CAMM-3

Modeling Machine by Roland DG Corporation

PNC-3200

USER'S MANUAL

2

Cutting Using RML-1

Thank you very much for purchasing the PNC-3200.

- To ensure correct and safe usage with a full understanding of this product's performance, please be sure to read through this manual completely and store it in a safe location.

- Unauthorized copying or transferral, in whole or in part, of this manual is prohibited.

- The contents of this operation manual and the specifications of this product are subject to change without notice.

- The operation manual and the product have been prepared and tested as much as possible. If you find any misprint or error, please inform us.
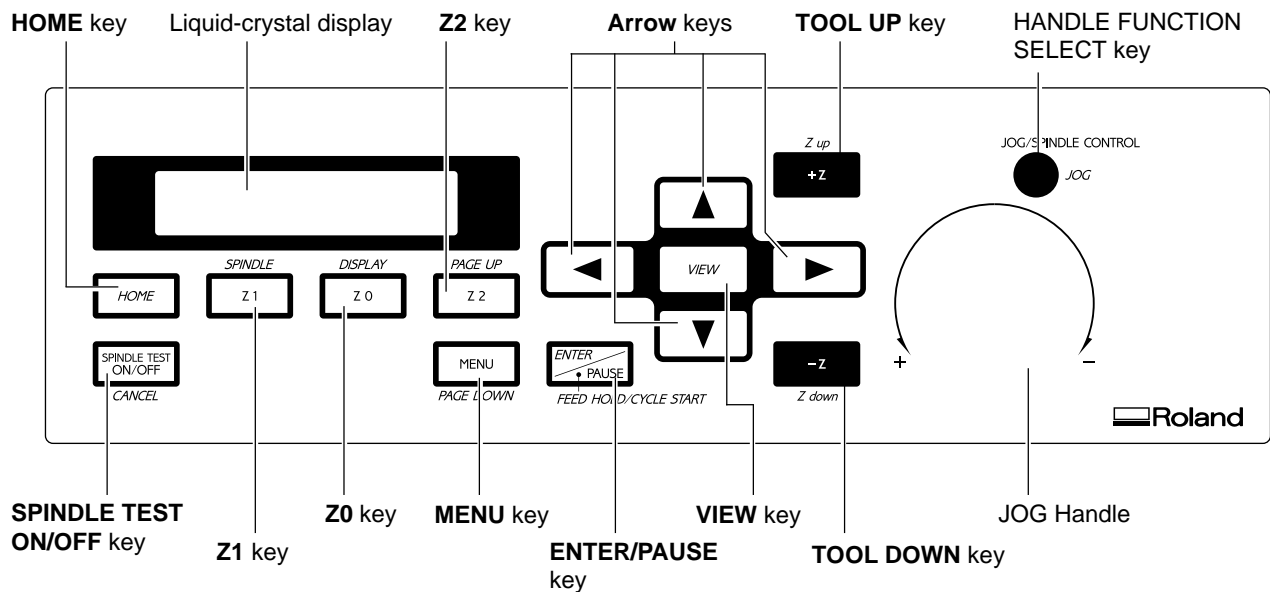
Table of Contents

Introduction

This document describes operation when performing cutting with the PNC-3200 using RML-1.
To perform cutting using RML-1, the command selection must be set to RML-1 when the PNC-3200 is switched on. For information on how to select commands, see "User's Manual 1 -- Setup and Maintenance."
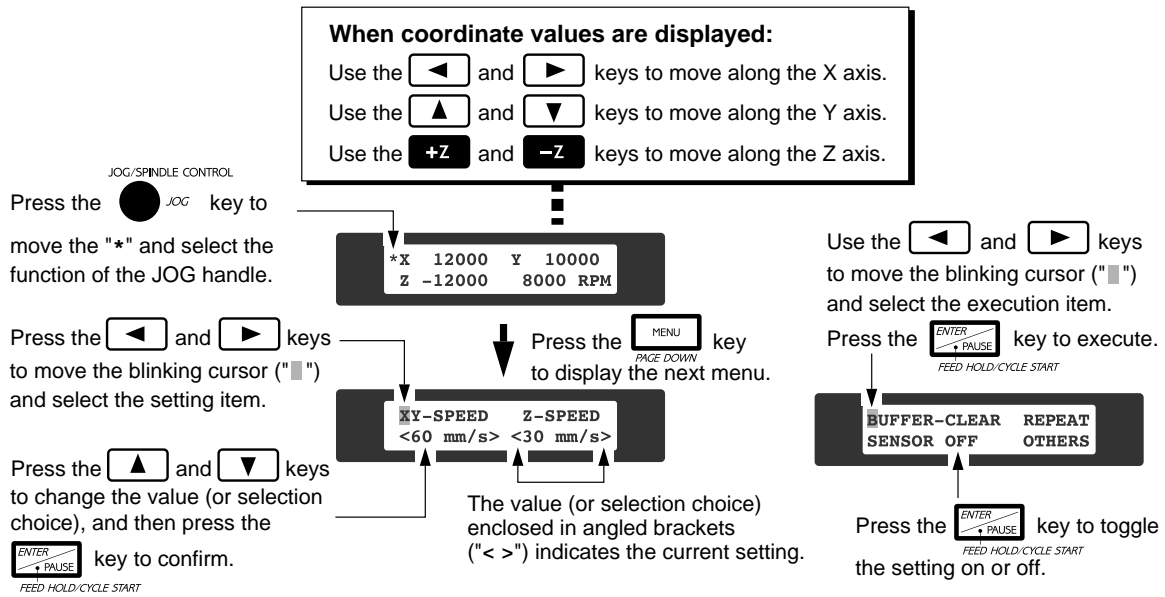
1   About the Switch Panel

Liquid-crystal display	The settings and selection choices (or values) for the PNC-3200 are shown on this display. Error messages also appear here in the event of a problem.
Arrow keys	Pressing an arrow key causes the XY table to move in the corresponding direction. The arrow keys are also used together with the liquid-crystal display to manipulate settings, select items, display other choices, and change values.
TOOL UP key	This key makes the cutting tool (blade) move in a positive direction on the Z axis (i.e., upward). Movement is always at a constant speed.
TOOL DOWN key	This key makes the cutting tool move in a negative direction on the Z axis (i.e., downward). Movement is always at a constant speed.
HOME key	This raises the tool (blade) to the highest point and moves the tool (blade) to the present home position (the origin point on the X and Y axes).
Z0 key	This key moves the cutting tool to the current Z-axis origin point.
Z1 key	This key starts the spindle motor and moves the tool to the current tool-down position. When the spindle switch is off, the spindle does not rotate and the tool does not move.
Z2 key	This key moves the tool to the current tool-up position.
MENU key	This key scrolls through the menu on the liquid-crystal display (i.e., it changes the panel display).
ENTER/PAUSE key	This key is used to confirm settings, values, and selections made with the liquid-crystal display. When pressed during cutting, operation is paused.
SPINDLE TEST ON/OFF key	This key is used to start and stop the spindle motor. To rotate, hold down the key for one second or longer. When the spindle switch is off, the spindle does not rotate.
VIEW key	This key raises the cutting tool to its highest point and moves the XY table to the front left.
JOG handle	This is used for inching the XY table and cutting tool (in steps of 0.01 mm (0.00039 in)), and also to set the speed of the spindle motor.
HANDLE FUNCTION SELECT key	This key is used together with the liquid-crystal display to select the function of the JOG handle.

Making Settings Using the Liquid-crystal Display

When coordinate values are displayed:

Use the [◄] and [►] keys to move along the X axis.

Use the [▲] and [▼] keys to move along the Y axis.

Use the **+Z** and **−Z** keys to move along the Z axis.

JOG/SPINDLE CONTROL

Press the ● *JOG* key to move the "*" and select the function of the JOG handle.

```
*X  12000   Y  10000
Z -12000    8000 RPM
```

Press the [◄] and [►] keys to move the blinking cursor ("▌") and select the setting item.

Press the **MENU** *PAGE DOWN* key to display the next menu.

Press the [▲] and [▼] keys to change the value (or selection choice), and then press the **ENTER ▸PAUSE** *FEED HOLD/CYCLE START* key to confirm.

```
XY-SPEED    Z-SPEED
<60 mm/s> <30 mm/s>
```

The value (or selection choice) enclosed in angled brackets ("< >") indicates the current setting.

Use the [◄] and [►] keys to move the blinking cursor ("▌") and select the execution item.

Press the **ENTER ▸PAUSE** *FEED HOLD/CYCLE START* key to execute.

```
BUFFER-CLEAR   REPEAT
SENSOR OFF     OTHERS
```

Press the **ENTER ▸PAUSE** *FEED HOLD/CYCLE START* key to toggle the setting on or off.

# 2 Setting the Origin (Home Position and Z0)

The PNC-3200 are suitable for use with a versatile range of workpiece shapes and a wide variety of tools, so determine the standard points for cutting each time a new workpiece is set. Set the home position (origin point for X an Y axes) and Z0 (Z axis origin point). (If these points can be set with your current software, they should be set using the software.)
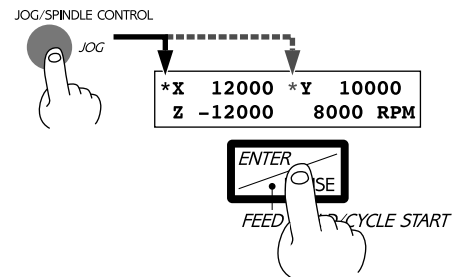
Setting the Home Position

The home position is the point that becomes the origin point in the X and Y directions. Usually, this point is set at the front left corner of the fixed workpiece. The setting method explained here, uses the left, bottom corner (nearest the operator) of the workpiece as the home position.
The home position points are registered in the PNC-3200 memory right after power is turned on and before power is turned off.
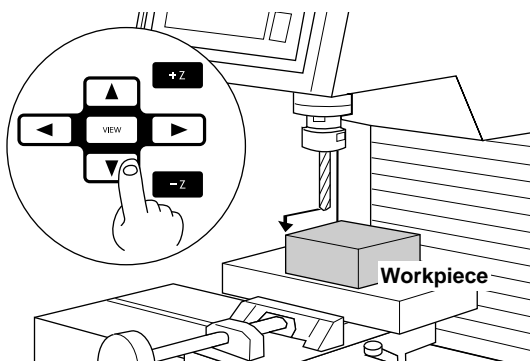
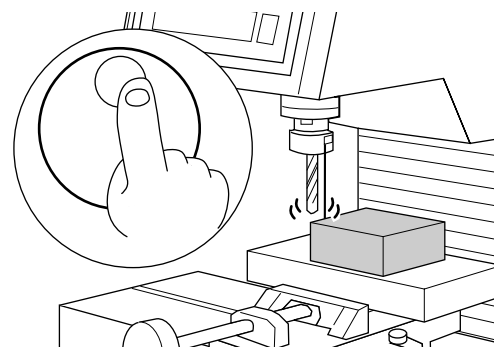**1** Press the [MENU] key to make the following screen appear on the display.

```
*X  12000   Y   10000
Z –12000     8000 RPM
```
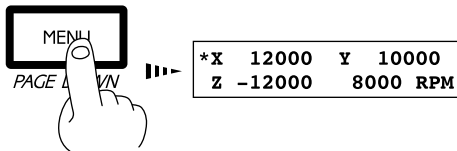
2 Press the HANDLE FUNCTION SELECT key to move the "*" on the screen to "X" or "Y," then press the [ENTER] key.

JOG/SPINDLE CONTROL

```
*X  12000  *Y   10000
Z –12000     8000 RPM
```

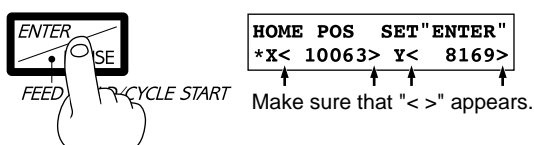**3** Press the arrow keys and the TOOL UP/DOWN keys to move the cutting tool to a position close to the front left corner of the workpiece.

Workpiece

4 Use the HANDLE FUNCTION SELECT key and the JOG handle to align the cutting tool with the front left corner of the workpiece.
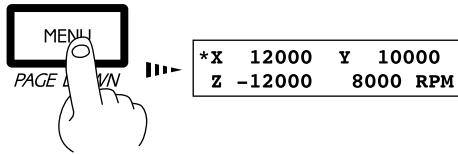
5 Press the [ENTER] key.

```
HOME POS  SET"ENTER"
*X< 10063> Y<  8169>
```

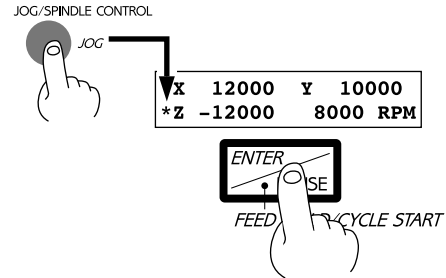Make sure that "< >" appears.

Setting the Z0 Position

The Z0 position is the point that becomes the origin point in the Z directions. Usually, this point is set at the surface of the fixed workpiece. The following explains the method for setting the workpiece surface Z0 position. If "Z0_MEMORY" is off, then the Z0 position is set to the mechanically uppermost position immediately after the power is switched on.
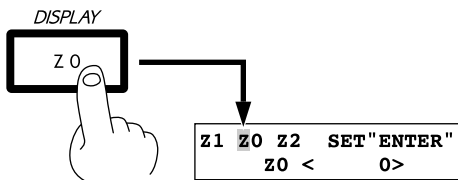
**1** Press the [MENU] key to make the following screen appear on the display.

MENU
PAGE DOWN

```
*X  12000   Y  10000
 Z -12000      8000 RPM
```

2 Press the HANDLE FUNCTION SELECT key to move the "*" on the screen to "Z," then press the [ENTER] key.

JOG/SPINDLE CONTROL
JOG

```
 X  12000   Y  10000
*Z -12000      8000 RPM
```

ENTER
SE
FEED   CYCLE START

3 Press the [Z0] key to move the blinking cursor ("▌") to "Z0."
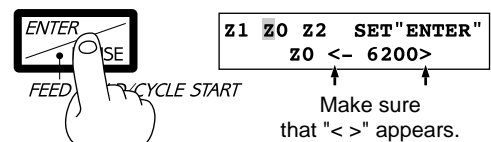
DISPLAY
Z 0

```
Z1 Z0 Z2  SET"ENTER"
       Z0 <      0>
```

4 Press the arrow keys and the [TOOL UP/DOWN] keys to move the cutting tool close to the surface of the workpiece.

+Z
VIEW
- Z
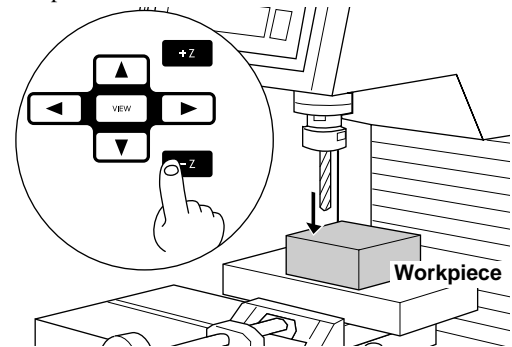
Workpiece

5 Rotate the JOG handle to align the tip of the cutting tool with surface of the workpiece.

6 Press the [ENTER] key.

ENTER
SE
FEED   CYCLE START
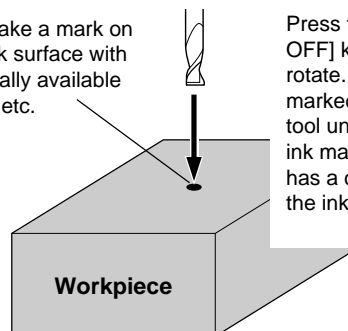
```
Z1 Z0 Z2  SET"ENTER"
       Z0 <- 6200>
```

Make sure
that "< >" appears.
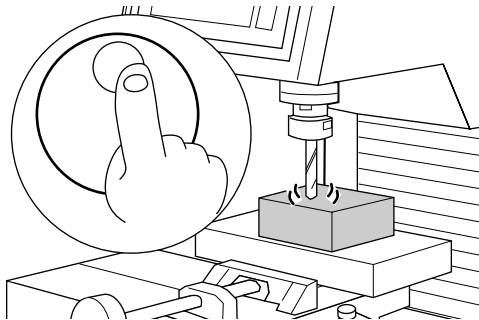
The following method can be used to set the Z0 position even more precisely. This method is suitable for cases where the position is marked with an oil pen and later cut off. Set Z0 as the position where the ink was cut off.

First, make a mark on the work surface with a generally available oil pen, etc.

Press the [SPINDLE TEST ON/ OFF] key to make the spindle rotate. Place the tool in the marked position, then lower the tool until the ink is cut off. The ink mark on the work surface has a certain thickness, so only the ink is removed.

Workpiece

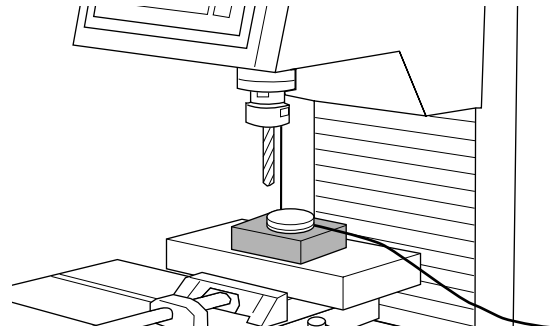# Setting Z0 with the Z0 Position Sensor (Included with the Unit)

The Z0 sensor included with the unit is used to set the Z0 point on the surface of the workpiece. The Z0 sensor is placed on the location which is to serve as the Z0 point, and the Z0 point is set.
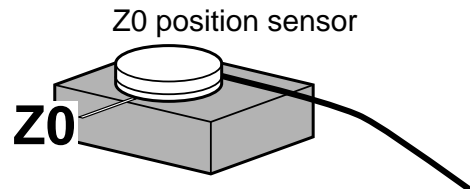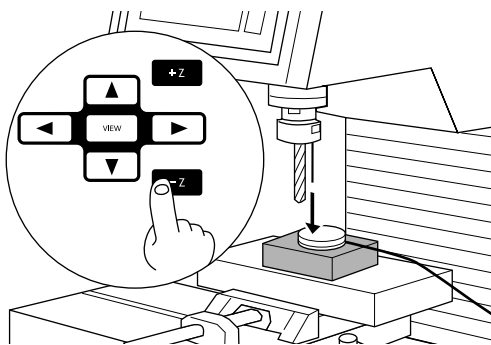
Z0 position sensor

1 Install the Z0 position sensor.
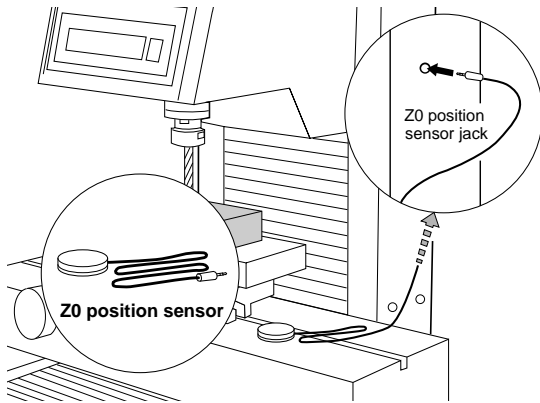
2 Place the Z0 position sensor on top of the workpiece.

3 Use the arrow keys and the tool up/down keys to move to a position 2 to 3 mm (0.079 in. to 0.118 in.) above surface of the Z0 sensor.

4 Press the [MENU] key to make the following screen appear on the display.


```
BUFFER-CLEAR   REPEAT
SENSOR OFF     OTHERS
```
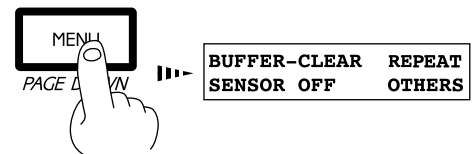
5 Press the [▼] key to move the blinking cursor ("▌") to "SENSOR OFF," then press the [ENTER] key.


```
BUFFER-CLEAR   REPEAT
SENSOR OFF     OTHERS
```
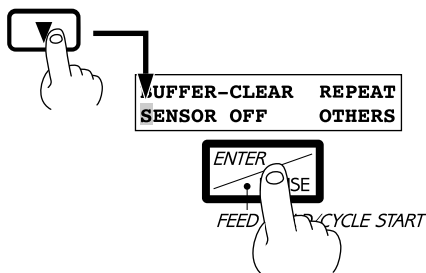
6 The display changes to indicate the message shown below.

```
*X   2000   Y    1000
 Z      0   8000 RPM
```

7 Press the TOOL UP/DOWN keys to move the cutting tool until its tip comes into contact with the Z0 position sensor. Movement of the cutting tool stops when it touches the Z0 position sensor.
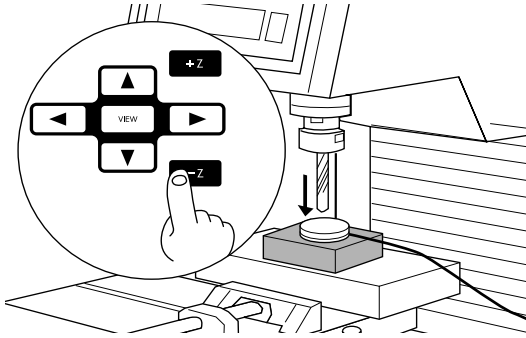
8 The display changes to indicate the message shown below.

```
UP SPINDLE,TAKE OFF
SENSOR,and PUSH "Z0"
```

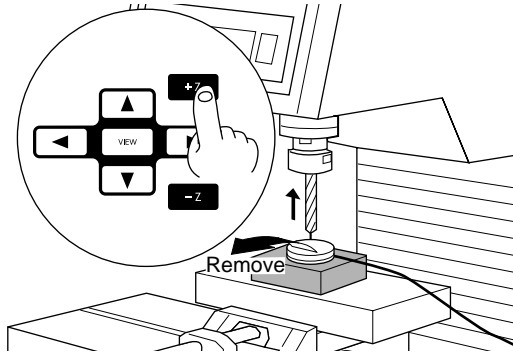**9** Use the tool-up key to raise the tool, then remove the Z0 sensor.

Remove

10 Press the [Z0] key. The tool descends automatically to the Z0 position, and the Z0 point is set.
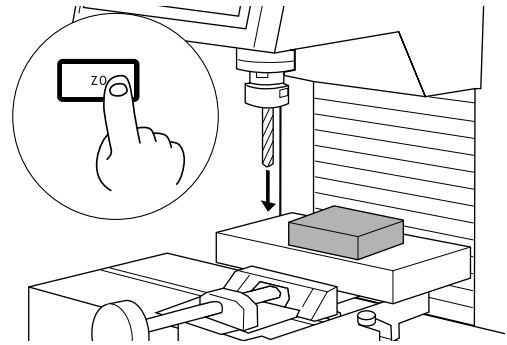
• The Z0 sensor removed from above the workpiece in step 9 must be placed outside the cutting range. Otherwise the cable may become caught during operation of the XY table, damaging the sensor.

• When the tool descends to the Z0 position in step 10, the tool may contact and scratch the surface of the workpiece. If you don't want the surface of the workpiece to be scratched, then before you press the [Z0] key, use the arrow keys to move the tool away from above the workpiece.

3 Cutting Condition Setting

Before you begin the actual cutting process, the cutting conditions such as the revolution speed of the spindle motor and the feeding speed of each axis must be designated according to the quality of the workpiece and the type of tool used. There are several deciding factors to be taken into account when designating the cutting conditions.

The quality of the workpiece **The type of tool used** **The diameter of the tool used**
The cutting method **The cutting shape**

Designate the cutting conditions in consideration of the above factors by performing the following three PNC-3200 setting operations.

    1. The spindle motor revolution speed (tool revolution speed)

    2. The feeding speed (tool moving speed)

    3. The cutting-in amount (depth of one cutting operation)

    Note : When settings have been made with both the software and the PNC-3200, the last settings made have priority.

In this manual, these three conditions are called the cutting conditions. The characteristics and points to consider for each of these conditions are as follows.

Item	Characteristics/Points to Consider
Spindle motor revolution speed	The bigger this number, the faster the cutting speed. However, if this number is too large, the work surface may melt or burn due to excessive friction. Conversely, if this number is made smaller, the time taken for cutting becomes too longer. Generally speaking, the entire cutting speed is determined by the cutting edge speed, so the smaller the tool diameter, the higher the spindle revolution speed required. (When performing engraving without rotating the cutting tool, set "REVOLUTION" to "OFF.") Revolution speed : 3000—8000 rpm
Feeding speed	When the feeding speed is high, processing becomes rough and flash marks tend to remain on the cut surface. On the other hand, when the feeding speed is slow, processing takes more time. Be careful because a slower feeding speed does not always result in improved finishing.
Cutting-in amount	When the cutting-in amount is deeper, the cutting speed increases, but the cutting-in amount is limited by the quality of the workpiece. In cases where the required depth can not be cut at once, repeat cutting several times to depth that does not breach the limit.

Manual Setting of Cutting Conditions

The cutting conditions can be set manually according to the method described below.
If the cutting conditions can be set with your current software, this is a faster and more efficient method than manual setting. It makes no difference when you come to construct a program. The following method is appropriate for making delicate halfway adjustments to conditions previously set using software, etc.

Feeding Speed

1 Press the [MENU] key to make the following screen appear on the display.
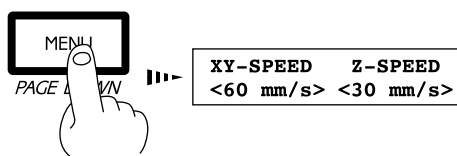
2 Press the [◄] or [►] key to move the blinking cursor ("▮") to "XY-SPEED."
To set the lowering speed of the head, move the blinking cursor ("▮") to "Z-SPEED."

3 Press the [▲] or [▼] key to set the feed rate.

```
XY-SPEED   Z-SPEED
 10 mm/s  <30 mm/s>
```

Setting range
X- and Y-axis : 0 to 60 mm/sec
Z-axis   : 0 to 30 mm/sec

4 Press the [ENTER] key.

```
XY-SPEED    Z-SPEED
<10 mm/s> <30 mm/s>
```

Make sure that
"< >" appears.
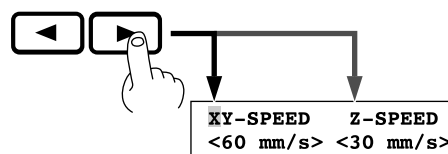
Spindle Motor Revolution Speed

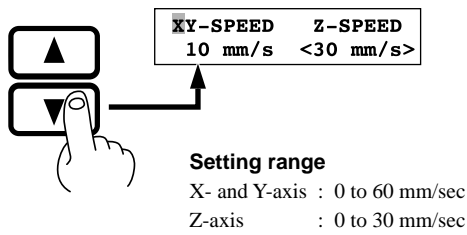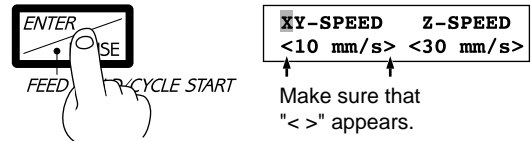**1** Press the [MENU] key to make the following screen appear on the display.

```
*X  12000   Y   10000
 Z -12000    8000 RPM
```

2 Press the HANDLE FUNCTION SELECT key to move the "*" on the screen to "??00 RPM."

JOG/SPINDLE CONTROL
JOG
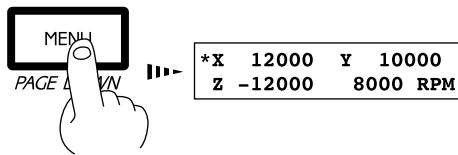
```
X  12000   Y   10000
Z -12000  *8000 RPM
```

3 Rotate the JOG handle to set the speed of rotation.

```
X  12000   Y   10000
Z  12000  *8000 RPM
```

Setting range:
3,000 to 8,000 rpm

RPM : Revolutions Per Minute
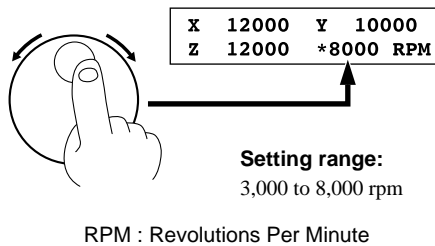
4 To store the speed setting in memory, press the [ENTER] key. The stored speed does not disappear even when the power is turned off, but remains in effect until the setting is changed.
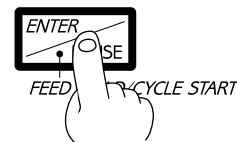
Cutting-in Amount

The cutting-in amount is set by setting Z1. For more information on the Z1 setting, see "4 Setting the Z1 and Z2 Position."

Cutting Condition Setting Examples

The chart below contains reference examples of the appropriate cutting conditions for several types of workpiece material. In the case that the conditions are input using software or when constructing your own programs, set the cutting conditions with reference to the chart. However, because conditions differ depending on tool sharpness and workpiece hardness, cutting performance may not always be optimal when adhering to the conditions specified below. In such a case, delicate adjustment should be performed at the time of actual cutting.

Workpiece	Tool	Spindle revolution speed [RPM]	Cutting-in amount [mm]	Feeding speed [mm/sec.]
Modeling wax (option)	ZUS-600	8000	2.5	14
Chemical wood	ZUS-600	8000	0.6	14
Acrylic resin	ZUS-600	8000	0.3	14
ABS plastic	ZUS-600	8000	0.7	14
Aluminum	ZUS-600	8000	0.1	14
Brass	ZUS-600	8000	0.1	14

4   Setting the Z1 and Z2 Position

The cutting tool up position (Z2 point) and down position (Z1 point) are normally set with the software. If they cannot be set with your current software then set them manually using the keys on the switch panel.
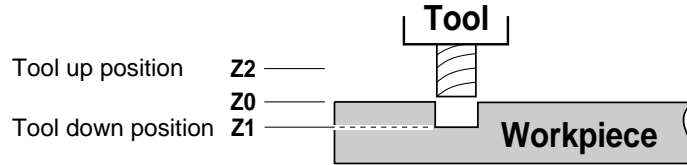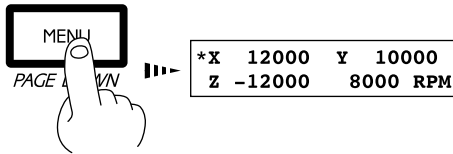
Tool

Tool up position   **Z2** ——
                   Z0 ——
Tool down position **Z1** ——
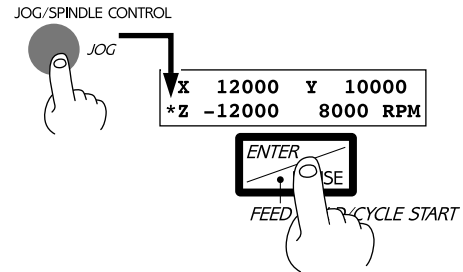
Workpiece

1 Press the [MENU] key to make the following screen appear on the display.

MENU

PAGE DOWN   ▮▮▸

```
*X  12000   Y  10000
 Z -12000      8000 RPM
```

2 Press the HANDLE FUNCTION SELECT key to move the "*" on the screen to "Z," then press the [ENTER] key.

JOG/SPINDLE CONTROL

JOG

```
 X  12000   Y  10000
*Z -12000      8000 RPM
```

ENTER
SE
FEED   CYCLE START

3 Press the [Z1] key to move the blinking cursor ("▮") to "Z1."
When setting the Z2 point, press the [Z2] key to move the blinking cursor ("▮") to "Z2."

DISPLAY

Z 0

```
Z1 Z0 Z2   SET"ENTER"
      Z0 <      0>
```
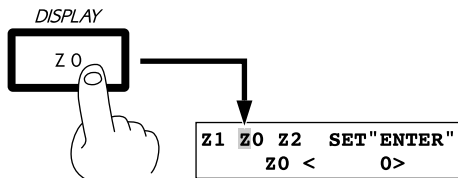
4 Press the arrow keys and the TOOL UP/DOWN keys to move the cutting tool close to the point where Z1 will be set.
When setting Z1, move the cutting tool to a position away from the loaded workpiece.

+Z
VIEW
-Z

Workpiece
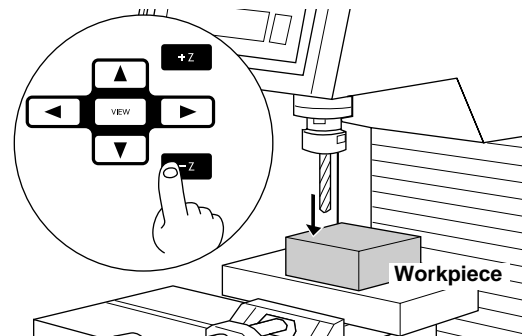
5 Rotate the JOG handle to gradually move the cutting tool to the height where the Z1 point is to be set.

6 Press the [ENTER] key.

ENTER
SE
FEED   CYCLE START

```
Z1 Z0 Z2   SET"ENTER"
      Z0 <- 6200>
```

Make sure
that "< >" appears.
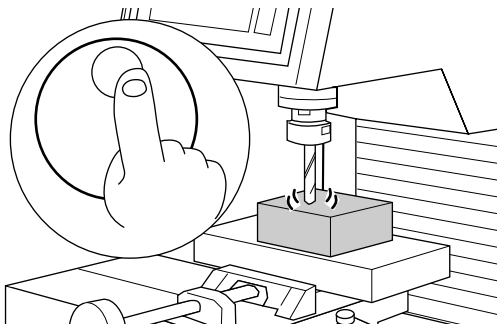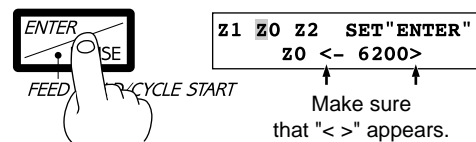
5 Downloading Cutting Data

⚠CAUTION

🚫 **Do not operate beyond capacity or subject the tool to undue force.**
The tool may break or fly off in a random direction. If and attempt is made by mistake to perform cutting beyond capacity, immediately switch off the spindle switch.

🚫 **Do not insert the fingers between the XY table and base or between the head and Z cover.**
The fingers may be pinched, resulting in injury.

Head   Z Cover

Base

XY Table

🚫 **Do not insert the fingers between the XY table and base or between the head and Z cover.**
Doing so may result in injury.
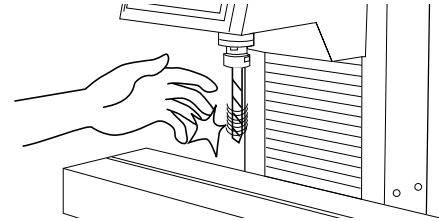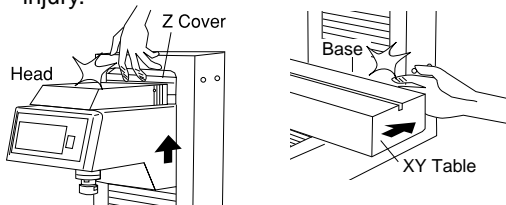
📝 To keep cutting waste from being scattered, we recommend using a commercially available vacuum cleaner to take up cutting waste during cutting. When attaching a vacuum cleaner to the PNC-3200, use a brush adapter for chip cleaning (ZAD-10/ZAD-20), sold separately.

Data is sent from the computer (the program), and the PNC-3200 performs cutting.

The included 2.5D DRIVER is used to perform output from the program.

The 2.5D DRIVER can be found on the included CD-ROM. For information on how to install it, take a look at "PNC-3200 Setup & Maintenance."

6 Finishing

⚠CAUTION

🚫 **Do not touch the tip of the blade with your fingers.**
Doing so may result in injury.

🚫 **Do not touch the tool immediately after cutting operating stops.**
The tool may have become hot due to friction heat and may cause burns if touched.

❗ **When mounting or removing a tool, first switch off the spindle switch.**
Doing so may result in injury.
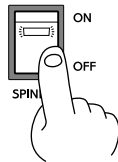
❗ **Please use a vacuum cleaner to remove cutting dust.**
Do not use any blower like airbrush.
Otherwise, dust spread in the air may harm your health or damage this machine.

After cutting has been finished, detach the tool, remove the material, and clean away chips.

1 Press the [MENU] key to make the following screen appear on the display.

```
*X   10020   Y    1801
 Z    2000   8000 RPM
```
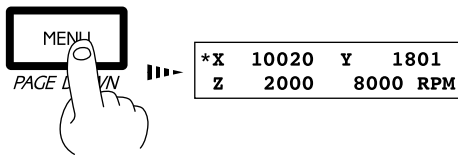
2 Press the [VIEW] key for at least 0.5 seconds.
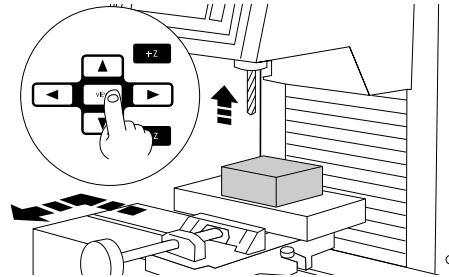
3 Turn off the spindle switch on the front of the unit.

LED Flashing

4 Detach the tool.

22 mm (0.87 in.)
30 mm (1.18 in.)
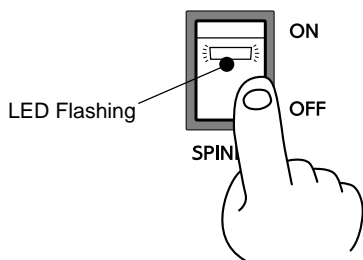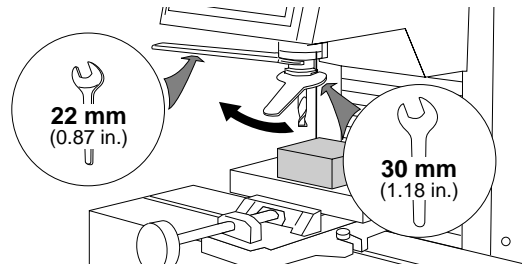
5 Remove the material.
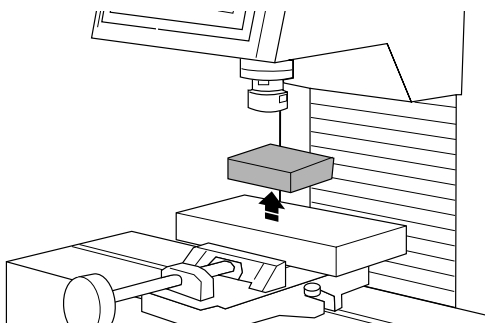
6 Use a commercially available vacuum cleaner to take up cutting waste.
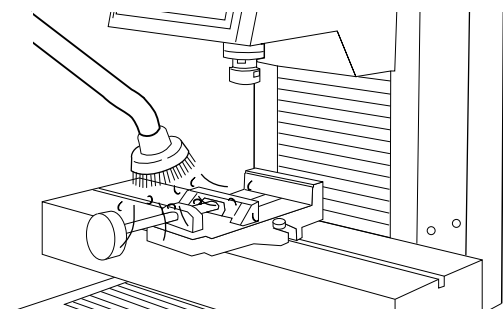
Part *2*   *User's Reference*

Cutting Area

The maximum cutting area of the PNC-3200 is 250 mm x 150 mm x 150 mm (9-13/16 x 5-7/8 x 5-7/8 in).   When converted to coordinate values (step size: 1/100 mm (0.00039 in)), (x, y, z) = (25,000, 15,000, 15,000).
The actual available cutting area is subject to restrictions according to the length of the attached tool, the X table position at which the workpiece is fixed, and the vice height (in the case that the vice is used); and in some cases it may be larger than the maximum operating area.

150 mm (5-7/8 in.)

**250 mm
(9-13/16 in.)**

150 mm (5-7/8 in.)
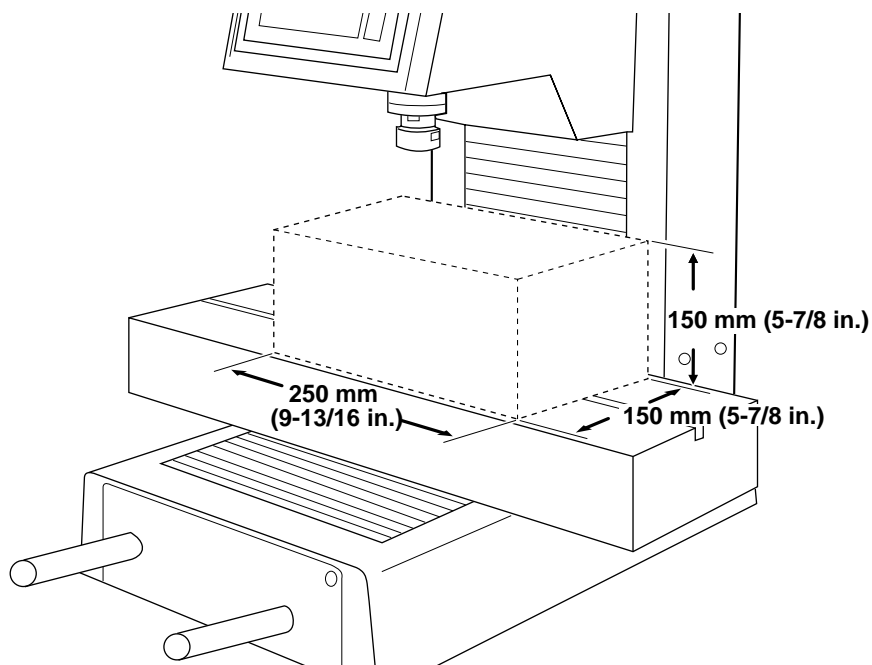
Coordinate System

The PNC-3200 employs three separate coordinate systems (described below) according to the application or purpose of use.

Machine Coordinate

Under the machine coordinate system, the coordinates are determined mechanically against the PNC-3200. This system forms the basis of the "work coordinates" and "user coordinates" which are explained later. The point to which the XY table and head move when the power is turned ON is the origin of the machine coordinate system (x, y, z)=(0, 0, 0). (The origin is fixed.)
The machine coordinate system basic unit is fixed as one step = 1/100 mm (0.00039 in).
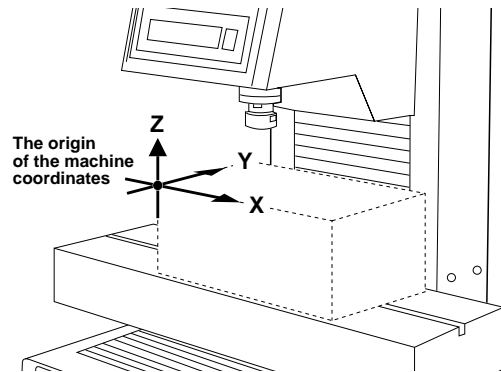
Work Coordinate

The origin of the machine coordinate system is fixed, but there is a coordinate system in which the origin can be moved relative to the machine coordinate system. This system is called the work coordinate system.
In the work coordinate system, the home position is the XY origin and Z0 is the Z axis origin. The origin of the work coordinates can be set by setting the home position (the XY axis origin) and Z0 (the Z axis origin).
The origin of the work coordinates is the standard point for cutting against the attached workpiece.
The work coordinate system basic unit is fixed as one step = 1/100 mm (0.00039 in).
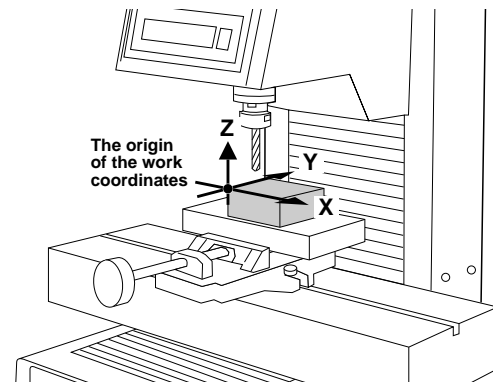
User Coordinate

* If you are using application software, there is no need to worry about the user coordinate system. You can ignore it completely.

Under the machine coordinate system and the work coordinate system, the unit value is fixed. In contrast, the user coordinate system allows the user to set the unit value freely. (However, the unit value can be set only for the XY axis. The Z axis unit value cannot be set.)
The user coordinate system unit is determined by replacing (converting) the work coordinate system unit with the user coordinate system unit. Also, the user can set the cutting data output to the position of the basic point of the workpiece on the XY axis. This operation is called scaling. It can be performed with the use instructions.
If scaling is not performed, the user coordinate system unit and the work coordinate system unit are equivalent.

Operating Each Function

Making Settings with the Liquid-crystal Display

When coordinate values are displayed:

Use the ◄ and ► keys to move along the X axis.

Use the ▲ and ▼ keys to move along the Y axis.

Use the +Z and −Z keys to move along the Z axis.

Press the ● *JOG* key to move the "*" and select the function of the JOG handle.

```
*X  12000  Y  10000
Z -12000     8000 RPM
```

Press the MENU key to display the next menu.

Press the ◄ and ► keys to move the blinking cursor ("▌") and select the setting item.

Press the ▲ and ▼ keys to change the value (or selection choice), and then press the ENTER/PAUSE key to confirm.

FEED HOLD/CYCLE START

```
XY-SPEED   Z-SPEED
<60 mm/s> <30 mm/s>
```

The value (or selection choice) enclosed in angled brackets ("< >") indicates the current setting.

Use the ◄ and ► keys to move the blinking cursor ("▌") and select the execution item.

Press the ENTER/PAUSE key to execute.

FEED HOLD/CYCLE START

```
BUFFER-CLEAR   REPEAT
SENSOR OFF     OTHERS
```

Press the ENTER/PAUSE key to toggle the setting on or off.

FEED HOLD/CYCLE START

Changing to Other-language Messages on the Liquid-crystal Display

1 Switch on the power while holding down the [MENU] key.
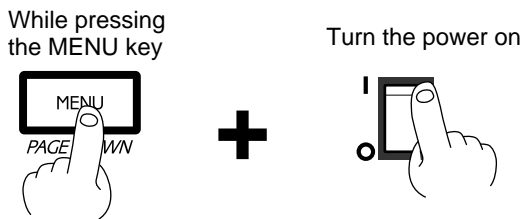
While pressing the MENU key

MENU
PAGE DOWN

+

Turn the power on

2 Press the [►] key to move the blinking cursor ("▌") to "ニホンゴ" and then press the [ENTER] key.

►

```
ENGLISH   ニホンゴ
```

ENTER
PAUSE

FEED HOLD/CYCLE START
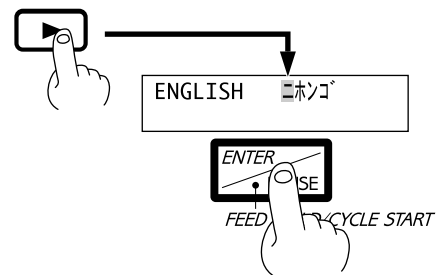
3 Messages on the display now appear in Japanese.

```
Hit "ENTER"
RML-1      NC-CODE
```

* To return the display to English-language messages, carry out Step 1 again. When the language-selection menu appears (similar to the one in Step 1, but in Japanese), move the cursor to "**ENGLISH**" and press the [ENTER] key.

Performing Repeat Cutting

The data buffer is the place where data received from the computer is stored temporarily. (The data in the data buffer can be erased by switching off the power or executing the "BUFFER-CLEAR".)
Executing the "REPEAT" calls up the cutting data stored in the PNC-3200's data buffer and executes the replotting procedure.
When replotting is executed, the entire data content of the data buffer is called up. When you perform replotting, clear the data from the data buffer before sending the cutting for replotting from the computer.

1 Press the [MENU] key to make the following screen appear on the display.

MENU
PAGE DOWN

BUFFER-CLEAR   REPEAT
SENSOR OFF   OTHERS
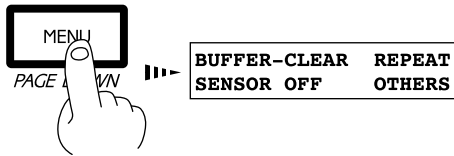
2 Press the [►] key to move the blinking cursor ("▮") to "BUFFER CLEAR," then hold down the [ENTER] key for at least 0.5 sec.

* The "BUFFER CLEAR" text flashes.

BUFFER-CLEAR   REPEAT
SENSOR OFF   OTHERS

ENTER
PAUSE
FEED   CYCLE START
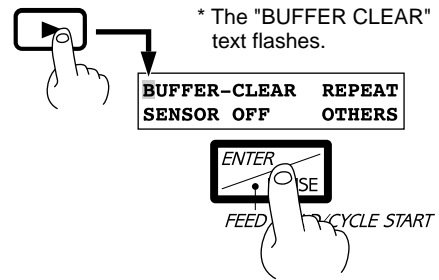
3 Install the tool (blade) and load the material. Use the software to send the cutting data.
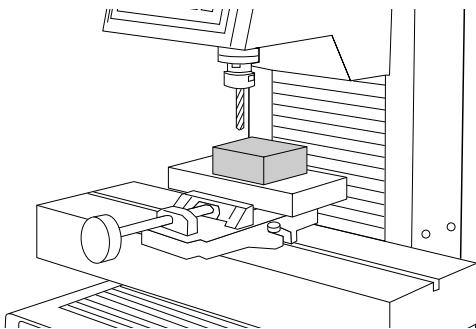
4 After cutting has finished, remove the cut material and load a new piece. Set the origin point if necessary.

5 Press the [MENU] key to make the following screen appear on the display.

MENU
PAGE DOWN

BUFFER-CLEAR   REPEAT
SENSOR OFF   OTHERS
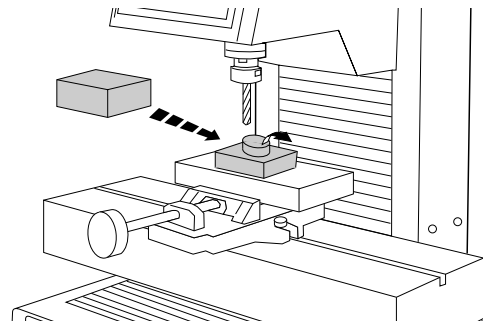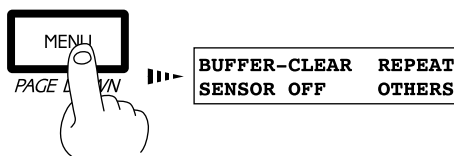
6 Press the [►] key to move the blinking cursor ("▮") to "REPEAT," and then press the [ENTER] key.

BUFFER-CLEAR   REPEAT
SENSOR OFF   OTHERS

ENTER
PAUSE
FEED   CYCLE START
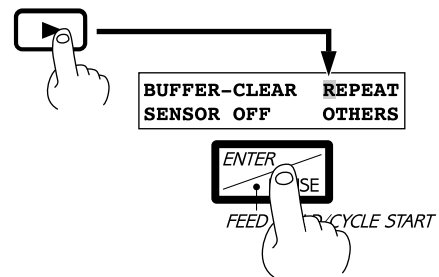
Changing the Feed Rate or Spindle Speed During Cutting

The feed rate and spindle rotating speed set by the software can be changed while cutting is in progress.

Changing the Feed Rate

This is done by first pausing the PNC-3200 during cutting, then changing the feed rate. However, if the computer subsequently sends a command to change the feed rate, the setting will change as specified by the new command. When set by software or set directly on the PNC-3200, the setting made last takes precedence.

1 Press the [ENTER/PAUSE] key while cutting is in progress. One cutting step is performed, after which operation stops. The display changes to show the following message.

```
       Pause On
CONTINUE     STOP
```

2 Press the [MENU] key to make the following screen appear on the display.
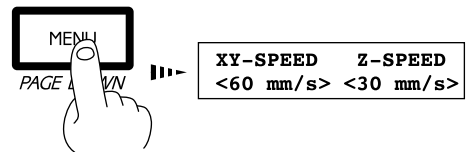
```
XY-SPEED   Z-SPEED
<60 mm/s> <30 mm/s>
```

3 Press the [◄] or [►] key to move the blinking cursor ("▌") to "XY-SPEED."
To set the lowering speed of the head, move the blinking cursor ("▌") to "Z-SPEED."

```
XY-SPEED   Z-SPEED
<60 mm/s> <30 mm/s>
```

4 Press the [▲] or [▼] key to set the feed rate.

```
XY-SPEED   Z-SPEED
 10 mm/s  <30 mm/s>
```

Setting range
X- and Y-axis : 0 to 60 mm/sec
Z-axis   : 0 to 30 mm/sec

5 Press the [ENTER] key.

```
XY-SPEED   Z-SPEED
<10 mm/s> <30 mm/s>
```

Make sure
that "< >" appears.
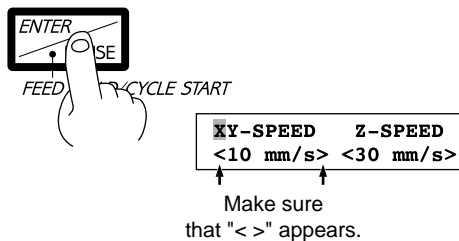
Canceling the Paused State to Resume Cutting

After changing the feed rate, cancel the paused state. Cutting then resumes at the new feed rate.

1 Press the [MENU] key to make the following screen appear on the display.

```
       Pause On
CONTINUE     STOP
```
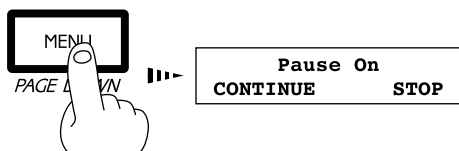
2 Press the [►] key to move the blinking cursor ("▌") to "CONTINUE," and then press the [ENTER] key.

```
       Pause On
CONTINUE     STOP
```
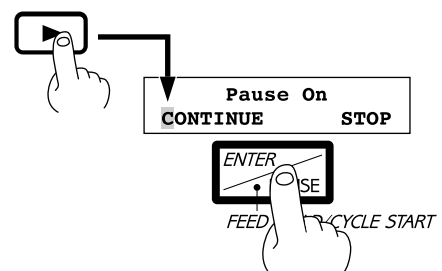
Changing the Spindle Speed

Spindle speed can be changed at any time. There is no need to pause operation. Use the jog dial to vary the speed.

LOW
3,000 rpm

HIGH
8,000 rpm
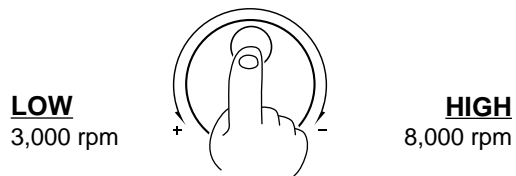
Setting range: 3,000 to 8,000 rpm

* RPM : Revolutions Per Minute

Stopping the Cutting Process

In the case that you begin cutting and then find that you have sent the wrong cutting data, perform the following operation.

1 Press the [ENTER/PAUSE] key while cutting is in progress. One cutting step is performed, after which operation stops. The display changes to show the following message.

```
      Pause On
CONTINUE        STOP
```
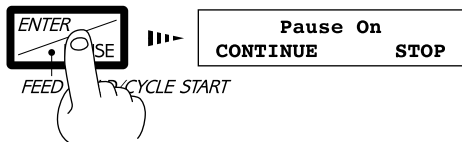
2 Use the software to stop data output.

3 Press the [►] key to move the blinking cursor ("▐") to "STOP," and then press the [ENTER] key.

```
      Pause On
CONTINUE        STOP
```
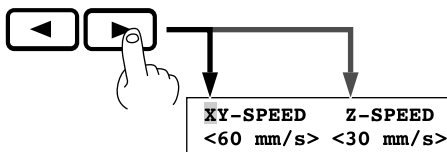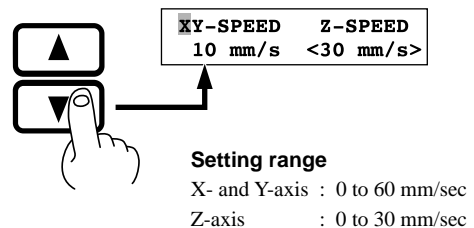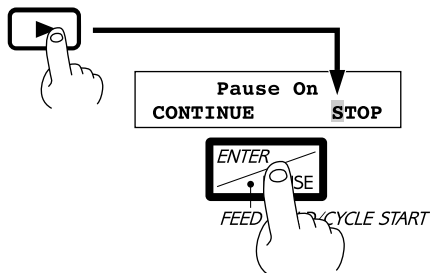
Explanation of the Display Menus

```
*X  12000   Y   10000
 Z -12000      8000 RPM
```

This shows the current position of the tool (in coordinates) and the spindle speed. The coordinate values indicate the home position as the origin point on the X and Y axes, and the Z0 point as the origin point on the Z axis. "RPM" is an abbreviations for "revolutions per minute."
It is possible to move from this menu to submenus for setting the X- and Y-axis origin point (home position), the Z-axis origin point (Z0), the tool-up position (Z2), the tool down position (Z1), and the spindle speed.

```
HOME POS  SET"ENTER"
  X< 12000> Y< 10000>
```

This sets the X- and Y-axis origin point (home position). Use the arrow keys to move the tool to the desired location for the home position, and press the [ENTER] key.
For details, see "Setting the Home Position".

```
Z1 Z0 Z2  SET"ENTER"
    Z0 <-12000>
```

This sets the Z-axis origin point (Z0), tool-up position (Z2), and tool down position (Z1). Move the blinking cursor ("▌") on the display to "Z0," "Z1," or "Z2," align the tip of the tool to the height to be set, then press the [ENTER] key.
For details, see "Setting the Z0 Position" or "4 Setting the Z1 and Z2".

```
 RPM  SET"ENTER"
   <8000 RPM>
```

This sets the spindle speed. Turn the jog handle to set the desired speed.
For details, see "Manual Setting of Cutting Conditions_Spindle Motor Revolution Speed".

```
XY-SPEED    Z-SPEED
<60 mm/s> <30 mm/s>
```

This shows the X/Y-axis feed rate and the Z-axis feed rate.
Move the blinking cursor ("▌") on the display to "XY-SPEED" or "Z-SPEED" use the [▲] or [▼] key to set the speed, and press the [ENTER] key.
For details, see "Manual Setting of Cutting Conditions_Feeding Speed".

```
BUFFER-CLEAR    REPEAT
SENSOR OFF      OTHERS
```

"**BUFFER-CLEAR**"
This deletes any cutting data stored in the data buffer.

"**REPEAT**"
This loads cutting data that is stored in the data buffer and performs cutting. This makes it possible to cut multiple copies of the same shape.
For details, see "Performing Repeat Cutting".

"**SENSOR OFF**"
This switches on a Z0 sensor connected to the PNC-3200. "SENSOR ON" is displayed when the Z0 sensor is used to set the Z0 point.
For details, see "Setting Z0 with the Z0 Position Sensor".

"**OTHERS**"
This switches to the submenu for setting communication parameters when a serial connection is used.

The submenus for "OTHERS" are described on the following page.

```
REVOLUTION OVER_AREA
 <ON>     <CONTINUE>
```

"REVOLUTION"
Default : ON
When set to "OFF," cutting can be performed without rotating the spindle.

"OVER_AREA"
Default : CONTINUE
This selects the action when the tool returns from a coordinate outside the cutting range to a coordinate inside the range. (The tool cannot actually be moved outside the cutting range, but the PNC-3200's internal processing handles this as if it had.)
"CONTINUE": Operation is not paused upon return to the cutting range. Cutting continues without interruption.
"PAUSE"   : Operation is paused when the tool returns to the cutting range.

"CONTINUE"

Cutting Area
(250 mm x 150 mm)
(9-13/16 x 5-7/8 in.)

Operation continues

"PAUSE"

Cutting Area
(250 mm x 150 mm)
(9-13/16 x 5-7/8 in.)

Operation is paused
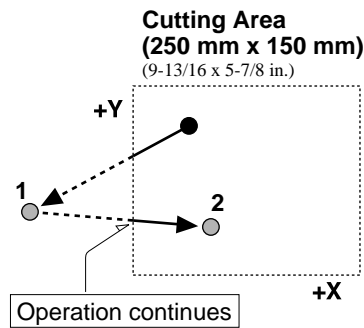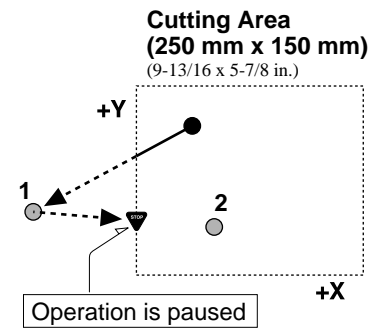
----- : Tool path
●○ : Coodinate point

```
MOVE_SPEED Z0_MEMORY
<60mm/sec>     <ON>
```

"MOVE_SPEED"
Default : 60 mm/sec
This sets the speed of movement with the tool raised.
 Use the [▲] or [▼] key to set the movement speed, then press the [ENTER] key.

"Z0_MEMORY"
Default : ON
This toggles the Z0 point memory function on or off. When set to "ON," the Z0 point remains in memory even after the power is switched off.

```
SENSE_HEIGHT  SMOOTH
 <**.**mm>      <ON>
```

"SENSE_HEIGHT"
Default : Thickness of the Z0 sensor when shipped from the factory (actual measured value).
The thickness of the Z0 sensor can vary slightly due to conditions of temperature or humidity. This allows the sensor thickness to be adjusted to match actual thickness.

"SMOOTH"
Default : ON
Smoothing is a function for cutting smooth arcs and circles. This selects the type of smoothing. Smoothing can also be switched off.
When shipped from the factory, this is set to "ON." If arcs cannot be cut well using this setting, try changing it to "OFF."

```
┌──────────────────────────┐
│  COMMAND        I/O      │
│ <AUTO >   <  AUTO  >     │
└──────────────────────────┘
```

"**COMMAND**"
Default : AUTO
This selects the RML-1 command mode. When set to "AUTO," "MODE 1" or "MODE 2" is determined automatically. If automatic determination is not made correctly, find out what instruction system the application software (or driver software) uses for data that is sent, and change this setting to "MODE1" or "MODE2." To determine which mode your software is sending data in, refer to the documentation for the software.

"**I/O**"
Default : AUTO
This sets the type of interface connected to the computer. When set to "AUTO," the interface type (parallel or serial) is determined automatically. However, serial communication parameters (baud rate, parity checking, stop bit, data bit, and handshaking settings) are not determined and must be set.

```
┌──────────────────────────┐
│  STOP   DATA   PARITY    │
│   <1>    <8>   <NONE>    │
└──────────────────────────┘
```

"**STOP**"
Default : 1
This sets the number of stop bits when using a serial connection. Either 1 bit or 2 bits can be selected.

"**DATA**"
Default : 8
This sets the data bit length when using a serial connection. A length of either 7 bits or 8 bits can be selected.

"**PARITY**"
Default : NONE
This makes the setting for parity checking when using a serial connection. The available selections are no parity ("NONE"), even parity ("EVEN"), and odd parity ("ODD").

```
┌──────────────────────────┐
│  BAUDRATE HANDSHAKE      │
│   <9600>   <HARDWIRE>    │
└──────────────────────────┘
```

"**BAUDRATE**"
Default : 9600
This sets the baud rate when using a serial connection. The available selections are 9600 and 4800 bps.

"**HANDSHAKE**"
Default : HARDWIRE
This sets the handshaking mode when using a serial connection. Either hardwire handshaking or Xon/Xoff control can be selected.

```
┌──────────────────────────┐
│  REVOLUTION TIME         │
│       0 hours            │
└──────────────────────────┘
```

This shows the rotation time of the spindle. The spindle rotation time cannot be returned to "0" (zero).
Refer to "Maintenance_Display of Spindle Rotation Time" in the separate "User's Manual 1 -- Setup and Maintenance."

What to Do If...

When the PNC-3200 does not work

Is operation paused?

Cancel the paused state.

Is the power for the PNC-3200 switched on?

Make sure the PNC-3200 is powered up.

Is cutting data stored in the buffer?

No operation takes place if no cutting data is stored in the buffer.
Switching off the power causes all cutting data stored in the buffer to be deleted.

When the spindle does not rotate

Is the PNC-3200 Spindle switch OFF?

Turn the Spindle switch ON.

Is "REVOLUTION" set to "OFF?"

If "REVOLUTION" is set to "OFF," the spindle will cut without rotating.
Refer to "Explanation od the Display Menus" and change the setting for "REVOLUTION" to "ON."

Data cannot be sent

Do the PNC-3200's connection parameter settings match the settings for the computer?

Refer to "6 Setting the Connection Parameters" in the separate "User's Manual 1 -- Setup and Maintenance."

Has the connection cable come loose?

Make sure the connection cable is plugged in securely with no looseness at either end.

Is the correct connection cable being used?

The type of connection cable varies according to the computer being used. Also, some application software requires the use of a special cable. Make sure the correct cable is being used.

Is the correct output device set for the application or driver software?

Refer to the manual for the application or driver software to set the output device correctly.
If you're using the included "2.5D DRIVER," refer to "4 Setting Up the Program" in the separate "User's Manual 1 -- Setup and Maintenance."

The power does not come on

Has the power cord come loose?

Make sure the power cord is plugged in securely with no looseness at either end.

Error Messages

An error message will appear if incoming data has any of the errors listed in table. Since the error is shown in the display for informational purposes, the data transfer continues and you are allowed to perform the next operation.
To get the error message to go away, press the [ENTER] key.
Occurrence of an error may make correct cutting impossible.

Error message	Meaning
1: Command Not Recognized	Appears if an instruction that the PNC-3200 cannot interpret is sent. This error is generated if an instruction from the "mode2" set is sent when the unit has been set to recognize "mode1," or viceversa. Change the setting for the recognized instruction set, using the control panel, and this error should no longer occur.
2: Wrong Number of Parameters	Appears if the number of parameters differs from the permissible number.
3: Bad Parameter	Appears if the value specified for a parameter is out of the permissible range.
10: Output Request Overlap	Appears if an output instruction is sent from the computer during execution of a previous output instruction. More precisely, there is a certain amount of delay between the moment an output instruction is given and the instant actual output begins. This error message appears if the new output request arrives during this delay time. (The delay time can be set using the [ESC].M instruction.)
11: Command Not Recognized	Appears if a device control instruction that the PNC-3200 cannot interpret is sent.
12: Wrong Parameter	Appears if an invalid parameter has been specified for a device control instruction.
13: Out of Parameter range	Appears if the value for a device control instruction parameter exceeds the permissible limit.
14: Termination Error	Appears if the number of parameters for a device control instruction is more than that permissible.
15: Framing/Parity Error	Appears if a framing error, parity error, or overrun error occurs at the time of data reception. (There is a problem with one of these settings: Baud Rate, Parity, Stop Bits, or Data Bits. The protocol settings for the PNC-3200 must be made correctly in order to match the settings your computer is set to use.)
16: Buffer Overflow	Appears if the I/O buffer has overflowed. (There is a problem with the connecting cable, or the settings for Handshaking. Make sure you are using a cable appropriate for the computer being used. Also, check that the setting for Handshaking is correct.)
18: Indeterminate Error	Appears if a communication error other than "Err10" through "Err16", one uninterpretable by the PNC-3200, occurs during data communications.

Other Messages

Besides error messages related to commands or communication parameters, the following messages may also appear on the display.

Message	Meaning
CAN'T REPEAT **TOO BIG REPEAT DATA**	When the amount of cutting data exceeds the capacity of the PNC-3200's data buffer, this message appear when an attempt is made to perform recutting with this data. The data cannot all fit in the PNC-3200's data buffer, so repeat cutting cannot be performed. The display can be cleared by pressing the [MENU] key.
CAN'T REPEAT **REPLOT DATA EMPTY**	This message appears if repeat cutting is attempted when the data buffer is empty. Send cutting data before performing repeat cutting. The display can be cleared by pressing the [MENU] key.
Hit "ENTER" **SPINDLE LOCK**	The PNC-3200 stops automatically if an excessive load is placed on the spindle during cutting. The message shown at right appears at this time. The overload may be due to excessive hardness of the material, an excessive amount of cutting, or a feed rate that is too fast. Investigate the problem and eliminate the cause of the overload. Press the [ENTER] key, then select "CONT" to resume cutting or "STOP" to end cutting.
Pause ON **SPINDLE SWITCH OFF**	When data has been sent from the computer to the PNC-3200, this message appears when the spindle switch is set to OFF. Turn on the spindle switch.
CHECK Z0 POSITION **SENSOR JACK**	This error appears if the Z0 sensor is loose when entering the sensor mode. The error message is displayed for approximately two seconds, then disappears. Make sure the Z0 sensor is securely connected.
CAN'T TURN ON **Z0SENSOR NOTHING**	This error appears if the Z0 sensor is not connected when entering the sensor mode. The error message is displayed for approximately two seconds, then disappears. Connection the Z0 sensor before entering the sense mode.
EMERGENCY STOP **Z0SENSOR ERROR**	This error appears if the Z0 sensor is detached when the tool is moved while in the sensor mode. The error can be cleared by switching the power off and back on again. Do not detach the Z0 sensor while in the sensor mode.

List of RML-1nstructions

$* 1 : -(2^{23}-1)—+(2^{23}-1)$

mode1

	Instruction	Format	Parameter		Range [Default]
@	Input Z1 & Z2	@ Z1, Z2	Z1	Position on Z1	-12000—0 [0]
			Z2	Position on Z2	0—+12000 [0]
H	Home	H	None		
D	Draw	D x1, y1, x2, y2, ... , xn, yn	xn, yn	Absolute coordinate	*1
M	Move	M x1, y1, x2, y2, ... , xn, yn	xn, yn	Absolute coordinate	*1
I	Relative Draw	I △x1, △y1, △x2, △y2, ... , △xn, △yn	△xn, △yn	Relative coordinate	*1
R	Relative Move	R △x1, △y1, △x2, △y2, ... , △xn, △yn	△xn, △yn	Relative coordinate	*1
V	Velocity Z-axis	V f	f	Feed rate for Z axis	0—30 [mm/sec] [2 [mm/sec]]
F	Velocity X,Y-axis	F f	f	Feed rate for X and Y axis	0—60 [mm/sec] [2 [mm/sec]]
Z	XYZ-axis Simultaneous Feed	Z x1, y1, z1, ... , xn, yn, zn	xn, yn	XY coordinate	*1
		Z x1, y1, z1, ... , xn, yn, zn	zn	Z coordinate	*1
W	Dwell	W t	t	Dwell time	0—32767 [msec] [2 [msec]]
^	Call mode2	^ [mode2] [parameter]..... [parameter] [;]			

mode2

	Instruction	Format	Parameter		Range [Default]
DF	Default	DF;	None		
IN	Initialize	IN;	None		
PA	Plot Absolute	PA x1, y1 (,x2, y2, ... , xn, yn); PA;	xn, yn	Absolute XY coordinate	*1
PD	Pen Down	PD x1, y1 (,x2, y2, ... , xn, yn); PD;	xn, yn	XY coordinate	*1
PR	Plot Relative	PR △x1, △y1 (,△x2, △y2, ... , △xn, △yn); PR;	△xn, △yn	Relative XY coordinate	*1
PU	Pen Up	PU x1, y1 (,x2, y2, ... , xn, yn); PU;	xn, yn	XY coordinate	*1
VS	Velocity select	VS s; VS;	s	Feed rate for X and Y axis	0—60 [mm/sec] [2 [mm/sec]]

mode1, mode2 common instruction

Instruction	Format	Parameter		Range [Default]
!DW Dwell	!DW t [terminator]	t	Dwell time	0—32767 [0]
!MC Motor Control	!MC n [terminator] !MC [terminator]	n	Motor ON/OFF switching	-32768—32767 [motor ON]
!NR Not Ready	!NR [terminator]	None		
!PZ Set Z1&Z2	!PZ z1 (,z2) [terminator]	z1	Z1 coordinates	-12000—0 [0]
		z2	Z2 coordinates	0—12000 [0]
!RC Revolution	!RC n [terminator]	n	Spindle motor revolution speed	0—15 [Value set by using panel keys]
!VZ Velocity Select Z-axis	!VZ s [terminator]	s	Feed rate (Z axis)	0—30 [mm/sec] [2 [mm/sec]]
!ZM Z-axis Move	!ZM z [terminator]	z	Z coordinate	-12000—0
!ZO Set Z0	!ZO z [terminator]	z	Z machine coordinate	-12000—0
!ZZ XYZ-axis Simultaneous Feed	!ZZ x1, y1, z1, ...,	xn, yn zn	XY coordinate Z coordinate	*1 *1

Device Control Instructions

The Device Control instructions determine how communication between the PNC-3200 and the computer will be handled using the RS-232C interface; and also are employed when relaying to the computer the status of the PNC-3200. Some of them can be used to format the output for RML-1 instructions.

A Device Control instruction is composed of three characters: ESC (1Bh), a ".", and an uppercase letter. There are also two types of device control instructions: one carries parameters and the other does not.

Parameters can be omitted. Semicolons, " ; " are used as separators between parameters. A semicolon without parameters means that parameters have been omitted. Device Control instructions with parameters require a terminator to indicate the conclusion of the instruction. A colon " : " is used as the terminator, and it must not be omitted.

No terminator is necessary for Device Control instructions without parameters.

Instruction	Format	Parameter	Range ([ ] is default)	Explanation
Handshake Instructions				
ESC .B Output Remaining Buffer Capacity	[ESC].B	None		Outputs the current remaining buffer capacity to the computer.
ESC .M Set Handshake Output Specifications (1)	[ESC].M<P1>;<P2>;<P3>;<P4>;<P5>;<P6>:	P1: Delay time P2: Output trigger character P3: Echo terminator P4: Output terminator P5: Output terminator P6: Output initiator	0-32767 (msec) [0 (msec)] [0 (Sets nothing)] [0 (Sets nothing)] [13 ([CR])] [0 (Sets nothing)] [0 (Sets nothing)]	Sets handshake output specifications. Note: When you specify some values to <P4> and <P5>, always set 0 to <P6>. When you specify some value to <P6>, always set 0 to <P5>.

ESC .N
Set Handshake Output Specifications (2)
	[ESC].N<P1>;<P2>;<P3>; ••••• ;<P11>:	P1: Intercharacter delay
		P2-P11
		 : Xoff character (for Xon/Xoff)
		  Immediate response character
		  (for ENQ/ACK)
			0-32767 (msec) [0 (msec)]
			[All 0 (Sets nothing)]
				Sets an intercharacter delay, and also an Xoff character for performing the Xon/Xoff handshake.

ESC .H Sets ENQ/ACK Handshake Mode1	[ESC].H<P1>;<P2>;<P3>; •••••••• ;<P12>:	P1: The number of bytes for data block P2: ENQ character P3-P12 : ACK character (only when <P2> is set)	0-15358 (byte) [80 (byte)] [0 (Sets nothing)] [All 0 (Sets nothing)]	When receiving the ENQ character set by <P2>, compares the value set by <P1> and the remaining buffer capacity, and returns the ACK character to the host computer when the remaining buffer capacity is larger. The [ESC].H with no parameter performs a dummy handshake.
ESC .I Set Xon/Xoff Handshake and ENQ/ACK Handshake Mode2	[ESC].I<P1>;<P2>;<P3> ; •••••••• ;<P12>:	P1: Limit of the remaining buffer capacity (for Xon/Xoff) The number of data block bytes (for ENQ/ACK (mode2)) P2: ENQ character (for ENQ/ACK (mode2)) 0 (for Xon/Xoff) P3-P12 : Xon character(for Xon/Xoff) ACK character (for ENQ/ACK (mode2))	0-15358 (byte) [80 (byte)] [0 (Sets nothing)] [All 0 (Sets nothing)]	Used for performing the Xon/Xoff handshake and the ENQ/ACK handshake mode 2. The [ESC].I instruction with no parameter performs a dummy handshake. In a dummy handshake, always returns the ACK character to the host computer, regardless of the remaining buffer capacity, when receiving the ENQ character.
ESC .@ Controls DTR	[ESC].@ P1;P2:	P1: Ignored P2: DTR signal control	0-255 [1]	Controls the DTR signal (No. 20 pin of RS-232C). An even number parameter (e.g. 0) always sets the DTR signal to High without performing the hardware handshake. An odd number parameter (e.g. 1) performs the hardware handshake and controls the DTR signal according to the remaining buffer capacity.

Instruction	Format	Parameter	Range ([ ] is default)	Explanation
Status Instructions				
ESC .O Outputs the Status of Buffer, Pause	[ESC].O	None		Outputs the status codes of PNC-3200 shown in the table below. | Code	Meaning
---	---
0	Data remaining in buffer.
8	Buffer empty.
16	Data remaining in buffer. PNC-3200 being paused (Pause On being displayed).
24	Buffer empty. PNC-3200 being paused (Pause On being displayed).	
ESC .E Output RS-232C Error Code	[ESC].E	None		Outputs an error code related to RS-232C interface (see the table below), and clears the error simultaneously. At the same time, the error being displayed is canceled. | Error code	Possible cause and action
---	---
0	No I/O errors
10	Cause: after execution of an output command, other output instructions are sent before the output was not completed. Action: let the computer to read the PNC-3200 output by the output instruction and then send another output instruction.
11	Cause: an error occurs in a device control instruction. Action: correct your program.
13	Cause: parameters are overflowing. Action: correct your program.
14	Cause: the number of the parameters set is more than specified or a colon ':' was not used to terminate. Action: correct your program.
15	Cause: framing error, parity error or over-run error at the time of data receipt. Action: match the communication protocols of both computer and PNC-3200 (baud rate, data bit length, stop bit length).
16	Cause: the I/O buffer overflows. Action: This error does not occur when hardware handshake is performed, but may occur when software handshake is performed. If this error occurs, check the remaining buffer capacity of the PNC-3200 and send less data than the remaining buffer capacity.	
ESC .L Output I/O buffer size	[ESC].L	None		PNC-3200 outputs the size of the I/O buffer to the computer when receiving this instruction. It usually outputs 1024 (bytes).
Abort Instructions				
ESC .J Abort Device Control Instruction	[ESC].J	None		Aborts both the currently executed device control instruction and output.
ESC .K Abort RML-1 Instruction	[ESC].K	None		Continues to execute the RML-1 instruction in operation, aborts other incoming RML-1 instructions and clears the data buffer.
ESC .R Initialize Device Control Instruction	[ESC].R	None		Initializes all settings established by the device control instructions. Execution of [ESC].R brings the same states as the following device control instructions are executed. [ESC].J, [ESC].M:, [ESC].N:, [ESC].H:, [ESC].I: and [ESC].@:

Display Menus Flowchart

POWER ON

Switch on the power while holding down the [MENU] key

```
PNC-3200
Roland DG Corp.
```

```
English      ﾆﾎﾝｺﾞ
```

Use [▶] or [◀] to select the language used for the display, then press [ENTER / PAUSE] *FEED HOLD/CYCLE START*

```
Hit "ENTER"
RML-1      NC-CODE
```

Use [▶] or [◀] to select the "RML-1", then press [ENTER / PAUSE] *FEED HOLD/CYCLE START*

```
*X  12000   Y  10000
 Z -12000     8000 RPM
```

[MENU] *PAGE DOWN*

[MENU] *PAGE DOWN*

JOG/SPINDLE CONTROL

Use ● JOG to move the "*" to "X" or "Y," then press [ENTER / PAUSE] *FEED HOLD/CYCLE START*

```
HOME POS  SET"ENTER"
  X< 12000> Y< 10000>
```

JOG/SPINDLE CONTROL

Use ● JOG to move the "*" to "Z," then press [ENTER / PAUSE] *FEED HOLD/CYCLE START*

```
Z1 Z0 Z2  SET"ENTER"
    Z0 <-12000>
```

Use [Z1] *SPINDLE* , [Z0] *DISPLAY* or [Z2] *PAGE UP* to move the blinking cursor.

JOG/SPINDLE CONTROL

Use ● JOG to move the "*" to "??00RPM," then press [ENTER / PAUSE] *FEED HOLD/CYCLE START*

```
RPM  SET"ENTER"
   <8000 RPM>
```

[MENU] *PAGE DOWN*

```
XY-SPEED    Z-SPEED
<60 mm/s> <30 mm/s>
```

[MENU] *PAGE DOWN*

Use [▶] or [▼] to move the blinking cursor to "OTHERS," then press [ENTER / PAUSE] *FEED HOLD/CYCLE START*

```
BUFFER-CLEAR  REPEAT
SENSOR OFF    OTHERS
```

```
REVOLUTION OVER_AREA
<ON>      <CONTINUE>
```

[MENU] *PAGE DOWN*

```
MOVE_SPEED Z0_MEMORY
<60 mm/sec>    <OFF>
```

[MENU] *PAGE DOWN*

```
SENSE_HEIGHT  SMOOTH
< 8.00 mm>    <ON>
```

[MENU] *PAGE DOWN*

[MENU] *PAGE DOWN*

```
REVOLUTION TIME
   0 hours
```

For I/O, select "PARALLEL" then press [MENU] *PAGE DOWN*

```
COMMAND      I/O
<AUTO>     <AUTO>
```

For I/O, select "SERIAL" or "AUTO" then press [MENU] *PAGE DOWN*

```
STOP  DATA  PARITY
<1>   <8>   <NONE>
```

[MENU] *PAGE DOWN*

[MENU] *PAGE DOWN*

```
BAUDRATE HANDSHAKE
<9600>   <HARDWIRE>
```

Menu Flowchart When Paused

**Press the [ENTER/PAUSE] key
while cutting is in progress.**

▼

```
    Pause On
CONTINUE      STOP
```

↓ MENU
   PAGE DOWN

```
XY-SPEED    Z-SPEED
<60 mm/s> <30 mm/s>
```
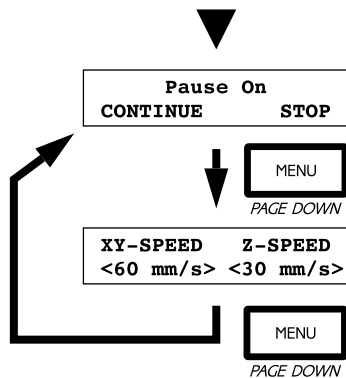
MENU
PAGE DOWN

Flowchart from the Emergency-stop Menu

**Emergency stop due to excessive load
on the spindle motor during cutting**

▼

```
       Retry?
CONT          STOP
```

Use [▶] or [◀]

to select "CONT" or "STOP", then press [ENTER / PAUSE]
FEED HOLD/CYCLE START
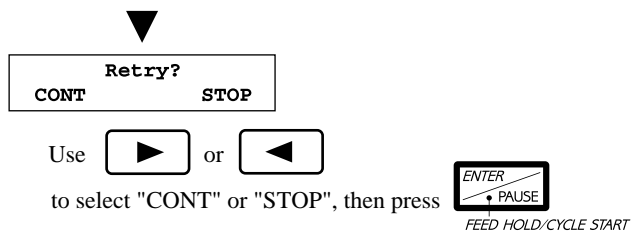
* Resuming operation is possible, but not recommended. Cutting precision after resuming operation is not guaranteed. When operation is resumed, the machine coordinates for the X, Y, and Z axes are detected again, and operation starts from the portion where the emergency stop occurred.

Position where cutting resumes

Position where cutting stopped

Roland