Cincom A20

(2F7PL)

Operator's Manual

CITIZEN MACHINERY CO., LTD.

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Remarks

- For safety operation, read thoroughly <Chapter 2 Safety Precautions> to fully understand the safety precautions before starting work.
- Every effort has been made to ensure the accuracy of all information in this manual. However, the manual may contain incorrect explanation or typographical errors. If you notice any part unclear, incorrect, or omitted in the manual, please contact Citizen Machinery Co., Ltd.
- The contents of this manual may be revised without prior notice.

  This manual applies to only the machine of the machine number shown on the back cover. Do not use manuals written for dealers and reference when operating the machine. Also, do not use this manual for other machines.
- The characteristics, functions, and operations of the machine explained in this manual do not apply to worldwide use. Some illustrations in the manual may not be identical to the actual machine.
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- This machine is a product controlled under the Foreign Exchange and Foreign Trade Control Law of Japan and is subject to restriction in export. Therefore, you should take necessary procedures in accordance with the above Law to export this machine. Contact us before exporting this machine.
- The company names and product names shown in this manual are trademarks or registered trademarks of the companies.
- The CE marking put on the machine indicates that the main unit of the machine and the standard attachment units conform to the EC Directive. The optional attachment units and the units of special specification may not conform to the EC Directive. If you intend to relocate the machine to the country where compliance to EC Directive is required, consult with Citizen beforehand.

- This Operator's Manual is a part of the three-volume documentation prepared for the Cincom.

  The Operator's Manual covers general information on the machine and procedures for basic daily machine operations.

  The remaining documentation is the Programmer's Manual and the Maintenance Manual.

  The Programmer's Manual is used for machine programming.
  It covers information for Cincom programming in order to carry out various basic machining.

  The Maintenance Manual is used when checking, maintaining, and repairing the machine.
  It contains detailed information for locating problems in the machine, identifying and eliminating their cause, and otherwise maintaining the machine.

- The peripheral devices for this machine are shipped with the instruction manual for the device. Be sure read the instruction manual of the relevant device before using it.

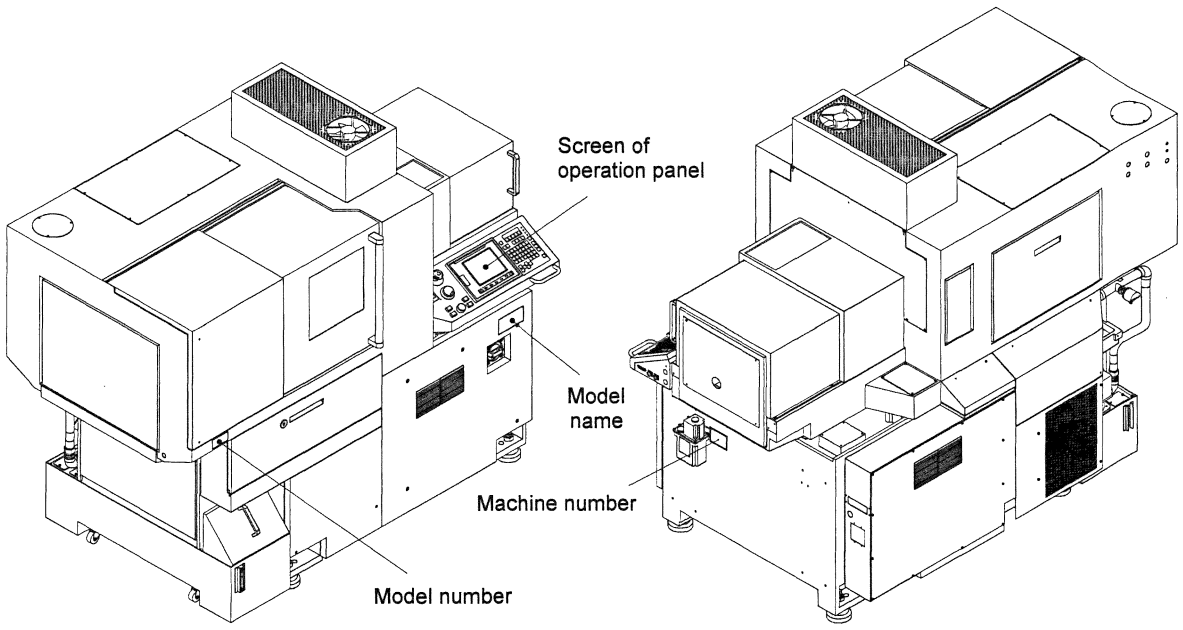
- This manual contains illustrations both for A20L and A20R. To confirm the names and locations of components, see the illustration appropriate to the machine you are using.

Information to be attached to inquiries

When making inquiries, please confirm the following items as far as possible so that we can take quick action:

No.	Item	Example	Location
1	Machine type	A20	Machine nameplate, operation panel, or the instruction manual
2	Model number (not indicated on some machine types)	2F7PL	Model sticker on the front panel of the machine, on the back of the instruction manual
3	Machine number	AC0001	Machine nameplate
4	NC unit	CINCOM SYSTEM FS32i	Operation panel or Machine Specification in <Section 3.3.2 NC functions> of the Operator's Manual
5	Delivery date	June, 2008	
6	Machine paint color	Silver two-tone color Your specified color	Appearance
7	Special specification	Dedicated transporter	
8	Page of the instruction manual that contains the information concerning your inquiry		Manual
9	Software version	CNC SYSTEM G203 10A PMC (LADDER 1) L001 01 MACRO EXE 1 M001 0001 CEXE APL C001 0001 Parameter 0001 0001	On the screen of the operation panel. See <Section 5.7.7 Software Version> of the Maintenance manual

Before making inquiries about problems, please read <Chapter 5 Troubleshooting> of the Maintenance Manual and take action if necessary.



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Operator's Manual

0. Table of Contents

This contents does not go into details.
Please refer to the table of contents for detailed headline listed on the top of each chapter.

Code No.	C-A220PL VII 1E1-0003	MFG No.	A220/0007 ~	Issue Date	2008.7

Product Code

C	–	A	2	2	0	P	L	VII					

Document Code

1	E	1	–	0	0	0	3

1. Outline

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1.1 Outline of This Manual

This manual is intended for operators who need to understand Cincom in order to operate the machine safely.

This manual explains operation methods of using the machine at full performance. Fully understand and learn operation methods described in this manual for correct and safe operations.

This manual is composed of the following chapters:

Chapter 1 Outline

Explains the purpose and organization of this manual.

Chapter 2 Safety Precautions

Explains notes on safety in programming, setting up and adjusting, operating, and maintaining the machine.
It also explains various safety devices provided, focusing on their use in an emergency.

Chapter 3 Machine Specifications

Explains the major parts of the machine and their functions.

Chapter 4 Operation Panel and Screens

Explains the operation panel, names and functions of switches, lamps, and keys, and various screens which are needed to operate the machine.

Chapter 5 Preparation for Operating the Machine

Explains power-on and power-off of the machine, menu keys, and page keys.

Chapter 6 Machine Operation

Explains the machining procedures in sequence of machine operation.

Chapter 7 Mounting and Adjusting

Explains the methods of mounting and adjusting methods needed for daily operation.

Chapter 8 Screen Functions

Explains functions on each screen in detail.

Appendix. Operating Procedures

Explains the essential points of the selected operating methods frequently used in daily operation.

1.2 Audience

This manual is intended for all users and operators who use the Cincom.

Read this manual thoroughly and fully understand it to operate the machine safely.

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2. Safety Precautions

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2.1 Safety Signs

Be sure to read and understand this chapter and all other applicable chapters of this Manual and all on-product safety signs before preparation, operating, and maintaining this machine.

Each safety sign has the specific signal word indicating the degree of the danger. The following three signal words are provided. Each signal word indicates a particular degree of danger as described below.

DANGER; alerts you to an imminently hazardous situation which, if not avoided, will result in death or serious personal injury.

WARNING; indicates a potentially hazardous situation which, if not avoided, could result in death or serious personal injury.

CAUTION; indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate personal injury and/or possible damage to the machine and its components.

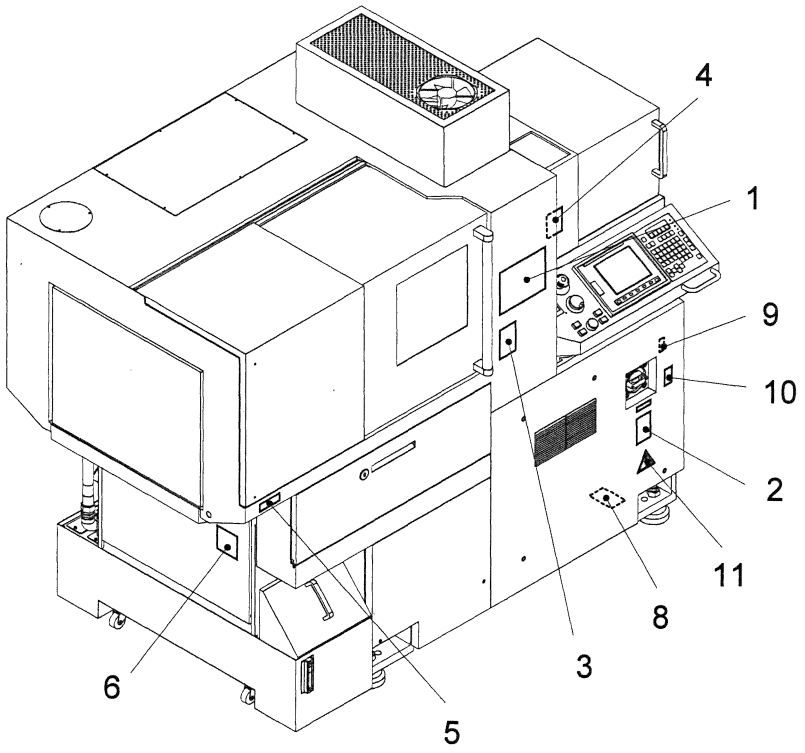
The location and content of the on-product safety signs are on the following pages. Be sure these signs are read and understood.

⚠ WARNING

Do not remove or hide any safety sign (warning label).
If it is peeling, contact your Cincom Service.

The warning labels are intended to call user's attention to dangers by indicating the contents of the dangers and further prevent the user's safety from being injured or dead and also the machine from being damaged.

Figure 2.1-1 shows the locations on which the warning labels are put. Figure 2.1-2 describes the contents of the warning labels.



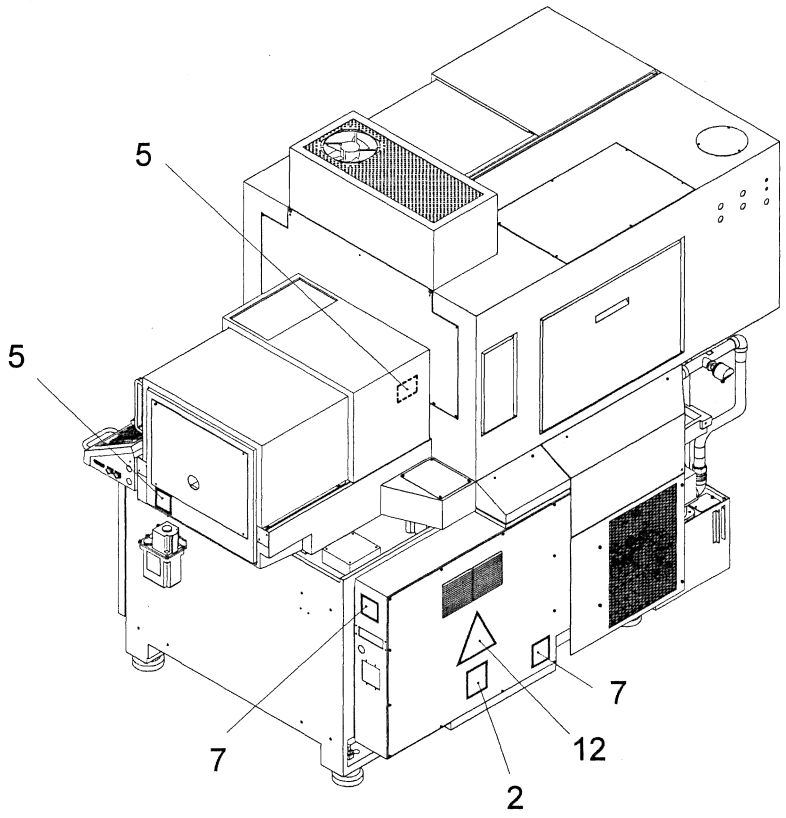


Figure 2.1-1 Locations of warning labels

1

⚠ WARNING

To prevent serious injury, death or property damage, follow these precautions when operating, inspecting or maintaining the machine:

- Read instruction manual before using machine.
- Do not touch tools or other moving parts when machine is operating.
- Do not operate machine unless all doors and all covers are closed.
- Turn off power at main breaker before opening control unit doors or covers.
- Before operation, be sure all safety devices are working.

⚠ WARNING

To prevent serious injury, death or damage due to fire, do the following:

- Monitor machine when operating.
- Do not use damaged tools.
- Apply sufficient coolant to cutting point during operation.
- Keep flammable items away from machine.
- Be sure all doors, all covers, chip outlet door and product outlet door are closed during operation.
- Regularly remove chip from chip collector and coolant tank.

EW201

2

⚠ WARNING

Hazardous voltage inside. Will shock, burn, or cause death.

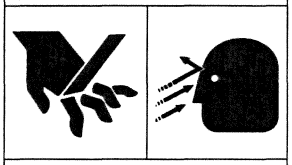
Only qualified personnel totally familiar with electrical circuits and service manual should work inside this enclosure.

Follow Lockout/Tagout.

EW01

3

⚠ WARNING



Moving part, hot chips and hot oil inside.

Keep door closed during operation.

EW02

4

⚠ WARNING

Moving parts inside.

Keep door closed during operation.

EW03

5

⚠ WARNING

Moving parts can cause serious injuries.

Keep hands and body away from moving parts.

EW04

6

⚠ WARNING

Turn off machine before removing chips inside.

Hands or chip remover tool can touch moving parts inside and cause serious injury.

EW05

7

⚠ WARNING

Hazardous voltage. Can shock, burn, or cause death.

Turn off main breaker before connecting or disconnecting coolant pump.

EW07

8

⚠ DANGER

Hazardous voltage inside.

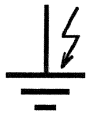
Will shock, burn, or cause death.

DO NOT work in this enclosure unless familiar with these electrical circuits and safe servicing procedures.

ED01

9

⚠ WARNING



GROUND

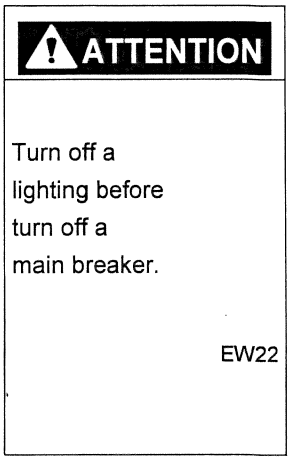
GETTING ELECTRIC SHOCK OR NOISE CAN OCCUR.

THE UNITS MUST BE GROUNDED.

(RESISTANCE VALUE MUST BE 100Ω OR LESS)

A-001

10



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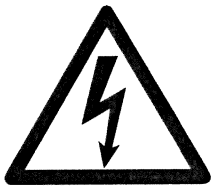

ATTENTION high voltage!
Opening by qualified personnel only!

Figure 2.1-2 Contents of warning labels

2.2 Emergency Stop Button

The red emergency stop button is located on the operation panel. When there is an emergency situation such as fire, power failure, earthquake, or lightning or if you need to evacuate at once, press this button to stop the operation immediately before you leave the work site. Press this button anytime your feel dangerous while operating the machine. Note, however, that pressing these emergency stop button during machine operation might damage a tool as well as the product being processed. To reset the emergency stop state, first verify your safety, turn the locked emergency stop button clockwise to release the lock, and turn the NC power and main breaker off once and then turn them on again. Also return all the mobile sections of the machine to their return positions and then remove all the workpieces subject to machining from the machine.

Figure 2.2-1 shows the location of Emergency Stop button.

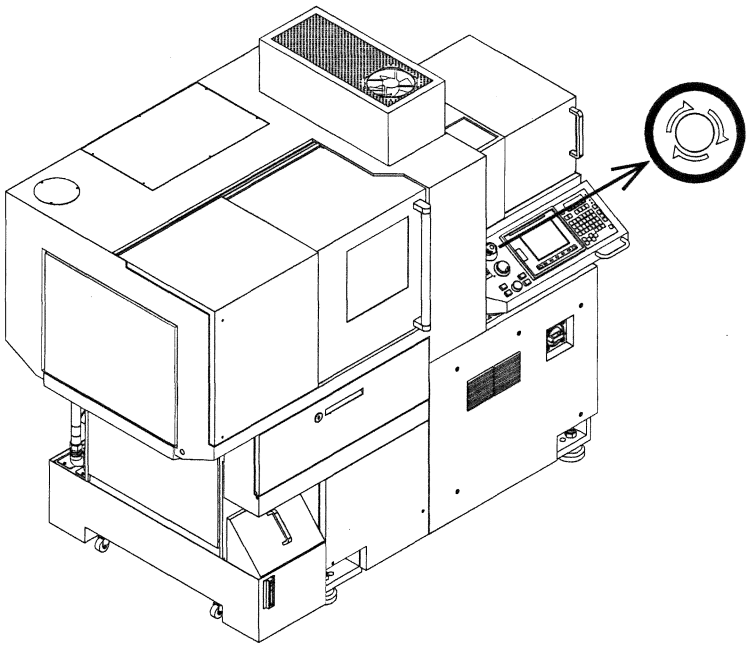

Figure 2.2-1 Location of the emergency stop button

2.3 Safety Devices

⚠ WARNING

No safety devices provide complete safety against accidents and hazards.
Be sure to follow the precautions and described in this chapter to operate the machine.
Failure to do so could result in death or serious personal injury.

Cincom provides the following kinds of safety devices to prevent and detect accidents and hazards when operating the machine.

The standard and optional safety devices shown and described on the following pages are installed depending on particular operating needs of the customer.

- Devices to detect any accident that occurs during machine operation.
- Devices to stop the machine operation under an unsafe condition.
- Devices to prevent production of defective products.
- Devices to prevent damage to the machine or tools.

Safety devices are strongly recommended in the following situations:

- When reducing operator's attention such as operating the machine continuously or in night shift.
- When extending the duties of the operator beyond this machine.
- When further reducing the possibility of accidents.

The remainder of this section shows the locations of safety devices and outlines their functions.

Note

Optional safety device can be used only when you purchase it.

Figure 2.3-1 and Figure 2.3-2 shows the locations on which safety devices are installed.

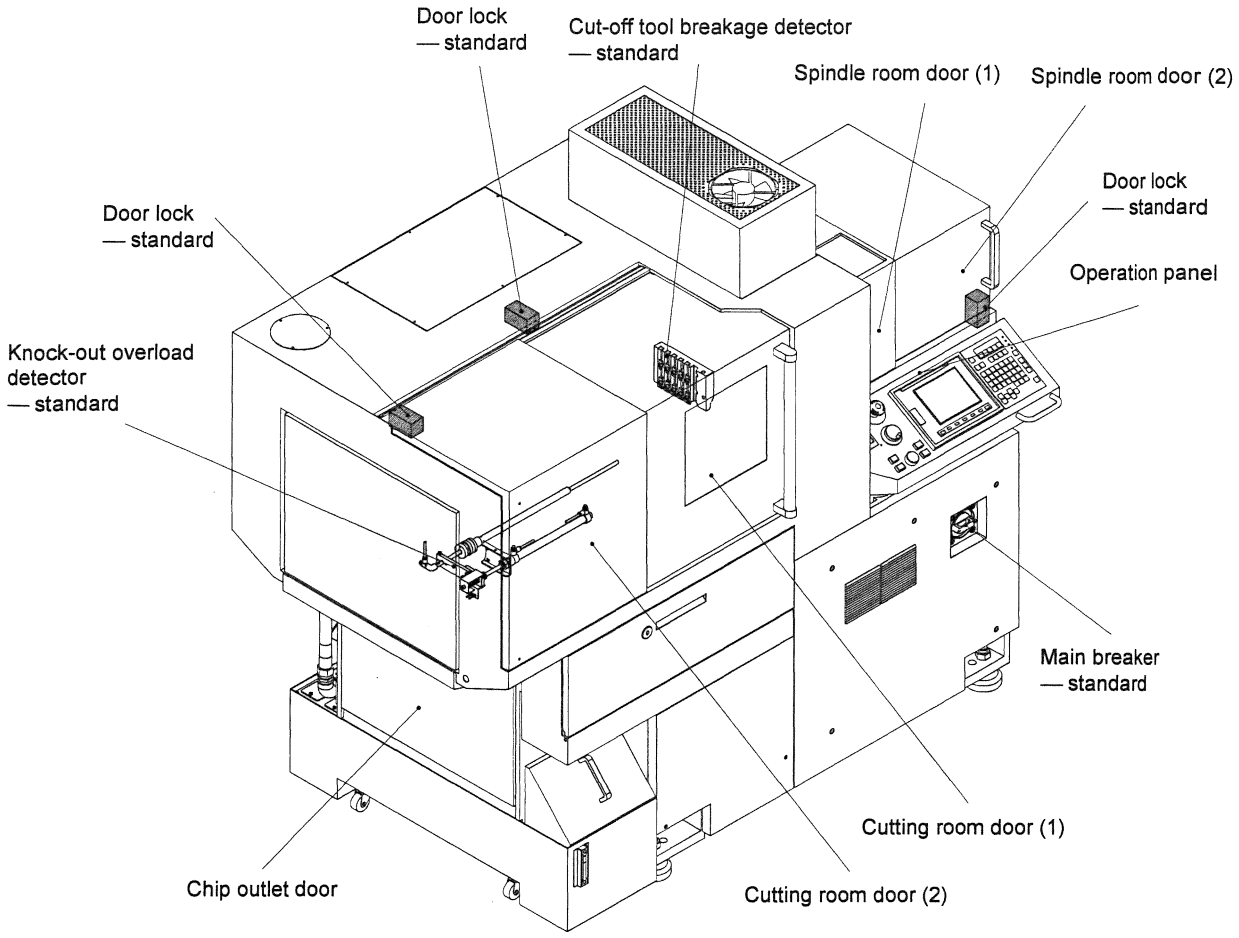

Figure 2.3-1 Locations of the safety devices (front view of the machine)

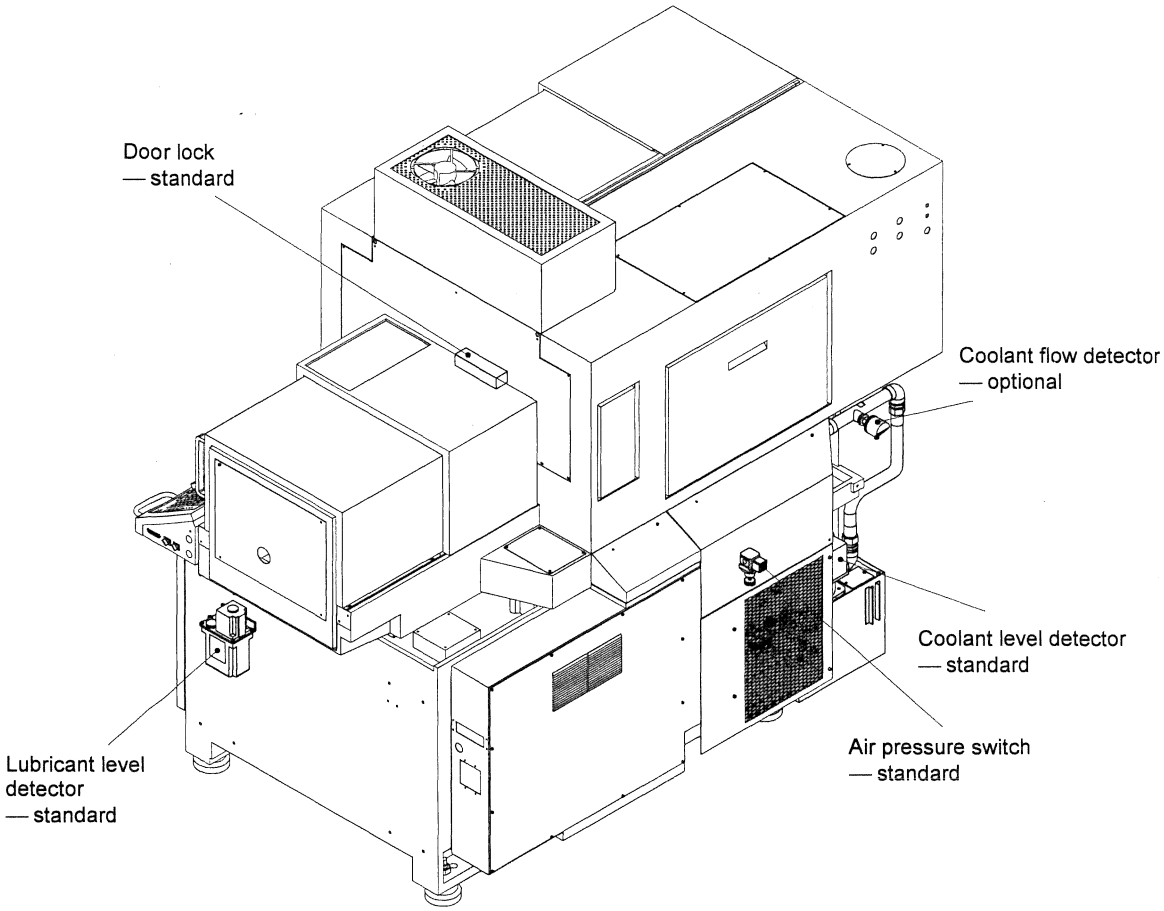

Figure 2.3-2 Locations of the safety devices (rear view of the machine)

The following are detailed descriptions of the safety devices:

Door locks — standard

Door locks prevent any person from opening the cutting side door (1), (2) and main spindle side door (1), (2) during machine operation. You will only be able to open these doors when the machine is stopped. See Figure 2.3-1.
In the Handle Feed or Preparation mode, however, operations (excluding operations regarding the main spindle) are performed at a speed of up to 2 m per minute even with such doors left open. In addition, manually opening or closing the chuck, manually rotating the spindle, and turning coolant supply on or off are performed whether the doors are open or closed.

Main breaker — standard

This device automatically shuts itself off when it detects an over current of 30A or more or an electric leakage of 30 mA or more.

Cut-off tool breakage detector — standard

A cut-off tool is very easily damaged. If you continue to operate the machine with a damaged cut-off tool, this might damage the machine or cause a fire. This device detects whether or not material is properly cut. In other words, it indirectly detects whether the cut-off tool is damaged to prevent the above possible dangers. When this device detects a damaged cut-off tool, the alarm message "1105 TOOL BIT ALARM" is displayed.

Coolant level detector — standard

This device is installed in the coolant tank and detects the height of the coolant level. When the coolant level gets lower than the limit, the alarm message "1201 COOLANT OIL EMPTY" is displayed and the operation of the machine is automatically stopped after completing one cycle to prevent a fire hazard.

Lubricant level detector — standard

This device is installed in the central lubricating oil unit and detects the level of the lubricating oil. When the oil level gets lower than the limit, the alarm message "1200 LUBRICATING OIL EMPTY" is displayed and the operation of the machine is automatically stopped after completing one cycle to prevent machine damage.

Air pressure switch — standard

This switch is used to check the air pressure of main spindle and guide bushing device to prevent damage to their bearing. If an abnormal high (or low) pressure is detected, the alarm message "1132 PNEUMATIC PRESSURE ALARM" is displayed, and the machine automatically stops operation.

Knock-out overload detector — standard

This device is used to detect an overload on the knock-out pipe.
If the workpiece which has been inserted too deep in the back spindle device at re-chucking interferes with the knock-out pipe, an alarm message "1145 KNOCK OUT OVERLOAD" is displayed and the operation of the machine is automatically stopped to prevent a machine damage.

Coolant flow rate detector — optional

This device is installed in the coolant supply path to observe the flow rate of the coolant.
When the coolant level gets lower than the setting value, the alarm message "1106 COOLANT OIL ALARM" is displayed and the operation of the machine is automatically stopped to prevent a machine damage.

The following software functions are installed as safety devices in the machine.

Spindle speed change detection — optional

This function detects excessive changes in spindle speed to prevent machine damage. The alarm message "SP9002 SSPA: 02 EX DEVIATION SPEED" is displayed when it detects a change of more than 10% from the specified speed.

Note, however, that this function must be disabled when the spindle synchronization control function or the constant surface speed control function (standard function) is used and during tap and die machining.

Interference check — standard

This function checks for interference between back spindle and opposite tool post. When the function determines the possibility of interference during machine operation, the NC alarm message "INTERFERENCE: ~ " is displayed and the operation of the machine is stopped to prevent machine damage.

If this alarm is displayed, the operator must correct the program.

2.4 Specifications for Safe Operation

For the sake of safety, the startup, stop, and operation speeds of the machine are defined as shown below.

	When a door is open: (The Door select switch key DOOR SW is set to "O".)	When all the doors are closed:
Automatic operation Program operation Program check MDI operation Preparation Cut-off process Phase adjustment	Stop and startup not permitted	Specified speed (Override enabled)
Preparation Start position Cut-off tool moves to the waiting point Tool set Return position Backward movement of gang tool Manual set Positioning point Backward movement of back spindle	Operation at a speed of up to 2 m per minute (Override enabled)	Operation at the specified speed (100%) (Override enabled)
Others Opening/closing of chuck with the SP.CHUCK key	Operation at the specified speed (100%)	Operation at the specified speed (100%)

The standard door locks is provided with the splash guard of the machine.

Note

If you open the doors when the Door select switch key DOOR SW is set to " ▌ ", an alarm will be issued and you cannot operate the machine.

2.5 General Precautions During Operation

Be sure to follow these general precautions for handling the machine.

⚠ DANGER

To prevent death or severe personal injury, always follow these safety practices:

- **Do not operate the machine with any cover open.**
- **Do not put your fingers or hands into any moving part of the machine during machine operation. When the Start key [I] LED on the operation panel lights or flashes, regard the machine status as Operating.**
- **Do not touch or stand close to any cutting tool or rotating part of the machine during machine operation.**
- **Do not touch any live electrical component of the electrical system. You could be electrocuted if you touch live electrical components.**
  All the control unit covers and doors must be closed during machine operation.
  Shutdown the main breaker of the machine before removing the control unit covers and doors.
- **Never change the machine and control circuit.**
- **Press the emergency stop button stop all machine motion when there is an emergency situation.**
  To reset the machine after an emergency stop, make sure that the machining situation is safe, reset the pressed emergency stop button, cycle power to the machine, return all machine moving parts to their return positions, and remove all materials in progress from the machine.

⚠ WARNING

Follow these safety practices while operating the machine. Failure to do so could result in death or serious personal injury.

- **Never disable any safety devices while operating the machine during automatic operation.**
- **Do not open all front left and right doors unless the machine is completely stopped.**
- **Make sure that all front left and right doors are closed and locked (if equipped with locks) and all safety devices are activated before operating the machine.**
- **When operating the machine, sufficiently understand the operation and visually confirm the operation switch to be used before actually pressing that switch.**
- **When machining a material combustible (flammable) during machining by cutting, operate the machine in a state in which the operator can always monitor the machining process.**

⚠ CAUTION

Follow these safety practices. Failure to do so may result in minor/moderate personal injury and/or damage to the machine:

- **The machine must be properly grounded. The ground must be electrically separated from power lines or the grounding wires of another machine that could be a source of massive electrical noise. See <Chapter 9 Relocating the NC Machine> in Maintenance Manual.**
- **Make sure that there is enough coolant in the machine and it is being supplied smoothly to all necessary parts.**
- **Check the tooling to see that it is securely clamped in place before starting the machine.**
- **Be sure to do the periodical checking described in the manual.**
- **Clean the machine regularly to remove any chips and debris from the cutting area and the chip receiving area.**
- **Remove stray chips from the coolant tank as required, depending on cutting condition and type of material being machined.**

2.6 Safety During Installing the Machine

To prevent accidents which could result in death or serious personal injury, be sure to observe the following precautions:

- Machine transfer requires work using cranes and forklifts and slinging work. Be sure to assign the personnel certified by the public institute to the work.
- Be sure to shutdown the main breaker of the machine and the breaker for power supply to the machine on the plant side before connecting/disconnecting the power cable to/from the machine.
- Be sure to connect the ground line when connecting the power cable to the machine.

2.7 Before Starting the Machine

Before starting the machine for the first time, you should know the following:

- The locations of the emergency stop button safety devices, and all front left and right doors.
- The meaning of all safety signs.
- How to stop the machine in an emergency situation.
- What happens to the machine when you operate buttons, switches and keys on the operation panel.
- Proper shutdown and startup procedures.
- Procedures for clearing machine troubles.
- How to shutdown the main breaker of the machine.
- Fire prevention procedures (see <Section 2.12 Fire Prevention Practices>).

Each time before you start the machine, do the following to prevent injury or damage:

- Make sure you wear the proper work clothes (no loose clothing), safety goggles, cap, and safety footwear. Also make sure you remove any gloves, rings, accessories, neckties that may cause you to be caught by the machine.
- Make sure you are not too tired or sick to operate the machine safely. If you are tired or sick, DO NOT OPERATE THIS MACHINE.
- Inspect the area around the machine for spills or objects that could cause slipping, falling, or tripping.
- Make sure that no maintenance work is being performed on the machine.
- Check the inside and outside of the machine to see that it is free of all foreign objects (tools, workshop towels, etc.).
- Make sure there is enough oil in the lubricating oil tank and coolant tank.
- Clean dirt, oil, and coolant off of the machine, especially on the operation panel.
- Make sure that the machine safety devices are engaged and working properly. NEVER operate the machine with the safety devices disabled or removed.
- Make sure that the emergency stop button is working properly.
- Check all screws of the tool holder, chuck, guide bushing and others to make sure they are not loose; tighten them if necessary.
- Make sure that the tools and the material are mounted firmly. Also make sure that the correct tools are installed for the machining program to be used and the offset has been specified properly (if necessary).
- Make sure that all front left and right doors are securely closed.

2.8 Safety During Setup

Disregarding this safety practice could cause severe personal injury.

- Never adjust the tools or measure the dimension of the material during machine operation. This can cause severe personal injury.
  If adjustment or measurement is necessary, stop the machine first. Then, before adjusting or measuring, make sure that all machine motion has stopped and that the work cycle will not start automatically.
- Check whether the chucking force is sufficient for the material.
- Do not make the guide bushing too tight--it can cause burning or galling. Fix the guide bushing using the most suitable tightening torque.
- When you have used any jig or tool for adjusting the guide bushing or chuck, be sure to remove the jig or tool.
- Before attempting to move a part by pressing a button, be sure to visually confirm that part and button.

When setting up the machine, follow these safety practices to prevent injury or damage:

- Make sure that tools attached do not interfere with mechanical portions of the machine every time the machine is set up for new and exchanged programs or tools. If there is interference, this could cause machine damage and personal injury.
- When you check the tool movement, always know where you are in the machining program so that you know when and how the machine will move and can follow the necessary safety precautions for this movement.
- Verify the machining program and the actual setup. Check for unintended results, which you should always try to anticipate, such as machine damage and dangerous operating conditions.
- Because this machine has no way to check and correct user's machining programs, the machine will act exactly the way it is programmed.
- Verify the machining programs carefully. Failure to do so could cause machine damage and personal injury.
- Never attempt to perform work that is beyond the specifications of the machine.
- Take coolant flow into consideration when you select the tooling. Select tooling that allows a smooth passage of chips.
- Use the proper tools and install them only after the machine is completely stopped.
- When either front left or right doors are open during machine setup, do not select a tool, or do not operate the main and back spindles or the tool spindle drive. Also, do not touch cutting tools on the tool posts during machine operation.

2.9 Safety During Automatic Operation

To prevent any secondary accident from being triggered by an unexpected incident, such as jammed chips be sure to monitor the operation status at appropriate intervals during the automatic operation and troubleshoot a failure, if any.

Regularly Monitor the Machine

- To produce high-quality products and avoid damage to the machine and possible personal injury, monitor the machine at regular intervals for alarm messages, tool wear, coolant flow, etc.
- Be aware of common operating problems and correct them immediately. Common problems include jammed chips, damaged tools, burned material, etc.
- Perform the following inspections on a regular basis. Monitoring intervals will depend on cutting condition, type of material, etc., and can only be determined by the operator through experience with the machine.
  - Clear the Machine of Chips

    Too many chips on the tools and materials can greatly reduce the cooling effect of the coolant. Reduced cooling effect can cause a fire, depending on the type of material being machined. Remove chips from the chip receiving area and the cutting area at suitable intervals. When the machine is regularly used, intervals depend on cutting condition, material, etc. Monitor the level and condition of coolant periodically. Failure to do so can result in damage to the tools and a possible fire hazard.
  - Inspect the Coolant

    Monitor the coolant condition and level periodically. Check regularly to make sure that the coolant is discharged smoothly and that the supply to the machining position is adequate. Failure to do so can result in damage to the tools and a possible fire hazard.
  - Inspect the Tools

    Dull, worn, or damaged tools put excessive load on the machine. This can damage the machine and possibly cause a fire. Follow a regular inspection/maintenance schedule for the tools. During machine operation, listen for abnormal sounds and be aware of possible troubles due to damaged, dull, or worn out tools. Also inspect completed workpieces for evidence of damaged, dull, or worn out tools.

2.10 Safety During Maintenance

Disregarding the following safety practices could cause machine damage and serious personal injury.

- Only qualified maintenance personnel should perform maintenance operations on the machine.
- The safety devices can be disengaged for maintenance operations using the operation panel. Before disengaging the safety devices, make sure you are familiar with the current program and where the machine is in the program. Make sure the machine has stopped before reaching into the machine to make any adjustments. Cincom recommends that the safety devices be engaged for all machine operations except during required maintenance.
  Before removing control unit covers and doors, turn off the work light, then turn off main circuit breaker of the machine.
- Always use the specified fuse. Installing a wrong type/size of fuse in the machine can cause machine damage and a possible fire.
- A blown fuse indicates an electrical problem that must be corrected.
- The electrical components in this machine are high precision devices that can be damaged by excessive force, shock, or vibration. Use caution when you handle all electrical components of the machine.
- Use care when you disconnect connectors. They are easily damaged.
- Periodically clean the air filter. The cleaning interval depends on the operating environment. Operating the machine with a dirty air filter could damage the electrical components.
- Follow appropriate lockout/tagout procedures during maintenance.

2.11 Safety After Everyday Operation

- Turn off the work light, then turn off the main circuit breaker of the machine.
- Carefully remove any chips caught on the material and cutting tools.
- Apply rust prevention oil on all unprotected (unpainted) machine surfaces.

2.12 Fire Prevention Practices

Follow these general safety practices to prevent fires:

- Keep all open flame or sparks (cigarettes, lighters, etc.) at least one meter away from the machine.
- Always perform the necessary daily maintenance.
- Always operate the machine within its capacity and according to the procedures outlined in the Operator's Manual and in this chapter.
- Dull, worn, or damaged tools put excessive load on the machine. This can damage the machine and possibly cause a fire. Follow a regular inspection/maintenance schedule for the tools.

Before operating the machine each day, perform these checks to help prevent fires:

- Inspect the tool for chips or cracks and make sure that the cutting capacity is adequate; the machine and tools must be suitable for the conditions and feeds of the machining program.
- Make sure that enough coolant is discharged to the machining position.
- The oil level in the coolant tank must be adequate.
- Make sure that the coolant flow path is clear.
- Make sure that the coolant hose is not twisted, and not damaged, there are no loose connections, and there is not too much chip accumulation on any curved portion of the hose.
- Inspect the chip receiver box and coolant tank for too much chip accumulation.
- Make sure all front left and right doors are securely closed.

During automatic operation, regularly perform these checks to help prevent fires:

- Inspect for chipped tools, excessive vibration and noise, and too much chip accumulation. Inspect finished workpieces for surface finish conditions that indicate tool wear or damage.
- Make sure the coolant nozzle is directed to provide optimum lubrication and chip removal.
- Check for too many jammed chips and remove as necessary. Check the coolant tank periodically for too much chip accumulation. Remove chips as necessary. Too much chip accumulation can reduce the effectiveness of the coolant pump.
- Make sure all machine covers and doors are securely closed.
- When doors are open, coolant mist or vapor may escape from the machine and catch fire outside the machine.

Prevent the following situations in which coolant supply may be insufficient, and possibly cause a fire.

- A chipped tool can induce an abnormally high friction temperature between the tool and the material.
- Chips can get caught on the machining surface and reduce the cooling effect of the coolant.
- Long chips may hit the coolant nozzle and change its position so that no coolant is applied to the machining position.
- If the coolant in the tank is at a low level or the mesh filter of the chip receiver box is blocked with chips, the coolant discharge may be insufficient.
- When the room temperature is abnormally high, the coolant may vaporize.

The following situation is especially hazardous. Stop the machine operation and shutdown the main breaker of the machine immediately, and contact the Cincom Service.

- If the machine's electrical system fails and causes a spark, it may ignite the coolant mist or vapor inside or outside around the machine.

2.13 Handling Emergency Situations

Actions and procedure required in emergency situations are explained in this section.

2.13.1 Machine operation at occurrence of an accident

If an accident (e.g., any part of an operator's body caught in the machine) occurs, immediately stop the machine and perform the following procedure:

When the Emergency Stop button is already pressed:

Release the Emergency Stop button by turning it clockwise, and press the Power off switch  .

After that, press the Power on switch  to turn on the power, and move the control axis into a safety direction in manual operation mode. For the manual operation mode, see <Section 6.5 Manual Operation> in the Operator's Manual.

When the Emergency Stop button is not pressed yet:

Move the control axis into a safety direction in manual operation mode. For the manual operation mode, see <Section 6.5 Manual Operation> in the Operator's Manual.

2.13.2 Emergency situations requiring evacuation

When evacuation is required in the case of emergency situations, such as fire, earthquake, or lightning, perform these procedures with the top priority on human lives.

- If you have time before evacuating

  Stop the machine quickly and turn off the main circuit breaker. Try to get the machine to stop when the tool is not touching the material. Otherwise, the tip of the tool may be damaged in the process of stopping or restarting operation.

- If you do not have time and must evacuate immediately

  Press the emergency stop button to stop the machine immediately.

2.13.3 Power failure

When power failure occurs, turn off the main circuit breaker.

2.13.4 Resuming work

After emergency stop of the machine or a power failure, follow the procedure below to resume operation of the machine:

Procedure

1. Inspect the tool and machine carefully for damage and replace or repair if necessary. And confirm the machine can be operated safely and properly.
2. Cut off the material that was being machined when the emergency occurred.
3. Resume operation of the machine according to the Manual.

2.14 Notes for prevention of machine damage

Be sure to follow the notes described below. If not, the assets including the machine and machining products may be lost.

- Confirm that the installed tool does not interfere with the machine in a preparation work such as program installation or tool replacement.
- DO NOT modify the machine and control circuit.
- DO NOT provide any machining exceeding over the machine specification.
- Electric parts are extremely precise to be damaged by excess force, shock, or vibration. Take sufficient notes on handling of electric parts.
- Take sufficient notes when connecting or disconnecting the connector because it can easily be damaged.
- Pay attention to the cleanness of supply air. Contaminated air can cause damage to the machine. For the cleanness of supply air, see <Section 9.1 Selecting the Installation Site> in the Maintenance Manual.

Product Code	C	–	A	2	2	0	P	L	C	L	VII		

Document Code	0	E	1	–	0	2	0	1

3. Machine Specifications

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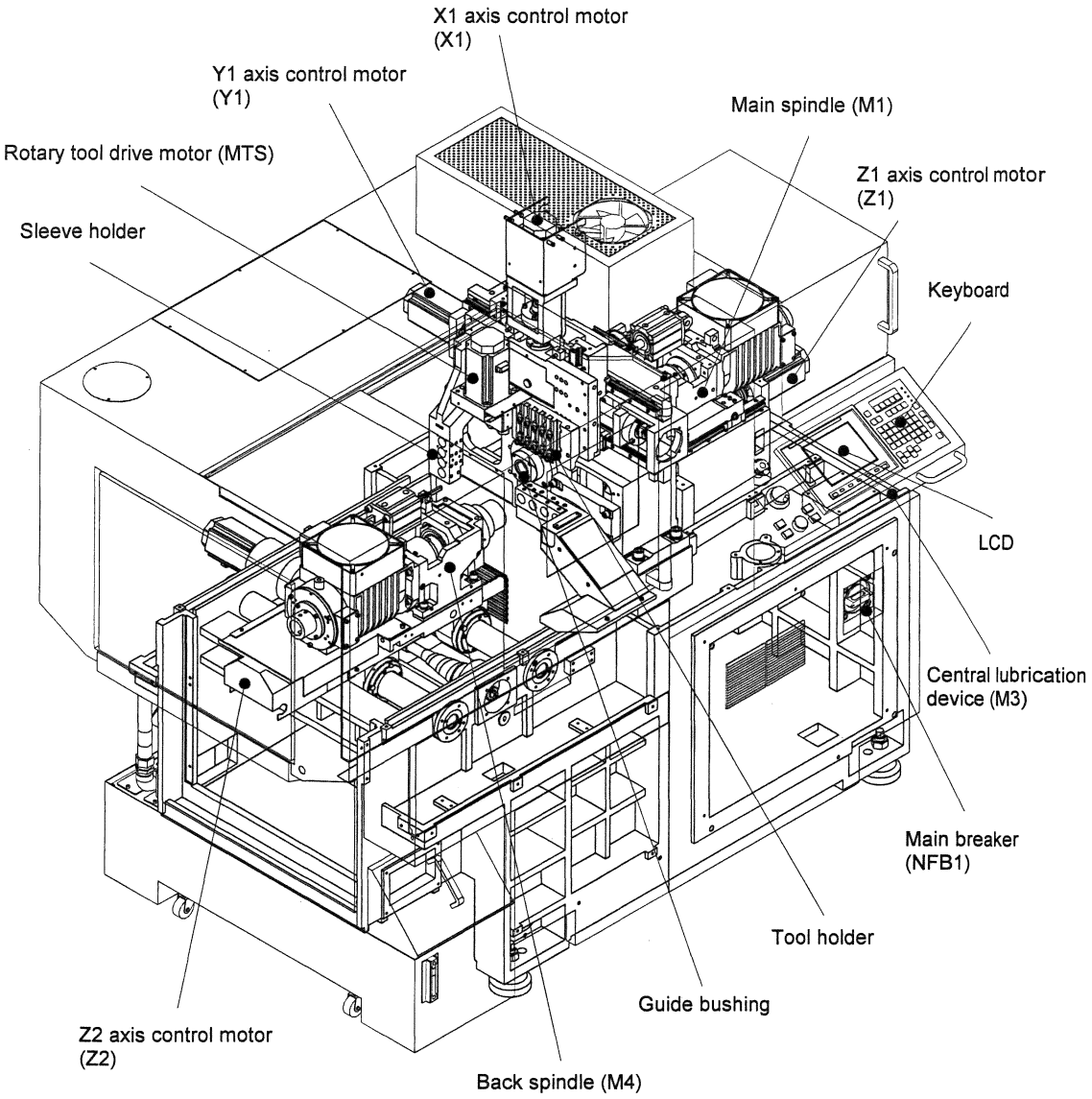
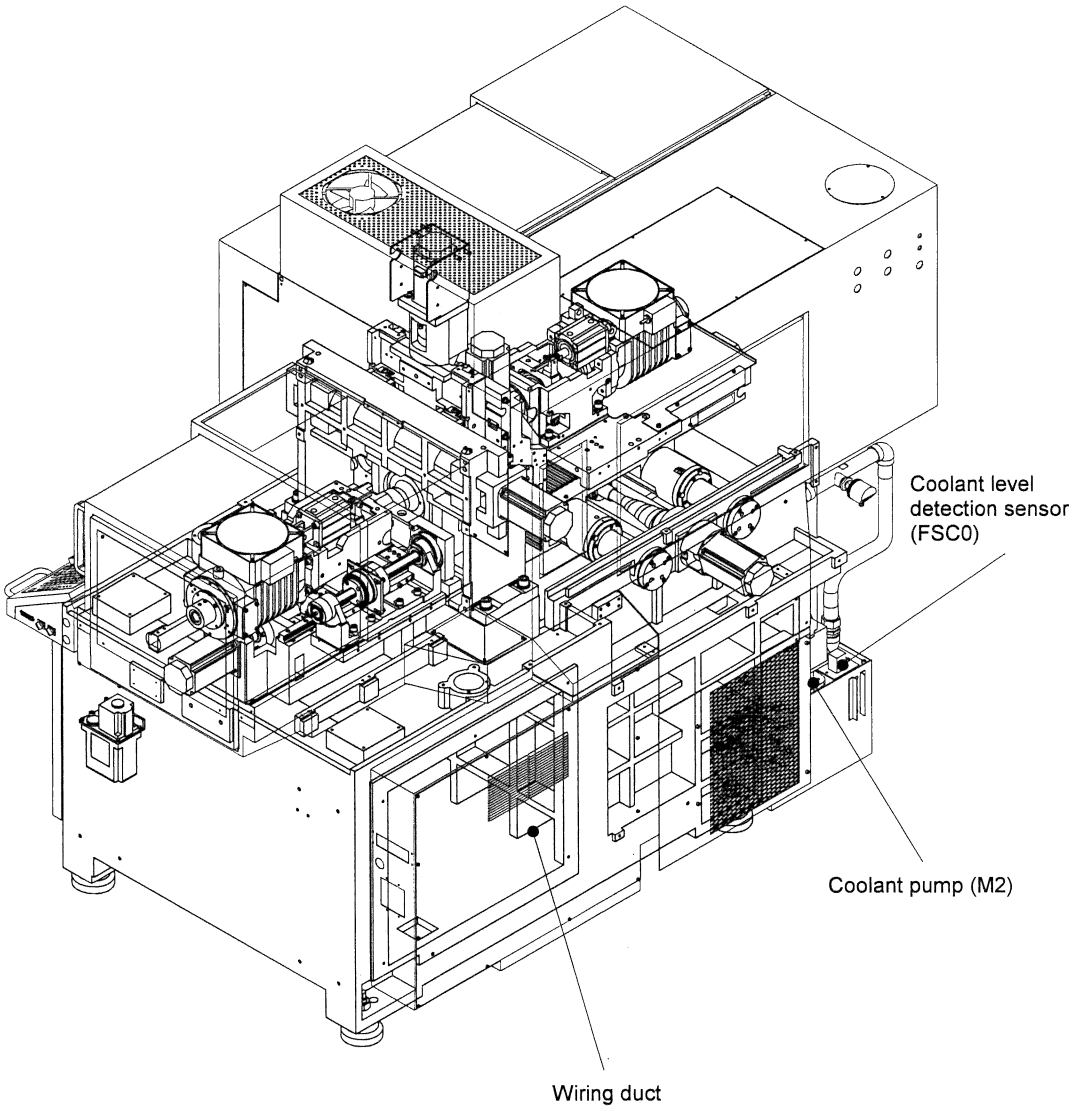
3.1 Names of Machine Components

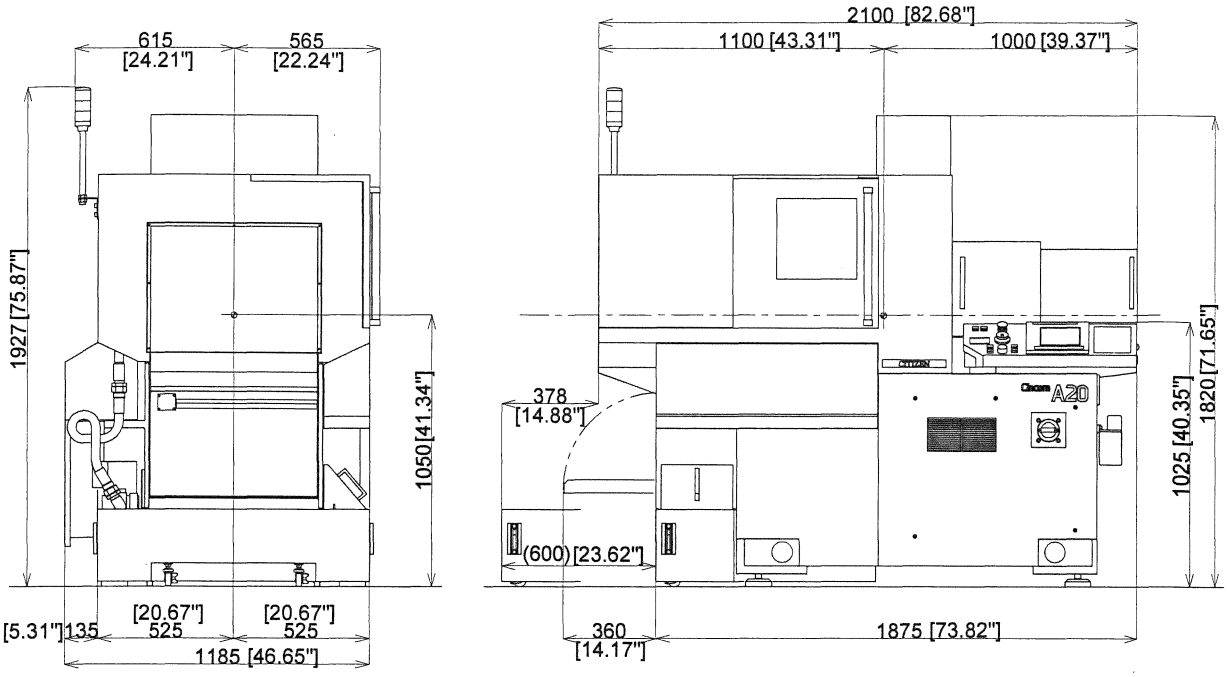


Front view of the machine

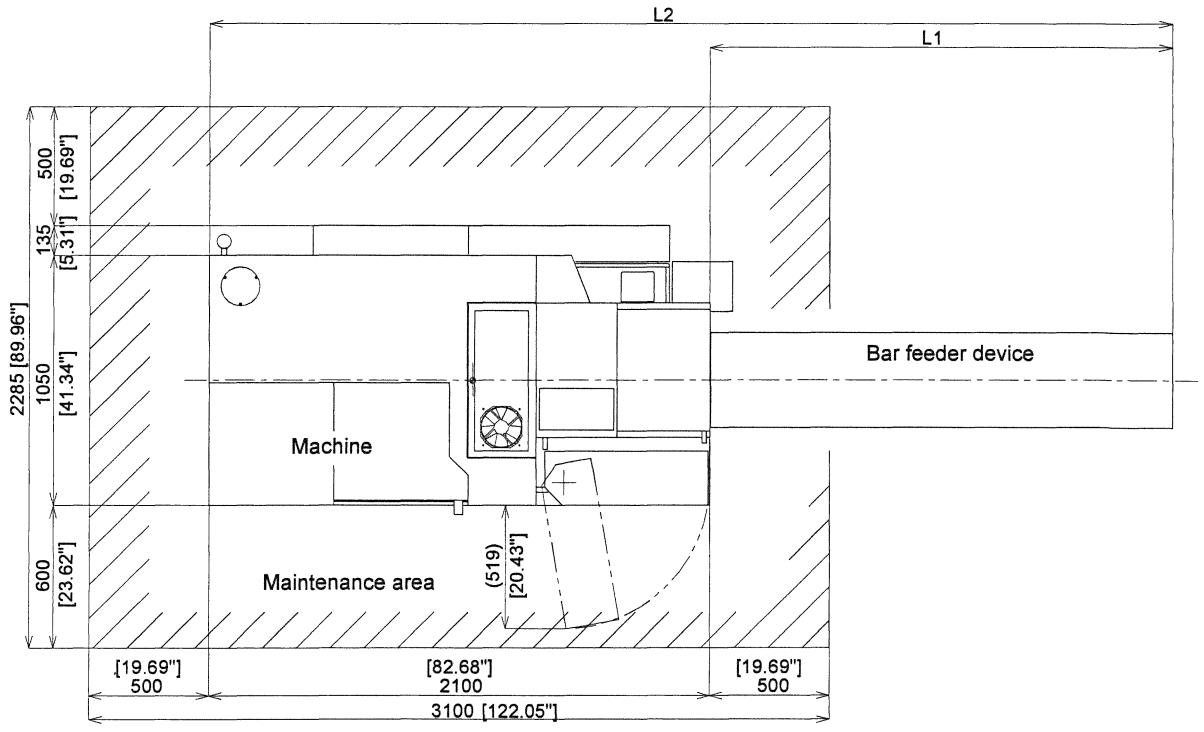


Rear view of the machine

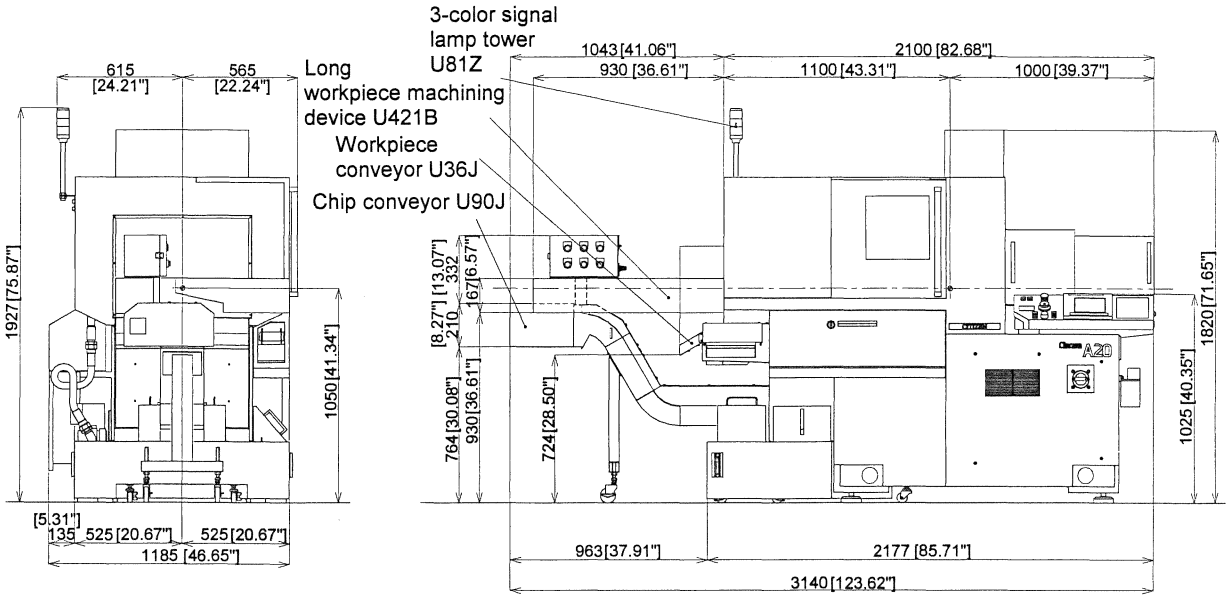
3.2 Outside Dimensions and Layout of the Machine



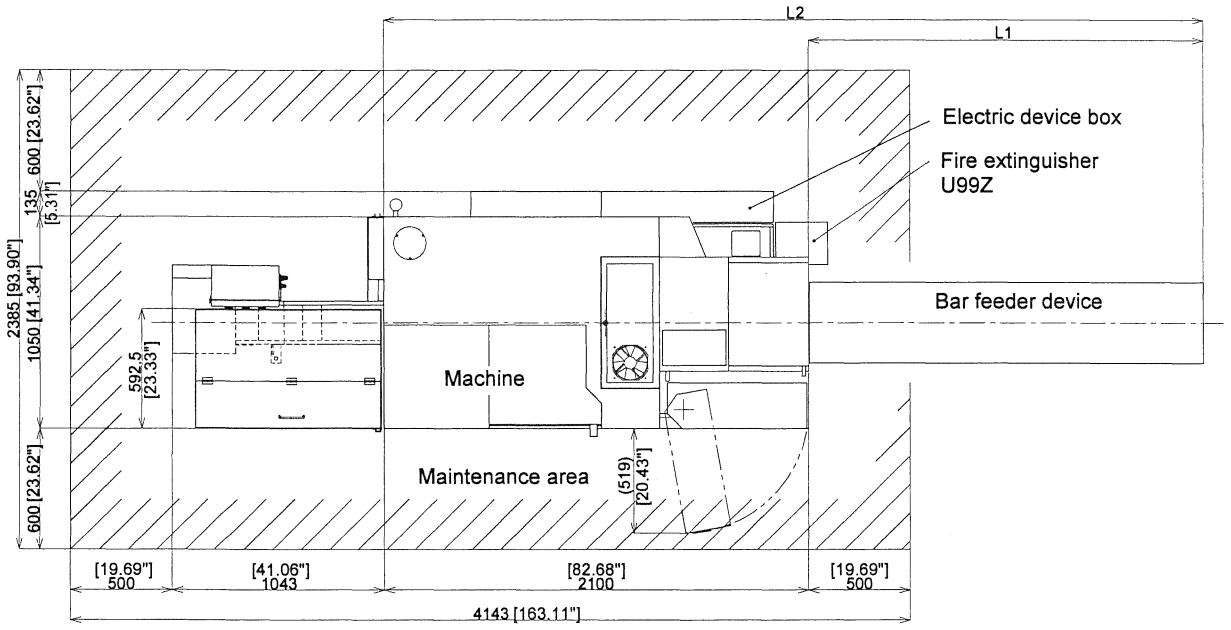
Outside dimensions of the machine



Machine layout



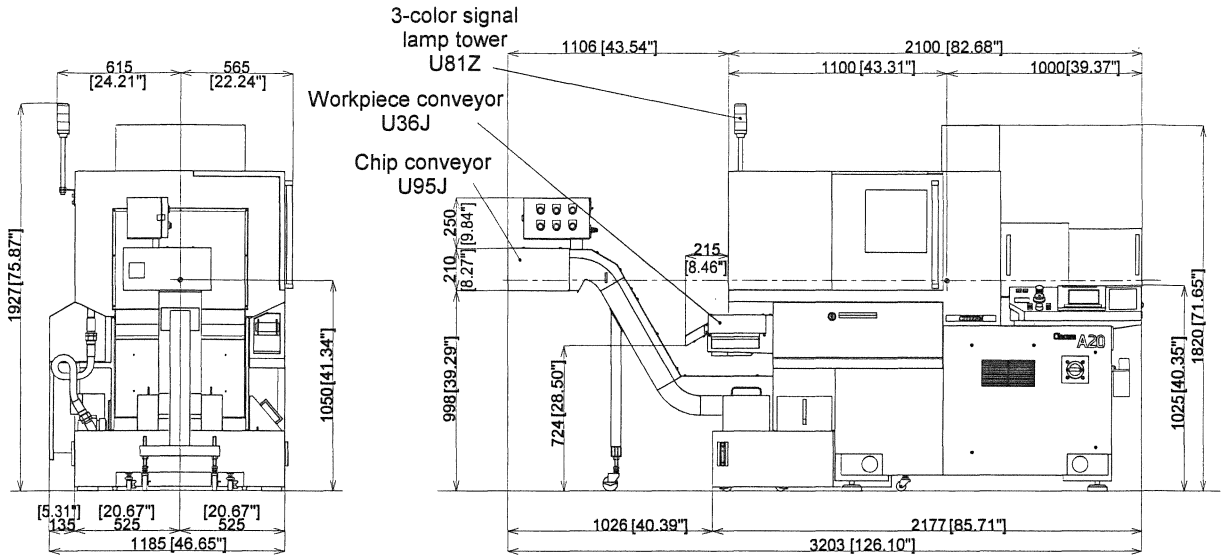
Outside dimensions of the machine (with chip conveyor U90J mounted)



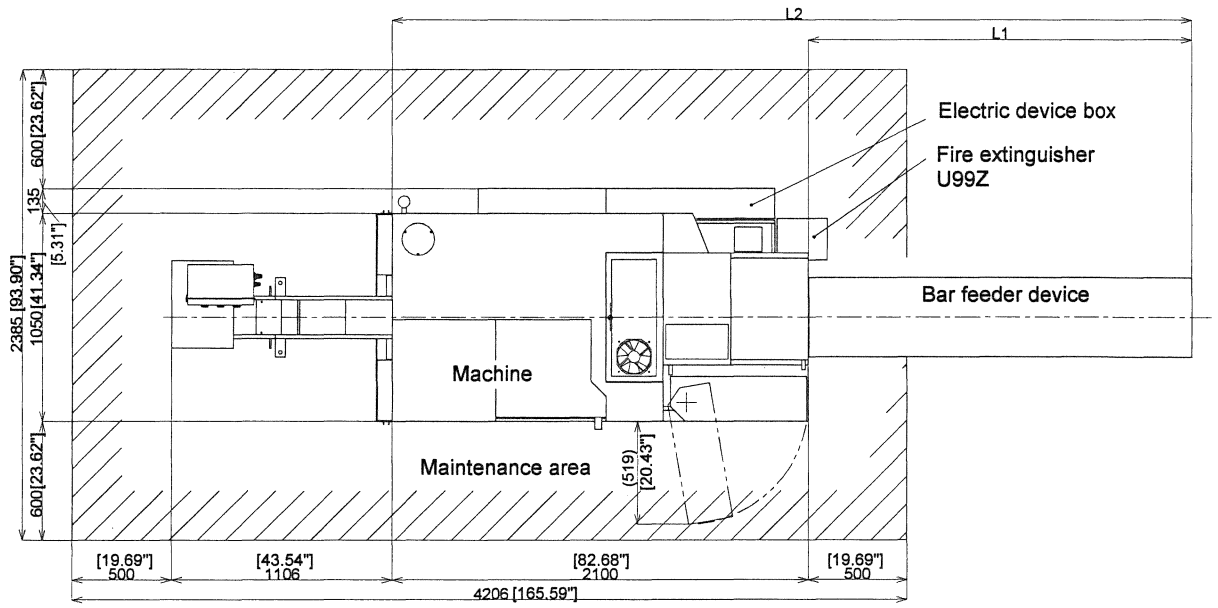
Machine layout (with chip conveyor U90J mounted)

Example)

Manufacturer	Model	Material length	L1	L2
IKURA	OS20A20	3.0 m	4100	6200
ALPS	ASR X-20ZC	3.0 m	3860	5960



Outside dimensions of the machine (with chip conveyor U95J mounted)



Machine layout (with chip conveyor U95J mounted)

Example)

Manufacturer	Model	Material length	L1	L2
IKURA	OS20A20	3.0 m	4100	6200
ALPS	ASR X-20ZC	3.0 m	3860	5960

3.3 Specifications

3.3.1 Machine specifications

No.	Item	A220L Type VII	Remarks
1	Maximum machining diameter (D) (Minimum machining diameter)	D=⌀20 mm [0.79"] (⌀3 ~)	The minimum machining diameter depends on specification of chuck or guide bushing.
2	Maximum machining length (L)	L=165 mm/1 Chuck	The standard workpiece receiver can collect workpieces in length up to 100 mm [3.94"]. This device enables the machining and collection of workpieces in length up to 600 mm.
3	Maximum taking-out length of the product	100 mm [3.94"]	Parts can be inserted Max. 90 mm [3.54"] length to Back Spindle chuck.
4	Maximum front drilling diameter	⌀10 mm [0.39"]	A hole of a diameter greater than 10 mm [0.39"] can be drilled depending on the cutting conditions and the material of workpieces.
5	Maximum front tapping diameter (tap and die)	M8 (Tap) M6 (Die)	Max. Tapping diameter conforms to the cutting tap.
6	Spindle through-hole diameter	⌀31mm [1.22"]	The through-hole diameter of the inner pipe of spindle is ø24 mm [0.94"]. The through-hole diameter of the chuck sleeve is ø21 mm [0.83"]. The maximum diameter of the finger of the bar loader must be smaller than above diameter.
7	Spindle speed	Max 8,000 min^{-1}	
8	Spindle speed change steps	Stepless S4 digits	
9	Spindle indexing	15 degree, (1 degree)	1-degree index is Option.
10	Spindle C axis	0.001 degree	Option
11	Maximum chucking diameter of back spindle	⌀20 mm [0.79"]	
12	Maximum external workpiece length of back spindle	50 mm [1.97"]	Maximum workpiece length protruded from the end face of back spindle cap nut.
13	Maximum drilling diameter in the back machining process	⌀8 mm [0.31"]	A hole of a diameter greater than 8 mm [0.31"] can be drilled depending on the cutting conditions and the material of workpieces.
14	Maximum tapping diameter in the back machining process	M6	Max. Tapping diameter conforms to the cutting tap.
15	Back spindle speed	Max 8,000 min^{-1}	
16	Back spindle speed change steps	Stepless S4 digits	
17	Back spindle indexing	1 degree	Option
18	Back spindle C axis	0.001 degree	Option
19	Rotary tool spindle for cross machining Maximum drilling diameter Maximum tapping diameter Spindle speed Spindle speed change steps	 ⌀7 mm [0.28"] M6 Max 8,000 min^{-1} (Rating: 6,000 min^{-1}) Stepless S4 digits	A hole of a diameter greater than 7 mm [0.28"] can be drilled depending on the cutting conditions and the material of workpieces. Max. Tapping diameter conforms to the cutting tap. ( ): Rated spindle speed. Rated spindle speed. The motor may be overloaded if the machining is continued with the spindle speed exceeding the rated value. In that case, reduce the spindle speed to prevent damage to the motor or gear.

No.	Item	A220L Type VII		Remarks
20	Chuck and guide bushing models			
	Spindle collet chuck	FC034-M [TF25, 40.005, 76-84]		
	Guide bushing	WFG206-M [0201, 61.002, 22.001]		
	Lego type chuck	ER16/AR16		
	Back spindle collet chuck	FC034-M-K [TF25, 40.005, 76-84]		For back spindle, use sealed K type spindles.
21	Number of mountable tools	(Japan) 21	(EC) 21	20 when a tool of □16 is used.
	Turning tools on the gang tool post	6	5	5 when a tool of □16 is used.
	Rotary tools for cross machining	3	4	The outer diameter milling spindle BSC210 is provided as standard.
	Front drilling tool	4	4	
	Back drilling tool	8	8	When both-end sleeve is used.
22	Tool size Tool (gang tool)	12×12×120 mm, 13×13×120 mm, 16×16×120 mm		Only one □16 tool can be mounted.
	Sleeve	⌀25.4 mm [1"]		
23	Maximum diameter of tool mounted in the rotary tool holder of tool post Drill and end mill	⌀10 mm [0.39"]		ER16, AR16
24	Rapid feed rate X1 axis	18 m/min		
	Y1 axis	32 m/min		
	Z1 axis	32 m/min		
	X2 axis	32 m/min		
	Z2 axis	32 m/min		
25	Least input increment X1 axis (diameter)	0.001 mm [0.0001"] (0.0001 mm) [0.0001"]		( ) Submicron is option.
	Y1 axis (diameter)	0.001 mm [0.0001"] (0.0001 mm) [0.0001"]		
	Z1 axis	0.001 mm [0.0001"] (0.0001 mm) [0.0001"]		
	X2 axis (diameter)	0.001 mm [0.0001"] (0.0001 mm) [0.0001"]		
	Z2 axis	0.001 mm [0.0001"] (0.0001 mm) [0.0001"]		
26	Axis Stroke X1 axis	112 mm [4.41"]		
	Y1 axis	326 mm [12.83"]		
	Z1 axis	170 mm [6.69"]		
	X2 axis	248.5 mm [9.78"]		
	Z2 axis	205 mm [8.07"]		
27	Bar length	2,500 mm [98.43"], 3,000 mm [118.11"]		
28	Center height	1,050 mm [41.34"]		

No.	Item	A220L Type VII	Remarks
29	Motor Spindle drive	2.2/3.7KW (αb80M/15000i) (Continuous/15 min rating)	List of axis servo motor is below Build in spindle motor
	Back spindle drive	1.1/1.5KW (αb80M/15000i) (Continuous/15 min rating)	Build in spindle motor
	Tool spindle drive for cross machining	0.75KW (βiS4/4000)	AC servo motor
30	Motor X1 axis	0.75KW (βiS4/4000)	Servo motor
	Y1 axis	0.75KW (βiS4/4000)	Servo motor
	Z1 axis	0.75KW (βiS4/4000)	Servo motor
	X2 axis	0.75KW (βiS4/4000)	Servo motor
	Z2 axis	0.75KW (βiS4/4000)	Servo motor
	Coolant	0.25KW	
	Lubricant	0.003KW	
31	Input power capacity	6KVA	
32	Coolant tank capacity	150 liters	
33	Size	Depth: 1,185 mm [46.65"] Width: 2,100 mm [82.68"] Height: 1,820 mm [71.65"]	
34	Pneumatic device Pressure Consumption	0.5MPa 95 Nℓ/min	Clean air should be supplied. Momentarily raised to 150Nℓ/min.
35	Weight	2,550 kg	

3.3.2 NC specifications

No.	Item	A220L Type VII	Remarks
1	NC unit	CINCOM SYSTEM FS32i-Model A	NC unit dedicated to CINCOM A20 series.
2	Display unit	7.2 inch Monochrome (LCD) Liquid Crystal Display	
3	Language	English, Japanese, Chinese (traditional), German, French, Italian, Spanish, Russian, Polish, Czech	
4	Spindle	S1, S2, S3	S1: Spindle S2: Back Spindle S3: Tool Spindle drive for cross machining
5	Control axis (command axis)	X1, Y1, Z1, X2, Z2 (C1, C2)	All axes can be controlled simultaneously. ( ) is option
6	Axis control group count	2	
7	Input code	ISO	
8	Command input system	Incremental and Absolute	
9	Feed command system	Feed per revolution or feed per minute (G code conversion)	
10	Override function Rapid feed Cutting feed	Rotary switch selection 200% at maximum (Standard function)	
11	Zero point return function	Manual zero point return system (Standard function)	The machine is equipped with the absolute encoder. Therefore, there is no need to perform operation for zero point return in normal state.
12	Virtual X and Y axes control function	31 max. (Standard function)	This function enables X1 and Y1 axes to move in desired angle.
13	Multi-axis control function	(Standard function)	This function can control two axes simultaneously.
14	Axis overlap function	(Standard function)	This function performs circular machining in thread cutting canned cycle (G92).
15	Queuing between axis control groups	(Standard function)	
16	Program selection function	(Standard function)	This function allows you to select a program for automatic operation.
17	Program check function	Manual pulse generator rotation system (Standard function)	When a program is checked using the machine, the execution speed of the program is proportional to the rotation speed of the manual pulse generator. The program can be run backward by rotating the pulse generator in the minus direction.
18	Manual feed function	Available for all the axes (Standard function)	This function enables the handle to move all the control axes.
19	Manual data input (MDI) function	(Standard function)	This function enables the MDI input and execution of program.
20	Self-diagnosis function	(Standard function)	Self-condition monitoring function indicates message if it finds any trouble

No.	Item	A220L Type VII	Remarks
21	Operating time display	(Standard function)	Total operating time/1 cycle time/ actual cutting time in 1 cycle are displayed
22	Product counter display	Max. 8 digit (Standard function)	The machine enters the 1-cycle stop state when the product counter reaches the specified number of products.
23	Preparation functions		The following functions support preparation for automatic operation.
	Automatic return to the positioning point	(Standard function)	The axes automatically return to their return positions (home positions) one after another in the defined order.
	Automatic return to the start position	(Standard function)	The axes automatically return to their start positions of automatic operation according to the numeric value specified in the machining data that can be set for each workpiece.
	Automatic cut-off machining function	(Standard function)	This function automatically performs cut-off-machining (short cut).
	In-machine tool set function	(Standard function)	This function supports the setting of tools of gang tool post.
24	Automatic operation function	(Standard function)	This function enables the selected program to run. Continuous, 1 cycle, or 1 block can be selected.
25	Automatic back-light off function	(Standard function)	
26	Door open sensor function	(Standard function)	
27	Alarm history display function	(Standard function)	
28	Manual start/stop spindle function	(Standard function)	This function allows you to start or stop the main spindle, back spindle, and tool spindle by using the switch on operation panel.
29	Optional block skip	(Standard function)	This function enables or disables the block including a slash ("/") in the program.
30	Optional stop	(Standard function)	This function stops (pauses) automatic operation at a block specified by the M01 command.
31	Memory protection function	(Standard function)	This function protects the program.
32	Machine lock	(Standard function)	This function locks or unlocks the machine by using the switch.
33	Chamfering ON/OFF	(Standard function)	This function enables or disables chamfering by using the switch or entering M code.
34	Exact Stop Check function	(Standard function)	
35	Error Detect function	(Standard function)	
36	Automatic power-off function	(Standard function)	This function shuts down the main circuit breaker to turn off the power when an alarm occurs during continuous operation in automatic mode.
37	3-dimensional interference check function	(Standard function)	This function monitors interference with a machine component, tool, or material and stops the machine before interference occurs.
38	Number of tool offset pair	32 sets	
39	Control axis superimpose function	(Standard function)	This function superimposes Z2 axis on Z1 axis. If C-axis function is enabled for main and back spindles, this function superimposes Z2 axis on C1 axis.

No.	Item	A220L Type VII	Remarks
40	Macro dedicated to the Cincom A20 series	(Standard function)	Dedicated macros (e.g., T code macros) are provided.
41	Background editing	(Standard function)	While program operation is in progress, another program can be edited.
42	Simultaneous program editing for two axis control groups	(Standard function)	The programs of two axes control groups can be edited on a screen at the same time.
43	Program Work Area capacity Program storage capacity	(Standard) Equivalent to 40m tape [About 16Kbyte]	Each tape length at left includes the size of the machining data. Each program capacity indicates a capacity for saving programs. To increase the capacity, add a program memory work area as an option.
		(Option) Equivalent to 80m tape [About 32 Kbyte]	
		(Option) Equivalent to 120m tape [About 48 Kbyte]	
44	Input/output interface	PCMCIA card Drive (Standard function)	This function inputs or outputs the machining program using the memory card.
		RS232C connector (Standard function)	This function inputs or outputs the machining program via RS232C port.
45	Spindle speed change detection	(Standard function)	This function stop the machine when it detects the actual spindle speed exceeds the specified spindle speed by the preset variation rate. The function is useful for preventing overload.
46	Back spindle speed change detection	(Standard function)	This function stop the machine when it detects the actual spindle speed exceeds the specified spindle speed by the preset variation rate. The function is useful for preventing overload.
47	Spindle indexing function	15 degree (Standard function) 1 degree (Option)	This function indexes the spindle at 15 degree (1 degree is option) increment.
	Back spindle indexing function	1 degree (Option)	
48	Spindle C axis function	0.001 degree (Option)	This function controls the profile positioning of the spindle at an arbitrary angle while using the spindle motor (for driving the spindle) as the C axis control servo motor. The function positions the spindle by the holding force of the spindle motor without using any mechanical lock.
	Back spindle C axis function	0.001 degree (Option)	
49	Main spindle constant surface speed control	(Standard function)	This function automatically controls the spindle speed for the tool position so that the workpiece surface speed becomes constant during the cutting process.
	Back spindle constant surface speed control	(Standard function)	
50	Main spindle chasing function	(Standard function)	The function enables feed per rotation (mm/rev) and thread cutting with a tool.
	Back spindle chasing function	(Standard function)	

No.	Item	A220L Type VII	Remarks
51	Simplified cut off tool breakage detection	(Standard function)	This function gives a speed command to the spindle when the back spindle has picked off a workpiece. The function checks if the back spindle rotates together with the spindle and determines if the cut-off tool is broken.
52	Corner chamfering/rounding function	(Option)	This function simplifies the specification of corner chamfering and corner rounding by using the "K" and "R" commands.
53	Tool nose radius compensation	(Standard function)	This function makes compensation for the radius of a tool nose by using the G code command. To use this function, store the tool nose radius of each tool in the memory in the same manner as for the tool offsets.
54	Thread cutting canned cycle	(Standard function)	
55	Rigid tapping function	(Option)	This function enables synchronous tapping on main spindle, back spindle, and tool spindle. It also enables phase adjustment on main and back spindle.
56	High-speed rigid tapping function	(Option)	This function enables to set the upper limit of the feed rate override to 200 % when pulling out the rigid tapping.
57	Continuous thread cutting	(Standard function)	Phase between End position of First thread and Start Position of second Thread will be adjusted in case of making more than 2-threadings.
58	Spindle Synchronization	(Option)	This is for Main and Back Spindle Synchronization.
59	User Macro	(Option)	Macro Program is available.
60	Multiple repetitive cycle for turning	(Option)	Several type of canned cycle are available.
61	Canned drilling cycle	(Option)	Canned cycle as well as Deep hole drilling and boring cycle are available.
62	Milling interpolation function	(Option)	This function performs contour control toward the end face of part by interpolation between Liner axis and C-axis.
63	Submicron command function	(Option)	Minimum Increment is 0.0001 mm or 0.00001 inch.
64	Tool life management I	(Option)	This function stops machine when specified tool reaches lifetime.
65	Tool life management II	(Option)	This function exchange to spare tool when specified tool reaches to Lifetime
66	B code	(Option)	B code can be used as a secondary auxiliary function.
67	Offset 49 sets	(Option)	Tool offset pairs can be extended to up to 49 sets.
68	Multiple threading cycle	(Standard function)	
69	Variable lead threading	(Option)	
70	Drawing data direct input	(Option)	
71	Y-axis offset function	(Option)	Offset is available in Y-axis direction.
72	Code list display	(Standard function)	This function displays the lists of available M codes, G codes, and T codes.
73	Cycle time check function	(Standard function)	This function checks the machine for abnormal state by managing cycle time. If the cycle time exceeds 20 minutes, the system stops the machine assuming the occurrence of an alarm.
74	Machine coordinate system command	(Standard function)	G53 command is available. (Z1, X2, Z2 axis)
75	Inch command function	(Option)	
76	Sub inch command function	(Option)	
77	Program pre-analysis function	(Standard function)	To reduce idle time can be expected by analyzing the machining program prior to actual running.

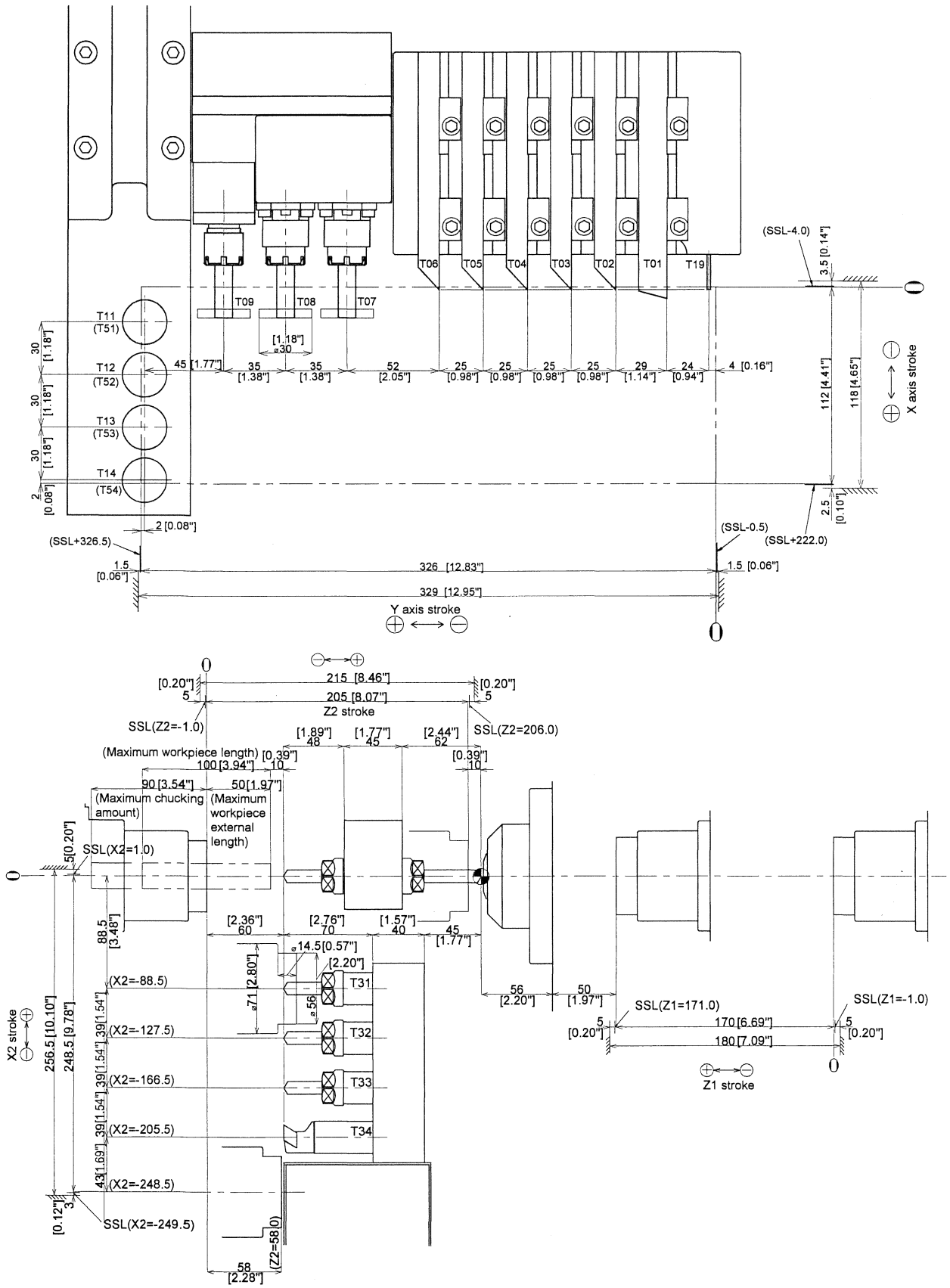
3.3.3 Attachments

No.	Item	A220L Type VII	Remarks
1	Spindle chucking device	A20 U920Z (Japan: FC034-M) A20 U9130Z (Export: TF25, 40.005, 76-64) (Standard function)	Collet chucking device provided with the spindle. This device is unnecessary for guide bushingless model.
2	Chuck sleeve for non-conform materials	A20 U620Z (FC917-M) (FC918-M) (Option)	Sleeve has located pin to keep phasing between material and collet chucks.
3	Rotary guide bushing drive unit	A20 U41Z (Standard function)	The drive unit synchronizes the synchronous rotary guide bushing device with the main spindle and the machine. This device is unnecessary for guide bushingless model.
4	Synchronous rotary guide bushing device	A220 U220Z (WFG206-M) A220 U2120Z (0201, 61.002, B238) A220 U2150Z (22.001) (Standard function, or option depending on region)	This device support the guide bushing while the guide bushing and spindle are being rotated synchronously by the rotary guide bushing motor device (U41Z). A high-precision high-speed angular ball bearing is used with the device for performing turning precisely. This device is unnecessary for guide bushingless model.
5	Rotary tool spindle drive unit of gang tool post	A220L U31B (Standard function/EC option)	This drive unit drives a tool spindle, mounted on the gang tool post, which performs drilling or key grooving on the outer circumference of a workpiece. The unit can drive three tool spindles.
6	Rotary tool spindle drive unit of gang tool post	A220L U32B (option/EC standard)	This drive unit drives a tool spindle, mounted on the gang tool post, which performs drilling or key grooving on the outer circumference of a workpiece. The unit can drive four tool spindles.
7	Back spindle device	A220 U40B (Standard function)	This device is able to perform back machining, which is similar to front machining, on the cut-off face (back) while front machining is in progress.
8	Back spindle chucking device	A20 U920Z (Japan: FC034-M) A20 U9130Z (Export: TF25, 40.005, 76-64) (Standard function)	Collet chucking device provided with the back spindle.
9	Knock-out device	A220 U51B (Standard function)	This device is driven by air cylinder.
10	Air supply system for air seal function	A220 U70N (Standard function)	Pressurized Air Seal system for Guide bush and front/back Spindle.
11	Knock-out jig for through-hole	A20 U550B A20 U551B (Option, or standard depending on region)	This unit can prevent Cutting chips into Back Spindle. Parts will be ejected to front side of Back Spindle.

No.	Item	A220L Type VII	Remarks
12	Long workpiece machining device maximum workpiece length	A220L U421B 600 mm [23.62"] (Option)	Used to cut a workpiece longer than 100 mm [3.94"]. It is equipped with a support pipe and unloads the workpiece from the left side of the machine.
	Pipe for long work piece	A220L U4211B (Option)	Designed for long workpiece devices. This pipe is used together with a long workpiece device.
	Cap nut for long work piece	A20 U9132B (Option)	Designed for long workpiece devices. This cap nut is used together with a long workpiece device and a pipe for long workpiece device.
13	Automatic magazine bar loader	(Option)	This bar feeder automatically loads bars consecutively.
14	Product chute Maximum length	A220 U31J 100 mm [3.94"] (Standard function)	This chute is used to collect the machined and cut-off workpieces in product receiving box.
15	Product receiving box	A220L U301J (Standard function)	This box accepts products collected by the product separator.
16	Workpiece separator Maximum product length (front)	A220 U352J 50 mm [1.97"] (Option)	This workpiece separator collects workpieces that are not back-machined.
17	Workpiece conveyor	A220 U36J (Option/EC standard)	This device unloads the products collected by workpiece conveyor to the right side of the machine.
18	Cut-off tool breakage detector	A220 Y90Z (Standard function)	This detector checks if a workpiece is cut off after cut-off machining is completed. If a workpiece remains due to a cut-off tool break, the detector automatically stops the machine.
19	Signal lamp	A220 U80Z (Option)	A signal lamp is mounted on the top of the machine. The lamp works in linkage with an alarm indicator on the operation panel of the machine.
20	3-color signal lamp tower	A220 U81Z (Option)	3 -color (green, yellow, and red) signal lamp is mounted on the top of the machine. Green indicates the machine is in continuous operation mode. Yellow indicates the machine is in the cycle-stop state. Red indicates an alarm has occurred.
21	Coolant device Pump type Cartridge type tank Tank capacity	A220 U10R 250W 150 liters (Standard function)	The coolant level detecting function is provided as standard.

No.	Item	A220L Type VII	Remarks
22	Coolant flow rate detector	A220 U53R (Option)	This device monitors the amount of coolant flow. The detector stops the machine automatically when it detects the flow rate becoming lower than the setting value.
23	Lubrication device Capacity Discharge amount	(Standard function) 0.8 liters 2.5 cc/30 min	This device is for ball screw slide. The lubricating oil level detection function is provided as standard.
24	Door Lock	A220L Y76Z (Standard function)	Installed with splash cover and Main spindle cover. Door is locked while machine running.
25	Electric leakage circuit breaker	Rated Current 30A (Standard function)	Rated sensitivity current: 30mA
26	Illumination	A220 U86Z: Halogen (Standard function)	Lifetime: Approx. 10,000 hours The lifetime does not mean the guaranteed period of time. It depends on ambient and operating environment.

3.4 Stroke Diagram



Stroke diagram

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Product Code	C	–	A	2	2	0	P	L	VII					

Document Code	1	E	1	–	0	3	0	1

4. Operation Panel and Screen

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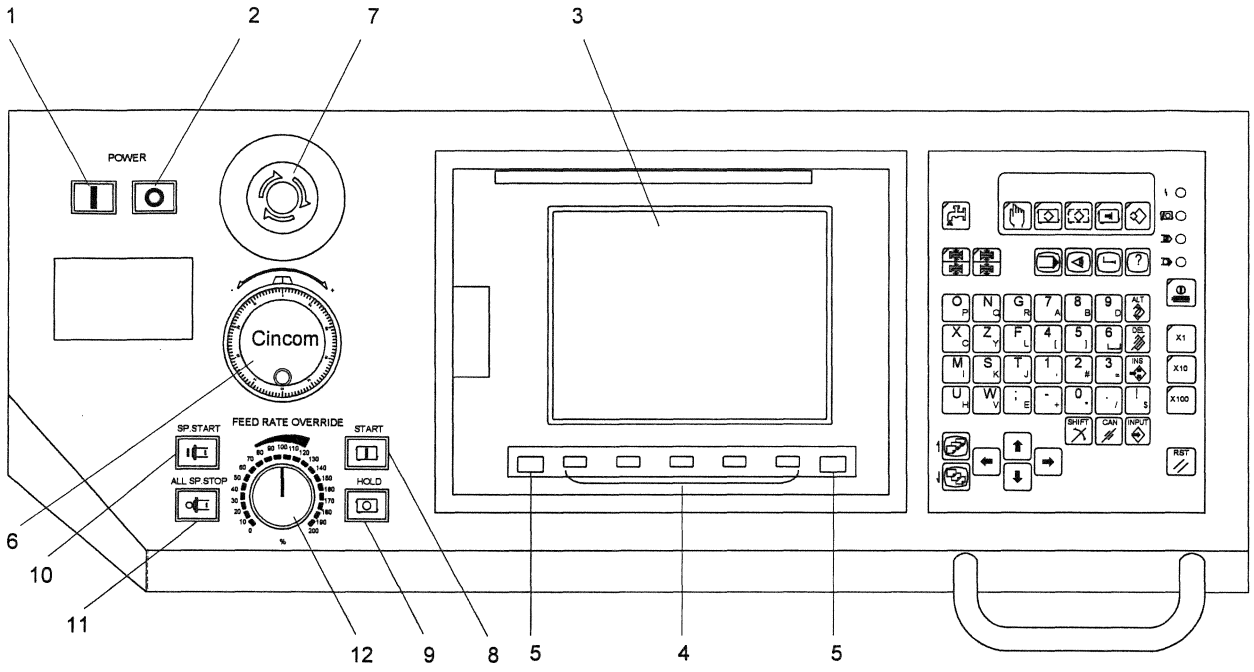
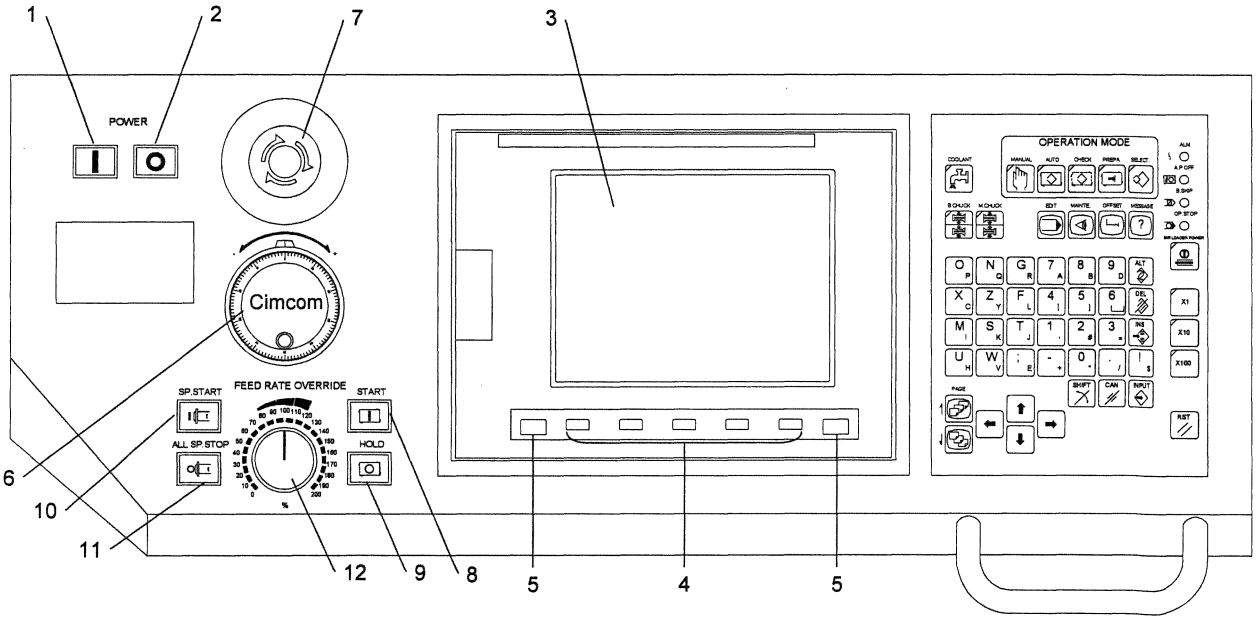
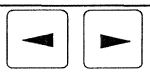
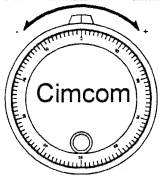
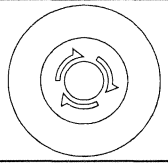
4.1 Switches, Lamps, and Keys on Operation Panel

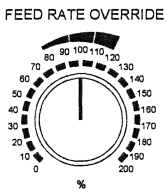
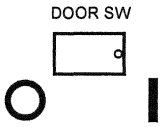
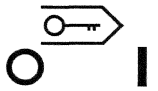
■ Sheet keyboard type: Symbol



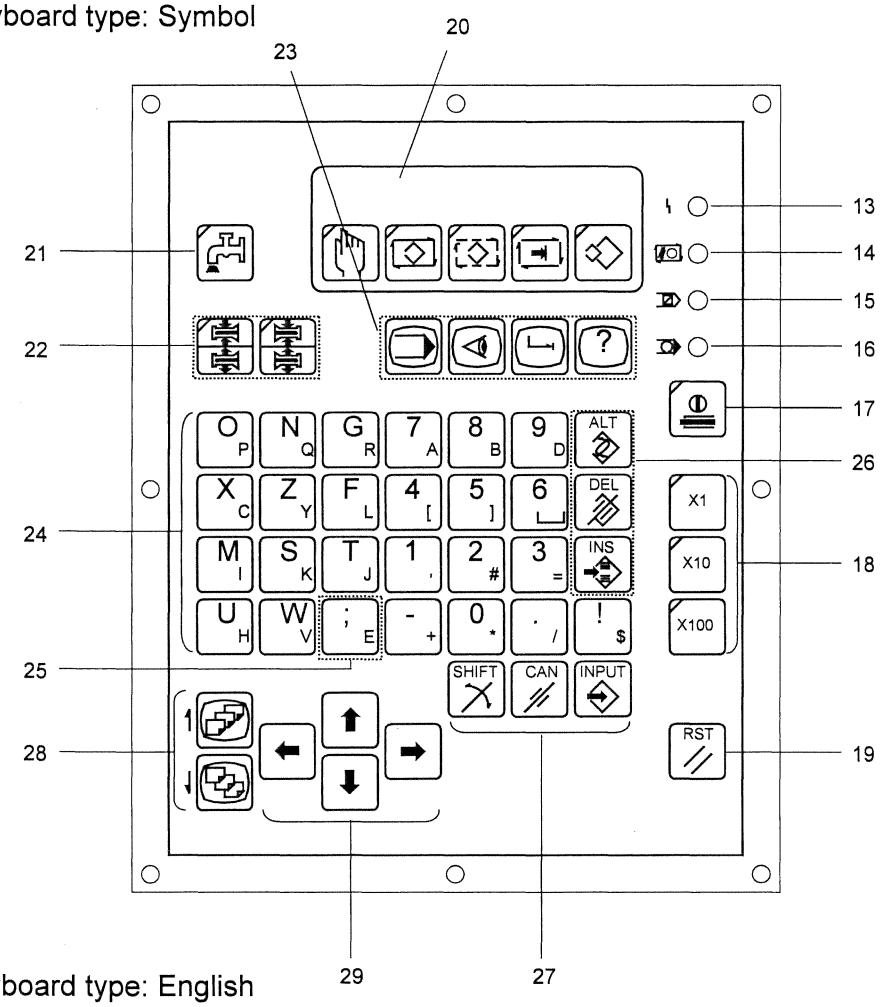
■ Sheet keyboard type: English



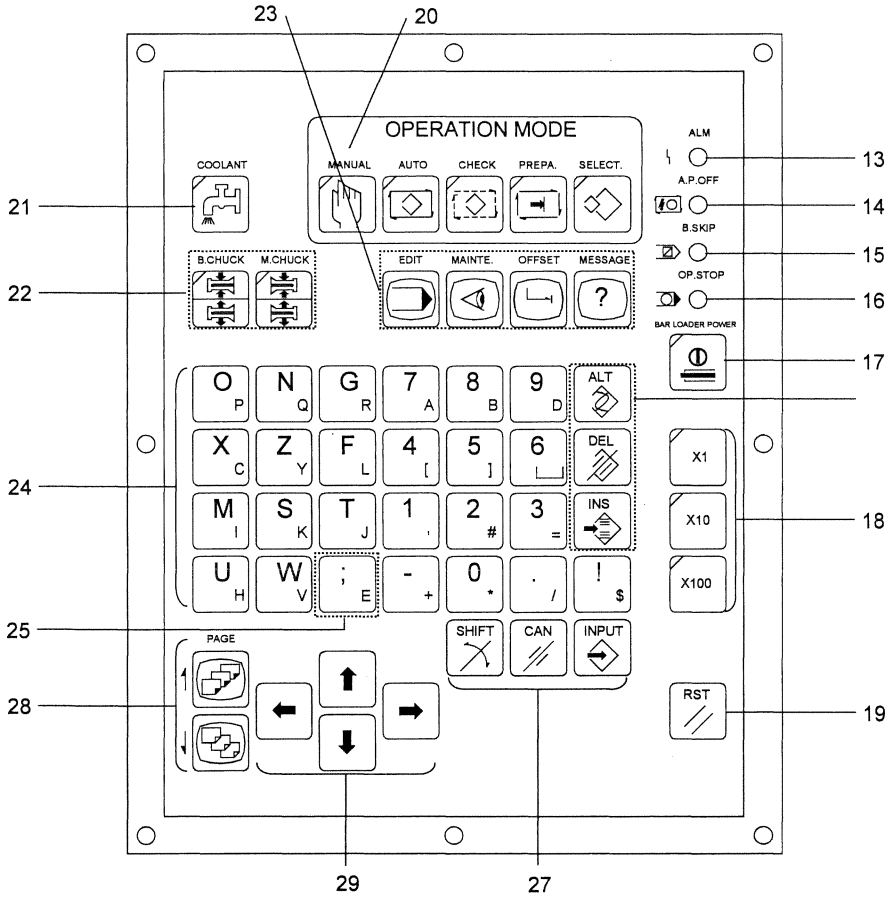
No.	Name	Symbol	Function
1	Power on switch		Turns on the power.
2	Power off switch		Turns off the power.
3	Liquid crystal display (LCD)		Displays menu keys, current values, program contents, offset data, alarm numbers, and diagnostic data.
4	Menu keys		Menu names are displayed at the bottom of the LCD. Each menu key selects a screen or operation in the menu when it is pressed. (The menu key is provided under each menu name.)
5	Menu selection key		Displays menu names following those displayed at the bottom of the LCD if any.
6	Handle		For handle feed, the turning direction of X, Y, and Z axes determines the move direction (to the + or – direction). For preparation of operation, the turning direction of X, Y and Z axes determines the move direction (to the + or – direction). For mechanical adjustment, the turning direction of X, Y, and Z axes determines the move direction (to the + or – direction). For program checking, the turning direction of the current program determines the forward or backward move.
7	Emergency stop button		Press this button to stop the machine in an emergency. (↷ Turn this button clockwise to reset it.)
8	Start		Starts the automatic operation. The green lamp lights during the automatic operation. The lamp blinks while the machine is paused during the preparation or is waiting for the cut-off. If the door is locked, the lamp blinks faster.
9	Hold		Pauses the automatic operation. The lamp lights if the automatic operation is paused.
10	Spindle start		If you have pressed the All spindles stop key to temporarily stop the spindles in the automatic operation mode or program check mode, this key rotates the main spindle, back spindle, and tool spindle at the original speed when pressed. This key is enabled only when the doors are closed while the machine is in the automatic operation hold state or block stop state. The green lamp lights while the spindle is rotating. The lamp blinks when the spindle is ready to restart rotating.
11	All spindles stop		Regardless of whether the manual operation mode or automatic operation mode is selected, this key stops the main spindle, back spindle, and tool spindle by the manual operation.

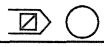
No.	Name	Symbol	Function
12	Feed rate override		This dial changes a feed rate in steps of 10% in the range 0 to 100% (specified feed rate). You can also set a feed rate in the range 0 to 200% on the Set SW screen.
13	DOOR SW (Door select switch)		When this key is set to " ▌ " with the door being open, an alarm is issued and the machine operation is disabled. When this key is set to "O" with the door being opened, each axis moves at the speed of 2 m/min or slower.
14	Program protection select		Set this key to " ▌ " to turn ON the machining program protection. While the protection is ON, you can not edit or write a machining program. When this key is set to "O", you can edit or write program.

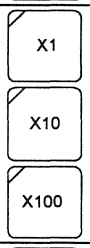
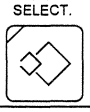
■ Sheet keyboard type: Symbol

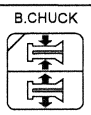


■ Sheet keyboard type: English

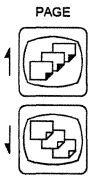
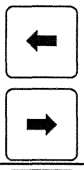
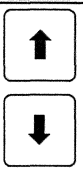


No.	Name	Symbol	Color of lamp	Function
13	Alarm lamp	ALM 	Red	Goes on or starts blinking if an alarm occurs. If this lamp lights, turn the power off, eliminate the cause of the alarm, then restart operation. If the lamp is blinking, eliminate the cause of the alarm, then press the Reset key to restart operation.
14	Automatic power off lamp	A.P.OFF 	Orange	Automatically turns off the power if an alarm occurs during machine operation in continuous cycles. This lamp is in effect while it is on.
15	Skip lamp	B.SKIP 	Orange	Disables program commands including a slash (/) in the program.
16	Optional stop	OP.STOP	Orange	The optional stop function is enabled while the lamp lights. The function automatically stops operation after the block specified with "M01" in the program has been executed. The Start key  lamp blinks while the program is in the stopped state. To restart operation, press the Start key again. The operation automatically restarts.

No.	Name	Symbol	Color of lamp	Function	Lamp
17	Not used				
18	Handle magnification		Orange	The ×1, ×10, and ×100 keys select a handle feed rate in the manual operation mode, and they select a program execution rate in the program check mode.	ON while selected
19	Reset			Resets NC and machine alarms.	
Operation mode 20	Manual operation		Orange	Selects handle feed or MDI.	ON while selected
	Auto		Orange	Executes programs stored in memory.	ON while selected
	Program check		Orange	Checks the program while the machine is in operation.	ON while selected
	Preparation		Orange	Performs the following: • Return to the start point • Return to the positioning point • Cut-off machining SP • Chuck adjustment • Guide bushing adjustment • Tool selection • Tool setting through handle feed	ON while selected
	Program select		Orange	Selects execution machining program in memory.	ON while selected

No.	Name	Symbol	Color of lamp	Function	Lamp
21	Coolant	COOLANT 	Orange	Turns on/off coolant during both manual operation and automatic operation.	ON while coolant is discharged
22	Main spindle chuck	M.CHUCK 	Orange	Opens and closes the chuck. Pressing this key opens the chuck, and re-pressing closes the chuck. This key is enabled when the spindle is not rotating during handle feed or preparation of operation.	ON while the chuck is closed
	Back spindle chuck	B.CHUCK 	Orange	Opens and closes the back spindle chuck. Pressing this key opens the chuck, and re-pressing closes the chuck. This key is enabled when the spindle is not rotating during handle feed or preparation of operation.	ON while the back spindle chuck is closed

No.	Key name	Symbol	Function
23	Edit	EDIT 	Edits programs (e.g., creation, registration, search, insertion, and deletion). Enters machining data. Inputs and outputs programs.
Screen operation functions	Maintenance	MAINTE. 	Selects a screen such as the system parameter screen, PMC screen, or diagnostics screen.
	Offset	OFFSET 	Selects a screen such as the tool offset display screen, parameter setting screen, or Operator's panel screen.
	Message	MESSAGE 	Selects a screen such as the alarm screen or alarm history display screen.
24	Alphanumeric key		Use these keys to input alphabetic characters, numbers, and symbols.
25	End of block		Enters the end-of-block symbol required for the end of each program block.
26	Alter	ALT 	Replaces program data.
	Delete	DEL 	Deletes program data (or setup data).
	Insert	INS 	Inserts data into the program (or setup data).

No.	Key name	Symbol	Function
27	Shift		Use this key to enter an alphabetic character, symbol, character string shown on the lower part of each Alphanumeric key. This key must be pressed before the address or numeric key.
	Cancel		Press this key to delete entered characters and symbols.
	Input		Stores edited programs in memory, and specifies edited setup data.
28	Page switching		Displays the previous page in the display area of the LCD screen. Displays the next page in the display area of the LCD screen.
29	Cursor move		These keys horizontally move the cursor in a character unit in the display area of the LCD screen.
			These keys vertically move the cursor in a block unit in the display area of the LCD screen.

4.2 Names and Functions of LCD Screen Areas

The LCD screen consists of the following four areas:

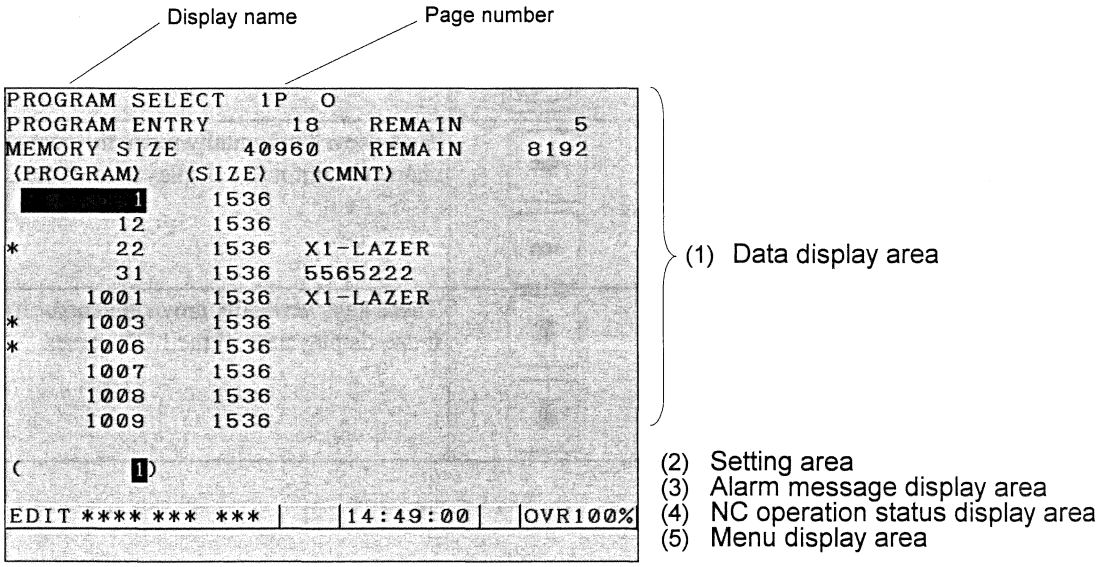
(1) Data display area

(2) Setting area

(3) Alarm message display area

(4) NC operation status display area

(5) Menu display area



(1) Data display area

Displays the current position and data registered in the NC unit.

(2) Setting area

A data number field and a data field are displayed in the setting area of a screen for data input or setting.

Enter a number and data, then press the Input key 

. The data is set with the entered number.

(3) Alarm message display area

(4) NC operation status display area

Displays the mode status and time.

Explanation of operation status display

- Current mode

Symbol:	Explanation
MDI:	Manual data input
MEM:	Automatic operation
EDIT:	Memory editing
HND:	Handle feed in manual mode
JOG:	Continuous feed in manual mode
REF:	Return to reference point in manual mode
RMT:	Remote

- Automatic operation status

Symbol:	Explanation
****:	Reset state (at power on, or completion of automatic operation after program execution)
STOP:	Automatic operation in stopped state (after termination of one-block execution)
HOLD:	Automatic operation in hold state (during suspension of one-block execution)
STRT:	Automatic operation in active state (during automatic operation)

- Axis moving or dwelling status

Symbol:	Explanation
MTN:	Axis moving
DWL:	Dwelling
PRP:	Pre-processing
***:	None of the above

- Execution status of auxiliary function

Symbol:	Explanation
FIN:	During execution of an auxiliary function (waiting for a completion signal from the PMC)
***:	Another state

- Emergency or reset status

Symbol:	Explanation
EMG:	Emergency stop (blinking in reverse video)
RESET:	Reset signal received

- Alarm status

Symbol:	Explanation
ALM:	Alarm issued (blinking in reverse video)
BAT:	Battery nearing the end of its useful life (blinking in reverse video)
Blank:	Another state

- Current time

hh:mm:ss:	Hours, minutes, and seconds

- NC axis control group status
  $1: 1 axis control group
  $2: 2 axis control group

- Override display
  0 to 200%: 0 to 200%

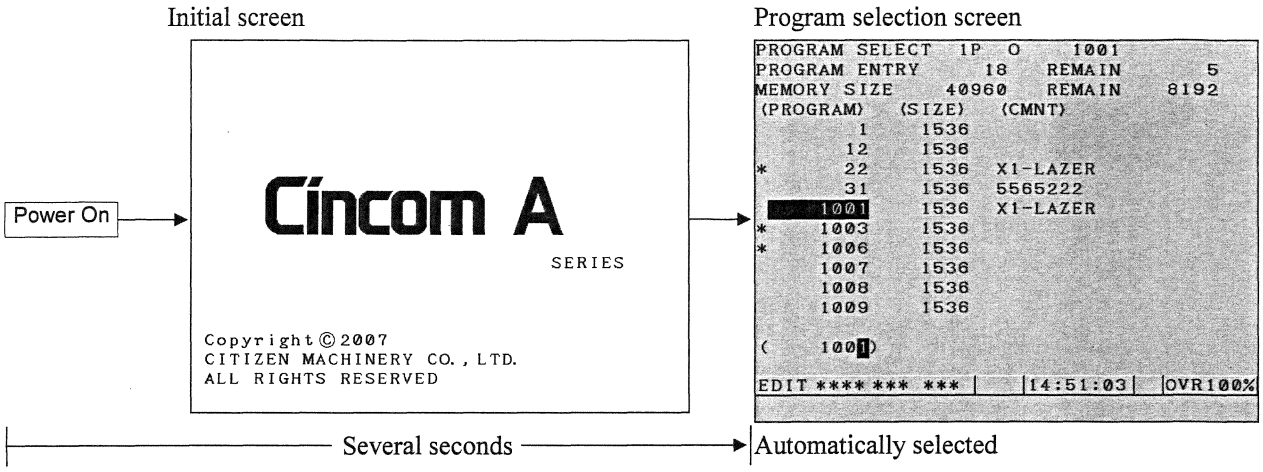
(5) Menu display area

The menu display area for selecting screens and operation appears at the bottom of the screen. To select a menu, press the menu key corresponding to the menu.

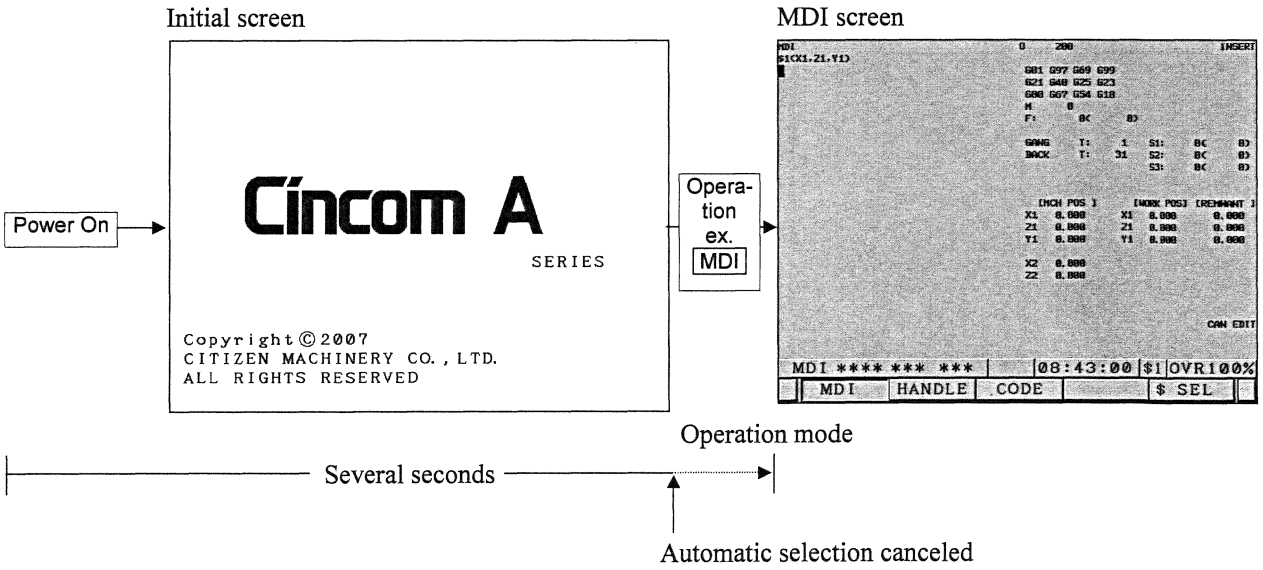
4.3 Screen Transition

4.3.1 Screen transition at power on

The initial screen is displayed when the power is turned on. The program selection screen is automatically displayed several seconds after the power is turned on.



If you perform an operation to display the screen related to operation mode before the program selection screen is automatically displayed, the screen is changed to the one for the selected operation. The automatic selection of the program selection screen is canceled.



Product Code C – A220PLCL VII

Document Code 1E1 – 0401

5. Preparation for Operating the Machine

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5.1 Power-on and Power-off

5.1.1 Power-on

Procedure

1. Set the main breaker to ON. The power lamp goes on.
2. Press the Power on switch  on the left side of the LCD. The initial screen is displayed.
3. The Program selection screen is displayed after several seconds.

Note

If an error message "1000 Emergency button pushed" appears, refer to <5.5.1 Action Against the Message "1000 Emergency button pushed"> in the Maintenance Manual.

5.1.2 Power-off

Procedure

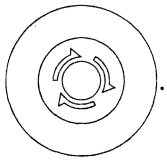
1. Press the Power off switch  on the left side of the LCD. The screen is erased.
2. Turn off the work light.
3. Set the main breaker to OFF.

CAUTION

To avoid machine damage, do not press any key on the operation panel while the machine is powering up or shutting down.

5.1.3 Emergency stop

Procedure

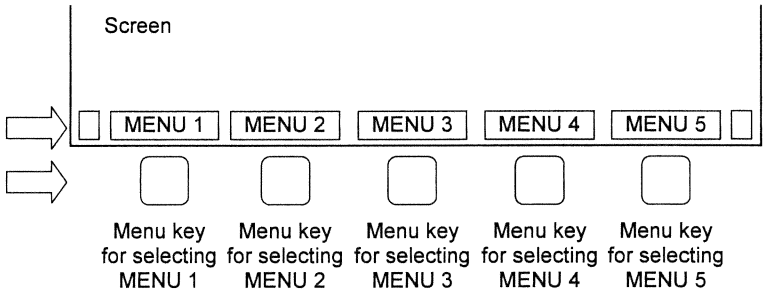
1. Press the Emergency stop button  .

Pressing this s button stops the machine operation. Note that pressing this button during machine operation may damage not only the product under machining but the tool itself. Use this button when you have to leave the working area due to an emergency such as a fire, power failure, earthquake, lightning, or some other serious situation occurs.

5.2 Menu Keys

This machine is designed for operators to select a desired screen easily. Screens are grouped according to functions and operation (e.g., screens having similar functions and screens used for the same operation). Press the key on the operation panel to select a screen group, then press the menu key to select the desired screen from the displayed menu.

5.2.1 Operating menu keys



Menu names are displayed at the bottom of the screen. There is a menu key under each menu name. When a menu key is pressed, a screen, operation, or another screen group is selected according to the menu.

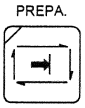
The menu key for selecting MENU 1 is expressed as [MENU 1] in this manual.

The menu, while being selected, is displayed as if it were pressed against the background. In any other state, it is displayed as if it were projected.

There are two types of menus: menus for screen selection (to change to another screen) and menus for operation selection (to edit data and perform machine operation).

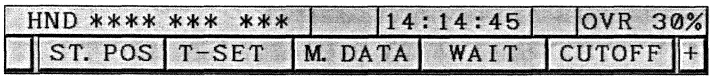
5.2.2 Menu selection

Some screens have more than ten menus while a screen can display up to five menu names. For screen having six or more menus, use the Menu selection key to feed the page to display all the menu names sequentially.

Menu selection when Preparation key 

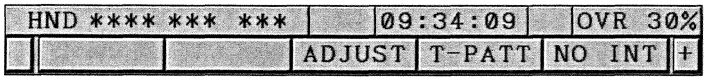
is selected

Display of menus 1 to 5



Press the Menu selection key ► . The page is fed to the next menu screen.

Display of menus 6 to 10



Press the Menu selection key ► . The page is fed to the next menu screen.

5.2.3 Screen selection

This machine has various display screens (30 or more). The display screens are grouped according to functions and usage in order to select a desired screen easily.

Displaying a desired screen:

Procedure

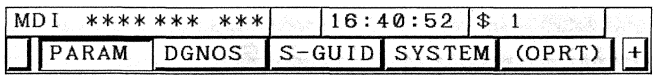
1. Select the group of the desired screen by pressing the screen operation function key or operation mode key.
   The previously selected screen of the group is displayed.
2. Find the desired screen name from the menu, and press the menu key to display the screen.
   If the desired screen name is not in the first page, press the Menu selection key ► until the desired screen name is displayed, then press the menu key to display the desired screen.
3. Press the Menu selection key ◄ to change operation selection menu keys (to edit data or perform machine operation) to screen selection menu keys (to change to another screen).

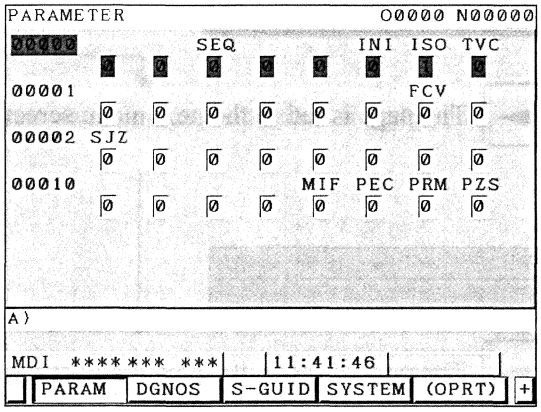
Example

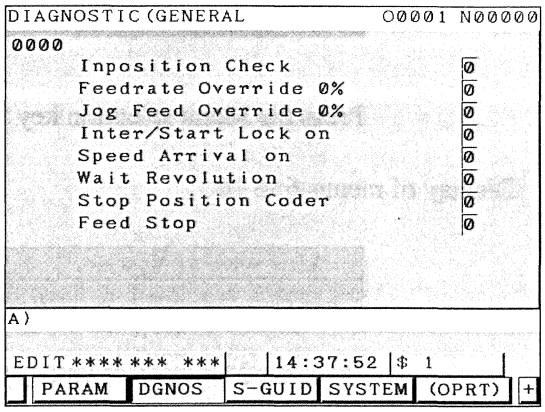
Display the Mechanical adjustment screen.

Procedure

1. MAINTE. : Displays the previously selected Maintenance screen.

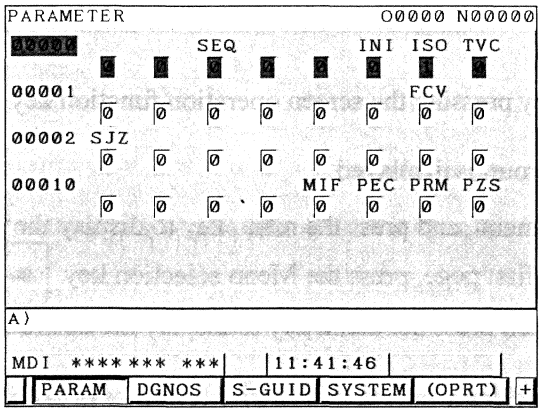






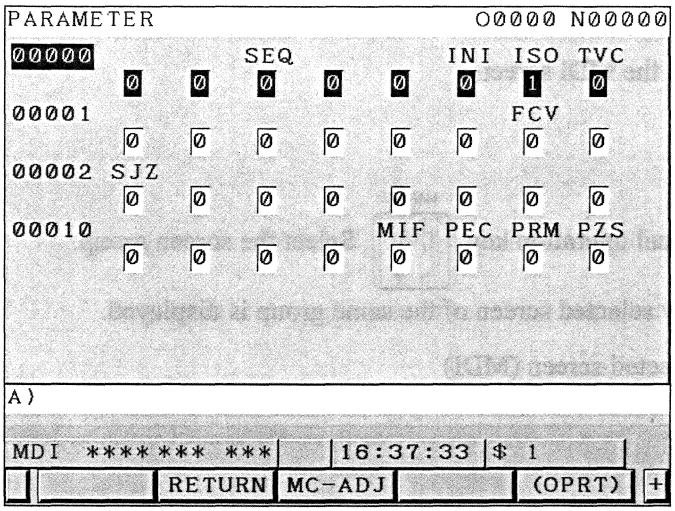
2. Press the Maintenance key MAINTE. select the screen group. The previously selected screen of the group is displayed.

Previously selected screen (parameter)

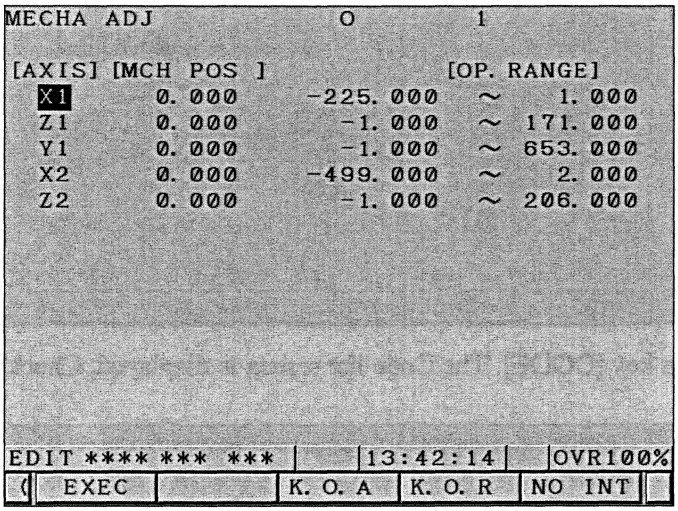


3. Press the Menu selection key [►] to display other menu keys. The menu screen is scrolled in pages (page feeding). Only the menu key display changes.

   Previously selected screen (parameter)



Press the menu key [MC-ADJ]. The Mechanical adjustment screen is displayed.



5.2.4 Operation selection

Select the menu keys to perform desired operation in the same manner as explained in <Section 5.2.3 Screen selection>. Press the menu key on each screen.

Example

See the code list on the MDI screen.

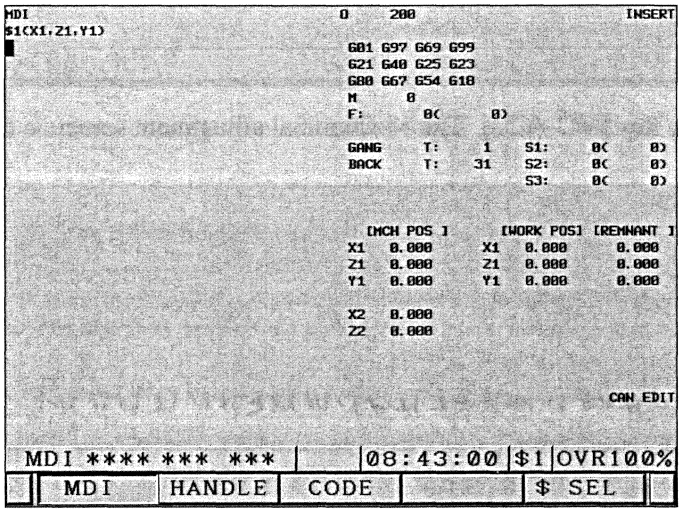
Procedure

1. Press the Manual operation key 

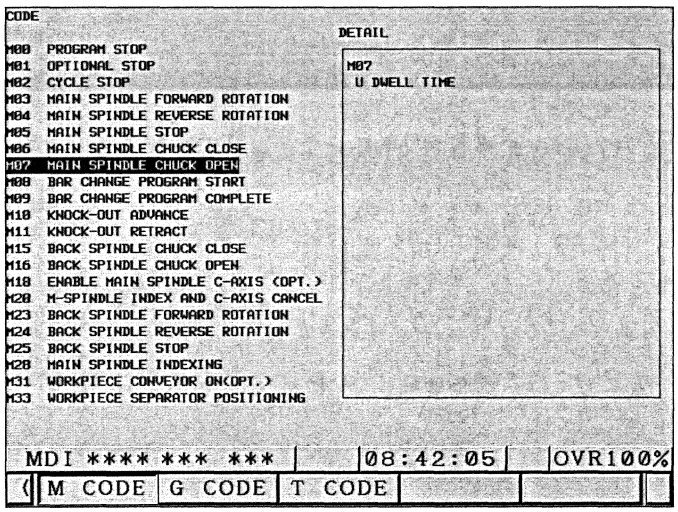
. Select the screen group.

   The previously selected screen of the same group is displayed.

   Previously selected screen (MDI)



2. Press the menu key [CODE]. The Code list screen is displayed. Check the code.



5.3 Page Keys

Use the keys to display a screen comprising more than one page. The screen is scrolled in pages (page feeding).


Previous page key

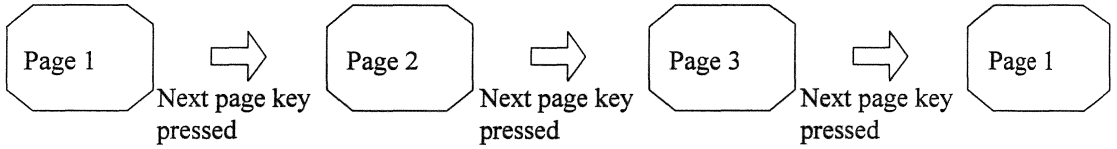

Next page key

Next page key

Pressing this key displays the next page. Pressing this key on the final page returns you to the first page.

Example

Screen comprising 3 pages



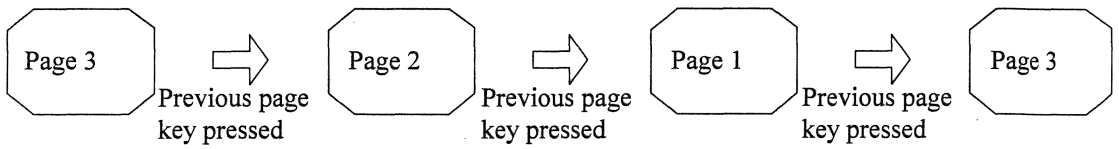
Some screen does not return to the first page even if you press this key on the final page.

Previously page key

Pressing this key displays the previous page. Pressing this key on the first page jumps you to the last page.

Example

Screen comprising 3 pages



Some screen does not go to the final page even if you press this key on the first page.

5.4 Setting Data

5.4.1 How to set data

If a screen for data input is selected, the setting field enclosed in parentheses is shown in the data setting area at the lower left of the screen.

Enter data using the Alphanumeric keys, then press the Input key 

.

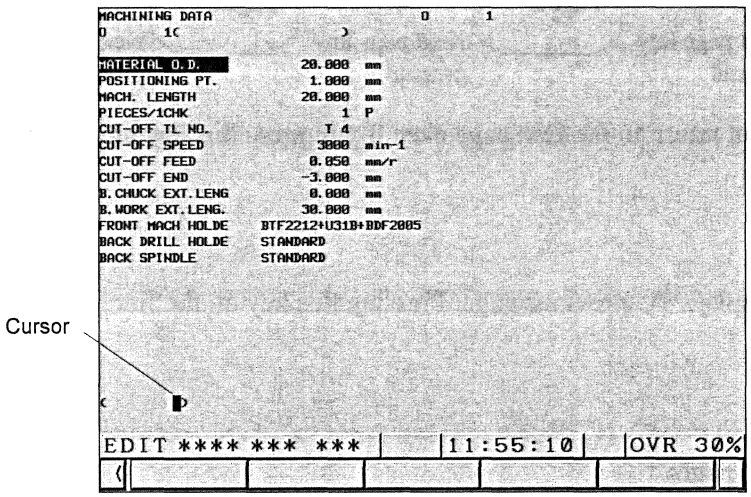
The data is set and displayed. A setting field is displayed for each data number.

Example

Change the machining length in the machining data to 15 mm.

Procedure

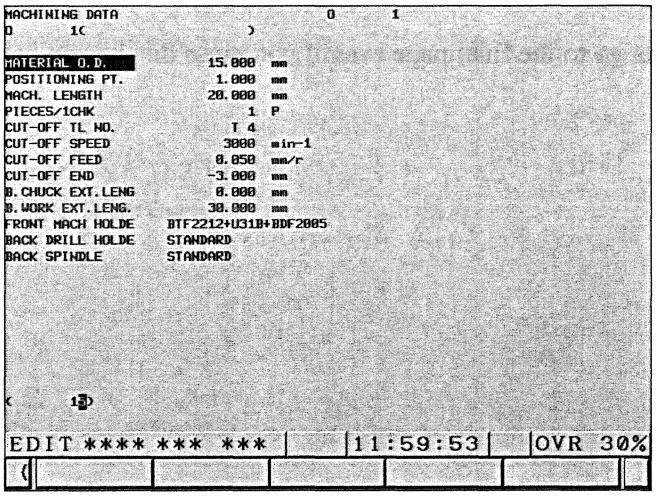
1. Set the Program protection select key to "O" to select a machining program selection screen. The cursor is displayed immediately before the right parenthesis.



2. Press the Alphanumeric keys to enter 15. The entered data is right-justified (15).

3. Press the Input key 

. The data is set and 15 is displayed.



5.4.2 Editing data

Data in the data setting area can be edited.

Moving the cursor

Pressing the Cursor move key [➡] moves the cursor one character position to the right.

#(12**3**) (1000)→#(12**3**) (1000)

#(12**3**) (1000)→#(123) (**1**000)

Pressing the Cursor move key [⬅] moves the cursor one character position to the left.

#(123) (1**0**00)→#(123) (**1**000)

#(123) (**1**000)→#(12**3**) (1000)

Insertion

A character can be inserted to the position immediately following the cursor.

Procedure

1. Move the cursor to the insertion position.
   #(1**2**45)
2. Press the Insert key [INS].
3. Press the Alphanumeric keys "3".
   #(12**3**45)

   "3" is inserted. Another character can be inserted.

Alteration

The character which the cursor is resting on can be altered.

Procedure

1. Move the cursor to the alteration position.
   #(1**2**45)
2. Press the Alter key [ALT].
3. Press the Alphanumeric keys "3".
   #(1**3**45)

   "3" is overwritten. Another character can be altered.

Deletion

a. The character which the cursor is resting on can be deleted.

Procedure

1. Move the cursor to the deletion position.
   #(12345)
2. Press the Delete key 

.

   #(1245)

   The one character is deleted.

b. All the data in a field in parentheses where the cursor is resting can be deleted.

Procedure

1. Move the cursor into the target field.
   #(100) (1000)
2. Press the Cancel key 

.

   #( ) (1000)

   All the data in the parentheses is deleted.

5.5 Erasing Screen

This machine uses a liquid crystal display which is used with personal computers (e.g., notebooks).

A back-light is provided with the LCD so that the display is easy to see. Like fluorescent lights, the back-light gradually fades as it is used.

To make the back-light life longer, turn it off while you do not need to see the display. The back-light is automatically turned off when any key on the operation panel is not pressed for 10 minutes or more.

5.5.1 Screen erasure (back-light off)

The screen is automatically erased when any key on the operation panel is not pressed for 10 minutes or more and when an alarm whose number is below 1000 does not occur. (Automatic erasing)

5.5.2 Screen redisplay

- The screen is redisplayed when a screen operation key on the operation panel is pressed.
- The screen is redisplayed when an alarm whose number is below 1000 occurs.

⚠ CAUTION

To redisplay the screen, press only a screen operation key (Edit, Maintenance, Offset, or Message) on the operation panel. Do not press another key. Pressing another key also redisplays the screen. However, the function assigned to the key may start working.
If an alarm whose number is 1000 or more occurs, the erased screen is not redisplayed. The alarm lamp goes on and the machine stops. In this case, press the Message key to redisplay the screen and check the alarm contents.

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6. Machine Operation

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6.1 Selecting Programs

Selects the program to be executed.

Procedure

1. Press the Program select key (SELECT.) .

   The Program select key lamp goes on. The Program Select screen is displayed.

2. Select the program to be executed using the Cursor move keys ↑ ↓. The selected program number is displayed in parentheses at the lower left of the screen.
   You can also select the program using the Alphanumeric keys.

```
PROGRAM SELECT  1P  O
PROGRAM ENTRY      18   REMAIN       5
MEMORY SIZE     40960   REMAIN    8192
(PROGRAM)   (SIZE)   (CMNT)
         1     1536
        12     1536
*       22     1536  X1-LAZER
        31     1536  5565222
      1001     1536  X1-LAZER
*     1003     1536
*     1006     1536
      1007     1536
      1008     1536
      1009     1536

(        1)
EDIT **** *** ***  |    14:49:00  |  OVR100%
```

3. Press the Input key (INPUT) .

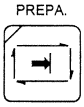
   The selected program is called. The selected program number is displayed at the upper right of the screen.

```
PROGRAM SELECT  1P  O     1001
PROGRAM ENTRY      18   REMAIN       5
MEMORY SIZE     40960   REMAIN    8192
(PROGRAM)   (SIZE)   (CMNT)
         1     1536
        12     1536
*       22     1536  X1-LAZER
        31     1536  5565222
      1001     1536  X1-LAZER
*     1003     1536
*     1006     1536
      1007     1536
      1008     1536
      1009     1536

(     1001)
EDIT **** *** ***  |    14:51:03  |  OVR100%
```

6.2 Preparing for Operation

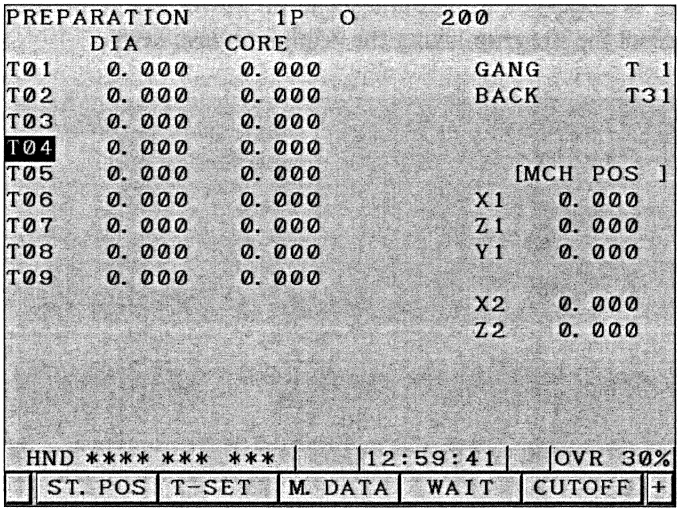
Performs operation between program selection and machining of products. The operation includes setting tools in the machine, moving the machine to the position for automatic operation, cutting off for adjustment of the end face.

Procedure

1. Press the Preparation key 

.

   The Preparation key lamp goes on. The Preparation screen is displayed.



6.2.1 Start point

6.2.1.1 Start point

Moves the machine to the position for automatic operation. Z axis moves to the position at the machining length. X axis moves to the cut-off end point.

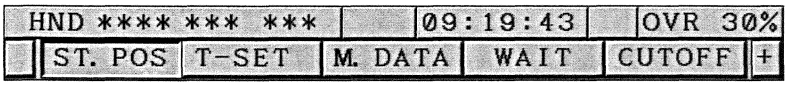
Procedure

1. Press the Preparation key 

.

   The Preparation key lamp goes on. The Preparation screen is displayed.

2. Press the menu key [ST.POS]. The menu key [ST.POS] is selected.



3. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.

4. Press the Start key 

. The lamp goes on and the machine moves to the start point.

   The cut-off tool number is selected according to that defined in the machining data.

> **⚠ WARNING**
>
> **The machine may move suddenly while the Start key lamp goes on.**
> **Be sure to keep hands away from the machine while the lamp is going on.**

Motion sequence

1. Z2 axis on back headstock moves to the retract point.
2. The back headstock moves to the center of the main spindle.
3. Z axis moves the distance equivalent to the (machining length) × (number of products in a chucking) position.
4. The cut-off tool moves to the positioning point.
5. The cut-off tool moves to the cut-off end point.
   If the cut-off tool is at the cut-off end point, it does not move to the positioning point.

> **⚠ CAUTION**
>
> **Moving the axes involves movement of the headstock.**
> **Be sure to remove the material or move the headstock to the forward end position before starting to move the axes to the machining start positions.**

Notes

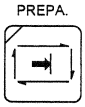
- If the door is open at the start of start position ([ST.POS]) operation, the door will not be locked.
- When the operation is completed, the Start key 

goes off.
- If you move the tool with the door opened, the feed rate is restricted to 2m/min. or less.
- When the operation is completed, the selected menu key is automatically canceled.
- The selected menu key is automatically canceled when a certain time after the selection of that menu key has elapsed with no operation invoked.

6.2.2 Cut-off machining

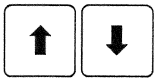
Performs cut-off machining according to the specified machining data.

Procedure

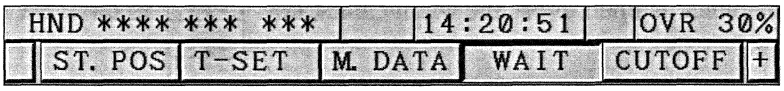
1. Press the Preparation key 

.

   The Preparation key lamp goes on. The Preparation screen is displayed.

2. Specify the cut-off tool number using the Cursor move keys  .

3. Press the menu key [WAIT]. The menu key [WAIT] is selected.



4. Confirm that the door is closed, then press the Start key 

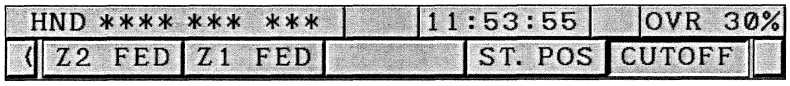
. The door is locked and the Start key lamp blinks.

5. Press the Start key 

. The lamp goes on and the holder moves to the material waiting point. Upon completion of movement, the selected menu key is canceled.

> **WARNING**
>
> **The machine may move suddenly while the Start key lamp goes on.**
> **Be sure to keep hands away from the machine while the lamp is going on.**

6. Press the menu key [CUTOFF]. The menu for cut-off is displayed. The menu key [CUTOFF] is selected.



7. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.

8. Press the Start key 

. The lamp goes on, the Z2 axis moves to the waiting position, and the cut-off tool moves to the waiting point at rapid feed.

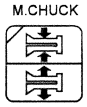
> **⚠ WARNING**
>
> **The machine may move suddenly while the Start key lamp goes on.**
> **Be sure to keep hands away from the machine while the lamp is going on.**

9. The Start key 

lamp starts blinking.

   * To proceed to cut-off machining operation in this state, skip the next step and go to Step 11.

10. You can adjust the cut-off position by moving the Z1 axis forward or backward in the following procedures.

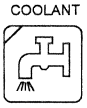
    10-1. If the chuck is open, press the Main Chuck key 

to close the chuck.

    10-2. Press the menu key [Z1 FED].

    10-3. Rotate the handle, and move the workpiece to the cut-off position.

    10-4. Press the menu key [CUTOFF] again to cancel Z1 feed.
    You can move the Z2 axis in similar way. Use the menu key [Z2 FED] to move the Z2 axis.

11. Press the Coolant key 

.

    Coolant is discharged.

12. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key starts blinking.

13. Press the menu key [CUTOFF] and the Start key 

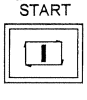
at the same time. Then the Start key goes on.

14. The chuck closes. The Main spindle chuck key 

lamp goes on.

15. The spindle rotates at the cut-off spindle speed specified in the machining data.

16. X axis performs cut-off machining at the cut-off speed specified in the machining data.

17. When X axis reaches the cut-off end point, the spindle stops, the coolant supply is stopped, the door is unlocked, and the Start key 

lamp goes off.

Notes

- If the door is open at the start of waiting point ([WAIT]) operation, the door will not be locked.
- When the operation is complete, the Start key 

goes off.
- The blinking sequence consists of 1 second ON and 1 second OFF modes in Steps 4, 7 and 12.
- Steps 12 and 13 will not be started unless the operation in Steps 6. to 10. are completed and the Start key 

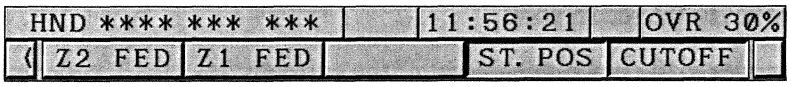
is flashing. Make sure to close the door prior to execute the operation. With the door opened, the machine will not work.
- With the door opened, the feed rate is 2m/min. or less when the operation is executed on the cut-off tool positioning point, whoever cut-off machining can not be executing.
  Make sure to close the door prior to execute the cut-off machining.
- Before starting cut-off machining, check:
  - If the type of the tool is correct,
  - If the start point is correct,
  - If the length of the material extending from the front end is correct, and
  - If the discharge amount of coolant and the discharge position are correct.
- If the start point is selected when X axis is at the cut-off end point, X axis does not move to the positioning point.
  However, if X axis is at the cut-off end point and if the start point is selected after mechanical adjustment and handle feed, X axis moves to the positioning point then moves back to the cut-off end point.
- When the operation is completed, the selected menu key is automatically canceled.
- The selected menu key is automatically canceled when a certain time after the selection of that menu key has elapsed with no operation invoked.

Start point operation after cut-off machining

Perform start point operation after completion of cut-off machining.

Procedure

1. Perform Steps 1. to 6. in "Cut-off machining".
2. Press the menu key [ST.POS]. The menu key [ST.POS] is selected.



3. Perform Step 7. and the subsequent steps in cut-off machining. You can press the menu key [ST.POS] in Step 9. For the sequence of start point operation, see <6.2.1 Start point>.

6.2.3 Tool setting

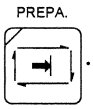
This section describes procedures and operation for the items displayed when the menu key [T-SET] is pressed.

This section does not describe the systematized tool set procedure. For detailed information for each tool number, see <Appendix 16> and the subsequent sections.

6.2.3.1 Positioning point

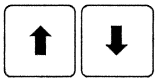
The selected tool moves to the position "material diameter specified in the machining data + tool positioning point specified in the machining data".

Procedure

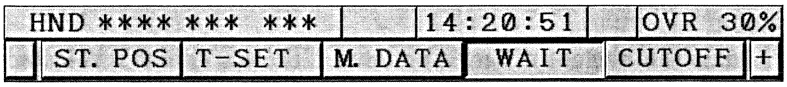
1. Press the Preparation key 

.

   The Preparation key lamp goes on. The Preparation screen is displayed.

2. Select the target tool number using the Cursor move keys  .

3. Press the menu key [WAIT]. The menu key [WAIT] is selected.



4. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.

5. Press the Start key 

. The lamp goes on and the holder moves to the material waiting point. Upon completion of movement, the selected menu key is canceled.

> **WARNING**
>
> **The machine may move suddenly while the Start key lamp goes on.**
> **Be sure to keep hands away from the machine while the lamp is going on.**

Motion sequence

1. Z2 axis moves to the return point.
2. The tool moves to the positioning point of the currently selected T code through X axis.
3. The tool moves to the positioning point of a newly selected T code through X and Y axes.

Notes

- If the door is open at the start of waiting point ([WAIT]) operation, the door will not be locked.
- When the operation is completed, the Start key 

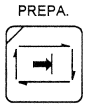
goes off.
- If you execute the operation with the door opened, the feed rate is restricted to 2m/min. or less.
- Upon completion of the operation, the selected menu key is automatically canceled.
- The selected menu key is automatically canceled when a certain time after the selection of that menu key has elapsed with no operation invoked.

6.2.3.2 Core (Cutting tool T01's)

Moves the tool holder to the position so that the rake face of the tool is aligned to the outer circumference of the material. Then, adjust the core height of the tool.

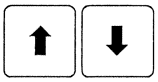
■ When the material diameter specified in the machining data is ⌀11 mm or less:

Procedure

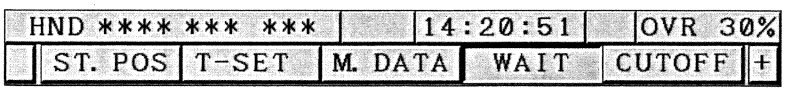
1. Press the Preparation key 

.

   The Preparation key lamp goes on. The Preparation screen is displayed.

2. Select the target tool using the Cursor move keys  .

3. Press the menu key [WAIT]. The menu key [WAIT] is selected.



4. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.

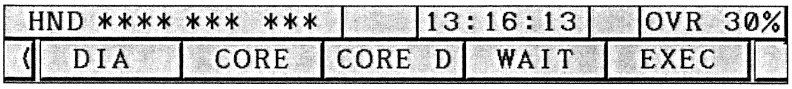
5. Press the Start key 

. The lamp goes on and the holder moves to the material waiting point. Upon completion of movement, the selected menu key is canceled.

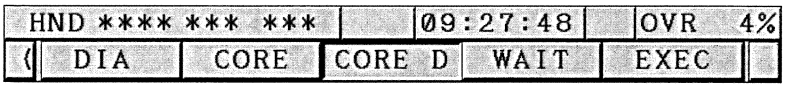
> **⚠ WARNING**
>
> **The machine may move suddenly while the Start key lamp goes on.**
> **Be sure to keep hands away from the machine while the lamp is going on.**

6. Confirm that the material does not extend from the guide bushing.

7. Press the menu key [T-SET].
   The tool setting menu is displayed.



8. Press the menu key [CORE D]. The menu key [CORE D] is selected.



9. Confirm that the door is closed, then press the Start key [START]. The door is locked and the Start key lamp blinks.

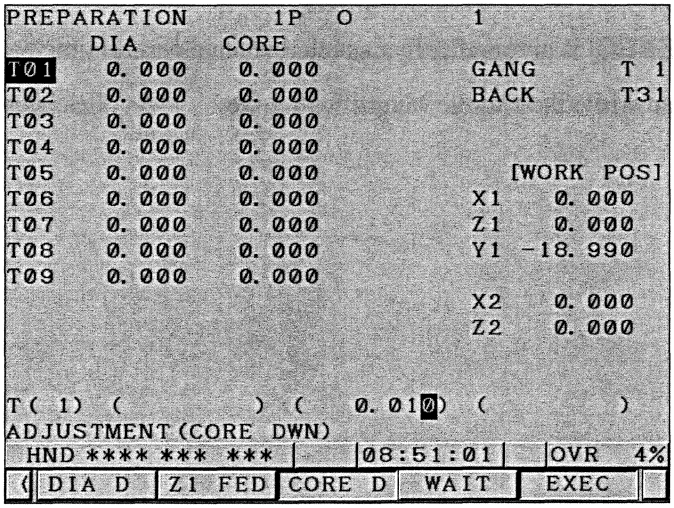
10. Press the Start key [START]. The lamp goes on and the holder moves to the outer circumference position of the material.
Upon completion of movement, the menu key [EXEC] is selected. The message "ADJUSTMENT (CORE D)" will be displayed on the screen.
(X axis moves to X0.)

> **WARNING**
>
> **The machine may move suddenly while the Start key lamp goes on.**
> **Be sure to keep hands away from the machine while the lamp is going on.**

11. Pull the material and check if the top surface of the tool is aligned to the outer circumference of the material.

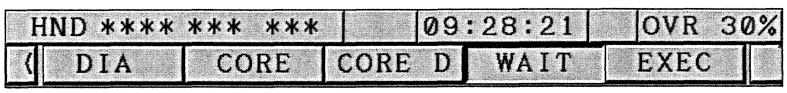
12. Press the Handle magnification keys [X1] or [X10] to select magnification of × 1 or × 10.

13. Adjust the position using the handle. The holder moves to Y axis direction. The moved distance is indicated in parentheses at the bottom of the screen.



14. Press the Input key [INPUT]. Data is set for the core of the tool of the selected T number.

15. Press the menu key [WAIT]. The menu key [WAIT] is selected.



16. Confirm that the door is closed, then press the Start key [START]. The door is locked and the Start key lamp blinks.

17. Press the Start key 

. The lamp goes on and the holder moves to the material waiting point. Upon completion of movement, the selected menu key is canceled.

> **⚠ WARNING**
>
> **The machine may move suddenly while the Start key lamp goes on.**
> **Be sure to keep hands away from the machine while the lamp is going on.**

Notes

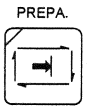
- If the door is open at the start of waiting point ([WAIT]) or core ([CORE]) operation, the door will not be locked.
- When the operation is completed, the Start key 

goes off.
- X axis moves to the direction in which the tool cuts into the material. Y axis moves to the direction at right angles to the infeed direction.
- If you execute the operation with the door opened, the feed rate is restricted to 2m/min. or less.
- When the operation is completed, the menu key [EXEC] is automatically selected.
- The selected menu key is automatically canceled when a certain time after the selection of that menu key has elapsed with no operation invoked.
- The menu key [EXEC] is automatically canceled when a certain time has elapsed with no operation invoked while the Handle Magnification key 

has been selected.

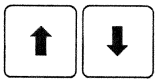
■ When the material diameter specified in the machining data exceeds ⌀11 mm

Procedure

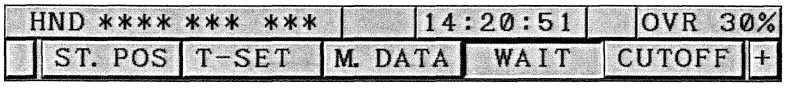
1. Press the Preparation key 

.

   The Preparation key lamp goes on. The Preparation screen is displayed.

2. Select the target tool number using the Cursor move keys  .

3. Press the menu key [WAIT]. The menu key [WAIT] is selected.



4. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.

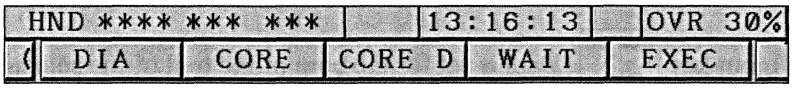
5. Press the Start key 

. The lamp goes on and the holder moves to the material waiting point. Upon completion of movement, the selected menu key is canceled.

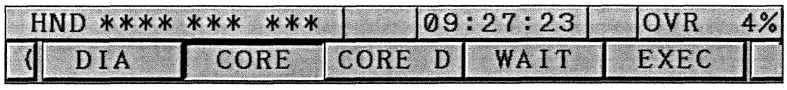
> **WARNING**
>
> **The machine may move suddenly while the Start key lamp goes on.**
> **Be sure to keep hands away from the machine while the lamp is going on.**

6. Confirm that the material does not extend from the guide bushing.

7. Press the menu key [T-SET].
   The tool setting menu is displayed.



8. Press the menu key [CORE]. The menu key [CORE] is selected.



9. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.

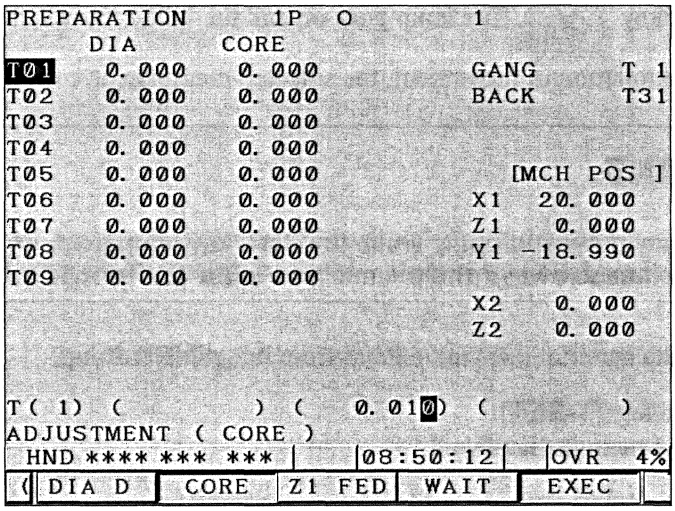
10. Press the Start key (START). The lamp goes on and the holder moves to the outer circumference position of the material.
    Upon completion of movement, the menu key [EXEC] is selected. The message "ADJUSTMENT (CORE)" will be displayed on the screen.

> **⚠ WARNING**
>
> **The machine may move suddenly while the Start key lamp goes on.**
> **Be sure to keep hands away from the machine while the lamp is going on.**

11. Pull the material and check if the top surface of the tool is aligned to the outer circumference of the material.

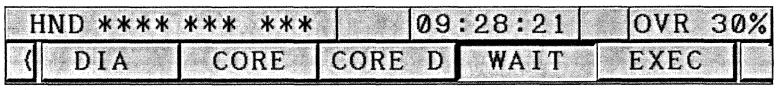
12. Press the Handle magnification keys (X1) or (X10) to select magnification of × 1 or × 10.

13. Adjust the position using the handle. The holder moves to Y axis direction. The move amount is displayed in parentheses at the bottom of the screen.



14. Press the Input key (INPUT). Data is set for the core of the tool of the selected T number.

15. Press the menu key [WAIT]. The menu key [WAIT] is selected.



16. Confirm that the door is closed, then press the Start key (START). The door is locked and the Start key lamp blinks.

17. Press the Start key (START). The lamp goes on and the holder moves to the material waiting point. Upon completion of movement, the selected menu key is canceled.

⚠ WARNING

The machine may move suddenly while the Start key lamp goes on.
Be sure to keep hands away from the machine while the lamp is going on.

⚠ CAUTION

The CORE operation must be performed after confirming the menu key "CORE" is selected. Otherwise, the tool next to right may interfere with the material if CORE D is executed.
If CORE D is unavoidably to be executed on the material of which diameter exceeds 11 mm (e.g., tool T4), remove the tool T3 and confirm that no interference between the material and the tool exists.

Notes

- If the door is open at the start of waiting point ([WAIT]) or core ([CORE]) operation, the door will not be locked.
- When the operation is completed, the Start key 

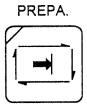
goes off.
- X axis moves to the direction in which the tool cuts into the material. Y axis moves to the direction at right angles to the infeed direction.
- If you execute the operation with the door opened, the feed rate is restricted to 2m/min.or less.
- When the operation is completed, the menu key [EXEC] will be automatically selecte
- The selected menu key is automatically canceled when a certain time after the selection of that menu key has elapsed with no operation invoked.
- The menu key [EXEC] is automatically canceled when a certain time has elapsed with no operation invoked while the Handle Magnification key 

has been selected.

6.2.3.3 Core (Drilling tool core direction T11's, T51's)

Adjust the drilling tool position in core direction.

Procedure

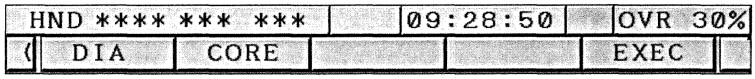
1. Press the Preparation key 

.

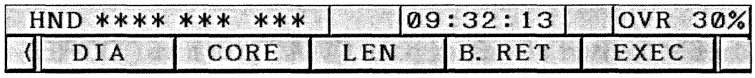
   The Preparation key lamp goes on. The Preparation screen is displayed.

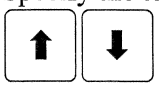
2. Press the menu key [T-SET].
   The tool setting menu is displayed.

T11's

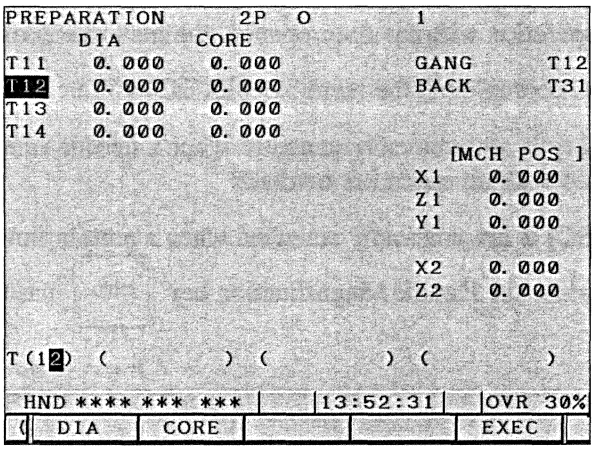


T51's

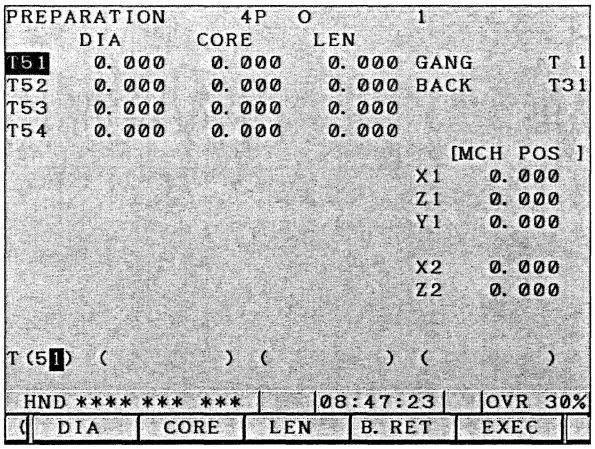


3. Specify the tool number of the tool to be adjusted by pressing the Cursor move keys  or the Alphanumeric keys. (Front drilling tool number: T11's) (Back drilling tool number: T51's)

T11's

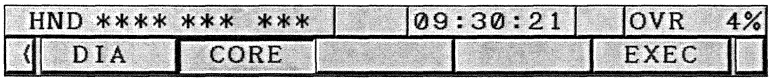


T51's

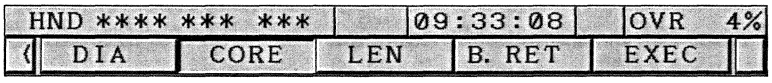


4. Confirm that the material does not extend from the guide bushing.
5. Press the menu key [CORE]. The menu key [CORE] is selected.

T11's



T51's



6. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.
7. Press the Start key 

.
The lamp goes on, the Z1 axis retracts 1.0 mm, then the holder moves to center of the material. Upon completion of movement, the menu key [EXEC] is selected. The message "ADJUSTMENT (CORE)" will be displayed on the screen.

WARNING

The machine may move suddenly while the Start key lamp goes on.
Be sure to keep hands away from the machine while the lamp is going on.

8. Press the Handle magnification keys 

or 

to select magnification of × 1 or × 10.
9. Confirm that the drilling tool point is positioned to the center of the material cut-off mark. Adjust the Y axis position using the handle.
The move amount is displayed in parentheses at the bottom of the screen.
10. Press the Input key 

.
Data is set for the core of the drilling tool of the selected T number.

Notes

- If the door is open at the start of core ([CORE]) operation, the door will not be locked.
- When the operation is completed, the Start key 

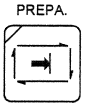
goes off.
- If you execute the operation with the door opened, the feed rate is restricted to 2m/min.or less.
- When the operation is completed, the menu key [EXEC] will be automatically selected.
- The selected menu key is automatically canceled when a certain time after the selection of that menu key has elapsed with no operation invoked.
- The menu key [EXEC] is automatically canceled when a certain time has elapsed with no operation invoked while the Handle Magnification key 

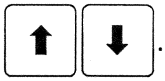
has been selected.
- To adjust the position of back drilling tool T51's in core direction, press the menu key [CORE] to select a tool. Move the Z2 axis forward on Handle Feed screen and adjust the tool position by moving the Y1 axis. Enter the distance you have moved the Y1 axis in [CORE] field on the Preparation screen.

6.2.3.4 Diameter (Cutting tool T01's)

Adjusts the tool position in diameter direction.

Procedure

1. Press the Preparation key 

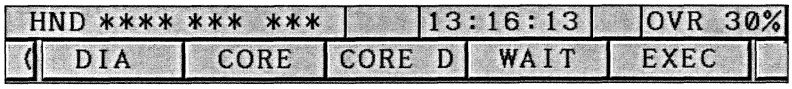
.
The Preparation key lamp goes on. The Preparation screen is displayed.
2. Select the target tool number using the Cursor move keys  .
3. Press the menu key [WAIT]. The menu key [WAIT] is selected.
4. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.
5. Press the Start key 

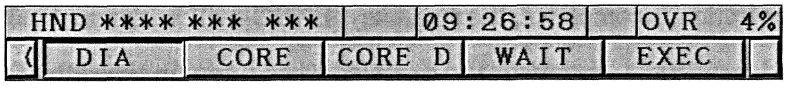
. The lamp goes on and the holder moves to the material waiting point. Upon completion of movement, the selected menu key is canceled.

> **WARNING**
>
> **The machine may move suddenly while the Start key lamp goes on.**
> **Be sure to keep hands away from the machine while the lamp is going on.**

6. Press the menu key [T-SET].
The tool setting menu is displayed.



7. Confirm that the material does not extend from the guide bushing.
8. Press the menu key [DIA]. The menu key [DIA] is selected.



9. Confirm that the door is closed, then press the Start key 

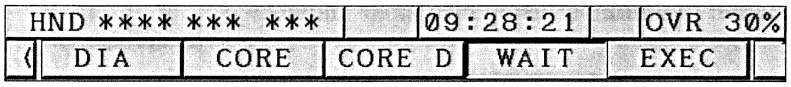
. The door is locked and the Start key lamp blinks.
10. Press the Start key 

. The lamp goes on and the holder moves to the material positioning point. Upon completion of movement, the menu key [EXEC] is selected. The message "ADJUSTMENT (DIA)" will be displayed on the screen.

WARNING

The machine may move suddenly while the Start key lamp goes on.
Be sure to keep hands away from the machine while the lamp is going on.

11. Pull the material, softly push the tool point to the outside diameter of the material, then temporarily secure the tool.
12. Press the menu key [WAIT]. The menu key [WAIT] is selected.



13. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.
14. Press the Start key 

. The lamp goes on and the holder moves to the material waiting point. Upon completion of movement, the selected menu key is canceled.
15. Firmly secure the tool.

WARNING

The machine may move suddenly while the Start key lamp goes on.
Be sure to keep hands away from the machine while the lamp is going on.

Notes

- If the door is open at the start of waiting point ([WAIT]) or diameter ([DIA]) operation, the door will not be locked.
- When the operation is completed, the Start key 

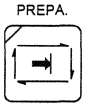
goes off.
- If you execute the operation with the door opened, the feed rate is restricted to 2m/min.or less.
- When the operation is completed, the menu key [EXEC] will be automatically selected.
- The selected menu key is automatically canceled when a certain time after the selection of that menu key has elapsed with no operation invoked.
- The menu key [EXEC] is automatically canceled when a certain time has elapsed with no operation invoked while the Handle Magnification key 

has been selected.

6.2.3.5 Diameter (Rotary tool)

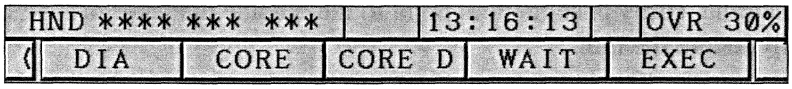
Adjusts the position of rotary tool in diameter direction.

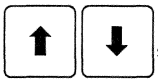
Procedure

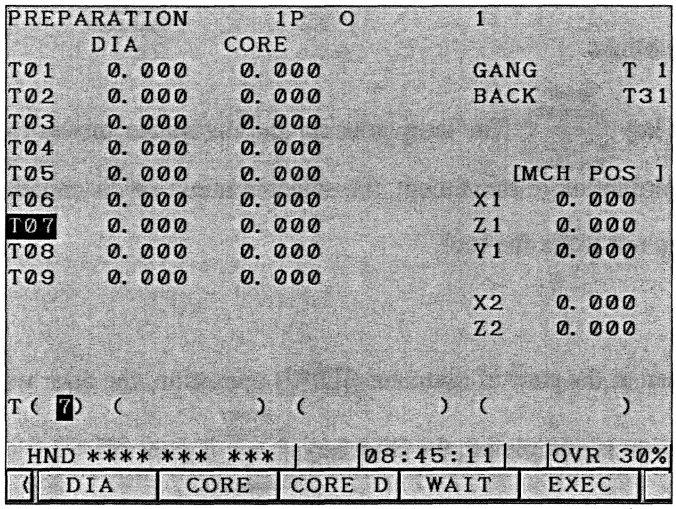
1. Press the Preparation key 

.
The Preparation key lamp goes on. The Preparation screen is displayed.

2. Press the menu key [T-SET].
The tool setting menu is displayed.

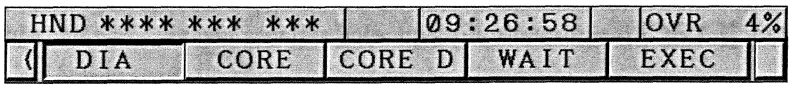


3. Select a tool you are going to adjust with the cursor key  , or enter the tool number in "T" field. The tool numbers for rotary tool are one of T06 through T09, depending on specification.



4. Confirm that the material does not extend from the guide bushing.

5. Press the menu key [DIA]. The menu key [DIA] is selected.



6. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.

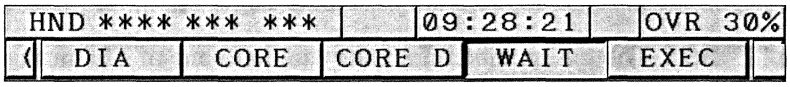
7. Press the Start key 

. The Start key lamp goes on, and the rotary tool moves to the set position on outer diameter of the material. Upon completion of movement, the menu key [EXEC] is selected. The message "ADJUSTING (DIA)" appears on the screen.

⚠ WARNING

The machine may move suddenly while the Start key lamp goes on.
Be sure to keep hands away from the machine while the lamp is going on.

8. Press the Handle magnification keys [X1] or [X10] to select magnification of × 1 or × 10.
9. If you need to set the tool with its protrusion length longer (or shorter) than normal length, adjust the position in X direction in Handle Feed mode. Then, press the Input [INPUT] key.
10. Pull the material, softly push the tool point to the outside diameter of the material, then temporarily secure the tool.
11. Press the menu key [WAIT]. The menu key [WAIT] is selected.



12. Confirm that the door is closed, then press the Start key [START]. The door is locked and the Start key lamp blinks.
13. Press the Start key [START]. The lamp goes on and the holder moves to the material waiting point. Upon completion of movement, the selected menu key is canceled.
14. Tighten the cap nut to fix the tool.

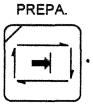
Notes

- If the door is open at the start of diameter ([DIA]) operation, the door will not be locked.
- When the operation is completed, the Start key [START] goes off.
- If you execute the operation with the door opened, the feed rate is restricted to 2m/min.or less.
- When the operation is completed, the menu key [EXEC] will be automatically selected.
- The selected menu key is automatically canceled when a certain time after the selection of that menu key has elapsed with no operation invoked.
- The menu key [EXEC] is automatically canceled when a certain time has elapsed with no operation invoked while the Handle Magnification key [X100] has been selected.

6.2.3.6 Diameter (Drilling tool diameter direction T11's, T51's)

Adjusts the drilling tool position in diameter direction.

Procedure

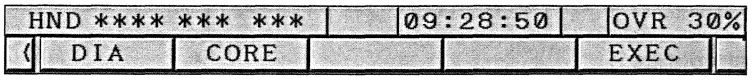
1. Press the Preparation key 

.

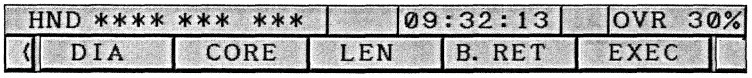
   The Preparation key lamp goes on. The Preparation screen is displayed.

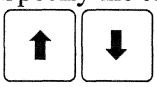
2. Press the menu key **[T-SET]**.
   The tool setting menu is displayed.

   T11's

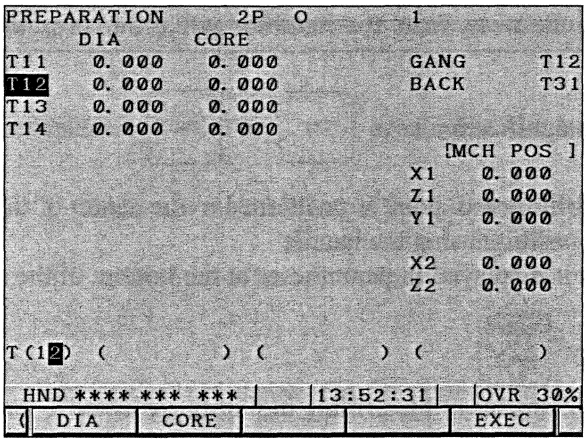


   T51's

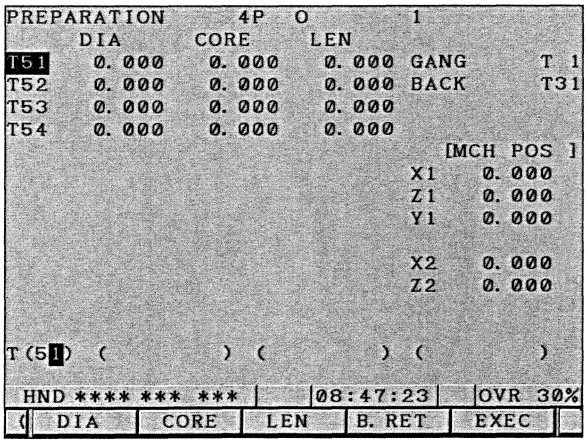


3. Specify the tool number of the tool to be adjusted by pressing the Cursor move keys  or the Alphanumeric keys. (Front drilling tool number: T11's) (Back drilling tool number: T51's)

   T11's

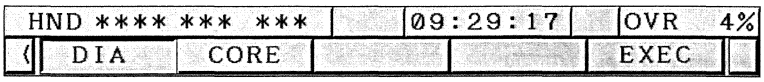


   T51's

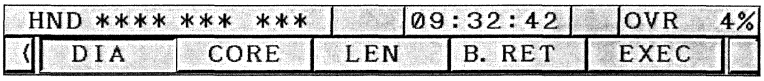


4. Confirm that the material does not extend from the guide bushing.
5. Press the menu key [DIA]. The menu key [DIA] is selected.

T11's



T51's



6. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.
7. Press the Start key 

. The lamp goes on and the holder moves to the center of the material.
Upon completion of movement, the menu key [EXEC] is selected. The message "ADJUSTMENT (DIA)" will be displayed on the screen.

> **WARNING**
>
> **The machine may move suddenly while the Start key lamp goes on.**
> **Be sure to keep hands away from the machine while the lamp is going on.**

8. Press the Handle magnification keys 

or 

to select magnification of × 1 or × 10.
9. Confirm that the drilling tool point is positioned to the center of the material cut-off mark.
Adjust the X axis position using the handle.
The move amount is displayed in parentheses at the bottom of the screen.
10. Press the Input key 

.
Data is set for the diameter of the drilling tool of the selected T number.

Notes

- If the door is open at the start of diameter ([DIA]) operation, the door will not be locked.
- When the operation is completed, the Start key 

goes off.
- If you execute the operation with the door opened, the feed rate is restricted to 2m/min.or less.
- When the operation is completed, the menu key [EXEC] will be automatically selected.
- The selected menu key is automatically canceled when a certain time after the selection of that menu key has elapsed with no operation invoked.
- The menu key [EXEC] is automatically canceled when a certain time has elapsed with no operation invoked while the Handle Magnification key 

has been selected.
- To adjust the position of back drilling tool T51's in diameter direction, press the menu key [DIA] to select a tool. Move the Z2 axis forward on Handle Feed screen and adjust the tool position by moving the X1 axis. Enter the distance you have moved the X1 axis in [DIA] field on the Preparation screen.

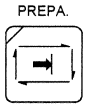
6.2.3.7 Longitudinal adjustment (Back drilling tool T31's, T51's)

Adjusts the positions between the back drilling tool and the workpiece end face on the back spindle.

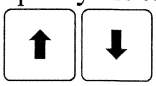
Procedure

1. Rechuck the workpiece and execute cut-off machining, then, chuck the workpiece on the back spindle (pick off).

   * Never fail to specify the external workpiece length from the back spindle end face for "B.WORK EXT.LENG." on the machining data screen.
   (If you are using the long-neck chuck, specify the protrusion length of chuck from the end face of back spindle cap nut for "B.CHUCK EXT.LENG.".)

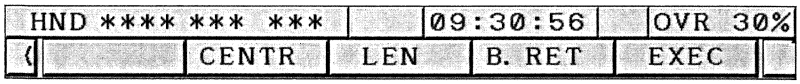
2. Press the Preparation key 

. The Preparation key lamp goes on. The Preparation screen is displayed.

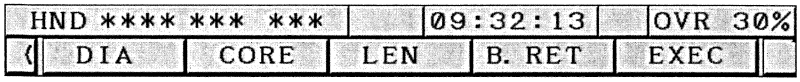
3. Specify the tool number of the tool to be adjusted by pressing the Cursor move keys  or the Alphanumeric keys. (Back drilling tool number: T31's, T51's)

4. Press the menu key [T-SET].
   The tool setting menu is displayed.

   T31's

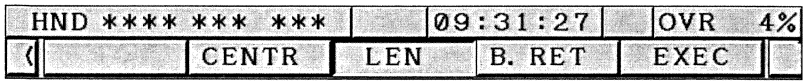


   T51's

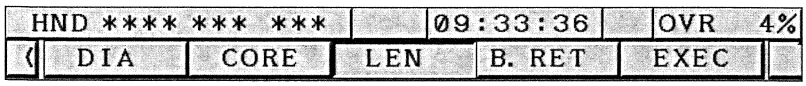


5. Press the menu key [LEN]. The menu key [LEN] is selected.

   T31's



   T51's



6. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.

7. Press the Start key 

.

   The Start key lamp goes on, the Z1 axis retract 1.0 mm, then the holder moves to the center of the material. Afterwards, the Z2 axis advances to the tool set position. Upon completion of movement, the menu key [EXEC] is selected.
   The message "ADJUSTMENT (LEN)" will be displayed on the screen.

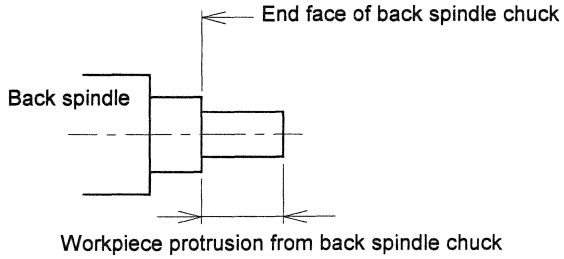
> **WARNING**
>
> **The machine may move suddenly while the Start key lamp goes on.**
> **Be sure to keep hands away from the machine while the lamp is going on.**

8. Attach the top end of the drilling tool to the end face of the material, then temporarily secure the sleeve.
9. Release the tool from the material by pressing the menu key [B. RET].
10. Firmly secure the sleeve.

Notes

- If the door is open at the start of longitudinal ([LEN]) operation, the door will not be locked.
- When the operation is completed, the Start key 

goes off.
- If you execute the operation with the door opened, the feed rate is restricted to 2m/min.or less.
- When the operation is completed, the menu key [EXEC] will be automatically selected.
- The selected menu key is automatically canceled when a certain time after the selection of that menu key has elapsed with no operation invoked.
- The handle feed is clamped when the handle is fed over 2m/min, the axis may not move according to the movement of the handle.
- Be sure to specify correct value for "B.WORK EXT.LENG." (or "B.CHUCK EXT.LENG.") in the machining data.



- The menu key [EXEC] is automatically canceled when a certain time has elapsed with no operation invoked while the Handle Magnification key 

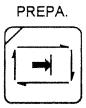
has been selected.

6.2.4 Adjustment

6.2.4.1 Adjusting chucking force

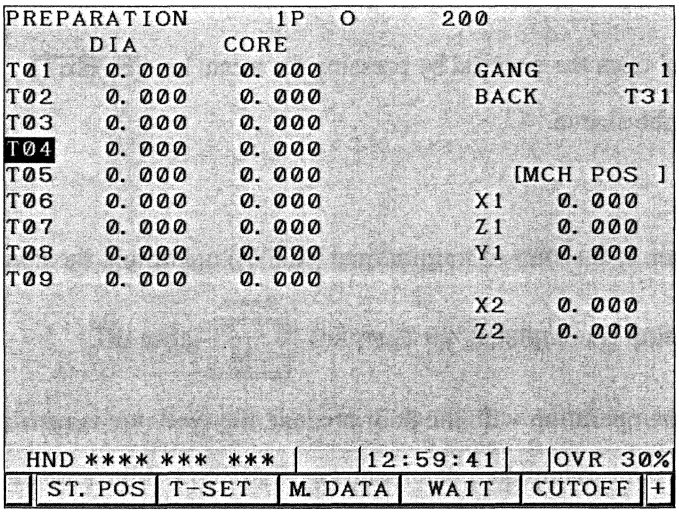
This section explains chucking force adjustment on the screen. See <Section 7.1.2 Adjusting chucking force> when you actually adjust the chucking force.

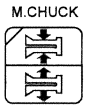
Procedure

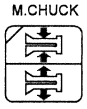
1. Press the Preparation key 

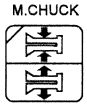
.

   The Preparation key lamp goes on. The Preparation screen is displayed.



2. Insert the material into the chuck.
3. Loosen the chucking force adjusting nut.
4. Press the Main spindle chuck key 

. The Main spindle chuck key lamp goes on. If the lamp does not go on, re-press the Main spindle chuck key to close the chuck.
5. Gradually tighten the chucking force adjusting nut until the chuck contacts the material and the chucking force adjusting nut cannot turn smoothly (the position where you can hardly move the material with your hand). Set the position as zero degree.
6. Press the Main spindle chuck key 

to open the chuck.
7. Tighten the chucking force adjusting nut further until the required angle is obtained.
8. Press the Main spindle chuck key 

. The Main spindle chuck key lamp goes on. Close the chuck, and check if the value matches the rotation angle of the adjusting nut.

9. Tighten the setscrew of the adjusting nut to prevent the nut loosening.

⚠ CAUTION

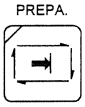
To avoid malfunctioning and collet chuck damage, ensure that the chuck grips a bar material before starting operation.

6.2.4.2 Return point (Use this funciton when replacing or adjusting the guide bushing device.)

Move the tool holder to the position so that the guide bushing can be replaced smoothly, and move the Z1 and Z2 axes to the return point.

This section explains guide bushing replacement on the screen.
See <Section 7.2 Mounting/Adjusting a Guide Bushing Device> and <Section 7.3 Replacing and Adjusting Guide Bushing> when you actually replace or adjust the guide bushing.

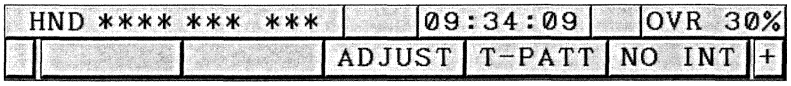
Procedure

1. Press the Preparation key 

.

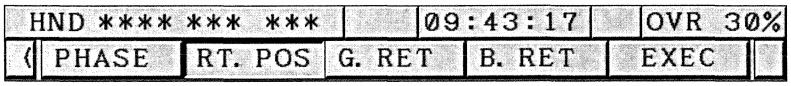
   The Preparation key lamp goes on. The preparation screen is displayed.

2. Press the Menu selection key  .



3. Press the menu key [ADJUST].
   The adjustment menu is displayed.

4. Press the menu key [RETURN].
   The menu key [RETURN] is selected.



5. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.

6. Press the Start key 

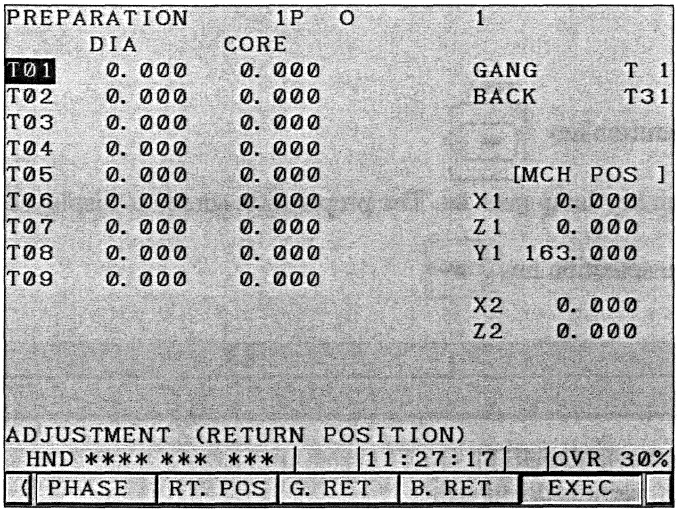
.

   The lamp goes on, all axes move to the retract point, then the Start key lamp goes off.
   Upon completion of movement, the selected menu key is canceled and "ADJUSTMENT (GB POS)" is displayed on the screen.

⚠ WARNING

The machine may move suddenly while the Start key lamp goes on.
Be sure to keep hands away from the machine while the lamp is going on.

7. Press the menu key [EXEC]. The menu key [EXEC] is selected.
8. You can move the Z1 axis by turning the handle.



Notes

- The door will not be locked if the door is open at the start of retract point operation.
- When the operation is completed, the Start key 

goes off.
- If you execute the operation with the door opened, the feed rate is restricted to 2m/min. or less.
- When the operation is completed, the selected menu key [RETURN] is automatically canceled.
- The selected menu key is automatically canceled when a certain time after the selection of that menu key has elapsed with no operation invoked.
- The handle feed is clamped when the handle is fed over 2m/min, the axis may not move according to the movement of the handle.
- The menu key [EXEC] is automatically canceled when if a certain time has elapsed with no operation invoked while the Handle Magnification key 

has been selected.

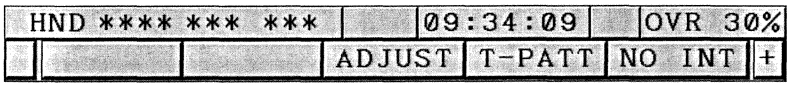
6.2.4.3 Retracting Gang Tool Post

Use this function to move the gang tool post (X1 axis) to the machine coordinate zero point

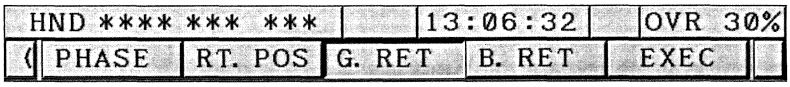
Procedure

1. Press the Preparation key 

.
The Preparation key lamp goes on. The preparation screen is displayed.
2. Press the Menu selection key  .



3. Press the menu key [ADJUST].
The adjustment menu is displayed.
4. Press the menu key [G. RET].
The menu key [G. RET] is selected.



5. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.
6. Press the Start key 

. The Start key lamp goes on. When the gang tool post has moved to the machine coordinate zero point, the Start key lamp goes off.

> **⚠ WARNING**
>
> **The machine may move suddenly while the Start key lamp goes on.**
> **Be sure to keep hands away from the machine while the lamp is going on.**

Notes

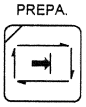
- The door will not be locked if the door is open at the start of operation to retract the gang tool post.
- When the operation is completed, the Start key 

goes off.
- If you execute the operation with the door opened, the feed rate is restricted to 2m/min. or less.
- When the operation is completed, the menu key [G. RET] will be automatically selected.
- The selected menu key is automatically canceled when a certain time after the selection of that menu key has elapsed with no operation invoked.

6.2.4.4 Retrace Back Headstock

Use this function to move the back headstock (Z2 axis) to machine coordinate zero point.

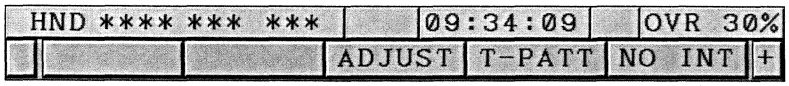
Procedure

1. Press the Preparation key 

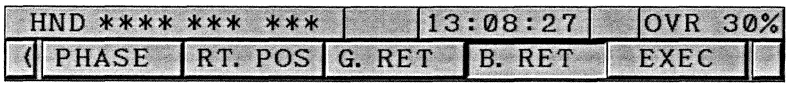
.

   The Preparation key lamp goes on. The Preparation screen is displayed.

2. Press the Menu selection key  .



3. Press the menu key [ADJUST]. Another menus appears on menu key.
4. Press the menu key [B. RET]. The menu key [B. RET] is selected.



5. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.
6. Press the Start key 

. The Start key lamp goes on. When the back headstock has moved to the machine coordinate zero point, the Start key lamp goes off.

> **⚠ WARNING**
>
> **The machine may move suddenly while the Start key lamp goes on.**
> **Be sure to keep hands away from the machine while the lamp is going on.**

Notes

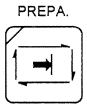
- The door will not be locked if the door is open at the start of operation to retract the back headstock.
- When the operation is completed, the Start key 

goes off.
- If you execute the operation with the door opened, the feed rate is restricted to 2m/min. or less.
- When the operation is completed, the menu key [B. RET] will be automatically selected.
- The selected menu key is automatically canceled when a certain time after the selection of that menu key has elapsed with no operation invoked.

6.2.4.5 Phase adjustment of non-conformed materials

Perform the following steps to store the values of phase shifts between main spindle and back spindle when machining non-conformed materials in the memory of the NC unit.

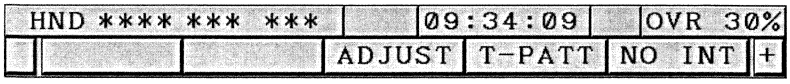
Procedure

1. Press the Preparation key 

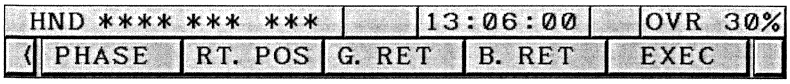
.

   The Preparation key lamp goes on. The preparation screen is displayed.

2. Press the Menu selection key  .

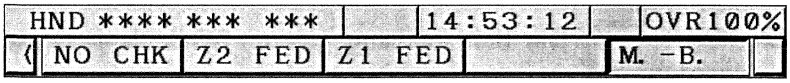


3. Press the menu key [ADJUST]. Another menus appears on menu key.



4. Press the menu key [PHASE].
   The menu key [PHASE] is selected.

5. Press the menu key [M.-B.]. The menu key [M.-B.] is selected.



6. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.

7. When the Start key 

and the menu key [M.-B.] is pressed at the same time, the main and back spindles are indexed. At this time, the Start key 

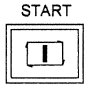
is flashing.

8. Open the door, and the material (non-conformed material) into the main spindle and pass it through the back spindle. Move the Z1 or Z2 axis forward and backward as needed.

   8-1. Press the menu key [Z1 FED].

   8-2. Rotate the handle to move the Z1 axis.

   8-3. Press the menu key [M.-B.] again to cancel the Z1 feed.
   You can move the Z2 axis in similar way. Use the menu key [Z2 FED] to move the Z2 axis.

9. Close the door and press the Start key 

. The door is locked and the Start key starts flashing.

10. Press the Start key 

and the menu key [M.-B.] at the same time. Start Start key lamp goes on, the main spindle chuck and the back spindle chuck close, and the phase shift is stored. Then, the Start key lamp goes off.

> **⚠ WARNING**
>
> **The machine may move suddenly while the Start key lamp goes on.**
> **Be sure to keep hands away from the machine while the lamp is going on.**

Notes

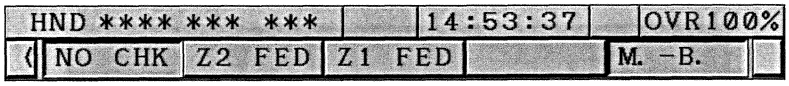
- The door will not be locked if the door is open at the start of operation for phase adjustment for non-conformed material.
- Upon completion of phase adjustment, the menu key [M.-B.] is automatically deselected.
- The menu key is automatically deselected when a certain time has elapsed with no operation invoked.

When gripping the round and non-conformed materials

If the round material is set on the main spindle, perform phase adjustment without opening the main spindle chuck.

Procedure

1. Perform Steps 1. through 5. in the "Phase Adjustment of Non-conformed Materials" section.
2. Press the menu key [NO CHK]. The menu key [NO CHK] is selected.

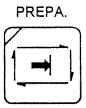


3. Perform Step 6. and the subsequent steps in the "Phase Adjustment of Non-conformed Materials" section.
   The main spindle chuck will not open.

6.2.5 Tooling

Displays the tool bit positioning data which is used in the machining program selected on the Program select screen. You can specify the tool type using these steps.

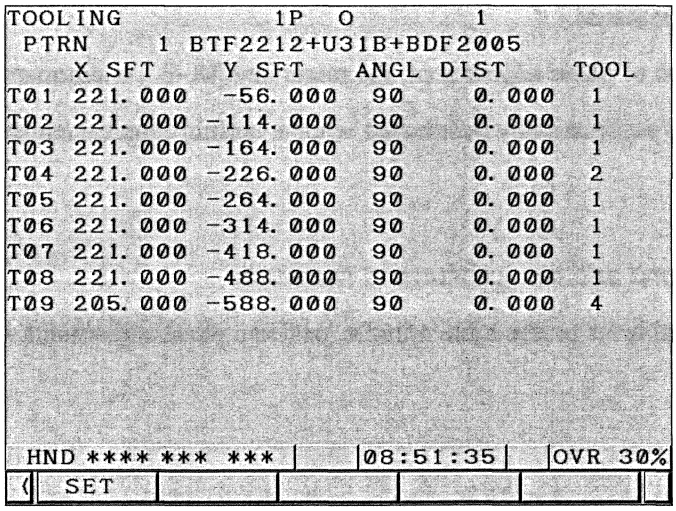
Procedure

1. Press the Preparation key 

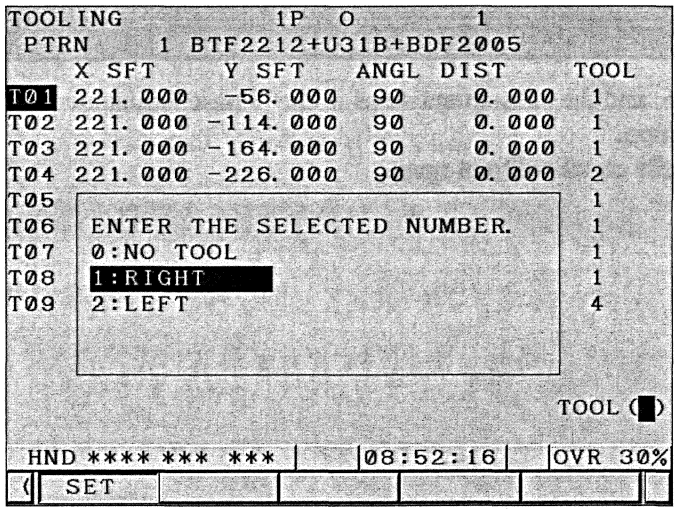
.

   The Preparation key lamp goes on. The Preparation screen is displayed.

2. Press the menu key [T-PATT].
   Tooling screen is displayed.



3. Press the menu key [SET] to specify the tool type.
   The guide for tool type is displayed on the screen.



4. Enter the guide number using the alphanumeric key.

5. Press the Input key 

. Tool type for the selected tool is determined.

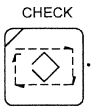
Note

On the Tooling screen accessed from the Preparation screen, the tool pattern cannot be changed. To change the pattern, use the Edit screen.

6.3 Checking Programs

Automatically operates the machine forward and backward in a cycle in order to check the program. If a fault such as an interference is detected, correct the program immediately.

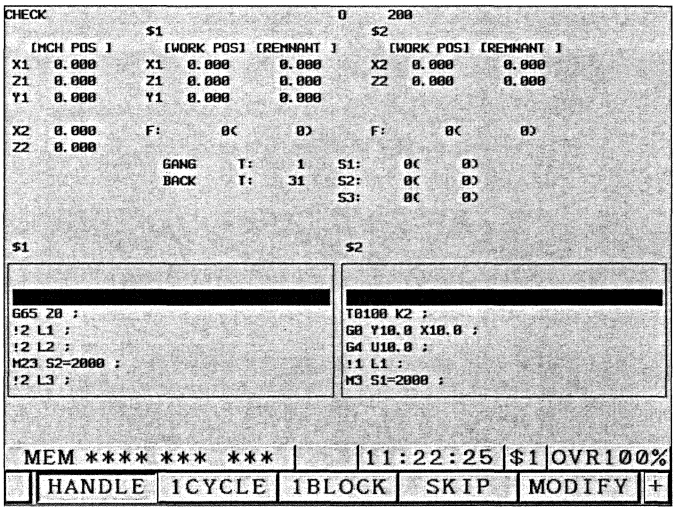
Procedure

1. Press the Program check key 

.

   The Program check key lamp goes on.

   The Check screen is displayed.

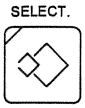


6.3.1 Operation for program checking in a cycle

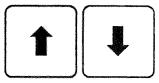
Automatically operates the machine in a cycle.

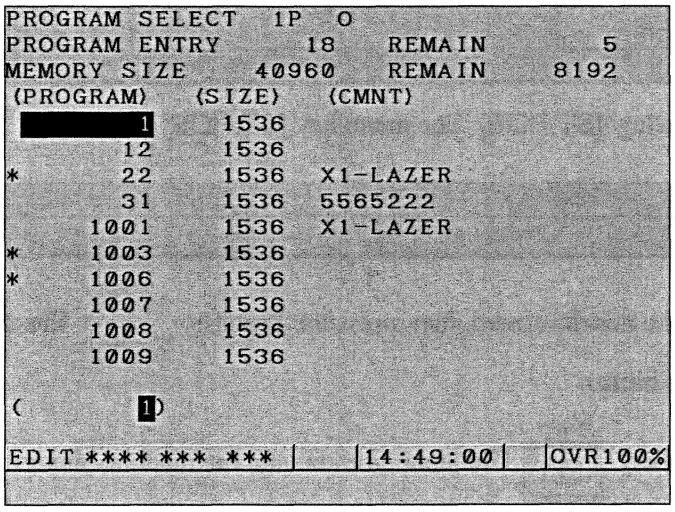
Procedure

Operation sequence from program selection to program checking

1. Press the Program select key 

. The Program select key lamp goes on. The Program select screen is displayed.

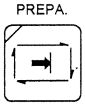
2. Select the program to be executed using the Cursor move keys  . The number of the currently selected program is displayed in parentheses at the lower left of the screen. You can also select the program using the Alphanumeric keys.



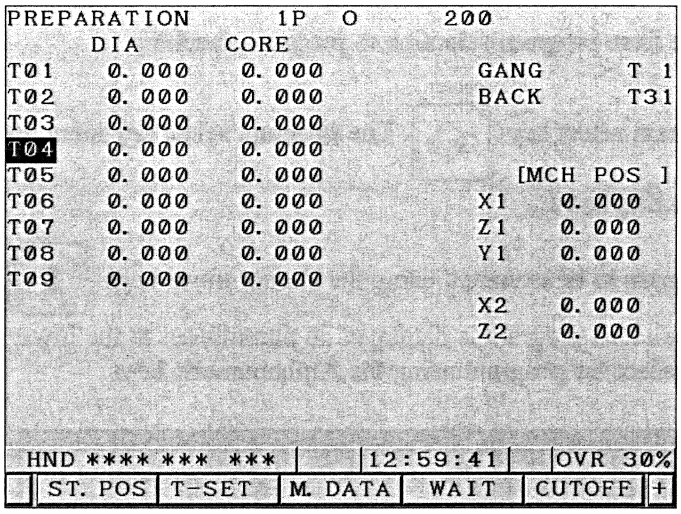
3. Press the Input key 

.

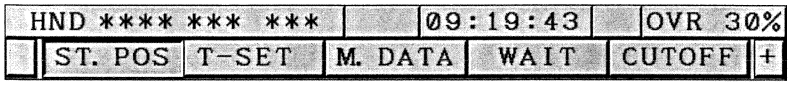
The selected program is called. The selected program number is displayed at the upper right of the screen.

4. Press the Preparation key 

. The Preparation key lamp goes on. The Preparation screen is displayed.



5. Press the menu key [ST.POS]. The menu key [ST.POS] is selected.



6. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.

7. Press the Start key 

. The lamp goes on and the machine moves to the start point.

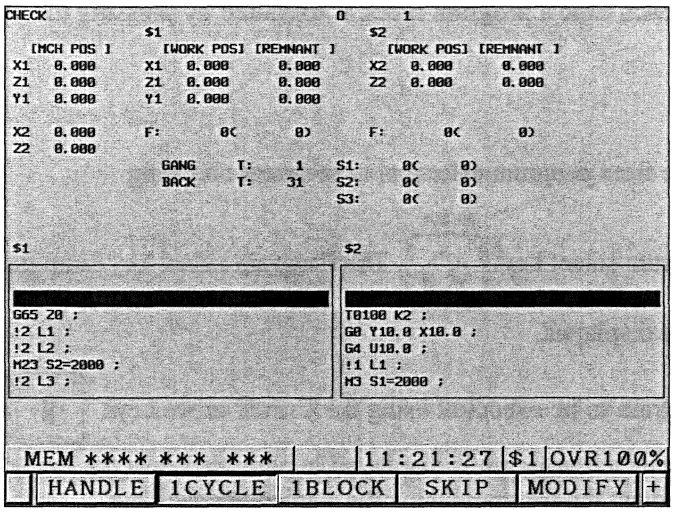
> **WARNING**
>
> **The machine may move suddenly while the Start key lamp goes on.**
> **Be sure to keep hands away from the machine while the lamp is going on.**

8. Press the Program check key 

.

The Program check key lamp goes on. The Check screen is displayed.

9. Press the menu key [1CYCLE].
   The menu key [1CYCLE] is selected.



10. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.

11. Press the Start key 

. The Start key lamp goes on and the program is executed. After one cycle is complete, the Start key lamp goes off, then the machine stops.

> **WARNING**
>
> **The machine may move suddenly while the Start key lamp goes on.**
> **Be sure to keep hands away from the machine while the lamp is going on.**

Notes

- If the door is open at the start of start position ([ST.POS]) operation, the door will not be locked.
- When the operation is completed, the Start key 

goes off.
- The operation is not executed with the door opened by door interlock function. To operate the machine, make sure to confirm that the door is closed, then press the Start key 

.
- Backward operation is disabled when [1CYCLE] is selected.
- Switching between the menu keys [1CYCLE] , [1BLOCK] and [HANDLE] is permitted during program execution.

6.3.2 Operation for program checking for each block

Stops the machine each time a program block is executed by pressing the Start key (START).

Procedure

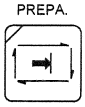
Operation sequence from program selection to program checking

1. Press the Program select key (SELECT.). The Program select key lamp goes on. The Program select screen is displayed.
2. Select the program to be executed using the Cursor move keys (↑) (↓). The number of the currently selected program is displayed in parentheses at the lower left of the screen. You can also select the program using the Alphanumeric keys.

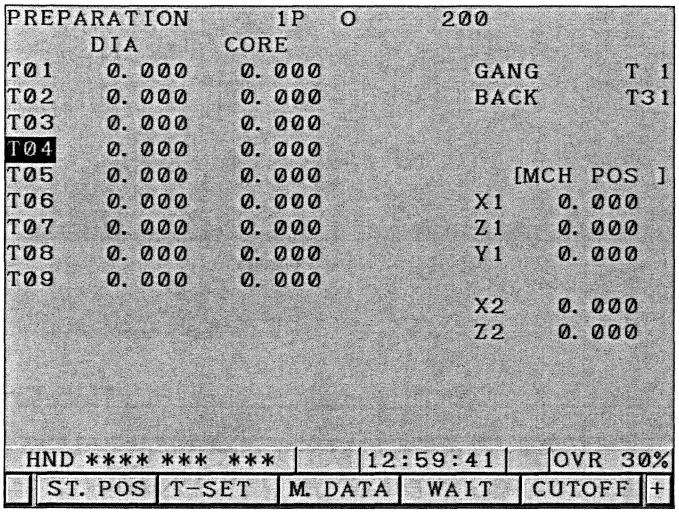
```
PROGRAM SELECT  1P  O
PROGRAM ENTRY      18    REMAIN        5
MEMORY SIZE     40960    REMAIN     8192
(PROGRAM)    (SIZE)    (CMNT)
         1      1536
        12      1536
*       22      1536   X1-LAZER
        31      1536   5565222
      1001      1536   X1-LAZER
*     1003      1536
*     1006      1536
      1007      1536
      1008      1536
      1009      1536

(       1)
EDIT **** *** ***  |    |14:49:00|    |OVR100%|
```

3. Press the Input key (INPUT).

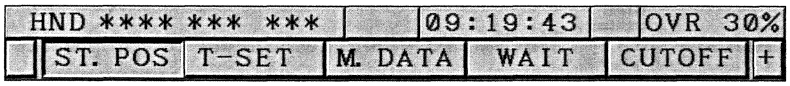
   The selected program is called. The selected program number is displayed at the upper right of the screen.

4. Press the Preparation key 

. The Preparation key lamp goes on. The Preparation screen is displayed.



5. Press the menu key [ST.POS]. The menu key [ST.POS] is selected.



6. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.

7. Press the Start key 

. The lamp goes on and the machine moves to the start point.

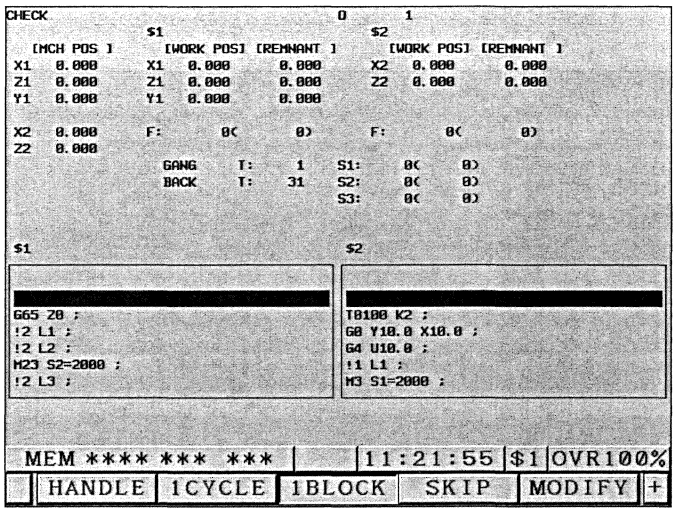
> **⚠ WARNING**
>
> **The machine may move suddenly while the Start key lamp goes on.**
> **Be sure to keep hands away from the machine while the lamp is going on.**

8. Press the Program check key 

.

The Program check key lamp goes on. The Check screen is displayed.

9. Press the menu key [1BLOCK].
   The menu key [1BLOCK] is selected.



10. Confirm that the door is closed, then press the Start key (START). The door is locked and the Start key lamp blinks.

11. Press the Start key (START). The Start key lamp goes on and the program is executed.
    The Start key lamp goes off when one block is completed.

12. If you want to continue program execution, press the Start key (START). The door is locked and the Start key lamp blinks.

13. Press the Start key (START). The Start key lamp goes on, and the next block is executed.

> **WARNING**
>
> **The machine may move suddenly while the Start key lamp goes on.**
> **Be sure to keep hands away from the machine while the lamp is going on.**

Notes

- If the door is open at the start of start position ([ST.POS]) operation, the door will not be locked.
- When the operation is completed, the Start key (START) goes off.
- The operation is not executed with the door opened by door interlock function. To operate the machine, make sure to confirm that the door is closed, then press the Start key (START).
- Backward operation is disabled when [1BLOCK] is selected.
- Switching between the menu keys [1CYCLE] , [1BLOCK] and [HANDLE] is permitted during program execution.

6.3.3 Operation for program checking through handle

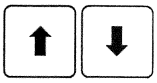
Turns the handle forward and backward. The machine is automatically operated forward and backward in a cycle in order to check the program (e.g., interference between two parts).

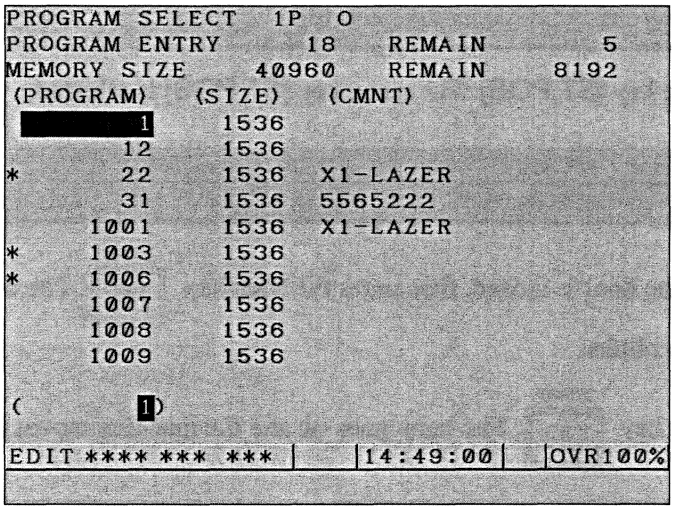
Procedure

Operation sequence from program selection to program checking

1. Press the Program select key 

. The Program select key lamp goes on. The Program select screen is displayed.

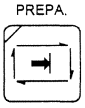
2. Select the program to be executed using the Cursor move keys  . The number of the currently selected program is displayed in parentheses at the lower left of the screen. You can also select the program using the Alphanumeric keys.



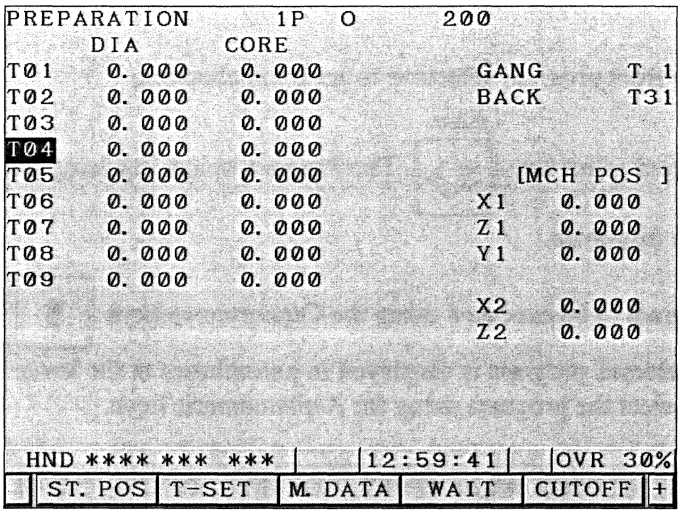
3. Press the Input key 

.

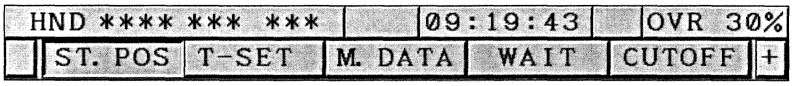
The selected program is called. The selected program number is displayed at the upper right of the screen.

4. Press the Preparation key 

. The Preparation key lamp goes on. The Preparation screen is displayed.



5. Press the menu key [ST.POS]. The menu key [ST.POS] is selected.



6. Confirm that the door is closed, then press the Start key 

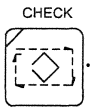
. The door is locked and the Start key lamp blinks.

7. Press the Start key 

. The lamp goes on and the machine moves to the start point.

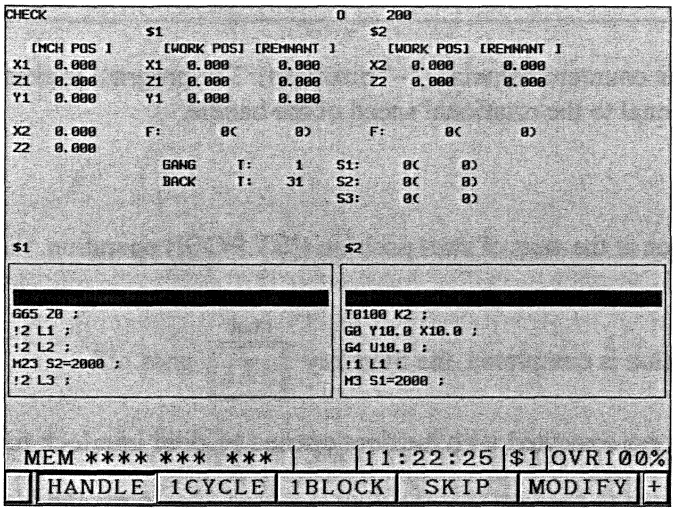
⚠ WARNING

The machine may move suddenly while the Start key lamp goes on.
Be sure to keep hands away from the machine while the lamp is going on.

8. Press the Program check key 

.

   The Program check key lamp goes on. The Check screen is displayed.



9. Press the menu key [HANDLE]. The menu key [HANDLE] is selected. Even if you turn the handle rapidly, the speed does not exceed that set in the program.

10. Press either of the Handle magnification keys 

or 

to select the feed speed.

11. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.

12. Press the Start key 

. The Start key lamp goes on.

> **⚠ WARNING**
>
> **The machine may move suddenly while the Start key lamp goes on.**
> **Be sure to keep hands away from the machine while the lamp is going on.**

13. Turn the handle clockwize ("+" direction). The program is executed at a speed proportional to the rotational speed of the handle. If you want to observe machine operation attentively, turn the handle slowly.

14. Stop the handle.

    The program stops. The Start key 

lamp remains on.

⚠ WARNING

The machine may move suddenly while the Start key lamp goes on.
Be sure to keep hands away from the machine while the lamp is going on.

15. Turn the handle counterclockwize ("–" direction). The program is executed backward at a speed proportional to the rotational speed of the handle.

Notes

- If the door is open at the start of start position ([ST.POS]) operation, the door will not be locked.
- When the operation is completed, the Start key 

goes off.
- The operation is not executed with the door opened by door interlock function. To operate the machine, make sure to confirm that the door is closed, then press the Start key 

.
- Switching between the menu keys [1CYCLE] , [1BLOCK] and [HANDLE] is permitted during program execution.

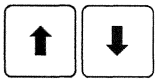
Operation for threading (thread cutting cycle included), tapping and die

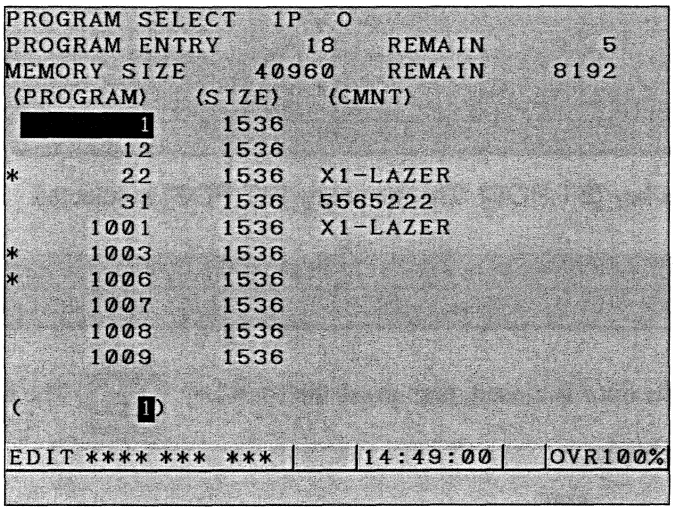
Procedure

Operation sequence from program selection to program checking

1. Press the Program select key 

. The Program select key lamp goes on. The Program select screen is displayed.

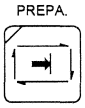
2. Select the program to be executed using the Cursor move keys  . The number of the currently selected program is displayed in parentheses at the lower left of the screen. You can also select the program using the Alphanumeric keys.



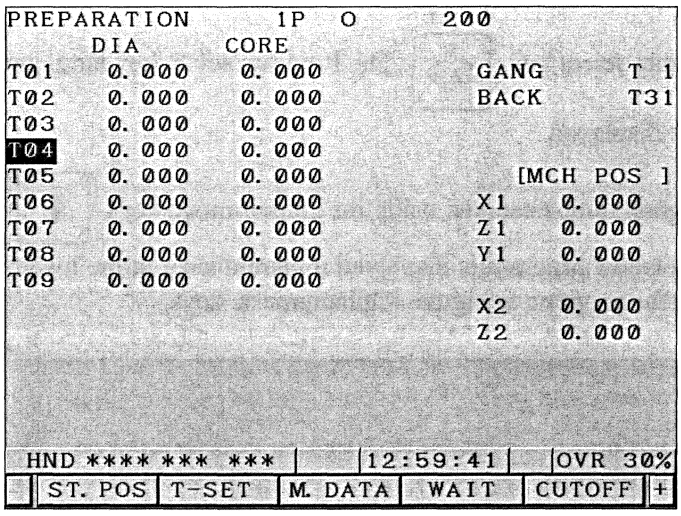
3. Press the Input key 

.

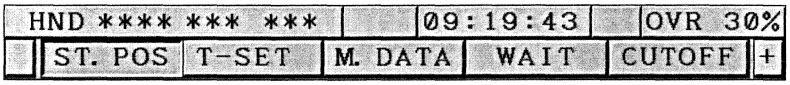
The selected program is called. The selected program number is displayed at the upper right of the screen.

4. Press the Preparation key 

. The Preparation key lamp goes on. The Preparation screen is displayed.



5. Press the menu key [ST.POS]. The menu key [ST.POS] is selected.



6. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.

7. Press the Start key 

. The lamp goes on and the machine moves to the start point.

WARNING

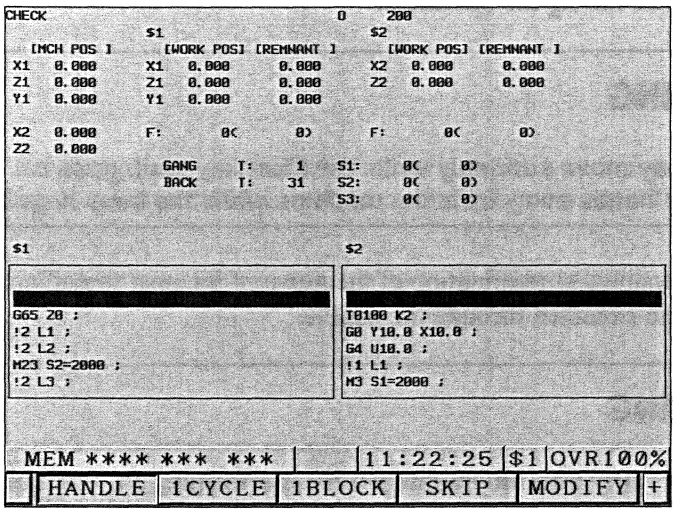
The machine may move suddenly while the Start key lamp goes on.
Be sure to keep hands away from the machine while the lamp is going on.

8. Press the Program check key 

.

The Program check key lamp goes on. The Program check screen is displayed.

9. Press the menu key [HANDLE].
   The menu key [HANDLE] is selected. Even if you turn the handle rapidly, the speed does not exceed that set in the program.



10. Press either of the Handle magnification keys [X1] or [X10] to select the feed speed.

11. Confirm that the door is closed, then press the Start key [START]. The door is locked and the Start key lamp blinks.

12. Press the Start key [START]. The Start key lamp goes on.

> **WARNING**
>
> **The machine may move suddenly while the Start key lamp goes on.**
> **Be sure to keep hands away from the machine while the lamp is going on.**

13. Turn the handle clockwize ("+" direction). The program is executed at a speed proportional to the rotational speed of the handle. If you want to observe machine operation attentively, turn the handle slowly.

14. The stopped state is automatically placed when the block preceding the threading block has been executed.
    The feed hold state is placed if thread cutting cycle is specified.

15. Confirm that the door is closed and the Check screen is displayed, then press the Start key [START]. The door is locked and the Start key lamp blinks.
    (If the On-machine program check screen is not displayed, press the Program check key [CHECK] to display it.)

16. Press the Start key 

. The Start key lamp goes on. Automatic operation is performed from the threading block to the next threading positioning block as automatic operation. The handle is disabled during the operation.

> **WARNING**
>
> **The machine may move suddenly while the Start key lamp goes on.**
> **Be sure to keep hands away from the machine while the lamp is going on.**

17. The handle is enabled at termination of the move of the next threading positioning block. The program is again executed through the handle.

> **WARNING**
>
> **Do not put your hand into the machine while performing on-machine program check by using the menu key [HANDLE].**
>
> **The machine does not operate in the handle operation unless you turn the handle. However, if the handle happens to turn, the machine operates, which could result in serious personal injury.**

> **CAUTION**
>
> **Pay close attention to the interference with the tapping and die (G32) or the drilling, tapping and die in reverse operation.**

Notes

- Not all the commands can be run backward. Some commands are restricted to run backward.
- The number of blocks that can be run backward is limited. It depends on the command, however, approximately 50 blocks shall be the standard.
- A magnification factor of [X100] is not available for adjustment using the handle. Use [X1] or [X10].
- When the operation is completed, the Start key 

goes off.
- The operation is not executed with the door opened by door interlock function. To operate the machine, make sure to confirm that the door is closed, then press the Start key 

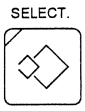
.
- For a pair of M codes (e.g., ON/OFF), an M code in the same group is executed during backward move; the preceding M code in the program is executed during forward move.
- The modal information of the G code is also processed during backward move.
- If the feed command and M code coexist in the same block, only forward move is permitted. (Backward move is not permitted.)
- Backward feed is not permitted in the M2 block.
- An alarm is issued at an attempt to move a block backward which must not be moved backward. Proceeding to move the block forward clears the alarm.

6.3.4 Modifying the program being executed

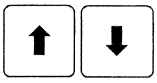
Modifies the program being executed.

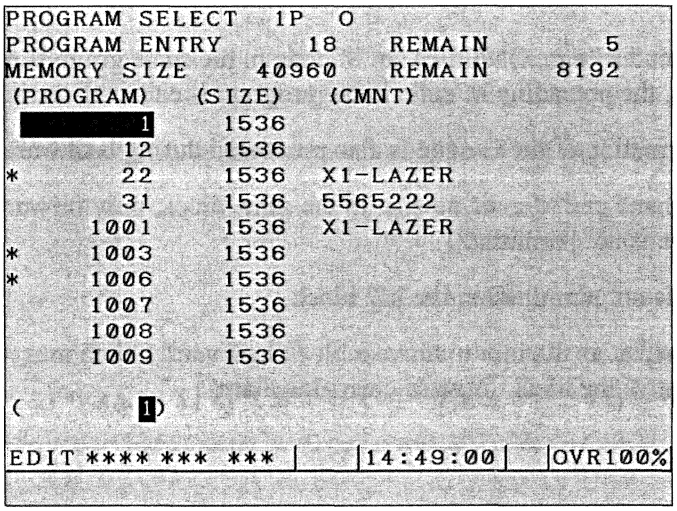
Procedure

Operation sequence from program selection to program checking

1. Press the Program select key 

. The Program select key lamp goes on. The Program select screen is displayed.

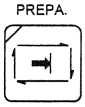
2. Select the program to be executed using the Cursor move keys  . The number of the currently selected program is displayed in parentheses in the lower left of the screen. You can also select the program using the Alphanumeric keys.



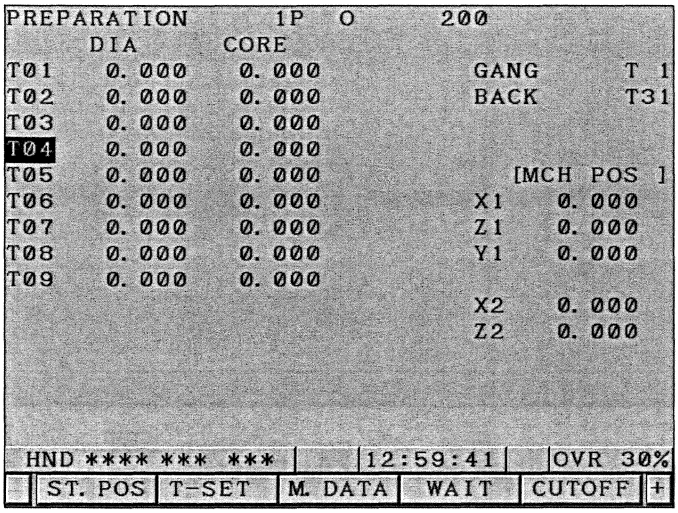
3. Press the Input key 

.

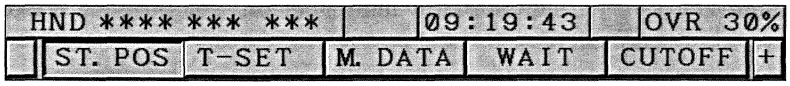
The selected program is called. The selected program number is displayed at the upper right of the screen.

4. Press the Preparation key 

. The Preparation key lamp goes on. The Preparation screen is displayed.



5. Press the menu key [ST.POS]. The menu key [ST.POS] is selected.



6. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.

7. Press the Start key 

. The lamp goes on and the machine moves to the start point.

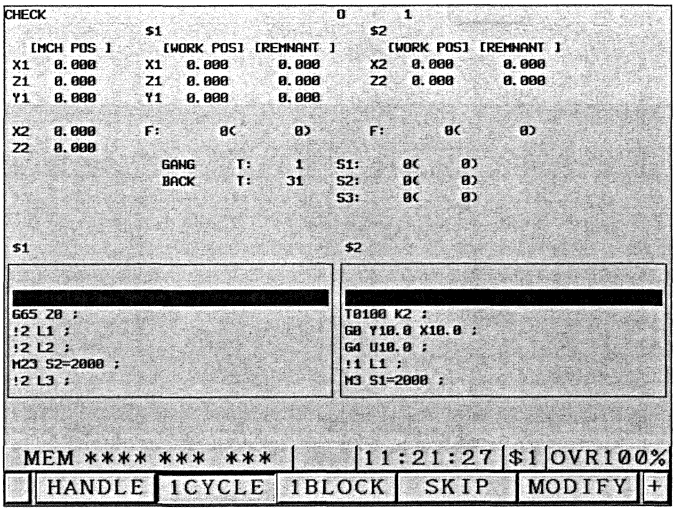
> **⚠ WARNING**
>
> **The machine may move suddenly while the Start key lamp goes on.**
> **Be sure to keep hands away from the machine while the lamp is going on.**

8. Press the Program check key 

.

The Program check key lamp goes on. The Check screen is displayed.

9. Press the menu key [1CYCLE] or [1BLOCK]. The pressed menu key is selected.



10. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.

11. Press the Start key 

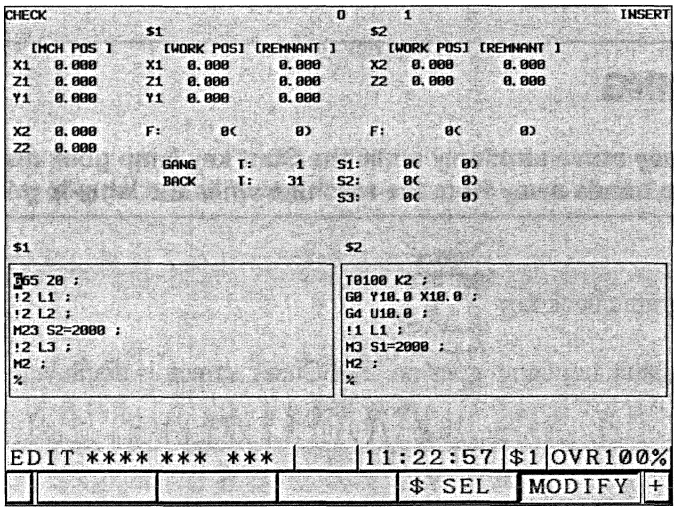
. The Start key lamp goes on. The program is executed.

12. Press the menu key [MODIFY]. The menu key [MODIFY] is selected.

13. The Hold key 

lamp goes on, the Start key 

lamp goes off, then the machine stops. At this time, the door lock is released if all the spindles have stopped. Only the Start key lamp may go off. The timing of pressing the menu key [MODIFY] determines this result.



14. The selected block is being executed. Editing is permitted for the five lines from the next block. If the NC is performing read ahead scheme, the block after the read-ahead block can be edited.

15. Start editing. See <Section 6.7.2 Editing programs> for details.
16. Press the menu key [MODIFY] at completion of editing. The selected menu key [MODIFY] is canceled.
17. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.
18. Press the Start key 

. The program execution is restarted.

⚠ WARNING

The machine may move suddenly while the Start key lamp goes on.
Be sure to keep hands away from the machine while the lamp is going on.

Notes

- Not all the commands can be run backward. Some commands are restricted to run backward.
- If the door is open at the start of start position ([ST.POS]) operation, the door will not be locked.
- When the operation is completed, the Start key 

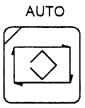
goes off.
- The operation is not executed with the door opened by door interlock function. To operate the machine, make sure to confirm that the door is closed, then press the Start key 

.

6.4 Automatic Operation

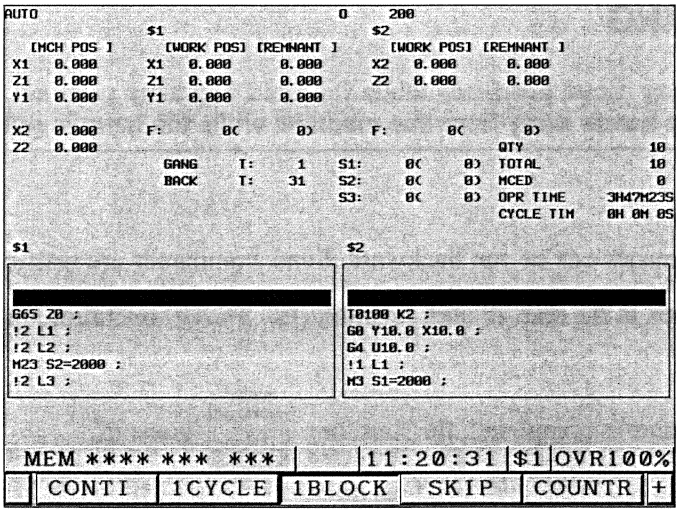
Executes the program selected for operation. There are three types of operations: continuous operation, 1-cycle operation, and 1-block operation.

Procedure

1. Press the Auto key 

.

   The Auto key lamp goes on. The Auto screen is displayed.



6.4.1 Continuous cycle

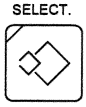
Performs automatic operation in continuous cycles.

Operation is started by pressing the Start key 

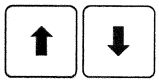
.

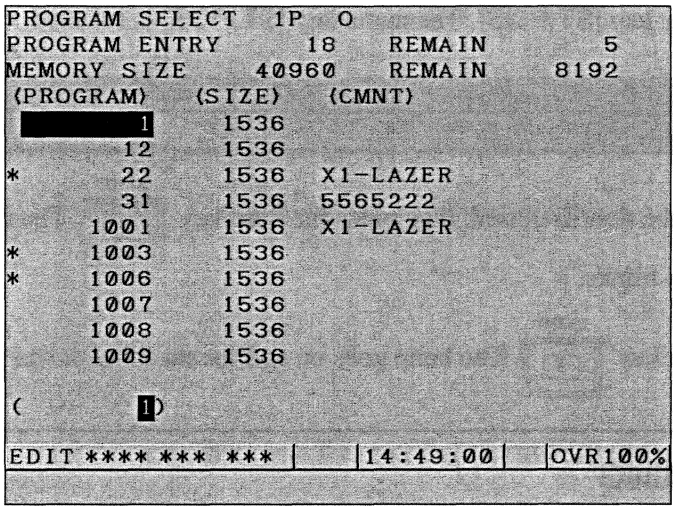
Procedure

Operation sequence from program selection to program execution

1. Press the Program select key 

. The Program select key lamp goes on. The Program select screen is displayed.

2. Select the program to be executed using the Cursor move keys 
. The number of the currently selected program is displayed in parentheses at the lower left of the screen. You can also select the program using the Alphanumeric keys.



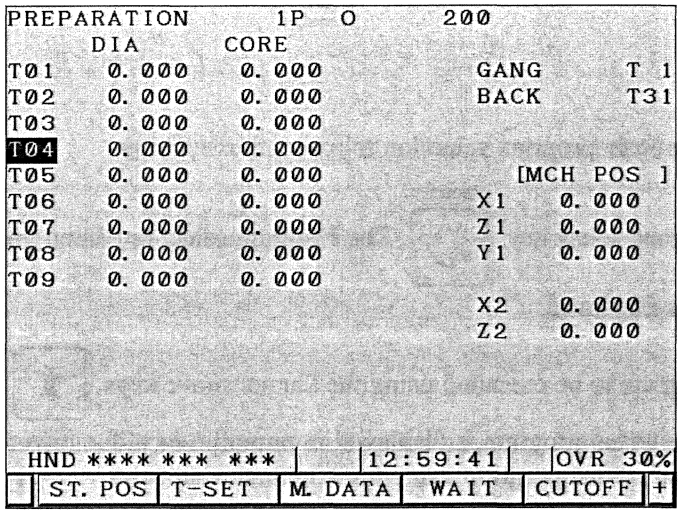
3. Press the Input key 

.

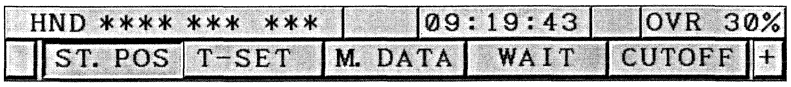
The selected program is called. The selected program number is displayed at the upper right of the screen.

4. Press the Preparation key 

. The Preparation key lamp goes on. The Preparation screen is displayed.



5. Press the menu key [ST.POS]. The menu key [ST.POS] is selected.



6. Confirm that the door is closed, then press the Start key 

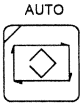
. The door is locked and the Start key lamp blinks.

7. Press the Start key 

. The lamp goes on and the machine moves to the start point.

⚠ WARNING

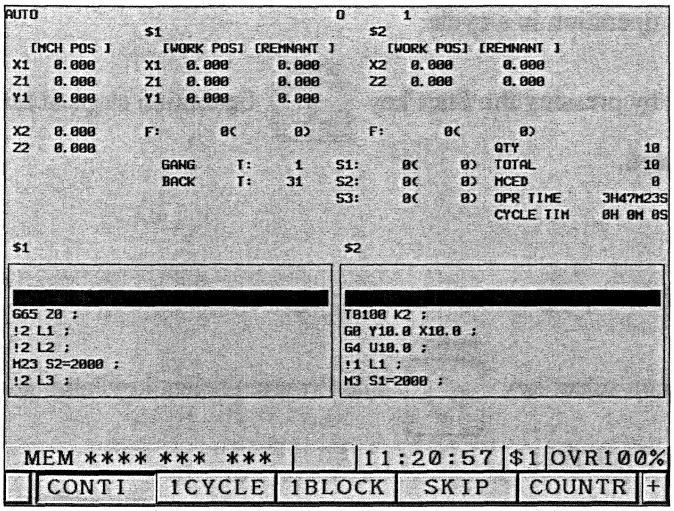
The machine may move suddenly while the Start key lamp goes on.
Be sure to keep hands away from the machine while the lamp is going on.

8. Press the Auto key 

.

The Auto key lamp goes on. The Auto screen is displayed.

9. Press the menu key [CONTI]. The menu key [CONTI] is selected.



10. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.

11. Press the Start key 

. The Start key lamp goes on.

12. The program is executed.

> **WARNING**
>
> **The machine may move suddenly while the Start key lamp goes on.**
> **Be sure to keep hands away from the machine while the lamp is going on.**

Notes

- If the door is open at the start of start position ([ST.POS]) operation, the door will not be locked.
- When the operation is completed, the Start key 

goes off.
- The operation is not executed with the door opened by door interlock function. To operate the machine, make sure to confirm that the door is closed, then press the Start key 

.

6.4.2 One cycle

Performs automatic operation in a cycle.

Operation is started by pressing the Start key (START). Operation stops at termination of a cycle, and the reset state is placed.

Procedure

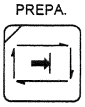
Operation sequence from program selection to program execution

1. Press the Program select key (SELECT.). The Program select key lamp goes on. The Program select screen is displayed.
2. Select the program to be executed using the Cursor move keys (↑) (↓). The number of the currently selected program is displayed in parentheses at the lower left of the screen. You can also select the program using the Alphanumeric keys.

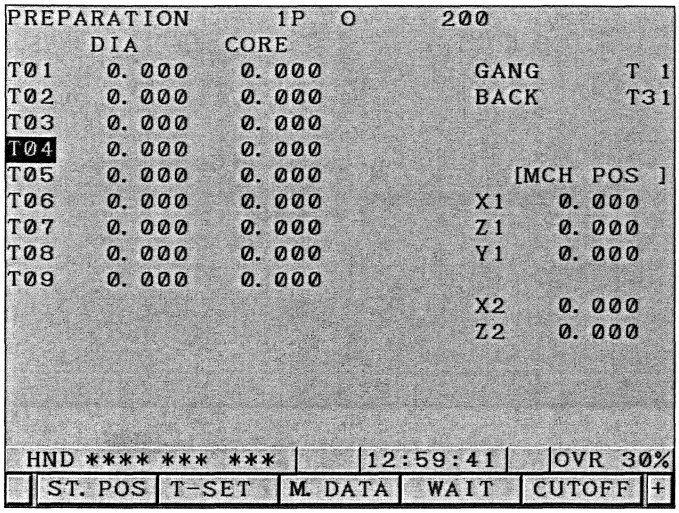
```
PROGRAM SELECT   1P  O
PROGRAM ENTRY      18    REMAIN       5
MEMORY SIZE     40960    REMAIN    8192
(PROGRAM)    (SIZE)   (CMNT)
          1      1536
         12      1536
*        22      1536   X1-LAZER
         31      1536   5565222
       1001      1536   X1-LAZER
*      1003      1536
*      1006      1536
       1007      1536
       1008      1536
       1009      1536

(         1)
EDIT **** *** ***  |    |14:49:00|    |OVR100%|
```

3. Press the Input key (INPUT).

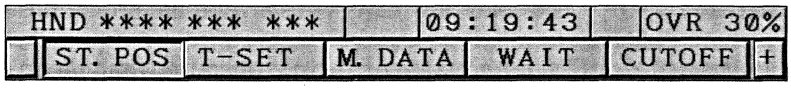
   The selected program is called. The selected program number is displayed at the upper right of the screen.

4. Press the Preparation key 

. The Preparation key lamp goes on. The Preparation screen is displayed.



5. Press the menu key [ST.POS]. The menu key [ST.POS] is selected.



6. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.

7. Press the Start key 

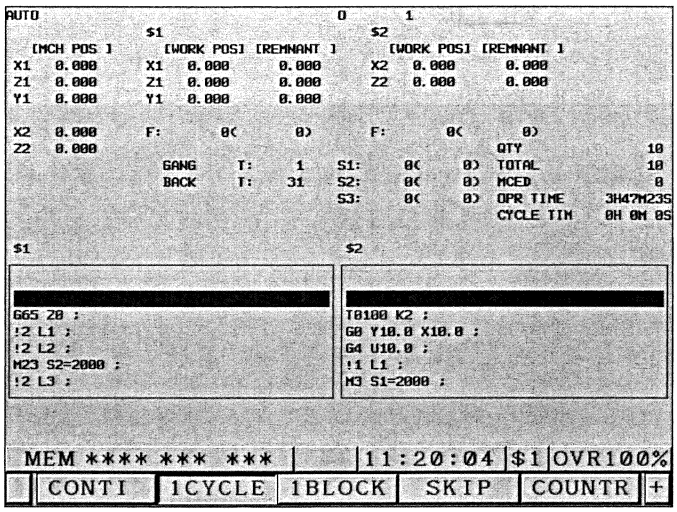
. The lamp goes on and the machine moves to the start point.

> **⚠ WARNING**
>
> **The machine may move suddenly while the Start key lamp goes on.**
> **Be sure to keep hands away from the machine while the lamp is going on.**

8. Press the Auto key 

. The Auto key lamp goes on. The Auto screen is displayed.

9. Press the menu key [1CYCLE]. The menu key [1CYCLE] is selected.



10. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.

11. Press the Start key 

. The Start key lamp goes on and the program is executed.
The Start key lamp goes off at termination of 1-cycle operation, and the machine stops.

> **WARNING**
>
> **The machine may move suddenly while the Start key lamp goes on.**
> **Be sure to keep hands away from the machine while the lamp is going on.**

Notes

- If the door is open at the start of start position ([ST.POS]) operation, the door will not be locked.
- When the operation is completed, the Start key 

goes off.
- The operation is not executed with the door opened by door interlock function. To operate the machine, make sure to confirm that the door is closed, then press the Start key 

.

6.4.3 One block

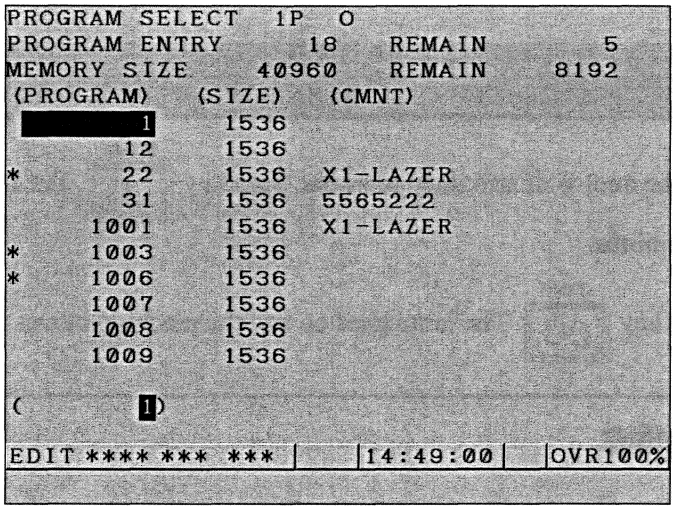
Performs automatic operation for each block.

Operation is started by pressing the Start key (START). Operation stops at termination of a block, and the reset state is placed.

Procedure

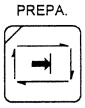
Operation sequence from program selection to program execution

1. Press the Program select key (SELECT.). The Program select key lamp goes on. The Program select screen is displayed.
2. Select the program to be executed using the Cursor move keys (↑) (↓). The number of the currently selected program is displayed in parentheses at the lower left of the screen. You can also select the program using the Alphanumeric keys.

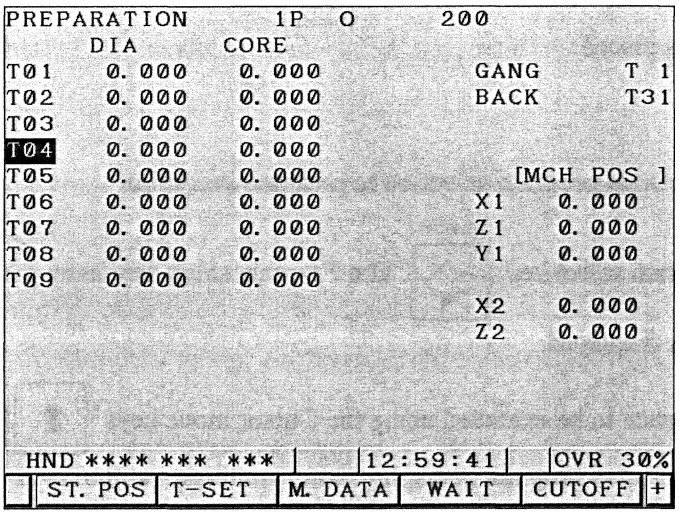


3. Press the Input key (INPUT).

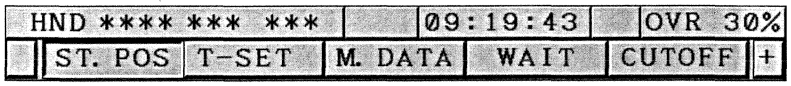
   The selected program is called. The selected program number is displayed at the upper right of the screen.

4. Press the Preparation key 

. The Preparation key lamp goes on. The Preparation screen is displayed.



5. Press the menu key [ST.POS]. The menu key [ST.POS] is selected.



6. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.

7. Press the Start key 

. The lamp goes on and the machine moves to the start point.

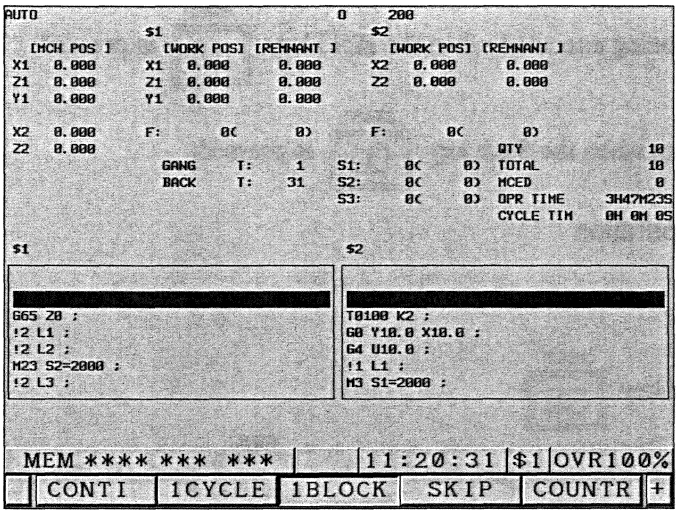
WARNING

The machine may move suddenly while the Start key lamp goes on.
Be sure to keep hands away from the machine while the lamp is going on.

8. Press the Auto key 

. The Auto key lamp goes on. The Auto screen is displayed.

9. Press the menu key [1BLOCK]. The menu key [1BLOCK] is selected.



10. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.

11. Press the Start key 

. The Start key lamp goes on and one program block is executed. The Start key lamp goes off.

12. If you want to continue program execution, press the Start key 

. The door is locked and the Start key lamp blinks.

13. Press the Start key 

. The Start key lamp goes on, and the next block is executed.

⚠ WARNING

The machine may move suddenly while the Start key lamp goes on.
Be sure to keep hands away from the machine while the lamp is going on.

Notes

- If the door is open at the start of start position ([ST.POS]) operation, the door will not be locked.
- When the operation is completed, the Start key 

goes off.
- The operation is not executed with the door opened by door interlock function. To operate the machine, make sure to confirm that the door is closed, then press the Start key 

.

6.4.4 Stopping and restarting automatic operation

Stops the program being executed when the Hold key 

is pressed.

The program restarts when the Start key 

is pressed.

Stopping automatic operation

Procedure

1. Press the Hold key 

.

   If all the spindles have stopped, the Start key 

goes off, the door lock is released, the Hold key lamp goes on, and then the machine stops.
   If any of spindles still rotates, the door lock is not released.

Restarting automatic operation

Procedure

1. Press the Start key 

. The door may be locked depending on the status of the door at that time. If the door is locked, press the Start key again.
   The Hold key 

lamp goes off, the Start key lamp goes on, then program execution is restarted.

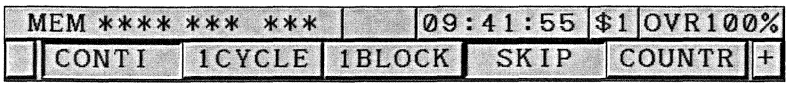
> **WARNING**
>
> **Do not put your hand or any other part of your body into the machine during automatic operation. Even when automatic operation is being paused, the spindle remains rotating, involving a potential risk of causing a fatal or severe injury.**

6.4.5 Skipping blocks

Ignores program blocks beginning with a slash (/) when the block skip function is enabled.

Procedure

1. Press the menu key [SKIP]. The menu key [SKIP] is selected. The block skip function is enabled. The skip lamp on the operation panel goes on.



Note

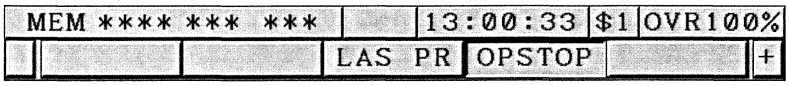
If "10 SKIP INHIBIT" on the operator's panel is 1 (enabled), block skip processing cannot be changed during automatic operation.
Set "10 SKIP INHIBIT" on the operator's panel to 0 (disabled) to change block skip processing.

6.4.6 Optional Stop (OPSTOP)

If Optional Stop is enabled, the program halts running at the M1 command in the program.

Procedure

1. Press the menu selection key ► to display the second-stage menu.
2. Press the menu key [OPSTOP]. The [OPSTOP] is selected and Optional Stop function is enabled.

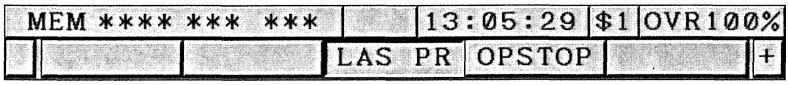


6.4.7 Last Program (LAS PR)

If Last Program is enabled, the last program of the currently selected program is executed.

Procedure

1. Press the menu selection key ► to display the second-stage menu.
2. Press the menu key [LAS PR]. The [LAS PR] is selected and Last Program function is enabled.

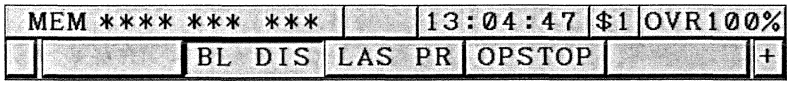


6.4.8 Disconnect Bar Loader (BL DIS)

If Disconnect Bar Loader function is enabled, the power status of the bar loader will not be checked.

Procedure

1. Press the menu selection key ► to display the second-stage menu.
2. Press the menu key [BL DIS]. The [BL DIS] is selected and Disconnect Bar Loader function is enabled.



6.5 Manual Operation

Operates machine axes individually. Manual operation is done through handles or MDI.

Procedure

1. Press the Manual operation key 

. The Manual operation key lamp goes on. The Manual operation screen is displayed.

6.5.1 Handle

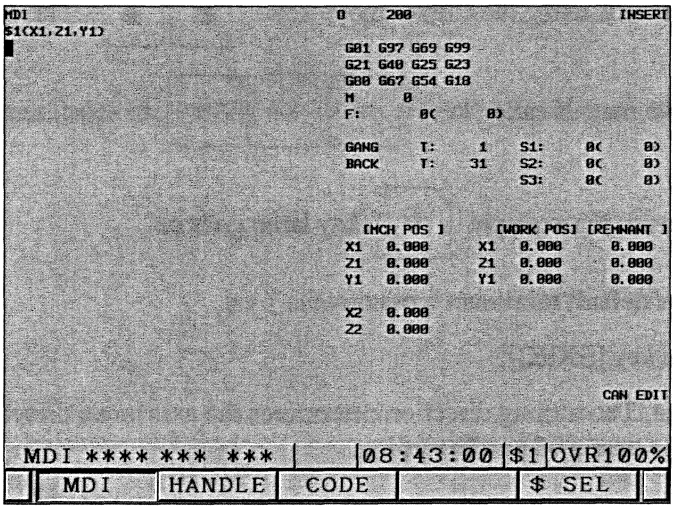
Turns the handle to move the axis. There are three move directions: the infeed direction (X) of the selected tool, core direction (Y), and longitudinal direction (Z).
For the back spindle, the axis moves only in X and Z directions.

Procedure

1. Press the Manual operation key 

.

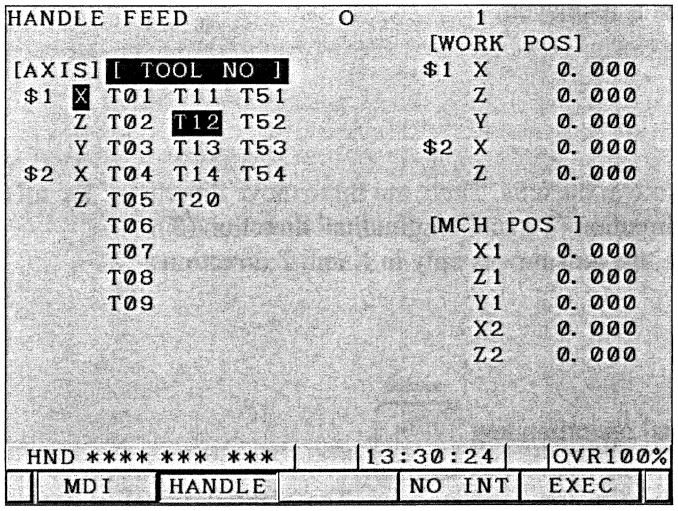
   The Manual operation key lamp goes on. The Manual operation screen is displayed.



2. Press the menu key [HANDLE]. The Handle feed screen is displayed with a tool number selected.

3. Select the desired tool number using the Cursor move keys [↑] [↓]. The selected tool number is reversed.
   For example, if you select 12, T12 is reversed.

4. Select the axis name using the Cursor move key [→].
   The AXIS name is reversed, and the TOOL NO reversed display is canceled.



5. Select the target axis using the Cursor move keys [↑] [↓]. The selected axis is reversed.

6. Press the Handle magnification keys [X1] [X10] [X100] to select magnification of × 1, × 10, or × 100.
   The pressed menu, for example [X1] key lamp goes on.

   In this case, the default minimum movement is 1 μm.

7. Press the menu key [EXEC].

8. Turn the handle. The turning direction determines the axis move direction. The axis moves according to the extent of handle turning.

Notes

- When the handle feed exceeds 2 m/min, the handle feed is clamped, then the axis may not move the same extent as handle turning.

> **CAUTION**
>
> **When moving the back spindle (Z2 axis) forward, be sure to move the back spindle to the center of front spindle, and select T0100, then select T3000. Otherwise, the drilling holder which is mounted on the tool post interferes with the back spindle, and it may cause a damage to the machine.**
> **As well, when the back spindle is in advance state, be sure not to issue a tool exchange command.**

- The menu key [EXEC] is automatically canceled when a certain time has elapsed with no operation invoked while the Handle Magnification key [X100] has been selected.

6.5.2 MDI

Creates and executes programs in MDI mode in the same manner as for registered programs.

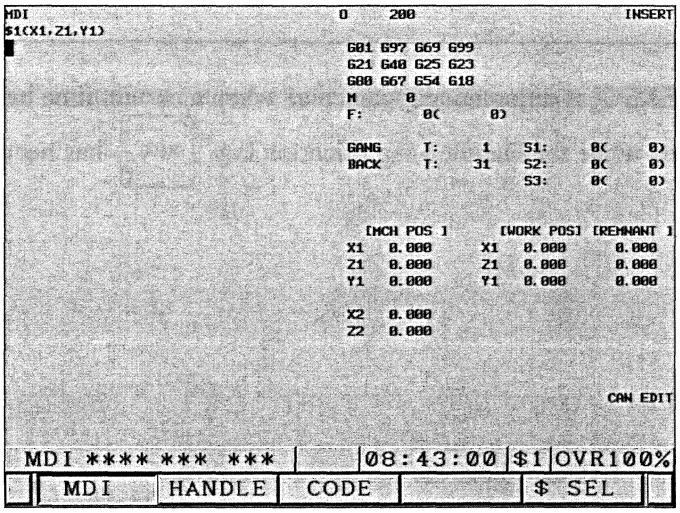
Procedure

1. Press the Manual operation key 

. The Manual operation key lamp goes on.

   The Manual operation screen is displayed.

2. Press the menu key [MDI]. The menu key [MDI] is selected.



3. Press the menu key [$ SEL] to select the axis control group to operate.
4. Enter the program. See <Section 6.7.2 Editing programs>.
5. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.
6. Press the Start key 

. The Start key lamp goes on and the program is executed.

   The program terminates. The Start key lamp goes off.

WARNING

The machine may move suddenly while the Start key lamp goes on.
Be sure to keep hands away from the machine while the lamp is going on.

Notes

- Make sure to close the door prior to execute MDI operation. With the cover opened, the machine will not work.
- The operation is not executed with the door opened by door interlock function. To operate the machine, make sure to confirm that the door is closed, then press the Start key 

.
- Pressing the menu key [$ SEL] toggles the axis control group.

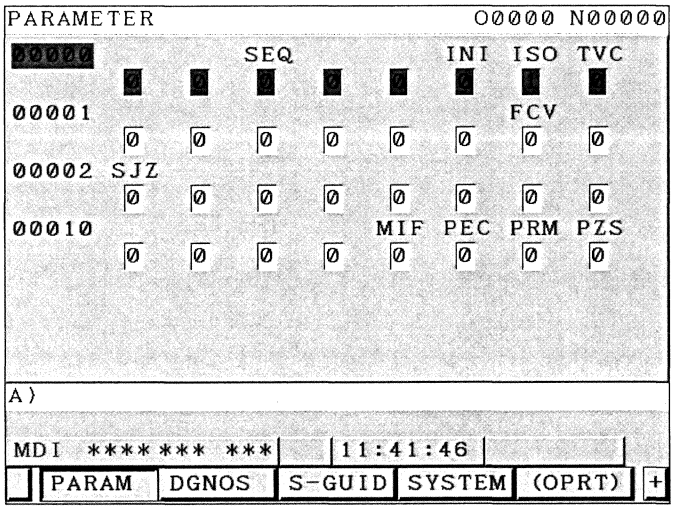
6.6 Maintenance

6.6.1 Return to zero point

Returns each axis (X1, Z1, Y1, X2, and Z2) to the zero point (origin) of the machine. Select the axis on the screen, then press the Start key (START) to return the axis to the zero point. This operation is not necessary in normal operation. It is required only when an alarm is issued requesting return to the zero point.

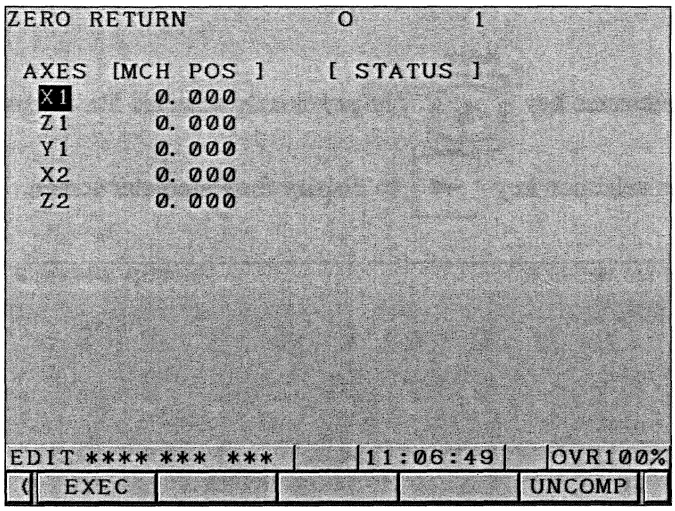
Procedure

1. Press the Maintenance key (MAINTE.). The previously selected Maintenance screen is displayed.Press the Menu selection key ◄ to display the Parameter screen.



2. Press the Menu selection key ► to display the menu key [RETURN]. Press the menu key [RETURN] to display the Return-to-zero-point screen.
3. Select the axis to be returned to the zero point by pressing the Cursor move keys ↑ ↓.

4. Press the menu key [EXEC].
5. Press the menu key [UNCOMP].
6. Turn off the NC power and circuit breaker.
7. Turn on the power of the machine according to power-on procedure.
8. Perform procedures 1 through 3 to select an axis to be returned to zero point.
9. Press the menu key [EXEC].



10. Confirm that the door is closed, then press the Start key 

. The door is locked and the Start key lamp blinks.
11. Press the Start key 

. The selected axis starts moving to the zero point. "INCOMPLETE" is displayed.
12. "COMPLETE" is displayed when the axis returns to the zero point.

⚠ WARNING

The machine may move suddenly while the Start key lamp goes on.
Be sure to keep hands away from the machine while the lamp is going on.

Notes

- The procedure applies if an alarm is issued requesting return to the zero point.
- Y axis can return to the zero point only when X axis has returned to the zero point.
- The operation is not executed with the door opened by door interlock function. To operate the machine, make sure to confirm that the door is closed, then press the Start key 

.

6.6.2 Mechanical adjustment

6.6.2.1 Handle feed

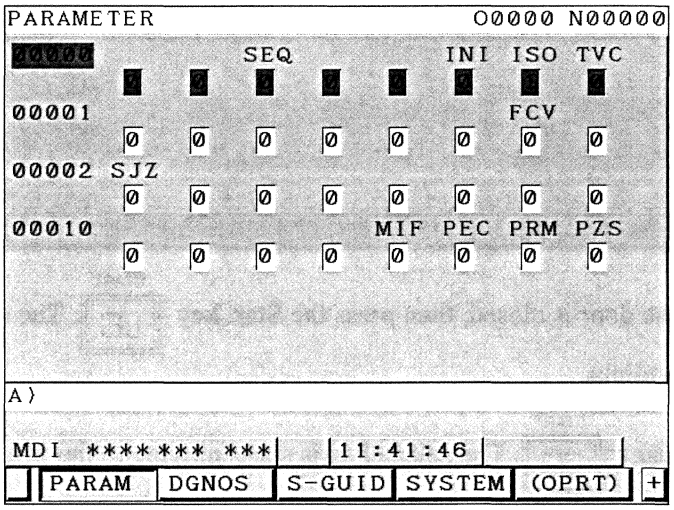
Moves the machine with machine coordinates (coordinates in feed screw direction) during mechanical adjustment.

Note that the coordinates are different from work coordinates or machine coordinates which are using the virtual X and Y axis coordinates.

Procedure

1. Press the Maintenance key (MAINTE.) . The previously selected Maintenance screen is displayed.

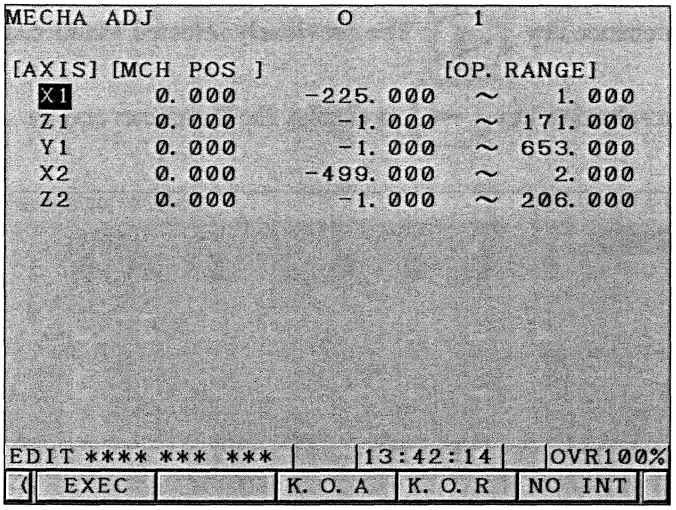
   Press the Menu selection key ◄ to display the Parameter screen.



2. Press the Menu selection key ► to display the menu key [MC-ADJ]. Press the menu key [MC-ADJ] to display the Mechanical adjustment screen.

3. Select the target axis using the Cursor move keys ↑ ↓ . The selected axis is selected.

4. Press the Handle magnification keys [X1] [X10] [X100] to select magnification of × 1, × 10, or × 100. The pressed menu, for example [X1] key lamp goes on.
   In this case, the default minimum movement is 1 μm.



5. Press the menu key [EXEC].
6. Turn the handle. The turning direction determines the axis move direction. The axis moves according to the extent of handle turning.

Notes

- When the handle feed exceeds 2 m/min, the handle feed is clamped, then the axis may not move the same extent as handle turning.

> **CAUTION**
>
> **When moving the back spindle (Z2 axis) forward, be sure to move the back spindle to the center of front spindle, and select T0100, then select T3000. Otherwise, the drilling holder which is mounted on the tool post interferes with the back spindle, and it may cause a damage to the machine.**

- The menu key [EXEC] is automatically canceled when a certain time has elapsed with no operation invoked while the Handle Magnification key [X100] has been selected.

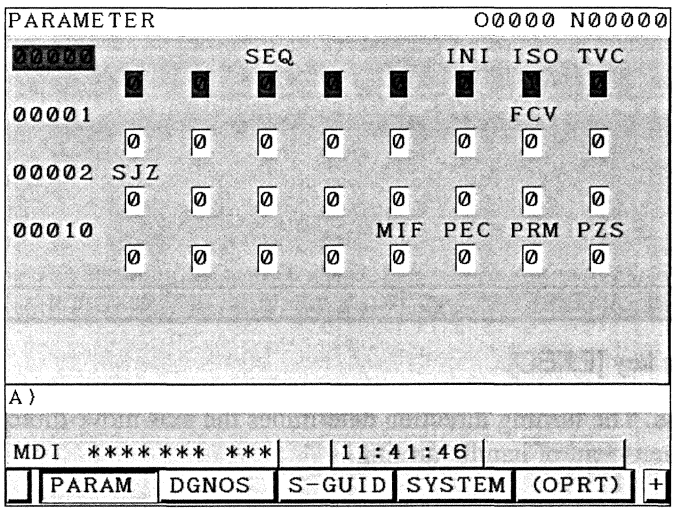
6.6.2.2 Knock-Out Advance

You can move the knock-out device forward during mechanical adjustment process.

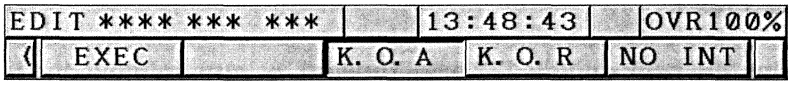
Procedure

1. Press the Maintenance key (MAINTE.)  . The previously selected Maintenance screen is displayed.

   Press the Menu selection key  to display the Parameter screen.



2. Press the Menu selection key  to display the menu key [MC-ADJ]. Press the menu key [MC-ADJ] to display the Mechanical adjustment screen.
3. Press the menu key [K.O.A]. The menu key [K.O.A] is selected.



4. Press the Start key (START)  . The Start key lamp goes on, and the knock-out device moves forward.

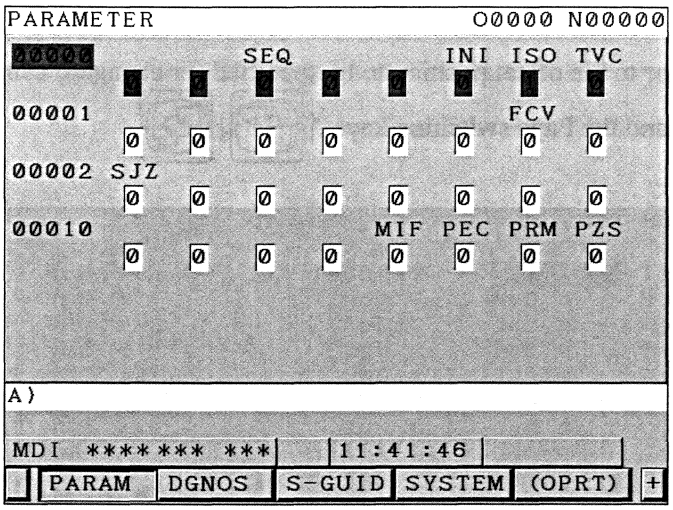
6.6.2.3 Knock-Out Retract

You can move the knock-out device backward during mechanical adjustment process.

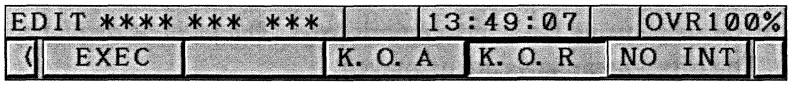
Procedure

1. Press the Maintenance key (MAINTE.) . The previously selected Maintenance screen is displayed.

   Press the Menu selection key ◄ to display the Parameter screen.



2. Press the Menu selection key ► to display the menu key [MC-ADJ]. Press the menu key [MC-ADJ] to display the Mechanical adjustment screen.
3. Press the menu key [K.O.R]. The menu key [K.O.R] is selected.

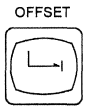


4. Press the Start key (START) . The Start key lamp goes on, and the knock-out device moves backward.

6.6.3 Offset

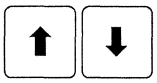
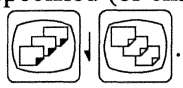
If the actual tool position is different from the tool position in the program, this function corrects the difference.

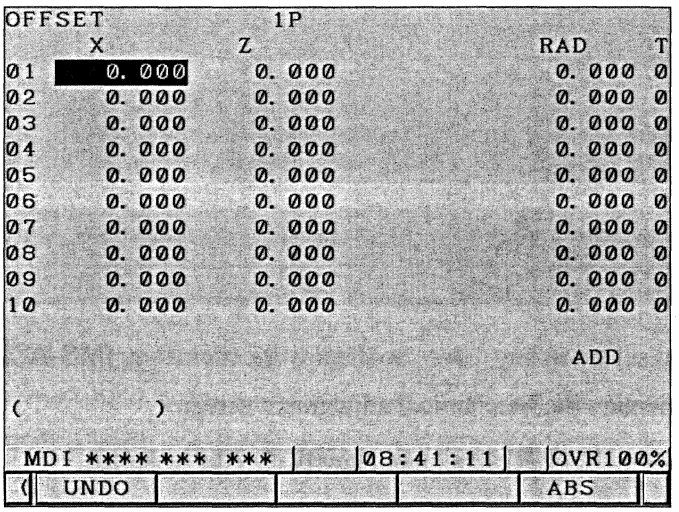
Procedure

1. Press the Offset key 

. The previously selected screen is displayed.

2. Press the menu key [OFFSET]. The menu key [OFFSET] is selected. The Offset screen is displayed.

3. Move the cursor to the offset position to be specified (or changed) using the Cursor move keys  and the Page switching keys  .



4. Enter the offset value using the Alphanumeric keys. The value is displayed at the lower left of the screen. The offset menu keys are displayed.

5. Press the menu key [INC] for Incremental Add or [ABS] for Absolute Add. (The selected method is displayed at the lower right of the screen.)

   The default setting is "Incremental Add".

6. Press the Input key 

.

   If you want to change a value, press the Cancel key 

to erase the entered value, then enter the new value.

7. If the entered value is incorrect, you can restore the latest offset data by pressing the menu key [UNDO].
   Note, however, the UNDO operation is available only once while the system is powered on. You cannot use UNDO function repeatedly.

Notes

- Offset value unit:
  With a decimal point: mm
  Without a decimal point: μm
- If the offset value is changed during automatic operation, the new offset value is not enabled with the cycle. It is enabled from the next cycle.

6.6.4 Operator's panel

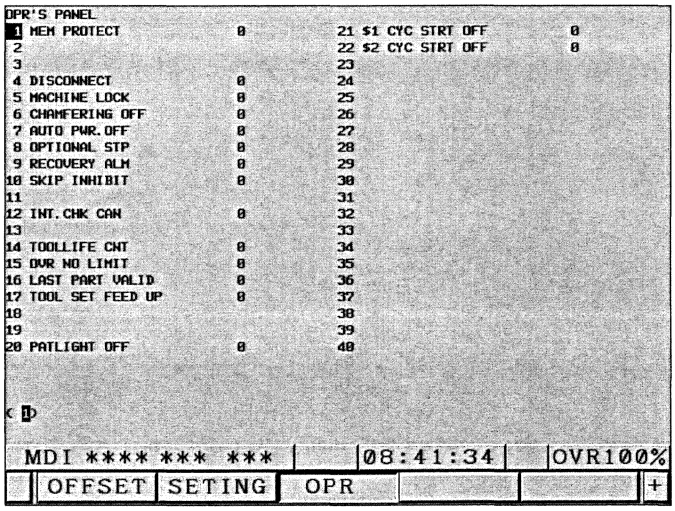
Substitutes for the functions of switches on the operation panel of the machine.

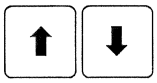
Procedure

1. Press the Offset key 

to select the offset mode. The previously selected screen is displayed.

2. Press the menu key [OPR].
   The menu key [OPR] is selected. The Operator's panel screen is displayed.



3. Specify the switch number using the Cursor move keys  or the Alphanumeric keys.

4. Press the Input key 

. 1 (ON) and 0 (OFF) are alternately displayed.

Explanation of the switches on the operator's panel when the setting value is 1:

1. MEM PROTECT: Inhibits the input and change of programs.
(Default: 0)

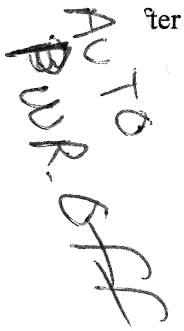
4. DISCONNECT: Checks the power of the bar feeder device. The bar feeder device is not disconnected when DISCONNECT is on. This switch is automatically turned off (setting value: 0) during screen transition of the automatic operation.
(Default: 0)
This switch is displayed only when the automatic bar loader is specified in the Machine structure screen.
This function can be turned on or off by pressing the menu key while running the program.

5. MACHINE LOCK: Locks the axis move command.
(Default: 0)

6. CHAMFERING OFF: Performs chamfering in threading cycles.
(Default: 0)

7. AUTO PWR.OFF: Automatically turns off the power if an alarm occurs during machine operation in continuous cycles.
Automatically tur vhen the machine is off-powered
(setting va
(De

8. OPTIONAL STP: ter executing a block with an M01



r off by pressing the menu key

pt for T11, has been
acing.
chine is off-powered

10. skip processing during automatic

12. IN When the interference check alarm appears, cancel the alarm by setting 1: ON, press Reset key. Then move the interfering axis from the interference area selecting the menu key [MC-ADJ]. Automatically turns off when the machine is off-powered (setting value: 0).
(Default: 0)
This function can be turned on or off by pressing the menu key on Preparation or Manual Operation screen.

14. TOOLLIFE CNT:
Select the count systems of the tool life management function (optional).
0: Used count 1: Time count
(Default: 0)
This switch is not displayed unless the optional setting is performed.

15. OVR NO LIMIT:
Sets the upper limit for feed rate override.
1: Upper limit 200% 0: Upper limit 100%.
(Default: 0)

16. LAST PART VALID:
When executing the last program set "1: VALID".
(Default: 0)
This function can be turned on or off by pressing the menu key while running the program.

17. TOOL SET FEED UP:
Sets the feedrate when setting tool with the door being closed.
1: 10 m/min 0: 2 m/min
(Default: 0)

20. PATLIGHT OFF:
Disables 3-step signal tower and patrol light.
(Default: 0)

21. $1 CYC STRT OFF:
Does not run the program of $1.
(Default: 0)

22. $2 CYC STRT OFF:
Does not run the program of $2.
(Default: 0)

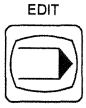
CAUTION

After escaped from an interference area, make sure to change setting of "No. 12 INT. CHK CAN" to 0: OFF. If the machine is operated with [MC-ADJ] with the setting remained unchanged, the tool post will interfere, causing severe machine damage.

6.7 Creating and Editing Programs

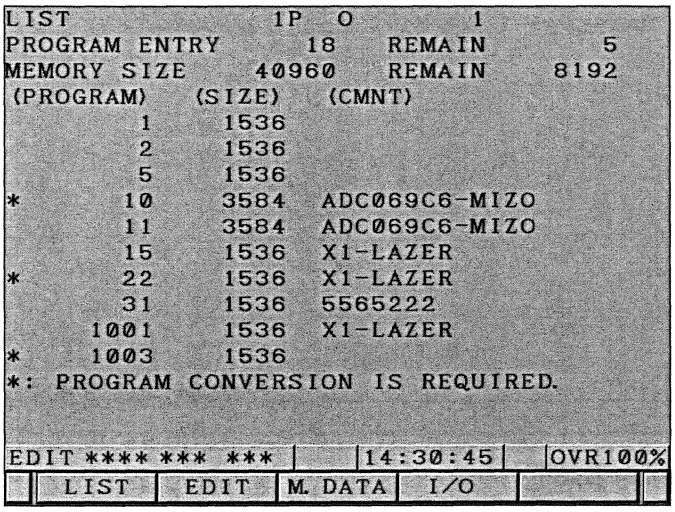
Creates and edits programs and displays the program list. (List used for each program, program editing, machining data for operation, and input/output for communication with external devices)

Procedure

1. Press the Edit key 

.

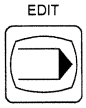
   The initial Edit screen or the previously selected screen is displayed.



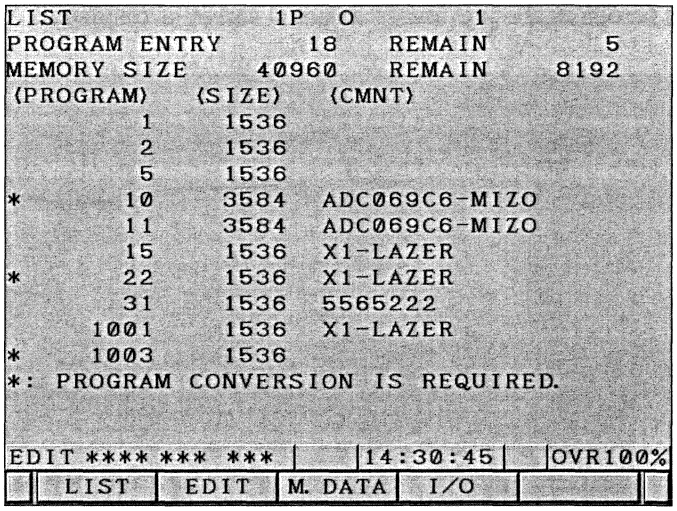
6.7.1 Program list

Enables editing for each program. (Program call, deletion, and copy, and comment description)

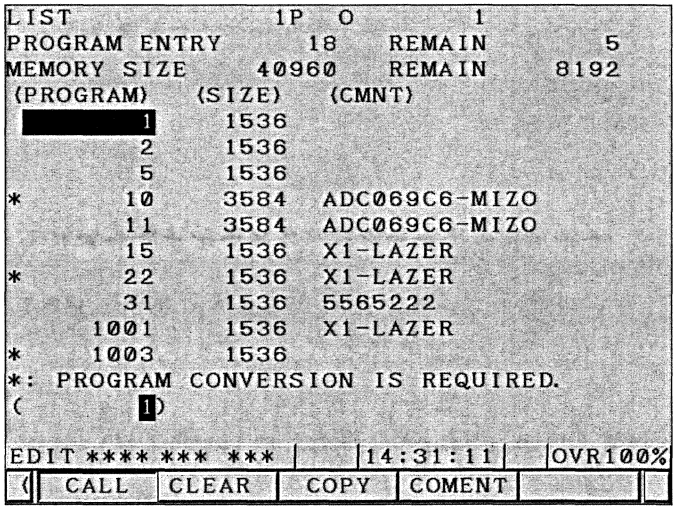
Procedure

1. Press the Edit key 

. The Edit screen is displayed.



2. Press the menu key [LIST].
   The program number is displayed in reverse video if the program to edit has been selected. If no program is selected, the program number on the first line is displayed in reverse video. The new menu keys are displayed with [CALL] selected.



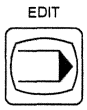
Notes

- Press the Menu selection key ◄ to switch the List screen (program call enabled state) to the initial Edit screen.
- If the program is input by IN/OUT function, its program number is preceded with an asterisk (*). The program code of such a program must be converted.

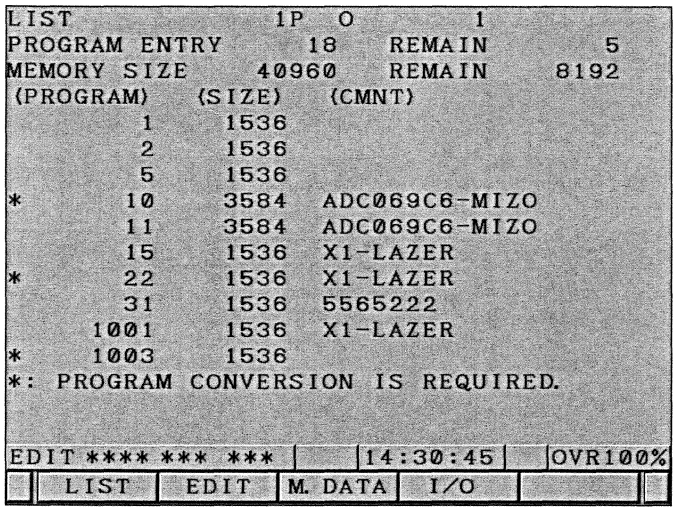
Calling programs

Calls a program into the work area for program editing.

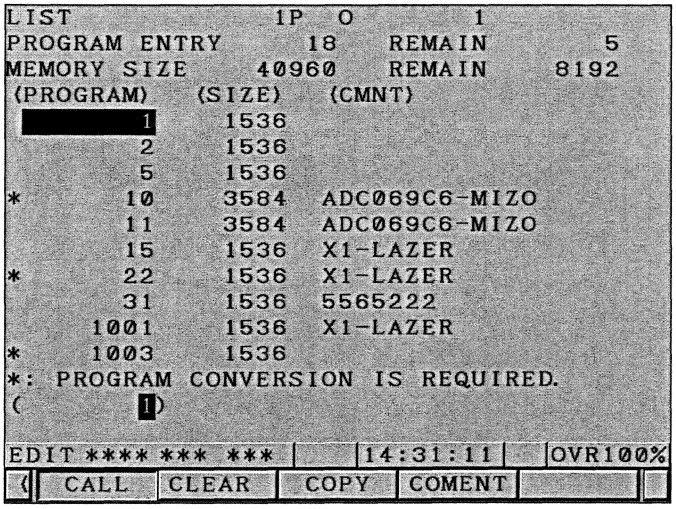
Procedure

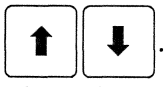
1. Press the Edit key 

. The initial Edit screen is displayed.



2. Press the menu key [LIST].
   The program number is displayed in reverse video if the program to edit has been selected. If no program is selected, the program number on the first line is displayed in reverse video. The new menu keys are displayed with [CALL] selected.



3. Select the desired program number using the Cursor move keys 
. The selected program number is reversed. You can also select the program number using the Alphanumeric keys.
   To create a new program, enter a new number (not included in the list) pressing the Alphanumeric keys.

4. Press the Input key 

. The selected program is called.

CAUTION

Do not specify 9000s for the program number you are creating.
The created program may fail to run correctly because these numbers are used for the system software or user macro program.

Deleting programs

Deletes programs from the memory area.

Procedure

1. Set the Program protection select key to "O" to cancel the protection.
2. Press the Edit key (EDIT). The initial Edit screen is displayed.

```
LIST              1P  O        1
PROGRAM ENTRY       18    REMAIN        5
MEMORY SIZE      40960    REMAIN     8192
(PROGRAM)    (SIZE)    (CMNT)
          1      1536
          2      1536
          5      1536
*        10      3584   ADC069C6-MIZO
         11      3584   ADC069C6-MIZO
         15      1536   X1-LAZER
*        22      1536   X1-LAZER
         31      1536   5565222
       1001      1536   X1-LAZER
*      1003      1536
*: PROGRAM CONVERSION IS REQUIRED.

EDIT **** *** ***      14:30:45     OVR100%
 | LIST | EDIT | M. DATA | I/O |
```

3. Press the menu key [LIST].
   The program number is displayed in reverse video if the program to edit has been selected. If no program is selected, the program number on the first line is displayed in reverse video. The new menu keys are displayed with [CALL] selected.
4. Press the menu key [CLEAR]. The menu key [CLEAR] is selected.

```
LIST              1P  O        1
PROGRAM ENTRY       18    REMAIN        5
MEMORY SIZE      40960    REMAIN     8192
(PROGRAM)    (SIZE)    (CMNT)
          1      1536
          2      1536
          5      1536
*        10      3584   ADC069C6-MIZO
         11      3584   ADC069C6-MIZO
         15      1536   X1-LAZER
*        22      1536   X1-LAZER
         31      1536   5565222
       1001      1536   X1-LAZER
*      1003      1536
*: PROGRAM CONVERSION IS REQUIRED.
(        1)

EDIT **** *** ***      17:11:19     OVR100%
( CALL | CLEAR | COPY | COMENT |
```

5. Select the desired program number using the Cursor move keys (↑) (↓). The selected program number is reversed. You can also select the program number using the Alphanumeric keys.

6. Press the Input key 

.

7. The message appears on the screen.
   Press the Input key 

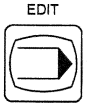
to delete the program, or press the Cancel key 

to abort.

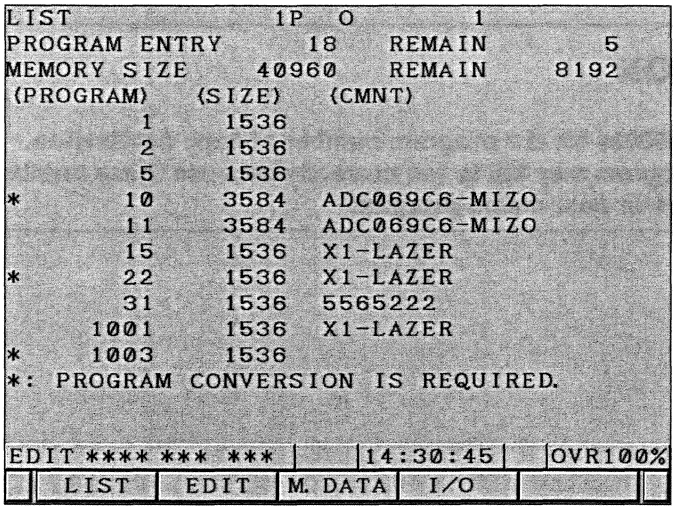
Copying programs

Copies a program and registers the program with a new program number in the memory area.

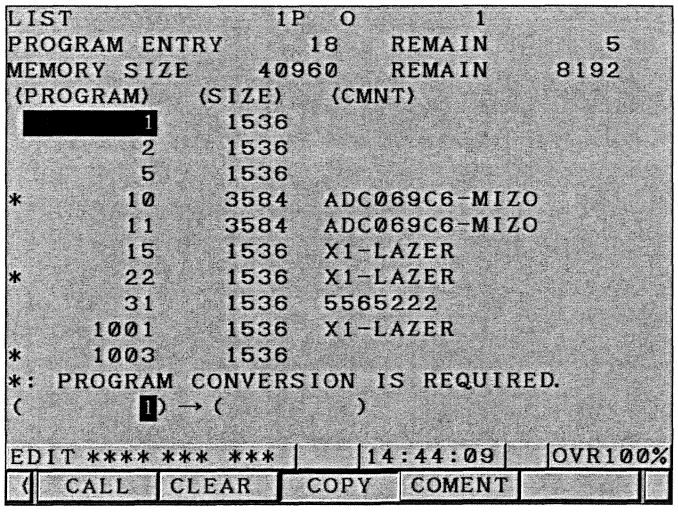
Procedure

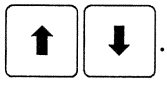
1. Set the Program protection select key to "O" to cancel the protection.
2. Press the Edit key 

. The initial Edit screen is displayed.



3. Press the menu key [LIST].
   The program number is displayed in reverse video if the program to edit has been selected. If no program is selected, the program number on the first line is displayed in reverse video. The new menu keys are displayed with [CALL] selected.
4. Press the menu key [COPY]. The menu key [COPY] is selected.



5. Select the copy source program number using the Cursor move keys 

. The selected program number is reversed. You can also select the program number using the Alphanumeric keys.

6. Move the cursor into parentheses on the right side using the Cursor move key  .

   (1) → (▌)

7. Enter the copy destination program number using the Alphanumeric keys.

   (1) → (10▌)

8. Press the Input key  . The selected copy source program is copied and registered with the copy destination program number.

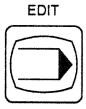
CAUTION

Do not specify 9000s for the program number of copy destination.
The created program may fail to run correctly because these numbers are used for the system software or user macro program.

Describing comments

Describes a comment in a program and registers the comment in the memory area.

Procedure

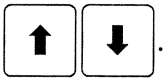
1. Set the Program protection select key to "O" to cancel the protection.
2. Press the Edit key 

. The initial Edit screen is displayed.

```
LIST              1P  O        1
PROGRAM ENTRY       18   REMAIN       5
MEMORY SIZE      40960   REMAIN    8192
(PROGRAM)   (SIZE)   (CMNT)
          1     1536
          2     1536
          5     1536
*        10     3584  ADC069C6-MIZO
         11     3584  ADC069C6-MIZO
         15     1536  X1-LAZER
*        22     1536  X1-LAZER
         31     1536  5565222
       1001     1536  X1-LAZER
*      1003     1536
*: PROGRAM CONVERSION IS REQUIRED.

EDIT **** *** ***     |14:30:45|   |OVR100%|
 | LIST | EDIT | M. DATA | I/O |          |
```

3. Press the menu key [LIST].
   The program number is displayed in reverse video if the program to edit has been selected. If no program is selected, the program number on the first line is displayed in reverse video. The new menu keys are displayed with [CALL] selected.
4. Press the menu key [COMENT]. The menu key [COMENT] is selected.

```
LIST              1P  O        1
PROGRAM ENTRY       18   REMAIN       5
MEMORY SIZE      40960   REMAIN    8192
(PROGRAM)   (SIZE)   (CMNT)
          1     1536
          2     1536
          5     1536
*        10     3584  ADC069C6-MIZO
         11     3584  ADC069C6-MIZO
         15     1536  X1-LAZER
*        22     1536  X1-LAZER
         31     1536  5565222
       1001     1536  X1-LAZER
*      1003     1536
*: PROGRAM CONVERSION IS REQUIRED.
(        1)     (                    )

EDIT **** *** ***     |14:44:36|   |OVR100%|
( | CALL | CLEAR | COPY | COMENT |          |
```

5. Select the desired program number using the Cursor move keys 
. The selected program number is reversed. You can also select the program number using the Alphanumeric keys.

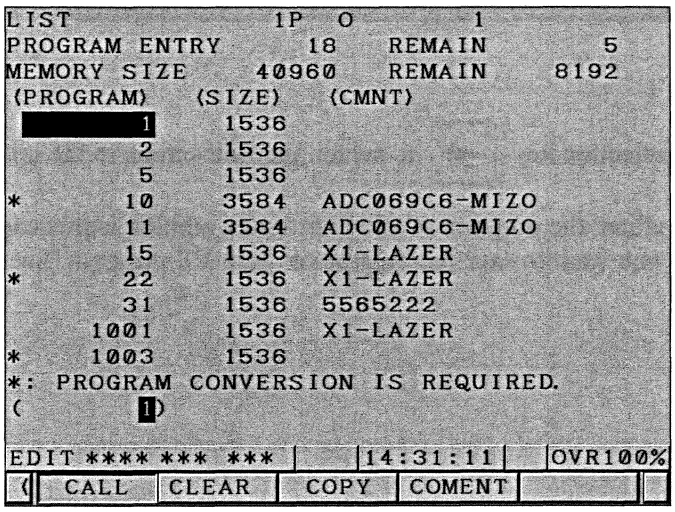
6. Move the cursor into parentheses on the right side using the Cursor move key  .
7. Enter the comment using the Alphanumeric keys. Up to 20 characters can be entered.
8. Press the Input key  . The comment is described in the selected program.

6.7.2 Editing programs

Edits programs. (Word insertion, change, and deletion, line deletion, copy, and move, and word search and replacement)

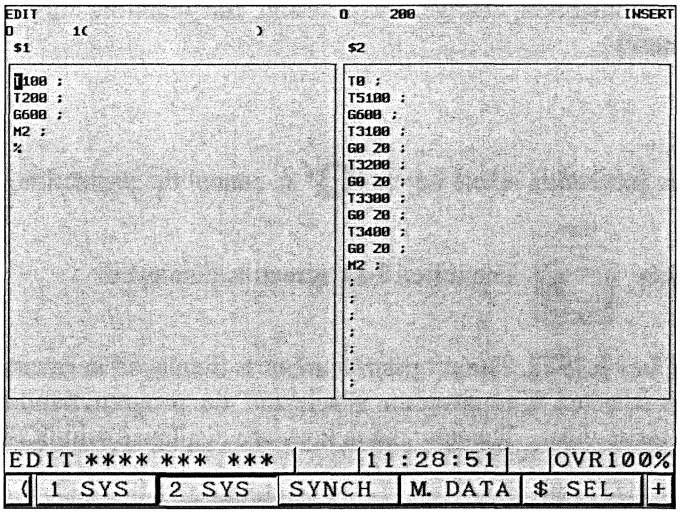
Procedure

1. Set the Program protection select key to "O" to cancel the protection.
2. Press the Edit key (EDIT). The initial Edit screen is displayed.
3. Press the menu key [LIST]. The program number is displayed in reverse video if the program to edit has been selected. If no program is selected, the program number on the first line is displayed in reverse video. The new menu keys are displayed with [CALL] selected.



4. Select the desired program number using the Cursor move keys (↑) (↓). The selected program number is reversed. You can also select the program number using the Alphanumeric keys.
5. Press the Input key (INPUT). The selected program is called.

6. The screen is switched and the program is displayed.



Notes

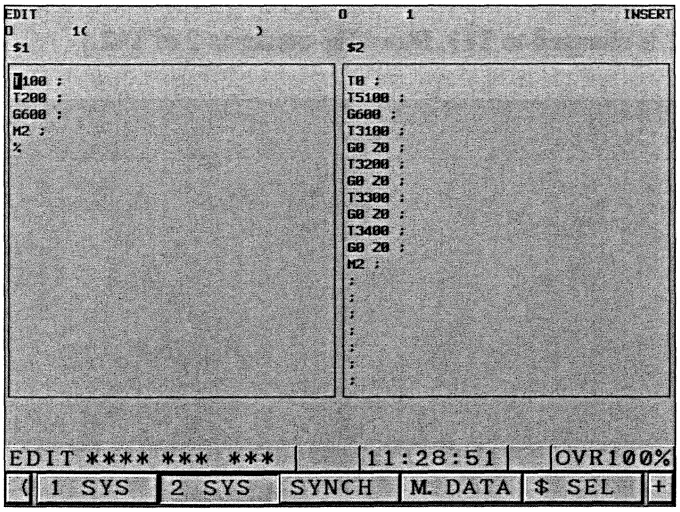
- Press the Menu selection key ◄ to switch the Edit screen to the initial Edit screen.
- When you have edited the program of which program number is preceded with an asterial (*), specify whether you want to save the program as A20 VII program. See <6.7.4 Program Conversion>.

Word insertion

The default setting is Insert mode. "INSERT" is displayed on the upper right of the screen.

Procedure

1. Move the cursor to the insertion position by pressing the Cursor move keys ↑ ↓ ← →.

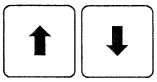
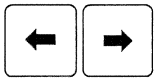


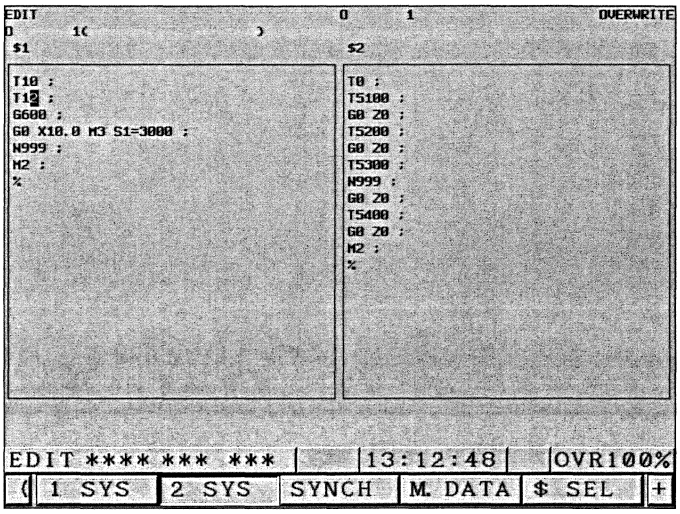
2. Enter a character using the alphanumeric key.
3. Press the Input key [INPUT ⇨]. The insertion is confirmed.

Word change

Procedure

1. Press the Insert key 

to change to overwrite mode. The display on the upper right of the screen will change to "OVERWRITE".
2. Move the cursor to the word to be changed by pressing the Cursor move keys   .
(Example: T12 is changed to T13. Move the cursor to 2 of T12.)



3. Enter a new word using the Alphanumeric keys. (Example: Enter 3.)
4. Press the Input key 

. The alteration is confirmed.
T12 is changed to T13.

Note

Pressing the Insert key 

in Word Change enters overwrite mode.

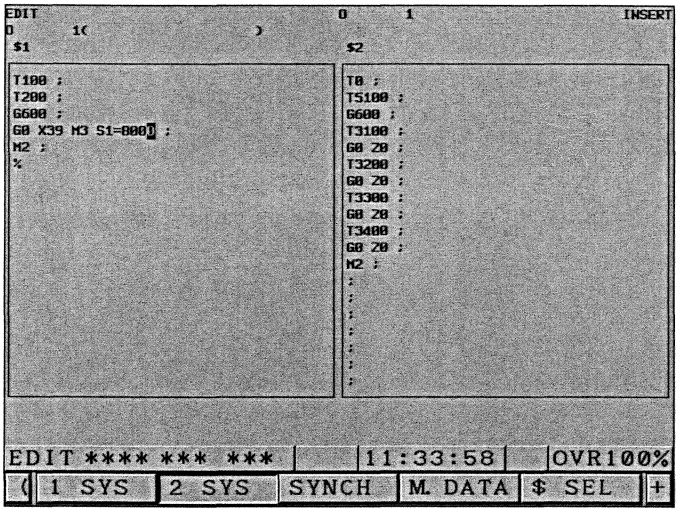
Pressing the Input key 

in Word Change enters insert mode.

Word deletion

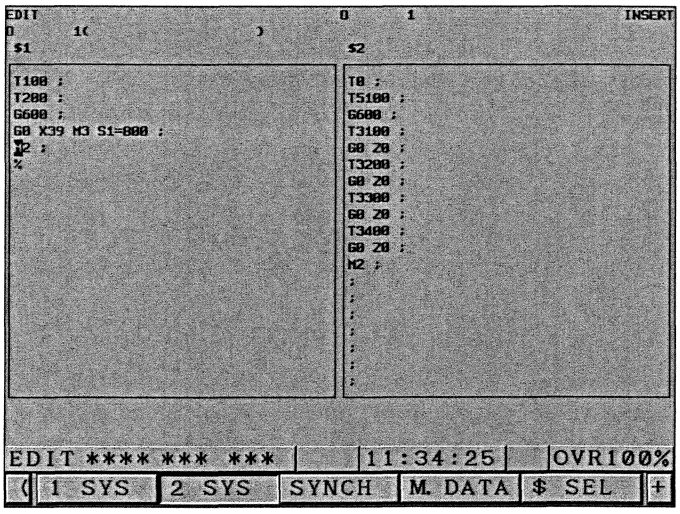
Procedure

1. Move the cursor to the word to be deleted by pressing the Cursor move keys ⬆ ⬇ ⬅ ➡.
   (Example: S8000 is changed to S800. Move the cursor to 0 of S8000.)



2. Press the Delete key [DEL]. The word is deleted.
   (0 is deleted.)

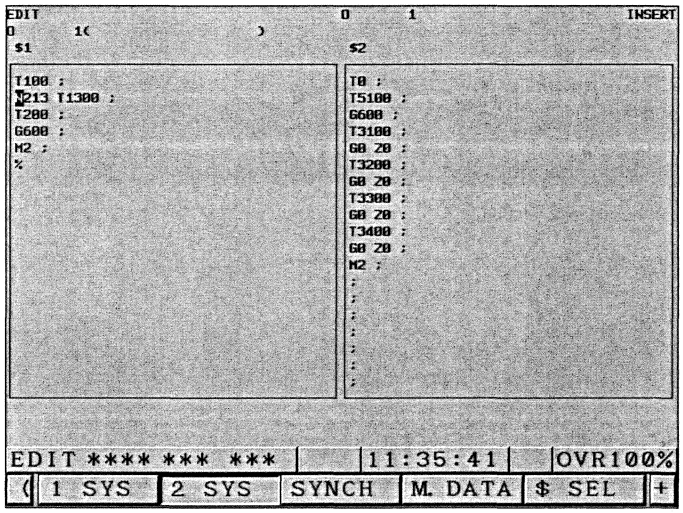
3. Press the Input key [INPUT]. The deletion is confirmed.
   (S1=8000 is changed to S1=800.)



Line deletion

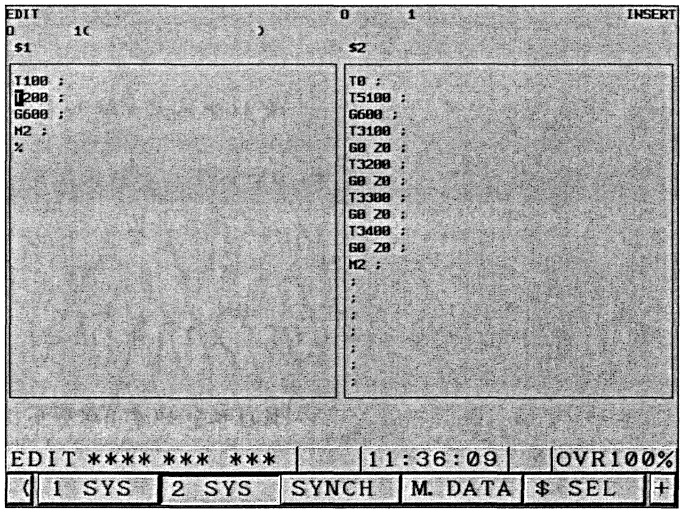
Procedure

1. Move the cursor to the line to be deleted by pressing the Cursor move keys ↑ ↓ ← →.
   (Example: Move the cursor to the line of N213 T1300;.)



2. Press the Cancel key [CAN]. The line is deleted.
   (The line of N213 T1300; is deleted.)

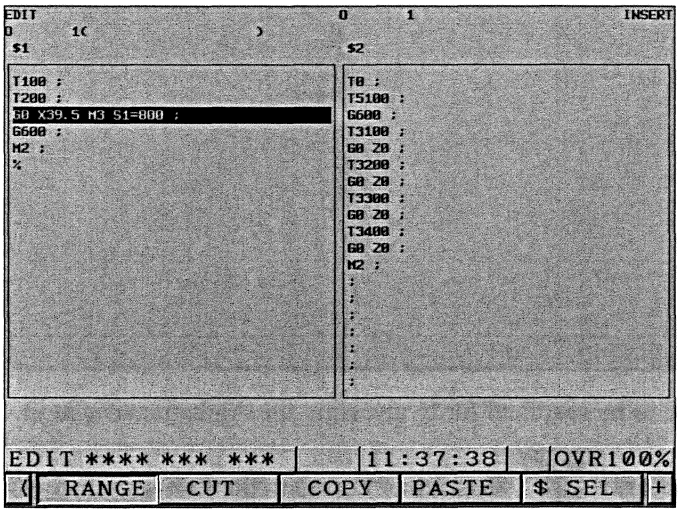
3. Press the Input key [INPUT]. The deletion is confirmed.
   (The line of N213 T1300; is deleted.)



Line copy and pastes

Procedure

1. Move the cursor to the first copy line by pressing the Cursor move keys ⬆ ⬇ ⬅ ➡.
2. Press the menu selection key ►, then press the menu key key [RANGE]. The first copy line is selected.



3. Move the cursor to the last copy line by pressing the Cursor move keys ⬆ ⬇. The lines from the line selected in 2 and the line selected in 3 are reversed.
4. Press the menu key [COPY]. The last copy line is selected. The reversed lines are switched back to normal display and stored to the internal memory.
5. Move the cursor to the copy destination line by pressing the Cursor move keys ⬆ ⬇ ⬅ ➡.
6. Press the menu key [PASTE]. The lines are copied.

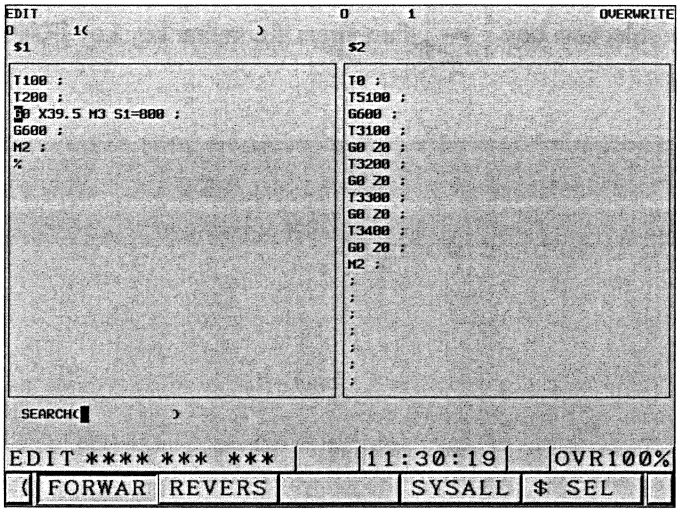
Note

Press the Cancel key CAN to cancel copy operation.

Word search

Procedure

1. Press the menu selection key [►] twice, then press the menu key [SEARCH]. The Search screen appears.
   The menu key [FORWAR] is selected.



2. Enter the word to be searched for by pressing the Alphanumeric keys.
3. Press the Input key [INPUT ⇨]. The cursor moves to the first-searched word.
4. Press the Input key [INPUT ⇨] to move the cursor to the next word.
5. To search a word toward the beginning, press the menu key [REVERS].
6. Repeat Steps 2. to 4. to search a word.
7. To search a word in programs for all axis control groups, press the menu key [SYSALL].
8. Select search direction by pressing [FORWAR] or [REVERS], and repeat Steps 2. to 4.

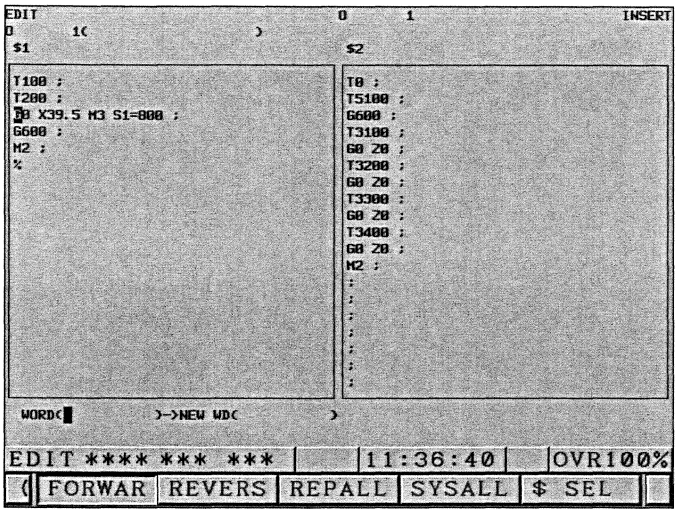
Note

Press the Cancel key [CAN //] to cancel search operation.

Word replacement

Procedure

1. Press the menu selection key ► twice, then press the menu key [REPL]. The Replace screen appears.
   The menu key [FORWAR] is selected.



2. Enter the word to be replaced and the replacement word by pressing the Alphanumeric keys.
3. Press the Input key INPUT. The cursor moves to the word to be replaced.
4. Press the menu key [REPL] to replace the word.

   The word is replaced whenever the menu key [REPL] is pressed.
5. Press the Input key INPUT to move the cursor to the next word without replacement.
6. To replace a word toward the beginning, press the menu key [REVERS].
7. Repeat Steps 2. to 5. to replace a word.
8. To replace all of the character strings found in the program with the specified character string, press the menu key [SYSALL].
9. Enter the wod to be replaced in the "WORD" text box, and the new word in the "NEW WD" text box, using the alphanumeric key.
10. The confirmation message appears when you press the Input key INPUT.
11. When you press the Input key INPUT again, all the words found in program are replaced.
12. To replace a word in programs for all axis control groups, press the menu key [SYSALL].
13. Select replace direction by pressing [FORWAR] or [REVERS], and repeat Steps 2. to 5. Or, press [SYSALL] to replace all the words.

Note

Press the Cancel key 

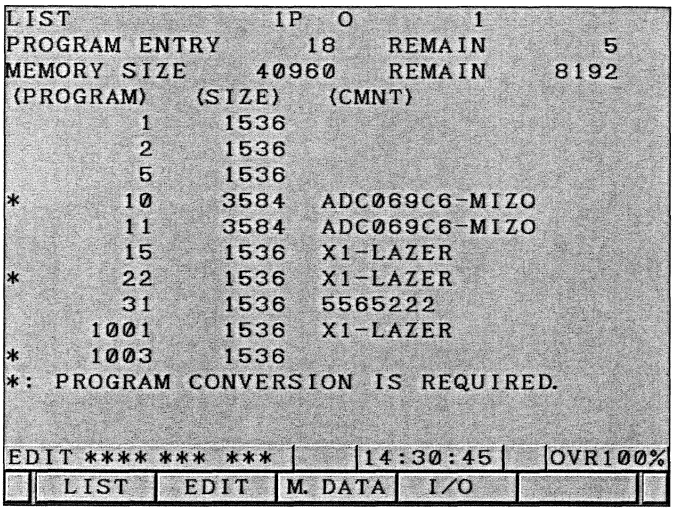
to cancel replacement operation.

6.7.3 Specifying machining data

Specifies machining data (e.g., material diameter, tool positioning point, and machining length) required for operation.

Procedure

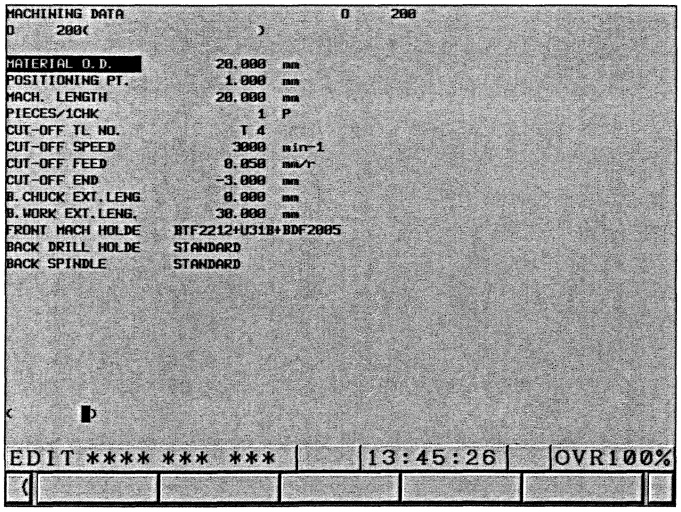
1. Press the Edit key (EDIT) . The Edit screen is displayed.



2. Press the menu key [M.DATA]. The menu key [M.DATA] is selected. The Machining data screen is displayed.

3. Select the desired item by pressing the Cursor move keys ↑ ↓ . The selected item is reversed.

4. Specify data using the Alphanumeric keys.



5. Press the Input key (INPUT) . The data is set in the selected item field.

Notes

- Press the Menu selection key  to switch the Machining data screen to the initial Edit screen.
- Call the program before starting machining data setup.
- When the program is input/output between A20L and A20R, be sure to select again the "FRONT MACH HOLDER" and "BACK SPINDLE" on the machining data.
  If not, the program selection is disabled with the error message "ILLEGAL VALUE IN MACHINING DATA".

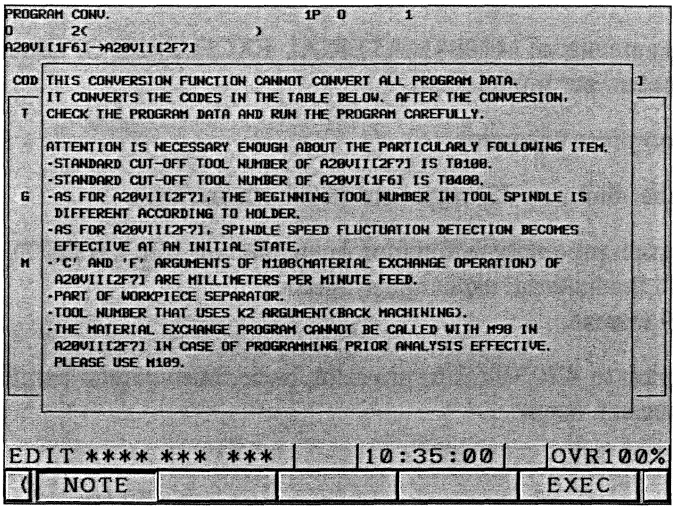
6.7.4 Program Conversion

Outline

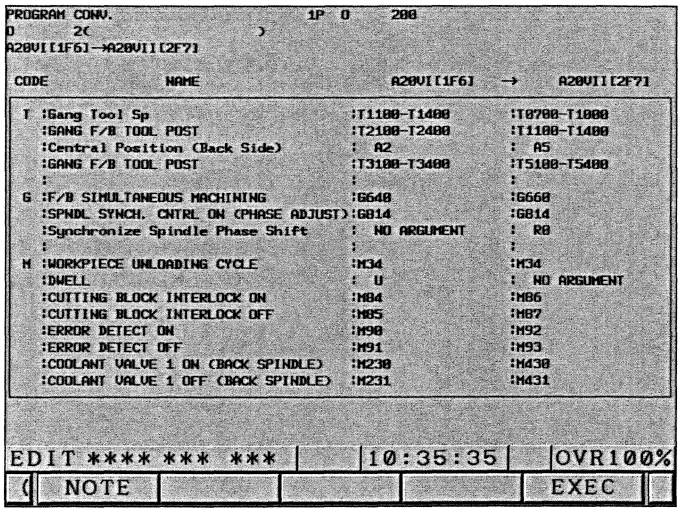
Use this function to convert the machining program for A20 VI model machine to A20 VII model machine, or vice versa. The program can be converted automatically.

Procedure

1. Display the Edit screen according to steps in <6.7.2 Editing programs>.
2. Press the menu selection key [►] three times, then press the menu key [CONV].
3. The system automatically identifies that the program is written for A20 VI (1F6) or A20 VII (2F7), and displays the Program Conversion screen.



4. Read the on-screen precautions carefully, then press the menu key [NOTE].



5. Confirm the program code you intend to convert, then press the menu key [EXEC].
6. The confirmation message appears. When you press the Input key [INPUT], conversion starts automatically.

Notes

- Before converting a program for A20 VI to that for A20 VII, specify the tool pattern of the front machining holder (FRONT MACH HOLDE) on the Machining Data screen.
- The program conversion function cannot convert the entire program data. Check the available codes on the screen. After conversion, check the program data and run the program carefully. Attention is necessary enough about the particularly following item.
  - Standard cut-off tool number of A20 VII (2F7) is T0100.
  - Standard cut-off tool number of A20 VI (1F6) is T0400.
  - As for A20 VII (2F7), the beginning tool number in tool spindle is different according to holder.
  - As for A20 VII (2F7), Spindle speed fluctuation detection becomes effective at an initial state.
  - C and F arguments of M108 (MATERIAL EXCHANGE OPERATION) of A20 VII (2F7) are millimeters per minute feed.
  - Part of workpiece separator.
  - Tool number that uses K2 argument (Back Machining).
  - If the program pre-analysis function is enabled on A20 VII (2F7), the M98 command cannot call the material exchange program.
    Use M109 instead.
  - In conversion to A20 VI (1F6) program, back chuck extend length is not added and interference can occur.

Saving program for A20 VII on Edit screen

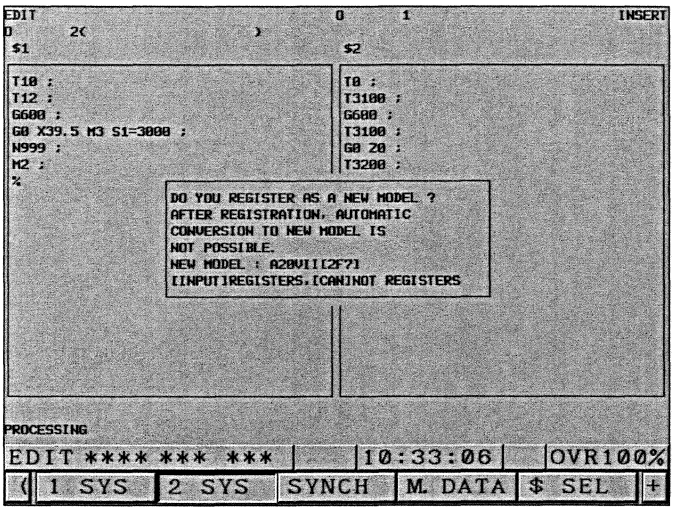
If you have edited the program that is preceded with an asterisk (*) on the LIST screen, you can save it as a program for A20 VII (2F7).

Procedure

1. Edit the program on Edit screen, then press the Input key 

.

2. The confirmation message as shown below appears.



3. Press the Input key 

to register, or Cancel key 

to abort.

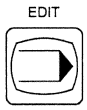
Note

If the program is registered as a program for A20 VII (2F7), it appears on Program Conversion screen as a program to be converted to A20 VI (1F6).

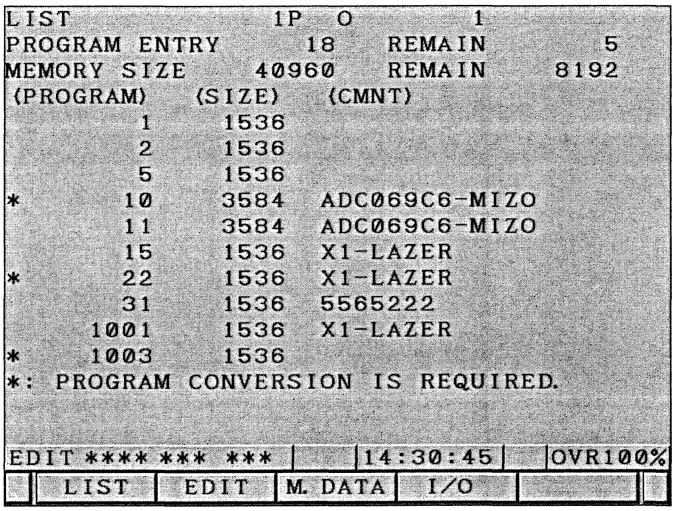
6.7.5 Program input and output (RS-232C)

Enables program file transfer between memory and external devices. (Program file input and output, and parameter setting)

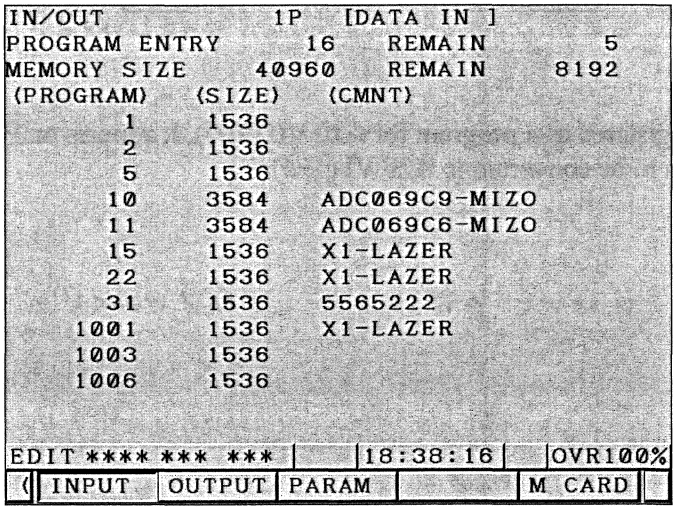
Procedure

1. Press the Edit key 

. The Edit screen is displayed.



2. Press the menu key [I/O]. The In/Out screen is displayed.



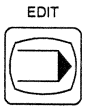
Notes

- Press the Menu selection key  to switch the In/Out screen to the initial Edit screen.
- When the program is input/output between A20L and A20R, be sure to select again the "FRONT MACH HOLDER" and "BACK SPINDLE" on the machining data.
  If not, the program selection is disabled with the error message "ILLEGAL VALUE IN MACHINING DATA".

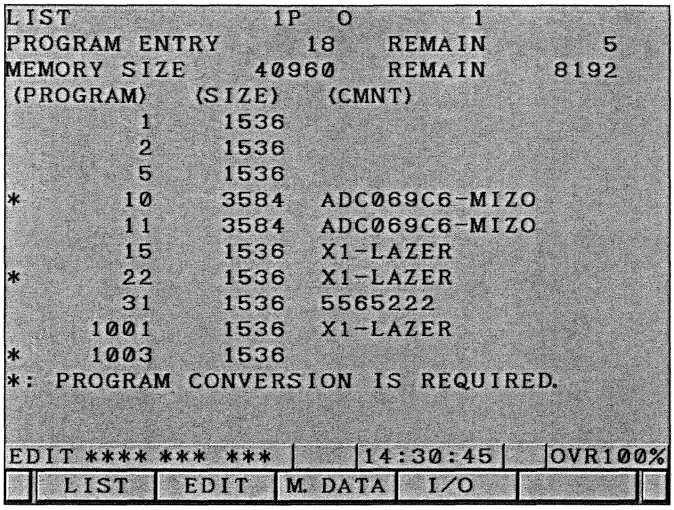
Program file input

Inputs program files from external devices to memory.

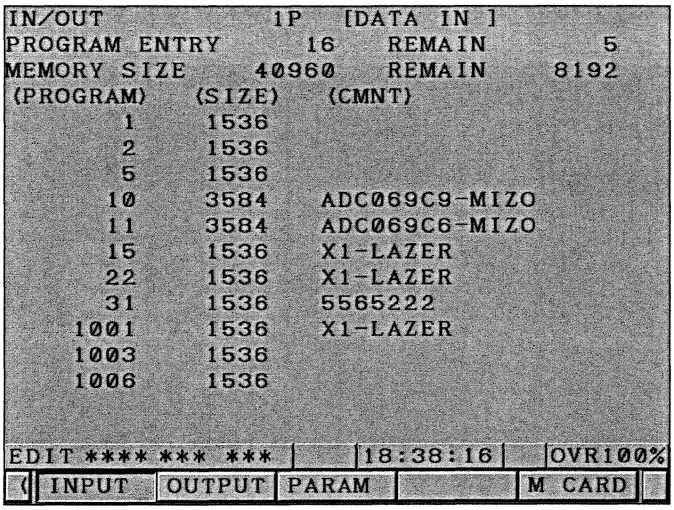
Procedure

1. Press the Edit key 

. The Edit screen is displayed.



2. Press the menu key [I/O]. The In/Out screen is displayed with the menu key [INPUT] being selected.



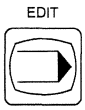
3. Press the Input key 

. The program is input.

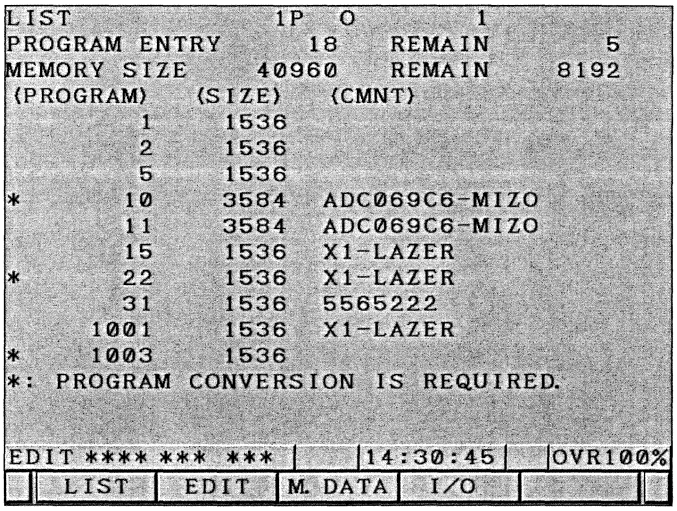
Program file output

Outputs program files from memory to external devices.

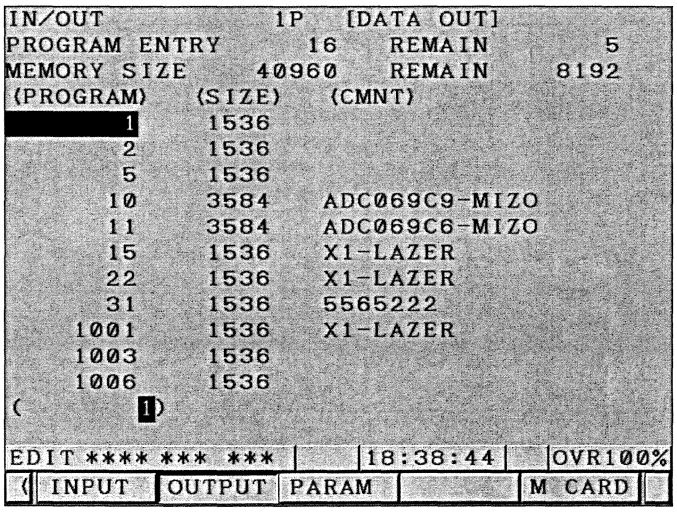
Procedure

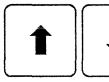
1. Press the Edit key 

. The Edit screen is displayed.



2. Press the menu key [I/O]. The program number on top is reversed. The In/Out screen is displayed with the menu key [INPUT] being selected.
3. Press the menu key [OUTPUT]. The menu key [OUTPUT] is selected.



4. Select the program number using the Cursor move keys 

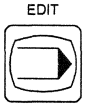
. The selected program number is reversed. You can also select the program number using the Alphanumeric keys.
5. Press the Input key 

. The selected program is output.

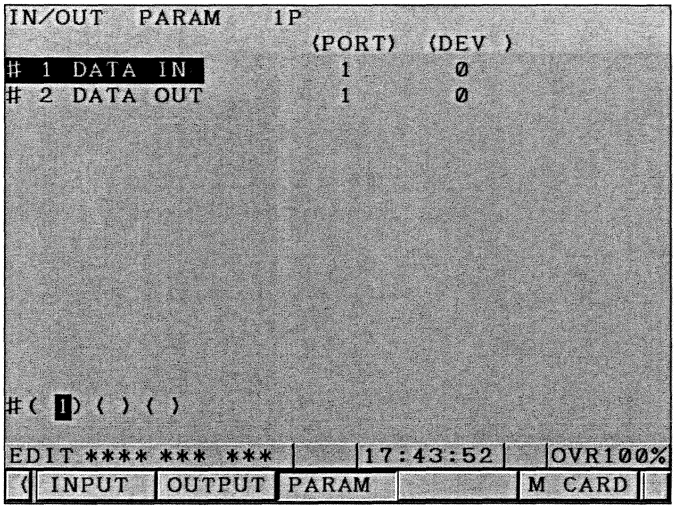
Setting parameters

- Setting a port and device

Procedure

1. Press the Edit key 

. The Edit screen is displayed.
2. Press the menu key [I/O]. The In/Out screen is displayed.
3. Press the menu key [PARAM]. The In/Out parameter screen is displayed.

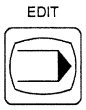


4. Set the number with # using the Alphanumeric keys.
5. Set the port number for input/output operation, using the Alphanumeric keys.
6. Set the device number using the Alphanumeric keys.
7. Press the Input key 

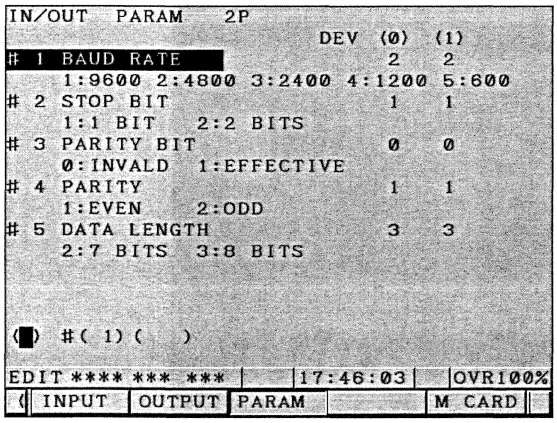
. The data is set in the item fields.

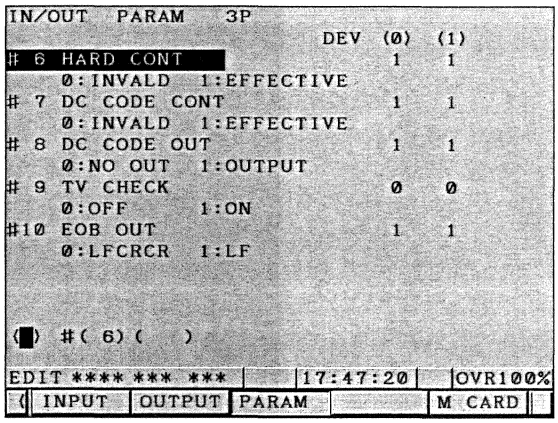
- Setting parameters

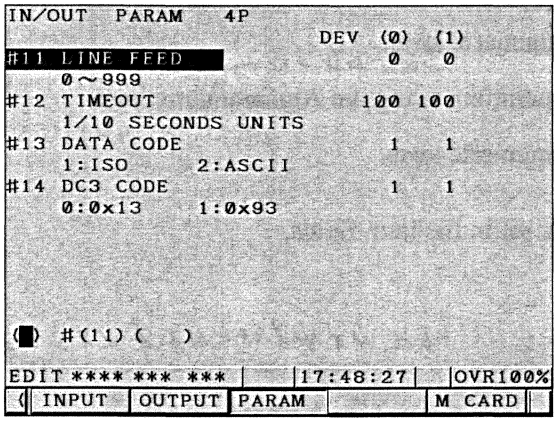
Procedure

1. Press the Edit key 

. The Edit screen is displayed.
2. Press the menu key [I/O]. The In/Out screen is displayed.
3. Press the menu key [PARAM]. The In/Out parameter screen is displayed.
4. Press the Page switching key  . The parameter setting item of each device is displayed.







5. Set the device number < > using the Alphanumeric keys.
6. Set the number with # using the Alphanumeric keys.
7. Set the data using the Alphanumeric keys.
8. Press the Input key 

. The data is set in the item fields.

I/O parameter description

#	Display item	Explanation	Default
1	BAUD RATE	Indicates the data transfer rate. 1: 9600 2: 4800 3: 2400 4: 1200 5: 600	2
2	STOP BIT	Indicates the stop bit length. 1: 1 BIT 2: 2 BITS	1
3	PARITY BIT	Indicates presence or absence of the parity bit. 0: INVALD 1: EFFECTIVE	0
4	PARITY	Indicates odd or even parity if the parity bit is used. 1: EVEN 2: ODD	1
5	DATA LENGTH	Indicates the data bit length. 2: 7 BITS 3: 8 BITS	3
6	HARD CONT	Indicates the control by the RTS/CTS method. 0: INVALD 1: EFFECTIVE	1
7	DC CODE CONT	Indicates the control by the DC code method. 0: INVALD 1: EFFECTIVE	1
8	DC CODE OUT	Indicates DC code output if the line is used. 0: NO OUT 1: OUTPUT	1
9	TV CHECK	Indicates that characters for TV checking are counted. 0: OFF 1: ON	0
10	EOB OUT (ISO)	Indicates EOB output in the ISO code. 0: LFCRCR 1: LF	1
11	LINE FEED	Indicates the number of characters as the length of paper tape fed before and after data output. 0 ~ 999	0
12	TIMEOUT	Indicates the time for indicating a timeout when the stop of data transfer is detected. 1/10 SECONDS UNITS	100
13	DATA CODE	Indicates that data is output in the ISO or ASCII code. 1: ISO 2: ASCII	1
14	DC3 CODE	Indicates that the DC3 code is 0x13 or 0x93. 0: 0x13 1: 0x93	1

RS232C communications parameters

With the D-II produced by Kyoritsu Co., Ltd.

Settings of the machine	
BAUD RATE	4800
STOP BIT	2 BITS
PARITY BIT	INVALID
PARITY	EVEN
DATA LENGTH	8 BITS
HARD CONT	EFFECTIVE
DC CODE CONT	EFFECTIVE
DC CODE OUT	OUTPUT
TV CHECK	OFF
EOB OUT (ISO)	LF
LINE FEED	0
TIMEOUT	100
DATA CODE	ISO
DC3 CODE	0x93

Settings of Kyoritsu D-II	
BAUD RATE	4800
STOP BIT	2 BITS
DC CODE	PROVIDED
TRANSFERCODE	ISO

With the D-III produced by Kyoritsu Co., Ltd.

Settings of the machine	
BAUD RATE	4800
STOP BIT	2 BITS
PARITY BIT	INVALID
PARITY	EVEN
DATA LENGTH	7 BITS
HARD CONT	EFFECTIVE
DC CODE CONT	EFFECTIVE
DC CODE OUT	OUTPUT
TV CHECK	OFF
EOB OUT (ISO)	LF CRCR
LINE FEED	0
TIMEOUT	100
DATA CODE	ISO
DC3 CODE	0x93

Settings of Kyoritsu D-III	
LEFT COUNTER SWITCH	DC CODE (PROVIDED) ISO
RIGHT COUNTER SWITCH	BAUD RATE 4800
PARITY BIT	EVEN PARITY
CHARACTER BIT	7 BITS
STOP BIT	2 BITS
EOB SETTING	LF CR

With the D-V produced by Kyoritsu Co., Ltd.

Settings of the machine	
BAUD RATE	4800
STOP BIT	1 BIT
PARITY BIT	INVALID
PARITY	EVEN
DATA LENGTH	8 BITS
HARD CONT	EFFECTIVE
DC CODE CONT	EFFECTIVE
DC CODE OUT	OUTPUT
TV CHECK	OFF
EOB OUT (ISO)	LF
LINE FEED	0
TIMEOUT	100
DATA CODE	ISO
DC3 CODE	0x93

Settings of Kyoritsu D-V		
LEFT COUNTER SWITCH	XON/XOFF ISO/ASCII	
RIGHT COUNTER SWITCH	BAUD RATE 4800	
STOP BIT	1 BIT	
ISO/ASCII	ISO	
DC3	93H	
DC CODE PROVIDED (IN) PROCESSING AT RECEIVING	DC3, DC1	
DC4	DISABLED	
EOB SETTING	No.6	ON
CR/LF AT SENDING	No.7	OFF
CR/LF AT RECEIVING	No.8	OFF

With the ED-8N produced by Kyoritsu Co., Ltd.

Settings of the machine	
BAUD RATE	4800
STOP BIT	2 BITS
PARITY BIT	EFFECTIVE
PARITY	EVEN
DATA LENGTH	7 BITS
HARD CONT	EFFECTIVE
DC CODE CONT	EFFECTIVE
DC CODE OUT	OUTPUT
TV CHECK	OFF
EOB OUT (ISO)	LF
LINE FEED	0
TIMEOUT	100
DATA CODE	ISO
DC3 CODE	0x93

Settings of Kyoritsu ED-8N	
BAUD RATE	4800
STOP BIT	2 BITS
DATA BIT	7 BITS
PARITY BIT	ON
DC CODE	ON TERMINAL
TRANSFER CODE	ISO

Settings of Kyoritsu ED-8N DIP switch (at the rear of the device)	
NO.7	ON
NO.8	ON

Note

To set the line feed code to LF, open the rear cover of Kyoritsu ED-8N and set DIP switches No. 7 and No. 8 to ON.

The counter switch of Kyoritsu ED-8N is set to 16.

With the TACTX K-203

Settings of the machine	
BAUD RATE	4800
STOP BIT	2 BITS
PARITY BIT	INVALID
PARITY	EVEN
DATA LENGTH	8 BITS
HARD CONT	EFFECTIVE
DC CODE CONT	EFFECTIVE
DC CODE OUT	OUTPUT
TV CHECK	OFF
EOB OUT (ISO)	LF
LINE FEED	0
TIMEOUT	100
DATA CODE	ISO
DC3 CODE	0x93

Settings of the TACTX K-203	
COMMUNICATION CODE	ISO
COMMUNICATION SPEED	4800
STOP BIT	2 BITS
DC CONTROL	DC IN
% CONTROL	NONE
EOB	CR LF
NULL CODE	NONE

With the TACTX M-220

Settings of the machine	
BAUD RATE	4800
STOP BIT	2 BITS
PARITY BIT	INVALID
PARITY	EVEN
DATA LENGTH	8 BITS
HARD CONT	EFFECTIVE
DC CODE CONT	EFFECTIVE
DC CODE OUT	OUTPUT
TV CHECK	OFF
EOB OUT (ISO)	LF
LINE FEED	0
TIMEOUT	100
DATA CODE	ISO
DC3 CODE	0x93

Settings of the TACTX M-220	
1. CODE	ISO
2. BAUD RATE	4800
3. STOP BIT	2 BITS
4. DC CONTROL	DC IN
5. % CONTROL	NONE
6. EOB CODE	CR LF
7. TV CHECK	NONE
8. NUL CODE	NONE
9. OVERRIDE	NONE
10. NESTING	NONE
11. EXTENSION	NC
12. FILE NAME	MANUAL

Note

Auto is selected for item 12. File name in the TACTX M-220 standard settings. While Auto is set, all program numbers become 1.NC. (This is because the character following $ is automatically recognized as the program number.)

Select Manual for item 12. File name, and enter the file name in manual mode.

With the Needs98

Settings of the machine	
BAUD RATE	4800
STOP BIT	2 BITS
PARITY BIT	INVALID
PARITY	EVEN
DATA LENGTH	8 BITS
HARD CONT	EFFECTIVE
DC CODE CONT	INVALID
DC CODE OUT	NO OUT
TV CHECK	OFF
EOB OUT (ISO)	LF
LINE FEED	10
TIMEOUT	100
DATA CODE	ISO
DC3 CODE	0x93

Settings of the Needs98	
COMMUNICATION CODE	ISO
COMMUNICATION SPEED	4800
STOP BIT	1 BIT
COMMUNICATION MODE	HOST
% CODE AT RECEIVING	USED
LINE FEED CODE AT SENDING	LF
DELAY AT SENDING	NONE

Note

A timeout error occurs when a program is received. To prevent the error, "INVALID" is selected for "DC CODE CONT" and "NO OUT" is selected for "DC CODE OUT".

With the NC Densuke

Settings of the machine	
BAUD RATE	4800
STOP BIT	2 BITS
PARITY BIT	INVALID
PARITY	EVEN
DATA LENGTH	8 BITS
HARD CONT	EFFECTIVE
DC CODE CONT	EFFECTIVE
DC CODE OUT	OUTPUT
TV CHECK	OFF
EOB OUT (ISO)	LF
LINE FEED	10
TIMEOUT	100
DATA CODE	ISO
DC3 CODE	0x93

Settings of the NC Densuke	
COMMUNICATION CODE	1
COMMUNICATION SPEED	4800
STOP BIT	3 BITS
DC CONTROL	2
COMMUNICATION CODE	1
DEVICE CLASSIFICATION	0

With the ETL produced by Hamamatsu Godo Co., Ltd.

Settings of the machine	
BAUD RATE	4800
STOP BIT	1 BIT
PARITY BIT	INVALID
PARITY	EVEN
DATA LENGTH	8 BITS
HARD CONT	EFFECTIVE
DC CODE CONT	EFFECTIVE
DC CODE OUT	NO OUT
TV CHECK	OFF
EOB OUT (ISO)	LF
LINE FEED	0
TIMEOUT	100
DATA CODE	ISO
DC3 CODE	0x93

Setting of Hamamatsu Godo ETL	
CODE	ISO
SPEED	4800
STOP BIT	1
DC CODE	IN
%	ON
STORAGE DESTINATION	MEMORY
DELIMITER CODE	CR LF
TV CHECK	OFF

Alternative settings

Settings of the machine	
BAUD RATE	4800
STOP BIT	2 BITS
PARITY BIT	INVALID
PARITY	EVEN
DATA LENGTH	8 BITS
HARD CONT	EFFECTIVE
DC CODE CONT	EFFECTIVE
DC CODE OUT	NO OUT
TV CHECK	OFF
EOB OUT (ISO)	LF
LINE FEED	0
TIMEOUT	100
DATA CODE	ISO
DC3 CODE	0x93

Setting of Hamamatsu Godo ETL	
CODE	ISO
SPEED	4800
STOP BIT	2
DC CODE	IN
%	ON
STORAGE DESTINATION	MEMORY
DELIMITER CODE	CR LF
TV CHECK	OFF

With MIKUNI

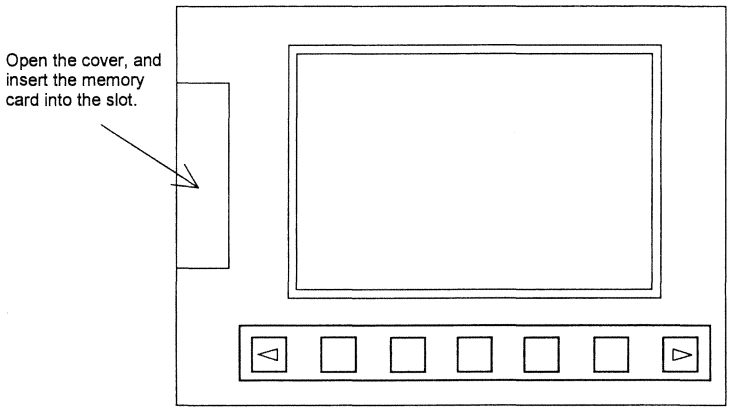
Settings of the machine	
BAUD RATE	4800
STOP BIT	2 BITS
PARITY BIT	INVALID
PARITY	EVEN
DATA LENGTH	8 BITS
HARD CONT	EFFECTIVE
DC CODE CONT	EFFECTIVE
DC CODE OUT	OUTPUT
TV CHECK	OFF
EOB OUT (ISO)	LF
LINE FEED	10
TIMEOUT	100
DATA CODE	ISO
DC3 CODE	0x93

Settings of the MIKUNI	
BAUD RATE	4800
DATA BIT	8 BITS
STOP BIT	2 BITS
PARITY BIT	NONE

6.7.6 Input/output through a memory card

A machining program registered in the NC unit can be output/input in the text file format to/from a memory card. You can edit the program, stored in the memory card, on your personal computer.

Insert the memory card into the memory card slot at the left of the liquid crystal display (LCD) unit.



Liquid crystal display (LCD) unit

Function

- Reading machining programs (input a machining program from a memory card)
  Reading a selected program from the memory card
  Reading all the programs one by one from the memory card (XALL)
- Writing machining programs (output a machining program to a memory card)
  Writing a selected program onto the memory card
  Writing all the programs collectively as a single file from the NC unit onto the memory card (ALL)
  Writing all the programs one by one from the NC unit onto the memory card (XALL)
- Renaming a file in the memory card
- Deleting a file from the memory card
- Initializing the memory card

Specifications

- Card specifications
  - Types of cards: PCMCIA TYPE 1 and TYPE 2
  - Card operation mode: Compliant with the PC-ATA specification
  - Card operating voltage: 5 V (single), or switching between 5 V and 3.3 V (automatic switching)
  - Recommended card: Compact flash card SDCFB (made by San Disk)
    PC card adapter SDAD-38-J60 (made by San Disk)

- File name and card access
  - Specification format of the file name of a machining program stored in NC unit which is written onto the memory card: O number + extension (PRG)
    Example: When writing the machining program O345 onto the memory card:
    The file name is "345.PRG".
  - Only the root directory is permitted to access the memory card.

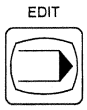
CAUTION

Be sure to use a card conforming to the specifications. Use of an unspecified card damages the NC unit.
Make backup copies of files in the memory card at regular intervals.
Close the slot cover after removing the memory card from the slot. Leaving the slot open may cause the slot to fail.

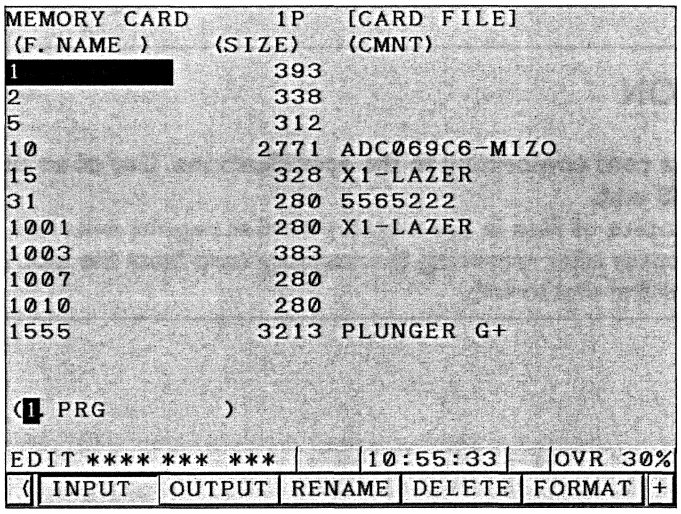
Input of a machining program

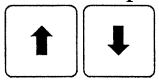
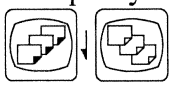
Take the following procedure to input a machining program from the memory card into the NC unit:

Procedure

1. Set the Program protection select key to "O" to cancel the protection.
2. Press the Edit key 

. The previously selected screen appears.
3. Insert the memory card into the slot, and press the menu key [M CARD]. The files in the memory card are listed on the screen. The menu key [INPUT] is in the selected status. Up to 11 files can be displayed in a page. Excess files are displayed in the subsequent pages.



4. Select the program number of the program to be input by using the Cursor move keys  and the Page switching keys  or enter the program number by using the Alphanumeric keys. To input all the programs one by one from the memory card, enter "XALL" in the parentheses.
5. Press the Input key 

.

   The "INPUT" display flashes at the lower right of the screen. The selected machining program is input into the NC unit when the flashing stops.

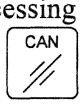
   (To cancel the processing, press the Cancel key 

.)

CAUTION

Do not remove the memory card while the "INPUT" display flashes at the lower right of the screen. Removing the memory card during input processing may damage the card. Close the slot cover after removing the memory card from the slot. Leaving the slot open may cause the slot to fail.

Notes

- The file (ALL.PRG) in the memory card contains all the programs output from the NC unit. If the file is selected, the programs are input into the NC unit, automatically divided by program numbers.
- All the programs in the memory card can be input one by one only when all the files in the memory card are of machining programs. If the files are in different file formats, the programs are not input into the NC unit. If a program number in the NC unit is specified in duplicate, the system temporarily stops the input processing and displays the error message. To continue the input processing, press the Cancel key 

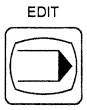
. The system inputs the next file.

  To cancel processing while files are input sequentially, press the Cancel key.
- When the program is input/output between A20L and A20R, be sure to select again the "FRONT MACH HOLDE", "BACK DRILL HOLDE", and "BACK SPINDLE" on the machining data.
  If not, the program selection is disabled with the error message "ILLEGAL VALUE IN MACHINING DATA".

Output of a machining program

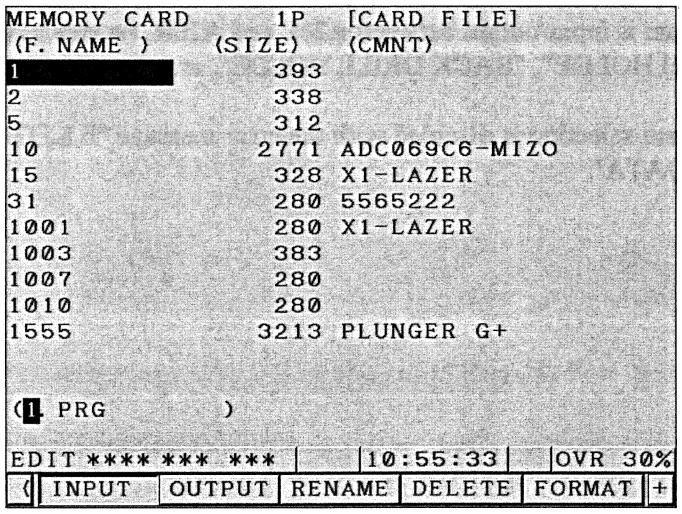
Take the following procedure to output a machining program from the NC unit to the memory card:

Procedure

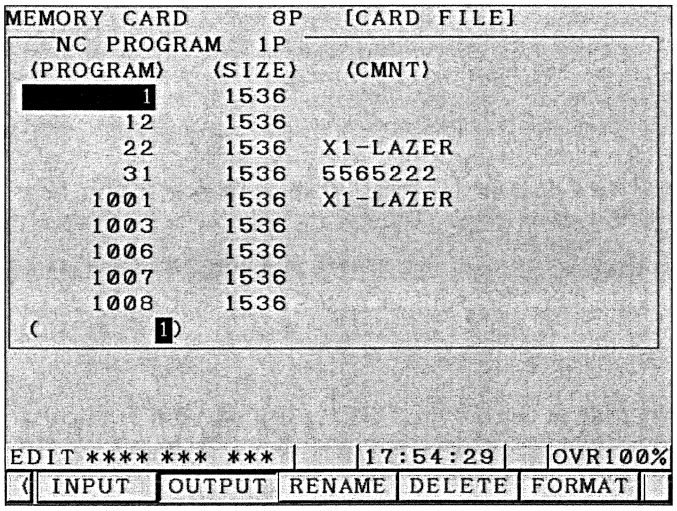
1. Press the Edit key 

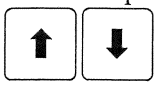
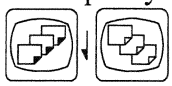
. The previously selected screen appears.

2. Insert the memory card into the slot, and press the menu key [M CARD]. The files in the memory card are listed on the screen. The menu key [INPUT] is in the selected status. Up to 11 files can be displayed in a page. Excess files are displayed in the subsequent pages.



3. Press the menu key [OUTPUT]. The screen displays the files registered in the NC unit. The name of the selected file is shown in the parentheses at the lower left of the screen.



4. Select the program number of the program to be output by using the Cursor move keys  and the Page switching keys  or enter the program number by using the Alphanumeric keys. To output all the programs collectively as a file from the NC unit to the memory card, enter "ALL" in the parentheses. To output all the programs one by one from the NC unit to the memory card, enter "XALL" in the parentheses.

5. Press the Input key  .

   The "OUTPUT" display flashes at the lower right of the screen. The selected machining program is output to the memory card when the flashing stops.

   (To cancel the processing, press the Cancel key  .)

   At this time, the file name is "machining-program-number.PRG".

   If all the programs in the NC unit are output collectively as a file to the memory card, the file name is "ALL.PRG".

   If the same file name is already registered in the memory card, the system asks if you want to overwrite it. To overwrite the file, press the Input key  again. Otherwise, press the Cancel key  .

⚠ CAUTION

Do not remove the memory card while the "OUTPUT" display flashes at the lower right of the screen. Removing the memory card during output processing may damage the card.
Close the slot cover after removing the memory card from the slot. Leaving the slot open may cause the slot to fail.

Note

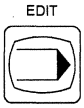
If detecting that the same file name exists in the memory card while output all the programs one by one from the NC unit to the memory card, the system temporarily stops the output processing and displays the overwrite confirmation message. When the Input key is pressed, the system overwrites the file and outputs the next file. When the Cancel key is pressed, the system does not overwrite the file and outputs the next file.

To cancel processing while files are output sequentially, press the Cancel key.

Deleting a file from the memory card

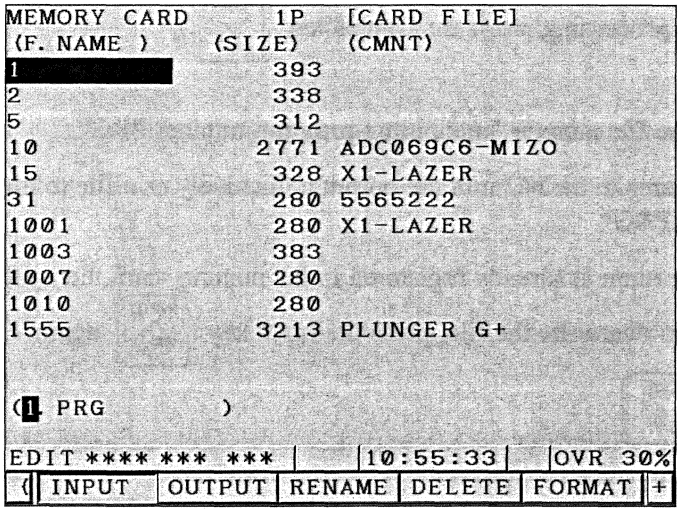
Take the following procedure to delete a file from the memory card:

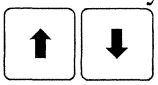
Procedure

1. Press the Edit key 

. The previously selected screen appears.

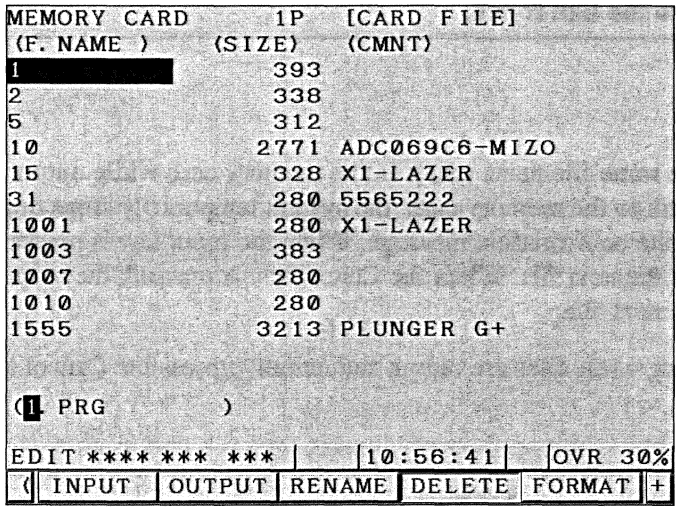
2. Press the menu key [M CARD]. The files in the memory card are listed on the screen.



3. Press the menu key [DELETE]. Select the file you want to delete by using the Cursor move keys 

.

   The selected file is displayed at the bottom of the screen.



4. Press the Input key 

.

5. Confirm the deletion. Press the Input key 

again to delete the file, or Cancel key 

to abort.

When you press the Input key 

again, the "DELETE" display flashes at the lower right of the screen. The selected file is deleted when the flashing stops.

> **CAUTION**
>
> **Do not remove the memory card while the "DELETE" display flashes at the lower right of the screen. Removing the memory card during delete processing may damage the card.**
> **Close the slot cover after removing the memory card from the slot. Leaving the slot open may cause the slot to fail.**

Note

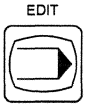
Make backup copies of files in the memory card at regular intervals.

Once a file is deleted, it is no longer restored. Make sure of the file contents before deleting the file.

Renaming a file in the memory card

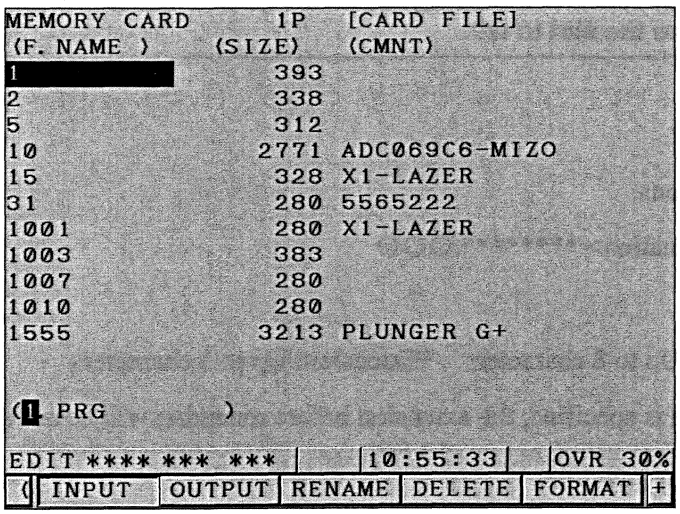
Take the following procedure to change a file name in the memory card:

Procedure

1. Press the Edit key 

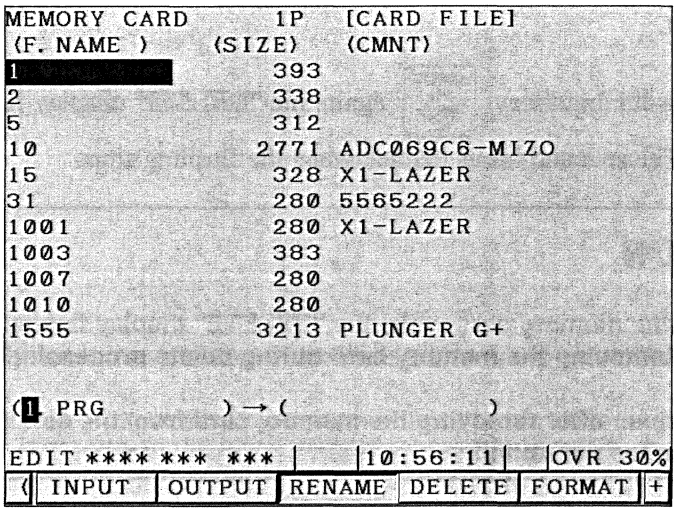
. The previously selected screen appears.

2. Press the menu key [M CARD]. The files in the memory card are listed on the screen.



3. Press the menu key [RENAME].

   Select the file name you want to change by using the Cursor move keys [↑] [↓], and confirm that the selected file name is displayed at the bottom of the screen.



4. Move the cursor into the right parentheses by using the Cursor move key [→].

   Example:

   (1000.PRG) → (

5. Enter a new file name by using the Alphanumeric keys.

6. Press the Input key [INPUT]. The "RENAME" display flashes at the lower right of the screen. The selected file is renamed when the flashing stops.

> **⚠ CAUTION**
>
> **Do not remove the memory card while the "RENAME" display flashes at the lower right of the screen. Removing the memory card during rename processing may damage the card.**
> **Close the slot cover after removing the memory card from the slot. Leaving the slot open may cause the slot to fail.**

Note

File name restrictions:

<File name specification> ********.OOO

↑ ↑

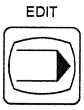
Up to 8 characters Extension: Up to 3 characters

If no file extension is specified, the extension before renaming will be added automatically.

Initializing a memory card

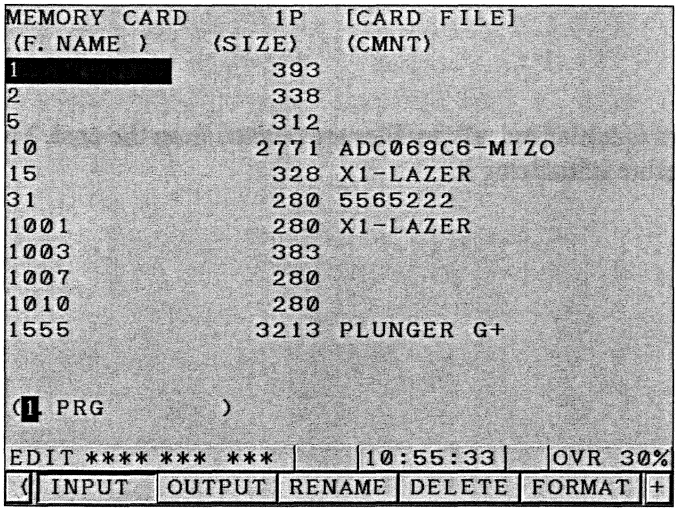
Take the following procedure to initialize (format) a memory card:

Procedure

1. Press the Edit key 

. The previously selected screen appears.

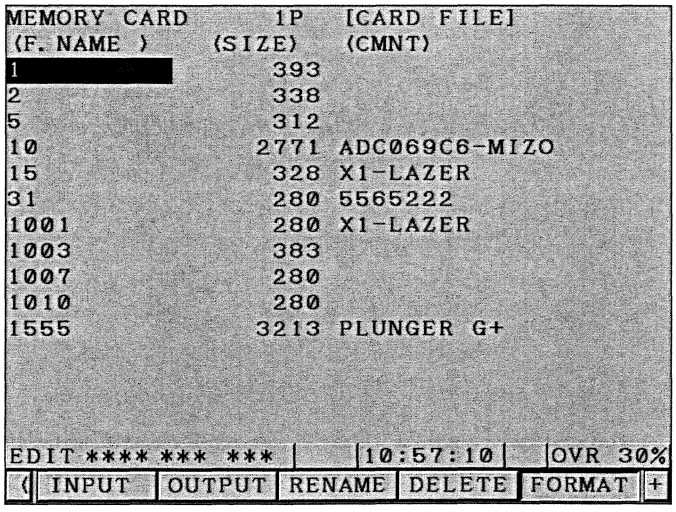
2. Press the menu key [M CARD]. The files in the memory card are listed on the screen.



3. Press the menu key [FORMAT].

   Make sure that the memory card you want to initialize is in the slot, and press the Input key 

.



   The confirmation message is displayed at the bottom of the screen.

   To initialize it, press the Input key 

again. Otherwise, press the Cancel key 

.

4. If Input key 

is pressed, the "FORMAT" display flashes at the lower right of the screen.
The memory card is initialized when the flashing stops.

> **CAUTION**
>
> **Do not remove the memory card while the "FORMAT" display flashes at the lower right of the screen. Removing the memory card during the initialization may damage the card.**

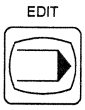
Note

Once a memory card is initialized, all the files are deleted from the card. Make sure of the files in the memory card before initializing it.

Displaying Created Date (Modified Date) of file in memory card

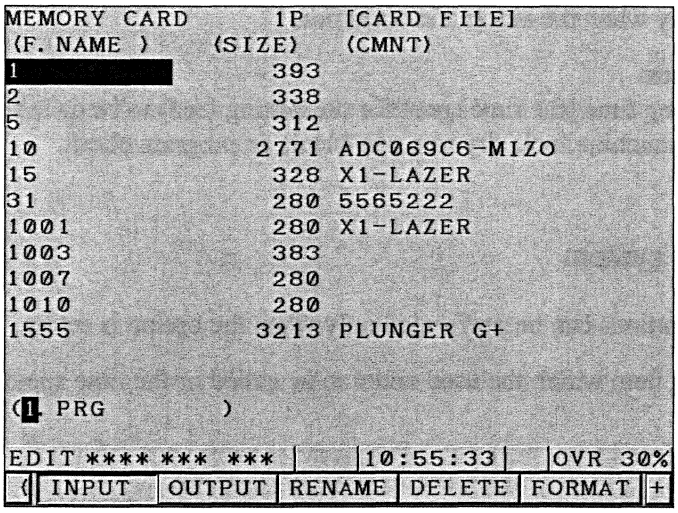
Displays the data when the file in the memory card is created (or modified).

Procedure

1. Press the Edit key 

. The previously selected screen appears.

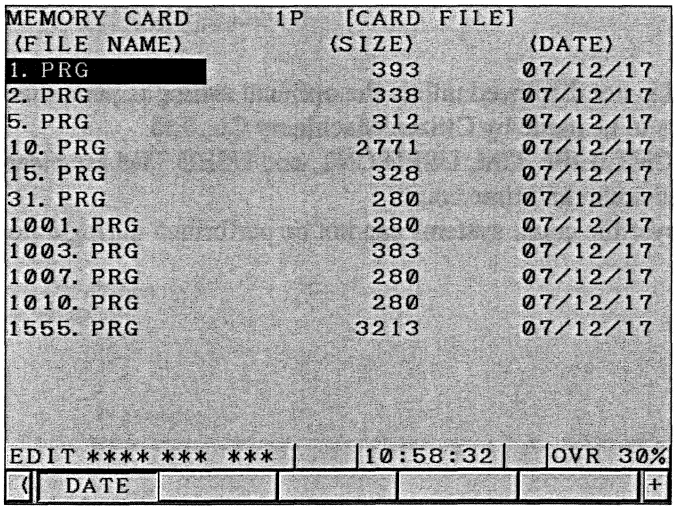
2. Press the menu key [M CARD]. A list of files in memory card is displayed.



3. Press the Menu selection key 

.

4. Press the menu key [DATE]. The screen changes from comment display to date display.



Pressing the menu key [DATE] again goes back to the comment display screen.

6.8 Tool Life Management I

Tool life management is the function which can count the tool use frequency (time), and recognizes with an alarm that it amounts to the predefined target count (time).

A20 provides two count systems for decision the tool lifetime.

These two systems can not be used together.

- Used count system
  Counts the frequency for every tool number to be called. Unless the other tools are called, it is recognized as once even if the same tool is called.
  It is counted only when the automatic operation.
- Time count system
  Counts the cutting time (the time spent for the cutting feed) to be called. However, it is not counted during machine lock, dry run, one-block, or program check.

6.8.1 Setting count system

The following operations can be performed only when the option is set up.

Select the counting item which the used count to be called or the time spent for the cutting feed.

Procedure

1. Set up "14 TOOLLIFE CNT" to 0: OFF when you select the used count. (Default: 0)
   The used count and lifetime count are displayed on the Tool life management screen
2. Set up "14 TOOLLIFE CNT" to 1: ON when you select the time count. (Default: 0)
   The cutting time and lifetime are displayed on the Tool life management screen.

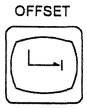
Notes

- Operator's panel is not displayed unless the optional setting is performed.
- Optional setup is to be made by Citizen Machinery Co., Ltd.
- The used LIFE CNT, LIFE TIM, USED CNT, and USED TIM are cleared when you switch between the used count and time count.
- The switching over the count systems can not be performed during automatic operation.

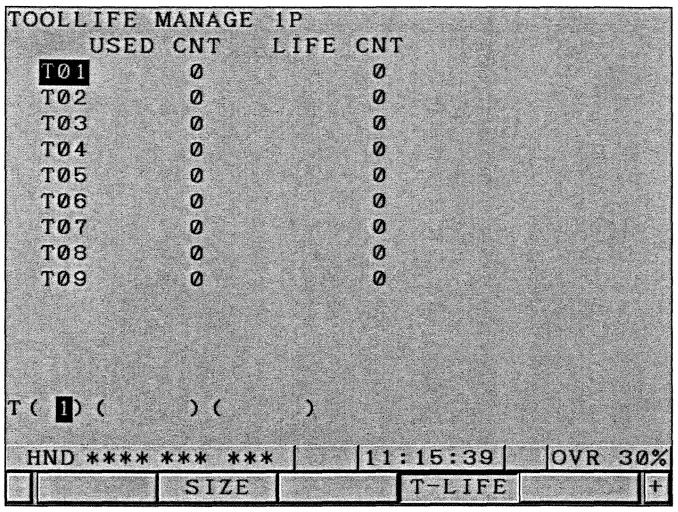
6.8.2 Operation procedures for used count system

Procedure

Select the used count system beforehand according to the <Section 6.8.1 Setting count system>.

1. Press the Offset key 

. The Offset screen is displayed.



2. Press the Menu selection key  . The menu key [T-LIFE] is displayed.

3. Press the menu key [T-LIFE].
   The Tool life management screen is displayed.

4. Select the tool number to be set up. Enter the count by the tool lifetime, then press the Input key 

.

   The lifetime count is set up. (Press the previous or next the Page switching keys   when the tool number to be set is not displayed.)

   Setting value is up to 99999.

5. Start the machining by any automatic operations. If the called count of each tool reaches the setting value, "T□□ TOOL LIFE OVER" occurs, then the machine stops.
   (T□□: tool number)

   An alarm is released by pressing the Reset key 

. The used count of tool is cleared to 0.

6. Make sure to set up the lifetime count to 0 when the tool life management function is not used.

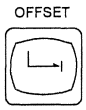
Note

The used count is valid only when automatic operation.

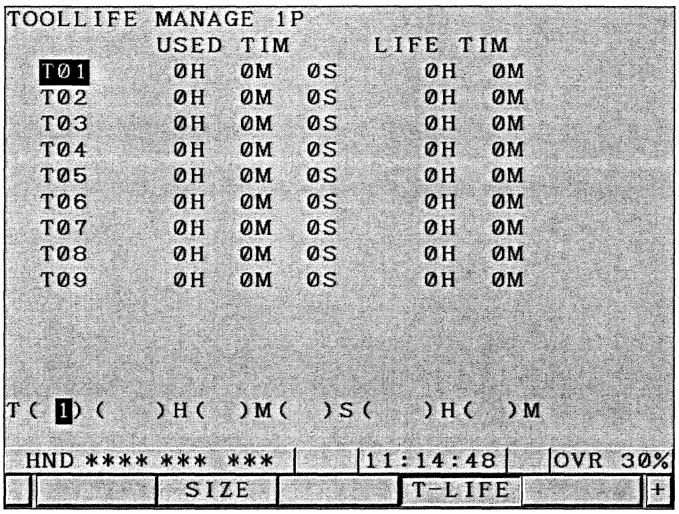
6.8.3 Operating procedures for time count system

Procedure

Select the time count system beforehand according to <Section 6.8.1 Setting count system>.

1. Press the Offset key 

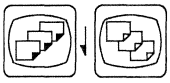
. The Offset screen is displayed.



2. Press the Menu selection key  . The menu key [T-LIFE] is displayed.

3. Press the menu key [T-LIFE].
   The Tool life management screen is displayed.

4. Select the tool number to be set up. Enter the time of the tool lifetime, then press the Input key 

. The lifetime count is set up.
   Up to 999H can be set up.
   (Press the previous or next the Page switching keys  when the tool number to be set is not displayed.)

5. Start the machining by any automatic operations. If the machining time of each tool spent for the cutting feed reaches the setting value, "T□□ TOOL LIFE OVER" occurs at the cycle end, then the machine stops.
   An alarm is released by pressing the Reset key 

. The used of tool time is cleared at 0.

6. Make sure to set up the lifetime count to 0 when the tool life management function is not used.

Note

The lifetime count is valid only when automatic operation ([CONTI], [1 CYCLE]).

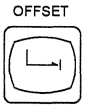
6.9 Tool Life Management II

This function sets a standby tool for each tool and automatically switches to the standby tool when the corresponding tool reaches the end of its useful life. There are two methods for determining the end of a tool life - counting the number of times a tool called and counting the time of cutting by the tool. For details, see <Section 6.8 Tool Life Management I>.

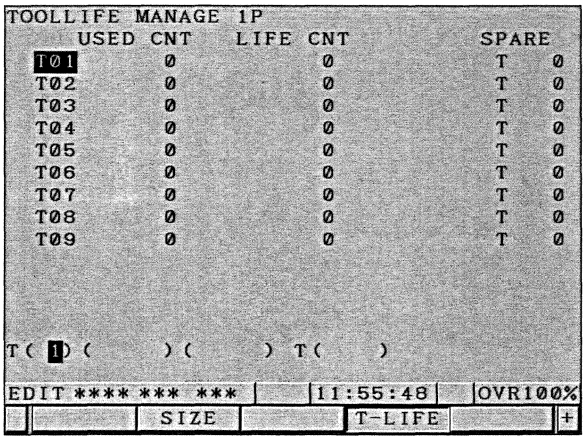
Notes

- The options of tool life management I and tool life management II are necessary for using this function.
- Be sure to disable the program pre-analysis function before using this function. If it is enabled, only the Tool Management Function I can be used. See <6.23 Program Pre-analysis Function> of the Programmer's Manual for enabling/disabling the program pre-analysis function.

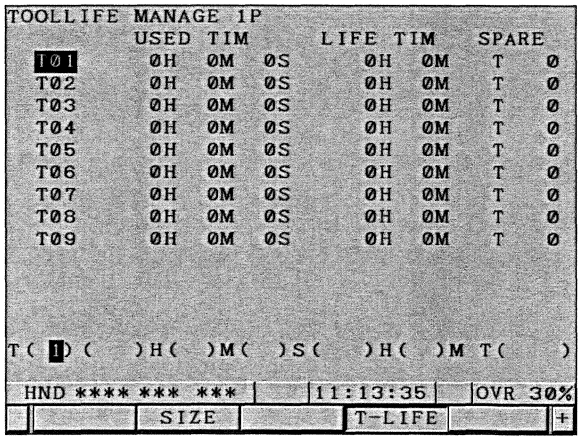
Procedure

1. Press Offset key 

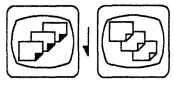
. The Offset screen appears.
2. Display [T-LIFE] in the menu display field by pressing the Menu selection key  .
3. Press the menu key [T-LIFE]. The Tool life management screen appears.



Counting the number of times each tool called



Counting the time of cutting by each tool

4. Select the tool number to be set, and set the 4-digit standby tool number in the standby tool setting field.
   Only the number of a tool defined in the tool layout pattern can be set. (Press the previous or next the Page switching keys  when the tool number to be set is not displayed.)
5. If a tool has reached the end of its useful life after it starts cutting in any automatic operation mode, an asterisk (*) is displayed next to the tool number, and the standby tool is selected. The current tool is switched to the standby tool at the end of a cycle in which it has reached the end of its useful life.

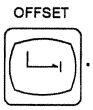
Notes

- If an offset number (TOOΔΔ) is specified following the T code for a selected standby tool in the program, the offset number (ΔΔ) is valid. If an offset number (ΔΔ) is not specified, offset operation before the switching to the standby tool is disabled.
  The offset cannot be specified for T30's on back spindle in front/back simultaneous machining (G640).
- When a standby tool reaches the end of its useful life, the next standby tool is selected if it has been set. If the next standby tool has not been set, the system issues the alarm "T□□ TOOL LIFE OVER " at the cycle end, and stops the machine.

6.10 Calling User Macro Program by G and M Codes

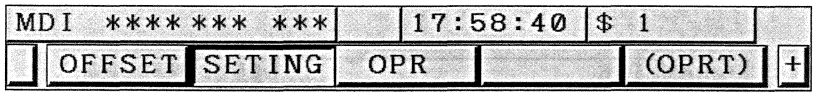
You can call up a program that has been registered by using G code or M code.

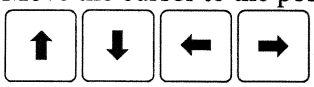
Procedure

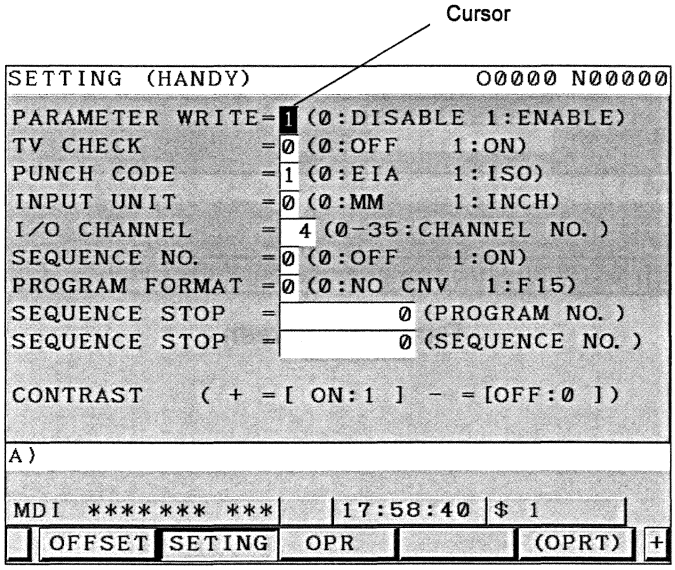
1. Press the Offset key 

.

2. Press the menu kay [SETING]. The Setting screen appears.



3. Select "1" for the write enabled parameter.
Move the cursor to the position of "PARAMETER WRITE" using the Cursor move keys  .



Setting Screen

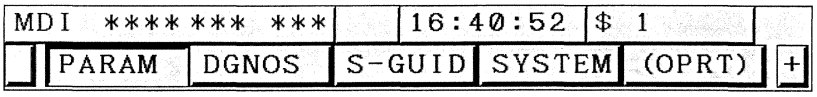
4. Enter 1, then press the Input key 

. Alarm message "SW0100 PARAMETER WRITE ENABLED" appears.

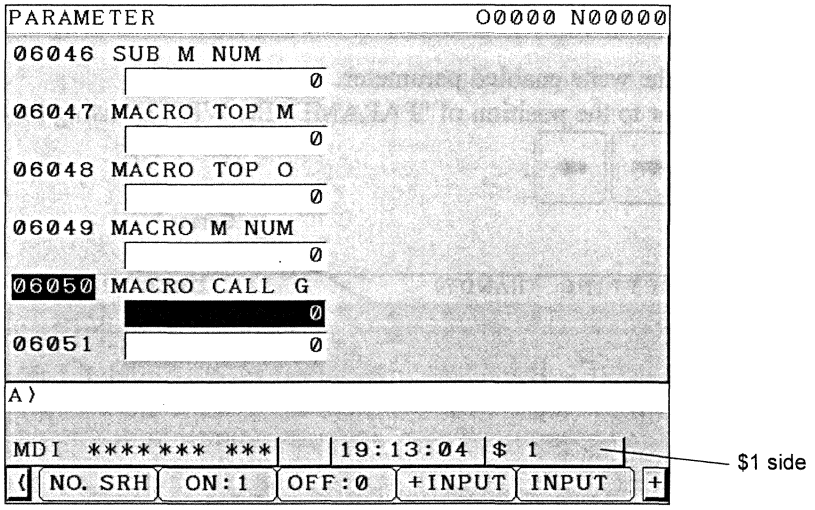
5. Press the Maintenance key 

. The Maintenance screen appears.

6. Press the menu key [PARAM]. The PMC maintenance screen appears.
   If the menu key [PARAM] is not displayed, press the Menu selection keys ◄ ► to display [PARAM].



7. Select Parameter screen for $1.
   Press the Menu selection key ◄ ► simulatneously to change screen between $1 and $2.



Parameter Screen

8. Select the parameter number to set the G code or M code to call up the user macro program according to the table below.

Parameter No.	Explanation
6050	Specify the G code number to call up program number O9010.
6051	Specify the G code number to call up program number O9011.
6052	Specify the G code number to call up program number O9012.
6053	Specify the G code number to call up program number O9013.
6054	Specify the G code number to call up program number O9014.
6055	Specify the G code number to call up program number O9015.
6056	Specify the G code number to call up program number O9016.
6057	Specify the G code number to call up program number O9017.
6058	Specify the G code number to call up program number O9018.
6059	Specify the G code number to call up program number O9019.
6080	Specify the M code number to call up program number O9020.
6081	Specify the M code number to call up program number O9021.
6082	Specify the M code number to call up program number O9022.
6083	Specify the M code number to call up program number O9023.
6084	Specify the M code number to call up program number O9024.
6085	Specify the M code number to call up program number O9025.
6086	Specify the M code number to call up program number O9026.
6087	Specify the M code number to call up program number O9027.
6088	Specify the M code number to call up program number O9028.
6089	Specify the M code number to call up program number O9029.

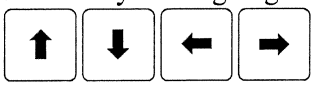
Note

Specifying the existing number of G or M code will disable their original functions. For example, if you specify "3" for parameter No. 6082, "M3" to rotate the spindle is disabled. When M3 is specified, the main spindle will not rotate and the program number O9022 is called up instead. In addition, some G codes and M codes are used for the system software. If you specify the same number as that of such G or M codes may disable their existing functions. Use the code number in the range listed below.

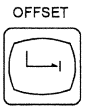
G code number: 2000 to 2999 (Up to 10 numbers can be selected.)
M code number: 2000 to 2999 (Up to 10 numbers can be selected.)

CAUTION

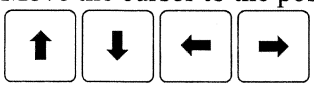
Do not use the number between 1000 and 1999 for M code.
Otherwise, queuing may fail.

9. Move the cursor to the position where you are going to specify or change the code number by using the Cursor move keys  .

10. Enter the data using the Alphanumeric keys and press the Input key  .

11. Press the Offset key  .

12. Press the menu key [SETING]. The Setting screen appears.

13. Select "0" for the write enabled parameter.
Move the cursor to the position of "PARAMETER WRITE" by using the Cursor move keys  .

14. Enter 0, then press the Input key  .

15. Press the Reset key  to reset the alarm.

16. In program numbers O9010 to O9019, O9020 to O9029, create a program relevant to the parameter you have specified in Step 8 in the similar way to create a subprogram.
To use the G or M code for $1 of the main program, specify the command in $1. To use it for $2, specify the command in $2. To use it for both $1 and $2, specify the same command in $1 and $2.

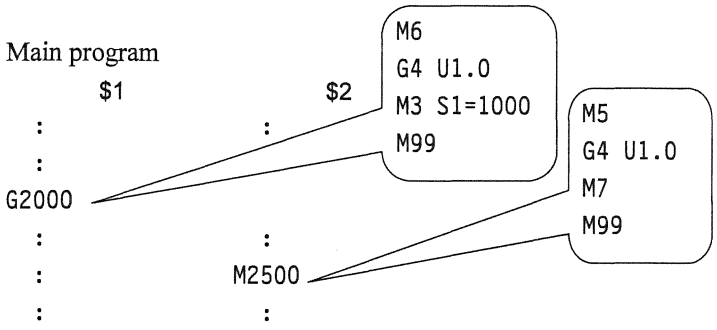
Setting example

1. Specify "2000" for parameter No. 6050, "2500" for No. 6082.

2. Create programs O9010 and O9022, and add the following descriptions.

O9010		O9022	
$1	$2	$1	$2
M6	M99	M99	M5
G4 U1.0			G4 U1.0
M3 S1=1000			M7
M99			M99

3. When G2000 is specified for $1 of the main program, the program O9010 is called up. When M2500 is specified for $2, the program O9022 is called up. Then the relevant programs are executed.



Notes

- Specifying G or M code of user macro program is invalid in MDI mode.
- The user macro programs O9010 to O9019 and O9020 to O9029 are stored in the same area as for the main program. Note that enough space is left for storing the user macro program.
- The user macro program can only be called up by using G or M code as described above. Calling up a subprogram by using T or M code is not available though it is found in the user's manual of NC manufacturer.
- No argument can be specified for G and M codes.

Product Code C – A220PL VII

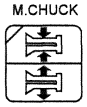
Document Code 1E1 – 0601

7. Mounting and Adjusting Chuck

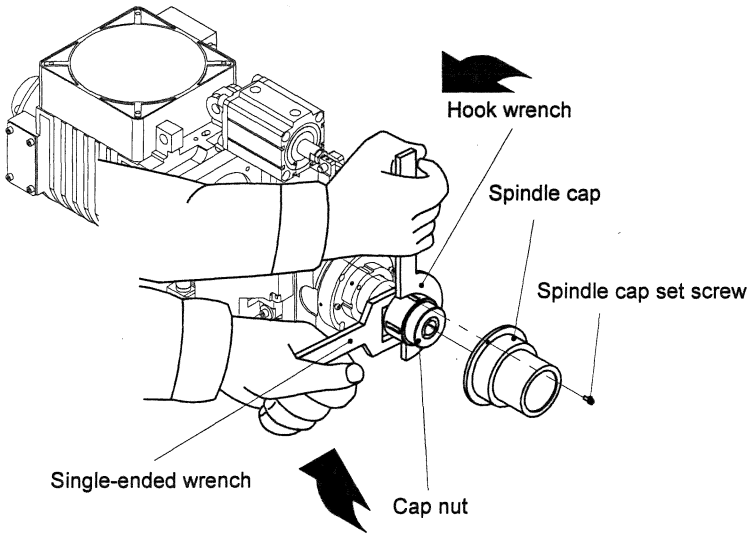
Code No.	C-A220PL VII 1E1-0701	MFG No.	A220/0007 ~	Issue Date	2008.6

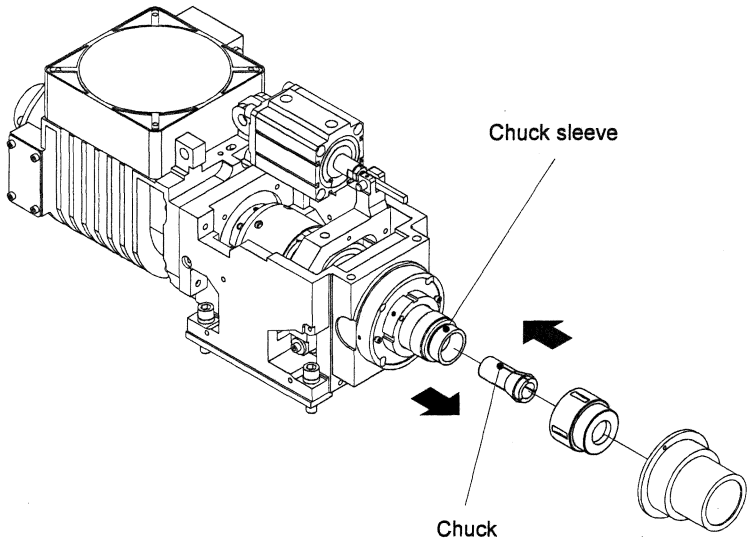
7.1 Mounting and Adjusting Chuck

7.1.1 Mounting and replacing spindle chuck

1. Press the Main spindle chuck key 

on the operation panel to open the chuck. The Main spindle chuck key lamp goes off.
2. Place the hook wrench (provided as a standard tool) on the cap nut, and fit a single-ended wrench onto the two-side width (50 mm wide) of the spindle to loosen the cap nut (right-hand screw).
3. Turn the cap nut to remove the cap nut from the spindle.
4. Mount a new chuck on the chuck sleeve inserted into the spindle. Before mounting it, check the square spring is in the chuck sleeve. If an old chuck is on the chuck sleeve, hold it and pull it out to this side, and mount a new one.
5. Screw the cap nut into the spindle, and firmly tighten it with the hook wrench and single-ended wrench.

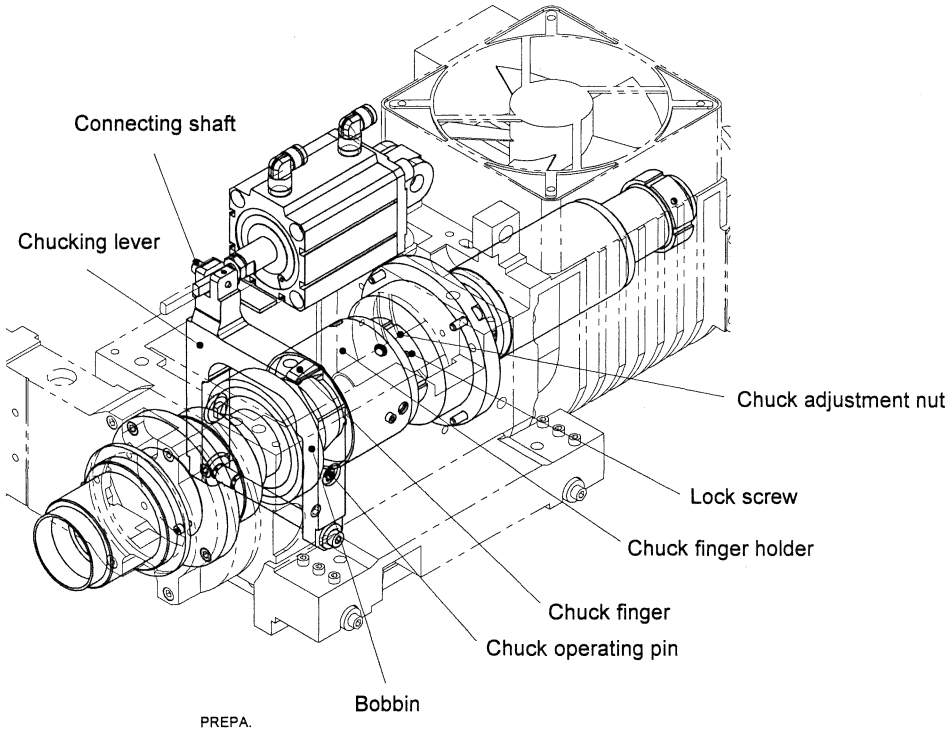




7.1.2 Adjusting spindle chucking force

⚠ WARNING

Be sure to confirm that the spindles and machine have stopped before attempting to adjust the chucking force.
The work during machine operation could result in serious personal injury.



1. Press the Preparation key 

on the operation panel.

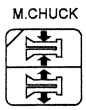
   The Preparation screen appears.

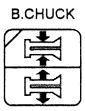
2. Press the Main spindle chuck key 

or Back spindle chuck key 

on the operation panel to open the chuck. Then, insert the material into it.

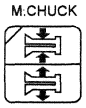
3. Loosen the lock screw of chuck adjustment nut located behind the chuck finger holder, and turn and loosen the chuck adjustment nut counterclockwise.

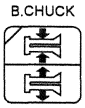
4. Press the Main spindle chuck key 

or Back spindle chuck key 

on the operation panel to close the chuck. Check the Main spindle or Back spindle chuck key lamp goes on.

5. With the chuck adjustment nut being fully loose and chuck closed, slowly tighten the chuck adjustment nut until the chuck gets in touch with the material and starts to chuck it. Define the point as the nut angle zero point.

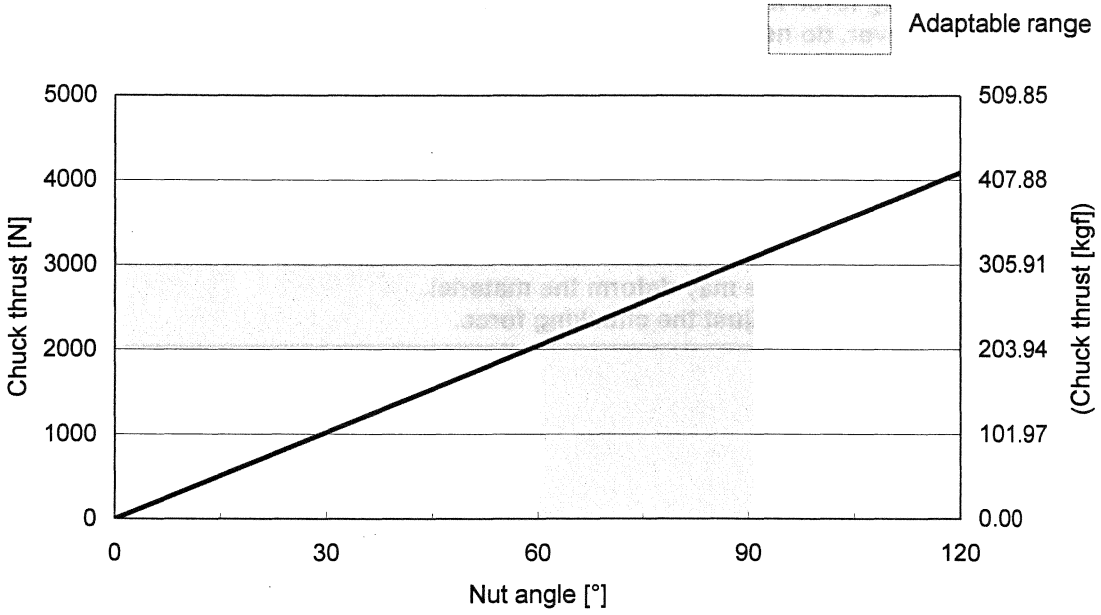
6. Press the Main spindle chuck key 

or Back spindle chuck key 

on the operation panel to open the chuck. The Main spindle chuck key or the Back spindle chuck key lamp goes off.

7. Loosen the set screw at the top end of chucking lever. Then, pull out the connecting shaft that secures the chucking lever and chuck open/close cylinder.

8. From the nut angle zero point defined in Step 5, tighten the chuck adjustment nut by the specified angle according to the guideline shown in the figure below.



Relationship between adjustment nut rotating angle of main spindle and chuck thrust

Note 1: The screw hole interval on the chuck finger holder side is 60°.

Note 2: The figure shown above indicates the data when a Citizen authorized chuck is used. If a third party chuck is used, the force may not be equivalent to the value shown in the figure above.

9. Use the chuck open/close tool, which is a standard accessory for the machine, and move the chucking lever to right and left to check the chucking force. If the chucking force is not proper, adjust the chucking force by turning the chuck adjustment nut.

10. When obtaining a suitable chucking force, set the chucking lever to place the spindle chuck in open state (the chuck finger is away from the bobbin).

11. Insert the connecting shaft into the chucking lever and the chuck open/close cylinder, and then secure the connecting shaft with the set screw.

12. Tighten the lock screw of the chuck adjustment nut to prevent loosening. Then, remove the material.

⚠ CAUTION

Avoid empty chuck (chucking without bar material). Otherwise, malfunctioning or damage to the collet chuck may occur.

⚠ CAUTION

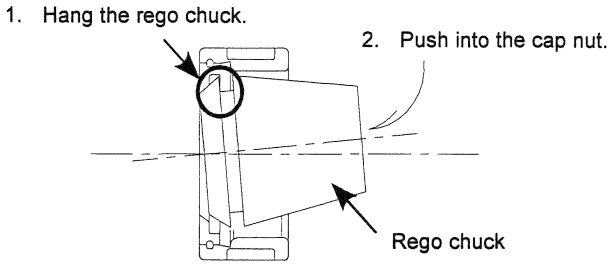
In the machining where higher cutting force is generated, set strong chucking force. If the chucking force is weak, the material may slip.
Note, however, do not set the value beyond the adaptable range shown in the graph on previous page. Doing so may cause damage to the machine.

⚠ CAUTION

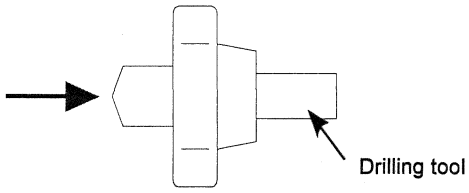
When chucking the thin material of which diameter is about 1 to 2 mm or pipe material, excess chucking force may deform the material.
In such the case, readjust the chucking force.

7.1.3 Mounting rego chuck

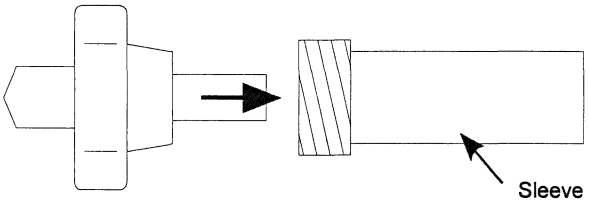
1. Mount the rego chuck to the cap nut.
   Wash the rego chuck cleanly and use the one free from scratches.



2. Insert a drilling tool into the rego chuck.



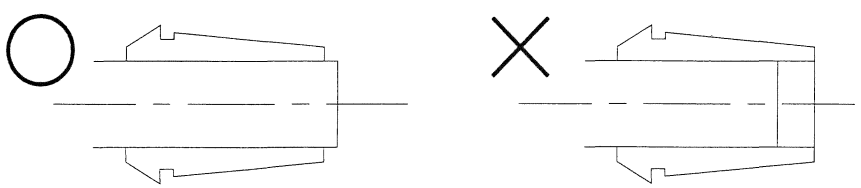
3. Screw the cap nut to which the tool was set into the sleeve thread.
   Wash the sleeve inner tapered portion cleanly and check it is free from scratches.



4. Fit a dedicated wrench onto the two-side width of the sleeve and tighten the cap nut firmly.

⚠ CAUTION

Be sure to mount the rego chuck to the cap nut before inserting the drilling tool.
The Inserted drilling tool length must always be longer than the overall length of the rego chuck.
Otherwise, the tool and/or rego chuck may be damaged.



7.2 Mounting/Adjusting a Guide Bushing Device

Two types of guide bushing devices are available: synchronous rotary guide bushing devices and fixed guide bushing devices (separately priced option) . Confirm the type of the mounted guide bushing device on the Machine structure screen. See <Section 8.18 Machine Structure Screen>.

If accessing from the front side is difficult, work with the machine from the rear side.

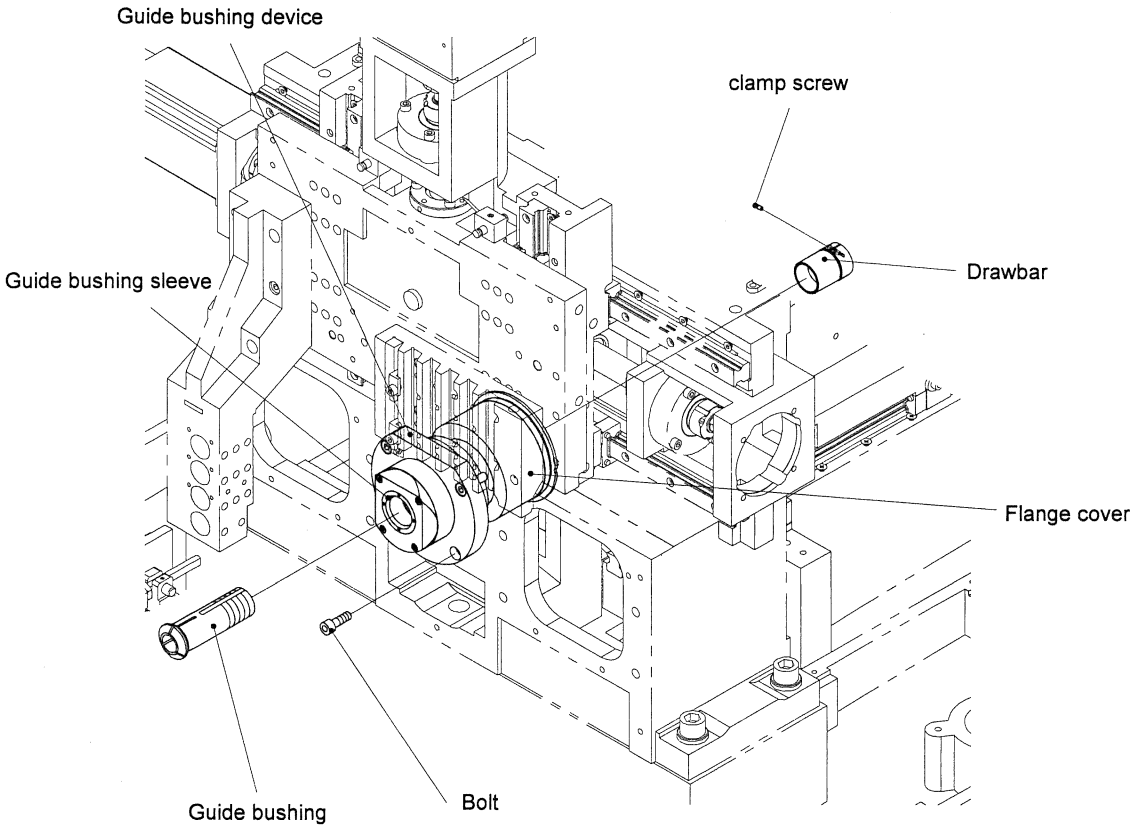
7.2.1 Replacing a synchronous rotary guide bushing device

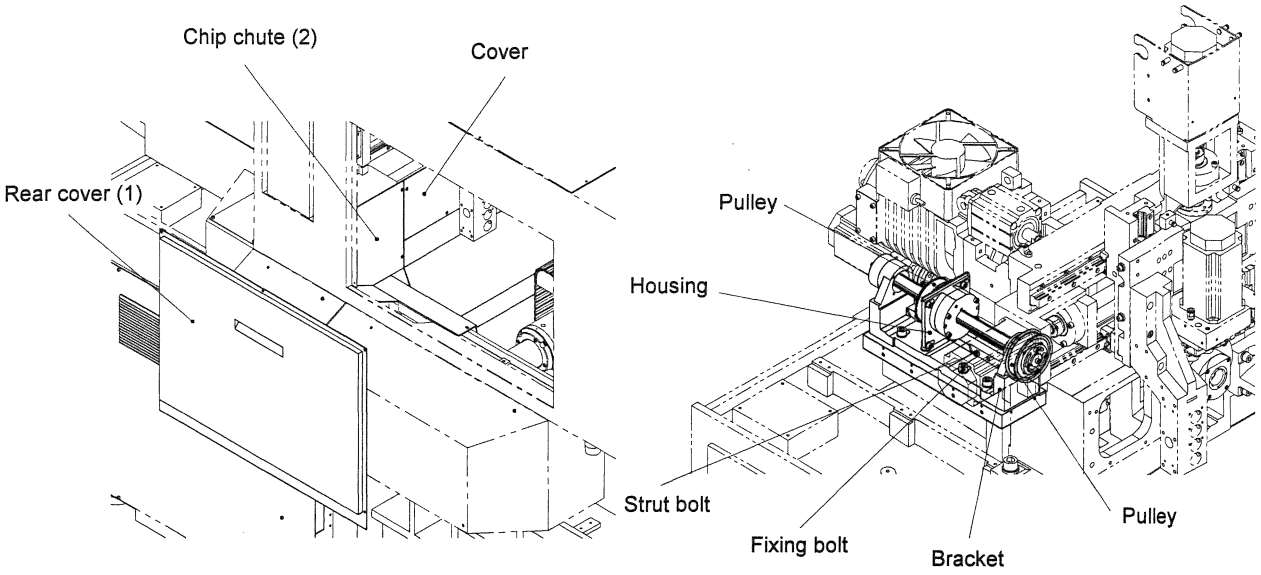
⚠ WARNING

Be sure to confirm that the spindles and machine have stopped before attempting to replace the guide bushing device.
The work during machine operation could result in serious personal injury.

⚠ CAUTION

When replacing the guide bushing device, you need to move the drive unit to loosen the tension of the belt. At this time, you need to move components such as brackets. To restore the original state, perform marking on relevant locations before starting job.





1. Press the Preparation key 

The Preparation key lamp goes on and the Preparation screen appears.
2. Press the menu key [ADJUST]. The menu keys turn into those for adjustment menu.
3. Press the menu key [RT.POS]. The menu key [RT.POS] is selected.
4. Lock the door, then press the Start key 

. After the holder moves to the return point, the Start key goes off.
5. Remove the flange cover from the main spindle room side.
6. Remove the fixing bolt from the guide bushing device.
7. Loosen the belt hanging on the guide bushing device and the spindle. Loosen the strut bolt. You need not to remove the bolt.
8. Loosen the bolt of the housing. You need not to remove the bolt.
9. Loosen a fixing bolt of the bracket that supports the spline shaft. You need not to remove the bolt.
   Move the bracket horizontally along with the key to loosen the belt.
10. Hold the flange and gently pull out the guide bushing device toward the front.

    Note) When you remove the guide bushing device, the air outflows and the sound is heard. But it is not a failure.

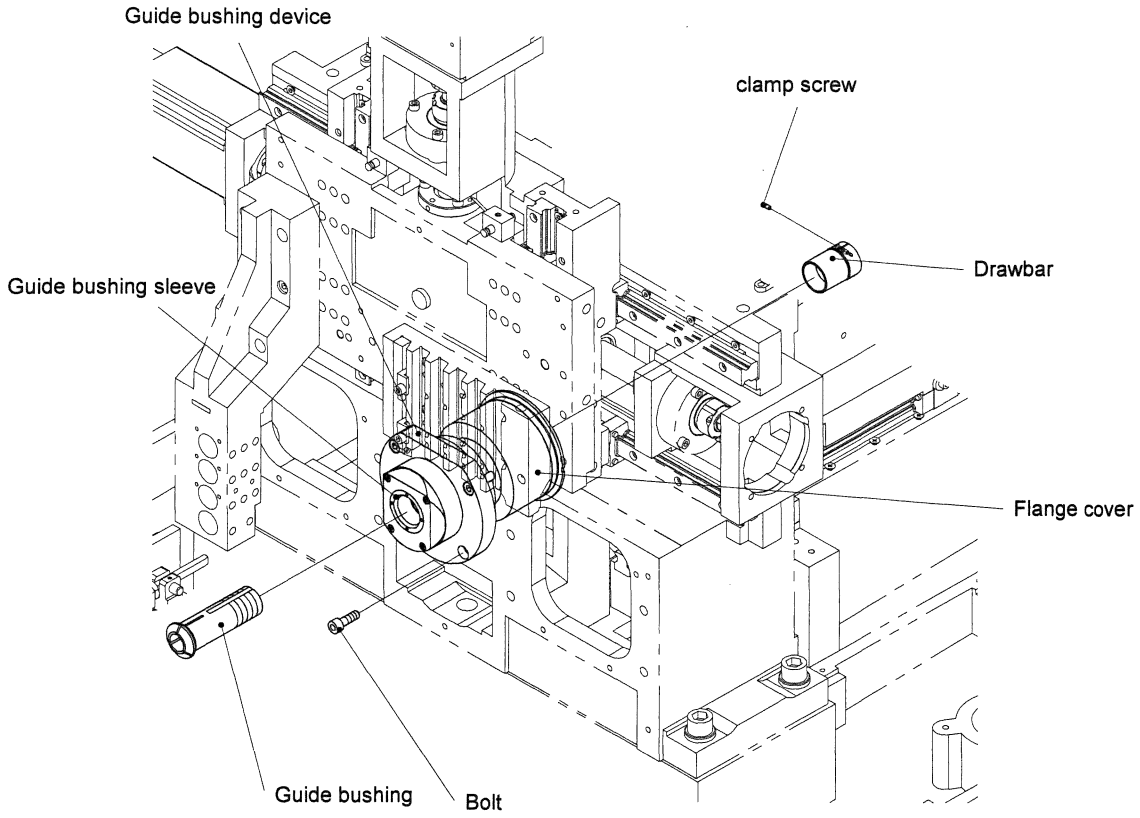
11. Insert the replacing guide bushing device into the mounting hole on the machine body. Pay attention so that the belt is not crushed by the guide bushing device.
12. Hang the belt securely on the timing pulley of the guide bushing device.
13. Make sure that the belts are hung on the two timing pulleys at the front and rear of the guide bushing device.
14. Move the bracket using the strut bolt to apply tension to the belt.
    The tension for the belt is about 40N.
15. Temporarily tighten the bolt of the housing.
16. Temporarily tighten the bolt of the flange. At this time, pay attention to parallerism (travel angle) with the spindle.
17. Securely tighten the bolts that were temporarily tightened to fix the housing and the flange.
18. Turn the spindle clockwise and counterclockwise by hand to make sure that the guide bushing driving device rotates along with the spindle rotation.
19. Fix the guide bushing device.
20. Mount the flange cover.

7.2.2 Replacing fixed type guide bushing device

The fixed type guide bushing device is an optional device.

To use the fixed type guide bushing device, you need to remove the belt from the counter shaft. See <7.2.3 Replacing synchronous rotary guide bushing device with fixed guide bushing device> for the procedure.

> **⚠ CAUTION**
>
> **Be sure to remove the belt at the guide bushing side when using the fixed type guide bushing device.**
> **The belt will skid when the spindle rotates, and it may cause a damage to the machine.**



1. Press the Preparation key 

. The Preparation key lamp goes on and the Preparation screen appears.
2. Press the menu key [ADJUST]. The menu keys turn into those for adjustment menu.
3. Press the menu key [RT.POS]. The menu key [RT.POS] is selected.
4. Lock the door, then press the Start key 

.
After the holder moves to the return point, the Start key lamp goes off.
5. Remove the flange cover.
6. Remove the fixing bolt from the guide bushing device.

7. Hold the flange and gently pull out the guide bushing device toward the front.

   Note) When you remove the guide bushing device, the air outflows and the sound is heard. But it is not a failure.

8. Insert the replacing guide bushing device into the mounting hole on the machine body.

7.2.3 Replacing synchronous rotary guide bushing device with fixed guide bushing device

The replacement work must be performed from the rear of the machine. Secure the sufficient work space in the rear of the machine.

> **⚠ CAUTION**
>
> **When replacing the guide bushing device, you need to move the drive unit to loosen the tension of the belt. To restore the original state, perform marking on relevant locations before starting job.**

1. Remove the rear cover (1).
2. Remover the cover. You will see the belt of the guide bushing device.
3. Remove the fixing bolt from the guide bushing device.
4. Loosen the belt hanging on the guide bushing device and the spindle. Loosen the strut bolt. You need not to remove the bolt.
5. Loosen the bolt of the housing. You need not to remove the bolt.
6. Loosen a fixing bolt of the bracket that supports the spline shaft. You need not to remove the bolt. Move the bracket horizontally along with the key to loosen the belt.
7. Hold the flange and gently pull out the guide bushing device toward the front.

   Note) When you remove the guide bushing device, the air outflows and the sound is heard. But it is not a failure.
8. Remove the belt at the guide bushing side that has been used to connect the guide bushing device and the drive unit.

> **⚠ CAUTION**
>
> **Be sure to remove the belt at the guide bushing side when using the fixed type guide bushing device.**
> **The belt will skid when the spindle rotates, and it may cause a damage to the machine.**

9. Apply tension to the belt at the spindle side using the strut bolt. The tension for the belt is about 40N.
10. Temporarily tighten the bolt of the housing.
11. Temporarily tighten the bolt of the flange. At this time, pay attention to parallerism (travel angle) with the spindle.
12. After making sure the parallerism with the spindle, securely tighten the bolts that were temporarily tightened to fix the housing and the flange.

⚠ CAUTION

Be sure to adjust the tension of the belt at the spindle side.
The belt will skid when the spindle rotates, and it may cause a damage to the machine.

13. Turn the spindle clockwise and counterclockwise by hand to make sure that the guide bushing driving device rotates along with the spindle rotation.
14. Insert the replacing guide bushing device into the mounting hole on the machine body.
15. Fix the guide bushing device.
16. Mount the flange cover.

7.2.4 Replacing fixed guide bushing device with synchronous rotary guide bushing device

The replacement work must be performed from the rear of the machine. Secure the sufficient work space in the rear of the machine.

> **⚠ CAUTION**
>
> **When replacing the guide bushing device, you need to move the drive unit to loosen the tension of the belt. At this time, you need to move components such as brackets. To restore the original state, perform marking on relevant locations before starting job.**

1. Remove the rear cover (1).
2. Remover the cover. You will see the timing pulley of the guide bushing driving device.
3. Remover the flange cover.
4. Remove the fixing bolt from the guide bushing device.
5. Hold the flange and gently pull out the guide bushing device toward the front.

   Note) When you remove the guide bushing device, the air outflows and the sound is heard. But it is not a failure.
6. Loosen the belt hanging on the guide bushing device and the spindle. Loosen the strut bolt. You need not to remove the bolt.
7. Loosen the bolt of the housing. You need not to remove the bolt.
8. Loosen a fixing bolt of the bracket that supports the spline shaft. You need not to remove the bolt. Move the bracket horizontally along with the key to loosen the belt.
9. Mount the belt used for connection between the synchronous guide bushing device and the guide bushing driving device. Hang the belt on timing pulley of the guide bushing driving device.
10. Insert the replacing guide bushing device into the mounting hole on the machine body. Pay attention so that the belt is not crushed by the guide bushing device.
11. Hang the belt securely on the timing pulley of the guide bushing device.
12. Make sure that the belts are hung on the two timing pulleys at the front and rear of the guide bushing device.
13. Move the bracket using the strut bolt to apply tension to the belt.
    The tension for the belt is about 40N.
14. Temporarily tighten the bolt of the housing.

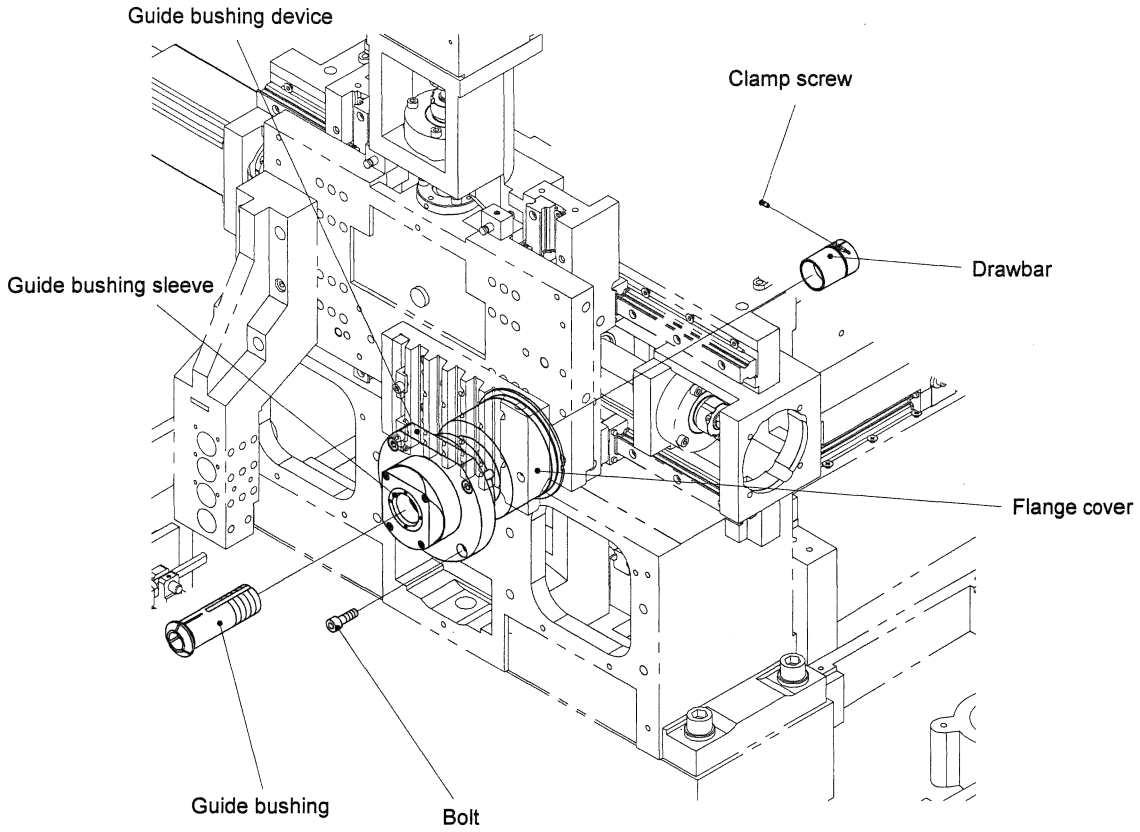
15. Temporarily tighten the bolt of the flange. At this time, pay attention to parallerism (travel angle) with the spindle.
16. After making sure the parallerism with the spindle, securely tighten the bolts that were temporarily tightened to fix the housing and the flange.
17. Turn the spindle clockwise and counterclockwise by hand to make sure that the guide bushing driving device rotates along with the spindle rotation.

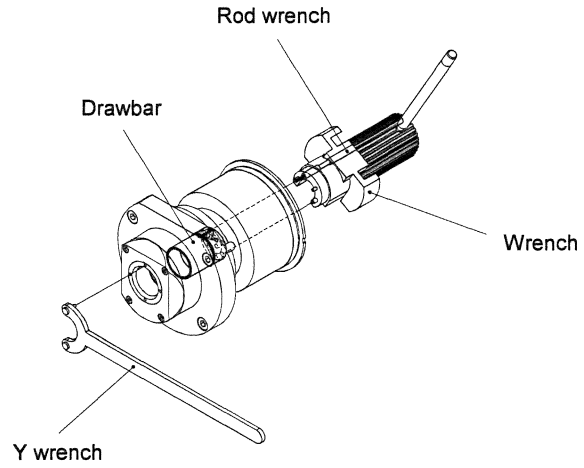
> **CAUTION**
>
> **Be sure to adjust the tension of the belt at the spindle side and guide bushing side. The belt will skid when the spindle rotates, and it may cause a damage to the machine.**

18. Fix the guide bushing device.
19. Mount the flange cover.

7.3 Replacing and Adjusting Guide Bushing

1. Insert the guide bushing adjustment wrench (provided as a standard tool) into the tommy hole of the drawbar, which is mounted at the rear of the guide bushing device, and loosen the drawbar clamp screw with a hexagonal rod wrench.
   The rod wrench should be attached to the guide bushing adjustment wrench before the work.





2. Turn the guide bushing adjustment wrench counterclockwise to loosen the drawbar. (To prevent the guide bushing device from turning, insert the Y wrench (provided as standard tool) into the tommy hole of the guide bushing sleeve.)

3. Pull out the guide bushing toward the front of the device.

4. Insert a new guide bushing into the guide bushing sleeve. (Align the key in the sleeve with the key groove on the outer circumference of the guide bushing.)
5. Screw the drawbar into the guide bushing rear and turn the drawbar clockwise for tightening.
6. Using the guide bushing adjustment wrench, tighten the drawbar. Insert a bar material into the guide bushing and adjust the clearance between guide bushing and bar material while moving the bar material to the axis direction.
7. With the guide bushing adjustment wrench inserted into the drawbar, tighten the clamp screw of the drawbar with a hexagonal rod wrench.
8. Be sure to cut-off or remove the bar material.

⚠ CAUTION

After the work, be sure to remove the used tool from the guide bushing. If the machine is operated without removing the tool, the machine may seriously be damaged.

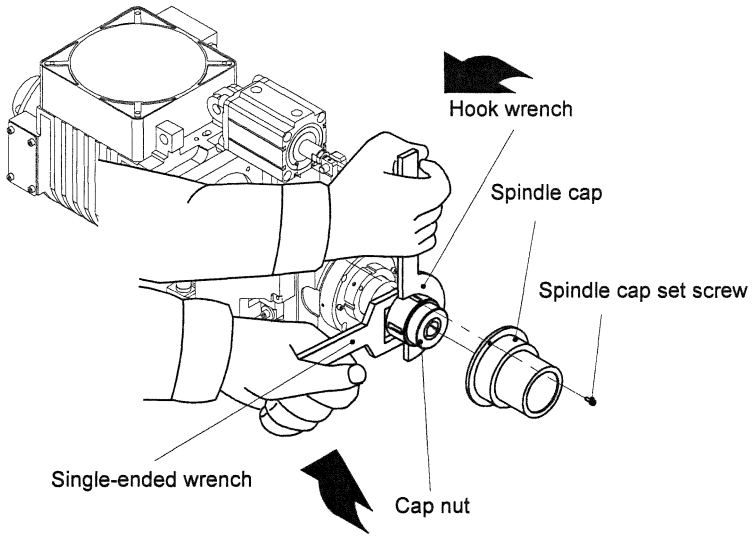
Notes

- Upon completion of [RT.POS], execute [ST.POS] on the Preparation screen.
- When the machine is operated with the door opened, the axis feed is limited to 2 m/min or less.
- After the operation is completed, the menu key selection is automatically canceled.
- When the machine is not operated in excess of given period after selection of menu key, the menu key selection is automatically canceled.

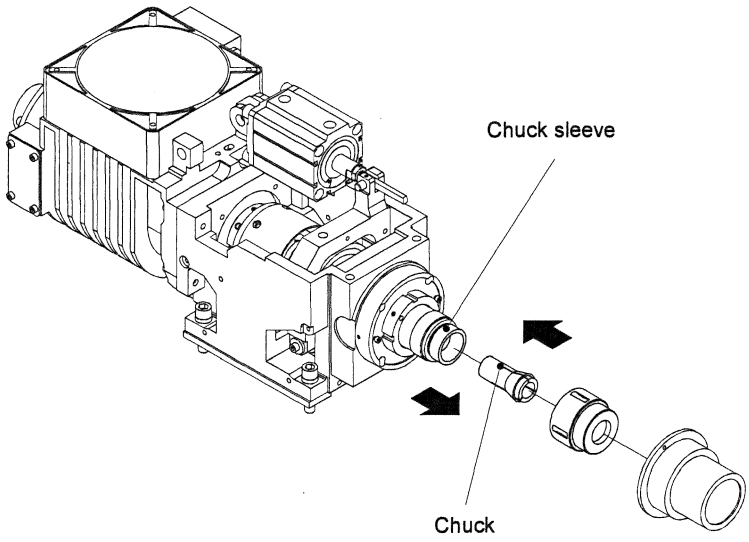
7.4 Rearrangement of Back Spindle Device

7.4.1 Mounting and adjusting chuck

1. Loosen the spindle cap set screws and remove the spindle cap.



2. Place the hook wrench (provided as a standard tool) on the cap nut, fit a single-ended wrench onto the two-side width of the spindle, and loosen the cap nut (right-hand screw).
3. Turn the cap nut to remove it from the spindle.
4. Mount a new chuck on the chuck sleeve inserted into the spindle. Check that the square spring is in the chuck sleeve. If an old chuck is on the chuck sleeve, hold it and pull it out to this side, and mount the new one.



5. Screw the cap nut into the spindle, and firmly tighten it with the hook wrench and single-ended wrench.
6. Finally, firmly secure the spindle cap with the set screws. Mount the cap so that the oval oil drain hole faces straight downward.

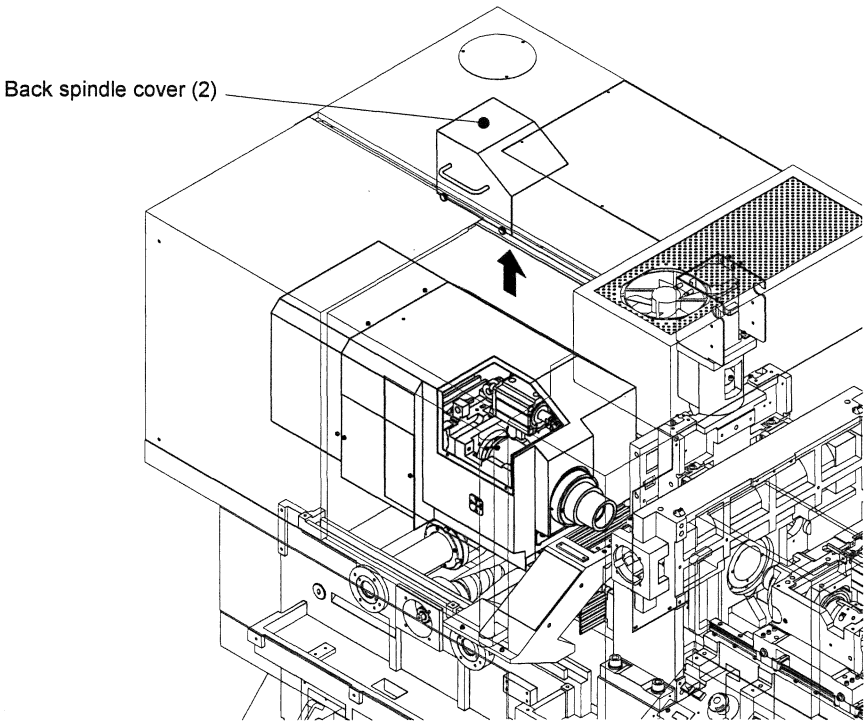
⚠ CAUTION

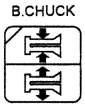
If the oil drain hole of the spindle cap does not face straight downward, oil enters into the bearing to cause possible damage. Be sure to mount the cap so that the oil drain hole faces straight downward.

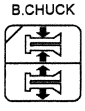
7.4.2 Adjusting back spindle chucking force

1. Press the Preparation key 

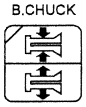
on operation panel. The Preparation key lamp goes on and the Preparation screen appears.
2. Loosen the screws securing the spindle cap, and remove the spindle cap.
3. Remove the back spindle cover (2).



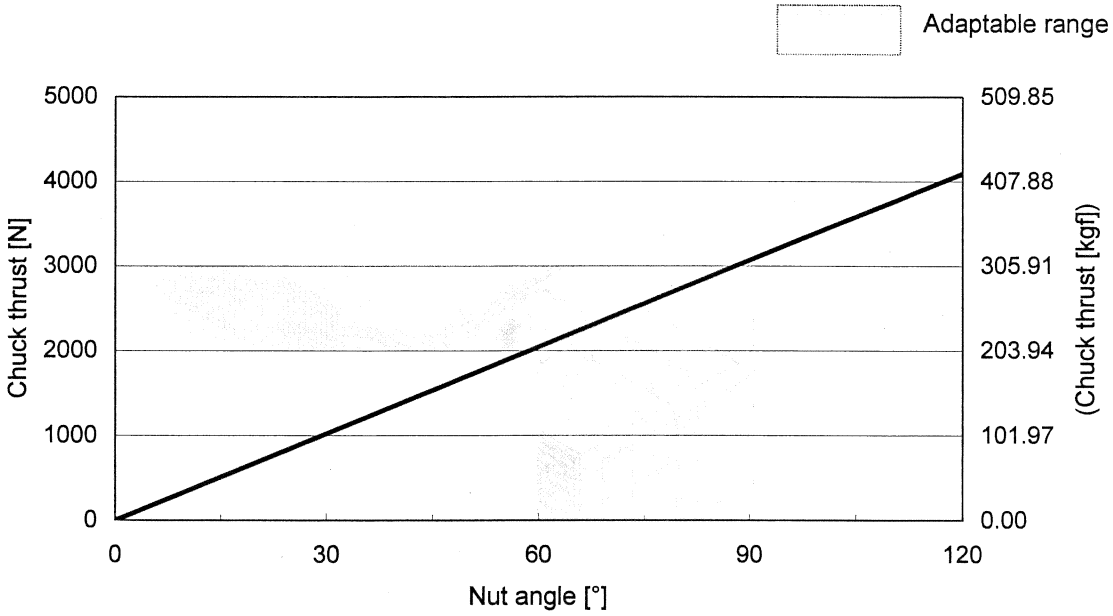
4. With the chuck opened, insert the workpiece into the chuck.
5. Loosen the lock screw on the chuck adjustment nut, and turn the nut counterclockwise for loosening.
6. Press the Back spindle chuck key 

on the operation panel to close the chuck. Check the Back spindle chuck key lamp goes on. If the lamp does not go on, press the Back spindle chuck key again.
7. Hold and move the workpiece in the longitudinal direction. Make sure that the workpiece is not chucked.
8. With the chuck adjustment nut being fully loose, slowly tighten the chuck adjustment nut until the nut becomes hard to turn. Define the point as the nut angle zero point.
9. Press the Back spindle chuck key 

. The Back spindle chuck key lamp goes off, and the chuck is open.

10. Tighten the chuck adjustment nut for the required angle from the zero point.
11. Press the Back spindle chuck key 

. The Back spindle chuck key lamp goes on.
12. When obtaining a suitable chucking force, tighten the lock screw on the chuck adjustment nut to prevent loosening.



Relationship between adjustment nut rotating angle of back spindle and chuck thrust

Note 1: The screw hole interval on the chuck finger holder side is 60°.

Note 2: The figure shown above indicates the data when a Citizen authorized chuck is used. If a third party chuck is used, the force may not be equivalent to the value shown in the figure above.

⚠ CAUTION

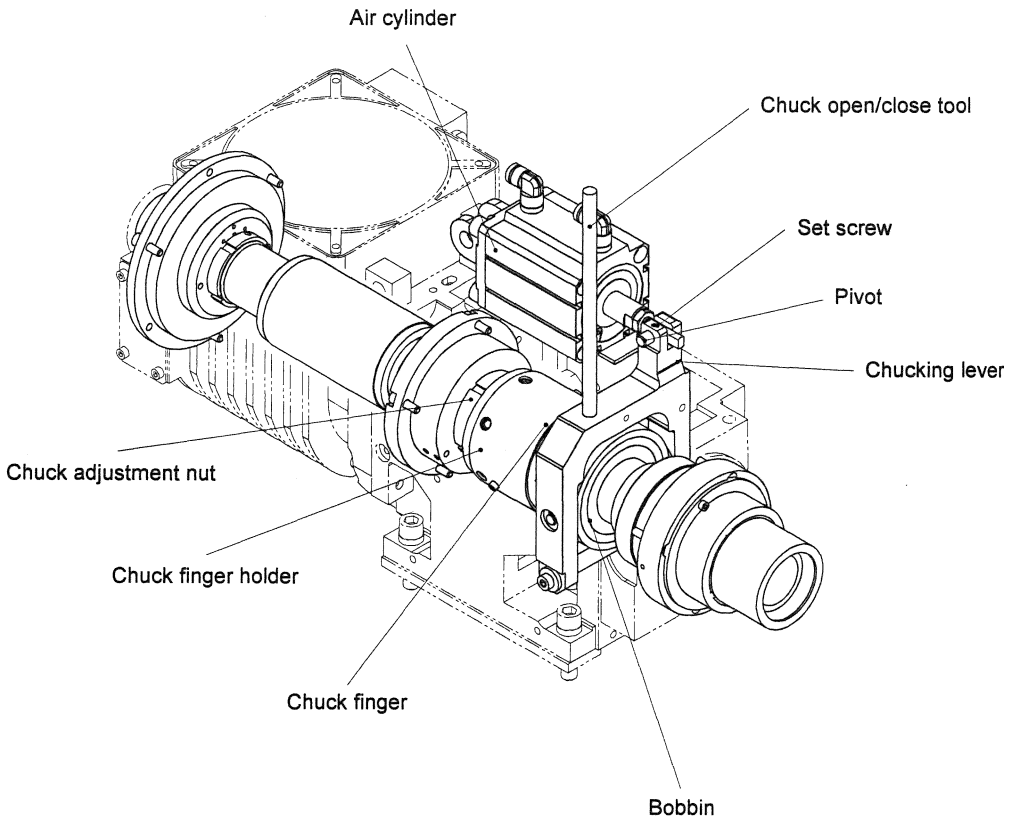
Avoid empty chuck (chucking without workpiece). Otherwise, malfunctioning or damaged collet chuck may occur.

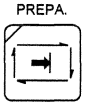
⚠ CAUTION

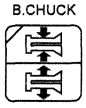
When the diameter of the workpiece is about 1 to 2 mm, extremely strong chucking force may deform the workpiece. In such the case, readjust the chucking force.

Supplement

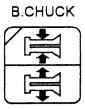
Making sure of the chucking force by using the chuck open/close tool



1. Press the Preparation key 

on the operation panel. The Preparation key lamp goes on and the Preparation screen appears.
2. Remove the back spindle cover (2) from the back spindle unit.
3. With the chuck opened, insert the workpiece into it.
4. Loosen the lock screw on the chuck adjustment nut, and turn the nut counterclockwise for loosening.
5. Loosen the set screw on the pivot receiver, and pull out the pivot, which holds the chucking lever and chuck open/close cylinder.
6. Press the Back spindle chuck key 

on the operation panel to close the chuck.
7. Insert the chuck open/close tool, which is a standard accessory for the machine, into the hole on the chucking lever, and manually adjust the back spindle chucking force while moving the lever to right and left to check the force. To adjust the chucking force, turn the chuck adjustment nut.
8. When obtaining a suitable chucking force, set the chucking lever to place the back spindle chuck in open state (the chuck open/close tool set to the righe position).

9. Press the Back spindle chuck key 

on the operation panel to open the chuck.

10. Insert the chucking lever and the chuck open/close cylinder into the pivot, and then secure them with the set screw.

11. Finally, tighten the lock screw of the adjusting nut of the chuck to remove the workpiece.

⚠ CAUTION

Be sure to firmly tighten the set screw of the pivot securing the chucking lever. Failure to do so may cause serious damage to the machine.

⚠ CAUTION

Do not forcibly move the air cylinder by your hand while adjusting the chucking force. Doing so may disconnect the cable and/or air tube being connected with the cylinder.

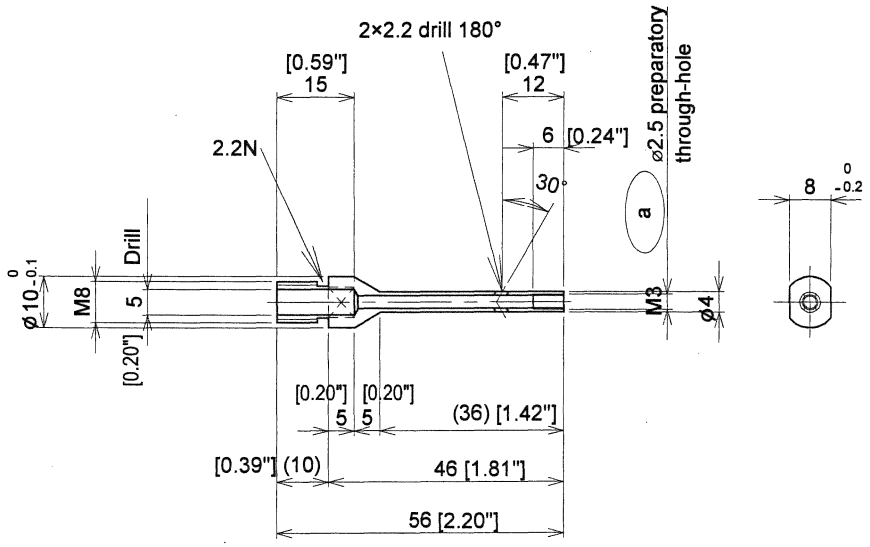
7.5 Adjusting knock-out device

The knock-out device unloads the workpiece from the back spindle. The knock-out device is also used as an air blower in the back spindle. The device is equipped with a safety unit so that an alarm occurs to stop it if the workpiece is not unloaded appropriately in spite of specification of workpiece unloading. A knock-out jig appropriate to the diameter of the workpiece must be used. Two knock-out jigs are provided as standard accessories for the device. If these knock-out jigs are not appropriate to the diameter of the machined workpiece, the customer must manufacture a proper knock-out jig.

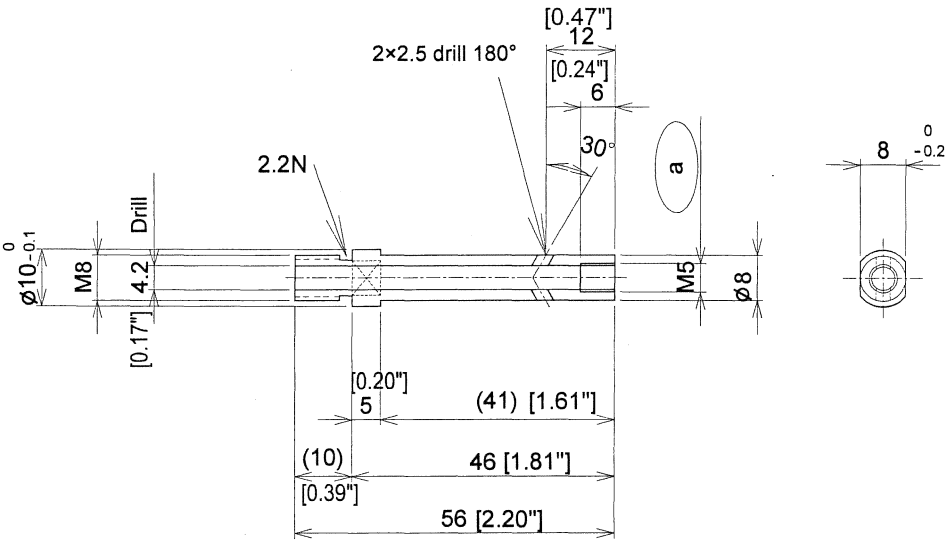
7.5.1 Mounting and replacing knock-out jig

1. Advance the knock-out device to allow you to see the knock-out jig through the front-end of the back spindle cap.
2. Stop the machine and remove the back spindle cap.
3. Remove the cap nut, chuck and chuck sleeve.
4. Loosen the bolt fixing the knock-out pipe, and pull the pipe toward front of the machine.
5. The knock-out pipe and the knock-out jig extrude from the front end of the spindle. Remove the knock-out jig by using the dedicated wrench, which is an accessory for the machine.

> **CAUTION**
>
> **When replacing the knock-out jig, pay attention not to apply excess force to the knock-out pipe. Deformed knock-out pipe will fail to knock-out the workpiece correctly, and it causes a damage to the machine.**

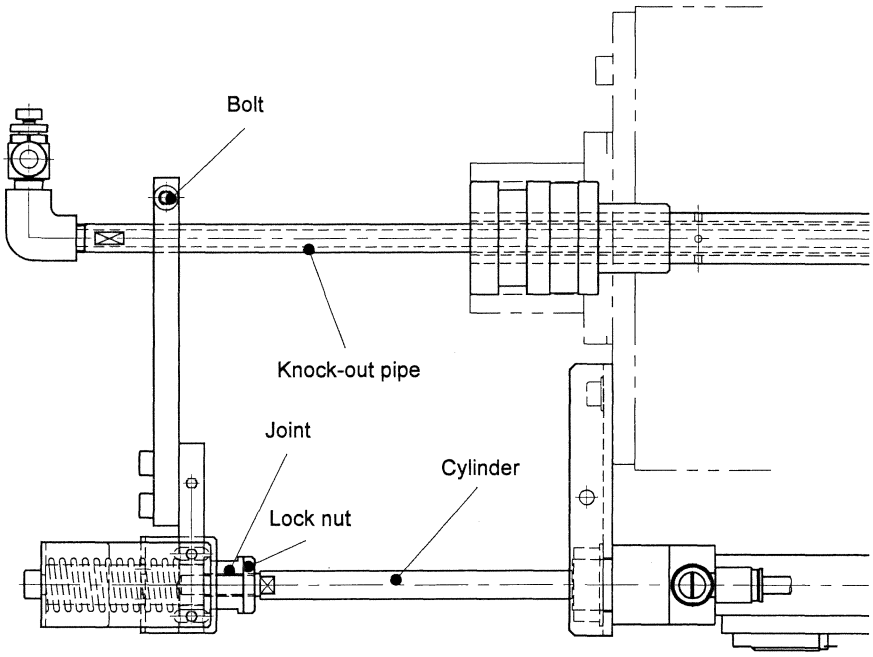


ø4 knock-out jig



ø8 knock-out jig

6. Mount a new knock-out jig appropriate to the workpiece diameter on the pipe.
7. Insert the chuck sleeve and the chuck and tighten the cap nut.
8. Adjust the longitudinal position of knock-out jig so that it protrudes about 4 mm from the front end of the cap nut according to <Section 7.5.2 Adjusting protrusion amount of knock-out jig>. Then, tighten the bolt.
9. Mount the back spindle cap.
10. Adjust the chucking force of back spindle.
    See <Section 7.4.2 Adjusting back spindle chucking force>.



7.5.2 Adjusting protrusion amount of knock-out jig

Adjust the knock-out jig protrusion amount from the end face of the back cap nut. The adjusting range is about 8 mm in the longitudinal direction.

1. Stop the machine and remove side cover (1).
2. Make the knock-out advanced.
3. Loosen the bolt, and adjust the position of knock-out pipe appropriately.
   Adjust the knock-out jig protrusion amount from the front end of the cap. Set the protrusion amount to 4 mm.
4. Tighten the bolt to fix the knock-out pipe.
5. Advance and retract the knock-out device several times to make sure that the bolt is not loosened and the knock-out jig protrusion amount does not change.
6. Mount side cover (1).

Note

When the "KNOCK-OUT OVERLOAD" alarm occurs after the adjustment, the sensor position must be readjusted. See <Section 7.5.3 Resetting knock-out overload alarm>.

7.5.3 Resetting knock-out overload alarm

If the knock-out operation fails, the workpiece may be left in the back spindle chuck. The sensor mounted on the knock-out device detects error status to prevent the machine from being damaged if the knock-out cylinder does not make normal stroke or the knock-out pipe is pushed backward by larger than the predetermined value.

Reset the "KNOCK OUT OVERLOAD" alarm in the following procedures.

1. Remove the back spindle cap and the cap nut. Then, remove the workpiece from the chuck.
2. Make sure that the knock-out pipe and the knock-out jig are not damaged.

> **CAUTION**
>
> **If the knock-out pipe is seriously damaged (e.g., bent or deformed), replace the knock-out pipe with new one. With the bent knock-out pipe will fail the knock-out operation, and causes a damage to the machine.**

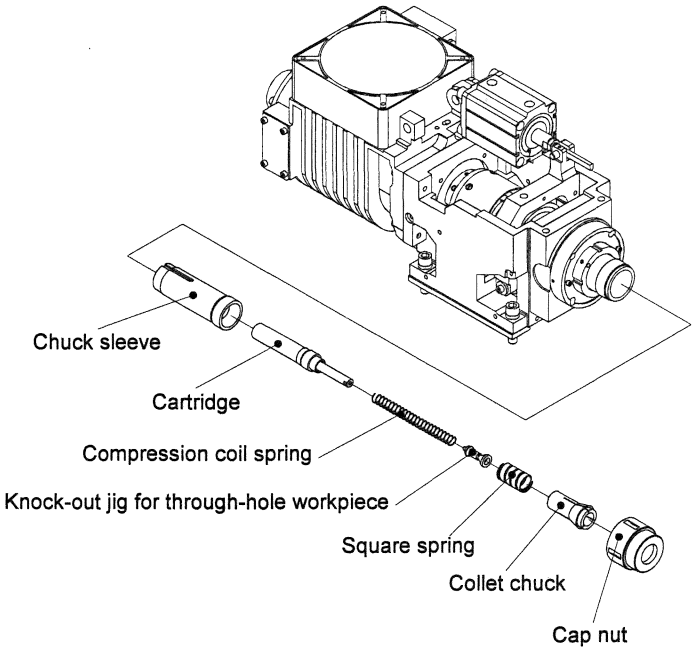
3. Move the knock-out to the retract position.
4. Press the Reset key 

to cancel "KNOCK OUT OVERLOAD" alarm.
5. If pressing the Reset key does not reset the alarm, the sensor must be adjusted again. If the alarm still appears after the adjustment of the sensor, see <5.5.11 Restoration from Other Alarms> in <Chapter 5 Troubleshooting> of the Maintenance Manual.
6. Mount the chuck, cap nut and the back spindle cap.
7. Make sure that the knock-out jig is protruding from the front-end of the cap nut by 4 mm.
8. Advance and retract the knock-out several times to make sure that the alarm does not occur.
9. Adjust the chucking force of back spindle. See <Section 7.4.2 Adjusting back spindle chucking force>.

7.6 Rearrangement of through-hole workpiece

Mounting knock-out device for through-hole workpiece knock-out device

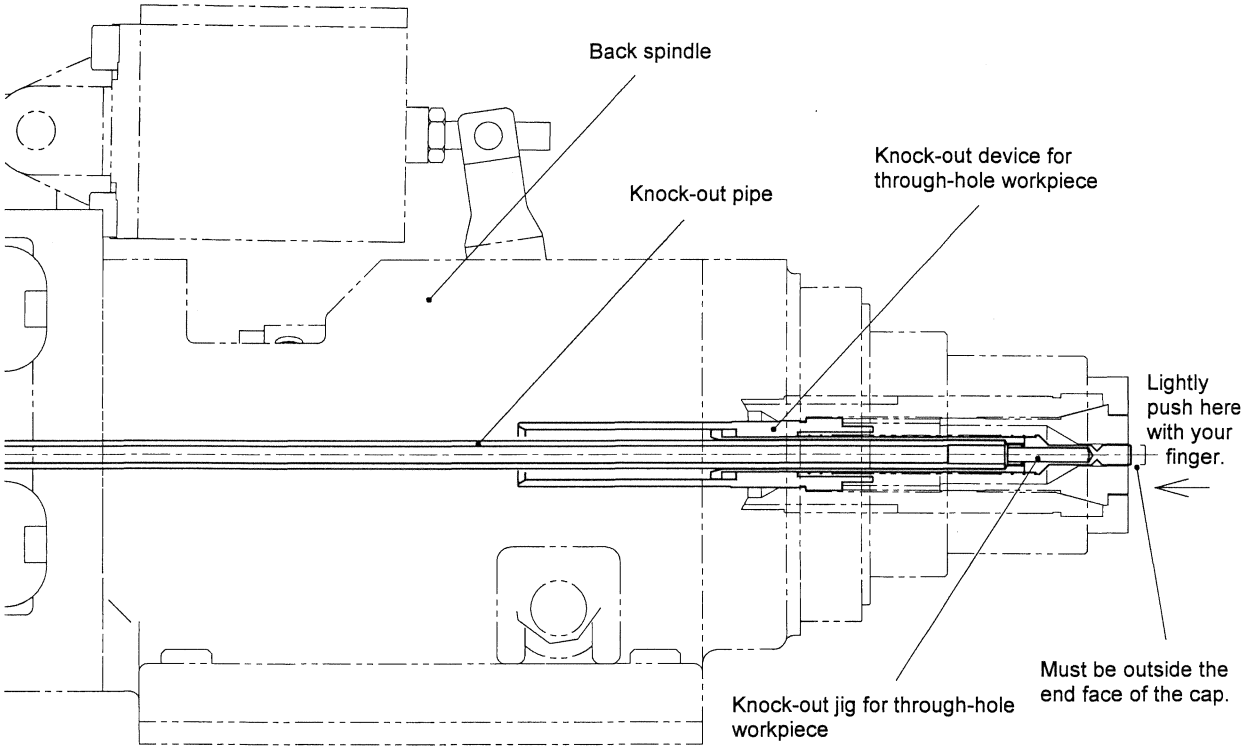
1. Remove the knock-out jig from the knock-out pipe according to the procedure given in <Section 7.5.1 Mounting and replacing knock-out jig>. You need not to remove the knock-out pipe.
2. Pull out the collet chuck, chuck sleeve, square spring, and collar according to the procedure given in <Section 7.4.1 Mounting and adjusting chuck>.
3. Insert the cartridge of the through-hole workpiece knock-out device into the chuck sleeve. Next, insert the square spring, compression coil spring, and collet chuck into the sleeve in this order.



4. Insert the chuck sleeve partially assembled in Step 3 into the back spindle, and mount the cap nut and spindle cap according to the procedure given in <Section 7.4.1 Mounting and adjusting chuck>.

⚠ CAUTION

Do not use the standard knock-out jig to mount the through-hole workpiece knock-out device. The machine may be damaged by interference with the knock-out jig.

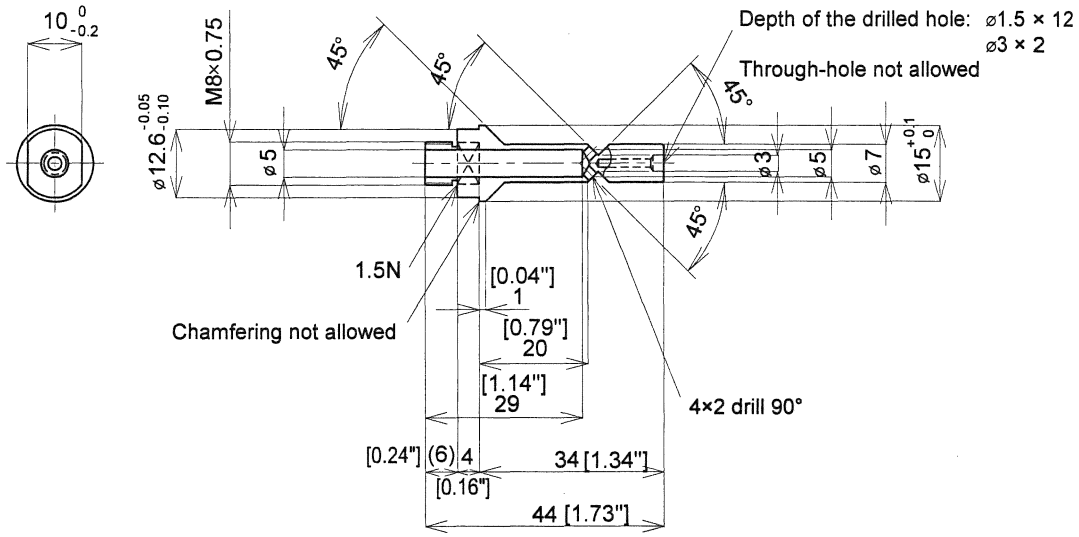


5. Move the knock-out device forward and backward to make sure that nothing engages with the knock-out pipe.
6. Advance the knock-out device, and lightly push the tip of the jig with your finger to make sure that the jig does not go any further from the cap end face.
7. If the jig goes into the cap in Step 6, it is necessary to adjust the knock-out device.
   See <Section 7.5 Adjusting knock-out device>.
8. Adjust the chucking force of back spindle.
   See <Section 7.4.2 Adjusting back spindle chucking force>.

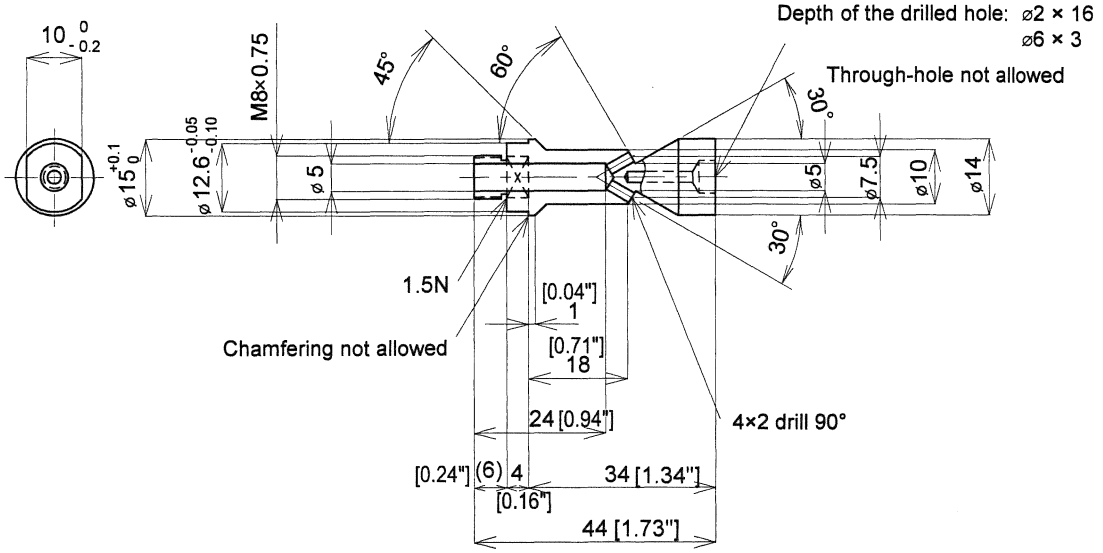
Replacing the knock-out jig for through-hole workpieces

You need to replace the knock-out jig depending on the workpiece profile (chuck diameter and through-hole diameter). The following four types of knock-out jigs for through-hole workpieces and a blank knock-out jig are available.

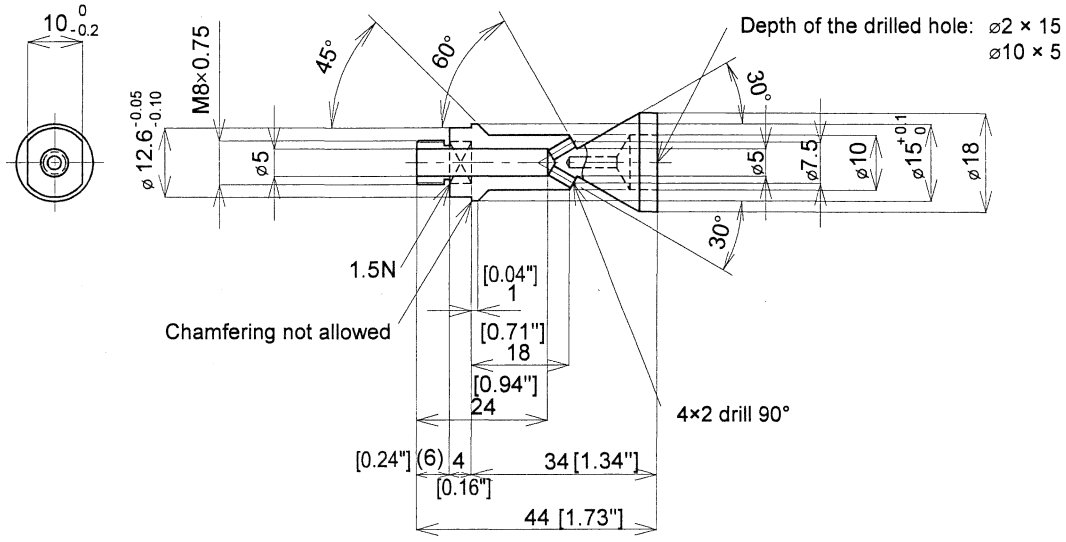
⌀8 through-hole diameter knock-out jig (material: C3604B)



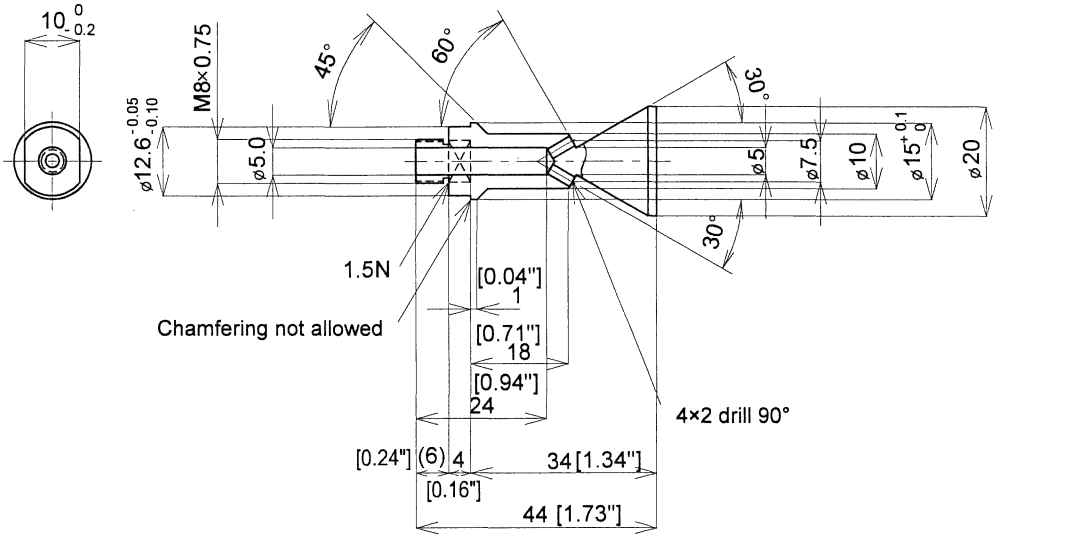
⌀16 through-hole diameter knock-out jig (material: C3604B)



⌀20 through-hole diameter knock-out jig (material: C3604B)



Through-hole diameter knock-out jig for blank (material: C3604B)



1. Remove the spindle cap, cap nut, and collet chuck according to <Section 7.4.1 Mounting and adjusting chuck>.
2. While holding the tip of knock-out jig for through-hole workpiece, pull out the square spring and the cartridge of knock-out device for through-hole workpiece toward you.
3. Replace the knock-out jig for through-hole workpiece at the tip of cartridge by using a wrench.
4. Insert the cartridge, square spring and collet chuck into the chuck sleeve in order. Then, mount the cap and spindle cap according to <Section 7.4.1 Mounting and adjusting chuck>.

5. Move the knock-out device forward and backward to make sure that nothing engages with the knock-out jig.
6. Advance the knock-out device. Lightly push the tip of the jig with your finger to make sure that the jig does not go any further from the cap end face.
7. If the jig goes into the cap in Step 6, it is necessary to adjust the knock-out device.
   See <Section 7.5 Adjusting knock-out device>.
8. Adjust the chucking force of back spindle.
   See <Section 7.4.2 Adjusting back spindle chucking force>.

Notes

- Two kinds of compression coil springs are provided with the machine. If the knock-out device does not work as expected, use the stronger one.
- If the knock-out device is used together with medium pressure coolant device, the same through-hole knock-out jig to be used.

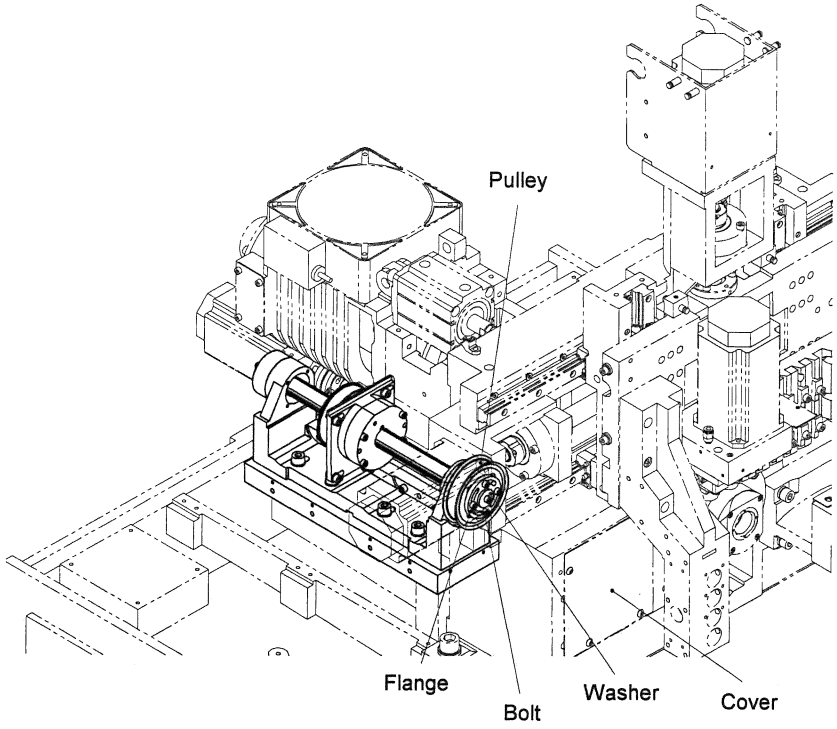
7.7 Phase Adjustment between Spindle and Guide Bushing (Non-conformed Material)

To use a non-conformed material, the phase between the main spindle and the guide bushing device must be adjusted. Take the following procedures to adjust the phase. Before starting, provide a sufficient work space because the adjustment is to be performed from the rear of the machine.

1. Mount the chuck for non-conformed material, and adjust the chucking force. For mounting the chuck for non-conformed material, see <Section 7.1.1 Mounting and replacing spindle chuck> and <Section 7.1.2 Adjusting spindle chucking force>.

> **⚠ CAUTION**
>
> **A pin is inserted into the chuck sleeve for non-conformed material. Be sure to align the chuck with a pin when tightening the main spindle cap nut. If the chuck and the pin are not aligned, the chuck may be damaged when tightening the main spindle cap nut.**

2. Mount the guide bushing for non-conformed material. See <Section 7.3 Replacing and Adjusting Guide Bushing>. Note that the clearance of guide bushing must be adjusted after the phases between the main spindle and the guide bushing device has been adjusted.
3. Conduct the job at the rear of the machine. Remove the rear cover.
4. Remove the cover. You will see the timing pulley of the guide bushing driving device.
5. Loosen the four bolts securing the flange with the timing pulley. You do not need to remove all the bolts. You can adjust the phase between the main spindle and the guide bushing device.
6. Rotate the timing pulley to align the phase of the main spindle with that of the guide bushing device so that non-conformed material can go into the guide bushing device. For adjustment, adjust the phases between the flange and the pulley.
7. If the phases between the spindle and the guide bushing device cannot be aligned completely, you need to move the hanging position of the belt by one teeth.
   See <Section 7.8 Replacing Belt of Guide Bushing Driving Device>.
8. Adjust the clearance between the guide bushing and the material. See <Section 7.3 Replacing and Adjusting Guide Bushing>.
9. Fix the phases of the spindle and the guide bushing. Firmly tighten the four bolts that have been loosened in Step 6. At that time, make sure that the belt is properly set to the timing pulley.
10. Slowly move the spindle forward and backward to make sure that the guide bushing device and the non-conformed material are properly adjusted.
11. Make sure that the non-conformed material can be inserted into guide bushing device repeately.
12. If the phases are not aligned, perform adjustment again.
13. Mount the cover.
14. Mount the rear cover you have removed in Step 3.


Pulley
Flange
Bolt
Washer
Cover

7.8 Replacing Belt of Guide Bushing Driving Device

The replacement work must be performed from the rear of the machine. Secure the sufficient work space in the rear of the machine.

If you feel difficult to assemble or adjust the guide bushing driving device, be sure to contact the manufacturer.

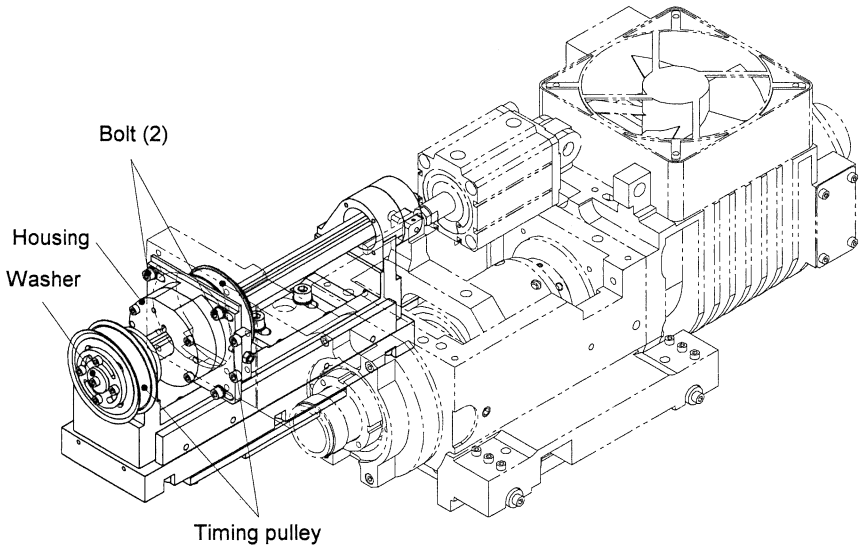
⚠ CAUTION

When replacing the belt for guide bushing driving device, you need to remove the spline shaft. To restore the original state, perform marking on relevant locations before starting job.

⚠ CAUTION

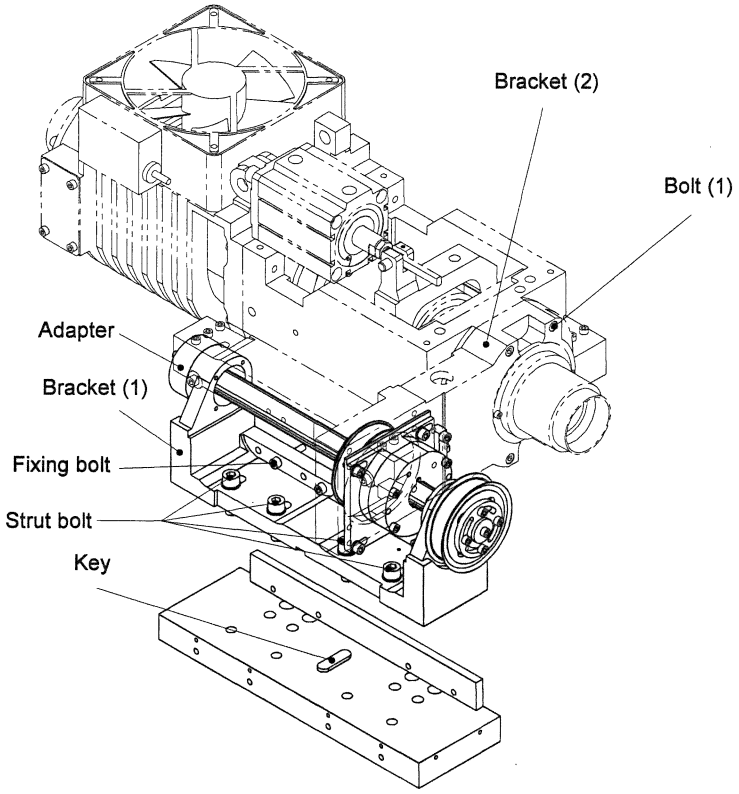
When replacing the guide bushing device, you need to move the drive unit to loosen the tension of the belt. At this time, you need to move components such as brackets. To restore the original state, perform marking on relevant locations before starting job.

1. Remove the rear cover from the cutting room at the rear of the machine.
2. Remover the cover located adjacent to the guide bushing device in the cutting room. You will see the timing pulley of the guide bushing driving device.
3. From the main spindle room side, remove the flange cover of the guide bushing device. See <7.2 Mounting/Adjusting a Guide Bushing Device>.
4. Loosen the belt hanging on the guide bushing device and the spindle. Loosen the strut bolt. You need not to remove the bolt.
5. Loosen the bolt (2) of the housing. You need not to remove the bolt.



6. Loosen a fixing bolt of the bracket (1) that supports the spline shaft. You need not to remove the bolt. Move the bracket (1) horizontally along with the key to loosen the belt.
7. Remove the fixing bolt from the guide bushing device.
8. Hold the flange and gently pull out the guide bushing device toward the front.

   Note) When you remove the guide bushing device, the air for protecting the bearing outflows and the sound is heard. But it is not a failure.



9. Remove the belt that has been used to connect the synchronous guide bushing device and the drive unit.
10. Remove the belt at spindle side. Remove the spindle cap.
11. Remove the bolt (1) that secures the bracket (2). Then, remove the bracket (2) from the spindle.
12. Pull out the belt from the spindle.
13. You need to remove the spline shaft from the guide bushing driving device. Remove the washer on the guide bushing side.
14. Remove the timing pulley.
15. Remove the bearing support.
16. Remove the washer on the opposite side.

17. Remove the adapter that contains the bearing.
18. Then the spline shaft can be pulled out toward the guide bushing side. Replace the belt at the spindle side from the guide bushing driving device.
19. Mount the adapter removed in Steps 16 and 17 and fix it with the washer.
20. Mount the bearing support removed in Step 15.
21. Mount the timing pulley removed in Steps 13 and 14.
22. Mount the belt removed in Step 12 to the spindle.
23. Mount the bracket (2) removed in Step 11 to the spindle, and then fix it with the bolt.
24. Replace the belt at guide bushing side with new one, and put it on the timing pulley of the guide bushing driving device.
25. Insert the guide bushing device into the mounting hole on the machine body. Pay attention so that the belt is not crushed by the guide bushing device.
26. Hang the belt securely on the timing pulley of the guide bushing device.
27. Make sure that the belts are hung on the two timing pulleys at the front and rear of the guide bushing driving device.
28. Apply tension to the belt with the strut bolt. The tension for the belt is about 40N.
29. Temporarily tighten the bolt (2) of the housing.
30. Temporarily tighten the fixing bolt of the bracket (1). At this time, adjust the parallerism (travel angle) with the spindle to ±0.005 μm.
31. After making sure the parallerism with the spindle, securely tighten the bolts that were temporarily tightened to fix the housing and the bracket (1).
32. Turn the spindle clockwise and counterclockwise by hand to make sure that the guide bushing driving device rotates along with the spindle rotation.

> **⚠ CAUTION**
>
> **Be sure to adjust the tension of the belt at the spindle side and guide bushing side. The belt will skid when the spindle rotates, and it may cause a damage to the machine.**

33. Fix the guide bushing device.
34. Mount the flange cover.
35. Mount the spindle cap removed in Step 10.

⚠ CAUTION

Be sure to provide running-in after you have replaced the timing belt. Initial change of belt tension may cause heat or vibration to occur.
If the tension is changed, adjust it again.

⚠ CAUTION

Use only the belt specified by the manufacturer. In addition, be sure to replace two belts at a time. If not, deviation of belt tension between the old and new ones may shorten the service life of the spline shaft.

7.9 Mounting and Adjusting Workpiece Separator

Workpiece collection mode

This machine provides the following two methods for collecting the workpiece.

[A] Pick-off collection mode (U31J) — (standard)

Holds a workpiece with the back spindle ("pick-off") and puts it in a workpiece chute ("knock-out"). This method is normally used for collecting a workpiece which can be chucked by the back spindle.

[B] Workpiece receiver box collection mode (U352J) — (optional)

This method is used for collecting a workpiece (a short workpiece or disc shape workpiece) which cannot be chucked by the back spindle. The back spindle chucking device is removed and replaced with the workpiece receiver box. The finished workpiece is cut off and collected in this workpiece receiver box.

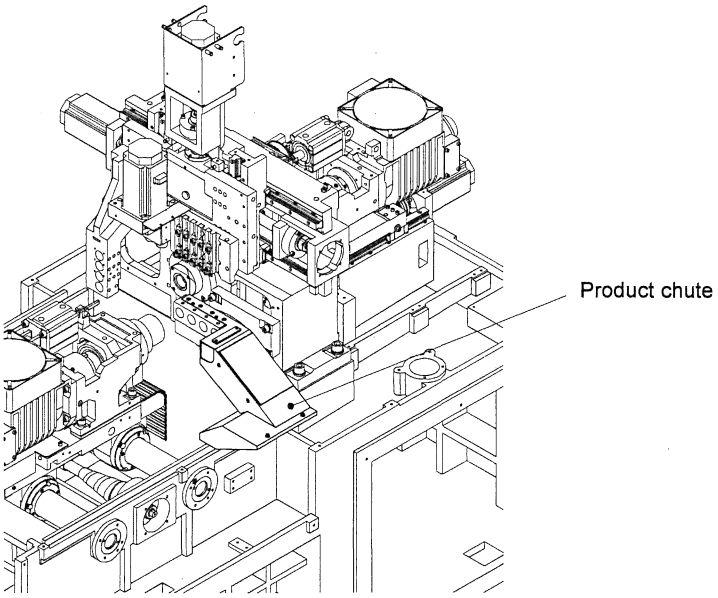
Note

The workpiece receiver box (U352J) can collect a workpiece which is up to 50 mm [1.97"] in length. When this method is used, however, back machining is disabled.

Setting up the workpiece separator

[A] Pick-off collection mode (U31J)

The back spindle approaches the fixed product chute, then holds and puts the workpiece in a workpiece chute. If the workpiece is too thin or small to collect, the advance position of the back spindle must be changed.

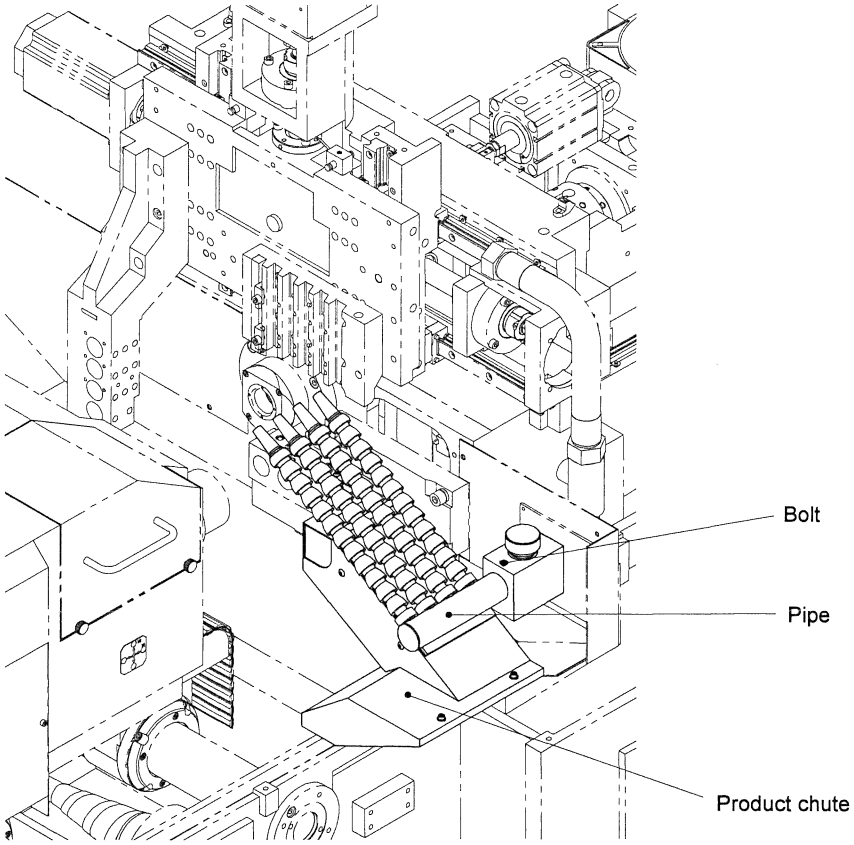


Maximum workpiece length: 100 mm [3.94"]

[A-1] Replacing Sheet

The workpiece chute is equipped with the POM (delrin) plate to protect the product from being damaged during collection. When you are collecting thin workpieces or small and light workpieces, they may adhere to the inner wall of the chute to reduce the collection efficiency. If adhesion occurs, turn the bottom sheet upside down to be appropriate to the workpiece. Select "flat face" or "odd-shaped face" to use the sheet. In addition, sweeping the product with coolant of an adequate amount is exclusively effective for the adhesion.

1. Stop the machine operation.
2. Remove the coolant nozzle at the top of the product chute.
3. Loosen the M6 bolts for preventing the pipe from being removed.
4. Pull out the pipe with the nozzles. It is unnecessary to remove each of the nozzles.
5. Remove the transparent plate from the top of the product chute. The plate is not fixed with bolts.
6. Remove the bottom sheet, which is not fixed with bolts.
7. Turn the bottom sheet upside down and return the sheet to the product chute. Insert the bolts mounted on the product chute into the center hole of the product chute.
8. Mount the transparent plate on the top of the product chute.
9. Return the pipe to the original position and tighten the M6 bolts for preventing the pipe from being removed.
10. If the direction of the coolant nozzle has been changed, adjust the nozzle to the proper position.



[A-2] Oil bath

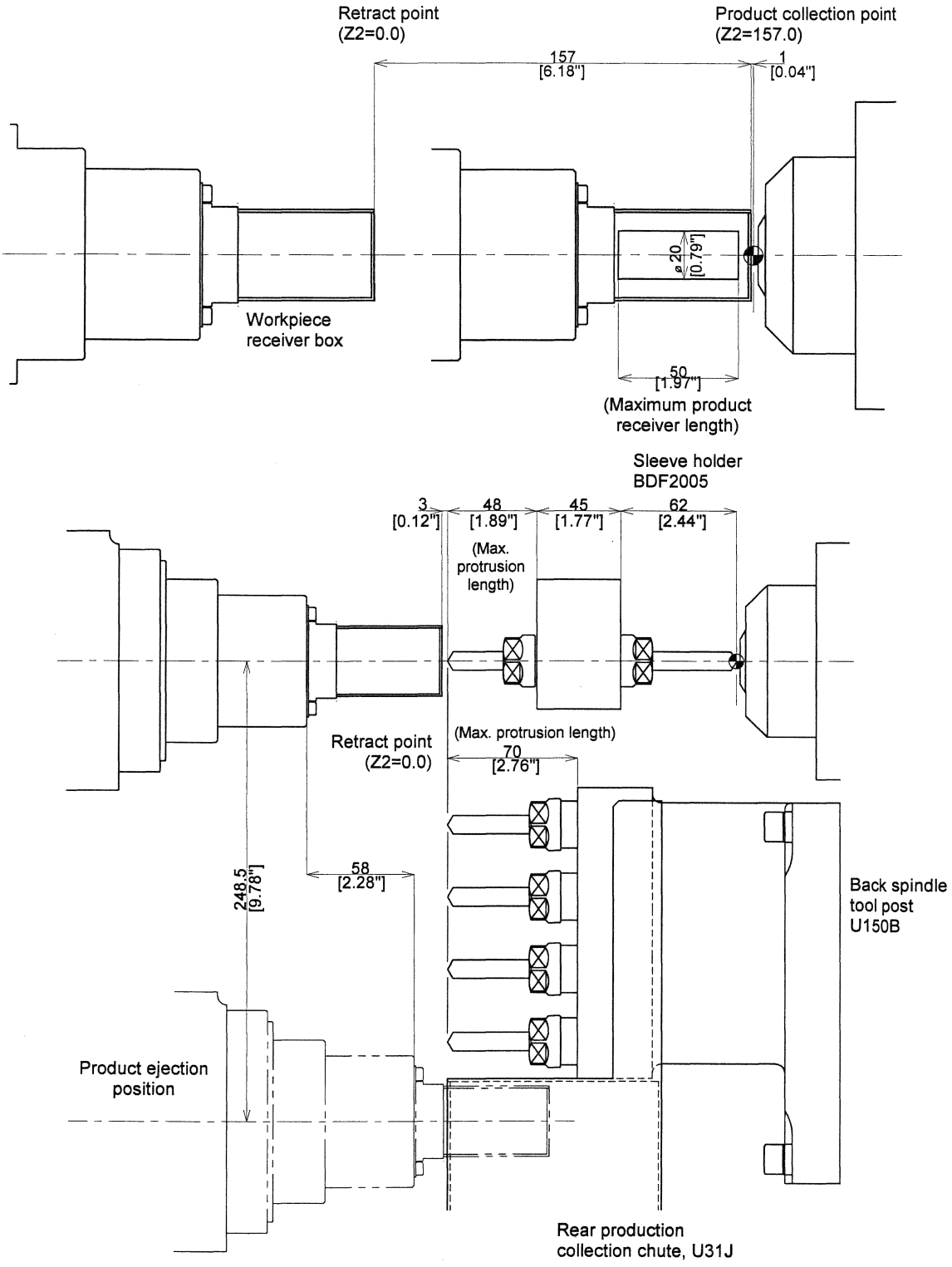
The product receiver box can be used as an oil bath. For the purpose, coolant of an adequate amount must be supplied to the product chute.

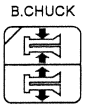
To exhaust the coolant in the product receiver box, shift the bottom plate to the face with the oil draining hole. For better coolant exhaustion in the product receiver box, change the horizontal direction of the bottom plate previously.

[B] Workpiece receiver box collection mode (U352J)

Mount the workpiece receiver box at the tip of back spindle. The machined workpiece is collected in the receiver box, and ejected to the product chute. You do not need to replace the product chute (U31J).

You do not need to remove the tools for back machining.



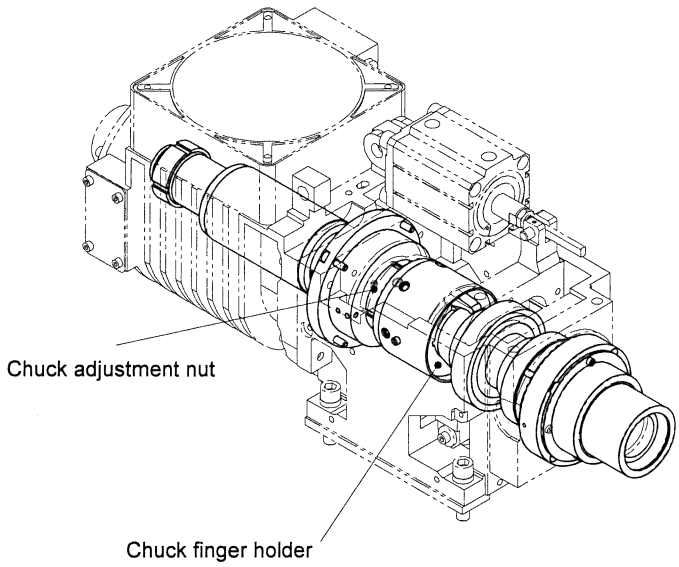
1. Press the Back spindle chuck key 

to open the back spindle chuck.

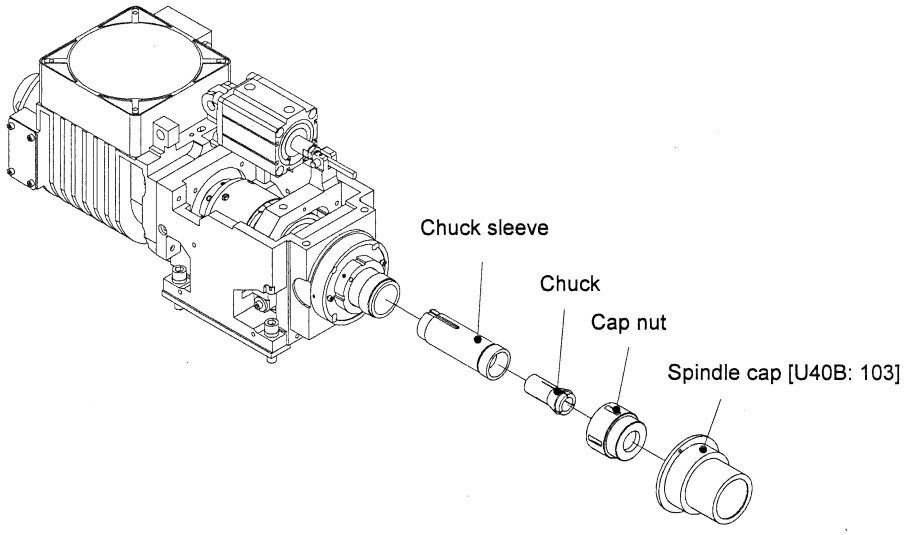
2. Remove the back spindle cover (2) from the back spindle device.

3. Loosen the lock screw of the chuck adjustment nut on the rear side of the chuck finger holder. Loosen the chuck adjustment nut.

4. Move the chuck finger holder to the rear side of the spindle.

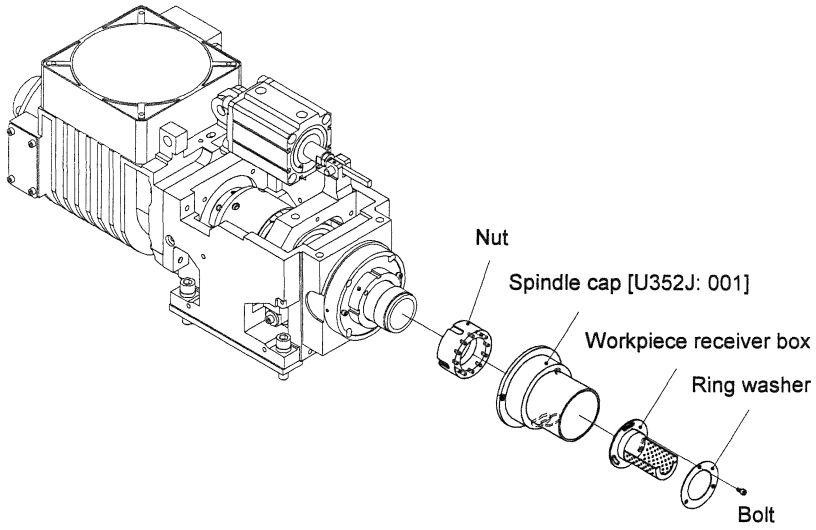


5. Remove the back spindle cap and cap nut using the procedure in <Section 7.4.1 Mounting and adjusting chuck>.
Remove the chuck and the square spring.



6. Remove the knock-out jig, using the procedure in <Section 7.5.1 Mounting and replacing knock-out jig>.

7. Insert the chuck sleeve into the back spindle.
   Screw the nut into the front end of the back spindle (mount the nut in a direction that allows the 12 taps on the end face of the nut to be seen). Use the hook wrench and dedicated wrench to tighten it firmly.



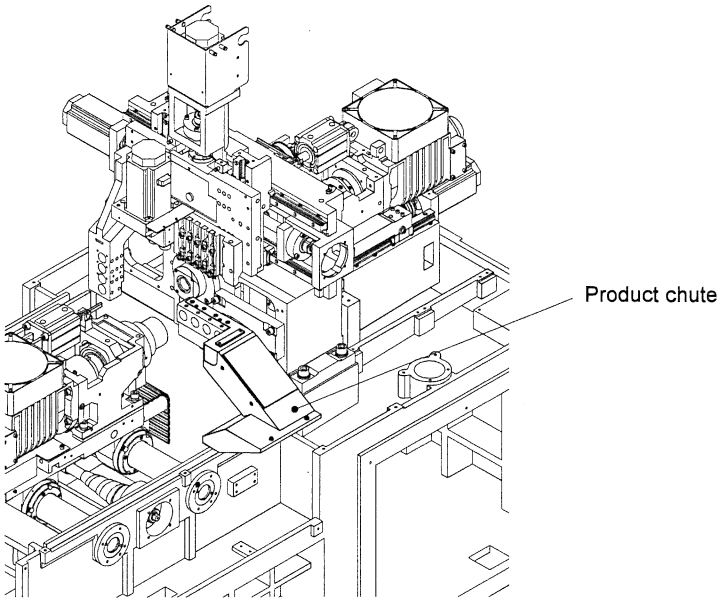
8. Specify M780 command in MDI mode to index the back spindle.
9. Press the All Spindle Stop key ALL SP.STOP or Reset key RST to cancel indexing of the back spindle.
10. Temporarily fix the workpiece receiver box and ring washer with bolt.
11. Mount the spindle cap, and secure the spindle cap with fixing screw. Be sure to mount the spindle cap so that its drain cutout facing straight down.

Note

The spindle cap for U352J workpiece separator (collection by basket on back spindle) is different from that for U40B back spindle device.

12. Insert the tommy rod into the chuck finger holder to hold the spindle. Then, tighten the bolts that has been temporarily fixed.

13. With the spindle chuck open state, turn the chuck adjustment nut toward you and lightly tighten it until it stops. Then, tighten the lock screw securely.



⚠ CAUTION

Otherwise, oil will enter the bearings and damage them.
Mount the spindle cap with its oil drain cutout facing straight down.

14. After mounting the receiver box, issue the M780 command again to confirm the normal operataion, since the back spindle is not energized.

15. Make sure that the device does not interfere with the guide bushing at cut-off machining. Slowly advance the back spindle to Z2=157.0 of the machine coordinate.

16. Make sure that the device does not interfere with the product chute.
Slowly advance the back spindle device until it reaches X2=–497.0, Z2=52.0 (product ejection position) observing the interference with the tools for back machining.

7.10 Setting Up and Adjusting the Long Workpiece Device

The device is used to unload products exceeding 100 mm [3.94"] in workpiece length. A product of up to 600 mm in workpiece length can be unloaded with this device. The product is transferred through the workpiece stock pipe mounted in the back spindle and unloaded to the workpiece receiver shelf mounted on the left side of the machine. Select the pipe and bushing appropriate to the diameter of the workpiece.

⚠ WARNING

If the specific receiver shelf for long workpiece is not mounted, the stock pipe extrudes from the machine. Running the machine with that state may cause a serious personal injury due to extruded pipe. Be sure to mount the workpiece receiver shelf specified by the manufacturer for your safety.

⚠ WARNING

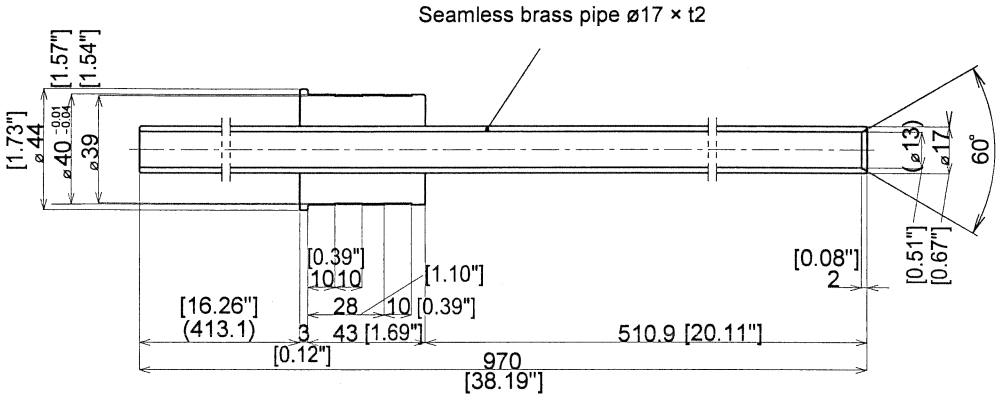
If the specific receiver shelf for long workpiece is not mounted, the stock pipe extrudes from the machine. Running the machine with that state may cause a workpiece to run out from the pipe, resulting in a serious personal injury. Be sure to mount the workpiece receiver shelf specified by the manufacturer for your safety.

7.10.1 Mounting stock pipe for long workpiece device

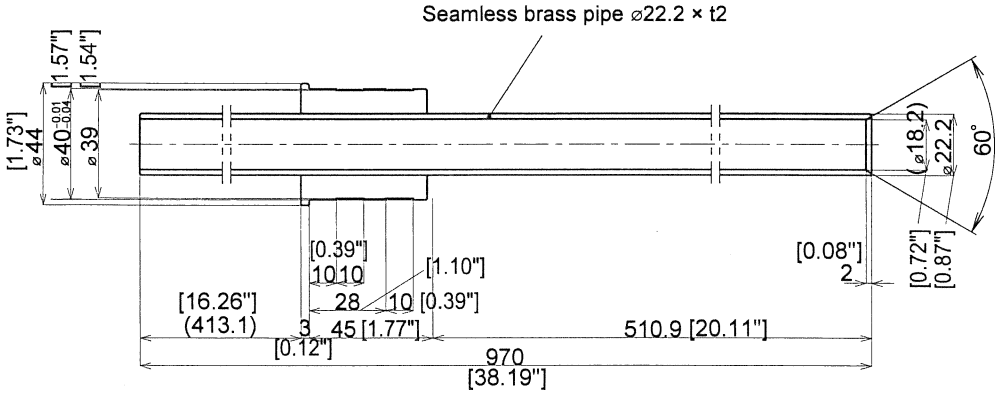
Mount the stock pipe for long workpiece device in the back spindle. Accordingly, the standard knock-out device must be removed. The work must be performed from the rear of the machine. Secure the sufficient work space in the rear of the machine.

Three types of stock pipes and adjustment pipes, and four kinds of bushing are provided with the machine.

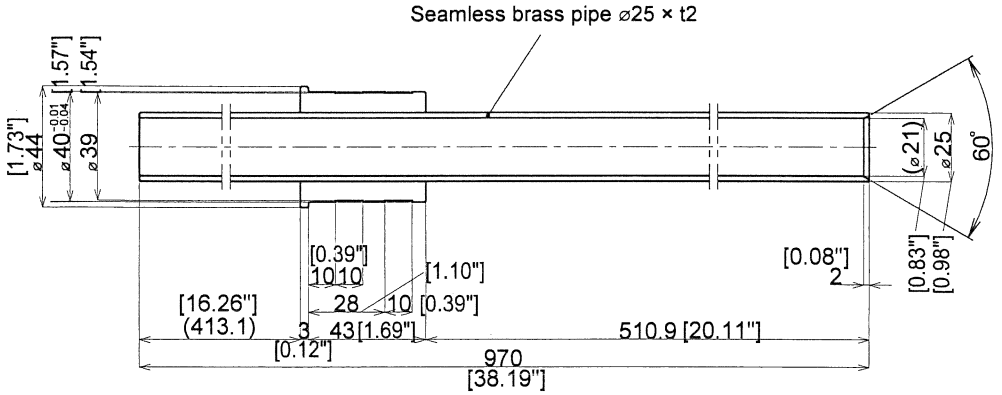
⌀12 workipiece stock pipe



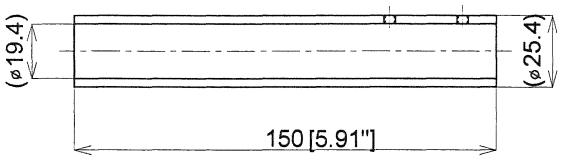
⌀16 workipiece stock pipe



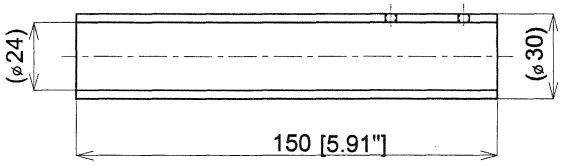
⌀20 workipiece stock pipe



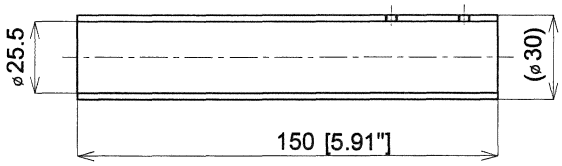
⌀12 longitudinal adjustment pipe



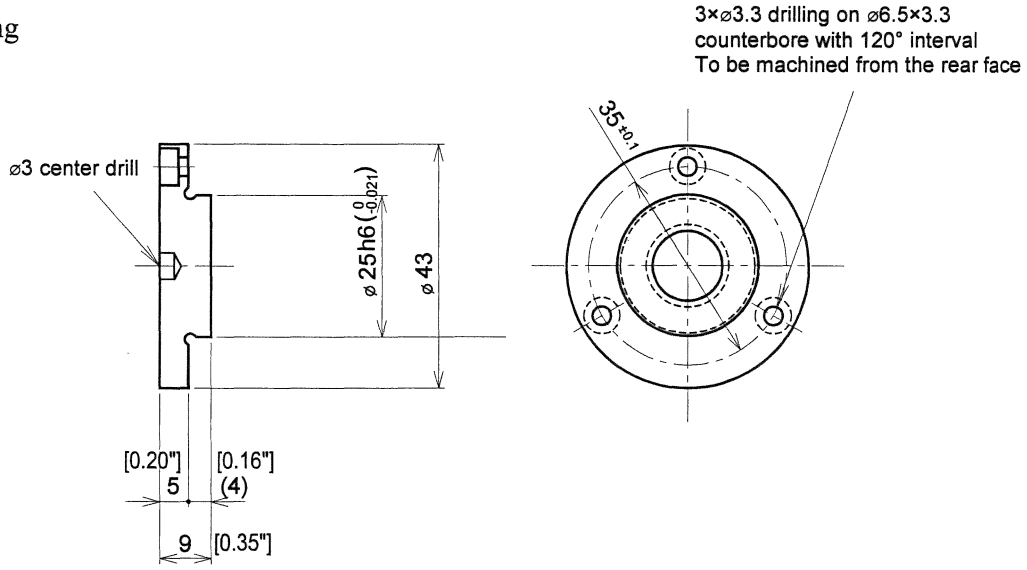
⌀16 longitudinal adjustment pipe



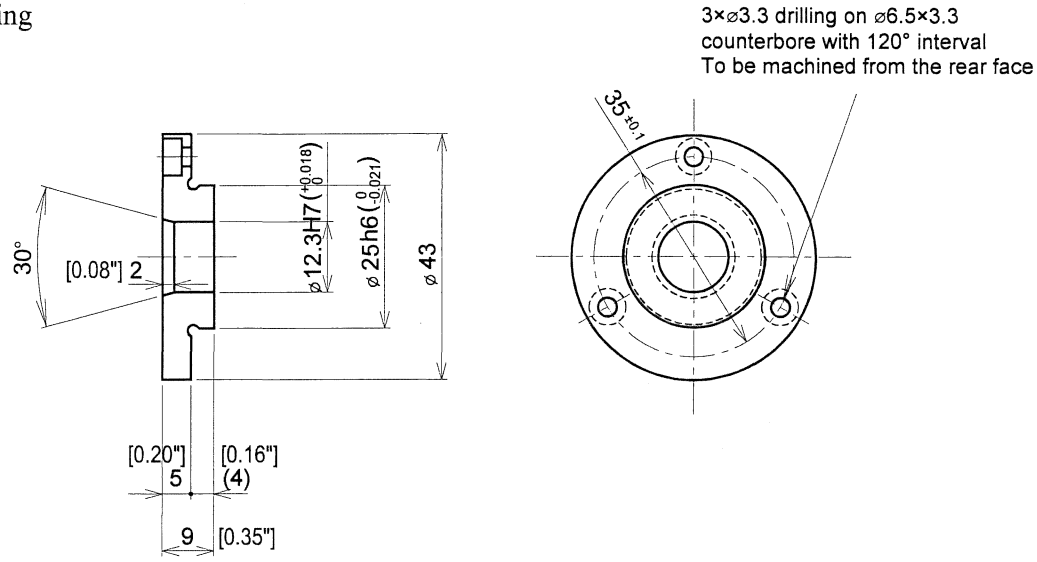
⌀20 longitudinal adjustment pipe



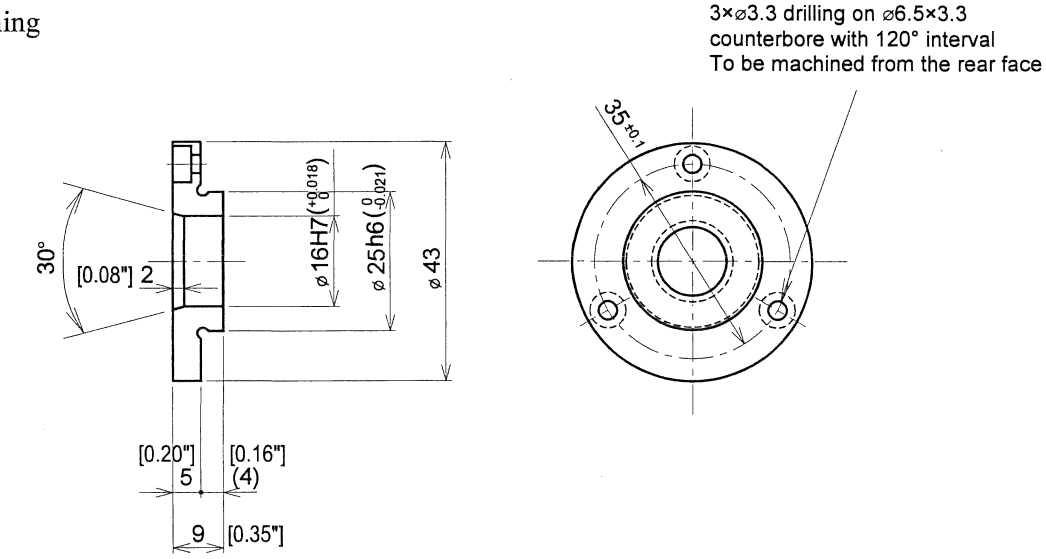
Bushing



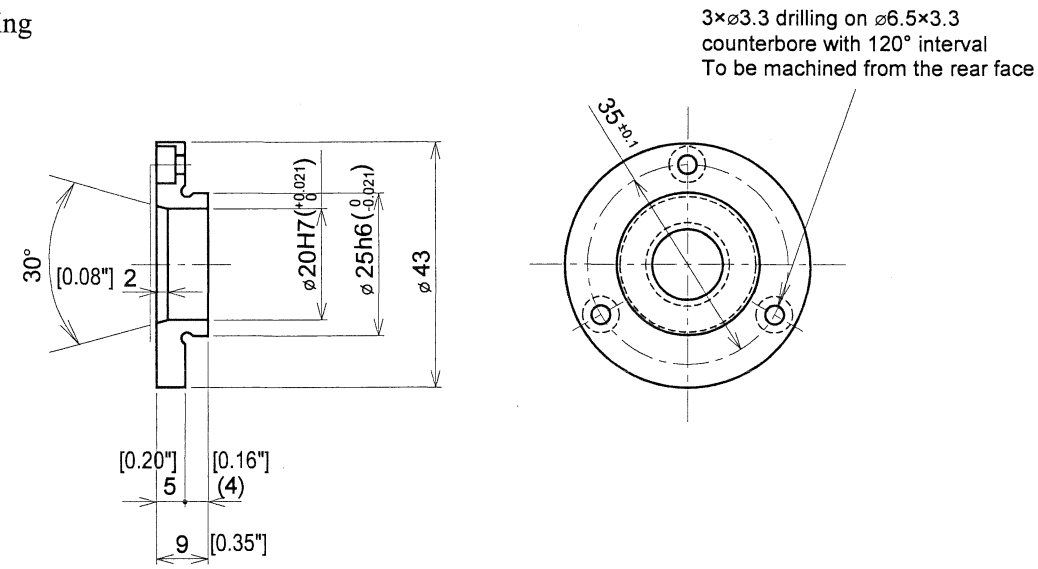
⌀12 bushing



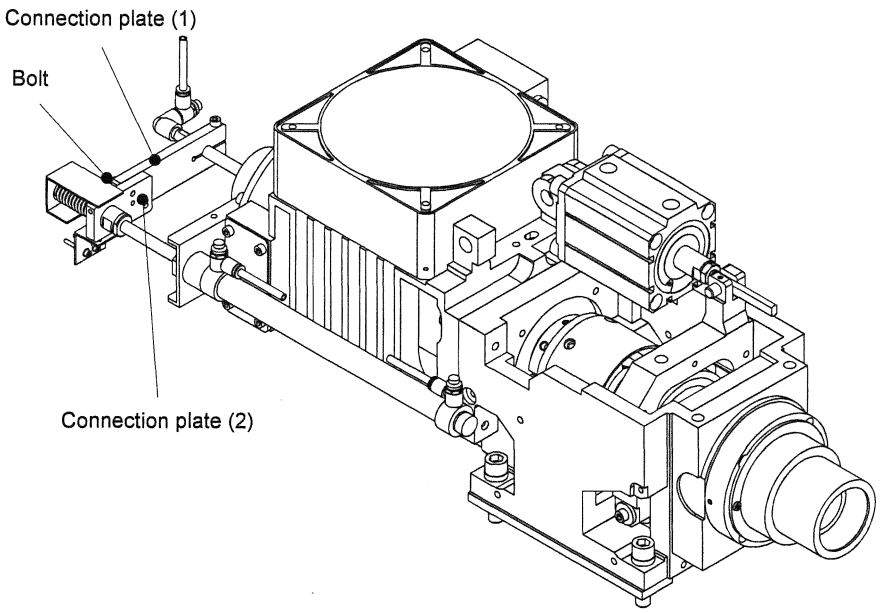
⌀16 bushing



⌀20 bushing



7.10.2 Mounting workpiece stock pipe



1. Remove side cover (1) to allow you to do jobs from the rear of the back spindle.
2. Remove the knock-out device. Remove the bolts to separate connection plate (1) from connection plate (2).
3. Pull out the knock-out pipe from the back spindle. First remove the air tube inserted to the back end of the knock-out pipe. Mount emboli on the removed air tube. Then fix the tube within the machine so that it does not disturb the machine operation. Cut the air supply to the machine before doing the above job, if necessary.
4. Remove the guide pipe inserted to the back spindle.
5. Insert a workpiece stock pipe appropriate to the workpiece diameter and fix the pipe with bolts.
6. Mount a longitudinal adjustment pipe to be appropriate to the pipe diameter. Fix the longitudinal adjustment pipe to the workpiece stock pipe securely. For adjusting the longitudinal adjustment pipe, see <7.10.5 Adjusting position of longitudinal adjustment pipe>.
7. Advance the air cylinder of the knock-out to shorten the cylinder rod. This is intended to protect the knock-out from vibration during the machine operation.

7.10.3 Mounting the receiver shelf for long workpiece device

The receiver shelf is very large and heavy component. At least two persons are required to handle the shelf to avoid personal injury.

1. Remove the left side cover.
2. Mount the shelf. If the height of the shelf does not match with the machine height, adjust the position of the shelf with the height adjustment bolt.
3. Mount the side cover for long workpiece device.
4. Keep the cover carefully that was removed in Step 1.

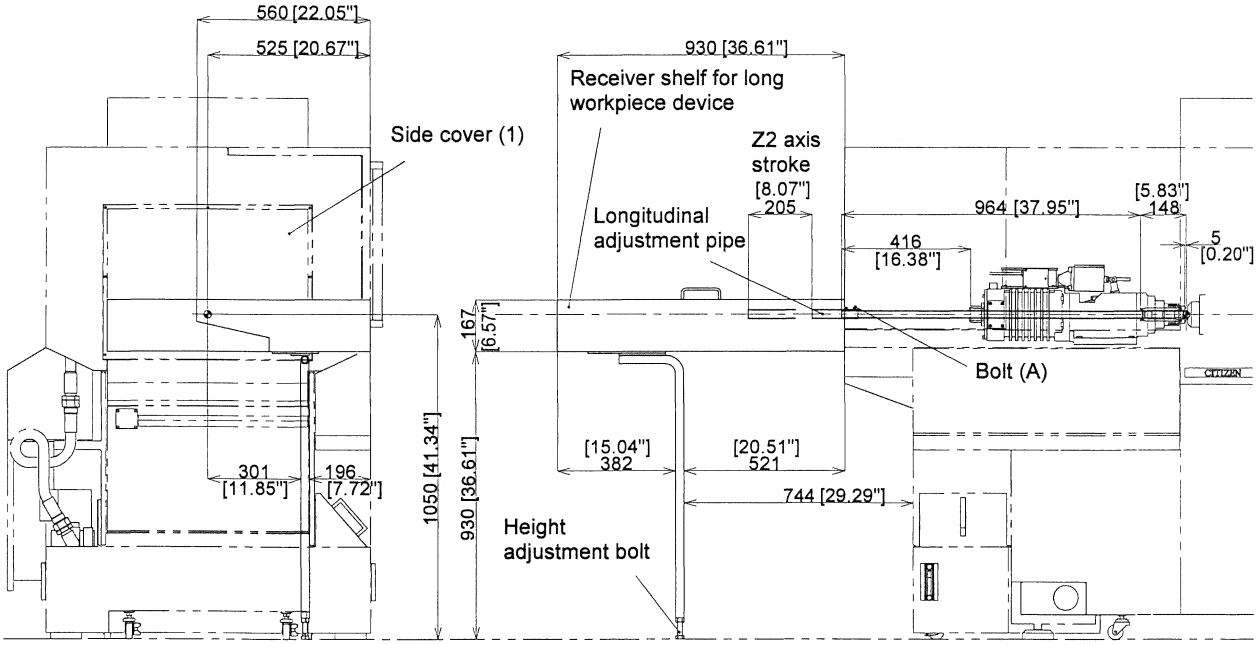
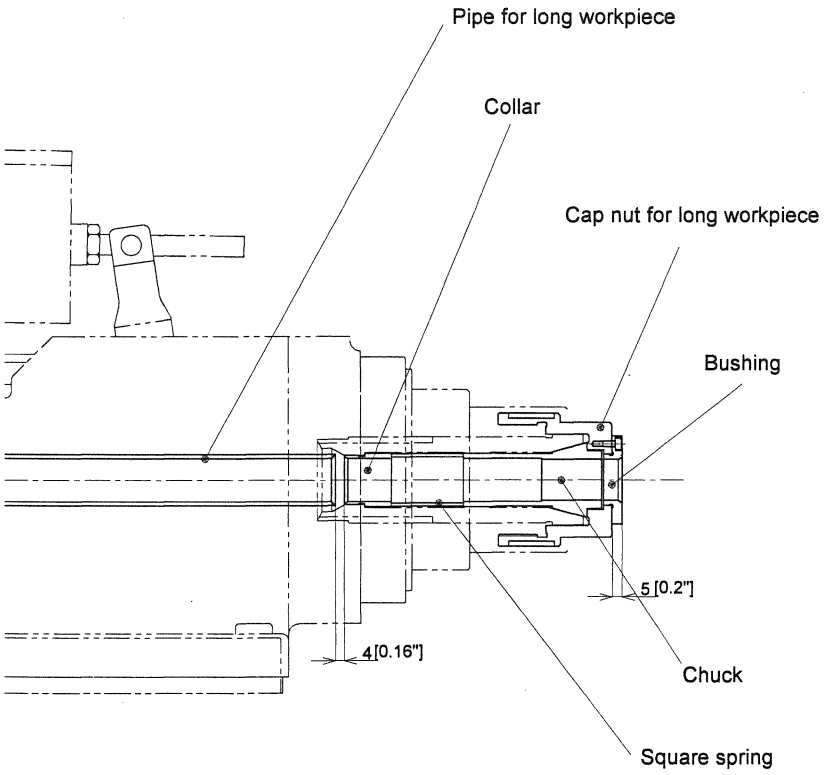


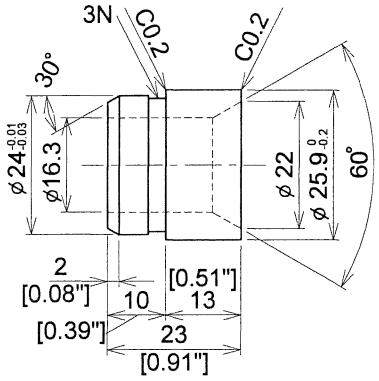
Figure 7.8-1 Long workpiece device

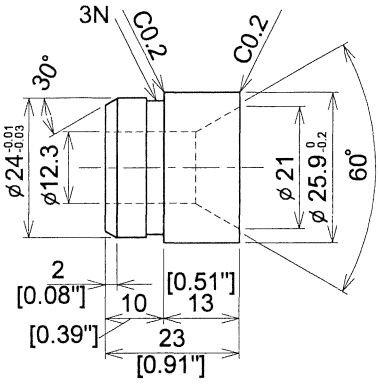
7.10.4 Mounting cap nut and collar for long workpiece device

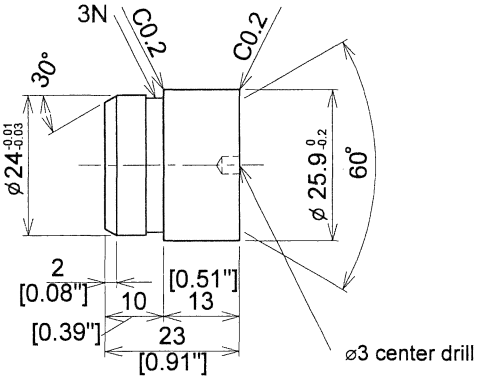
Four types of collars are provided with the device.

1. Remove the chuck, square spring, and collar from the chuck sleeve of back spindle. See <Section 7.4.1 Mounting and adjusting chuck>.
2. Mount the cap having the diameter appropriate to the workpiece.
3. Mount the cap nut for long workpiece device.
4. Adjust the chucking force again. See <7.4.2 Adjusting back spindle chucking force>.




3N
C0.2
C0.2
30°
ø24 -0.01 -0.03
ø16.3
ø 22
ø 25.9 0 -0.2
60°
2
[0.08"]
10
[0.51"]
13
[0.39"]
23
[0.91"]


3N
C0.2
C0.2
30°
ø24 -0.01 -0.03
ø12.3
ø 21
ø 25.9 0 -0.2
60°
2
[0.08"]
10
[0.51"]
13
[0.39"]
23
[0.91"]


3N
C0.2
C0.2
30°
ø24 -0.01 -0.03
ø 25.9 0 -0.2
60°
2
[0.08"]
10
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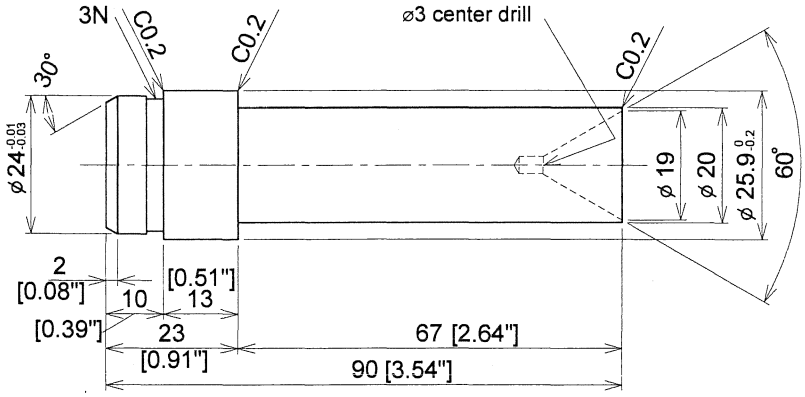
13
[0.39"]
23
[0.91"]
ø3 center drill


3N
C0.2
C0.2
ø3 center drill
C0.2
30°
ø24 -0.01 -0.03
ø 19
ø 20
ø 25.9 0 -0.2
60°
2
[0.08"]
10
[0.51"]
13
[0.39"]
23
[0.91"]
67 [2.64"]
90 [3.54"]

7.10.5 Adjusting position of longitudinal adjustment pipe

The workpiece is transferred through the workpiece stock pipe mounted in the back spindle and unloaded sequentially to the left side of the machine. You need to adjust the position of stock pipe in longitudinal direction using the adjustment pipe mounted at the exit of the stock pipe.

1. Loosen the bolt (A) according to Figure 7.8-1.
2. Adjust the position of longitudinal adjustment pipe so that the workpiece to be unloaded does not run out from the end of pipe.
3. Firmly tighten the bolt (A) to fix the longitudinal adjustment pipe.

⚠ CAUTION

Be sure to adjust the position of adjustment pipe in longitudinal direction. The workpiece to be unloaded may run out from the end of pipe, and it may cause damage to the receiver shelf or machine body.

⚠ WARNING

Be sure to confirm that the machine has stopped before attempting to adjust the position of adjustment pipe.
The adjustment during machine operation could result in serious personal injury.

7.11 Adjusting the Workpiece Conveyor

The workpiece conveyor unloads the workpiece out of the machine. The conveyor unloads workpieces one by one. Using the workpiece conveyor protects the workpiece from being damaged due to an interference with other workpieces.

> **⚠ WARNING**
>
> **Be sure to confirm that the machine has stopped before attempting to take out the product on the belt conveyor.**
> **The work during machine operation could result in serious personal injury.**

Adjusting workpiece chute

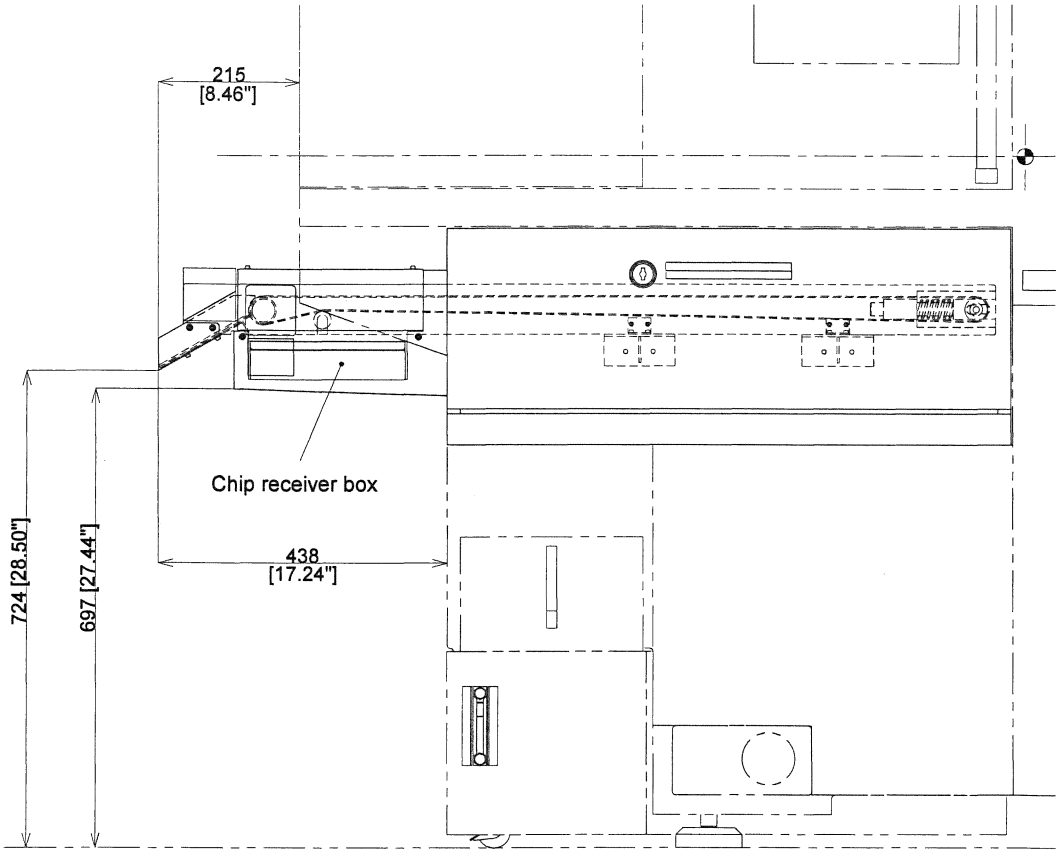
Adjust the position of the delrin plate appropriate to the workpiece, and adjust the gap between the workpiece chute and the belt.
Collecting the thin or small workpieces without adjusting the gap may reduce the collection efficiency. Therefore, it is recommended to adjust the gap every time the different size of workpiece is machined.

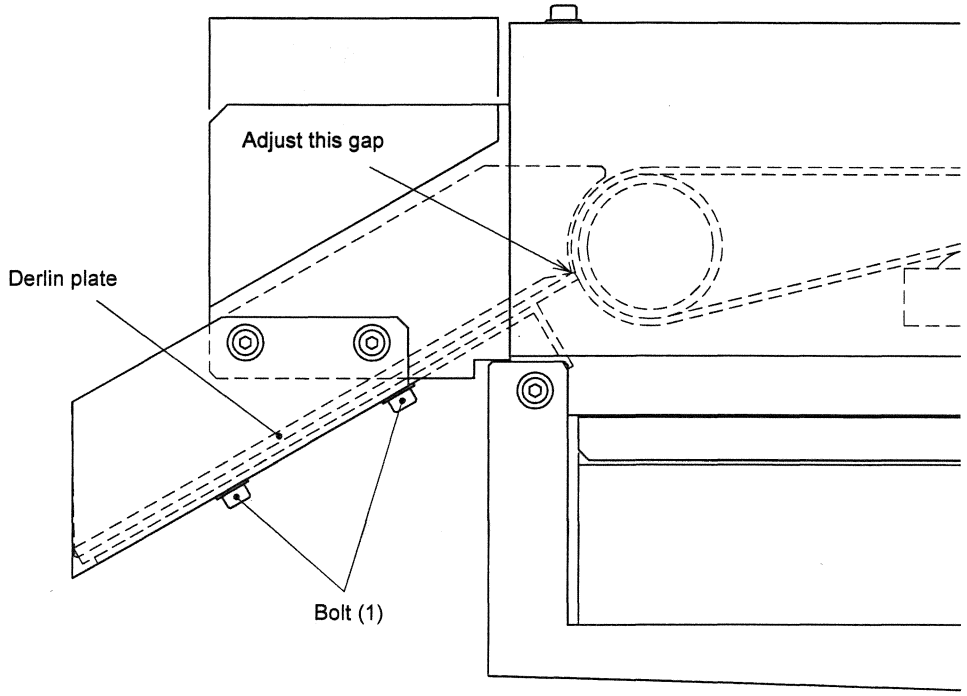
1. Loosen the bolt (1).
2. Move the position of delrin plate to adjust gap between the chute and the belt.
3. Tighten the bolt (1).
4. Make sure that the workpiece chute is firmly fixed.

> **⚠ CAUTION**
>
> **Adjust the delrin plate so that it does not contact with the belt. Otherwise, the belt conveyor might be damaged when running the machine.**

Removing chips

In normal operation, the workpiece conveyor carries chips together with the workpiece, and ejects them in product receiver box. Be sure to remove chips accumulated in receiver box before starting machine operation.


215
[8.46"]
Chip receiver box
438
[17.24"]
724 [28.50"]
697 [27.44"]

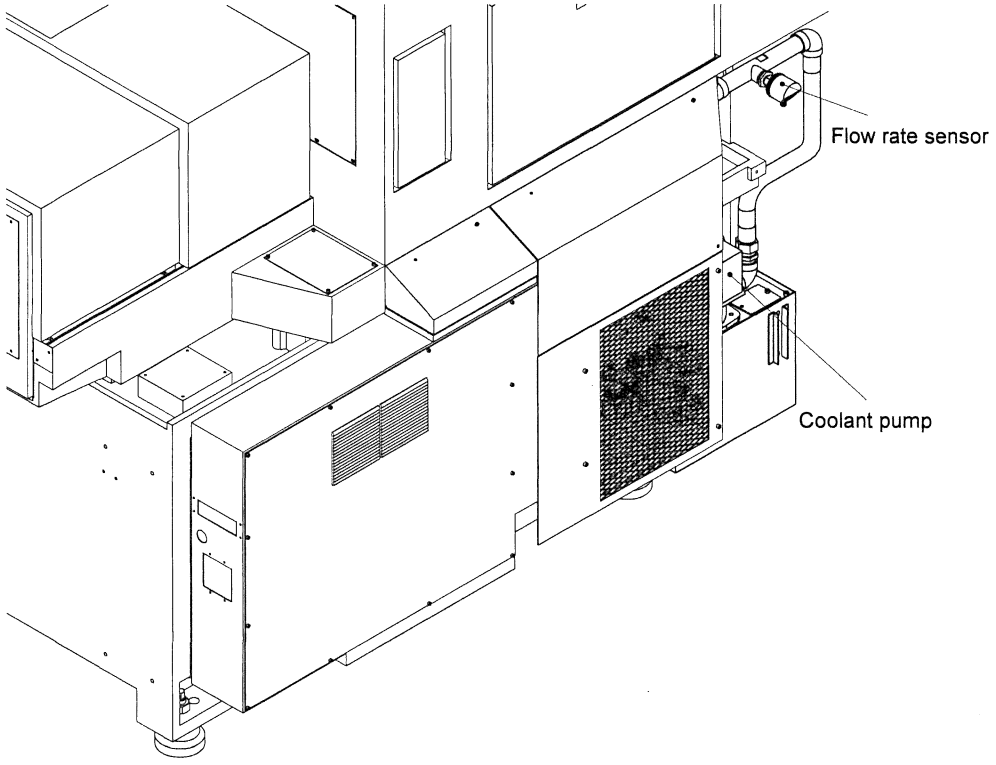

Adjust this gap
Derlin plate
Bolt (1)

7.12 Coolant Flow Detector (U53R)

If the coolant flowrate is dropped due to some reason, the coolant is not fed to the cutting point to likely cause fire or other disasters. This device detects the drop in coolant flowrate and automatically stops the machine operation.

Notes

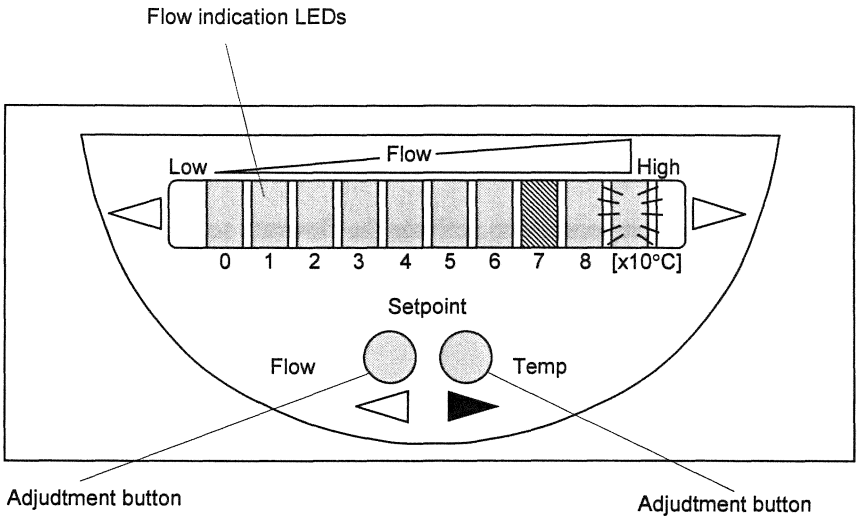
- The coolant flowrate varies depending on the temperature. To distinguish the change in flowrate under normal conditions from that in abnormal state, set the alarm flowrate (Low Rate) with the upper three coolant nozzles being closed. Define the normal flowrate as the value determined by valve full-open state.
- When the initial coolant temperature is 15°C or less, this detector does not work. Therefore, although the machine must be started early in the morning of the winter, for example, this device is turned off until the coolant temperature is elevated to at least 15°C. The operator must watch the temperature. Once the coolant temperature reaches 15°C, this detector works and maintains the active state; and even if the temperature is dropped by environment, the device keeps the function enabled.



Position of coolant flow detector

7.12.1 Names and functions of components

Coolant flow sensor



- Flow indication LEDs

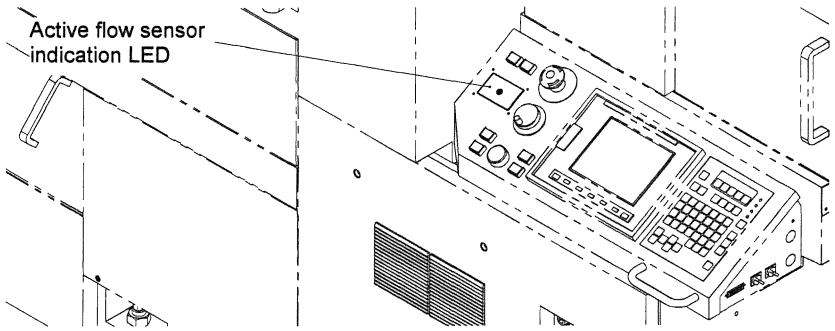
  In normal operation, the LED shows the current flowrate in green LED.
  The Set point LED lights orange while coolant is discharged in normal rate, and red in slow rate.
  The LEDs are used to indicate the specified flow rate, current temperature, specified temperature, or alarm.

- Adjustment buttons◁ ►

  Use these buttons to change indications and setting values.

- Active flow sensor indication LED

  Indicates that the flowrate sensor is enabled. The flowrate is monitored while the LED is on, but not when the LED is off.
  If LED is off, pay strict attention to run the machine. Do not leave the machine while running.



7.12.2 Setting

Setting Procedure

1. Set the High Flow rate.
2. Set the Low Flow rate.
3. Set the flowrate switch point.

*) 4. Set the switch point of temperature to activate the flowrate sensor.

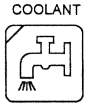
* At the shipment, the temperature to activate the flowrate sensor is set to 15°C. Accordingly, you do not need to set it again in normal operation. If you restore the default temperature setting (4°C), you need to set it to 15°C.

Procedure

Setting High Flow

Set the indication of maximum flowrate to the upper limit.
(All the LEDs except the switch point LED light green.)

Set High Flow in the following procedure.

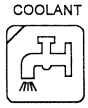
1. Press the Coolant key 

, and confirm that all nozzles discharge the coolant at maximum flowrate.
2. Hold the ► button for a certain time.
LED9 goes on, then starts flashing five seconds later.
3. When LED9 starts flashing, release the button.
The value for High Flow is set, and the system goes back to operation mode.

Setting Low Flow

Note

Be sure to set Low Flow after setting for High Flow has completed.

1. Close the three nozzles at the upper part of the cutting room. Fully open the other nozzles.
Press the Coolant key 

to let the coolant flow.
2. Hold the ◁ button for a certain time.
LED0 goes on, then starts flashing five seconds later.
3. When LED0 starts flashing, release the button.
The value for Low Flow is set, and the system goes back to operation mode.

Setting Setpoint (Flowrate Monitoring)

Set the Setpoint in the following procedure:

1. Press the ◁ button for a short time.
   The LED for the current switch point starts flashing.
2. Use either of the ◁ (toward left) or ▶ (toward right) button to move to the desired position. About five seconds have passed after the button is released, the position currently being indicated is set as the new switch point. Then, the machine goes back to operation mode. (Set the range appropriately, using the LED7 as a guideline.)

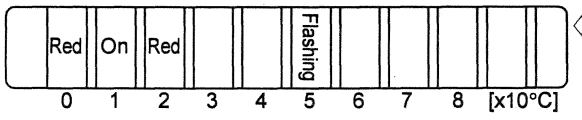
Setting Setpoint (Temperature Monitoring)

At the shipment, the temperature to activate the flowrate sensor is set to 15°C. Accordingly, you do not need to set it again in normal operation.
However, if you reset the flowrate sensor, the default temperature setting (4°C) is restored. Use the following procedure to set it to 15°C.

1. Press the ▶ button once to let the current temperature and temperature setting to be displayed.
   Press the ▶ button to enter into the temperature setting mode.

   Lighting green (or orange): Indicates the current coolant temperature in unit of 10°C.
   Flashing green (or orange): Indicates the current coolant temperature in unit of 1°C.

   (When the current coolant temperature is higher than the initial temperature: Orange LED.
   When the current coolant temperature is lower than the initial temperature: Green LED)



⇦ Indicates the setting value in green or orange. (In the example, current setting is 15°C.)
Red LED indicates the current coolant temperature. The rightmost position shows the 10°C unit.
(In the example, current coolant temperature is in the range between 20 and 29°C.)

2. Press the ◁ (drop 1°C) or ▶ (raise 1°C) button several times until it reaches 15°C. The LED for indicating 10°C unit is turned on or off automatically.
   About five seconds have passed after the button is released, the position currently being indicated is set as the new switch point. Then, about five seconds later, the machine goes back to operation mode to monitor the flowrate.

Notes

- If the button is not pressed for five seconds, the new setpoint is set, the temperature monitoring setpoint is displayed with new setting. After the additional five seconds later, the system goes back to flowrate monitoring mode.
- If an error is detected in setting procedure, all LEDs flash red. The system goes back to operation mode with the previous setting. When you finish setting, make sure that no LED is flashing red.

7.12.3 Operation check / Maintenance

1. After the machine is turned on, all the flow indication LEDs go on once. Afterwards, LEDs go off one by one, and the system goes to operation mode.
2. Turn the coolant discharge on.
3. Make sure the flowrate sensor shows the coolant temperature of at least 15°C.
   (Press the ► button once to check the current coolant temperature indicated by the red LED.)
   The red LED at the rightmost position indicates the coolant temperature in unit of 10°C.

   Ex.) In the example 2, the current coolant temperature is in the range between 20 and 29°C.
4. Check if the flowrate sensor works normally (by indications in operation mode).
   The green LED shows the flowrate change.
   Setpoint indication: Output ON: Orange LED
   Output OFF: Red LED

Notes

- If only LED 9 is flashing green while all other LEDs are lighting green, it indicates an excess flowrate.
- If the setpoint lights in red and LED0 lights in green, it indicates an insufficient flowrate.

Error indication

If the output 1 (flowrate monitoring) is short-circuited, indication of operation mode and five red LEDs (LED0 to LED4) are alternately displayed.

If the output 2 (temperature monitoring) is short-circuited, indication of operation mode and five red LEDs (LED5 to LED9) are alternately displayed.

Lock / Unlock

You can lock the setting value electrically to protect the settings from being modified.

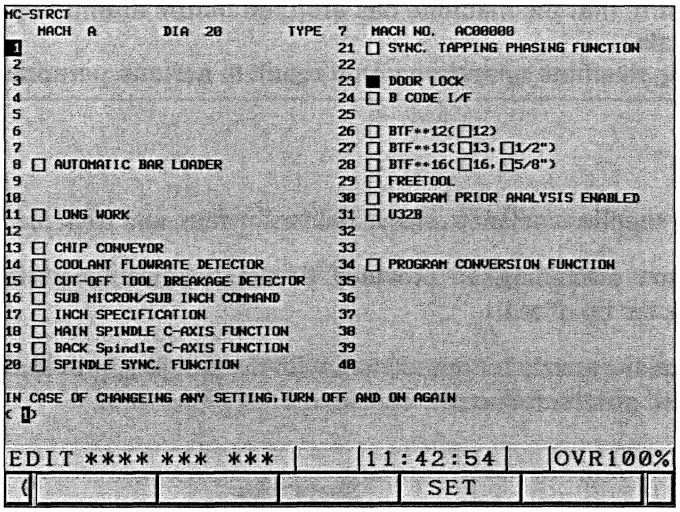
Press the ◁ and ► buttons simultaneously for about 10 seconds lock (or unlock) the setting. (After 10 seconds, all LEDs go off for about 1 second.)

7.13 Connecting Automatic Bar Loader

To use the machine with automatic bar loader connected, specify it by putting a check mark in the "AUTOMATIC BAR LOADER" on the Machine structure screen.

Procedure

1. Press the Maintenance key (MAINTE.) . The screen previously selected in the Maintenance menu appears.
2. Use the Menu selection key ◄ ► until the menu key [COMPOS] appears. Press the menu key [COMPOS] to display the Machine structure screen.



3. Press the menu key [SET].
4. Use the Cursor move keys ↑ ← ↓ → to select "AUTOMATIC BAR LOADER" and press the Input key (INPUT) . A check mark is placed in "AUTOMATIC BAR LOADER" field.

7.14 Adjustment and Handling of Medium Pressure Coolant Device

The device supplies medium pressure coolant to sleeve holders for front machining, oil blower in the back spindle, tool post for back machining, and cutting point.

The device uptakes coolant from the coolant tank. By using the medium pressure coolant device, the coolant level may be lowered than the normal level. If you add coolant in the coolant tank, the coolant may overflow from the tank when the medium pressure coolant device is stopped. Be sure to keep the proper level of coolant when using the medium pressure coolant device.

7.14.1 Adjusting the nozzle

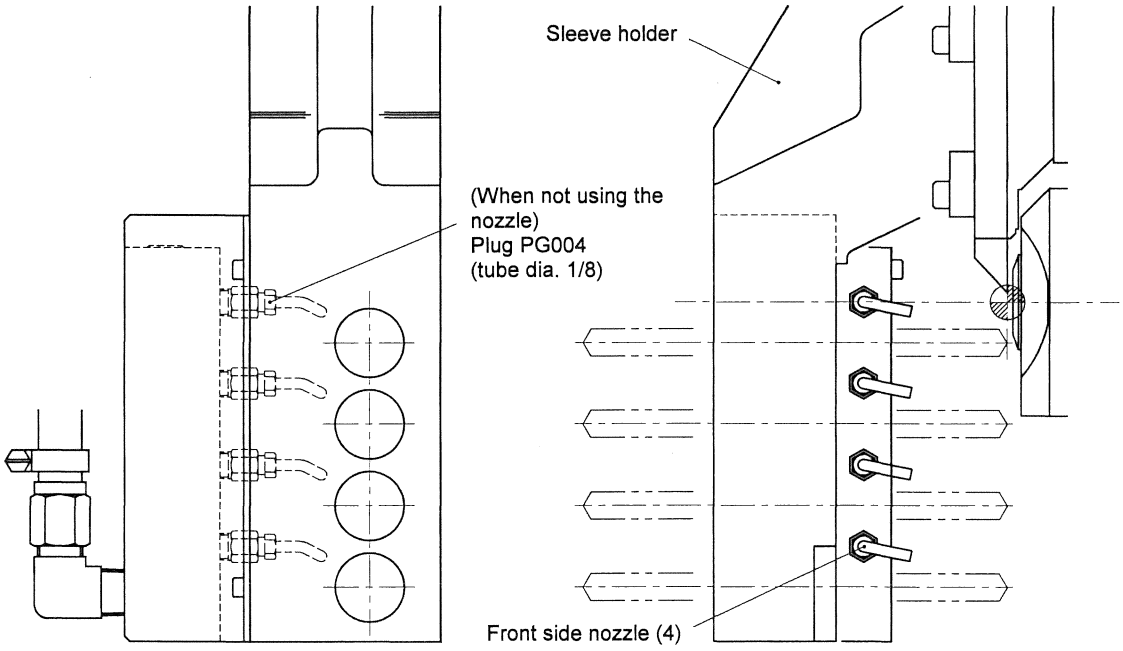
> **⚠ WARNING**
>
> **Be sure to confirm that the machine has stopped before attempting to adjust the position of nozzle.**
> **The work during machine operation could result in serious personal injury.**

Sleeve holder

The coolant device supplies coolant to sleeve holder for front and back machining.

Four nozzles (for front machining) are provided. Be sure to adjust the position of nozzle so that the coolant oil sprashes the tip of tool.

Note) Be sure to seal the nozzle for unused tool with the seal plug provided with the machine. Too many unsealed nozzles reduce the coolant discharge pressure.



Oil blower in back spindle

Coolant is discharged from the back spindle.

Use the standard knock-out jig. When the through-hole workpiece knock-out device is used together, use the knock-out jig provided with the through-hole workpiece knock-out device. If the blow hole is required, drill the hole additionally before using. See <7.5.1 Mounting and replacing knock-out jig> and <Replacing the knock-out jig for through-hole workpieces> for replacement of knock-out jig and dimensions of provided jigs.

When the medium pressure coolant device is mounted, air-driven back spindle blower can be used together.

Reset the "KNOCK OUT OVERLOAD" alarm as usual according to <7.5.1 Mounting and replacing knock-out jig>.

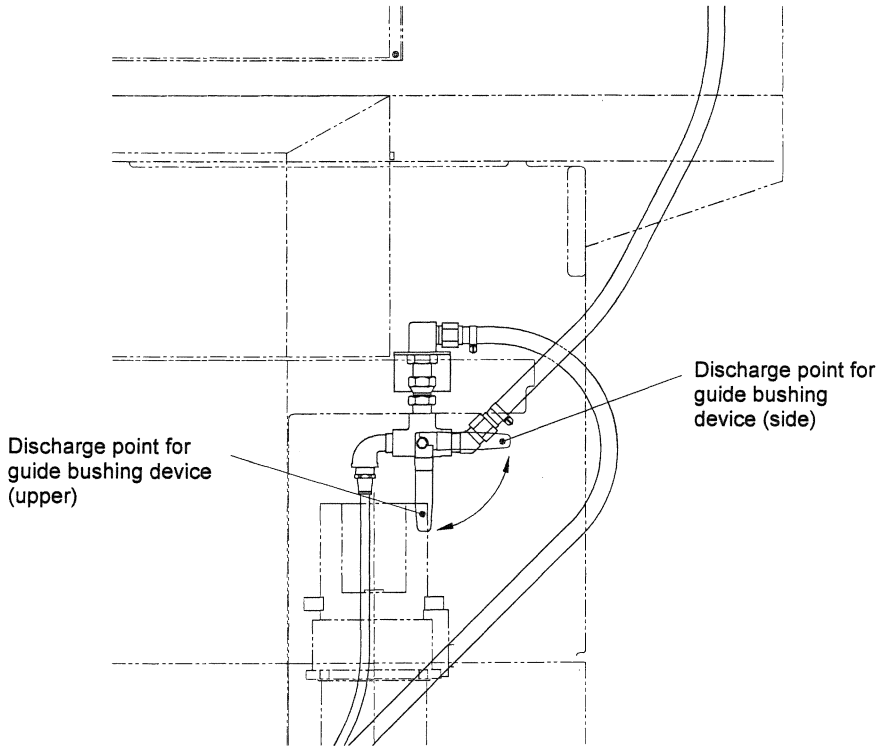
Guide bushing device

The coolant device supplies coolant to the guide bushing device (machining point).

The coolant can be supplied from the upper of the guide bushing device or from the side, by switching the valve in the machine rear side.

⚠ WARNING

Be sure to confirm that the machine has stopped before attempting to switch the valve. The work during machine operation could result in serious personal injury.



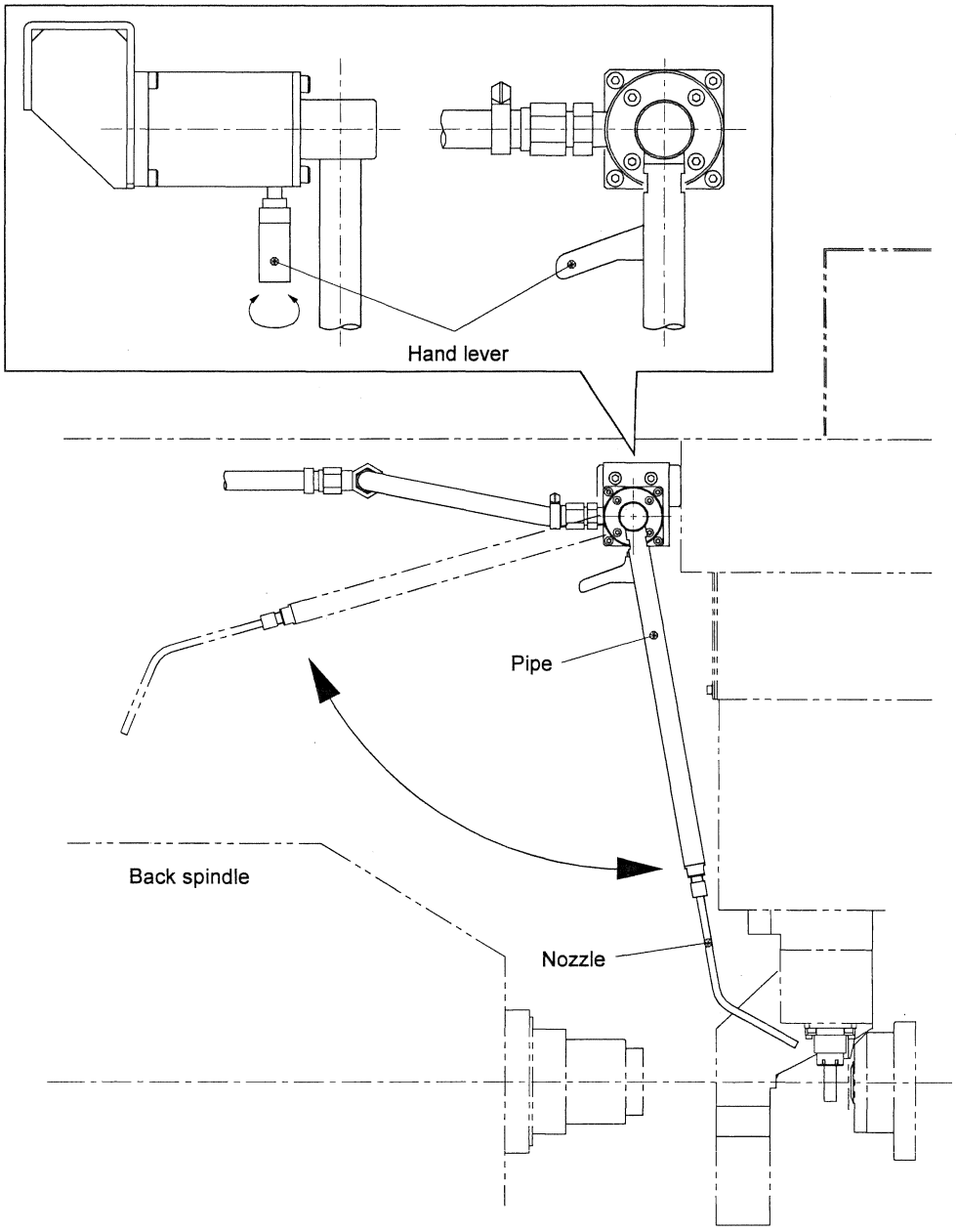
Rotate the hand lever rotates the pipe. Adjust the pipe and nozzle appropriate to the machining.

⚠ CAUTION

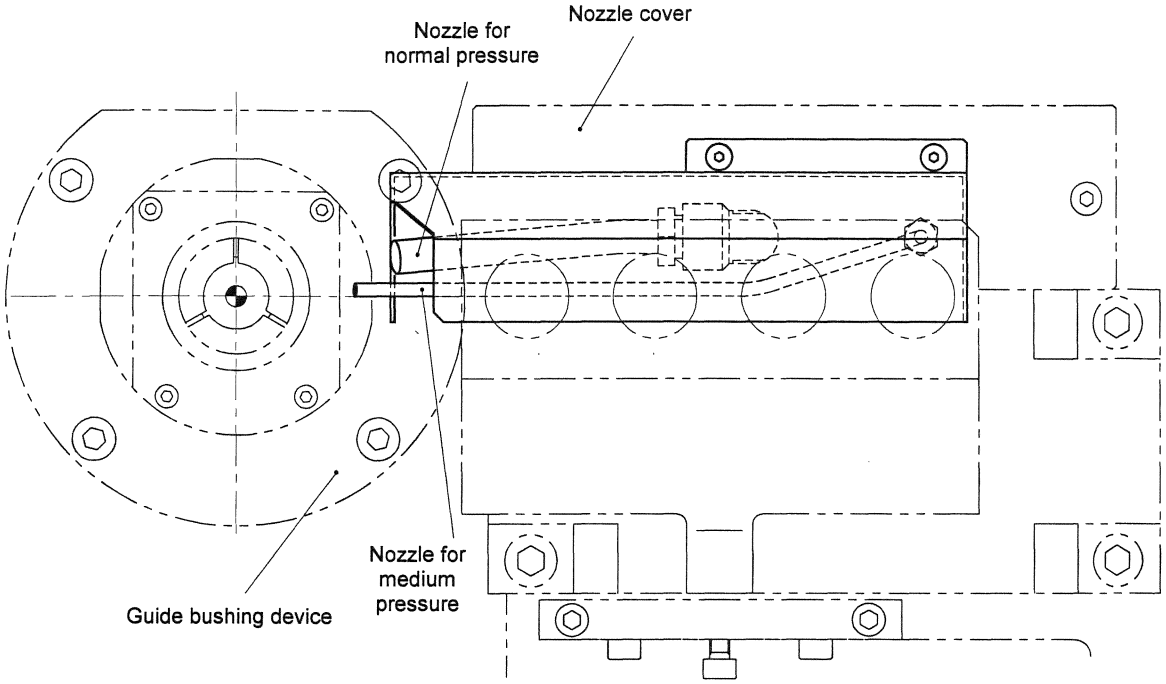
After adjustment of pipe, be sure to close the lever to fix the pipe. Otherwise, the pipe may fall during operation and cause damage to the machine.

⚠ WARNING

Be sure to confirm that the machine has stopped before attempting to adjust the position of pipe.
The work during machine operation could result in serious personal injury.



Adjust the position of the nozzle for supplying coolant, from the side of the guide bushing device.



1. Remove the nozzle cover. You will see the coolant nozzle.
2. Adjust the position of nozzle.
3. Mount the nozzle cover removed in Step 1. If the nozzle cover is not properly mounted, adjust the nozzle position again.

⚠ CAUTION

Be sure to mount the nozzle cover. If not, the chips adheres the nozzle causing the damage to the machine.

7.14.2 Notes on using the separate pump unit

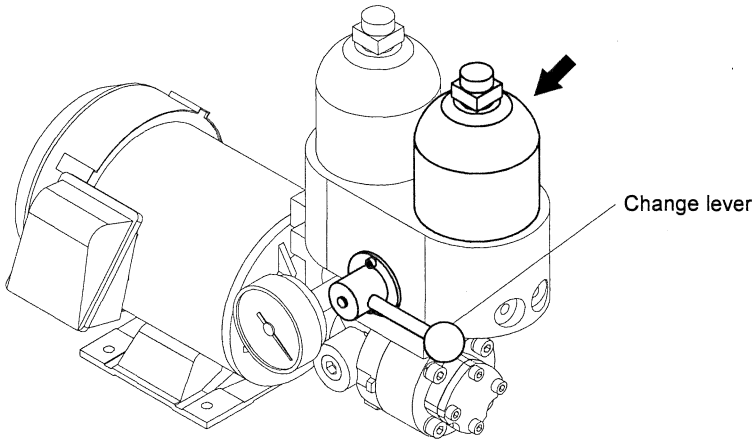
The medium pressure coolant device is equipped with a separate pump unit. The pump unit has many piping and wiring, e.g., suction tube from coolant tank, supply tube to the machine side, cables for connection with other devices. Be sure to arrange these piping and wiring by using the provided duct or others to secure the sufficient space where you can work safely.

The separate pump unit has a filter to filtrate the chips and other substances contained in the coolant oil. Because the filter must be checked regularly, install the pump unit in the place where the sufficient work space for maintenance can be sucured.

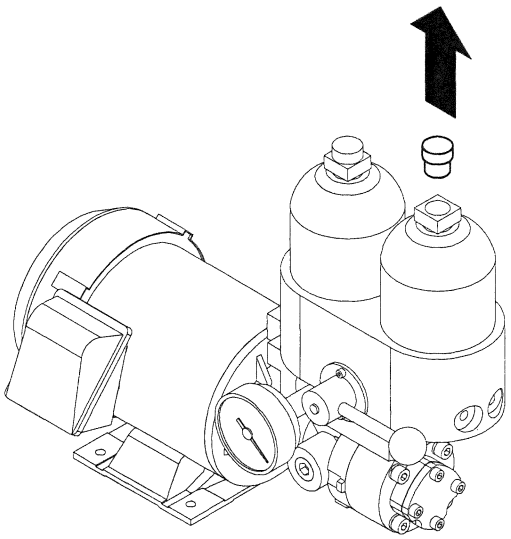
> **⚠ WARNING**
>
> **Be sure to check filter on a regular basis. Using the dirty or clogged filter may cause a serious accident such as a damage to the pump or a fire due to ignition of the pump.**

Replacement of filter in trochoid pump

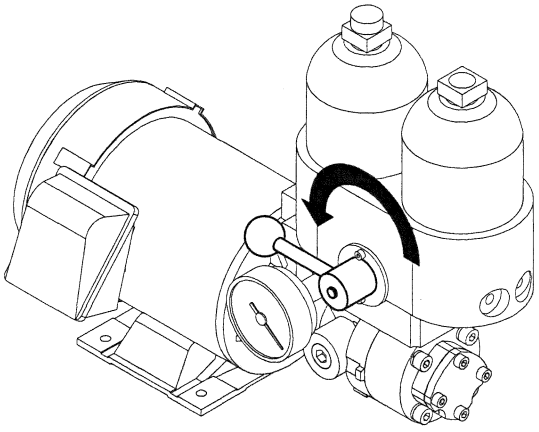
The filter in the cartridge mounted in upper portion of trochoid pump can be used repeatedly by cleaning. The time to clean the filter can be known from the indication of pressure gauge. See <4.1 Periodical Check> for details of cleaning.



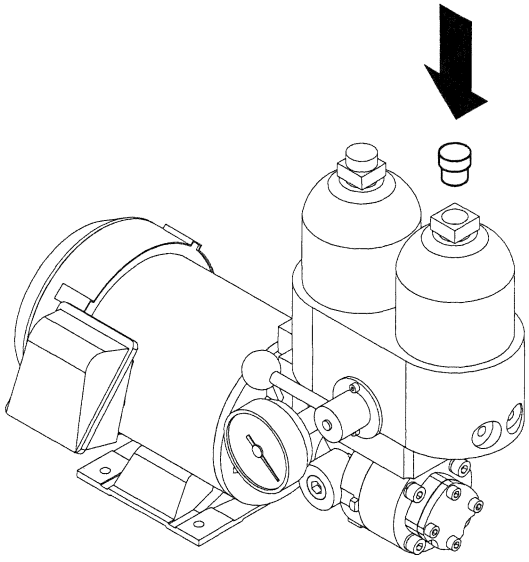
1. Stop the machine and trochoid pump.



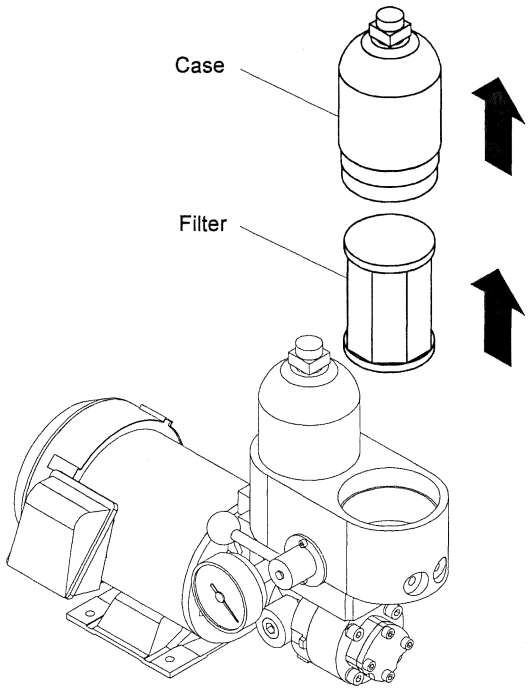
2. Remove the plug from the top of the case. When this plug has removed, air is taken into the pump, and the coolant in the filter is sucked into the tank and the discharge port side. It takes about 10 seconds until the coolant in the filter is removed.
3. Switch the lever.



4. Remove the case.



5. Take out the filter and clean it.
6. Clean the case. Remove chips and sludges adhered to the screws of the case.



7. Put the filter back to the original position.
8. Apply certain amount of grease to the screw position of the case, and mount the case.
9. Switch the lever as before.

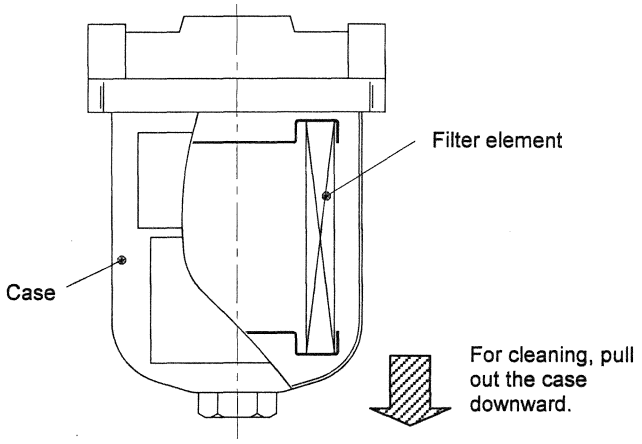
⚠ WARNING

If the filter has deformed or is badly clogged and hard to clean, be sure to replace the filter with new one. Using the deteriorated filter may cause a serious accident such as damage to the pump or fire due to ignition of the pump.

Replacing the line filter

The elements in the line filter can be used repeatedly by cleaning. The time to clean the filter can be known from the indication of pressure gauge. See <4.1 Periodical Check> for details of cleaning.

It is recommended to record an indication of pressure gauge when the element is clean and not clogged. For how to check the indication of pressure gauge, see <Checking discharge pressure of trochoid pump>.



1. Stop the machine and trochoid pump.
2. Rotate the case of line filter and take it out downward. You will see the element.
3. Take the element out of the case, and clean it.
4. Clean the case. Remove chips and sludges adhered to the screws of the case.
5. Put the element back into the case.
6. Apply certain amount of grease to the screw position of the case, and mount the case.

⚠ WARNING

If the element has deformed or is badly clogged and hard to clean, be sure to replace the element with new one. Using the deteriorated element may cause a serious accident such as damage to the pump or fire due to ignition of the pump.

Checking discharge pressure of trochoid pump

The discharge pressure of trochoid pump can be checked by pressure gauge mounted on the line filter.

The value indicated by the pressure gauge of the line filter is different from the pressure of coolant when discarged from the nozzle tip. The pressure at the nozzle chip is reduced by the number of nozzles used, pile line resistance, and others. The pressure is also reduced due to clogged filter of trochoid pump. Use the indication of pressure gauge as a guideline.

1. Stop the machine operation to prevent the valve from switching.
2. Discharge the medium pressure coolant.
3. Wait until the pointer of pressure gauge of the trochoid pump becomes steady.
4. Turn the valve.
5. You can check the pressure by viewing the pointer of the pressure gauge of the line filter.
6. After checking the pressure, turn the valve to its original position.

⚠ CAUTION

Be sure to fully close the valve for line filter pressure gauge (green) except when performing periodical check. If running the machine with the valve (green) being open, the pressure gauge may be damaged due to surge pressure.

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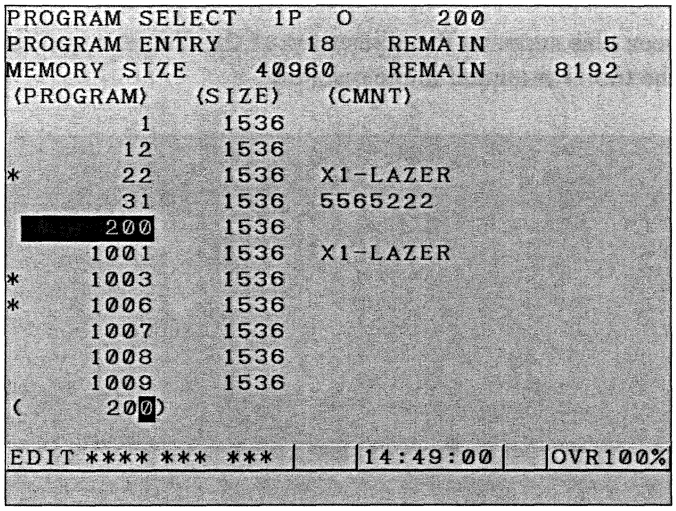
Product Code	C	–	A	2	2	0	P	L	VII					

Document Code	1	E	1	–	0	7	0	1

8. Screen Functions

8.1 Program Selection Screen

This screen is used to select a machining program for automatic operation or program checking. Machining data is also selected at the same time.

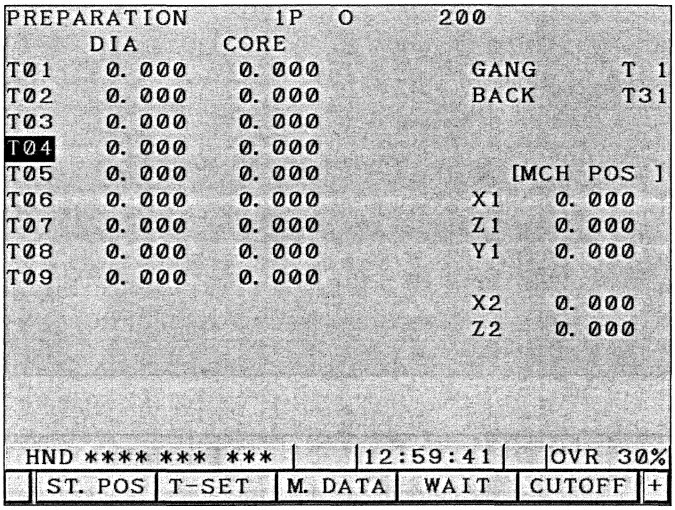


Display item	Explanation
O 200	Indicates the currently selected machining program number.
PROGRAM ENTRY	Indicates the current number of machining programs stored in memory. Up to 10 programs can be stored as standard. However, if the remaining memory size shown below is insufficient, no more programs can be stored even when the current number of programs stored in memory is less than 10.
REMAIN	Indicates the number of machining programs that can be registered in remaining memory capacity. No more programs can be stored when the available memory size becomes zero even if remaining count is available.
MEMORY SIZE	Indicates the number of characters (bytes) used by machining programs (machining data included) which are stored in memory. A program consists of a machining program, machining data, and management information. Thus, 1536 characters are used for storing only the program number.
REMAIN	Indicates the number of characters which can be still stored. The remaining character count is also obtained by subtracting the number of stored characters (in the above) from the number of characters for program capacities. No more programs can be stored when the remaining count becomes 0.
<PROGRAM>	Indicates the program numbers of machining programs stored in memory. The numbers are shown in ascending order.
<SIZE>	Indicates the number of characters used in each machining program.
<CMNT>	Indicates the comment described for each machining program.
*	The machining program of other machine model has been loaded. Program selection is disabled.

8.2 Preparation Screen

Prepare for operation before you start machining products. Select the Preparation key in operation mode to display the preparation screen. You can prepare for various types of operations on this screen.

The preparation screen also supports the adjustment of the diameter and center of the cutting edge of each tool when the tool is mounted in the machine.

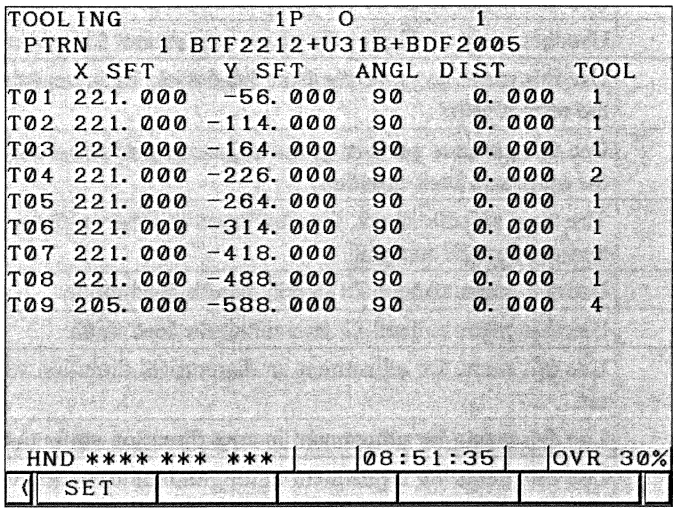


Display item	Explanation
O 200	Indicates the currently selected machining program number.
DIA	Indicates the adjustment amount for an error in the diameter direction of each cutting edge to the zero point of the work coordinates.
CORE	Indicates the adjustment amount for an error in the center height of each cutting edge to the zero point of the work coordinates.
GANG	Indicates the selected tool on the gang tool post.
BACK	Indicates the selected tool on the back tool post.
[MCH POS]	Indicates the current machine coordinate of each axis.

Menu key	Function
ST. POS	Enables automatic return to the start point.
T-SET	Displays the menu necessary for setting tools.
M. DATA	Displays the machining data of the selected program. The data cannot be changed.
WAIT	Enables automatic return to the positioning point.
CUTOFF	Cuts off the material as specified in the machining data.
T-PATT	Displays the tool layout pattern of the holder.
DIA	Use this menu key to adjust the diameter. Enables the tool to move to the outside diameter position of the material.
CORE	Use this menu key to adjust the center of the diameter. Enables the tool to move to the outer circumference position of the material.
CORE D	Use this menu key to adjust the move distance of tool in core direction.
LEN	Use this menu key when adjusting the longitudinal position. You axis moves in the longitudinal direction of the material.
CENTR	Use this menu key to adjust the center of workpiece.
ADJUST	Use this menu to display the menu for adjustment.
B.RET	Use this menu to move the back spindle to the retract point.

Menu key	Function
NO INT	Use this menu to disable the interference check function.
G.RET	Use this menu to move the gang tool post to the retract point.
PHASE	Use this menu to display the phase adjustment for non-comformed material menu.
RT.POS	Use this menu to move the front headstock, back headstock, and gang tool post to the retract point.
M.-B.	Use this menu to perform phase adjustment of non-conformed material between the main and back spindles.
NO CHK	The main spindle chuck does not open or close in phase adjustment of non-conformed material.
Z1 FED	Use this menu to feed Z1 axis in handle feed mode.
Z2 FED	Use this menu to feed Z2 axis in handle feed mode.
DIA D	Use this menu for adjustment in diametrical direction while the other tool is being set.
CORE D	Use this menu for adjustment in core direction while the other tool is being set.
LONG D	Use this menu for adjustment in longitudinal direction while the other tool is being set.
CEN D	Use this menu for adjustment in centrical direction while the other tool is being set.
EXEC	Use this menu to enter the handle mode.

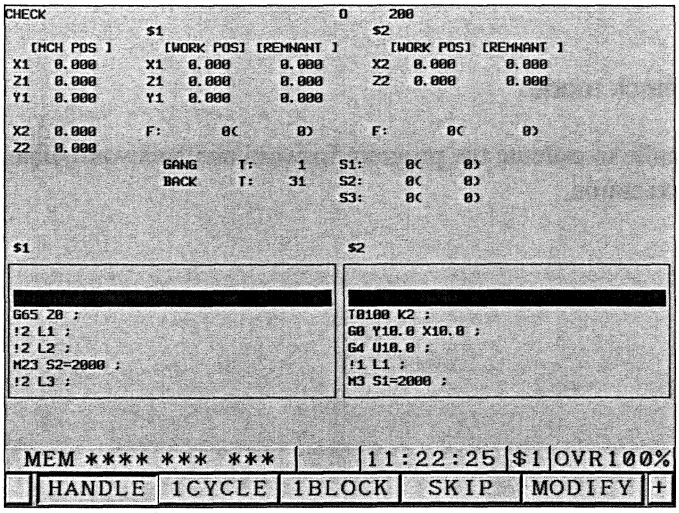
8.3 Tooling Pattern Screen



Display item	Explanation
PTRN	Indicates the current tooling pattern.
X SFT	Indicates the X shift amount specified in the positioning data of the tooling pattern. (X-direction shift amount from the reference point of the machine coordinate system)
Y SFT	Indicates the Y shift amount specified in the positioning data of the tooling pattern. (Y-direction shift amount from the reference point of the machine coordinate system)
ANGL	Indicates the angle specified in the positioning data of the tooling pattern. (Angle between the point of the cutting edge and the point that is the X shift amount and Y shift amount away from the reference point of the machine coordinate system)
DIST	Indicates the distance specified in the positioning data of the tooling pattern. (Distance between the point of the cutting edge and the point that is the X shift amount and Y shift amount away from the reference point of the machine coordinate system)
TOOL	Indicates the tool type to be used in tool layout pattern. 1: Right-handed tool 2: Left-handed tool 3: Rotary cross machining tool 4: End-face drilling tool 5: Cut-off tool breakage detector 0: No tool

8.4 Check Screen

This screen is used for checking an execution program during machine operation in program check mode. Operation can be stopped when program editing is necessary, and restarted at completion of program editing.



Display item	Explanation
O 200	Indicates the currently selected machining program number.
[MCH POS]	Indicates the current machine coordinate of each axis.
[WORK POS]	Indicates the current work coordinate of each axis.
[REMNANT]	Indicates the current remaining movable amount of each axis.
F: 0 (0)	Indicates the specified feed rate. The measured value is shown in parentheses. Indicates the setup time. The operating time is added in automatic operation mode.
GANG	Indicates the currently selected tool number. (gang tool post)
BACK	Indicates the currently selected tool number. (back tool post)
S1: 0 (0)	Indicates the specified spindle speed. The measured value is shown in parentheses.
S2: 0 (0)	Indicates the specified back spindle speed. The measured value is shown in parentheses.
S3: 0 (0)	Indicates the specified gang tool speed. The measured value is shown in parentheses.

Menu key	Function
HANDLE	Executes the program through handle.
1CYCLE	Automatically executes the program in a cycle.
1BLOCK	Automatically executes the program for each block.
SKIP	Disables blocks including a slash (/) in the program.
MODIFY	Places the program modification mode (editing).
W POS.	Displays the workpiece coordinate value and the residual move distance of each axis in sub-window (when large character size is selected).
POS.	Switches the screen to display the machine coordinate, the workpiece coordinate value, and the residual move distance of each axis (when large character size is selected).
OPSTOP	Enables optional stop function.
LAS PR	Executes the last program.
BL DIS	Disables power status check of bar loader.

Program display area

The block being executed is reversed on line 2. The other blocks are displayed in white. Editing is permitted for the next block (line 3) and subsequent blocks in block stopped state. Press the menu key [MODIFY] to enable the program edit mode. You can edit the machining program on lines 3 and subsequent lines.

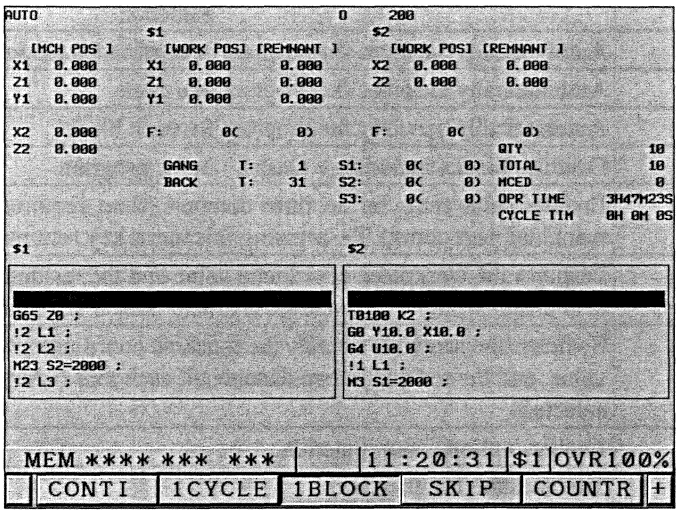
Operation in program check mode

You can use the handle to execute the program forward and backward, change the execution speed, and stop program execution.

8.5 Automatic Operation Screen

This screen is used for automatically operating the machine when an operation mode menu key [CONTI], [1CYCLE], or [1BLOCK] is selected.

You can specify the required number of the parts to be machined on this screen. When [CONTI] is selected, the number of machined parts is incremented each time a part is machined. When the number of machined parts reaches the required number of parts, a counter alarm is issued to stop the operation.



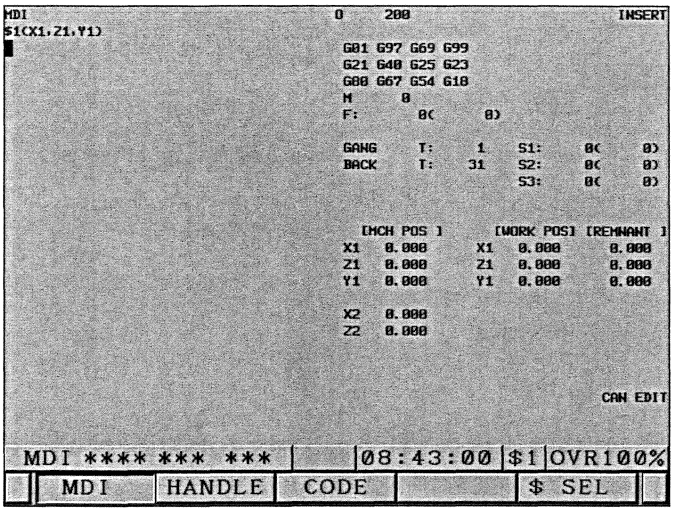
Display item	Explanation
O 200	Indicates the currently selected machining program number.
[MCH POS]	Indicates the current machine coordinate of each axis.
[WORK POS]	Indicates the current work coordinate of each axis.
[REMNANT]	Indicates the current remaining movable amount of each axis.
F: 0 (0)	Indicates the specified feed rate. The measured value is shown in parentheses. Indicates the setup time. The operating time is added in automatic operation mode.
GANG	Indicates the currently selected tool number. (gang tool post)
BACK	Indicates the currently selected tool number. (back tool post)
S1: 0 (0)	Indicates the specified spindle speed. The measured value is shown in parentheses.
S2: 0 (0)	Indicates the specified back spindle speed. The measured value is shown in parentheses.
S3: 0 (0)	Indicates the specified gang tool speed. The measured value is shown in parentheses.
QTY	Indicates the number of the parts to be machined. When the number of machined parts reaches the required number of parts, a counter alarm is issued to stop continuous automatic operation. Up to 99,999,999 can be specified. If 0 is specified for this item, the number of machined parts is not counted.
TOTAL	Indicates the counter that will not be cleared even when it reaches the required number of parts. Up to 99,999,999 can be specified.
MCED	Indicates the number of machined parts. The preset counter is incremented each time M56 is specified. When the number of machined parts reaches the required number of parts, a counter alarm is issued to stop continuous automatic operation. The counter is cleared to 0 if the Reset key RST // is pressed at stop of the automatic operation.

Display item	Explanation
OPR TIME	Indicates the setup time. The operating time is added in automatic operation mode. Specify 00H00M00S to clear the display value. When the display value reaches 9999H59M59S, it is resumed to 00H00M00S, then incrementation starts again.
CYCL TIM	Displays the time required for one cycle. In the default, the previous running time is displayed.

Menu key	Function
CONTI	Automatically executes the program in continuous mode.
1CYCLE	Automatically executes the program in a cycle.
1BLOCK	Automatically executes the program for each block.
SKIP	Disables blocks including a slash (/) in the program.
COUNTR	Enables value setup for the three counters (time, required part count, and machined part count). Re-pressing this menu key returns to the original screen.
W POS.	Displays the workpiece coordinate value and the residual move distance of each axis in sub-window (when large character size is selected).
POS.	Switches the screen to display the machine coordinate, workpiece coordinate value, and the residual move distance of each axis (when large character size is selected).
OPSTOP	Enables optional stop function.
LAS PR	Executes the last program.
BL DIS	Disables power status check of bar loader.

8.6 MDI Screen

This screen is provided for entering machining programs which enable MDI operation.

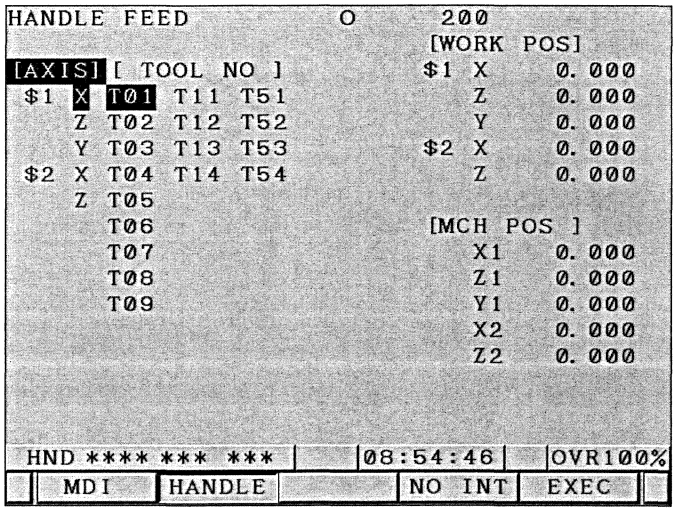


Display item	Explanation
O 200	Indicates the currently selected machining program number.
$1 (X1, Z1, Y1, C1)	Indicates the currently selected axis control group and axes of the group.
G M F T S	Indicates the modal information.
[MCH POS]	Indicates the current machine coordinate of each axis.
[WORK POS]	Indicates the current work coordinate of each axis.
[REMNANT]	Indicates the current remaining movable amount of each axis.

Menu key	Function
MDI	Displays the MDI screen.
HANDLE	Displays the handle feed screen.
CODE	Displays the code screen.
$ SEL	Switches between the axis control groups.
W POS.	Displays the machine coordinate value of each axis in sub-window (when large character size is selected).

8.7 Handle Feed Screen

This screen is used for moving each axis through manual operation of the handle.

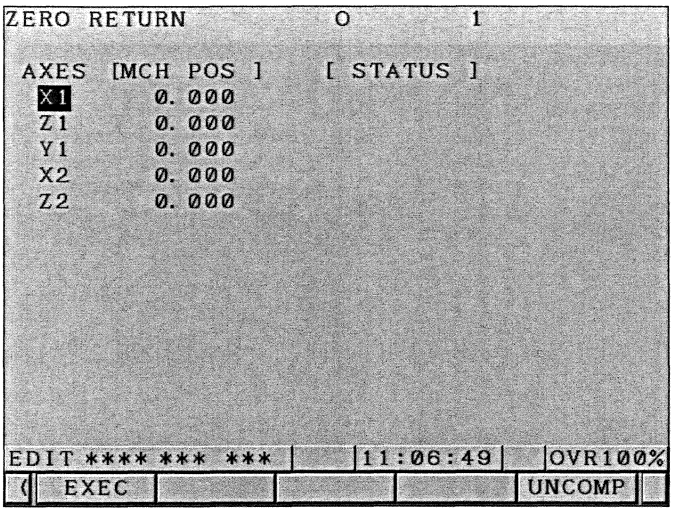


Display item	Explanation
O 200	Indicates the currently selected machining program number.
[AXIS]	Indicates the axis to be controlled by the handle.
[TOOL NO]	Indicates the tool number for which the handle is used.
[WORK POS]	Indicates the current work coordinate of each axis.
[MCH POS]	Indicates the current machine coordinate of each axis.

Menu key	Function
MDI	Displays the MDI screen.
HANDLE	Displays the Handle feed screen.
EXEC	Enables manual operation by handle (handle feed mode).
NO INT	Disables interference check function.

8.8 Zero Return Screen

This screen is used for returning each axis to the zero point (origin) of the machine.

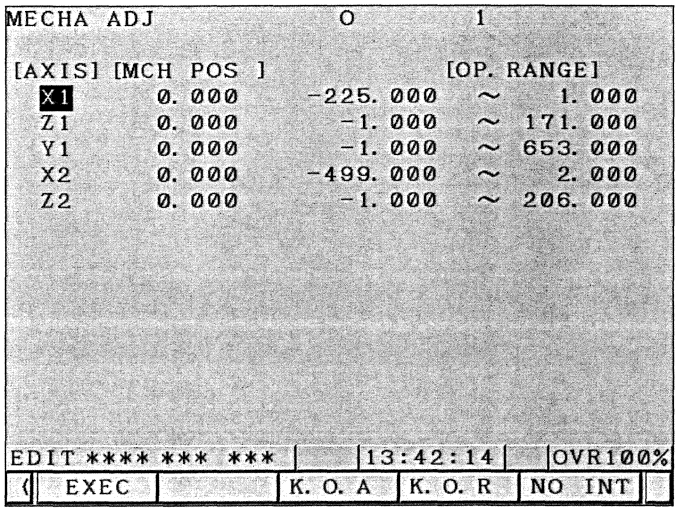


Display item	Explanation
AXES	Specifies that all the axes return to the zero point.
X1	Specifies that X axis returns to the zero point.
Z1	Specifies that Z axis returns to the zero point.
Y1	Specifies that Y axis returns to the zero point.
X2	Specifies that X2 axis returns to the zero point.
Z2	Specifies that Z2 axis returns to the zero point.
[MCH POS]	Indicates the current machine coordinate of each axis.
[STATUS]	Displays "ZERO RETURNING" during the zero return process. "COMPLETE" is displayed when the relevant axis reaches the zero point.

Menu key	Function
EXEC	Places the state (the return-to-zero-point mode) in which axes can return to the zero point.
UNCOMP	Places each axis in the state where the zero return is incomplete.

8.9 Mechanical Adjustment Screen

This screen is used for moving each axis through manual operation of the handle in the machine coordinate system.

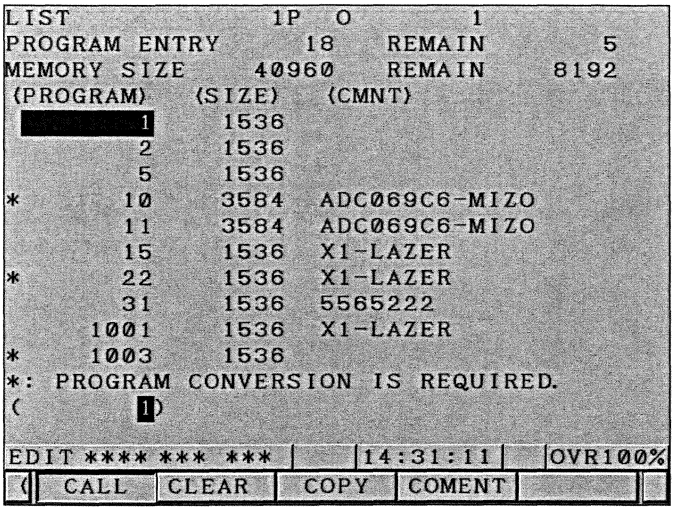


Display item	Explanation
AXIS	Selects each axis to move.
[MCH POS]	Indicates the current machine coordinate of each axis.
[OP. RANGE]	Indicates the moving range of each axis.

Menu key	Function
EXEC	Places the state (the handle mode) in which mechanical adjustment can be made.
K.O.A	Advances knock-out device.
K.O.R	Retracts knock-out device.
NO INT	Disables interference check function.

8.10 List Screen

This screen shows the list of machining programs stored in memory.

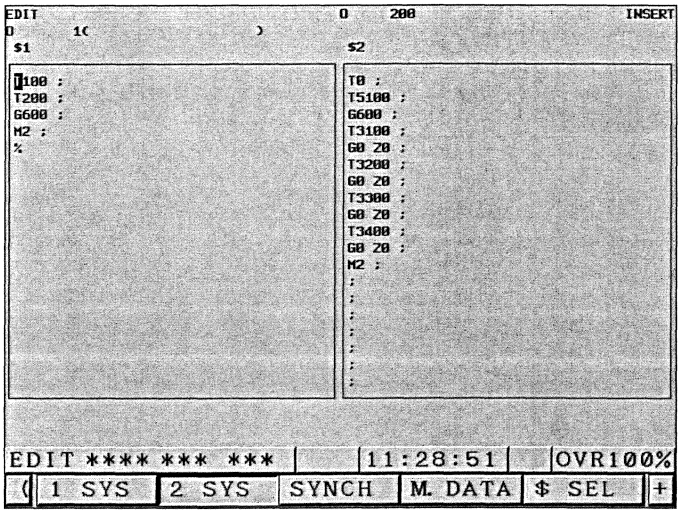


See <Section 8.1 Program Selection Screen> for the display items.

Menu key	Function
CALL	Calls machining programs and machining data that are used as programs for editing. If an entered machining program number does not exist, a new program is created.
CLEAR	Deletes machining programs and machining data from memory.
COPY	Copies machining programs and machining data into memory.
COMENT	Specifies comments in machining program.

8.11 Edit Screen

This screen is used for editing machining programs.

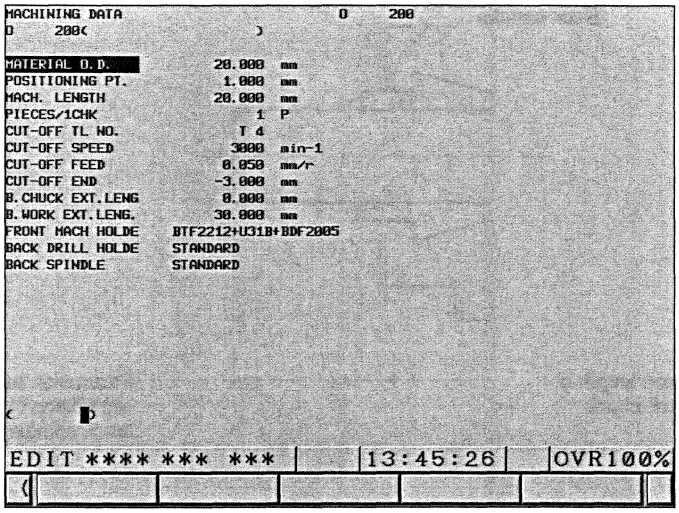


Display item	Explanation
O 200	Indicates the currently selected machining program number.

Menu key	Function
1 SYS	Displays $1 and $2 program solely.
2 SYS	Displays $1 and $2 programs side by side.
SYNCH	Displays the program in synchronous mode.
M. DATA	Displays the machining data in the program being edited.
$ SEL	Moves the cursor while two axis control groups are being displayed. Switches the axis control group to edit while a single axis control group is being displayed.
RANGE	Specifies the line to be copied or cut.
CUT	Cuts the line specified with the RANGE menu.
COPY	Copies the line specified with the RANGE menu.
PASTE	Pastes the line copied or cut.
CODE	Displays the code list screen.
SEARCH	Searches the program for the specified character string.
REPL	Replaces the character string specified in the program with another character string.
[ ] SWT	Used to select ( ) (parentheses) or [ ] (brackets). Displayed only when the custom macro program is enabled.
CONV.	Displays the menu to convert the program code being edited from A20 VI [1F6] to A20 VII [2F7] or vice versa.
FORWAR	The search and replace function searches forward from the current cursor position, toward the end of the program.
REVERS	The search and replace function searches forward from the current cursor position, toward the beginning of the program.
SYSALL	The search and replace function searches the entire program of all axis control groups.
REPALL	Replaces all of the character strings found in the program with the specified character string.

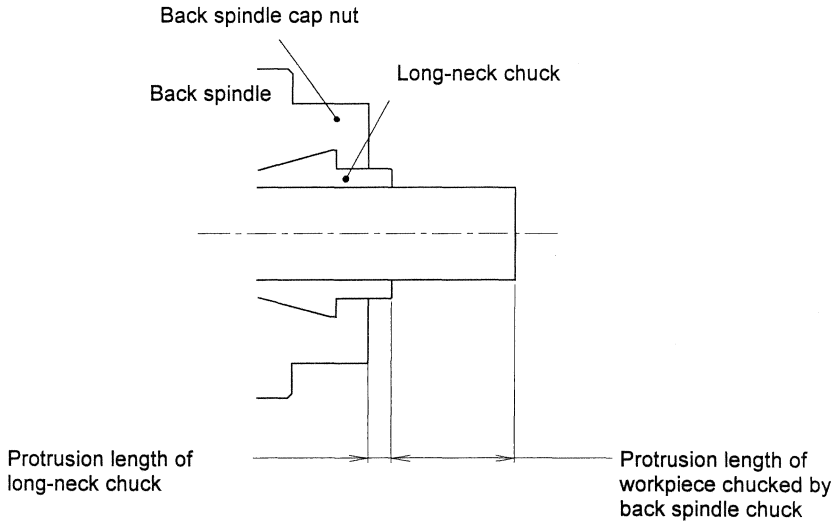
8.12 Machining Data Screen

This screen is used for editing machining data. Machining data comprises data for machining and preparation of operation. Machining data is treated in the same manner as for machining programs.



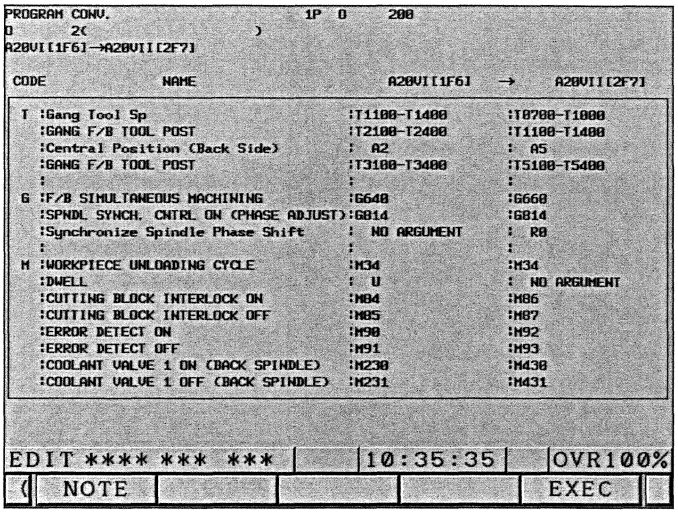
Display item	Explanation
O 200	Indicates the currently selected machining program number.
MATERIAL O.D.	Indicates the outside diameter of the material to be machined with the selected machining program.
POSITIONING PT.	Moves the cut-off tool to the tool positioning point through rapid feed when [CUTOFF] is selected on the Preparation screen. The tool positioning point is calculated from the diameter, indicating the distance between the material and the position where the cut-off tool stops.
MACH. LENGTH	Indicates the length of the material necessary for producing a product. (Product length + cut-off width + end finishing allowance)
PIECES/1CHK	Indicates the number of products to be produced with a chucking. Z1 axis moves back to the position (machining length x number of products) at return to the start point.
CUT-OFF TL NO.	Indicates the tool number used for the cut-off machining.
CUT-OFF SPEED	Indicates the spindle speed when [CUTOFF] is selected on the Preparation screen.
CUT-OFF FEED	Indicates the feed rate used between the tool positioning point and the cut-off end point when [CUTOFF] is selected on the Preparation screen.
CUT-OFF END	Indicates the position where cut-off machining terminates when [CUTOFF] is selected on the Preparation screen.
B.CHUCK EXT.LENG.	Indicates the protrusion length of chuck from the end face of back spindle cap nut.
B.WORK EXT.LENG.	Indicates the distance from the workpiece reference point of back machining to the chucking position (face of the back spindle cap)
FRONT MACH HOLDE	Indicates the tool pattern of the front machining holder.
BACK DRILL HOLDE	Indicates type of back drilling tool holder.
BACK SPINDLE	Sets the back spindle mounted to the back spindle cap.

When long-neck chuck is used:



8.13 Program Conversion Screen

This screen is used to convert the machining program for A20 VI model machine to A20 VII model machine, or vice versa. The program can be converted automatically.

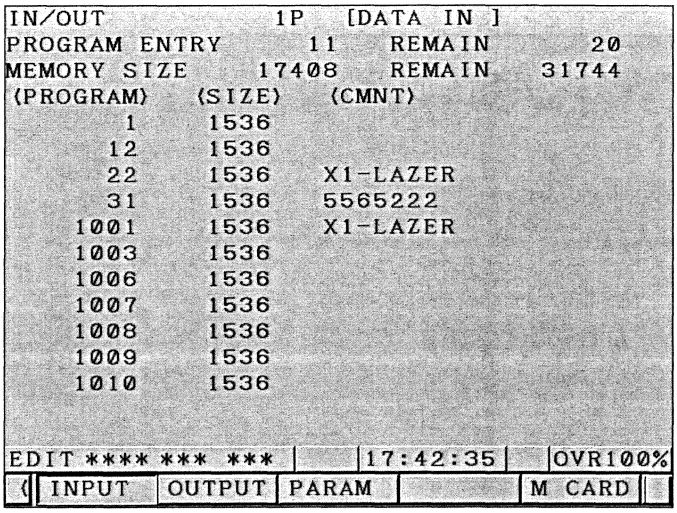


Display item	Explanation
O	Indicates the machining program number currently being selected.
A20 VI [1F6] → A20 VII [2F7]	Indicates that the program will be converted from that for A20 VI to that for A20 VII. When converting the program for A20 VII to that for A20 VI, the arrow head is shown in direction toward left.
NOTE	Displays precautions required for automatic conversion.
CODES	Displays codes to be converted.

Menu key	Function
NOTE	Displays precautions.
EXEC	Executes program conversion.

8.14 In/Out Screen

Inputs/outputs machining programs to/from external devices.

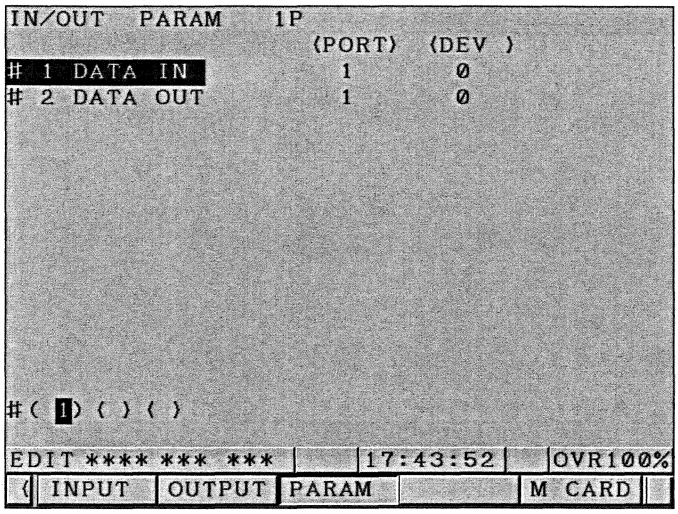


See <Section 8.1 Program Selection Screen> for the display items.

Menu key	Function
INPUT	Inputs programs from external devices to memory.
OUTPUT	Outputs programs from memory to external devices.
PARAM	Displays the screen for specifying I/O parameters.
M CARD	Displays the memory card screen.

Parameter 1

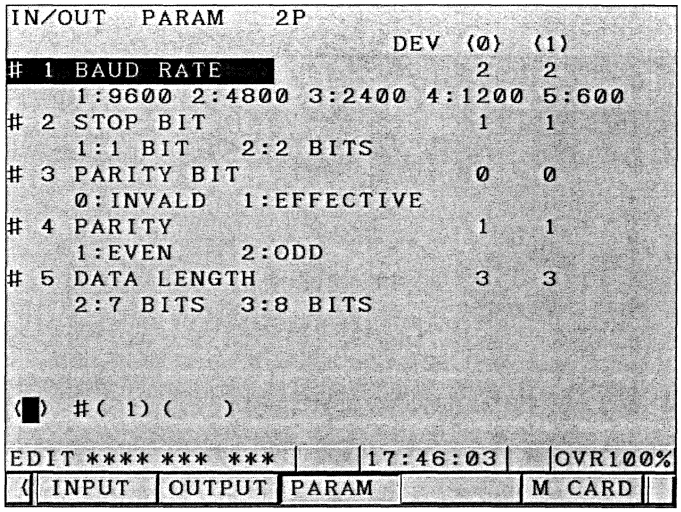
Specifies I/O parameters.

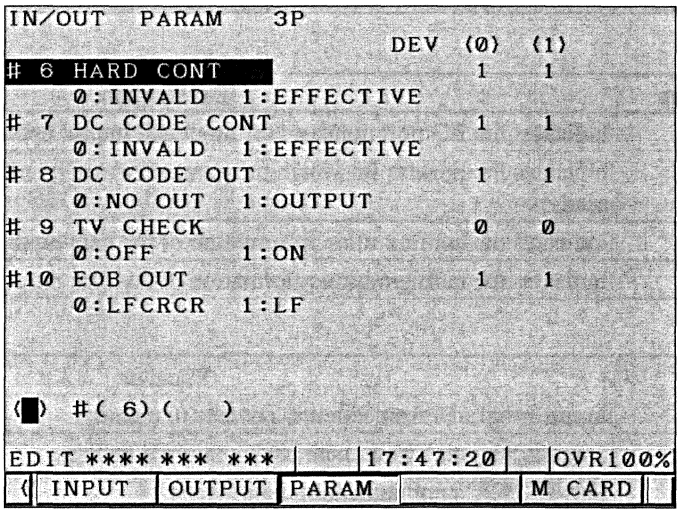


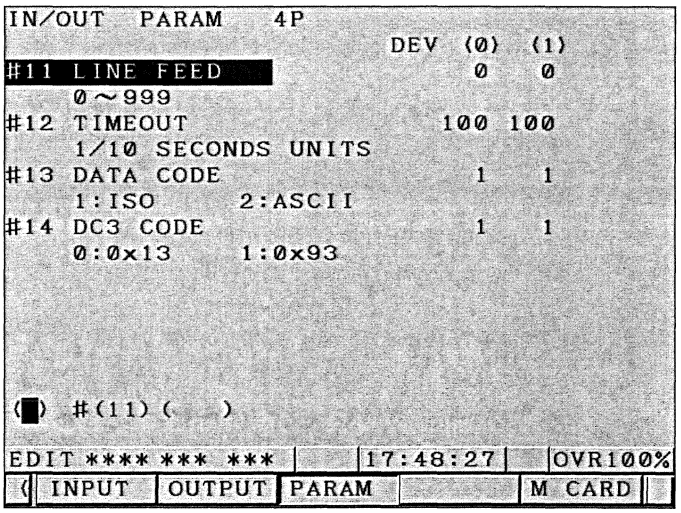
#	Display item	Explanation
	<PORT>	Indicates the I/O port numbers for input and output operations.
	<DEV>	Indicates the devices for which the parameters are specified and which are to be used.
#1	DATA IN	Indicates the configuration information of the data input port and the machine.
#2	DATA OUT	Indicates the configuration information of the data output port and the machine.

Menu key	Function
INPUT	Inputs programs from external devices to memory.
OUTPUT	Outputs programs from memory to external devices.
PARAM	Sets RS232C communication parameters.
M CARD	Displays the Memory card screen.

Parameter 2, 3 and 4







#	Display item	Explanation
1	BAUD RATE	Indicates the data transfer rate. 1: 9600 2: 4800 3: 2400 4: 1200 5: 600
2	STOP BIT	Indicates the stop bit length. 1: 1 BIT 2: 2 BITS
3	PARITY BIT	Indicates presence or absence of the parity bit. 0: INVALD 1: EFFECTIVE
4	PARITY	Indicates odd or even parity if the parity bit is used. 1: EVEN 2: ODD
5	DATA LENGTH	Indicates the data bit length. 2: 7 BITS 3: 8 BITS
6	HARD CONT	Indicates the control by the RTS/CTS method. 0: INVALD 1: EFFECTIVE
7	DC CODE CONT	Indicates the control by the DC code method. 0: INVALID 1: EFFECTIVE
8	DC CODE OUT	Indicates DC code output if the line is used. 0: NO OUT 1: OUTPUT
9	TV CHECK	Indicates that characters for TV checking are counted. 0: OFF 1: ON
10	EOB OUT (ISO)	Indicates EOB output in the ISO code. 0: LFCRCR 1: LF
11	LINE FEED	Indicates the number of characters as the length of paper tape fed before and after data output. 0 to 999
12	TIMEOUT	Indicates the time for indicating a timeout when the stop of data transfer is detected. 1/10 SECOND UNITS
13	DATA CODE	Indicates that data is output in the ISO or ASCII code. 1: ISO 2: ASCII
14	DC3 CODE	Indicates that the DC3 code is 0x13 or 0x93. 0: 0x13 1: 0x93

Example of output format (reference)

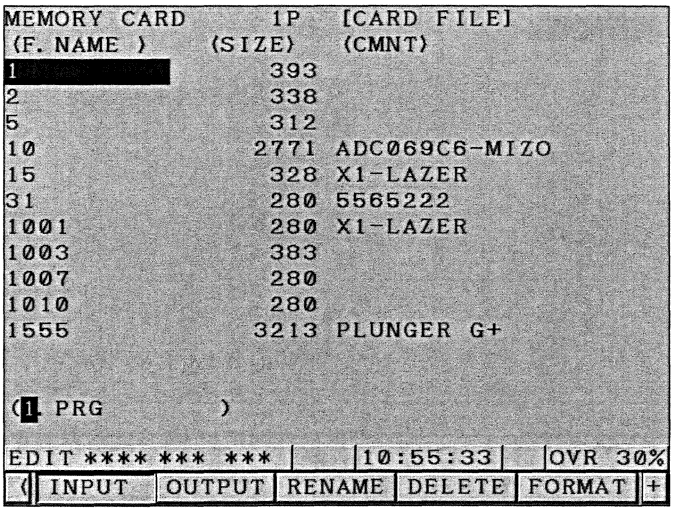
Data which is output to NC external devices comprises machining programs and machining data.

The following is an example of data output:

```
%LF                    ← Program start code
00005(NAIN             )LF
$1
M06LF
M98P00030006LF
M05LF
N07LF
M98P0007LF
G300I3.0LF
M05LF
N07LF
M108LF
M02LF
$2
$0LF                   ← Program code of the machining data
DLF                    ← Version code of the machining data
#16=0000012000LF       ← (Material diameter = 12.000)
#20=0000001000LF       ← (Tool positioning point = 1.000)
#24=0000020000LF       ← (Machining length = 20.000)
#28=0000001000LF       ← (Number of products to be produced with a chuck = 1)
#32=0000001000LF       ← (Cut-off machining tool number = 1)
#36=0003000000LF       ← (Cut-off spindle speed = 3000)
#40=0000000020LF       ← (Cut-off machining feed rate = 0.020)
#44=–000001000LF       ← (Cut-off end point = –1.0)
#76=0000001000LF       ← (Protrusion length of long-neck chuck on back spindle = 1.000)
#48=0000000000LF       ← (Back workpiece length = 0.000)
#52=0000001000LF       ← (Front machining holder = 1)
#60=0000601000LF       ← (Back drilling holder = 601)
#64=0000201000LF       ← (Back spindle = 201)
%                      ← Program end code
```

8.15 Memory Card Screen

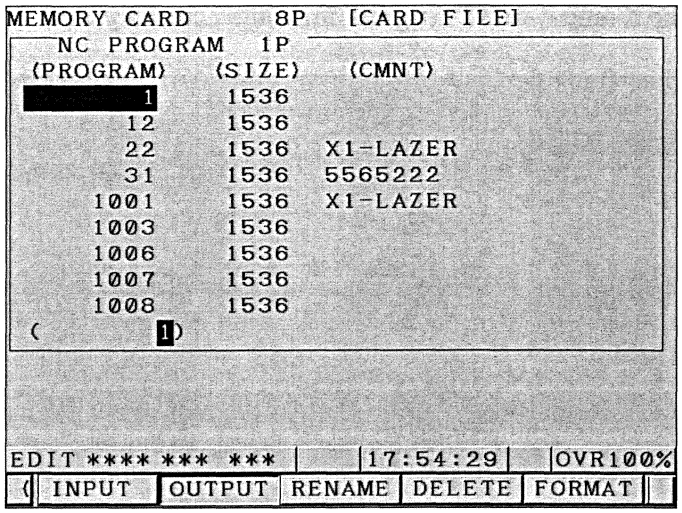
Use this screen to input/output an NC program from/into a memory card.



Display item	Explanation
<F. NAME>	File names in the memory card
<SIZE>	Size (bytes) of each file
<CMNT>	Displays the comment for the program.
<DATE>	File creation (correction) dates

Menu key	Function
INPUT	This menu key input the target program from the memory card.
OUTPUT	This menu key output the target program into the memory card.
RENAME	This menu key renames the target file in the memory card.
DELETE	This menu key deletes the target file from the memory card.
FORMAT	This menu key initializes the memory card.
DATE	Use this menu key to change display of date and comment.

Use the following screen to output an NC program into the memory card:

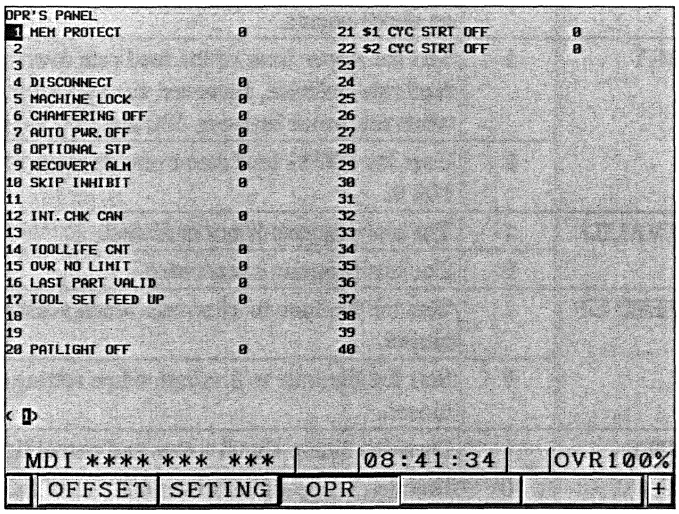


Display item	Explanation
<PROGRAM>	Machining program numbers registered in the memory of the NC unit
<SIZE>	File size (bytes) for each machining program number registered in the memory of the NC unit
<CMNT>	Indicates the comment described for each machining program stored in the memory of the NC unit.

Menu key	Function
INPUT	This menu key input the target program from the memory card.
OUTPUT	This menu key output the target program into the memory card.
RENAME	This menu key renames the target file in the memory card.
DELETE	This menu key deletes the target file from the memory card.
FORMAT	This menu key initializes the memory card.

8.16 Operator's Panel Screen

This screen is used for turning on/off the control signals for NC operation.



	Display item	Setup	Explanation
1	MEM PROTECT	1	Disables the function described below.
		0	Enables editing, input, and output of machining program.
4	DISCONNECT	1	Disables the function described below.
		0	Checks the power of the bar feeder device.
5	MACHINE LOCK	1	Locks the axis move command.
		0	Disables the above function. (Enables the axis move command.)
6	CHAMFERING OFF	1	Performs chamfering in threading cycles.
		0	Disables the above function.
7	AUTO PWR.OFF	1	Automatically turns off the power if an alarm occurs during machine operation in continuous cycles.
		0	Disables the above function.
8	OPTIONAL STP	1	Enables the optional stop.
		0	Disables the above function.
9	RECOVERY ALM	1	Examines the tool number (T04) used when the product separation is being executed, and disables the alarm function.
		0	Enables the above function.
10	SKIP INHIBIT	1	Inhibits the change of block skip processing during automatic operation.
		0	Disables the above function.
12	INT.CHK CAN	1	An interference alarm is canceled by reset operation and an interference check function is disabled.
		0	An interference alarm is not canceled by reset operation.

	Display item	Setup	Explanation
14	TOOLLIFE CNT	1	Counts the tool used count. If it amounts to the target count predefined, an alarm occurs.
		0	Counts the tool use time. If it amounts to the target time predefined, an alarm occurs.
15	OVR NO LIMIT	1	Sets the upper limit of the feed rate override to 200 %. For the rapid feed rate override, however, the upper limit is fixed to 100 % even when any value between 100 and 200 % is entered.
		0	Uses the 100 % feed rate override even when it is set to more than 100 %.
16	LAST PART VALID	1	The last program is not executed.
		0	The last program is executed.
17	TOOL SET FEED UP	1	Sets the feedrate to 10 m/min when setting tool with the door being closed.
		0	Sets the feedrate to 2 m/min when setting tool with the door being closed.
20	PATLIGHT OFF	1	Disables 3-setp signal tower and patrol light.
		0	Enables 3-setp signal tower and patrol light.
21	$1 CYC STRT OFF	1	Does not run the program in $1.
		0	Runs the program in $1.
22	$2 CYC STRT OFF	1	Does not run the program in $2.
		0	Runs the program in $2.
23	LENGTH ALM INVL	1	Disables maximum diametral protrusion alarm.
		0	Enables maximum diametral protrusion alarm.

Menu key	Function
OFFSET	Displays the Offset screen.
SETTNG	Displays the Setting screen.
OPR	Displays the Operator's panel screen.

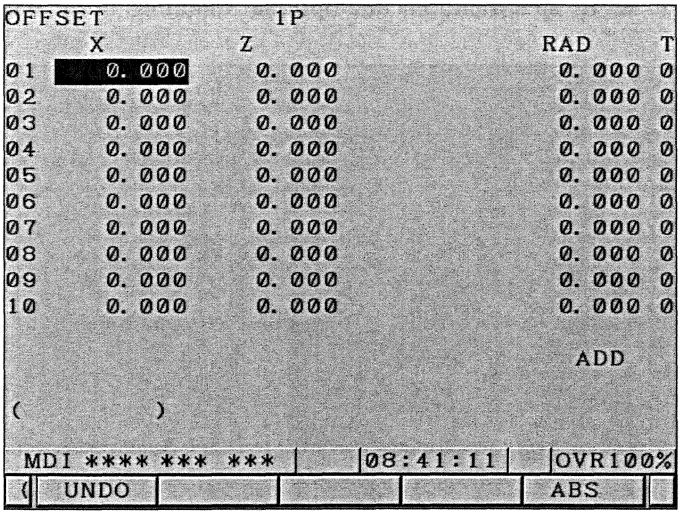
Note

"4 DISCONNECT" is not displayed if "AUTOMATIC BAR LOADER" is not selected in the Machine structure screen.

It is optional whether "14 TOOLLIFE CNT" is displayed or not.

Whether "23 LENGTH ALM INVL" is displayed or not depends on the holder for front machining specified in the machining data or on the selected operation mode.

8.17 Offset Screen

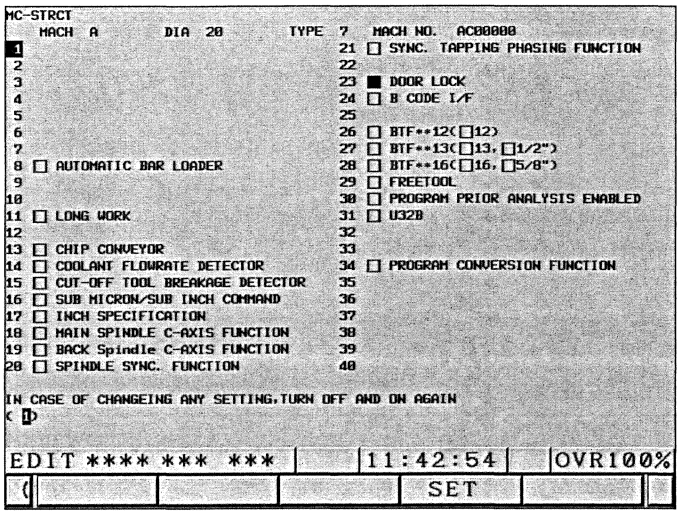


Display item	Explanation
X	Tool offset value for X axis
Y	Tool offset value for Y axis (optional)
Z	Tool offset value for Z axis
RAD	Offset value for tool nose R
T	Direction of virtual tool nose

Menu key	Function
UNDO	Restores the offset data before change.
ABS	Switches input method for offset data between Absolute Add and Incremental Add.

8.18 Machine Structure Screen

This screen is used to set up specifications and optional functions of the machine.



	Display item	Setup	Explanation	Remarks
8	AUTOMATIC BAR LOADER	☐	The automatic bar loader is not mounted.	
		■	The automatic bar loader is mounted.	
11	LONG WORK	☐	The long workpiece device is not mounted.	
		■	The long workpiece device is mounted.	
13	CHIP CONVEYOR	☐	The chip conveyor is not mounted.	
		■	The chip conveyor is mounted.	
14	COOLANT FLOWRATE DETECTOR	☐	The coolant flow rate detector is not mounted.	
		■	The coolant flow rate detector is mounted.	
15	CUT-OFF TOOL BREAKAGE DETECTOR	☐	The cut-off tool breakage detector is not mounted.	
		■	The cut-off tool breakage detector is mounted.	
16	SUB MICRON/ SUB INCH COMMAND	☐	Sub micron/sub inch command is unavailable.	
		■	Sub micron/sub inch command is available.	
17	INCH SPECIFICATION	☐	Inch size is unavailable (millimeter specification).	
		■	Inch size is available.	
18	MAIN SPINDLE C-AXIS FUNCTION	☐	Main spindle C-axis function is disabled.	
		■	Main spindle C-axis function is enabled.	
19	BACK Spindle C-AXIS FUNCTION	☐	Back spindle C-axis function is disabled.	
		■	Back spindle C-axis function is enabled.	
20	SPINDLE SYNC. FUNCTION	☐	Spindle synchronized control function is disabled.	
		■	Spindle synchronized control function is enabled.	
21	SYNC. TAPPING PHASING FUNCTION	☐	Phase adjustment for synchronous tapping is disabled.	
		■	Phase adjustment for synchronous tapping is enabled.	
23	DOOR LOCK	☐	Door lock is disabled.	
		■	Door lock is enabled.	

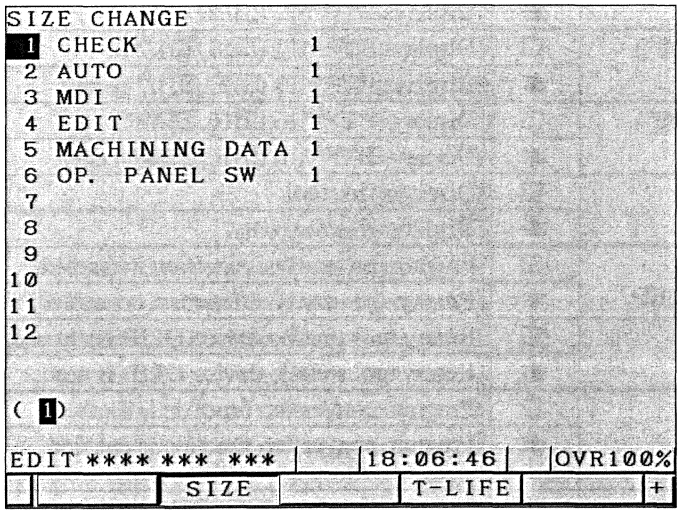
	Display item	Setup	Explanation	Remarks
24	B CODE I/F	□	B code I/F is unavailable.	
		■	B code I/F is available.	
26	BTF**12 (□12)	□	Displays BTF**12 (□12).	
		■	Displays BTF**12 (□12) only.	
27	BTF**13 (□13, □1/2")	□	Displays BTF**13 (□13, □1/2").	
		■	Displays BTF**13 (□13, □1/2") only.	
28	BTF**16 (□16, □5/8")	□	Displays BTF**16 (□16, □5/8").	
		■	Displays BTF**16 (□16, □5/8") only.	
29	FREETOOL	□	Displays free tool.	
		■	Displays free tool only.	
30	PROGRAM PRIOR ANALYSIS ENABLED	□	Program pre-analysis function is disabled.	
		■	Program pre-analysis function is enabled.	
31	U32B	□	Rotary tool spindle device U32B is not used.	
		■	Rotary tool spindle device U32B is used.	
34	PROGRAM CONVERSION FUNCTION	□	Program conversion function is disabled.	
		■	Program conversion function is enabled.	
37	A20VI BAR LOADER	□	The mounted bar loader is not dedicated to A20 type VI machine.	
		■	The mounted bar loader is dedicated to A20 type VI machine.	
42	PROGRAM STORAGE 40m	□	Program storage capacity is not equivalent to 40m tape.	
		■	Program storage capacity is equivalent to 40m tape.	
43	PROGRAM STORAGE 80m	□	Program storage capacity is not equivalent to 80m tape.	
		■	Program storage capacity is equivalent to 80m tape.	
44	PROGRAM STORAGE 120m	□	Program storage capacity is not equivalent to 120m tape.	
		■	Program storage capacity is equivalent to 120m tape.	
49	CUSTOM MACRO	□	Custom macro program is unavailable.	
		■	Custom macro program is available.	
52	SYNCHRONOUS TAP FUNCTION	□	Synchronous tapping function is disabled.	
		■	Synchronous tapping function is enabled.	
56	MAIN SPINDLE 1-DEGREE INDEXING	□	Main spindle 1-degree indexing function is disabled.	
		■	Main spindle 1-degree indexing function is enabled.	
58	BACK SPINDLE 1-DEGREE INDEXING	□	Back spindle 1-degree indexing function is disabled.	
		■	Back spindle 1-degree indexing function is enabled.	
61	TOOLLIFE MANAGE1	□	The tool life management function is disabled.	
		■	The tool life management function is enabled.	
62	TOOLLIFE MANAGE2	□	The spare tool change function is disabled.	
		■	The spare tool change function is enabled. (The tool life management I is needed.)	
73	EC SPECIFICATION	□	EC specification is unavailable.	
		■	EC specification is available.	
77	HIGH SPEED SYNC. TAPPING FUNC.	□	High speed synchronous tapping function is disabled.	
		■	High speed synchronous tapping function is enabled.	

Note

For items 26 through 29, select either ON (■) or OFF (□). If these items are set to OFF (□), all the holders are displayed.
The item 37 "A20VI BAR LOADER" appears only if Item 8 "AUTOMATIC BAR LOADER" is set to ON (■). (The automatic bar loader is mounted.)

8.19 Size Change Screen

This screen is used to change the size of characters displayed.

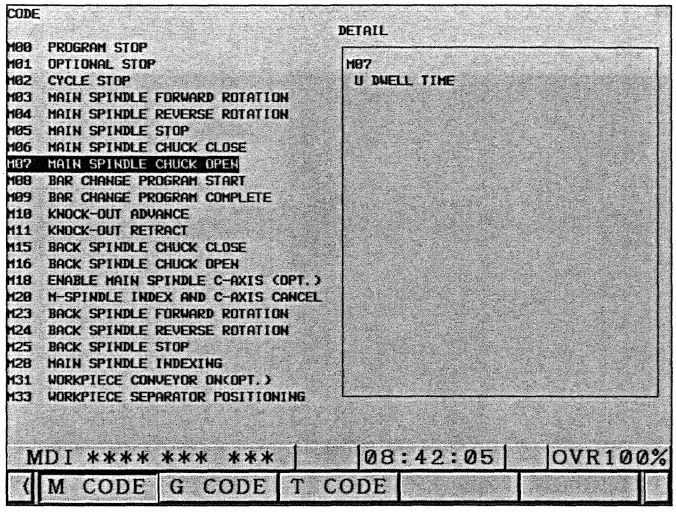


	Selectable screen	Setup	Character size displayed
1	CHECK	0	Large
		1	Small
2	AUTO	0	Large
		1	Small
3	MDI	0	Large
		1	Small
4	EDIT	0	Large
		1	Small
5	MACHINING DATA	0	Large
		1	Small
6	OP. PANEL SW	0	Large
		1	Small

Menu key	Function
SIZE	Displays the Size change screen.
T-LIFE	Displays the Tool life management screen.

8.20 Code Screen

This screen displays the available M, G, and T codes and their arguments.



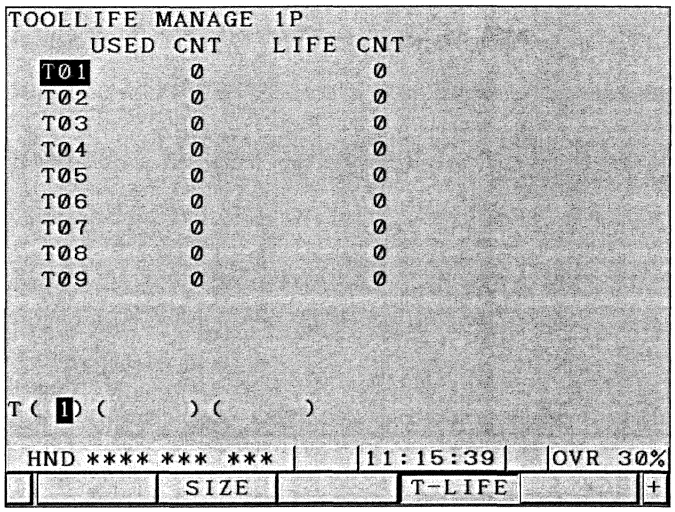
Display item	Explanation
M**	Contents of M codes are displayed.
DETAIL	The detailed explanation is displayed if it is required for the cursor position code. Some codes are not displayed. Contents are composed of descriptions about arguments and other information.

Menu key	Function
M CODE	Displays the M code list.
G CODE	Displays the G code list.
T CODE	Displays the T code list.

8.21 Tool Life Management I

This function is used to prescribe the tool life by setting tool use frequency (or time).

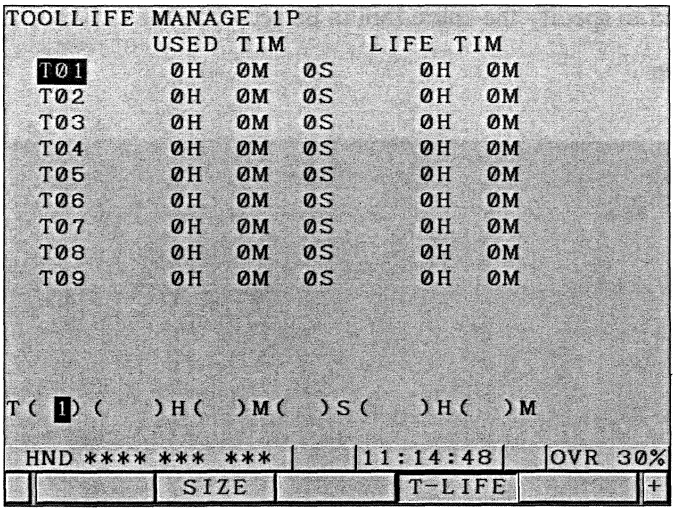
Frequency count system



Display item	Explanation
USED CNT	Displays the called frequency for every tool number.
LIFE CNT	Displays the life frequency prescribed for the tool.

Menu key	Function
SIZE	Displays the Size change screen.
T-LIFE	Displays the Tool life management screen.

Time count system



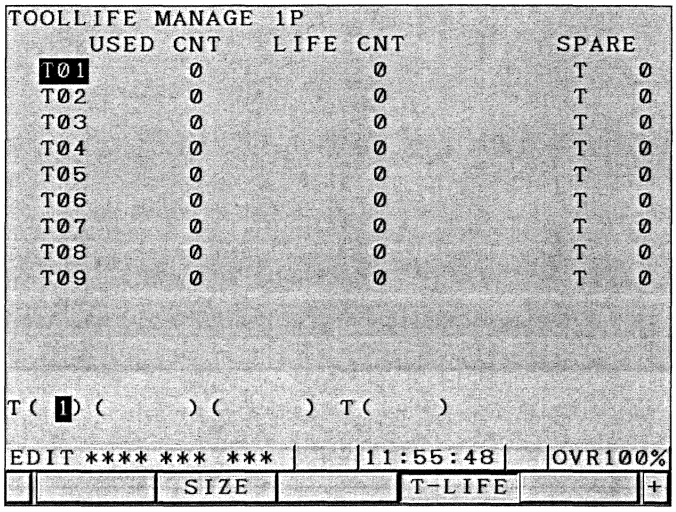
Display item	Explanation
USED TIM	Displays the accumulated cutting time for the called tool number.
LIFE TIM	Displays the life time prescribed for the tool.

Menu key	Function
SIZE	Displays the Size change screen.
T-LIFE	Displays the Tool life management screen.

8.22 Tool Life Management II

This function is used to specify the spare tool to be set when the tool reaches its life.

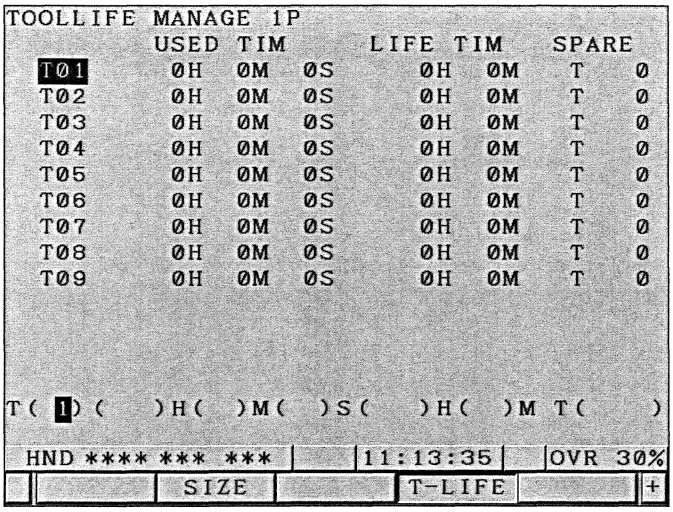
Frequency count system



Display item	Explanation
USED CNT	Displays the called frequency for every tool number.
LIFE CNT	Displays the life frequency prescribed for the tool.
SPARE	Displays the tool number assigned as a spare tool.

Menu key	Function
SIZE	Displays the Size change screen.
T-LIFE	Displays the Tool life management screen.

Time count system



Display item	Explanation
USED TIM	Displays the accumulated cutting time for the called tool number.
LIFE TIM	Displays the life time prescribed for the tool.
SPAR	Displays the tool number assigned as a spare tool.

Menu key	Function
SIZE	Displays the Size change screen.
T-LIFE	Displays the Tool life management screen.

Product Code C – A220PL VII

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Appendix. Operating Procedures

Important Notice to Operators!

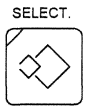
This manual is for quick reference operating procedures. It is a condensed version of the complete A20 Operator's Manual.

This manual does not include important information such as safety precautions, a description of the operation panel and screens, instructions on preparation for operating the machine, and mounting and adjusting instructions.

You must not operate this machine without first reading the complete A20 Operator's Manual. Be sure you read, understand and follow the important safety precautions in Chapter 2 and elsewhere in the complete manual. Periodically reread the safety information to be sure you continue to operate this machine safely.

Citizen Machinery Co., Ltd. will not be responsible for damage or injury caused by your failure to read and follow the precautions and instructions in the complete A20 Operator's Manual.

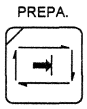
1. Procedure from Power-On to Automatic Operation

1. Set the main circuit breaker to ON.
2. Press the Power on switch  on the left side of the LCD screen.
3. Press the Program select key 

.

   The Program select key lamp goes on. The Program select screen is displayed.
4. Move the cursor to the program to be selected by pressing the Cursor move key  .
5. Press the Input key 

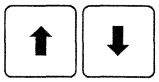
.

   The program number is displayed at the upper right of the screen.
6. Press the Preparation key 

.

   The Preparation key lamp goes on. The Preparation screen is displayed.
7. Pull the material to the end of the spindle.

> **CAUTION**
>
> **If the material is not pulled to the end of the spindle, it may come in contact with the tool.**

8. Move the cursor to the cutting-off tool number by pressing the Cursor move keys  .
9. Press the menu key [ST. POS].

> **WARNING**
>
> **Keep the safety cover closed while the Start key lamp is on. Otherwise, an accident resulting in injury or death may occur.**

10. Close the safety cover.
11. Press the Start key 

.

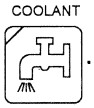
    The door is locked and the Start key lamp blinks.
12. Press the Start key 

.

    Start point operation is executed. After all the axes have moved, the door lock is released.

13. Slowly push the material to the cutting-off tool.
    If the guide bushing is strictly adjusted and you fail to push the material to the cutting-off tool, move the cutting-off tool to the waiting position to make the material end face protrude from the cutting tool edge, then cut off the material manually.

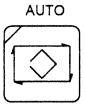
14. Turn on the bar feeder, then turn on the torque switch.

15. Press the Coolant key 

    .

    The Coolant key lamp goes on. Coolant is supplied.

> **CAUTION**
>
> **Verify the discharge amount of coolant and the discharge position.**
> **If the discharged amount of coolant or the discharge position is not correct, the guide bushing or tool may be damaged.**

16. Press the Auto key 

    .

    The Auto key lamp goes on.

17. Press the either menu key [CONTI], [1CYCLE], or [1BLOCK].
    When the menu key [1CYCLE] is pressed, the program is executed for each product. When the menu key [1BLOCK] is pressed, the program is executed for each line.

18. Press the Start key 

    .

    The door is locked and the Start key lamp blinks.

19. Press the Start key 

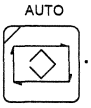
    .

    The Start key lamp goes on. The program is executed.

Notes

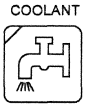
- If the door is open at the start of start position ([ST.POS]) operation, the door will not be locked.
- Make sure to close the safety cover prior to execute automatic operation. With the cover opened, the machine will not work.

2. Procedure from Continuous Operation to Power-Off

1. Press the Auto key 

.
2. Press the menu key [1CYCLE].
3. When one cycle operation is complete and all the axes (including rotation axis) have stopped, the door lock is released, and the Start key 

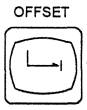
goes off.

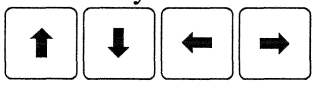
   One cycle is completed when the Start key lamp goes off.
4. Press the Coolant key 

.

   The Coolant key lamp goes off. Supply of coolant is stopped.
5. ress the Power off switch  on the left side of the LCD screen.
6. Turn off the work light.
7. Set the main circuit breaker to OFF.

3. Procedure for Entering Offset Data

1. Press the Offset key 

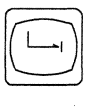
.
2. Press the menu key [OFFSET].
   The Offset screen is displayed.
3. Move the cursor to the axis for which the X-axis, Z-axis or Y-axis (optional) offset data indicated by the offset number is entered. Use the Cursor move keys  to move the cursor.
4. Enter the offset value on the lower part of the LCD screen, then press the Input key 

.

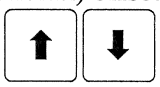
   The entered value is added. To input an absolute value, press the menu key [ABS], then press the Input key 

.

4. Procedure for Clearing Offset Data

1. Press the Offset key 

.
2. Press the menu key [OFFSET].
   [OFFSET] is selected. The Offset screen is displayed.

3. Move the cursor to the axis for which the X-axis, Z-axis or Y-axis (optional) offset data indicated by the offset number is entered. Use the Cursor move keys  to move the cursor.

4. Press the numeric key "0", press the menu key [ABS], then press the Input key  . (absolute command)

5. Procedure for Manual Operation (MDI)

1. Press the Manual operation key  .

2. Press the menu key [MDI].
   The MDI screen is displayed.

3. Enter the command address and command value by pressing the Alphanumeric keys, then press the End of block key  .

4. Press the Input key  .

> **WARNING**
>
> **Keep the safety cover closed while the Start key lamp is on.**
> **Otherwise, an accident resulting in injury or death may occur.**

5. Close the safety cover.

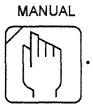
6. Press the Start key  .
   The door is locked and the Start key lamp blinks.

7. Press the Start key  .
   The MDI program is executed.

Note

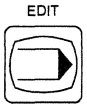
Make sure to close the safety cover prior to execute MDI operation. With the cover opened, the machine will not work.

6. Procedure for Manual Operation (Pulse Handle)

1. Press the Manual operation key 

.
2. Press the menu key [HANDLE].
3. Move the cursor to the axis to be moved by pressing the Cursor move keys ↑ ↓.
4. Move the cursor to the tool number by pressing the Cursor move key →.
5. Move the cursor to tool No. which operates the handle. Use the Cursor move keys ↑ ↓ to move the cursor.
6. Press the Handle magnification keys X1, X10, X100.
   The change lamp of the selected key goes on.
   When the Handle magnification key X1 is pressed, the axis moves 1 micromillimeter per gradation. When the Handle magnification key X10 is pressed, the axis moves 10 micromillimeters per gradation. When the Handle magnification key X100 is pressed, the axis moves 100 micromillimeters per gradation.
7. Press the menu key [EXEC].
8. Move the axis with the pulse handle.
   The selected axis moves to the plus (+) side when the handle is turned clockwise. It moves to the minus (–) side when the handle is turned counterclockwise.

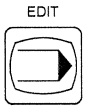
7. Procedure for Entering Program from External Device

1. Connect the cable of the external device to the RS232C connector of the machine.
2. Turn on the external device.
3. Set the Program protection select key to "O" to cancel the protection.
4. Press the Edit key 

.
   The List screen is displayed.
5. Press the menu key [I/O].
   The In/Out screen is displayed.
6. Press the menu key [INPUT].
7. Enable the external device for input.
8. Press the Input key 

.

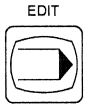
8. Procedure for Outputting Program to External Device

1. Connect the cable of the external device to the RS232C connector of the machine.
2. Turn on the external device.
3. Press the Edit key 

.
   The List screen is displayed.
4. Press the menu key [I/O].
   The In/Out screen is displayed.
5. Press the menu key [OUTPUT].
6. Enable the external device for output.
7. Select the program number of the program to be output by the cursor keys, then press the Input key 

.

9. Procedure for Creating New Program

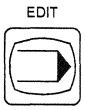
1. Set the Program protection select key to "O" to cancel the protection.
2. Press the Edit key 

.
   The List screen is displayed.
3. Press the menu key [LIST].
   The contents of the menu are changed.
4. Press the menu key [CALL].
5. Press the Cancel key 

.
6. Enter the new program number in the field enclosed with parentheses on the lower part of the LCD screen, then press the Input key 

.
   The edit program is displayed.

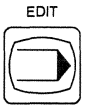
10. Procedure for Calling Program

1. Press the Edit key 

.
   The List screen is displayed.
2. Press the menu key [LIST].
   The contents of the menu are changed.
3. Press the menu key [CALL].
4. Move the cursor to the program number of the program to be called by the Cursor move key  , then press the Input key 

.
   The Edit screen of the called program is displayed.

11. Procedure for Editing Program

1. Set the Program protection select key to "O" to cancel the protection.
2. Press the Edit key 

.
   The List screen is displayed.
3. Press the menu key [LIST].
   The contents of the menu are changed.
4. Press the menu key [CALL].
5. Move the cursor to the program number of the program to be called by the Cursor move key  , then press the Input key 

. The Edit screen of the called program is displayed.
6. Enter the address and numeric value by pressing the Alphanumeric keys, then press the Input key 

.
   Press the Input key whenever you enter or change data. Data is stored only when the Input key is pressed.

   Delete key 

: Deletes a character on which the cursor is.

   Cancel key 

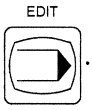
: Deletes a line on which the cursor is.

   Insert key 

: Inserts characters to the position immediately before the cursor.

   Pressing the Insert key toggles editing and input method between "Insert" mode or "Overwrite" mode.

12. Deletion Procedure for Program

1. Set the Program protection select key to "O" to cancel the protection.
2. Press the Edit key 

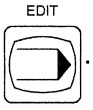
.
   The List screen is displayed.
3. Press the menu key [LIST].
   The contents of the menu are changed.
4. Press the menu key [CLEAR].
5. Move the cursor to the program number of the program to be erased by the Cursor move key ↓, then press the Input key 

.
6. The screen displays "Clear → INPUT" and "Cancel → CAN".
   Press the Input key 

to erase the program, or the Cancel key 

to return to the previous menu.

13. Procedure for Entering Machining Data

1. Set the Program protection select key to "O" to cancel the protection.
2. Press the Edit key 

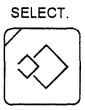
.
   The List screen is displayed.
3. Press the menu key [LIST].
   The contents of the menu are changed.
4. Press the menu key [CALL].
5. Move the cursor to the program number of the program to be called by the Cursor move key ↓, then press the Input key 

. The Edit screen of the called program is displayed.
6. Press the menu key [M. DATA].
   The Machining data screen is displayed.
7. You can move the cursor to each data item by pressing the Cursor move keys ↑ ↓.
8. Enter the numeric value in the field enclosed with parentheses on the lower part of the LCD screen, then press the Input key 

. Press the Cancel key 

to delete the numeric value in the field enclosed with parentheses.

14. Procedure for Selecting Program to be Executed

1. Press the Program select key 

.

   The Program select key lamp goes on. The Program select screen is displayed.

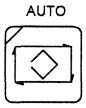
2. Move the cursor to the program to be selected by pressing the Cursor move key 
.

3. Press the Input key 

.

   The program number is displayed at the upper right of the screen.

15. Procedure for Setting Counter

1. Press the Auto key 

.

   The Auto screen is displayed.

2. Press the menu key [COUNTR].
   The item is indicated by the cursor.

3. Move the cursor to the required parts count field by pressing the Cursor move key 
.

4. Enter the required number of parts in the field enclosed with parentheses, then press the Input key 

.

5. Move the machined parts count field.

6. Enter 0 in the field enclosed with parentheses by the Alphanumeric keys, then press the Input key 

.

16. Procedure for Setting Tools (T01's, Tool and Rotary Tool)

16.1 When the material diameter is ⌀11.0 mm or less:

With the rotary tool, you can apply the procedures below for the material of which diameter exceeds 11.0 mm.

1. Press the Program select key 

.

   The Program select key lamp goes on. The Program select screen is displayed.

2. Move the cursor to the program to be selected by pressing the Cursor move key 
.

   Verify the machining data on the Edit screen beforehand.

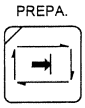
⚠ CAUTION

Be sure to verify the machining data. If the machining data is incorrect, the tools or the tool holder may interfere with material.

3. Press the Input key 

.

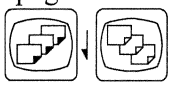
   The program number is displayed on the upper right of the screen.

4. Press the Preparation key 

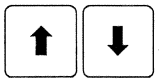
.

   The Preparation key lamp goes on. The Preparation screen is displayed.

5. Press the menu key [T-SET].
   The contents of the menu are changed.

6. If page 1 of the Preparation screen is not displayed, press the Page switching keys  to display page 1.

   "PREPARATION 1P" is displayed at the upper left of the screen.

7. Move the cursor to the tool number of the tool to be set by pressing the Cursor move keys  .

8. Press the menu key [DIA].
   If the specified time has elapsed without any operation after the menu key [DIA] was selected, the selected function is automatically canceled.

⚠ WARNING

The machine may move suddenly while the Start key lamp goes on.
Be sure to keep hands away from the machine while the lamp is going on.

9. Close the door.

10. Press the Start key 

.

    The door is locked.

11. Press the Start key 

.

    The holder moves to the outside diameter position of the material, then the door lock is released.

12. Move the material so that it extends about 10 mm from the end of the guide bushing.

13. Push the tool to the outside diameter of the material, then tighten the tool temporarily.

14. Press the menu key [WAIT].
    If the specified time has elapsed without any operation after the menu key [WAIT] was selected, the selected function is automatically canceled.
15. Close the door.
16. Press the Start key 

.
    The door is locked.
17. Press the Start key 

.
    The holder moves to the waiting position of the material, then the door lock is released.
18. Retighten the tool clamp screw or the rotary tool cap nut firmly.
19. Move the material backward from the end of the guide bushing.

> **CAUTION**
>
> **If the material is not moved backward from the end of the guide bushing, the material may interfere with the tool.**

* You need only to specify "DIA" for cross machining rotary tool.

20. Press the menu key [CORE D].
    If the specified time has elapsed without any operation after the menu key [CORE D] was selected, the selected function is automatically canceled.
21. Close the door.
22. Press the Start key 

.
    The door is locked.
23. Press the Start key 

.
    The holder moves to the outer circumference position of the material, then the door lock is released.
24. Move the material forward from the end of the guide bushing.
25. Press the Handle magnification keys 

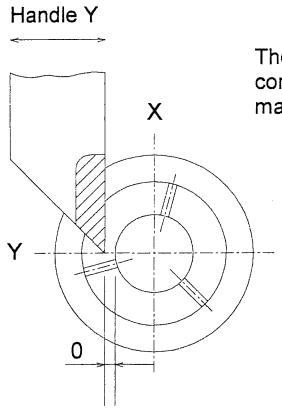
, 

.
    The lamp of the selected key goes on.
    When the Handle magnification key 

is pressed, the holder moves 1 micromillimeter per gradation. When the Handle magnification key 

is pressed, the holder moves 10 micromillimeters per gradation.

26. Adjust to match the outer circumference of the material to the top surface of the tool using the pulse handle.



The core is adjusted when the tool contacts the outer circumference of the material.

In this state, diametrical adjustment and moving Z1 axis can be performed.
To perform diametrical adjustment, press the menu key [DIA D] to perform diametrical adjustment, and [Z1 FED] to move the Z1 axis. Use the pulse handle to move each axis. Press the menu key [CORE D] to go back to the menu for core adjustment.

CAUTION

- **Operate the pulse handle slowly.**
- **Do not touch the tool or material while operating the pulse handle.**

Otherwise, an accident resulting in injury or death may occur.

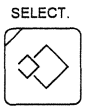
27. The core adjustment is displayed as a numeric value in the field enclosed with parentheses.
28. Press the Input key 

.
The adjusted value is input to the core position.
29. Press the menu key [WAIT].
The cursor returns to the tool number field enclosed with parentheses.
If the specified time has elapsed without any operation after the menu key [WAIT] was selected, the selected function is automatically canceled.
30. Close the door.
31. Press the Start key 

.
The door is locked.
32. Press the Start key 

.
The holder moves to the waiting position of the material, then the door lock is released.
33. Move the material backward from the end of the guide bushing.
34. Take the steps 7. to 28. to set the other tools.

16.2 When the material diameter exceeds ⌀11.0 mm:

1. Press the Program select key 

.

   The Program select key lamp goes on. The Program select screen is displayed.

2. Move the cursor to the program to be selected by pressing the Cursor move key 
.

   Verify the machining data on the Edit screen beforehand.

> **CAUTION**
>
> **Be sure to verify the machining data. If the machining data is incorrect, the tools or the tool holder may interfere with material.**

3. Press the Input key 

.

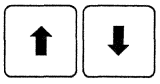
4. Press the Preparation key 

.

   The Preparation key lamp goes on. The Preparation screen is displayed.

5. Press the menu key [T-SET].
   The contents of the menu are changed.
   Move the material backward from the end of the guide bushing, then remove the tool to be set.

6. If page 1 of the Preparation screen is not displayed, press the Page switching key 
to display page 1. "PREPARATION 1P" is displayed at the upper left of the screen.

7. Move the cursor to the tool number of the tool to be set by pressing the Cursor move keys 
.

8. Press the menu key [CORE].
   If the specified time has elapsed without any operation after the menu key [CORE] was selected, the selected function is automatically canceled.

9. Close the door.

10. Press the Start key 

.

    The door is locked.

11. Press the Start key 

.

    The holder moves to the outer circumference position of the material, then the door lock is released.

12. Move the material so that it extends about 10 mm from the end of the guide bushing.
13. Slowly move the cutting edge of the tool to the outer circumference of the material.
14. Press the Handle magnification keys [X1], [X10].
15. Adjust to match the outer circumference of the material to the cutting edge of the tool using the pulse handle.
    In this state, diametrical adjustment and moving Z1 axis can be performed.
    To perform diametrical adjustment, press the menu key [DIA D] to perform diametrical adjustment, and [Z1 FED] to move the Z1 axis. Use the pulse handle to move each axis. Press the menu key [CORE] to go back to the menu for core adjustment.
16. The core adjustment is displayed as a numeric value in the field enclosed with parentheses.
17. Press the Input key 

    .
    The adjusted value is input to the core position.
18. Move the material backward to the end of the guide bushing.
19. Press the menu key [DIA].
    If the specified time has elapsed without any operation after the menu key [DIA] was selected, the selected function is automatically canceled.
20. Close the door.
21. Press the Start key 

    .
    The door is locked.
22. Press the Start key 

    .
    The holder moves to the outside diameter position of the material, then the door lock is released.
23. Move the material so that it extends about 10 mm from the end of the guide bushing.
24. Push the tool to the outside diameter of the material, then tighten the tool temporarily.
25. Press the menu key [WAIT].
    If the specified time has elapsed without any operation after the menu key [WAIT] was selected, the selected function is automatically canceled.
26. Close the door.
27. Press the Start key 

    .
    The door is locked.
28. Press the Start key 

    .
    The holder moves to the waiting position of the material, then the door lock is released.

29. Retighten the tool clamp screw firmly.
30. Move the material backward from the end of the guide bushing.

> **⚠ CAUTION**
>
> **If the material is not moved backward from the end of the guide bushing, the material may interfere with the tool.**

31. Similarly, carry out the steps 7. to 17. or other tools to set them.

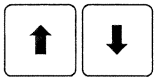
Notes

If the next tool holder on the right side contains no tool, you can adjust the tool set position using the menu key [CORE D] even if the material diameter exceeds 11.0 mm.

Ex.) Set tools starting from T06 to T01.
Note, however, this method is not a normal method to set a tool. Pay strict attention to interference between the material and the tool.

17. Procedure for Setting Tools (T11's)

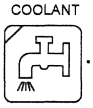
Cutting-off (T11's) is performed prior to set the cutting-off tools.

1. Take the steps 1. to 25. shown in <Section 16. Procedure for Setting Tools (T01's, Tool and Rotary Tool)>.
2. Press the menu key [T-SET] – [WAIT].
   If the specified time has elapsed without any operation after the menu key [WAIT] was selected, the selected function is automatically canceled.
3. Move the cursor to the number at which the cutting-off tool is set. Use the Cursor move keys  to move the cursor.
4. Close the door.
5. Press the Start key  .
   The door is locked.
6. Press the Start key  . After the cut-off tool reaches the queuing point, the machine stops, then, the selected menu key [WAIT] status is canceled.
   Then the door lock is released.
7. Press the menu key [CUTOFF].
8. Close the door.
9. Press the Start key  .
   The door is locked.
10. Press the Start key  .
    When the cut-off tool reaches the queuing point, the door lock is released once, and the Start key starts blinking.

> **WARNING**
>
> **The machine may move suddenly while the Start key lamp goes on.**
> **Be sure to keep hands away from the machine while the lamp is going on.**

11. Move the material so that the part to be cut-off extends from the end of the guide bushing.
12. Close the safety cover.

> **WARNING**
>
> **Keep the safety cover closed while the Start key lamp is on. Otherwise, an accident resulting in injury or death may occur.**

13. Press the Coolant key 

.

> **CAUTION**
>
> **Verify that enough coolant is discharged to the cutting-off position.**
> **If the discharged amount of coolant or the discharge position is not correct, the guide bushing or tool may be damaged.**

14. Press the Start key 

.

    The door is locked.

15. Press the menu key [CUTOFF] and the Start key 

at the same time. The Start key lamp goes on. The material is cut off.
    If the cutting-off tool is right-handed, proceed to step 15.
    If the cutting-off tool is left-handed, move downward the Z1 axis to the distance (cut-off tool width) – (tool tip width) in manual mode or in MDI mode.

> **CAUTION**
>
> **The machine operation does not stop once even if you release the Start key.**
> **Do not start any other operation while the Start key lamp is on.**

16. Set the drilling tool on the sleeve, then insert them into the sleeve holder. Verify that the sleeve and the edge of the drilling tool are positioned back at least 10 mm from the end of the guide bushing.

> **CAUTION**
>
> **Position the sleeve and edge of the drilling tool correctly. Otherwise, the sleeve or drilling tool may interfere with the guide bushing.**

17. Press the menu key [T-SET].
    The contents of the menu are changed.

18. Move the cursor to T11 by pressing the Cursor move key 
.

19. Press the menu key [CORE].
    If the specified time has elapsed without any operation after the menu key [CORE] was selected, the selected function is automatically canceled.

> **WARNING**
>
> **Keep the safety cover closed while the Start key lamp is on. Otherwise, an accident resulting in injury or death may occur.**

20. Close the door.
21. Press the Start key 

.

    The door is locked.
22. Press the Start key 

.

    The Z1 axis moves downward by 1.0 mm.
    The tool T11 moves to the center of the material, the Z1 axis move upward by 1.0 mm, then the door lock is released.
23. Push the tool to the end face of the material, then tighten the tool temporarily.
24. Press the Menu selection key  , then move the cursor to T12.
25. Press the menu key [T-SET].
    The contents of the menu are changed.
26. Press the menu key [CORE].
27. Close the door.
28. Press the Start key 

.

    The door is locked.
29. Press the Start key 

.

    The Z1 axis moves downward by 1.0 mm.
    The tool T12 moves to the center of the material, the Z1 axis move upward by 1.0 mm, then the door lock is released.
30. Retighten the tool T11 firmly.
31. When only one drilling tool is to be used, setting tool is complete in this step. Otherwise, go to next step.
32. Push the tool to the end face of the material, then tighten the tool temporarily.
33. Call the next tool by taking steps 23. through 28., then retighten the tool T12 firmly.
34. Take the steps 23. to 31. to set the tool T12 and the other tools.

Notes

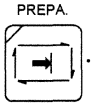
- Step 14. will not be started unless the operation in step 8. to 10. are completed and the Start key 

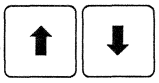
is flashing. Make sure to close the safety cover prior to execute automatic operation. With the cover opened, the machine will not work. To resume the operation, keep pressing the Start key once again.
- Do not open the chuck while the cut-off tool is still contact with the end face of the material after cutting off. Doing so may cause damage to the cut-off tool tip due to the mechanical shock generated by opening of the chuck.

18. Procedure for Setting Tools (T31's, T51's)

CAUTION

Be sure to verify the machining data. If the machining data is incorrect, the tools or the tool holder may interfere with material.

1. Cut the workpiece of which dimensions of front side was determined for 1 cycle, and let the workpiece be chucked by the back chuck.
2. Cut the feeding torque of bar feeder, and pull the material to the end of the guide bushing.
3. Press the Preparation key 

.
The Preparation key lamp goes on. The Preparation screen is displayed.
4. Push the back machining tool to be set into the sleeve.
5. Press the menu key [T-SET].
The contents of the menu are changed.
6. Move the Cursor to the number at which the back machining tool is set (T31's, T51's). Use the Cursor move keys  to move the cursor.
7. Press the menu key [LEN].
If the specified time has elapsed without any operation after the menu key [LEN] was selected, the selected function is automatically canceled.

⚠ WARNING

Keep the safety cover closed while the Start key lamp is on.
Otherwise, an accident resulting in injury or death may occur.

8. Close the door.
9. Press the Start key 

.

   The door is locked and the Start key lamp blinks.

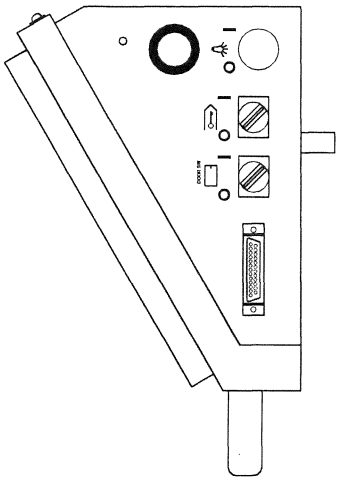
10. Press the Start key 

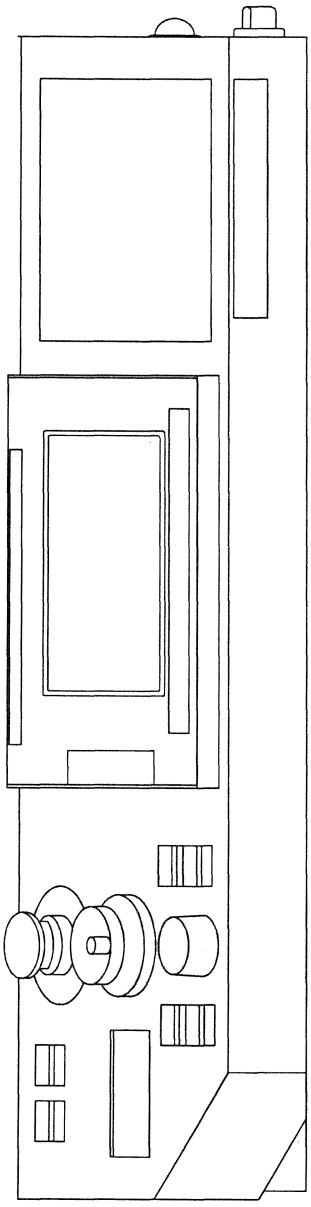
.

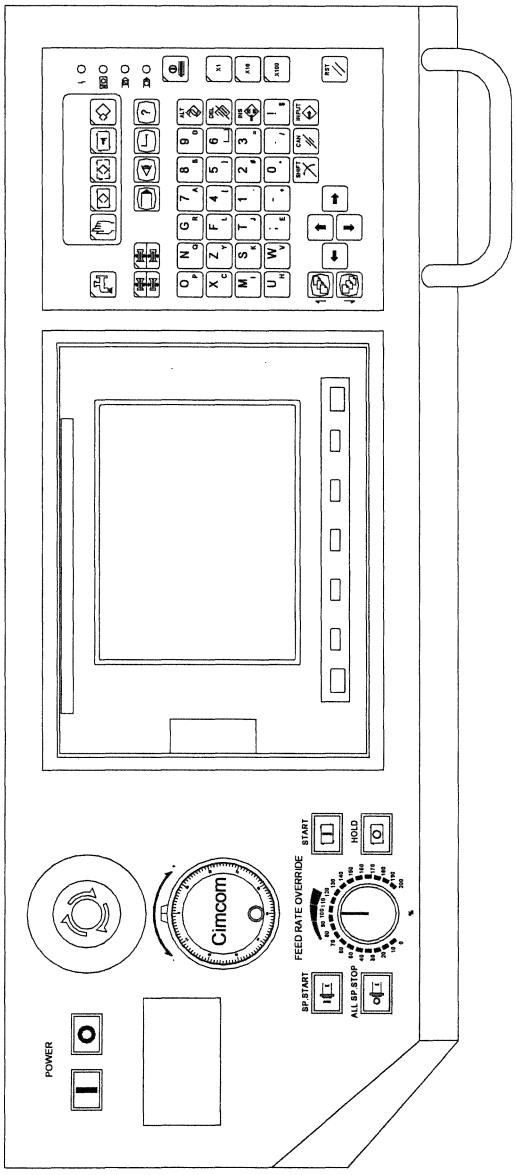
    The Start key goes on. The back spindle moves to the positioning point, and the drilling tool holder moves to the center of the workpiece. Then, the back spindle moves to the standard setting position, then the door lock is released.
    "ADJUSTMENT (LEN)" is displayed on the lower part of the screen.

11. Push the tool to the end face of the material, then tighten the tool temporarily.
12. Retract the Z2 axis with menu key [B.RET], and retighten the tool.
13. Set other back machining tools in the same way as in steps 6. to 12.

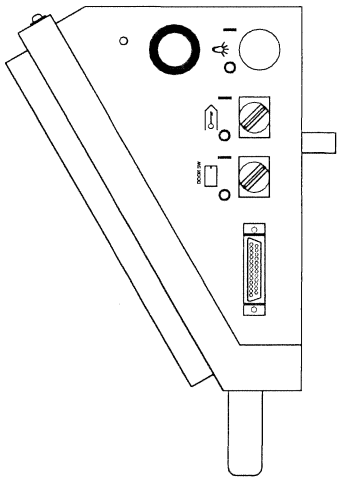
■ Sheet keyboard type: Symbol

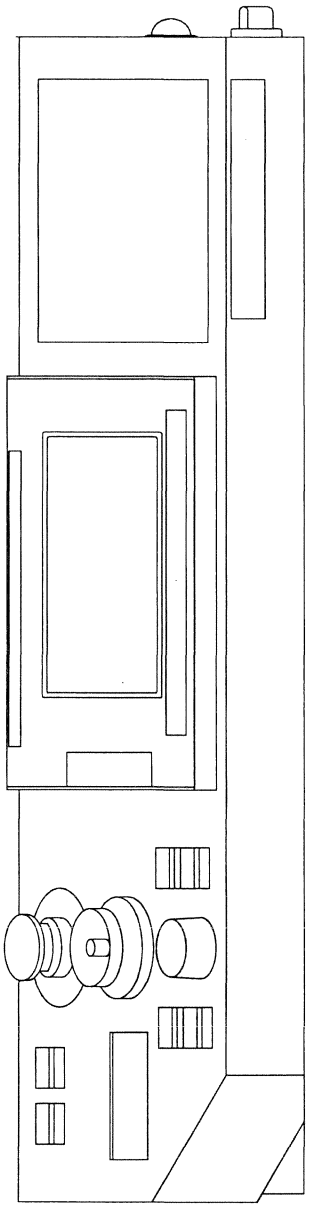


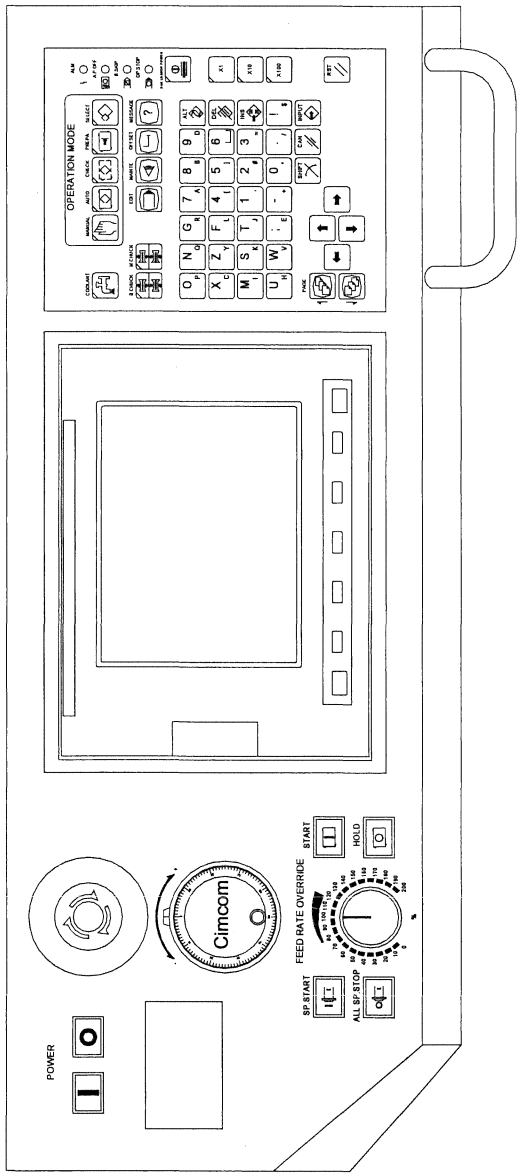




■ Sheet keyboard type: English







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