292-36026C
Mar. 2013

Microchip Electrophoresis System for DNA/RNA Analysis

MCE-202 MultiNA

INSTRUCTION MANUAL

Read the instruction manual thoroughly before you use the product.
Keep this instruction manual for future reference.

SHIMADZU

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Introduction

Thank you for purchasing the MCE-202 MultiNA microchip electrophoresis system for DNA/RNA analysis (hereafter "MultiNA").

Original version approved in English.

■ Important:

- Read this manual thoroughly prior to operating this product.
- Keep this manual near the product in a safe location for future reference.
- Operate this product in accordance with the instructions given in this manual.
- Follow all WARNING and CAUTION instructions.
- For information on the basic operation of the Windows® operating system, please refer to that product's Instruction Manuals.
- Do NOT disassemble or modify this product without permission from Shimadzu Corporation.
- Ensure that these instruction manuals are transferred if the user or site of use changes.
- Contact your Shimadzu representative if the following is required:
  - Replacement of this manual, or any WARNING or CAUTION labels
  - Product installation, adjustment, or re-installation after product movement, or for service and repairs

■ Notice

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- For the sake of improvement, the content of this manual is subject to modifications without notice.
- Every effort has been made to ensure that the content of this manual was correct at the time of creation. However, in the event that any mistakes or omissions are discovered, it may not be possible to correct them immediately.
- The MultiNA and dedicated consumables are for research use only. Do NOT use them for any other purpose.
- The contents of the hard disk in a PC can be lost due to accident. To protect your important data from accidents, back up your data.
- Registered trademark:
  - MultiNA® and MCE® are registered trademarks of Shimadzu Corporation.
  - SYBR® is a registered trademark of Invitrogen Corporation.
  - GelStar® is a registered trademark of FMC Corporation.
  - pGEM® is a registered trademark of Promega Corporation.
  - MicroAmp® and RNaseZAP® are registered trademarks of Applied Biosystems Inc.
  - Thermo-Fast® is a registered trademark of Advanced Biotechnologies Ltd.
  - Intel® and Pentium® are registered trademarks of Intel Corporation.
  - BEMCOT® is a registered trademark of Asahi Kasei Fibers Corporation.
  - Microsoft® Windows®XP Professional operating system is written as Windows XP.
  - Microsoft® Windows® 7 Professional operating system is written as Windows 7.
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Instruction Manuals

List of Instruction Manuals

The following manuals are provided.

Name	Media	Description
MultiNA Instruction Manual	Booklet + PDF	Describes the complete MultiNA system, including handling, operation, maintenance, and troubleshooting. Also describes the preparation and placement of reagents and samples in the system, execution of analysis, data analysis, and basic operation of the MultiNA system using the provided software.
Quick Manual	Booklet + PDF	This quick manual includes the essential information to allow operating the MultiNA system smoothly and in good condition. Please keep in a convenient location.
Help	Online Help	Display the PDF files for the MultiNA Instruction Manual and Quick Manual via the [Help] menu at the top of the window in the provided software.

Manual Notation

The following symbols are used in this manual.

Symbol	Meaning
⚠ **WARNING**	Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or possibly death.
⚠ **CAUTION**	Indicates a potentially hazardous situation which, if not avoided, may result in minor to moderate injury or equipment damage.
NOTE	Emphasizes additional information that is provided to ensure the proper use of this product.
☞ Reference	Indicates location of related information.
[ ]	Indicates text displayed on the screen, such as the names of buttons, menu items, settings, screens, and icons. Example: Click [OK] (where "OK" is the name of a button in a dialog box)

Safety Instructions

To ensure safe product operation, read these important safety instructions carefully before use and follow all WARNING and CAUTION instructions given in this section.

■ Product Applications

⚠ WARNING

- This is a microchip electrophoresis system for DNA/RNA analysis. Do NOT use it for any other application.
  Doing so may result in accidents.
- This instrument is for Research Use Only. Not for use in diagnostic procedures.
  If this instrument is used for non-research applications, please note that Shimadzu Corporation is in no way responsible for any problems related to the instrument, its data, claims from third parties, or any other problems that occur.

■ Installation Site

⚠ WARNING

- Fire is prohibited in the vicinity of the instrument.
  Fire must not be used at the site where the instrument is installed. In addition, avoid installation in the same room with equipment that generates sparks. Do NOT use flammable sprays (such as hairsprays or aerosol insecticides) or flammable solvents in the vicinity of this instrument. Provide fire extinguishers in case of an emergency.
- Install a sink in the vicinity of this instrument.
  If reagent chemicals come in contact with the eyes or skin during operation, flush them away immediately with a large quantity of water. A sink should be installed in the vicinity of this equipment if at all possible.

⚠ CAUTION

- Installation of the instrument is prohibited at sites exposed to corrosive gases, or to significant debris and dust.
  To ensure the life of the instrument and to maintain proper operation, avoid installation sites that are exposed to corrosive gases or to significant dust or debris.
- Do NOT install the instrument near equipment that generates strong magnetic fields.
  To ensure normal operation of this instrument, avoid installation sites that are subject to strong magnetic fields. Add noise filters if there is significant noise on the power lines.
- To maintain performance, observe the following site conditions.
  - Rooms with an ambient temperature between 18°C and 28°C, and minimal daily temperature fluctuations (If the ambient temperature exceeds 28°C, a temperature control error can occur and instrument operation may stop.)
  - Sites where the instrument is protected from direct exposure to drafts from coolers, heaters or air conditioners
  - Sites protected from exposure to direct sunlight
  - Sites not exposed to vibrations
  - Sites where humidity is maintained between 40% and 80%
  - Sites where condensation does not occur
  - Sites with a maximum altitude of 2000 m.
- During analysis, ensure that the drain tubing ports and the gap between the top cover and the instrument are not exposed to direct light sources (such as desktop fluorescent lamps, flashlights, and camera flashes).
  This may result in noise.

■ Installation

⚠ WARNING

- For safe instrument operation, after the instrument is moved to a different location, contact your Shimadzu representative for instrument installation, adjustment, or reinstallation.
- Always supply power from a power supply equipped with an electrical leakage breaker.
- The instrument's power supply voltage and power consumption are as follows. The power supply voltage is indicated on the label on the power connector on the back of the instrument. Connect the instrument to a suitable power source.

  Connecting it to an improper power source may result in fire or shock.

  The intended performance may not be obtained if the power supply voltage is unstable or the power capacity is insufficient. Check the power requirements for the entire system before arranging a suitable power source.

Voltage (Indicated on the Label On the Back of the Instrument)	100-120/220-240 V ~
Power consumption	300 VA
Frequency	50/60 Hz
Voltage fluctuation	Less than ±10%
Interrupting capacity	40 A
Installation category	II
Pollution degree	2

- Ground the instrument.

  If malfunctions or leakages occur, shock may result if the equipment is not properly grounded. Grounding is also important to ensure stable instrument operations.
- Do NOT insert or touch the adaptor ground lead to the power outlet.

  This may result in fire or electric shock.
- Handle the power cable carefully.

  If the following cautions are not observed, the cable may be damaged, resulting in fire, electric shock, or malfunction. If the cord does become damaged, contact your Shimadzu service representative immediately.
  - Do NOT place it under heavy objects.
  - Do NOT place it near heating equipment.
  - Do NOT modify the cord.
  - Do NOT forcibly bend or stretch the cord.
  - Hold the plug when inserting and removing the cord.

⚠ CAUTION

- This instrument weighs 43 kg. When installing the system, consider the total system weight including the PC and other system components.
  Install the instrument on a flat, stable desk or stand, capable of supporting the total system weight.
- Install on a flat desk or stand.
  If the instrument is significantly inclined, the analysis performance will be adversely affected.
- Installation space for the instrument, PC, and glass rinse water bottle must be at least 1,015 mm to 1,165 mm W (if a desktop PC is used) by 600 mm D by 980 mm H.
  (See *" Example Installation 1: Waste container positioned in front of the instrument" P.264*.)
  This does not include the waste container which is placed on the floor. The size displays the maximum height with the cover open.
- When installing the instrument against a wall, leave a gap of at least 50 mm between the rear of the instrument and the wall.
  If this condition is not met, fan-driven air cooling will not be sufficient and the instrument may overheat and reduce performance. Also the top cover will not fully open.
- Install the instrument at a site where the rear of the instrument can be accessed easily.
  The syringe cover on the rear of the instrument must be opened when replacing the syringe or plunger.
- Allow at least a 100 mm of space in front of the instrument.
  The front cover must be opened to replace the pump cartridges.
- When installing the instrument, leave enough space to operate the power switch on the bottom right side of the instrument near the rear.
  The power must be turned OFF quickly in the event of an instrument or other emergencies. The power must be turned OFF quickly in the event of a problem with the instrument or other emergency.
- Place the waste container on the floor.
  Waste fluid is conveyed to the waste container by gravity. Place the container at a position lower than the instrument.
- Note the following cautions regarding the waste tubing. Cut the tubing as necessary to suit the installation site.
  - The tubing should not be bent.
  - The tubing should not be elevated.
  - The tip of the tubing should not be immersed in the waste fluid inside the waste container.
- If necessary, install safety fasteners and other earthquake measures.
  Recommended product: Part No. S037-62401-03, FASTENER, RT-400 GRAY (set of two)

■ Operation

⚠ WARNING

- Always wear protective equipment (protective clothing, gloves, eyewear, and mask) when handling reagents.
  Reagents contain irritating and harmful chemical substances. If any type of reagent makes contact with the eyes or skin, immediately rinse the affected area with large amounts of water and seek medical attention from a doctor and follow their advice.
  If a reagent is ingested or inhaled by accident, immediately seek medical attention from a doctor and follow their advice.
- Always read the MSDS before handling reagents.
  The MSDS contains important safety information regarding the handling, storage, and disposal of reagents.

⚠ CAUTION

- Dispose of the waste fluid in accordance with guidelines from the applicable management departments.
  In addition to rinse water, the waste liquid contains a separation buffer, marker solution, and dyes. It will also contain formamide from RNA analysis.
- Discard waste fluid on a regular basis to prevent the waste container from overflowing.
  If the waste tubing becomes clogged, waste fluid may leak from inside the instrument.
- Check the state of the waste container and tube before starting analysis.
  There is a risk that waste fluid may overflow within the instrument. Check that:
  - The tip of the waste tubing is not immersed in waste fluid in the waste container.
  - There is enough empty space in the waste container.
  - The waste tubing is not bent or elevated.
- Do NOT allow liquid to be spilt on the PC.

■ Top Cover Usage

⚠ WARNING

- Do NOT forcibly open the top cover during instrument operation (blinking green LED on front indicator).
  During operation the top cover is locked and cannot be opened.
- Do NOT apply lateral force to the top cover when opening or closing.
  This may deform the top cover and result in damage.
- Do NOT remove the top cover.
  Injury or accident may occur.
- If the top cover does not open or close properly, contact your Shimadzu service representative immediately.
  A field engineer from Shimadzu will perform repairs.

■ Microchip Use

⚠ CAUTION

- Do NOT scrub the reservoir on the microchip when wiping away moisture.
  Lint may clog the microchip channels.
- Do NOT touch the surfaces of the microchip with your bare hands.
- Do NOT scratch the microchip electrodes during handling.
  If salt or other material has hardened on the electrodes, apply water to dissolve the salt and then gently wipe it away.
- Do NOT clean the microchip using an ultrasonic cleaner.
  This will damage the microchip.

■ Reagent Kit Use

⚠ WARNING

- The reagent kit provided with this instrument is only for experimental and research purposes.
  It is not authorized for the diagnosis and treatment of human or animal illnesses. Do NOT use it for any applications that directly affects humans or animals, such as with medical products, cosmetics, or food.
- If reagent gets into the eyes or makes contact with the skin, immediately wash the applicable area with copious amounts of water and consult a medical professional. If reagent is accidentally swallowed or the vapor is inhaled, immediately consult a medical professional.
  Refer to the MSDS for details.
- Use only the reagents specified in these instruction manuals.

■ Chip Cleaning Kit Use

⚠ WARNING

- Always read the instruction manual provided with the chip cleaning kit before handling the contents of the kit.
  The instruction manual for the chip cleaning kit describes safety precautions that are important to ensure safe use.

■ Drive Unit

⚠ WARNING

- Do NOT touch any parts other than those specified in these manuals.

■ Maintenance and Servicing

⚠ WARNING

- Turn the instrument OFF before maintenance.
  Shock or accident may occur.
- If the instrument requires servicing, contact your Shimadzu service representative.
- Do NOT perform any disassembly or modification procedures that are not described in these manuals.
  Injury or accident may occur.

⚠ CAUTION

- Use only the parts described in *"10 Parts Specifications" P.279*.
  Normal operations are not ensured if other parts are used.
- Do NOT leave the instrument wet.
  This may result in rust or discoloration. To clean the instrument, wipe it with a soft cloth moistened slightly with water, then remove any moisture with a soft dry cloth.
- Do NOT wipe it with alcohol, paint thinner or other organic solvents.
  These solvents may damage the paint on the instrument cover.

■ Relocating the Product

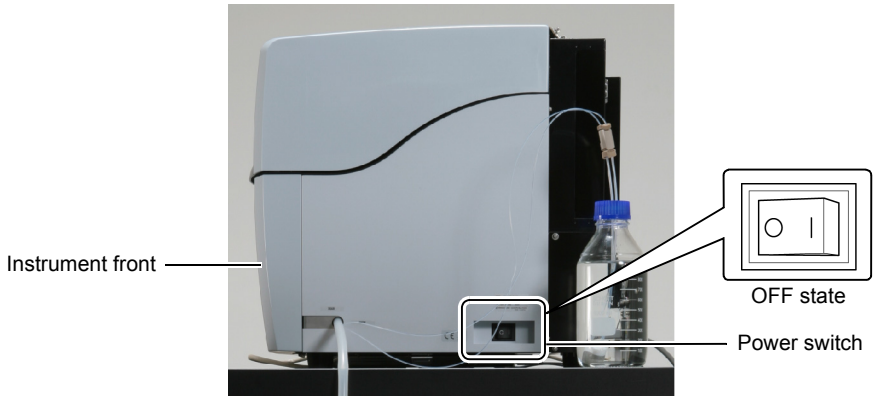
⚠ CAUTION

- Before moving the instrument, the drives must be fastened with the transportation fixtures.
  Contact your Shimadzu service representative.
- Unplug the LAN cable connected to the PC.
- Do NOT lift the instrument by the top cover.
- Do NOT pinch fingers or hands in gaps inside the product.
  This may result in injury.
- Do NOT bump the instrument or subject it to excessive vibrations.

■ Emergency Measures

⚠ WARNING

- If a strange noise or smell emanates from the instrument, or some other irregularity is noticed, stop instrument operation using the following procedure, and contact your Shimadzu service representative.
  1. Switch OFF the power switch on the lower right side of the product.



  2. Detach the power cable.

■ During a Power Outage

⚠ CAUTION

- If an electric power outage occurs during analysis, the instrument stops. If separation buffer is left remaining in a microchip or sample probe when the instrument stops it may dry out and obstruct the microchip or sample probe. To avoid such a condition, take the action described below.
  1. Turn OFF the power of the instrument.
  2. When the electric power comes back on, turn ON the instrument. If the power of the PC is OFF, turn it ON.
  3. Rinse the microchip with water according to the procedure described in *"6.2.6 Inspecting and Washing Microchip Reservoirs" P.204* and reinstall it in the instrument.
  4. Rinse the sample probe according to the procedure described in *"6.2.2 Sample Probe and Aspirator" P.200*.
  5. Check if the sample probe is obstructed according to the procedure described in *"■ Inspection Procedure" P.218*.
  6. Rinse all microchips installed in the instrument according to the procedure described in "All Chip Washing" in *"4.5.8 Wash" P.119*.

  Carrying out the procedure above enables regular operation. In case of any abnormal condition, see *"8 Troubleshooting" P.241* and take action accordingly.

NOTE

- Files may not be normally created on rare occasions when the PC stops during a process to save data in a file.
- In MultiNA, results of analysis for each sample are saved in data files during analysis of multiple samples. Therefore, even if analysis is stopped due to a power outage during analysis, results of analyses up to right before the power outage are saved in files.

Warranty

Shimadzu provides the following warranty for this product.

1. Period: Please contact your Shimadzu representative for information about the period of this warranty.

2. Description: If a product/part failure occurs for reasons attributable to Shimadzu during the warranty period, Shimadzu will repair or replace the product/part free of charge. However, in the case of products which are usually available on the market only for a short time, such as personal computers and their peripherals/parts, Shimadzu may not be able to provide identical replacement products.

3. Limitation of Liability:
   1) In no event will Shimadzu be liable for any lost revenue, profit or data, or for special, indirect, consequential, incidental or punitive damages, however caused regardless of the theory of liability, arising out of or related to the use of or inability to use the product, even if Shimadzu has been advised of the possibility of such damage.
   2) In no event will Shimadzu's liability to you, whether in contract, tort (including negligence), or otherwise, exceed the amount you paid for the product.

4. Exceptions: Failures caused by the following are excluded from the warranty, even if they occur during the warranty period.
   1) Improper product handling
   2) Repairs or modifications performed by parties other than Shimadzu or Shimadzu designated companies
   3) Product use in combination with hardware or software other than that designated by Shimadzu
   4) Computer viruses leading to device failures and damage to data and software, including the product's basic software
   5) Power failures, including power outages and sudden voltage drops, leading to device failures and damage to data and software, including the product's basic software
   6) Turning OFF the product without following the proper shutdown procedure leading to device failures and damage to data and software, including the product's basic software
   7) Reasons unrelated to the product itself
   8) Product use in harsh environments, such as those subject to high temperature or humidity levels, corrosive gases, or strong vibrations
   9) Fires, earthquakes, or any other act of nature, contamination by radioactive or hazardous substances, or any other force majeure event, including wars, riots, and crimes
   10) Product movement or transportation after installation
   11) Consumable items
   Note: Recording media such as floppy disks and CD-ROMs are considered consumable items.

5. Non-Research Applications: This instrument should be used only for research applications. It should not be used for diagnosis or examination purposes. If this instrument is used for non-research applications, please note that Shimadzu Corporation is in no way responsible for any problems related to the instrument, its data, claims from third parties, or any other problems that occur.

* If there is a document, such as a warranty, provided with the product, or there is a separate contract agreed upon that includes warranty conditions, the provisions of those documents shall apply.

* Warranty periods for products with special specifications and systems are provided separately.

After-Sales Service and Availability of Replacement Parts

After-Sales Service

If a problem arises, inspect the product and take the appropriate corrective action described in *"6 Inspection and Maintenance" P.197* and *"8 Troubleshooting" P.241*. If the problem persists or the symptoms are not covered in these chapters, contact your Shimadzu representative.

Replacement Parts Availability

Replacement parts for this product will be available for a period of seven (7) years after the product is discontinued. Thereafter, such parts may cease to be available. Note, however, that the availability of parts not manufactured by Shimadzu shall be determined by the relevant manufacturers.

Maintenance, Inspections, and Adjustment

In order to maintain the instrument's performance and obtain accurate measurement data, daily inspection and periodic inspection/calibration are necessary.

- For daily maintenance, inspection, and replacement parts, see *"6 Inspection and Maintenance" P.197* of this Instruction Manual.
- Periodic inspection/calibration should be requested to your Shimadzu representative.
- Replacement cycles described for periodic replacement parts are rough estimate.
  Replacement may be required earlier than the described replacement cycles depending on usage environment and frequency.

Software License Agreement

PLEASE READ THIS AGREEMENT CAREFULLY BEFORE USING THE SOFTWARE.

SHIMADZU Corporation ("SMZ") is willing to license the SMZ software provided herein, together with accompanying documentation (collectively "SOFTWARE") to you only upon the condition that you accept all of the terms and conditions contained in this License Agreement. By using the SOFTWARE, you agree to be bound by the terms of this Agreement. If you do NOT agree to all these terms of this Agreement, promptly return the unused SOFTWARE to the party (either SMZ or its reseller) from whom you acquired it to receive a refund of the amount you paid.

1. LICENSE

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b.Copy the SOFTWARE except one (1) archival copy of the SOFTWARE.

c.Modify, reverse engineer, decompile, disassemble, or create derivative works based upon the SOFTWARE.

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You are entitled to receive all official software upgrades for the SOFTWARE that SMZ will release as deemed necessary by SMZ. An upgrade means certain supplemental program modules and/or information for bug fixing and/or updates to the defects and/or failures of the SOFTWARE that are acknowledged or confirmed by SMZ. An upgrade excludes hardware, network, consulting services, third party products, operation and general computer system maintenance. All supplemental program module for upgrades and enhancements furnished to you shall be deemed to be part of the SOFTWARE and subject to the terms and conditions set forth in this Agreement.

5. LIMITED WARRANTY

SMZ warrants that for a period of one (1) year from the date of purchase, as evidenced by a copy of the receipt, the media on which SOFTWARE is furnished will be free of defects in materials and workmanship under normal use.

Except for the foregoing, SOFTWARE is provided AS IS. Your exclusive remedy and the entire liability of SMZ and its suppliers under this limited warranty will be, at SMZ's option, repair, replacement, or refund of the Software if reported (or, upon request, returned) to the party supplying the SOFTWARE to you. In no event does SMZ warrant that the Software is error free or that you will be able to operate the SOFTWARE without problems or interruptions.

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IN NO EVENT WILL SMZ BE LIABLE FOR ANY LOST REVENUE, PROFIT OR DATA, OR FOR SPECIAL, INDIRECT, CONSEQUENTIAL, INCIDENTIAL OR PUNITIVE DAMAGES, HOWEVER CAUSED REGARDLESS OF THE THEORY OF LIABILITY, ARISING OUT OF OR RELATED TO THE USE OF OR INABILITY TO USE SOFTWARE, EVEN IF SMZ HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGE. IN NO EVENT WILL SMZ'S LIABILITY TO YOU, WHETHER IN CONTRACT, TORT (INCLUDING NEGLIGENCE), OR OTHERWISE, EXCEED THE AMOUNT PAID FOR SOFTWARE.

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This License is effective until terminated. You may terminate this License at any time by destroying all copies of SOFTWARE including any documentation. This License will terminate immediately without notice from SMZ if you fail to comply with any provision of this License. Upon termination, you must destroy all copies of SOFTWARE.

8. GENERAL

a.This Agreement is the entire agreement. If any provision of this agreement is held invalid, the remainder of this agreement shall continue in full force and effect.

b.This Agreement shall be construed and governed in accordance with the laws of Japan, excluding its conflict of law rules.

c.The exclusive jurisdiction for any disputes arising out of or in connection with this Agreement shall be Kyoto District Court of Japan.

d.The invalidity or unenforceability of any provision of this Agreement shall not affect the validity or enforceability of any other provision.

Disposal of this Product

■ Disposal of the Instrument

Contact your Shimadzu service representative for details on returning the instrument for disposal.
If disposing of the instrument independently, segregate the instrument into general industrial waste and household waste and dispose of it according to the processing guidelines stipulated by law in your region.

■ Disposal

Dispose of waste fluid appropriately in accordance with prescriptions or guidelines from the applicable management department.

⚠ WARNING

- Always wear protective equipment (protective clothing, gloves, eyewear, and mask) when disposing of waste fluid.
  Waste fluid may contain irritating and harmful chemical substances. If any type of waste fluid makes contact with the eyes or skin, immediately rinse the affected area with large amounts of water and seek medical attention from a doctor and follow their advice.
  If waste fluid is ingested or inhaled by accident, immediately seek medical attention from a doctor and follow their advice.

⚠ CAUTION

- Dispose of waste fluid appropriately in accordance with the laws, regulations, or rules of your country, municipality, or facility.
  In addition to rinse water, waste fluid includes the separation buffer, marker solution, and dye. It also contains formamide from RNA analysis.

Warning Labels

For safety, warning labels are attached in locations where special attention is required.
Should any of these labels peel off or become damaged, contact your Shimadzu representative immediately for a replacement.

•Indicates a high temperature area.

•Refer to the Instruction Manual before performing operations in this area.

•Fuses

Before fuse replacement, refer to *"6.3.10 Fuse Replacement" P.234*.

Warning label: Part No. S228-42603

- Class 1 LED Product

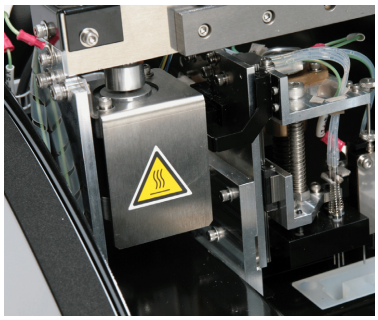
This is a Class 1 LED Product.

Warning label: Part No. S292-27990

- Autosampler Motor Unit

  CAUTION: HOT! Touching while hot can result in burns.

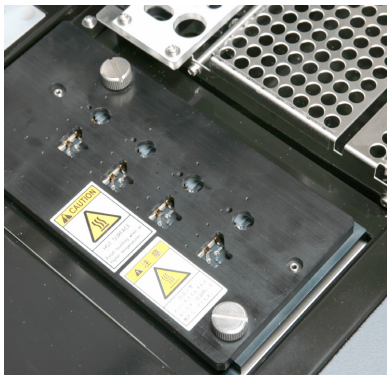
  Warning label: Part No. S037-72999-12



- Chip Stage

  The chip stage is kept at 37°C. During microchip replacement, prolonged contact with chip stage can result in low-temperature burns.

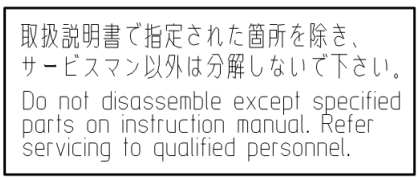
  Warning label: Part No. S037-72123-00 (Japanese)/S037-72126-02 (English)

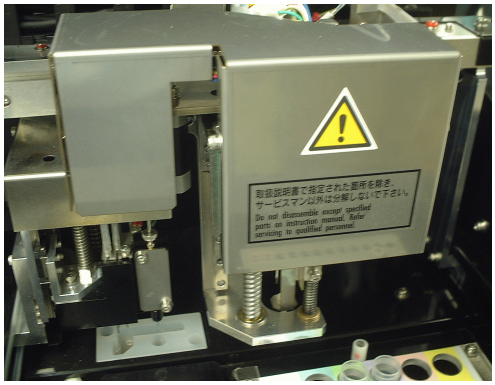


- Autosampler Cover

  Do NOT remove or disassemble any part of the cover, except where specified in the Instruction Manual.

  Warning label: Part No. S037-72999-02, S292-27778





Electromagnetic Compatibility

Descriptions in this section apply only to the following models:

- S292-28000-38/44/58 MULTINA SYSTEM ASSY (230 VAC, English)

This product complies with European standard EN61326-1: 2006, class B for electromagnetic interference (Emissions) and basic test requirements for electromagnetic susceptibility (Immunity).

■ EN61326-1 Immunity (Electromagnetic Susceptibility)

Test conditions are as follows.

- IEC 61000-4-2 Electrostatic Discharge:
  Air: 2/ 4/ 8 kV, Contact: 2/ 4 kV
- IEC 61000-4-3 Radiated, Radio-Frequency, Electromagnetic Field:
  3 V/m (80 MHz to 1.0 GHz), 3 V/m (1.4 GHz to 2.0 GHz), 1 V/m (2.0 GHz to 2.7 GHz)
- IEC 61000-4-4 Transient/Burst (Electrical Fast Transients):
  2 kV on AC Power Port, 0.5/ 1 kV on Signal and Control Lines
- IEC 61000-4-5 Voltage Surge:
  0.5/ 1 kV line to line, 0.5/ 1/ 2 kV line to ground
- IEC 61000-4-6 Conducted RF Immunity:
  3 V on AC Power Port, 3 V on Signal and Control Lines
- IEC 61000-4-8 Power Frequency Magnetic Field:
  30 A/m, 50 Hz
- IEC 61000-4-11 Voltage Variations/Dips/Interrupts:
  0 % for 0.5/1 cycle, 40 % for 10 cycle, 70 % for 25 cycle, 0 % for 250 cycle

Compliance with these standards does not ensure that the product can operate at a level of electromagnetic interference that is stronger than the level tested. Interference stronger than the values specified above may cause the product to malfunction.

When installing or using this product, especially in an industrial location:

Locate the product away from any device emitting strong levels of electromagnetic noise.

Use a power source that is separated from the power source of any device emitting strong levels of electromagnetic noise.

To prevent static electricity:

Prior to touching the product, the operator should be sure to discharge the static electricity stored in their body by first touching a grounded metallic structure.

Do NOT touch any terminals or connectors that are not connected to cables while the product is turned ON.

Action for Environment (WEEE)

To all users of Shimadzu equipment in the European Union:

WEEE Mark

Equipment marked with this symbol indicates that it was sold on or after 13th August 2005, which means it should not be disposed of with general household waste. Note that our equipment is for industrial/professional use only.

Contact Shimadzu service representative when the equipment has reached the end of its life. They will advise you regarding the equipment take-back.

With your co-operation we are aiming to reduce contamination from waste electronic and electrical equipment and preserve natural resource through re-use and recycling.

Do not hesitate to ask Shimadzu service representative, if you require further information.

Contents

7 Instrument Storage and Relocation

8 Troubleshooting

9 Installation

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1 Overview and System Configuration

1.1 Overview

> **⚠ WARNING**
>
> • This instrument is a microchip electrophoresis system for DNA/RNA analysis. Do NOT use it for any other application.
>
> Using this instrument for any purposes other than intended purposes (for DNA / RNA analysis) may result in equipment damage or personnel injury.

- This instrument conducts electrophoresis in channels formed in a microchip with a quartz substrate.
- This instrument is fully automated, including the filling of the microchip with separation buffer, injection of the sample, application of voltage, the fluorescence detection of the separated fragments, and data analysis.
- The instrument consists of an autosampler, a pneumatic unit, a high voltage unit, and a detector using LED and PMT.
- The PC software performs analysis processing on the fluorescent signal obtained from the fluorescent detector.
- The ratio of 28S/18S rRNA is calculated during RNA analysis.
- The gel image, electropherogram, and data analysis results will be displayed and printed.

1.2 Features

■ Reduction of Running Costs

Reusing microchips repeatedly instead of disposing of them after a single use allows for low analysis costs that are equal to or less than those for agarose gel electrophoresis (as investigated by Shimadzu).

■ Equipped with Automatic Analysis Functions

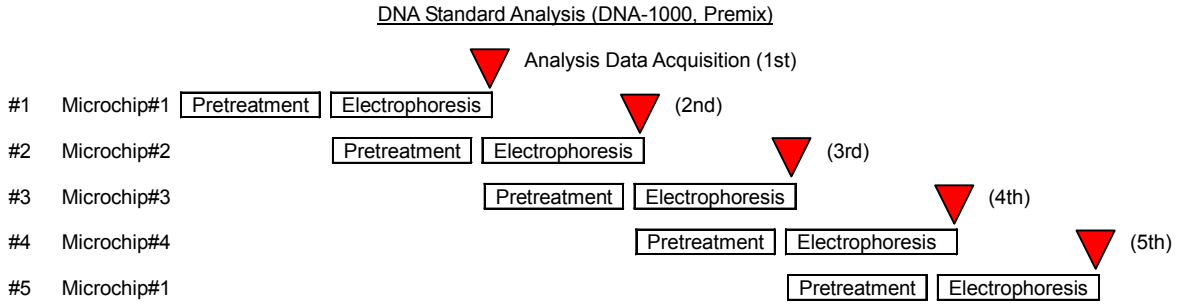
Place the reagent and sample in the instrument and start the registered analysis schedule. Everything else is automatic until analysis is completed.

■ Parallel Processing with Four Microchips Increases Throughput

Up to four microchips can be installed.

Processing speed is increased by parallel processing of pretreatment (rinsing the microchips, dispensing and filling with separation buffer, and dispensing of samples), electrophoresis, and detection by using multiple chips. As a result, processing speeds of 12 samples/20 minutes, and 96 samples/124 minutes* have been achieved.

* The result of performing analysis using four microchips in DNA-1000 kit premix mode. The time does not include pre and post analysis rinsing. Indicated processing times are approximate.



■ High-Precision Size Estimation and Quantitation

By mixing markers with the samples for analysis, high-precision sample size estimation and quantitation results are obtained in comparison with agarose electrophoresis.

■ Gel Image Displays Comparable to Those for Agarose Electrophoresis

Analysis data can be typically obtained based on the migration time. This can be converted to images of migration distances, and the list of these images can be displayed. This is comparable to the gel images obtained by conventional agarose gel electrophoresis.

1.3 System Configuration

The structure of the MultiNA system is as shown below.

Part Name	Part No.	Remarks
MULTINA SYSTEM ASSY	292-28000-XX	For details on part names and functions, see *"1.6 Instrument Description" P.8* For details on pump cartridge replacement, see *"6.3.6 Pump Cartridge Replacement" P.223*
Standard accessories		For details, see *"■ Standard Accessories" P.279*
PC	To be provided by the customer.	For the required specifications, see *"1.4 Specifications" P.3*
Microchip	S292-36000-91 S292-36010-41	Type WE-C Type WT Material: High purity synthetic quartz
Reagent Kit DNA-500 DNA-1000 DNA-2500 DNA-12000 RNA	 S292-27910-91 S292-27911-91 S292-27912-91 S292-36600-91 S292-27913-91	 25 - 500 bp 100 - 1,000 bp 100 - 2,500 bp 100 - 12,000 bp Up to 28S rRNA (4.7 knt to 5.0 knt)

1.4 Specifications

■ Basic Analysis Performance*1

Type of Kit	Four types for DNA analysis (DNA-500, DNA-1000, DNA-2500, and DNA-12000), and one type for RNA analysis Five types in total
Size Range	DNA-500 kit : 25 bp to 500 bp DNA-1000 kit : 100 bp to 1,000 bp DNA-2500 kit : 100 bp to 2,500 bp DNA-12000 kit : 100 bp to 12,000 bp RNA kit : Up to 28S rRNA (4.7 knt to 5.0 knt)
Sizing Resolution	DNA-500 kit : 5 bp (25 bp to 100 bp), 5 % (100 bp to 500 bp) DNA-1000 kit : 5 % (100 bp to 500 bp), 10 % (500 bp to 1,000 bp) DNA-2500 kit : 10 % (100 bp to 1,000 bp), 20 % (1,000 bp to 2,500 bp) DNA-12000 kit : 10 % (100 bp to 1,000 bp), 20 % (1,000 bp to 12,000 bp)
Sizing Accuracy	DNA-500 kit : ±5bp (25 bp to 100 bp), ±5 % (100 bp to 500 bp) DNA-1000 kit : ±15 % (100 bp to 1,000 bp) DNA-2500 kit : ±15 % (100 bp to 2,500 bp) DNA-12000 kit : ±15 % (100 bp to 12,000 bp)
Quantitative Range	DNA analysis: 0.5 ng/µL to 50 ng/µL (10 mM Tris-HCl buffer containing 50 mM KCl, 1.5 mM $MgCl_2$) RNA analysis: 25 ng/µL to 500 ng/µL (Total RNA), 25 ng/µL to 250 ng/µL (mRNA) (10 mM Tris-HCl buffer containing 1 mM EDTA)
Quantitative Accuracy	DNA-500 kit: ±30% (10 mM Tris-HCl buffer containing 50 mM KCl) DNA-1000 kit: ±30% (10 mM Tris-HCl buffer containing 50 mM KCl) DNA-2500 kit: ±30% (10 mM Tris-HCl buffer containing 50 mM KCl) DNA-12000 kit: ±40 % *2 (10 mM Tris-HCl buffer containing 50 mM KCl)
Quantitative Repeatability	RNA analysis: CV 10 % max. (CV 20 % max. for 150 ng/µL or higher of total eukaryotic RNA)
Maximum Salt Concentration	DNA analysis: Maximum 10 mM Tris containing 125 mM KCl (NaCl) RNA analysis: Maximum 10 mM Tris containing 1 mM EDTA
Limit of Detection	DNA analysis: 0.2 ng/µL (10 mM Tris-HCl buffer containing 50 mM KCl, 1.5 mM $MgCl_2$) RNA analysis: 5 ng/µL (Total RNA), 25 ng/µL (mRNA) (10 mM Tris-HCl buffer containing 1 mM EDTA)
Sample Container	96-well plate • Applied Biosystems: MicroAmp® Optical 96-well Reaction Plate (Part No. N801-0560) • ABgene: PCR plate (Part No. AB-0600) 8-strip tube (no caps) • Applied Biosystems: MicroAmp® Strip Tubes (8 tubes/strip) (Part No. N801-0580) • ABgene: Strips of 8 Thermo-Tubes (Part No. AB-0452) • ABgene: 8 Low Profile Thermo-Strip (Part No. AB-0771)*3 12-strip tube (no caps) • ABgene: Strips of 12 Thermo-Tubes (Part No. AB-1112) • ABgene: 12 Low Profile Thermo-Strip (Part No. AB-0847)*3 Single-strip tube (no caps) • Applied Biosystems: MicroAmp® Reaction Tubes (Part No. N801-0533)
Aluminum Seal	ABgene: PCR foil seal #0626 (adhesive seal)

Required Sample Volume	DNA analysis: • Premix mode : 2 μL to 10 μL (6 μL to 30 μL after mixing with marker solution) • On-chip mixing mode : 5 μL to 30 μL RNA analysis: • Premix mode : 3 μL to 15 μL (6 μL to 30 μL after mixing with marker solution)

*1 The above specifications have been verified with standard samples and analysis conditions prescribed by Shimadzu. There are cases where these specifications will not be satisfied due to the sample for analysis and specified analysis conditions.

*2 The quantitative accuracy of the DNA-12000 kit is based on verification at 200 to 12000 bp.

*3 Since the tubes have tabs at both ends, they cannot be used with the extra sample stand.

■ Hardware

MCE-202 MultiNA

Number of Microchips Installed	Up to four microchips
Maximum Number of Samples	108 samples (96 samples + extra 12 samples)
Maximum Number of Analyses per Analysis Schedule	120 analyses (multiple analyses are possible with the extra sample stand)
Size and Weight of Instrument	W415 × D545 × H508 mm, 43 kg
Power Supply	100 V AC to 120 V AC / 220 V AC to 240 V AC, 300 VA max.
Usage Conditions	Temperature: 18°C to 28°C, Temperature fluctuations: 10°C/hr max., RH: 40 % to 80 % No condensation
Detection System	Fluorescence, filter spectrum (cuton wavelength 525 nm)
Light Source	Blue LED
Detector	PMT
Temperature Control	37 °C
Power Supply for Electrophoresis	Max. rated voltage 1.5 kV, maximum current 250 μA
Separation Buffer Filling	Offline filling using air cylinder pressurization

PC Requirement

OS	Windows® XP Professional SP2 or later (English/Japanese versions) 32-bit version Windows® 7 Professional (English/Japanese versions) 32-bit version
CPU	Intel® Pentium® III processor or equivalent, 1 GHz min.
Memory	Windows XP: 512 MB min. Windows 7: 1 GB min.
HDD	40 GB min.
Display	1,024 × 768 pixel min. resolution
LAN port	100Base-TX: 1 port min. (Expansion LAN ports are required if connected to LAN since 1 port is dedicated for MultiNA control.)
Other	CD-ROM drive (required for installation), printer (B/W or color)

■ Software

MultiNA Control Software

Analysis	Analysis schedule creation, real-time control, automatic analysis pretreatment, automatic analysis post-treatment, automatic error processing
Display Monitor and Log	Real-time display, analysis log management, management of consumables and maintenance parts usage record
Maintenance Service	Analysis performance check, and inspection following replacement of consumables
Data Formats	Proprietary data format. Analysis sample information can be imported in CSV or EXCEL format.

Data Analysis Software MultiNA Viewer

Data Analysis	Size estimation, concentration quantitation, data manipulation of automatic analysis results
Data Display	Gel image, electropherogram list and detailed display, peak tables, RNA report display
Output	Analysis information, gel images, electropherograms, and analysis results can be printed in various layouts, and exported in CSV format.
Utilities	Data searches, display of inspection results for analysis performance

1.5 Operating Principles

1.5.1 Flow of Automatic Analysis

The MultiNA automatically executes the following operations when analysis is started.

Initial Checks and Analysis Preparation

- The following items are checked before proceeding to analysis.
  - Mounted state of the sample plate holder
  - Presence of chips
  - Residual volume of reagent (separation buffer/marker)
- The following instrument preparation is executed.
  - Probe rinsing
  - Chip conditioning

Pretreatment

- The following pretreatment is executed for each analysis.
  - Microchip channel and reservoir rinsing
  - The separation buffer filling to the channels and dispensing to the reservoir
  - Dispensing sample/marker solution to reservoir No. 1.

Sample Loading

Voltage is applied to the microchip and the sample is introduced to the loading channel from reservoir No. 1.

Electrophoresis Separation/Detection

The direction of the voltage applied changes.
Part of the sample introduced to the loading channel is diverted into the separation channel and moved in the direction of the detector. This part of the sample undergoes separation in the separation channel while combining with the dye in the separation buffer. The detector detects fluorescent signals (excited by LED) using the confocal optical system.

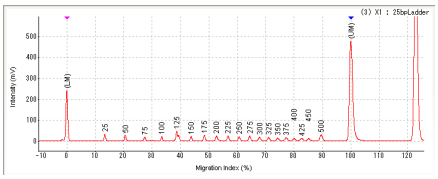
Post Treatment

The microchip, sample probe, and aspirator are rinsed.

1.5.2 Analysis and Data Processing

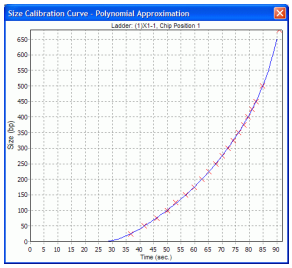
In MultiNA, the standard sample used to create the size calibration curve is referred to as a "ladder". First, the ladder is analyzed to create a calibration curve. Next, the sample is analyzed and size and concentration values are determined based on the created calibration curve.

Step 1: Ladder analysis *(P.64)*



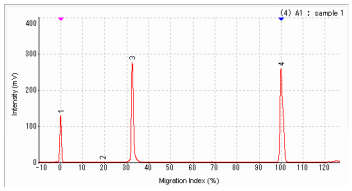
The ladder is analyzed on each microchip.

Step 2: Size calibration curve creation *(P.173)*



A size calibration curve is calculated for each microchip, based on the fragments contained in each ladder and their migration times.

Step 3: Sample analysis *(P.69)*



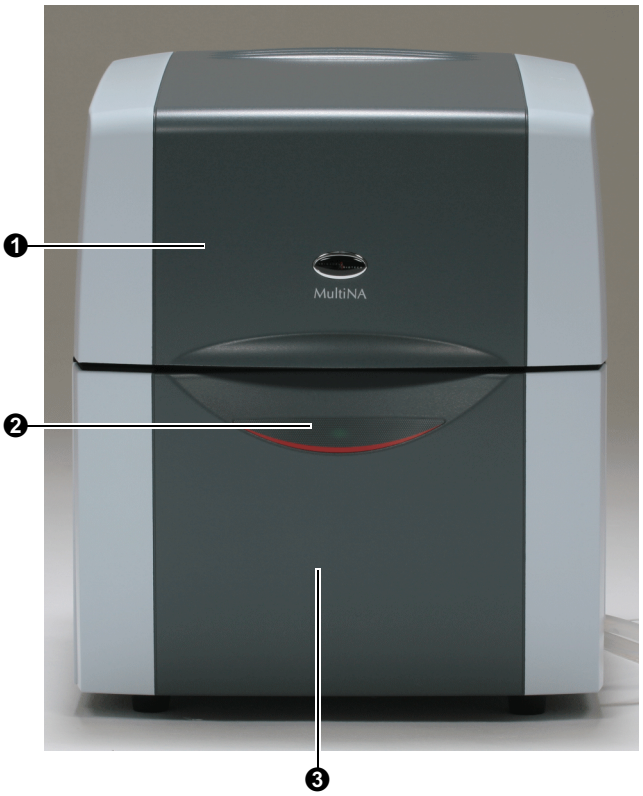
The sample is analyzed. The size of the fragments contained in the samples is predicted based on the size calibration curve. Fragment concentration is also quantified from the peak area and marker area.

NOTE

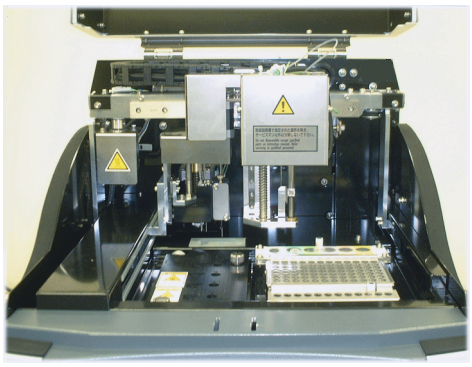
When multiple ladders are analyzed at the same chip position, the latest ladder data is used in sample data analysis.

1.6 Instrument Description

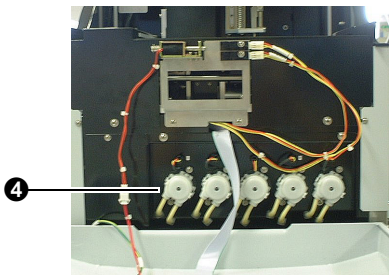
■ Front



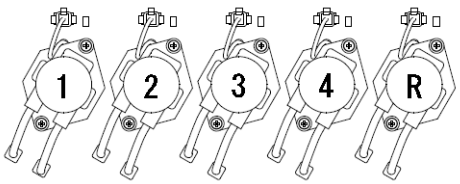
Top Cover Closed



Top Cover Opened



Front Cover Opened



Peristaltic Pump Names

No.	Item	Explanation
❶	Top cover	Opening and closing cover on top of the instrument. During operation the top cover is locked and cannot be opened.
❷	Indicators	LED indicators on the front of the instrument.
❸	Front cover	Cover on the bottom front of the instrument. This cover is removed for replacement of the peristaltic pumps and their cartridges.
❹	Peristaltic pump	This is the suction pump at the bottom front of the instrument. Five peristaltic pumps are arranged inside the front cover. Four of these (Nos. 1 to 4) correspond to the respective reservoir numbers. They suction out the buffer and sample within the reservoirs. The remaining pump (R) is used to supply water to the rinse pool.

Top Cover

⚠ WARNING

- Do NOT forcibly open the top cover during instrument operation (blinking green LED on front indicator).
  During operation the top cover is locked and cannot be opened.
- Do NOT apply lateral force to the top cover when opening or closing.
  This may deform the top cover and result in damage.
- Do NOT remove the top cover.
  Injury or accident may occur.
- If the top cover cannot be opened or closed properly, contact your Shimadzu service representative.
  A field engineer from Shimadzu will perform repairs.

The top cover must be closed to start analysis, automatic rinsing and other operations. During operation the top cover is locked and cannot be opened.

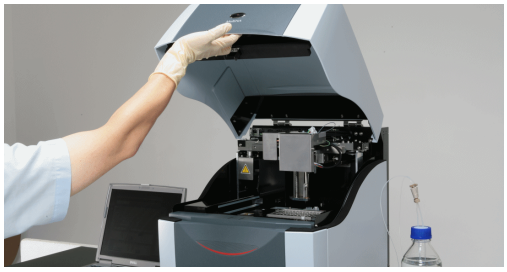
This instrument uses the following interlock systems as a safety mechanism.

- Commands from the PC to start analysis or other operations are only received if the top cover is closed.
- Voltage is only applied if the top cover is closed.
- The drives only operate if the top cover is closed.
- The top cover is locked when voltage is applied and during operation of the drives.
- If the top cover is accidentally opened during operation, the application of high voltage and the operation of mechanisms will stop immediately.

Opening the Top Cover

The top cover uses a "free-stop" mechanism, to stop the cover when it reaches an opening angle of approximately 60°. When the top cover is fully open, the instrument height is 98 cm.

Hold the front of the top cover and lift it upwards, confirm that the top cover will remain stationary, and then let go.

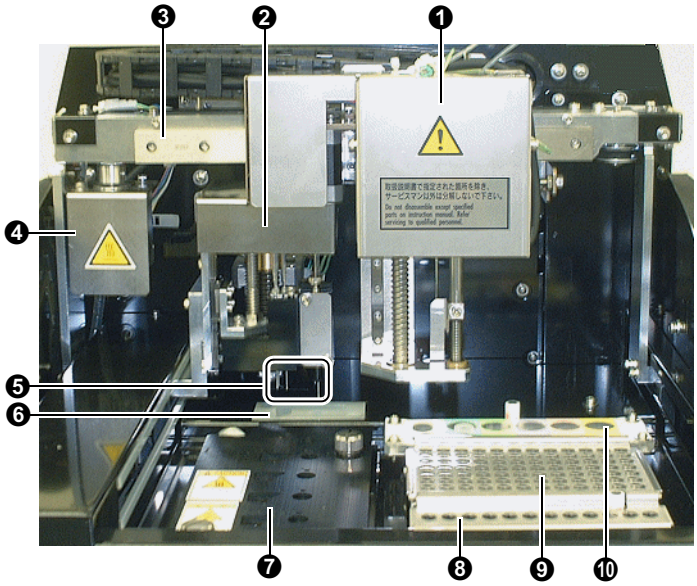


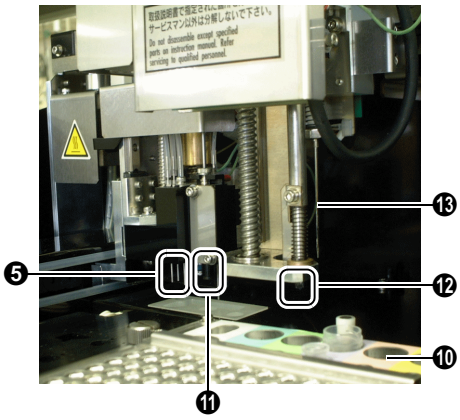
Indicators

The instrument's green LED indicator blinks during analysis, automatic rinsing, and other operations. The following conditions are indicated by the combination of LED color and lit/blinking status.

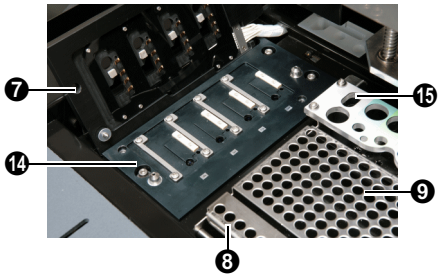
Type of LED	Operation	Details
Green (center)	Blinking (0.3 second interval)	Initializing after power is turned ON
	Blinking (1 second interval)	Operating
	Lit	Normal standby
Red (both sides)	Lit	An error has occurred (stays lit until the error is reset).

■ Internal Parts





Bottom of Autosampler, Bottom Right



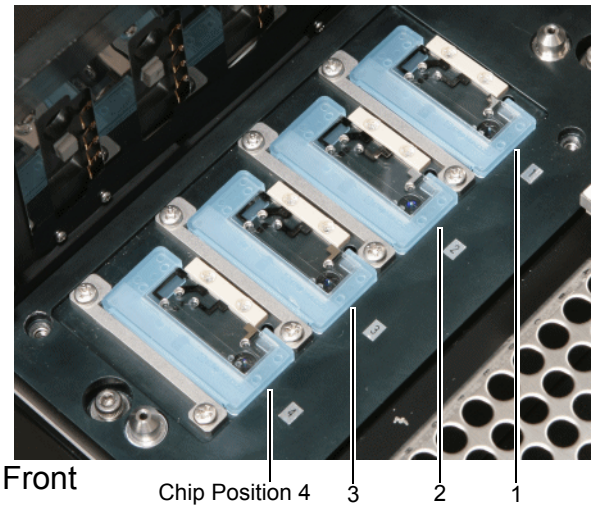
Chip Cover Opened

No.	Item	Explanation
❶	Autosampler	Dispenses sample, separation buffer, and marker solution to the microchip reservoirs.
❷	Pneumatic unit	Part to which the air cylinder and aspirators are attached.
❸	Autosampler arm	The part to which the autosampler is fastened. Moves the autosampler forward and backward.
❹	Autosampler motor	Moves the autosampler right and left.
❺	Aspirator	Suctions the separation buffer and sample from the microchip reservoirs.
❻	Rinse pool	Where the aspirator is rinsed with rinse water.
❼	Chip cover	Holds the microchips, and is equipped with electrode contacts.
❽	Extra sample stand	Separate from the sample stand, and capable of holding up to 12 samples or ladders. The wells are named X1 to X12.
❾	Sample stand	Where the sample tubes or sample plates are placed.
❿	Reagent holder	Where the separation buffer, marker solution, and probe rinsing solution are placed.
⓫	Air cylinder	Pressurization cylinder that fills the microchips with separation buffer.
⓬	Piercing needle	Pierces the aluminum seal on the sample plate prior to dispensing the sample.
⓭	Sample probe	Dispenses sample, ladder, and separation buffer to the microchips.

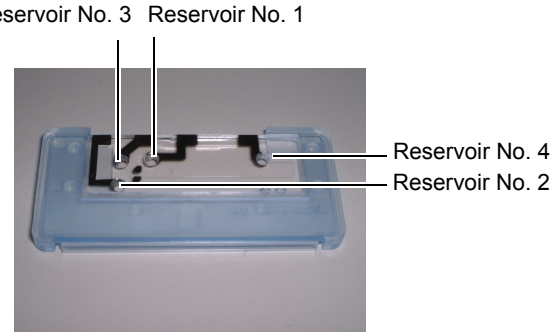
No.	Item	Explanation
⓮	Chip stage	The base used to install microchips A temperature control function is installed in the stage.
⓯	Rinse port	Where the sample probe is rinsed with rinse water.

Chip Stage and Microchips

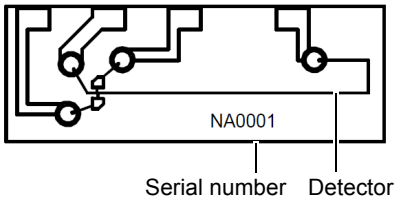
The microchips are made of quartz and up to four microchips can be used with a single instrument.



Chip Stage



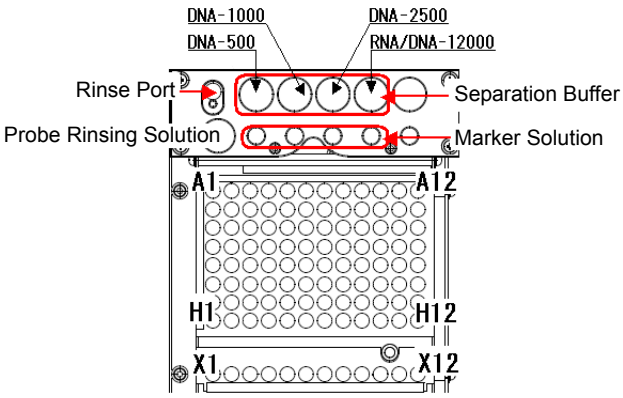
Microchip



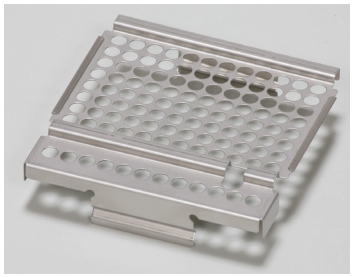
Channel Pattern Diagram

Reagent Holder, Sample Stand, and Extra Sample Stand

The sample plate or sample tube set in the sample stand and extra sample stand are held down from above.

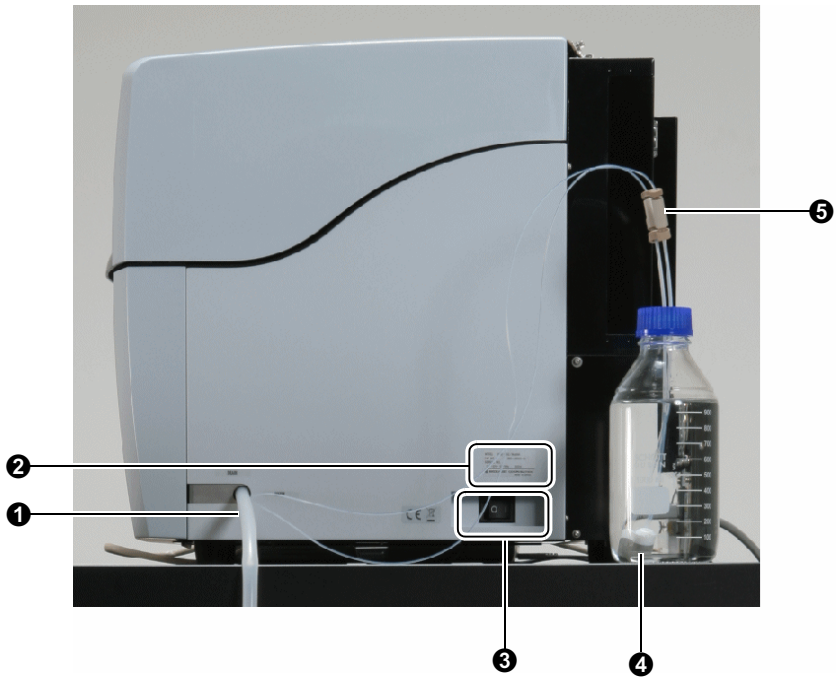


Reagent Holder, Sample Stand, and Extra Sample Stand



Sample Holder

■ Right Side



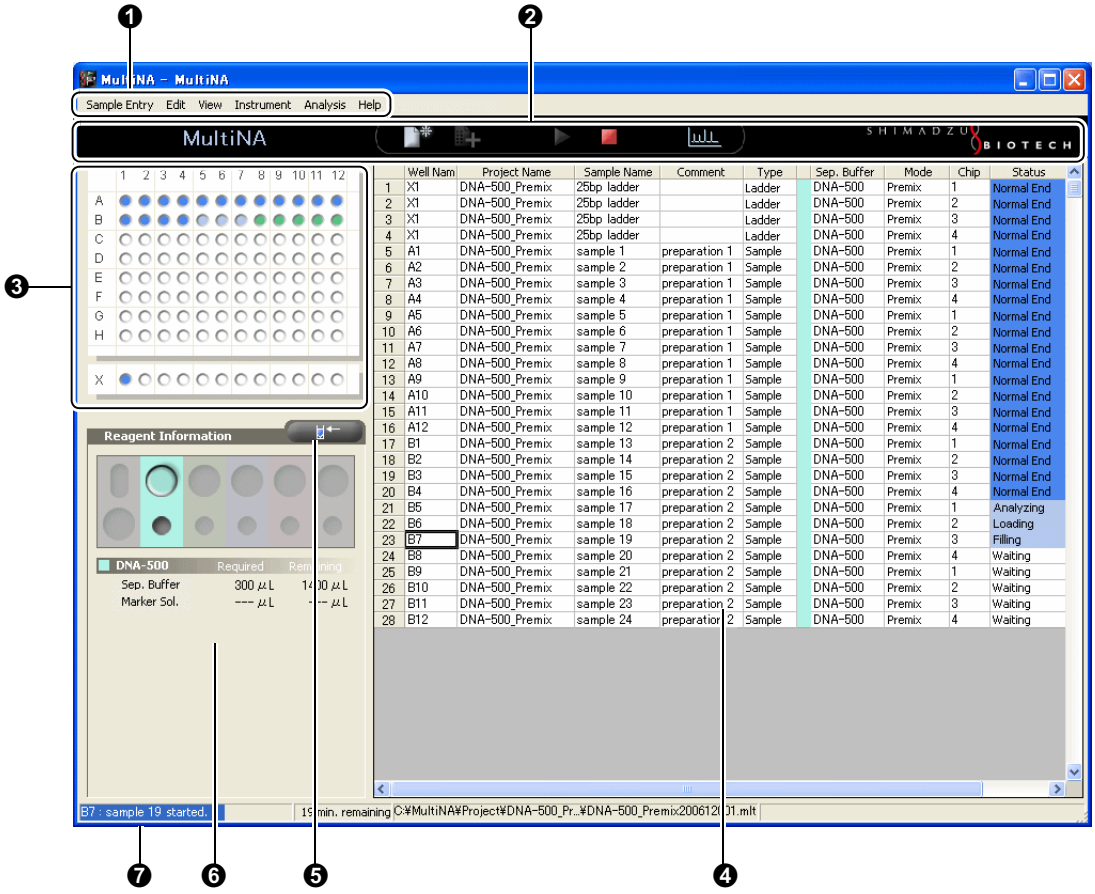
No.	Item	Explanation
❶	Drain tube	Delivers waste fluid discharged from the instrument to the waste container.
❷	Serial number label	Indicates the instrument's model and serial number.
❸	Power switch	Turns the instrument ON/OFF.
❹	Suction filter	Filter at the end of the water line.
❺	Water line	Tubing between the instrument and the glass rinse water bottle.

■ Rear

No.	Item	Explanation
❶	Syringe cover	Syringe pump cover The syringe pump is located inside the cover. Open to replace the syringe or the plunger.
❷	AC adapter with fuse box	Fuse location
❸	Power supply connector	Where the power cable is inserted.
❹	Screws for transportation fixtures	Holds the 3 types of transportation fixtures to the rear of the instrument.
❺	Transportation fixtures	Fasten the autosampler, arm, and pneumatic unit respectively.
❻	LAN port	Where the cable connecting the instrument and PC is inserted.

1.7 Main Window of MultiNA Control Software

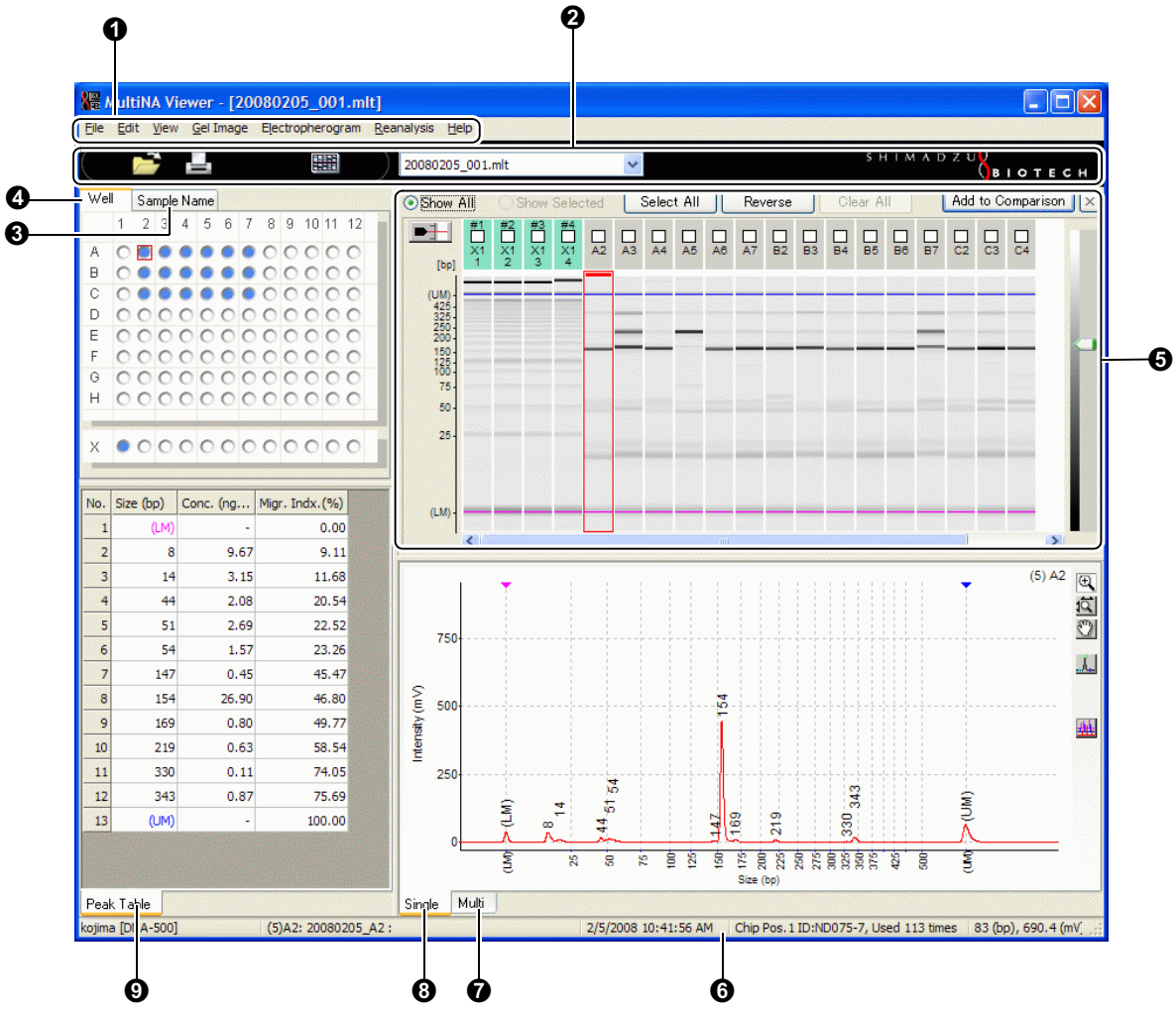
This window is displayed when the MultiNA control software starts (hereafter referred to as the MultiNA window).



No.	Name	Reference
❶	Menu bar	*"4.1.1 Menu Bar" P.74*
❷	Toolbar	*"4.1.2 Toolbar" P.75*
❸	Well status display	*"4.1.3 Well Status Display" P.75*
❹	Analysis schedule list	*"4.1.4 Analysis Schedule List" P.76*
❺	Detect Remaining Reagent Amount button	*"4.1.5 Detect Remaining Reagent Amount Button" P.76*
❻	Reagent information	*"4.1.6 Reagent Information" P.77*
❼	Status bar	*"4.1.7 Status Bar" P.77*

1.8 Main Window of MultiNA Viewer

This window is displayed when the data analysis software, MultiNA Viewer, starts (hereafter referred to as the Viewer window).



No.	Name	Reference
❶	Menu bar	*"5.1.1 Menu Bar" P.126*
❷	Toolbar	*"5.1.2 Toolbar" P.128*
❸	Sample name tree	*"5.1.5 Sample Name Tree" P.129*
❹	Well display	*"5.1.4 Well Display" P.129*
❺	Gel image	*"5.1.6 Gel Image" P.129*
❻	Status bar	*"5.4.3 Status Bar" P.166*
❼	Electropherogram (Multi)	*"5.1.10 Electropherogram (Multi)" P.137*
❽	Electropherogram (Single)	*"5.1.9 Electropherogram (Single)" P.135*
❾	Peak table	*"5.1.7 Peak Table" P.133*

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2 Before Analysis

This chapter explains the microchip used with the MultiNA as well as reagents and mixing marker solution.

2.1 Microchip

Up to four chips may be used with a single MultiNA instrument. The more chips used, the shorter the time required for the overall analysis schedule.

For details on the microchips, refer to the instruction manual included with the product.

Part Name	Part No.	Specification
Microchip Type WE-C Type WT	S292-36000-91 S292-36010-41	Material: High purity synthetic quartz

- A record of the number of runs is managed by the serial number (chip ID) in the software.
- The chip ID is stamped on the surface of the microchip, and is also listed in the instruction manual that comes with the microchip (indicated on the right side of S/N.)
- The microchip is composed of a quartz microchip and a plastic protective frame (chip frame).

NOTE

Shimadzu recommends only using a single type of dye per microchip.

- Continuous usage of different dye types (such as SYBR® Gold, SYBR® Green II, GelStar®) may have an adverse effect on analysis results.
- When changing the type of dye used for a microchip, refer to the following procedure to wash the microchip.

Reference

"11.6 Changing the Type of Dye to Be Used" P.293

If the separation performance of a microchip has deteriorated, perform chip cleaning using the dedicated washing fluid.

Part Name	Part No.	Specification
Chip cleaning kit -RA	S292-35925-91	250 mL, main constituent: ethanol

For information on the chip cleaning method, refer to the following references or the instruction manual included with the chip cleaning kit.

☞ Reference

"3.5.5 Chip Cleaning Solution Placement" P.50, *"6.2.9 Chip Cleaning" P.209*

2.2 Reagent Kit

The reagent kit comprises DNA analysis kits (four types) and an RNA analysis kit (one type). The customer must provide dyes and ladders in addition to the reagent kit.

☞ Reference

"10.3 Reagents and Apparatus Required for Analysis" P.281

Part Name	Part No.	Specification (Size Range)
DNA-500 KIT ASSY	S292-27910-91	DNA-500 kit (25 bp to 500 bp*)
DNA-1000 KIT ASSY	S292-27911-91	DNA-1000 kit (100 bp to 1,000 bp*)
DNA-2500 ASSY	S292-27912-91	DNA-2500 kit (100 bp to 2,500 bp*)
DNA-12000 ASSY	S292-36600-91	DNA-12000 kit (100 bp to 12,000 bp*)
RNA KIT ASSY	S292-27913-91	RNA kit (28S rRNA: Up to 4.7 knt to 5.0 knt*)

*bp: Size unit of double-strand DNA. "bp" is an abbreviation for "base pair." nt: Size unit of RNA. "nt" is an abbreviation for "nucleotide."

■ Contents of the DNA Kit

The DNA-500/1000/2500/12000 kits are composed of the following items. When the kit is delivered, immediately open it, check the part names and quantity, and then store them at the temperatures specified for each part.

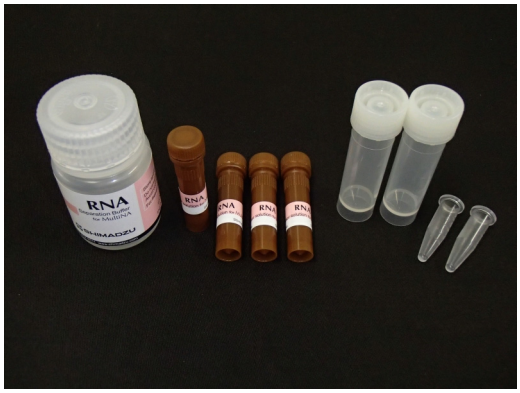
No.	Part Name	Volume	Quantity	Remarks
❶	Separation buffer	30 mL	1	Refrigerated storage at 2°C to 8°C (PP bottle) (Up to 1000 analyses)
❷	Marker solution	1.2 mL	4	Frozen storage at -20°C (Aluminum pack) (Up to 1000 analyses)
❸	Buffer bottle	(5 mL)	1	Separation buffer dispensing container (with cap)
❹	Vial	(0.6 mL)	2	Marker solution dispensing tube (without cap)
❺	Manual	-	1	-

NOTE

- Expiration dates are noted on the labels. Use reagent before its expiration date.
- Store separation buffer in refrigeration at 2 to 8°C. Do NOT put separation buffer in frozen storage.
- If undissolved substances, dust, or salt residue on the cap get inside the buffer bottle, salt precipitation can collect on the bottom of the bottle.
- Do NOT use reagent kits with salt precipitation inside their containers. Use a new reagent kit.
- When repeating schedules with a small number of analyses, the number of analyses per reagent kit may fall below 1000.
- When analyzing restriction enzyme digests, inactivate the enzyme activity according to the manufacturer's instruction. If any enzyme activity remains, components in the marker solution will degrade and this may prevent normal performance from being achieved.
- Avoid excessive agitation of the marker solution using vortex mixers, etc. Components in the marker solution will degrade and this may prevent normal performance from being achieved.

■ Contents of the RNA Kit

The RNA kit is composed of the following items. When the kit is delivered, immediately open it, check the part names and quantity, and then store them at the temperatures specified for each part.



No.	Part Name	Volume	Quantity	Remarks
❶	RNA separation buffer	30 mL	1	Refrigerated storage at 2°C to 8°C (PP bottle) (Up to 1000 analyses)
❷	RNA marker solution	1.2 mL	4	Frozen storage at -20°C (Aluminum pack) (Up to 1000 analyses)
❸	Buffer bottle	(5 mL)	2	Separation buffer and probe rinsing solution dispensing container (with cap)
❹	Vial	(0.6 mL)	2	Marker solution dispensing tube (without cap)
❺	Manual	-	1	-

NOTE

- Expiration dates are noted on the labels. Use reagent before its expiration date.
- Store separation buffer in refrigeration at 2 to 8°C. Do NOT put separation buffer in frozen storage.
- If undissolved substances, dust, or salt residue on the cap get inside the buffer bottle, salt precipitation can collect on the bottom of the bottle.
- Do NOT use reagent kits with salt precipitation inside their containers. Use a new reagent kit.
- When repeating schedules with a small number of analyses, the number of analyses per reagent kit may fall below 1000.

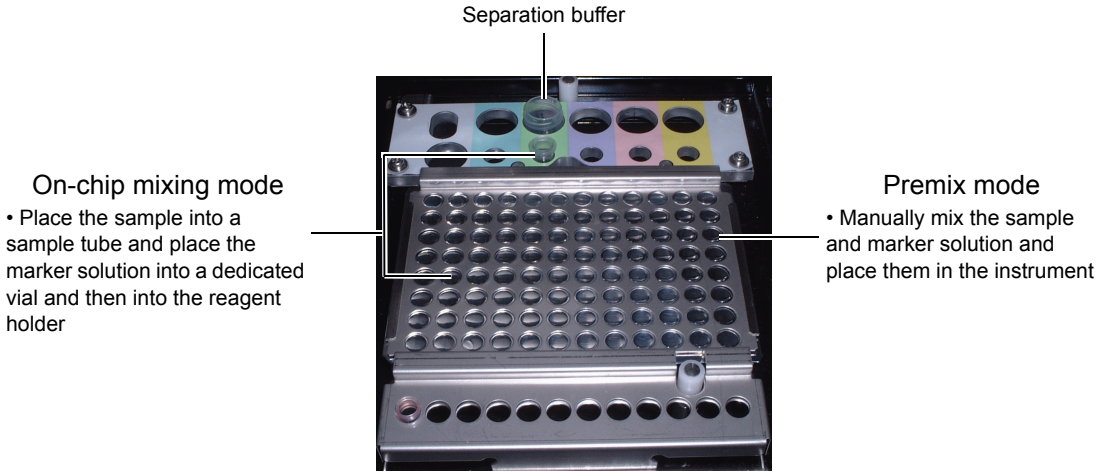
2.3 Mixing the Marker Solution

This instrument mixes an internal standard substance (marker), required for high-precision sample sizing and quantitation, with a ladder or sample and then performs analysis. The marker solutions in the DNA analysis kits include two types of markers, a lower marker and an upper marker. The marker solution in the RNA analysis kit includes only the lower marker.

The following two methods (marker mixing modes) are used for mixing the marker solution into the ladder or sample.

On-chip mixing mode	The ladder or sample is automatically mixed with the marker solution in a reservoir on the microchip. This method involves placing the ladder or sample into a sample tube (or sample plate) and placing the marker solution into a dedicated vial and then into the reagent holder.
Premix mode*	This method involves manually mixing the sample and marker solution and then placing them in the instrument.

* In RNA analysis only the premix mode is used.



Characteristics of the two modes are shown below.

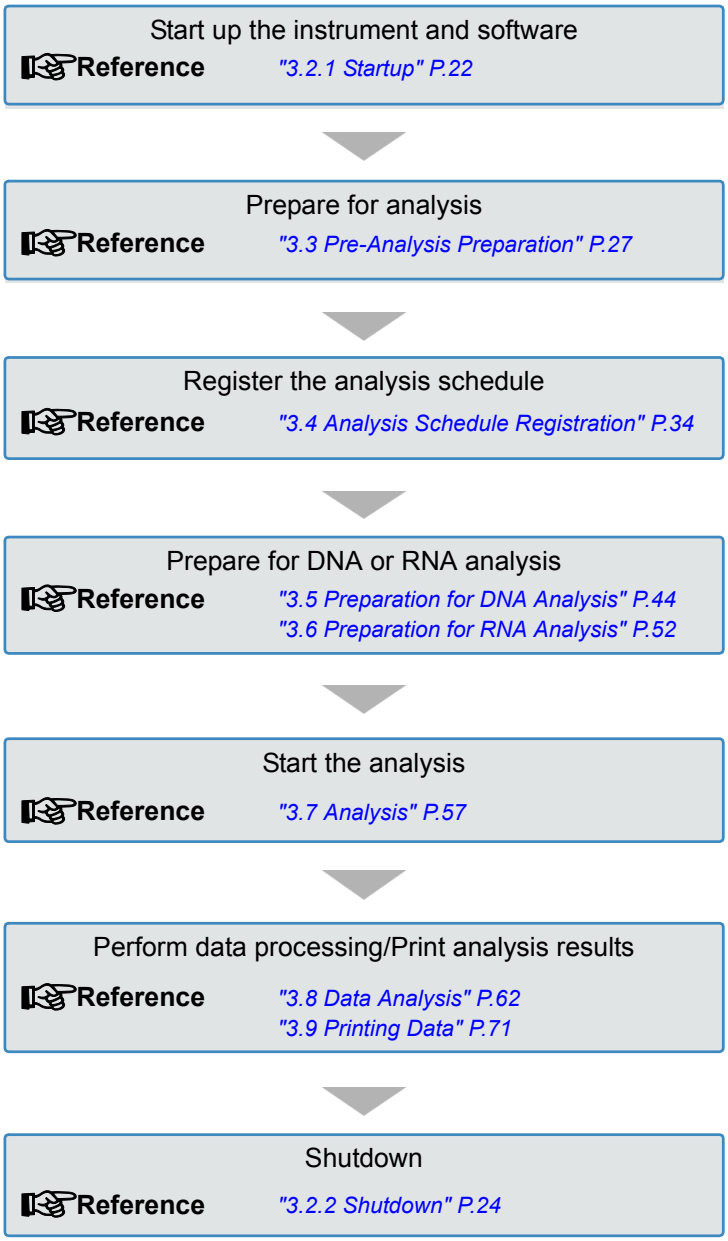
The sample for preparation, required volume of marker solution, and preparation method differ depending on the type of marker mixing mode.

Mixing Mode	On-Chip Mixing	Premix
Mixing method	Automatic (mixed inside microchip reservoir No.1)	Manual mixing
Minimum required sample or ladder solution volume	5 μL to 30 μL (sample/ladder solution only)	DNA: 2 μL to 10 μL (after mixing in marker solution: 6 μL to 30 μL) RNA: 3 μL to 15 μL (after mixing in marker solution: 6 μL to 30 μL)
Addition of marker solution to sample or ladder	Not required	Required
Marker solution preparation	The marker solution is added to a dedicated vial (0.6 mL tube), and then it is placed in the reagent holder.	Placement in the reagent holder is not required
Features	A sample tube or sample plate for the completed PCR reaction can be placed directly into the instrument and analyzed.	Can perform analysis with a small volume of sample.

3 Basic Operation of Analysis

This chapter explains the how to start up and shutdown the instrument as well as the basic operations required to perform normal analysis.

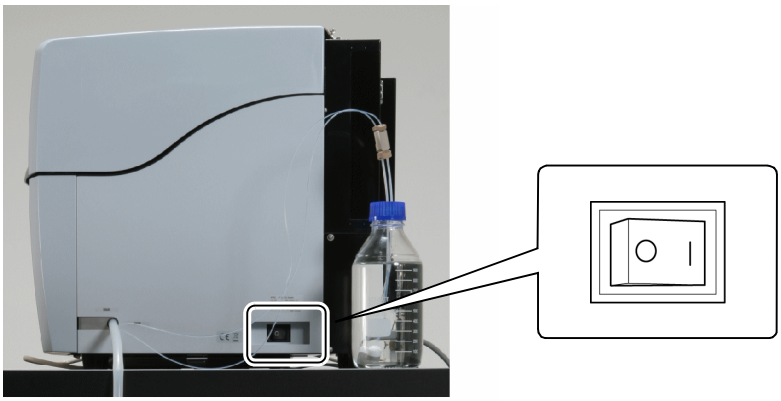
3.1 Flow of Basic Operations



3.2 Startup and Shutdown

3.2.1 Startup

1 **Turn ON the power switch located on the right side of the MultiNA instrument.**



The instrument is initialized. The green LED indicator blinks during initialization.
Once initialization is complete, the green LED stops blinking and becomes constantly lit and a buzzer sounds.

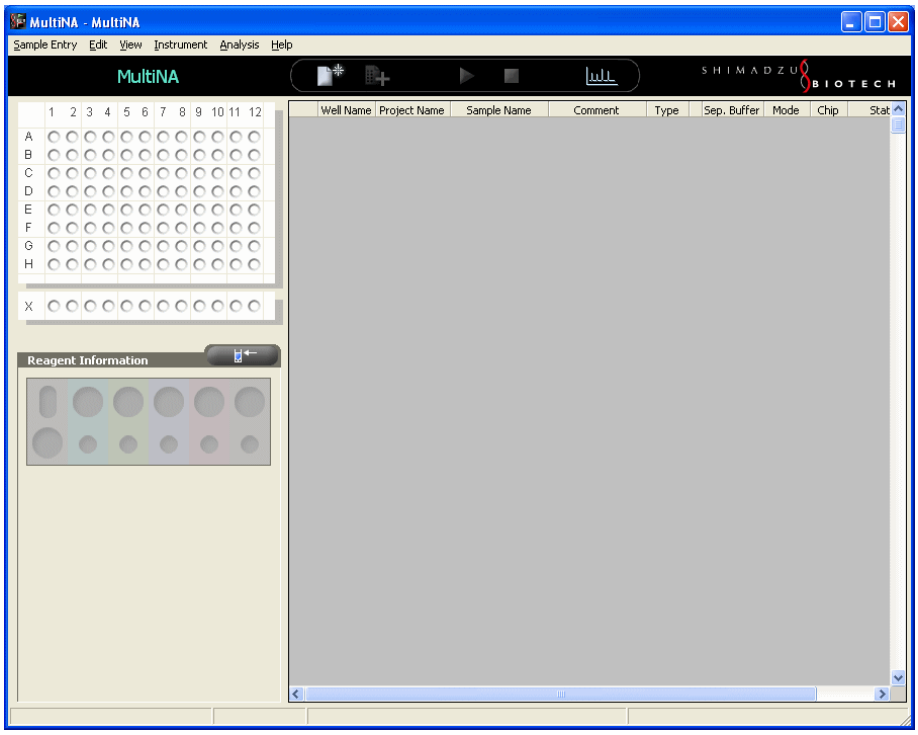
2 **Turn ON the PC.**

3 **Enter your user ID and password to logon to Windows.**

NOTE
Use the same user ID as when the MultiNA software was installed.

4 Double click  (MultiNA Control Software) on the desktop.

The MultiNA Control Software starts up.



NOTE

- The instrument name will be shown at the left end of the toolbar in light blue if the MultiNA instrument and PC are connected. It will be shown in light orange if they are disconnected.

- In the default setting, the PC automatically connects with the instrument at startup.

Reference

"4.1.2 Toolbar" P.75

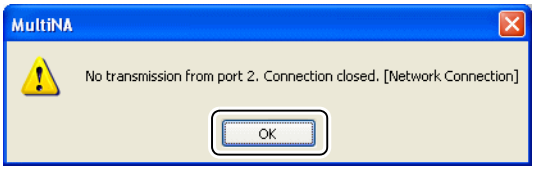
NOTE

If the following window is displayed when starting the MultiNA Control Software program, click [Unblock]. The window will not be displayed from the next startup.

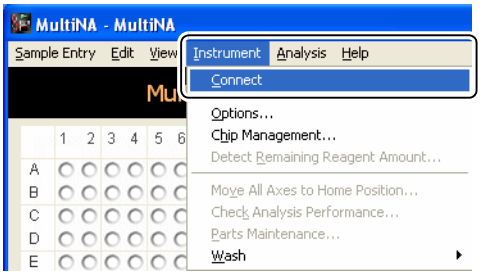
■ When the Instrument and PC Cannot Connect

In the event that the MultiNA Control Software is started before power to the MultiNA instrument is turned ON or settings are configured to prevent connection on startup, a message is displayed indicating that a connection could not be established.

5 **Click [OK].**



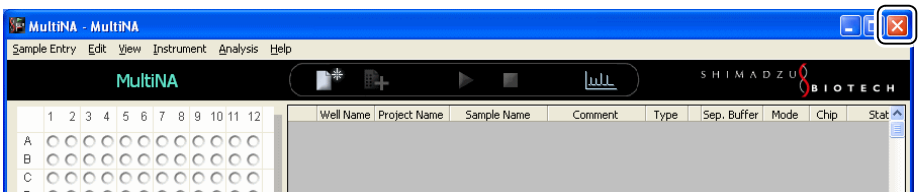
6 **Select [Connect] from the [Instrument] menu on the menu bar.**



The software connects with the instrument and the instrument name on the toolbar changes to light blue.

3.2.2 Shutdown

1 **Click (Close) at the top right corner of the MultiNA window.**

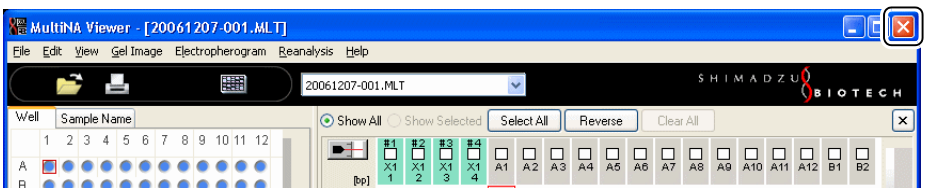


The MultiNA Control Software program closes.

NOTE

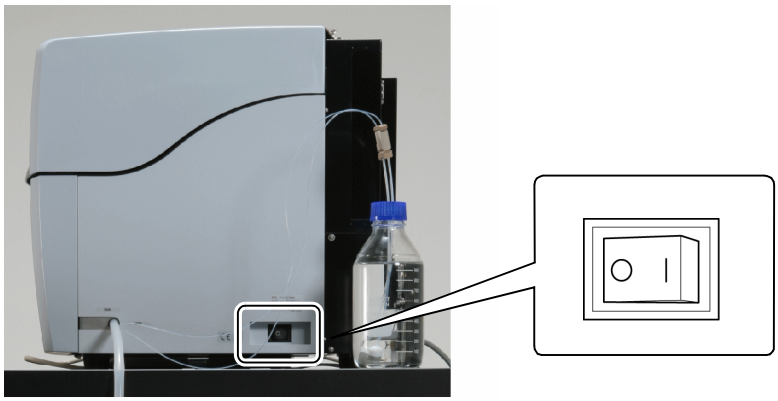
The software cannot be shutdown when analysis or rinsing is in progress.

2 **Click (Close) at the top right corner of the Viewer window.**



The MultiNA Viewer program closes.
This procedure is not required if the MultiNA Viewer program was not started.

3 **Turn OFF the power switch located on the right side of the MultiNA instrument.**

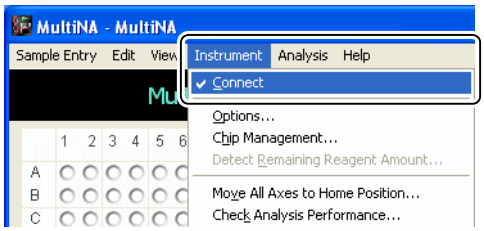


4 **Turn OFF the PC.**

■ Shutting Down the Instrument Only

Use the procedure below to only shut down the instrument for maintenance or other reasons.

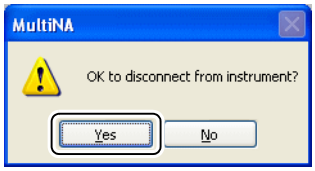
1 **Select [Connect] from the [Instrument] menu in the MultiNA window.**



A message is displayed to confirm whether to close the connection with the instrument.

2 **Click [Yes].**

The instrument name on the toolbar changes to light orange (disconnected).



3 **Turn OFF the power switch on the MultiNA instrument.**

3.2.3 Precautions Regarding Windows

■ Precaution for Stable PC Operation

Depending on the PC operating environment, memory leaks or memory fragmentation may occur if the system is run continuously for long periods of time, resulting in unstable PC operation. To avoid this kind of unexpected Windows-derived problem, either turn OFF the PC or restart the PC at regular intervals (about once a week).

■ Precautions Regarding the Windows Low Power Mode

Windows 7

Never use the sleep function during analysis. Communications with the instrument will be cut and analysis will not be able to proceed. In particular, do not select [Sleep] or [Hibernate] that are displayed in the Start menu.

Windows XP

If you attempt to activate sleep mode during analysis, the message "Cannot put computer on standby or into hibernation." is displayed and the computer does not enter the sleep state.

3.2.4 Precautions Regarding the MultiNA Software

■ Precautions Regarding Software Versions

This instruction manual describes the functions incorporated into the latest version of the MultiNA software. Some of these functions cannot be used in previous versions of the software. Refer to the release notes for the software change log (select [All Programs] - [MultiNA] - [Release Notes] in the Windows start menu).

Always use the latest version of the MultiNA software. Opening data files with a previous version of the MultiNA software may cause problems. Be particularly vigilant when using multiple instances of the MultiNA software.

☞ Reference

"4.7.3 About MultiNA" P.124, *"5.8.2 About MultiNA Viewer" P.195*

■ Precautions Regarding Reagent Information

The "Required" amounts displayed in the [Reagent Information] window of the MultiNA Control Software are the minimum amounts of reagents required to analyze registered samples. When preparing the separation buffer, follow the "Guidelines for Required Volumes of Separation Buffer and Diluted Dye Solution," which is found in *"3.5.1 Diluted Dye Solution and Separation Buffer Preparation" P.44* or *"3.6.1 Diluted Dye Solution and Separation Buffer Preparation" P.52* of the instruction manual.

■ Precautions Regarding Remaining Time

The remaining time displayed in the status bar of the MultiNA Control Software is the estimated remaining time when predetermined conditions are met. The actual operating time may significantly differ from the remaining time when the analysis schedule deviates from predetermined conditions such as the following.

- After an error occurs during the analysis schedule.
- After you stop the analysis schedule.
- You run all chip washing or all chip cleaning when three or less microchips are placed in the instrument. (It is assumed for the remaining time that four microchips are placed in the instrument.)

3.3 Pre-Analysis Preparation

This section describes how to replenish the rinse water, set the waste container, and prepare the microchip.

3.3.1 Replenishing the Rinse Water

Replenish the rinse water.

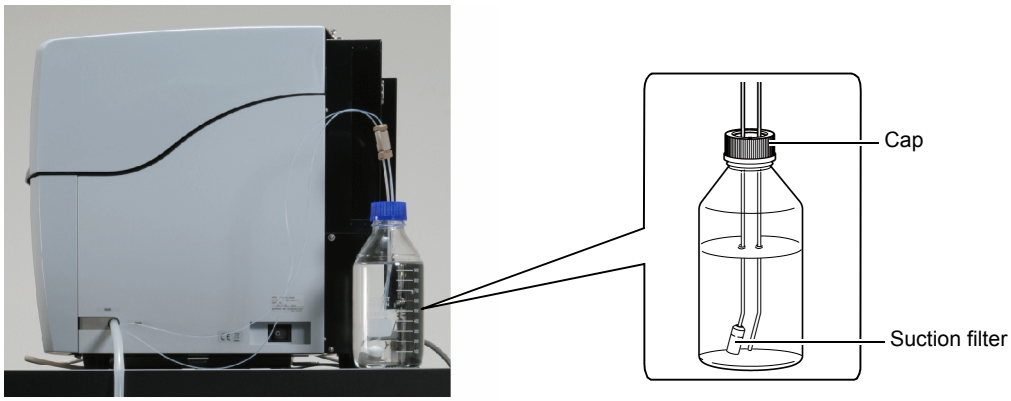
⚠ WARNING

- Uncap the rinse water bottle and fill the bottle away from the instrument.
  Spilled water on the MultiNA instrument risks electrical leak or electrical shock.

⚠ CAUTION

- Only use Milli-Q ultrapure water for the rinse water.
  Use of other types of water could result in defective rinsing or equipment malfunction.
- Before starting analysis, verify that the volume of rinse water in the glass rinse water bottle is sufficient.
  Insufficient rinse water during analysis could result in deteriorated data, clog the microchip so that it becomes unusable, or cause other problems.

1 **Remove the cap from the glass rinse water bottle.**



2 **Replenish the glass bottle with Milli-Q ultrapure water.**

NOTE
Fill the 2000 mL glass rinse water bottle with rinse water until the bottle is full. The amount of rinse water consumption varies depending on the project used, number of rinses, number of times chip cleaning is performed, and instrument state. The amount of rinse water may exceed 2000 mL depending on conditions so refill the rinse water bottle during analysis as necessary.

NOTE
After obtaining water, storing the water for long periods can cause the suction filter to clog. Discard any water that has not been used for 3 days or more and replenish with fresh water.

3 **Reattach the cap and immerse the tip of the suction filter all the way to the bottom of the bottle.**

3.3.2 Checking the Waste Container

Check that the waste container is not full and the liquid waste tube is not bent.
If the waste container is full, discard its contents.

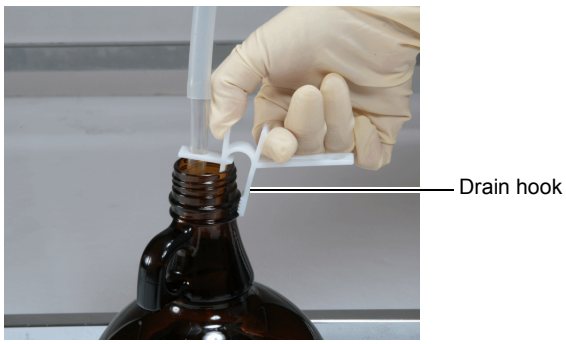
⚠ WARNING

- Always wear protective equipment (protective clothing, gloves, eyewear, and mask) when disposing of waste fluid.
  Waste fluid may contain irritating and harmful chemical substances. If any type of waste fluid makes contact with the eyes or skin, immediately rinse the affected area with large amounts of water and seek medical attention from a doctor and follow their advice.
  If waste fluid is ingested or inhaled by accident, immediately seek medical attention from a doctor and follow their advice.

⚠ CAUTION

- Treat the waste fluid appropriately in accordance with prescriptions or guidelines from the applicable management department.
  In addition to rinse water, waste fluid includes the separation buffer, marker solution, and dye. It will also contain formamide from RNA analysis.
- Discard waste fluid on a regular basis to prevent the waste container from overflowing.
  If the waste tubing becomes clogged, waste fluid may leak from inside the instrument.
- Check the state of the waste container and tube before starting analysis.
  There is a risk that waste fluid may overflow within the instrument.
  - The tip of the liquid waste tube is not immersed in waste fluid in the waste container.
  - There is enough empty space in the waste container.
  - The waste tubing is not bent or elevated.

1 **If waste fluid has accumulated in the container, remove the drain hook attached to the waste container.**

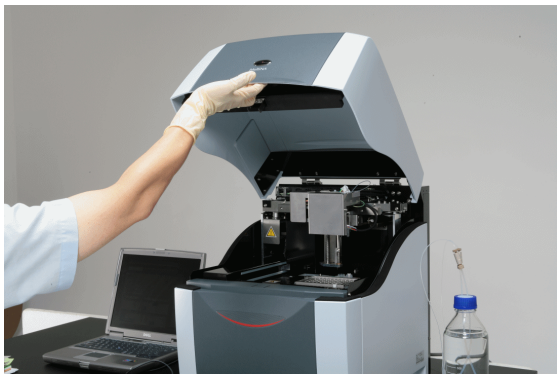


2 **Dispose of the waste fluid accumulated in the waste container.**

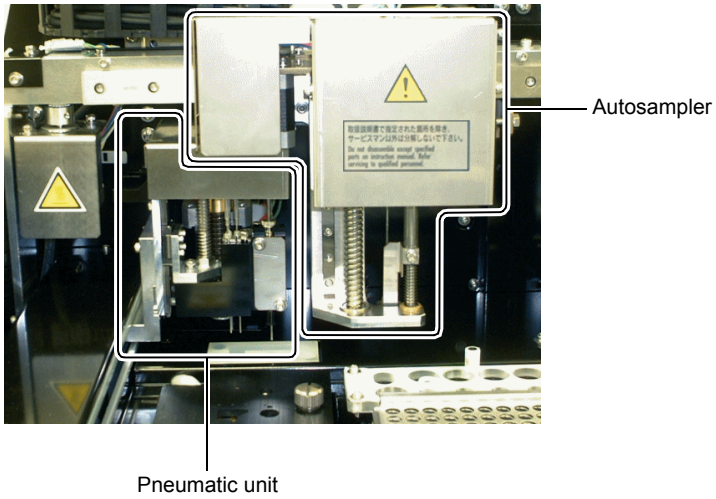
3 **Attach the drain hook to the waste container.**
The waste container is now ready for use.

3.3.3 Drive Positions

1 **Open the instrument top cover.**



2 **Ensure that the drive positions (autosampler and pneumatic unit) are at the back of the instrument (home position) as shown in the figure below.**



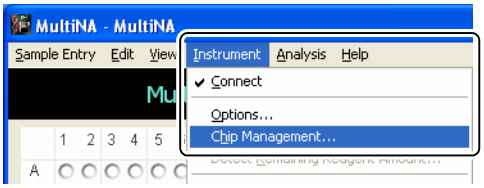
NOTE

If the drives are not positioned at their home position, refer to the procedure described in *"6.1.1 Moving All Axes to Home Position" P.198* to return the drives to their home position (note that the drives do not move to the home position during initialization after power is turned ON).

3.3.4 Microchip Registration

Register microchips and select the microchips to be used in analysis.

1 **Select [Chip Management] from the [Instrument] menu in the MultiNA window.**



The [Chip Management] window is displayed.

2 **Click the [...] (Change) button corresponding to the position of the chip to be installed (chips 1 to 4).**

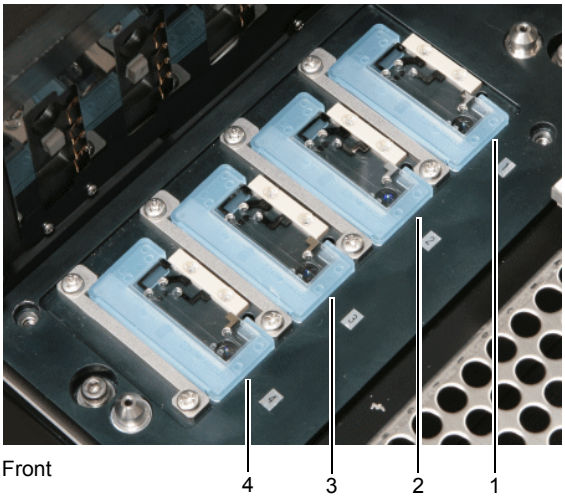
The [Chip # Change] window is displayed.

Reference

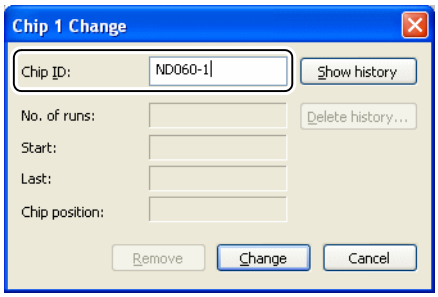
For details, see *"4.5.3 Chip Management" P.110*.

NOTE

The chip positions are arranged in 1, 2, 3 order from the back, with the front-most position being No. 4.

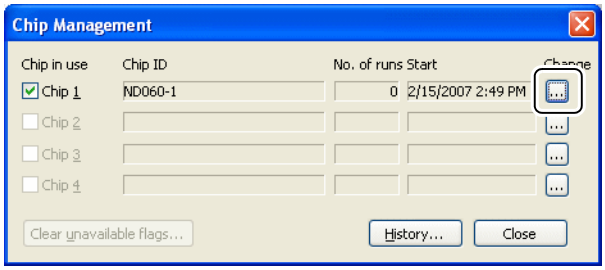


3 **Enter the chip ID (e.g.: ND060-1) into the chip ID column.**



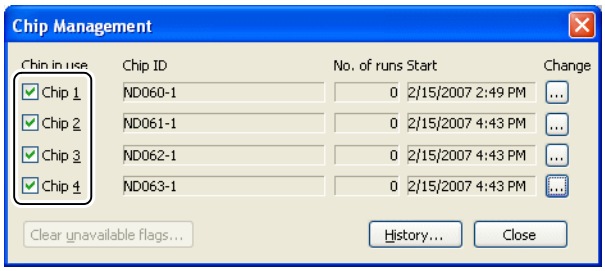
4 **Click [...] (Change).**

The microchip is registered and a check mark appears next to the chip to be used.



5 **Repeat steps *2* to *4* for all of the microchips that will be used.**

6 **Verify that all of the microchips to be used in analysis have been selected.**



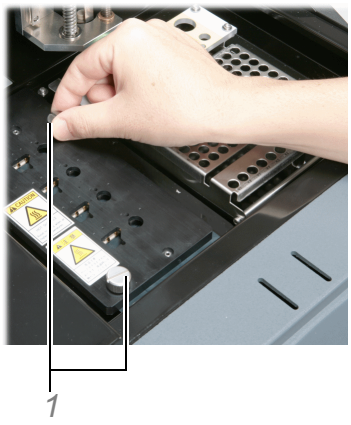
NOTE

Microchips without check marks will not be used in analysis even if they are installed in the instrument.

3.3.5 Microchip Installation

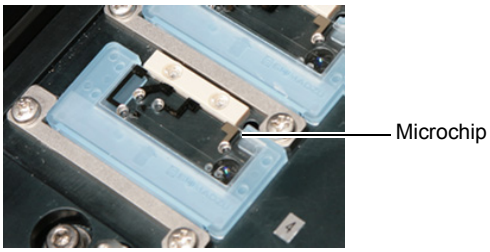
1 **Remove the chip cover.**

> **⚠ CAUTION**
>
> • Do NOT touch the electrode pins in the back of the chip cover.
> Deformed electrode pins may cause defective contact with electrodes on the microchip surface and result in improper voltage application.



1 Loosen the knurled screws (2 locations) on the chip cover.
2 Remove the chip cover and set it upright.

2 **Install the microchips into the chip stage.**



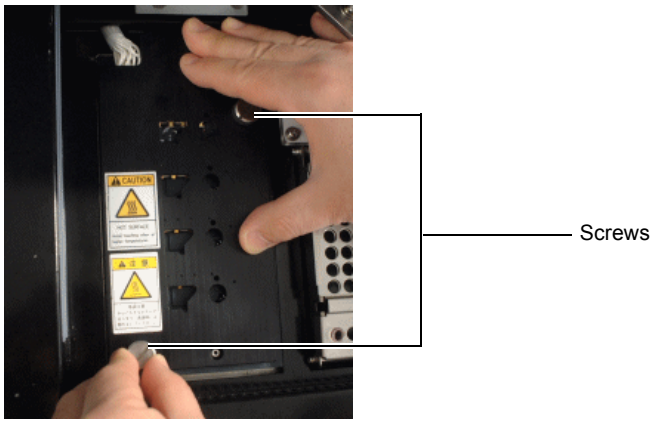
> **⚠ CAUTION**
>
> • Do NOT press too firmly on the quartz section at center of the microchip.
> Doing so could damage the chip.
>
> • Do NOT touch the quartz section at center of the microchip directly with your finger.
> Contamination may cause a decrease in sensitivity.

NOTE

- If the microchip surface shows any trace of leakage, it cannot be used. In this case, contact your Shimadzu service representative.
- Do NOT rub too hard around the reservoir. Doing so could cause lint to fall in the reservoir and clog the flow channels.

3 **Press lightly near the center of the microchip, with microchip cleaning wipes *(P.285)*, to confirm that the microchip is not raised off the stage.**

4 **Close the chip cover and tighten the screws.**



This fastens the chip cover in place.

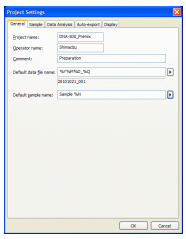
NOTE

- Align the chip cover with the guide pins and close the cover. Use both hands to hold the chip cover in place and tighten the knurled screws.

3.4 Analysis Schedule Registration

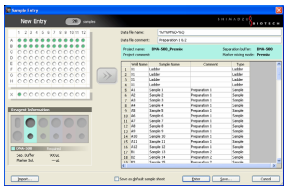
Configure project settings, create a sample sheet, and register the analysis schedule.

Configure a project *(P.35)*



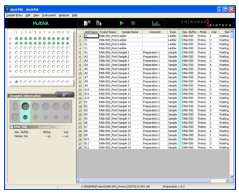
Configure information including the marker solution mixing method (on-chip or premix), default data file name, and graph scale.

Create a sample sheet *(P.38)*



Select the configured project. Using the on-screen well display, enter all the ladder and sample information, such as where ladders and samples are set.

Register an analysis schedule *(P.42)*

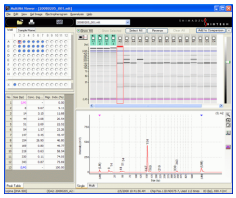


Register the created sample sheet into an analysis schedule.

Prepare for DNA analysis *(P.44)* or RNA analysis *(P.52)*

Perform analysis *(P.57)*

A data file is created *(P.62)*



The data file (raw data/analyzed data) registered in the analysis schedule is created. Inspect the electropherograms of all of the ladders and samples included in the data file. Reanalyze the data, if necessary.

3.4.1 Project Settings

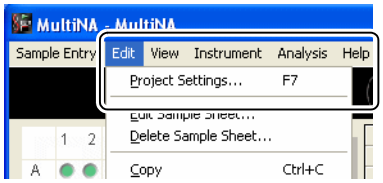
A project* must be configured before registering samples into an analysis schedule.

*A project is used to configure and store information required for analysis, including the reagent kit, marker solution mixing method (on-chip or premix), default data file name, and graph scale.

Reference

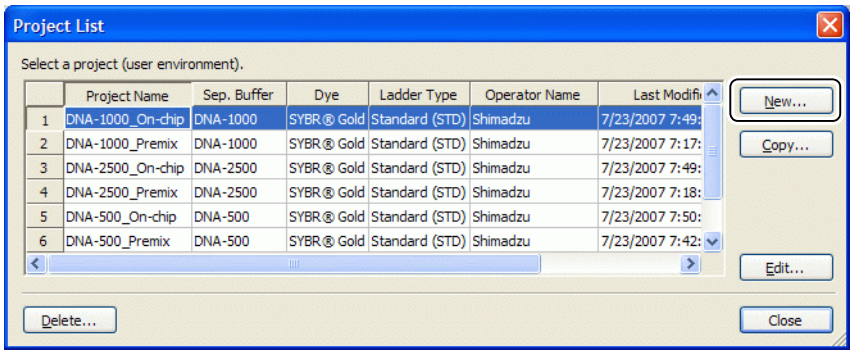
If using a project that is already configured, proceed to *"3.4.2 Sample Sheet Creation" P.38*.

1 **Select [Project Settings] on the [Edit] menu.**



The [Project List] window is displayed.

2 **Click [New].**

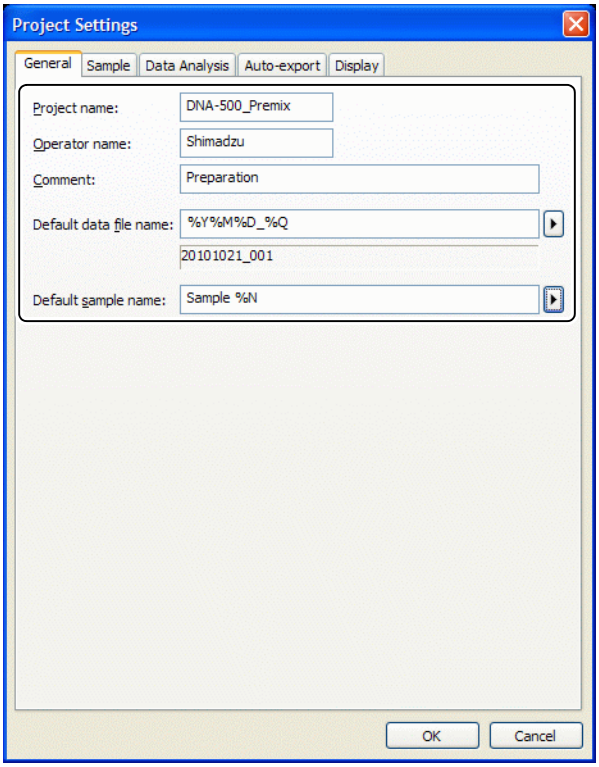


The [Project Settings] window is displayed.

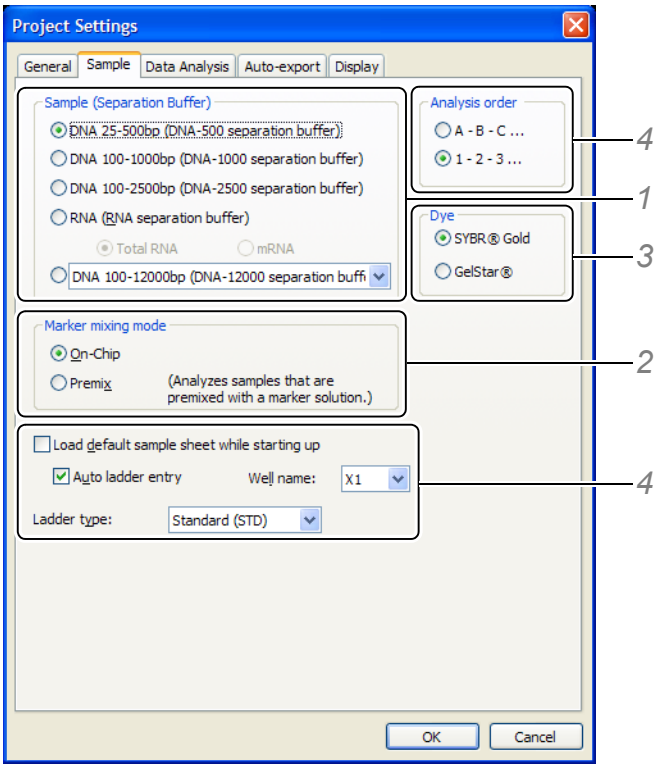
3 Fill in the fields on the [General] tab.

Reference

For details on field settings, see "■ New" P.94



4 Click the [Sample] tab and configure the conditions.



1 Select the type of sample (separation buffer).
2 Select the marker mixing mode (on-chip or premix).
3 When performing DNA analysis, select the type of dye to use.
4 Configure any other conditions.

Reference

For details on the dyes to use, see *"3.5.1 Diluted Dye Solution and Separation Buffer Preparation" P.44*.

NOTE

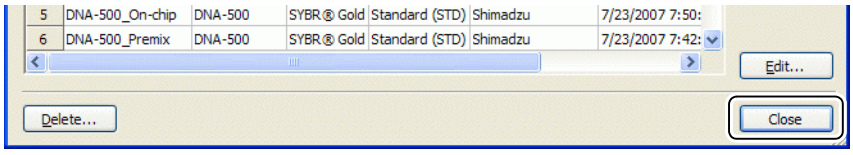
- Ladder analysis is essential for size estimation, quantitation, and other data analysis. (For details, see *"1.5.2 Analysis and Data Processing" P.7*)
- Select the check mark for [Auto ladder entry] and configure the well position for the ladder (X1 to X12).
- The ladder is analyzed once at the start of the sample sheet for all microchips used in the analysis.
- The performance specifications for this instrument (*"1.4 Specifications" P.3*) are based on using a standard ladder. Performance may differ from the specifications if an optional ladder or user ladder is selected.

5 Configure settings on the other tabs, if necessary.

6 Click [OK] in the [Project Settings] window.

The settings are saved and the [Project Settings] window closes.

7 In the [Project List] window, click [Close].



3.4.2 Sample Sheet Creation

Create a sample sheet once the project is configured.

The following rules apply when creating a sample sheet.

Rules for Creating a Sample Sheet

- Information in the selected project is reflected in the sample sheet.
- The well name for the set sample/ladder, sample name, comments, and type (ladder or sample) can be entered.
- A sample or ladder set in the sample stand (well position from A1 to H12) is analyzed only once. If it is set in the extra sample stand (well position from X1 to X12), analysis can be performed multiple times (assuming it is registered multiple times in the sample sheet).
- The maximum number of analyses that can be entered for both ladders and samples combined is 120.
- Ensure that the ladder is analyzed first for each of the microchips that are used.

NOTE

While analysis can be performed in sample sheets that do not include a ladder, analyzing a ladder first is recommended for obtaining analysis data with the highest precision.

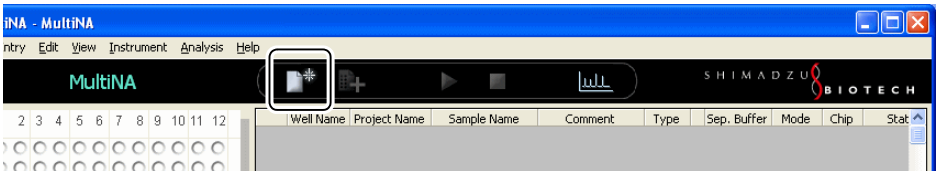
This section explains the method for specifying the ladder and sample positions using the on-screen well display when creating a sample sheet.

NOTE

Use one of the following methods to enter information into the sample sheet.

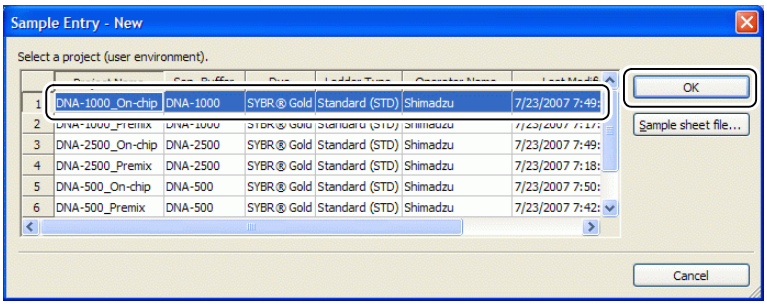
- Enter the position name of wells directly *(P.81)*
- Only enter the number of analysis samples *(P.80)*
- Import information from Excel or a CSV file *(P.86)*
- Load information from the default sample sheet *(P.85)*

1 Click (New Entry) on the toolbar in the MultiNA window.



The [Sample Entry - New] window is displayed.

2 Select the project to use and click [OK].

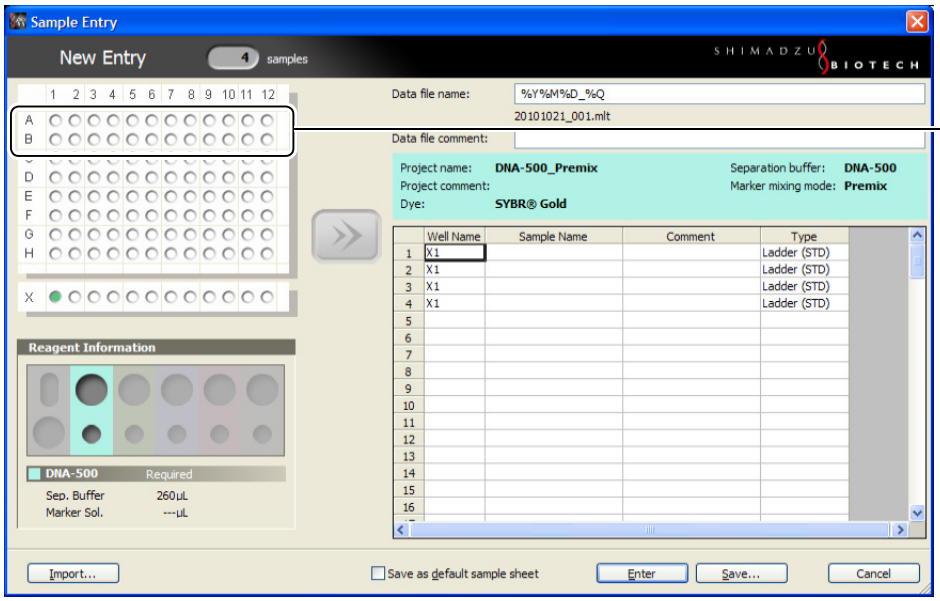


The [Sample Entry] window is displayed.

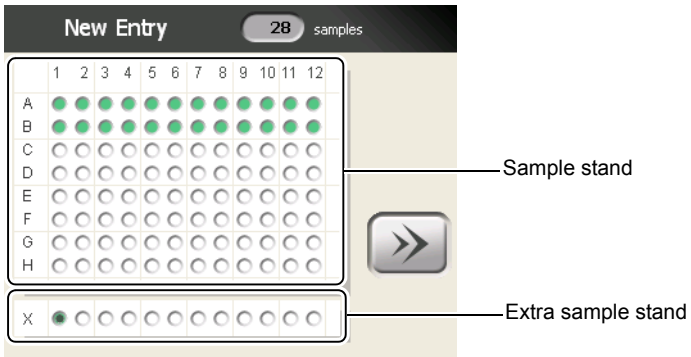
NOTE

The file name shown below the [Data file name] field is the name of the data file that will be created. Clicking [Enter] confirms the file name.

3 In the well status display, click each well or drag with the mouse to enclose multiple wells.



This selects the specified wells, changes their color in the sample stand and extra sample stand to green, and specifies the position where the ladders and samples are set.



NOTE

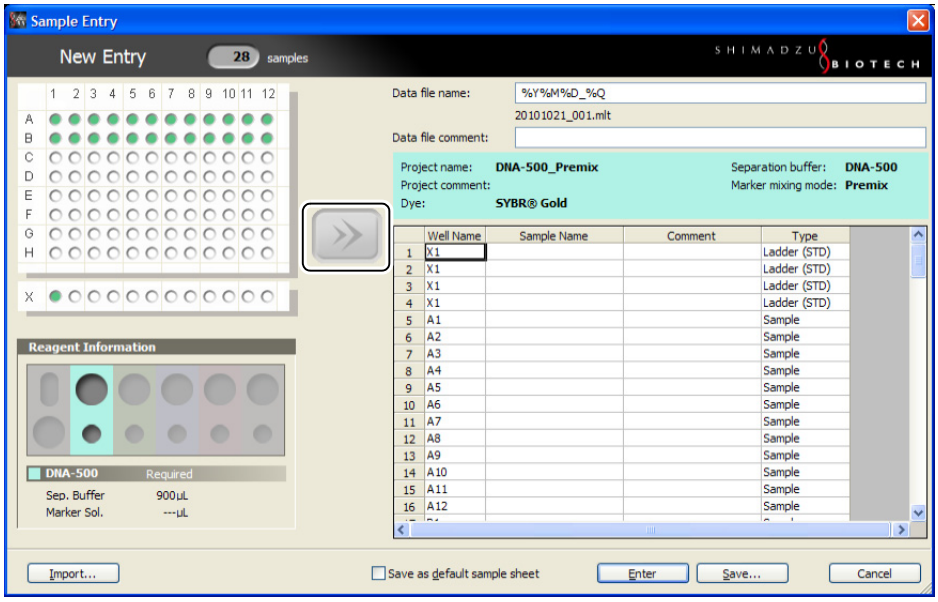
- Each well on the sample stand can only be analyzed once, whereas each well on the extra sample stand can be analyzed multiple times. Choose the appropriate well positions according to the sample and number of analyses.
- When performing analysis multiple times on wells in the extra sample stand, use one of the following methods to create multiple lines in the sample sheet.
  - In the well display, re-select the wells in X1 to X12, and click the button.
  - Right-click the X1 to X12 lines that you want to copy, go to the menu to select [Copy], right-click the line in the vacant column, and select [Paste].
  - Enter X1 to X12 lines directly into the sample sheet.

Reference

"4.2.1 New" P.79

4 Click .

The [Well Name] and [Type] are automatically entered in the column on the right side. The [Type] is always [Sample].



5 Enter the sample name and comment, and change the type.

	Well Name	Sample Name	Comment	Type
1	X1	Ladder		Ladder
2	X1	Ladder		Ladder
3	X1	Ladder		Ladder
4	X1	Ladder		Ladder
5	A1	Sample 1	Preparation 1	Ladder
6	A2	Sample 2	Preparation 1	Sample
7	A3	Sample 3	Preparation 1	Ladder

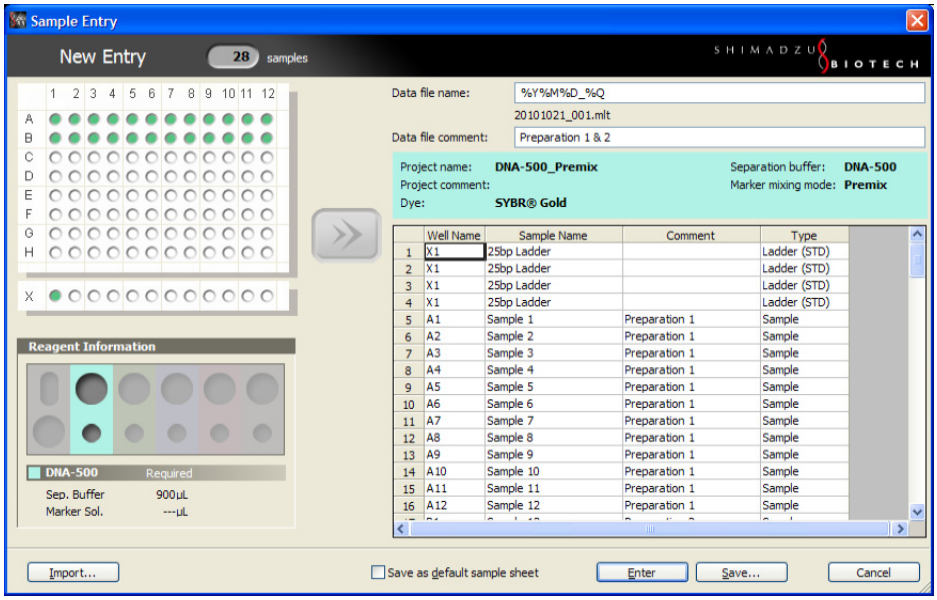
NOTE

- Clicking the [Type] cell displays a drop-down list. The type can be changed to [Ladder].
- The ladder for analysis can be selected from the standard ladder (STD), an optional ladder, or a user ladder.

Reference

"11.7 Using Optional Ladders" P.294, "11.8 User Ladders" P.295

6 **Repeat steps *4* to *5* as often as necessary to enter information for all of the ladders and samples to be analyzed.**



NOTE

- If necessary, click [Save] to save the information as a sample sheet.
- Selecting [Save as default sample sheet] and then clicking [Save] will save it as the default sample sheet.
  If [Load default sample sheet while starting up] was selected in the project settings, this default sample sheet will automatically be displayed when a new [Sample Entry] window is opened.

Reference

"4.2.1 New" P.79

■ Creating a Schedule for RNA Analysis

Observe the following rules when creating a schedule for RNA analysis.

NOTE

- To ensure stable analysis, enter a blank analysis as the first analysis for each microchip. Select [Ladder] as the [Type] for the blank analysis.
- Refer to the table below for the number of samples that can be entered for a single analysis.
  Note that the denatured state of RNA samples cannot be maintained over a long period of time because the instrument is not equipped with a sample refrigeration function.

Number of Microchips Used	1	2	3	4
Blank Analysis	1	2	3	4
Ladder Analysis	1	2	3	4
Sample Number	1 - 6	2 - 12	3 - 16	4 - 14
Total Number of Analyses	8 max.	16 max.	22 max.	22 max.

3.4.3 Analysis Schedule Registration

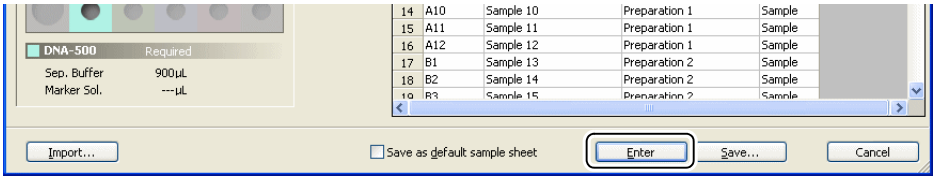
Register the analysis schedule into the created sample sheet.

The following rules apply when registering an analysis schedule.

Rules for Registering an Analysis Schedule

- The maximum number of analyses that can be registered into a schedule is 120.
- Analyses are performed in the order shown in the analysis schedule.
- All available microchips are used to execute the analysis schedule.

1 Click [Enter].



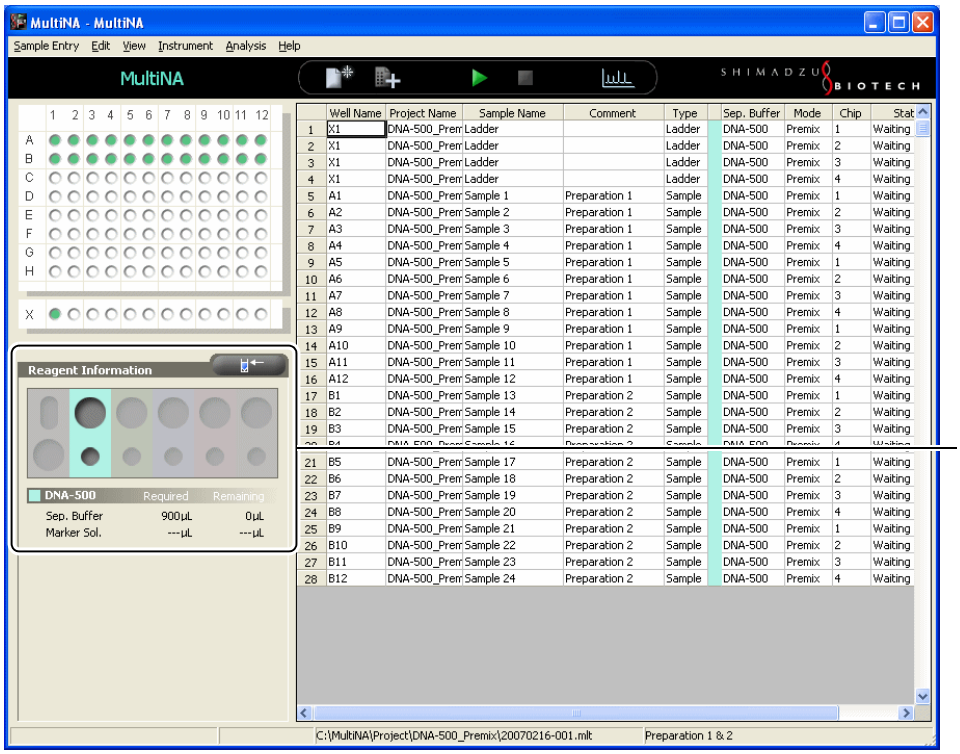
The created sample sheet is registered to the analysis schedule in the MultiNA window.
The separation buffer and marker solution volumes required for analysis are displayed in [Reagent Information].

Reference

"4.1.6 Reagent Information" P.77

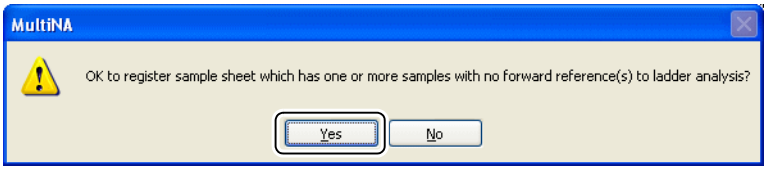
NOTE

Separation buffer and marker solution placement is described in sections *3.5* to *3.6*.



NOTE

If ladder analysis is not included in the sample sheet, the following message is displayed.



- Select [Yes] to enter the sample sheet without a ladder analysis into the analysis schedule. You cannot automatically obtain size estimation and quantitation results in the analysis data. However, you can import a ladder file created for other analysis data to perform a reanalysis and obtain the size estimation and quantitation.

Reference

"5.7.3 Change Ladder and Analyze" P.189

- Selecting [No] stops registration in the analysis schedule, and returns focus to the [Sample Entry] window.

NOTE

If a sample sheet is created during analysis, although it can be saved using [Save], it cannot entered into the analysis schedule using [Enter]. [Enter] is not displayed in the [Sample Entry] window.

2 **If necessary, click [Add] on the [Sample Entry] menu to add the sample sheet.**

The [Sample Entry] window for adding entries is displayed.
For details, see *"4.2.2 Add" P.92*.

3 **Perform *"Preparation for DNA Analysis" P.44* (or *"Preparation for RNA Analysis" P.52*).**

To perform chip cleaning upon completion of the analysis schedule, see *"■ [Analysis Schedule] Tab" P.109* in *"4.5.2 Options"*.

3.5 Preparation for DNA Analysis

This section explains how to prepare the separation buffer solution, ladder solution, sample, and marker solution for DNA analysis.

Reference

For details on reagents and apparatus required for analysis, see *"■ DNA Analysis" P.281*

For RNA analysis preparation, see *"3.6 Preparation for RNA Analysis" P.52*

⚠ WARNING

- Always wear protective equipment (protective clothing, gloves, eyewear, and mask) when handling reagents.
  Reagents contain irritating and harmful chemical substances. If any type of reagent makes contact with the eyes or skin, immediately rinse the affected area with large amounts of water and seek medical attention from a doctor and follow their advice.
  If a reagent is ingested or inhaled by accident, immediately seek medical attention from a doctor and follow their advice.
- Always read the MSDS before handling reagents.
  The MSDS contains important safety information regarding the handling, storage, and disposal of reagents.

⚠ CAUTION

- Use the recommended reagents and apparatus correctly.
  Failure to do so may result in instrument damage or the inability to obtain the prescribed analysis performance.

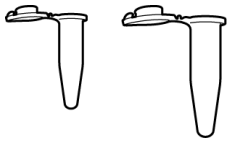
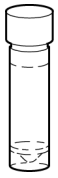
NOTE

- Leave reagent at room temperature for a minimum of 30 minutes before use.
- Do NOT mix and use reagents of different lot numbers.
  The lot number is displayed on the buffer bottle or aluminum pack of the marker solution.
- Use a micropipette that can dispense fluid accurately.
  Inaccurate dispensing and mixing ratios will cause incorrect analysis results.

3.5.1 Diluted Dye Solution and Separation Buffer Preparation

Mix the separation buffer and the diluted dye solution.

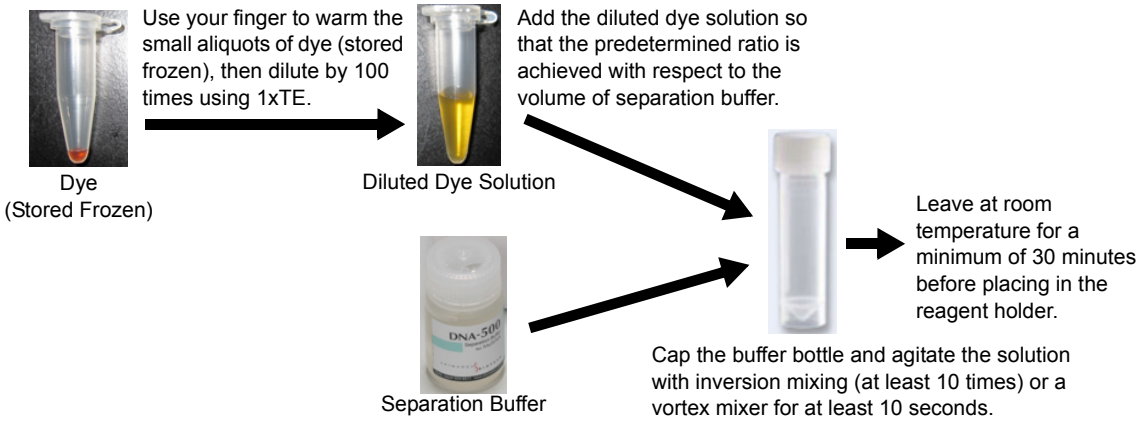
■ Reagent and Apparatus Used

Reagent and Apparatus to Prepare		
• Dye (GelStar® or SYBR® Gold) • TE buffer • Micropipette • Vortex mixer • Separation buffer *(P.18)*	• Microtube (200 µL to 1.5 mL capacity) 	• Buffer bottle 

NOTE

- Divide the dye into microtubes in small aliquots (about 10 µL) and keep them shielded from light in frozen storage.
  The dye deteriorates when repeatedly frozen and thawed or when exposed to light.
- Use diluted dye solution within 3 days if kept refrigerated or within 3 months if kept frozen (–20 °C).
- Leave separation buffers at room temperature for a minimum of 30 minutes before preparing or setting them in place.
- If air bubbles form in the separation buffer due to agitation, remove them using a centrifuge or leave the separation buffer to stand until the bubbles disappear.

■ Procedure



Separation Buffer Solution Preparation

1 **Dilute the dye solution with TE buffer at a ratio of 1:99 (dilution factor of 100).**

2 **Cap the microtube and agitate the solution with the vortex mixer for at least 10 seconds.**

3 **Dispense the separation buffer and diluted dye solution included in the reagent kit into the buffer bottle at the corresponding volume ratio indicated in the table below.**

Ensure that the volume of the mixed separation buffer solution exceeds the required volume displayed in the [Reagent Information] window.

Reference

"4.1.6 Reagent Information" P.77

- When using GelStar®
  Mix the separation buffer and diluted dye solution at a ratio of 199:1.

Guidelines for Required Volumes of Separation Buffer and Diluted Dye Solution (GelStar®)				
Total Number of Analyses	**8 Analyses or Less**	**9 to 29 Analyses**	**30 to 79 Analyses**	**80 to 120 Analyses**
Volume of Separation Buffer	497.5 µL	995 µL	1990 µL	2985 µL
Volume of Diluted Dye Solution	2.5 µL	5 µL	10 µL	15 µL

Guidelines for Required Volumes of Separation Buffer and Diluted Dye Solution (GelStar®)				
Total Number of Analyses	**8 Analyses or Less**	**9 to 29 Analyses**	**30 to 79 Analyses**	**80 to 120 Analyses**
Volume of Prepared Separation Buffer Solution	500 µL	1000 µL	2000 µL	3000 µL

- When using SYBR® Gold
  Mix the separation buffer and diluted dye solution at a ratio of 99:1.

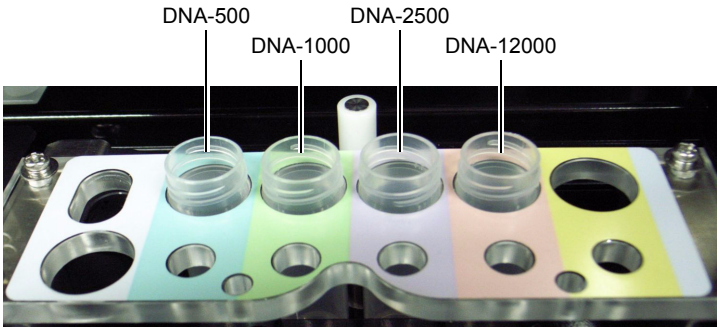
Guidelines for Required Volumes of Separation Buffer and Diluted Dye Solution (SYBR® Gold)				
Total Number of Analyses	**8 Analyses or Less**	**9 to 29 Analyses**	**30 to 79 Analyses**	**80 to 120 Analyses**
Volume of Separation Buffer	495 µL	990 µL	1980 µL	2970 µL
Volume of Diluted Dye Solution	5 µL	10 µL	20 µL	30 µL
Volume of Prepared Separation Buffer Solution	500 µL	1000 µL	2000 µL	3000 µL

4 **Cap the buffer bottle and agitate the solution with inversion mixing (at least 10 times) or a vortex mixer for at least 10 seconds.**

5 **Uncap the buffer bottle and place it in the reagent holder at the buffer bottle position (the position corresponding to the color displayed in the [Reagent Information] window).**

NOTE
Let the solution adhering to the inner surface of the buffer bottle settle, and use a micropipette to remove any residual bubbles before placing the tube in the reagent holder.

NOTE
Move the bottle around to verify that the bottom of the buffer bottle is in the correct position at the bottom of the reagent holder.



⚠ CAUTION

- Uncap the buffer bottle before placing it in the reagent holder.
  The sample probe may be damaged.

3.5.2 Ladder, Sample, and Marker Preparation

Prepare the ladder solution used for size calibration curve creation.

For premix analysis, mix the sample/ladder solution with the marker solution.

NOTE

If using an optional ladder, prepare the ladder solution by referring to *"11.7 Using Optional Ladders" P.294*.

■ Reagent and Apparatus Used

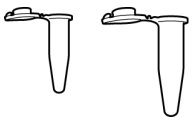
Ladder	
DNA-500	25 bp DNA ladder pUC19Hpa II Digest*
DNA-1000	ϕX174 DNA/HaeIII Markers 100 bp DNA Ladder*
DNA-2500	pGEM® DNA Markers
DNA-12000	2-Log DNA Ladder (0.1-10.0 kb)

*Option ladder

Reagent and Apparatus to Prepare

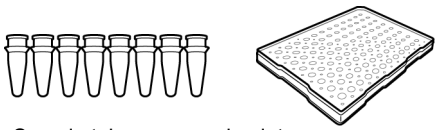
- TE buffer
- Micropipette
- Vortex mixer
- Marker solution *(P.18)*
- Sample

- Microtube
(200 µL to 1.5 mL capacity)



- Vial*

- Container for MultiNA analysis



Sample tubes or sample plate

- Aluminum seal

*Used in on-chip mixing mode

NOTE

When the sample for measurement is expected to exceed the concentration range (0.5 ng/µL to 50 ng/µL) or the maximum salt concentration (KCl or NaCl concentration; maximum of 125 mM) for DNA samples, use the TE buffer (pH 8.0) to dilute it within specification prior to analysis.

■ Procedure

1 **Use a micropipette to dispense TE buffer and DNA ladder into a microtube.**

Dispensing Amount			
Reagent Kit	TE buffer	Ladder	
DNA-500	49 μL	25 bp DNA ladder	1 μL
	49 μL	pUC19Hpa II Digest*	1 μL
DNA-1000	99 μL	ϕX174 DNA/HaeIII Markers	1 μL
	45 μL	100 bp DNA Ladder*	5 μL
DNA-2500	99 μL	pGEM® DNA Markers	1 μL
DNA-12000	99 μL	2-Log DNA Ladder (0.1-10.0 kb)	1 μL

*Option ladder

2 **Agitate the solution with the vortex mixer for at least 10 seconds.**

3 **Transfer the ladder solution created in step *2* to the container for MultiNA analysis.**

4 **Dispense the sample solution into the container for MultiNA analysis.**

NOTE

The amount required for analysis differs for on-chip mixing and premix. Refer to the following table for the correct amount.

- For on-chip mix

Item	Sample Stand (One Analysis per Well)		Extra Sample Stand (Multiple Analyses per Well)	
Total Number of Analyses	~12	13~	-	-
Number of Analyses	-	-	~3	3 - 13
Container	Sample tube	Sample plate with seal	Sample tube	
Volume of Ladder or Sample	9 μL	5 μL	9 μL	5 + 2 × (Number of analyses - 1) μL

- For premix

Item	Sample Stand (One Analysis per Well)		Extra Sample Stand (Multiple Analyses per Well)	
Total Number of Analyses	~12	13~	-	-
Number of Analyses	-	-	~4	5 - 9
Container	Sample tube	Sample plate with seal	Sample tube	
Volume of Ladder or Sample	3 μL	2 μL	5 μL	1 × (Number of analyses + 1) μL
Volume of Marker Solution	6 μL	4 μL	10 μL	2 × (Number of analyses + 1) μL
Volume of Prepared Solution	9 μL	6 μL	15 μL	3 × (Number of analyses + 1) μL

NOTE

- For premix, add twice the amount of marker solution and mix.
- The amount dispensed to the sample tube should not exceed 30 μL otherwise it may interfere with the analysis sequence.
- For the 13th and subsequent analyses in the analysis schedule, attach an aluminum seal onto the sample plate in order to prevent evaporation.
- Avoid excessive agitation of the marker solution using vortex mixers, etc. The upper marker will degrade and this may prevent normal performance from being achieved.

5 **For on-chip mixing, dispense the marker solution.**

Use a micropipette to dispense marker solution in excess of the required volume shown in [Reagent Information] into a vial (PP 0.6 mL vial, no cap).

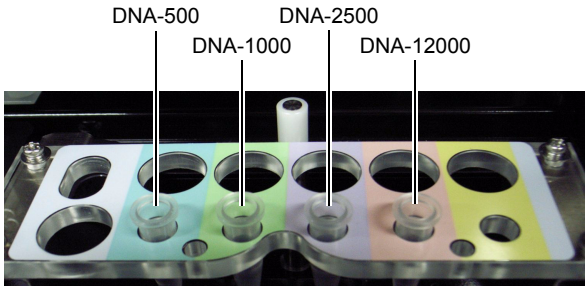
NOTE

- Dispense an amount in excess of the volume displayed in [Reagent information].
- For premix, dispensing of marker solution is not required.
- Avoid excessive agitation of the marker solution using vortex mixers, etc. The upper marker will degrade and this may prevent normal performance from being achieved.

3.5.3 Ladder, Sample, and Marker Placement

1 **Place the sample and ladder solution in the sample stand or extra sample stand at the position specified in the analysis schedule.**

2 **For on-chip mixing, place the marker solution vial in the reagent holder at the marker container position (the position corresponding to the color displayed in the [Reagent Information] window).**



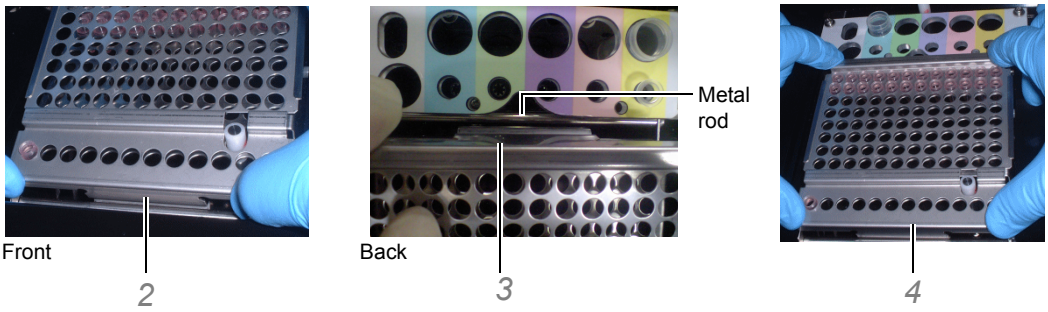
3.5.4 Sample Holder Installation

Install the sample holder over the sample tubes or sample plate and fasten it in place.

⚠ CAUTION

- Use the sample holder correctly.
  Starting the instrument when the sample holder is improperly installed (elevated) may cause instrument damage.
  An error will occur if analysis is started when the sample holder is not correctly installed.
- Be careful not to bump the sample tubes or plates when installing the sample holder.
  Sample spatter caused by an impact may prevent samples from being suctioned properly.
  If sample spatter occurs, use a centrifuge to force the liquid down to the bottom of the tube.

1 Install the sample holder.



1 Examine the orientation of the sample holder.
2 Insert the front side of the sample holder between the extra sample stand and the metal rod (behind the metal rod).
3 Insert the back side of the sample holder in front of the metal rod between the sample stand and reagent holder. At this point, align the holes with those of the sample stand and extra sample stand.
4 Apply downward pressure on the four corners of the sample holder, and verify that it is securely installed (not loose) over the sample stand and extra sample stand.

3.5.5 Chip Cleaning Solution Placement

Place the chip cleaning solution into the reagent holder when automatically performing chip cleaning upon the completion of analysis.

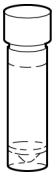
☞ Reference

For details on how to configure the chip cleaning function, see *"■ [Analysis Schedule] Tab" P.109* in *"4.5.2 Options"*.

⚠ WARNING

- Always read the instruction manual provided with the chip cleaning kit before handling the contents of the kit.
  The instruction manual for the chip cleaning kit describes safety precautions that are important to ensure safe use.

■ Reagent and Apparatus Used

Reagent and Apparatus to Prepare		
• Chip cleaning solution • Micropipette	• Buffer bottle 	• Open-hole screw cap 

1 **Dispense chip cleaning solution into the buffer bottle.**

NOTE

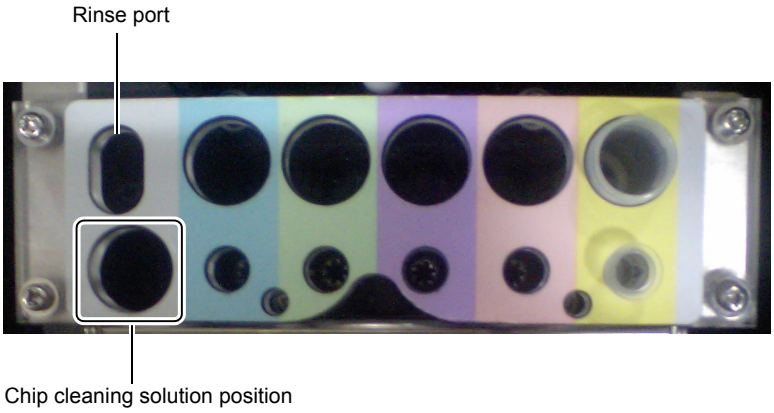
The volume of chip cleaning solution required varies depending on conditions including the number of microchips in use and number of times to perform cleaning. Also, the time required for analysis will increase according to the number of times chip cleaning is performed. Refer to the table below for the required volume of chip cleaning solution and the increase in time required for analysis.

- Required volume of chip cleaning solution and the increase in time required for analysis

Number of Cleanings	Using 1 Microchip	Using 2 Microchips	Using 3 Microchips	Using 4 Microchips
1 time	1.2 mL / 20 min	1.4 mL / 25 min	1.6 mL / 32 min	1.8 mL / 40 min
2 times	1.4 mL / 35 min	1.8 mL / 45 min	2.2 mL / 57 min	2.6 mL / 70 min
3 times	1.6 mL / 50 min	2.2 mL / 65 min	2.8 mL / 82 min	3.4 mL / 100 min
4 times	1.8 mL / 65 min	2.6 mL / 85 min	3.4 mL / 107 min	4.2 mL / 130 min
5 times	2.0 mL / 80 min	3.0 mL / 105 min	4.0 mL / 132 min	5.0 mL / 160 min

2 **Securely tighten the open-hole screw cap onto the buffer bottle.**

3 **Insert the buffer bottle at the chip cleaning solution position (indicated in the figure below) in the reagent holder.**



Reagent Holder

NOTE

Move the bottle around to verify that the bottom of the buffer bottle is in the correct position at the bottom of the reagent holder.

3.6 Preparation for RNA Analysis

Reference

For details on reagents and apparatus required for analysis, see "■ RNA Analysis" P.283

⚠ WARNING

- Always wear protective equipment (protective clothing, gloves, eyewear, and mask) when handling reagents.
  Reagents contain irritating and harmful chemical substances. If any type of reagent makes contact with the eyes or skin, immediately rinse the affected area with large amounts of water and seek medical attention from a doctor and follow their advice.
  If a reagent is ingested or inhaled by accident, immediately seek medical attention from a doctor and follow their advice.
- Always read the MSDS before handling reagents.
  The MSDS contains important safety information regarding the handling, storage, and disposal of reagents.

⚠ CAUTION

- Use the recommended reagents and apparatus correctly.
  Failure to do so may result in instrument damage or the inability to obtain the prescribed analysis performance.

NOTE

- Leave reagent at room temperature for a minimum of 30 minutes before use.
- Do NOT mix and use reagents of different lot numbers.
  The lot number is displayed on the buffer bottle or aluminum pack of the marker solution.
- Use a micropipette that can dispense fluid accurately.
  Inaccurate dispensing and mixing ratios will cause incorrect analysis results.

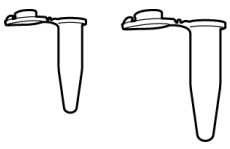
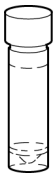
3.6.1 Diluted Dye Solution and Separation Buffer Preparation

Mix the separation buffer and the diluted dye solution.

NOTE

Store formamide below -20 °C.
Dispense about 1 mL of formamide into microtubes prior to frozen storage to prevent decomposition due to repeated freezing and thawing.

■ Reagent and Apparatus Used

Reagent and Apparatus to Prepare		
• SYBR®Green II • TE buffer • Micropipette • Vortex mixer • RNA separation buffer *(P.19)* • Formamide	• Microtube (200 µL to 1.5 mL capacity) 	• Buffer bottle 

NOTE

- Divide the SYBR® Green II into microtubes in small aliquots (about 10 µL) and keep them shielded from light in frozen storage.

  SYBR® Green II deteriorates when repeatedly frozen and thawed or when exposed to light.
- The separation buffer mixed with diluted dye solution should be used on the day it is prepared.

■ Procedure

1 **Dilute the dye solution with TE buffer at a ratio of 1:99 (dilution factor of 100).**

2 **Cap the microtube and agitate the solution with the vortex mixer for at least 10 seconds.**

3 **Dispense the separation buffer included in the RNA kit, diluted dye solution, and formamide into the buffer bottle.**

Ensure that the volume of the mixed separation buffer solution exceeds the required volume displayed in the [Reagent Information] window.

Guidelines for Required Volumes of Separation Buffer and Diluted Dye Solution			
Number of Analyses (Total Ladders, Samples, and Blank Analyses)	**~6**	**7 - 15**	**16 - 22**
Volume of Separation Buffer	395 µL	632 µL	790 µL
Volume of Diluted Dye Solution	5 µL	8 µL	10 µL
Volume of Formamide	100 µL	160 µL	200 µL

1. Refer to the table above, and dispense the separation buffer into the buffer bottle in the required volumes based on the total number of analyses (ladder, sample, and blanks).
2. Add the diluted dye solution until it reaches a volume ratio of 1/80 to the separation buffer.
3. Add formamide until it reaches a volume ratio of 4:1 with the mixture of separation buffer and diluted dye solution.

NOTE

When formamide is added, the volume of the mixed solution decreases by about 10 %.

4 **Cap the bottle and agitate the solution with the vortex mixer for at least 10 seconds.**

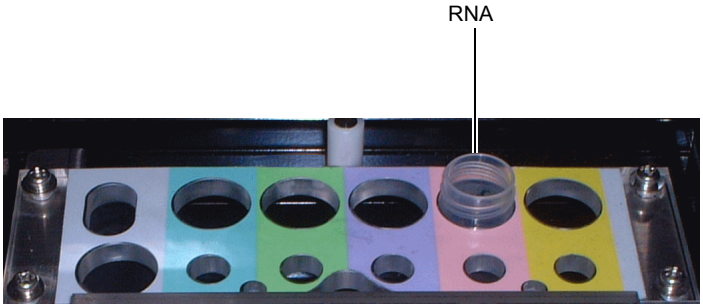
5 **Uncap and place the bottle in the peach reagent holder position (color code for RNA kit).**

NOTE

Let the solution adhering to the inner surface of the buffer bottle settle, and use a micropipette to remove any residual bubbles before placing the tube in the reagent holder.

NOTE

Move the bottle around to verify that the bottom of the buffer bottle is in the correct position at the bottom of the reagent holder.



⚠ CAUTION

- Uncap the buffer bottle before placing it in the reagent holder.
  The sample probe may be damaged.

3.6.2 Ladder, Sample, and Marker Preparation

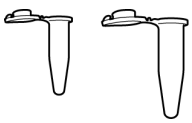
- Prepare the ladder solution used for size calibration curve creation.
- Mix the blank, ladder solution, and sample with an equal volume of marker solution.
- Attach the cap to the sample tube and the aluminum seal to the sample plate and perform thermal denaturation.

■ Requirements

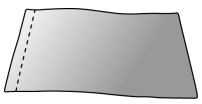
Reagent and Apparatus to Prepare

- RNA 6000 ladder
- THE RNA Storage Solution
- Micropipette
- Vortex mixer
- Marker solution *(P.19)*
- Sample

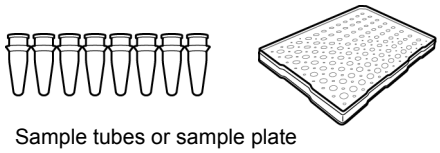
- Microtube
(200 µL to 1.5 mL capacity)



- Aluminum seal



- Container for MultiNA analysis



Sample tubes or sample plate

- Cap

NOTE

When the prepared sample is expected to exceed the concentration range (Total RNA of 25 ng/µL to 500 ng/µL, mRNA of 25 ng/µL to 250 ng/µL) or the maximum salt concentration (Tris concentration 10 mM and EDTA concentration 1 mM or less) for RNA samples, use THE RNA Storage Solution to dilute it prior to analysis.

■ Procedure

1 **Dispense 5 μL of THE RNA Storage Solution and 1 μL of RNA 6000 ladder to a microtube.**

2 **Use a micropipette to agitate the solution by sucking and expelling it 5 times.**

3 **Dispense the ladder solution, mixed in steps *1* to *2*, and an equal volume of marker solution into a sample tube (or sample plate) and mix the solution thoroughly by pipetting.**

Item	Sample Stand (One Analysis per Well)		Extra Sample Stand (Multiple Analyses per Well)	
Total Number of Analyses	~12	13~	-	-
Number of Analyses	-	-	~4	5 - 9
Container	Sample tube	Sample plate with seal	Sample tube	
Volume of Ladder, Sample, or Blank	4.5 μL	3 μL	7.5 μL	1.5 × (Number of analyses + 1) μL
Volume of Marker Solution	4.5 μL	3 μL	7.5 μL	1.5 × (Number of analyses + 1) μL
Volume of Prepared Solution	9 μL	6 μL	15 μL	3 × (Number of analyses + 1) μL

NOTE

The amount dispensed to the sample tube should not exceed 30 μL otherwise it may interfere with the analysis sequence.

4 **Dispense THE RNA Storage Solution for blank analysis and an equal volume of marker solution into the sample plate (or sample tube) and mix the solution thoroughly by pipetting.**

5 **Dispense the sample and an equal volume of marker solution into the sample plate (or sample tube) and mix the solution thoroughly by pipetting.**

6 **Attach the cap to the sample tube and the aluminum seal to the sample plate and use the oil-free thermal cycler to perform thermal denaturation.**

65 °C for 5 minutes

↓

4 °C for 5 minutes

NOTE

After performing thermal denaturation at 65 °C for 5 minutes, allow for cooling inside the thermal cycler at 4 °C for 5 minutes.

(Do NOT freeze the solution immediately after thermal denaturation at 65 °C.)

3.6.3 Ladder and Sample Placement

1 **Place the sample plate (or sample tube) in the sample stand or extra sample stand at the position specified in the analysis schedule.**

⚠ CAUTION

- Remove the cap used for thermal denaturation before placing the sample tubes into the sample stand (or extra sample stand).
  Analysis with the cap attached may result in damage to the sample probe, or in other instrument problems.
  It is not necessary to remove the aluminum seal before placing the sample plate on the sample stand.

NOTE

For RNA analysis, only the premix mode is used for mixing the marker solution. Nothing has to be placed in the marker solution position.

3.6.4 Sample Holder Installation

Reference

For details on sample holder installation, see *"3.5.4 Sample Holder Installation" P.50* for DNA analysis

3.7 Analysis

This section describes the operations for starting analysis.

3.7.1 Pre-Analyses Checks

1 **Check the following and then close the top cover.**

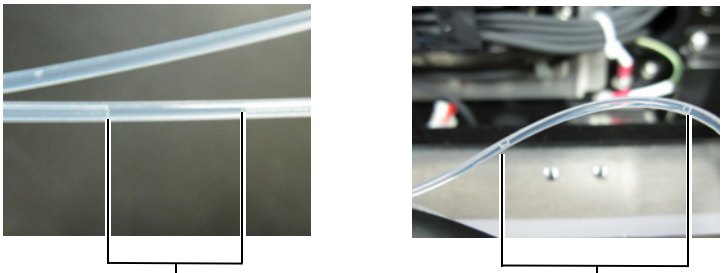
- Chip cover is closed.
- Ladder solution or sample, separation buffer, and marker solution (for on-chip mix) are all set at their prescribed positions.
- Chip cleaning solution is set at the prescribed position (when performing chip cleaning after analysis).
- Sample holder is installed.
- Rinse water is replenished.
- Waste container is properly installed.

2 **If more than 2 hours have elapsed since the last use, select [Wash] and then [Probe Rinse] on the [Instrument] menu.**

Probe rinsing starts and the rinse water line fills with rinse water.

NOTE

If bubbles are visible in the rinse intake line or tubing at the top of the autosampler, rinse the probe again.



3 **When starting the instrument for the first time of the day, select [Wash] and then [All Chip Washing] on the [Instrument] menu.**

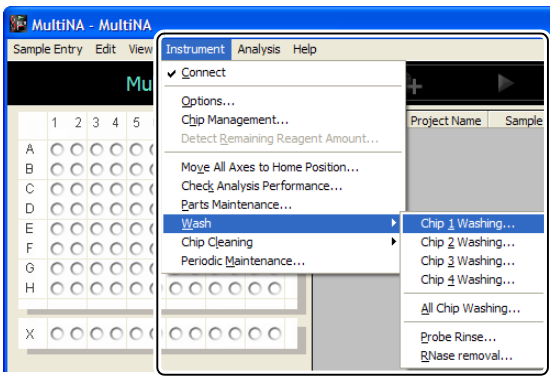
Chip washing starts.

NOTE

When analysis was not performed on the previous day, it is recommended that you run all chip cleaning in stead of all chip washing. Select [Chip Cleaning] and then [All Chips] on the [Instrument] menu.

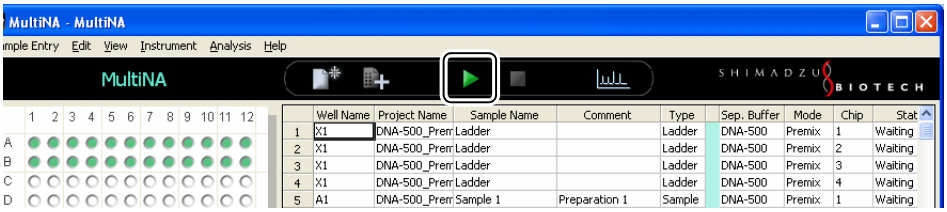
Reference

For details, see *"4.5.8 Wash" P.119*



3.7.2 Starting Analysis

1 **Click [Start] on the toolbar in the MultiNA window.**



The analysis is started.
The current progress of analysis can be checked in the MultiNA window.
The state of analysis is displayed on the well display at the left of the window and the schedule list at the right of the window.
The status bar at the bottom of the window shows the content of the latest instrument action, and the expected time remaining until the end of the analysis.

NOTE

- Clicking [Start] automatically performs an instrument status check. If a problem is detected, analysis does not start and an error message is displayed.
  - Chip cover is closed.
  - Top cover is closed.
  - Sample holder is properly installed.
  - Microchip is installed in the specified chip position.
  - A sufficient volume of separation buffer and marker solution are correctly positioned in the reagent holder.
  - The chip stage is at the set temperature.
- Do NOT step away from the instrument while pre-analysis checks are in progress since an error message may be displayed.

Either select [Chip Status] on the [View] menu, or press the [F8] key to switch between the [Reagent Information] window (next page, top figure) and [Chip Status] window (next page, bottom figure).

NOTE

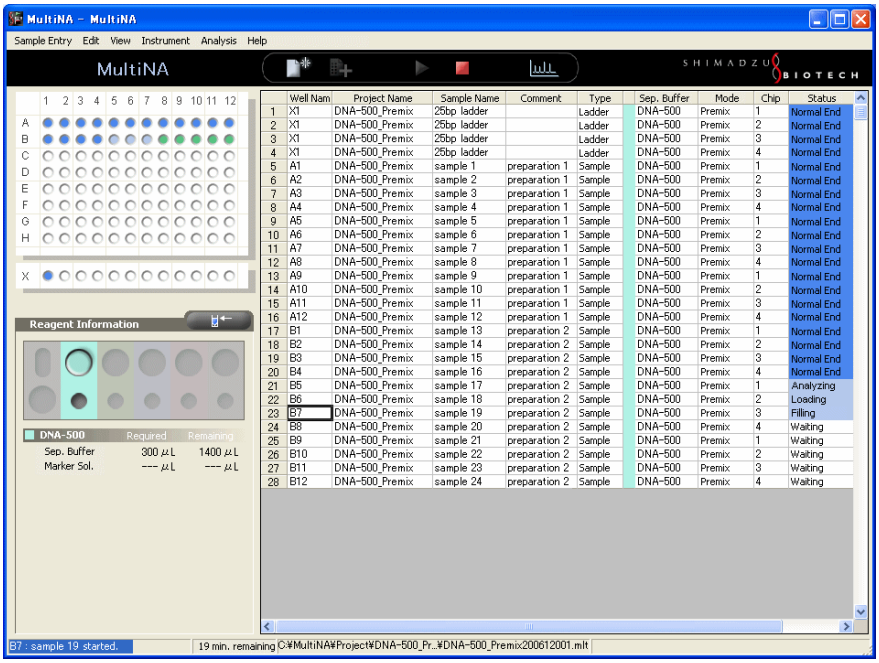
The window will automatically switch to the [Chip Status] window when starting to fill the first sample.

Reference

"4.1.8 Chip Status Window" P.78

NOTE

The expected time remaining includes the automatic rinsing time after completion of analysis (see *"3.7.3 Ending Analysis" P.60*).



Well Status Display	Status Display in Analysis Schedule List	State
Green	Waiting	State before pretreatment process on microchip (such as filling the separation buffer)
Light blue	Filling	Currently filling separation buffer into microchip
Blue (blinking)	Loading	Currently loading the sample
Blue (blinking)	Analyzing	Currently analyzing the sample (separation analysis)
Blue	Normal analysis end	Analysis has ended normally
Red	Abnormal end	An error occurred, or analysis was interrupted

■ Interrupting Analysis

To interrupt the analysis, either select [Stop] on the [Analysis] menu or click the  (Stop) button on the toolbar in the MultiNA window.

☞ Reference

"4.6.2 Stop" P.122

3.7.3 Ending Analysis

The instrument automatically performs microchip rinsing and other posttreatment functions at the completion of the analysis sequence. Then the instrument stops.

■ Treatment after Analysis End

Removing the current containers

Remove the buffer bottle, marker solution vial (on-chip mix), and ladders or samples from the instrument.

⚠ CAUTION

- During removal, avoid spilling any residual solution.
  Lift the buffer bottle from the reagent holder.

Discarding waste fluid

⚠ CAUTION

- Discard waste fluid on a regular basis to prevent the waste container from overflowing.
- Treat the waste fluid appropriately in accordance with prescriptions or guidelines from the applicable management department.
  In addition to rinse water, waste fluid includes the separation buffer, marker solution, and dye. It will also contain formamide from RNA analysis.

☞ Reference

"3.3.2 Checking the Waste Container" P.28

- Use the cartridge below for dye absorption in the waste container.
  bond EX Starter Kit: Nippon Genetics (Catalog No. 740701)

Rinsing the microchips

- If analysis ends normally, the microchips are automatically rinsed and can remain installed in the instrument after analysis.
- If analysis does not end normally, an error message is displayed. In this case, manually rinse the microchips as instructed in section *"6.2.6 Inspecting and Washing Microchip Reservoirs" P.204*.

☞ Reference

For details on error messages, see *"8.2 Error Messages" P.244*

NOTE

When RNA analysis ends or is interrupted, it is recommended that [RNase removal washing] also be performed on the sample probe as per *"4.5.8 Wash" P.119* after automatic rinsing is completed.

■ Preparation for Long Idle Periods

If the instrument is not to be used for a long period (two weeks or more), see *"7.1 Before Transport and Storage" P.237* and *"7.3 Storage" P.239* and clean the rinse water tubing and the microchips, and properly store the microchips.

■ Data

The analysis results measured by the MultiNA are saved automatically. The data files automatically created are as follows.

Type	Extension	File Name	Folder Saved
Raw data	MLT	Specified at time of sample sheet creation	Analysis results are saved for each sample sheet. This data is used for display.
Analyzed data	MLA		
Ladder data	LDR	Data and time of the start of analysis (set automatically)	Calibration curve information is saved automatically for each ladder analysis. This data is used in reanalysis.
Analytical performance check results	LOG	Same as raw data	Analytical performance check results are saved.

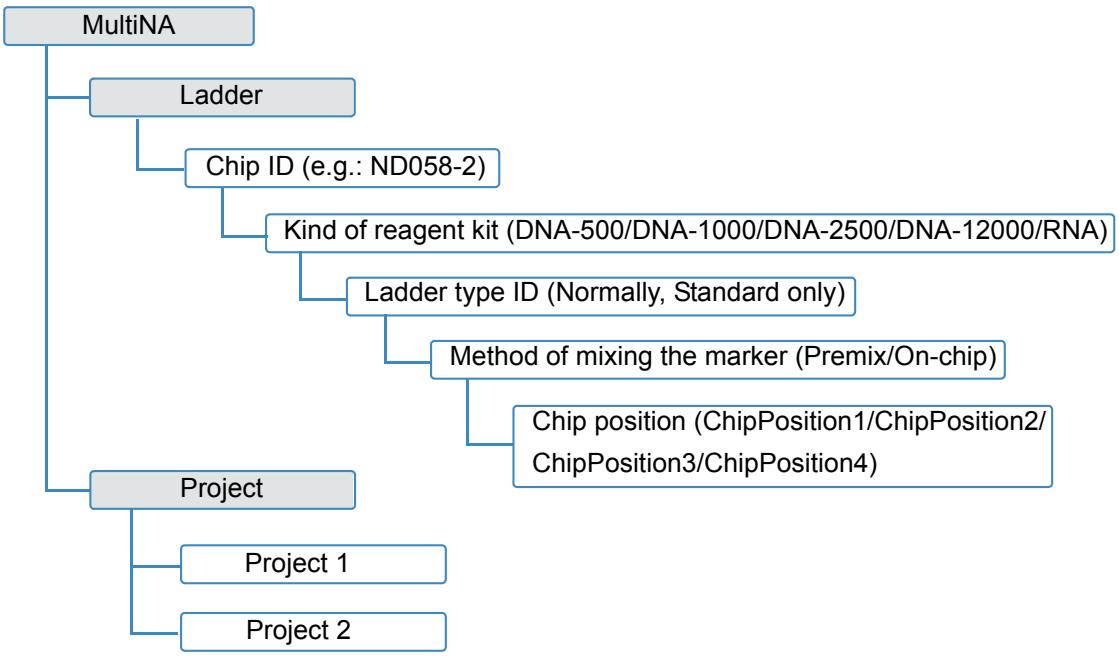
Guidelines for data file size are as follows.

- MLT file: 96 sample data, about 6 MB
- MLA file: 96 sample data, about 3 MB
- LDR file: 1 Ladder data, about 100 KB
- LOG file: 1 kit, 4 microchip data, about 3 KB

Folder structure

Each type of data is saved to the data folder specified during installation (default: C:\MultiNA). The data folder structure is as follows.

- In the MultiNA - Project folder, a folder is created for each created project, within which acquired data (extension MLT, MLA), etc., is saved.
- In the MultiNA - Ladder folder, ladder data that is automatically created when data was analyzed is saved (extracted to one file for each ladder). Folders are created as follows, based on the conditions where the ladder is acquired, and the ladders are categorized and saved in these folders.



3.8 Data Analysis

This section describes the method for using the MultiNA Viewer software to display and reanalyze data after sample analysis.

Raw data and analyzed data

MultiNA data consists of two types: raw data and analyzed data.

- Raw data: Primary data obtained during analysis (change in fluorescent intensity over time)
- Analyzed data: Reanalyzed raw data for which the fragment size estimation value and concentration are calculated

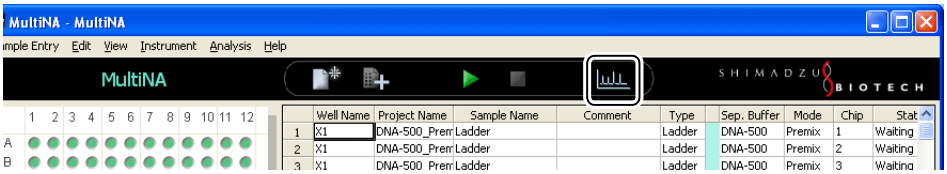
Reference

"5.4.5 Analyzed Data/Raw Data" P.167

Normally, when a data file is loaded, [Analyzed Data] is displayed. Display raw data by selecting [Raw Data] on the [View] menu in the Viewer window.

3.8.1 Displaying Data

1 **Click (View Data File) on the toolbar in the MultiNA window.**

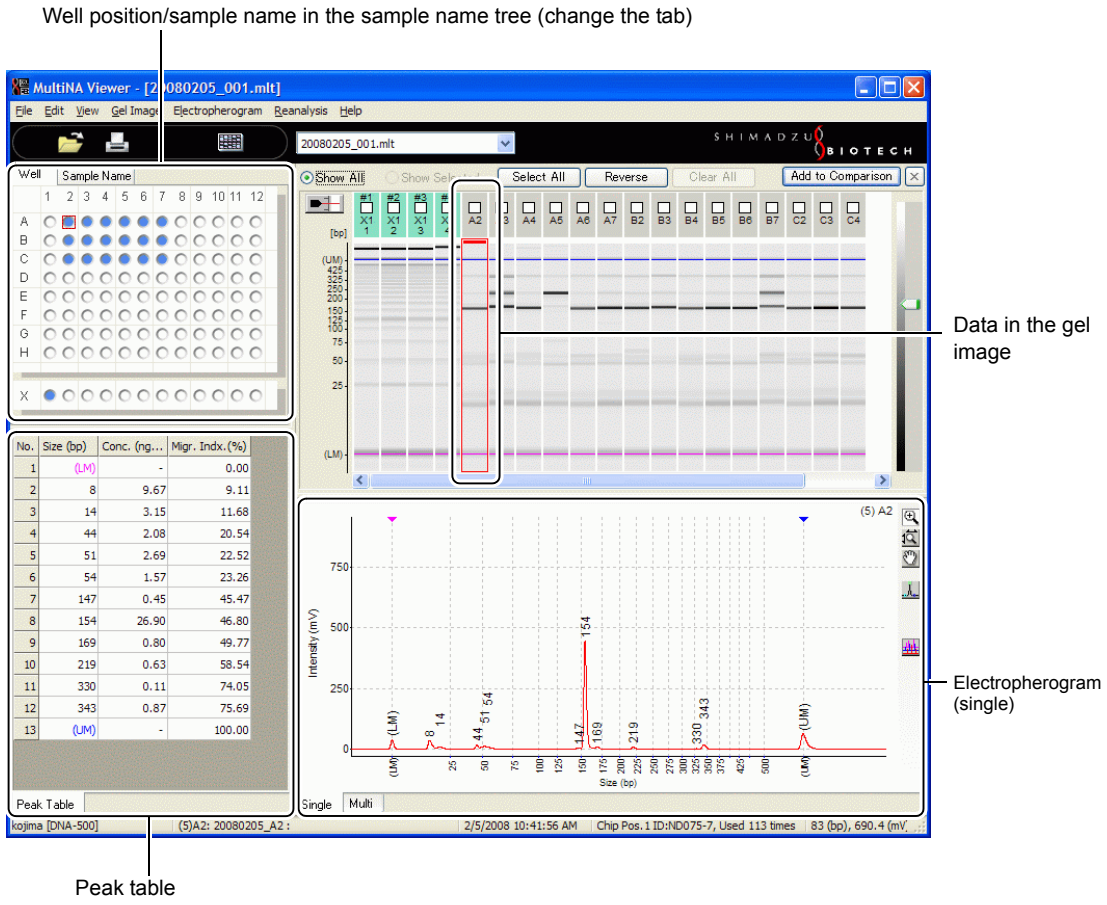


The MultiNA Viewer software starts and automatically displays the data file in the analysis schedule.

NOTE

- Clicking (MultiNA Viewer) on the desktop starts the MultiNA Viewer program but does not automatically load any data files.
  Click [Open] on the [File] menu in the Viewer window and specify the data to load. (For details, see *"5.2.1 Open" P.138*)
- The MultiNA Viewer program can also be started by pressing the [F12] key.

2 Click the well position on the well display, the sample name in the sample name tree, or the data in the gel image.



Focus changes to the data (which is enclosed in a red frame) and the corresponding electropherogram (single) and peak table are displayed.

NOTE

- In the well display, the analysis status determines the display colors, as shown below.
  - Sample analyzed normally: Blue
  - Sample with Warning: Yellow
  - Sample with Error (or Fatal): Red
- When Warning, and Error or Fatal, appear simultaneously, the status color is red.
- If multiple analyses were performed on the extra sample stand (X1 to X12), the yellow or red display color will appear if even one Warning, Error or Fatal, is generated.

Reference

- For information about Warning or Error, see *"8 Troubleshooting" P.241*
- For details on data focus, see *"5.1.3 Focused Data and Selected Data" P.128*
- For details on changing items displayed in the peak table, see *"5.4.13 Options" P.175*

3.8.2 Data Examination and Reanalysis

Inspect the electropherograms of all of the ladders and samples included in the data file.

NOTE

The peak detection level in automatic analysis is classified into four categories, [Fine], [Standard], [Coarse], and [Custom], according to the peak height and width at the lower detection limit. Automatic analysis is performed immediately after analysis is complete according to the data analysis conditions of the project used.

Select [Fine] to detect smaller peaks or [Coarse] to only detect larger peaks, and then perform reanalysis.

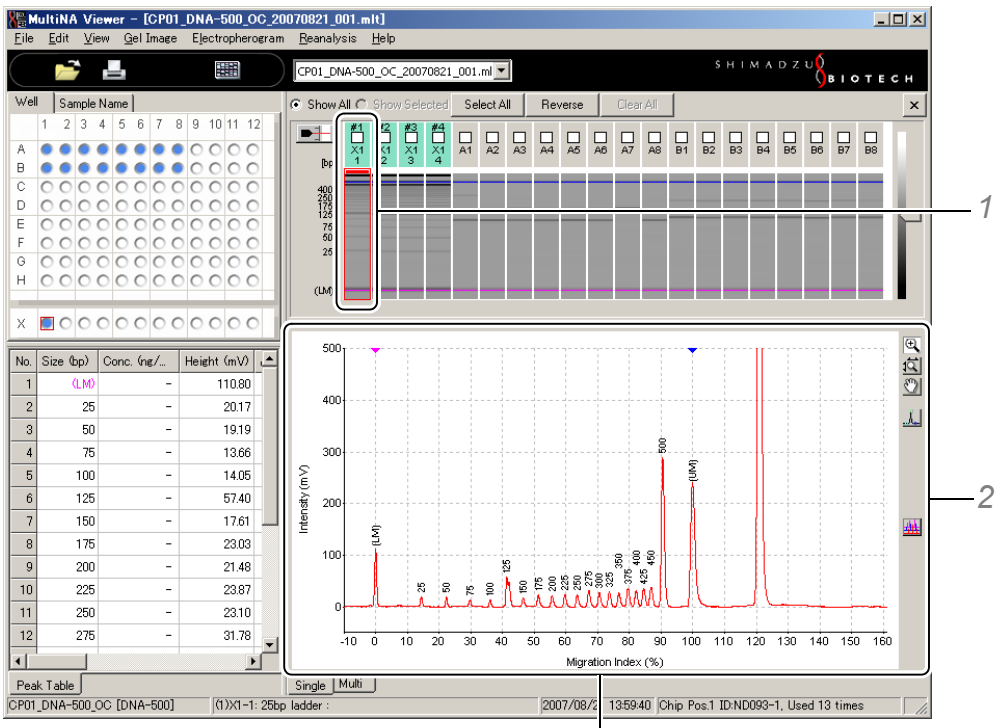
Reference

"5.7.1 Automatic" P.182

1 Check the ladder data.

NOTE

Accurate ladder analysis is necessary for obtaining highly precise results for size estimation and concentration quantitation. Check all the acquired ladder data.



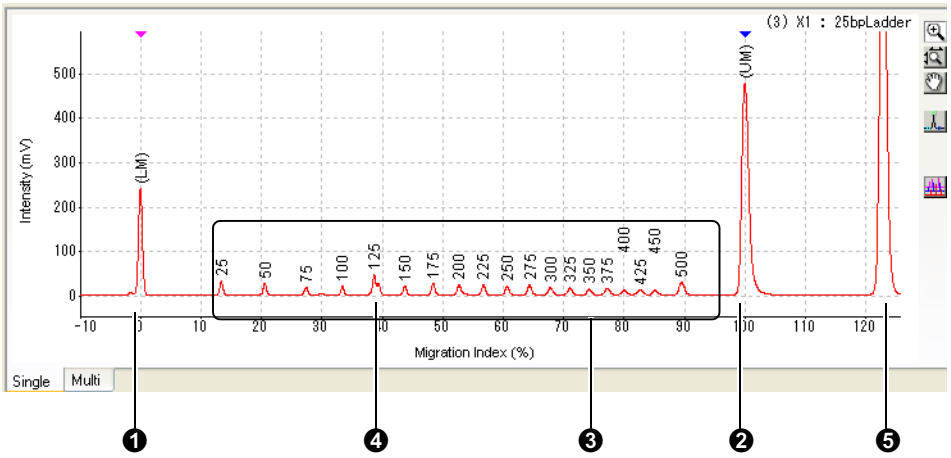
1 Click the ladder data for checking.
The target electropherogram is displayed.
Lower markers are displayed as LM, while upper markers are displayed as UM.

2 Verify that analysis has been performed correctly for the ladder.

- Each fragment peak in the ladder must be separated as in the data examples.
- Each marker peak must be correctly detected.
- The size number must be displayed correctly for each fragment peak in the ladder.

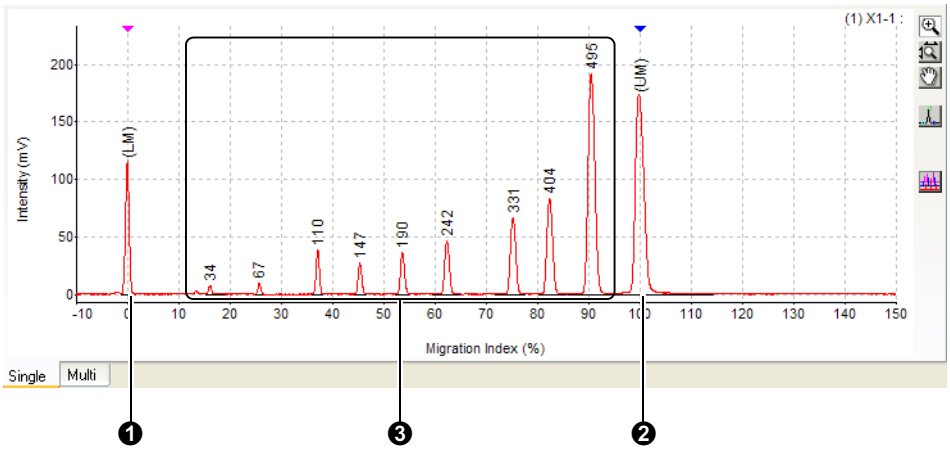
DNA-500 kit

Standard ladder



No.	Explanation
❶	Lower marker (Magenta arrow displayed on upper part)
❷	Upper marker (Blue arrow displayed on upper part)
❸	25 bp to 500 bp peaks included in ladder 25 bp, 50 bp, 75 bp, 100 bp, 125 bp, 150 bp, 175 bp, 200 bp, 225 bp, 250 bp, 275 bp, 300 bp, 325 bp, 350 bp, 375 bp, 400 bp, 425 bp, 450 bp and 500 bp; 19 peaks in total
❹	125 bp peak is divided into 2 at front edge. While this is derived from the 25 bp DNA ladder components, it is recognized as one peak in the data analysis.
❺	2652 bp peak detected after upper marker. This does not affect the analysis.

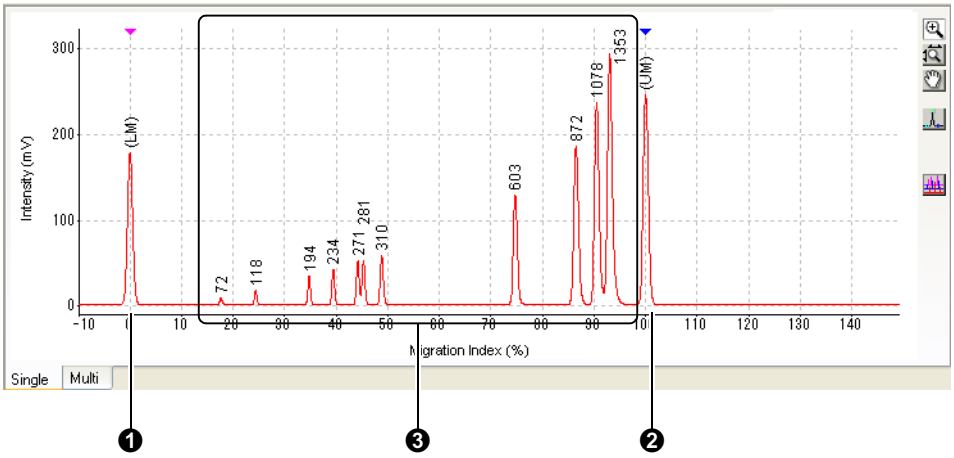
Option ladder



No.	Explanation
❶	Lower marker (Magenta arrow displayed on upper part)
❷	Upper marker (Blue arrow displayed on upper part)
❸	34 bp to 495 bp peaks included in ladder 34 bp, 67 bp, 110 bp (110/111 bp), 147 bp, 190 bp, 242 bp, 331 bp, 404 bp, and 495 bp (489/501 bp); 9 peaks in total

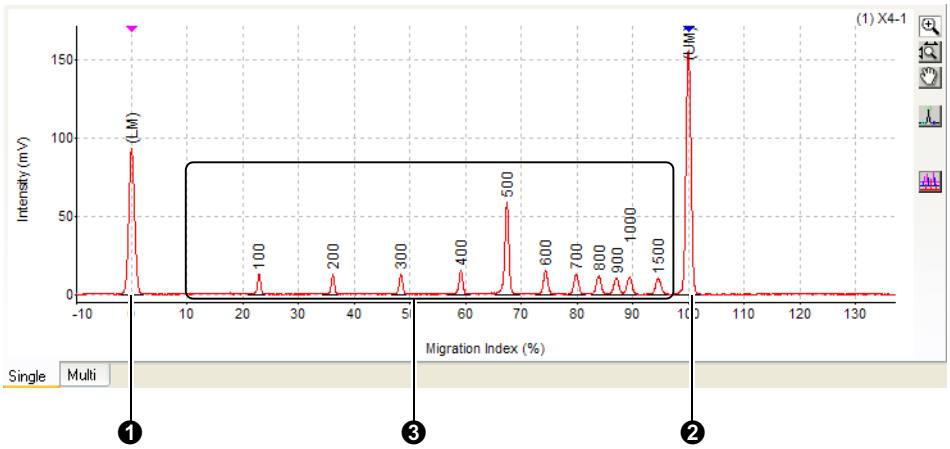
DNA-1000 kit

Standard ladder



No.	Explanation
❶	Lower marker (Magenta arrow displayed on upper part)
❷	Upper marker (Blue arrow displayed on upper part)
❸	72 bp to 1353 bp peaks included in ladder 72 bp, 118 bp, 194 bp, 234 bp, 271 bp, 281 bp, 310 bp, 603 bp, 872 bp, 1078 bp, 1353 bp; 11 peaks in total

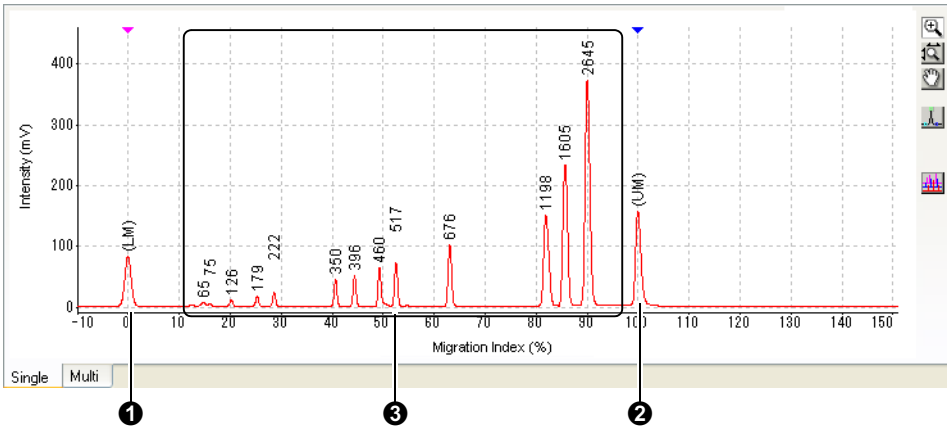
Option ladder



No.	Explanation
❶	Lower marker (Magenta arrow displayed on upper part)
❷	Upper marker (Blue arrow displayed on upper part)
❸	100 bp to 1500 bp peaks included in ladder 100 bp, 200 bp, 300 bp, 400 bp, 500 bp, 600 bp, 700 bp, 800 bp, 900 bp, 1000 bp, and 1500 bp; 11 peaks in total

DNA-2500 kit

Standard ladder



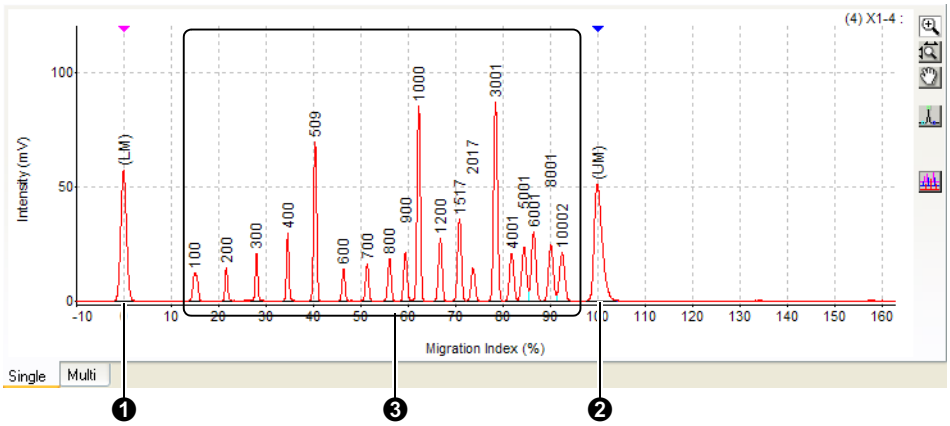
No.	Explanation
❶	Lower marker (Magenta arrow displayed on upper part)
❷	Upper marker (Blue arrow displayed on upper part)
❸	65 bp to 2645 bp peaks included in ladder 65 bp, 75 bp, 126 bp, 179 bp, 222 bp, 350 bp, 396 bp, 460 bp, 517 bp, 676 bp, 1198 bp, 1605 bp, and 2645 bp; 13 peaks in total

NOTE

- While peaks of less than 65 bp are detected, these are not used for preparation of size calibration curves.
- When using GelStar® dye, 75 bp peak is not used in the preparation of size calibration curves.

DNA-12000 kit

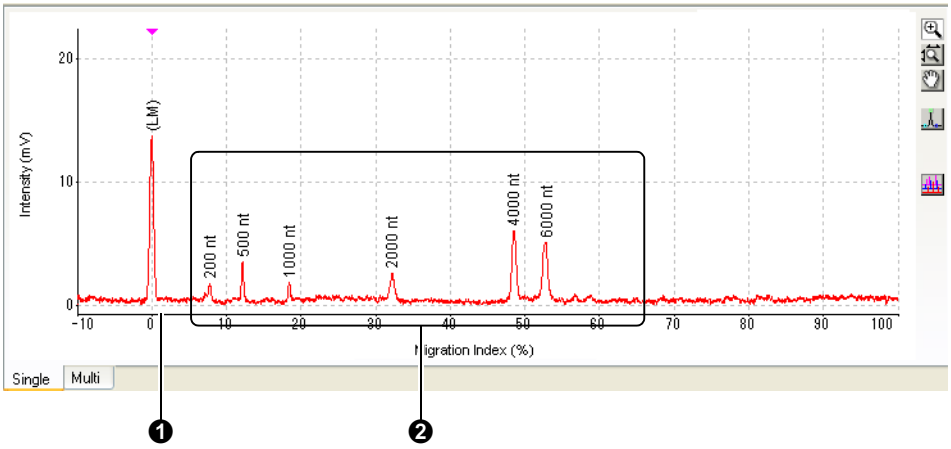
Standard ladder



No.	Explanation
❶	Lower marker (Magenta arrow displayed on upper part)
❷	Upper marker (Blue arrow displayed on upper part)
❸	100 bp to 10000 bp peaks included in ladder 100 bp, 200 bp, 300 bp, 400 bp, 509 bp (500/517 bp), 600 bp, 700 bp, 800 bp, 900 bp, 1000 bp, 1200 bp, 1517 bp, 2017 bp, 3001 bp, 4001 bp, 5001 bp, 6001 bp, 8001 bp, and 10002 bp; 19 peaks in total

RNA kit

Standard ladder



No.	Explanation
❶	Lower marker (Magenta arrow displayed on upper part) (Note: The RNA marker solution does not include an upper marker)
❷	200 nt to 6000 nt peaks included in ladder 200 nt, 500 nt, 1000 nt, 2000 nt, 4000 nt and 6000 nt; 6 peaks in total

2 Reanalyze the data if the ladder has not been analyzed correctly.

NOTE

- To add or delete peaks, or change markers (when lower or upper markers are not detected correctly), use the [Manual Edit Mode] in the [Reanalysis] menu to configure these items manually.

Reference

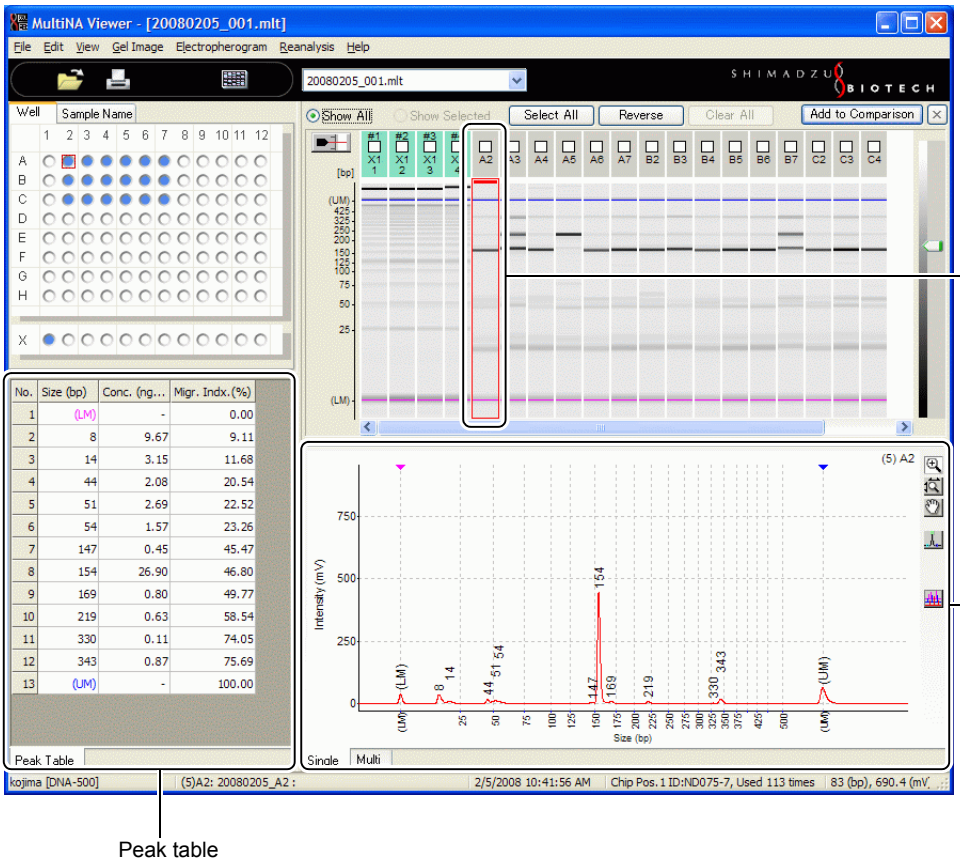
"5.7.2 Manual Edit Mode" P.185

- If the ladder used in analysis is not suitable or ladder data does not exist in the data file, load ladder data from another file and perform reanalysis.

Reference

"5.7.3 Change Ladder and Analyze" P.189

3 Check the sample data.



1 Click the sample data for checking.
The target electropherogram is displayed.

2 Check the marker and fragment peaks.

NOTE

To change the peak detection state of the data, reanalyze the sample data.

Reference

"5.7.2 Manual Edit Mode" P.185

3 Check the peak table.

No.	Size (bp)	Conc. (ng/µL)	Molar. (pmol/L)
1	(LM)	-	-
2	103	1.58	4.75
3	479	2.51	7.53
4	1030	2.59	7.77
5	(UM)	-	-

Peak Table

NOTE

Items displayed in the peak table can be selected via [Options] on the [View] menu.

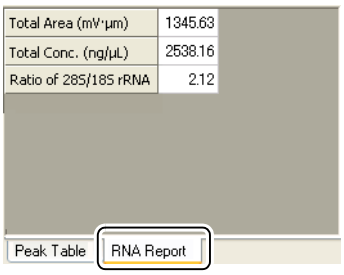
Reference

"5.4.13 Options" P.175

4 For RNA analysis, check the RNA report.

In RNA analysis, the peak table and the RNA report tab are displayed.

The RNA report displays the [Total Area] and [Total Concentration]. In addition, the total RNA analysis displays the [Ratio of 28S/18S rRNA].

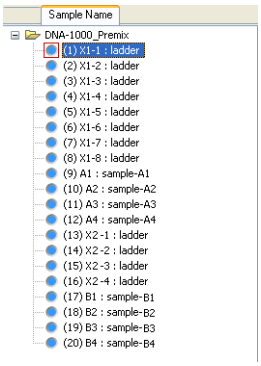


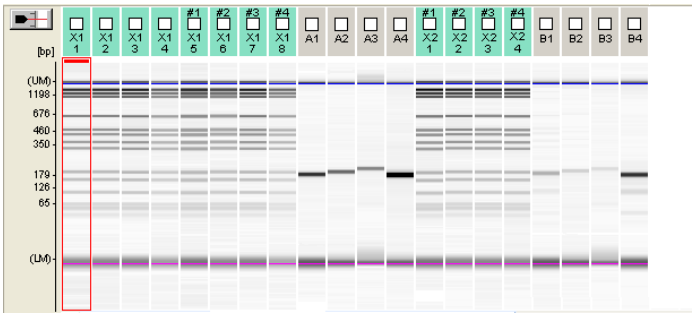
Notes regarding samples and ladders

An example is used to explain an analysis using four microchips where 2 ladder analyses, 1 sample analysis, 1 ladder analysis and 1 sample analysis are performed.

- (1) X1-1 to (4) X-4: Not used in analysis.
- (5) X1-5 to (8) X1-8: Used in the analysis of (9) A1 to (13) A4 (corresponding to the latest ladder data).

(13) X2-1 to (16) X2-4: Used in the analysis of (17) B1 to (20) B4 (corresponding to the latest ladder data).



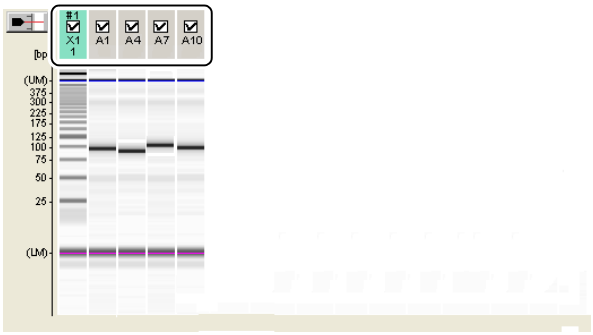


Sample	Ladder Used in Analysis	Chip Position
(9) A1	(5) X1-5	1
(10) A2	(6) X1-6	2
(11) A3	(7) X1-7	3
(12) A4	(8) X1-8	4
(17) B1	(13) X2-1	1
(18) B2	(14) X2-2	2
(19) B3	(15) X2-3	3
(20) B4	(16) X2-4	4

3.9 Printing Data

Print the electropherogram, gel image, and analysis results.

1 **Select the checkboxes of data to print in the gel image.**



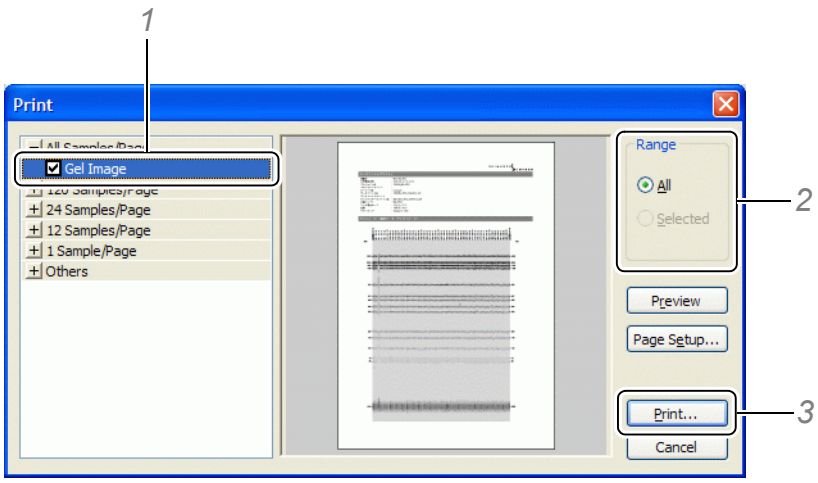
NOTE

If printing all of the data, selecting checkboxes is not necessary.

2 **Click on the toolbar in the Viewer window.**

The [Print] dialog box is displayed.

3 **Configure the print conditions.**



1 Add checkmarks to the layouts for printing.

2 Click [All] or [Selected] on the [Range] menu.

NOTE

[Selected] indicates data that has been selected on the gel image or the electropherogram (multi).

3 Click [Print].

Printing starts.

Reference

For details about printing, see *"5.2.8 Print" P.148*.

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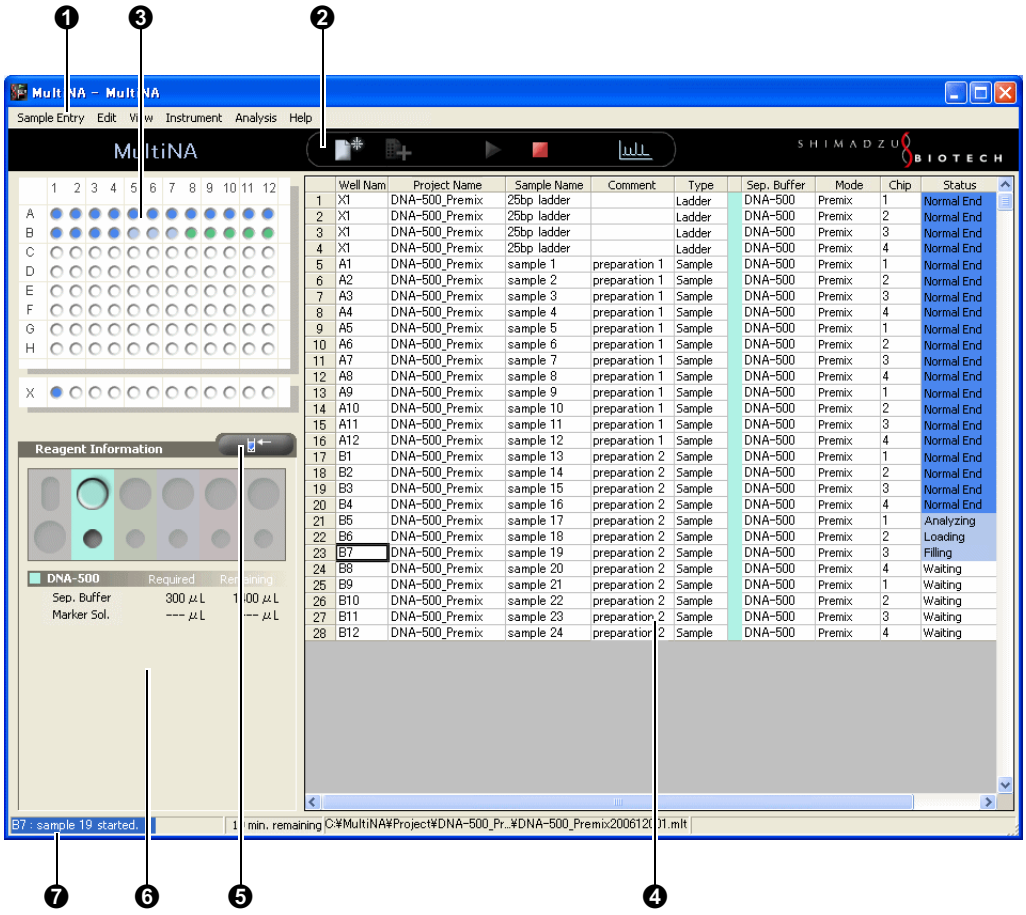
4 MultiNA Control Software Functions

4.1 MultiNA Window

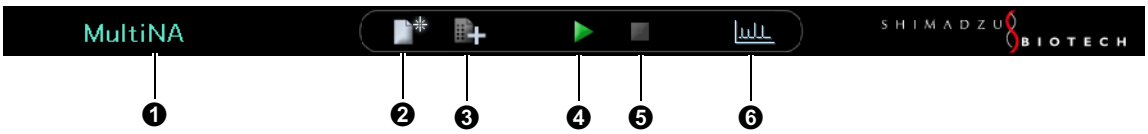


No.	Name	Reference
❶	Menu Bar	*"4.1.1 Menu Bar" P.74*
❷	Toolbar	*"4.1.2 Toolbar" P.75*
❸	Well Status Display	*"4.1.3 Well Status Display" P.75*
❹	Analysis Schedule List	*"4.1.4 Analysis Schedule List" P.76*
❺	Detect Remaining Reagent Amount Button	*"4.1.5 Detect Remaining Reagent Amount Button" P.76*
❻	Reagent Information	*"4.1.6 Reagent Information" P.77*
❼	Status Bar	*"4.1.7 Status Bar" P.77*

4.1.1 Menu Bar

Menu Item		Functional Overview	Shortcut Key	Reference Page
Sample Entry	New	Create a new sample sheet to be analyzed.	F5	P.79
	Add	Add another sample sheet to an open analysis schedule.	F6	P.92
	Exit	Close the MultiNA Control Software.		P.93
Edit	Project Settings	Create and edit a project.	F7	P.94
	Edit Sample Sheet	Edit a sample sheet that is included in the open analysis schedule.		P.100
	Delete Sample Sheet	Delete a sample sheet from an open analysis schedule.		P.101
	Copy	Copy range selected from analysis schedule to clipboard.	Ctrl + C	P.102
View	Chip Status	Display the electropherogram and current voltage for each microchip.	F8	P.78, P.103
	Data File	Open the MultiNA Viewer software and displays the selected data file.	F12	P.104
	Log	Display event log.		P.105
Instru-ment	Connect	Connect to or disconnects from instrument.		P.107
	Options	Set up optional settings for instrument and displays.		P.108
	Chip Management	Open the [Chip Management] window where, microchips can be selected, deselected or changed.		P.110
	Detect Remaining Reagent Amount	Check residual amounts of separation buffer and marker.		P.113
	Move All Axes to Home Position	Move all of the drive axes to their home position.		P.114
	Check Analysis Performance	Close the current analysis schedule and opens an inspection schedule.		P.114
	Parts Maintenance	Control replacement parts and execute check program after replacement.		P.118
	Wash	Wash (rinse) microchips and probes. Execute RNase removal and rinsing.		P.119
	Chip Cleaning	Microchip cleaning using chip cleaning solution		P.120
	Periodic Maintenance	Peristaltic pump maintenance when the instrument is out of use for an extended period.		P.120
Analysis	Start	Start the analysis schedule.	F9	P.121
	Stop	Stop the analysis schedule.	F10	P.122
Help	Quick Manual	Display the Quick Manual.	F1	P.123
	MultiNA Instruction Manual	Display the Instrument Manual (system, control software, and data analysis software).		
	Check Integrity	Perform an integrity check on the MultiNA program files.		P.123
	About MultiNA	Display the version information of the program.		P.124

4.1.2 Toolbar



No.	Explanation
❶	Instrument name: Instrument name entered in option setting ([Instrument] - [Options] - [General]). The text color expresses the state, as follows. • Light blue: Connected to instrument • Pale orange: Disconnected from instrument • Light blue: Analyzing • Red: Error occurred
❷	[New] ([Sample Entry] - [New])
❸	[Add] ([Sample Entry] - [Add])
❹	[Start] ([Analysis] - [Start])
❺	[Stop] ([Analysis] - [Stop])
❻	[View Data File] ([View] - [Data File]): Start MultiNA Viewer

4.1.3 Well Status Display

The well status is displayed as follows, depending on the status of the corresponding sample.

- White: Sample not registered
- Green: Sample registered, not yet analyzed
- Light blue: Separation buffer now filling
- Light blue/Blue blinking: Sample loading/Analyzing
- Blue: Analysis has ended normally
- Red: Analysis has ended abnormally

NOTE

When multiple analyses are performed on a sample in the extra sample stand, the status of the sample is displayed. The display becomes red if any one of the multiple analyses ends abnormally.

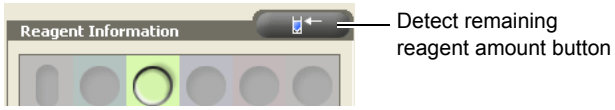
4.1.4 Analysis Schedule List

Displays the sample information entered in the analysis schedule and the sample status.

The column display can be changed by selecting [Options] on the [Instrument] menu and then selecting the [Column Selection] tab.

Column	Explanation	
Well name	Displays the information of sample registration. For details, see *"4.2 Sample Entry Menu" P.79*	
Project name		
Sample name		
Comment		
Type		
Sep. Buffer		
Mode		
Chip	Displays the chip No. to be used (or used) for the respective samples.	
Status	The status is displayed as follows, depending on the sample analysis state.	
	Waiting	Pre-analysis state before pretreatment of microchip.
	Filling	Pretreatment of microchip in progress (separation buffer filling, etc.).
	Loading	Loading sample onto microchip in progress.
	Analyzing	Analysis of sample in progress (separation in progress).
	Normal End	Analysis has ended normally.
	Abnormal End	An error occurred, or analysis was interrupted.
	Skipped	Because failure occurs to the microchip during analysis performance inspection, analysis was skipped.

4.1.5 Detect Remaining Reagent Amount Button

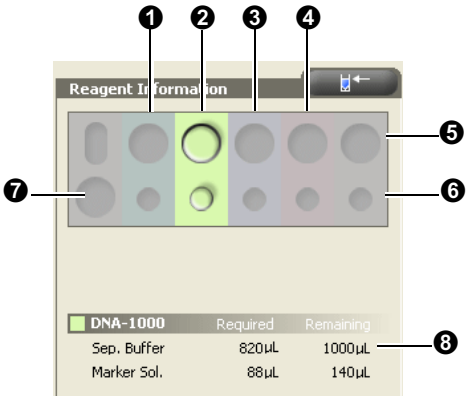


Click this button before starting an analysis schedule to determine the residual amount of separation buffer or marker solution in the reagent holder.

This function can also be accessed by selecting [Detect Remaining Reagent Amount] from the [Instrument] menu.

4.1.6 Reagent Information

This window displays the volumes of separation buffer, marker solution (for on-chip mix only), and chip cleaning solution required for analysis of the unanalyzed samples in the analysis schedule, and the remaining volumes of each reagent (after detection of the residual reagent volumes).

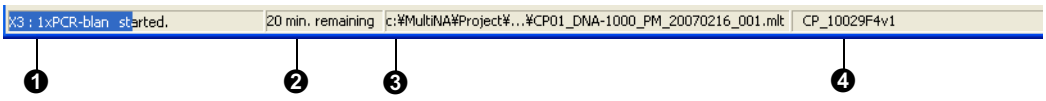


No.	Explanation
❶	DNA-500 kit
❷	DNA-1000 kit
❸	DNA-2500 kit
❹	RNA/DNA-12000 kit
❺	Displayed color indicates state of residual separation buffer amount. • Gray: Residual amount unconfirmed • Same color as background: Residual amount acceptable • Red: Residual amount insufficient
❻	Displayed color indicates state of residual marker solution amount. • Gray: Residual amount unconfirmed • Same color as background: Residual amount acceptable • Red: Residual amount insufficient
❼	Chip cleaning solution
❽	Displays volumes of separation buffer, marker solution, and chip cleaning solution required for use (calculated from the sample sheet), and their residual volumes.

Required amount of separation buffer displayed in [Reagent Information] includes the following excess volumes.

- Minimum amount detectable by the liquid level sensor used to check the volume of remaining reagent
- Amount consumed in the conditioning process
- Amount required when the fill check results in NG and a refill is performed

4.1.7 Status Bar

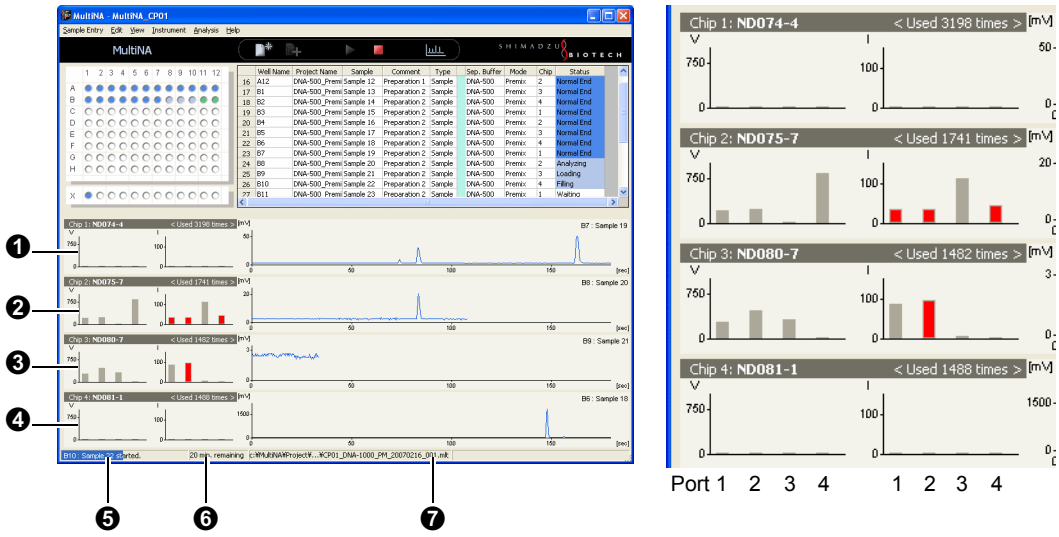


No.	Explanation	No.	Explanation
❶	Displays of the latest instrument action	❸	Data file name
❷	The remaining time in the entire analysis schedule	❹	Data file comment

4.1.8 Chip Status Window

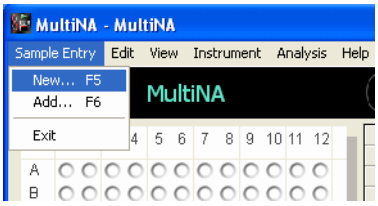
Selecting [Chip Status] from the [View] menu switches between the [Reagent Information] window and [Chip Status] window (figure below).

The [Chip Status] window displays the electropherogram and current/voltage graphs for each microchip. The window will automatically switch to the [Chip Status] window when starting the analysis (when starting to fill the first sample). To change the graph scale, point to [Project Settings] and select [Display] (see *"4.3.1 Project Settings" P.94*).



No.	Explanation
❶	Chip position 1
❷	Chip position 2
❸	Chip position 3
❹	Chip position 4
❺	Voltage status: Displays, in real-time, the voltage monitor value in each of microchip ports 1 to 4.
❻	Current status: Displays, in real-time, the current monitor value in each of microchip ports 1 to 4. (A negative value is indicated in red.)
❼	Electropherogram: Displays, in real-time, the photometry data detected for each microchip.

4.2 Sample Entry Menu



4.2.1 New

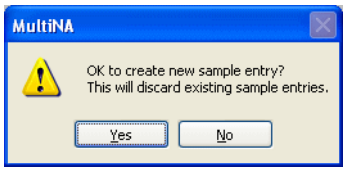
A new sample sheet is created and entered into the analysis schedule.

(Click [New Entry] on the toolbar to obtain the same result.)

NOTE

The following message is displayed if the analysis schedule already contains a sample sheet.

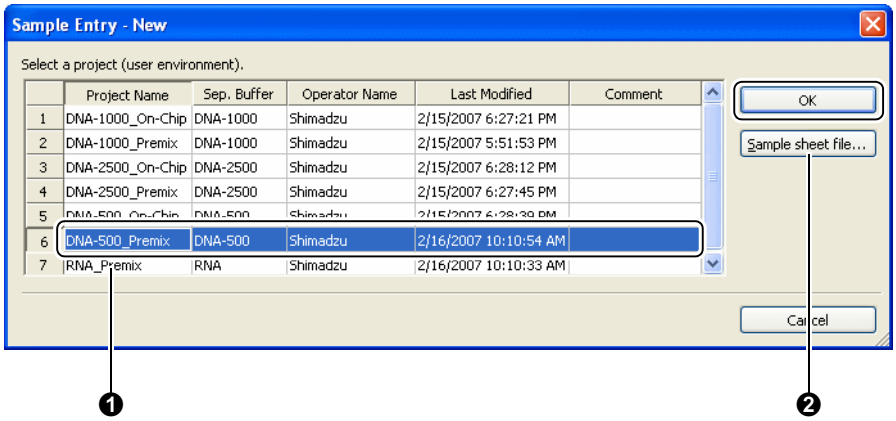
Click [Yes] to proceed with the new entry. The content of the existing sample sheet is discarded when the new sample sheet is entered.



1 **Select [New] on the [Sample Entry] menu.**

The [Sample Entry - New] window is displayed.

2 **In the [Sample Entry - New] window, select one project and click [OK], or double-click the line.**



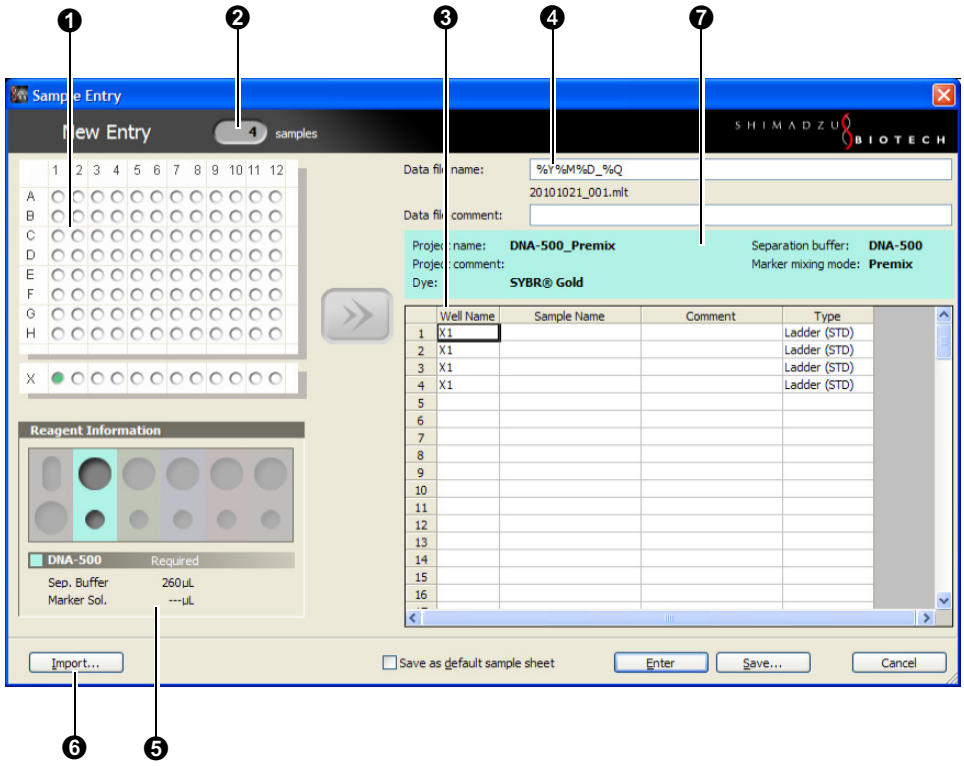
No.	Explanation
❶	List of projects already created
❷	Click this button to open a window for selecting the existing sample sheet file. Select the file name and click [Open] to display the sample sheet in the [Sample Sheet] window (for details, see *"Sample Sheet File" P.84*).

NOTE

If no project exists that corresponds to the sample for analysis or dye to be used, cancel the window and create a new project.

(see *"4.3.1 Project Settings" P.94*)

The [New Entry] window is displayed.



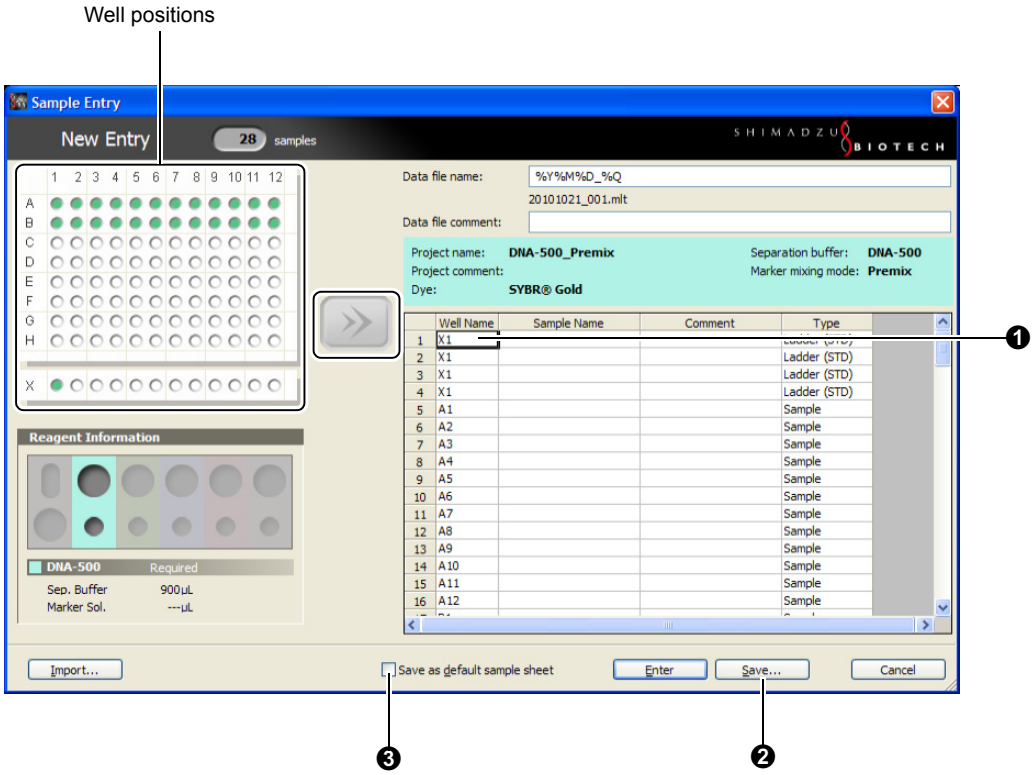
No.	Explanation
❶	Specifies the well position where the ladder solution or sample is located. Either click on the well, or drag the mouse over it to select it.
❷	Displays the number of the samples included in the sample sheet. If it is "0", you can create a sample sheet by entering the total number of samples. The well positions are entered automatically based on the [Analysis Order] selected in the [Project Settings] window. In [Add Entry] (*"4.2.2 Add" P.92*), this number includes the samples in the current analysis schedule and the samples in the current sample sheet.
❸	When [Auto ladder entry] is selected on the [Edit] - [Project Settings] menu, the ladders are automatically entered at the top of the sample sheet according to the number of microchips being used (*"3.4.1 Project Settings" P.35*).
❹	The data file name is automatically entered according to the [Default data file name] selected on the [Edit] - [Project Settings] menu. For example, for %Y%M%D-%Q, the file name is automatically the year-month-day and sequential number (e.g.: 20070130-001, first data file for January 30, 2007). The file name shown below the column indicates the file name created. (Clicking [Enter] confirms the file name.)
❺	The required amounts of separation buffer and marker solution (on-chip mix only) are calculated and displayed in the [Reagent Information] window.
❻	Use the [Import] window (*"Import" P.86*) to extract sample information from an existing Excel or CSV file.
❼	This area displays information including the project name, separation buffer, and dye.

3 After selecting the sample well position, click  .

The sample information is entered into the appropriate columns. The content is automatically entered according to the [Project Settings].

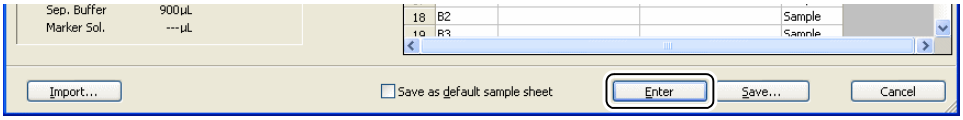
Reference

"4.3.1 Project Settings" P.94



No.	Explanation
❶	Enter a [Sample Name] and [Comment]. Select ladder or sample for the [Type].
❷	Click [Save] to save the sample sheet content as a sample sheet file. Use [Sample sheet file] in either the [Sample Entry - New] window or [Sample Entry - Add] window to open the saved file ("Opening the Saved Sample Sheet" P.85).
❸	Clicking [Enter] or [Save] with this check box selected saves the content of the current [Sample Entry] window as the default sample sheet (file name: default.ssh). If [Load default sample sheet while starting up] is selected in the [Project Settings] window, this default sample sheet is displayed when the [Sample Entry] window is opened ("3.4.1 Project Settings" P.35).

4 Click [Enter].



The set sample sheet is added to the analysis schedule.

NOTE

In the following cases, [Enter] is not displayed and sample sheets cannot be added to the analysis schedule.

- When the instrument is performing analysis or rinsing

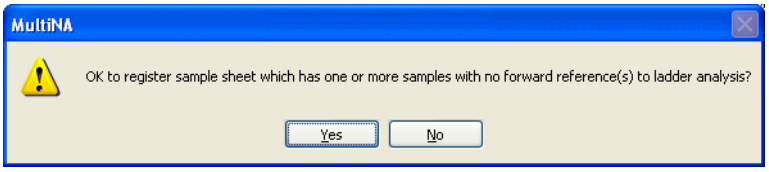
- When the MultiNA instrument and PC are not connected (see *"3.2 Startup and Shutdown" P.22*)
- When the selected microchip is not installed or registered (see *"3.3.4 Microchip Registration" P.30*).

NOTE

The following message is displayed when the sample sheet does not contain a ladder analysis.

Usually, click [No], and edit the sample sheet to add the ladder analysis.

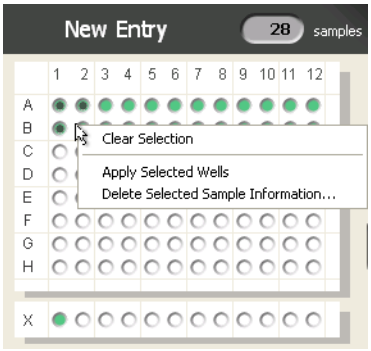
- Although the analysis schedule can be executed without a registered ladder, a ladder must be imported in order to obtain analysis results including size estimation and quantitation (see *"5.7.3 Change Ladder and Analyze" P.189* regarding the [Reanalysis] menu).



NOTE

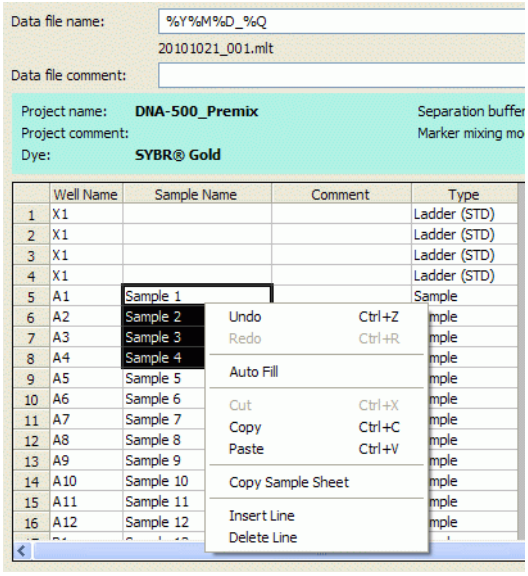
The maximum number of analyses (both ladders and samples) that can be entered into an analysis schedule is 120. The maximum number of analyses that can be entered into a sample sheet is also 120.

■ Well Image Right-Click Menu



Menu	Explanation
Clear Selection	Clears all well selections (black).
Apply Selected Wells	Enters sample information for the selected wells into the sample sheet.
Delete Selected Sample Information	Deletes information about the selected wells from the sample sheet.

■ Sample Sheet Right-Click Menu



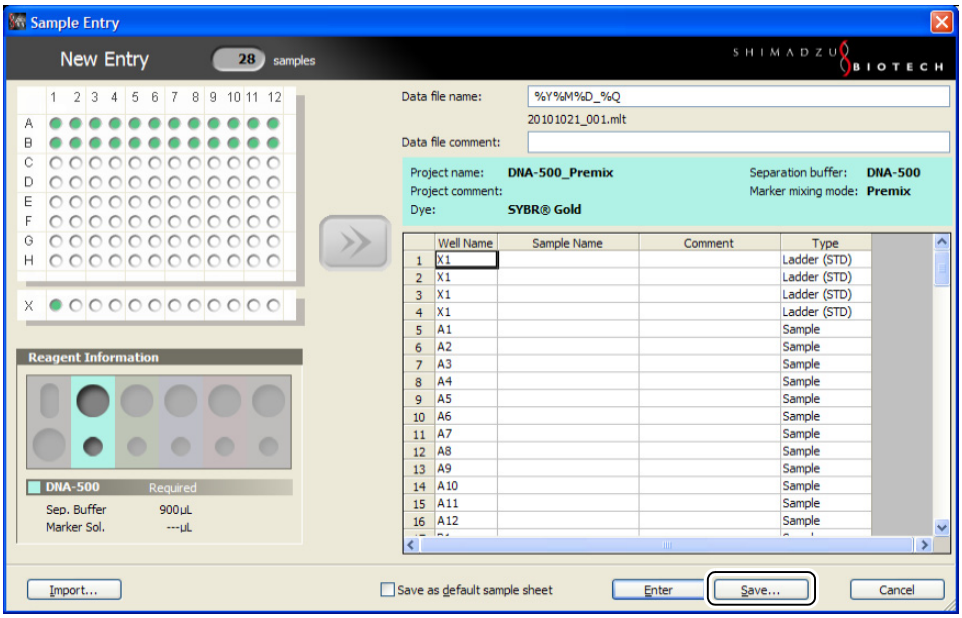
Menu	Explanation
Undo	Restores operation to the content before change.
Redo	Re-performs the just-canceled operation.
Auto Fill	Fills in the content of the selected cells. Enters the sample name, comment, and type, as follows. **Sample name and comment columns:** Enter a name or comment in the top cell. Select the range to be filled and select [Auto Fill]. The cells are filled with the sample name or comment and a sequential numeric value is added at the end of the sample name or comment. If the last character is a number the sequence initiates from that number. (Example: 002 is entered in the top cell, the sequence becomes 002,003,004...) **Type column:** Select the type in the top cell. Select the range to be set and select [Auto Fill], to copy the entered content from the top cell.
Cut	Copies the content of the selected cell to the clipboard, and then deletes it.
Copy	Copies the content of the selected cell to the clipboard.
Paste	Pastes the content in the clipboard to the selected range.
Copy Sample Sheet	Copies all information in the sample sheet to the clipboard.
Insert Line	Inserts a line.
Delete Line	Deletes sample information in the selected line.
Hide/Show Columns (It is displayed if right-clicking on the top title line.)	Displays the window used for selecting items to be displayed in the column (see *"4.5.2 Options" P.108*).

■ Sample Sheet File

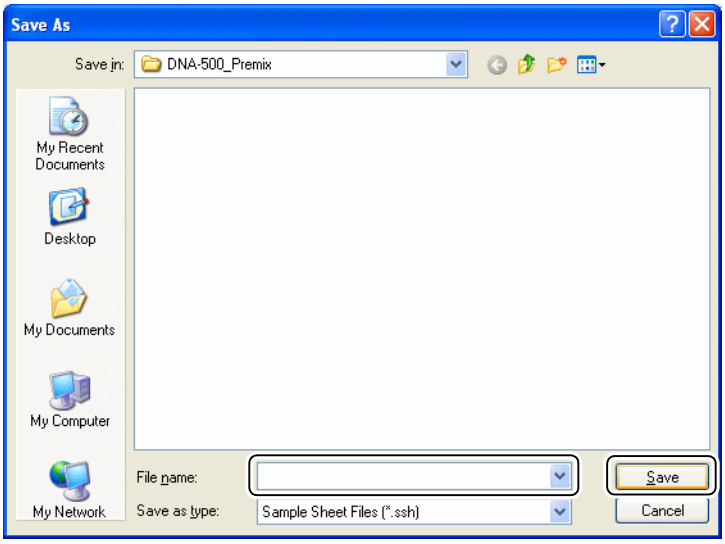
To perform repeated analyses with the same sample composition and save sample entry time, save the content entered in the [Sample Entry] window to a file, then open that file for the subsequent sample sheet entries.

Saving the Sample Sheet

1 **After creating the sample sheet, click [Save].**



2 **In the [File name] column, enter the name of the file and click [Save].**
A sample sheet file with extension .ssh is saved in the project folder.

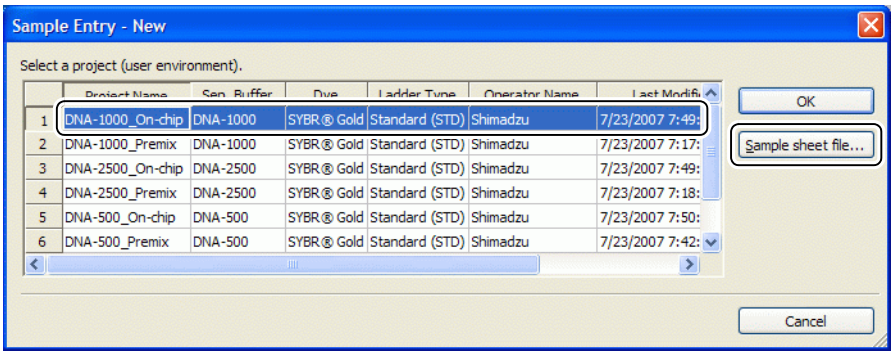


Opening the Saved Sample Sheet

1 **Select [New] on the [Sample Entry] menu or click [New Entry] on the toolbar.**

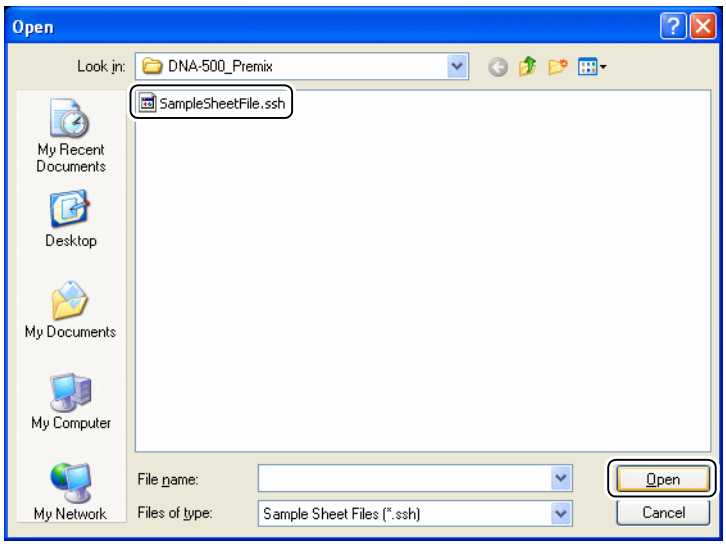
The [Sample Entry - New] window is displayed.

2 **Select the project, and then click [Sample sheet file].**

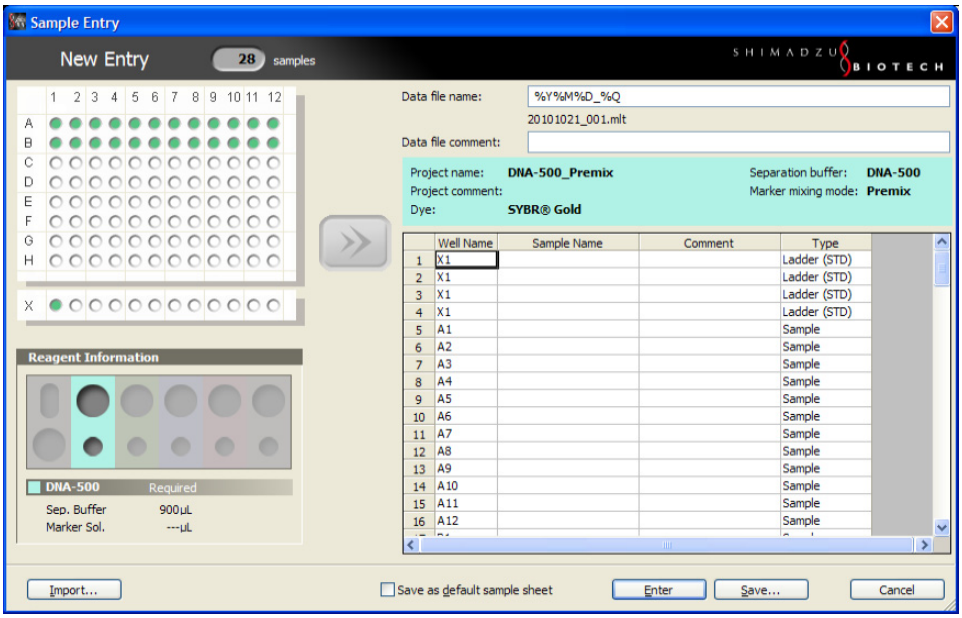


A window for opening the file in the corresponding project folder is displayed.

3 **Select the sample sheet file, and then click [Open].**



The selected sample sheet file is opened, and the [Sample Entry] window is displayed.



■ Import

[Import] is a function for converting and inputting sample information from an existing Excel or CSV file to a MultiNA sample sheet.

[Import from]: import source

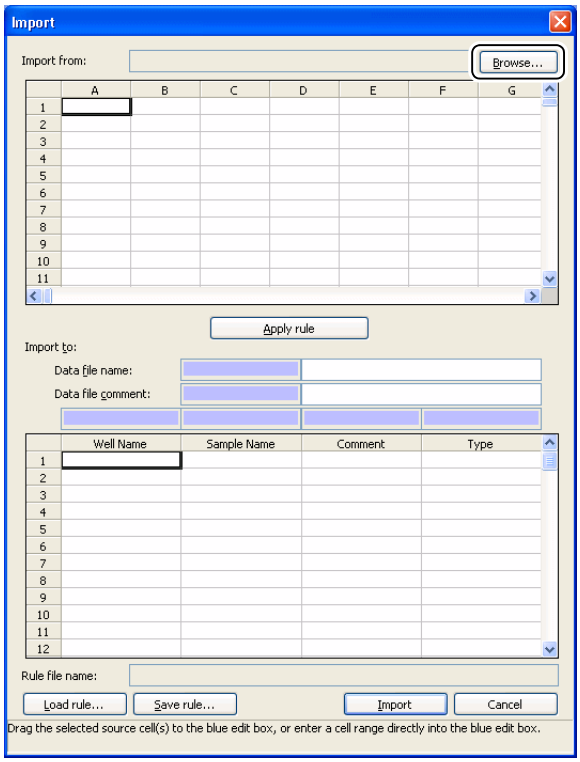
[Import to]: import destination

- [Data file name], [Data file comment], [Well name], [Sample name], [Comment] and [Type] information can all be imported.

1 **In the [Sample entry] window, click [Import].**

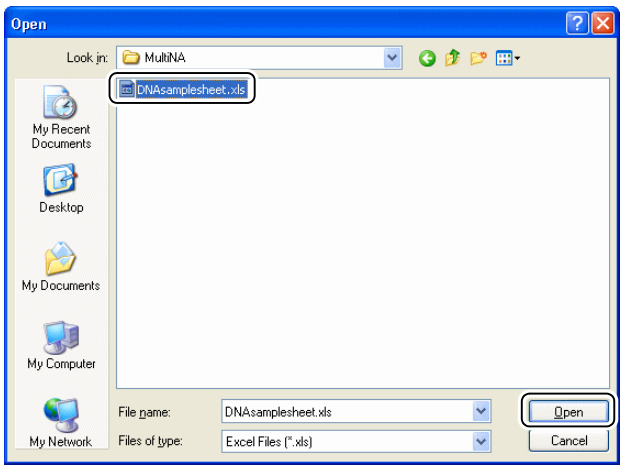
The [Import] window is displayed.

2 Click [Browse].



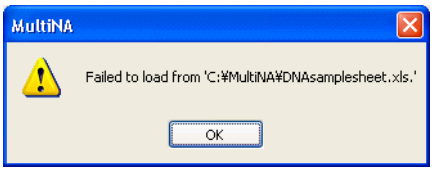
The [Open] dialog box is displayed.

3 Select an Excel file or CSV file, and click [Open].

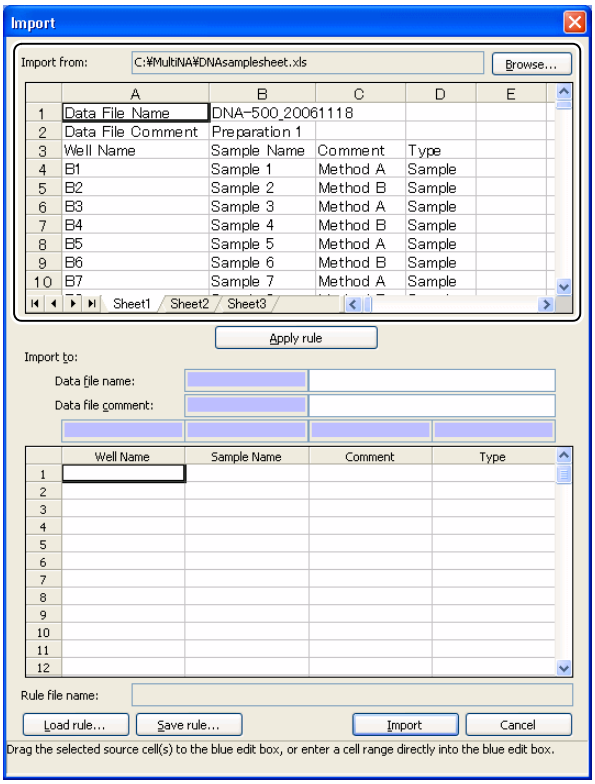


NOTE

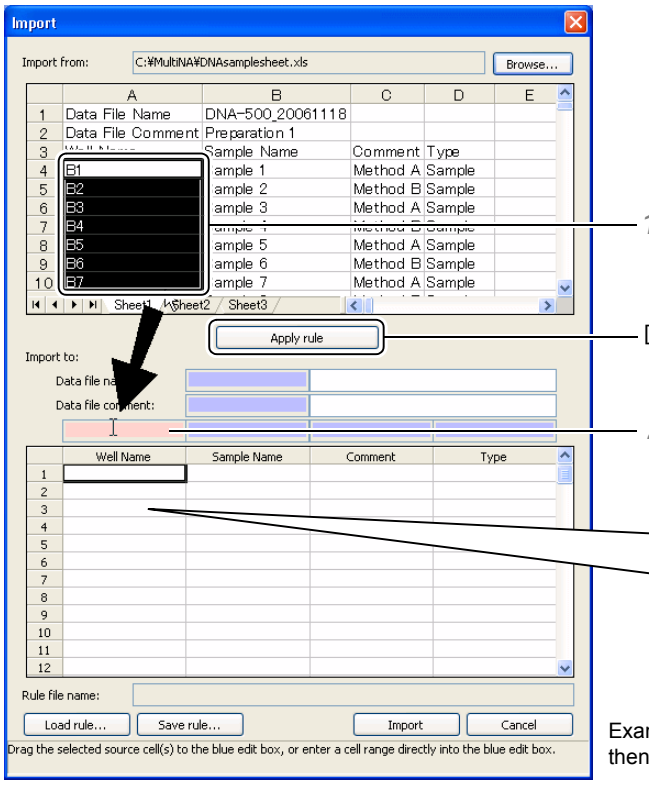
If the Excel or CSV file is currently open in another program (Excel, etc.), the following message will be displayed. Close the file in other software, and then reopen the file in the MultiNA Control Software.

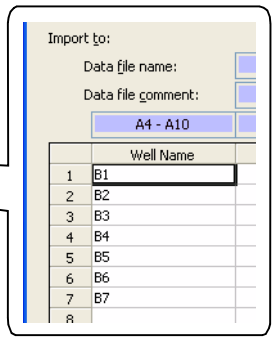


The Excel or CSV file is displayed in the [Import from] section of the [Import] window.



4 Create a rule for converting the [Import from] information to [Import to].





Example in which cells A4 to A9 are selected and then dropped into the box above the well name

1 Drag the mouse to select the import source cell, and align the mouse cursor with the selected range.
The mouse pointer changes to an arrow.

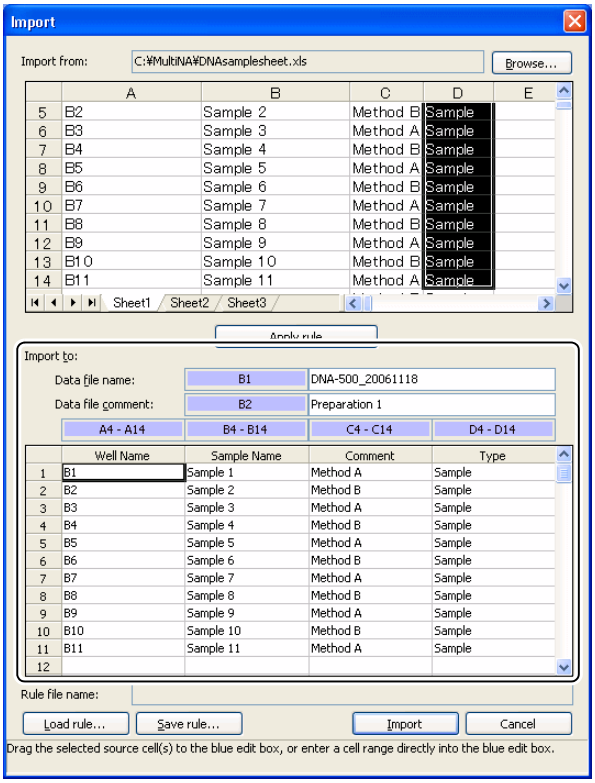
2 Drop the cells into the blue box above the column corresponding to the import destination (moving the mouse pointer over the box changes its color to pink).
The selected import source information (cell range) is entered in the blue boxes above the import destination column. The import source information is copied under these boxes.

NOTE

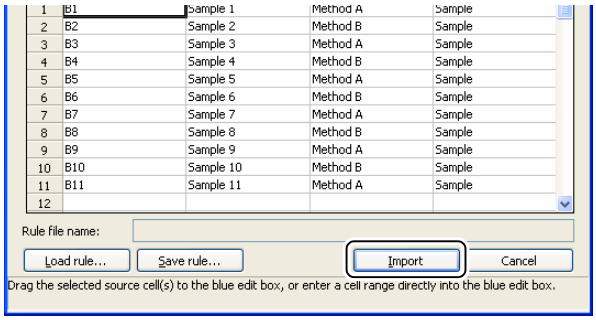
The same operation can be performed by entering the desired import source cell information for conversion directly into the blue box above the import destination and then clicking the [Apply rule] button in the center of the window.

5 Create a rule for the information to be imported using the same operation as step 4.

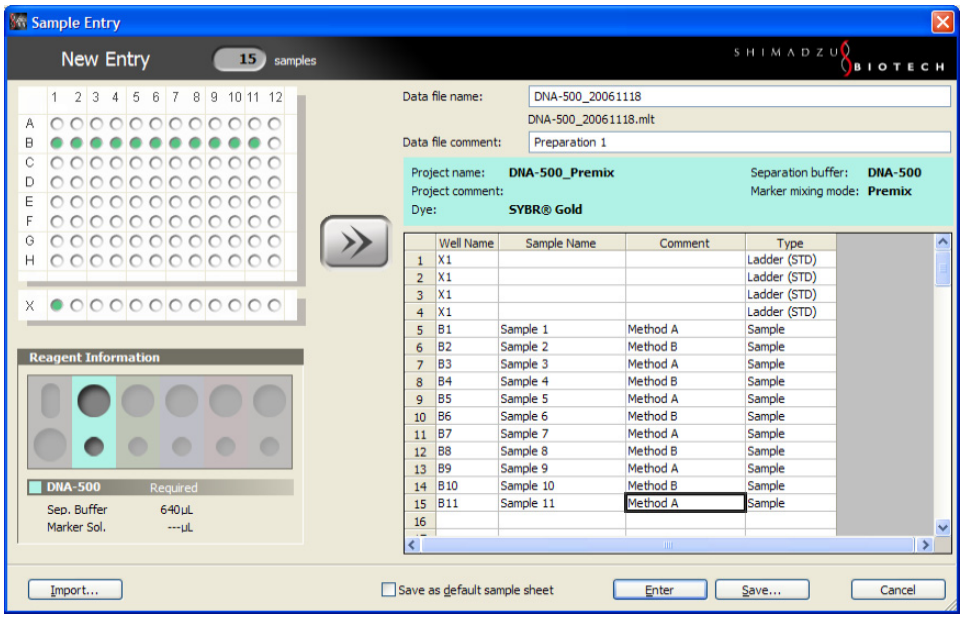
The imported information is copied (sample name, comment, type, data file name, and data file comment).



6 Click [Import].

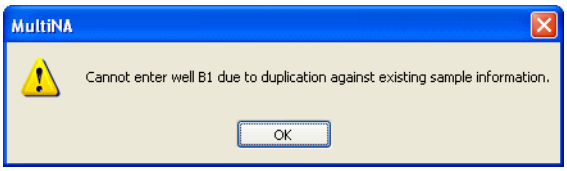


The content of the import destination is imported into the sample sheet.



NOTE

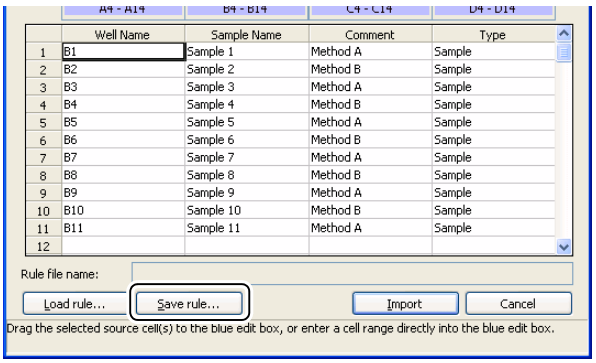
If you attempt to import a well position included in a previously created sample sheet, the import operation is not performed and the following message is displayed.



Saving the Import Rule

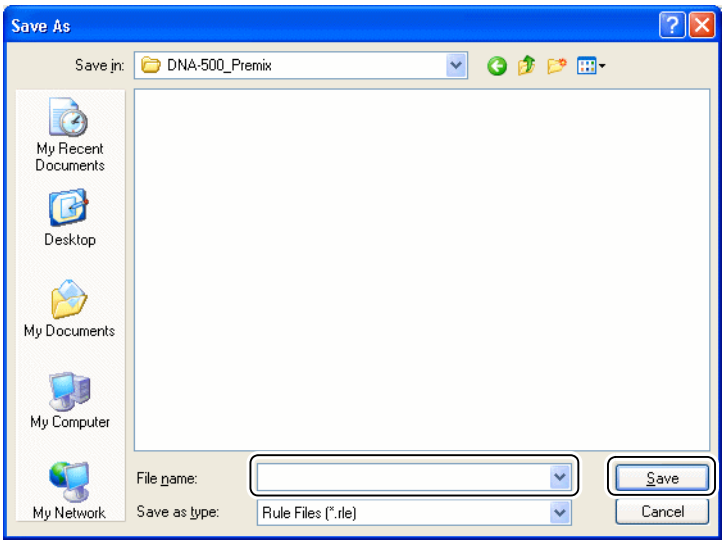
If saving the rule, you can easily convert the import source information to the import destination when importing the file with the same format next time.

1 **Click [Save rule].**



The [Save as] window is displayed.

2 **Enter a file name and click [Save].**



Cell information converted from the import source to import destination is saved as a rule file (extension: .rle).

NOTE

- When the next analysis schedule is created, click [Load Rule] in the [Import] window to open the saved rule file.
- Click [Browse] to open the import source file, and the information is automatically input at the import destination.

4.2.2 Add

Sample sheets can be added to the registered analysis schedule.

NOTE

If a sample sheet is added to an analysis schedule using a project name that is already entered in the analysis schedule, all of the data will be stored in the same data file.

Typically, data from separate sample sheets is stored in separate data files. A separate data file is created even when a sequence-number format has been applied to the data file name.

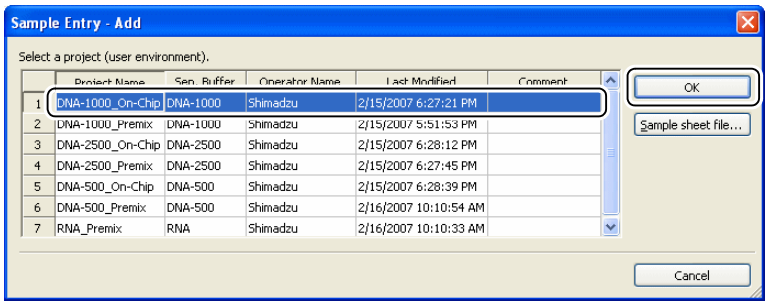
1 **Select [Add] on the [Sample Entry] menu.**

The [Sample Entry - Add] window is displayed.

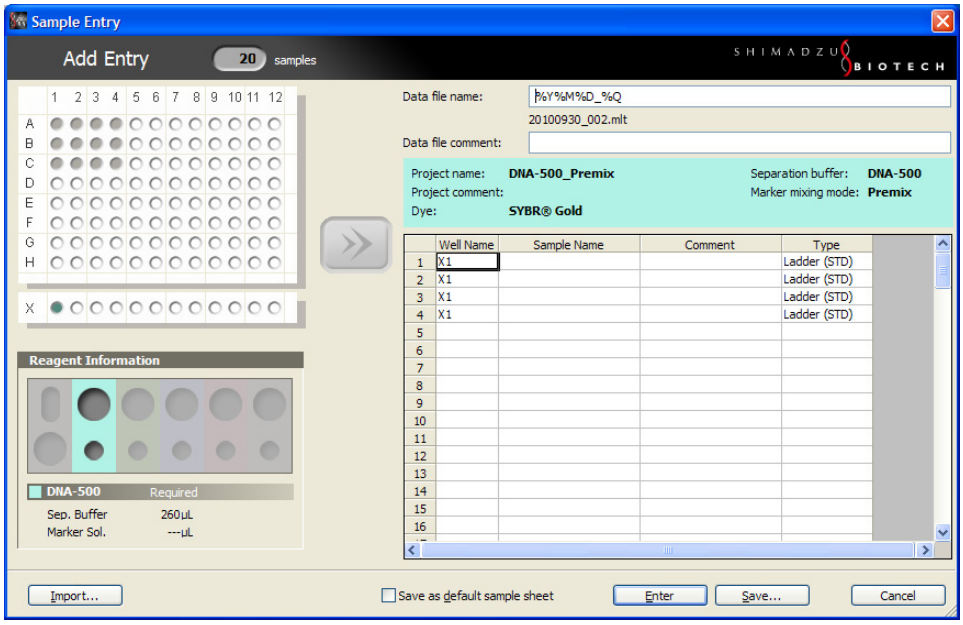
(Add Entry) is enabled on the analysis schedule toolbar after the first (new) sample sheet is entered in the analysis schedule.

2 **Select a project and click [OK].**

Alternatively, click [Sample sheet file] to open an existing sample sheet.

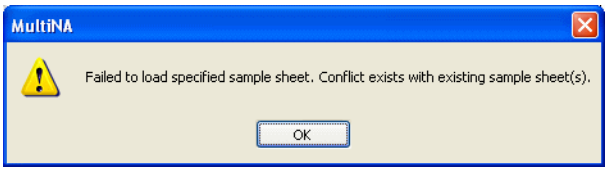


The [Add Entry] window is displayed.
Wells already registered in the analysis schedule are grayed out.



NOTE

If a well in the existing sample sheet is already being used by the samples in the analysis schedule, the sample sheet file fails to load and the following error message is displayed.



3 **Select any open well, and use the same procedure as new entries to insert the sample.**

The additional entry is inserted next to the existing analysis schedule.

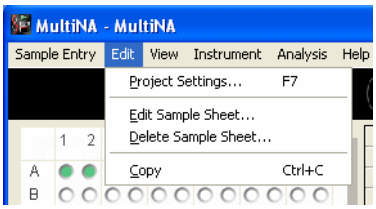
4.2.3 Exit

The MultiNA Control Software is closed.

NOTE

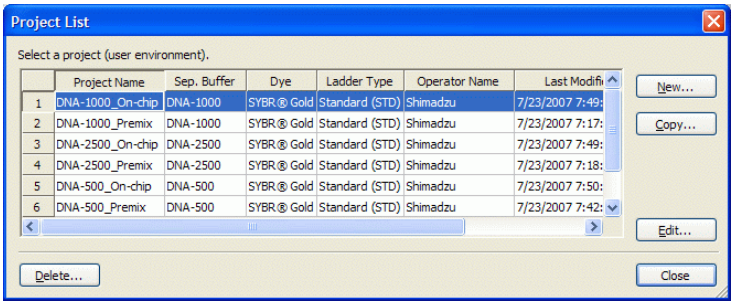
The application cannot be exited when the instrument is performing analysis or rinsing.

4.3 Edit Menu



4.3.1 Project Settings

Create new projects or edit existing projects in the [Project List] window.

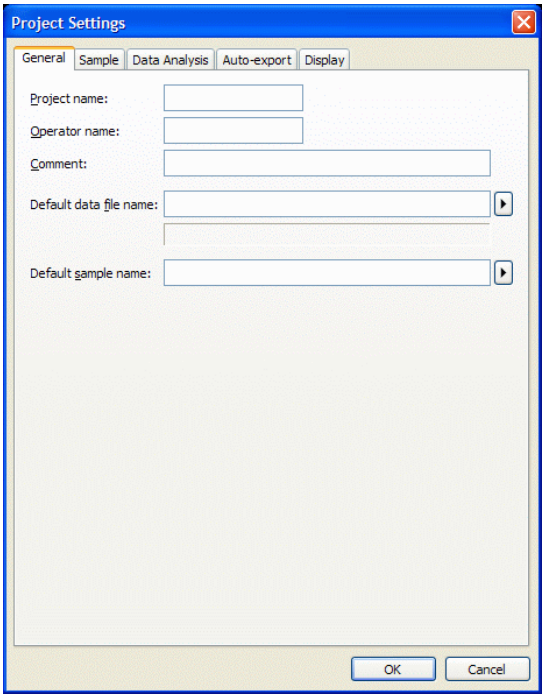


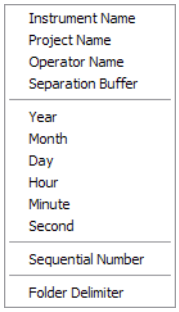
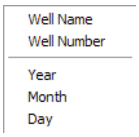
- [New]: Create a new project. *(P.94)*
- [Copy]: Copy and edit an existing project. *(P.99)*
- [Edit]: Edit an existing project. *(P.99)*
- [Delete]: Delete an existing project. *(P.100)*

■ New

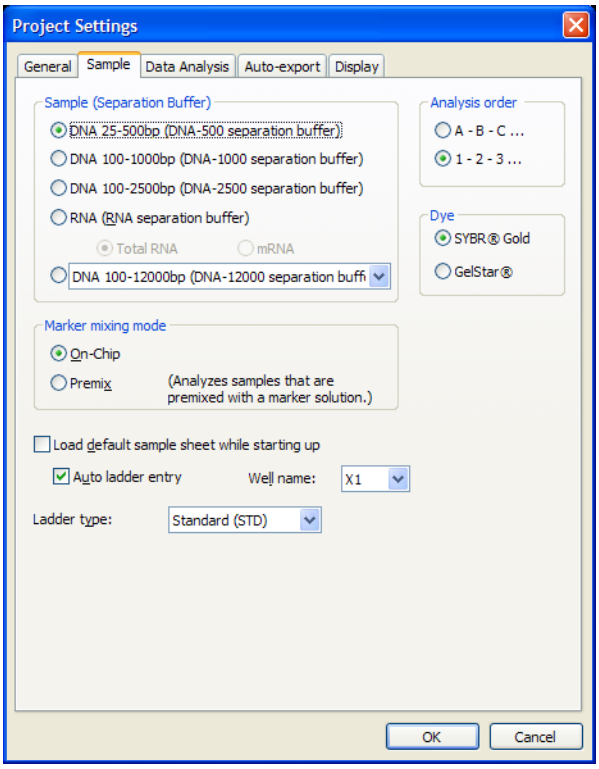
Create a new project.

1 **Enter the displayed items in [General] tab.**



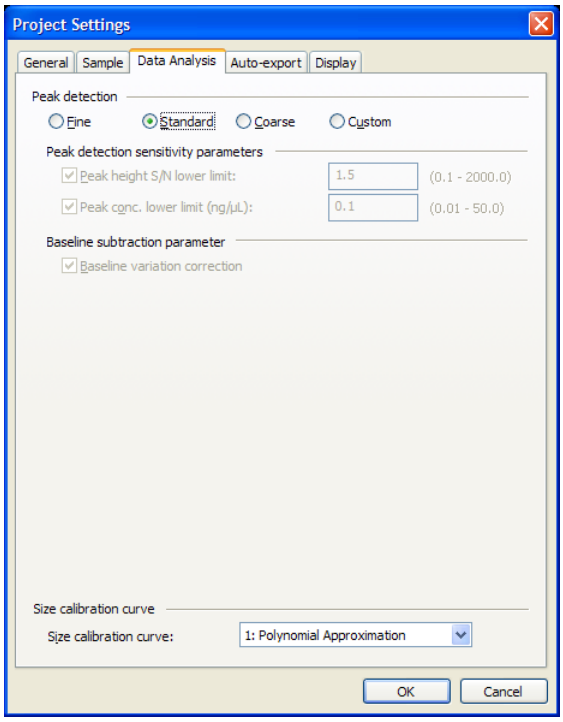
Item	Maximum Number of Characters	Explanation
Project name	30	Enter the project name (required). /\<>:"|?* and space cannot be used.
Operator name	20	Enter the operator name (required). /\<>:"|?* and space cannot be used.
Comment	50	Enter a comment about the project.
Default data file name	258 (Including path)	When the [Sample Entry] window is opened, specify the data file name to be automatically set. /\<>:"|?* and space cannot be used. In addition to normal characters, the following format characters can be used. %I: Instrument name (The name set in [Instrument] - [Option]) %J: Project name %O: Operator name %B: Separation buffer %Y: Year, %M: Month, %D: Day, %h: Hour, %m: Minute, %s: Sec. %Q: Sequential number (Reset in 3 digits at midnight) Click ▸ to select and enter a format.  Ex. In %Y%M%D-%Q, for analyses performed on January 30, 2007, the first data file name is 20070130-001 and the next one is 20070130-002.
Default sample name	30	In the sample entry window, select the sample name to be automatically entered. In addition to normal characters, the following format characters can be used. %W: Well name (A1, B1,...) %N: Well No. (1 to 108) %Y: Year, %M: Month, %D: Day Click ▸ to select and enter a format. 

2 Select the displayed items in the [Sample] tab.



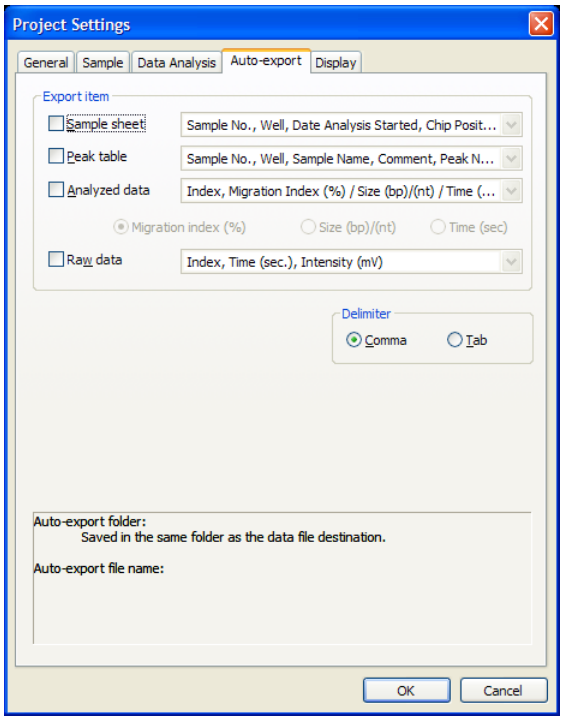
Item	Explanation
Sample (Separation Buffer)	Select the separation buffer to be used in the project.
Total RNA/mRNA	Select RNA (RNA separation buffer) for RNA analysis. (The content of data analysis differs between Total RNA and mRNA. When calculating the ratio between 28S rRNA and 18S rRNA, select Total RNA.)
Marker mixing mode	Select on-chip or premix. For details about each mode, see *"2.3 Mixing the Marker Solution" P.20*.
Load default sample sheet while starting up	If this is selected, the default sample sheet (file name: default.ssh) is automatically read when the [Sample Entry] window is opened (*"4.2.1 New" P.79*).
Auto ladder entry / Well name	If the ladder is selected, the ladder is automatically registered when the [Sample Entry] window is opened. A well position (one from X1 to X12) for setting the ladder is specified at the same time.
Ladder type	Select the standard ladder [Standard (STD)] normally. The optional ladder [Ladder1 (LD1)] may also be selected.
Analysis order	Select the analysis order (A1-B1-C1…, or A1-A2-A3…) for a sample sheet created from the wells selected in the [Sample Entry] window.
Dye	Select the dye to use when performing DNA analysis (see *"3.5.1 Diluted Dye Solution and Separation Buffer Preparation" P.44*).

3 Select the required items on the [Data Analysis] tab.



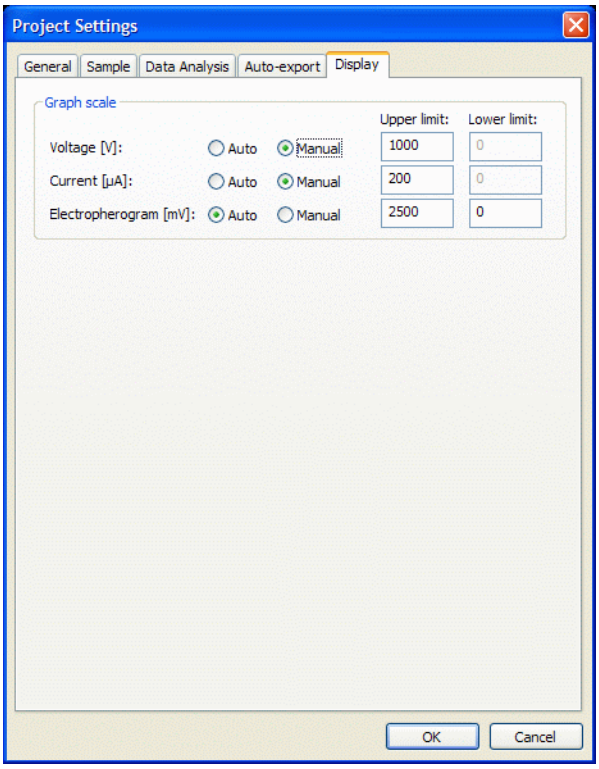
The data analysis conditions to use when analysis completes can be configured. The method of configuration is the same as that for reanalysis settings in the MultiNA Viewer (see *"5.7.1 Automatic" P.182*).

4 Select the required items on the [Auto-export] tab.



An export file for each selected item is automatically output upon completion of analysis. The method of configuration is the same as that for *"5.2.7 Export" P.145* in the MultiNA Viewer. [Auto-export file name] indicates the name of the exported file.

5 Select the displayed items in the [Display] tab.



Item	Explanation
Graph scale	Configure the graph scales described in *"4.1.8 Chip Status Window" P.78*. The possible manual selection ranges are as follows. Voltage: 1 to 1500 (V) Current: 1 to 300 (µA) Electropherogram: 0 to 2500 (mV)

6 Click [OK].

■ Copy

Copy and edit an existing project.

1 **Select an existing project in the [Project List] window *(P.94)*, and click [Copy].**

The [Project Settings] window is displayed.

NOTE

A window is displayed with a blank project name and all of the other items copied from the existing project.

2 **Enter a new project name.**

3 **After completing entry and selection for the necessary items on each tab, click [OK].**

The project is saved.

■ Edit

Edit the content of an existing project.

NOTE

The project name cannot be changed. To change the project name, [Copy] the project and save it with a different name.

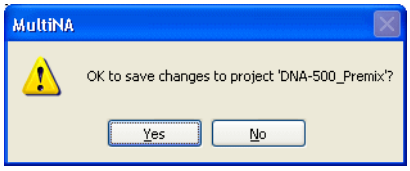
1 **Select an existing project in the [Project List] window *(P.94)*, and click [Edit].**

2 **Change the necessary items in the [Project Settings] window.**

3 **Click [OK].**

The following confirmation message is displayed.

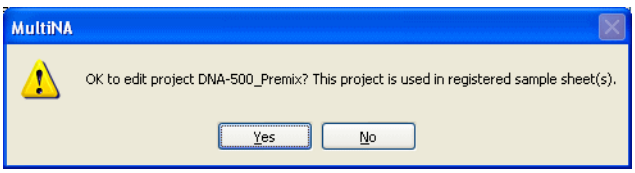
4 **Click [Yes].**



The changes are saved.

NOTE

The following message is displayed when an attempt is made to edit a project that is currently associated with samples entered on the MultiNA window. Select [Yes] to open the [Edit] window. Some items such as, type of separation buffer, will be disabled and cannot be changed.

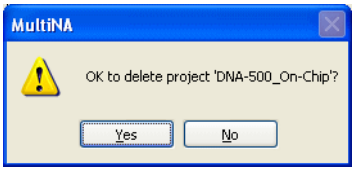


■ Delete

Delete an existing project.

1 **Select an existing project in the [Project List] window *(P.94)*, and click [Delete].**

The following confirmation message is displayed.



2 **Verify the project name, and click [Yes].**

The project is deleted.

NOTE

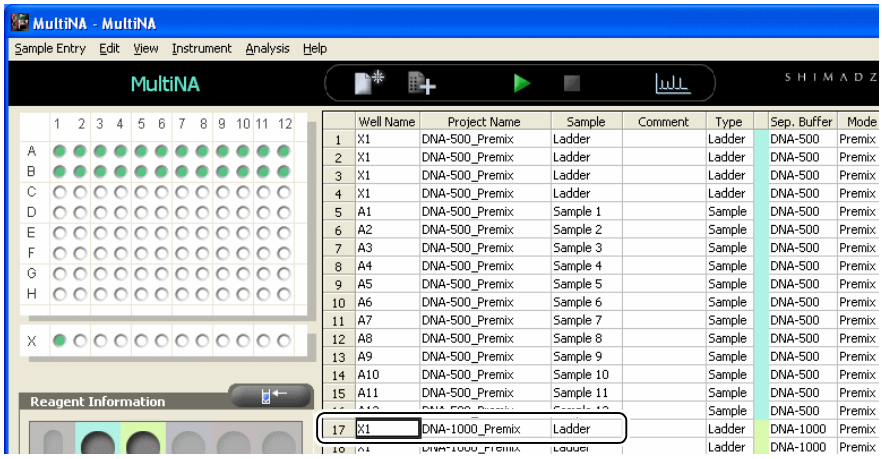
A project cannot be deleted if it is associated with a sample entered on the MultiNA window. The following message is displayed.

4.3.2 Edit Sample Sheet

Use this menu to edit a sample sheet that is entered in the analysis schedule.

1 **Click any cell in the sample sheet to be edited in the MultiNA window.**

If only one sample sheet has been added to the analysis schedule, this procedure is not required.



2 **Select [Edit Sample Sheet] on the [Edit] menu.**

You can also right-click on the sample sheet to bring up a menu, then select [Edit Sample Sheet].
The [Sample Entry] window is displayed.

3 **Edit the sample sheet in the [Sample Entry] window.**

4 **After editing the sample sheet file, click [Enter].**

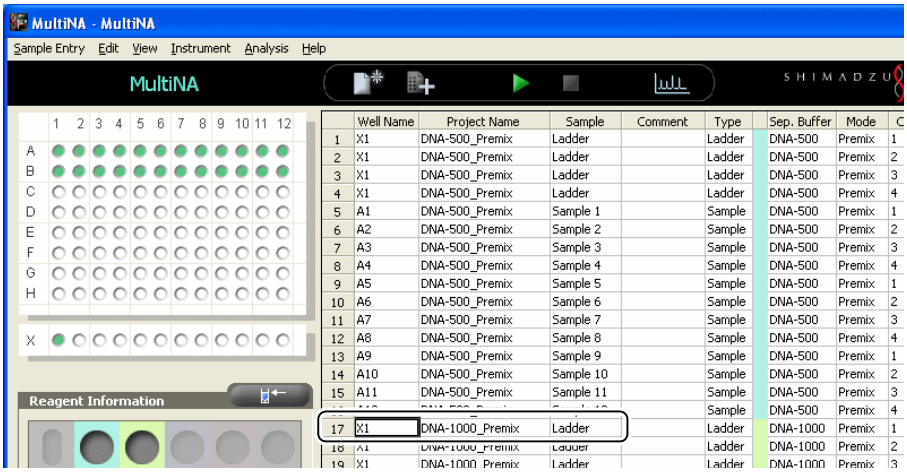
The sample sheet is re-entered into the analysis schedule.

4.3.3 Delete Sample Sheet

Use this menu to delete a sample sheet from the analysis schedule.

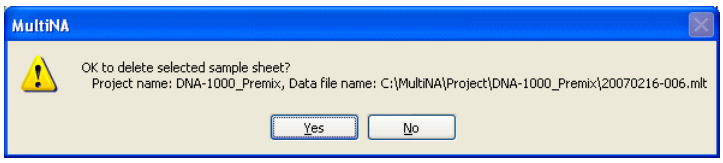
1 **Click any cell in the sample sheet to be deleted in the MultiNA window.**

If only one sample sheet has been added to the analysis schedule, this procedure is not required.



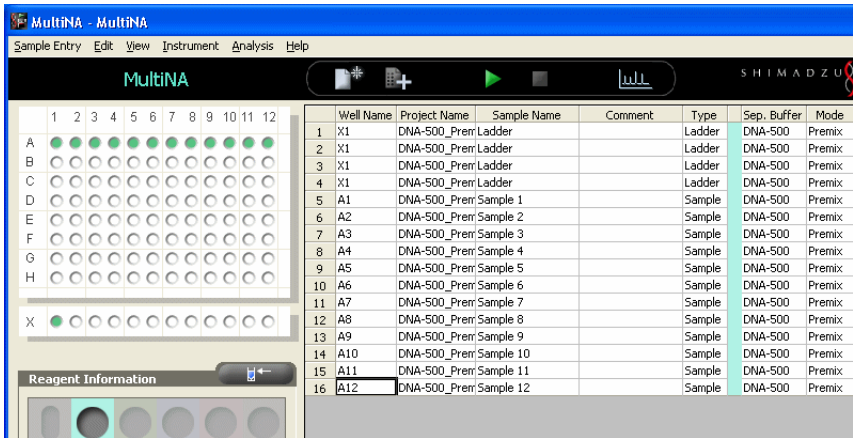
2 **Select [Delete Sample Sheet] on the [Edit] menu.**

Alternatively, right-click on the sample sheet and select [Delete Sample Sheet].
The following confirmation message is displayed.



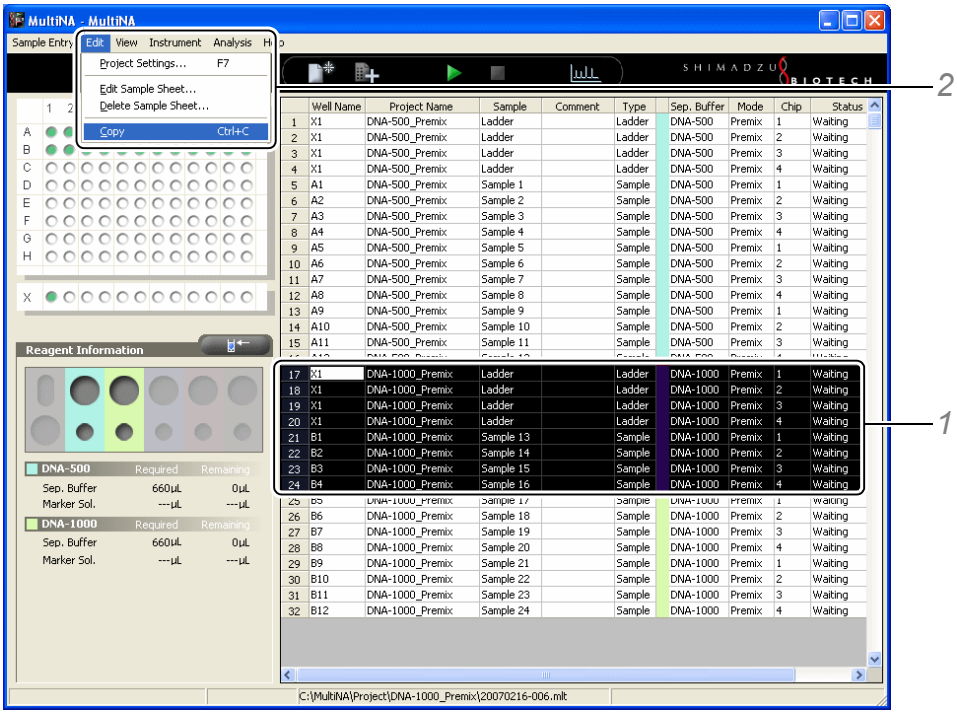
3 **Check the project name and data file name, and click [Yes].**

The sample sheet is deleted, and the analysis schedule in the MultiNA window is changed.



4.3.4 Copy

1 **Use this menu to copy the content (text) selected in the analysis schedule to the clipboard.**



1 Drag the mouse over the range to be copied in the analysis schedule to select it.

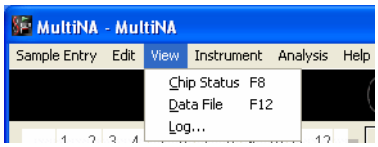
2 Select [Copy] on the [Edit] menu.

The selected content is copied to the clipboard. (The selected range is copied to the clipboard with partition tabs.)

NOTE

The content can be pasted into other applications for editing.

4.4 View Menu



4.4.1 Chip Status

Select [Chip Status] from the [View] menu.

The [Reagent Information] window and [Chip Status] window display changes.

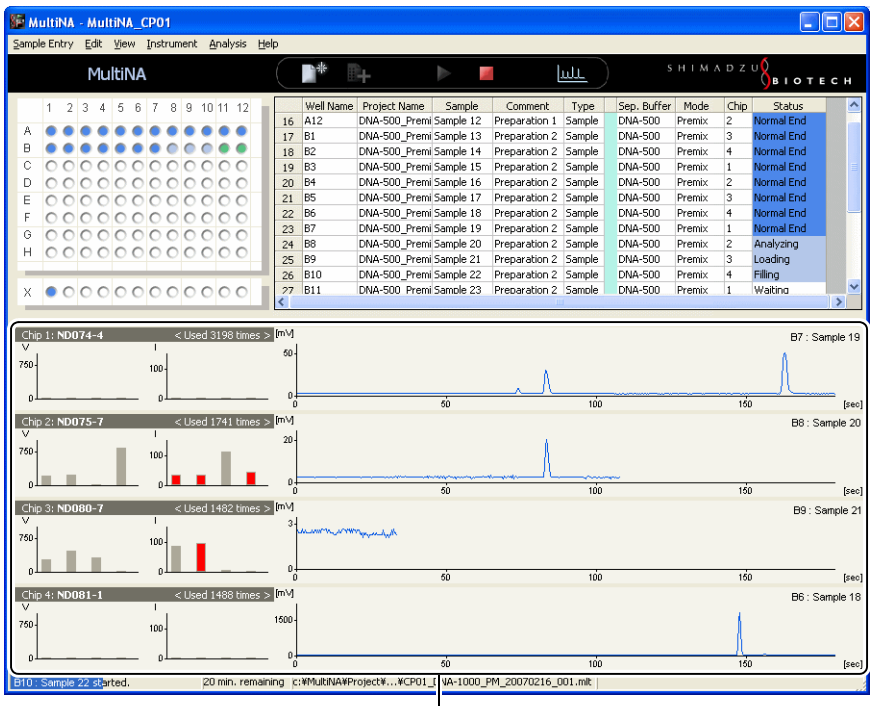
The [Chip Status] window displays the electropherogram and current/voltage graphs for each microchip.

Reference

"4.1.8 Chip Status Window" P.78

NOTE

The window will automatically switch to the [Chip Status] window when starting the analysis (when starting to fill the first sample).



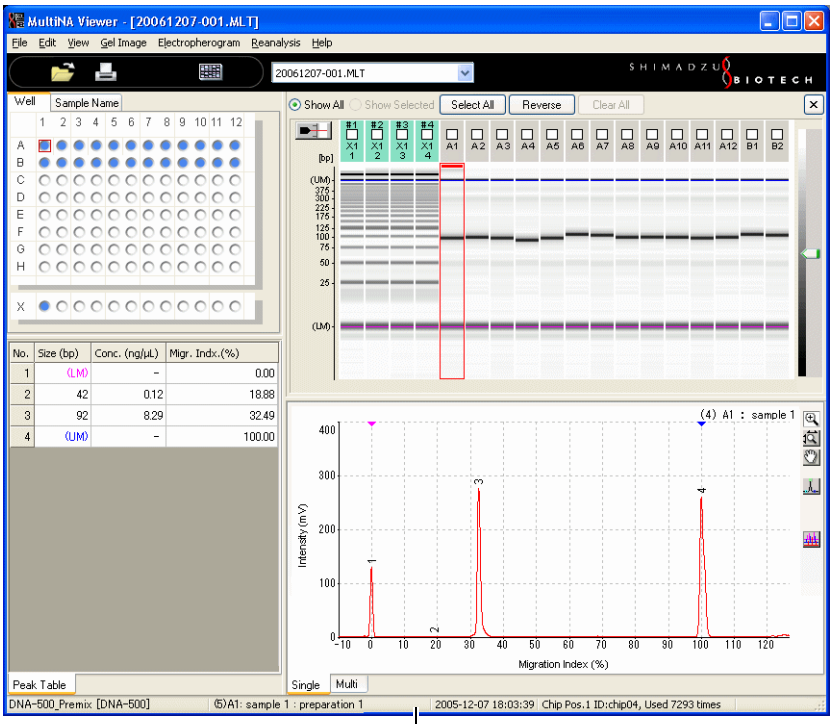
[Chip Status] window

4.4.2 Data File

Select [Data File] from the [View] menu.

Alternatively, click  (View Data File) on the right end of the toolbar.

Start the MultiNA Viewer to display the analyzed data.



Viewer window

NOTE

If the analysis schedule contains more than one sample sheet, only the data file for the selected sample sheet is displayed when the MultiNA Viewer is opened.

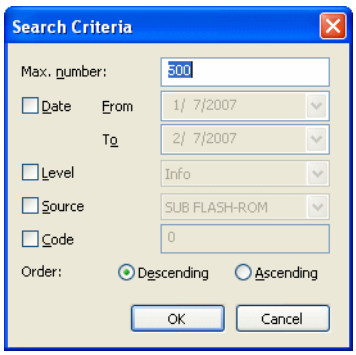
4.4.3 Log

Follow the procedures below to display the instrument events recorded in the log.

1 **Select [Log] on the [View] menu.**

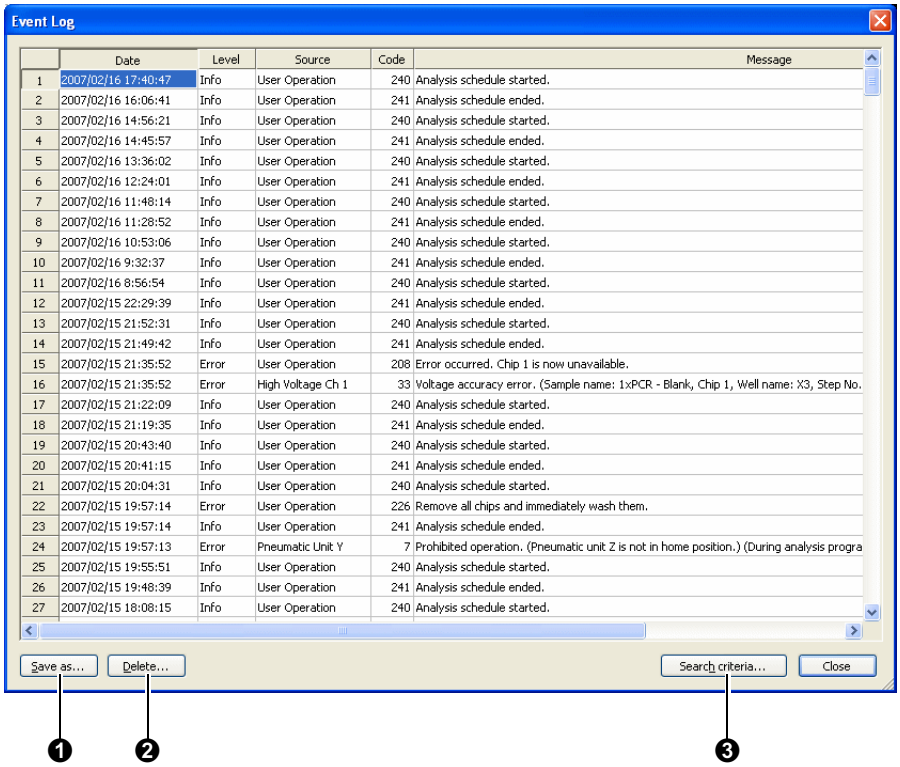
The [Search Criteria] window is displayed.

2 **Specify any search conditions and then click [OK].**



Search Criteria	Explanation
Max. number	Indicates the number of cases to be displayed. A maximum of 5000 cases can be entered.
Date (From/To)	Specifies the event generation date range.
Level	Specifies the event level (Info, Warning, Error, Fatal).
Source	Specifies the event source.
Code	Specifies the event code.

An [Event Log] window is displayed.

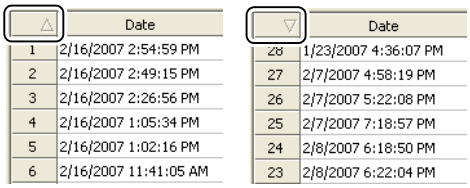


NOTE

The levels in the log are described below.

Level	Explanation
Info	Event (information) generated in the instrument (Analysis start or end, etc.).
Warning	Event that will not impede the continuous analysis but could have an effect on data. See "■ Warning" P.256.
Error	Event that disables continuation of automatic analysis. See "■ Error" P.248.
Fatal	Event that requires an instrument status check and could lead to a situation where continuation of operations in this condition is either impossible or dangerous. See "■ Fatal" P.246.

- To rearrange the list displayed in the [Event Log] window, click the header of [Date] or [Level].



	Date
1	2/16/2007 2:54:59 PM
2	2/16/2007 2:49:15 PM
3	2/16/2007 2:26:56 PM
4	2/16/2007 1:05:34 PM
5	2/16/2007 1:02:16 PM
6	2/16/2007 11:41:05 AM

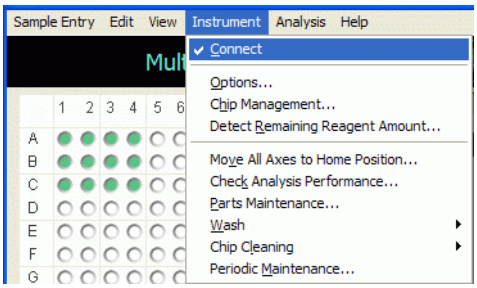
	Date
28	1/23/2007 4:36:07 PM
27	2/7/2007 4:58:19 PM
26	2/7/2007 5:22:08 PM
25	2/7/2007 7:18:57 PM
24	2/8/2007 6:18:50 PM
23	2/8/2007 6:22:04 PM

- Right-click in the [Event Log] window and select [Select All] from the displayed menu to select all entries in the event log.
- Select the range, then right-click and select [Copy] to copy the selected range to the clipboard.

[Event Log] Window Button

No	Button	Explanation
❶	Save as	Use this button to save the displayed content to a CSV file. Enter a name in the file save dialog box.
❷	Delete	Use this button to delete the selected event log line. Select [Yes] in the displayed confirmation dialog box to delete the content. (The content is deleted not only from the display, but also from the file where the event log is saved.)
❸	Search criteria	The event log search window is re-displayed.

4.5 Instrument Menu



4.5.1 Connect

Communication between the MultiNA instrument and the PC is connected or disconnected with this menu.

- When connected, the check box of this menu is selected.
- During analysis, the [Connect] menu is disabled and cannot be selected.

- The characters in the [Instrument name] display ("MultiNA" in the figure above) on the left end of the toolbar are light blue when connected and pale orange when disconnected.

NOTE

Select the [Connect at start up] check box to automatically establish communication between the PC and the instrument when the MultiNA software is opened. Refer to *"4.5.2 Options" P.108*.

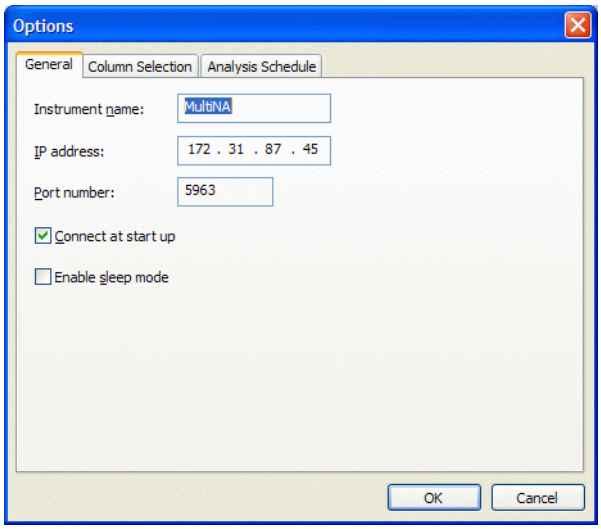
Automatic connection is not performed in the following cases. Verify that the instrument power is ON and that the LAN cable is properly connected, then establish communication.

- Instrument was not turned ON when the software was started up
- [Connect at start up] check box is cleared
- LAN cable is not correctly connected
- Communication was disconnected from the instrument due to a communication error

4.5.2 Options

The instrument options and display items common to all projects are set with this menu.

■ [General] Tab

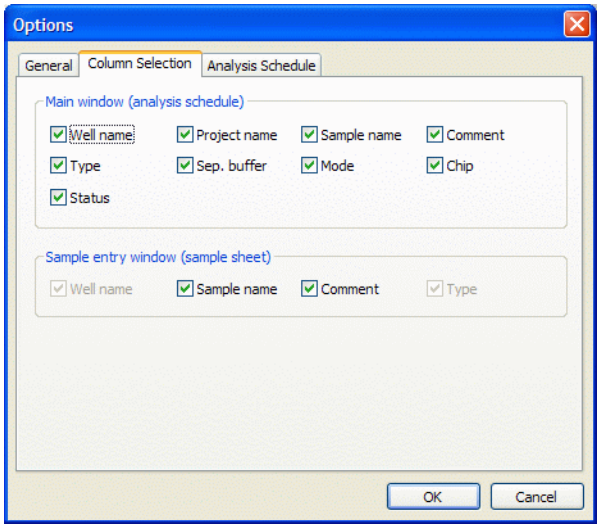


Item	Explanation
Instrument name	Instrument name displayed on left end of toolbar. (Up to 16 characters.)
IP address	Instrument IP address (entered during installation)
Port number	Port number used for socket communication (cannot be changed)
Connect at start up	Determines whether automatic connection to the instrument is established when the software is opened.
Enable sleep mode	Determines whether the instrument enters the sleep mode after completion of the analysis schedule. If selected: • The instrument enters into the sleep mode when all instrument operations (analysis, washing, and all other operations) are complete, and there are no PC mouse or keyboard operations for a period of at least one hour. • In sleep mode, all motor power, chip stage temperature adjustment, and fan operation stop, to reduce power consumption. • Operating the PC mouse or keyboard cancels the sleep mode. • It takes up to 5 minutes for the chip stage to reach the designated temperature after the sleep mode is canceled. (If analysis is started during this warm-up period, the analysis will not begin until the chip stage reaches the designated temperature.)

NOTE

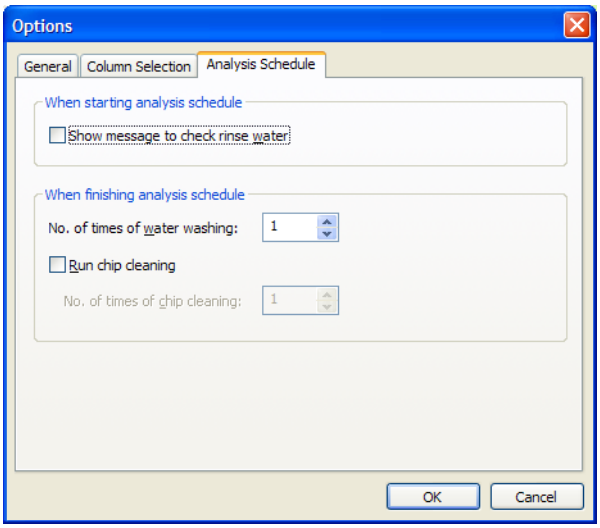
Do NOT change the IP address from the address set during the instrument installation. If any change is necessary, contact your Shimadzu service representative.

■ [Column Selection] Tab



Item	Explanation
MultiNA window (analysis schedule)	Determines the columns to be displayed in the analysis schedule.
Sample entry window (sample sheet)	Determines the columns to be displayed in the sample sheet. (The well names and types are essential for sample entry and cannot be changed.)

■ [Analysis Schedule] Tab

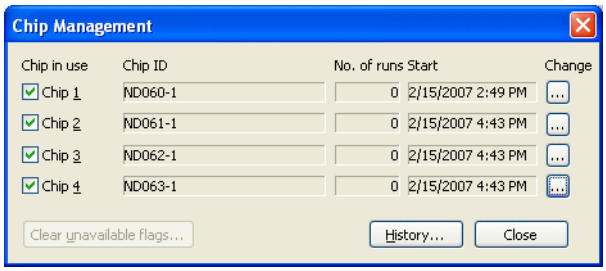


Configure the operations to be performed before and after execution of the analysis schedule.

Item	Explanation
Show message to check rinse water	Displays a rinse water confirmation message before the start of every analysis.
No. of times of water washing	Sets the number of times to perform rinsing after analysis is complete.
Run chip cleaning	Automatically executes chip cleaning (see *"3.5.5 Chip Cleaning Solution Placement" P.50*) after analysis is complete. Also sets the number of times to perform cleaning.

4.5.3 Chip Management

Follow the procedures below to control information for microchips installed in the instrument.



- The chip No. at [Chip in use] shows the chip position in the instrument. (Chip 1 is farthest back, followed in order by chip 2 and chip 3, with chip 4 in front.)
- Removing the [Chip in use] check box prevents use of that microchip for analysis.

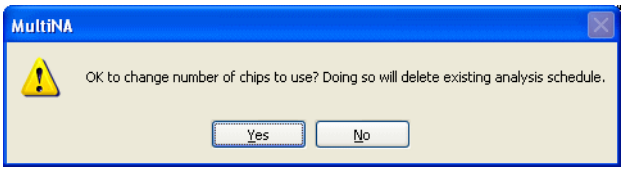
NOTE

Changing the chip to be used after a sample has been entered causes the following warning message to be displayed.

- Select [Yes] to delete the analysis schedule and enter a new sample.
  The analysis schedule is deleted.
- Select [No] to use the same analysis schedule and then save the sample sheet once before changing the chip to be used.

Reference

"Saving the Sample Sheet" P.84



■ [Clear unavailable flags]

Click [Clear unavailable flags] in the [Chip Management] window to make a microchip judged unavailable during analysis usable again.

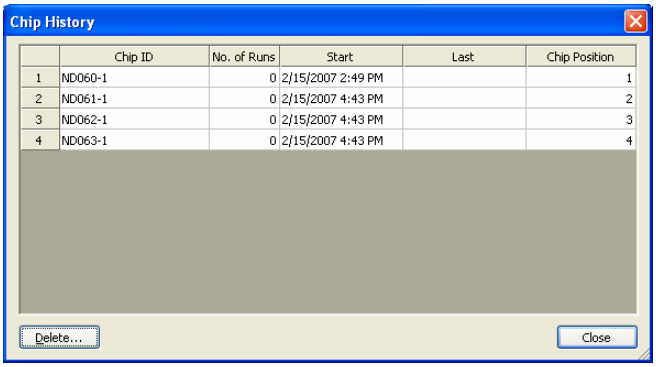
- The unavailable status is cleared.

NOTE

A microchip judged during analysis to be unavailable cannot be used any further. Manually clean the microchip, to eliminate clogging or other problems.
Refer to *"6.2.6 Inspecting and Washing Microchip Reservoirs" P.204*.

■ [History]

- Click [History] to check the history of the microchip being used.
  The history of used microchip (chip ID, No. of runs, start / last date and time, and chip position) is displayed in the [Chip History] window.
- Click [Delete] at the bottom left of the [Chip History] window to delete the microchip history. Note that the history of microchips currently in use cannot be deleted.



■ Exchanging the Microchip

Use the [Chip Management] window to control microchip exchange or removal.

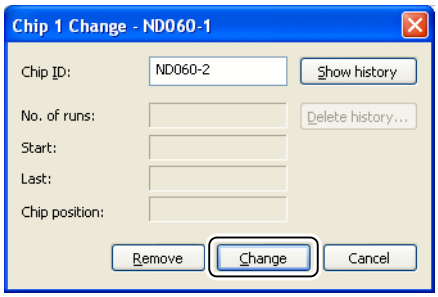
To exchange the microchip

1 **Click ... (Change) next to the microchip to be exchanged.**

The [Chip x Change] window is displayed.

2 **Enter the microchip serial number (chip ID) in the [Chip x Change] window, and click [Change].**

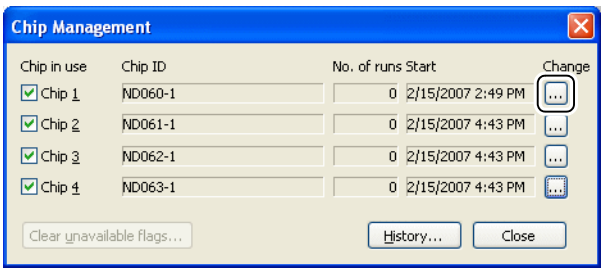
If the microchip was previously used, the history of its usage is displayed.



To remove the microchip

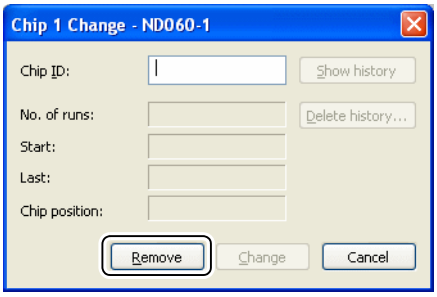
The following describes the procedure for removing a microchip, using chip position 1 for the example.

1 **Click [...] (Change) next to chip 1, in the [Chip Management] window.**



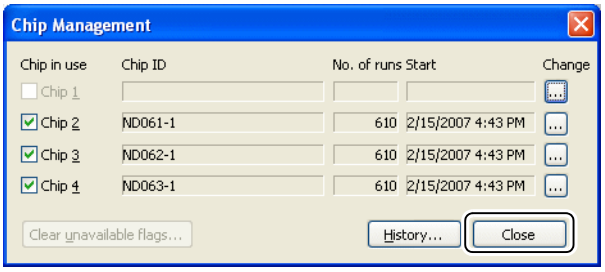
The [Chip 1 Change] window is displayed.

2 **Click [Remove] in the [Chip 1 Change] window.**



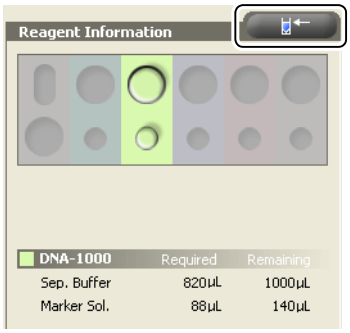
Chip 1 is grayed out, and the check box is cleared.

3 **Click [Close].**



4.5.4 Detect Remaining Reagent Amount

Follow the procedures below to check the residual amount of separation buffer or marker solution.



- The residual reagent amount is calculated by inserting a sample probe into the reagent bottle to detect the reagent liquid level.
- The residual reagent amount is automatically checked when an analysis sequence is started. This function can also be used to check the residual reagent amount without starting the analysis sequence.

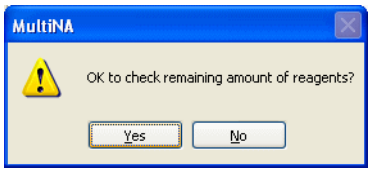
1 **Place the reagents and samples in the appropriate positions and close the top cover.**

2 **Verify that the analysis schedule has been entered.**

3 **Select [Detect Remaining Reagent Amount] from the [Instrument] menu or click the button on the upper right corner of the [Reagent Information] window.**

4 **If the following message is displayed, click [Yes].**

The residual reagent amount check starts.
Once the check is finished, the residual amount of reagent is displayed in the [Reagent Information] window.
If the amount of reagent is insufficient, the position of the separation buffer or marker solution is displayed in red.



4.5.5 Move All Axes to Home Position

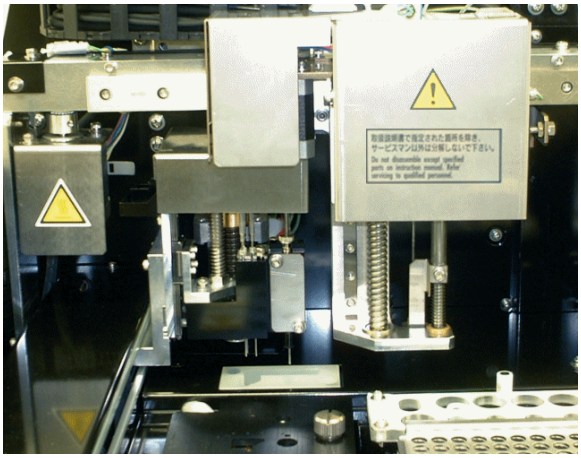
If drives are stopped at a position other than the home position due to an error or other reasons, use this menu to return the instrument drives (autosampler, pneumatic unit, and syringe pump) to the home position.

1 **Select [Move All Axes to Home Position] from the [Instrument] menu.**

The green LED indicator blinks during the operation. A blue status bar is displayed at the bottom left of the window.
When the operation is complete, the blue status bar is no longer displayed and the green indicator LED is steady lit.

2 **Open the top cover.**

Verify that the drive axes have returned to the home position as shown in the figure below.



NOTE

This function will not operate if the chip cover or the top cover are open. Close the chip cover and instrument cover before starting this operation.

4.5.6 Check Analysis Performance

The state of the instrument, microchips, and reagent kit can be checked by periodically executing analysis performance checks.

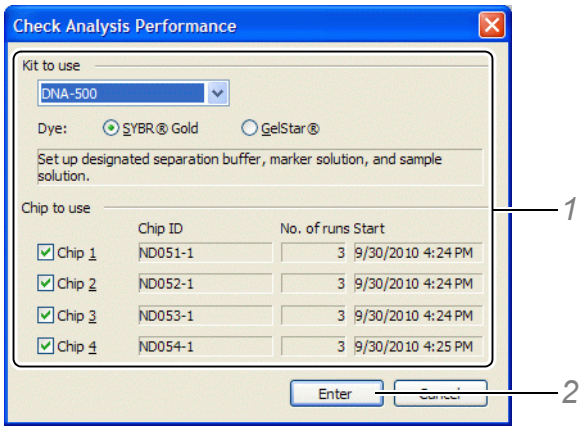
■ Registering a Schedule and Starting Analysis Performance Checks

Select the kit and microchip to be used.

1 **Click [Check Analysis Performance] on the [Instrument] menu.**

The [Check Analysis Performance] window is displayed.

2 Enter a schedule for checking the analysis performance.



1 Select the kit, dye, and microchip to be used.
2 Click [Enter].
The schedule for checking the analysis performance is registered.

NOTE

- The marker mixing modes are, DNA kit: on-chip mixing, RNA kit: premix.
- When checking multiple kits or repeating checks for the same kit, [Check Analysis Performance] can be selected again to perform another registration after registering the schedule for checking.
- Normal analysis cannot be additionally registered to a schedule for checking.
- Although [Delete Sample Sheet] can be performed in schedules for checking, [Edit Sample Sheet] cannot be performed.

3 Prepare the separation buffer, marker solution, and sample required for analysis performance checking according to normal analysis procedures and place them in the instrument.

Reference

"3.3 Pre-Analysis Preparation" P.27
"3.5 Preparation for DNA Analysis" P.44
"3.6 Preparation for RNA Analysis" P.52

NOTE

- Refer to the table below for the samples to use and the corresponding placement positions.

Reagent Kit	Sample	Well Position
DNA-500	TE buffer	X1
DNA-1000	TE buffer	X2
DNA-2500	TE buffer	X3
DNA-12000	TE buffer	X4
RNA	THE RNA Storage Solution	X4

NOTE

Always place samples in the specified wells because the sample positions listed above cannot be changed.

4 **Start the analysis.**

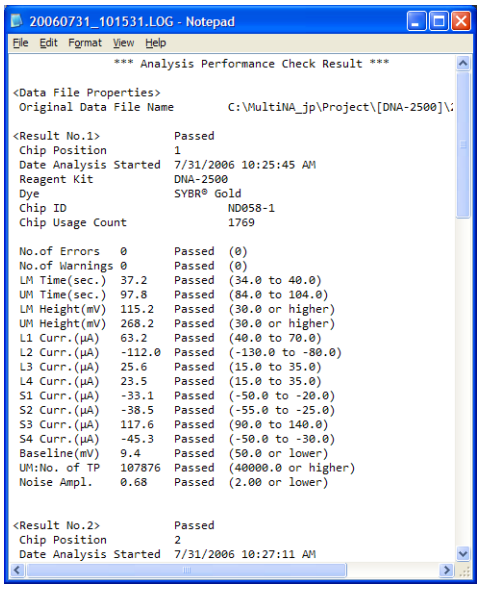
The following files are created when the analysis performance check is executed.

Type	File Name (Base Name)	Extension	Save Folder
Raw data	A name that reflects the year, month, day, and time that the check was executed (E.g.: File name for a check executed on 13th September 2006 at 14:50:20 is "20060913_145020.MLT")	MLT	[Reagent kit name] folder in the Project folder located inside the data folder (normally, C:\MultiNA\).
Analyzed data	Same as raw data	MLA	Same folder as raw data
Analysis performance check results log	Same as raw data	LOG	Same folder as raw data

- If the check results raw data file (MLT file) is opened in MultiNA Viewer, the check results log file (LOG file) is also automatically opened. (*"5.4.9 Analysis Performance Check Result" P.173*)
- Since the LOG file is text data, it can also be opened with Notepad program or editor program.

■ Checking the Analysis Performance Results

Either select [Data File] on the [View] menu, or click [View Data File] on the toolbar. The check results are automatically displayed.



Check Item	Explanation
No. of Errors	Number of "Errors" that occurred during sample analysis
No. of Warnings	Number of "Warnings" that occurred during sample analysis
LM Time (sec.)	Peak detection time for the lower marker
UM Time (sec.)*	Peak detection time for the upper marker
LM Height (mV)	Peak height for the lower marker
UM Height (mV)*	Peak height for the upper marker
L1 to L4 Curr. (µA)	Current value for sample injection in microchip reservoirs No.1 to No.4
S1 to S4 Curr. (µA)	Current value for sample separation in microchip reservoirs No.1 to No.4

Check Item	Explanation
Baseline (mV)	Baseline height in [Raw Data]
UM No. of TP*	Theoretical plate number for the upper marker peak
Noise Ampl.	Noise amplitude in electropherogram

- Items marked with asterisk (*) are not displayed for RNA checks (RNA uses lower marker only).
- "Passed" or "Failed" is displayed for each check item. The value in parentheses to the right of the pass or fail is the pass reference value (which varies depending on the reagent kit and dye used).
- If any one of the check items has a "Failed" result, the general result (<Result No. #>) is also "Failed".

If the check result is "Failed", the following causes can be considered.

Check Item	Symptom	Possible Cause
No. of Error/ Warning	An error or warning occurred during analysis.	"Error" or "Warning" occurred in the instrument during sample analysis. Display the log (*"4.4.3 Log" P.105*) and check the content. For details about error messages, see *"8.2.1 MultiNA Control Software" P.244*.
LM Time	Value under standard range (detection is too fast)	Low separation buffer concentration Kit type used differs from the recorded kit.
	Value over standard range (detection is too slow)	Incorrect current running High separation buffer concentration Kit type used differs from the recorded kit.
UM Time	Value under standard range (detection is too fast)	Low dye concentration in separation buffer Kit type used differs from the recorded kit.
	Value over standard range (detection is too slow)	Incorrect current running High dye concentration in separation buffer Kit type used differs from the recorded kit.
LM Height	Value under standard range (peak is too low)	Lower marker has deteriorated. Microchip surface is contaminated. Microchip not installed correctly on chip stage (For RNA analysis) Formamide has deteriorated.
UM Height	Value under standard range (peak is too low)	Dye has deteriorated. Separation performance degraded due to microchip deterioration Separation performance degraded due to separation buffer deterioration Insufficient marker solution dispensed to microchip (degraded instrument dispensing precision) Microchip surface is contaminated. Microchip not installed correctly on chip stage (For RNA analysis) Formamide has deteriorated.
L1 to L4 Curr.	Value under standard range (value is too low.)	Microchip flow channel is clogged, or partially clogged. Bubbles generated in microchip flow channel Insufficient amount of separation buffer in microchip reservoir Insufficient amount of sample dispensed to microchip Kit type used differs from the recorded kit.
	Value over standard range (value is too high.)	Separation buffer concentration increase Foreign material (salt) intruded into separation buffer High salt concentration in sample Kit type used differs from the recorded kit.

Check Item	Symptom	Possible Cause
S1 to S4 Curr.	Value under standard range (value is too low.)	Microchip flow channel is clogged, or partially clogged. Bubbles generated in microchip flow channel Insufficient amount of sample dispensed to microchip Kit type used differs from the recorded kit.
	Value over standard range (value is too high.)	Separation buffer concentration increase Foreign material (salt) intruded into separation buffer High salt concentration in sample Kit type used differs from the recorded kit.
Baseline	Small value (baseline is too low.)	Low dye concentration in separation buffer
	Large value (baseline is too high.)	High dye concentration in separation buffer Microchip has deteriorated. Microchip surface is contaminated.
UM No. of TP	Small value (theoretical plate number is too small)	Microchip has deteriorated. Reagent kit has deteriorated, and salt concentration changing (increase).
Noise Ampl.	Large value (noise is large)	Microchip surface is contaminated.

- Corresponding to the presumed cause, clean the microchip surface, or replace the reagent kit, dye, microchip, and formamide (RNA analysis only), and repeat the analysis performance check again.
- If this does not solve the problem, contact your Shimadzu service representative.

4.5.7 Parts Maintenance

This window displays usage status information including the previous number of analyses, operation times, and previous replacement dates and times.

[Reset]:

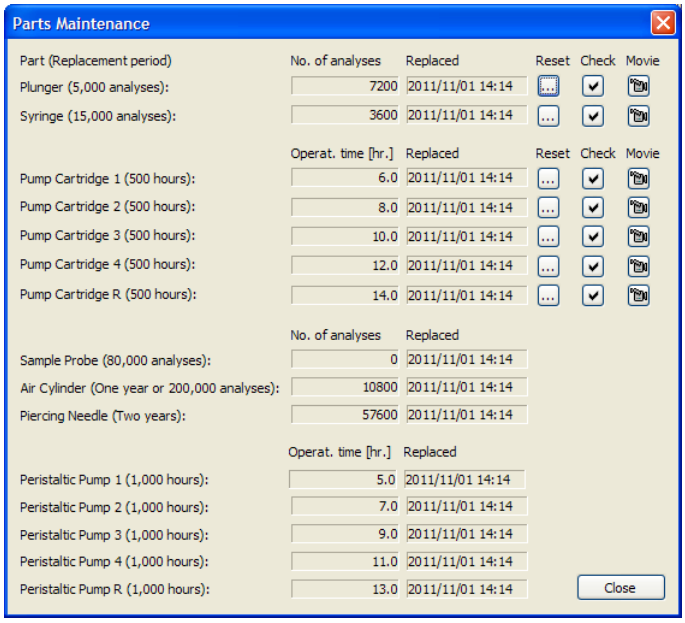
Resets the number of analyses and operation time and changes the replacement time to the current time. Click this button after replacing parts or performing checks.

[Check]:

Starts the inspection program after replacing parts. Click this button after replacement and check preparation are complete.

[Movie]:

Plays video that explains part replacement procedures.

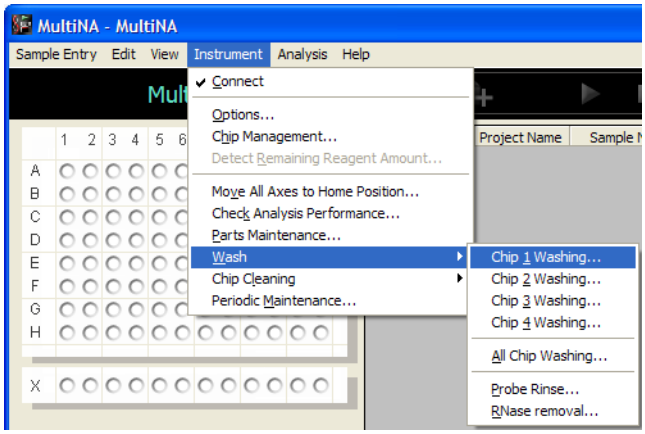


Reference

For details on replacement parts, see *"10 Parts Specifications" P.279*

For details on how to replace parts, see *"6.3 Parts Maintenance and Replacement" P.211*

4.5.8 Wash

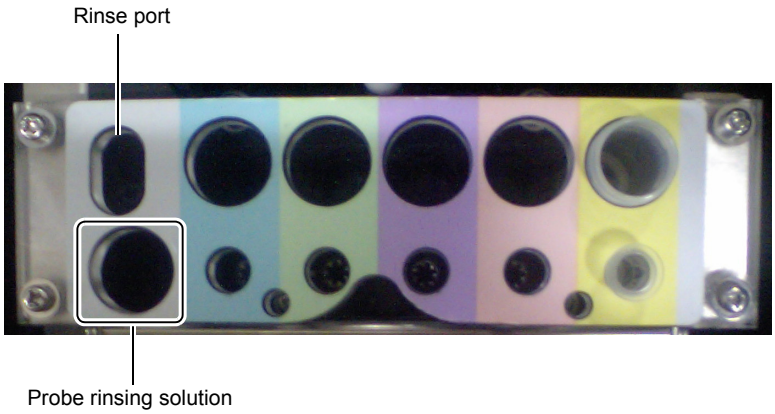


Select the following items from the [Wash] menu, and perform each rinsing operation.

Menu Item	Explanation
Chip 1 to Chip 4 Washing	Rinse each microchip with water. The number of rinses can be set between 1 and 5 times. Although 1 time is normally sufficient, adjust this value as necessary.
All Chip Washing	Rinse all the microchips installed with water. The number of rinses can be set between 1 and 5 times. Although 1 time is normally sufficient, adjust this value as necessary. Even chips that are not selected in the [Chip Management] window are washed.
Probe Rinse	Rinse the sample probe with water.
RNase Removal	Rinse the sample probe with probe rinsing solution and water.

NOTE

- Before rinsing, verify that the glass rinse water bottle for rising contains at least 100 mL of Milli-Q ultrapure water or distilled water.
- Before RNase removal, insert 1 mL of probe rinsing solution (RNaseZAP® Applied Biosystems (formerly Ambion)) into the buffer bottle, and place it in front of the rinse port in the reagent holder.
- Avoid a mix up with the chip cleaning solution by discarding the probe rinsing solution set in the reagent holder after RNase removal is complete.



Reagent Holder

4.5.9 Chip Cleaning

Select any of the following items from the [Chip Cleaning] submenu to perform microchip cleaning using chip cleaning solution.

Menu Item	Explanation
Chip 1 - Chip 4	Rinse each microchip with chip cleaning solution.
All Chips	Rinse all microchips with chip cleaning solution.

NOTE

- Perform chip cleaning according to the procedure described in *"6.2.9 Chip Cleaning" P.209*.
- To perform chip cleaning upon completion of an analysis schedule, see *"■ [Analysis Schedule] Tab" P.109* in *"4.5.2 Options"*.
- Cleaning of all chips is recommended after the last analysis of the day is complete.

4.5.10 Periodic Maintenance

Operate the peristaltic pump, so that the operation prevents the pump from performance decrement when the instrument is out of use for an extended period (for 1 month or more). See *"7.3.3 Peristaltic Pump Storage" P.239*.

4.6 Analysis Menu

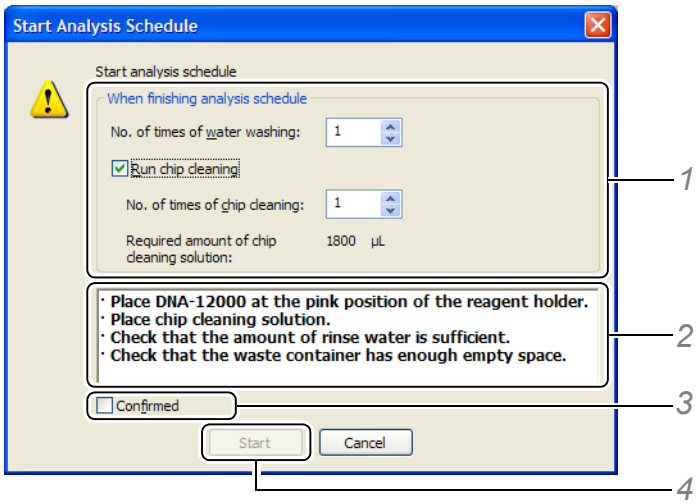
4.6.1 Start

Start a registered analysis schedule.

1 **Either select [Start] on the [Analysis] menu or click the (Start) button on the toolbar.**

The [Start Analysis Schedule] window is displayed.

2 **Start the analysis schedule.**



1 Check the settings of operations to be performed after execution of the analysis schedule.
The setting details are the same as the *"■ [Analysis Schedule] Tab"* in *"4.5.2 Options" P.108*.

2 Check the displayed message.

3 Select the [Confirmed] checkbox.

4 Click the [Start] button.

NOTE

- The following items are checked automatically when analysis starts. If an error occurs during the automatic checks, perform appropriate measures according to the displayed error message. See *"8.2.1 MultiNA Control Software" P.244* for more details.
- Do NOT leave the instrument unattended until the check is complete and the analysis starts.

Check Item	Explanation
Control power supply unit	Check the voltage.
Top cover/chip cover open/close	An error message is displayed if the top cover or chip cover are open. Close the top cover or chip cover and restart the analysis.

Check Item	Explanation
Sample holder conditions	Checked using the contact detection function of the sample probe. An error message is displayed if the sample holder is not correctly installed. Install the sample holder correctly and restart the analysis.
Microchip in position	Checked using the contact detection function of the sample probe. An error message is displayed if a microchip is not installed at the specified chip position or if a microchip is not attached correctly. Correctly install the microchip in the specified position and restart the analysis.
Amount of remaining reagent	Checked using the liquid level detection function of the sample probe. An error message is displayed if the residual reagent amount is insufficient. Prepare the required amount of reagent and then restart the analysis.
Chip temperature	The temperature of the chip stage is checked. If the temperature is outside the set temperature range, analysis starts automatically after the temperature comes within the set temperature range.

4.6.2 Stop

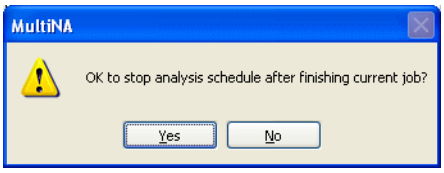
Selecting [Stop] from the [Analysis] menu or clicking [Stop] on the toolbar stops the instrument automatically after post-treatment is complete, such as chip washing.

Use this menu to stop analysis.

Depending on the instrument status, one of the two messages below is displayed.

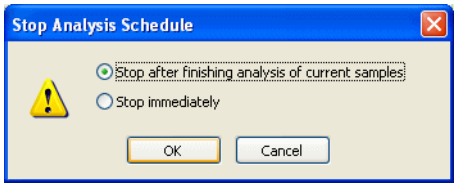
1 Before starting sample analysis

The following message is displayed. Click [Yes] to stop analysis after completing the processes in progress.



2 During sample analysis

The following message is displayed. Select either [Stop after finishing analysis of current samples] or [Stop immediately], and click [OK].



- [Stop after finishing analysis of current samples]
  Selecting this check box continues analysis of sample currently being analyzed or currently being loaded. After the analysis is completed, rinsing of the microchip and sample probe is automatically executed, and the operation is ended.
- [Stop immediately]
  Selecting this check box immediately stops analysis even if a sample is currently being analyzed. Rinsing of the microchip and sample probe is then automatically executed, and operation ends.

  Samples currently in loading or analysis have a data file prepared for partway through the analysis.

4.7 Help Menu

4.7.1 Manual

Select the menu below to display the PDF files for the corresponding instruction manuals.

- [MultiNA Instrument Manual]: Display the Instrument Manual (Instrument, Control Software, and Data Analysis Software)
- [Quick Manual]: Display the Quick Manual

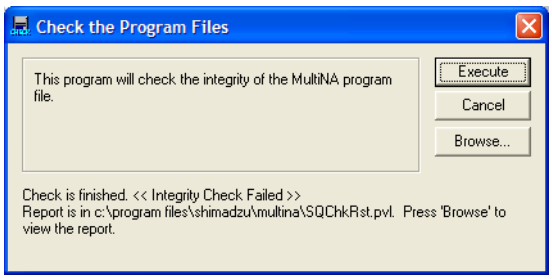
NOTE

Adobe® Reader® distributed by Adobe Systems Co. or other PDF file viewing software (provided free) is required to view the PDF file. Adobe® Reader® (Ver. 4 or later) can be downloaded from the following website:

http://www.adobe.com/products/acrobat/readstep2.html

4.7.2 Check Integrity

This function checks whether the MultiNA program has been improperly altered. Select [Check Integrity] in the [Help] menu to display the [Check the Program Files] dialog box. Click [Execute].



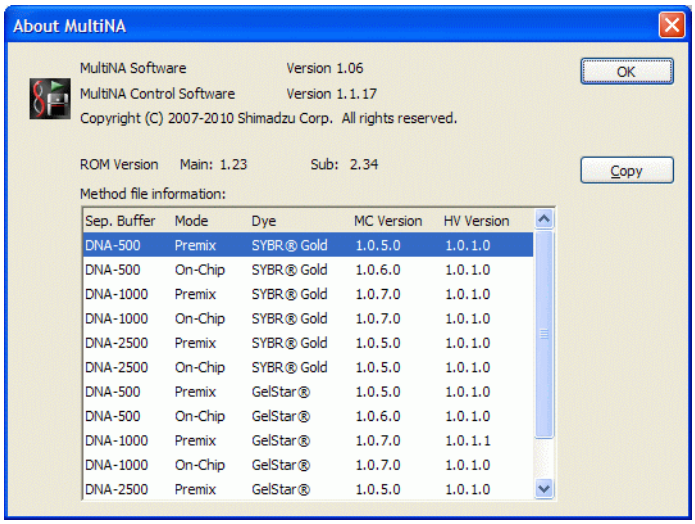
<<Integrity Check Passed>> is displayed if no problems are encountered with the program files.

If <<Integrity Check Failed>> is displayed, as shown in the screenshot, the MultiNA program has been improperly altered. In this case, reinstall the MultiNA software (see *"9.5 Software Installation" P.270*).

Click the [Browse] button to display the details of the integrity check.

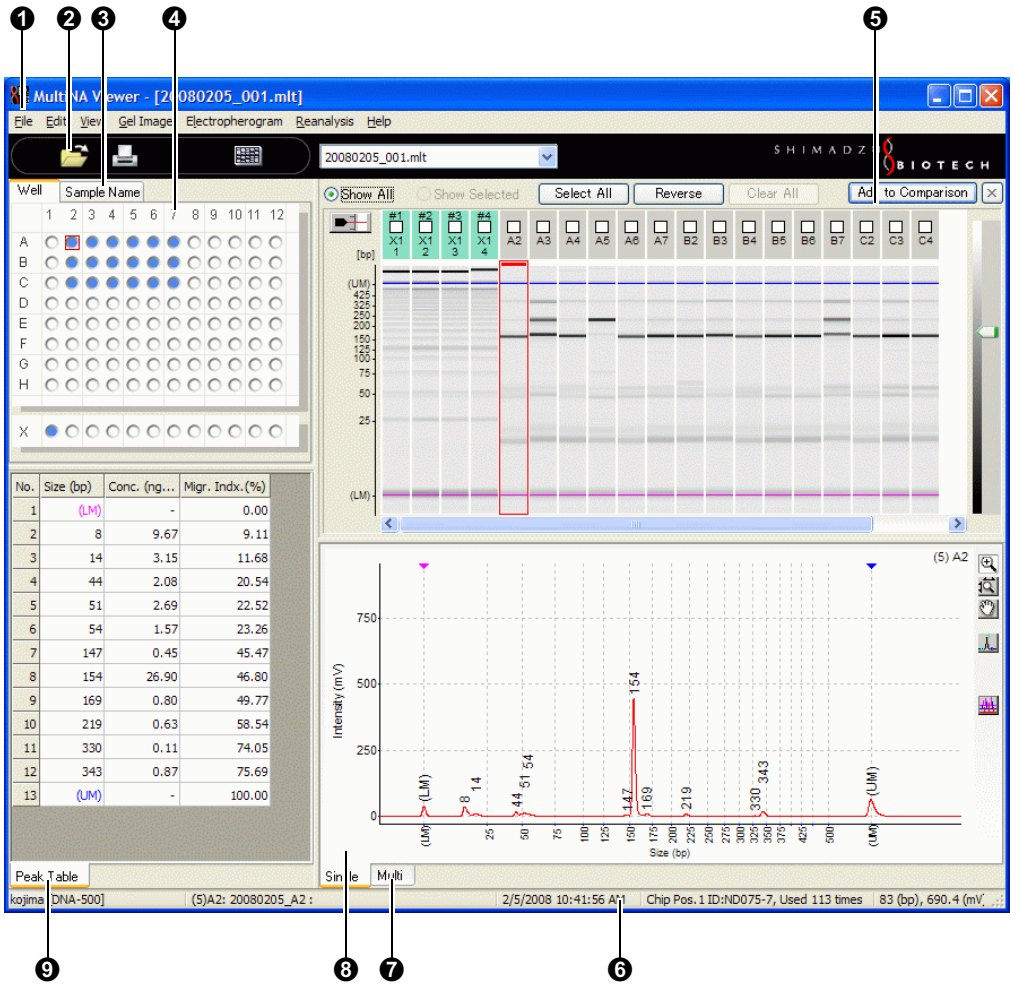
4.7.3 About MultiNA

Display the version information of the MultiNA Control Software, instrument ROM, and method files.



5 MultiNA Viewer Functions

5.1 MultiNA Viewer Window



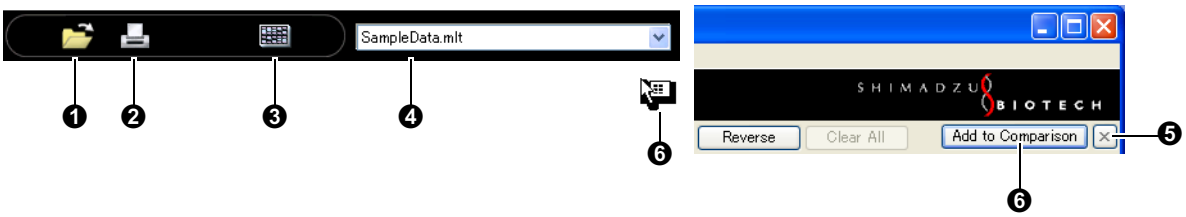
No.	Name	Reference
❶	Menu Bar	*"5.1.1 Menu Bar" P.126*
❷	Toolbar	*"5.1.2 Toolbar" P.128*
❸	Sample Name Tree	*"5.1.5 Sample Name Tree" P.129*
❹	Well Display	*"5.1.4 Well Display" P.129*
❺	Gel Image	*"5.1.6 Gel Image" P.129*
❻	Status Bar	*"5.4.3 Status Bar" P.166*
❼	Electropherogram (Multi)	*"5.1.10 Electropherogram (Multi)" P.137*
❽	Electropherogram (Single)	*"5.1.9 Electropherogram (Single)" P.135*
❾	Peak Table	*"5.1.7 Peak Table" P.133*

5.1.1 Menu Bar

Menu Item		Outline of Function	Shortcut Key	Reference Page
File	Open	Open a data file.	Ctrl + O	P.138
	Close	Close a data file being viewed.		P.140
	Save	Rewrite and save a data file.	Ctrl + S	P.140
	Save As	Save a data file with a different name.		P.141
	Save Selected Data	Save only the selected data in a separate file.		P.142
	Search	Search data files.		P.144
	Export	Export data in CSV format.		P.145
	Print	Print out data.	Ctrl + P	P.147
	Print Setup	Set up a printer.		P.156
	Data File Properties	Display conditions where a data file is acquired.		P.156
	Sample Properties	Display conditions where each sample data item in a data file is acquired.	Alt + Enter	P.157
	Ladder Monitor	Enable or disable the ladder monitor function.		P.159
	Analyze As Ladder	Analyze the selected data as ladder.		P.159
	Ladder List	Display and edit registered ladder information.		P.161
	(File Name)	Reopen a file that has already been opened.		
	Exit	Quit the data analysis software MultiNA Viewer.		P.162
Edit	Copy	Copy information displayed on [Gel Image], [Electropherogram], [Peak Table], or [RNA Report] to the clipboard.		P.163
	Save Image As	Save what is displayed on [Gel image] and [Electropherogram] as an image file.		P.164
View	Refresh	Reopen a data file.	F5	P.165
	Marker	Switch between hide and display marker peak sign.		P.166
	Status Bar	Switch between hide and display the status bar.		P.166
	Title	Tool tip displayed in the upper right area of [Electropherogram (Single)] and at the top of [Gel Image].		P.167
	Analyzed Data / Raw Data	Switch between analyzed data and raw data.		P.167
	Normal Sensitivity Data / Low Sensitivity Data	Switch between normal sensitivity data and low sensitivity data.		P.168
	Comparison	Display multiple data files for comparison.		P.169
	Size Calibration Curve	Display the size calibration curve used for data analysis.		P.173
	Analysis Performance Check Result	Display the results of analysis performance check.		P.173
	Ladder Monitor Result	Display the ladder monitor results.		P.173

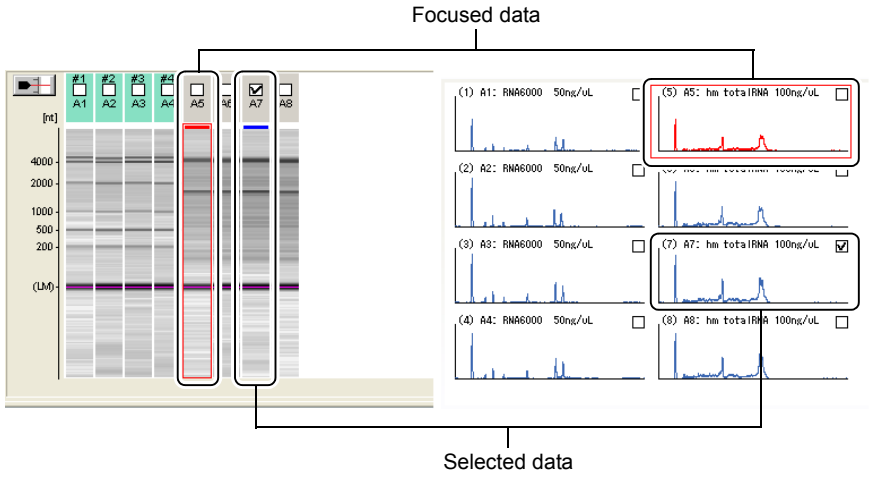
Menu Item		Outline of Function	Shortcut Key	Reference Page
View	Select Ladder Used for Analysis	Select and display the ladder used to analyze the focused sample.		P.174
	Select All Samples Analyzed Using This Ladder	Select and display the samples analyzed using the focused ladder.		P.174
	Options	Set options for items to be displayed or scale.		P.175
Gel Image	Invert Black and White	Switch black and white highlighting.		P.177
	Vertical Axis	Select the image to be displayed on the vertical axis from among [Distance Image], [Size Image], or [Time Image].		P.177
	Gel Image List	Display the [Gel Image List] window.		P.178
	Undo Zoom	Undo the last zooming operation on [Gel Image].	Ctrl + Z	P.179
	Undo Zoom All	Undo all zooming operations on [Gel Image].	Ctrl + R	P.179
Electro-phero-gram	Peak Top	Select the item displayed at the top of the peak.		P.180
	Font Size	Select size of text displayed at the top of the peak.		P.180
	Show Baseline	Switch between show and hide baseline.		P.180
	Horizontal Axis	Switch the item to be displayed on the vertical axis from among [Migration Index], [Size], or [Migration Time].		P.181
	Overlay	Switch between [Ascending Order] and [Descending Order] for displaying overlays.		P.181
	Undo Zoom	Undo the last zooming, enlargement, and pan operations on [Electropherogram].		P.181
	Undo Zoom All	Undo all zooming, enlargement, and pan operations on [Electropherogram].		P.181
Reanal-ysis	Automatic	Reanalyze all data by automatic operation.		P.182
	Manual Edit Mode	Switch to the mode where addition or deletion of peaks or attribution of peaks are manually edited.		P.185
	Change Ladder and Analyze	Reanalyze with a different ladder data.		P.189
Help	Quick Manual	Display the analysis operation flow.	F1	P.195
	MultiNA Instruction Manual	Display the Instrument Manual (system, control software, and data analysis software).		
	About MultiNA Viewer	Display the version information of the program.		P.195

5.1.2 Toolbar



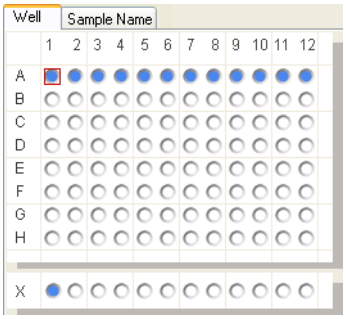
No.	Explanation
❶	[Open existing data file] ([File] menu - [Open]): Open an existing data file (*.MLT).
❷	[Print active data file] ([File] menu - [Print]): Display the [Print] dialog box and start printing.
❸	[View Gel Image List]: Display the gel image list. There are three types of layouts available to display the gel image list, 12-well unit, 8-well unit, or sort by chip position. The list is displayed in a layout previously displayed by selecting the [Gel Image List] on the [Gel Image] menu.
❹	[Data file name] list box: Display the name of the data file currently open. When multiple files are loaded, click the downward arrow on the right to select a data file to be displayed.
❺	[Open active data file] ([File] menu - [Close]): Close the currently displayed data file.
❻	Clicking the [Add to Comparison] button changes the mouse pointer display over the gel image. Data can be continuously added to the [Comparison] view (*"5.4.7 Comparison" P.169*) by clicking on the gel image with this mouse pointer. Click the [Add to Comparison] button again to return the mouse pointer to its original state.

5.1.3 Focused Data and Selected Data



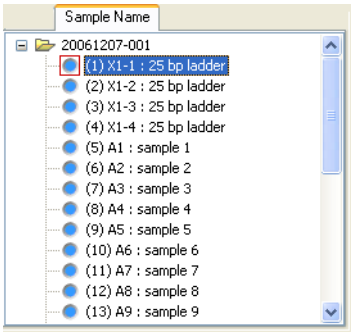
- "To focus" refers to the operation of clicking the well display, sample name tree, gel image, or data displayed on the multi electropherogram. Focused data (or data in focus) is enclosed in a red frame.
- "To select" refers to the operation of clicking check boxes displayed in the gel image or on the multi electropherogram. Check marks are displayed for selected data. Multiple data entries can be selected.

5.1.4 Well Display



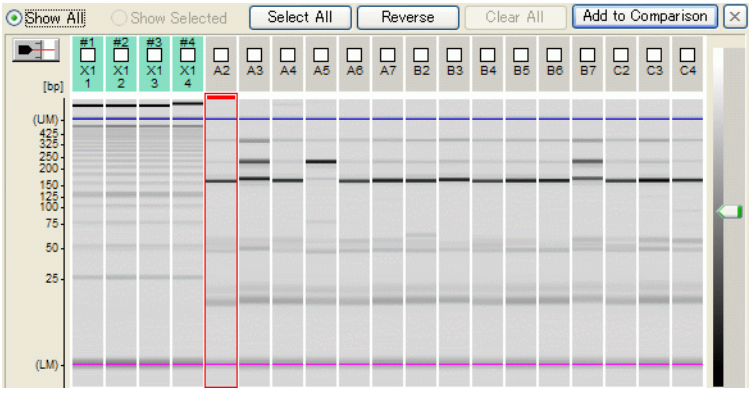
- Samples analyses that completed normally are displayed in blue. If a "Warning" occurred during the analysis, the sample is displayed in yellow. If an "Error" or "Fatal" error occurred during the analysis, the sample is displayed in red.
- Click a colored well to focus on that sample. The data on the [Gel Image] and [Electropherogram (Multi)] is outlined in red. The applicable data is displayed for [Electropherogram (Single)].

5.1.5 Sample Name Tree

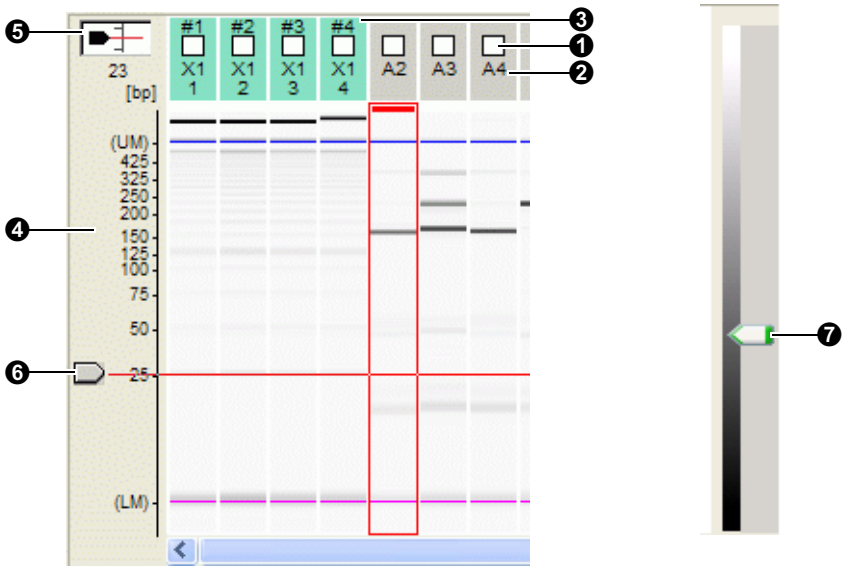


- Click the [Sample Name] tab to display the [Sample Name Tree].
- The original file name (one used to save the sample sheet) is displayed at the top of the tree. The name remains the same even if the file is saved with a different name.
- Analysis order (number), well, and sample name are displayed under the original file name. The (number) indicates the order that analysis was performed in the sample sheet.
- The well and sample name were entered on the sample sheet.
- Click a sample name to focus on that sample. The data on the [Gel Image] and [Electropherogram (Multi)] is outlined in red. The applicable data is displayed for [Electropherogram (Single)].

5.1.6 Gel Image

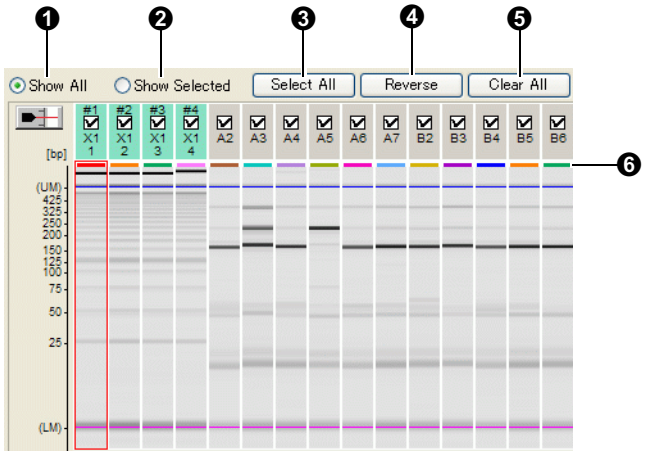


- Click a desired piece of [Gel Image] to focus on that sample. The corresponding [Electropherogram] is displayed.
- The upper tab of the [Gel Image] is gray for sample data and pale green for ladder data.
- For DNA analysis, [Gel Image] ([Analyzed Data]) is displayed so that the position of the lower marker (LM) and upper marker (UM) align. For RNA analysis, it is displayed so that the position of the lower marker (LM) and the end of electrophoretic data align.



No.	Explanation
❶	Click the check box. The respective data becomes "selected data."
❷	Indicates a well name. More than one analysis can be performed from the extra sample stand and analysis order is displayed below the well name.
❸	The "#" mark and chip position (1 to 4) is displayed above the check box of the ladder data used for analysis.
❹	Size axis. (It is based on the position of fragment peaks in the ladder data.)
❺	Click the red cursor button to display the knob (❻) and a red horizontal line on the gel image. When [Size Image] is selected for the gel image vertical axis, an estimated size value for the position of the red line is also displayed under the button.
❻	Drag the knob up or down to move the red line.
❼	Drag the knob up or down to adjust color contrast of [Gel Image]. While dragging the knob, the color contrast adjustment is applied only to the focused data. After adjustment, the color contrast is applied to all of the data displayed.

An example of selected check boxes on the [Gel Image] is displayed below.



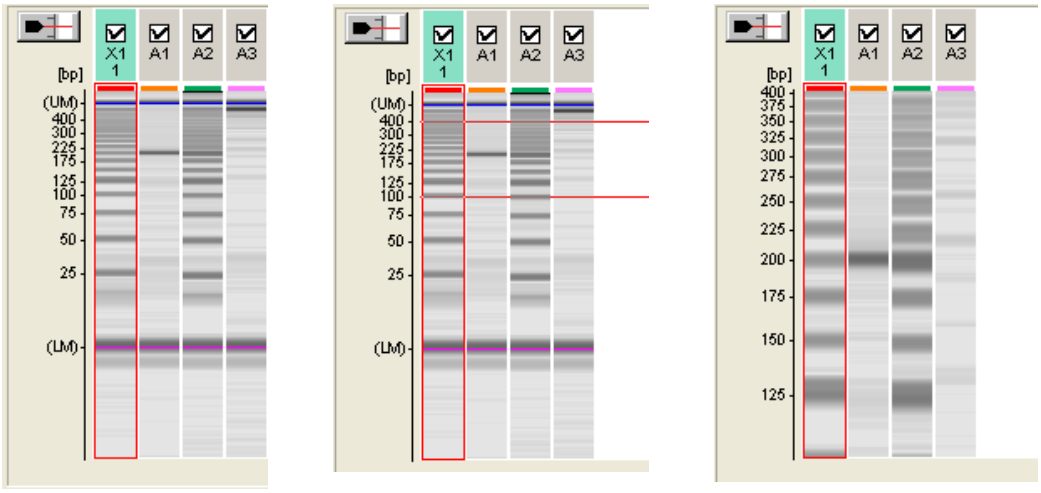
No.	Explanation
❶	[Show All] is selected in the initial display. All data (with and without a check mark) is displayed.
❷	Select [Show Selected] to display only the data that is selected with a check mark. This button is enabled when at least one data item is selected with a check mark.
❸	Click [Select All] to select all of the data in a data file with check marks.
❹	Click [Reverse] to switch between the selected and non-selected data.
❺	Click [Clear All] to remove the check marks from all of the samples.
❻	A small color bar is displayed at the top of the gel image for the selected data. The color of the bar corresponds to the color in the [Electropherogram] overlay (see *"5.1.9 Electropherogram (Single)" P.135*).

NOTE

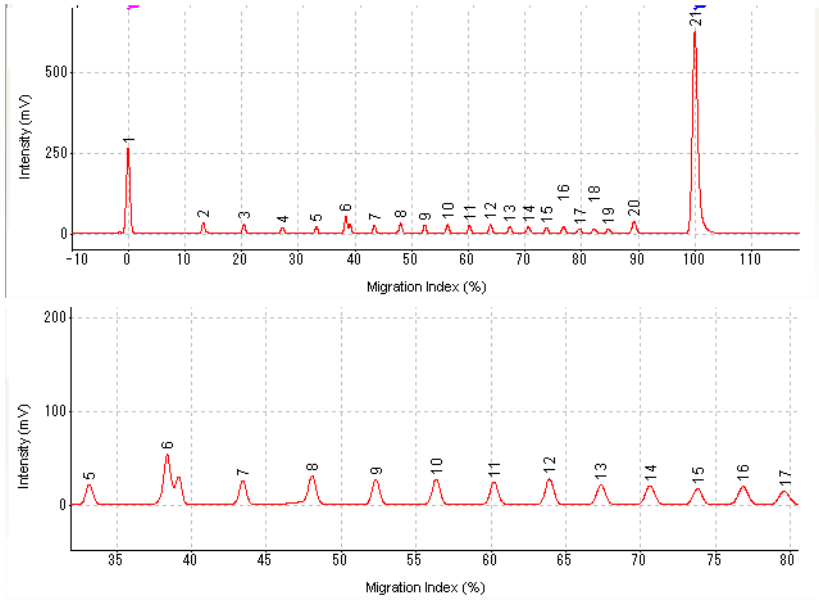
- If the check mark is cleared from a selected data when [Show Selected] is selected, the respective data disappears from [Gel Image] because the data is no longer selected.
- If the check mark is cleared from all of the displayed data and [Show Selected] is selected, the display state automatically changes to [Show All].

Zooming of [Gel Image]

- Select an area by dragging the mouse and then releasing it. While dragging the mouse up or down on [Gel Image], red lines are displayed at the starting and ending points of the area to be enlarged.
- To return to the original display, select [Undo Zoom]/[Undo Zoom All] on the [Gel Image] menu or use the right click pop-up menu.
- When the display range on [Gel Image] is changed, the display range of the horizontal axis of [Electropherogram (Single)] is scaled to the same.
- To return to the original display in [Electropherogram (Single)], select [Undo Zoom]/[Undo Zoom All] on the [Electropherogram] menu or right click pop-up menu on [Electropherogram (Single)].



Example of [Gel Image] Zooming In
(Left: Before Zooming In, Center: While Specifying the Range, Right: After Zooming In)

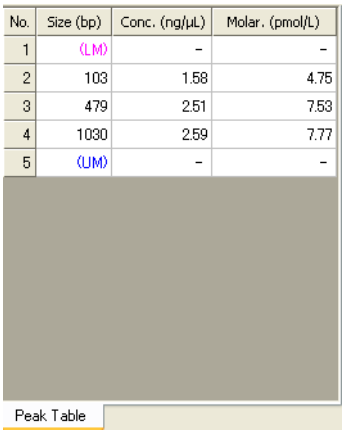


[Electropherogram] Zoomed In
(Top: Before Zooming in, Bottom: After Zooming In)

■ [Gel Image] Right-Click Pop-up Menu

Menu	Explanation	Reference Page
Undo Zoom	Undo the last zooming operation on [Gel Image].	*P.179*
Undo Zoom All	Undo all zooming operations on [Gel Image] to recover the initial display state.	*P.179*
Copy	Copy the image data displayed on [Gel Image] to the clipboard. (Or select [Copy] on the [Edit] menu and select [Gel Image].)	*P.163*
Copy Gel Image Only	Only copy the gel image to the clipboard. (This performs the same action as selecting [Copy] - [Gel Image Only] from the [Edit] menu.)	*P.163*
Save Image As	Save the image data displayed on [Gel Image] to a file. (Or select [Save Image As] on the [Edit] menu and select [Gel Image].)	*P.164*
Save Gel Image Only As	Only save the gel image to file. (This performs the same action as selecting [Save Image As] - [Gel Image Only] from the [Edit] menu.)	*P.164*
Add Focused Data to Comparison	Add focused data to the [Comparison] view.	*P.169*
Add All Selected Data to Comparison	Add all selected data (ones with a check mark) to the [Comparison] view.	
Delete Focused Data from Comparison	Delete focused data from the [Comparison] view.	
Delete All Selected Data from Comparison	Delete all selected data (ones with a check mark) from the [Comparison] view.	
Select Ladder Used for Analysis	Select and display ladder data used for analyzing the focused sample and the sample data.	*P.174*
Select All Samples Analyzed Using This Ladder	Select and display sample data analyzed using the focused ladder and the ladder.	*P.174*
Sample Properties	Display properties for acquiring data of each sample.	*P.157*

5.1.7 Peak Table

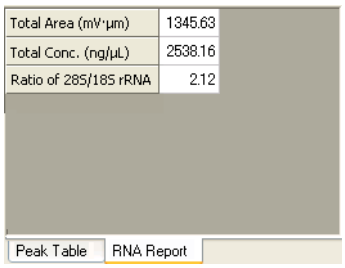


- The peak table of the focused data is displayed.
- (LM) represents the lower marker peak and (UM) represents the upper marker peak.
- To customize Items displayed on the columns, select [Options] on the [View] menu. (see *"5.4.13 Options" P.175*)
- Double-click a cell in the [Peak Table] or a peak to apply a "*" mark next to the peak no. and cause the corresponding peak top information on [Electropherogram] to be displayed in red.
- Double-click the cell with the "*" mark next to the peak number again to remove the mark and return to it to its original display.
- The size value is displayed in red if the peak size of the user ladder (see *"5.2.13 Analyze As Ladder" P.159*, *"11.8 User Ladders" P.295*) is outside the specifications for separation.

■ [Peak Table] Right-Click Pop-up Menu

Menu	Explanation	Reference Page
Copy Selected Cells	Copy the data selected in [Peak Table] to the clipboard.	P.163
Set to Lower Marker	Set the peak right-clicked in [Peak Table] as the lower marker when [Manual Edit Mode] is selected on the [Reanalysis] menu.	P.185
Set to Upper Marker	Set the peak right-clicked in [Peak Table] as the upper marker when [Manual Edit Mode] is selected on the [Reanalysis] menu.	
Set to 18S rRNA	Set the peak right-clicked in [Peak Table] as 18S rRNA in the case of RNA sample (total RNA) when [Manual Edit Mode] is selected on the [Reanalysis] menu.	
Set to 28S rRNA	Set the peak right-clicked in [Peak Table] as 28S rRNA in the case of RNA sample (total RNA) when [Manual Edit Mode] is selected on the [Reanalysis] menu.	
Delete Peak	Delete the peak right-clicked in [Peak Table] when [Manual Edit Mode] is selected on the [Reanalysis] menu.	

5.1.8 RNA Report



- For RNA analysis data, the [RNA Report] tab is displayed. The following items are displayed.

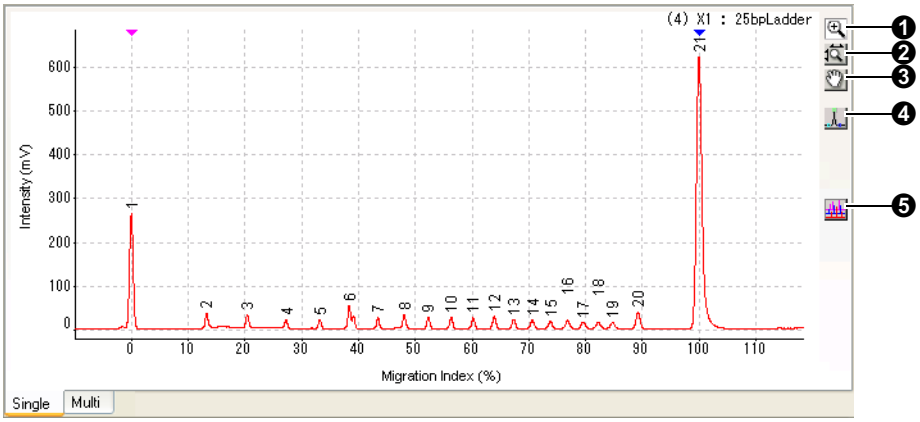
  Total RNA: [Total Area], [Total Conc.], [Ratio of 28S/18S rRNA]

  mRNA: [Total Area], [Total Conc.]
- Although peaks other than 18s rRNA and 28S rRNA are not displayed in the RNA electropherogram, the area and concentration of all RNA peaks are calculated.

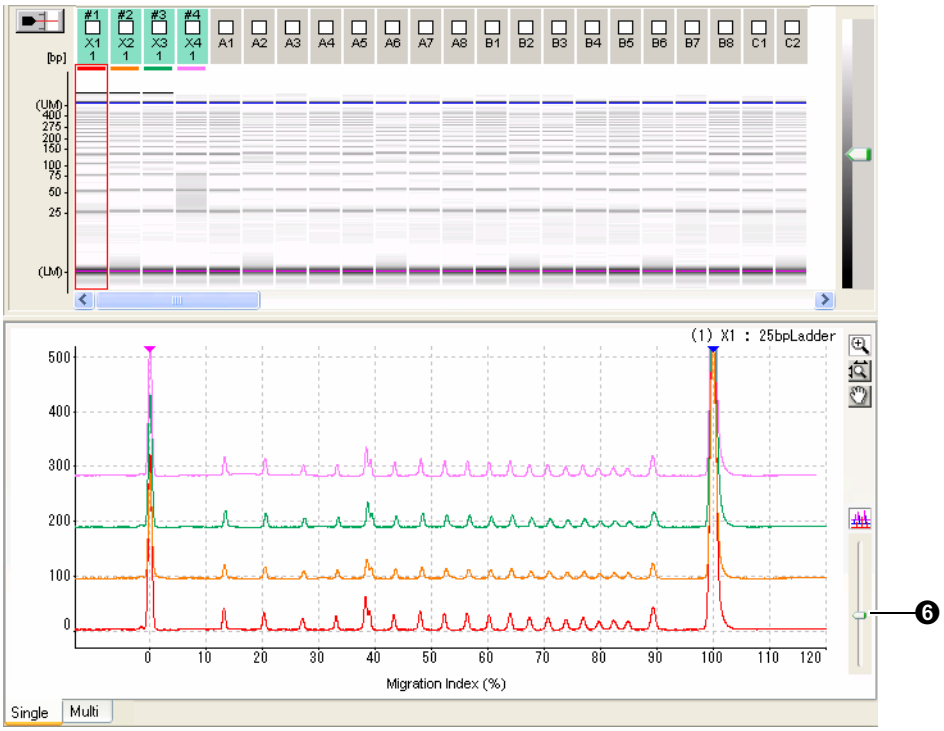
■ [RNA Report] Right-Click Pop-up Menu

Menu	Explanation	Reference Page
Copy Selected Cells	Copy the data selected in [Peak Table] to the clipboard.	P.163

5.1.9 Electropherogram (Single)



No.	Explanation
❶	[Rectangle Zoom] (default setting): Click to start the [Rectangle Zoom] mode. Drag the rectangular box in the graph to zoom in on the area surrounded by the box. To return the display to its original state, select [Undo Zoom] or [Undo Zoom All] on the [Electropherogram] menu or right-click pop-up menu.
❷	[Horizontal/Vertical Zoom]: Click to start the [Horizontal/Vertical Zoom] mode. Drag the mouse vertically or horizontally. The selected area is zoomed in or out in the respective direction according to the dragged distance. To return the display to its original state, select [Undo Zoom] or [Undo Zoom All] on the [Electropherogram] menu or right-click pop-up menu.
❸	[Pan]: Click to start the [Pan] mode. Drag the mouse in a desired direction in the graph to move the displayed range in that direction. To return the display to its original state, select [Undo Zoom] or [Undo Zoom All] on the [Electropherogram] menu or right-click pop-up menu.
❹	[Manual Edit Mode]: Click to switch ON/OFF of manual editing of analysis results. (This operation is also available by selecting [Manual Edit Mode] on the [Reanalysis] menu.) (See *"5.7.2 Manual Edit Mode" P.185*.)
❺	[Overlay]: Click to start the [Overlay] mode, and selected data and focused data are overlaid. [Ascending Order] / [Descending Order] display setting is specified by selecting the [Electropherogram] menu and pointing to [Overlay].
❻ Next figure	[Slider]: (Displayed when data is overlaid.) Drag the slider to adjust the width to display overlaid data that is off vertically. Focused data is displayed on the bottom.



- The vertical axis of the analyzed data indicates signal strength (with background removed).
- Raw data can be displayed by selecting [Raw data] on the [View] menu. In this case, the horizontal axis indicates migration time and the vertical axis indicates signal strength.
- The information displayed at the top of the peak can be selected from [Peak Top] on the [Electropherogram] menu.
- Select [Show Baseline] from the [Electropherogram] menu to display the baseline and vertical peak parting line.
- Double-clicking near a peak changes the top of the peak to red and displays a "*" mark next to the corresponding peak number in the peak table.
- Double-click the peak with the "*" mark to remove the mark and recover the original display.

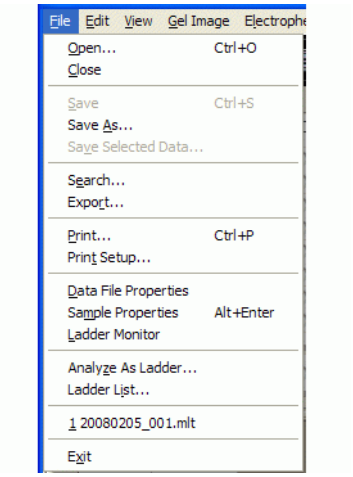
■ [Electropherogram (Single)] Right-Click Pop-up Menu

Menu	Explanation	Reference Page
Undo Zoom	Undo the previous zooming or pan operation on [Electropherogram].	*P.181*
Undo Zoom All	Undo all zooming or pan operations on [Electropherogram] to recover the initial display state.	*P.181*
Copy	Copy image data of [Electropherogram] to the clipboard. (Alternatively, on the [Edit] menu, select [Copy] and point to [Electropherogram].)	*P.163*
Save Image As	Saves the image data displayed on [Electropherogram] to a file. (Alternatively, select [Save Image As] on the [Edit] menu and select [Electropherogram].)	*P.164*
Set to Lower Marker	When there is a peak near the cursor where the mouse is right-clicked in the Manual Edit mode, the peak is set as the lower marker. When there is no peak near the cursor, a peak for the lower marker is added.	*P.185*
Set to Upper Marker	When there is a peak near the cursor where the mouse is right-clicked in the Manual Edit mode, the peak is set as the upper marker. When there is no peak near the cursor, a peak for the upper marker is added.	
Set to 18S rRNA	When there is a peak near the cursor where the mouse is right-clicked in the Manual Edit mode, the peak is set as 18S rRNA. When there is no peak near the cursor, a peak for 18S rRNA is added.	
Set to 28S rRNA	When there is a peak near the cursor where the mouse is right-clicked in the Manual Edit mode, the peak is set as 28S rRNA. When there is no peak near the cursor, a peak for 28S rRNA is added.	
Add Peak	In the Manual Edit mode, the peak closest to the cursor where the mouse is right-clicked is detected and added.	
Delete Peak	In the Manual Edit mode, peaks near the cursor are deleted when the mouse is right-clicked.	

5.1.10 Electropherogram (Multi)

- Click the [Multi] tab to display multiple electropherograms.
- If the check box on the upper right of an electropherogram is selected, the data becomes "selected data." (Or select the check box on [Gel Image].)

5.2 File Menu

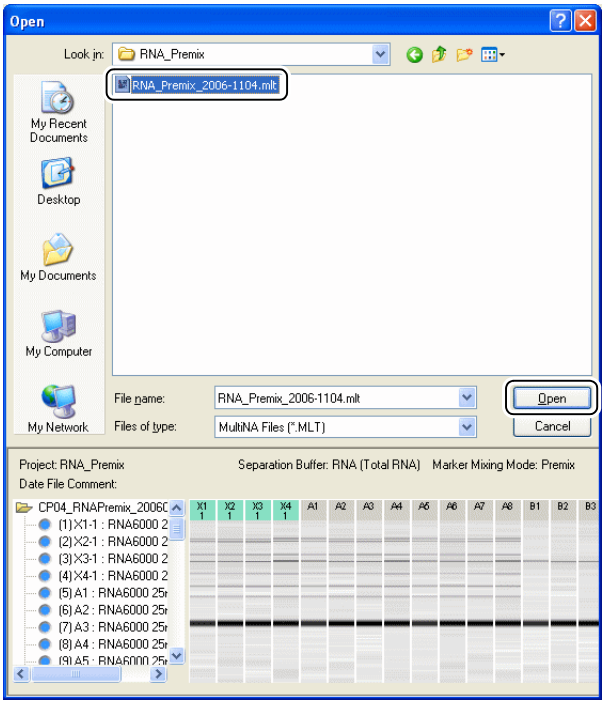


5.2.1 Open

1 **Select [Open] on the [File] menu or click (Open existing data file) at the left end of the toolbar.**

The [Open] dialog box is displayed.

2 **Either select a data file and click [Open] or double-click on a file.**



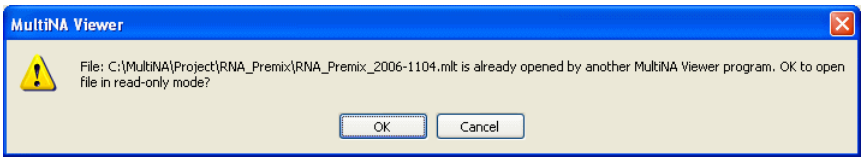
The data file is opened.

NOTE

- Data files are saved in a folder named with the project name used for analysis.
  When a data file (extension: MLT) is selected, the content of the data file is displayed as preview (project name, separation buffer used, marker mix mode, data file comment, sample name tree, and gel image).
- A data folder contains two files: a raw data file (extension: .MLT) and analyzed data file (extension: .MLA). When [Open] is selected on the [File] menu, only a raw data file (extension: .MLT) is displayed. When this file is opened, the analyzed data file is also loaded and automatically displayed.
- Two or more files can be loaded by repeatedly selecting [Open] on the [File] menu. Switch the file to be displayed on the File Name list box on the toolbar (see *"5.1.2 Toolbar" P.128*).
- Data files can be opened by double-clicking them on "Windows Explorer" (single-clicking in some settings on Windows). They can also be opened by dragging and dropping to the [MultiNA Viewer] window from Explorer.

NOTE

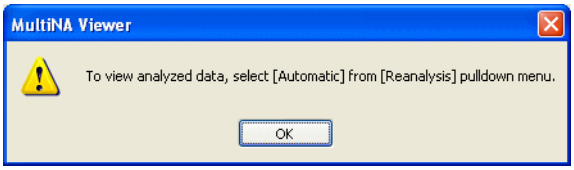
If multiple iterations of the MultiNA Viewer are open, the following message is displayed when an attempt is made to open a data file that is already open in one of the other iterations.



- [OK]: Opens the file in read-only mode.
  Reanalysis (automatic, manual edit or ladder change) is disabled.
- [Cancel]: Stops the open file process.

NOTE

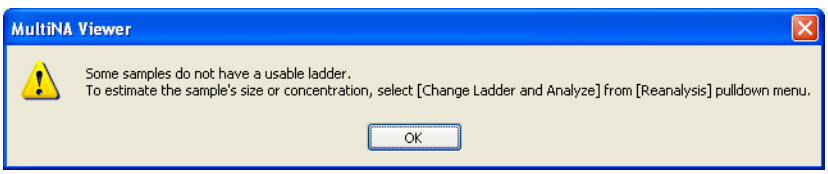
If only raw data (no analyzed data) exists in the folder, the following message is displayed and only raw data is opened. This occurs when the analyzed data file has been deleted or moved to a different folder.



In this case, select [Automatic] from the [Reanalysis] menu to perform analysis again. The analyzed data is then created and displayed. (See *"5.7.1 Automatic" P.182*.)

NOTE

The following message is displayed when there is no ladder data selected for analysis.



In this case, select [Change Ladder and Analyze] on the [Reanalysis] menu and add ladder data (see *"5.7.3 Change Ladder and Analyze" P.189*).

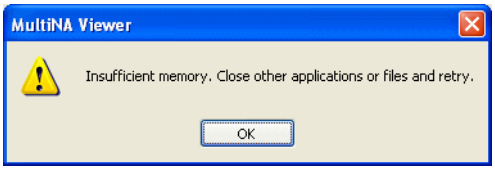
NOTE

In the following cases, data files are opened in the read-only mode and "(Read only)" is displayed at the end of the file name on the window title and the file selection drop-down list box.

- When the specified file is currently being acquired in the MultiNA Control Software
- When [Comparison View] is displayed

NOTE

The following message is displayed when a file, being analyzed by the instrument, is opened or updated by a PC with insufficient memory.



Click [OK] and close other applications or close the other files open in the MultiNA Viewer then repeat the operation.

If this memory error appears frequently, a PC memory upgrade is recommended.

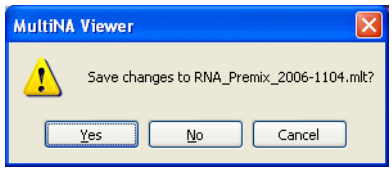
5.2.2 Close

Select [Close] to close the file currently being displayed.

(Alternatively, click ⊠ (Close) under the toolbar.)

NOTE

The following message is displayed when the results were not saved after editing using [Manual Edit Mode] on the [Reanalysis] menu or [Change Ladder and Analyze] on the [Reanalysis] menu.



- Click [Yes] to save and close the window.
- Click [No] to close the window without saving.
- Click [Cancel] to cancel the close operation.

5.2.3 Save

Select [Save] to overwrite an analyzed data file that has been changed.

Analyzed data can be changed and saved in the following cases.

- Manually edit the file using [Manual Edit Mode] on the [Reanalysis] menu.
- Reanalyze the file using [Change Ladder and Analyze] on the [Reanalysis] menu.

5.2.4 Save As

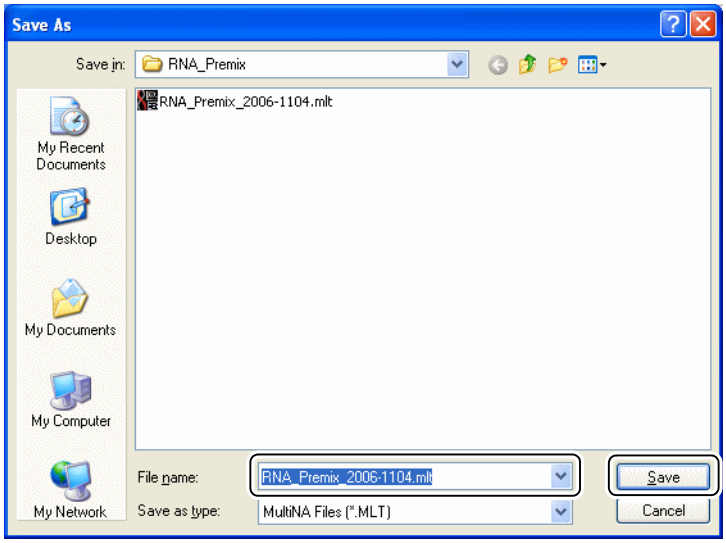
Select [Save As] to save a data file with a new name.

Raw and analyzed data are saved with different names at the same time.

1 **Select [Save As] on the [File] menu.**

The [Save As] dialog box is displayed.

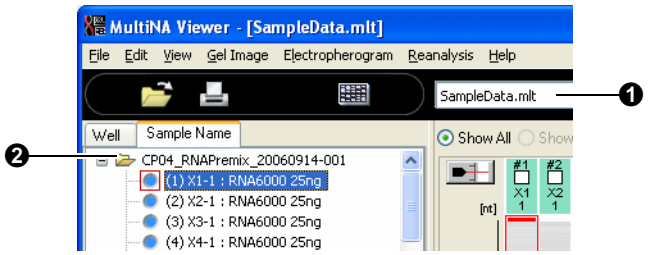
2 **Enter a new file name in the [File name] box and click [Save].**



The data file (raw and analyzed data) is saved with the new name.
(/\<>:"|?* cannot be used for a file name.)

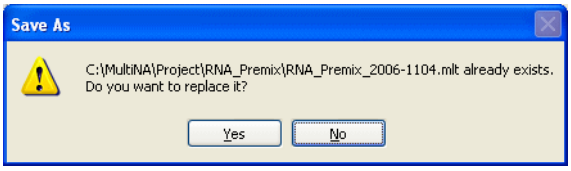
NOTE

Although the data file is saved with the new name, the data file name given when the sample sheet was created is kept in the data file as "Original data file name." "Original data file name" is displayed on the top ❷ of [Sample Name Tree]. (❶ is displayed by the new name.)



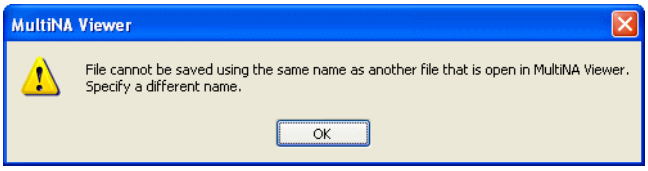
NOTE

The following message is displayed if an attempt is made to save the file using a previously used file name.



- Click [Yes] to overwrite the existing file.
- Click [No] to return to the current window without saving.

When [Yes] is clicked and the applicable file is open on Viewer window, the following message is displayed. In this case, the file cannot be saved with the specified name. Click [OK] and enter a different file name to save.

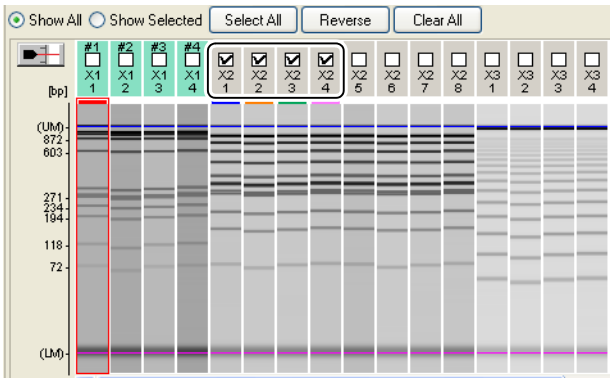


5.2.5 Saving Selected Data

Save selected data to a separate file.

1 **Select data (sample) to be saved in a different file with a check mark on a gel image (or an electropherogram (multi)).**

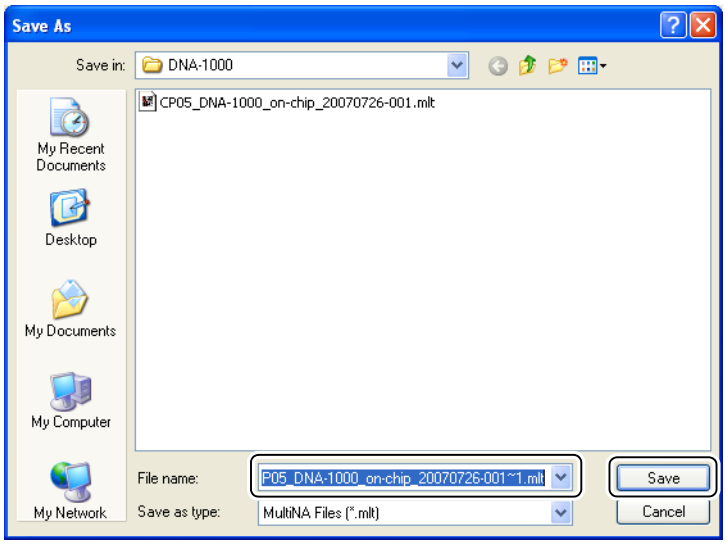
Ladders used for sample analysis are automatically saved. Therefore, they do not need to be selected with a check mark.



2 **Select [Save Selected Data] on the [File] menu.**

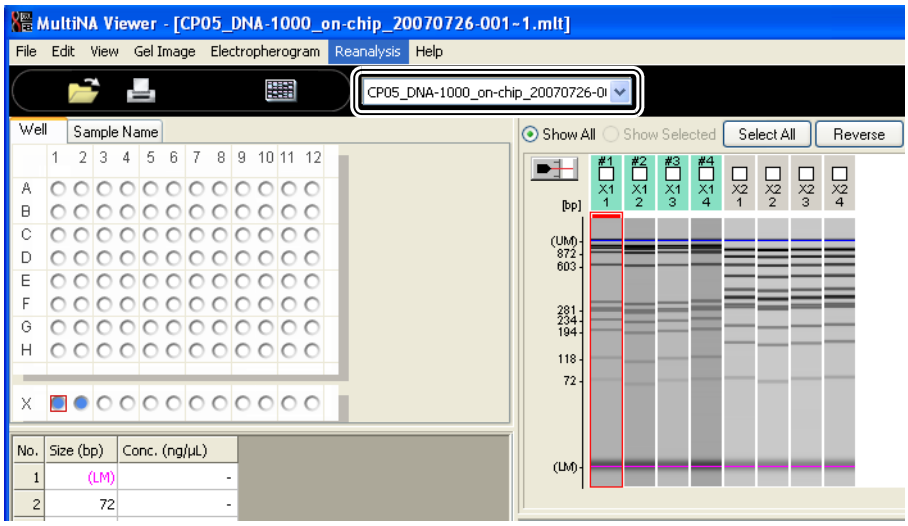
The [Save As] dialog box is displayed.

3 **Enter a new file name in the [File name] box and click [Save].**



By default, the new file name has "~" and numbers at the end of the original data file name.

The saved file is automatically loaded and displayed.



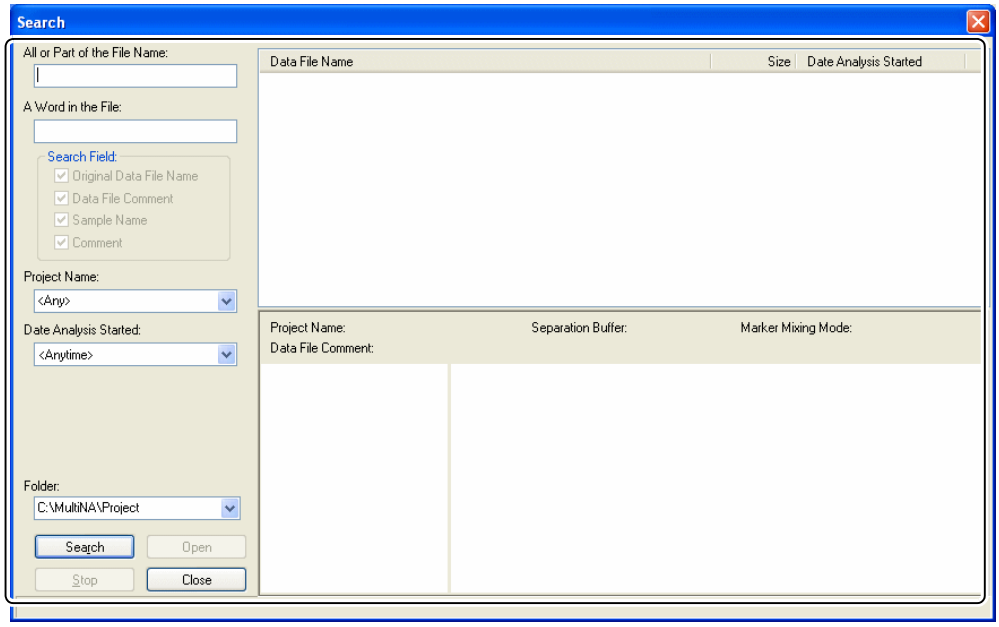
5.2.6 Search

Select [Search] to search data files in a specified folder with specific screening conditions such as data file names, keywords, or date analysis started.

1 **Select [Search] on the [File] menu.**

The [Search] dialog box is displayed.

2 **Enter or select search conditions.**



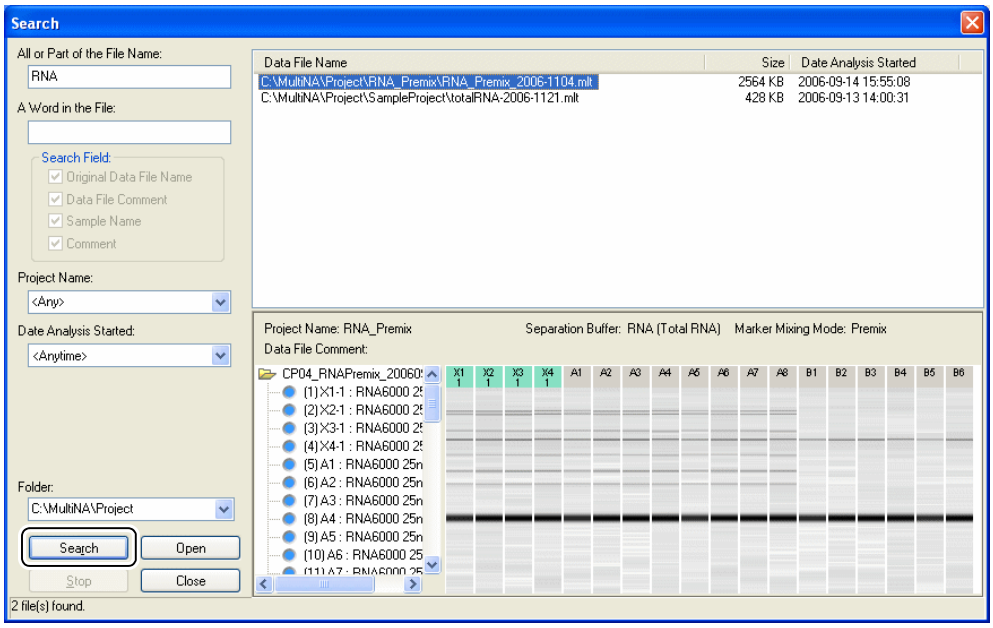
Item	Explanation
[Data file name]	Enter all or part of a data file name.
[A Word in the File]	Enter a keyword for searching in selected search fields.
[Project Name]	Select or enter a project name.
[Date Analysis Started]	Select the date when analysis started.
[Folder]	Select or enter a target folder.

- "AND" is applied to each condition entered in search fields.
- Only one target keyword can be used for searching. Select at least one search field from [Original data file], [Data file comment], [Sample name], and [Comment].
- To search by specifying a project name, select a project name from the combo box below [Project Name] or enter a project name (or part of it). Select <Any> when not specifying any name.
- To specify [Date Analysis Started], select the range of date analysis started from the list in the combo box ([Today], [Within the last week], [Within the last 30 days], [Within the last 90 days]) or select [Custom] and then specify the start and end of the time range.
- To search by specifying a folder, select the folder from the combo box or enter the folder name. Click <Browse…> from the list in the combo box. The [Select Folder] dialog box is displayed and a folder can be selected.

NOTE

[Date Analysis Started] represents date and time where analysis of each data saved in MLT files started (see *"5.4.3 Status Bar" P.166*). It may be different from the time when the file was updated.

3 **Click [Search].**



Searching starts.
Extracted data files are displayed on the list to the right with information such as data file name and date analysis started.
Click a file name to display the preview of gel image and sample names.

NOTE
Click [Stop] to stop searching.

4 **Select a file and click [Open].**

The data is loaded.

NOTE
- Data can also be loaded by double-clicking on the file name.
- Only one data file can be selected or loaded at a time.

5.2.7 Export

Select [Export] to export sample sheet or peak table as a CSV format file.

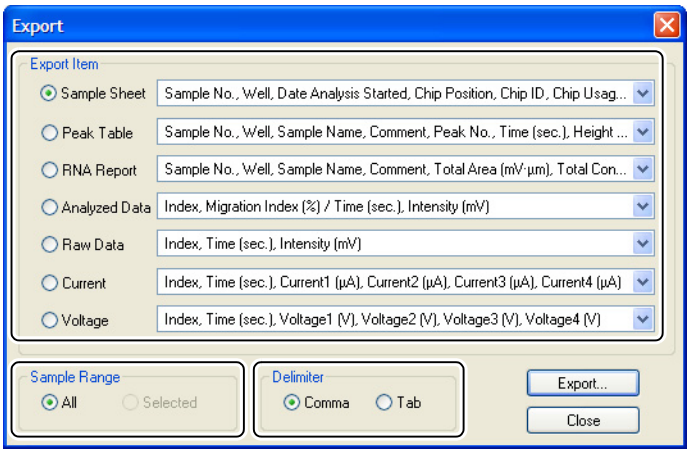
1 **Select data to be exported by selecting the respective check box on [Gel Image] (or [Electropherogram (Multi)]).**

When exporting all data, data selection is unnecessary.

2 **Select [Export] on the [File] menu.**

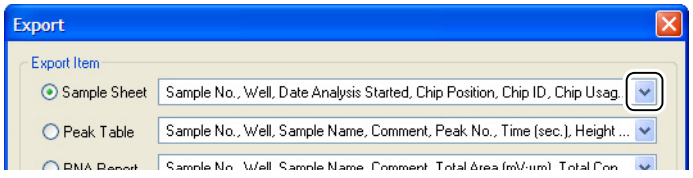
The [Export] dialog box is displayed.

3 Specify items, range, and delimiter to be exported.



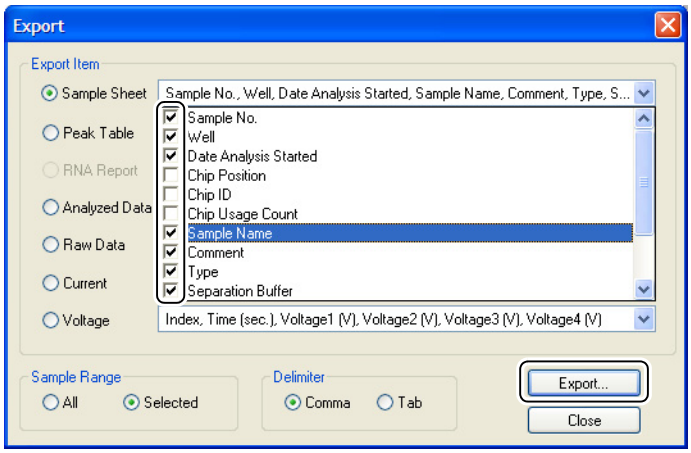
Item		Explanation
[Export Item]		
	[Sample Sheet]	Well name, sample name, comment, chip ID, date analysis started, etc.
	[Peak Table]	Peak table of sample data (size, concentration, height, time, area, etc.)
	[RNA Report]	Total area, total concentration, and 28S rRNA/18S rRNA ratio for RNA sample (total RNA analysis only)
	[Analyzed Data]	Index, migration time index/size/time, and signal strength of the data in the analyzed data
	[Raw Data]	Time and signal strength at each data point in raw data
	[Current]	Time and current on four electrodes of a microchip at each data point
	[Voltage]	Time and voltage on four electrodes of a microchip at each data point
[Sample Range]		
	[All]	All data in the data file
	[Selected]	Selected data with a check mark on [Gel Image] (or [Electropherogram (Multi)])
[Delimiter]		
	[Comma]	Data items are separated by commas.
	[Tab]	Data items are separated by tabs and enclosed by double quotation marks.

4 Click the arrow facing downward on the right side of items.



A drop-down list is displayed.

5 **Select necessary detailed items with a check mark and click [Export].**

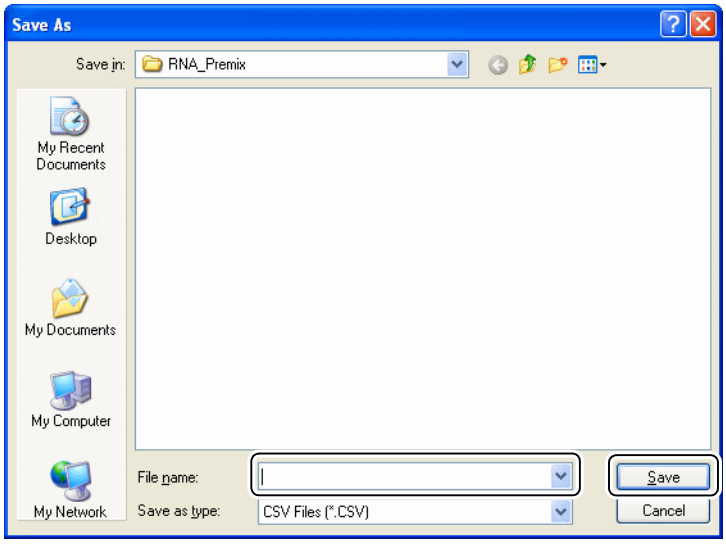


The [Save As] dialog box is displayed.

NOTE

When [Analyzed Data] is selected, the exported data depends on the horizontal axis selected for the electropherogram.

6 **Enter a file name and click [Save].**



7 **Return to step *3* to continue exporting other information. Click [Close] in the [Export] dialog box if exporting is complete.**

5.2.8 Print

Select [Print] from the [File] menu to print data.

■ Printing Procedure

1 **Select the data to be printed.**

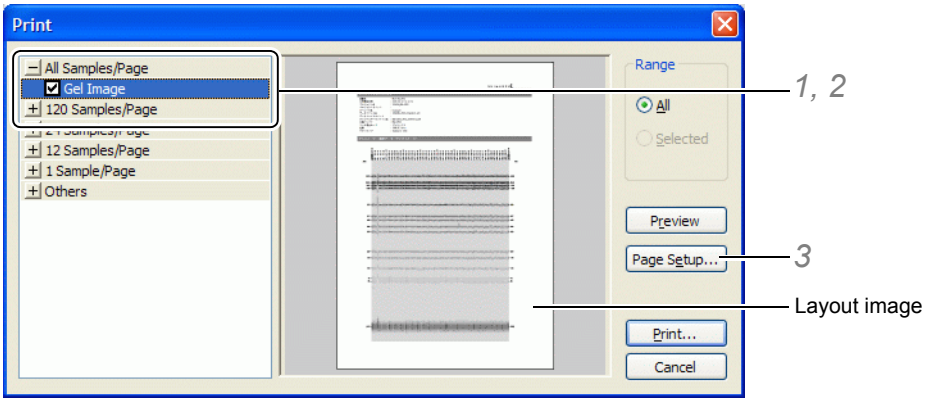
NOTE

This process is unnecessary when printing all data.

2 **Select [Print] on the [File] menu or click [Print active data file] on the toolbar.**

The [Print] dialog box is displayed.

3 **Select a layout for printing.**

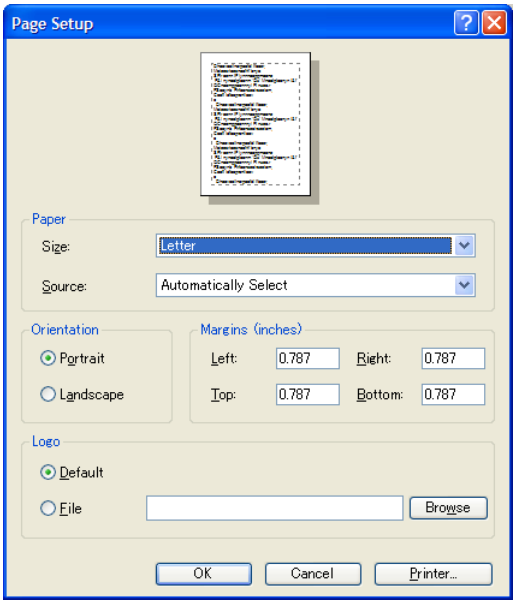


1 Click a "+" mark displayed with printing layouts at the left. The items to be printed such as sample sheet and gel image are displayed under each printing layout category.

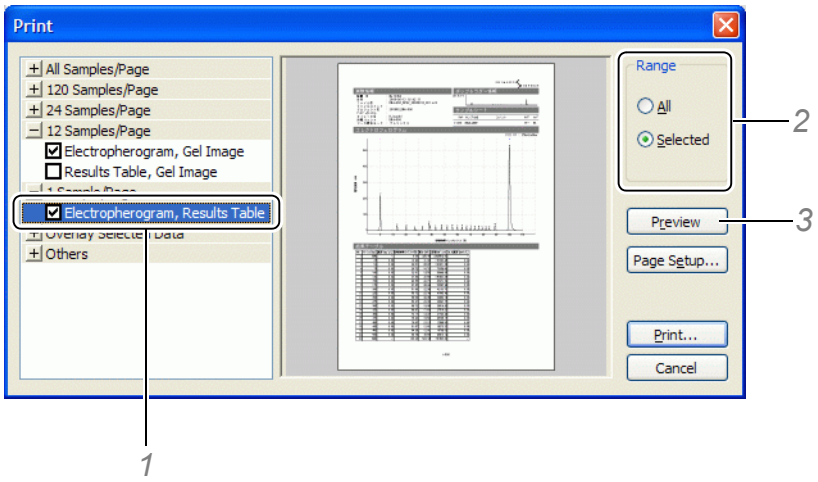
2 Check the items to be printed. The image of the respective layout is displayed in the right field of the dialog box.

3 Click [Page Setup] to set paper size, orientation, page margins, and other items.

A logo can be printed by specifying the file name of a bitmap for [Logo].



4 Select the items and range for printing.

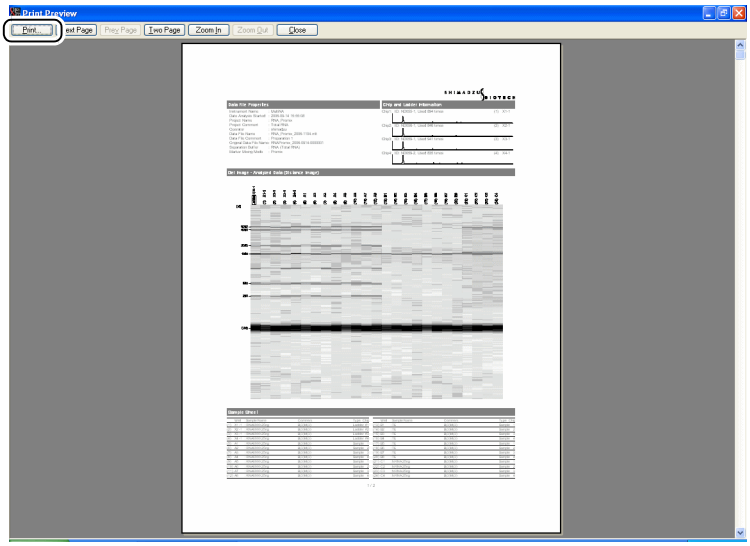


1 Select the items to be printed.
[Preview] and [Print] are enabled.

2 Select [All] to print all of the data in the file or [Selected] to print only the selected data.
The range of the data for printing is set.

3 Click [Preview] to review the print image and determine the number of pages.

5 Click [Print] in the [Print] window or [Print Preview] window.



The data is printed.

NOTE

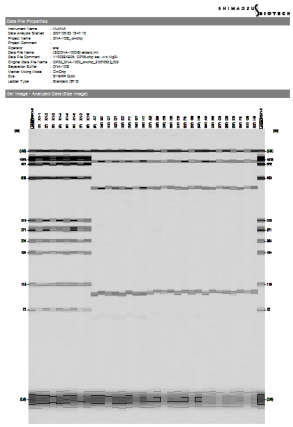
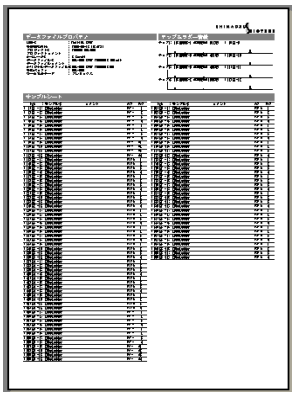
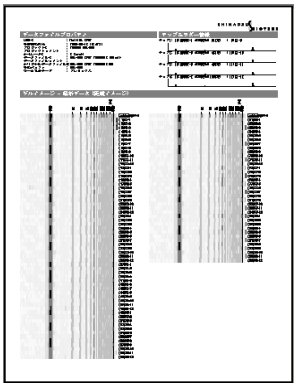
The settings in displayed windows are reflected in printing for the following items. Check the settings in displayed windows before printing.

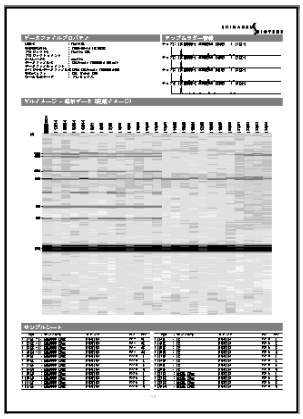
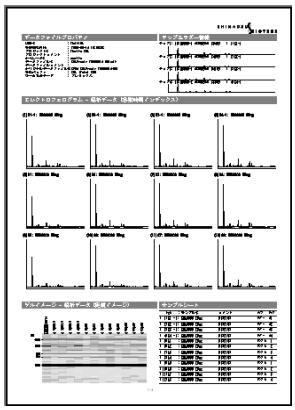
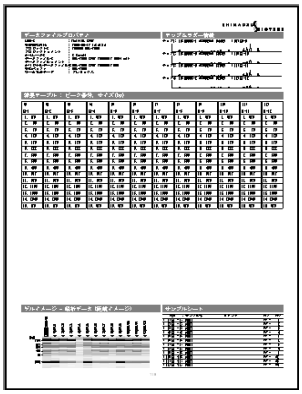
- For the data that fails in analysis, even if [Size Image] is selected for the gel image vertical axis, the distance image is printed.
- For the data that fails in analysis, even if [Size] is selected for the electropherogram horizontal axis, the electropherogram with migration index is printed.

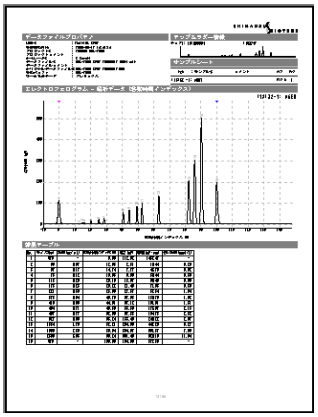
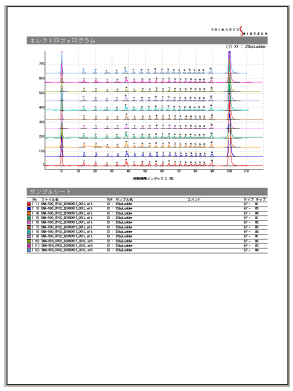
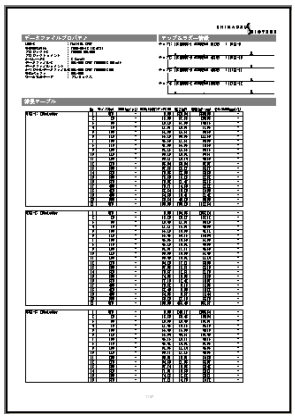
Matters Reflected in Printing	Settings in Windows Displayed	Reference Page
• Both Gel Image and Electropherogram		
Selection between [Analyzed Data] / [Raw Data]	[View] menu - [Analyzed Data] / [Raw Data]	*P.167*
Scale	[View] menu - [Options] - [Scale of Default View]	*P.175*
• Gel Image		
Selection of inversion of black and white	[Gel Image] menu - [Invert Black and White]	*P.177*
Brightness adjustment	Slider at the right of [Gel Image]	*P.129*
Selection of [Distance Image] / [Size Image] / [Time Image]	[Gel Image] menu - [Vertical Axis] - [Distance Image] / [Size Image] / [Time Image]	*P.181*
• Electropherogram (whole)		
Show or hide baseline	[Electropherogram] menu - [Show Baseline]	*P.180*
Selection of [Migration Index] / [Size] / [Migration Time]	[Electropherogram Menu] menu - [Horizontal Axis] - [Migration Index] / [Size] / [Migration Time]	*P.181*
• Electropherogram (single)		
Show or hide marker signs	[View] menu - [Marker]	*P.166*
Peak top item	[Electropherogram] menu - [Peak Top]	*P.180*
Title items	[View] menu - [Title]	*P.167*
• Analysis result (excluding 12 samples/page layout)		
Selection of items on the peak table	[View] menu - [Options] - [Peak Table]	*P.133*
• Overlaying selected data		
Width to make overlaid data vertically off	Slider during overlaying on [Electropherogram (Single)]	*P.135*

■ Print Layout

Available print layouts are shown in the table below. Layout diagrams are shown assuming that printing is carried out vertically. The layout is changed when printing horizontally.

Layout Category	Printed Subjects	Explanation
[All Samples/Page]	Gel Image	Gel images for all samples are printed on a single page. Data file properties are also printed. 
[120 Samples/Page]	Sample sheets	A sample sheet containing up to 120 samples is printed on a page. Data file properties and chip and ladder information are also printed. 
	Gel Image	Gel images for up to 120 samples are printed on a page. Data file properties and chip and ladder information are also printed. 

Layout Category	Printed Subjects	Explanation
[24 Samples/Page]	Sample sheet, gel image	A sample sheet and gel images for up to 24 samples are printed on a page. Data file properties and chip and ladder information are also printed.  (Among the ladders displayed, the ladder used for the first analysis is printed.)
[12 Samples/Page]	Electropherogram, gel image	Electropherograms and gel images for up to 12 samples are printed on a page. Data file properties, chip and ladder information, and sample sheets are also printed. 
	Analysis result, gel image	Analysis results for up to 12 samples are printed on a page. Data file properties, chip and ladder information, and sample sheets are also printed. In the analysis results, the size of each peak is printed for DNA analysis, and the RNA report contents and concentration of each peak are printed for RNA analysis. For one analysis, up to 60 lines of data can be printed. 

Layout Category	Printed Subjects	Explanation
[1 Sample/Page]	Electropherogram, analysis result	An electropherogram and analysis result for one sample are printed on a single page. Data file properties, chip and ladder information, and sample sheets are also printed. More than one page may be used if the analysis result display will not fit on a single page. 
[Overlay Selected Data]	Electropherogram	Electropherograms of selected data and focused data are printed overlaid. Sample sheets are also printed. 
[Others]	All analysis results	Analysis results for all data to be printed are printed. 

NOTE

- Imported ladder data is not printed except for "Chip and Ladder Information" (see *"5.7.3 Change Ladder and Analyze" P.189*).
- For printing [Comparison View], "1 sample/page" layout cannot be used. Some displayed contents are different from ones of ordinary data files (see *"5.4.7 Comparison" P.169*).

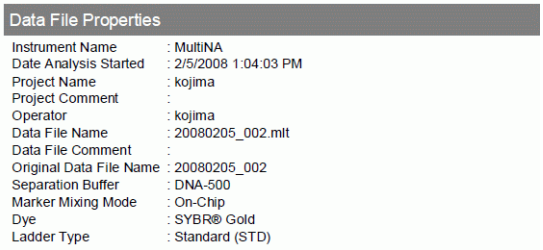
■ Contents Printed

Data File Properties

Properties such as data acquisition date and conditions set for the instrument are printed.

NOTE

If a large number of characteristics are selected for each item, all of the information may not be printed. (Printable range differs according to the printing conditions such as paper size and margin.)

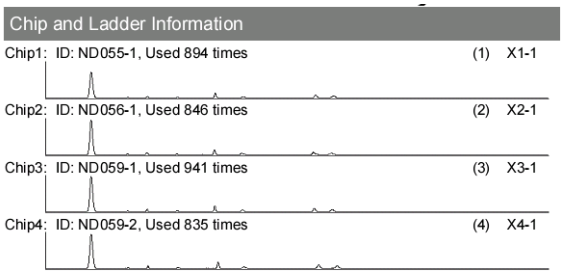


Data File Properties

Instrument Name	: MultiNA
Date Analysis Started	: 2/5/2008 1:04:03 PM
Project Name	: kojima
Project Comment	:
Operator	: kojima
Data File Name	: 20080205_002.mlt
Data File Comment	:
Original Data File Name	: 20080205_002
Separation Buffer	: DNA-500
Marker Mixing Mode	: On-Chip
Dye	: SYBR® Gold
Ladder Type	: Standard (STD)

Chip and Ladder Information

Microchip ID, number of uses (analysis schedule starting point), no., well, and electropherogram for the ladder used is printed for each chip position.



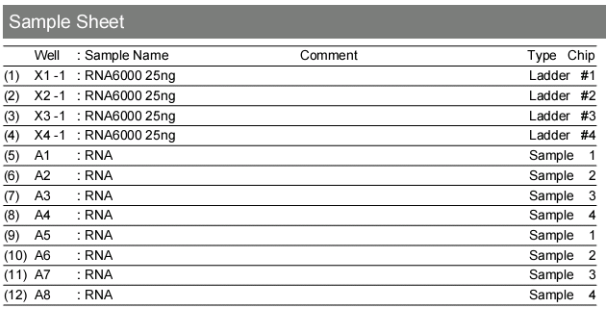
Sample Sheet

The sample sheet is printed (no., well, sample name, comment, type, and microchip position).

A "#" mark is added on the left of the chip position number to indicate the ladder used for analysis.

NOTE

If a large number of characteristics are selected for each item, all of the information may not be printed. (Printable range differs according to the printing conditions such as paper size and margin.)



Sample Sheet

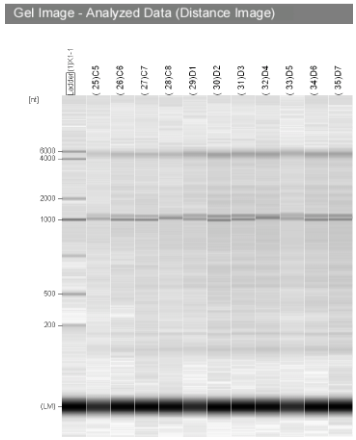
	Well	: Sample Name	Comment	Type	Chip
(1)	X1 -1	: RNA6000 25ng		Ladder	#1
(2)	X2 -1	: RNA6000 25ng		Ladder	#2
(3)	X3 -1	: RNA6000 25ng		Ladder	#3
(4)	X4 -1	: RNA6000 25ng		Ladder	#4
(5)	A1	: RNA		Sample	1
(6)	A2	: RNA		Sample	2
(7)	A3	: RNA		Sample	3
(8)	A4	: RNA		Sample	4
(9)	A5	: RNA		Sample	1
(10)	A6	: RNA		Sample	2
(11)	A7	: RNA		Sample	3
(12)	A8	: RNA		Sample	4

Gel Image

There are four types of gel images; for analyzed data (distance image), for analyzed data (size image), for analyzed data (time image), and for raw data.

[Ladder] (the ladder used for the first analysis among ladder data displayed in Gel Image) is added to the left end of each gel image. A size scale can be marked according to the band of this ladder.

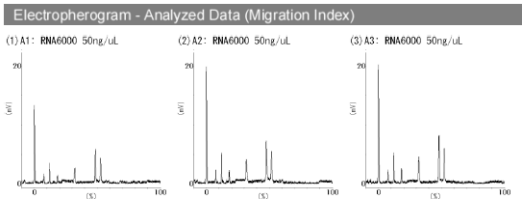
Contrast is adjusted by the slider on the right end in the [Gel Image] window (see *"5.1.6 Gel Image" P.129*).



Electropherogram

There are four types of electropherograms; analyzed data (migration index), analyzed data (size), analyzed data (migration time), and raw data.

The (number), well, and sample name are printed at the top of each electropherogram. The electropherogram settings in [View] - [Options] are reflected on the vertical scale.



Results Table: DNA analysis

In the [12 samples/page] layout, (number), well, and predicted size of each peak are printed.

In the [1 sample/page and all results table] layout, (number), well, and items selected in [Options] on the [View] menu are printed.

Results Table: RNA analysis

In the [12 samples/page] layout, (number), well, concentration of each peak, and contents of RNA report (total area, total concentration, and the 28S rRNA/18S rRNA ratio for total RNA) are printed.

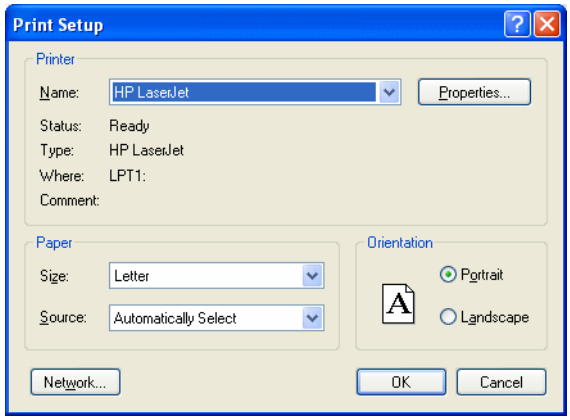
In the [1 sample/page and all results table] layout, (number), well, and items selected on [Options] on the [View] menu are printed.

Overlay Selected Data

On sample sheet, data file names, (numbers), wells, sample names, comments, types, and chip positions of overlaid data.

5.2.9 Print Setup

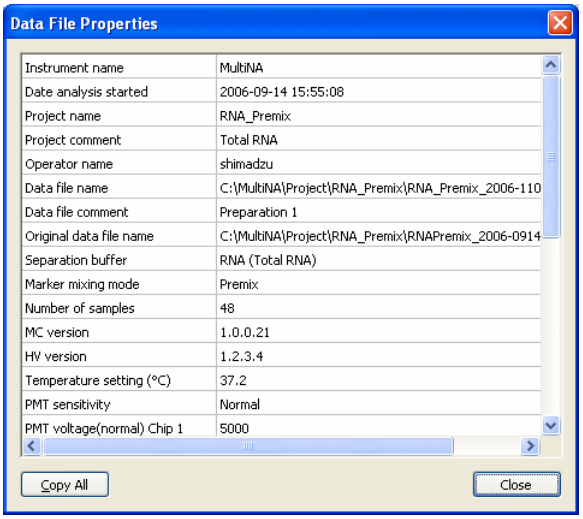
The [Print Setup] dialog box is displayed. Select a printer and set the printer properties such as paper size and orientation.



5.2.10 Data File Properties

Select [Data File Properties] to display the instrument conditions when a data file was acquired.

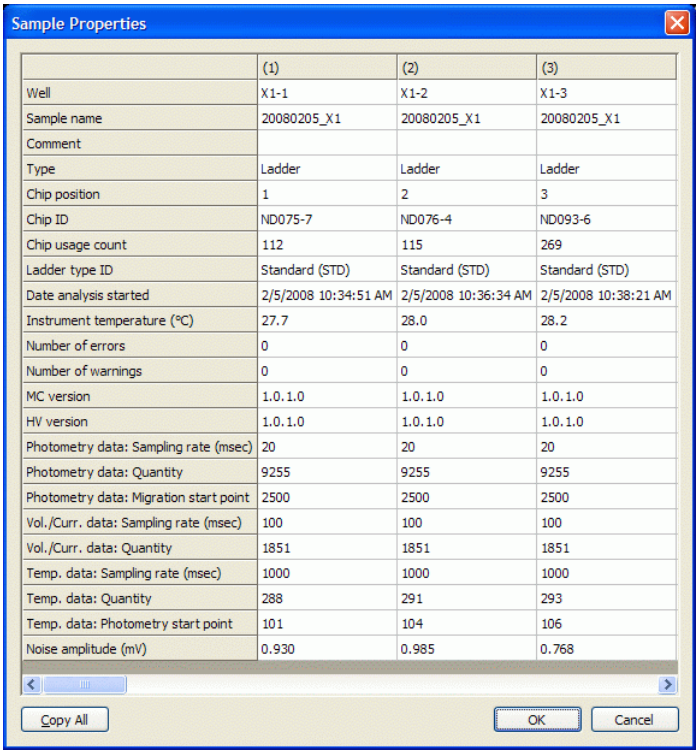
- Click [Copy All] to copy all of the displayed contents to the clipboard.
- Select cells, lines, or columns and then right-click and select [Copy Selected Cells] to copy the selected cells to the clipboard.



5.2.11 Sample Properties

Select [Sample Properties] to display all of the information in the file such as the conditions when the data was acquired.

- Click [Copy All] to copy all of the displayed contents to the clipboard.
- Select cells, lines, or columns and then right-click and select [Copy Selected Cells] to copy the selected cells to the clipboard.

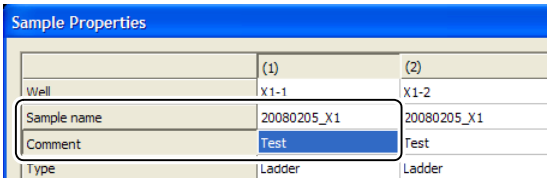


	(1)	(2)	(3)
Well	X1-1	X1-2	X1-3
Sample name	20080205_X1	20080205_X1	20080205_X1
Comment			
Type	Ladder	Ladder	Ladder
Chip position	1	2	3
Chip ID	ND075-7	ND076-4	ND093-6
Chip usage count	112	115	269
Ladder type ID	Standard (STD)	Standard (STD)	Standard (STD)
Date analysis started	2/5/2008 10:34:51 AM	2/5/2008 10:36:34 AM	2/5/2008 10:38:21 AM
Instrument temperature (°C)	27.7	28.0	28.2
Number of errors	0	0	0
Number of warnings	0	0	0
MC version	1.0.1.0	1.0.1.0	1.0.1.0
HV version	1.0.1.0	1.0.1.0	1.0.1.0
Photometry data: Sampling rate (msec)	20	20	20
Photometry data: Quantity	9255	9255	9255
Photometry data: Migration start point	2500	2500	2500
Vol./Curr. data: Sampling rate (msec)	100	100	100
Vol./Curr. data: Quantity	1851	1851	1851
Temp. data: Sampling rate (msec)	1000	1000	1000
Temp. data: Quantity	288	291	293
Temp. data: Photometry start point	101	104	106
Noise amplitude (mV)	0.930	0.985	0.768

1 **On the [File] menu, click [Sample Properties] or click [Sample Properties] on the right-click pop-up menu displayed on the gel image.**

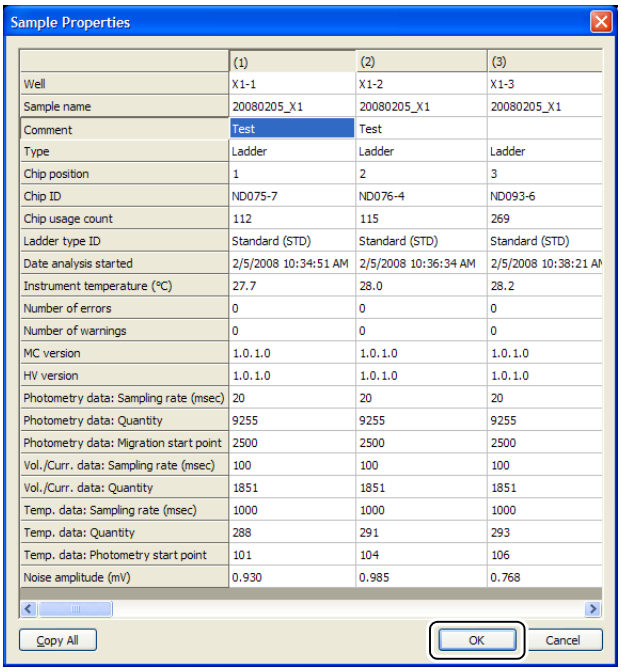
The [Sample Properties] window is displayed.

2 **Double-click the sample name or comment box to be edited.**



A cursor appears and the contents can be edited.

3 Edit the contents and then click [OK].

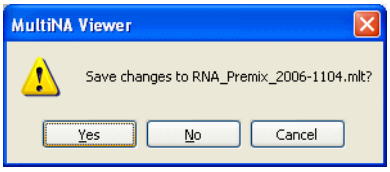


This confirms the edited contents and closes the window.
Clicking [Cancel] aborts any editing changes made.

4 On the [File] menu, select [Save] or [Save As] to save the file.

NOTE

The message below is displayed when an attempt is made to close a data file without saving the changes.



- Click [Yes] to save the changes in the initial data file.
- Click [No] to cancel the changes.
- Click [Cancel] to stop the closing process.

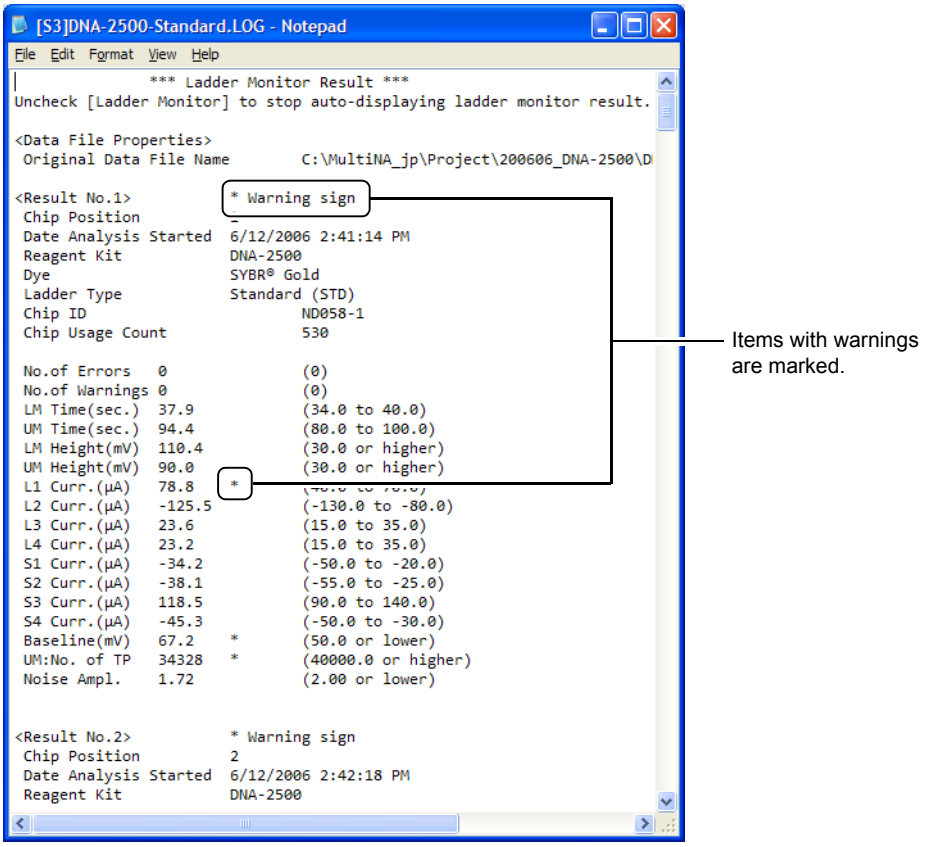
5.2.12 Ladder Monitor

The ladder monitor function monitors information including the current value and baseline of ladder data contained in a data file when the file is opened and automatically displays the results of any warnings that occurred.

- Enable this function by selecting [Ladder Monitor] from the [File] menu. A check mark appears in the menu when the function is enabled.
- Items with warnings are marked.

NOTE

The ladder monitor only monitors standard ladders and a DNA-1000 option ladder. Other ladders cannot be used with the ladder monitor function.



NOTE

Ladder data marked with a warning sign (*) may indicate low analysis accuracy. Use the electropherogram to check that peaks are being detected correctly.

- Warning signs do not always mean that a problem exists with microchips or the instrument.
- If warning signs appear frequently, perform the procedure described in *"6.2 Daily Maintenance" P.199*.

5.2.13 Analyze As Ladder

Ladders that satisfy predetermined conditions can be used as user ladders in DNA analysis (see *"11.8 User Ladders" P.295*).
User ladder registration is performed according to the procedure described below. Once registration is complete, user ladders can be selected during project registration.

NOTE

RNA data cannot be targeted by user ladders. The [Analyze As Ladder] function cannot be used in the following situations.

- When displaying the [Comparison] view, [Manual Edit Mode], or [Low Sensitivity Data].
- When [Analyze As Ladder] or [Ladder List] are already executed in another instance of the data analysis software running on the same PC.

1 Migrate user ladders as samples in the first migration.

Reference

"11.8 User Ladders" P.295

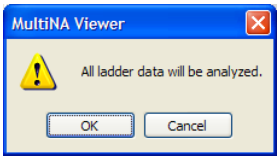
2 Open the data file in the MultiNA Viewer. Click the check box of the sample to be defined as the user ladder on the gel image.

3 Select [Analyze As Ladder] from the [File] menu.

The [Analyze As Ladder] window is displayed.

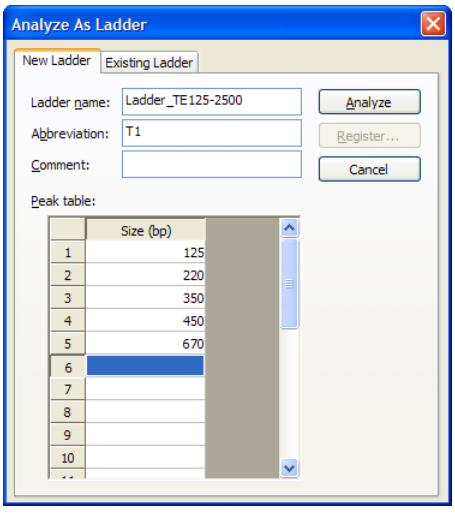
NOTE

The following message is displayed if all ladders contained in the data file are not selected.



- Click [OK] to set all ladders for analysis.

4 Enter the required ladder information on the [New Ladder] tab.



Item	Explanation
Ladder name	Enter a name for the ladder. Up to 30 characters can be entered.
Abbreviation	Enter an abbreviation for the ladder. Up to 3 characters can be entered.
Size (bp)	Enter a peak size. Only ladders with three or more peaks can be used.

5 **Click the [Analyze] button.**

NOTE

- If the new ladder does not satisfy any of the ladder conditions, reenter any of the above information according to the displayed message.
- If the input size is outside the specifications for separation, an analysis confirmation message is displayed. Click [Yes] to proceed with the analysis anyway.

6 **Once analysis is complete, check that peaks of the corresponding size were correctly detected on the electropherogram and that the size calibration curve is acceptable. (See *"5.4.8 Size Calibration Curve" P.173*.)**

NOTE

The [Point To Point] setting is applied to the size calibration curve of user ladders.

7 **Click [Register] if the ladder is acceptable for use.**

A confirmation message for ladder registration is displayed. Click [Yes] to register the user ladder and perform reanalysis.

5.2.14 Ladder List

The ladder list is used for checking registered ladders and editing information.

NOTE

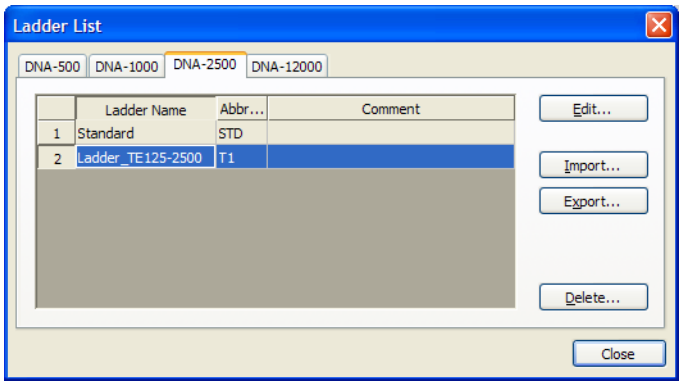
This function can only be used in DNA analysis.

The [Ladder List] function cannot be used in the following situations.

- When [Analyze As Ladder] or [Ladder List] are already executed in another instance of the data analysis software running on the same PC.
- Ladder information used during analysis with the MultiNA cannot be edited or deleted.

1 **Select [Ladder List] from the [File] menu.**

The [Ladder List] window is displayed. Ladders are registered for each separation buffer.



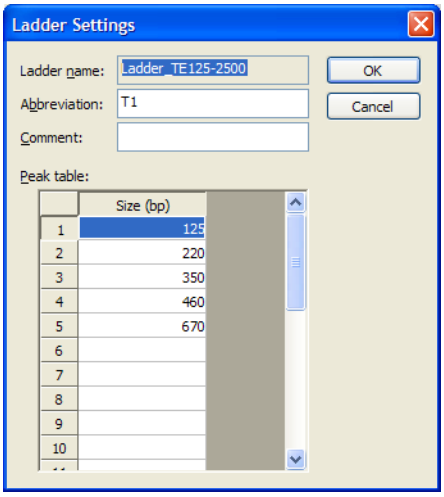
2 **Select the tab corresponding to the target separation buffer.**

A list is displayed that contains the factory default ladders.

■ Editing

1 **Select the registered ladder for editing or referencing and click [Edit].**

The [Ladder Settings] window is displayed.



2 **Edit the required information and click [OK] to save the changes.**

☞ **Reference**

"5.2.13 Analyze As Ladder" P.159

■ Deleting

Select the ladder to delete and click [Delete].

■ Importing and Exporting

These functions are used to share user ladder information between multiple MultiNA instruments.
Click [Export] to output ladder information to an appropriate folder.
To load ladder information, click [Import] and select the output file shown on screen to register the user ladder.

NOTE

The import function can only import files output using the export function.

5.2.15 Exit

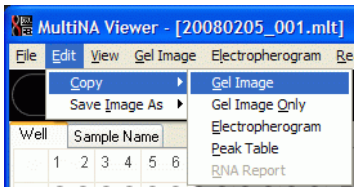
Click [Exit] to quit MultiNA Viewer.

NOTE

The following message is displayed when the results were not saved after editing using [Manual Edit Mode] on the [Reanalysis] menu or [Change Ladder and Analyze] on the [Reanalysis] menu.

- Click [Yes] to save and exit.
- Click [No] to exit without saving.
- Click [Cancel] to cancel the exit operation.

5.3 Edit Menu



5.3.1 Copy

Selecting [Gel Image], [Gel Image Only], [Electropherogram], [Peak Table], [RNA Report], (RNA analysis only) via the [Copy] submenu on the [Edit] menu copies the corresponding display data to the clipboard.

- [Gel Image] / [Gel Image Only] / [Electropherogram]

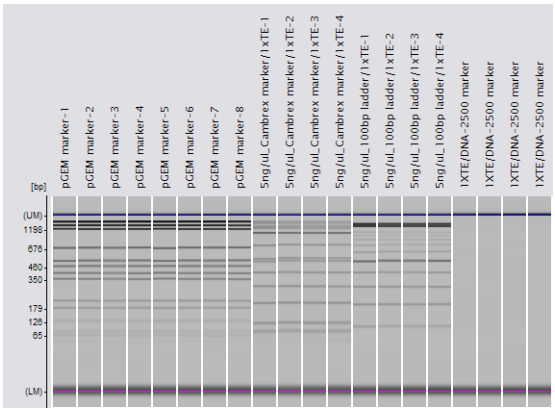
  Image data (except for the red focus outline) is copied.

  The same result can be achieved by selecting [Copy] on the right-click pop-up menu on [Gel Image] or [Electropherogram].

NOTE

If [Gel Image] is selected, each data number, well, sample name, and comment can be copied to the top of the gel image. Select the items to copy by clicking [View] and pointing to [Title] on the menu.

Selecting [Gel Image Only] only copies the gel image and all other information is omitted.



- [Peak table], [RNA report]

  When [Copy] is selected on the [Edit] menu:

  All cells including item names and line numbers are copied.

  When "Copy Selected Cells" is selected on the right-click pop-up menu:

  Only selected cells are copied. Item names and line numbers are not copied.

NOTE

The [Copy] - [Electropherogram] function copies the information currently displayed on screen. Note that if a different window is displayed over the MultiNA Viewer window immediately after selecting the menu (within approx. one second), the content of the different window is copied.

5.3.2 Saving Images to File

On the [Edit] menu, clicking [Save Image As] and selecting [Gel Image], [Gel Image Only] or [Electropherogram] saves the gel image or electropherogram currently displayed as an image file.

The same result can be achieved by selecting [Save Image As] on the right-click pop-up menu on [Gel Image] or [Electropherogram].

If [Gel Image] is selected, items selected by clicking [Title] on the [View] menu (number, well, sample name, and comments) are inserted at the top of the gel image.

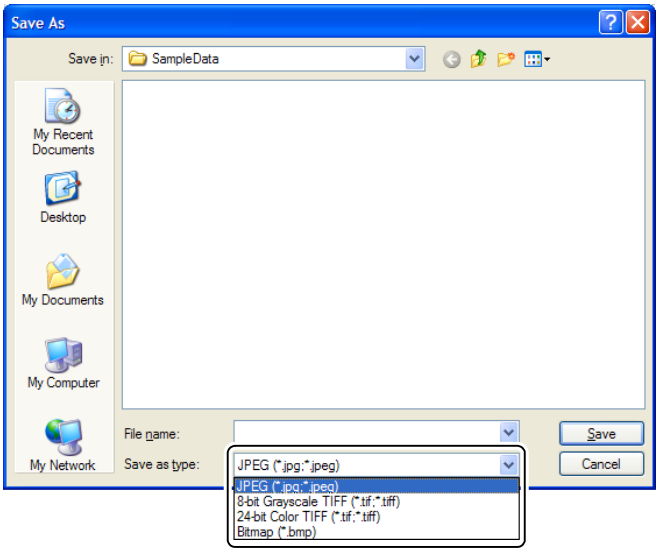
NOTE

The [Save Image As] - [Electropherogram] function saves the image currently displayed on screen. Note that if a different window is displayed over the MultiNA Viewer window immediately after selecting the menu (within approx. one second), the content of the different window is saved.

1 **Select [Save Image As] from the [Edit] menu and then select [Gel Image], [Gel Image Only], or [Electropherogram].**

Alternatively, click [Save Image As] on the right click pop-up menu displayed on [Gel Image] or [Electropherogram].
The [Save As] window is displayed.

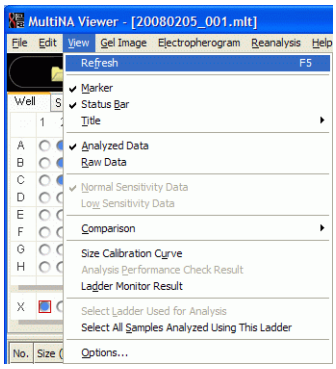
2 **Enter a file name for [File name] and folder location for [Save in] and select a file type from [TIFF], [Bitmap], or [JPEG].**



3 **Click [Save].**

File extensions are automatically added to file names.

5.4 View Menu

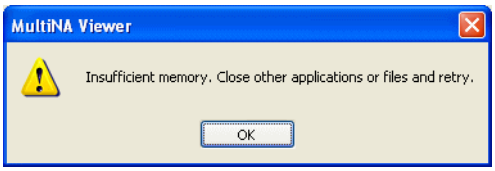


5.4.1 Refresh

Select [Refresh] to reload a data file and update it. Use this function to update data being analyzed.

NOTE

The following message is displayed when a file, being analyzed by the instrument, is opened or updated by a PC with insufficient memory.

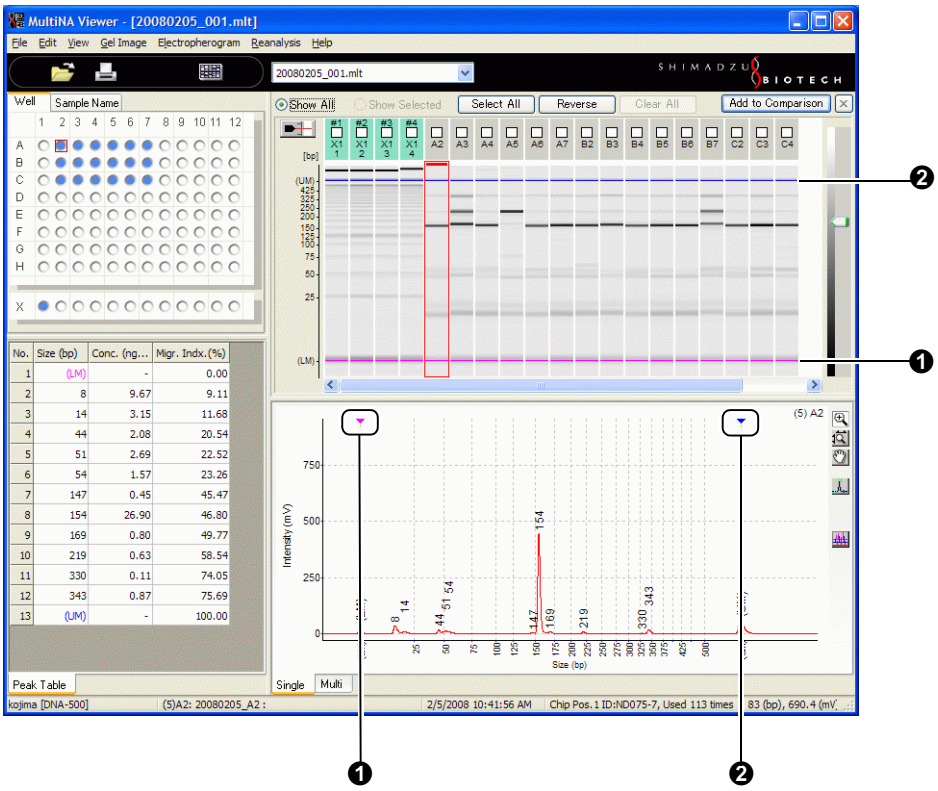


Click [OK] and close other applications or close the other files open in the MultiNA Viewer then repeat the operation.

If this memory error appears frequently, a PC memory upgrade is recommended.

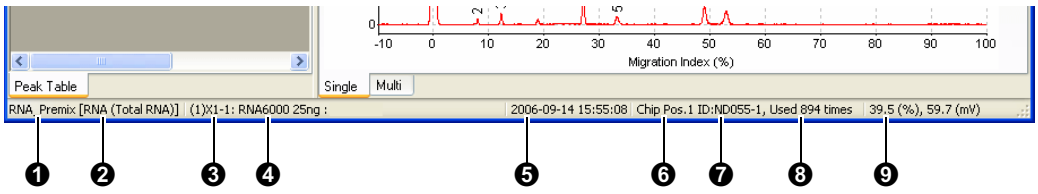
5.4.2 Marker

Select [Marker] to switch between display/hide the marker on [Gel Image] or [Electropherogram (Single)]. When the [Marker] menu is selected with a check mark (default), the lower marker (magenta line and triangle ❶) and the upper marker (blue line and triangle ❷) are displayed as shown in the figure below.



5.4.3 Status Bar

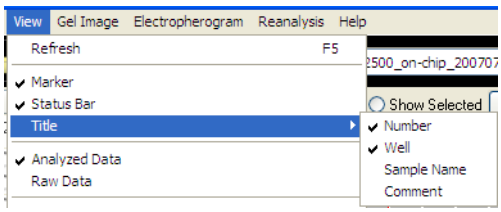
Select [Status Bar] on the [View] menu to display or hide the status bar at the bottom of the window. The information displayed on the status bar pertains to the focused data and is described below.



No.	Explanation
❶	Project name
❷	Separation buffer type (Total RNA or mRNA distinction for RNA analysis)
❸	(Analysis No.) Well name:
❹	Sample name: Comment
❺	Date and time analysis started
❻	Chip position
❼	Chip ID
❽	Chip use count

No.	Explanation
❾	Information from MultiNA Viewer (cursor position); values on vertical and horizontal axes on [Electropherogram (Single)]

5.4.4 Title



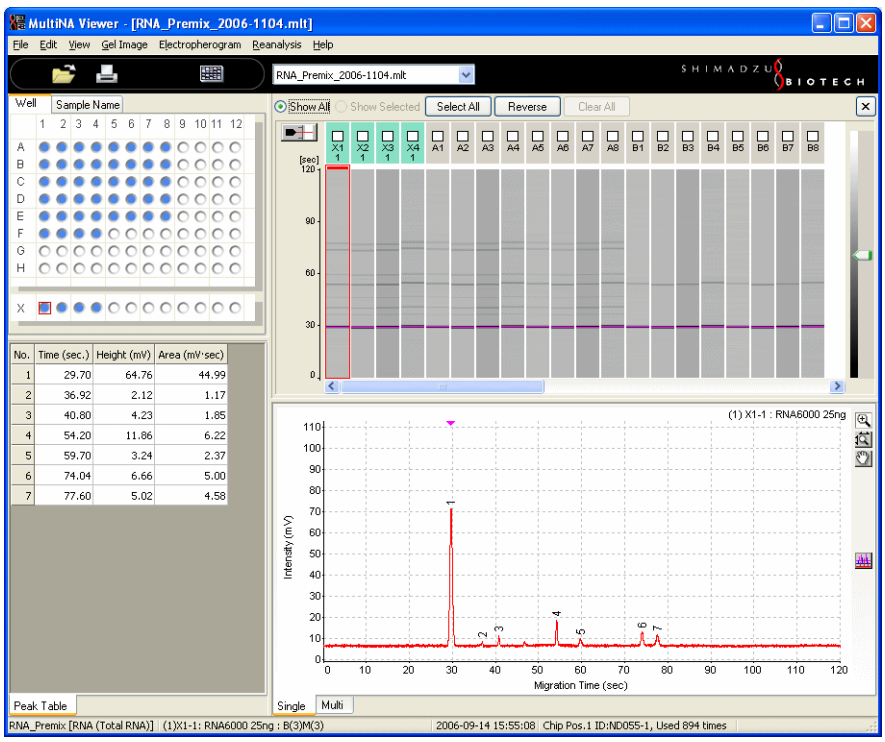
Items selected with checkmarks will be reflected in the following displayed or printed information.

- Title displayed in upper right area on [Electropherogram (Single)]
- Tool tip displayed when the cursor rolls over the top (light green or gray) area of gel images
- Information displayed in lower right area of respective overlaid electropherograms
- Information inserted at top of gel images when they are copied or saved by clicking [Copy] or [Save Image As]
- Title printed in upper right area of electropherograms by clicking [Sample] or [Page Print]
- Information printed in lower right area of each image overlaid when printing overlays of selected data

5.4.5 Analyzed Data/Raw Data

Analyzed data is displayed when a data file is opened. To display raw data, select [Raw Data] on the [View] menu.

To display analyzed data again, select [Analyzed Data] on the [View] menu.



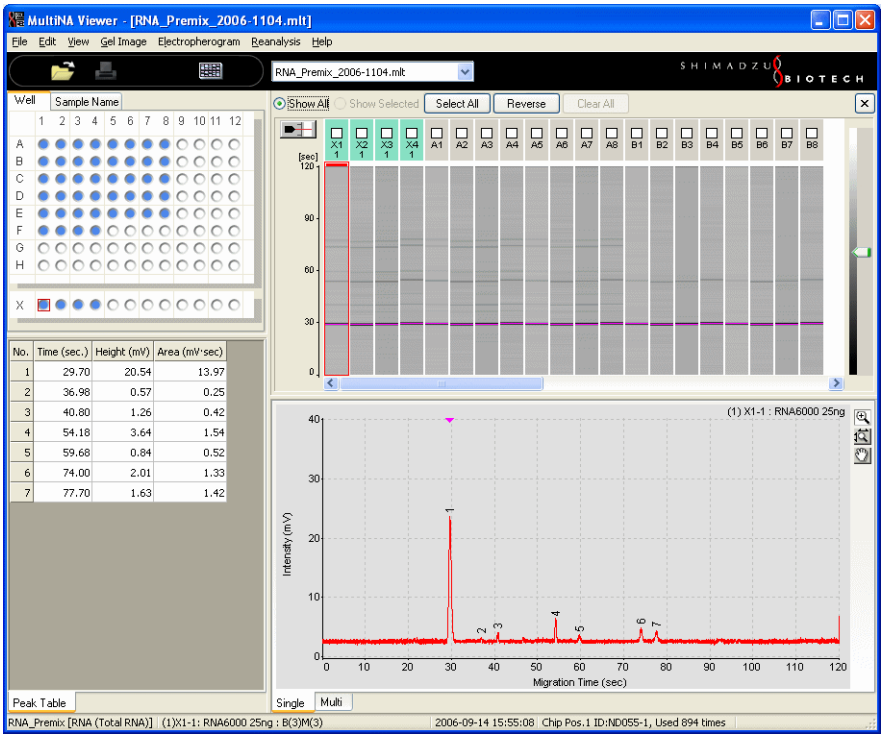
Item	Analyzed Data	Raw Data
Contents	Data processed with respect to raw data and for which the fragment size estimation value and concentration are calculated	Primary data obtained during analysis (change in fluorescent intensity over time)
Peak table	Display items: Configurable in [View] menu - [Options] Area unit: mV•μm	Time (sec), height (mV) and area (mV•sec) (display items cannot be changed.)
Electropherogram horizontal axis	Migration index (%), size (bp)/(nt), migration time (sec)	Migration time (sec)
Electropherogram vertical axis	Signal intensity after baseline subtraction (mV)	Signal intensity before baseline subtraction (mV)
Gel image vertical axis	Distance image, size image, time image	Time
Reanalysis	All items on the [Reanalysis] menu can be executed	[Reanalysis] - [Automatic] can be executed [Change Ladder and Analyze] and [Manual Edit Mode] on the [Reanalysis] menu cannot be executed

NOTE

The migration index is a relative value of the electropherogram time axis based on the marker detection time. In DNA analysis, the lower marker and upper marker detection times are set to 0 % and 100 %, respectively. In RNA analysis, the lower marker and electropherogram end point are set to 0 % and 100 %, respectively. If the lower marker was not detected, the electropherogram start point is set to 0 %. In addition, in DNA analysis, if the upper marker was not detected, the electropherogram end point is 100 %.

5.4.6 Normal Sensitivity Data/Low Sensitivity Data

Select [Low Sensitivity Data] from the [View] menu to display low sensitivity raw data.

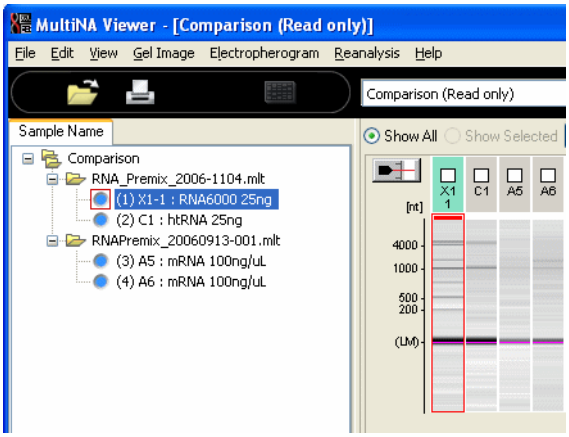


- Signal intensity of low sensitivity data is approximately half compared to normal sensitivity data.
- If signal saturation occurs on normal sensitivity data due to high sample concentration (over 50 ng/μL in DNA concentration), the sample may need to be diluted. Refer to the peak height obtained in low sensitivity data to decide how much the sample should be diluted.
- Reanalysis, print, or export is not available with low sensitivity data.
- To return the display to analyzed data, select [Normal Sensitivity Data] on the [View] menu, and select [Analyzed Data] on the [View] menu.

5.4.7 Comparison

Select [Comparison] to display data in different data files in one window.

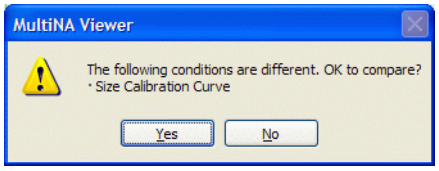
- Well numbers and sample names of the samples that have been added to the [Comparison] view are displayed under the original data file names in the comparison sample name tree. A sequential number (displayed in parentheses) is added to each sample name on the view.
- Data displayed in the [Comparison] view is "read only." The [Save], [Save As], and [Reanalysis] functions are not enabled.



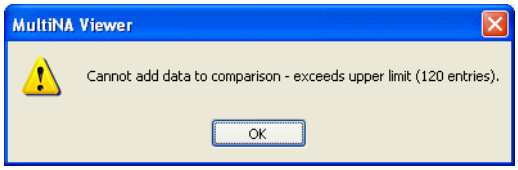
- The ladder used in analysis is not displayed in the [Comparison] view.

NOTE

- A warning message is displayed when attempting to add data that contains a different dye, ladder type, or calibration curve type into the [Comparison] view. Click [Yes] if you wish to compare data with different migration and analysis conditions.

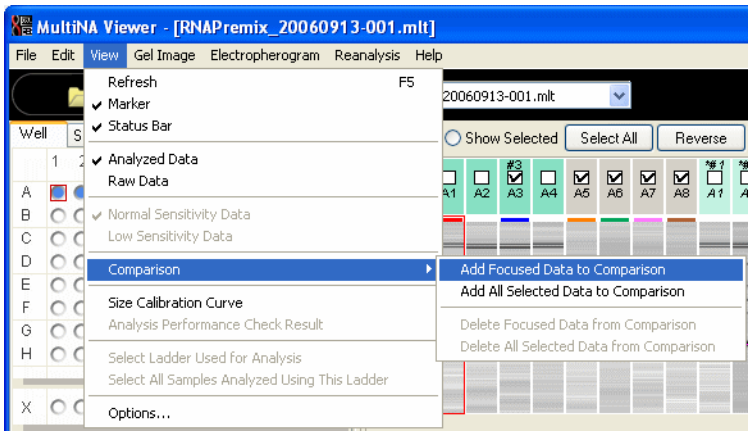


- Up to 120 data entries can be added to the [Comparison] view. The following message is displayed if an attempt is made to add more than 120 data entries to the [Comparison] view.



■ Add Data to Comparison

This section describes the addition of focused or selected data to the [Comparison] view.



Add Focused Data to Comparison

1 **Focus (Click) the data to be added to the [Comparison] view on the gel image.**

2 **On the [View] menu, select [Comparison] and [Add Focused Data to Comparison] or select [Add Focused Data to Comparison] on the right-click pop-up menu on the gel image.**

The data is added to the [Comparison] view.

Add All Selected Data to Comparison

1 **Select the check box of the data to be added to the [Comparison] view on the gel image.**

2 **On the [View] menu, select [Comparison] and [Add All Selected Data to Comparison] or select [Add All Selected Data to Comparison] on the right-click pop-up menu on the gel image.**

The data is added to the [Comparison] view.

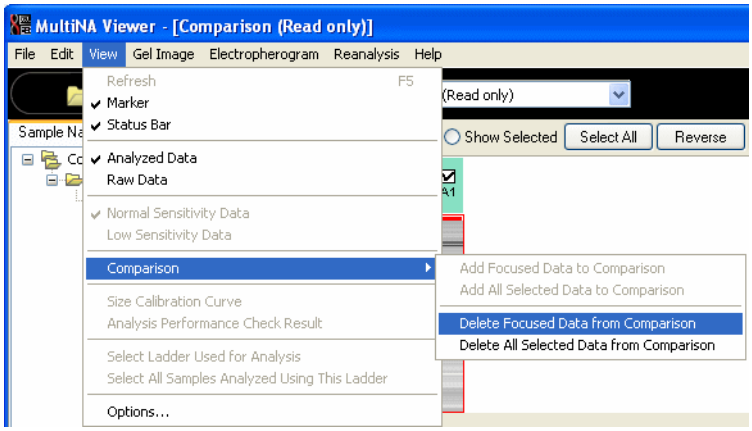
NOTE

When the first data is added to the [Comparison] view, the window automatically changes to [Comparison]. However, the [Comparison] window is not automatically displayed when the next or following data is added.

Add all data to be compared then select [Comparison] in the file name list box on the toolbar.

■ Delete Data From Comparison

This section describes procedures to delete focused or selected data from the [Comparison] view.



Delete Focused Data from Comparison

1 **Focus the data to be deleted on the gel image at the [Comparison] view.**

2 **On the [View] menu, select [Comparison] and [Delete Focused Data from Comparison] or select [Delete Focused Data from Comparison] on the right-click pop-up menu on the gel image.**

The focused data is deleted from the [Comparison] view and the view is updated.

Delete All Selected Data from Comparison

1 **Select the check box of the data to be deleted on the gel image at the [Comparison] view.**

2 **On the [View] menu, select [Comparison] and [Delete All Selected Data from Comparison] or select [Delete All Selected Data from Comparison] on the right-click pop-up menu on the gel image.**

The selected data is deleted from the [Comparison] view and the view is updated.

■ Print

Data displayed on the [Comparison] view can be printed by selecting [Print] on the [File] menu. (*P.148*)
Some differences from printing ordinary data files are described below.

- The [1 Sample/Page] layout is not available.
- <Data file numbers> and the original data file names are printed in the [Data File Information] section.
- (Sequential data numbers), wells in the original data file, and <data file numbers> are printed in the [Sample Sheet] section. Sample names, comments, types, and positions of the chip used are also printed to the right.

Comparison

Data File Information

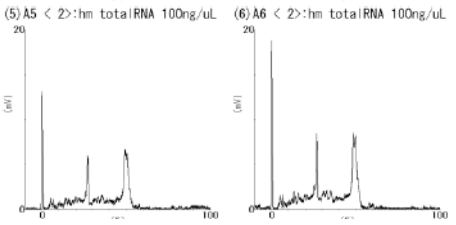
<1> RNA_Premix_2006-0913-001.mlt
<2> RNA_Premix_2006-1104.mlt

Sample Sheet

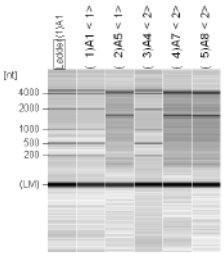
	Well		: Sample Name	Comment	Type	Chip
(1)	A3	<1>	: RNA6000 50ng/uL	B(2) M(2)	Ladder	3
(2)	C1	<2>	: htRNA 25ng	B(3)M(3)	Sample	1
(3)	C2	<2>	: htRNA 25ng	B(3)M(3)	Sample	2
(4)	C3	<2>	: htRNA 25ng	B(3)M(3)	Sample	3
(5)	C4	<2>	: htRNA 25ng	B(3)M(3)	Sample	4

- The (sequential data number), well, and <data file number> are printed in the [Electropherogram] and [Gel Image] sections. The left end ladder on the gel image is the first ladder displayed on the [Comparison] view. The ladder is automatically added to the gel image.

Electropherogram - Analyzed Data (Migration Index)



Gel Image - Analyzed Data (Distance Image)



- The (sequential data number), well, <data file number>, and sample name of each sample are printed in the left cell of the [Results Table].

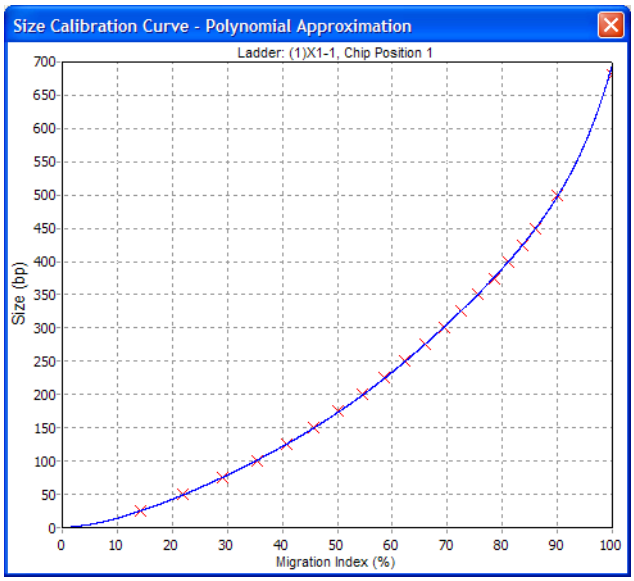
Results Table

	No.	Attrib.	Conc. (ng/μL)
(1)A3 <1>:RNA6000 50ng/uL	1	(LM)	-
	2	200 nt	-
	3	500 nt	-
	4	1000 nt	-
	5	2000 nt	-
	6	4000 nt	-
	7	6000 nt	-

5.4.8 Size Calibration Curve

Select [Size Calibration Curve] to display a graph of the size calibration curve used in analysis of focused data (sample and ladder).

- Size calibration curve is created for each chip position based on the ladder that was analyzed on that chip. For the ladder used for analysis, see *"3.8.2 Data Examination and Reanalysis" P.64*.
- When raw data is displayed, size calibration curve is not displayed.
- The type of size calibration curve is displayed on the title bar of the window. For details on the types of size calibration curves, see step *2 (P.183)* in *"■ Specifying the Detection Criteria and Performing Automatic Analysis"*.



5.4.9 Analysis Performance Check Result

Select [Analysis Performance Check Result] to display the result of analysis performance check.

- Normally, when an analysis performance check data file is loaded, the result is automatically displayed as well. Select this menu to display the result window again after closing it.
- The result (LOG file) is saved in a [reagent kit name] folder in the project folder as plain text and can be opened on "Notepad" or an editor program. (The data is easier to view when it is displayed in single spaced font.)

☞ Reference

"4.5.6 Check Analysis Performance" P.114

5.4.10 Ladder Monitor Result

Select [Ladder Monitor Result] to display the ladder monitor results that indicate the migration state of the standard ladder.

☞ Reference

"5.2.12 Ladder Monitor" P.159

5.4.11 Select Ladder Used for Analysis

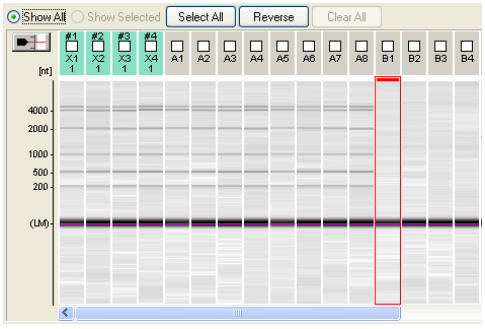
Select the [Select Ladder Used for Analysis] menu item from the [View] menu to display the ladder data used to analyze the focused data.

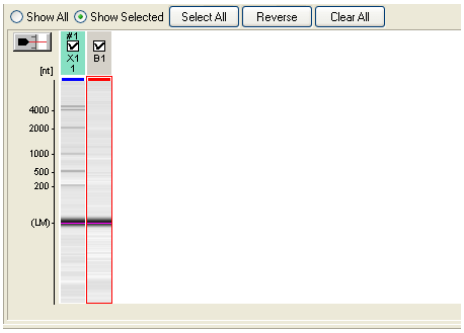
1 **Focus (click) the sample data on the gel image.**

The upper area of the gel image is gray for sample data.

2 **Select [Select Ladder Used for Analysis] on the [View] menu or select [Select Ladder Used for Analysis] on the [Gel Image] right-click pop-up menu.**

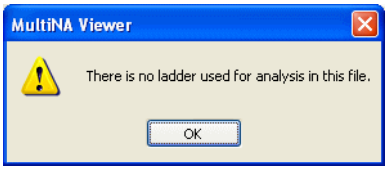
The gel image changes to the [Show Selected] state and the check boxes are selected for the focus data and ladder data used in focus data analysis.
To return to the original display, select [Show All].





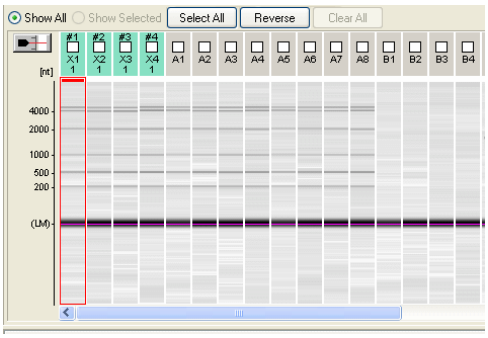
NOTE

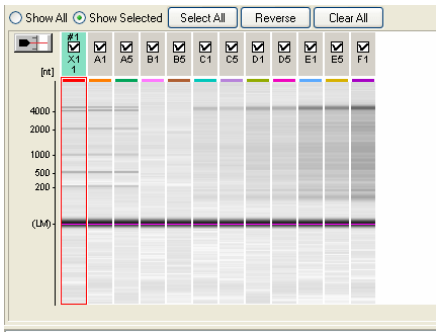
The following message is displayed if there is no ladder data associated with the focused sample data.



5.4.12 Select All Samples Analyzed Using This Ladder

Select [Select All Samples Analyzed Using This Ladder] from the [View] menu to display all of the sample data that was analyzed using the focused ladder.





1 **Focus (click) the ladder data on the gel image.**

For ladders used for analysis, numbers #1 to #4 (numbers indicate chip positions) are displayed above the check box.

2 **Select [Select All Samples Analyzed Using This Ladder] on the [View] menu or select [Select All Samples Analyzed Using This Ladder] on the [Gel Image] right-click pop-up menu.**

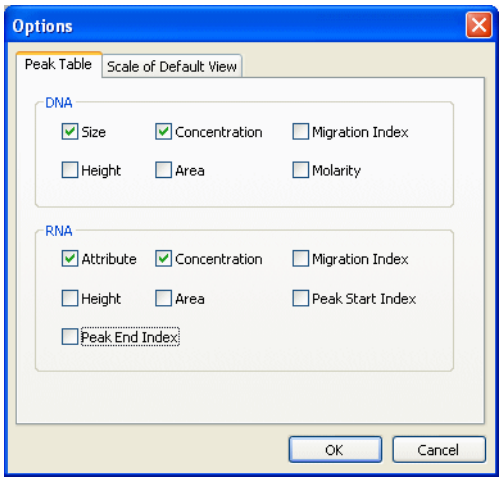
The gel image changes to the [Show Selected] state. In addition, check boxes are selected for the focused ladder data and all sample data that was analyzed using the focused ladder data.
To return to the original display, select [Show All].

5.4.13 Options

Select [Options] from the [View] menu to change the following items.

[Peak Table] Tab

Select the items to be displayed on the peak table.

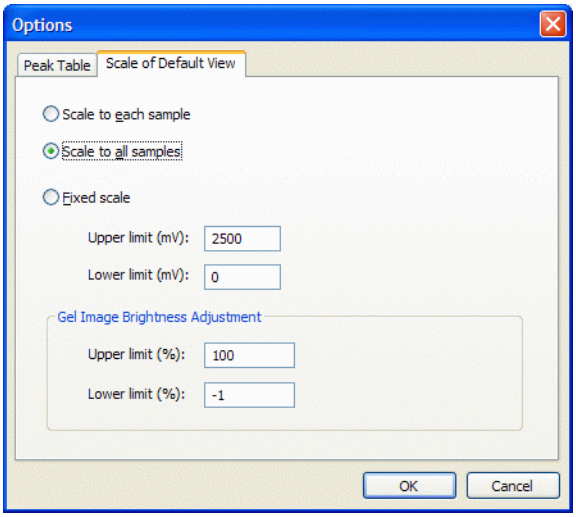


Item		Explanation
DNA (Display items for DNA data)	Size (bp)	Specified size for ladder data. Size calculated using the size calibration curve for sample data
	Concentration (ng/μL)	Concentration calculated using the fragment and marker peak areas.
	Migration Index (%)	Migration index based on marker detection time (Lower marker: 0%, Upper marker: 100%).
	Height (mV)	Peak height measured from baseline
	Area (mV•μm)	Peak area calculated by converting the migration time into the migration distance
	Molarity (nmol/L)	Molar concentration calculated from the concentration assuming that the average molecular weight is 333 per mer
RNA (Display items for RNA data)	Attribute	Specified size for lower marker (LM), rRNA (18S, 28S), and ladder data Size for samples (reference value)
	Concentration (ng/μL)	Concentration calculated using the fragment and marker peak area
	Migration Index (%)	Migration index based on marker detection time (Lower marker: 0%, End point of data: 100%)
	Height (mV)	Peak height measured from baseline
	Area (mV•μm)	Peak area calculated by converting the migration time into the migration distance
	Peak start index (%)	Migration index at the peak start point
	Peak end index (%)	Migration index at the peak end point

NOTE

For [Raw data], only time (sec), height (mV), and area (mV•sec) are displayed and these settings cannot be changed.

[Scale of Default View] Tab



Item	Explanation
Scale to each sample	The maximum concentration displayed on the gel image and the maximum vertical axis value on the electropherogram are displayed according to the maximum value of each data entry.
Scale to all samples	The maximum concentration displayed on the gel image and the maximum vertical axis value on the electropherogram are displayed according to the maximum value of all data (except for import ladder) included in the data file.
Fixed scale	The maximum and minimum values both for contrast displayed on the gel image and the vertical axis on the electropherogram are displayed according to the entered values.

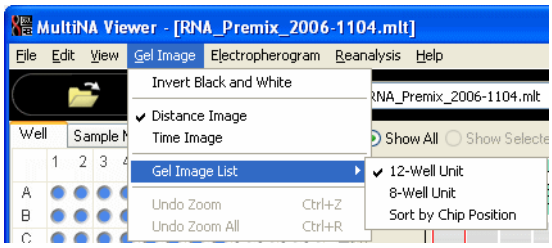
Gel Image Brightness Adjustment

An upper and lower limit to the brightness of gel images can be set. These limits can be set when an option other than [Fixed scale] is selected as the default display scale.

NOTE

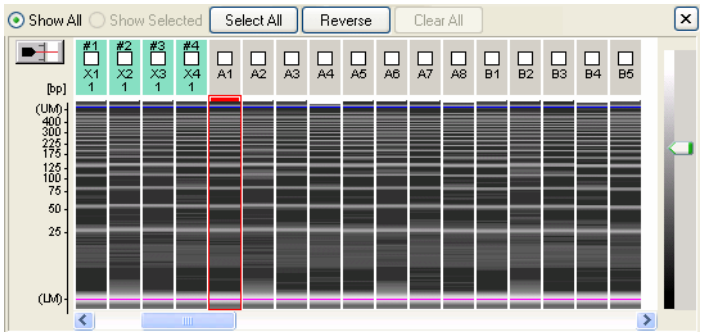
- Scale changes are not immediately reflected when the [Electropherogram] is zoomed in. [Scale of Default View] changes are applied when the default display is recovered by selecting [Undo Zoom All].
- The graph may be displayed over the display range even after [Undo Zoom All] has been selected if [Fixed scale] has been selected.

5.5 Gel Image Menu



5.5.1 Invert Black and White

Select [Invert Black and White] from the [Gel Image] menu to change the background of the gel image display from white to black and back again.



- Select [Invert Black and White] on the [Gel Image] menu to invert black and white on the gel image.
- Brightness can be adjusted by dragging the slider at the right end up or down.
- To revert the black and white display, select [Invert Black and White] again.

5.5.2 Vertical Axis

Select the display on the vertical axis of the analyzed data from among [Distance Image], [Size Image], or [Time Image].

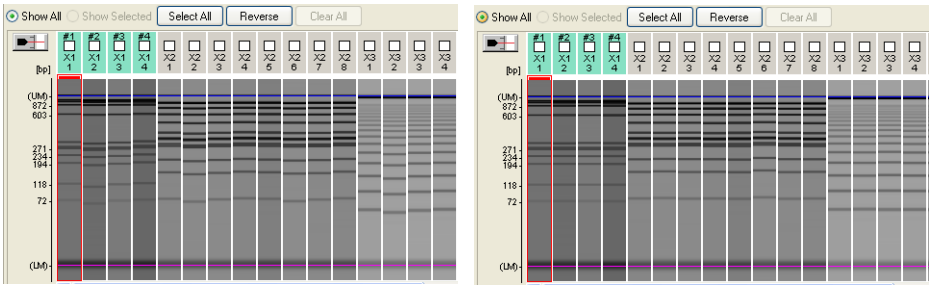
- [Distance Image]: The value calculated by converting the migration time into the migration distance is displayed on the vertical axis. This gel image is similar to one obtained by agarose gel electrophoresis.
- [Size Image]: Corrects the distance image based on the size of the reference ladder (ladder used in the first analysis). Peaks with the same size are displayed at the same position band.
- [Time Image]: The vertical axis is displayed as migration index for analyzed data and migration time for raw data.

NOTE

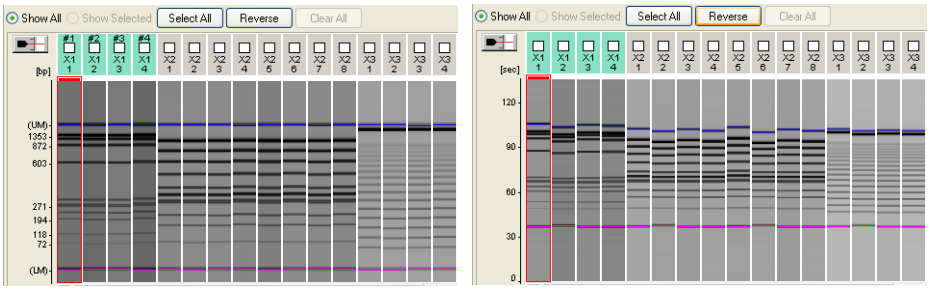
The vertical axis displays the image for [Distance Image] because size estimation of detected peaks for the following data cannot be performed even if [Size Image] is selected.

- Sample data without usable ladder for analysis
- Data that failed to be analyzed

- For raw data, [Time Image] is always displayed and this menu is not selectable (see *"5.4.5 Analyzed Data/ Raw Data" P.167*).



Distance Image (Left) and Size Image (Right)



Analyzed Data (Left) and Raw Data (Right) of Time Image

5.5.3 Gel Image List

From the [Gel Image] menu, select [Gel Image List], and select [12-well Unit], [8-well Unit], or [Sort by Chip Position]. The selected [Gel Image List] layout is displayed.

- Alternatively, click (View Gel Image List) on the toolbar to display the gel image list. When the [Gel Image List] is open from the toolbar icon, it is displayed the last selected layout ([12-well Unit], [8-well Unit], and [Sort by Chip Position]).
- The other gel image display (black and white inversion, selection between distance image and time image) are applied as they were last set.
- Double-clicking on the gel image list closes the list window and focuses on the corresponding data.
- Click (Close) in the upper right corner to close the [Gel Image List] window.
- To copy an image data to the clipboard, select [Copy] on the [Gel Image List] right-click pop-up menu.
- To print an image data, select [Print] on the [Gel Image List] right-click pop-up menu. (The paper margins previously specified in the [Page Setup] window are applied.)

NOTE

[Copy] and [Print] are functions for the currently displayed window. If a different window is displayed over that window immediately (approx. one second) after selecting [Copy] or [Print], the content of the new window is copied or printed.

12-well Unit

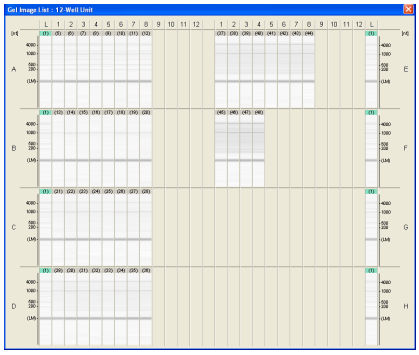
- Gel image list is displayed by a horizontal line on the sample stand (12 wells). The list is displayed in two separated portions; the left side (A to D) and the right side (E to H).
- "L" displays the ladder used for the first analysis in the data file.
- The number above each data represents (sample number) (see *"5.1.5 Sample Name Tree" P.129*).

8-well Unit

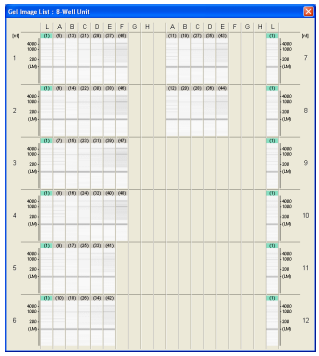
- Gel image list is displayed by a vertical column on the sample stand (8 wells). The list is displayed in two separate portions; the left side (1 to 6) and the right side (7 to 12).
- "L" displays the ladder used for the first analysis in the data file.
- The number above each data represents (sample number) (see *"5.1.5 Sample Name Tree" P.129*).

Sort by Chip Position

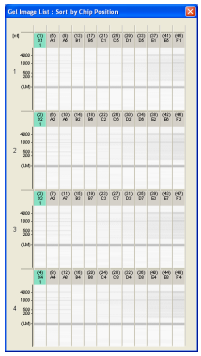
- Gel image list is displayed in sideways (1 to 4) for each chip position.
- The numbers above each data display (sample number) (see *"5.1.5 Sample Name Tree" P.129*) and well name.



12-well Unit



8-well Unit



Sort By Chip Position

5.5.4 Undo Zoom

Select [Undo Zoom] to cancel the previous zooming operation on the gel image. The same operation is available using the [Gel Image] right-click pop-up menu.

NOTE

When the display range in the gel image is changed, the display range of the horizontal axis of the electropherogram (single) is rescaled to match.

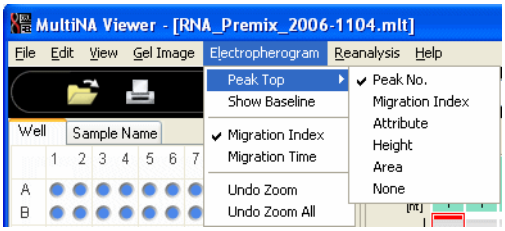
5.5.5 Undo Zoom All

Select [Undo Zoom All] to cancel all previous zooming operations on the gel image. The same operation is available on the [Gel Image] right-click pop-up menu.

NOTE

When the display range in the gel image is changed, the display range of the horizontal axis of the electropherogram (single) is rescaled to match. To return to the original display in the electropherogram (single), select [Undo Zoom]/[Undo Zoom All] on the [Electropherogram] menu or the [Electropherogram (Single)] right-click pop-up menu.

5.6 Electropherogram Menu



5.6.1 Peak Top

Select [Peak Top] to choose the information that is displayed at the top of the electropherogram (single) peak.

Item	Explanation
Peak No.	Peak number on the peak table
Migration Index / Migration Time	Value on the horizontal axis of the electropherogram
Size (DNA analysis only)	Predicted size, LM (lower marker), UM (upper marker) When size estimation is not completed, (---) is displayed.
Attribute (RNA analysis only)	Peak attribute of LM (lower marker), 18S rRNA, or 28S rRNA Reference values for size
Height	Peak top height
Area	Peak area
None	None

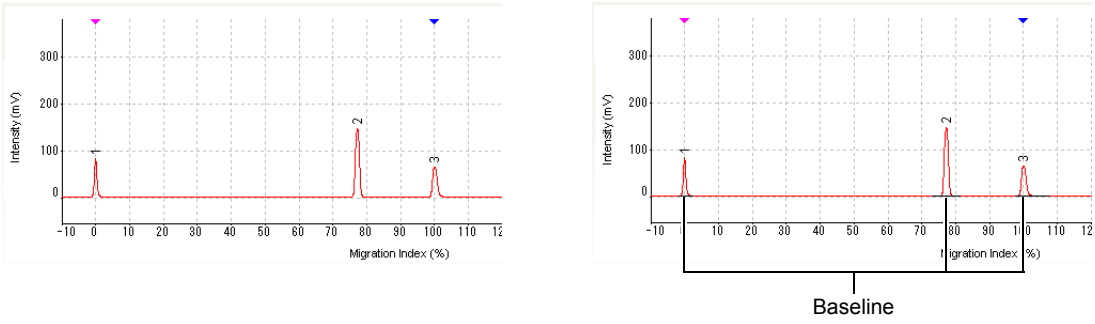
5.6.2 Font Size

Select [Large], [Medium], or [Small] as the font size for peak-top text and the title (displayed on the upper right) on the electropherogram (single).

5.6.3 Show Baseline

Selecting [Show Baseline] in the [Electropherogram] menu and adding a check mark displays the baseline for the electropherogram (single) and auxiliary lines when vertically partitioned (right figure).

Select the menu again and eliminate the check mark and hide baseline and auxiliary line (left graph).



5.6.4 Horizontal Axis

Select the display on the horizontal axis of the analyzed data from among [Migration Index], [Size], or [Migration Time].

- [Migration Index]: Displays a relative index value resulting from normalization of marker detection time.
  - DNA Analysis: Detection time for the lower marker and upper marker are set to 0% and 100%, respectively.
  - RNA Analysis: Detection time for the lower marker and end point for the electropherogram are set to 0% and 100%, respectively.
- [Size]: Corrects and displays the migration index based on the size value of the reference ladder (ladder used in the first analysis).
- When [Manual Edit Mode] is selected on the [Reanalysis] menu, the horizontal axis is automatically set to [Migration Time].
- When displaying raw data, the horizontal axis only shows the migration time and the [Horizontal Axis] menu cannot be selected. (For details, see *"5.4.5 Analyzed Data/Raw Data" P.167*)

NOTE

The horizontal axis displays the migration index because size estimation of detected peaks for the following data cannot be performed even if [Size] is selected.

- Sample data without usable ladder for analysis
- Data that failed to be analyzed

5.6.5 Overlaying Images

When displaying overlaid data, select either [Ascending Order] or [Descending Order].

Reference

"5.1.9 Electropherogram (Single)" P.135

5.6.6 Undo Zoom

Select [Undo Zoom] to cancel the previous zoom or pan operation on the electropherogram.

The same operation is available on the electropherogram right-click pop-up menu.

NOTE

Display range on the gel image does not change in conjunction with the electropherogram display range.

5.6.7 Undo Zoom All

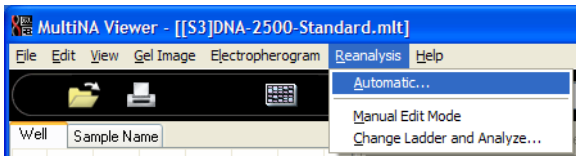
Select [Undo Zoom All] to cancel all of the previous zoom or pan operations on the electropherogram.

The same operation is available on the electropherogram right-click pop-up menu.)

NOTE

Display range on the gel image does not change in conjunction with the electropherogram display range.

5.7 Reanalysis Menu



NOTE

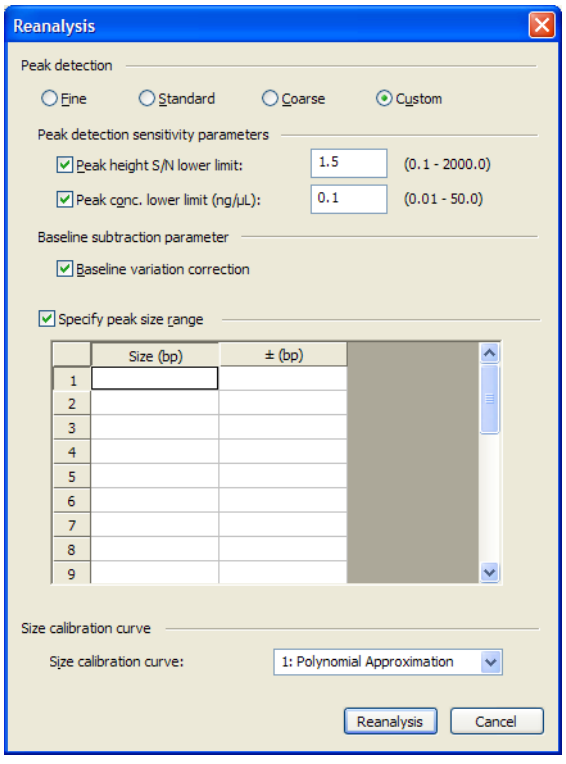
Reanalysis cannot be performed when "read-only mode" is enabled in the following situations.

- When the instrument is loading data during analysis
- [Comparison] View (see *"5.4.7 Comparison" P.169*) is displayed on MultiNA Viewer.

Import ladders (see *"5.7.3 Change Ladder and Analyze" P.189*) cannot be manually edited.

5.7.1 Automatic

This function automatically analyzes all the data contained in a file. Select [Automatic] from the [Reanalysis] menu. The [Reanalysis] window is displayed.



NOTE

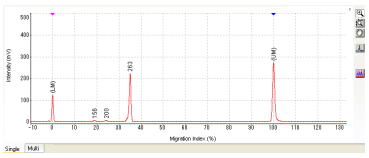
The custom settings function cannot be used for RNA data.

■ Specifying the Detection Criteria and Performing Automatic Analysis

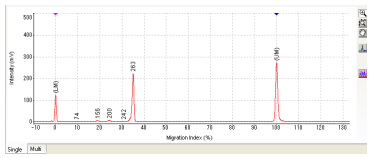
1 **Select [Fine], [Standard], or [Coarse] from the [Peak detection] selection buttons.**

The differences in detection peaks are shown in the figure below.

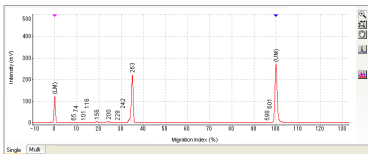
- [Standard]: Normal detection criteria
- [Fine]: Select when the required peaks cannot be detected as this setting detects smaller peaks than [Standard]
- [Coarse]: Select when too many peaks are detected as this setting detects larger peaks than [Standard]



[Coarse]



[Standard]

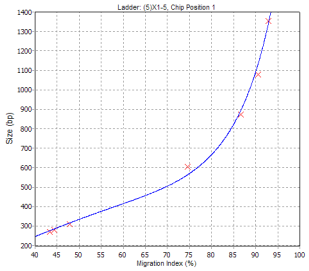


[Fine]

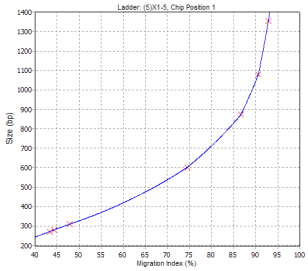
2 **Select the calibration curve type from [Size calibration curve].**

The types of calibration curves are shown below.

- Polynomial Approximation: Creates a polynomial that calculates size from all calibration points.
- Point To Point: Creates a calibration curve by connecting the individual calibration points on a straight line with size represented on a logarithmic axis.



[Polynomial Approximation]



[Point To Point]

NOTE

The size value may vary depending on the type of calibration curve used.

3 **Click [Reanalysis].**

Reanalysis is executed.

■ Analysis using Custom Settings

1 **Select [Custom] from the [Peak detection] selection buttons.**

2 **Enter the threshold values for peak detection in the fields under [Peak detection sensitivity parameters].**

- [Peak height S/N lower limit]: Lower values allow detection of peaks with smaller signal intensities (default: 1.5)
- [Peak conc. lower limit]: Lower values allow detection of peaks with smaller areas (default: 0.1)

NOTE

Deselecting the check boxes of the sensitivity parameters disregards the threshold values and causes all recognizable peaks to be detected.

3 **Select [Baseline variation correction] as necessary (default: selected).**

4 **Selecting [Specify peak size range] enables the specification of the size range for detecting peaks.**

NOTE

- A maximum of 25 detection ranges can be specified.
- Detection is performed in the [± (bp)] range on each side of the [Size (bp)] value.
- All peaks are detected when a single range contains several peaks.

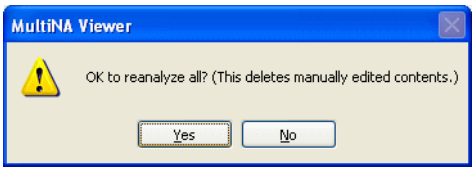
5 **Select the calibration curve type from [Size calibration curve].**

6 **Click [Reanalysis].**

Reanalysis is executed.

NOTE

- If peak detection threshold values and ranges are specified as custom settings, a warning message is displayed if the set values are invalid.
- Selecting [Automatic] from the [Reanalysis] menu after editing peaks as described in *"5.7.2 Manual Edit Mode" P.185* displays the following message. Clicking [Yes] deletes all the results of editing.



5.7.2 Manual Edit Mode

The following revisions can be made for analysis data in the manual edit mode.

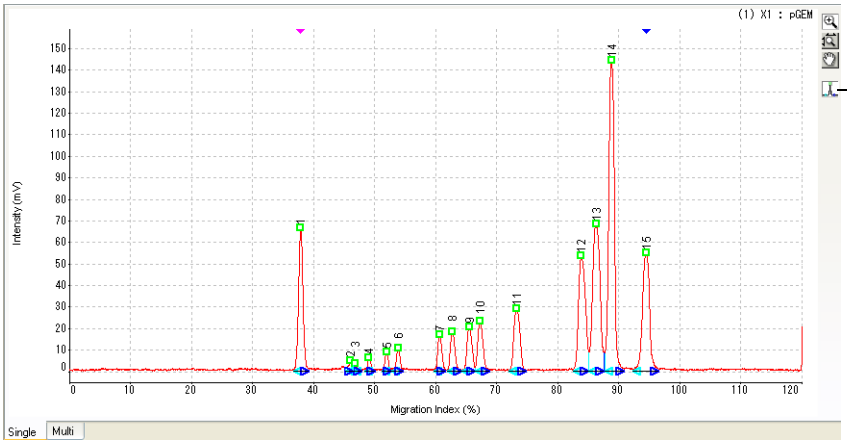
- Add or delete peaks
- Set or change markers
- Change peak detection points

NOTE

Manually editing peaks may change the area and peak detection points of automatically detected peaks.

To return the peaks to their original state, select [Automatic] on the [Reanalysis] menu to perform reanalysis.

1 **Select [Manual Edit Mode] on the [Reanalysis] menu or click (Manual Edit Mode) on the upper right side of the electropherogram (single).**

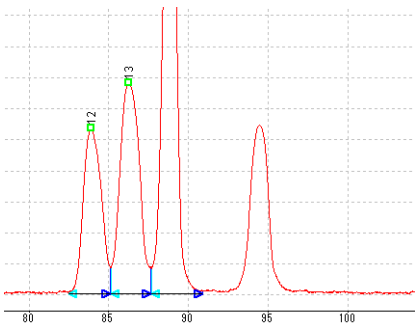


The peak detection points are displayed.

◁	Peak start (light blue triangle)
□	Peak top (yellow green rectangle)
▷	Peak end (blue triangle)

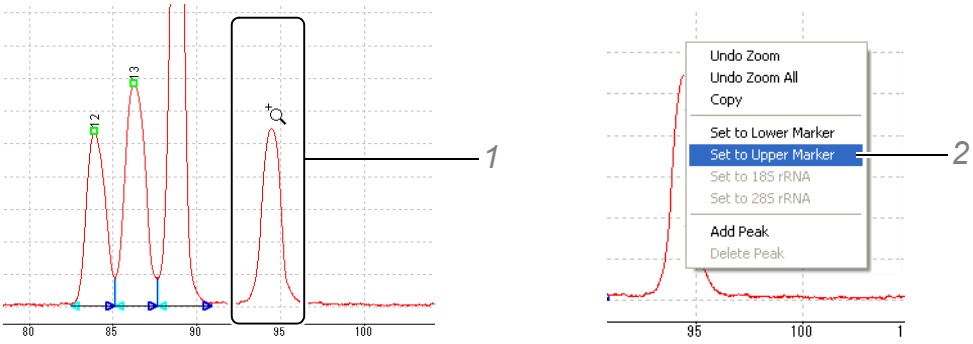
2 **Edit peaks manually.**

Enlarge a target peak by zooming or panning on the electropherogram.



[Set to Lower Marker] / [Set to Upper Marker]

Select [Set to Lower Marker] or [Set to Upper Marker] to set the target peak to the lower maker or upper marker.

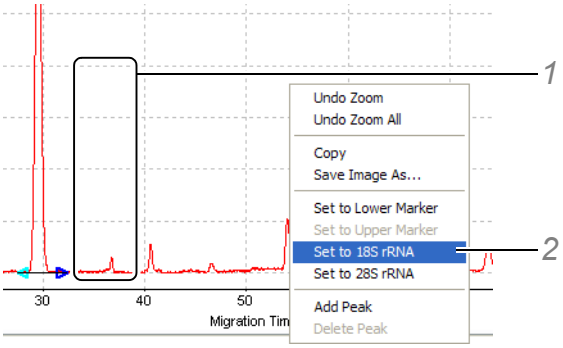


1 Move the mouse pointer near the position of the marker to set on the electropherogram.
(Also possible for locations that are not detected as peaks.)

2 Select [Set to Lower Marker] or [Set to Upper Marker] on the right-click pop-up menu.
The marker is set to the new peak and the peak table is automatically updated.

[Set to 18S rRNA] / [Set to 28S rRNA]

Select [Set to 18S rRNA] or [Set to 28S rRNA] to change the 18S rRNA or 28S rRNA peaks in total RNA analyzed data.

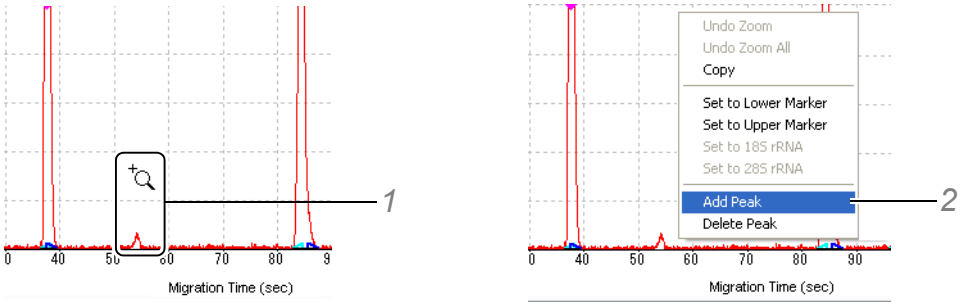


1 Move the mouse pointer near the position of the rRNA peak to set on the electropherogram.
(Also possible for locations that are not detected as peaks.)

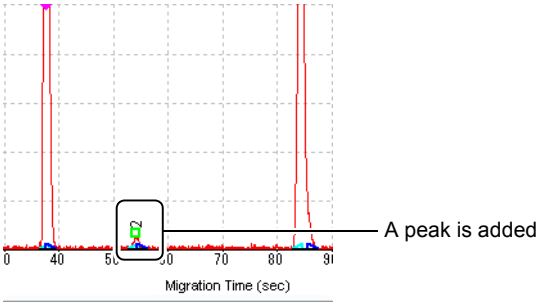
2 Select [Set to 18S rRNA] or [Set to 28S rRNA] on the right-click pop-up menu.
18S rRNA or 28S rRNA is set to the new peak position and recalculation is automatically performed. As a result, the peak table and RNA report are updated as well.

[Add Peak]

Select [Add Peak] to add a peak that has not been detected.

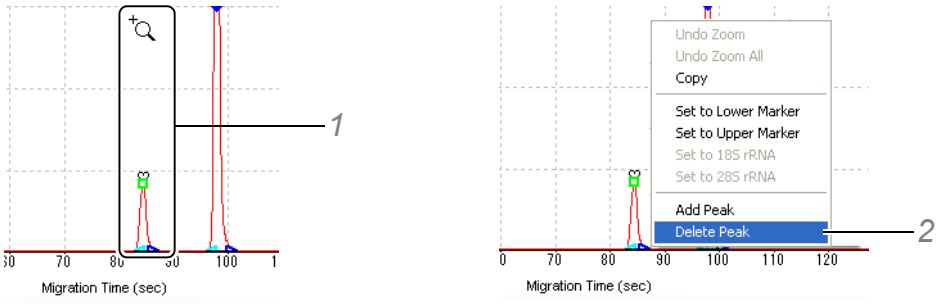


1 Place the cursor near the peak to be added on the electropherogram.
2 Select [Add Peak] on the right-click pop-up menu.
The peak is added and the peak table is automatically updated.

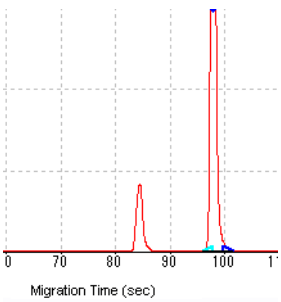


[Delete Peak]

Select [Delete Peak] to delete an unnecessary peak.

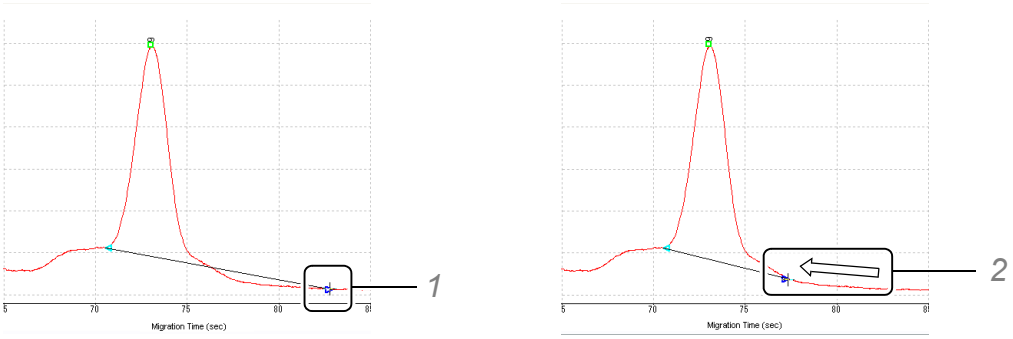


1 Place the cursor near the peak to be deleted on the electropherogram.
2 Select [Delete Peak] on the right click pop-up menu.
The peak is deleted and the peak table is automatically updated.



Changing the Peak Detection Position

The position of the peak start, top, and end can be changed.



1 Place the cursor at the peak mark (peak start, top, or end). The cursor becomes a "+."

2 Drag the cursor to a desired peak position.

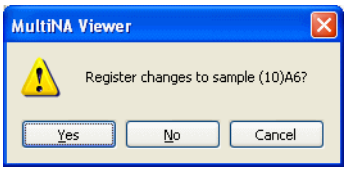
Release the mouse button. The peak detection point is changed and recalculation is automatically performed and the peak table is updated.

NOTE

In vertical partitioning, the end mark of a peak goes over the start mark of the next peak. The start mark and end mark can be separated or overlapped again by dragging the peak detection point mark.

3 Select [Manual Edit Mode] on the [Reanalysis] menu again.

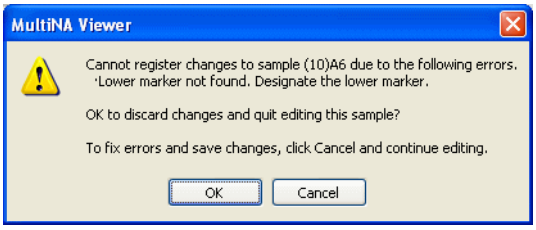
(Alternatively, click [Manual Edit Mode] on the right side of the electropherogram (single).)
The following message is displayed. Click [Yes] to end manual edit mode and register the changes.



- Click [Yes] to register the changes.
- Click [No] to cancel the changes.
- Click [Cancel] to return to the [Manual Edit Mode].

NOTE

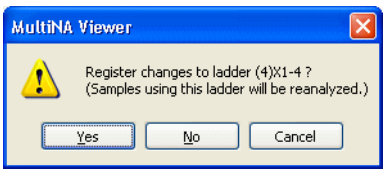
- Even after clicking [Yes] and registering the changes, they are not saved in the data file yet. Perform the procedure described in step ***4*** below to save the changes.
- The message shown above is displayed again as other data in the same data file is focused upon and edited in the [Manual Edit Mode].
- If an error is encountered in the edited content, a warning message is displayed and the changes cannot be confirmed.



- Click [Cancel] to resolve the error.
  Continue editing according to the displayed error message and resolution method.
- Click [OK] to discard the changes.

NOTE

The message shown below is displayed after editing ladder data.



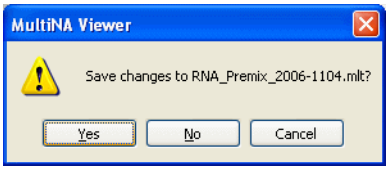
- Click [Yes] to reanalyze all of the samples analyzed using this ladder.
- Click [No] to discard the changes and make no changes to the sample data.
- Click [Cancel] to return to the [Manual Edit Mode].

4 **Select [Save] or [Save As] from the [File] menu.**

Save the changes in the data file to the initial data file or to one with another name.

NOTE

The message below is displayed when an attempt is made to close a data file without saving the changes.



- Click [Yes] to save the changes in the initial data file.
- Click [No] to cancel the changes.
- Click [Cancel] to stop the closing process.

5.7.3 Change Ladder and Analyze

Select [Change Ladder and Analyze] to reanalyze sample data using a different ladder.

When a ladder is inappropriate or does not exist in the data file, ladder data from a different file can be loaded and the samples reanalyzed.

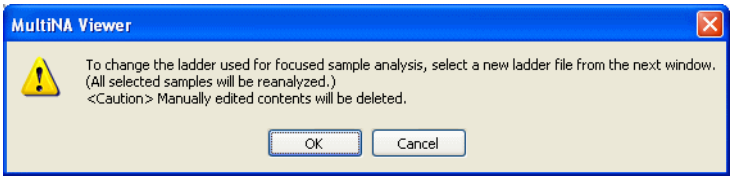
- The new ladder data is called an "imported ladder."
- To display a ladder and samples analyzed using the ladder, see *"5.4.11 Select Ladder Used for Analysis" P.174* or *"5.4.12 Select All Samples Analyzed Using This Ladder" P.174*.

NOTE

- The accuracy of the results may not meet the specification when analysis is performed with an imported ladder.
- Loadable ladder data is restricted to data that uses the same separation buffer and dye and obtained using the microchip of the same ID.

NOTE

- When [Change Ladder and Analyze] is selected for saved or registered data that has been changed through manual editing, the manual editing changes are deleted. The message below is displayed when [Change Ladder and Analyze] is selected for manually edited data.

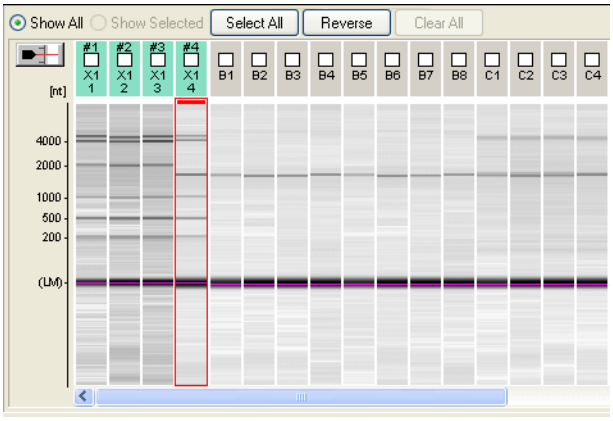


- Click [OK] to delete the changes.
- Click [Cancel] to stop the ladder change process.

■ Changing the Ladder Used in Analysis

When the ladder is inappropriate in automatically analyzed data (ex., the ladder's electropherogram does not show fragment peak), change the ladder as described below and perform reanalysis.

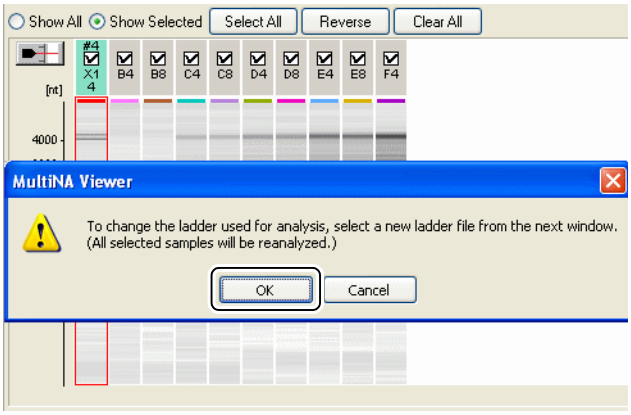
1 **Focus (click) the target ladder on the gel image.**



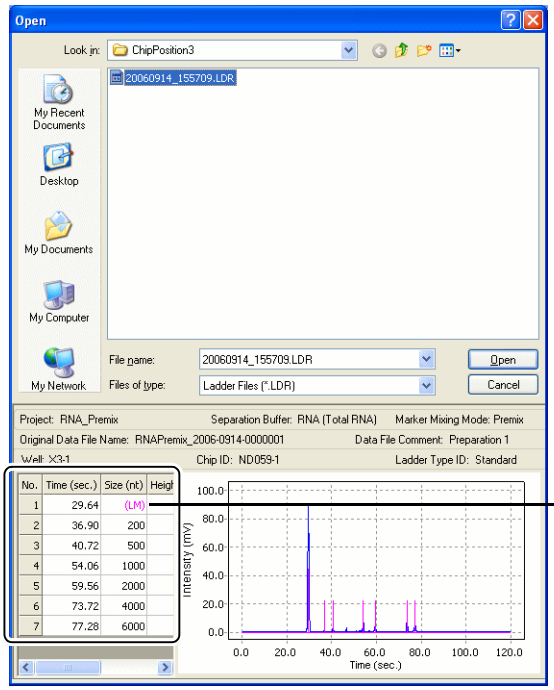
2 **Select [Change Ladder and Analyze] on the [Reanalysis] menu.**

The message below is displayed. The ladder and samples analyzed using the ladder are selected with a check mark.

3 **Review the selected gel image and click [OK].**



The folder that contains ladder data that was obtained with the same conditions (the five matching conditions of "Chip ID," "Separation buffer," "Ladder type ID", "Marker mixing mode," and "Chip position") is opened.



NOTE

When a user ladder is selected as the data file, the size value in the peak table is displayed in red if the registered peak size is outside the specifications for separation.

NOTE

The following folders are created for each condition acquired for the ladder.

[Data folder]

-[Ladder]

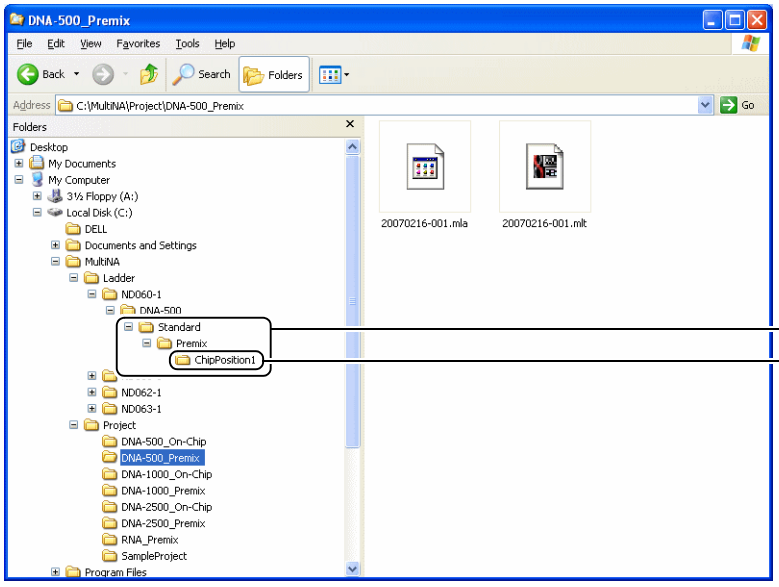
-[Chip ID] (ex., ND058-2)

-[Separation buffer] (DNA-500/DNA-1000/DNA-2500/DNA-12000/RNA)

-[Ladder type ID] (regularly, "Standard")

-[Marker mixing mode] (Premix/On-chip)

-[Chip position] (ChipPosition1/ChipPosition2/ChipPosition3/ChipPosition4)



Ladder data names reflect the time the ladder data analysis was started. This includes year, date, hour, minute and second and end with ".ldr". For example, ladder data that started analysis at 18:53:00 on June 7, 2006 is named "20060607_185300.ldr".

Example)
C:\MultiNA\Ladder\ND058-2\DNA-2500\Standard\Premix\ChipPosition4\20060607_185300.ldr

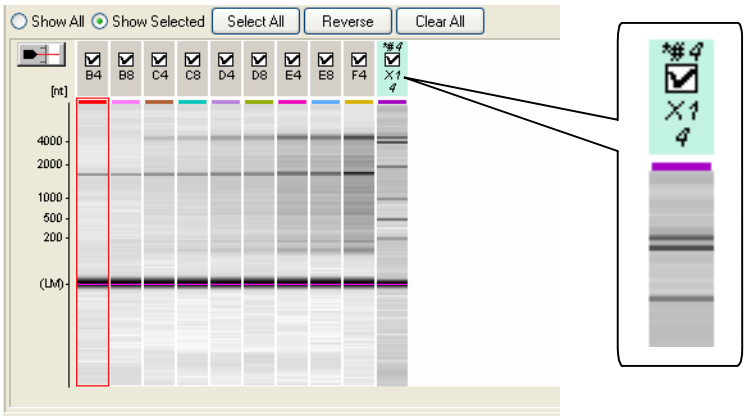
- The lower windows of the ladder data folder displays a preview of the electropherogram and peak table of the selected ladder data.
- When no appropriate ladder exists in the open folder, select ladder data from a ladder data folder where the "Chip ID" and "Separation buffer" match. Ladder data can be selected even if the "Marker mixing mode" and "Chip position" differ from ladder data being replaced.

NOTE

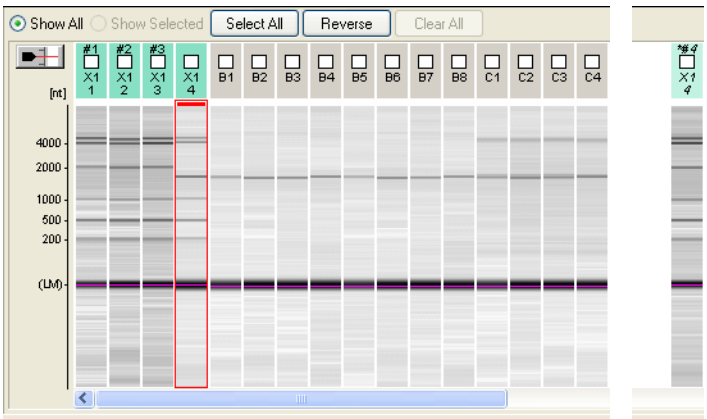
An error message is displayed if ladder data that uses a different separation buffer, dye, or chip ID is selected. If this occurs, select ladder data that has consistent data and conditions for analysis.

4 Select an appropriate ladder data file and click [Open].

Data is reanalyzed and the results are displayed.
"Imported ladder" is displayed on the right end of the gel image. An asterisk mark (*) is put above the check box of the imported ladder. The asterisk mark is followed by # and the "chip position."
The well name of the ladder initially used for analysis is displayed under the check box. All of the indications for the imported ladder are in italics.



Clicking [Show All] displays all of the data in the data folder. The ladder used for analysis before ladder change ("X1-4" in this example) does not have the "#" mark, showing that it was not used for analysis.



5 Go back to step *1* to change other ladder data.

To change the imported ladder to a different ladder data, focus (click) on the imported ladder.

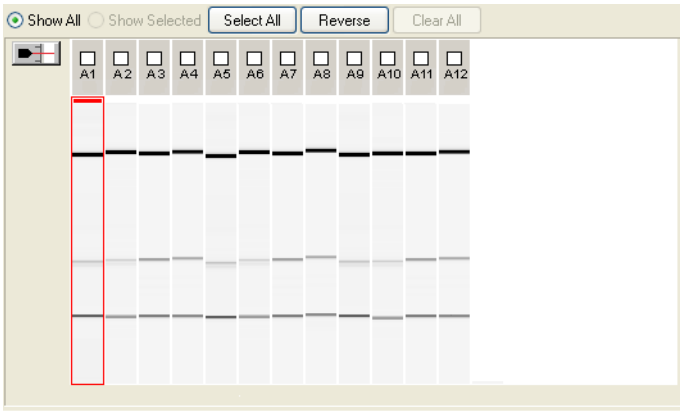
6 **Save the analysis results in the data file.**

Select [Save] on the [File] menu to overwrite the data file, and select [Save As] to save the results in a data file with a different name.

■ When No Ladder Data Exists in the Data File

When no ladder data exists in the data file because no ladder was analyzed or for other reasons, perform reanalysis using the procedures described below.

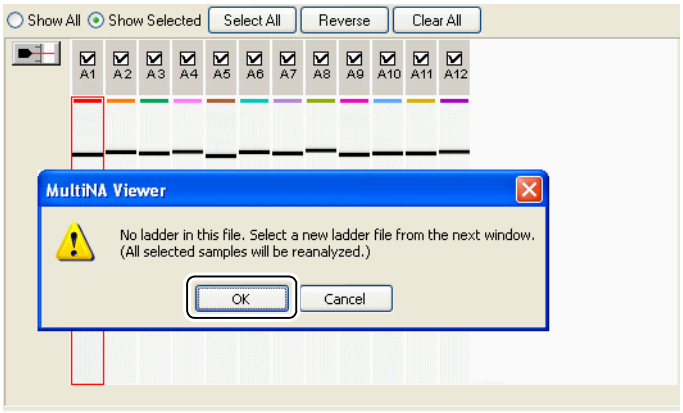
1 **Focus (click) the gel image of the sample to be analyzed.**



2 **Select [Change Ladder and Analyze] on the [Reanalysis] menu.**

The message in the figure below is displayed and the data analyzed by the same microchip as the focused sample is selected (with a check mark) and displayed.

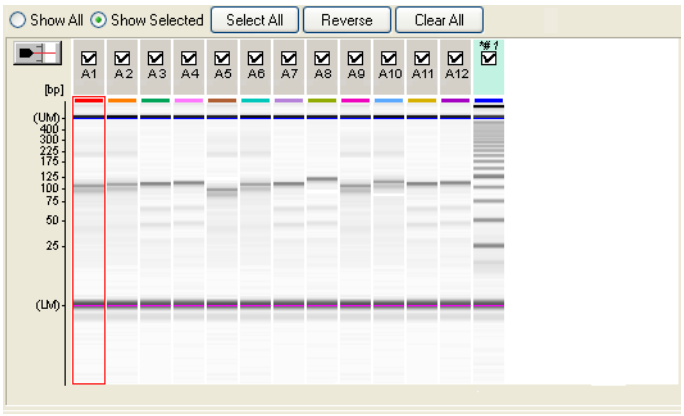
3 **Review the selected gel image and click [OK].**



The [Select Ladder Data] window is displayed. (Procedures to select ladder data are the same as the procedures described in *"Changing the Ladder Used in Analysis" P.190*.)

4 **Select an appropriate ladder data and click [Open].**

Data is reanalyzed and the results are displayed.
"Imported ladder" is displayed on the right end of the gel image. An asterisk mark (*) is put above the check box of the imported ladder. The asterisk mark is followed by # and "chip position".
The area below the check box is blank. All of the indications for the imported ladder are in italics.



5 **Go back to step *1* to analyze another sample.**

Focus (click) the imported ladder to change the imported ladder to different ladder data.

6 **Save the analysis results in the data file.**

Select [Save] on the [File] menu to overwrite the data file and select [Save As] to save the results in a data file with a different name.

5.8 Help Menu

5.8.1 Manual

Select a menu listed below to display a PDF file for the respective manual.

- [MultiNA Instrument Manual]: Display the Instrument Manual (system, control software, and data analysis software)
- [Quick Manual]: Display the Quick Manual

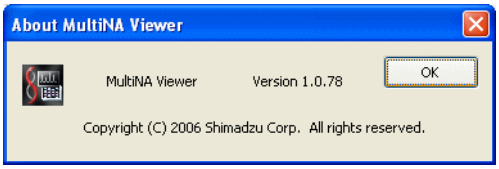
NOTE

Adobe® Reader® distributed by Adobe Systems Co. or other PDF file viewing software (provided free) is required to view the PDF file. Adobe® Reader® (Ver. 4 or later) can be downloaded from the following website:

http://www.adobe.com/products/acrobat/readstep2.html

5.8.2 About MultiNA Viewer

Select [About MultiNA Viewer] to display the version of the MultiNA Viewer data analysis software.



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6 Inspection and Maintenance

6.1 Before Inspection and Maintenance

It may be necessary to shutdown or restart the instrument and PC when performing inspection and maintenance work on the instrument.

⚠ WARNING

- Do NOT touch any parts other than those specified for analysis operation and inspection and maintenance stipulated in this manual.

⚠ WARNING

- Turn the instrument OFF before performing inspection or maintenance work.
  Shocks or accidents due to short circuits may result.
- If the instrument requires servicing, contact your Shimadzu service representative.
- Do NOT perform any disassembly or modification procedures that are not described in these manuals.
  Injury or accident may occur.

⚠ CAUTION

- Use only the parts described in *"10 Parts Specifications" P.279*.
  Normal operation is not ensured if other parts are used.
- Do NOT leave the instrument wet.
  This may result in rust or discoloration. To clean the instrument, wipe it with a soft cloth moistened slightly with water. Then remove any moisture with a soft dry cloth.
- Do NOT wipe it with alcohol, paint thinner or other organic solvents.
  These solvents may damage the paint on the instrument cover.

6.1.1 Moving All Axes to Home Position

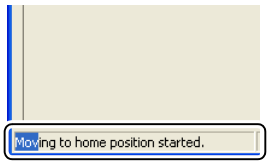
When performing inspection and maintenance work, turn ON power to both the instrument and the PC, verify that a connection has been established, and then move all the drive axes to their home position.

1 **Start the MultiNA Control Software. Verify that the instrument and PC are connected.**

2 **Close the top cover.**

3 **Select [Move All Axes to Home Position] from the [Instrument] menu in the MultiNA window.**

The operation starts and the green indicator LED blinks during execution. A blue status bar is displayed at the bottom left of the window.

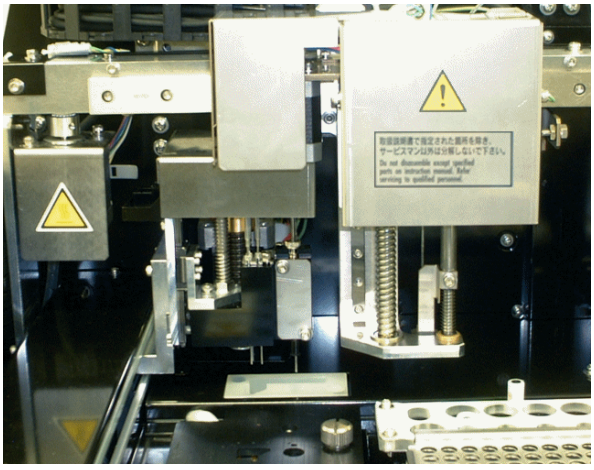


4 **Verify that the operation is complete.**

The blue status bar is no longer displayed, and the green indicator LED is steady lit.

5 **Open the top cover.**

Verify that the drive axes have returned to the home position as in the figure below.



6.2 Daily Maintenance

Daily maintenance prior to starting analysis is recommended to ensure the quality of the results.

☞ Reference

For details on each part of the instrument, see *"■ Internal Parts" P.10*

6.2.1 Piercing Needle

■ Purpose

To remove any substances adhered to the tip of the piercing needle.
Adhered substances may prevent the needle from piercing the aluminum seal on the sample plate, or cause contamination of the sample.

■ Guidelines for Procedure

When adhered substances are present on the tip of the piercing needle.

■ Requirements

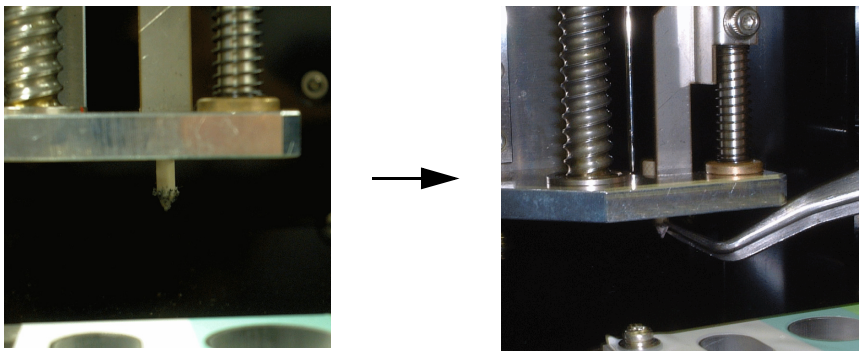
- Tweezers
- Wipes

■ Cleaning Procedure

1 **Perform the procedure in *"6.1.1 Moving All Axes to Home Position" P.198*.**

2 **Open the top cover.**

3 **Using the tweezers, peel off any adhered substances on the tip of the piercing needle in a downwards direction.**



Tip of the Piercing Needle with Adhered Substance (Left) and After Cleaning (Right)

4 **Use the wipes to remove any adhered substances from the tweezers.**

6.2.2 Sample Probe and Aspirator

■ Purpose

To remove any substances adhered to the tips of the sample probe and aspirator.
Adhered substances may cause the sample probe and aspirator to become partially obstructed, reducing dispensing precision.

■ Guidelines for Procedure

When adhered substances are present on the tip of the sample probe or aspirator.

■ Requirements

- Milli-Q ultrapure water, 100 mL

■ Cleaning Procedure

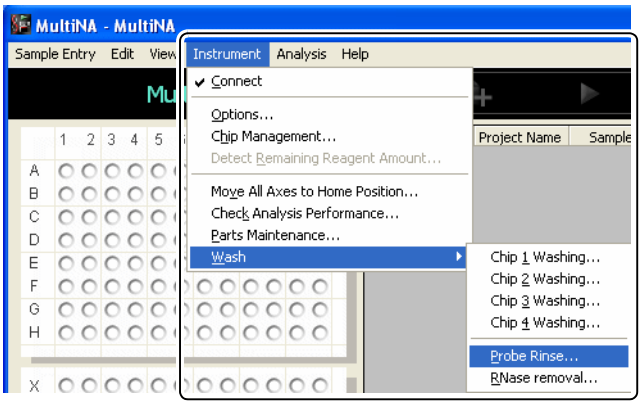
⚠ CAUTION

- Do NOT touch the tips of the sample probe and aspirator.

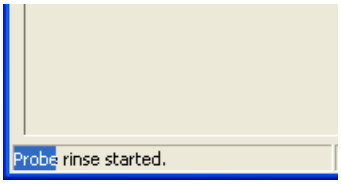
1 **Perform the procedure in *"6.1.1 Moving All Axes to Home Position" P.198*.**

2 **Ensure that the glass rinse water bottle contains at least 100 mL of Milli-Q ultrapure water.**

3 **On the [Instrument] menu, select [Wash] - [Probe Rinse].**

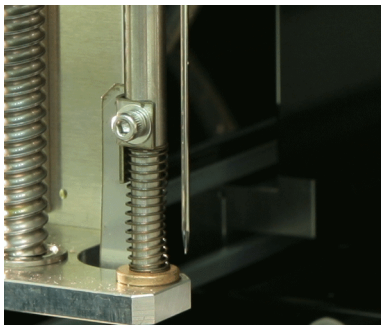


The rinsing operation starts. The aspirator is also rinsed during the sample probe rinsing.
The green indicator LED blinks during the operation. A blue status bar is displayed at the bottom left of the window.



4 **Verify that the rinse operation is complete.**

The blue status bar is no longer displayed, and the green indicator LED is steady lit.



Any adhered substances on the tip of the sample probe are removed.

6.2.3 Air Cylinder Seal

■ Purpose

To remove any substances adhered to the air cylinder seal.
Salt or other substances adhered to the air cylinder seal will reduce the efficiency of the separation buffer transfer process.

■ Guidelines for Procedure

- When adhered substances are present on the air cylinder seal.
- When a seal mark is evident on a microchip surface after analysis is complete.

■ Requirements

- Wipes
- Milli-Q ultrapure water

■ Cleaning Procedure

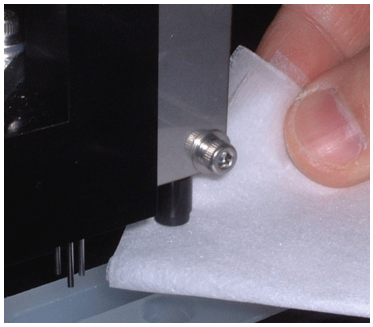
1 **Perform the procedure in *"6.1.1 Moving All Axes to Home Position" P.198*.**

2 **Wipe the tip of the air cylinder seal with a wipe soaked in water.**

⚠ CAUTION

- Do NOT scratch the air cylinder seal.
- Do NOT apply unnecessary force to the tip of the aspirator.

3 **Then remove any residual water with a dry wipe.**



6.2.4 Chip Cover

■ Purpose

To remove any precipitate adhering to the electrode pins on the chip cover and verify that the electrode pins are not bent and the chip pressing cushion is not deformed or peeling.

Contact your Shimadzu service representative if the electrode pins are bent, or if the chip pressing cushion is deformed or peeling.

■ Guidelines for Procedure

- When adhered substances are present on the chip cover surface.
- When adhered substances are present on the electrode pins.

■ Requirements

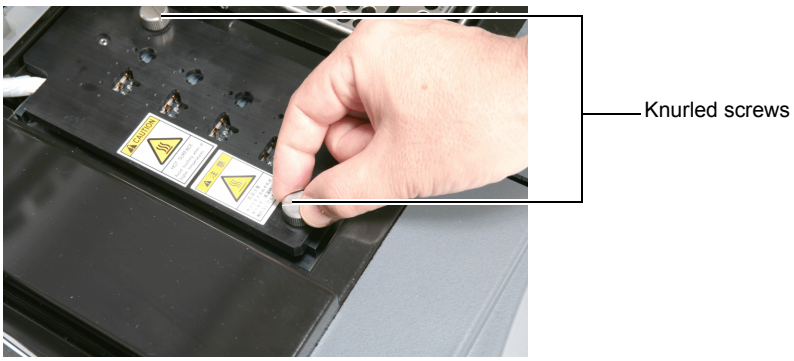
- Wipes
- Milli-Q ultrapure water

■ Cleaning Procedure

1 **Perform the procedure in *"6.1.1 Moving All Axes to Home Position" P.198*.**

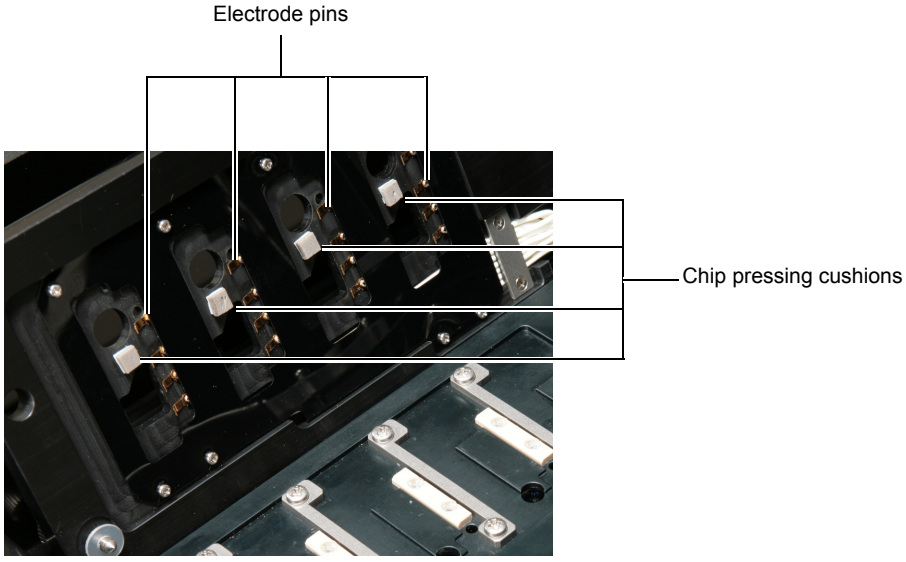
2 **If there is precipitate on the chip cover surface, wipe it away with a wipe soaked in Milli-Q ultrapure water. Then remove residual water with a dry wipe.**

3 **Loosen the knurled screws (2) then open the chip cover and set it upright.**



4 **If there are adhered substances on the electrode pins on the inside surface of the chip cover, wipe it away with a wipe soaked in Milli-Q ultrapure water. Then remove residual water with a dry wipe.**

> **⚠ CAUTION**
>
> • Do NOT deform the electrode pins when removing the adhered substances.
> If the electrodes become deformed, contact with the microchip electrodes will not be sufficient to apply the proper voltage to the chip.



5 **Check for deformation or peeling of the chip pressing cushion on the back surface of the chip cover.**

6 **Set the chip cover, and tighten the knurled screws.**

6.2.5 Sample (Extra Sample) Stand

■ Guidelines for Procedure

When adhered substances are present on the sample stand or extra sample stand.

■ Requirements

- Wipes
- Milli-Q ultrapure water

■ Cleaning Procedure

1. **Perform the procedure in *"6.1.1 Moving All Axes to Home Position" P.198*.**
2. **Wipe off any adhered substances with a wipe soaked in Milli-Q ultrapure water.**
3. **Then remove any residual water with a dry wipe.**

6.2.6 Inspecting and Washing Microchip Reservoirs

■ Purpose

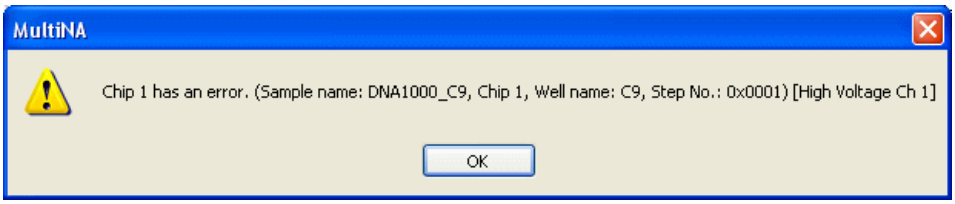
To manually clean the microchip channels and surface and confirm that the channels are unobstructed.

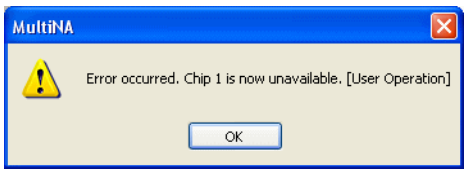
■ Guidelines for Procedure

When any of the following three situations arise:

- The "Remove all chips and immediately wash them" message is displayed.
  The microchips were not washed because analysis did not end properly. The microchip channels and reservoirs can become blocked due to dried separation buffer.

- The "Chip # has an error" message is displayed (# indicates the chip position).
  Click [OK] in the dialog box. An "Error occurred. Chip # is now unavailable" message will be displayed when the analysis schedule is complete.
  All microchips used in analysis are washed automatically (including microchips for which an error occurred). However, the channels and reservoirs of microchips for which an error occurred can become blocked.





☞ Reference

"8.2 Error Messages" P.244

- If no message has been displayed, but adhered substances are present on or in the vicinity of the microchip reservoir.

■ Requirements

- Milli-Q ultrapure water
- Micropipette (20 μL to 200 μL) and pipette tips (required quantity)
- Wipes (Recommended: BEMCOT LINTFREE PS-2)

NOTE
Use the recommended brand of wipes.

■ Procedure

⚠ CAUTION

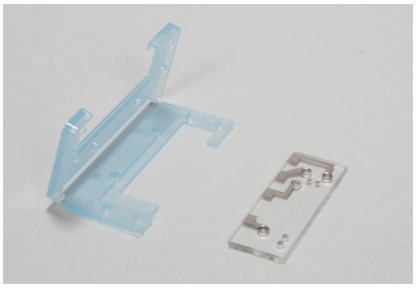
- Do NOT scrub the reservoir when removing the moisture from the surface of the microchip.
  Lint from the wipe could clog the microchip channels.
- Do NOT touch the surfaces of the microchip with your bare hands.
- Do NOT scratch the microchip electrodes during handling.
  If salt or other material has hardened on the electrodes, do NOT scrub the electrodes. Apply water to dissolve the salt and then gently wipe it away.
- Do NOT clean the microchip with an ultrasonic cleaner.
  This will damage the microchip.

Reference
For details on microchip insertion and removal, see *"3.3.5 Microchip Installation" P.32*

1 **Perform the procedure in *"6.1.1 Moving All Axes to Home Position" P.198*.**

2 **Open the chip cover, and remove the microchip from the instrument.**

3 **Remove the microchip from the chip frame, and place it on a flat surface.**

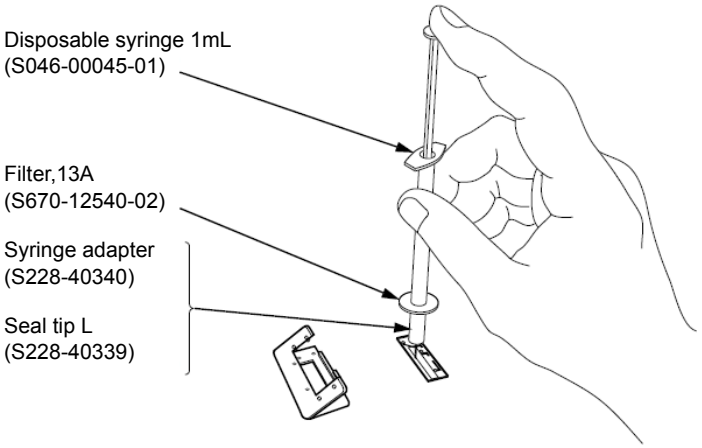


4 **If precipitate is evident around the reservoir, use a micropipette to drop about 20 μL of Milli-Q ultrapure water onto the precipitate.**

5 **Wait for 5 minutes.**

6 **Verify that the precipitate has dissolved, and then remove the water with a wipe.**

7 **Fill the standard accessory disposable syringe with 1 mL of Milli-Q ultrapure water. Assemble the filter, syringe adapter, and seal tip as shown in the figure below. Apply pressure to force water through one of the reservoirs.**



8 **Apply water through one of the reservoirs and verify that water pours out through the other three reservoirs.**

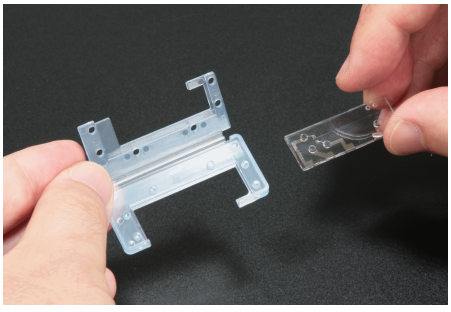
If water does not pour out, return to step ***4***, drop Milli-Q ultrapure water onto the precipitate, and extend the waiting period to 30 minutes. If the chip still remains clogged, stop using it for analysis, and replace it with a new microchip.

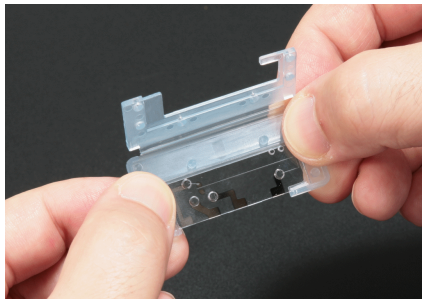
> **⚠ CAUTION**
>
> - Be sure the microchip soak time is no more than 30 minutes.
>
> There is a danger that soaking for longer periods can damage the channel coating, and lead to degraded performance.

9 **Remove any water in the microchip reservoirs using the micropipette.**

10 **If the microchip surface is still dirty, wipe it gently with a wipe soaked in Milli-Q ultrapure water.**

11 **Place the microchip in the chip frame.**

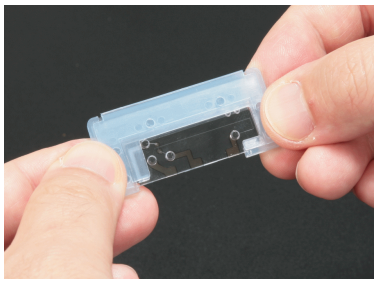




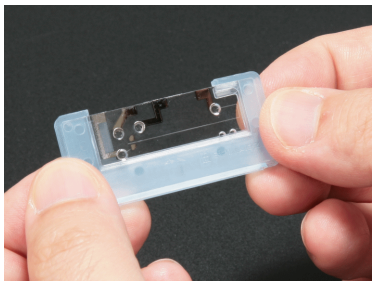
NOTE

Place the microchip in the chip frame so that the electrode side on the top of the microchip (surface with reservoirs) is located toward the back side (area without plastic) of the chip frame top (surface with the Shimadzu logo).

12 **Close the chip frame, securing the microchip.**



13 **Turn the microchip so that the front surface faces away from you.**



14 **Place the microchip back in its original position in the instrument.**

⚠ CAUTION

- If analysis is not performed after that, perform [All Chip Washing] to prevent water residue in the microchip channels. (For details, see *"4.5.8 Wash" P.119*)

6.2.7 Chip Stage and Objective Lens

■ Purpose

To clean the chip stage and objective lens.
If there is any adhered substance, it may reduce the detection sensitivity.

■ Guidelines for Procedure

Perform this procedure in either of the following situations:

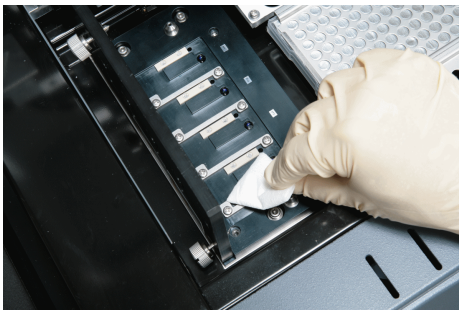
- If adhered substances are found on the chip stage or objective lens when the microchip is removed.
- If detection sensitivity is reduced.

■ Requirements

- Wipes
- Cotton swabs
- Milli-Q ultrapure water

■ Procedure

1. Perform the procedure in *"6.1.1 Moving All Axes to Home Position" P.198*.
2. Open the top cover.
3. If adhered substances are found on the chip stage, wipe it away with a wipe moistened in Milli-Q ultrapure water.
4. Remove any residual water with a dry wipe.



5. If the detector's objective lens is dirty, clean it using a cotton swab moistened with Milli-Q ultrapure water.
6. Remove any residual water with a dry cotton swab.

6.2.8 Cleaning the Cover

■ Guidelines for Procedure

If the cover is conspicuously dirty.

■ Requirements

- Cloth (2 cloths)
- Neutral detergent

■ Procedure

1 **Turn the instrument OFF or verify that the instrument is OFF.**

Reference

For details on how to turn off the instrument, see *"3.2.2 Shutdown" P.24*

2 **Wipe the cover with a cloth moistened with a small amount of water.**

NOTE

If the cover is particularly dirty, use neutral detergent.

3 **Remove any residual water with a dry cloth.**

⚠ WARNING

- Do NOT turn the instrument ON if it is still wet.
  Shocks or accidents due to short circuits may result.

6.2.9 Chip Cleaning

■ Purpose

To remove components adhered in the microchip's channels using chip cleaning solution.

Reference

To perform chip cleaning automatically upon completion of analysis, see *"3.5.5 Chip Cleaning Solution Placement" P.50*.

■ Guidelines for Procedure

- When the UM theoretical plate number or UM time fail in the analysis performance inspection
- When the separation performance is determined to deteriorate as the upper marker (UM) peak widens

■ Requirements

- Chip cleaning kit
- Buffer bottle
- Open-hole screw cap
- Micropipette and pipette tip
- Milli-Q ultrapure water
- Wipes

⚠ WARNING

- Always read the instruction manual provided with the chip cleaning kit before handling the contents of the kit.
  The instruction manual for the chip cleaning kit describes safety precautions that are important to ensure safe use.

■ Procedure

1 **Dispense chip cleaning solution into the buffer bottle.**

NOTE

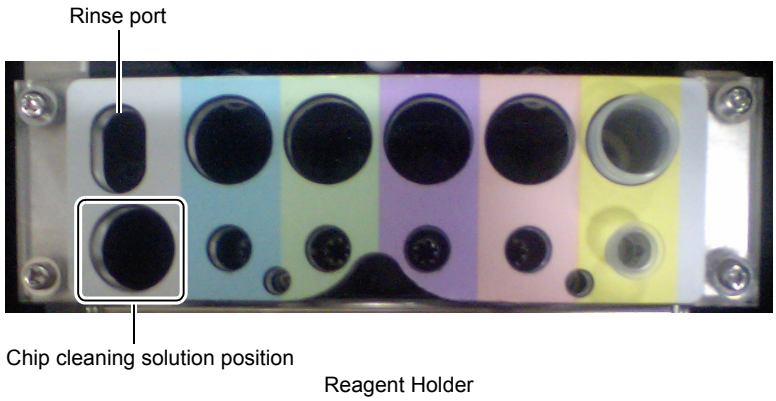
The required volume of chip cleaning solution varies depending on conditions such as the number of microchips in use and number of times cleaning is performed.

Reference

For details on the required volume of chip cleaning solution, see *"3.5.5 Chip Cleaning Solution Placement" P.50*.

2 **Securely tighten the open-hole screw cap onto the buffer bottle.**

3 **Insert the buffer bottle at the chip cleaning solution position in the reagent holder.**



NOTE

Move the bottle around to verify that the bottom of the buffer bottle is in the correct position at the bottom of the reagent holder.

4 **Select [Chip Cleaning] from the [Instrument] menu.**

The chip cleaning window is displayed.

NOTE

- Select a microchip from [Chip 1] to [Chip 4] to clean an individual microchip.
- Select [All Chips] to clean all the microchips installed in the instrument.

5 **After specifying the number of times to perform cleaning, click the start button.**

The chip cleaning process starts.

NOTE

- Select a suitable number of times to perform cleaning according to the degree of deterioration in microchip performance.
- The amount of time required for cleaning increases according to the number of times cleaning is specified to be performed.
- If the instrument determines that the remaining volume of cleaning solution is insufficient, cleaning stops and a warning is displayed on screen. Also, chip washing with rinse water is performed automatically to help keep the microchips in good condition.

6 **Once chip cleaning is complete, open the top cover and chip cover and check the condition of the microchip.**

NOTE

Contamination may be observed around reservoir 4 of microchips after performing chip cleaning. In this case, use a wipe moistened with Milli-Q ultrapure water to clean the area around reservoir 4.

■ Immersion Cleaning

If the procedure described above does not improve microchip performance, clean the affected microchip by immersing it in cleaning solution. For details on the procedure for cleaning through immersion, refer to the instruction manual included with the chip cleaning kit.

6.3 Parts Maintenance and Replacement

Reference

"10.5 Replacement Guidelines" P.286

6.3.1 Parts Maintenance

Confirm information, such as the number of runs, for the parts used in the instrument.

■ Microchips

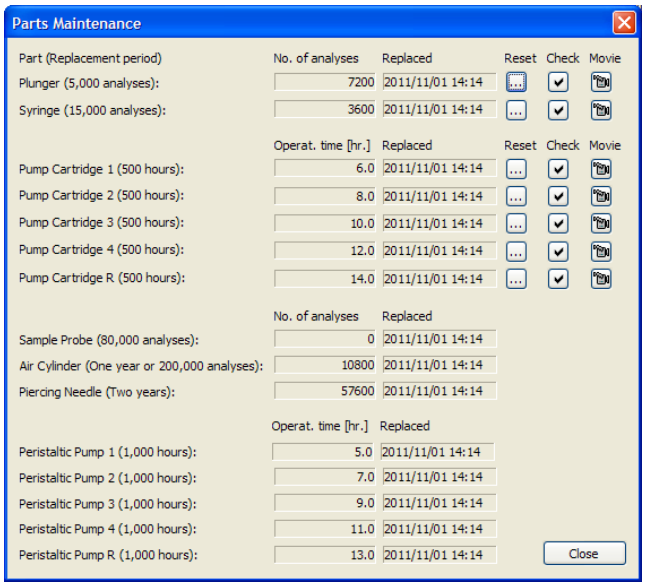
Select [Chip Management] from the [Instrument] menu in the MultiNA window.

The microchip usage status (number of runs, date and time of first usage) is displayed.

■ Instrument

Select [Parts Maintenance] from the [Instrument] menu in the MultiNA window.

The instrument body usage status (number of analyses, operation time) is displayed.



NOTE

- The replacement guidelines are not a guarantee of the operational period of parts. The period will vary depending on the usage conditions.
- The replacement intervals were calculated under the following conditions.
  160 analyses per day, divided into 10 schedules, with 20 operating days per month.
- Use only the parts described in *"■ Standard Accessories" P.279* or *"■ Periodic Replacement Parts" P.280*.
  Normal operation is not ensured if other parts are used.

6.3.2 Before Replacing Parts

Before replacing any parts, move all the drive axes to their home position and then turn OFF the instrument.

1 **Perform the procedure in *"6.1.1 Moving All Axes to Home Position" P.198*.**

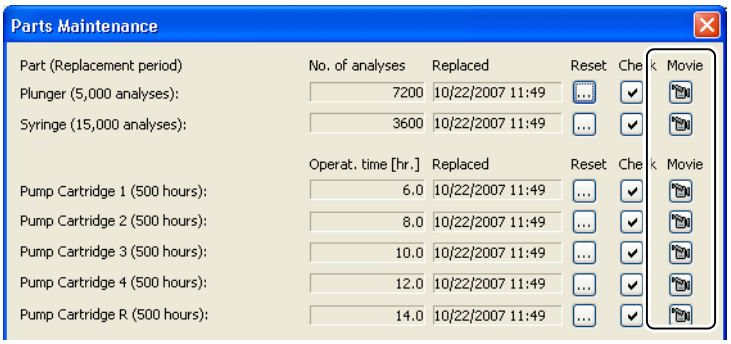
2 **Turn the instrument OFF as per *"■ Shutting Down the Instrument Only" P.25*.**

Leave the PC turned ON.

6.3.3 Video

On the Windows [Start] menu, select [All Programs] - [MultiNA] and click on the [Procedure for Replacing a Plunger]/[Procedure for Replacing a Pump Cartridge]/[Procedure for Replacing a Syringe] items to display videos of the replacement procedures for the respective parts.

With the instrument ON and connected to the PC, videos can be also displayed by clicking the [Movie] icon in the MultiNA Control Software [Parts Maintenance] window.



NOTE

- The pump cartridge replacement procedure is identical for all pump cartridges.
- The recorded video shows the replacement procedure for pump cartridge No. 3.

6.3.4 Plunger Replacement

The syringe consists of a plunger and syringe barrel (glass cylinder). A PTFE plunger seal is attached to the plunger tip to improve air tightness.

Syringe (Left), Syringe Barrel (Center) and Plunger (Right). The Tip of the PTFE Plunger Seal is Circled

■ Purpose

If the instrument is used for an extended period of time, the air tightness of the plunger seal is reduced by wear. Replace the plunger to restore the air tightness.

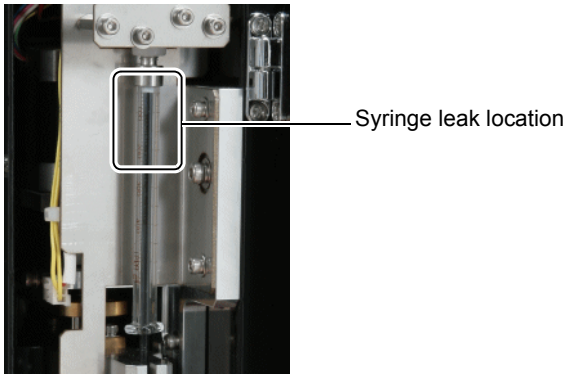
NOTE

It is not possible to replace only the plunger seal.

■ Replacement Guidelines

Perform this procedure in either of the following situations:

- When either the number of analyses or replacement date for the plunger, indicated in the [Parts Maintenance] window, exceeds the guidelines (standard interval) for replacement (see *(P.286)*).
- If leakage is discovered below the plunger seal.
  (The syringe cover must be removed if the syringe is found to be leaking.)



■ Inspection Procedure

30 μL of rinse water is transferred to a sample tube placed in the extra sample stand. Measure this quantity using a micropipette and confirm that there is no water leakage.

■ Requirements

For replacement

- Plunger: Part No. S228-25237-14
- Wipes
- Beaker
- Milli-Q ultrapure water
- Phillips screwdriver

For inspection

- Sample tube
- Milli-Q ultrapure water
- Micropipette (100 μL to 200 μL)
- Phillips screwdriver

■ Replacement Procedure

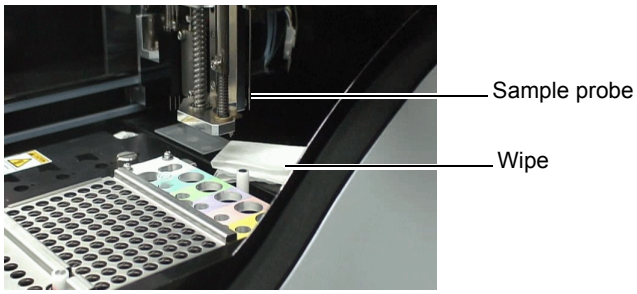
The following referenced step numbers indicate the step numbers shown in the video.

1 **Perform the procedure in *"6.3.2 Before Replacing Parts" P.212*.**

2 **Open the top cover, and spread out a wipe below the sample probe.**

☞ **Reference**

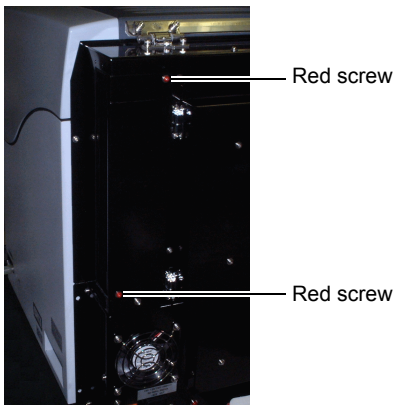
Video Step 1



3 **Remove the red screws (2) on the back of the instrument with a Phillips screwdriver and remove the syringe cover.**

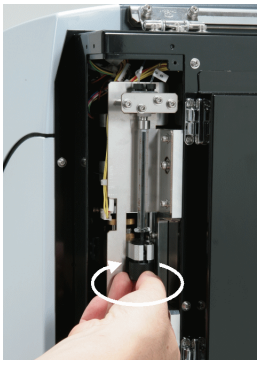
☞ **Reference**

Video Step 2



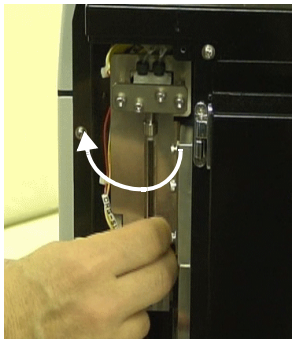
4 **Turn the black knurled screw at the bottom of the syringe in the direction indicated by the arrow and remove it.**

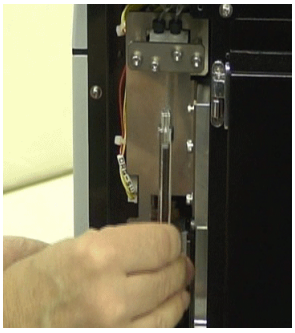
☞ **Reference**
Video Step 3



5 **Holding the syringe barrel, turn it in the direction indicated by the arrow, and remove the upper section of the syringe from the instrument.**

☞ **Reference**
Video Step 4





NOTE
Once the syringe has been removed, rinse water left over in the tubing may leak from the sample probe. This rinse water is absorbed by the wipe spread out in step **2**.

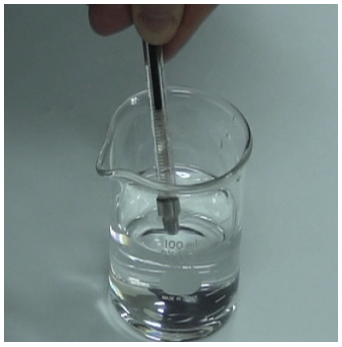
☞ **Reference**
Video Step 5

6 **Replace the plunger.**

☞ **Reference**
Video Step 6

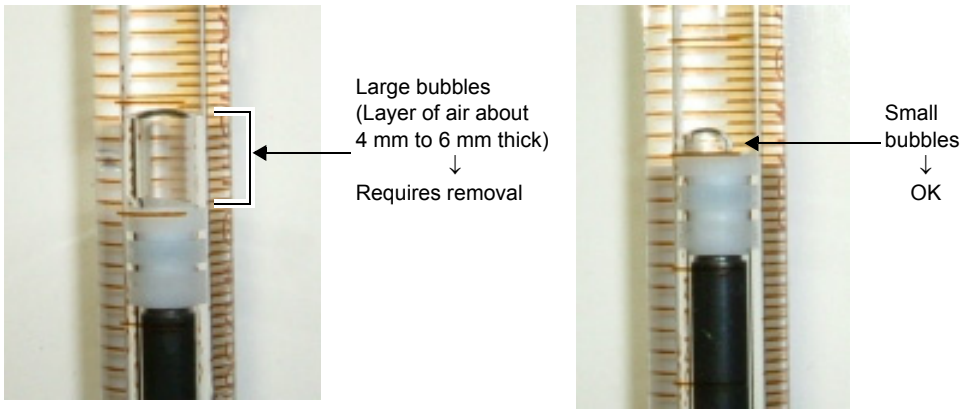
7 **Submerge the syringe tip in a beaker of Milli-Q ultrapure water. Suction up 150 µL of Milli-Q ultrapure water. Then expel it. Repeat this process several times.**

☞ **Reference**
Video Step 7



8 **Verify that there are no air bubbles in the syringe.**

Small bubbles, like the ones shown to the right, are not a problem.



9 **Aspirate about 50 µL Milli-Q water into the syringe.**

☞ **Reference**
Video Step 7

10 **With the Milli-Q ultrapure water still in the syringe, attach the top of the syringe to the instrument.**

☞ **Reference**
Video Step 8

⚠ CAUTION

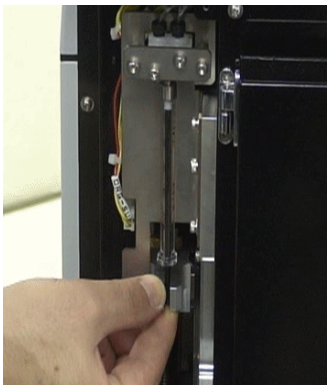
- Hold the syringe vertically during attachment.
  The syringe may be damaged if it is attached on an angle.
- Do NOT use a wrench or other tools.

11 **Push in the plunger.**

Verify that no water leaks from the syringe attachment port.

Reference

Video Step 9



NOTE

Inserting the plunger may cause rinse water left over in the tubing to leak from the sample probe. This rinse water is absorbed by the wipe spread out in step **2** *(P.215)*.

Reference

Video Step 10

12 **Attach the black knurled screw.**

Reference

Video Step 11

13 **While the syringe cover is still removed, perform an inspection according to the *"■ Inspection Procedure" P.218* procedure below.**

■ Inspection Procedure

Before performing an inspection, turn the instrument ON.

Reference

For details on how to start the instrument and software, see *"3.2.1 Startup" P.22*

1 **Select [Connect] from the [Instrument] menu in the MultiNA window.**

2 **Perform the procedure in *"6.1.1 Moving All Axes to Home Position" P.198*.**

3 **Place an empty sample tube in well position X1 on the extra sample stand.**

4 **Install the sample holder.**

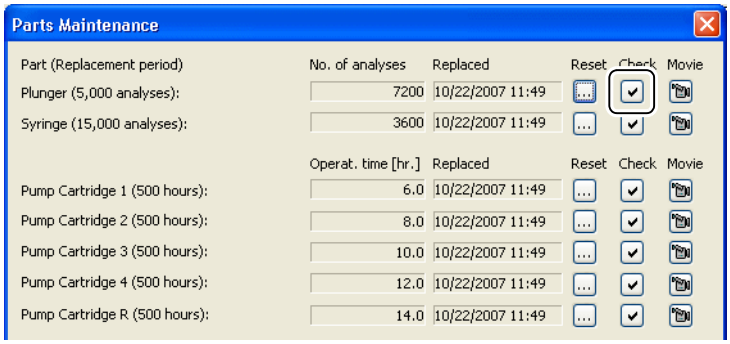
5 **Ensure that the glass rinse water bottle contains at least 100 mL of Milli-Q ultrapure water.**

6 **Close the top cover.**

7 **Select [Parts Maintenance] from the [Instrument] menu in the MultiNA window.**

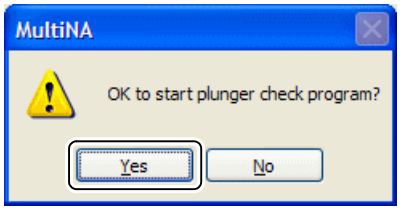
The [Parts Maintenance] window is displayed.

8 **Select the [Check] checkbox for [Plunger].**

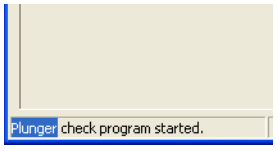


A message is displayed to confirm whether to perform the inspection operation.

9 **Click [Yes].**



The inspection operation starts and the green indicator LED blinks during execution. A blue status bar is displayed at the bottom left of the window.



10 **Check the following after inspection is complete.**

1 Check the syringe connector.

Check that there is no water leakage from the syringe connector.

If there is water leakage, repeat the procedures in *"6.3.4 Plunger Replacement" P.213*, attaching the syringe to avoid leakage from the connector. Then, repeat the inspection procedure from step ***1***.

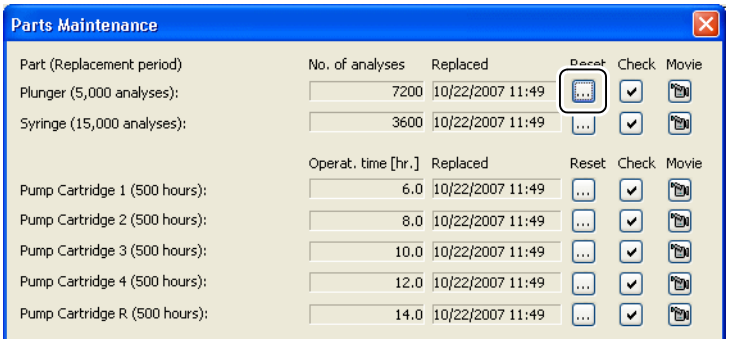
2 Check the water volume in the sample tube.

Open the top cover and suction up the rinse water in the sample tube at X1 with a micropipette set to 25 μL.

After suctioning up 25 μL, verify that rinse water remains in the sample tube at X1.

If there was no water remaining in the sample tube, check for leaks again, and then perform the inspection again.

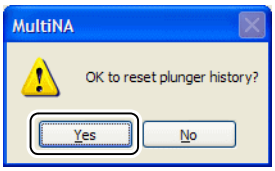
11 **Click [...] (Reset) for [Plunger] in the [Parts Maintenance] window.**



A message is displayed to confirm whether to perform a reset.

12 **Click [Yes].**

The number of analyses is set to 0.



13 **Replace the syringe cover on the back of the instrument.**

6.3.5 Syringe Replacement

■ Purpose

If the instrument is used for an extended period of time, air tightness is reduced by syringe barrel wear. If air tightness is not improved by replacing the plunger, then replace the syringe.

■ Replacement Guidelines

Perform this procedure in either of the following situations:

- When either the number of analyses or replacement date for the syringe, indicated in the [Parts Maintenance] window, exceeds the guidelines (standard interval) for replacement (see *"10.5 Replacement Guidelines" P.286*).
- If leakage is discovered below the plunger seal.
  (The syringe cover must be removed according to the following procedures to check for syringe leaks.)

■ Inspection Procedure

The procedure is the same as that for plunger inspection (*"■ Inspection Procedure" P.214*).

■ Requirements

For replacement

- Micro syringe: Part No. S228-25237-04
- Wipes
- Beaker
- Milli-Q ultrapure water
- Phillips screwdriver

For inspection

- Sample tube
- Milli-Q ultrapure water
- Micropipette (100 μL to 200 μL)
- Phillips screwdriver

■ Replacement Procedure

1 **Perform steps *1* through *5* in *"6.3.4 Plunger Replacement" P.213*.**

2 **Prepare a new syringe.**

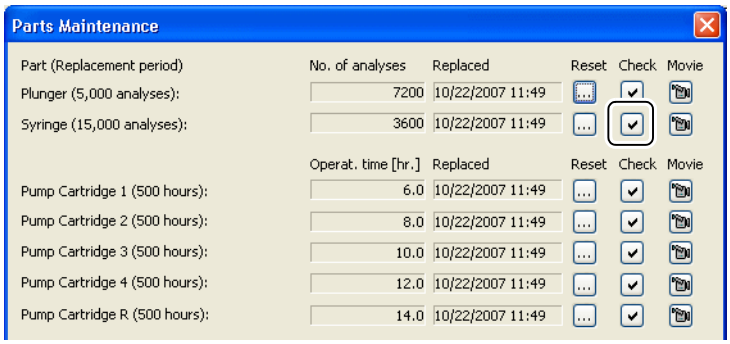
☞ **Reference**
Video Step 7

3 **Perform steps *7* through *12* in *"6.3.4 Plunger Replacement" P.213*.**

■ Inspection Procedure

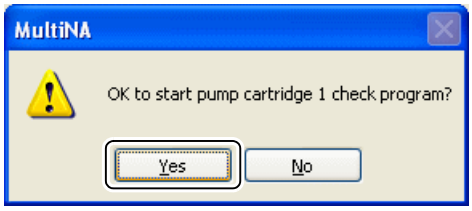
1 **Perform steps *1* through *6* in *"■ Inspection Procedure" P.218*.**

2 **Select [Parts Maintenance] from the [Instrument] menu in the MultiNA window and click the [Check] checkbox for [Syringe].**

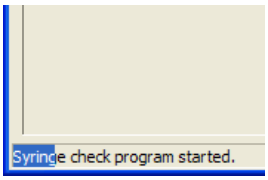


The following confirmation message is displayed.

3 **Click [Yes].**



The inspection operation starts and the green indicator LED blinks during execution. A blue status bar is displayed at the bottom left of the window.



4 Check the following after inspection is complete.

1 Check the syringe connector.

Check that there is no water leakage from the syringe connector.
If there is water leakage, repeat the procedures in *"6.3.4 Plunger Replacement" P.213*, attaching the syringe to avoid leakage from the connector. Then, repeat the inspection procedure from step ***1***.

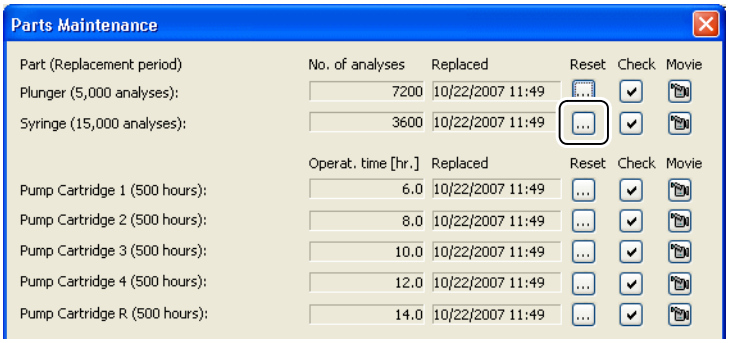
2 Check the water volume in the sample tube.

Open the top cover and suction up the rinse water in the sample tube at X1 with a micropipette set to 25 μL.

After suctioning up 25 μL, verify that rinse water remains in the sample tube at X1.

If there was no water remaining in the sample tube, check for leaks again, and then perform the inspection again.

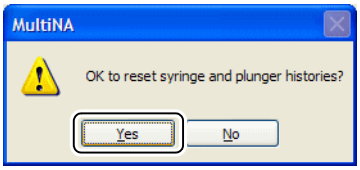
5 Select [Parts Maintenance] from the [Instrument] menu in the MultiNA window and click … (Reset) for [Syringe].



The following confirmation message is displayed.

6 Click [Yes].

The number of analyses is set to 0.



7 Replace the syringe cover on the back of the instrument.

6.3.6 Pump Cartridge Replacement

Reference

"1.6 Instrument Description" P.8

■ Purpose

Extended use wears out the pump cartridge rotor and may cause a reduction in flow rate or tube failure. Replace the pump cartridges when the guidelines (standard interval) for replacement have been reached.

■ Replacement Guidelines

When the pump cartridge operation time displayed in the [Parts Maintenance] window exceeds the guidelines (standard interval) for replacement (see "10.5 Replacement Guidelines" P.286).

It is also necessary to replace the pump cartridge when there is at least one "fail" in the analysis performance inspection ("4.5.6 Check Analysis Performance" P.114).

■ Inspection Procedure

When the inspection program is run, rinse water is dropped into the microchip reservoir and then suctioned up. If the peristaltic pump is not operating properly, or if there is a problem with the connection between the pump cartridges and the tubes, the suction is insufficient, and rinse water remains in the reservoir. This is detected by the sample probe, and an error message (water level detection error) is displayed.

■ Requirements

For replacement

- Pump cartridge*
- Phillips screwdriver
- Wipes

* Pump cartridges are not compatible between different pumps. Check the type of pump cartridge installed on the instrument and replace it with an identical one.

	Pump Cartridge	RoHS Compliant Pump Cartridge
Part No.	S042-00405-13	S292-96682
Name	CASSETTE HEAD	CASSETTE HEAD
Applicable instrument	292-28000-2X/3X	292-28000-4X/5X
		

For inspection

- Microchip (1)
- Milli-Q ultrapure water
- Micropipette (10 μL to 200 μL)
- Phillips screwdriver

■ Replacement Procedure

The following referenced step numbers indicate the step number shown in the video.

NOTE
Replacement of cartridge No. 3 is used as the example in the videos for pump cartridges Nos. 1 through 4, and cartridge R.

⚠ CAUTION

- The front cover must be opened to replace the pump cartridges. Ensure at least a 10 cm space in front of the instrument.

1 **Perform the procedure in *"6.3.2 Before Replacing Parts" P.212*.**

2 **Using the Phillips screwdriver, remove the 2 screws fastening the front cover.**

☞Reference
Video Step 1

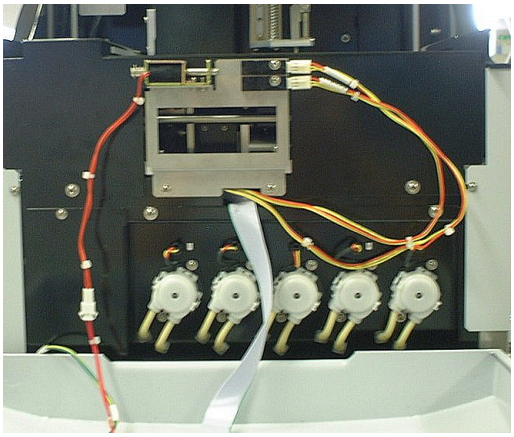
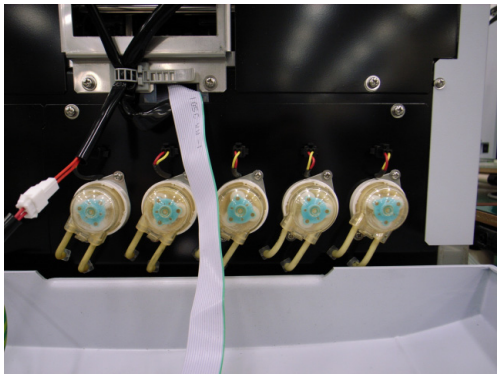
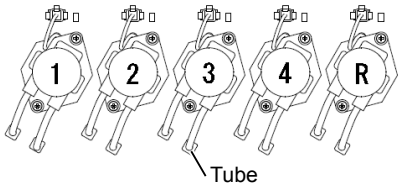
3 **Drop the front cover forwards.**

The five pump cartridges are arranged in a row. Nos. 1 to 4 from the left, and then R.

☞ Reference
Video Step 2

⚠ CAUTION

- After the front cover screws have been removed, drop the front cover forwards, holding the cover by hand.
- Do NOT remove the cables connecting the front cover to the instrument.

For 292-28000-2X/3X	For 292-28000-4X/5X
	
 Pump Cartridge (Enlarged View) (From the Left, 1 to 4 and R)	

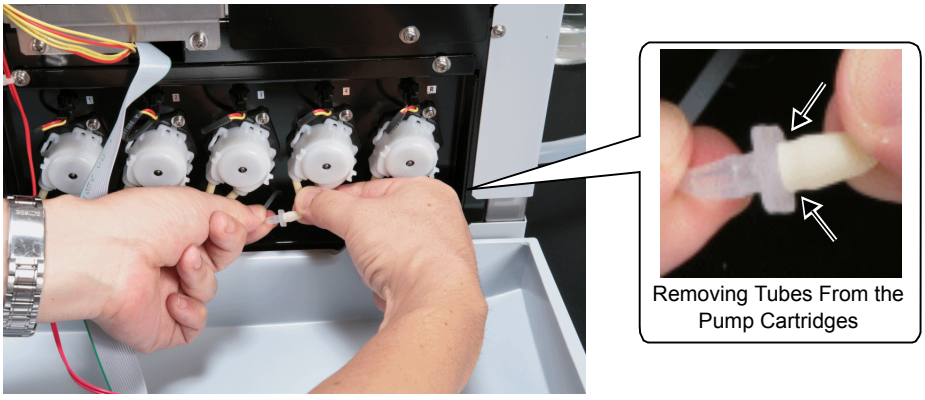
4 **Pull the 2 yellow pump cartridge tubes out of the semi-transparent joint.**

☞Reference

Video Step 3

⚠ CAUTION

- The narrow white tube is attached to the joint on the other side of the yellow tube. Do NOT remove the white tube.
  The tubes may fall into the instrument and become irretrievable.
- When removing pump cartridge R, the rinse water in the tubing will leak from the joint. Clean up this water with a wipe.



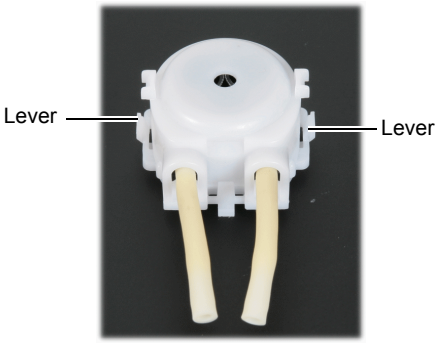
Removing Tubes From the Pump Cartridges

NOTE

Remove the part shown by the arrow in figure. Removal is easier if you grip the joint and yellow tubes and then pull.

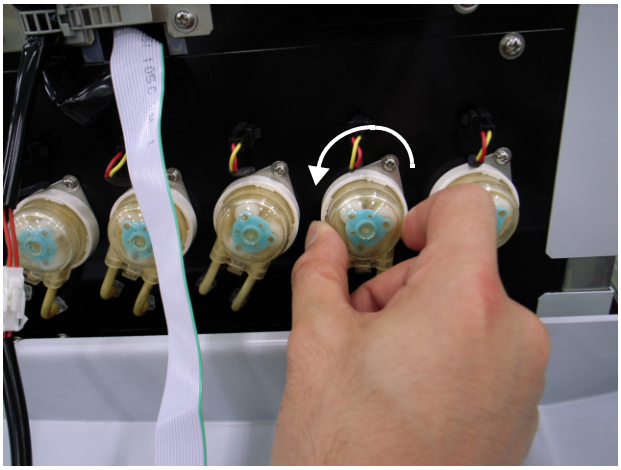
5 **Gripping the 2 levers on the pump cartridge, pull the pump cartridge forwards, removing it from the motor shaft.**

Reference
Video Step 4



Pump Cartridge (Enlarged View)

NOTE
When using a RoHS compliant pump cartridge, turn the pump cartridge in the counterclockwise direction and pull it off the motor shaft toward you at the position where it stops rotating.



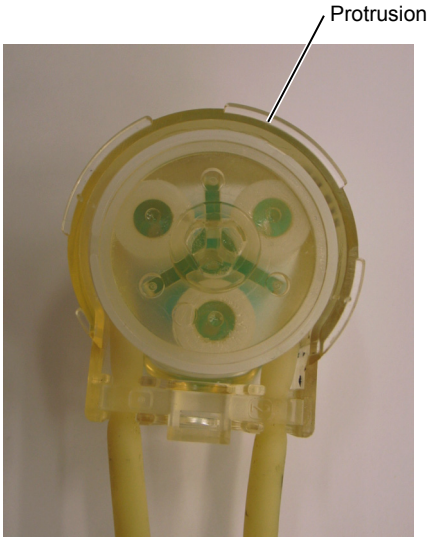
6 Attach the new pump cartridge to the motor shaft.

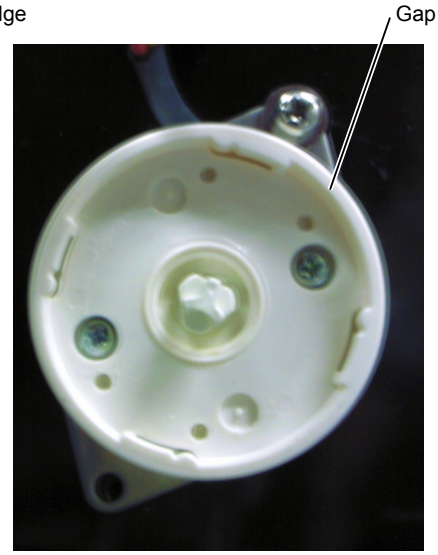
Push the opening at the center of the pump cartridge onto the motor shaft.

Reference
Video Step 5

NOTE

When using a RoHS compliant pump cartridge, insert the pump cartridge by aligning the protrusions on the cartridge periphery with the gaps on the motor and fix the pump cartridge into position by turning it in the clockwise direction until it clicks.





⚠ CAUTION

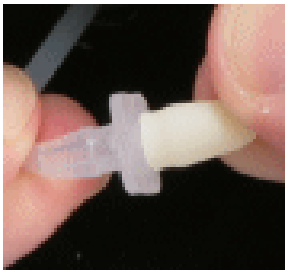
- Install the pump cartridge in the correct direction.

7 **Install the 2 yellow tubes on the pump cartridge onto the joints.**

Push the yellow tube until its tip touches the base at the center of the joint.

Reference

Video Step 6



⚠ CAUTION

- Do NOT pull on the yellow tube when pushing it onto the joint.
- Ensure that the pump cartridge's yellow tubes are connected to the proper joints.
- After insertion, verify that the yellow tube is not crimped.
  If it is crimped, it will not provide normal suction.

While the front cover is still removed, perform an inspection according to the following procedures.

NOTE

See *"6.3.7 Pump Cartridges (1 to 4) Inspection" P.229* to inspect pump cartridges Nos. 1 through 4, and *"6.3.8 Pump Cartridge R Inspection" P.231* to inspect pump cartridge R.

6.3.7 Pump Cartridges (1 to 4) Inspection

■ Inspection Procedure

When the inspection program is run, rinse water is dropped into the microchip reservoir and then suctioned up. If the peristaltic pump is not operating properly, or if there is a problem with the connection between the pump cartridges and the tubes, the suction is insufficient, and rinse water remains in the reservoir. This is detected by the sample probe, and an error message (water level detection error) is displayed.

■ Requirements

- Microchip (1)
- Milli-Q ultrapure water
- Micropipette (10 μL to 200 μL)
- Phillips screwdriver

■ Procedure

1 **Turn ON the power switch on the MultiNA instrument and then select [Connect] from the [Instrument] menu in the MultiNA window.**

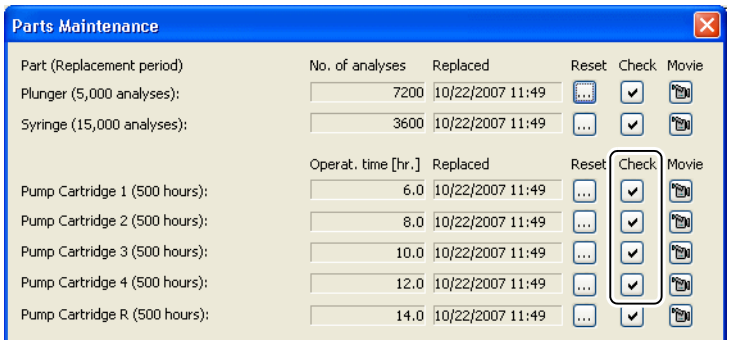
2 **Perform the procedure in *"6.1.1 Moving All Axes to Home Position" P.198*.**

3 **Open the top cover and insert a microchip in chip position 4.**

If the microchip is not installed in chip position 4, install one according to *"3.3.5 Microchip Installation" P.32*.

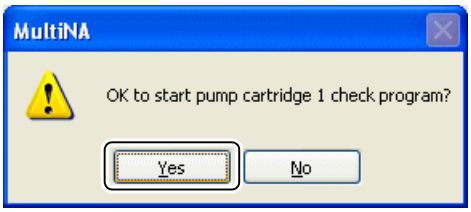
4 **Close the top cover.**

5 **Select [Parts Maintenance] from the [Instrument] menu in the MultiNA window and click the [Check] checkbox that corresponds to the replaced pump cartridge.**

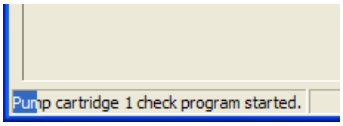


The following confirmation message is displayed.

6 Click [Yes].

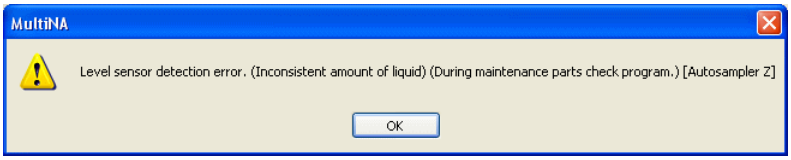


The inspection operation starts and the green indicator LED blinks during execution. A blue status bar is displayed at the bottom left of the window.



7 Verify that the inspection process has finished.

- If it has finished properly, the blue status bar disappears without an error message (water level detection error) being displayed. Proceed to step ***8***.
- If a water level detection error occurred, the following message is displayed.



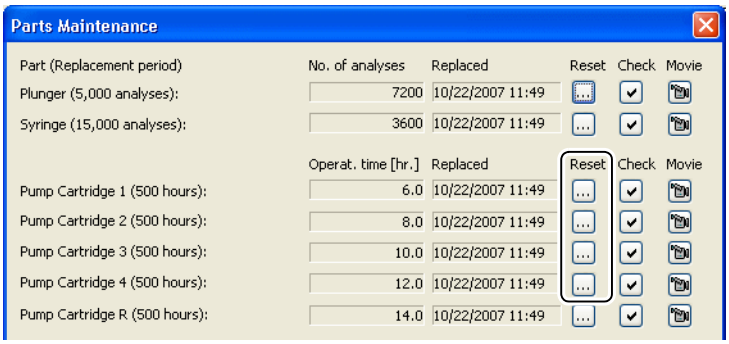
Check the following items and then repeat the procedure from step ***5***.

- Open the top cover and the chip cover. Check that rinse water remains in the microchip reservoir. If rinse water remains, suck it out with a micropipette.
- Verify that the replaced pump cartridge and tubes are connected properly.

NOTE

If the error message is displayed again, contact your Shimadzu service representative.

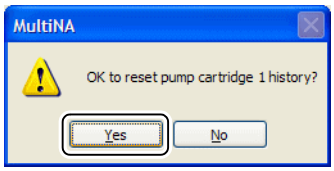
8 Select [Parts Maintenance] from the [Instrument] menu in the MultiNA window and click … (Reset) that corresponds to the replaced pump cartridge.



The following confirmation message is displayed.

9 **Click [Yes].**

The operation time is set to [0].



10 **Replace the front cover.**

6.3.8 Pump Cartridge R Inspection

■ Inspection Procedure

Rinse water is supplied to the rinse pool. Confirm this visually.

■ Requirements

- Milli-Q ultrapure water
- Phillips screwdriver

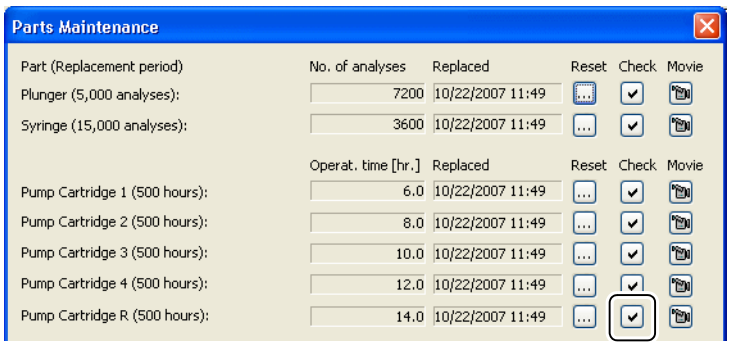
■ Procedure

1 **Turn ON the power switch on the MultiNA instrument and then select [Connect] from the [Instrument] menu in the MultiNA window.**

2 **Perform the procedure in *"6.1.1 Moving All Axes to Home Position" P.198*.**

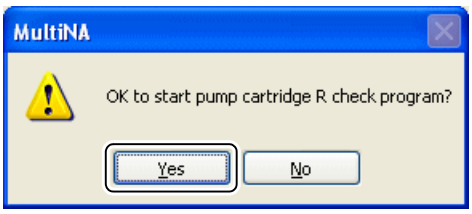
3 **Ensure that the glass rinse water bottle contains at least 100 mL of Milli-Q ultrapure water.**

4 **Select [Parts Maintenance] from the [Instrument] menu in the MultiNA window and click the [Check] checkbox for [Pump Cartridge R].**

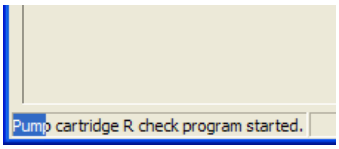


The following confirmation message is displayed.

5 Click [Yes].

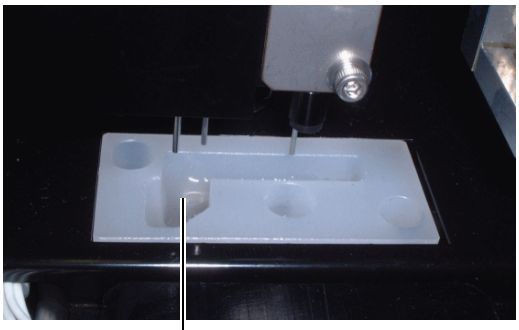


The inspection operation starts and the green indicator LED blinks during execution. A blue status bar is displayed at the bottom left of the window.



6 After the inspection process has finished, open the top cover and confirm the following items.

- Confirmation 1: Check that no rinse water has leaked from the connection between the pump cartridge R and the tubes.
  If there is any leakage, reconnect the tubes and repeat the procedure from step *3*.
- Confirmation 2: Check the water level of the rinse pool. Verify that the water level in the rinse pool is more than half of the pool's depth.

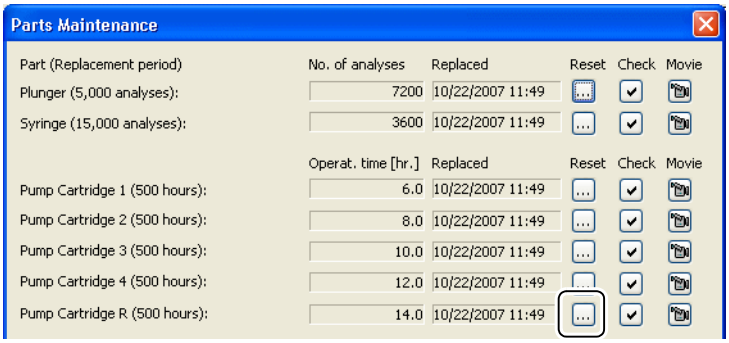


The water level in the rinse pool is more than half of the rinse pool's depth

NOTE

If the rinse pool does not fill adequately after the procedure is repeated, contact your Shimadzu service representative.

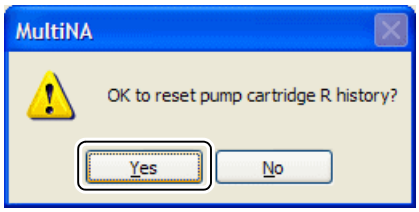
7 Select [Parts Maintenance] from the [Instrument] menu in the MultiNA window and click [...] (Reset) for [Pump Cartridge R].



The following confirmation message is displayed.

8 **Click [Yes].**

The operation time is set to [0].



9 **Replace the front cover.**

6.3.9 Suction Filter Inspection and Maintenance

■ Guidelines for Procedure

When a significant number of bubbles are present in the rinse water suction line.

When the suction filter appears to be dirty.

⚠ WARNING

- Refer to the MSDS of the reagent used.

⚠ CAUTION

- Do NOT touch the suction filter with bare hands.

■ Requirements

- Ultrasonic cleaner
- 2-propanol
- Beaker
- ELEMENT, SUS FILTER: Part No. S228-45707-91 (if replacement is required)

■ Procedure

1 **Remove the suction filter from the glass rinse water bottle, and pull the suction filter off of the suction tubing.**

2 **Place the suction filter in a beaker filled with 2-propanol, and clean it for 5 minutes using an ultrasonic cleaner.**

3 **Replace the suction filter on the suction tube, and return it to the glass rinse water bottle.**

> **⚠ CAUTION**
>
> • Insert the suction filter into the suction tube marked with an "F".

4 **Select [Wash] on the [Instrument] menu in the MultiNA window and click [Probe Rinse].**

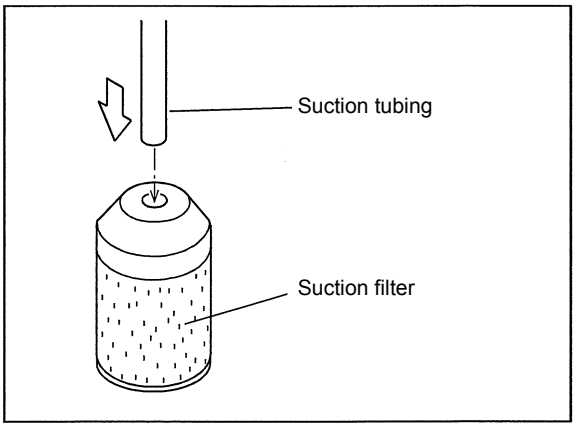
A probe rinse is executed.

☞ **Reference**

"6.2.2 Sample Probe and Aspirator" P.200

5 **Verify that no bubbles accumulate in the suction tubing.**

If bubbles are still accumulating in the suction tubing, replace the suction filter with a new one (ELEMENT, SUS FILTER).



6.3.10 Fuse Replacement

> **⚠ WARNING**
>
> • Before replacing the fuses, turn the instrument OFF, and unplug the power cord from the outlet.
>
> • Only use the specified fuses (Part No. S072-02004-22).
> Fires, electric shocks, or accidents may otherwise result.

■ Requirements

- Fuse: Part No. S072-02004-22 (2 are required)
- Flathead screwdriver

■ Procedure

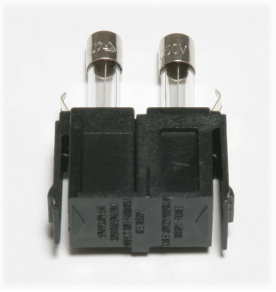
1 Perform the procedure in *"6.3.2 Before Replacing Parts" P.212*.

2 Remove the power cable from the AC adapter with fuse box.

3 Use the flathead screwdriver to pull the cover of the fuse box towards you.

4 Pull the fuse box out towards you.

5 Remove the fuse from the fuse box and replace it with a new one.



6 Push the fuse box into the instrument until you hear a click sound.

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7 Instrument Storage and Relocation

⚠ WARNING

- Do NOT lift the instrument by the top or front cover. Use care when handling the cables and tubing connected to the instrument.

⚠ CAUTION

- Ensure that these instruction manuals are transferred if the user or site of use changes.
- Contact your Shimadzu representative for product installation, adjustment, or re-installation after product movement, or for service and repairs.

7.1 Before Transport and Storage

7.1.1 Rinse Water Removal

Follow the procedures below to remove rinse water in the rinse water suction line prior to moving or storing the instrument.

1 **Remove all of the installed microchips from the instrument.**

Store all microchips according to *"7.3.2 Microchip Storage" P.239*.

2 **Remove both of the rinse water tubes from the glass rinse water bottle, and place them on a clean surface.**

NOTE

Do NOT touch the suction filter with bare hands.

3 **Discard the rinse water remaining in the glass rinse water bottle.**

4 **Perform [Probe Rinse] three times.**

Reference

"4.5.8 Wash" P.119

5 **Discard any waste fluid remaining in the waste container.**

Reference

"3.3.2 Checking the Waste Container" P.28

7.1.2 Cleaning with Ethanol

If this instrument will be unused for longer than 2 weeks, follow the procedures below to clean the rinse water suction line with ethanol.

1. **Perform procedures *1* to *5* in *"7.1.1 Rinse Water Removal" P.237*.**
2. **Put at least 300 mL of ethanol in a beaker or similar container and insert both of the rinse water tubes into the container.**
3. **Perform [Probe Rinse] three times.**

   ☞ **Reference**
   "4.5.8 Wash" P.119
4. **Remove the rinse water tubes from the ethanol, and place them on a wipe or other dust-free surface.**
5. **Perform [Probe Rinse] three times.**
6. **Discard any waste fluid remaining in the waste container.**

   ☞ **Reference**
   "3.3.2 Checking the Waste Container" P.28

7.2 Instrument Relocation

Observe the following precautions when relocating the instrument.

⚠ CAUTION

- Before moving the instrument, the drives must be fastened with the transportation fixtures. Contact your Shimadzu service representative.
- Remove the LAN cable that connects to the PC.
- Do NOT hold the top cover when moving the instrument.
- Take care to prevent your hands and fingers being caught in gaps in the instrument exterior. This may result in injury.
- Do NOT bump the instrument or subject it to excessive vibrations.

7.3 Storage

7.3.1 Instrument Storage

The following conditions must be satisfied when storing the instrument.

- Site with minimal temperature variations
- Dust should be minimal.
- Vibrations should be minimal.
- No corrosive gases should be produced at the site.
- No significant magnetic fields or abnormal radio waves should be present.
- The instrument should not be subject to jarring or excessive vibrations.

7.3.2 Microchip Storage

If microchips are not to be used for a long period (two weeks or more), perform [Chip Washing] (see *"4.5.8 Wash" P.119*) and then return them to their original plastic case for storage. They may become contaminated with dust if left installed in the instrument.

NOTE

- If separation buffer is left in the microchip flow channels or on the surface, and it is allowed to dry, salts and polymers will precipitate, rendering the chip unusable. If rinsing with the instrument is insufficient, rinse them manually as per *"6.2.6 Inspecting and Washing Microchip Reservoirs" P.204*.
- The plastic case they were in when purchased has been treated with a desiccant. Be sure that the microchips are dry for storage.

7.3.3 Peristaltic Pump Storage

If the instrument will be stored for an extended period (for 1 month or more), remove and store the peristaltic pump cartridge. However, if *"4.5.10 Periodic Maintenance" P.120* will be performed during this time (within 1 month), the pump cartridge does not need to be removed. If the pump cartridge is not removed for an extended period (3 months or more) and periodic maintenance is not performed, pump performance may decrease. If this occurs, replace the pump cartridge according to the procedure described in *"6.3.6 Pump Cartridge Replacement" P.223*.

7.4 Inspection Following Long-Term Storage

Check the following points before using the instrument after it has been stored for an extended period.

NOTE

If the instrument has been stored in a cold state and not used for a long period, perform a warming up operation.

Operation of the instrument in a cold state may cause drive shaft errors (home position sensing error). If repeated warming up operations do not resolve these errors, contact your Shimadzu service representative.
For details on the warming up operation procedure, see *"7.5 Warming Up Operation" P.240*.

7.4.1 Connections

Verify that the instrument and PC are connected properly, as per *"3.2 Startup and Shutdown" P.22*.

7.4.2 Syringe

1. **Remove the syringe cover as per *"6.3.4 Plunger Replacement" P.213*, step 3.**
2. **Select [Wash] on the [Instrument] menu in the MultiNA window and select [Probe Rinse].**
3. **The syringe plunger moves up and down (water supply operation), verify that no air bubble forms on the syringe tip.**
   If an air bubble remains, remove the syringe as per *"6.3.4 Plunger Replacement" P.213*, remove the air (Procedure 7), and then reattach it.
4. **Replace the syringe cover.**

7.4.3 Checking Analysis Performance

Inspect the analysis performance according to *"4.5.6 Check Analysis Performance" P.114*.

7.5 Warming Up Operation

Follow the procedure below to perform a warming up operation.

1. **Turn ON the instrument.**
2. **Start the control software, and confirm that the instrument and PC are connected.**
3. **Select [Move All Axes to Home Position] from the [Instrument] menu in the MultiNA window.**
4. **Wait for 30 minutes, with the top cover closed.**
5. **After 30 minutes, operate the instrument as usual.**
   If the error continues, wait another 30 minutes before starting the instrument.

8 Troubleshooting

⚠ CAUTION

- If the instrument malfunctions, contact your Shimadzu service representative immediately.
- When removing the microchips, rinse them with water according to *"6.2.6 Inspecting and Washing Microchip Reservoirs" P.204*.
  If the instrument is left unchecked after malfunctioning, the microchip and sample probe may become blocked due to dried separation buffer.
- If the instrument is shut down by a power failure rather than a malfunction, rinse the microchips according to the procedures above, and rinse the sample probe according to *"6.2.2 Sample Probe and Aspirator" P.200*.
  After rinsing, verify that the sample probe is not obstructed according to *"6.3.4 Plunger Replacement" P.213*.

8.1 Troubleshooting

This section describes typical causes and corrective measures sorted by the "Symptom". Refer to the "Reference Page" in the table below for detailed corrective measures.

If the symptom is not remedied by the corrective measures described, or if the problem has not been described, contact your Shimadzu service representative.

Symptom	Typical Causes	Corrective Measures
Before Analysis		
The indicator LED is not lit, even though the power is ON.	The power cable is not plugged in.	Plug in the power cable into the outlet properly. *"9.3.1 Connecting the Instrument to the Power Outlet" P.267*
	The power supplied does not meet the specifications for the instrument.	Use a power supply that meets the power specifications for the instrument. *"9.3.1 Connecting the Instrument to the Power Outlet" P.267*
	A fuse has blown.	Replace the fuses as per *"6.3.10 Fuse Replacement" P.234*.
The instrument and PC are not connected.	The LAN cable is not connected.	Connect the LAN cable properly.
	The PC or instrument IP address is not set properly.	Set the IP address as per *"9.5.2 IP Address" P.274*.
	The instrument is being blocked by the PC's Windows firewall.	Confirm that the [MultiNA Control Software] check box has been selected on the [Exceptions] tab in the [Control Panel] - [Windows Firewall].
	Communications failed to initialize between the instrument and computer.	Switch the instrument power OFF and shut down the computer. Next, switch the instrument power ON. Lastly, boot the computer and try connecting again.
After Analysis Starts		
The baseline fluctuates.	Separation buffer and dye are not mixed evenly.	Add dye to a new batch of separation buffer, and agitate it sufficiently.
	Rinse water is insufficient.	Verify that there is rinse water in the glass rinse water bottle.

Symptom	Typical Causes	Corrective Measures
Analysis Results (Peak Resolution)		
Peaks do not separate.	The correct separation buffer is not used.	Check the reagent kit.
	The separation buffer or marker has deteriorated.	Verify that they have been stored at the specified temperature, and that they have not exceeded their "use by" date.
	The microchips have deteriorated.	Perform the procedure described in *"4.5.6 Check Analysis Performance" P.114* and then check the condition of the microchip. If the microchip fails in the inspection, perform the procedure described in *"6.2.9 Chip Cleaning" P.209* or replace the microchip with a new one.
	The sample concentration or salt concentration in the sample is too high.	Dilute the sample. Desalt the sample.
	An air bubble has formed in the syringe.	Examine the inside of the syringe according to *"6.3.4 Plunger Replacement" P.213*. If an air bubble has formed, remove the syringe, remove the air bubble (step **7**), and then reattach the syringe. If the symptom is not remedied, replace the syringe.
	The prescribed sample quantity is not added to the reservoir. The sample probe has deteriorated (due to blockage or bending).	Contact your Shimadzu service representative.
The ladder does not separate in the first analysis.	Microchip washing is insufficient. More than two weeks have elapsed since the last analysis was performed.	Before analysis, automatically rinse the microchips (see *"4.5.8 Wash" P.119*). Perform [Probe Rinse].
Analysis Results (Peak Detection Position)		
The peak detection position fluctuates for the same microchip.	The room temperature has changed suddenly.	Install the instrument in a room with as little thermal variation as possible.
	The correct separation buffer is not used.	Check the reagent kit used.
	The microchip is clogged.	Remove the microchips and rinse them with water as per *"6.2.6 Inspecting and Washing Microchip Reservoirs" P.204*. If the obstruction is not removed, replace with new microchips.
	Separation buffer and dye are not mixed evenly.	Agitate the separation buffer solution thoroughly.
There is a difference in peak detection times between multiple microchips.	A deteriorated microchip is used.	Contamination within the microchip channels can lead to slower peak detection times. Perform the procedure described in *"4.5.6 Check Analysis Performance" P.114* and then check the condition of the microchip. If the microchip fails in the inspection, perform the procedure described in *"6.2.9 Chip Cleaning" P.209* or replace the microchip with a new one.

Symptom	Typical Causes	Corrective Measures
Analysis Results (Peak Detection State)		
None of the microchips detect peaks for markers or samples.	Incorrect usage of microchips, reagent, rinse water, glass rinse water bottle, or waste container.	Verify that the microchips, reagent, rinse water, glass rinse water bottle, and waste containers have been used properly. If the problem reappears after confirmation, contact your Shimadzu service representative.
	The sample salt concentration is too high.	Check that the salt concentration in the sample is within the permissible salt concentration range of the reagent kit.
	The microchip surface is contaminated.	Check the microchip surfaces for contamination. If they are contaminated, rinse them (see *"6.2.6 Inspecting and Washing Microchip Reservoirs" P.204*).
Upper marker or lower marker peaks are detected, but the sample/ladder peaks are not.	The sample concentration is lower than the concentration limit of detection.	Check the specifications for the minimum concentration for the reagent kit used.
	The sample size is outside of the size range for the separation buffer.	Check the size range specifications for the reagent kit used.
	On-chip mixing mode: The volume of sample solution in the sample tubes is less than the prescribed quantity.	For on-chip mixing, provide at least 5 µL of sample. Attach the aluminum seal to the sample plate to prevent evaporation.
	On-chip mixing mode: The sample solution evaporates inside the instrument, reducing the volume.	Attach the aluminum seal to the sample plate.
Only lower marker peaks are detected. Upper marker and sample/ladder peaks are not detected.	Dye is not added to the separation buffer. The dye added to the separation buffer has deteriorated.	Use new separation buffer to which freshly prepared dye solution is added.
Although the lower marker and sample/ladder peaks are detected, the upper marker is not detected.	The marker solution has degraded.	Check whether the solution was stored at the specified temperature, whether the solution was excessively agitated in a vortex mixer, etc., or whether the solution is still within the recommended usage period.
	The sample concentration or salt concentration in the sample is too high.	Dilute the sample. Desalt the sample.
	Enzymes in the sample were not inactivated.	Inactivate the enzyme activity according to the manufacturer's instruction.
The sample/ladder peaks are detected, but the marker peaks are not.	Premix mode	The marker solution has not been mixed with the sample/ladder. Verify that the marker solution was mixed with the sample/ladder.
Analysis Results (Peak Height)		
There is a difference in peak detection sensitivity between chip positions.	The microchip surfaces are contaminated.	If the surfaces are contaminated, rinse them (see *"6.2.6 Inspecting and Washing Microchip Reservoirs" P.204*).
	Microchip flow channel positions are offset from the detector.	If the microchips were rinsed manually, verify that they are positioned properly in the chip frame (see *"6.2.6 Inspecting and Washing Microchip Reservoirs" P.204*).
	The objective lens is contaminated.	Clean the objective lens (see *"6.2.7 Chip Stage and Objective Lens" P.207*).
Analysis Results (Peak Recognition)		
Peaks other than the marker peaks are recognized as marker peaks.	Another peak near the marker is mistakenly recognized as the marker.	Set the correct marker peak using the [Manual Edit Mode] accessible from the [Reanalysis] menu in the Viewer window (see *"5.7.2 Manual Edit Mode" P.185*).

Symptom	Typical Causes	Corrective Measures
The ladder fragment peaks are confused with inappropriate peaks.	A peak not derived from the ladder is mistakenly recognized as a ladder-derived peak.	Set the correct fragment peak using the [Manual Edit Mode] accessible from the [Reanalysis] menu in the Viewer window (see *"5.7.2 Manual Edit Mode" P.185*).
Analysis Results (Size Accuracy)		
Analysis performance deviates from specification around the lower end of the size range.	The ladder size and target fragment size are too far separated from one another.	Use an optional ladder or user ladder instead. Adjust the diluted ladder solution according to the salt concentration of the sample. Because measurement peaks tend to be lower as salt concentration increases, increase the concentration of the ladder until peak detection is performed correctly. Ex) DNA-12000 Ladder concentration: 20 ng/μL Ladder salt concentration: 50 mM KCl Use a different type of calibration curve.
The estimated size value is different from the actual size.	The sample concentration is too high.	A high sample concentration can cause a small estimated size value. Dilute the sample.
	The nucleic acid in the sample was formed into structures.	If the nucleic acid in the sample is not linear, the estimated size value may differ from the actual size.
Printing		
The contents displayed in the print preview are not printed properly.	An older version of the printer driver is being used.	Obtain and install the newest printer driver from the printer manufacturer. If the problem persists, contact your Shimadzu service representative.

8.2 Error Messages

8.2.1 MultiNA Control Software

Errors are classified as "fatal", "error", or "warning" depending on the details. Point to [View] menu on the MultiNA window and select [Log]. The error details will be displayed even after the message window has been closed.

☞ Reference

"4.4.3 Log" P.105

Check the following items when an error message is displayed.

1 **Where did the error occur in the analysis schedule?**

Find the location of the error in the MultiNA window well status display or analysis schedule status display. The error location can also be found using the well display in Viewer window.

☞ Reference

"4.1.3 Well Status Display" P.75, *"4.1.4 Analysis Schedule List" P.76*, *"5.1.4 Well Display" P.129*

2 Where did the error occur in the instrument?

The source is displayed at the end of the error message (shown in the frame on the sample message in the figure below). The source can also be found by clicking [View] - [Log]. The source is noted in the [Source] column.

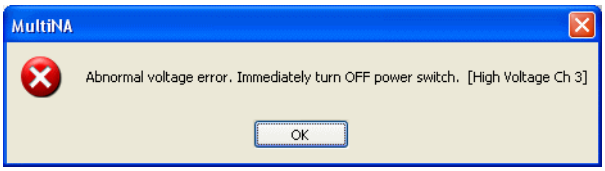
Typical causes and corrective measures are described by type and source of error.

If the same error occurs repeatedly even after taking the described corrective measures, or if a message occurs that is not described here, contact your Shimadzu service representative and explain the message details.

■ Fatal

A "fatal" error means that the instrument must be checked. Use of the instrument in its current state is either impossible or dangerous.

If this type of error occurs, the instrument immediately shuts down and a buzzer sounds until the instrument power supply is turned OFF. Immediately turn OFF the instrument power supply. Check the error message displayed on the PC and perform the corrective measures described in the following table.



Source	Message	Typical Causes and Corrective Measures
Temperature Control	**Temperature error. (Unchanged temperature) - Immediately turn OFF power switch.** | (Click [OK]) | Remove the microchips and wash them immediately.	**<Typical Causes>** • The environment temperature is outside the installation condition range (low temperature). • The chip base temperature fuse has blown. **<Instrument Operations>** The analysis schedule is immediately aborted. The microchips are not rinsed. **<Corrective Measures>** • Turn the instrument OFF immediately. • If the temperature in the installation environment is low, warm the room temperature using a heater to within the installation condition range (18 °C to 28 °C). • Wait until the inside of the instrument has warmed up and then turn the instrument back ON. If this fails to correct the error, turn the instrument OFF immediately. • Contact your Shimadzu service representative. • Open the top cover. • If the autosampler and pneumatic unit are at the home position, open the chip cover, remove the microchips, and wash them with water according to the procedure described in *"6.2.6 Inspecting and Washing Microchip Reservoirs" P.204*.
	Temperature error. (Initial temperature is below lower limit.) - Immediately turn OFF power switch.	**<Details>** The chip stage temperature was below the lower limit (10 °C). **<Typical Causes>** • The environment temperature is outside the installation condition range (low temperature). • The chip stage is cold because the instrument was stored in a low temperature environment. **<Instrument Operations>** The temperature control function has not started. **<Corrective Measures>** • Immediately turn OFF the instrument power supply. • If the temperature in the installation environment is low, warm the room temperature using a heater to within the installation condition range (18 °C to 28 °C). • Wait until the inside of the instrument has warmed up and then turn the instrument back ON. If this fails to correct the error, contact your Shimadzu service representative.

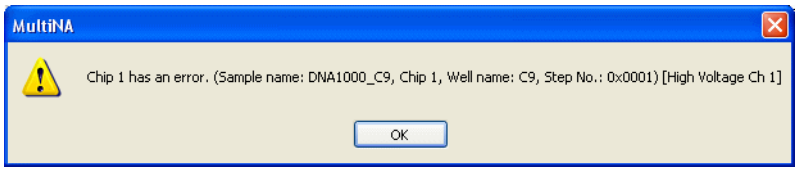
Source	Message	Typical Causes and Corrective Measures
Communi-cation Port (M)	**Transmit retry error. Immediately turn OFF power switch.** | (Click [OK]) | Remove the microchips and wash them immediately.	**<Typical Causes>** The instrument has communication fault with local system. **<Instrument Operations>** The analysis schedule is immediately aborted. The microchips are not rinsed. **<Corrective Measures>** • Turn the instrument OFF immediately. • Contact your Shimadzu service representative. • Open the top cover. • If the autosampler and pneumatic unit are at the home position, open the chip cover, remove the microchips, and wash them with water according to the procedure described in *"6.2.6 Inspecting and Washing Microchip Reservoirs" P.204*.
High Voltage ch1 High Voltage ch2 High Voltage ch3 High Voltage ch4	**Abnormal voltage error. Immediately turn OFF power switch.** | (Click [OK]) | Remove the microchips and wash them immediately.	**<Details>** A constant voltage was detected when no high voltage was applied or, the voltage detected was outside of the specified range. **<Typical Causes>** Malfunction of the high voltage board **<Instrument Operations>** The analysis schedule is immediately aborted. The microchips are not rinsed. **<Corrective Measures>** • Turn the instrument OFF immediately. • Contact your Shimadzu service representative. • Open the top cover. • If the autosampler and pneumatic unit are at the home position, open the chip cover, remove the microchips, and wash them with water according to the procedure described in *"6.2.6 Inspecting and Washing Microchip Reservoirs" P.204*.
Power	**24 V power supply error. Immediately turn OFF power switch.** | (Click [OK]) | Remove the microchips and wash them immediately.	**<Details>** The voltage of the 24 V internal power supply exceeded the normal range during operation. **<Typical Causes>** The control PCB or power supply unit is broken. **<Instrument Operations>** The analysis schedule is immediately aborted. The microchips are not rinsed. **<Corrective Measures>** • Turn the instrument OFF immediately. • Contact your Shimadzu service representative. • Open the top cover. • If the autosampler and pneumatic unit are at the home position, open the chip cover, remove the microchips, and wash them with water according to the procedure described in *"6.2.6 Inspecting and Washing Microchip Reservoirs" P.204*.
	15 V power supply error. Immediately turn OFF power switch. | (Click [OK]) | Remove the microchips and wash them immediately.	**<Details>** The voltage of the 15 V internal power supply exceeded the normal range during operation. **<Typical Causes>** The control PCB or power supply unit is broken. **<Instrument Operations>** The analysis schedule is immediately aborted. The microchips are not rinsed. **<Corrective Measures>** • Turn the instrument OFF immediately. • Contact your Shimadzu service representative. • Open the top cover. • If the autosampler and pneumatic unit are at the home position, open the chip cover, remove the microchips, and wash them with water according to the procedure described in *"6.2.6 Inspecting and Washing Microchip Reservoirs" P.204*.

■ Error

The "error" category refers to a problem that renders continued automatic analysis impossible.

There are two types depending on the details: "aborted immediately" and "analysis will be completed for samples now loading or under analysis".

In some cases automatic rinsing (which includes rinsing the chips with water) is performed before analysis completion, while in other cases, it is not performed.



Source	Message	Typical Causes and Corrective Measures
(Not Displayed) Error occurs before analysis begins.	**Cannot start analysis schedule. + 24 V DC power supply is not ready.**	**<Details>** The internal control voltage did not stabilize. **<Typical Causes>** • The power supply is broken. • Analysis was started immediately after turning the power ON or immediately after waking from sleep mode. **<Instrument Operations>** Analysis does not start. **<Corrective Measures>** • Wait for about 10 seconds and then start the analysis again. • If analysis still does not start, turn the instrument power OFF once and then turn it back ON again. If the corrective measure above does not solve the problem, contact your Shimadzu service representative.
	Cannot start analysis schedule. + 15 V DC power supply is not ready.	**<Details>** The internal control voltage did not stabilize. **<Typical Causes>** • The power supply is broken. • Analysis was started immediately after turning the power ON or immediately after waking from sleep mode. **<Instrument Operations>** Analysis does not start. **<Corrective Measures>** • Wait for about 10 seconds and then start the analysis again. • If analysis still does not start, turn the instrument power OFF once and then turn it back ON again. If the corrective measure above does not solve the problem, contact your Shimadzu service representative.

Source	Message	Typical Causes and Corrective Measures
(Not Displayed) The error occurs during analysis confirmation.	**Cannot continue. Sample holder is not present.**	**<Typical Causes>** • The sample holder is not properly installed. • The sensor that detects the sample holder is broken. • The number of runs for the sample probe has exceeded the replacement guideline. **<Instrument Operations>** Analysis does not start. **<Corrective Measures>** Verify that the sample holder is properly installed (*"3.5.4 Sample Holder Installation" P.50*). If the problem is not corrected, contact your Shimadzu service representative.
	Cannot continue. Chip # is not present.	**<Typical Causes>** • The microchips specified in the [Chip Management] window are not properly installed. • The sample probe is damaged. • The sensor that detects microchips is broken. • The number of runs for the sample probe has exceeded the replacement guideline. **<Instrument Operations>** Analysis does not start. **<Corrective Measures>** Verify that the microchips are properly installed. (*"3.3.5 Microchip Installation" P.32*). If the problem is not corrected, contact your Shimadzu service representative.
	Cannot continue. Remaining amount of separation buffer xxxx is not sufficient.	**<Details>** The volume of separation buffer in the reagent holder is deemed to be less than the required amount as a result of liquid level detection by the sample probe. **<Typical Causes>** • Separation buffer is placed at an incorrect position. • The volume of separation buffer placed in the reagent holder was insufficient. • The sample probe is bent. • The sensor that detects the liquid level is broken. **<Instrument Operations>** Analysis does not start. **<Corrective Measures>** Dispense at least the required amount of separation buffer into a recommended container, and place it in the correct reagent holder position (*"4.1.6 Reagent Information" P.77*). If the problem is not corrected, contact your Shimadzu service representative.
	Cannot continue. Remaining amount of marker solution xxxx is not sufficient.	**<Details>** The volume of marker solution in the reagent holder is deemed to be less than the required amount as a result of liquid level detection by the sample probe. **<Typical Causes>** • Marker solution is placed at an incorrect position. • The volume of marker solution placed in the reagent holder was insufficient. • The sample probe is bent. • The sensor that detects the liquid level is broken. **<Instrument Operations>** Analysis does not start. **<Corrective Measures>** Dispense at least the required amount of separation buffer into a recommended container, and place it in the correct reagent holder position (*"4.1.6 Reagent Information" P.77*). If the problem is not corrected, contact your Shimadzu service representative.

Source	Message	Typical Causes and Corrective Measures
(Not Displayed) The error occurs during analysis confirmation.	**Cannot continue. Remaining amount of chip cleaning solution is not sufficient.**	**<Details>** The volume of chip cleaning solution in the reagent holder is deemed to be less than the required amount as a result of liquid level detection by the sample probe. **<Typical Causes>** • Chip cleaning solution was placed at an incorrect position. • The volume of chip cleaning solution placed in the reagent holder was insufficient. • The sample probe is bent. • The sensor that detects the liquid level is broken. **<Instrument Operations>** Analysis does not start. **<Corrective Measures>** Dispense at least the required amount of chip cleaning solution into a recommended container, and place it in the correct reagent holder position (*"4.1.6 Reagent Information" P.77*). If the problem is not corrected, contact your Shimadzu service representative.
I/O	**Top cover switch error. Immediately turn OFF power switch.** | (Click [OK]) | Remove the microchips and wash them immediately.	**<Typical Causes>** The top cover has opened during operation or it was not closed securely. **<Instrument Operations>** The analysis schedule is immediately aborted. The microchips are not rinsed. **<Corrective Measures>** (1) Open the top cover, and close it again securely. (2) Perform the procedures in *"4.5.5 Move All Axes to Home Position" P.114*. (3) Open the top cover and chip cover, remove the microchips, and rinse them according to *"6.2.6 Inspecting and Washing Microchip Reservoirs" P.204*. (4) Reenter the analysis schedule before proceeding with analysis. If the problem is not corrected, contact your Shimadzu service representative.
	Chip cover switch error. Immediately turn OFF power switch. | (Click [OK]) | Remove the microchips and wash them immediately.	**<Typical Causes>** The chip cover has opened during operation or it was not closed securely. **<Instrument Operations>** The analysis schedule is immediately aborted. The microchips are not rinsed. **<Corrective Measures>** (1) Open the top cover, and securely close the chip cover. (2) Close the top cover, and perform the procedures in *"4.5.5 Move All Axes to Home Position" P.114* (3) Open the top cover and chip cover, remove the microchips, and rinse them according to *"6.2.6 Inspecting and Washing Microchip Reservoirs" P.204*. (4) Reenter the analysis schedule before proceeding with analysis. If the problem is not corrected, contact your Shimadzu service representative.

Source	Message	Typical Causes and Corrective Measures
Autosampler X Autosampler Y Autosampler Z Syringe unit Pneumatic unit Y Pneumatic unit Z	**Home position sensing error.** | (Click [OK]) | (After finishing analysis schedule) Remove the microchips and wash them immediately.	**<Typical Causes>** The position of drives is out of alignment due to interference, wear, or vibration. **<Instrument Operations>** Analysis of the sample is aborted at the time the error occurred. Analysis is completed for the samples currently under analysis or now loading. Then the analysis schedule is aborted. The microchips are not rinsed. **<Corrective Measures>** (1) Open the top cover, and determine if the axes are interfering with each other. (2) If no interference is found, close the top cover, and perform the procedures in *"4.5.5 Move All Axes to Home Position" P.114*. (3) Open the top cover and chip cover, remove the microchips, and rinse them according to *"6.2.6 Inspecting and Washing Microchip Reservoirs" P.204*. (4) Contact your Shimadzu service representative.
Autosampler Z	**Level sensor detection error. (Detection area ended)** | (Click [OK]) | (After finishing analysis schedule) Remove the microchips and wash them immediately.	**<Typical Causes>** • Leaks or evaporation have depleted the reagent volume. • The sensor that detects the liquid level is broken. **<Instrument Operations>** Analysis of the sample is aborted at the time the error occurred. Analysis is completed for the samples currently under analysis or now loading. Then the analysis schedule is aborted. The microchips are not rinsed. **<Corrective Measures>** (1) Open the top cover, and determine if the axes are interfering with each other. (2) If no interference is found, close the top cover, and perform the procedures in *"4.5.5 Move All Axes to Home Position" P.114*. (3) Open the top cover and chip cover, remove the microchips, and rinse them according to *"6.2.6 Inspecting and Washing Microchip Reservoirs" P.204*. (4) Reenter the analysis schedule before proceeding with analysis. If the problem is not corrected, contact your Shimadzu service representative.
Autosampler Z	**Level sensor detection error. (Inconsistent amount of liquid)** | (Click [OK]) | (After finishing analysis schedule) Remove chips and wash them immediately.	**<Typical Causes>** • The level of the separation buffer or marker solution has risen. • Liquid remained in the microchip reservoir after an aspirator suction operation. • The sample probe is blocked by foreign material. **<Instrument Operations>** Analysis of the sample is aborted at the time the error occurred. Analysis is completed for the samples currently under analysis or now loading. Then the analysis schedule is aborted. The microchips are not rinsed. **<Corrective Measures>** (1) Open the top cover, and determine if the axes are interfering with each other. (2) If no interference is found, close the top cover, and perform the procedures in *"4.5.5 Move All Axes to Home Position" P.114*. (3) Open the top cover and chip cover, remove the microchips, and rinse them according to *"6.2.6 Inspecting and Washing Microchip Reservoirs" P.204*. (4) Reenter the analysis schedule before proceeding with analysis. If the problem is not corrected, contact your Shimadzu service representative.

Source	Message	Typical Causes and Corrective Measures
Autosampler Z	**Shock sensor detection error. (Detection fault)** | (Click [OK]) | (After finishing analysis schedule) Remove chips and wash them immediately.	**<Typical Causes>** The sample plate or sample tube is not properly installed. **<Instrument Operations>** Analysis of the sample is aborted at the time the error occurred. Analysis is completed for the samples currently under analysis or now loading. Then the analysis schedule is aborted. The microchips are not rinsed. **<Corrective Measures>** (1) Open the top cover, and determine if the axes are interfering with each other. (2) If no interference is found, close the top cover, and perform the procedures in *"4.5.5 Move All Axes to Home Position" P.114*. (3) Open the top cover and chip cover, remove the microchips, and rinse them according to *"6.2.6 Inspecting and Washing Microchip Reservoirs" P.204*. (4) Properly position the sample, and reenter the analysis schedule before proceeding with analysis. If the problem is not corrected, contact your Shimadzu service representative.
Autosampler X Autosampler Y Autosampler Z	**Shock sensor detection error. (False detection)** | (Click [OK]) | (After finishing analysis schedule) Remove chips and wash them immediately.	**<Typical Causes>** • The sample holder is not properly installed. • The shock sensor is blocked by foreign material. **<Instrument Operations>** Analysis of the sample is aborted at the time the error occurred. Analysis is completed for the samples currently under analysis or now loading. Then the analysis schedule is aborted. The microchips are not rinsed. **<Corrective Measures>** (1) Open the top cover. Check on the sample holder installation and for drive axis interference. (2) If no interference is found, close the top cover, and perform the procedures in *"4.5.5 Move All Axes to Home Position" P.114*. (3) Open the top cover and chip cover, remove the microchips, and rinse them according to *"6.2.6 Inspecting and Washing Microchip Reservoirs" P.204*. (4) Properly install the sample holder, and reenter the analysis schedule before proceeding with analysis. If the problem is not corrected, contact your Shimadzu service representative.
Temperature Control	**Temperature error. (Temperature exceeds upper limit.)**	**<Typical Causes>** The environment temperature is outside the installation condition range (high temperature). **<Instrument Operations>** The analysis schedule is not aborted. The microchips are rinsed. **<Corrective Measures>** • If the temperature in the installation environment is high, cool the room temperature using a cooler to within the installation condition range (18 °C to 28 °C). If the problem is not corrected, contact your Shimadzu service representative.
	Temperature timeout error.	**<Typical Causes>** • The environment temperature is outside the installation condition range (low temperature). • The chip base temperature fuse is blown. **<Instrument Operations>** The analysis schedule is not aborted. The microchips are rinsed. **<Corrective Measures>** • Turn the instrument OFF, and then turn it ON again. • If the temperature in the installation environment is low, warm the room temperature using a heater to within the installation condition range (18 °C to 28 °C). If the problem is not corrected, contact your Shimadzu service representative.

Source	Message	Typical Causes and Corrective Measures
Network Connection	**Failed to connect to port 1.**	**<Typical Causes>** Communication between the instrument and PC could not be performed. **<Corrective Measures>** 1) Verify that the instrument is ON and that the instrument and PC are properly connected by a LAN cable. 2) Then connect them according to *"3.2 Startup and Shutdown" P.22*. If the problem is not corrected, contact your Shimadzu service representative.
	No response from port 1. Connection closed. | (Click [OK]) | Connection error. Unable to check chip status. Remove the microchips and immediately wash them.	**<Typical Causes>** During communication between the instrument and PC, communication from the instrument was disrupted for more than 10 seconds so the connection was closed. **<Instrument Operations>** The analysis schedule is interrupted during execution. If the instrument is operable, the microchips are rinsed. **<Corrective Measures>** 1) Verify that the instrument is ON and that the instrument and PC are properly connected by a LAN cable. 2) Establish a connection according to the procedure described in *"3.2 Startup and Shutdown" P.22*. 3) If the instrument is in an operable state, return the drives to the home position according to the procedure described in *"6.1.1 Moving All Axes to Home Position" P.198*. If the problem is not corrected, contact your Shimadzu service representative.
	No transmission from port 2. Connection closed. | (Click [OK]) | Connection error. Unable to check chip status. Remove the microchips and immediately wash them.	**<Typical Causes>** During communication between the instrument and PC, communication from the instrument was disrupted for more than 10 seconds so the connection was closed. **<Instrument Operations>** The analysis schedule is interrupted during execution. If the instrument is operable, the microchips are rinsed automatically. **<Corrective Measures>** 1) Verify that the instrument is ON and that the instrument and PC are properly connected by a LAN cable. 2) Establish a connection according to the procedure described in *"3.2 Startup and Shutdown" P.22*. 3) If the instrument is in an operable state, return the drives to the home position according to the procedure described in *"6.1.1 Moving All Axes to Home Position" P.198*. If the problem is not corrected, contact your Shimadzu service representative.

Source	Message	Typical Causes and Corrective Measures
High Voltage ch1 High Voltage ch2 High Voltage ch3 High Voltage ch4	**Chip # has an error.** | (Clicking [OK]) | (At analysis schedule end) **Error occurred. Chip # is now unavailable.**	**<Details>** The test current value for the chip that generated "fill check NG" was also outside the standard range after the separation buffer refill. **<Instrument Operations>** The microchip that generated the error is washed automatically and becomes unavailable in the software. The analysis schedule is rescheduled and continues to execute only using the available microchips. **<Corrective Measures>** • After analysis, open the top cover and chip cover and remove the affected microchip. • Confirm that it is unobstructed according to the procedure described in *"6.2.6 Inspecting and Washing Microchip Reservoirs" P.204*. • To reuse a microchip that was unobstructed (or for which the blockage was resolved), clear the unavailable state according to the procedure described in *"4.5.3 Chip Management" P.110*.
	Overcurrent error.	**<Details>** An excessive current value was detected. **<Typical Causes>** • A short circuit was caused by leaking separation buffer or sample solution on the microchip surface where the sample's salt concentration was outside the specification range. **<Instrument Operations>** Analysis is aborted for the sample being analyzed at the time the error occurred. Subsequent sample analyses proceed, ending with automatic rinsing of the microchips. **<Corrective Measures>** • Check that the salt concentration of the sample is within the specification range. • After analysis is complete, check the microchip surfaces and chip stage for separation buffer or sample solution. If spillage occurred, clean the microchips and chip stage according to the procedure described in *"6.2.6 Inspecting and Washing Microchip Reservoirs" P.204* and *"6.2.7 Chip Stage and Objective Lens" P.207*.
	Undercurrent error.	**<Details>** An insufficient current value has been detected. **<Typical Causes>** • The microchip was clogged. • Air bubbles were mixed into the separation channel. **<Instrument Operations>** Analysis is aborted for the sample being analyzed at the time the error occurred. Subsequent sample analyses proceed, ending with automatic rinsing of the microchips. **<Corrective Measures>** • Return the drives to home position as in *"6.1.1 Moving All Axes to Home Position" P.198*. • Open the top cover and chip cover and remove the affected microchip. • Rinse the microchips according to the procedure described in *"6.2.6 Inspecting and Washing Microchip Reservoirs" P.204*.

Source	Message	Typical Causes and Corrective Measures
High Voltage ch1 High Voltage ch2 High Voltage ch3 High Voltage ch4	**Current accuracy error** | (Click [OK]) | (At analysis schedule end) **Error occurred. Chip # is now unavailable.**	**<Typical Causes>** The HV voltage monitor value has fallen outside the specified range. **<Instrument Operations>** The microchip that generated the error is washed automatically and becomes unavailable in the software. The analysis schedule is rescheduled and continues to execute only using the available microchips. **<Corrective Measures>** • After analysis, open the top cover and chip cover and remove the affected microchip. • Confirm that it is unobstructed according to the procedure described in *"6.2.6 Inspecting and Washing Microchip Reservoirs" P.204*. • To reuse a microchip that was unobstructed (or for which the blockage was resolved), clear the unavailable state according to the procedure described in *"4.5.3 Chip Management" P.110*.
Detector ch1 Detector ch2 Detector ch3 Detector ch4	Cannot detect usable signal. | (Click [OK]) | (At analysis schedule end) **Error occurred. Chip # is now unavailable.**	**<Details>** A significant signal was not detected after a certain period after migration start. **<Typical Causes>** • No dye added to the separation buffer. • Malfunction of the detector **<Instrument Operations>** The microchip that generated the error is washed automatically and becomes unavailable in the software. The analysis schedule is rescheduled and continues to execute only using the available microchips. **<Corrective Measures>** • After analysis, open the top cover and chip cover and remove the affected microchip. • Confirm that it is unobstructed according to the procedure described in *"6.2.6 Inspecting and Washing Microchip Reservoirs" P.204*. • To reuse a microchip that was unobstructed (or for which the blockage was resolved), clear the unavailable state according to the procedure described in *"4.5.3 Chip Management" P.110*.
	Signal exceeded measurement limit. | (Click [OK]) | (At analysis schedule end) **Error occurred. Chip # is now unavailable.**	**<Details>** A signal outside the measurement range continued for a given length of time. **<Typical Causes>** • The concentration of dye in the separation buffer was incorrect. • The sample concentration is outside the specification range. • Stray light entered the detection unit or the detection unit is broken. **<Instrument Operations>** The microchip that generated the error is washed automatically and becomes unavailable in the software. The analysis schedule is rescheduled and continues to execute only using the available microchips. **<Corrective Measures>** • Check that conditions such as the separation buffer mix and sample concentration are correct. • After analysis, open the top cover and chip cover and remove the affected microchip. • Confirm that it is unobstructed and the surface is not contaminated according to the procedure described in *"6.2.6 Inspecting and Washing Microchip Reservoirs" P.204*. • To reuse a microchip that was unobstructed (or for which the blockage was resolved), clear the unavailable state according to the procedure described in *"4.5.3 Chip Management" P.110*.

■ Warning

A "warning" error means that while automatic analysis may continue, there may be an influence on the data.

Accurate results may not be obtainable if a "warning" occurs during the analysis sequence. Examine the analysis results, and repeat the analysis if there is a problem.

Source	Message	Cause and Actions
High Voltage ch1 High Voltage ch2 High Voltage ch3 High Voltage ch4	**Chip # filling check error.**	**<Details>** The test current value for the microchip at chip stage number # was also outside the standard range after the separation buffer fill. **<Typical Causes>** • Microchip obstruction • The separation buffer used was different to the separation buffer registered in the schedule. **<Instrument Operations>** The analysis schedule continues. The applicable microchip is refilled with separation buffer.
	Current accuracy error	**<Details>** The HV current monitor value was outside the specification range. **<Typical Causes>** • The salt concentration of the sample was outside the usable range. • The reagent kit used was different to the reagent kit registered in the schedule. **<Instrument Operations>** • Analysis schedule execution continues.

8.2.2 MultiNA Viewer Data Analysis Software

If the symptom is not remedied by the corrective measures described, or if the problem has not been described, contact your Shimadzu service representative.

Message	Typical Causes	Corrective Measures
File-Related Messages		
File: (File name) is already opened by another MultiNA Viewer program. OK to open file in read-only mode?	The selected file is already open in another instance of MultiNA Viewer.	Click [OK] to open the file in read-only mode. Click [Cancel] to cancel the file open process.
To view analyzed data, select [Automatic] from [Reanalysis] menu.	There is no analysis (*.MLA) data file associated with the selected raw (*.MLT) data file.	Select [Automatic] on the [Reanalysis] menu and click [Standard] to generate an analysis (*.MLA) data file.
Some samples do not have a usable ladder. To estimate the sample's size or concentration, select [Change Ladder and Analyze] on the [Reanalysis] menu.	A ladder is not entered in the analysis schedule or the ladder analysis failed. As a result, there are samples with no usable ladder for analysis in the data file.	Click [Change Ladder and Analyze] on the [Reanalysis] menu to add a previously analyzed ladder file and reanalyze the data.
Cannot open file: (File name)	The file is deleted, or the network connection has been lost. As a result, the file to open does not exist or is unreadable.	Use Windows [Explorer] to confirm the existence of the file, and determine if it is readable.
Cannot write to folder. File will be opened in read-only mode.	The data file to open is located in a read-only folder.	Examine the write protection settings for the folder, and the remaining disk space.
This file is already open in another folder.	A data file with the same name in another folder is already open.	Close the file with the same name, and then reopen the intended file.
File cannot be saved using the same name as another file that is open in MultiNA Viewer. Specify a different name.	The name of the file to be saved is the same as that of another file already open in MultiNA Viewer.	Specify another file name or close the other open file before saving.
Insufficient memory. Close other applications or files and retry.	PC memory is insufficient while there was an attempt to open a file during analysis, or the user clicked [View] - [Refresh] during analysis.	Close the other files open in MultiNA Viewer, or close any other applications to free up PC memory. Then repeat the operations. If this memory appears frequently, a PC memory upgrade is recommended.
Cannot create CSV file.	During export, a CSV file could not be created. This is because HDD space is insufficient, or the folder is write protected.	Check the remaining disk space and the folder write permission settings.
Reanalysis Messages		
Separation buffer types are different. Cannot change ladder.	The user clicked [Change Ladder and Analyze] to specify a ladder file, but selected a ladder obtained with a different type of separation buffer.	Select a ladder obtained with the same type of separation buffer (and the same microchip (ID).
Chip ID is different. Cannot change ladder.	The user clicked [Change Ladder and Analyze] to specify a ladder file, but selected a ladder obtained with a different microchip (ID).	Select a ladder obtained with the same microchip ID (and same type of separation buffer).
Ladder validation failed. Cannot change ladder.	The user clicked [Change Ladder and Analyze], but the ladder analysis results for the file specified are inappropriate.	Preview the ladder file and select a ladder for which appropriate peaks and analysis results are obtained.

Message	Typical Causes	Corrective Measures
Cannot load LDR file.	The user clicked [Change Ladder and Analyze] and selected a corrupted ladder file.	Select another ladder obtained with the same microchip ID and type of separation buffer If the problem persists, contact your Shimadzu service representative.
Error occurred while processing ladder.	A program error occurred when opening the ladder file.	Restart the program or the PC. If the problem persists, contact your Shimadzu service representative.
Error occurred while adding peak.	A program error occurred when the user selected [Manual Edit Mode] and added a peak.	Restart the program or the PC. If the problem persists, contact your Shimadzu service representative.
Error occurred while deleting peak.	A program error occurred when the user selected [Manual Edit Mode] and deleted a peak.	Restart the program or the PC. If the problem persists, contact your Shimadzu service representative.
Error occurred while changing peak information.	A program error occurred when the user selected [Manual Edit Mode] and configured a marker peak.	Restart the program or the PC. If the problem persists, contact your Shimadzu service representative.
Error occurred while setting to 18S rRNA peak.	A program error occurred when the user selected [Manual Edit Mode] and configured 18S rRNA.	Restart the program or the PC. If the problem persists, contact your Shimadzu service representative.
Error occurred while setting to 28S rRNA peak.	A program error occurred when the user selected [Manual Edit Mode] and configured 28S rRNA.	Restart the program or the PC. If the problem persists, contact your Shimadzu service representative.
Error occurred while setting to lower marker.	A program error occurred when the user selected [Manual Edit Mode] and configured a lower marker.	Restart the program or the PC. If the problem persists, contact your Shimadzu service representative.
Error occurred while setting to upper marker.	A program error occurred when the user selected [Manual Edit Mode] and configured a upper marker.	Restart the program or the PC. If the problem persists, contact your Shimadzu service representative.
Cannot register changes to sample/ ladder (Sample No.,welll name) due to the following errors.	The following error occurred when the user selected [Manual Edit Mode] and edited the sample or ladder peaks.	
• Too many ladder data peaks (ladder fragments and markers). Delete peak(s) from ladder data.	The number of peaks is larger than the number of detected ladder fragments.	Delete all except the ladder fragment peaks.
• Not enough ladder data peaks (ladder fragments and markers). Add peak(s) to ladder data.	The number of peaks is smaller than the number of detected ladder fragments.	Add ladder fragment peaks.
• Invalid ladder data. Edit ladder or select [Change Ladder and Analyze] from [Reanalysis] menu.	No marker or fragment peaks are detected for the configured ladder.	Select [Manual edit Mode] and reconfigure the ladder data marker and fragment peaks, or click [Change Ladder and Analyze] and repeat the analysis using other ladder data.
• Upper marker not found. Designate the upper marker.	An upper marker peak is not detected.	Add an appropriate peak for the upper marker.
• Lower marker not found. Designate the lower marker.	A lower marker peak is not detected.	Add an appropriate peak for the lower marker.
Cannot load analysis parameters.	"Parameter.ini", a file required during analysis, could not be read.	Reinstall the program from the MultiNA software CD-ROM provided.
Error occurred while processing sample.	A program error occurred during analysis.	Restart the program or the PC. If the problem persists, contact your Shimadzu service representative.

Message	Typical Causes	Corrective Measures
Error occurred while reanalyzing.	A program error occurred during reanalysis.	Restart the program or the PC. If the problem persists, contact your Shimadzu service representative.
Cannot save LDR file.	Ladder analysis data cannot be saved to a file. • The HDD may be full. • The folder may be write protected.	Check the remaining disk space and the folder write permission settings.
Cannot save MLA file.	The analysis data cannot be saved to a file. • The HDD may be full. • The folder may be write protected.	Check the remaining disk space and the folder write permission settings.
[Comparison] Messages		
Added data has not been analyzed. Cannot compare. **Comparison data has not been analyzed. Cannot compare.**	The analysis data or file is being compared to a file that does not contain analysis data.	For the file with no analysis data, select [Reanalysis] - [Automatic] to create analysis data, and the proceed with comparison.
Separation buffer types are different. Cannot compare.	An attempt is being made to compare data from different separation buffers.	Select data with the same separation buffers for comparison.
Cannot add data to comparison - exceeds upper limit (120 entries).	An attempt is being made to add more than 120 data entries to the compare table.	Delete unnecessary data before adding entries.
Messages Related to Analysis Performance Check Results		
To view analysis performance check results, select [Automatic] from [Reanalysis] menu.	The analysis file contains only raw (*.MLT) data, but no corresponding analysis (*.MLA) data.	Select [Automatic] on the [Reanalysis] menu and click [Standard] to generate analysis data.
Cannot start 'Notepad' program.	"Notepad.exe" required to display the analysis performance inspection results, cannot be opened.	If "Notepad.exe" does not exist, install it on the PC from the Windows CD-ROM. If "Notepad.exe" does exist but the problem persists, contact your Shimadzu service representative.
Failed to create log file.	The analysis performance inspection results cannot be saved to a file. • The HDD may be full. • The folder may be write protected.	Check the remaining disk space and the folder write permission settings.
Cannot read current data.	The analysis performance check results cannot be displayed. The analysis data file is likely corrupted.	Repeat the analysis performance check with the MultiNA Control Software.
Current data length is short.	The analysis performance check results cannot be displayed. The analysis data file is likely corrupted.	Repeat the analysis performance check with the MultiNA Control Software.
Other Messages		
Printer is not installed. Cannot print.	The user has attempted to print, but no printer has been configured in Windows.	Configure a printer in Windows before printing.
No help files found. Install these files from MultiNA Setup CD-ROM.	The help files are not in the program folder, or they are corrupted.	Install the files using the provided MultiNA software CD-ROM.

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9 Installation

This instrument will be installed and adjusted by a Shimadzu technician or field engineer. To ensure safe product operation, read and follow all of the WARNING and CAUTION instructions given in this section. Install the instrument in a proper location.

9.1 Installation Site

9.1.1 Installation Site Preparation

To ensure safe and proper use of this instrument, observe the following conditions and install the instrument in a proper location.

⚠ WARNING

- Fire is prohibited in the vicinity of the instrument.

  Fire must not be used at the site where the instrument is installed. In addition, avoid installation in the same room with equipment that generates sparks. Do NOT use flammable sprays (such as hairsprays or aerosol insecticides) or flammable solvents in the vicinity of this instrument. Provide fire extinguishers in case of an emergency.

- Install a sink in the vicinity of this instrument.

  If reagent chemicals come in contact with the eyes or skin during operation, flush them away immediately with a large quantity of water. A sink should be installed in the vicinity of this equipment if at all possible.

⚠ CAUTION

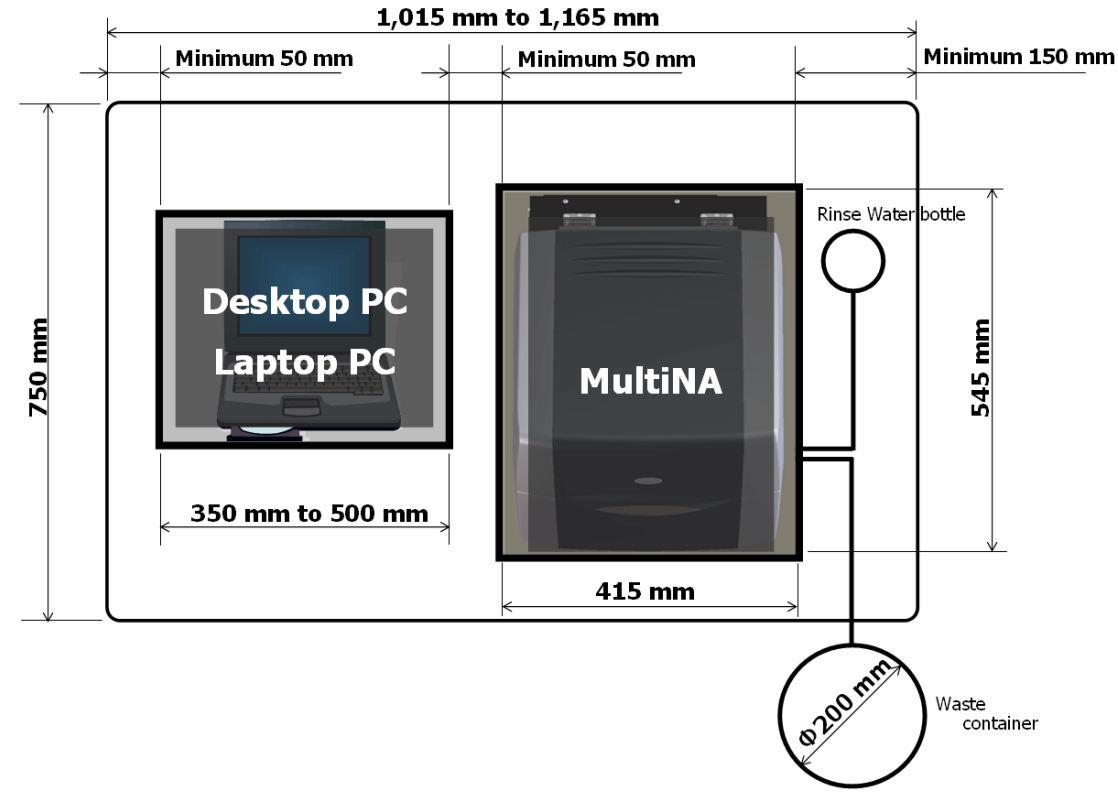
- Installation of the instrument is prohibited at sites exposed to corrosive gases, or to significant debris and dust.
  To ensure the life of the instrument and to maintain its operation, avoid installation at sites exposed to corrosive gases or to significant debris and dust.
- Do NOT install the instrument near equipment that generates strong magnetic fields.
  To ensure normal operation of this instrument, avoid installation at sites subject to strong magnetic fields. In addition, install power line noise filters if there is significant noise from the power source.
- To maintain performance, observe the following site conditions.
  - Rooms with an ambient temperature between 18°C and 28°C, and minimal daily temperature fluctuations
    If the ambient temperature exceeds 28°C, a temperature control error can occur and instrument operation may stop.
  - Sites where the instrument is protected from direct exposure to drafts from coolers, heaters or air conditioners
  - Sites protected from exposure to direct sunlight
  - Sites not exposed to vibrations
  - Sites where humidity is maintained between 40% and 80%
  - Sites where condensation does not occur
  - Sites with a maximum altitude of 2000 m.
- During analysis, ensure that the drain tube ports and the gap between the top cover and the instrument are not directly exposed to light sources, such as desktop fluorescent lamps, flashlights, and camera flashes.
  This may interfere with the operation of the detector and result in noise.

9.1.2 Installation Space

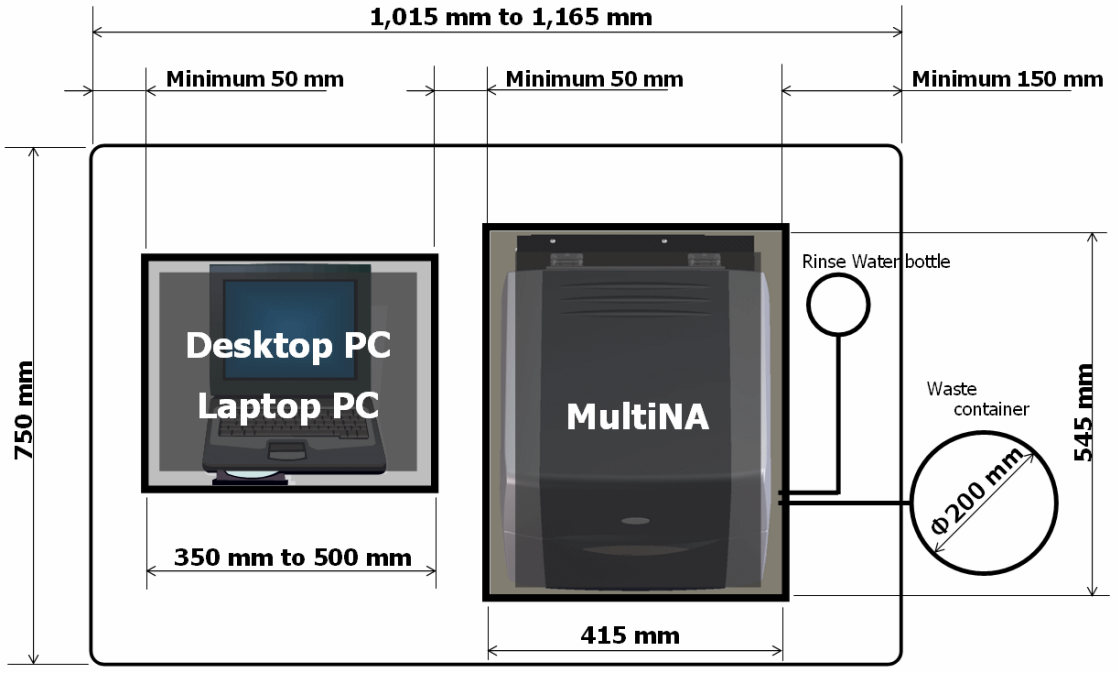
⚠ CAUTION

- This instrument weighs 43 kg. When installing the system, consider the total weight including PC and other system.
  Install the instrument on a flat, stable desk or stand, capable of supporting the total system weight.
- Install the instrument on a flat desk or stand.
  If the instrument is placed on a surface which is not horizontal, the analysis performance will be adversely affected.
- Installation space for the instrument, PC, and glass rinse water bottle must be at least 1,015 mm to 1,165 mm W (if a desktop PC is used) by 600 mm D by 980 mm H.
  (See *" Example Installation 1: Waste container positioned in front of the instrument" P.264*.)
  These dimensions do not include the waste container, which is placed on the floor. The height reflects the maximum size with the cover open.
- When installing the instrument against a wall, leave a gap of at least 50 mm between the rear of the instrument and the wall.
  If this condition is not met, fan-driven air cooling will not be sufficient and the instrument may overheat, reducing performance. In addition, it will not be possible to fully open the top cover.
- Install the instrument at a site where the rear of the instrument can be accessed easily.
  The syringe cover on the rear of the instrument must be opened when replacing the syringe or plunger.
- Ensure at least a 100 mm space in front of the instrument.
  The front cover must be opened to replace the pump cartridges.
- When installing the instrument, leave enough space to operate the power switch at the bottom right side at the back.
  The power must be turned OFF quickly in the event of a problem with the instrument or other emergency.
- Place the waste container on the floor.
  Waste fluid is conveyed to the waste container by the difference in water level. Install the container at a position lower than the instrument.
- Note the following cautions regarding the waste tubing. Cut the tubing as necessary to suit the installation site.
  - The tubing should not be bent.
  - The tubing should not be elevated.
  - The tip of the tubing should not be immersed in the waste fluid inside the waste container.
- If necessary, install safety fasteners and other earthquake measures.
  Recommended product: Part No. S037-62401-03, FASTENER, RT-400 GRAY (set of two)

Example Installation 1: Waste container positioned in front of the instrument



Example Installation 2: Waste container positioned to the right of the instrument



9.2 Installation Procedures

9.2.1 Rinse Water Tubing

■ Requirements

- Glass rinse water bottle containing Milli-Q ultrapure water.

☞ **Reference**
"■ Glass Rinse Water Bottle" P.285

■ Procedures

1 **Connect the two rinse water tubes and the suction tube ASSY.**

This instrument has two rinse tubes-one for the syringe pump (marked with an "F") and another (unmarked) for the rinse pool.

> **⚠ CAUTION**
>
> - Connect the tubing correctly.
> Attach the tubes marked with an "F" to each other and the unmarked tubes to each other.
> - Ensure that the tubing is not bent. Do NOT over-tighten the fittings.

2 **Insert both of the suction filters to the bottom of the rinse water bottle containing the Milli-Q ultrapure water.**

The standard accessory cap fits the recommended glass bottle.

9.2.2 Waste Tubing

Arrange the waste tubing to collect the rinse water, separation buffer, and sample waste fluids used during analysis.

■ Requirements

- Waste container

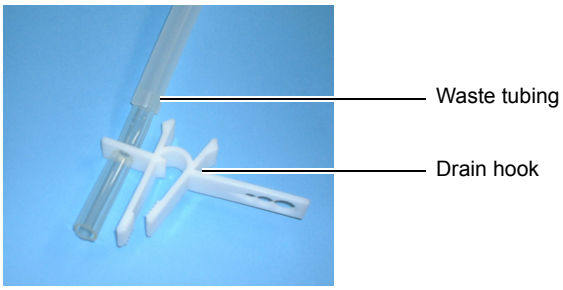
☞ Reference

"■ Waste Container" P.285

■ Procedures

1 **Verify that the waste container is empty.**

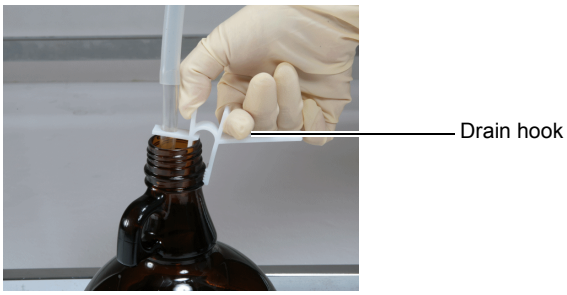
2 **Insert the waste tubing into the drain hook ASSY provided as a standard accessory.**



3 **Do NOT bend the waste tubing, pull the tip of the tubing to the top of the waste container.**

Cut the waste tubing if it is too long.

4 **Using the drain hook assembly, fasten the tip of the waste tubing to the waste container.**



9.3 Power Source Connection

9.3.1 Connecting the Instrument to the Power Outlet

⚠ WARNING

- Always supply power from a power supply equipped with an electrical leakage breaker.
- The instrument's power supply voltage and power consumption are as follows. The power supply voltage is indicated on the label on the power connector on the back of the instrument. Connect the instrument to a suitable power source.
  Connecting it to an improper power source may result in fire or shock.
  The intended performance may not be obtained if the power supply voltage is unstable or the power capacity is insufficient. Check the power requirements for the entire system before arranging a suitable power source.

Voltage (Indicated on the Label On the Back of the Instrument)	100-120/220-240 V ~
Power consumption	300 VA
Frequency	50/60 Hz
Voltage fluctuation	Less than ±10%
Interrupting capacity	40 A
Installation category	II
Pollution degree	2

- Handle the power cable carefully.
  If the following cautions are not observed, the cable may be damaged, resulting in fire, electric shock, or malfunction. If the cord does become damaged, contact your Shimadzu service representative immediately.
  - Do NOT place the power cord under heavy objects.
  - Do NOT place the cord near heating equipment.
  - Do NOT modify the cord.
  - Do NOT forcibly bend or stretch the cord.
  - Hold the plug when inserting and removing the cord.

⚠ CAUTION

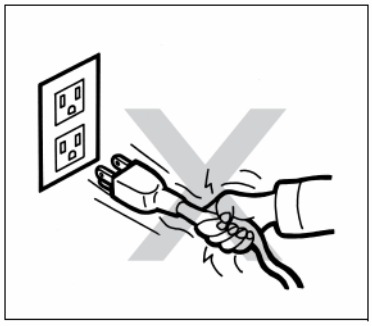
- Verify that the instrument power switch is OFF, before plugging the cord into the outlet.

1 **Insert the power cable connector into the power connector on the rear of the instrument.**

2 **Then insert the power cable plug into the power outlet.**

⚠ CAUTION

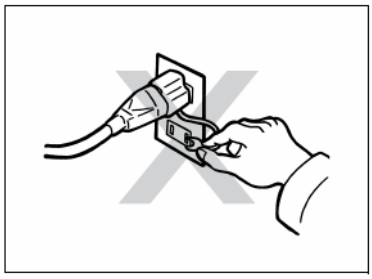
- Do NOT pull on the power cord to remove the plug from the power outlet.



9.3.2 Grounding

⚠ WARNING

- Ground the instrument to prevent electric shock and ensure stable operation.
- Do NOT insert or touch the power adaptor's ground lead to the power outlet.
  This may result in fire or electric shock.



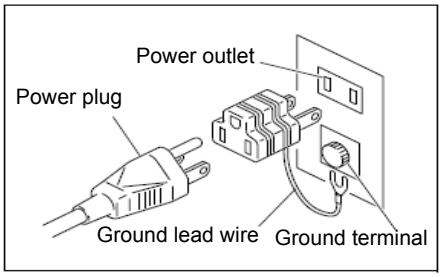
- Never connect the ground lead to a gas pipe, water main, or telephone line. This may result in accident or malfunction.

For 3-pronged power outlets

The instrument ground is provided by the power cable.

For 2-pronged power outlets

If the instrument uses a 2-pronged power outlet, ground the instrument reliably using the adaptor ground provided.



9.4 Connecting the Instrument to a Computer (PC)

This instrument uses an Ethernet connection (100BASE-TX) to communicate with the PC. The network controller port built into the PC is used to connect to the instrument. Use the Windows [Device Manager] to confirm that the network controller is operating normally.

Prepare and connect an expansion network controller (such as a USB LAN adaptor) if connecting the PC with another LAN.

☞ **Reference**
"9.5.2 IP Address" P.274

9.4.1 Connection

■ Requirements

- LAN cable ASSY (Standard accessory)

■ Procedures

1 **Place the PC beside the instrument, and connect the keyboard, mouse, and monitor.**

2 **Connect the accessory LAN cable to the LAN port on the back of the instrument, and to the Ethernet port (RJ-45) on the PC.**

3 **Connect the PC and monitor power cables to the prescribed outlets.**

9.5 Software Installation

This section describes how to install the MultiNA software (instrument control software and data analysis software) on the PC using the provided CD-ROM.

Software installation requirements are listed below.

Installation Requirements
• At least 500 MB of free disk space is required on the PC.
• A monitor resolution of at least 1024 x 768 pixels is required.
• Adobe® Reader® from Adobe or other PDF viewing software (provided free) is required to view the PDF manual files. Adobe® Reader® (Ver. 4 or later) can be downloaded from the following website: http://www.adobe.com/products/acrobat/readstep2.html

Follow these procedures to install the following two types of MultiNA software.

- MultiNA Control Software: Controls the instrument.
- MultiNA Viewer: Displays, prints, and re-analyzes the data obtained.

9.5.1 Installation

⚠ CAUTION

- Close all of the other software during the installation.

1 **Start the PC. Login to Windows as a user with administrative privileges.**

2 **Place the MultiNA software CD-ROM in the CD-ROM drive.**

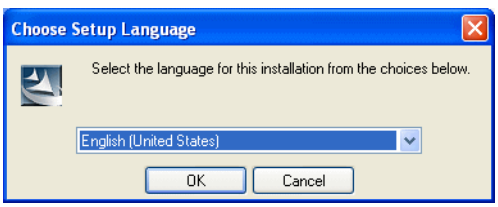
The [MultiNA Software] setup program will automatically start.
(If it does not start automatically, use Windows Explorer to open the "setup.vbs" file in the CD-ROM drive.)

NOTE

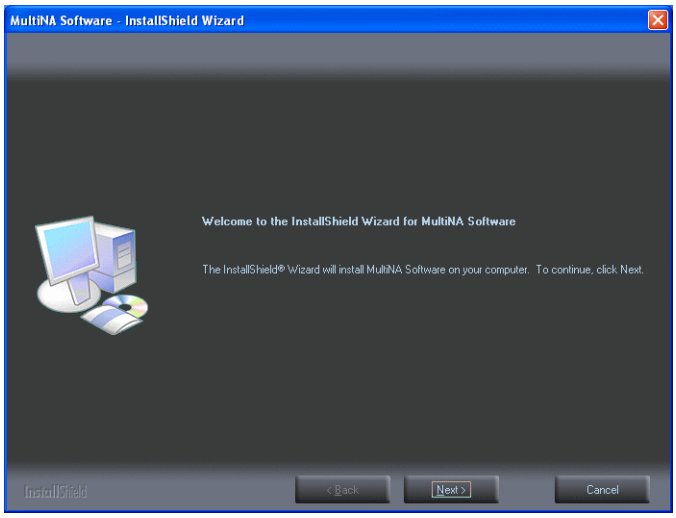
Do NOT start up "setup.exe". If "setup.exe" is started on a PC where the MultiNA software is already installed, the setting values of the preinstalled projects (DNA-500_on-chip, DNA-500_Premix, DNA-1000_on-chip, DNA-1000_Premix, DNA-2500_on-chip, DNA-2500_Premix, mRNA, and TotalRNA) will revert to their default values. Be sure to start up "setup.vbs".

3 **The following window is displayed.**

Click [OK].



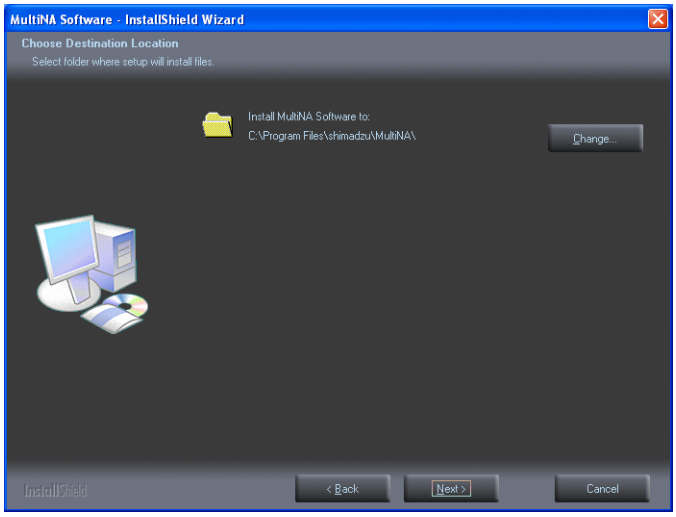
4 **Click [Next] in the window below.**



5 **Click [Change] to select a different software installation folder.**

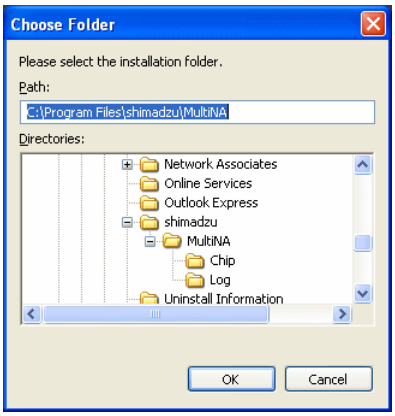
NOTE

Click [Next] to leave the installation folder unchanged.



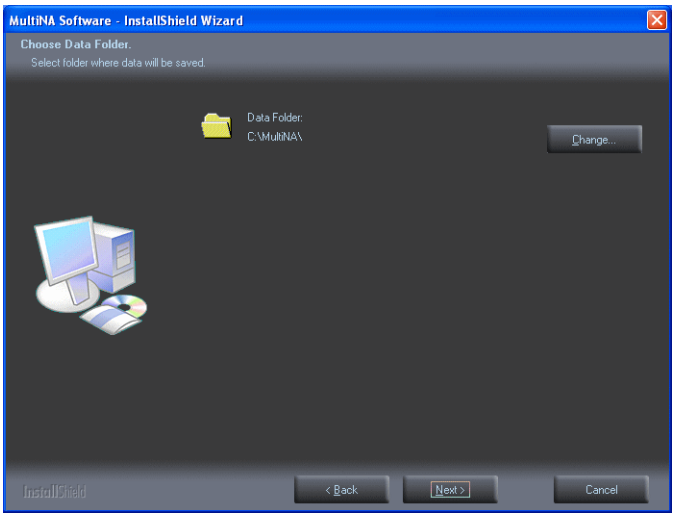
The folder selection window is displayed.

6 **Select the software installation folder and click [OK].**



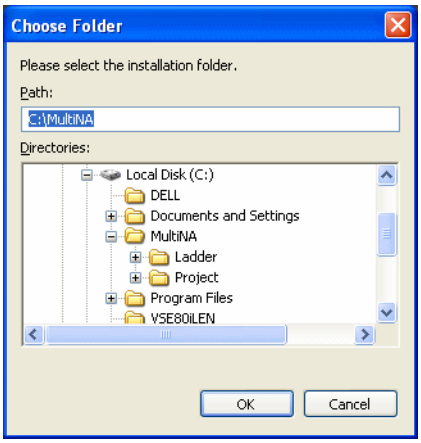
7 **Click [Change] to select a different data storage folder.**

Click [Next] to leave the data storage folder unchanged.



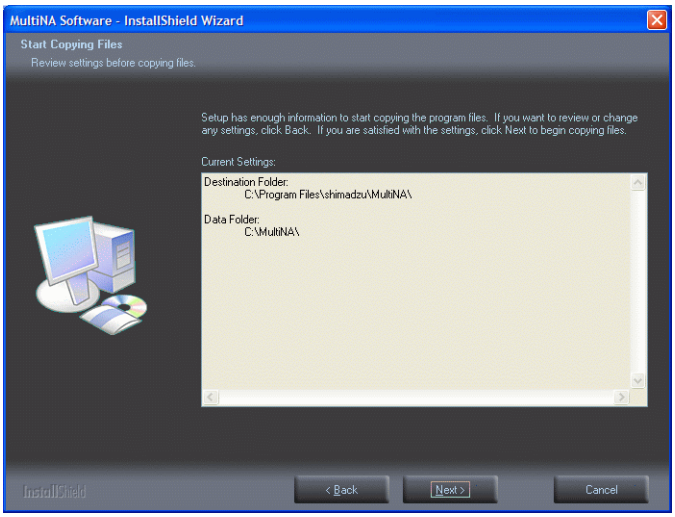
8 **The folder selection window is displayed.**

Select the data folder and click [OK].



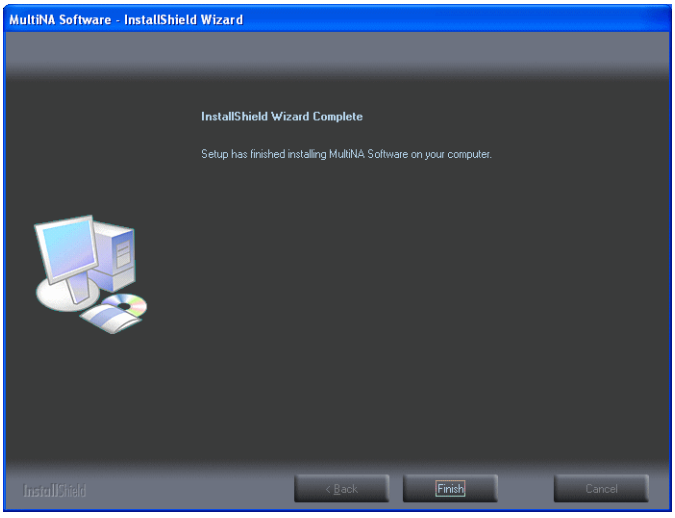
9 **Click [Next].**

Installation begins.



The following window is displayed when installation finishes normally.

10 **Click [Finish].**



Installation is complete.

11 **Remove the MultiNA software CD-ROM from the CD-ROM drive.**

> **⚠ CAUTION**
>
> The following items are automatically configured during installation. Do NOT change these items. If these items are changed, the PC may enter standby or halt mode during analysis, or may automatically restart.
>
> - [Control Panel] - [Power Options] - [Power Schemes]
>
> [Always On] is automatically selected. [System standby] and [System hibernates] must be set to [Never].
> - Windows Automatic Update
>
> This is set to ensure that the PC does not automatically restart after automatic updates.
> The following registry value is set to [1].
> HKLM\SOFTWARE\Policies\Microsoft\Windows\WindowsUpdate\AU\NoAutoRebootWIthLoggedOnUsers
> - Automatic Execution of Windows Disk Defragmenter
>
> Configure settings to disable automatic execution of Windows Disk Defragmenter.
> Window Disk Defragmenter rearranges all hard disk content, including data, system files, and program files. Disk Defragmenter may affect batch analysis and data if executed during analysis. The default setting for Windows XP is OFF and every Wednesday for Windows 7.

9.5.2 IP Address

The initial IP address for the instrument, and the recommended IP address for the PC are as follows.

- Initial instrument IP address 172.31.87.45
- Recommended PC IP address 172.31.87.44
- Subnet mask 255.255.255.0

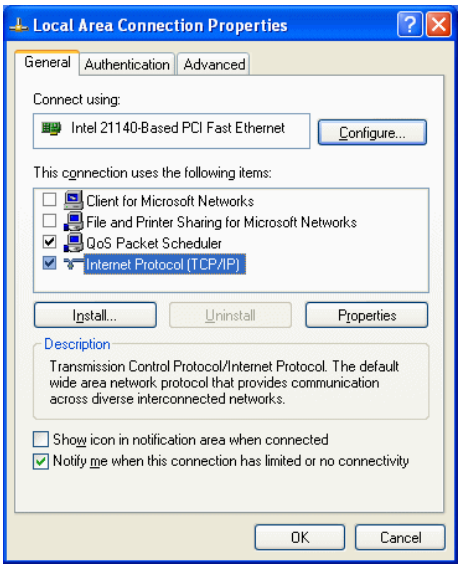
> **⚠ CAUTION**
>
> - The PC may also be connected with another LAN through an expansion network controller.
>
> Check with the system administrator at the installation site to ensure that the instrument and PC IP addresses do not conflict with the expansion LAN address.
> - If they do conflict, contact your Shimadzu service representative and provide the instrument and PC IP addresses.

This section describes how to configure the recommended PC IP address. If the IP address of the PC connected to the instrument is changed, the software will need to be re-installed (see *"9.5.1 Installation" P.270*) and the following procedures performed.

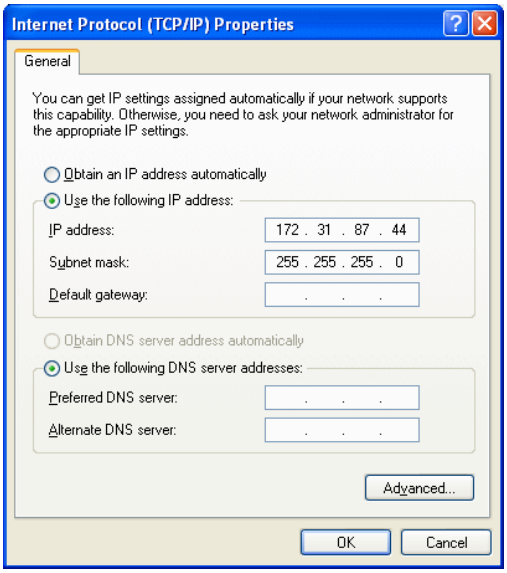
1 **Start the PC. Login to Windows as a user with administrative privileges.**

2 **On the [Start] menu, select [Control Panel] and click [Network Connections] to open the network connections window.**

3 **Open the network controller connected with the instrument. Click [Properties].**



4 **Click the [Internet Protocol (TCP/IP) Properties] item. Enter "172.31.87.44" in the [IP Address] field. Enter "255.255.255.0" in the [Subnet mask] field.**



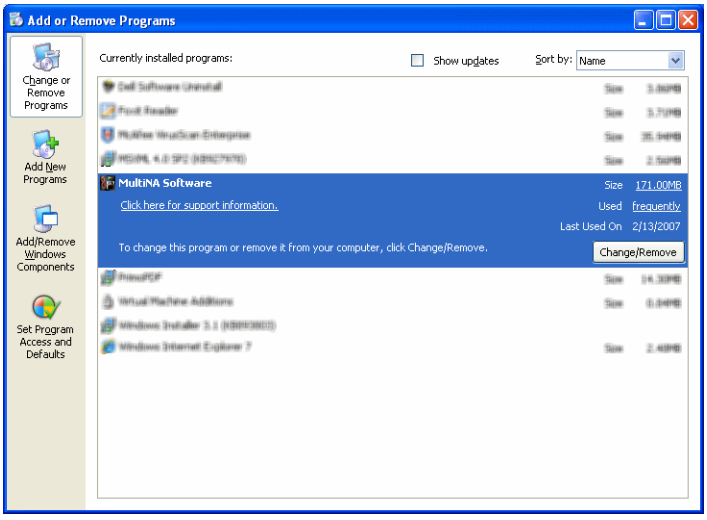
5 **Click [OK] to close the window.**

9.5.3 Uninstalling the Software

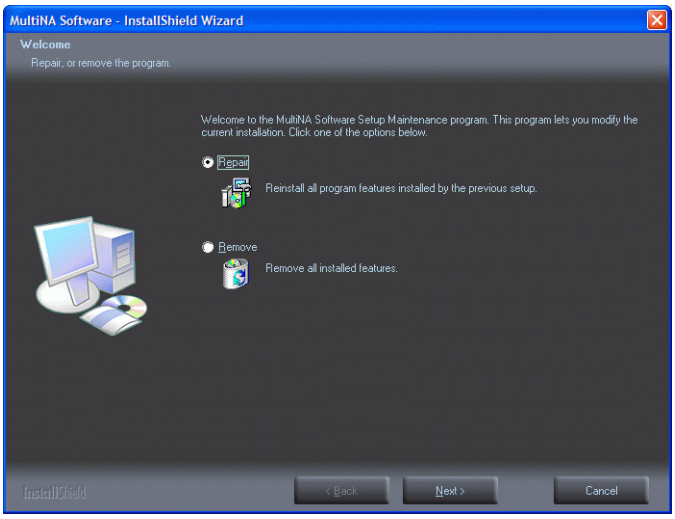
Follow the procedures below to uninstall the MultiNA software from the PC.

1 **On the [Start] menu, select [Control Panel] and click [Add or Remove Programs] to display the [Add or Remove Programs] window.**

2 **Select [MultiNA Software] and click [Change/Remove].**

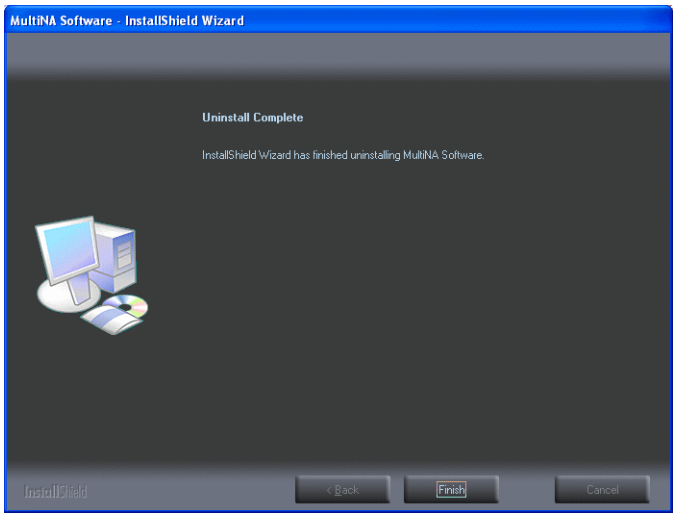


3 **Select [Remove] and click [Next].**



4 **Click [Yes] to start the removal process.**

5 **The following window is displayed when the removal process is complete.**



Click [Finish] to exit.

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10 Parts Specifications

10.1 Instrument Components

■ Components

Part Name	Quantity	Remarks
MULTINA SYSTEM ASSY	1	
Standard Accessories	1 set	See the table below for parts specifications.

■ Standard Accessories

Part Name	Part No.	Quantity	Remarks
IM, MULTINA (E)	S292-36026	1	Instruction Manual
QIM, MULTINA (E)	S292-28465	1	Quick Manual
CORD, EC-651-N01	S071-60821-09	1	Power cable, 250 VAC, 10 A with earth terminal
CABLE ASSY, LAN IV	S292-28124-93	1	LAN crossover cable, 2 m, for connecting the PC with this instrument
FUSE, 218 004XP	S072-02004-22	2	Fuse 250 V 4 A
MULTINA CD-ROM (J-E)	S292-36330-91 *1	1	MultiNA software setup CD-ROM
SUCTION TUBE ASSY	S292-35753-91	1	Rinse water filter
SAMPLE HOLDER 0.6, TABLE	S292-27734-03	1	Sample tube and sample plate fixtures
CAP, 9000-0007	S038-02031-06	1	Cap for glass rinse water bottle (screw cap, standard GL45)
SYRINGE, SS-01T	S046-00045-01	1	Disposable syringe, 1 mL (for microchip maintenance)
SEAL TIP L	S228-40339	1	(For microchip maintenance)
SYRINGE ADAPTER	S228-40340	1	(For microchip maintenance)
FILTER, 13A	S670-12540-02	1	(For microchip maintenance)
DRAIN HOOK ASSY	S292-28021-91	1	Component for fastening the waste fluid tube to the waste container

*1 Refer to the release notes for the part numbers of previous software versions (select [All Programs] - [MultiNA] - [Release Notes] in the Windows start menu).

10.2 MultiNA Special Consumables and Maintenance Parts

■ Microchip

Part Name	Part No.	Specification
Microchip Type WE-C	S292-36000-91	Material: High purity synthetic quartz
Microchip Type WT	S292-36010-41	Material: High purity synthetic quartz
Chip cleaning kit -RA	S292-35925-91	250 mL, main constituent: ethanol
Open-hole screw cap	S292-36329	Cap for chip cleaning solution

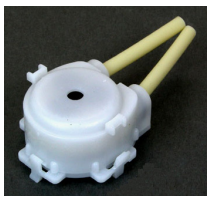
☞ **Reference**

"2.1 Microchip" P.17

■ Reagent Kit

Part Name	Part No.	Remarks
DNA-500 KIT ASSY	S292-27910-91	DNA-500 kit (1,000 analyses)
DNA-1000 KIT ASSY	S292-27911-91	DNA-1000 kit (1,000 analyses)
DNA-2500 ASSY	S292-27912-91	DNA-2500 kit (1,000 analyses)
DNA-12000 ASSY	S292-36600-91	DNA-12000 kit (1,000 analyses)
RNA KIT ASSY	S292-27913-91	RNA kit (1,000 analyses)

■ Periodic Replacement Parts

Part Name	Part No.	Remarks
MICRO SYRINGE 1750C	S228-25237-04	
PLUNGER ASSY, 1750	S228-25237-14	Plunger
CASSETTE HEAD, SR10/30-N2*	S042-00405-13	Pump cartridge*1 Applicable instrument: 292-28000-2X/3X 
CASSETTE, WPM1-P2(140)-B	S292-96682	RoHS compliant pump cartridge*1 Applicable instrument: 292-28000-4X/5X 

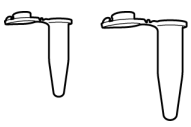
*1 Pump cartridges are not compatible between different pumps. Check the type of pump cartridge installed on the instrument and replace it with an identical one.

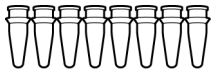
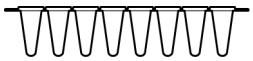
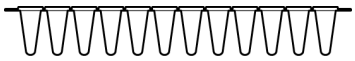
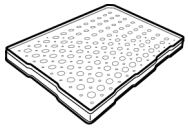
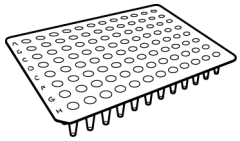
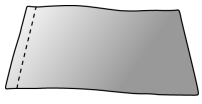
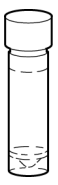
■ Maintenance Parts

Part Name	Part No.	Remarks
SUCTION TUBE ASSY	S292-35753-91	
STAINLESS STEEL FILTER ELEMENT ASSY	S228-45707-91	
WARNING LABEL	S228-42603	Warning label: Fuse
LABEL, HOT SURFACE	S037-72999-12	Warning label: HOT SURFACE (autosampler motor)
LABEL, LED	S292-27990	Warning label: CLASS 1 LED Product
LABEL, SAFETY ALERT SYMBOLS	S037-72999-02	Warning label: Safety alert symbols
LABEL, WARNING	S292-27778-07	Warning label: With the exception of locations specified in the manual, only a certified Shimadzu field engineer should disassemble the instrument.

10.3 Reagents and Apparatus Required for Analysis

■ DNA Analysis

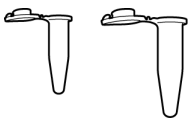
Product	Vendor (Manufacturer in Parentheses)	Part No. (Catalog No.)	Remarks
Dye			
SYBR® Gold	Invitrogen	S-11494	Mix with separation buffer (dilute to 1/10000)
GelStar®	TAKARA BIO INC. (FMC)	F0535	Mix with separation buffer (dilute to 1/20000)
Ladder			
25 bp DNA ladder	Invitrogen	10597-011	Use with DNA-500, dilute to 1/50
pUC19Hpa II Digest (option ladder)	Applied Biosystems	AM7770	Use with DNA-500, dilute to 1/50
ϕX174 DNA/Hae III Markers	Promega	G1761	Use with DNA-1000, dilute to 1/100
100 bp DNA Ladder (option ladder)	TAKARA BIO INC.	3407A	Use with DNA-1000, dilute to 1/10
pGEM® DNA Markers	Promega	G1741	Use with DNA-2500, dilute to 1/100
2-Log DNA Ladder (0.1 to 10.0 kb)	New England Biolabs Inc.	N3200S N3200L	Use with DNA-12000, dilute to 1/100
TE buffer	-	-	10 mM Tris-HCl pH 8.0
Microtube	-	-	200 µL to 1.5 mL capacity Use in the preparation of diluted dye solution and ladder solution 

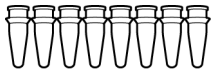
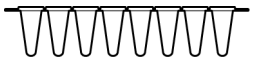
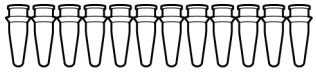
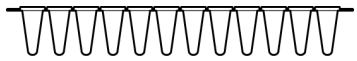
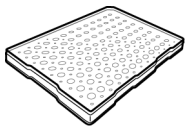
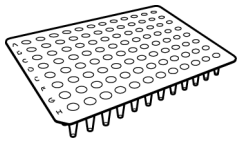
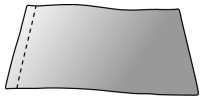
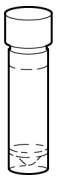
Product	Vendor (Manufacturer in Parentheses)	Part No. (Catalog No.)	Remarks
Sample tube (single)			Recommended sample container
MicroAmp® Reaction Tube	Applied Biosystems	N801-0533	
Sample tubes (8-strip)			Recommended sample container
MicroAmp® strip tubes (without cap, 8 tubes/strip)	Applied Biosystems	N801-0580	
8-strip PCR tubes	Nippon Genetics (ABgene)	AB-0452	
8-strip PCR tubes (low profile) *1		AB-0771	
Sample tubes (12-strip)			Recommended sample container
12-strip PCR tubes	Nippon Genetics (ABgene)	AB-1112	
12-strip PCR tubes (low profile) *1		AB-0847	
Sample plate			Recommended sample container
MicroAmp® Optical 96-well Reaction Plate	Applied Biosystems	N801-0560	
Thermo-Fast® 96 PCR Plate Non-Skirted	Nippon Genetics (ABgene)	AB-0600	
Aluminum seal			
Adhesive PCR Foil Seals	Nippon Genetics (ABgene)	AB-0626	
Buffer bottle	Assist (Sarstedt)	60,558S	Skirted tube (conical, screw cap) 5 mL 500 (10 × 50 packs) 

Product	Vendor (Manufacturer in Parentheses)	Part No. (Catalog No.)	Remarks
Vial	BM Equipment	NC-502	Capless tube 0.6 mL 1000 tubes/pack (no caps) 
Micropipette and tip	-	-	Designed for capacity of 0.5 μL to 5 mL
Protective equipment	-	-	Protective glasses, protective mask, and protective gloves
Vortex mixer	-	-	

*1 Since the tubes have tabs at both ends, they cannot be used with the extra sample stand.

■ RNA Analysis

Product	Vendor (Manufacturer in Parentheses)	Part No. (Catalog No.)	Remarks
SYBR® Green II	Invitrogen	S-7564	Separation buffer and mixture
Ladder			
RNA6000 ladder	Applied Biosystems	AM7152	Dilute to 1/6
Formamide Deionized for biochemical use UltraPure®formamide	 Wako Pure Chemical Industries Invitrogen	 066-02301 15515-026	-
RNase ZAP®	Applied Biosystems	AM9780	Probe rinsing solution
THE RNA Storage Solution	Applied Biosystems	AM7001	-
TE buffer	-	-	10 mM Tris-HCl pH 8.0
Microtube	-	-	200 μL to 1.5 mL capacity Use in the preparation of diluted dye solution and ladder solution 
Sample tube (single)			Recommended sample container
MicroAmp® Reaction Tube	Applied Biosystems	N801-0533	

Product	Vendor (Manufacturer in Parentheses)	Part No. (Catalog No.)	Remarks
Sample tubes (8-strip)			Recommended sample container
MicroAmp® strip tubes (without cap, 8 tubes/strip)	Applied Biosystems	N801-0580	
8-strip PCR tubes	Nippon Genetics (ABgene)	AB-0452	
8-strip PCR tubes (low profile) *1		AB-0771	
Sample tubes (12-strip)			Recommended sample container
12-strip PCR tubes	Nippon Genetics (ABgene)	AB-1112	
12-strip PCR tubes (low profile) *1		AB-0847	
Sample plate			Recommended sample container
MicroAmp® Optical 96-well Reaction Plate	Applied Biosystems	N801-0560	
Thermo-Fast® 96 PCR Plate Non-Skirted	Nippon Genetics (ABgene)	AB-0600	
Aluminum seal			
Adhesive PCR Foil Seals	Nippon Genetics (ABgene)	AB-0626	
Buffer bottle	Assist (Sarstedt)	60,558S	Skirted tube (conical, screw cap) 5 mL 500 (10 × 50 packs) 

Product	Vendor (Manufacturer in Parentheses)	Part No. (Catalog No.)	Remarks
Vial	BM Equipment	NC-502	Capless tube 0.6 mL 1000 tubes/pack (no caps) 
Cap			Use in the thermal denaturation of ladder and sample solution
MicroAmp®Caps, 8Caps/strip	-	N801-0535	
Oil-free thermal cycler	-	-	Use in the thermal denaturation of ladder and sample solution Designed for rapid cooling after heating to 65 °C
Micropipette and tip	-	-	Designed for capacity of 0.5 μL to 5 mL
Protective equipment	-	-	Protective glasses, protective mask, and protective gloves
Vortex mixer	-	-	

*1 Since the tubes have tabs at both ends, they cannot be used with the extra sample stand.

10.4 Other Equipment Required for Analysis

■ Glass Rinse Water Bottle

The following glass rinse water bottle is recommended, as the screw top can be fastened with the cap provided as a standard accessory.

Recommended product: LABORATORY BOTTLE (DURAN®), thread standard GL45,
Cat. No. 21 801 63 5, Capacity 2,000 mL (http://www.duran-group.com/)

■ Waste Container

Prepare a waste container (glass bottle or plastic tank) with a minimum 2 L capacity. Attach the waste tubing using the standard accessory drain hook.

☞ Reference

"9.2.2 Waste Tubing" P.266

■ Microchip Cleaning Wipes

Lint free wipes are recommended for cleaning the microchips.

Recommended product: BEMCOT LINTFREE PS-2
(http://www.asahi-kasei.co.jp/bemliese/en/industrial_02.html)

☞ Reference

"6.2.6 Inspecting and Washing Microchip Reservoirs" P.204

10.5 Replacement Guidelines

Reference

"6.2 Daily Maintenance" P.199

Part	Guidelines for Replacement	Part No.	Part Name	Remarks
Microchip	When separation performance deteriorates	S292-36000-91 S292-36010-41	MICROCHIP,TYPE WE-C MICROCHIP,TYPE WT	
Plunger	5,000 analyses (2 months)	S228-25237-14	PLUNGER ASSY,1750	
Syringe	15,000 analyses (6 months)	S228-25237-04	MICRO SYRINGE 1750C	This includes the plunger.
Pump cartridge	500 hours (1 year)	S042-00405-13	CASSETTE HEAD,SR10/30-N2*	Five are used in the instrument.
RoHS compliant pump cartridge	500 hours (1 year)	S292-96682	CASSETTE, WPM1-P2(140)-B	A RoHS compliant dedicated part. Five are used in the instrument.
Suction filter	2 years	S228-45707-91	STAINLESS STEEL FILTER ELEMENT ASSY	This instrument uses one filter.
Fuse	4 years	S072-02004-22	FUSE,218 004	Two are used in the instrument.

The following parts must be replaced by a field engineer. Contact your Shimadzu service representative.

Part	Guidelines for Replacement	Part No.	Part Name	Remarks
Sample Probe	80,000 analyses (2 years)	S292-28054-94	PROBE ASSY (with packing)	
Air cylinder	1 year or 200,000 analyses	S292-36075-92	AIR CYLINDER ASSY	
Piercing needle	2 years	S292-28403	PREPUNCH PIN	
Peristaltic pump	1,000 hours (2 years)	S292-28046-91	PUMP UNIT ASSY	Five are used in the instrument.
RoHS compliant peristaltic pump	1,000 hours (2 years)	S292-32044-42	PUMP UNIT 2 ASSY	A RoHS compliant dedicated part. Five are used in the instrument.

11 Appendix

Sections *11.1* to *11.5* briefly explain the preparation of each reagent kit.

For preparation details, see the sections of this instruction manual listed below.

☞ Reference

"3.5 Preparation for DNA Analysis" P.44

"3.6 Preparation for RNA Analysis" P.52

11.1 Preparation of the DNA-500 Kit (On-Chip Mix)

■ Requirements

Reagent	DNA-500 separation buffer (stored at 4°C to 8°C)
	DNA-500 marker solution (stored at -20°C)
	Diluted dye solution (GelStar® or SYBR® Gold diluted to 100 times using TE buffer)
	DNA ladder (Size markers: 25 bp DNA ladder diluted to 1/50, concentration 20 ng/μL; pUC19Hpa II Digest (option ladder) diluted to 1/50, concentration 10 ng/μL)
Containers and utensils	Sample containers (200-μL tube, 96-well plate + aluminum seal)
	Micropipette (10 μL, 100 μL, 1000 μL)

NOTE

When using an optional ladder, see *"11.7 Using Optional Ladders" P.294*.

■ Protocol (Necessary Time: 5 to 10 min.)

❶ Mix the diluted dye solution into the DNA-500 separation buffer and agitate using a vortex mixer.

- Dispense diluted dye solution and separation buffer into a buffer bottle.

  GelStar®: Dilute to 200 times (final concentration at 20,000 times)

  SYBR® Gold: Dilute to 100 times (final concentration at 10,000 times)

  * For 24 analyses: 1,000 μL of buffer
  * For 96 analyses: 3,000 μL of buffer

↓

❷ Pour the DNA ladder into a sample tube and set it on the extra sample stand.

- When four chips are used for analysis, the DNA ladder is analyzed four times, once per chip.
  * For 4 analyses: 11 μL of DNA ladder
- Multiple analyses can be performed on the extra sample stand.

↓

❸ Pour the DNA-500 marker solution into a vial and place it in the blue reagent holder position.

- Necessary amount: 2 x (the number of analyses) + 40 μL

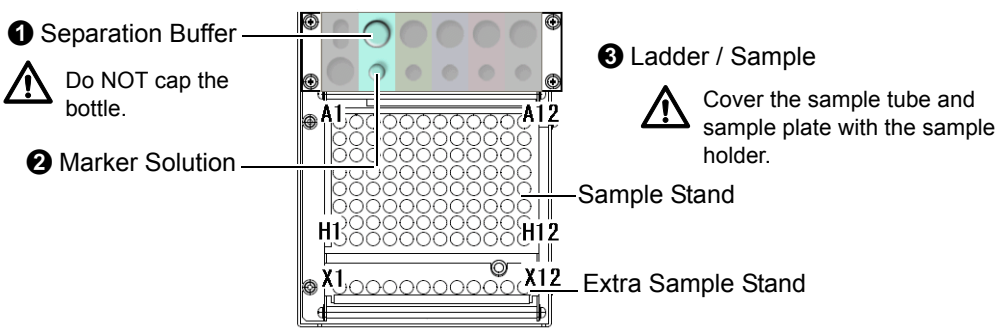
↓

❹ Put the sample into a 96-well plate, seal with the aluminum seal, and place it on the sample stand.

- On the sample stand, only one analysis is performed per well.
- For up to 12 samples, put 9 μL of the sample in the tube. Aluminum seal is unnecessary.

↓

❺ Uncap the buffer bottle, place it in the blue reagent holder position and install the sample holder on the sample stand.



11.2 Preparation of the DNA-1000 Kit (On-Chip Mix)

■ Requirements

Reagent	DNA-1000 separation buffer (stored at 4°C to 8°C)
	DNA-1000 marker solution (stored at -20°C)
	Diluted dye solution (GelStar® or SYBR® Gold diluted to 100 times using TE buffer)
	DNA ladder (Size markers: ϕX174 DNA/Hae III Markers diluted to 1/100, concentration 10 ng/μL; 100 bp DNA Ladder (option ladder) diluted to 1/10, concentration 13 ng/μL)
Containers and utensils	Sample containers (200-μL tube, 96-well plate + aluminum seal)
	Micropipette (10 μL, 100 μL, 1000 μL)

NOTE

When using an optional ladder, see *"11.7 Using Optional Ladders" P.294*.

■ Protocol (Necessary Time: 5 to 10 min.)

❶ Mix the diluted dye solution into the DNA-1000 separation buffer and agitate using a vortex mixer.

- Dispense diluted dye solution and separation buffer into a buffer bottle.
  GelStar®: Dilute to 200 times (final concentration at 20,000 times)
  SYBR® Gold: Dilute to 100 times (final concentration at 10,000 times)
  * For 24 analyses: 1,000 μL of buffer
  * For 96 analyses: 3,000 μL of buffer

⬇

❷ Pour the DNA ladder into a sample tube and set it on the extra sample stand.

- When four chips are used for analysis, the DNA ladder is analyzed four times, once per chip.
  * For 4 analyses: 11 μL of DNA ladder
- Multiple analyses can be performed on the extra sample stand.

⬇

❸ Pour the DNA-1000 marker solution into a vial and place it in the green reagent holder position.

- Necessary amount: 2 x (the number of analyses) + 40 μL

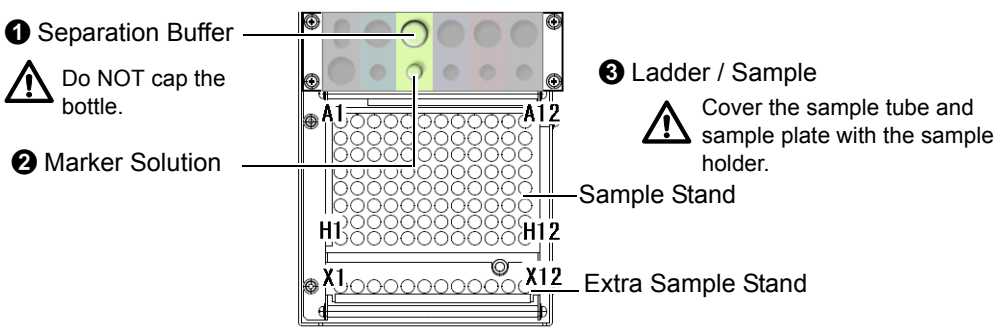
⬇

❹ Put the sample into a 96-well plate, seal with the aluminum seal, and place it on the sample stand.

- On the sample stand, only one analysis is performed per well.
- For up to 12 samples, put 9 μL of the sample in the tube. Aluminum seal is unnecessary.

⬇

❺ Uncap the buffer bottle, place it in the green reagent holder position, and install the sample holder on the sample stand.



11.3 Preparation of the DNA-2500 Kit (On-Chip Mix)

■ Requirements

Reagent	DNA-2500 separation buffer (stored at 4°C to 8°C)
	DNA-2500 marker solution (stored at -20°C)
	Diluted dye solution (GelStar® or SYBR® Gold diluted to 100 times using TE buffer)
	DNA ladder (Size marker: pGEM® DNA Markers diluted to 1/100, Concentration: 10 ng/μL)
Containers and utensils	Sample containers (200-μL tube, 96-well plate + aluminum seal)
	Micropipette (10 μL, 100 μL, 1000 μL)

■ Protocol (Necessary Time: 5 to 10 min.)

❶ Mix the diluted dye solution into the DNA-2500 separation buffer and agitate using a vortex mixer.

- Dispense diluted dye solution and separation buffer into a buffer bottle.
  GelStar®: Dilute to 200 times (final concentration at 20,000 times)
  SYBR® Gold: Dilute to 100 times (final concentration at 10,000 times)
  * For 24 analyses: 1,000 μL of buffer
  * For 96 analyses: 3,000 μL of buffer

⇩

❷ Pour the DNA ladder into a sample tube and set it on the extra sample stand.

- When four chips are used for analysis, the DNA ladder is analyzed four times, once per chip.
  * For 4 analyses: 11 μL of DNA ladder
- Multiple analyses can be performed on the extra sample stand.

⇩

❸ Pour the DNA-2500 marker solution into a vial and place it in the purple reagent holder position.

- Necessary amount: 2 x (the number of analyses) + 40 μL

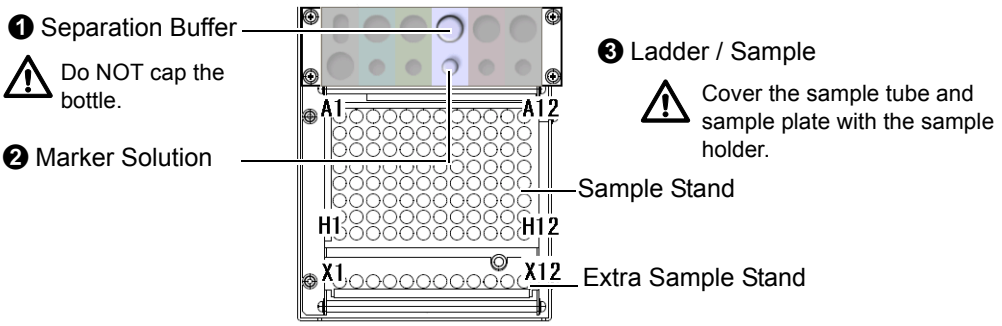
⇩

❹ Put the sample into a 96-well plate, seal with the aluminum seal, and place it on the sample stand.

- On the sample stand, only one analysis is performed per well.
- For up to 12 samples, put 9 μL of the sample in the tube. Aluminum seal is unnecessary.

⇩

❺ Uncap the buffer bottle, place it in the purple reagent holder position, and install the sample holder on the sample stand.



11.4 Preparation of the DNA-12000 Kit (On-Chip Mix)

■ Requirements

Reagent	DNA-12000 separation buffer (stored at 4°C to 8°C)
	DNA-12000 marker solution (stored at -20°C)
	Diluted dye solution (GelStar® or SYBR® Gold diluted to 100 times using TE buffer)
	DNA ladder (Size marker: 2-Log DNA Ladder (0.1-10.0 kb) diluted to 1/100, Concentration: 10 ng/μL)
Containers and utensils	Sample containers (200-μL tube, 96-well plate + aluminum seal)
	Micropipette (10 μL, 100 μL, 1000 μL)

■ Protocol (Necessary Time: 5 to 10 min.)

❶ Mix the diluted dye solution into the DNA-12000 separation buffer and agitate using a vortex mixer.

- Dispense diluted dye solution and separation buffer into a buffer bottle.
  GelStar®: Dilute to 200 times (final concentration at 20,000 times)
  SYBR® Gold: Dilute to 100 times (final concentration at 10,000 times)
  * For 24 analyses: 1,000 μL of buffer
  * For 96 analyses: 3,000 μL of buffer

❷ Pour the DNA ladder into a sample tube and set it on the extra sample stand.

- When four chips are used for analysis, the DNA ladder is analyzed four times, once per chip.
  * For 4 analyses: 11 μL of DNA ladder
- Multiple analyses can be performed on the extra sample stand.

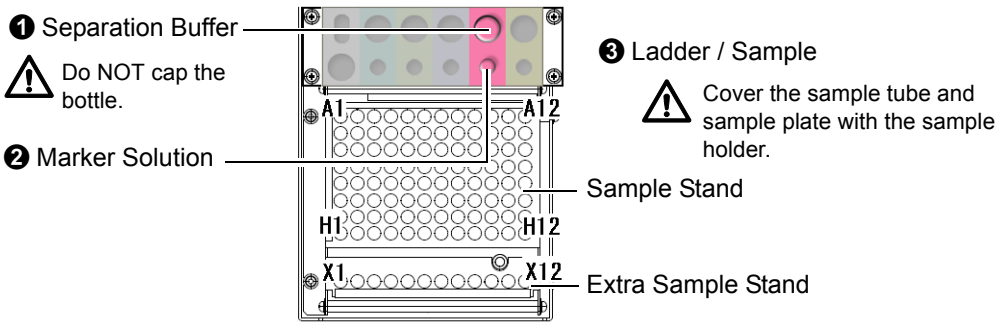
❸ Pour the DNA-12000 marker solution into a vial and place it in the pink reagent holder position.

- Necessary amount: 2 x (the number of analyses) + 40 μL

❹ Put the sample into a 96-well plate, seal with the aluminum seal, and place it on the sample stand.

- On the sample stand, only one analysis is performed per well.
- For up to 12 samples, put 9 μL of the sample in the tube. Aluminum seal is unnecessary.

❺ Uncap the buffer bottle, place it in the pink reagent holder position, and install the sample holder on the sample stand.



11.5 Preparation of the RNA Kit

■ Requirements

Reagent	RNA separation buffer (stored at 4°C to 8°C)
	RNA marker solution (stored at -20°C)
	SYBR® Green II storage solution (diluted to 1/100 with 1xTE buffer)
	RNA ladder (RNA6000 ladder diluted to 1/6, concentration: 25 ng/μL)
	Formamide
	THE RNA Storage Solution (Applied Biosystems)
Containers and utensils	Sample containers (200-μL tube, 96-well plate + aluminum seal)
	Micropipette (10 μL, 100 μL, 1000 μL)

■ Protocol (Necessary Time: 15 to 20 min.)

❶ Add SYBR® Green II storage solution and formamide to RNA separation buffer and mix them with a vortex mixer.

- For 22 analyses, put 790 μL of separation buffer, 10 μL of SYBR® Green II storage solution, and 200 μL of formamide in the buffer bottle.

⬇

❷ Mix the RNA ladder and RNA marker solution in the 200-μL sample tube to a 1:1 volume ratio.

- When four chips are used for analysis, the RNA ladder is analyzed four times, once per chip.
  * Mix 7.5 μL of RNA ladder and 7.5 μL of RNA marker.
- Multiple analyses can be performed on the extra sample stand.

⬇

❸ Mix the sample and RNA marker solution them in the 96-well plate to a 1:1 volume ratio, and seal with the aluminum seal.

- Blank (THE RNA Storage Solution) is analyzed first (before the ladder) per microchip.
- Mix 3 μL of the sample and 3 μL of RNA marker for each well.
- On the sample stand, only one analysis is performed per well.

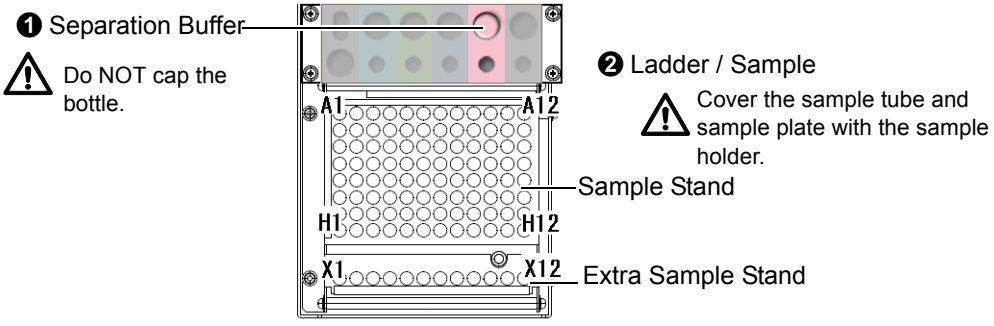
⬇

❹ Heat-denature the RNA ladder and sample.

- Cap the sample tube.
- Temperature condition: 65°C for 5 min. -> 4°C for 5 min.

⬇

❺ Uncap the buffer bottle and place it in the pink reagent holder position. Do NOT cap the sample tube. Install the sample holder on the sample stand.



11.6 Changing the Type of Dye to Be Used

- Continuous usage of different dye types may have an adverse effect on analysis results.
- When changing the type of dye used by the same microchip, wash the microchip as described in the following procedure.

1 **Place the microchip in the MultiNA instrument.**

☞ **Reference**

"3.3.4 Microchip Registration" P.30

"3.3.5 Microchip Installation" P.32

2 **Select [Chip Cleaning] from the [Instrument] menu. Select 1 time for the number of times to perform cleaning.**

☞ **Reference**

"6.2.9 Chip Cleaning" P.209

3 **Prepare separation buffer according to the analysis conditions of the new dye.**

DNA Analysis

Mix the diluted dye solution and separation buffer.

☞ **Reference**

"3.5.1 Diluted Dye Solution and Separation Buffer Preparation" P.44

RNA Analysis

Mix the separation buffer and formamide solution. Do not add the diluted dye solution at this point.

☞ **Reference**

"3.6.1 Diluted Dye Solution and Separation Buffer Preparation" P.52

4 **Prepare the sample solution and marker solution.**

DNA Analysis

Place the TE buffer in the sample stand and the marker solution in the reagent holder (for on-chip mixing). Alternatively, mix twice the volume of marker solution into the TE buffer and place it in the sample stand (premix).

☞ **Reference**

"3.5.2 Ladder, Sample, and Marker Preparation" P.47

RNA Analysis

Mix equal volumes of THE RNA Storage Solution and marker solution and place it in the sample stand.

☞ **Reference**

"3.6.2 Ladder, Sample, and Marker Preparation" P.54

5 **Perform analysis three times for the target chip.**

☞ **Reference**

"3.7.2 Starting Analysis" P.58

11.7 Using Optional Ladders

Optional ladders are available for use with DNA-500, and DNA-1000 kits. The optional ladders and dilution conditions that can be used with respective kits are indicated below.

Type and Dilution Conditions for Optional Ladders

Applicable Kit	Ladder Type ID (abbreviated name)	Supplier	Name	Catalog No.	Dilution
DNA-500	Ladder1 (LD1)	Applied Biosystems	pUC19Hpa II UDigest	AM7770	1/50 dilution
DNA-1000	Ladder1 (LD1)	Takara Bio	100bp DNA Ladder	3407A	1/10 dilution

The Ladder Type ID is used by the software to differentiate between ladder types. The ID for standard ladders is "Standard (STD)".

NOTE

When using an optional ladder, analysis performance, such as size accuracy, may not reach the analysis performance specifications of the MCE-202 MultiNA (using a standard ladder, see *"1.4 Specifications" P.3*).

■ Requirements

- Optional ladder to be used (see the "Type and Dilution Conditions for Optional Ladders" table above)
- TE buffer
- Microtube (volumes from 200 µL to 1.5 mL)
- Micropipettes
- Vortex Mixer

■ Procedures

1 **Use a micropipette to dispense TE buffer in the microtube.**

For 1/100 dilutions, dispense 99 µL in the tube, for 1/50 dilutions, dispense 49 µL, and for 1/20 dilutions, dispense 19 µL. (Confirm dilution conditions in the "Type and Dilution Conditions for Optional Ladders" table above.)

2 **Add 1 µL of optional ladder to the microtube and agitate the solution with a vortex mixer for at least 10 seconds.**

11.8 User Ladders

Ladders that satisfy predetermined conditions can be used as user ladders in DNA analysis.

The recommended conditions for ladders that can be used as user ladders are indicated in the table below. Adopt a dilution factor that achieves DNA fragment concentration and DNA total concentration within the recommended condition range.

- Recommended conditions for user ladders

Reagent Kit	Size Range	DNA Fragment Concentration	DNA Total Concentration
DNA-500	10 to 600 bp	0.5 to 2 ng / μL	1 to 10 ng / μL
DNA-1000	10 to 2000 bp		
DNA-2500	10 to 4000 bp		
DNA-12000	100 to 12000 bp	0.5 to 1 ng / μL	1 to 10 ng / μL

NOTE

- When using user ladders, analysis performance, such as size accuracy, may not reach the analysis performance specifications.
- Select a suitable ladder appropriate to the analysis performance of the MultiNA. Peaks that cannot be separated or peaks outside the size range may indicate false recognition of such peaks.
- Dilute with TE buffer so that the DNA fragment concentration and DNA total concentration are within the recommended condition range. False recognition of peaks can be caused by an unsuitable dilution factor.
- Ladders mixed with loading dye cannot be used.
- The [Point To Point] setting is applied to the size calibration curve of user ladders.

■ Flow of Operations

Analysis of the user ladder

- Analyze the user ladder as a sample.

Registration

- Check the analysis results and register the user ladder.
  - Enter ladder information
  - Perform analysis
  - Check the detected peaks
  - Check the calibration curve
  - Register ladder information

Use the user ladder

- Use the registered user ladder in analysis.
  - Create a project
  - Perform analysis

■ Procedure

1 Register an analysis schedule that contains the target user ladder.

Register the sample position for placing the user ladder as a sample in the analysis schedule.

☞ **Reference**

"3.4 Analysis Schedule Registration" P.34

2 Prepare the reagent and sample and execute the analysis schedule created in step *1*.

☞ **Reference**

"3.5 Preparation for DNA Analysis" P.44, *"3.7 Analysis" P.57*

3 Register user ladder information.

1 Once analysis is complete, display the data file in the MultiNA Viewer.

☞ **Reference**

"3.8.1 Displaying Data" P.62

2 Click the check box of the target user ladder data.

NOTE

Click the check boxes of all the user ladder data to analyze the target user ladder at one time.

3 Click [Analyze As Ladder] on the [File] menu.

The [Analyze As Ladder] window is displayed.

☞ **Reference**

"5.2.13 Analyze As Ladder" P.159

4 Enter the required information that includes ladder name, abbreviation, peak table details.

5 Click [Analyze].

The peak detection results are displayed in the MultiNA Viewer.

6 Check the peak detection results and the size calibration curve in the MultiNA Viewer and click [Register] if they are satisfactory.

Reanalysis starts and the [Analyze As Ladder] window closes.

NOTE

The analysis results are not saved when the [Register] button is clicked.

7 Exit the MultiNA Viewer.

A confirmation message for saving the analysis results is displayed.

Click [Yes] to save the analysis results.

☞ **Reference**

"5.2.2 Close" P.140

4 Create a new project that employs the user ladder.

1 Display the [Project Settings] window and enter the required information.

☞ **Reference**

"3.4.1 Project Settings" P.35

2 Click the [Sample] tab and select the newly registered ladder for [Ladder type].

3 Click [OK].

The project settings are saved.

5 **Performing analysis using the created project automatically executes analysis using the configured user ladder.**

NOTE

Existing ladder settings can also be modified for ladders other than the one described above. For details on the operation method, see *"5.2.14 Ladder List" P.161*.

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Index

Symbols

Numerics

A

B

C

D

E

F

G

H

I

L

M

N

O

P

Q

R

S

T

U

V

W

Z

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