PICZA

3D LASER SCANNER LPX-60

⊟Roland

LPX-60
User's Manual

Thank you very much for purchasing this product.

➢ 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.

➢ Roland DG Corp. assumes no responsibility for any direct or indirect loss or damage which may occur through use of this product, regardless of any failure to perform on the part of this product.

➢ Roland DG Corp. assumes no responsibility for any direct or indirect loss or damage which may occur with respect to any article made using this product.

Roland DG Corporation

Contents

Contents

⚠ To Ensure Safe Use

Improper handling or operation of this machine may result in injury or damage to property. Points which must be observed to prevent such injury or damage are described as follows.

About ⚠WARNING and ⚠CAUTION Notices

⚠WARNING	Used for instructions intended to alert the user to the risk of death or severe injury should the unit be used improperly.
⚠CAUTION	Used for instructions intended to alert the user to the risk of injury or material damage should the unit be used improperly. * Material damage refers to damage or other adverse effects caused with respect to the home and all its furnishings, as well to domestic animals or pets.

About the Symbols

⚠	The △ symbol alerts the user to important instructions or warnings. The specific meaning of the symbol is determined by the design contained within the triangle. The symbol at left means "danger of electrocution."
🚫	The ◯ symbol alerts the user to items that must never be carried out (are forbidden). The specific thing that must not be done is indicated by the design contained within the circle. The symbol at left means the unit must never be disassembled.
⬤	The ● symbol alerts the user to things that must be carried out. The specific thing that must be done is indicated by the design contained within the circle. The symbol at left means the power-cord plug must be unplugged from the outlet.

⚠ Incorrect operation may cause injury

⚠WARNING

Do not disassemble, repair, or modify.
Doing so may lead to fire or abnormal operation resulting in injury.

Never allow children near the machine.
The machine includes locations and components that pose a danger to children, and accidental injury may occur.

⚠ Incorrect operation may damage the scan object

⚠CAUTION

Securely fasten the object to be scanned to the table so that it does not slip or topple over.
The table rotates during scanning. Tipover or contact by the scan object may cause damage. Scan-object damage is not covered by warranty.

Never try to scan an object whose height is 304.8 mm (12 in.) or more, or that protrudes beyond the table.
The object may strike the interior of the machine, causing breakdown or damage. The scan object may also be damaged. Scan-object damage is not covered by warranty.

⚠ This machine weighs approximately 40 kg (88 lb.)

⚠CAUTION

Lifting and carrying are operations that must be carried out by two or more persons, by grasping the bottom of the machine.
Failure to do so may result in falling of the unit, leading to injury.

Install in a location that is level and stable.
Installation in an unsuitable location may cause an accident, including a fall or tipover.

⚠ External emission of laser light may occur

⚠CAUTION

Do not use if the housing or window area is cracked or deformed.
In such cases, there is danger of external emission of Class 3R laser light. Staring at externally emitted laser light may cause eye injury.

⚠ Important Cautions Regarding Laser Light

This machine uses a laser beam to scan objects, but dangerous laser radiation is not emitted outside the machine. It is safe to view the laser light through the window.
However, this may not be the case if the machine is disassembled or if its cover or safety devices are broken or disabled. Please observe the cautionary notes in this documentation and never attempt to use this machine if the machine is in an abnormal state.
Direct contact with the laser beam will not cause burns or fire due to incorrect use or the like. The natural blink reflex protects the eye in the event that laser light from the machine directly enters the eye, but staring directly into the laser beam may result in eye injury.

⚠ Danger of electrical short, shock, electrocution, or fire

⚠WARNING

Do not use with any electrical power supply that does not meet the ratings displayed on the AC adapter.
Use with any other power supply may lead to fire or electrocution.

Do not use with any power supply other than the dedicated AC adapter.
Use with any other power supply may lead to fire or electrocution.

Never use any power cord other than the power cord included with the machine.
Doing so may cause fire.

Do not use with a damaged AC adapter, power cord or plug, or with a loose electrical outlet.
Doing so may lead to fire, electrical shock, or electrocution.

Never damage the power cord or pull it with force.
Doing so may tear the cord's insulation, causing an electrical short and resulting in electrical shock, electrocution, or fire.

Never place any object on the power cord, bend the power cord using excessive force, or allow the power cord to become deformed.
If it becomes deformed, the deformed location may grow hot and cause fire.

When unplugging the electrical power cord from the power outlet, grasp the plug, not the cord.
Unplugging by pulling the cord may damage it, leading to fire, electrical shock, or electrocution.

When not in use for several hours, unplug the power-cord plug from the electrical outlet.
Failure to do so may result in danger of electrical shock, electrocution or fire due to deterioration of electrical insulation.

Never operate the machine or insert or remove its power plug with wet hands.
Doing so may result in electrical shock or electrocution.

In the event of an abnormal state (such as smoke or sparks, odor or burning or unusual noise), immediately unplug the power cord.
Failure to do so may result in fire, electrical shock, or electrocution. Immediately disconnect the power cord and contact your authorized Roland DG Corp. dealer.

Never insert metal objects, flammable objects, or any other foreign object into interior areas other than the top of the table. Also, do not place water or other liquids on any area, including the table.
Doing so may cause an electrical short, resulting in shock or electrocution, or the inserted object may catch fire.

⚠ About the Labels Affixed to the Unit

This machine bears caution labels. These are intended to ensure the safety of the operator. Never remove the labels or allow them to become obscured. Also, be sure to observe the stated cautions during use.

For service engineer / サービスマンの方へ

CAUTION - CLASS 3R LASER RADIATION
WHEN OPEN
AVOID DIRECT EYE EXPOSURE
注意 - ここを開くとクラス3Rのレーザ放射が出る
目への直接被ばくを避けること

Left   Front   Right

CLASS 1 LASER PRODUCT
LASERPRODUKT KLASSE 1
PRODUIT LASER CLASSE 1
PRODOTTO LASER CLASSE 1
PRODUCTO LASER CLASE 1
품목 1 레이저 제품
クラス1レーザ製品

Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No.50, dated July 26, 2001

In addition to these symbols, the symbol shown below is also used.

Point : Indicates a handy tip or advice regarding use.

Important Notes on Handling and Use

This machine is a precision device. To ensure the full performance of this machine, be sure to observe the following important points. Failure to observe these may not only result in loss of performance, but may also cause malfunction or breakdown.

Main Unit

This Machine Is a Precision Device

➢ Handle carefully, and never subject the machine to impact or excessive force.
➢ Never touch any internal component except the table. Doing so may make scanning impossible.

Install in a Suitable Location

➢ Install in a location having the specified temperature and relative humidity.
➢ Install in a stable location offering good operating conditions.

Never Touch the Machine During Scanning

➢ Never subject the machine to impact during a scanning operation. Doing so may cause scanning noise.
➢ Except in an emergency, never open the machine's door during a scanning operation. Doing so switches off the power, and scanning operation cannot be resumed.

Important Notes on Connecting the Cables

➢ Connect the AC adapter, power cord, and USB cable securely so that they do not come loose or experience faulty connection during use.
➢ Be sure to use the included USB cable.
➢ Never use a USB hub or the like.

About the Documentation

This machine comes with the following documentation.

User's Manual (this document)

Read this first. It contains important notes and cautions on usage, as well describing scanning methods, what to do in the event of a problem, and other information.

Dr.PICZA3 Online Help
3D Editor Online Help

You view this documentation on your computer screen. Installing the program enables you to view the documentation.
☞ See "2-4 Installing and Setting Up the Software."
It provides detailed descriptions of the commands you use for each of the programs.

You can use either of two methods to view the documentation.

• From the [Start] Menu in Windows

From the [Start] menu, choose [All programs (or Programs)], then [Roland Dr.PICZA3 (Roland 3D Editor)], then [Dr.PICZA3 (3D Editor) Help].

• Clicking the Help Menu in the Program

From the [Help] menu, click [Contents].

1. Getting Started

1-1 What Is the LPX-60?

Features

The LPX-60 is a three-dimensional (3D) scanner that uses a noncontacting laser method to scan the shape of solid objects.

Noncontacting Laser System for Fast, Dependable Scanning

You can perform scanning without contact with the scan object, using a laser beam. This enables high-speed scanning without the worry of damage to the object.

Support for Two Scanning Modes

Using the included Dr. PICZA3 program lets you perform scanning in either of two modes: plane scan or rotary scan. You can choose the scanning mode that matches the shape of the scan object. By combining the two modes, you can even scan objects with complex shapes.

A Wide Array of Scanning Functions

In addition to the two basic scanning modes, line-segment and point scanning functions are also supported. By using Dr. PICZA3, you can extract the data for just the characteristic line segments (such as contour lines) and points of an object. Using this as auxiliary data for three-dimensional modeling operations using CAD or computer-graphics programs makes it possible to reduce the time and effort of modeling operations.

Scanning System

The LPX-60 scans objects using laser light. It emits a spot beam onto the scan object and detects reflected light from the object with sensors.

It performs scanning as it rotates the scan object and moves the laser beam from bottom to top.

1-2 Names and Functions

Door

When performing scanning, be sure to close this. The power cannot be switched on while the door is open. Opening the door while the power is on switches off the machine. Be sure to use the handle when opening or closing the door.

Handle

Table

This is the base where you place objects to be scanned. It rotates during scanning. Never touch any internal area other than the table.

Interlock switch

This is one of the safety devices. Never insert any objects here. Doing so may keep the door open and prevent the safety devices from working properly.

Movement lights

These are arranged in a ring around the power button. They flash when the machine is performing some operation.

☞ See the next page "About the Indicator Lights."

Power button

This switches the power on and off. To switch on the power, you press this button. To switch off the power, you hold it down for one second or longer. The color of the light indicates the status of the machine.

☞ See the next page "About the Indicator Lights."

Rear

USB connector

This connects the included USB cable.

AC adapter jack

This connects the AC adapter.

About the Indicator Lights

The lighted state of the power button and the movement lights tells you the status of the LPX-60.

Indicator lights		The status of the LPX-60
Power button	Movement lights	
Dark	Dark	The power is off.
Lit (blue)	Flashing two at a time	Initialization is in progress.
Lit (blue)	Dark	Scanning is possible.
Lit (blue)	Flashing one at a time	Scanning is in progress.
Lit (blue and red) (*) Lit or flashing (red)	Dark	An error has occurred. ☞ See "5-1 What to Do If...."

(*)Illumination pattern (blue and red)

Red

Blue

Status Indicated by the Movement Lights

These light up blue and move clockwise two at a time during initialization at powerup, and one at a time during scanning.

Flashing two at a time

Move clockwise

Initialization

Flashing one at a time

Move clockwise

Scanning

🖋 **Point**

When you open or close the door after connecting the power cord to the machine, the power button and movement lights flash momentarily, but this is normal and does not indicate a problem.

2. Preparing the Machine

This section describes what to do when you first open the packing, including how to connect the machine to a computer and install the programs and the like.

2-1 Checking Accessaries

The following items are packed with the machine. Make sure they are all present and accounted for.

AC adaptor: 1   Power cord: 1   Clay: 1

CD-ROM: 1   User's manual: 1   Roland LPX EZ Studio : 1

AC adaptor holder: 1   USB cable: 1   Cable clamps: 2

2-2 Installing

Deciding On an Installation Site

Install in a stable location offering good operating conditions. An unsuitable location can cause accident, faulty operation, or breakdown.

⚠ **CAUTION**   **Install in a location that is level and stable.**
Installation in an unsuitable location may cause an accident, including a fall or tipover.

⚠ **CAUTION**   **Lifting and carrying are operations that must be carried out by two or more persons.**
Failure to do so may result in falling of the unit, leading to injury.

Unsuitable Installation Sites

➢ Locations with excessive humidity or dust
➢ Locations subject to high temperature
➢ Locations subject to shaking or vibration
➢ Locations exposed to considerable electrical or magnetic noise, or other forms of electromagnetic energy
➢ Locations with poor heat radiation

Power cord

Height 619 mm (24.4 in.)

382 mm (15 in.)

Leave enough space to the right side and the rear of the machine to allow the power cord to be reached by hand at all times.

500 mm (19.7 in.)

Top view

Removing the Packing Materials

Remove the protective material, head retainer, and other packing materials.

➢ Be sure to use the handle when opening the door.
➢ Never touch or needlessly try to move any of the internal components. Doing so may result in malfunction.
➢ The packing material is required when moving the machine. Do not discard it.
☞ See "5-2 When Moving the Machine."

■ Front

Remove the protective material from the front of the machine and peel off the tape holding the door in place.

This is a portion of the protective material. Do not peel it off.

■ Interior

Open the door, and with your fingers, unscrew the screws securing the table and head retainer in place to remove them.

Head retainer

X screws
After removing, store them at the specified locations.
☞ See the next page.

Y screws
These are used to attach the head retainer and the included AC adapter holder at the back of the machine.
☞ See the next page.
☞ See "2-3 Connecting the Cables."

■ Storing the Head Retainer and Screws

You can store the head retainer and the screws (X and Y) at locations designated for each.

Store the X screws that secured the table in place at the location the figure below.

Use two Y screws to attach the head retainer, and two more to attach the AC adapter holder. Store the remaining two screws by screwing them into the screw holes shown in the figure.
☞ See "2-3 Connecting the Cables."

Store the head retainer by attaching it to the back of the machine as shown in the figure.

The back of the machine

2-3 Connecting the Cables

When you connect the cables to the machine, use the included cable clamps and AC adapter holder.

Attaching the Cable Clamps and the AC Adapter Holder

Attach the cable clamps and the AC adapter holder to the back of the machine.

AC adaptor holder
Use two Y screws.

Cable clamps
Peel off the double-sided tape and attach.

Y screws

Connecting the Cables

⚠**WARNING** **Do not use with any electrical power supply that does not meet the ratings displayed on the AC adapter.**
Use with any other power supply may lead to fire or electrocution.

⚠**WARNING** **Never use any AC adapter and power cord other than the AC adapter and power cord included with the machine.**
Doing so may lead to fire, electrical shock, or electrocution.

⚠**WARNING** **Never damage the power cord or pull it with force.**
Doing so may tear the cord's insulation, causing an electrical short and resulting in electrical shock, electrocution, or fire.

⚠**WARNING** **Never place any object on the power cord, bend the power cord using excessive force, or allow the power cord to become deformed.**
If it becomes deformed, the deformed location may grow hot and cause fire.

⚠**WARNING** **Do not use with a damaged AC adapter, power cord or plug, or with a loose electrical outlet.**
Doing so may lead to fire, electrical shock, or electrocution.

Secure the cable for the AC adapter and the included USB cable in place using the cable clamps.
Place the AC adapter on the AC adapter holder.

AC adaptor

USB cable

Cable clamp

Orient the AC adapter as shown in the figure.

The "Roland" logo is visible.

Power cord

AC adaptor holder

Electrical outlet

DO NOT connect the USB cable at this point.
You connect the USB cable only when instructed to in the procedures for installing the driver. Starting driver installation with the cable connected may cause installation to fail and make the machine unusable.
Make the connection according to the procedures in "2-4 Installing and Setting Up the Software."

USB port

Computer

Point

When you connect the power cord to the machine, the power button and movement lights flash momentarily, but this is normal and does not indicate a problem.

2-4 Installing and Setting Up the Software

Here you connect the machine to your computer and install and set up the included software on the computer, enabling you to perform scanning with the machine.

Installing the Driver

Be sure to follow this procedure to install the driver. Failure to do so may make installation impossible.
☞ Go to "5-1 What to Do If ...," see "What to Do If Installation Is Impossible."

Procedure

■ Windows XP

1 Before you start installation, make sure the machine and your computer are <u>not connected by the USB cable</u>.

2 Start Windows and log on as "Administrator."

3 Insert the Roland Software Package CD-ROM into the CD-ROM drive.

The window shown in the figure appears automatically.

4 Switch on the machine.

Wait a short while until the lights stop flashing. The flashing continues for about one minute.

From this point on, keep the door closed until installation ends. Failure to do so switches off the power, which may prevent installation from completing correctly.

Press the power button.

These lights flash clockwise two at a time.

5 Connect the included USB cable.

The [Found New Hardware Wizard] dialog box appears.

USB connector   USB cable

The back of the machine

Computer

USB port

6 When the window shown in the figure appears, select [No, not this time], then click [Next].

If the window in step 7 appears instead of this window, continue with installation and setup.

7 Select [Install the software automatically (Recommended)], then click [Next].

8 When this dialog box appears, click [Continue Anyway].

Installation starts automatically.

9 Click [Finish].

The [Welcome to the Found New Hardware Wizard] dialog box appears.

10 Carry out steps 6 through 9 again.

This completes the installation of the driver.

Windows 2000

1 Before you start installation, make sure the machine and your computer are not connected by the USB cable.

2 Start Windows and log on as "Administrator."

3 Insert the Roland Software Package CD-ROM into the CD-ROM drive.

The window shown in the figure appears automatically.

4 Switch on the machine.

Wait a short while until the lights stop flashing. The flashing continues for about one minute.

From this point on, keep the door closed until installation ends. Failure to do so switches off the power, which may prevent installation from completing correctly.

Press the power button.

These lights flash clockwise two at a time.

5 Connect the included USB cable.

The [Found New Hardware Wizard] dialog box appears.

USB connector   USB cable

The back of the machine

Computer

USB port

6 Click [Next].

7 Select [Search for a suitable driver for my device (recommended)], then click [Next].

8 Select the [CD-ROM drives] check box, then click [Next].

9 Click [Next].
Installation starts automatically.

10 Click [Finish].
The [Welcome to the Found New Hardware Wizard] dialog box appears.

11 Carry out steps 6 through 10 again.

This completes the installation of the driver.

■ Windows Me/98 SE

1 Before you start installation, make sure the machine and your computer are not connected by the USB cable.

2 Start Windows.

3 Insert the Roland Software Package CD-ROM into the CD-ROM drive.

The window shown in the figure appears automatically.

4 Switch on the machine.

Wait a short while until the lights stop flashing. The flashing continues for about one minute.

From this point on, keep the door closed until installation ends. Failure to do so switches off the power, which may prevent installation from completing correctly.

Press the power button.

These lights flash clockwise two at a time.

5 Connect the included USB cable.

The [Add New Hardware Wizard] dialog box appears.

USB connector   USB cable

The back of the machine

Computer

USB port

6 • Windows Me

Choose [Automatic search for a better driver (Recommended)], and click [Next].

• Windows 98 SE

Click [Next].

Windows Me

Windows 98 SE

7
• Windows Me
Installation of the driver starts automatically. Go to step 10.

• Windows 98 SE
Select [Search for the best driver for your device. (Recommended)], and click [Next].
Go to step 8.

8 Choose the folder on the Roland Software Package CD-ROM to search the driver.

3 Double-click on your CD-ROM drive.

4 Select [\Drivers\Lpx-60].

1 Select [Specify a location].

2 Click [Browse].

5 Click [OK].

9 Execute installation of the driver.

Click [Next].

Clicking [Next] starts installing.

10 Click [Finish].
Installation is executed automatically.

This completes the installation of the driver.

Installing the Programs

Install the following programs.

Dr.PICZA3   This program enables you to perform scanning using the machine.
3D Editor   This program enables you to edit scanned 3D data.

Procedure

1   Make sure the window shown in the figure is displayed.

2   Follow the on-screen instructions to start installation and setup.

Clicking the button starts installing.

Select [LPX-60].

Make sure that all the check boxes be selected.

3   When the window shown in the figure appears, click "Next." Thereafter, follow the on-screen instructions.

When all installation and setup finishes, the final window appears.

4   Click [Close].

This completes the installation of the included software.

Making the Settings for Using Dr.PICZA3

You use the included Dr. PICZA3 program to make the settings that let you perform scanning with the machine.

Procedure

1 Start Dr.PICZA3.
From the [Start] menu, choose [All programs (or Programs)], then [Roland Dr.PICZA3], then [Dr.PICZA3].

2 Go to the [File] menu and click [Preferences].

3 Make the setting for the communication port and the unit of measurement to use with Dr. PICZA3.

Click [OK] after you complete making the setting.

Choose the number of the port labeled "Roland LPX-60 USB Port."

Set [Unit] to either [mm] or [inch].

This completes all the preparations you need to make to perform scanning using the machine.

3. Creating 3D Data

This chapter describes how to create 3D data using the machine and the included Dr. PICZA3 program.

3-1 Task Flow

This machine can scan three-dimensional shapes using the included Dr. PICZA3 program. To make 3D data obtained by scanning available for use by other programs, you need to convert and save the data using Dr. PICZA3.

This section describes the sequence of operations from getting ready to scan through to saving the 3D data.

1 Prepare the object to be scanned and mount it on the machine.

Check whether the object you want to scan (we'll call this the "scan object") is suitable for scanning, and if so, mount it on the machine.

☞ See "3-2 Mounting the Scan Object."

2 Perform scanning.

Use Dr. PICZA3 to carry out scanning (basic scanning).

☞ See "3-3 Performing Scanning."

3 Finish the data.

After the basic scanning, you finish the data to the appropriate degree by performing additional scanning and creating polygon meshes as required.

☞ See "3-4 Finishing the Data."

4 Save the data.

Save the finished data in a file format compatible with the program you're using.

☞ See "3-5 Saving and Exporting Data."

> **Point**
>
> Using the included 3D Editor program lets you import directly and edit data scanned with Dr. PICZA3.
>
> ☞ See "4. Editing Scanning Results -- Using 3D Editor."

3-2 Mounting the Scan Object

First, you prepare the object to be scanned. After making sure the object is one that can be scanned, you mount the object on the machine.

Preparing the Scan Object

This machine is not able to scan every possible kind of object. Some objects may be impossible to scan because of their composition or shape. Refer to the following and make sure the object to be scanned is one that can be scanned on this machine.

◼ Object Size

⚠**CAUTION**   **Never try to scan an object that protrudes beyond the table or whose size exceeds the scanning area.**
Doing so may cause the machine to malfunction or damage the object to be scanned. Scan-object damage is not covered by warranty.

An object that protrudes beyond the table or whose height is too high cannot be scanned.

Not OK

203.2 mm (8 in.)

304.8 mm (12 in.)

Table

In such cases, consider separating the object into pieces whose individual sizes do not protrude beyond the area described above.

◼ Object Shape

Areas where the laser beam strikes at a shallow angle cannot be scanned.

Not OK

20 degrees or less

■ Object Material

An object that has a comparatively smooth surface is suitable for scanning. Fabrics and objects that have a rough nap cannot be scanned.

Some objects may be difficult to scan because of the type of material it is made of, or because of its color or other qualities.

OK	Objects that do not pass light		**OK**	Brightly colored objects (White, yellow, red, etc.)		**OK**	Objects of a nonglossy material (plaster, wood, or modeling clay etc.)
Not OK	Clear or transparent objects		**Not OK**	Dark-colored objects (black, blue, etc.)		**Not OK**	Glossy and highly reflective objects (metals, mirrors, etc.)

In such cases, applying a surface coat (primer coat) to the object may make scanning possible.
Note: Avoid highly reflective objects because of danger of eye injury.

■ Items That May Not Be Copied

Unauthorized reproduction of a copyrighted item for any purpose other than personal use may be a violation of copyright. Roland DG Corp. will not be responsible for any violation of third-party copyright by any article made through use of this product.

Mounting the Scan Object

Choose the object to be scanned, then mount the scan object.

⚠**CAUTION**   **Securely fasten the object to be scanned to the table so that it does not slip or topple over.**
The table rotates during scanning. Tipover or contact by the scan object may cause damage. Scan-object damage is not covered by warranty.

Mount in the center of the table.

Secure the bottom surface in place with clay or the like.

Table

Table centerline

The table rotates during scanning. Using double-sided tape, clay, or the like, fasten the object in place securely so that it will not fall over or slip. Any slipping of the object makes correct scanning impossible.

When the object to be scanned has areas with cavities or voids, mounting the object at an orientation that allows the laser beam to pass through the cavities, as shown in the figure, makes scanning easier.

Scan object

Orientation of the laser beam

Cavity

Table

🖊 Point

Effective Sensor Area

The figure at right shows the area in which the machine's sensors detect the reflection of the laser beam, allowing the object to be scanned.
The surfaces that reflect laser light as the table rotates and the object passes through this area can be scanned.
When scanning an object that is considerably uneven, or that is crank-shaped, you may need to take this effective sensor area into account.

If the object is mounted at the edge of the table, it may not be possible to scan the entire object correctly.
In the case of the apple shown at right, the area enclosed by the shaded portion is not scanned.

Orientation of the laser beam

203.2 mm

304.8 mm

Effective Sensor Area

Table

3 mm

10 mm

Not OK

Outside the effective sensor area

Not reached by the laser beam

3-3 Performing Scanning

Once you have mounted the object of the machine, you can now perform scanning.
Before you start scanning, make sure the door is closed and turn on the machine.

Basic Scanning

This is the scanning that you perform first after mounting the scan object. The scanning data obtained by executing basic scanning makes possible a wide variety of operations.

Procedure

1 Start Dr.PICZA3.

From the [Start] menu, choose [All programs (or Programs)], then [Roland Dr.PICZA3], then [Dr.PICZA3].

2 Click the [SCAN] button.

The [Scan] dialog box appears.

3 Choose the scanning mode that matches the shape of the scan object.

The [Settings for Scanning] dialog box appears.

- Object whose shape is close to a sphere or cylinder
- Object with little unevenness
  Choose rotary scanning.

- Other object
  Choose plane scanning.

You normally choose plane scanning, which has little restrictions as to shape.

Click one of these buttons.

4 Click the [Preview] button.

The preview starts.
From this point on, never open the door until scanning ends. Doing so switches off the power. Scanning cannot be resumed when you then switch on the power again.

The general shape of the object to be scanned is displayed.

The height of the scanning area is setting automatically at this time.

Click

Preview in progress

After preview has finished

5 While viewing the preview, make the following settings, then start scanning.

Scanning pitch
Using a fine setting can reproduce details more accurately, but the amount of memory required increases, and scanning takes longer time.

Scanning area
Specify the minimum area that allows the entire object to be scanned, thereby speeding up scanning time.
Note: When [Set for Each Surface] is selected, you can set the scanning area and scanning pitch individually for each surface.

(The following settings are only for plane scanning.)

The number of scanning surfaces
You can specify from one to as many as six surfaces. It's a good idea to decide on the number of surfaces to match the shape of the object.

Scanning angle
Specify the incident angle of the laser for each surface. It may be a good idea to set the preview to Top View. When the object to be scanned has areas with cavities or voids, specify the angle that allows the laser beam to pass through the cavities.

Settings for Scanning dialog box (Plane Scan)

This sets the number of scanning surfaces (plane scan only).

This changes the orientation and perspective for the preview.
These let you switch between Top View and Front, and expand or reduce the view.

This sets the scanning pitch.
During rotary scan, these make the settings for "Height" and "Circumference."

This changes to the surface whose scanning angle you want to set (plane scan only).

Selecting this check box enables you to set the scanning area and scanning pitch individually for each surface.

This sets the scanning area.
During rotary scan, these set the "Height Direction" and "Circumferential" pitch values.

This sets the scanning angle (plane scan only).

This displays the amount of memory that scanning requires.

Clicking the button displays the estimated scanning time.

Clicking this button starts scanning.

6 When scanning ends, the results of scanning appear.
☞ Go to "3-3 Performing Scanning," see "Checking the Scanning Results."

Point

Scanning Pitch and Scanning Area

The methods for making the settings are different for plane scanning and rotary scanning.

Required Memory

[Required Memory] at the lower right of the [Settings for Scanning] dialog box is automatically updated when you change the scanning area or scanning pitch. When this amount of memory exceeds the amount of free memory on the computer, performing scanning may result in extremely slow processing by the computer. We recommend making sure enough memory is installed in the computer when you are performing scans that use up large amounts of memory.

For reference:
  Maximum memory use
    (amount of memory used when scanning at maximum scanning area and minimum scanning pitch)
    Plane scan: 685 Mbyte (per surface)
    Rotary scan: 1214 Mbyte

Checking the Scanning Results

You can examine the results of scanning while changing the view method and perspective. The Scan List displays a list of scanning data. For detailed information about this window, see the online help for Dr. PICZA3.

These move and rotate the perspective, and change the amount of zoom.

This changes the view method.

The three-dimensional item that has been scanned is called the "object."

Drag the object to orient the area you want to examine to the front.

Dr.PICZA3 Window

This switches between showing and hiding the group and the object.

This indicates the name of a group that contains a number of objects.

This indicates the name of the object.

Scan list

3-4 Finishing the Data

You take the data from basic scanning and modify it to produce finished data that has the form you want.

Selecting and Scanning a Specific Area

After the basic scanning, you can select specific areas and performing additional scanning (rescanning). The available types of rescanning are as follows.

◼ Rescan

You use rescanning when you want to increase the number of measuring points (scan points) and enhance the degree of completion of the 3D data.

Perform coarse scanning of the entire object.

Rescan required areas in detail.

You can reproduce detailed surface patterns.

Even when holes are present...

...you rescan just these areas.

The holes are sealed, yielding the same shape as the original!

◼ Line Scan/Point Scan

You use line scanning and point scanning when you want line-segment or point data to serve as supplemental data for three-dimensional modeling operations using CAD or computer-graphics programs.

Perform line scanning with Dr. PICZA3...

...and re-create the curved surfaces with the 3D CAD program!

Perform point scanning with Dr. PICZA3...

...and re-create the curves with the 3D CAD program!

⚲ Point

Scanning Modes for Rescanning

You can choose the same scanning modes for rescanning and line scanning as you can for basic scanning.

- Scanning using plane scanning --   Plane rescan and plane line scan
- Scanning using rotary scanning --   Rotary rescan and rotary line scan

What follows is a general guide for using these selectively.

Rescan
• When you're rescanning areas that could not be scanned
Normally you choose plane rescanning. When the scan object has a complex shape, it may be a good idea to use plane rescanning to perform overlapping scanning, changing the angle between each scanning pass.
Note, however, that rescanning is not effective in cases where the laser beam cannot reach the area or the reflected laser beam does not reach the sensor from any angle.

• When you're rescanning a specific area at a fine scanning pitch
It may be a good idea to perform rescanning in the same mode you used for the basic scanning.
When you want to perform fine-detail scanning of the surface pattern of a scan object whose shape is cylindrical or close to cylindrical, you first perform coarse rotary scanning, then choose rotary rescanning.

Line Scan
Normally you choose the same mode you used for basic scanning. However, when you want to scan line segments that wrap around to the back of the object, you choose rotary line scanning. Plane line scanning can scan only line segments on the surface visible in the window.

The entire circumference can be scanned.

Only the line segment shown by the thick line can be scanned.

Rotary line scan   Plane line scan

To Use the Data with a 3D CAD Program or the Like

To use line-segment and point data as supplementary data for a 3D CAD program, you may need to export the data and convert the file.

☞ See "3-5 Saving and Exporting Data."

Procedure

You perform rescanning using the following procedure. The windows shown are those for plane rescanning.

1 First, scan the entire object.

Choose a scanning mode according to the shape of the scan object.
From this point on, never open the door until rescanning ends. Doing so switches off the power. Scanning cannot be resumed when you then switch on the power again.

> ### Point
>
> **Shortening the Scanning Time by Performing Basic Scanning at a Coarse Pitch**
>
> You can speed up operations during basic scanning by scanning at a coarse pitch. For line scanning and point scanning in particular, it is a good idea to scan at the minimum pitch necessary to get the general shape.

2 When the scan of the entire object finished, click the [▦] button to choose the method you want to use for rescanning.

3 Drag to specify the rescanning area.

You can specify more than one rescanning area.

> ### Point
>
> **Shortcut Keys for Shifting the Perspective**
>
> • To Rotate the Object
>   Hold down the SPACE key and drag
>
> • To Move the Object
>   Hold down the Ctrl key and drag
>
> • To expand and reduce the Object
>   Hold down the shift key and drag
>
> In addition to these shortcuts, you can also shift the perspective using the arrow keys.
>
> **Delineating Areas That Need Rescanning**
> You can remove improper surfaces that shouldn't exist and clearly delineate areas that need to be rescanned.
> Before you specify a rescanning area, clicking the [▦] button displays the "Delete Abnormal Faces" dialog box. Running this command deletes, for example, the abnormal surface produced on the handle of the cup shown in the figure at right.
>
> For detailed information about this, refer to the online help for Dr. PICZA3.

SPACE key + drag left or right to shift the perspective.

Drag to specify the rescanning area.

4 Click the [✛] button.

The mode for specifying the rescanning area is canceled.

5 Drag to verify the area to rescan.

The specified rescanning area is displayed as a three-dimensional form.

> **(✎) Point**
>
> **When You Want to Respecify the Rescanning Area**
> Go back to step 2 on the previous page, then click anywhere on the object to clear the specified area.

Specified rescanning area

6 Click the [SCAN] button.

The [Settings for Scanning] dialog box appears.

7 If necessary, change the scanning pitch, then click [Scan].

Here, none of the settings except for the scanning pitch can be changed. It is also not possible to set a different scanning pitch for each area.

> **(✎) Point**
>
> **Setting the Scanning Pitch**
> When performing rescanning, make the setting for the scanning pitch as fine as possible. This increases the number of scanning points, enhancing the degree of completion. When little free memory is available, it may be a good idea to use a narrow scanning area and perform rescanning in several passes.

Rescanning area

These set scanning pitch.   This executes rescanning.

You can perform rescanning as many times as you like after basic scanning. Also, when you want to redo scanning after checking the scanning results, you can go back to the previous state before rescanning by clicking the [↰] button.

For detailed information on rescanning methods, refer to the online help for Dr. PICZA3.

Creating New Polygons

You can create new polygons using all the scanning points, including the data produced by rescanning. These polygons are called a "polygon mesh." Creating a polygon mesh can make it possible for you to reproduce cavities and voids in the object and fill in holes according to the surrounding shape.

Creating a polygon mesh for area of connected voids...

...deletes surfaces, reproducing the void area of the original!

Creating a polygon mesh when a hole has occurred...

...lets you fill in the hole simply and easily!

A polygon mesh is composed of polygons created by estimating the original shape of the scan object from the scanning points. They differ from the polygons displayed immediately after scanning, which are generated simply by connecting the scanning points.

Procedure

1 Click the [Create Polygon Mesh...] button.

The [Polygonization Options] dialog box appears.

[Create Polygon Mesh...] button

2 Select the parameters for creating a polygon mesh, then click [OK].

For detailed information on the [Polygonization Options] dialog box, refer to the online help for Dr. PICZA3.

3 If the polygon mesh is not what was intended, change the parameters and create it again.

✎ Point

Tips for Creating a Polygon Mesh

To create a polygon mesh having a high degree of completion, you may need to scan at as fine a pitch as possible in order to increase the number of scanning points. In particular, cases like those described below may yield a polygon mesh having a configuration that is not what you intended.

- When there is a small number of scanning points with respect to undulations in the scan object
- When areas with holes are too big or the shape of them is complex

In such cases, rescan just that area at a fine pitch. When little memory is available on the computer, it may be a good idea to divide the area into parts and repeat rescanning several times to increase the number of scanning points sufficiently, and then create the polygon mesh.

☞ Go to "3-4 Finishing Data," see "Selecting and Scanning a Specific Area."

3-5 Saving and Exporting Data

You can take data obtained by scanning and creating polygon meshes and save it in a file format compatible with Dr. PICZA3. You can also convert (export) data and save it in a file format allowing import into other programs.

Saving Data

Go to the [File] menu and click [Save As]. The data is saved in Dr. PICZA project format.
In addition to working with saved files with Dr. PICZA3, you can edit them using 3D Editor, an editing program for 3D data.

```
┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐         ┌─────────────────────────┐
│  Scanning data    │         │ Dr.PICZA project format │
│                   │   Save  │    Scanning data        │
│  Polygon-mesh data│   ──▶   │    Polygon-mesh data    │
│  Line-scan data   │         │    Line-scan data       │
│  Point-scan data  │         │    Point-scan data      │
└ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘         └─────────────────────────┘
```

All data is saved in a single file.

Exporting Data

When you want to take data obtained by scanning and make use it with a 3D CAD program or other such program, you export the data.

Choose some data.

```
┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐         ┌──────────────────────────┐
│  Scanning data    │  Export │ DXF format, STL format etc.│
│  Polygon-mesh data│   ──▶   │    Scanning data         │
│  Line-scan data   │         │                          │
│  Point-scan data  │         └──────────────────────────┘
└ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┘
```

> ### Point
>
> **About Exportable Data**
>
> Scanning data is measuring points (scanning points) data obtained by scanning.
> Polygon-mesh data is data composed of new polygons created by estimating the proper shape of the scan object from the scanning data.
> Line-scan data and point scan data are measuring-points data newly obtained respectively by line scanning and point scanning.
> However, the exportable file formats for each type of data are predetermined.
> For detailed information, refer to the online help for Dr. PICZA3.

Procedure

1 At the Scan List, select just the data you want to export and display the window.

Select the box of the object you want to export.

2 Click the [📄] button. Click the file format you want to use for exporting.

3 Depending on the file format you clicked, a dialog box may appear. Choose a selection supported by the program with which you want to share the data, then click [OK].

4 Type in the name of the file to export, then click [Save].

4. Editing Scanning Results – Using 3D Editor

This chapter describes basic operation methods for "3D Editor," the 3D-data editing program included with the machine.

4-1 What You Can Do Using 3D Editor

3D Editor lets you do things like the following.

Enlarge and reduce	Deforming operations such as stretching in one direction are also possible.
Move and rotate	Specifying numerical values for the movement distance and angle of rotation is also possible.
Sever	You can divide an object into parts. Filling cut surfaces is also possible.
Delete	You can delete unneeded objects.
Merge	You can unite a number of objects. There is even an alignment feature for doing this.
Reduce the number of polygons	This reduces the amount of data while keeping detail.
Smoothing feature	This smooths the surfaces of objects.
Export	Data can be saved in a wide variety of file formats.
Repolygonization	This creates a polygon mesh by using imported data.

For detailed information on the features of 3D Editor, refer to the online help for 3D Editor.
Note that 3D Editor can only work with surface models.

4-2 Importing and Exporting Data

This section describes how to import and export data using 3D Editor.

Importing Scanning Results Immediately

In Dr. PICZA3, clicking the [Run 3D Editor] button starts 3D Editor and simultaneously imports the displayed scanning results.

[Run 3D Editor] button

Dr.PICZA3

3D Editor starts and data is imported.

Importing and Exporting

Clicking the [Import] button lets you import files in Dr. PICZA project format, DXF format, and so on.
Clicking the [Export] button lets you save data in a wide variety of file formats that are useful for creating 3D CAD data and 3D computer graphics.

[Import] button   [Export] button

> ### Point
>
> 3D Editor also supports importing for PIX-format files from Dr. PICZA versions 1 through 2.

Importing More Than One Set of Data

You can use the [Import] button to import more than one set of data and place a number of objects in the 3D Editor window.

4-3 Basic Operations for Objects

This section describes the windows in 3D Editor and how to perform simple editing using the program.

How to View the 3D Editor Window

The 3D Editor window is composed of panels that display the object from four different perspectives at the same time. You can carry out editing tasks using any one of these views.

Top
This is a view of the object seen from directly above. You use it at times such as when you want to move only in the X or Y direction. Z-direction movement is not possible.

Perspective
You use this when you want to view the overall shape. You can move in all three directions (X, Y, and Z), but it does not let you gauge the direction or distance of such movement with any accuracy.

This indicates the X, Y, and Z orientation.

Front
This is a view of the object seen from directly in front. You use it at times such as when you want to move only in the X or Z direction. Y-direction movement is not possible.

Side
This is a view of the object seen directly from the side. You use it at times such as when you want to move only in the Y or Z direction. X-direction movement is not possible.

Imported objects appear in the Object List. You can perform tasks such as displaying only the objects you want to view and deleting unneeded objects.

Group name
This is a collection of multiple objects.

Object name

Object List

Let's Try Editing Data with 3D Editor

Let's try some simple editing. We'll scan an apple with the machine, then try cutting and moving it. The explanations in this section begin at the point where you have scanned an apple using Dr. PICZA3.

Procedure

1 Start 3D Editor.

Click the [Run 3D Editor] button.

3D Editor starts.
The scanning data for the apple is imported at the same time.

Dr.PICZA3 Window

2 Try cutting the apple vertically. First, do the preparation.

Click the [Cut at Plane] button.

The cut surface and a dialog box appear.

Cut surface

Dialog box

3 Using the [Front] window, let's try shifting the cut surface to the left, then carry out cutting.

1 Drag the cut surface to move it to the left.

Front

2 When you have decided on the cut location, click [Run].

The apple is divided into two parts. However, its still looks like a single object.

New objects with names like [Cut-0] and [Cut-1] appear in the Object List.

4 Let's try separating the two objects.

When you're done with the operation, right-click to quit the [Move Object] mode.

1 Click the [Select Object] button.

3 Click the [Move Object] button.

2 Click the left part of the apple to select it.

4 Drag the portion you selected to the left.

5 Now try orienting the cut surface of the apple on the right to face the front.
You can only do this when you're in the [Top] window.

When you're done with the operation, right-click to quit the [Move Object] mode.

3 Click the [Rotate Object] button.

1 Click the [Select Object] button.

4 Drag to turn the object counter-clockwise.

2 Click the right side of the apple to select it.

Look at the [Perspective] window to see how the cut surface faces the front.

6 Finally, let's try deleting the cut-off object.
This operation can be carried out from any perspective except [Side].

1 Click the [Select Object] button.

The cut-off portion is deleted.

2 Click the cut-off portion to select it.

3 Click the [Erase] button.

When you view the Object List, you see that [Cut-0] has been deleted.

5. What to Do If...

This section describes how to resolve problems that can occur during operation, and what is required when moving the machine to a different location.

5-1 What to Do If...

The power doesn't come on or go off.

■ The power doesn't come on.

Are the AC adapter and the power cord connected correctly?
- Connect the AC adapter and power cord securely so that they do not come loose.
- Unplug the AC adapter from the electrical outlet, then plug it in again.

Is the door open?
Close the door. The power does not come on while the door is open.

■ The power is not switched off when the door is opened.

Is a foreign object caught in the interlock switch?
Remove the foreign object.

Scanning is impossible.

■ The power button illuminates red.

The machine is malfunctioning. Immediately unplug the AC adapter from the electrical outlet and contact your authorized Roland DG Corp. dealer.

■ The power button flashes red.

Are the head retainer or the screws securing the table still attached?
Be sure to remove them before you turn on the power.

Is anything placed on some internal location other than the table?
Remove whatever has been placed.

■ The power button illuminates red and blue.

Open the door, then close the door and turn on the machine again.

- About the illumination pattern of the power button
  ☞ Go to "1-2 Names and Functions," see "About the Indicator Lights."

■ The message "Cannot communicate with present scanner" appears on the computer.

Is the number for the communication port set correctly?
In Dr. PICZA3, go to [Preferences] and make sure the number for the communication port is set correctly.

☞ Go to "2-4 Installing and Setting Up the Software," see "Making the Settings for Using Dr.PICZA3."

■ The message "COM:** not ready" appears on the computer.

Is the machine powered up?
Be sure to turn on the machine before you run Dr. PICZA3.

Is the number for the communication port set correctly?
In Dr. PICZA3, go to [Preferences] and make sure the number for the communication port is set correctly.

Are you using a lengthy USB cable or a USB hub?
Use the included USB cable. Never use a USB hub or the like.

After you have checked the matters just described, if scanning is still not possible, then take action as follows.

1. Switch off the power.
2. Unplug the AC adapter from the electrical outlet, then plug it in again.
3. Restart the computer.
4. Switch on the power.

Other Symptoms

■ Scanning ended, but the computer then stopped.

Does the computer have enough memory?
Go to Dr. PICZA3's [Settings for Scanning] dialog box and check how much memory is required, then increase the scanning pitch. Alternatively, consider installing more memory. When scanning exceeds the amount of free memory on the computer, the operation of the computer may become very slow.

■ The message "Can't find MODELA Player" or "Can't find 3D Engrave" appears on the computer.

The buttons for running these do not function on this system. They become available when you are using it together with the MODELA series or the like.

■ Uninstalling the driver

Remove [Roland LPX-60 USB Device] from the list of [Add or Remove Programs] (or [Add/Remove Programs]).

☞ See the next section "What to Do If Installation Is Impossible."

What to Do If Installation Is Impossible

If installation quits partway through, or if the wizard does not appear when you connect the USB cable, take action as follows. Before you perform this procedure, make sure the power to the machine is turned on.

1. If the [Found New Hardware Wizard] dialog box appears, click [Finish] to close it.

2. Display [Add or Remove Programs] (or [Add/Remove Programs]).

Windows XP
From the [Start] menu, choose [Control Panel], then click [Add or Remove Programs].

Windows 2000/Me/98 SE
From the [Start] menu, choose [Settings], then [Control Panel], then double-click [Add/Remove Programs].

3. Uninstall [Roland LPX-60 USB Device].

1 Click [Change/Remove].

2 Click [Continue].   *3* Click [Finish].

4. Detach the USB cable connected to the computer.

5. Restart Windows.

6. Redo installation from the beginning.
☞Go to "2-4 Installing and Setting Up the Software," see "Installing the Driver."

If [Roland LPX-60 USB Device] does not appear in the list, follow the steps below.

1. Display [System Properties].

Windows XP
Click the [Start] menu, then right-click [My Computer]. Click [Properties].

Windows 2000/Me/98 SE
Right-click [My Computer] on the desktop. Click [Properties].

2. Display [Device Manager].

Windows XP/2000

1 Click the [Hardware] tab.

2 Click [Device Manager].

Windows Me/98 SE
Click [Device Manager].

3. Delete [LPX-60].
Windows XP/2000

1 Double-click [Universal Serial Bus controllers].

2 Click [LPX-60].

3 Click [View], then click [Uninstall].

4 Click [OK].

Windows Me/98 SE

1 Click [LPX-60].

2 Click [OK].

3 Click [OK].

4. Close the [Device Manager] dialog box and click [OK].

5. Detach the USB cable connected to the computer.

6. Restart Windows.

7. Redo installation from the beginning.
☞Go to "2-4 Installing and Setting Up the Software," see "Installing the Driver."

5-2 When Moving the Machine

When you move the machine to another location, you secure the table and the head in place.

Procedure

1 Make sure the power to the machine is turned off, then detach the AC adapter, the USB cable, and the power cord.

2 Remove the AC adapter holder and the head retainer.
Use the removed screws to secure the head retainer and the head in place.

The back of the machine

Head retainer

Y screws

AC adaptor holder

Y screws

3 Open the door, then move the head to the location shown in the figure below.
  ➢ Be sure to use the handle when opening the door.
  ➢ Needlessly touching anything other than the knob may cause malfunction. Carry out this operation carefully.

Knob

Grasp the knob and turn in the direction of the arrow until it reaches the position where it strikes the surface at the back of the machine.

Holding the knob, lower the head all the way.

4 Position the head retainer, then provisionally tighten the Y screws in the sequence shown in the figure below.

Y screws

Reference point

Y screws

Using the protrusion at the front of the machine as the reference point, provisionally tighten at the front.

Move the head back slightly toward the front, line up the inner end of the retainer with the screw locations, then tighten provisionally.

5 Lift the head knob until it strikes the retainer, then use Y screws to fasten the head to the retainer.

Finally, firmly tighten all screws to secure in place.

Knob

Y screws

6 Secure the table in place using X screws.

Adjust the position of the table so that the screw locations are lined up.
Adjust the table so that an imaginary line connecting the two screw holes is perpendicular to the front surface of the machine.
After tightening the screws, check to ensure that the table is fastened securely.

X screws

6. Appendix

6-1 Table Dimensional Drawing

150
110
70
16
45°
45°
203.2

12 screw holes (M6, depth 4mm)

1/2 scale
(Unit: mm)

6-2 Locations of the Power Rating and Serial Number Labels

Serial Number
This is required when you seek maintenance, servicing, or support. Never peel off the label or let it get dirty.

Power Rating
Use an electrical outlet that meets the requirements for voltage, frequency, and amperage given here.

6-3 Specifications

Machine Specifications

	LPX-60
Table size	Diameter 203.2 mm (8 in.)
Maximum scanning area	Plane scanning: Width 203.2 mm (8 in.), height 304.8 mm (12 in.)
	Rotary scanning: Diameter 203.2 mm (8 in.), height 304.8 mm (12 in.)
Scanning pitch	Plane scanning: width direction 0.2 to 203.2 mm, height direction 0.2 to 304.8 mm
	Rotary scanning: circumference 0.2 to 3.6 degrees, height direction 0.2 to 304.8 mm
Repeat accuracy	±0.1 mm (This figure reflects standard scanning conditions established by Roland DG.)
Maximum table load weight	5 kg
Laser	Wavelength: 645 to 660 nm Maximum output: less than 390 μW (maximum output of the laser light emitted inside housing is 5 mW)
Sensor	Noncontact laser sensor
Scanning method	Spot-beam triangulation
Operating speed	Table rotation speed: 10.06 rpm, head rotation speed: 4.98 rpm, maximum head movement speed: 50 mm/sec.
Interface	USB (compliant with Universal Serial Bus Specification Revision 1.1)
Power requirements	Dedicated AC adapter : AC 100 to 240 V ±10% 50/60 Hz Machine: DC 19 V, 2.1 A
Power consumption	Approx. 20 W (including AC adapter)
Dimensions	500 [W] x 382 [D] x 619 [H] mm (19-11/16 [W] x 15-1/16 [D] x 24-3/8 [H] in.)
Weight	32 kg (71 lb.)
Packed dimensions	700 [W] x 603 [D] x 807 [H] mm (27-5/8 [W] x 23-3/4 [D] x 31-7/8 [H] in.)
Packed weight	41 kg (91 lb.)
Environment	Temperature: 10 to 40ºC (50 to 104ºF) (25ºC [77ºF] or more recommended) Humidity: 35 to 80% (no condensation)
Included items	AC adapter, power cord, AC adapter holder, cable clamps, USB cable, CD-ROM, clay, user's manual, Roland LPX EZ Studio

System Requirements for the Software

Operating system	Windows XP/2000/Me/98
CPU	Pentium 4 processor or better recommended
Memory	512 MB or more recommended
Free hard-disk space required for installation	Dr.PICZA3: 20 MB or more 3D Editor: 10 MB or more
Display	800 x 600 resolution and 16 bit colors (High color) or more recommended. OpenGL-compatible accelerator board recommended.

System Requirements for USB Connection

Operating system	Windows 98 SE (Second Edition)/Me/2000/XP
Computer	1) Computers preinstalled with Windows 98 SE/Me/2000/XP at the time of purchase (This includes such computers later upgraded to Windows Me/2000/XP.) 2) Computers on which USB operation is assured by the manufacturer of computers

- Whether a USB connection is possible depends on the specifications of the computer. To determine whether the computer you're using is capable of correct USB operation, check with the manufacturer of the computer.
- Use the included USB cable. Never use a USB hub or the like.

Software license agreement

Roland DG Corporation (hereinafter referred to as the "Company") shall grant you a non-transferable, non-exclusive right to use the Software supplied with this Agreement, on the condition that you agree to the following provisions.

If you agree to the following provisions, you should unpack the media on which the Software is recorded, or simply click the button or other indicator that you agree to the following provisions. By doing so, this Agreement shall be concluded.

If you do not agree with the following provisions, do not unpack the media. Or, you can click the button or other indicator that you do not agree to the following provisions of this Agreement. In this case, a license is not granted and you cannot use the Software.

1. Definition

The "Software" includes the software program and related files supplied with this Agreement and the related software programs and files distributed through the Internet and other services.

2. Ownership

All the ownership, copyright and other intellectual property rights of the Software, trademark, and related documents shall belong to the Company.

3. Terms and conditions

(1) You are authorized to use the Software on one computer.
(2) You are allowed to create a backup copy of the Software.
The right to keep the Software and the backup copy of the Software continues to belong to the Company, but the right to the media on which the backup copy of the Software is recorded does not belong to the Company.

4. Forbidden items

(1) This copy of the Software, or a backup copy of the Software, must not be used on multiple computers at the same time, on a network, the Internet, or on other computers through any other means of distribution.
(2) The Software shall not be reverse engineered, decompiled or reverse assembled.
(3) The rights to the Software cannot be transferred, assigned, lent, loaned or licensed to a third party in any case, regardless of whether this Agreement has been terminated or cancelled.

5. Termination

(1) The Company can cancel this Agreement and require you to discontinue use of the Software if you breach any provision of this Agreement or if you infringe on the ownership, copyright, or other intellectual property rights of the Company.
(2) This Agreement shall be automatically terminated when you stop using the Software.
(3) If this Agreement is terminated or cancelled, you must return your copy of the Software to the Company, or discard it as soon as practicable, at your own expense.

6. Guarantee

(1) The Company shall not guarantee that the quality or functionality of the Software will satisfy any purpose that you may have in mind.
(2) The Company shall not accept any responsibility for the results obtained from using the Software.
(3) The Company shall not accept any responsibility for any loss which might be caused as a result of your exercising the rights granted under this Agreement.
(4) The specifications for the Software are subject to change without prior notice.

7. Governing Law

This Agreement shall be governed by the laws of Japan.

1000006067

R2-090113