLOCKS WHEN G70 ∿ G73) * SEE O.M. (6-1)	Line number of finishing profile program of G70, G71, G72, G73, P, Q, command is over 46-line equivalent.
093	CANNED CYCLE ERR. (M-CODE ERR. IN G70 ∿ G73) * SEE O.M. (6-1)	
094	CANNED CYCLE ERR. (PROGRAM ERR. WHEN G70 ∿ G73) * SEE OPE. MA. (6-1)	Final command is chamfering and rounding at the end of the command finishing profile commanded with P and Q of G71, G72.
095	CANNED CYCLE ERROR (PROGRAM ERR. WHEN G71, G72) * SEE OPE. MA. (6-1)	There is problem in programming profile of finishing profile commanded with P and Q of G71, G72.
096	CANNED CYCLE ERR. (D/I/K-CODE FOR G73, D/K FOR G76) * SEE O.M. (6-1)	D (notching time) indication of G63, is over 0 or 128. I, K (roughing total margin) of G73 is 0 in both. Indication (command) range of D and K of G76 exceed the command range.
097	CANNED CYCLE ERROR (PROGRAM ERROR WHEN G71, G72) * SEE O.M. (6-1)	In roughing cycle of G71, G72 R1 command, machining interrupting point by finishing profile program by roughing cycle of G71, G72 R1 command.

Alarm No.	Alarm message	Contents
098	CANNED CYCLE ERROR (NO DATA IN MEMORY WHEN G71) * SEE O.M. (6-1)	Information of command block with G70 P and Q is not registered. (Tape Mode)
099	CANNED CYCLE ERROR (G70 ∿ G76 PROGRAM ERROR)	There is no necessary command in the program specified by G70, G71, G72, G73, G74, G75 or G76, or there exists an unnecessary command.
100	ABSOLUTE VALUE OVERSIZE * EDIT PROGRAM	Absolute value of data (numeral) exceeds the upper limit.
101	REGISTER OVERFLOW * EDIT PROGRAM	Data (numeral) index exceeds the allowable range.
102	VALUE OF DENOMINATOR IS 0. * VALUE MUST BE OTHER THAN ZERO.	Calculated divisor is "0".
103	VALUE OF SQUERE ROOT IS MINUS(-). * EDIT PROGRAM	
104	DUPLICATE LETTER ERROR * EDIT PROGRAM	Letter impossible of overlapped command in one line is commanded.
105	ERROR IN MACRO (CONSTANTS OVER THE LIMIT) * EDIT PROGRAM	Constant exceeds the limited range.
106	ERROR IN MACRO (G76 CANCEL ERROR) * SEE OPERATION MANUAL (6-1)	G67 cancel-codes are excessive.
107	ERROR IN MACRO (FORMAT ERROR) * SEE OPERATION MANUAL (6-1)	There is error at format except formula.

Alarm No.	Alarm message	Contents
108	ERROR IN MACRO (VARIABLE UNDEFINED) * SEE OPERATION MANUAL (6-1)	Indication of value undefined as variable No.
109	MACRO ERR. (LEFT SIDE OF SUBSTITUTED VARIABLE INVALID) * SEE (6-1)	The variable in substituting sentence is prohibited variable.
110	ERROR IN MACRO (PARENTHESES) * MULTIPLICITY MUST BE FIVE OR LESS.	Multiple degree of parenthesis exceeds upper limit (5).
111	ERROR IN MACRO (POSITIONING COMMAND WITH M99) * EDIT PROGRAM	Moving command is given to M99-block of called macro-end command M99 by G66.
112	ERROR IN MACRO (MACRO NESTING) * LAYERS MUST BE FOUR OR LESS.	Multiple degree of macro-call exceeds upon limit (4).
114	ERROR IN MACRO (DO-END RELATION) * SEE OPERATION MANUAL (6-1)	DO-END does not correspond 1 : 1.
115	ERROR IN MACRO (FORMAT) * EDIT PROGRAM	There is error at format.
116	ERRO IN MACRO (DO-END NO.) * REPLACE DO-END NO. WITH 1 THRU 3.	DOm is not in the range of $1 \leqq m \leqq 3$.
118	ERROR IN MACRO (GO-TO NO.) * REPLACE GO-TO NO. WITH 1 THRU 9999.	GOTOn is not in the range of $0 \leqq n \leqq 9999$.

Alarm No.	Alarm message	Contents
120	ERR. WHEN PROG. RE-START (UNDEFINED SEQUENCE NO. SEARCH) * EDIT PROGRAM	Searched Sequence No. (N) is not found in the program.
121	ERR. WHEN PROG. RE-START * RELEASE ALARM BY RESET KEY, NOT BY G31.	There was a command of G31 during reopening program.
124	POSITIONING (BY MDI) INHIBITED IN RE-START MODE * SEE O.M. (6-1)	After preparing the reopening program, axis was moved by data-input operation.
130	EXTERNAL DATA INPUT ERROR * SEE OPERATION MANUAL (6-1)	Big segmentation by outside-data input.
131	EXTERNAL ALARM MESSAGE ERROR * SEE OPERATION MANUAL (6-1)	There is no corresponding alarm No. by outside-alarm message clear.
132	EXTERNAL ALARM MESSAGE ERROR * SEE OPERATION MANUAL (6-1)	There is no corresponding Alarm No. by outside-alarm message clear.
133	EXTERNAL ALARM MESSAGE ERROR * SEE OPERATION MANUAL (6-1)	There is no data-error of small segmentation by outside alarm message and outside operator message.
134	EXT. PROGRAM NO. SEARCH ERROR (UNDEFINED NO.) * SEE O.M. (6-1)	There was no Program No. indicated by outside No. search.
135	EXTERNAL DATA INPUT ERROR (INCORRECT DATA) * SEE OPE. MA. (6-1)	There is error in indication of data by outside-data input.
140	G111/G112 ERROR (INCORRECT INDICATION) * SEE OPE. MANUAL (6-1)	There is error in command method of address-word (English) of G111 (tapered complex chamfer, rounding).
141	G111/G112 ERROR (INCORRECT ANGLE COMMAND) * SEE OPE. MA. (6-1)	Command value of A and B of angle indication of G111 (tapered complex chamfer, rounding) is not within the range of $-360° \leq A, B \leq 360°$.

Alarm No.	Alarm message	Contents
142	G111/G112 ERROR (INCORRECT CHAMF. COMMAND) * SEE OPE. MA. (6-1)	First chamfering part is at the outside of rectangle formed by the start- and finish-points or in between straight line of 45° directing to the finishing point from starting point and the straight line of 45° directed to the starting towards finishing points.
143	G111/G112 ERROR (INCORRECT G111 FIGURE) * SEE OPE. MANUAL (6-1)	There is problem on line form of G111 (taper-chamfering and rounding).
144	G111/G112 ERROR (INCORRECT M/S/T-CODE) * SEE OPE. MANUAL (6-1)	Command of auxiliary function (M), rotation-number, cutting speed (S), turret No. (T) are given to the line of command G111 (taper-multiple chamfering, rounding) and G112 (circular multiple chamfering and rounding).
145	G111/G112 ERROR (INCORRECT G112 COMMAND) * SEE OPE. MANUAL (6-1)	There is error in command method of address word (English) or command line of G112 (circular multiple chamfering and rounding).
146	G111/G112 ERROR (INCORRECT G112 FIGURE) * SEE OPE. MANUAL (6-1)	There is problem online form of F112 (arc chamfering and rounding).
150	TOOL LIFE MANAGEMENT ERROR * SEE OPE. MANUAL (6-1)	G122 and G123 command are not single commands.
		Same tool is registered in over 2 groups.
		Addresses others than P, L and T are commanded into tool-information registered program.
		Offset Memory No. of the same tool is used for over 2 tools.

Alarm No.	Alarm message	Contents
151	TOOL LIFE MANAGEMENT ERROR * SEE OPE. MANUAL (6-1)	Group No. P is not indicated. Also, other values than 1 ≦ P ≦ 19 are commanded.
		There is no indication of the life L per one tool.
152	TOOL LIFE MANAGEMENT ERROR * SEE OPE. MANUAL (6-1)	The value other than 1 ≦ L ≦ 9999 is commanded.
		The other value than 1 ≦ correction-memory No. ≦ 50 is commanded to the correction Memory No.
		The value over 0 or 20 are commanded to □□ (group No.) commanded of T□□90 ∿ T□□95, □□99 command.
153	TOOL LIFE MANAGEMENT ERROR * SEE OPE. MANUAL (6-1)	Tool information of the same Group No. is registered twice.
154	TOOL LIFE MANAGEMENT ERROR * SEE OPE. MANUAL (6-1)	"Tool No. + correction Memory No. of over 16 types are going to be registered into one Group No.
155	TOOL LIFE MANAGEMENT ERROR * SEE OPE. MANUAL (6-1)	Tool of commanded group No. is registered.
		T□□92, T□□93 T□□94, T□□95 are commanded, while the corresponding correcting Memory No. is not registered.
156	TOOL LIFE MANAGEMENT ERROR * SEE OPE. MANUAL (6-1)	Command was given for tool-life control by the unit without additional function of "T4-digit indication" and "offset memory addition".
157	TOOL LIFE MANAGEMENT ERROR * SEE OPE. MANUAL (6-1)	Tool-replacing demand output is set to ON.

Alarm No.	Alarm message	Contents
158	TOOL LIFE MANAGEMENT ERROR * SEE OPE. MANUAL (6-1)	There is Tool No. over "31" in the registered tool in the command tool-Group No. with ☐☐ of work-coordinates system setting (G50 T☐☐90).
159	TOOL LIFE MANAGEMENT ERROR * SEE OPE. MANUAL (6-1)	For one tool, correcting Memory No. over 6 types are registered.
170	TOOL OFFSET TOTAL CHECK ERROR * SEE OPERATION MANUAL (6-1)	These alarm shows the re-written change of tool-compensation amount (total layout), setting data and parameter by some causes. The considered causes are as follows: ° Battery unit NG (battery alarm display). ° Connection mistake or NG of memory module.
172	SETTING AREA TOTAL CHECK ERROR * SEE OPERATION MANUAL (6-1)	
173	PARAMETER AREA TOTAL CHECK ERROR * SEE OPERATION MANUAL (6-1)	
174	KEEP MEMORY TOTAL CHECK ERROR	
175	MACRO TOTAL CHECK ERROR	
178	TOOL NO. INPUT SIGNAL ERROR (NO. ERROR)	Error in designation of tool offset No. of external input.
179	ABNORMAL TEMPERATURE IN CABINET * SEE OPERATION MANUAL (6-1)	Contact Hitachi Seiki servicemen.
180	SEQUENCER ERROR (1) * SEE OPERATION MANUAL (6-1)	

For user macro (alarm No. 180 ~ 199) for user macro (work-meter system, tool-nose measuring unit, spare-tool calling)

Alarm No.	Alarm message	Contents
180	SEQUENCER ERROR (1) * SEE OPERATION MANUAL (6-1)	Either one of T, X, Z, U is instructed. (Work-measuring system)
		E is not instructed. (tool nose measuring unit)
		Z is not instructed. (spare tool call)
181	USER MACRO ERROR (ARGUMENT "M" NOT CORRECT) * SEE OPE. MANU. (6-1)	M-indicating compensation No. is incorrect. Correct the program to $1 \leqq M \leqq 50$. (work-measuring system)
182	USER MACRO ERROR (UNDEFINED ARGUMENT I/K) * SEE OPE. MANUAL (6-1)	I.K numeral is not correct. (tool nose measuring unit)
183	USER MACRO ERROR (TURRET STA. NO. NOT FOUND) * SEE OPE. M. (6-1)	Turret No. is not found. (work-measuring system, tool nose measuring unit, spare tool call)
184	USER MACRO ERROR(Z-COMMAND INCORRECT) * SEE OPE. MANUAL (6-1)	Z-command is incorrect. Adjust it to $Z < W$. (work-measuring system)
185	USER MACRO ERROR (CONSTANT NUMBER INCORRECT) * SEE OPE. M. (6-1)	Constant is not set. Check the program of 08050 (CONSTANT SET) (work-measuring system)
186	USER MACRO ERROR (X-VALUE TOO SMALL) * SEE OPERATION MANUAL (6-1)	At outer diameter $X \leqq 0$ is not instructed. At inner diameter $X \leqq 0$, probe diameter + 1 (mm) less than 6mm is not instructed. (work-measuring system)

Alarm No.	Alarm message	Contents
187	USER MACRO ERROR (I/R/U INCORRECT) * SEE OPERATION MANUAL (6-1)	Either one of I, U, R is erroneous. Adjust it to make $Q \leqq I \leqq U \leqq R$. (work-measuring system)
188	USER MACRO ERROR (A-CODE TOO LARGE) * SEE OPERATION MANUAL (6-1)	Measuring NO. A is too big. A-maximum is "3". (work-measuring system)
190	USER MACRO ERROR (UNDEFINED PROBE-DIA) * SEE OPERATION MANUAL	Probe diameter is not indicated. ($R \leqq 0$). (work-measuring system)
191	USER MACRO ERROR (NO SKIP SIGNAL G31) * SEE OPERATION MANUAL (6-1)	Program error: No contact with sensor wirk by the command-error of target value (X) and measuring position (Z). Trouble of meter ⟶ Contact Hitachi Seiki servicemen. (work-measuring system)
192	USER MACRO ERROR (VARYING DIMENSIONS MEASURED) * SEE OPE. M. (6-1)	Clean the contact surface of sensor and work. Trouble of sensor air blow.⟶ Contact Hitachi Seiki servicemen. (work-measuring system)
193	USER MACRO ERROR (OVER TOLERANCE +/- NG) * SEE OPE. MANUAL (6-1)	Compensation is already input, thus it can enter into the next machining as it is. (work-measuring system)
194	USER MACRO ERROR (TOOL BREAKAGE / NO SPARE TOOL) * SEE OPE. M. (6-1)	After change of tool, clear the life flag. (Tool nose measuring unit, spare tool call)

Alarm No.	Alarm message	Contents
195	USER MACRO ERROR (UNDEFINED PROBE-DIA) * SEE OPERATION MANUAL (6-1)	After change of tool, clear the life flag. (Tool nose measuring unit)
197	USER MACRO ERROR (OVER TOLERANCE ++/-- NG) * SEE OPE. MANUAL (6-1)	After cheking the damage of tool, make compensation. (work-measuring system)
198	USER MACRO ERROR (TOUCH SIGNAL CONTINUOUSLY ON) * SEE OPE. M. (6-1)	Touch signal is already put out at the starting time of measuring feed. Make programming to cut coolant before measurement as early as possible. (because of electrification by soluble cutting fluid.) Trouble of meter ⟶ Contact Hitachi Seiki servicemen. (work-measuring system, Tool nose measuring unit)
199	USER MACRO ERROR (MACRO PROCESS ERROR) * SEE OPERATION MANUAL (6-1)	Trouble of macro-system for work measurement ⟶ Contact Hitachi Seiki servicemen. (work-measuring system)

Alarm No.	Alarm message	Contents
201	X-AXIS OVER TRAVEL * SEE OPERATION MANUAL (6-1)	No. 201 ~ 225 are alarms on overtravel (O.T). In this system, these alarms are not output. If generated, confirm parameters.
202	Z-AXIS OVER TRAVEL * SEE OPERATION MANUAL (6-1)	
211	X-AXIS STORED STROKE LIMIT 1 * SEE OPERATION MANUAL (6-1)	
212	Z-AXIS STORED STROKE LIMIT 1 * SEE OPERATION MANUAL (6-1)	
220	STORED STROKE LIMIT 2 (INSIDE FORBIDDEN) * SEE OPE. MANUAL (6-1)	
221	X-AXIS STRED STROKE LIMIT 2 (OUTSIDE FORBIDDEN) * SEE O.M. (6-1)	
222	Z-AXIS STORED STROKE LIMIT 2 (OUTSIDE FORBIDDEN) * SEE O.M. (6-1)	
223	STORED STROKE LIMIT 3 (INSIDE FORBIDDEN) * SEE OPE. MANUAL (6-1)	
224	X-AXIS STORED STROKE LIMIT 3 (OUTSIDE FORBIDDEN) * SEE O.M. (6-1)	
225	Z-AXIS STORED STROKE LIMIT 3 (OUTSIDE FORBIDDEN) * SEE O.M. (6-1)	

Alarm No.	Alarm message	Contents
231	X-AXIS ZERO RETURN AREA ERROR * SEE OPERATION MANUAL (6-1)	Zero-point return was made manually at each shaft on the position too near the zero-point. Bring the tool stand fully in front (minus side) from zero point. After resetting operation, make operation again.
232	Z-AXIS RETURN AREA ERROR * SEE OPERATION MANUAL (6-1)	
241	X-AXIS ZERO RETURN ERROR * SEE OPERATION MANUAL (6-1)	As a result of manual zero point return on auto-zero point return (G27, G28), previous zero-point position is different from present one.
242	Z-AXIS ZERO RETURN ERROR * SEE OPERATION MANUAL (6-1)	
271	X-AXIS SERVO DETECTION ERROR * SEE OPERATION MANUAL (6-1)	As a result of positioning the command value, present value against command is not within 32-pulse (parameter setting).
272	Z-AXIS SERVO DETECTION ERROR * SEE OPERATION MANUAL (6-1)	
280	NOT READY * RESET EMERGENCY,THEN DEPRESS STANDBY SWITCH (6-1)	After resetting the emergency button, set the button for preparing the operation. After setting ON, if alarm does not disappear, it is due to the effects of other alarms.
310	POWER FOR SERVO NOT SUPPLIED * RESET EMERG., THEN DEPRESS STANDBY	Same as Alarm No. 280
320	PREPARATION FOR CONTROL UNFINISHED * SEE OPERATION MANUAL (6-1)	Contact Hitachi Seiki servicemen.

Alarm No.	Alarm message	Contents
327	INITIALIZATION OF PROGRAM AREA INCOMPLETE	Initialization of program area incomplete. It is necessary to perform program deletion from 0 to 9999.
328	MISMATCH OF PROGRAM MEMORY AREA AND MEMORY MODULE CAPACITY	The memory PCB configuration at initialization of program area differs from that at power ON. Contact Hitachi Seiki servicemen.
329	PC CONTROL·CPU ERROR	Contact Hitachi Seiki servicemen.
330	EMERG. STOPPED COND. * RESET EMERGENCY, THEN DEPRESS STANDBY BUTTON	After resetting the emergency button, set the button for preparing the operation. After setting ON, if alarm does not disappear, it is due to the effects of other alarms.
331	X-AXIS FUSE BLOWN * SEE OPERATION MANUAL (6-1)	Trouble content: fuse cut at servo pack. This trouble is due to the damage of transistor. ⟶ Contact Hitachi Seiki servicemen.
332	Z-AXIS FUSE BLOWN * SEE OPERATION MANUAL (6-1)	
341	X-AXIS SERVO ERROR * SEE OPERATION MANUAL (6-1)	The following causes are considered. o Cutting conditions are higher than load-capacity of servo-motor. o Machine load is heavy. Contact Hitachi Seiki servicemen. o Other instrumentation-parts NG. (For details, refer to LX_3 Maintenance Manual.)
342	Z-AXIS SERVO ERROR * SEE OPERATION MANUAL (6-1)	
343	SERVO ERROR (SPINDLE)	
351	X-AXIS OVER LOAD 1 * SEE OPERATION MANUAL (6-1)	Electronic thermal relay is tripping. (Trouble state): Overload ..... Check the cutting condition or machine-load ⟶ Contact Hitachi Seiki servicemen.
352	Z-AXIS OVER LOAD 1 * SEE OPERATION MANUAL (6-1)	

Alarm No.	Alarm message	Contents
357	OVER LOAD 2 * SEE OPERATION MANUAL (6-1)	Alarm due to the temperature-abnormality of regeneration resistor is generated. The causes will be higher using frequency of motor (over 100% of rating), servo-drive unit NG, or servo-motor NG. (For details, refer to LX_3 Maintenance Manual.)
361	X-AXIS PG ERROR * SEE OPERATION MANUAL (6-1)	In spite of TGON-signal of servo-pack set to ON, PG-input is not made into servo-CPU module. (For details, refer to LX_3 Maintenance Manual.)
362	Z-AXIS PG ERROR * SEE OPERATION MANUAL (6-1)	
365	PG ERROR (SPINDLE)	
366	PG ERROR (SPINDLE)	
371	FG ERROR 1 * SEE OPERATION MANUAL (6-1)	Contact Hitachi Seiki servicemen.
372	FG ERROR 2 * SEE OPERATION MANUAL (6-1)	
381	PROGRAM ERROR * SEE OPERATION MANUAL (6-1)	
390	TG·OC·OV ERROR (SPINDLE)	This alarm lights at time of reverse wiring and disconnection of PR or TG or reverse wiring or overcurrent, overvoltage of motor A or B. (For detail, set LX_3 Maintenance Manual.)
391	X-AXIS TG DISCONNECTED * SEE OPERATION MANUAL (6-1)	
392	Z-AXIS TG DISCONNECTED * SEE OPERATION MANUAL (6-1)	
400	SEQUENCER ERROR 2 * SEE OPERATION MANUAL (6-1)	Contact Hitachi Seiki servicemen.
500	AC100V. POWER ABNORMAL * SEE OPERATION MANUAL (6-1)	Check the following (1) Solenoid circuit (2) Coil circuit of magnet SW. (3) Circuit of fan for cooling (4) Circuit of par light counter (5) Chip conveyor control circuit

Alarm No.	Alarm message	Contents
501	SPINDLE MOTOR ABNORMAL * SEE OPERATION MANUAL (6-1)	This alarm occurs with the abnormality of spindle motor or its drive unit. The same alarm display is made on drive unit. Take measures by troublestate.
502	MOTOR OVER LOAD EXCEPT SPINDLE MOTOR * SEE OPERATION MANUAL (6-1)	This alarm occurs at abnormality motor-power circuits such as lubricating motor, coolant motor except spindle-motor, or at abnormal action of thermal SW. By inspecting the thermal SW, check its load and motor circuit.
503	LUBE OIL LACKING " ADD OIL	Supply lubricating oil.
504	HYD. PRESSURE ABNORMAL * SEE OPERATION MANUAL (6-1) AFTER CHECKING PRESS.	This alarm occurs with the reduced pressure by the attached hydraulic checking system (pressure SW). It returns to normal state with operating-ready ON.
505	PNEU. PRESSURE ABNORMAL * SEE OPERATION MANUAL (6-1) AFTER CHECKING PRESS.	This alarm occurs at dropped air pressure with pneumatic devices such as auto-door and spindle-air lubrication. Return the pressure, and set the operation ready.
506	X-AXIS TORQUE LIMITER DISENGAGED * DEPRESS MAINTENANCE (?) KEY	Make restoration by maintenance Guide Item 1.
507	Z-AXIS TORQUE LIMITER DISENGAGED * DEPRESS MAINTENANCE (?) KEY	
510	SPINDLE START IMPOSSIBLE * CHECK THE CHUCK (EXT/INT WORK GRIP)	Clamp the chuck.
511	SPINDLE START IMPOSSIBLE * CLOSE THE DOOR (CHECK THE LIMIT SWITCH)	Shut the door. (Check the limit SW.)

Alarm No.	Alarm message	Contents
512	SP. START IMPOS. * ADJUST CENTER POSITION OR SEE OP. MA. (5-4)	Adjust the center position
513	SP. START IMPOS. * RETURN Q-SETTER TO ORG. POS.	Return Q-setter
514	SP. START IMPOS. * RETURN Z-SETTER TO ORG.POS	Return Z-setter
515	SP. START IMPOS. * JAWS ARE AT STROKE END. SEE OPE. MANU. (6-1)	Chuck is too tight. REset the workpiece. Or, adjust the proximate SW.
516	SP. START IMPOS. * JAWS ARE CLOSE TO STROKE END. SEE OP. MA. (6-1)	Work-chucking position NG Reset the workpiece. Or, adjust the proximate SW.
520	PROGRAM START IMPOSSIBLE * CHECK-CLAMP,DOOR-CLOSE, CENTER-POS	Confirm center-position, door-close, and chuck-clamp. CHECK RUBBER Band
521	Z-SETTER IS NOT AT ORIGIN * RETURN Z-SETTER UNIT TO ORIGIN	Return Z-setter
522	INCORRECT QUILL COMMAND WHILE SPINDLE TURNING * PRESS RESET BUTTON	Press reset button, and stop the spindle, then, perform the moving command.
524	SPINDLE SPEED DETECTION ERROR * SEE OPERATING MANUAL (6-1)	Check the spindle speed and control circuit. Contact our servicemen.
526	Q-SETTER IS NOT AT ORIGIN * RETURN Q-SETTER UNIT TO ORIGIN	Return Q-setter.
527	LOADER/ROBOT ABNORMAL * SEE OPERATING MANUAL (6-1)	Check it by Special Check List of Maintenance Manual.

Alarm No.	Alarm message	Contents
530	ZERO RETURN IN X OR Z NOT COMPLETED * SEE OPERATING MANUAL (6-1)	Make zero-point return.
531	SPINDLE GEAR SHIFT NOT COMPLETED * SEE OPERATING MANUAL (6-1)	(1) Check the solenoid. (2) Check the relay circuit. (3) Check the slow moving motor (slow ration).
534	DOOR OPEN COMMAND WHILE SPINDLE TURNING * PRESS RESET BUTTON	Press reset button. After stopping the spindle, make door-open command.
535	PNEU. PRESSURE FOR DOOR OPEN/CLOSE ABNORMAL * SEE OPE.MANU. (6-1)	By door opening/closing, air pressure was reduced lower than setting value. Elavate the pressure, or adjust pressure SW.
536	SPINDLE SPEED DETECTION ERROR * SEE OPERATION MANU (6-1)	o Big motor load or deviated setting value. o Suspected abnormality of signal-detecting circuit or wiring-system Contact our servicemen.
537	SPINDLE ZERO SPEED, DETECTION ERROR * SEE OPERATION MANUAL (6-1)	o Check if motor stops completely. o The stopping, might be due to the abnormality of singnal-detecting circuit or wiring system. o No complete stopping might be due to the abnormal setting of speed-control unit.
540	Q-SETTER NOT ORIGIN * RETURN Q-SETTER UNIT TO ORIGIN	Return Q-setter.

Alarm No.	Alarm message	Contents
541	Z-SETTER NOT ORIGIN * RETURN Z-SETTER UNIT TO ORIGIN	Return Z-setter
542	Z-SETTER NOT ORIGIN * RETURN Z-SETTER UNIT TO ORIGIN	Return Z-setter
543	TURRET INDEX ERROR * SEE OPERATING MANUAL (6-1)	o It occurs when turret does not turn, and when clamp is not made after stop, or when there is difference between command and position. o Check the relay circuits such as solenoid, limit switch, encoder, hydraulic system (leak) valve.
544	LOW SPEED GEAR SHIFT NOT CONFIRMED - SEE OPERATING MANUAL (6-1)	(1) No movement of shifter. (2) No confirmation of shift-position. Check the solenoid shift, hydraulic system (leak), limit SW, its positional abnormality, and relay-circuit in panel.
545	HIGH SPEED GEAR SHIFT NOT CONFIRMED - SEE OPERATING MANUAL (6-1)	Same as above.
546	TURRET UNCLAMP NOT CONFIRMED - SEE OPERATING MANUAL (6-1)	Similar to 543.
547	TURRET CLAMP NOT CONFIRMED - SEE OPERATING MANUAL (6-1)	Similar to 543.

Alarm No.	Message	Content
820	RAM check. CP04. MM01 error	Contact Hitachi Seiki servicemen.
830	CPU error 1	CPU is operated erroneouslly, and calculation is impossible. ⟶ Contact Hitachi Seiki servicemen.
840	CPU error 2	
910	Program content match (off-line)	Contact Hitachi Seiki servicemen.
920	Program reading error. (off-line)	

6-2 Instruction for alarm-message on NC-screen

Message	Contents
AL-1 AC100V DC24V ALARM	Power-supply alarm
AL-2 SPINDLE MOTOR DRIVER ALARM	Spindle alarm
AL-3 THERMAL EXEZP SP. MOTOR	Motor alarm (except the spindle)
AL-4 LUBRICATION ALARM	Lubrication alarm
AL-5 HYDRAULIC PRESSURE ALARM	Hydraulic pressure alarm
AL-6 AIR PRESSURE ALARM	Air pressure alarm
AL-7 X-AXIS TORQUE ALARM	X-axis torque alarm
AL-8 Z-AXIS TORQUE ALARM	Z-axis torque alarm
AL-9	
AL-10	
AL-11 POWER-OFF NC ALARM	NC-alarm power OFF
AL-12 DOOR OPERATION INHIBITED	Door operation inhibited
AL-13 SP. ROTATION FAULT	Spindle rotation fault
AL-14 TURRET INDEX FAULT	Turret operation fault
AL-15 MEASURING SYSTEM FAULT	Measuring alarm return incompleted
AL-16 ROBOT OF LOADER FALUT	Robot or loader fault
AL-17 ZERO RETURN INCOMPLETED	Program start zero point interlock
AL-18 SP. GEAR SHIFT INCOMPLETED	Sp. gear shift incompleted
AL-19 SP. GEAR SHIFT FAULT	Sp. gear shift fault
AL-20 NC SERVO ALARM	NC servo alarm
POWER-OFF PROGRAM END	Program stop power off
AL-22 SP. POSITION INCOMPLETED	Spindle positioning operation fault
AL-23 TURRET POSITION INCOMPLET	Workpiece-measuring face detection fault
AL-24 T-STOCK POSITION INCOMPLET	Tail stock connecting position incomplet

Message		Contents
AL-25	CHUCK CLOSED NOT DETECTED	Chuck closing incomplete
AL-26	DOOR CLOSED NOT DETECTED	Door closing incomplete
AL-27	CENTER SETTING INCOMPLETED	Center setting fault
AL-28	SP. STOP INCOMPLETED	Spindle stop fault
AL-29	T-STOCK SET. INCOMPLETED	Tail stock set. incompleted
AL-30	BAR-FEEDER NOT-READY	Bar-feeder ready fault
AL-31	COUNTER COUNT UP	Counter-count UP
AL-32	SP. DOOR INTERROCK	Spindle-door interlock alarm

AL-33	POWER-OFF ROBOT WORK END	Robot power-off demand
AL-34	TURRET INDEX INHIBITED ZONE	Turret base index inhibited area
AL-35	THERMAL TRIP HYDRAULIC	Hydraulic motor thermal overload
AL-36	THERMAL TRIP COOLANT	Coolant motor thermal overload
AL-37		
AL-38	SOFT OT	Soft overtravel
AL-39	X OT	X-axis hard overtravel
AL-40	Z OT	Z-axis hard overtravel

AL-41	MEASURING SYSTEM FAULT	Z-setter return incomplete
AL-42	SPINDLE ROTATION INHIBIT	Spindle start inhibition (during Z-setter arm swing)
AL-43		
AL-44		
AL-45		
AL-46		
AL-47		
AL-48		