Hitachi High-Tech
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INSTRUCTION MANUAL

FOR

MODEL TM3000
TABLETOP MICROSCOPE

	・Before using the instrument, read the safety instructions and precautions carefully. ・Be sure to follow the instructions and warning of instruction manual and warning label. ・Keep this manual in a safe place nearby so it can be referred to whenever needed.

Hitachi High-Technologies Corporation

Part No. 55E-9001-1 HT-R (H-HMS)

NOTICE:

1. Information contained in this document is subject to change without notice for improvement.
2.
3. Hitachi High-Technologies Corporation assumes no liability for any direct, indirect, or consequential damages arising from use not described in this manual.
Utmost care must be exercised when using the instrument.
4. This document does not provide any warranty or permission for industrial properties or any rights to grant license lawfully and without infringement.

PREFACE

Thank you for your recent purchase of a TM3000 Tabletop Microscope.
The TM3000 Tabletop Microscope (“TM” for short) is designed to observe and evaluate specimens that are prepared specifically for the TM, using an electron beam accelerated to 5 or 15kV as a light source.
This product involves the use of a vacuum and high voltages. Only properly trained personnel are authorized to operate and service this system. In order to ensure the safe and proper operation of the system, you are urged to receive a briefing on operation, maintenance, and safety precautions by representatives of Hitachi’s service department or technicians certified by the same. Carefully read the safety tips provided in this manual, and use the system after you have thoroughly understood the safety precautions (“Safety Tips” for short) contained in this publication.
When allowing children and pupils (“minors”) to use the system, do so under the supervision of a system administrator who is thoroughly familiar with the above-mentioned safety tips, and by limiting their use to personal computer (PC) operations and moving the specimen stage. Because minors can take unexpected action out of curiosity, the system administrator should use utmost caution to ensure that the safety tips are complied with and the system is not handled in a manner departing from the range of operations provided in the Instruction Manual. Also, securely control the system so that minors will not use the system on a solo basis.

ABOUT THIS INSTRUCTION MANUAL

- This Instruction Manual describes TM operating methods, maintenance and inspection methods, items that are necessary to support these requirements, and items that require special attention.

- The Instruction Manual consists of the following components:
  Cautionary Items (warranty, installation, relocation, after service, the life length of the system, and other items)
  Safety (a summary of safety tips)
  Chapter 1: Specifications and Installation Conditions (installation conditions, customer-provided items, and so forth)
  Chapter 2: Installation and Setup (installing an application, connecting the system to the PC, and so forth)
  Chapter 3: System Configuration (configuration, descriptions of parts, and so forth)
  Chapter 4: Operations (image observation, saving image data, and so forth)
  Chapter 5: Maintenance (beam axis adjustment, servicing the various parts, taking corrective action, and so forth)
  Chapter 6: Replacement Parts (consumables, finite-life items, and lists of spare parts)

- First, please read the sections on “IMPORTANT” and “For the Safe Handling of the System” provided at the beginning of this Instruction Manual.

List of Abbreviations

Abbreviations that appear frequently in this Instruction Manual and their full spellings are given below:

PC : Personal Computer
HV : High Voltage
DFP : Diaphragm Pump
TMP : Turbo Molecular Pump
FOV : Field of View

IMPORTANT

Product Warranty

Product Warranty

Hitachi High Technologies Corporation (“HHT”) warrants that the Model TM3000 Tabletop Microscope is free of defect, either in material or manufacturing, based on the specifications provided in this Instruction Manual, provided that the system is used in compliance with the contents of the Instruction Manual.

If your product fails during the warranty period due to a manufacturing defect, it will be repaired free of charge at HHT’s discretion. In the event of a repair, substitute parts may be used or your system may be replaced with an equivalent product instead of repairing it. For example, in the case of PCs, printers, and the like that are used in conjunction with the system and that are frequently discontinued and replaced with newer models, it may not be possible to provide the same model as the one that is needed to be replaced. The warranty does not cover systems that have been discarded, systems that have been relocated without notice to HHT, systems that are purchased from a reseller, and consumables or parts with a limited warranty period that have failed after the warranty period.

Geographic Area of Warranty

The warranty is limited to within the borders of the country in which the product was purchased.

Warranty Period

The warranty period is one (1) year from the completion date of installation.

Warranty Limitations and Exclusions

HHT does not extend any warranty, either implicitly or expressly, such as, but not limited to, warranty for marketability or market suitability, or for a particular purpose or use, other than the terms of warranty provided herein.

The warranty does not cover the situation where the information conveyed either orally or in writing by a sales dealer or employees without HHT-stipulated approval procedures differs from product specifications.

Even within the warranty period, if a given problem falls in any of the categories below, it will be excluded from free-of-charge repair warranty coverage:

(1) A system failure arising from the use of the system in a place not in compliance with the installation site standards established by HHT.

(2) A system failure arising from the use of the system with a power source not in compliance with HHT-specified requirements (voltage and frequency) or due to a power supply abnormality.

(3) A system failure arising from the corrosion of its electrical circuits or deterioration of its optical elements due to the use of the system under a strongly corrosive atmosphere, such as chlorine gas, or in a dusty environment.
(4) A system failure arising from the use of hardware, software, or supplies that are not provided by HHT.
(5) A system failure arising from servicing or repairing the system by individuals other than a service department designated by HHT or from system modifications, such as removal of a component by customer personnel.
(6) A system failure arising from the transport of the system after system installation, not under HHT control.
(7) A system failure arising from a fire, earthquake, water damage or flooding, lightening, civil unrest, a riot, a crime, terrorism, radioactive contamination, war, contamination by harmful substances, and other accidents in the form of an act of God.
(8) A system failure arising from the use of consumables or parts past their warranty period in the case of parts with a limited warranty period, or from the use of finite-life parts past their replacement period.
(9) A system failure arising from disassembling or alteration not authorized by HHT.
(10) A system that has been discarded or sold or relocated without notice to HHT, or a system that is bought from a reseller.
(11) A system failure arising from the use of the system, or by an operating method not provided in this Instruction Manual, or from a repair performed not under HHT's control.
(12) A system failure arising from the failure of the PC being used, or damage to the basic software, application software, or data due to an instantaneous voltage sag caused by a power outage or lightening.
(13) A system failure arising from the failure of the PC being used, or damage to the basic software, application software, or data caused by shutting off the main power supply unit for the PC without performing normal shutdown procedures.
(14) A system failure arising from damage to the basic software, application software, or data caused by a computer virus.
(15) A system or a part from which the system or part nameplate (ID label) has been removed or with an altered ID label.

Limitation of Liability

HHT's liability is limited to liability for compensation on life, body, or tangible objects arising from HHT's negligence. HHT is not liable for any direct, indirect, special, incidental, or consequential damage arising from the use of the product.

Third-Party Intellectual Property

HHT disclaims any liability for claims made by a third party, such as on products made by using a system delivered by HHT or an affiliate thereof, or on patents owned by a third party with respect to the use of a delivered system.

Installation, Relocation, and After Service

Installation and Relocation

(1) Customers are not requested to install the system. For the safe and accurate use of the system, the system will be installed by a maintenance service company designated by HHT or by technicians trained and certified by HHT.

(2) For the installation, please refer to the Instruction Manual, and undertake preparations at the customer's responsibility in a manner that satisfies the requisite installation conditions.

(3) Customers are requested not to relocate the system. When relocating the system, please contact in advance the sales department that handles your account or a maintenance service company designated by HHT and request for the performance of a relocation service.

After Service

(1) For any after service requirements, please contact the HHT's dealership.

(2) Any system relocated or sold without contacting in advance the sales department that handles your account or a maintenance service company designated by HHT will be ineligible to receive after service.

(3) For a period of seven (7) years after delivery of the instrument, maintenance service will be available to support its normal operation.
Note, however, that such a system component as a personal computer (PC) to be updated frequently for improvement has a limited time for repairability in maintenance servicing. For such a component, the user may be requested to purchase a substitute or equivalent product.
Even when more than ten years have elapsed from the date of delivery of the instrument, maintenance service will be provided if necessary items are obtainable.
It should however be noted that maintenance service after a lapse of ten years from the date of delivery does not mean an extension of the estimated service lifetime of the instrument.

Workshop and Training for Customers

For the safe and accurate use of the system, HHT provides workshop and training, either at HHT's facility or on an on-site visit basis. For procedures for receiving such training, please consult the sales department that handles your account (it will be on a charge basis).

System Life

The life length of the system is seven (7) years from the commencement of its use, provided that the system is properly maintained in terms of the periodic maintenance and inspection, and the replacement and repair of any finite-life parts as provided in the Instruction Manual.

Disposal

At present, no substances that directly lead to environmental damage are used in the system. However, because changes in relevant laws and directives can conceivable occur in the future, when discarding the system, either do so by checking relevant laws and regulations or consult the sales department that handles your account or a maintenance service company designated by HHT.
When discarding a used PC or turning it over for recycling, please be sure to erase any data remaining on the hard disk at the customer's responsibility.
When disposing of any dry batteries installed on the PC, either hire a dedicated disposal operator or turn them over to recycling operation by insulating the "+" and "-" terminals of the battery with a tape.
Lithium batteries are used in the PC associated with the system. Since depending on how they are handled, lithium batteries are liable to produce fumes or ignite, discard and dispose of them appropriately under customer control in compliance with the applicable laws and regulations. The same is true for customer-provided PCs.

Miscellaneous

Leaked X-Rays

Unlike equipment that emits X-rays to the outside for use, electron microscopes are not subject to filing requirements under the Radiation Damage Prevention Act or the Ionizing Radiation Damage regulations. The International Committee on Radiation Protection (ICRP), identify electron microscopes, as well as home television sets, as potential, undesirable sources of X-rays as byproducts. The system should be used within the scope of intended objectives and operating methods provided in the Instruction Manual. When used properly in accordance with the Instruction Manual, the system poses no danger of exposure to leaked X-rays.

Handling of Chemicals

(1) When cleaning the system, any chemicals (ethyl or isopropyl alcohol) used by a customer must be handled and disposed of at the customer's responsibility.

(2) The chemicals should be handled, stored, and disposed of according to the instructions provided by their suppliers.

Electromagnetic Wave Interference

The system is in compliance with Class A of EN standard EN61326-1（First edition 2006） (except for PC). When installed in close proximity to other types of electrical or electronic equipment, the system and the adjacent equipment can exert adverse impact on one another. In particular, the system should be installed away from television sets or the radio. In addition, the room in which the system is installed should be controlled so that none of the following electrical devices* are brought near it:

＊ Designated low-power devices that produce electromagnetic waves, such as mobile telephones, transceivers, and cordless telephone handsets.

Trademarks

Windows® is a registered trademark of (US) Microsoft Corporation.
Windows® Vista and Windows® 7 are trademarks of (US) Microsoft Corporation.
The ® mark is not provided in the body of text of this manual.

For the Safe Handling of the System

Before using the Tabletop Microscope, carefully read the safety precautions provided below, and please be sure to understand them thoroughly.

Precautions on human safety are displayed using the following headers combining the safety alert symbol ⚠ and the phrases “DANGER”, “WARNING”, and “CAUTION”:

: This Safety Alert Symbol is intended to alert the user to the presence of potential danger that can be harmful to humans. In order to avoid injury or death that can occur, comply with all the safety messages that follow the symbol.

⚠**WARNING**: This indicates the presence of a dangerous condition that, if not avoided, can potentially lead to severe injury or death.

⚠**CAUTION**: This indicates the presence of a dangerous condition that, if not avoided, can potentially lead to minor or moderate injury.

Precautions concerning safety of things other than the person and notes for ensuring the proper use are displayed by the following headword:

NOTICE: This indicates the presence of a hazardous condition that, if not avoided, can potentially lead to serious property damage, damage to the system, data damage, or environmental pollution without endangering humans.

NOTE: This item is used to provide an explanation to ensure the proper use of the function and the accurate performance of measurements while avoiding minor damage to the system.

- Please comply with all the warning labels attached on the device and all the cautionary items and instructions described in instruction manuals. When this is neglected, death and serious injury due to a fire and electric shock and the damage of the device might be caused.
- The operation and the maintenance that the customer executes are only items described to this manual. Do not perform operation or maintenance that is not provided in the manual. For instance, the customer must not carry out the following items.
  - Do not carry out modification of the instrument, and do not use non-specified parts.
  - Do not use the device without the safety mechanisms.
  - Do not use parts attached to this device for other devices.
  - Do not install the device when delivering and do not transfer the device after installation. Our engineer must carry out it.

- When using the chemical such as the reagent, confirm properties of the material and information on handling (MSDS etc.) and handle it properly.

- If any problem arises with respect to the system, please contact the Sales Department that handles your account or a maintenance service company designated by HHT.

- The cautionary items and instructions provided on the system or in the Instruction Manual have been developed with a great deal of care. Notwithstanding this fact, unexpected events can occur. When operating the system, beyond complying with the instructions, it is requested that the customer himself use adequate care.

General Precautions on Safety

Notes that have not been described in the instruction manual are shown below.

⚠ WARNING

Accident by using the device continuously with abnormal condition

- If an abnormal noise, a strange odor, or the generation of fumes occurs when the system is being used, immediately turn it off, and unplug the power cord from the outlet. After that, take safety measures according to the conditions under which the problem occurred, and contact either the maintenance service company designated by HHT or the service department of HHT (as provided at the end of the Instruction Manual). Using the system in the abnormal condition can cause electric shock or fires.

Trouble by radiation of laser light

- The CD/DVD drive internal to the PC contains a built-in laser light source. PCs equipped with such laser devices are designed not to emit any laser beam harmful to humans to the outside, under normal operating conditions. However, if the laser beam leaks out of the system and gets into eyes, it can cause vision problems. Please read the precautions on the laser provided in the Instruction Manual supplied with the PC, and in addition, be sure to comply with the following safety tips:

  (1) Do not open the panel for the laser device; there are no components that can be repaired by customers.
  (2) Do not attempt any adjustments on the laser device, such as control operations, that are not provided in this Instruction Manual.

⚠ CAUTION

Tiredness by using the device for a long time

- If you operate the system by viewing the monitor, fatigue can build up in your eyes or body if you continue to view the monitor in the same posture for long hours. When operating the system for long hours, be sure to take a break for 10 to 15 minutes every hour to rest your eyes or body.

Warnings Provided in the Instruction Manual

Notes that have been described to the manual and their description places are shown as follows.

⚠ WARNING

Use in humid and dusty place

- Do not use the system near a sink, a humidifier, or any place near water, in a humid basement room, or a dusty place or a place subject to fumes. A failure to heed this precaution can result in electric shock or fires.

  (Chapter 1. Specifications and Installation Conditions)

Electric Shock from High Voltages

- Internally, the system uses maximum voltages of AC 240 V and DC 15 kV.
  Touching any of the internal components or circuits when the system is powered on can potentially result in severe injury or death from electric shock.
  Do not remove the cover from the system.
  When opening the electron gun and other components for maintenance purposes, be sure to turn off the earth leakage breaker and the power switch, and unplug the power cord before commencing the work.

  (Chapter 5. Maintenance)

Electric Shock from Improper Grounding

- When connecting the main unit to the power supply, use the grounded three-prong power cable supplied with the system.
  Using a power cable not supplied with the system can potentially cause electric shock. Also, be sure to connect the power cable to a grounded three-prong power outlet.
  If a grounded three-prong power outlet is not available for some reason, provide a grounded three-prong table tap or a conversion adapter. In such a case, be sure to provide an appropriate grounding. Use a grounding wire with a minimum core wire size of 2.0mm. In addition, for connection use a minimum screw diameter of M4 and a thread count of 3. Be sure to plug it in securely.

  (Chapter 1. Specifications and Installation Conditions)

Warnings Provided in the Instruction Manual (continued)

⚠ WARNING

Injury by heavy load

- The system is a heavy object weighing approximately 63 kg. Install the system on a table with a minimum load bearing capacity of 100 kg. Installing it on a table with an inadequate load bearing capacity can cause the table to break, which can result in unexpected injury beyond damage to the system.
  To avoid injury from the falling or toppling of the system, do not install the equipment in an unstable place or a place liable to fall or toppling due to an earthquake or other events.
  Do not install the device when delivering and do not transfer the device after installation. Our engineer must carry out it.
  (Chapter 1. Specifications and Installation Conditions)

- As a rule, do not move the diaphragm pump because it is a heavy load of 4.5 kg. When moving it by necessity, move it carefully after considering the length of piping and cable, the safety to one's foot, and impact to the pump.
  (Chapter 1. Specifications and Installation Conditions)

Injury by volatile solvent

- When using a volatile solvent during the cleaning of parts for the system, verify information (MSDS and the like) on the nature and handling of the solvent, and be sure to handle it properly.

  (1) Do not such chemicals near an open fire.
  (2) Ventilate a room.
  (3) Wear the directed protection tool.

  (Chapter 5. Maintenance)

Warnings Provided in the Instruction Manual (continued)

⚠ CAUTION

Injury from Being Pinched

- The specimen stage's weight is approximately 5 kg. It might cause injury when operating it grasping the parts other than the handle. When changing specimens, securely grasp the handle, and use caution so that your hands will not be pinched.
  (Chapter 4. Operation)

- The electron gun weighs is 2.5 kg. It might cause finger injury when opening and shutting. Be sure not to pinch fingers when opening and shutting.
  (Chapter 5. Maintenance)

- The finger might get injured in the opening and shutting part of the top cover. Be sure not to pinch fingers when opening and shutting.
  (Chapter 5. Maintenance)

Burns from Touching the Filament Assembly and Peripheral Components

- After the system has been in use, the Wehnelt and the anode around the filament are heated about 90℃. Touching any of them can cause burns. Before undertaking any filament replacement work, turn off the main unit and wait at least 30 minutes to allow it to cool down.
  (Chapter 5. Maintenance)

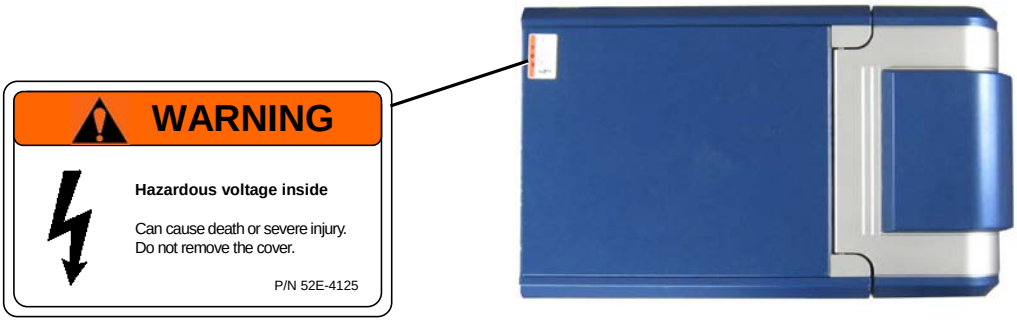
WARNING and CAUTION Labels on the System

The warning and caution labels affixed on the Tabletop Microscope are shown on pages SAFETY - 7 to SAFETY - 8.
Check the contents of the warning and caution labels against the actual equipment.
Inspect the warning and caution labels from time to time. Keep them in a clean condition so that they can be read clearly from a safe distance.
If the warning and caution labels become faint due to aging, contact the Service Department that services your account and request replacement labels.

Locations of WARNING and CAUTION Labels on the TM3000 Main Unit (on the Sides)

WARNING and CAUTION Labels on the System (continued)

Location of WARNING Labels (on the Back)



Location of WARNING Labels (Upper View)

Location of WARNING Label (Front View)

To Avoid Serious Property Damage or Damage to the System

NOTICE

About the Power Supply

(1) Make sure the power supplied to the Tabletop Microscope is AC 100－240V (Min. 90V, Max. 250V), 500 VA or higher (50/60Hz). Voltage fluctuations and superposed noise on the power line can adversely affect the main unit.
(2) Be sure to connect the power line to a grounded three-prong outlet. Verify that the grounding for the outlet is connected with a grounding resistance of less than 100Ω Improper grounding not only makes the system vulnerable to external noise; it is also dangerous due to a potential for electric shock associated with floating voltages.

About the Cable Connection

To prevent a system malfunction, when connecting the power cable or a dedicated cable, be sure to turn off the earth leakage breaker and the power switch. In particular, when plugging or unplugging a USB cable, do so by turning off the PC. Remember that performing a “Safe removal of hardware” step on the PC and receiving a “USB device can now be removed safely” message does not mean that the USB has been turned off. Plugging or unplugging the USB cable in this condition can potentially damage the system.

About the Detector

The semiconductor backscattered electron detector is vulnerable to damage. Scratches made on the surface of the detector element can cause performance degradation. To prevent damage to the semiconductor backscattered electron detector, when adjusting the height of the specimen stub, be sure to use the special specimen height adjustment jig.

To Avoid Serious Property Damage or Damage to the System (continued)

NOTICE

About Power Outages

An instantaneous voltage sag caused by a power outage or lightening can potentially damage the basic software, the application software, or data. As a countermeasure against instantaneous voltage sag, the use of the system with a PC battery mounted is recommended. If a power outage occurs, turn off the earth leakage breaker and the power switch to guard against voltage surges that can occur when power is restored.
When power is restored, the system returns to the condition that existed before the power outage. If the power outage occurred in the midst of evacuation, the system automatically resumes evacuation. If the system was open to the atmosphere, that condition is maintained as is.

On the Power Supply for the PC

If power is shut off during access to the hard disk or other memory devices, a PC malfunction can occur and the data and software stored on them can be destroyed. When finished with the current operation, be sure to perform PC termination operations and then turn off the power switch for the PC.

On Data Backup

In some cases, a PC failure or malfunction can cause data corruption. To avoid such a problem, periodically copy the contents of the hard disk to another hard disk, CD-ROM, a magneto-optical disk, or other external storage devices. Such periodic copying is referred to as a backup. For further details on this topic, see the instruction manual supplied with the PC.

About Application Software

Other application software programs should not be installed on the PC associated with the system. Such programs, beyond producing unexpected operation screens, can adversely affect the system and cause the system to fail to operate properly.

To Avoid Serious Property Damage or Damage to the System (continued)

NOTICE

About the Computer Virus

If a program or data suddenly becomes corrupt, an unexpected operation occurs, or an abnormal screen appears, the infection of the PC by a computer virus must be suspected.

The computer virus refers to a malicious program that surreptitiously invades the PC, runs the PC uncontrollably, or damages data. By the same token, the program that detects/eliminates computer viruses is referred to as anti-virus software.

The PC and the recording media provided with the system are checked with anti-virus software before they are shipped from the factory.

PCs can be infected by a virus through interchangeable storage media, such as virus-infected CDs, DVDs, a USB-connected flash memory units, or through the network. Do not use files that pose a risk of infection by a computer virus.

Before connecting interchangeable storage media or the network, be sure to check it with anti-virus software with the most up to date virus definitions. When connecting to the network, HHT recommends the establishment of a firewall as an anti-computer virus measure between the system and the network. Setting up a firewall is a customer responsibility. HHT does not warrant that all computer viruses can be prevented by setting up a firewall.

If there are concerns about a computer virus infection, check your system by using anti-virus software.

Procuring anti-virus software and removing the viruses are a customer responsibility. Remember that some anti-virus programs may not be able to remove all computer viruses. HHT does not warrant anti-virus software products themselves.

Some virus detection/eradiation programs, when made memory resident, can have an adverse impact on the operation of the Tabletop Microscope. If a problem arises after anti-virus software is installed, either uninstall the anti-virus software or make it non-resident (by not registering it in the Startup program. Alternatively, perform operations such as manually starting it when the Tabletop Microscope control program is not running, detecting the viruses, and closing it when the virus detection process is finished, or conducting the scanning process when the control program for the system is not running.

To Avoid Serious Property Damage or Damage to the System (continued)

NOTICE

About Network Connection

For network connection, the PC is equipped with an Ethernet port. As connecting to the network through the use of Ethernet requires sufficient knowledge on the network environment, perform such a connection by consulting your network administrator.

(1) Providing a cable connection to the Ethernet port must be performed by either the system installer or a service engineer. For these services, contact either the sales department handling your account or the Service Department.

(2) When connecting the PC to a network, be sure to take adequate anti-computer virus measures. For details, see the [About the computer virus] section in this chapter.

(3) The system is not supplied with an Ethernet cable; an appropriate cable should be procured.

(4) Any change in settings for network connection should be performed with care. Unwittingly changing the settings necessary for the operation of the system can render the system inoperative.

(5) Do not install any special software necessary for network connection. Uninstalling it can adversely impact the system or cause the system to fail to operate normally.

For the Proper Use of the System While Avoiding Minor Damage to It

Installing the Control Application

If the control application is installed using a privilege other than the administrator privilege, when a user logs in by using power user or general user privileges, the control application may fail to run properly. To avoid this problem, be sure to install the control application by using Administrator privileges.

Properties of the PC Screen

Do not change the screen resolution by means of PC screen property settings. Changing it can cause the system to fail to display screens properly, produce color changes, and a failure of the system to run properly. Note that the screen resolution is set according to the following parameters (by using the [Screen Properties] and [Advanced display] tabs):

Color palette: 16,777,216 colors
Desktop area: 1024×768 pixels
Font size: small

About PC Freezing

If the PC freezes (the mouse and the keyboard won't work) for some reason, on the keyboard press the [Ctrl], [Alt], and [Delete] keys simultaneously, and shut down the system by following the instructions that appear in the dialog box (software resetting).
After that, close Windows normally, turn off the main unit, and restart it. If this condition occurs, any data up to that point will be lost. If the PC fails to restart after a software reset operation, verify that the hard disk access indicator light is off, and press the Power button for a long time to turn it off forcibly. Since turning off power when the hard disk is still running can damage the hard disk and disable the PC from starting, this technique should be used only as a last resort. For a description on the hard disk access indicator light, see the instruction manual supplied with the PC.

About the Power Saving Feature and the Screen Saver

On the PC used in conjunction with the system, disable any screen saver, the display power saving feature, and power management settings.
If any of these items are enabled, USB communications can be disrupted, causing the PC to freeze.

For the Proper Use of the System While Avoiding Minor Damage to It (continued)

Precautions on Operating the System

(1) When leaving the system unattended, turn off the Start button.

(2) Do not use large quantities of chemicals (such as conducting paste) that fix specimens onto the specimen stub.

(3) When the system is not used, conduct evacuation at least once a week in order to prevent any uneven distribution of the bearing grease used in the turbo molecular pump. Also, keeping the system in a vacuum state helps to maintain the interior of the system clean.

About the Environment around the System

In order to ensure a stable observation, use the system by paying attention to the environment around the installation site for the system.

(1) Avoid installing the system in a place near power lines serving equipment such as a large magnetic clutch and subject to sudden current or magnetic field changes.

(2) Install the system in a place away from sources of vibration, such as large machine tools or transportation facilities (roads, railroads, and the like).

About Magnetic Fields Generated by a Notebook PC

Do not use the system by placing a notebook PC on its main unit. The effects of magnetic fields generated from the notebook PC can cause image distortion during a high magnification image observation.

About the Temperature and Humidity of the Room

The room in which the system is installed should be kept at a 15 to 30°C room temperature with a maximum humidity of 70% RH without condensation. The occurrence of water condensation can cause system failure.

Contents

PRECAUTIONS ON HANDLING

For safety, please comply with the following precautions:

1. Precautions on Using the System

⚠ WARNING (1) Do not remove the cover from the main unit.
Maximum voltages of AC 240 V and DC 15 kV prevail inside the main unit, potentially causing severe injury or death from electric shock when touched.

⚠ WARNING (2) Connect the grounding wires properly.
An improper grounding wire connection poses a potential electric shock hazard beyond a failure of the system to run correctly.

⚠ WARNING (3) When stopping abnormally, the diaphragm pump remains hot, posing a potential hazard of burns. In the event of a diaphragm pump problem, contact a service engineer without touching it.

CAUTION (4) Correctly measure and set the specimen size and height. An incorrect setting can potentially damage the specimen or components inside the specimen chamber.

CAUTION (5) The turbo molecular pump is a limited life item. It should be replaced after five years. When the bearings reach the end of their life, abnormal heat generation, an abnormal noise, or abnormal stoppage can occur. When replacing the TMP, please contact the Service Department.

CAUTION (6) The diaphragm pump is a limited life item. It should be overhauled after five years. When the diaphragm reaches the end of its life, abnormal heat generation, an abnormal noise, or abnormal stoppage can occur, causing the entire pump to stop running. When having the DP overhauled, please contact the Service Department.

2. General Items

System service operations other than those which are provided in this Instruction Manual should be delegated to service engineers.

3. Emergency Action

3a. Turn off the POWER switch located on the main unit.

3b. Unplug the power cord from the outlet.

3c. Contact a service engineer.

4. Precautions on Operating the System

4a. When leaving the system unattended, turn off the accelerating voltage.

4b. To avoid contamination of a specimen, do not use large amounts of a chemical (such as conducting paste) that fixes the specimen onto the specimen stand.

5. Miscellaneous

The room in which the system is installed should be maintained under the following conditions even when the system is idle:

Room temperature : 15°C to 30°C

Humidity : 45 to 70% RH (no condensation)

If the system is not used for a long time, leave it in an evacuated condition instead of opening the specimen chamber to the atmosphere.

6. Electromagnetic Wave Interference

The TM3000 is in compliance with EN Standard EN61326-1：2006 Class A(except for PC). Do not install the system near a device in which data is subject to adverse impact by electromagnetic noise within the tolerance value of the Standard.

The data stored in the system is vulnerable to electromagnetic noise, and the system itself is liable to malfunction when subjected to such noise. The room in which the system is installed should be controlled so that any of the following electrical devices * will not be brought into it:

* Special, small-power consumption devices such as mobile telephones, transceivers, and cordless telephone handsets.

1 SPECIFICATIONS AND INSTALLATION CONDITIONS

1.1 Overview

The TM3000 is a tabletop microscope operating under the principle of low-vacuum observation, wherein a narrowly focused electron beam is directed onto the specimen, the resulting backscattered electrons are detected, and minute parts of the specimen are enlarged for observation. The main features of the system are the capacity to permit specimen observations in high-magnification regions beyond the reach of an optical microscope and the ability to produce three-dimensional like images emerging from a great focal depth. By downsizing a conventional electron microscope and simplifying the operations, the Tabletop Microscope invites users who have never touched an electron microscope before to use it as a handy tool. The TM3000 represents considerable improvements in performance and functionality over the previous Model TM-1000 Tabletop Microscope, offering a truly easy to use high-performance system.

Figure 1.1 External View of the TM3000

1.2 Features

The TM3000 provides the following main features.

1. A compact desktop electron microscope.

2. Provides a great focal depth and permits high magnification observations when compared with an optical microscope.

3. Elimination of cumbersome preparation of samples.

4. The capacity to accept the mounting of specimens up to 70 mm across and 50 mm thick.

5. PC-based operations and the provision of an automated focus/brightness adjustment functions.

6. A quick 3-minute lead time from the time the system is turned on until the specimen can be observed.

7. The system can be operated simply by plugging it into an electric outlet (AC100 to 240 V : 5 A or less).

8. The capacity to perform observation to suit various conditions by switching observation modes and observation condition settings.

1.3 Specifications

Table 1.3 Specifications

	Item	Product Specifications
1	Accelerating voltage	5 kV, 15 kV
2	Magnification	15 to 30000x (image display magnification: number of steps: 40 (※1)) (digital zoom 2x, 4x), max. observation range: 3.5 mm on an edge The minimum magnification depends on the accelerating voltage, D (※2), and the screen size.
3	Maximum specimen size	70 mm (diameter)
4	Maximum specimen thickness	50 mm
5	Specimen stage	X：35 mm, Y：35 mm (X, Y only)
6	Electron gun	Pre-centered cartridge filament
7	Stigma correction coil	Provided
8	Image shift	±50 μm (15 kV mode: D=4.5 mm)
9	Detector	High-sensitivity semiconductor backscattered electron detector
10	Control CPU method	Notebook PC + dedicated microcomputer control
11	Monitor (recommended)	LCD attached to the notebook PC (15.4-inch)
12	Image data recording	Hard disk mounted on PC, and other recording media
13	Recording pixels	1280×960 pixels (max.) /640×480 pixels
14	Data display	Micron marker, file No., date, comments
15	Automated function	Auto luminosity control, auto focusing adjustment
16	Auxiliary operation function	Raster rotation Magnification preset (2 steps)
17	Vacuum pump	Compact turbo molecular pump: 30 l/s Diaphragm pump: 1 m^3/h
18	Vacuum detector	Pirani gauge
19	Frequency	50/60 Hz
20	Main unit power supply	AC 100 to 240 V (Min. 90 V, Max. 250 V), 500 VA Built-in earth leakage breaker (5 A/(15 mA)): 3P outlet connection
21	Dimensions/weight	Main unit: 330×606×550 63 kg (manual stage) 330×630×550 66 kg (motor drive stage) Diaphragm pump: 145×256×217 4.5 kg

(※1) Magnification steps

×15 18 20 25 30 40 50 60 80 100 120 150 180 200 250 300 400 500 600 800 1000 1200 1500 1800 2000 2500 3000 4000 5000 6000 7000 8000 9000 10000 12000 15000 18000 20000 25000 30000

(※2) [D] denotes the distance between the specimen surface and the detector.

1.4 Installation Conditions

Install the system in a place that meets the following conditions.

Table 1.4 Installation conditions

<table>
<tr><th>Item</th><th>Installation conditions</th></tr>
<tr><td>General requirements</td><td>1. Level location
2. Away from water spill
3. Away from external shock
4. Away from heat sources
5. Away from a strong magnetic field (vertically from system: 15 nT, horizontally from system: 5 nT)
6. Absence of a strong electric field
7. Absence of dust particles
8. Absence of vibrations</td></tr>
<tr><td>Vibration</td><td>Frequency ≦ 7 Hz, 4.0 μm p-p or less
7 Hz ＜ frequency ≦ 10 Hz, 1.5 μm p-p or less
10 Hz ＜ frequency, 2.0 cm/s^2 or less</td></tr>
<tr><td>Magnetic field</td><td>Allowable stray magnetic field for the TM3000
<table>
<tr><th rowspan="2"></th><th colspan="2">AC magnetic field (nT)</th><th colspan="2">DC magnetic field fluctuation (nT) (Peak-to-Peak)</th></tr>
<tr><th>Horizontal</th><th>Vertical</th><th>Horizontal</th><th>Vertical</th></tr>
<tr><td>Accelerating voltage: 5 kV
Magnification: 2 kx
D：4.5 mm</td><td>151</td><td>243</td><td>1065</td><td>1717</td></tr>
<tr><td>Accelerating voltage: 15 kV
Magnification: 5 kx
D：4.5 mm</td><td>116</td><td>148</td><td>818</td><td>1045</td></tr>
</table></td></tr>
<tr><td>Noise</td><td>75 dB or less (frequency ≦ 150 Hz) [C characteristics: 72 dB max. (frequency ≦ 150 Hz)]</td></tr>
<tr><td>Ambient temperature</td><td>15 to 30°C (⊿t＝±2.5°C/h or less)</td></tr>
<tr><td>Ambient humidity</td><td>45 to 70［%RH］. (No condensation)</td></tr>
<tr><td>Main unit power supply</td><td>Single-phase AC 100 to 240 V (Min. 90 V, Max. 250 V), 500 VA, 50/60 Hz
3P outlet (grounding resistance of less than 100 Ω)</td></tr>
<tr><td>Installation area</td><td>Recommended: 700 mm (H) x 1200 mm (W) x 800 mm (D) or larger
Minimum: 700 mm (H) x 1000 mm (W) x 800 mm (D) or larger</td></tr>
</table>

WARNING : Do not use the system near a sink, a humidifier, or any place near water, in a humid basement room, or a dusty place or a place subject to fumes. A failure to heed this precaution can result in electric shock or fires.

WARNING : When connecting the main unit to the power supply, use the grounded three-prong power cable supplied with the system.
Using a power cable not supplied with the system can potentially cause electric shock. Also, be sure to connect the power cable to a grounded three-prong power outlet.
If a grounded three-prong power outlet is not available for some reason, provide a grounded three-prong table tap or a conversion adapter. In such a case, be sure to provide an appropriate grounding. Use a grounding wire with a minimum core wire size of 2.0 mm. In addition, for connection use a minimum screw diameter of M4 and a thread count of 3. Be sure to plug it in securely.

WARNING : The system is a heavy object weighing approximately 63 kg. When falling the device, the injury and the damage of the device might be caused.

- Install the system on a table with a minimum load bearing capacity of 100 kg.
- To avoid injury from the falling or toppling of the system, do not install the equipment in an unstable place, or a place liable to fall due to an earthquake etc.
- Keep the interval of 200 mm or more from the left side of the main unit and install the main unit so that the center of gravity of the main unit is near the center of the table.
- The customer must not transfer the device. When transferring the device is required, contact the Hitachi's service engineer or qualified engineers trained and certified by Hitachi.

WARNING : As a rule, do not move the diaphragm pump because it is a heavy load of 4.5 kg. When moving it by necessity, move it carefully after considering the length of piping and cable, the safety to one's foot, and impact to the pump.

For layout, see Figure 1.4 below.

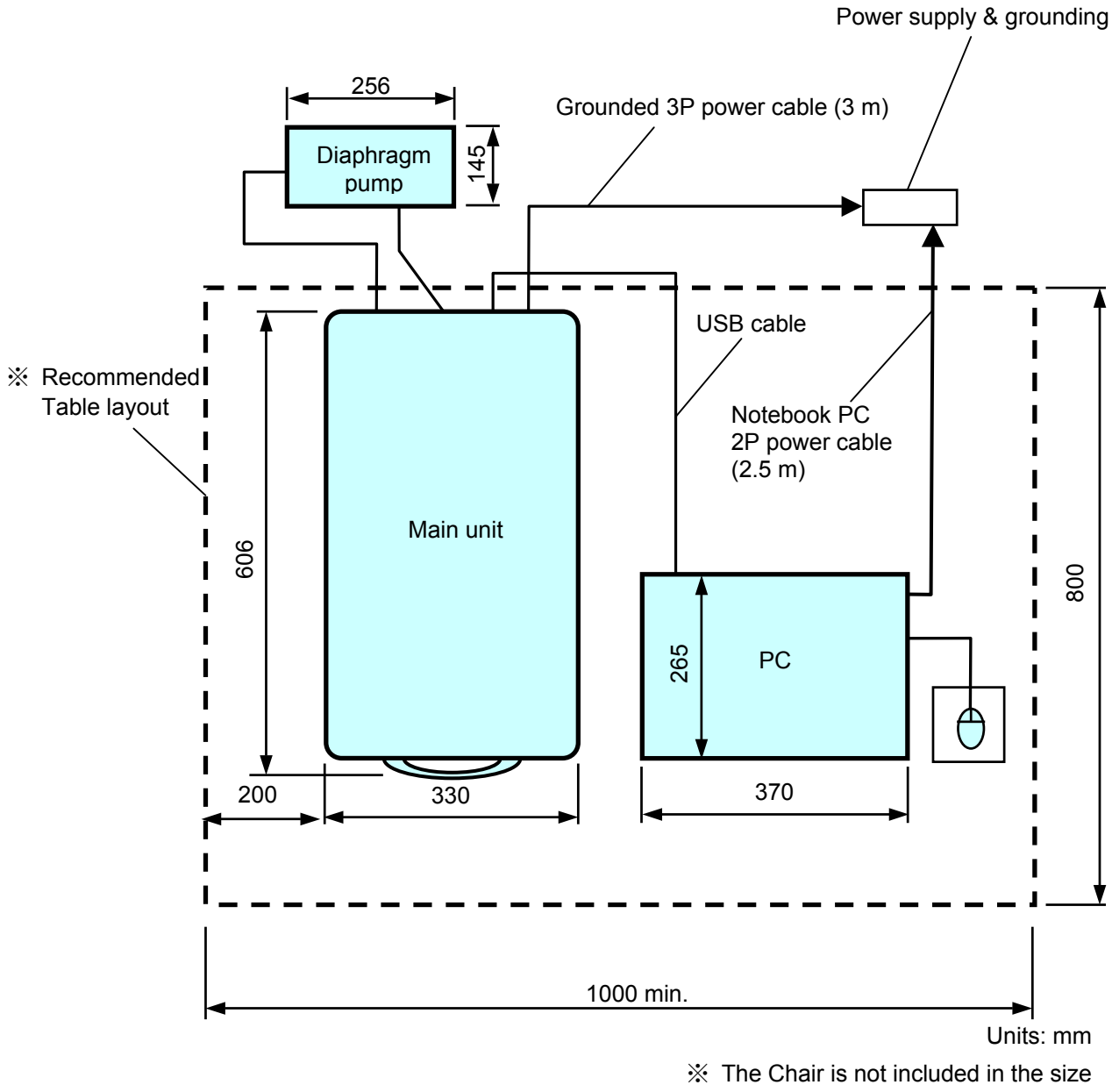


Figure 1.4 Layout Diagram

1.5 PC Specifications

Table 1.5 PC Specifications

Item	Details
PC	Recommended PC specifications OS : Windows® 7 Professional (32 bit, English Version) CPU : Intel® Core™ 2Duo T8700 (or a compatible CPU) or greater Memory capacity : 2 GB minimum Display resolution : 1280 x 800 pixels (1,677,000 colors) WXGA Display : 15.4-inch Interface connector : USB2.0 PC card slots : PC Card Standard compliant (Type I/II x 1 slots) Card Bus compatible File device : HDD, DVD-ROM drive installed Miscellaneous : A minimum available free space of 100 MB on HDD, with Adobe® Reader® installed (for applications)

NOTE : A PC display resolution of 1024 x 768 pixels or less may cause the application to fail to start.
The use of a high-resolution monitor, such as SXGA (1280 x 1024 pixels), SXGA ＋(1400 x 1050 pixels), etc. may render the size of observation images small. Setting these monitors in the stretch mode can cause blurring of observation screens.

NOTE : Do not change the language of Regional Setting. If the language of OS and the language of Regional Setting are different, the error message is displayed.

1.6 Customer-provided Items

Before installation work can be started, the following items must be available:

Table 1.6 Customer-provided Items

Table	Recommended table Dimensions : 1200 mm (W) x 800 mm (D) or larger Load bearing capacity : 100 kg or greater Other : Level, without casters
Miscellaneous	Ethyl alcohol Metal polishing agent

2 INSTALLATION AND SETUP

2.1 Connecting to the PC

Connect the PC to the main unit as shown in Figure 2.1

1. Connect the USB cable protruding from the main unit to the USB port on the back of the PC. (Because PCs are subject to frequent model change, the actually delivered model may not look the same as the photograph below and the location of the USB port may differ.)

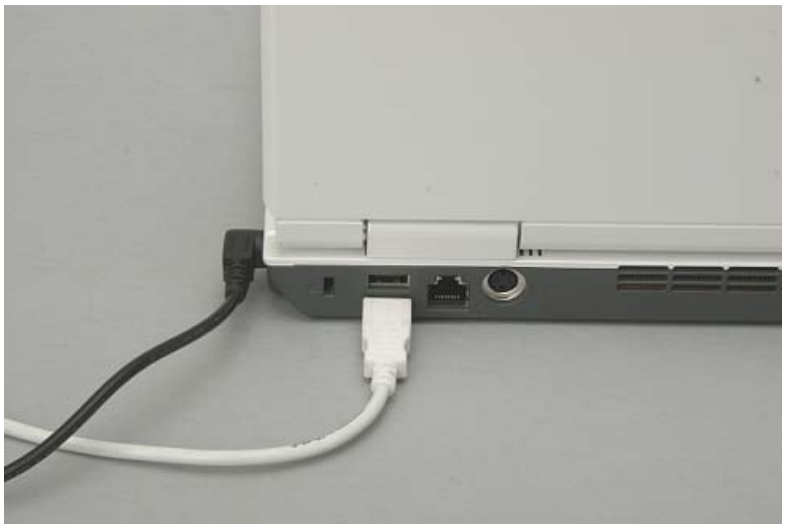


Figure 2.1 Connecting a USB Cable to the PC

2. Connect the power cable for the PC to a customer-provided outlet.

3. Connect the power cable for the main unit to a customer-provided outlet.

2.2 Setting up the PC

2.2.1 Installing an Application

NOTE : Before installing an application, check the following precautions:

1. For installation, log on as Administrator.
2. Install the application before connecting the system main unit to the PC via the USB.
3. Do not change the language of Regional Setting. If the language of OS and the language of Regional Setting are different, the error message is displayed.

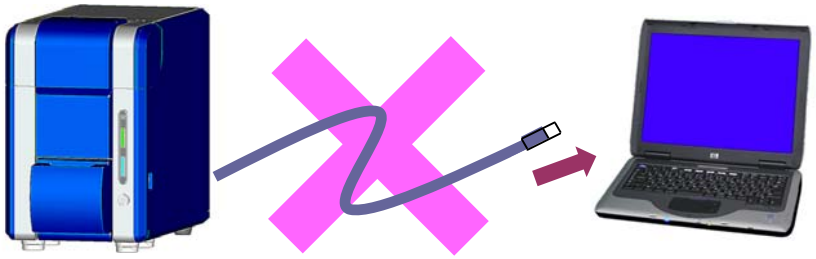


Figure 2.2.1-1 Connecting the Main Unit to the PC

1. Turn on the PC. Log in as “TM3000USER”. If no other user settings have been added, a login window does not appear, in which case move to the next step.

2. Load the setup disk on the CD/DVD drive.

3. Auto Play menu is displayed on the window. Click [Run SETUP.exe].

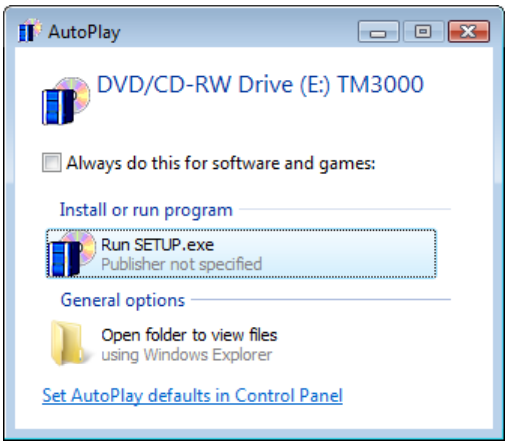


Figure 2.2.1-2 AutoPlay

4. TM3000 Setup Tools is run automatically. If User Account Control is displayed on the window, click [ALLOW].

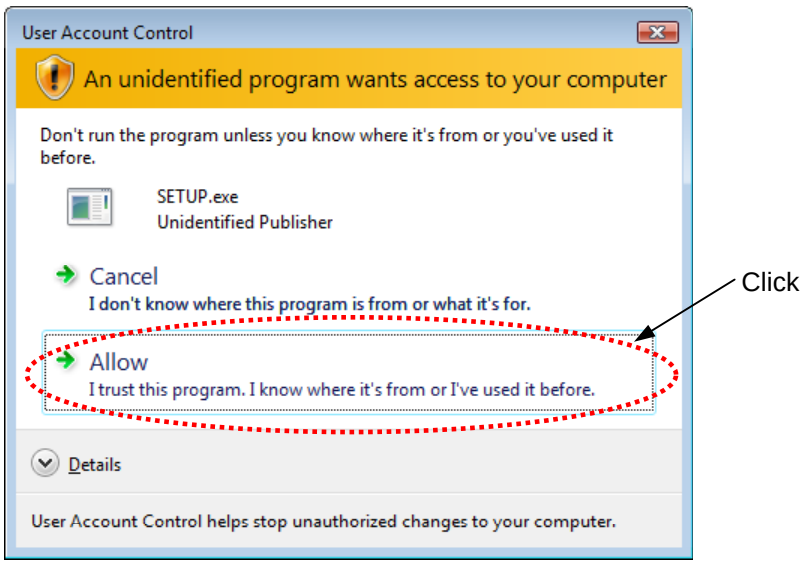


Figure 2.2.1-3 User Account Control

5. Type Serial Number in the dialogue box, and click [OK].

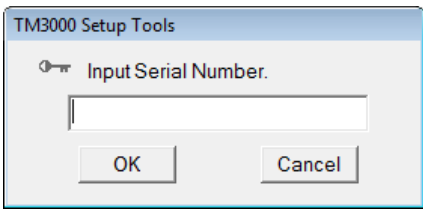


Figure 2.2.1-4 Passwords

6. Serial No. is on the seal of back of main unit .

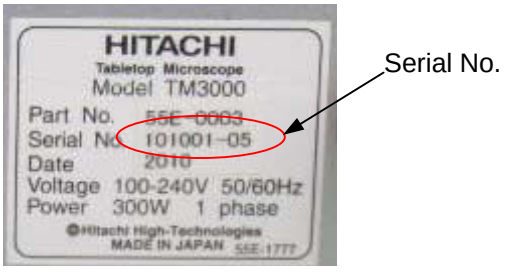


Figure 2.2.1-5 Serial No.

7. Displayed the menu of TM3000 Setup Tools. Click [Installation for TM3000 application] on that window.

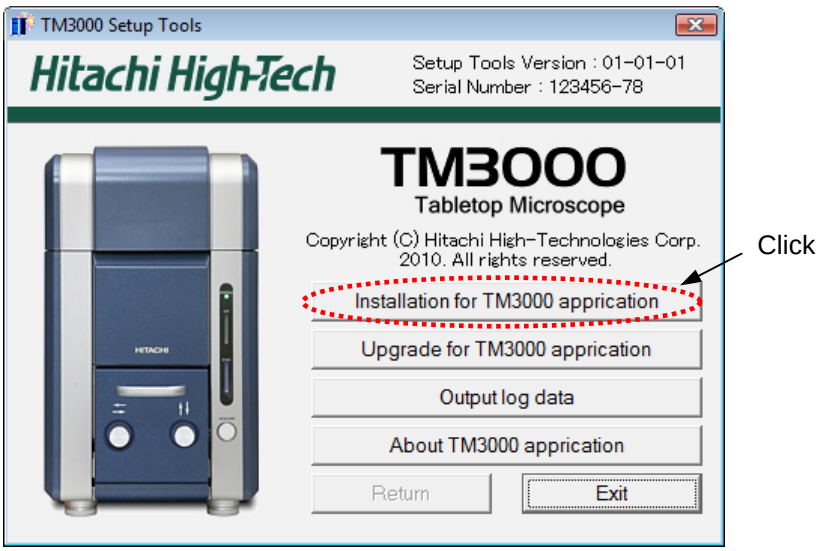


Figure 2.2.1-6 The Main Menu of TM3000 Setup Tools

8. The following window appears. Click the button [Installation of application program].

Figure 2.2.1-7 Installation for TM3000 Application

NOTE : If the application is already installed, the window shown below appears. If this is the case, click [OK], uninstall the application, and then re-install it. (For details on the uninstall process, see [2.2.9 Uninstalling an application]).

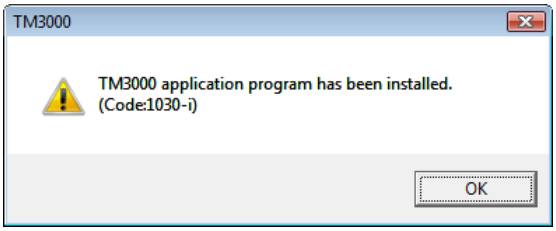


Figure 2.2.1-8 Message

9. The following window appears. Click the [OK] button.

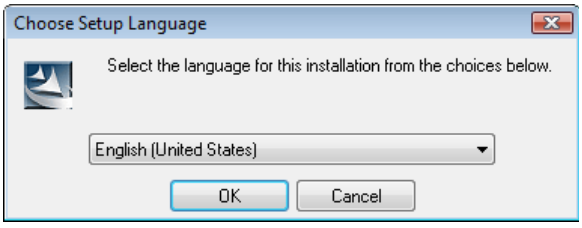


Figure 2.2.1-9 Choose Setup Language

10. The following window appears. Please wait slightly.

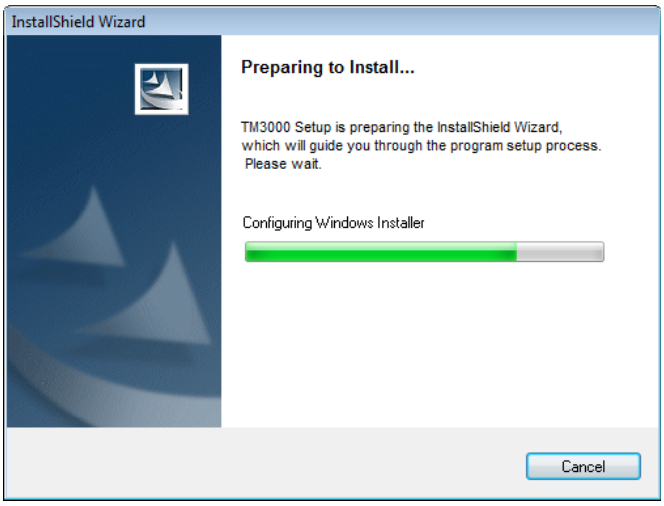


Figure 2.2.1-10 Preparing to Install

11. The following window appears. Click the [Next>] button.

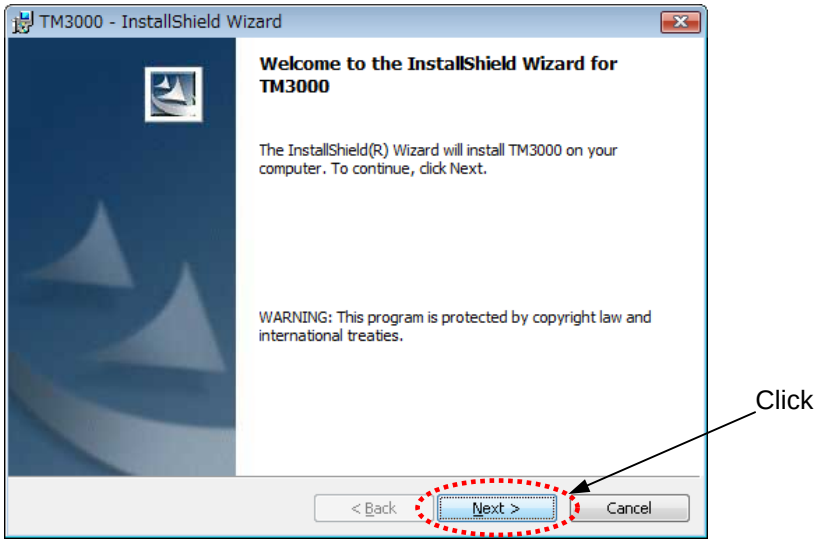


Figure 2.2.1-11 InstallShield Wizard

12. The following window appears. Enter the [User Name:] and [Organization:]. It is information recorded to a PC that it is displayed by default. No change is OK.
Verify that [Anyone who uses this computer (all users)] is selected in [Install this application for:]; click the [Next] button

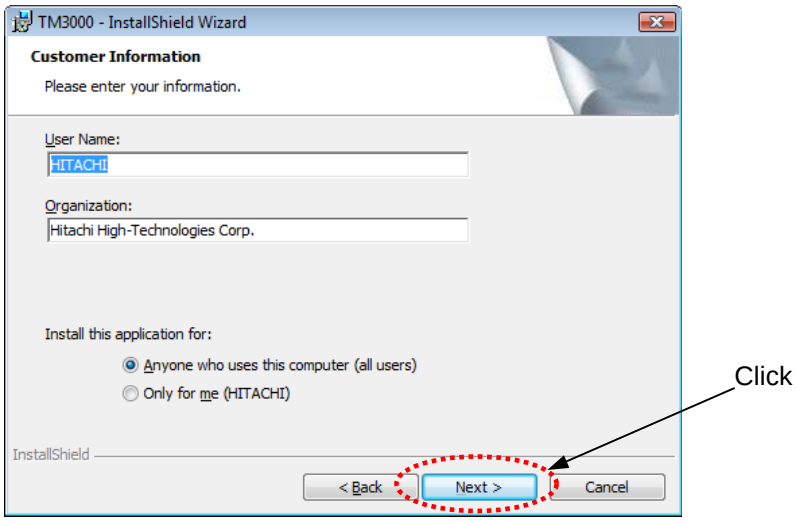


Figure 2.2.1-12 User Information Entry Window

NOTE : If the TM3000 application is for all login users on the PC, select [Anyone who uses this computer (all users)].
The [Only for me] option excludes users other than the one who is performing the installation from using the TM3000 application.

13. The following window appears. Click [Install] button.

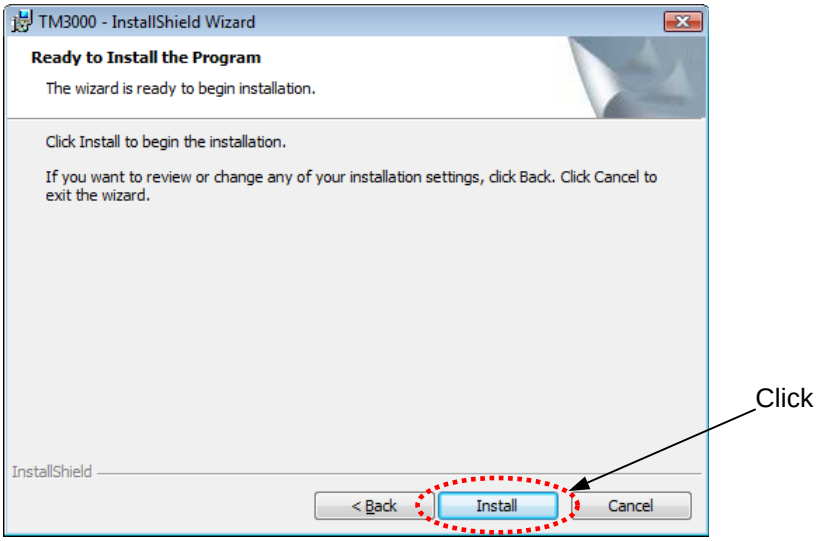


Figure 2.2.1-13 Install Start Window

14. The following window appears. (Do not click the [Cancel;] button.)

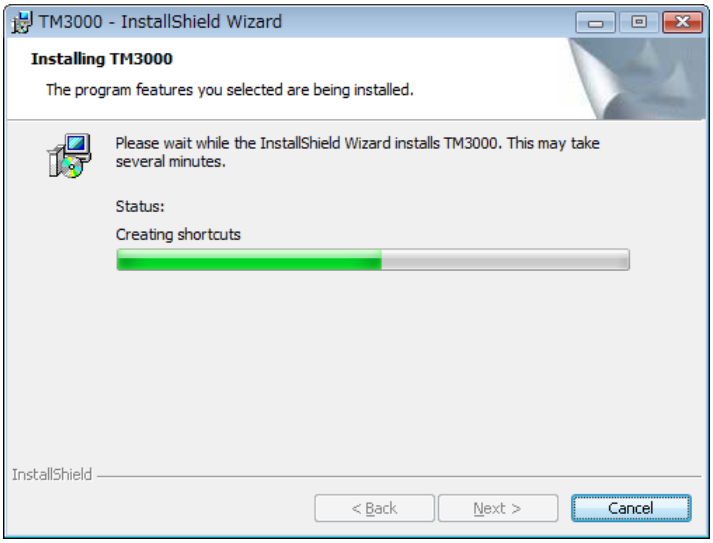


Figure 2.2.1-14 Application Install Window (a)

15. When the window shown in Figure 2.2.1-15 (Windows Security) appears, click [Install this driver software anyway].

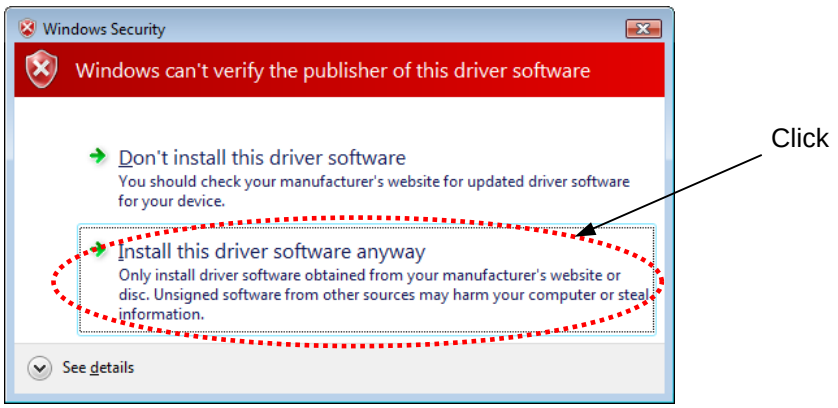


Figure 2.2.1-15 Application Install Window (b)

16. Operation stops with the following windows in a few minutes.

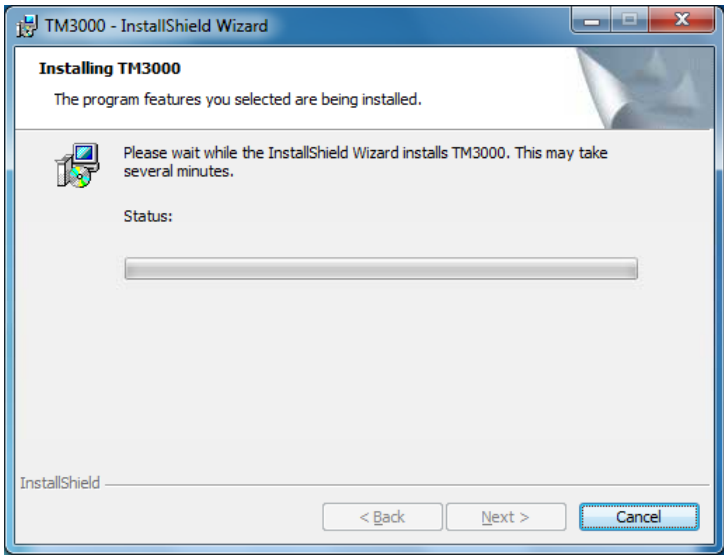


Figure 2.2.1-16 Application Install Window (c)

17. This is because a message of Figure 2.2.1-19 is covered on the back of the above window (Figure2.2.1-16). In this case because [Attach Your device] is displayed on task bar, and click it.

Figure 2.2.1-17 Task Bar (Windows VISTA)

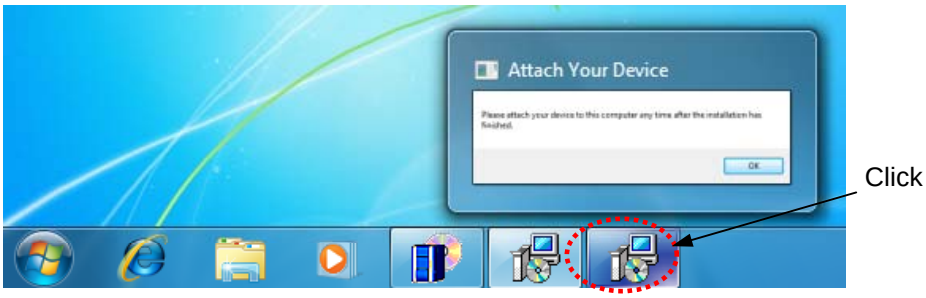


Figure 2.2.1-18 Task Bar (Windows 7)

18. The following [Attach Your device] is displayed. Click [OK] button.

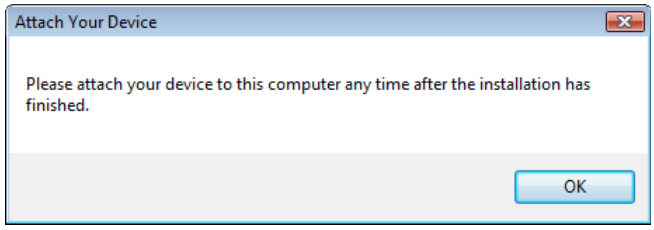


Figure 2.2.1-19 Attach Your Device

19. The following [InstallShield Wizard Completed] is displayed. Click [Finish] button.

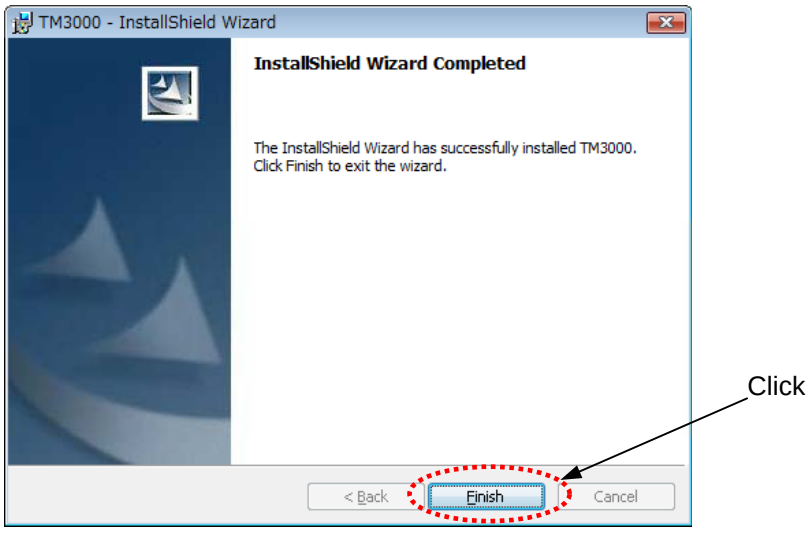


Figure 2.2.1-20 InstallShield Wizard Completed

2.2.2 Installing an Instruction Manual

1. Install an instruction manual. Click the button [Installation for TM3000 application].

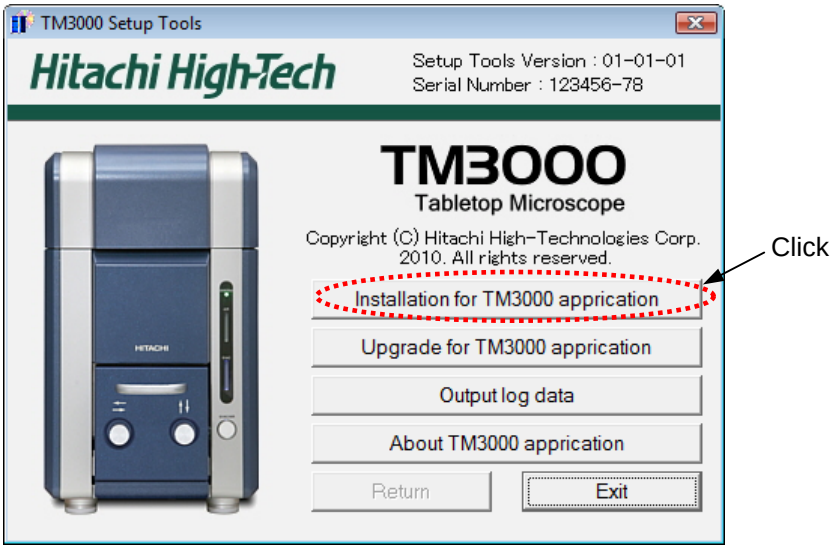


Figure 2.2.2-1 The Main Menu of TM3000 Setup Tools

2. The following window appears. Click the button [Installation of the instruction manuals].

Figure 2.2.2-2 Installation for TM3000 Application

NOTE : If the Instruction Manual is already installed, the window shown below appears. If this is the case, click [OK], uninstall the Instruction Manual, and then re-install it. (For details on the uninstall process, see [2.2.12 Uninstalling an Instruction Manual]).

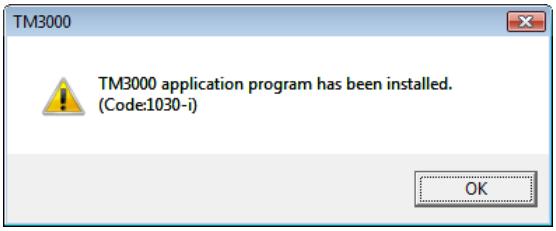


Figure 2.2.2-3 Message

3. The following window appears. Click the [OK] button.

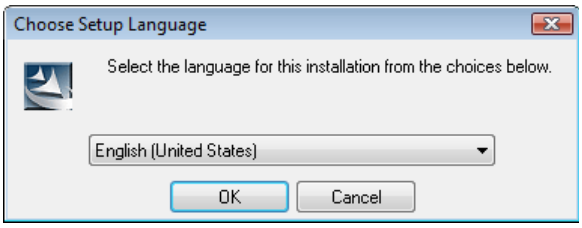


Figure 2.2.2-4 Choose Setup Language

4. The following window appears. Please wait slightly.

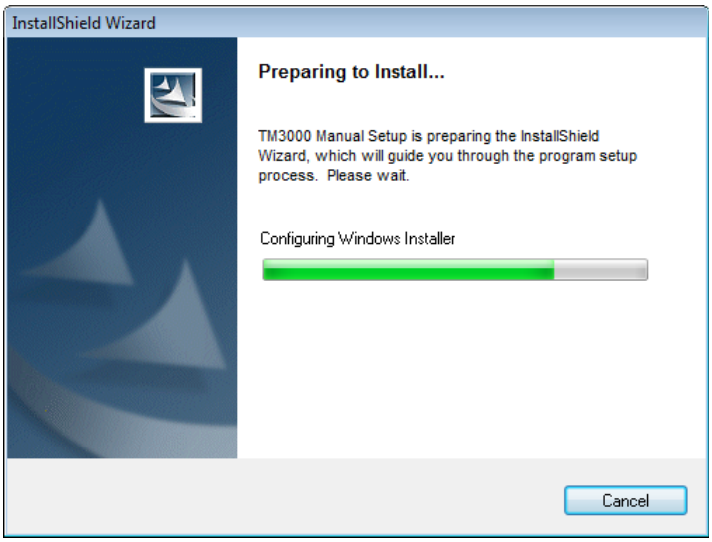


Figure 2.2.2-5 Preparing to Install

5. The following window appears. Click the [Next] button.

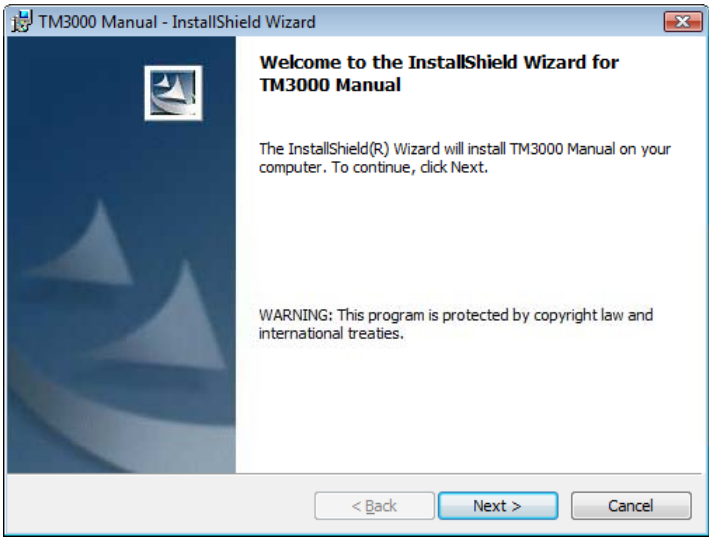


Figure 2.2.2-6 Application Install Window

6. The following window appears. Verify that [Anyone who uses this computer (all users)] is selected in [Install this application for:], click the [Next] button.

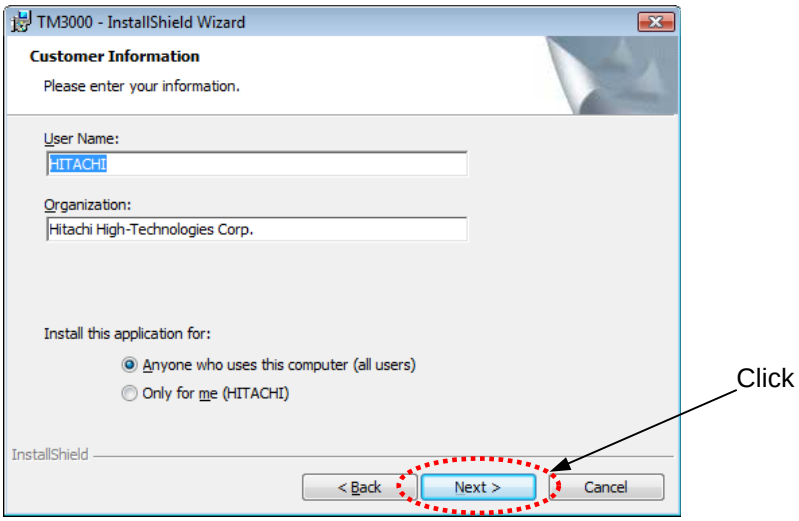


Figure 2.2.2-7 User Information Entry Window

NOTE : If the TM3000 application is for all login users on the PC, select [Anyone who uses this computer (all users)].
The [Only for me] option excludes users other than the one who is performing the installation from using the TM3000 application.

7. The window shown in Figure 2.2.2-8 appears. Click the [Install] button.

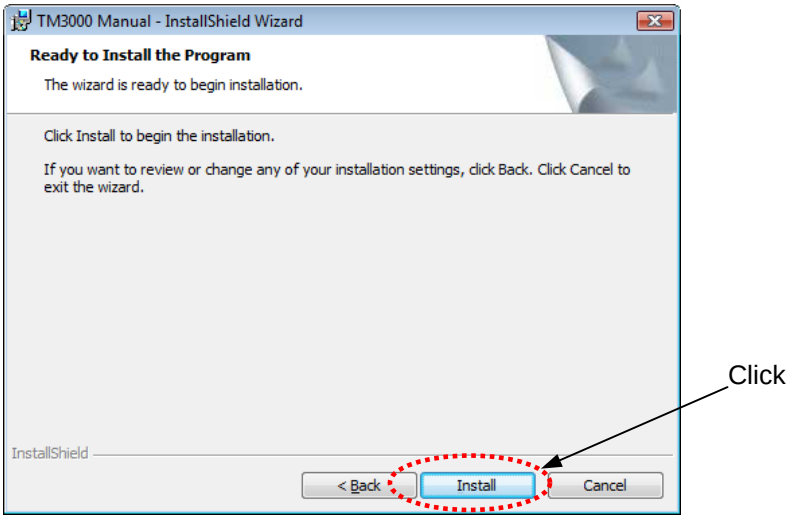


Figure 2.2.2-8 Instruction Manual Install Window

8. The following window appears. (Do not click the [Cancel;] button.)

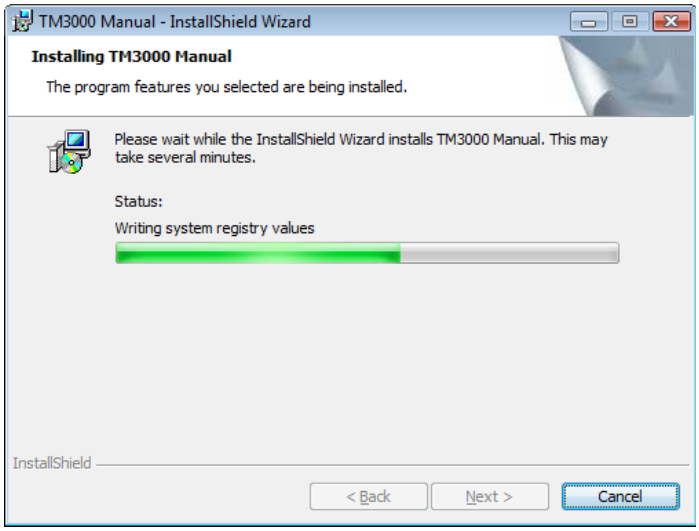


Figure 2.2.2-9 Manual Install Window

9. The following [InstallShield Wizard Completed] is displayed. Click [Finish] button.

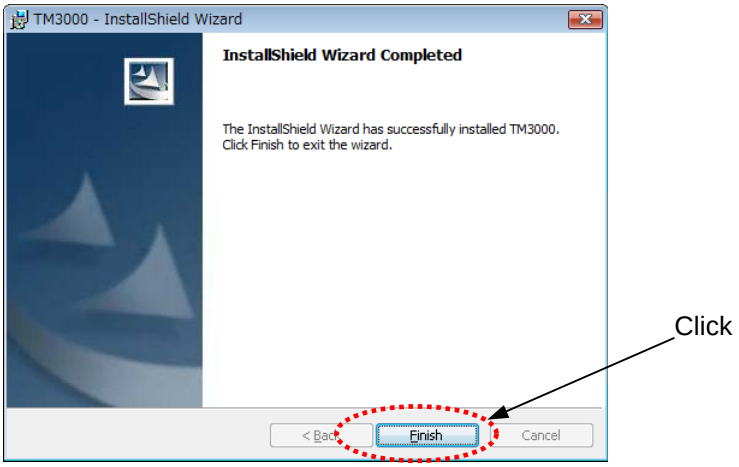


Figure 2.2.2-10 InstallShield Wizard Completed Window

2.2.3 Setup of System Files

1. Setup System Files. Click the button [Installation for TM3000 application].

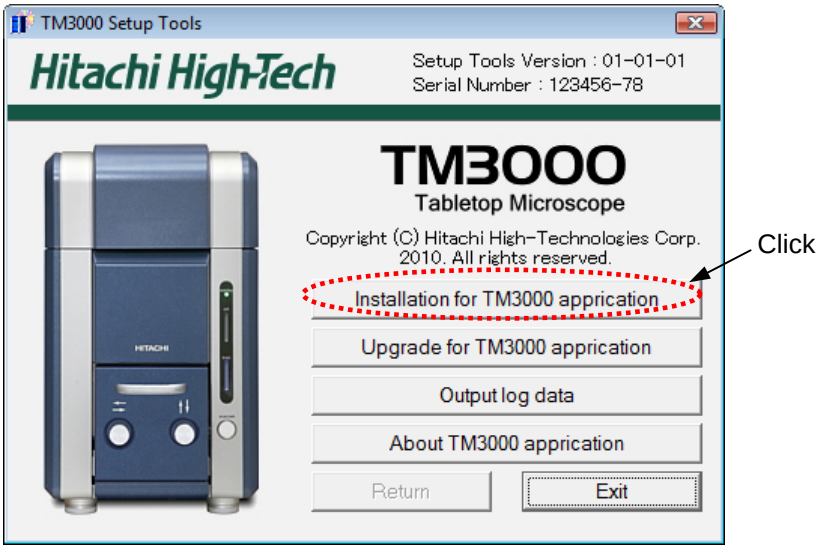


Figure 2.2.3-1 The Main Menu of TM3000 Setup Tools

2. The following window appears. Click the button [Setup of system files].

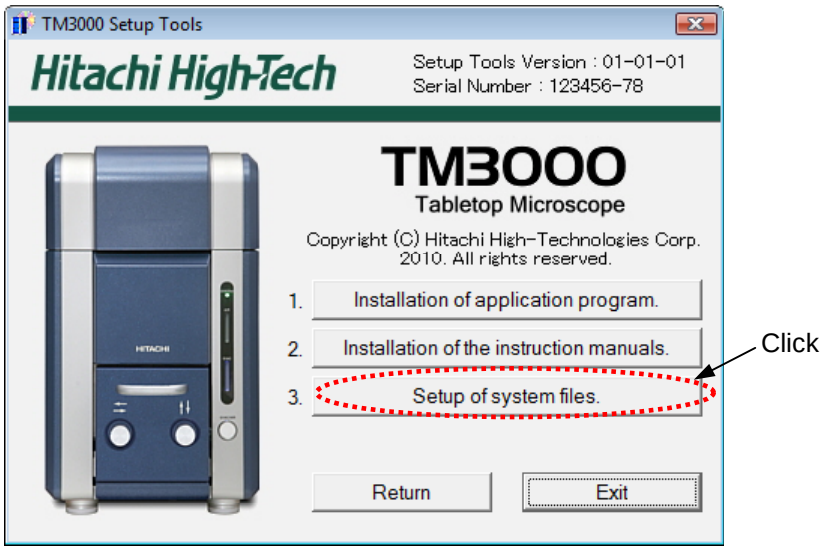


Figure 2.2.3-2 Installation Menu of TM3000 Setup Tools

3. The following message is displayed, after finishing installation of System Files.

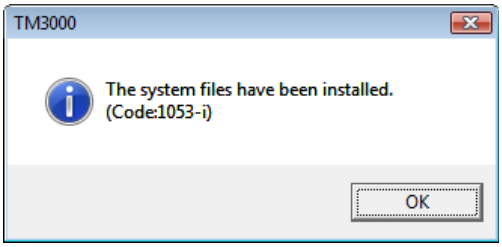


Figure 2.2.3-3 Message of Finishing Installation of System Files

4. Click the button [Exit] of Installation menu of TM3000 Setup Tools.

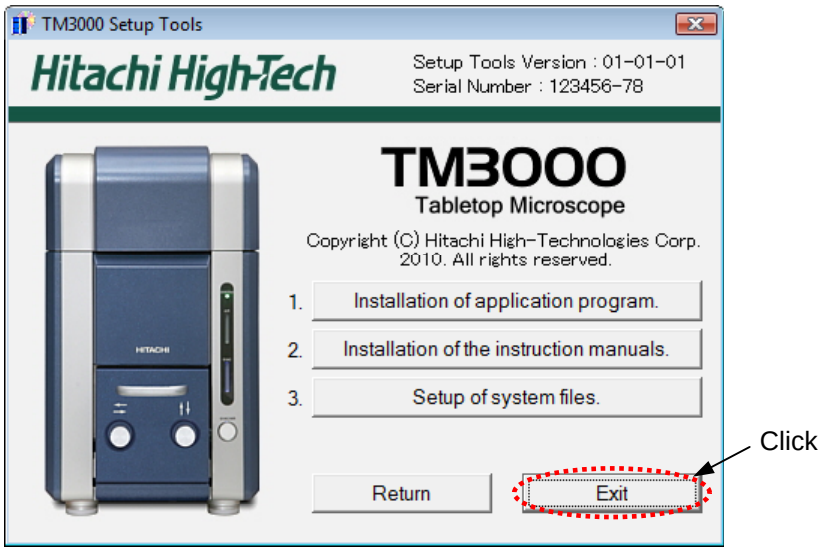


Figure 2.2.3-4 Installation for TM3000 Application

5. Take out the setup disk from CD/DVD drive.

NOTE : In a setup disk, system data at the time of the shipment of the device are saved. Please keep it carefully. Never lost!

2.2.4 Checking the Installation of Application

1. Verify that a [TM3000] shortcut exists on Desktop.

Figure 2.2.4-1 TM3000 Shortcut Icon

2. Verify that [TM3000] has been added to the Start program menu.

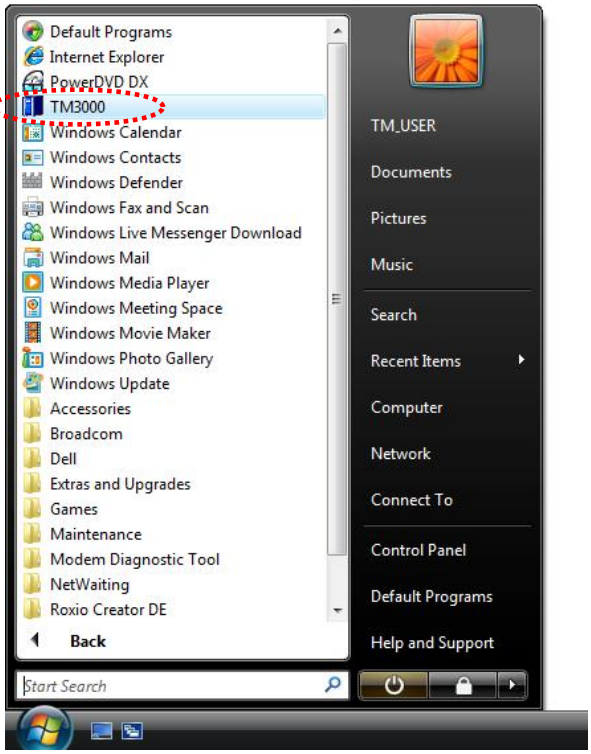


Figure 2.2.4-2 Checking the Application

3. The files containing the application are installed in a folder named [C:\Program Files\TM3000\]. Do not edit, move, or delete the installed files.

2.2.5 Installing the USB Driver Software

Installing the USB software has to be done after having installed a TM3000 application program.

1. With a USB cable, connect the system main unit to the PC. Keep turning off the system of main unit.

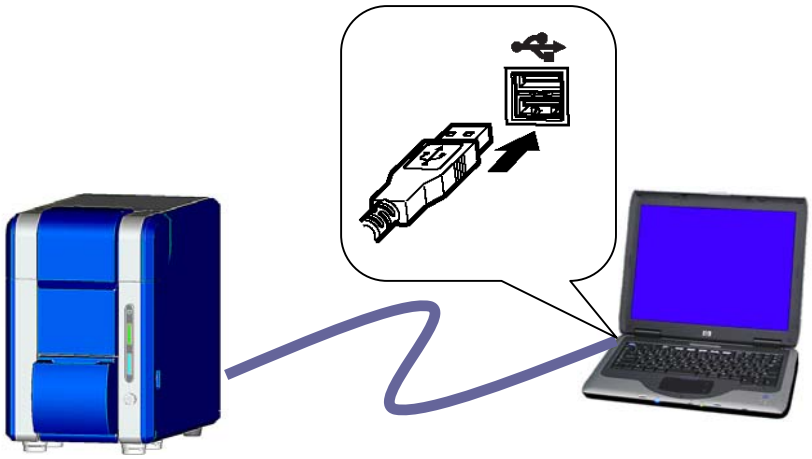


Figure 2.2.5-1 Connecting the Main Unit to the PC

2. Turn on the system main unit. The Plug-and-Play feature of the PC recognizes the USB device, and displays the following message for a few seconds in the lower part of the window.

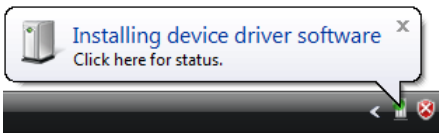


Figure 2.2.5-2 Main Unit Connection Verification Message

3. When the installation of the USB device driver is completed, the following messages are displayed.

Figure 2.2.5-3 Main Unit Connection Verification Message

2.2.6 Checking the Driver Software

1. From [Control Panel], open [Device Manager].

Figure 2.2.6-1 Device Manager Icon

※ If Device Manager fails to appear, click [Classic View] to display it.

2. The window (User Account Control) shown in Figure 2.2.6-2 appears. Click [Continue].

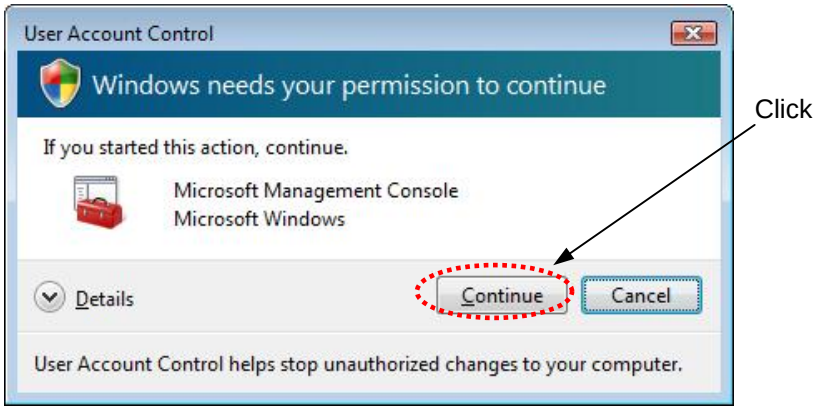


Figure 2.2.6-2 User Account Control Window

3. Device Manager is displayed. On Device Manager, verify that the [SemUsb Device] exists. If [SemUsb Device] does not exist, re-install the USB driver.

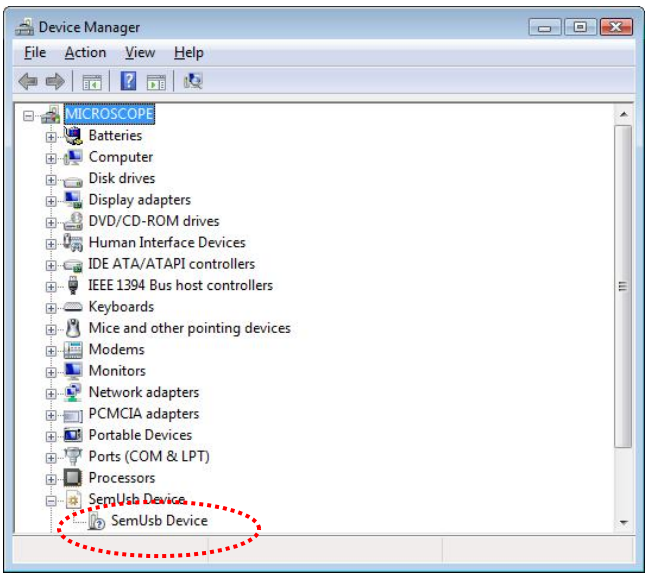


Figure 2.2.6-3 Device Manager Window

4. Close the Device Manager.

2.2.7 Screen Settings

1. In the Case of Windows® 7

1a. Click the lower left of desktop  button, click [Control Panel].

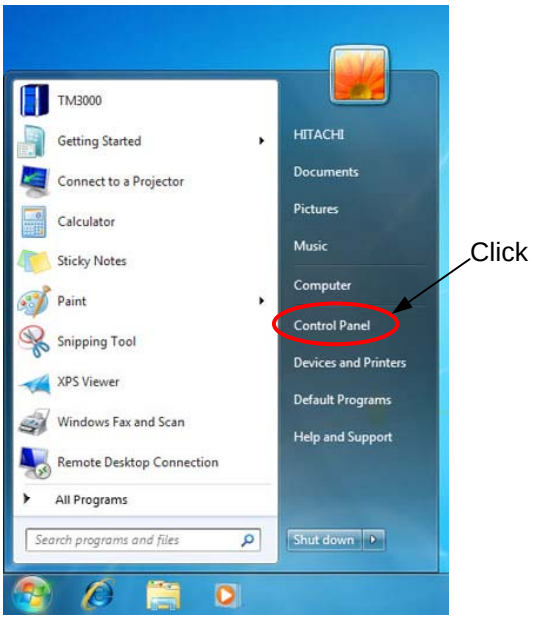


Figure 2.2.7-1 Open the Control Panel

1b. Click [Small icons] of View by: [Category] on Control panel.

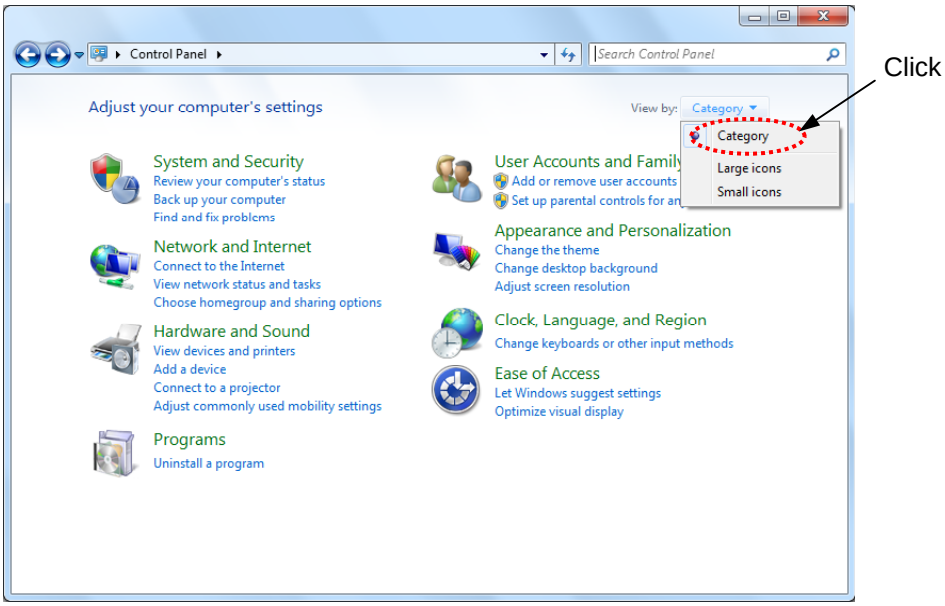


Figure 2.2.7-2 Control Panel

1c. Click [Personalization].

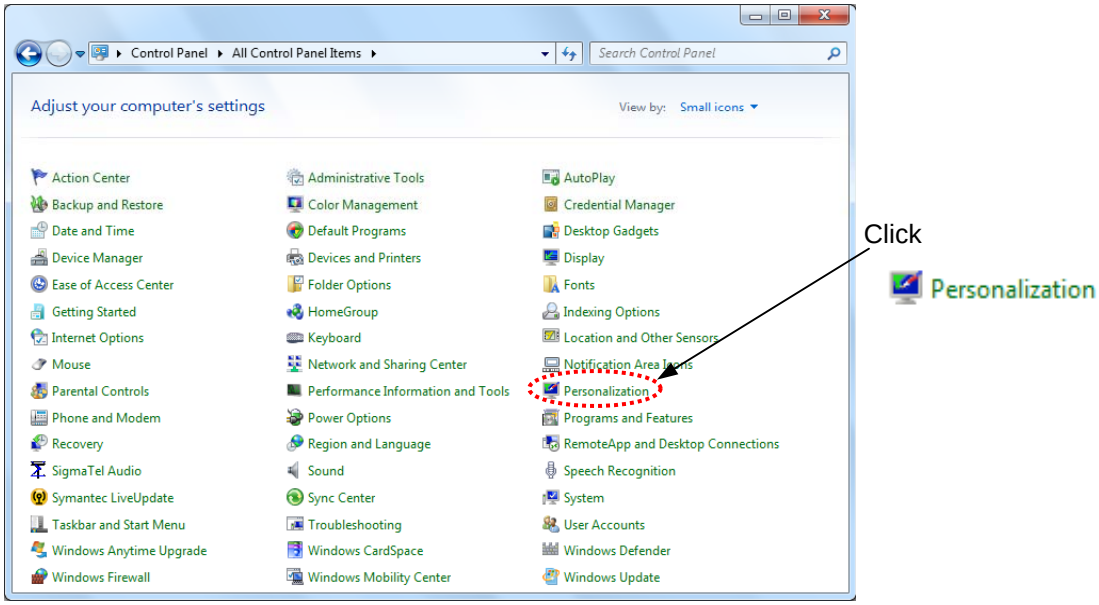


Figure 2.2.7-3 Adjust your computer's settings

1d. Down the scrollbar, and click [Windows 7 Basic].

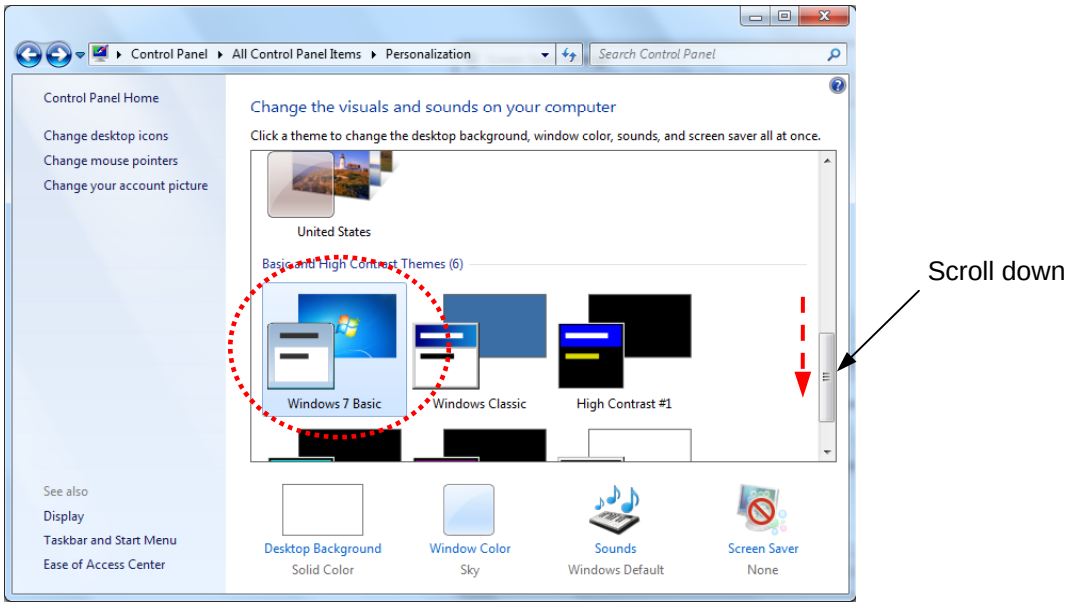


Figure 2.2.7-4 Personalization

1e. The window is B/W image in a few seconds, and return. Confirm [Windows color] is changed to [Windows 7 Basic], [Screen saver] is changed to [None].
Click [Screen saver].

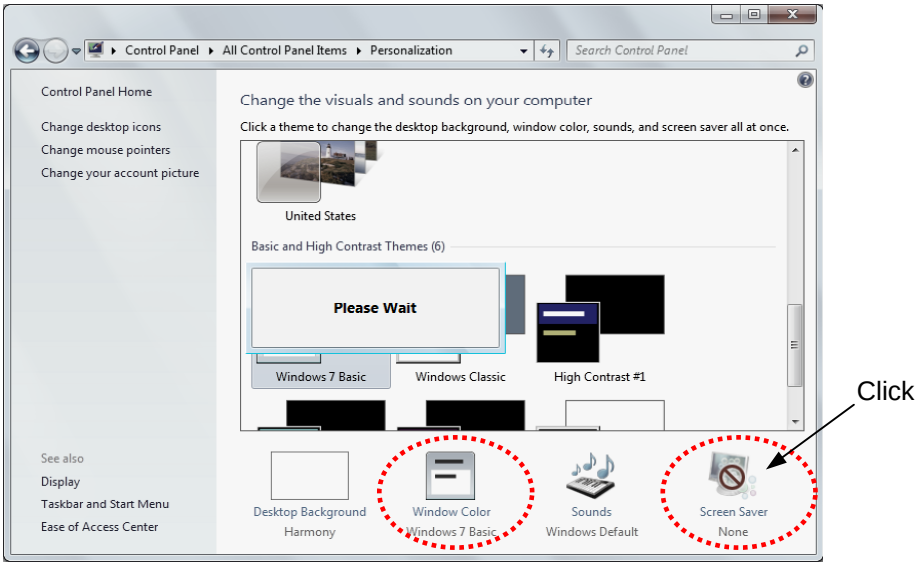


Figure 2.2.7-5 Setting of Personalization

NOTE : It is recommend use by the setting mentioned above. Especially, there is the case that does not some function smoothly when using [Windows Aero] function.

1f. The following window appears. Click [Change power settings].

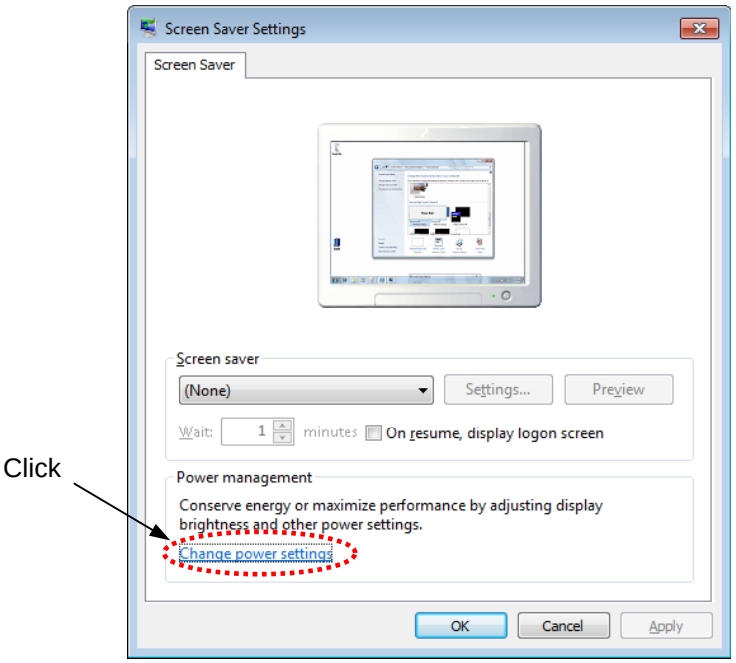


Figure 2.2.7-6 Power Management

1g. [Power Options] window appears. Confirm [Plans shown on the battery meter] is [Balance], and click [Change plan settings].

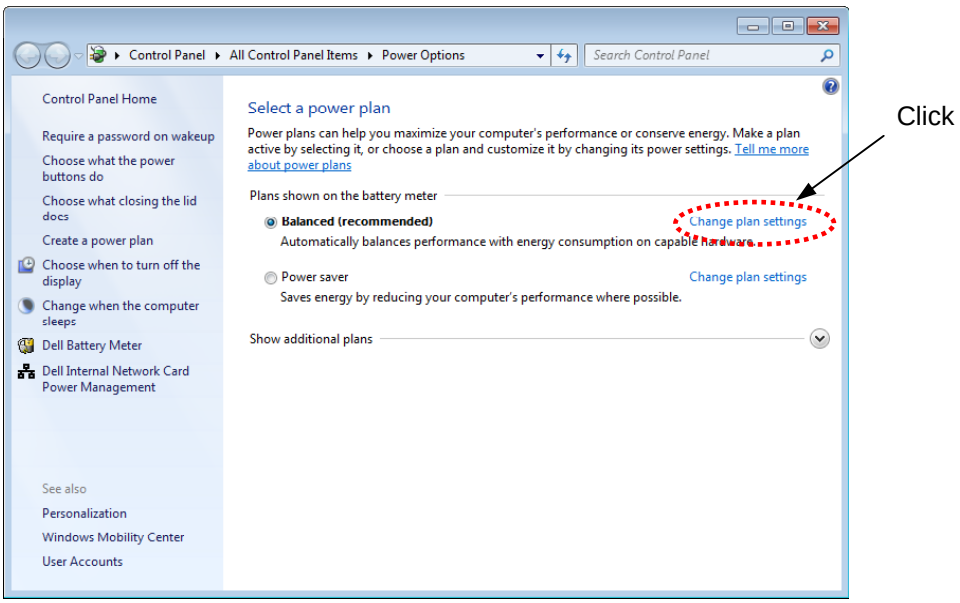


Figure 2.2.7-7 Select a power plan

1h. [Edit Plan Settings] window appears. Change [Turn off the display], [Put the computer to sleep] and [On battery] [Plugged in] both to [Never]. Click [Save changes]
Back to **1g**, and change the mode to [Power saver].

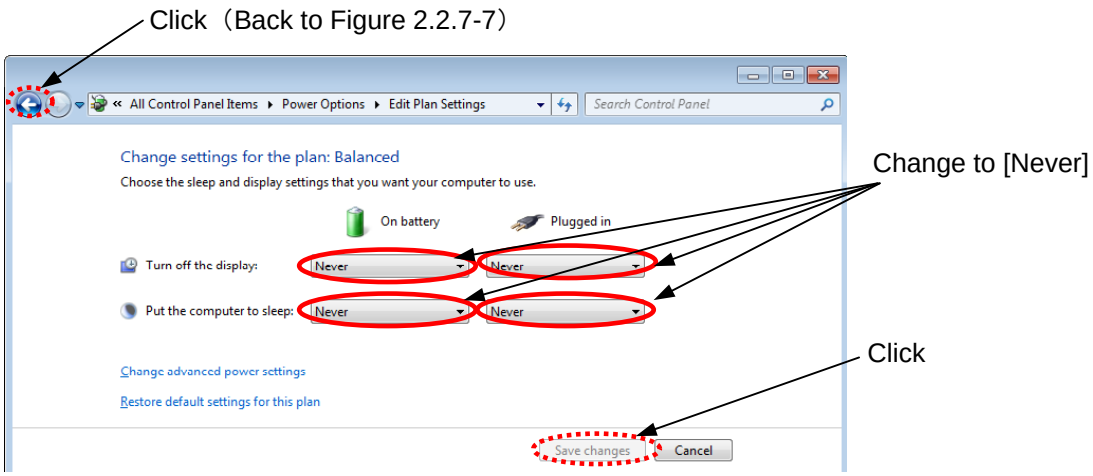


Figure 2.2.7-8 Edit Plan Settings

1i. Change a plan to [Power saver], and Click [Change plan settings]. Change the setting to [Never] in a procedure same as **1h**. Click the [Save changes].

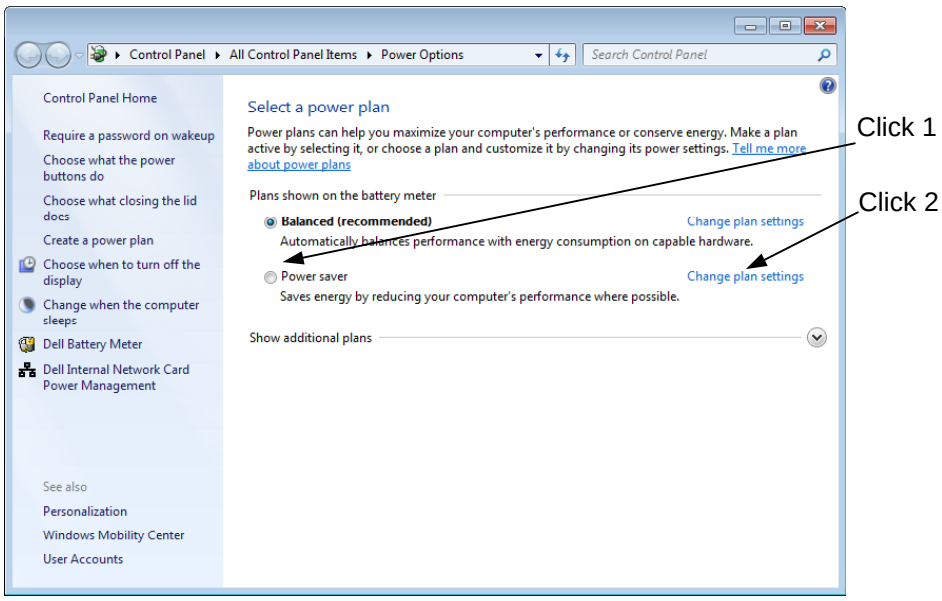


Figure 2.2.7-9 Select a Power Plan Again

1j. Back to [Power Options], and Click [Choose what closing the lid does].

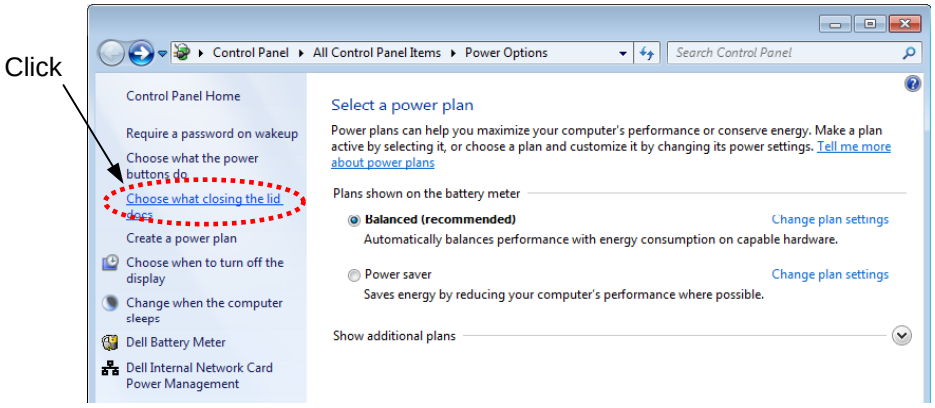


Figure 2.2.7-10 Select a Power Plan Again

1k. The following window appears. Change the setting to [Shut down] of When I press the power button: Change the setting to [Do nothing] of When I close the lid:
Set same condition to [On battery] and [Plugged in].
After setting, click [Save changes].

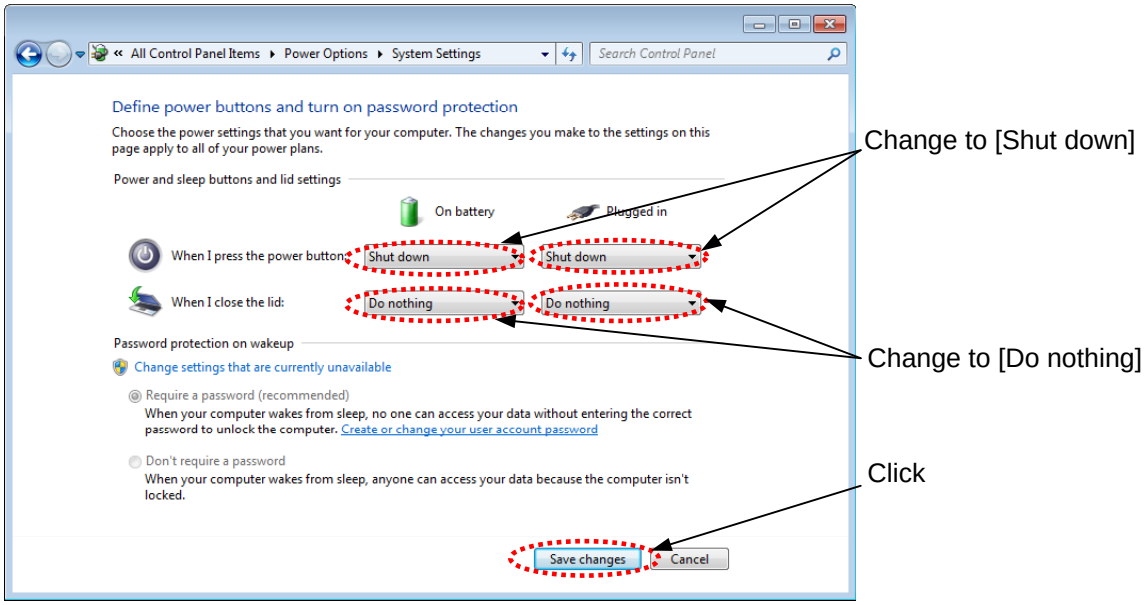


Figure 2.2.7-11 Power and Sleep Buttons and Lid Setting

NOTE : When an application is running, do not use the screen saver, and do not make a PC a sleep state or System stand-by. If any of these actions are taken, USB communication is disrupted in Windows, causing the application to fail to start or run normally.
When a communication error occurred, the reboot of the application is necessary.

1l. Return to [Select a power plan], click [Personalization] and click [Display].

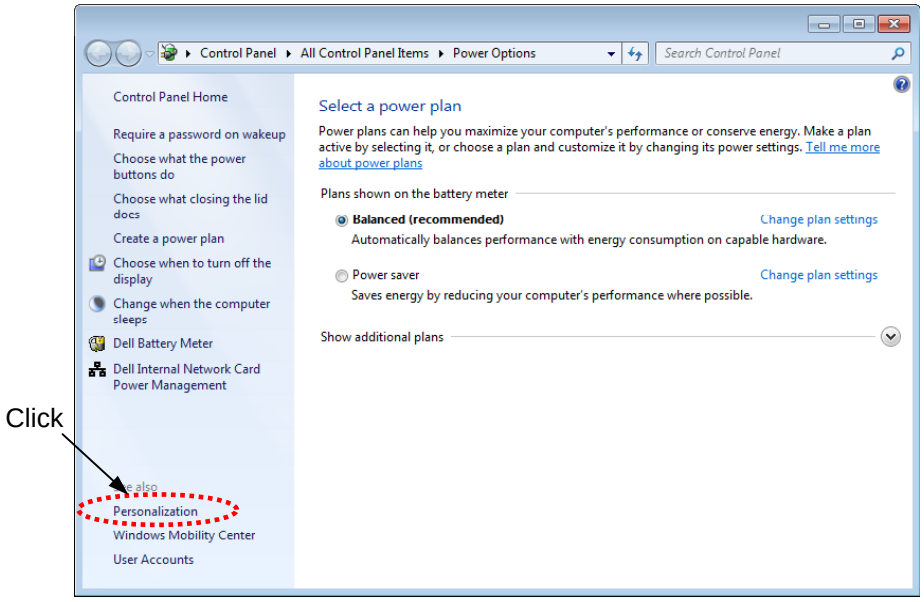


Figure 2.2.7-12 Select a Personalizations

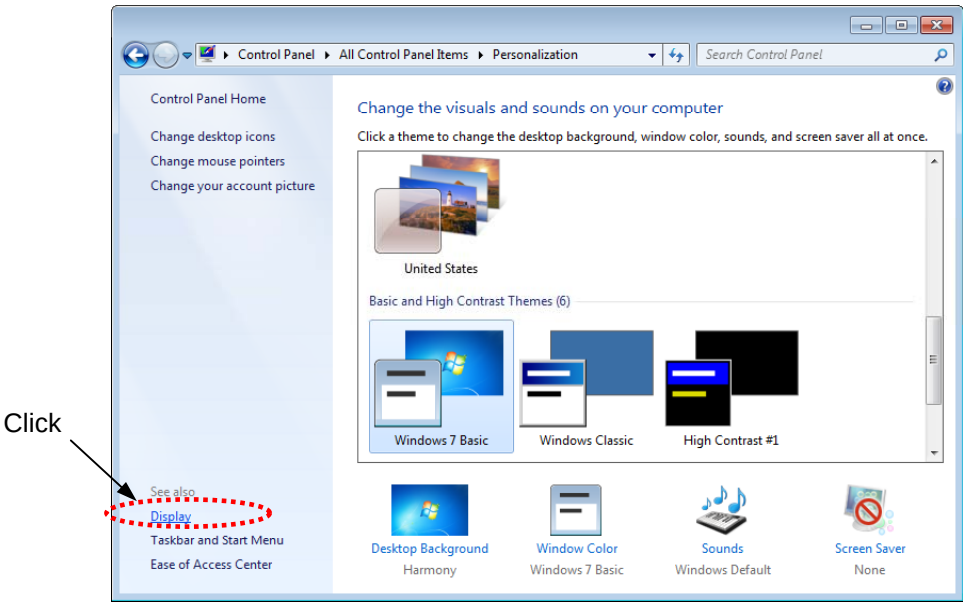


Figure 2.2.7-13 Click [Display]

1m. The following window appears. Click [Set custom text size (DPI)].

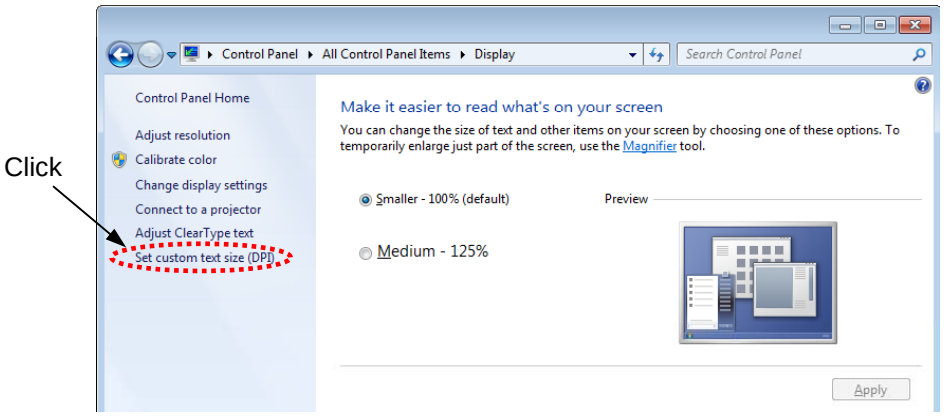


Figure 2.2.7-14 Display

1n. Confirm the setting is follow (9point Segoe UI at 96 pixels per inch), click [OK].

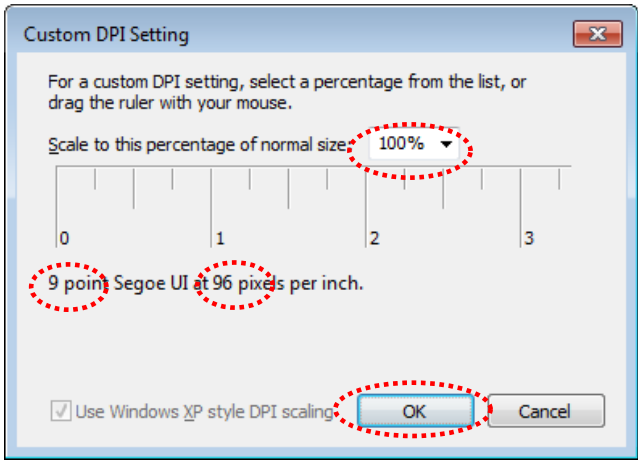


Figure 2.2.7-15 Custum DPI Setting

1o. Back to Display, Click [Adjust resolution].

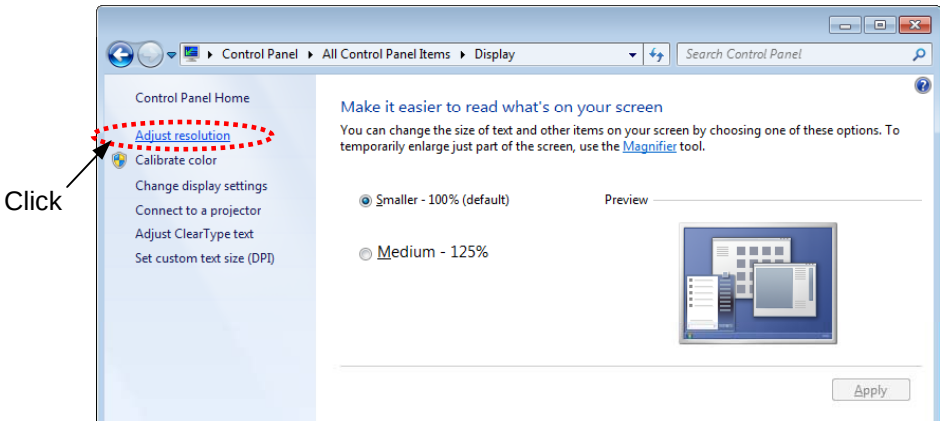


Figure 2.2.7-16 Click [Adjust resolution]

1p. Confirm the setting is follow (1280x800 (Recomended)), click [OK].

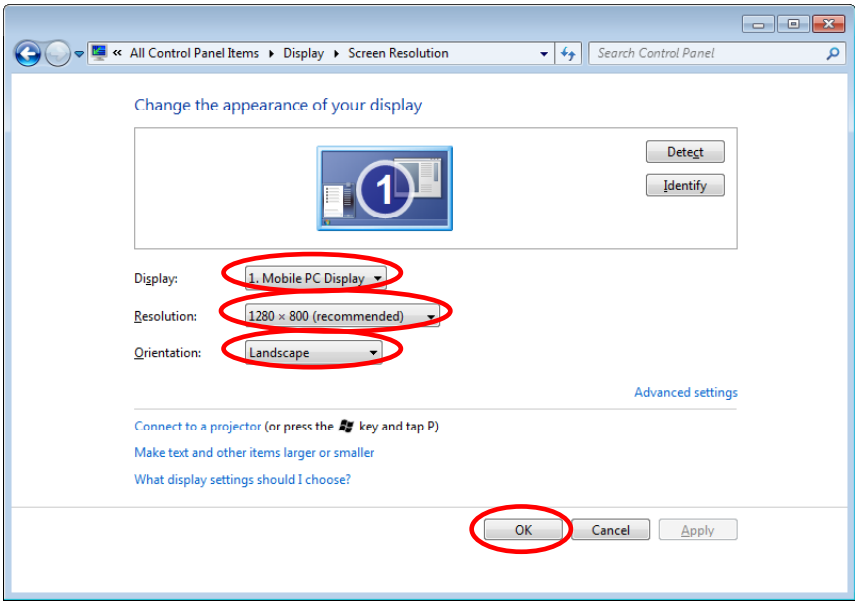


Figure 2.2.7-17 Screen Resolution

With the above setup of the PC is completion. Refer to [2.2.1 Installing an Application] about installation of TM3000 application.

2. In the Case of Windows® VISTA

2a. From [Control Panel], open [Personalize].

Figure 2.2.7-18 Personalize Icon

2b. The Personalization menu appears. Click [Display Settings].

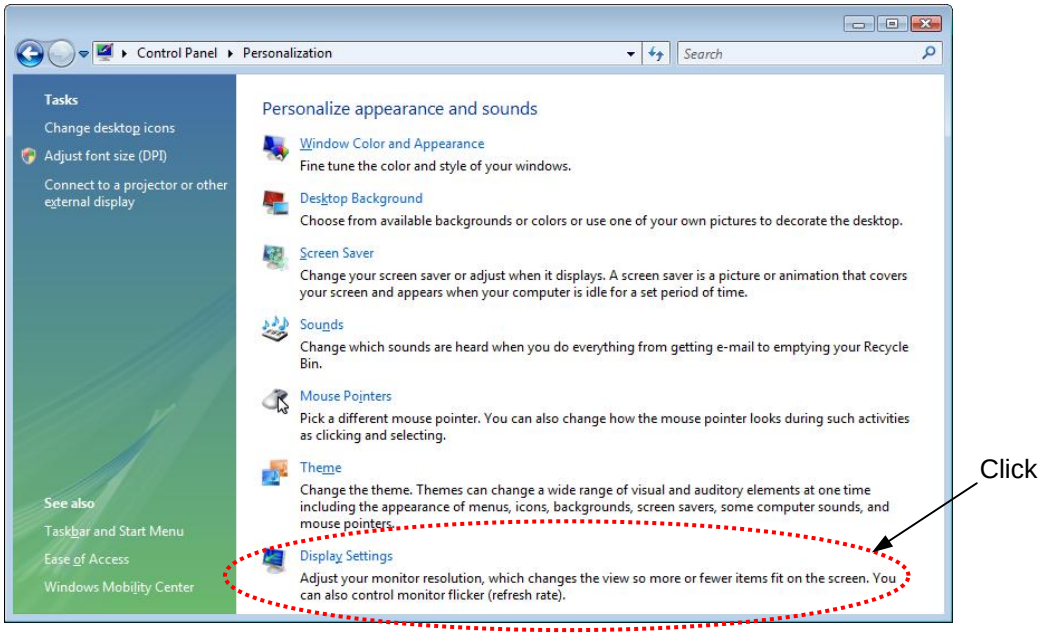


Figure 2.2.7-19 Personalize Window

2c. A Display Settings dialog appears. Select a [1280×800 pixel] resolution and a [maximum (32-bit)] color. Click the [Apply] button and the [OK] button to close the window. If the resolution and the color are already set as indicated above when the Display Settings dialog is opened, simply click the [OK] button to close the window.

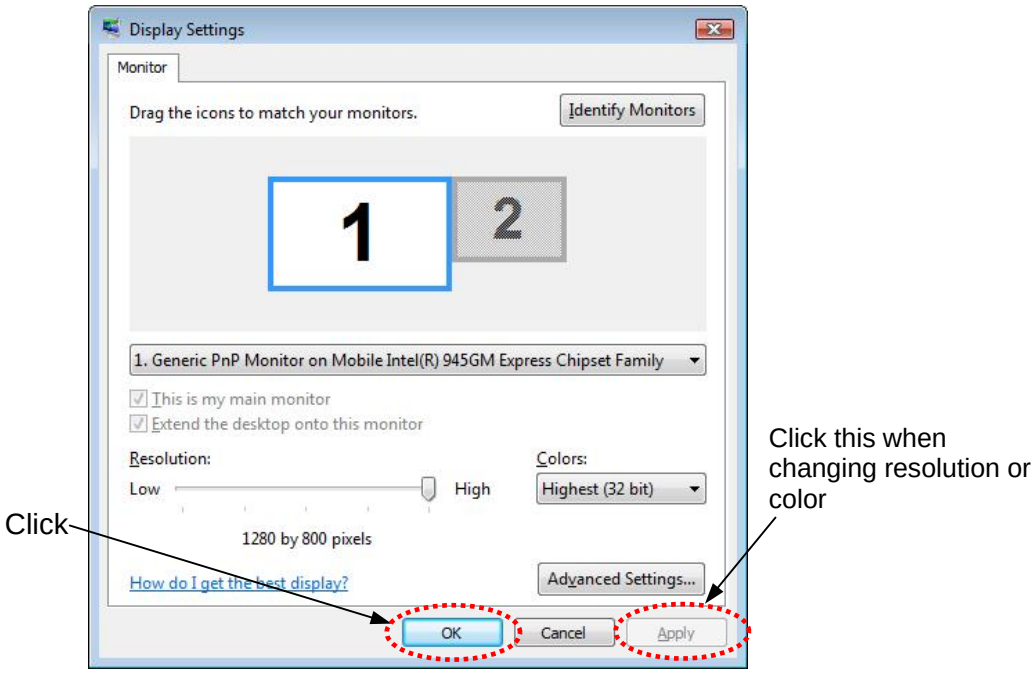


Figure 2.2.7-20 Display Settings Window

NOTE : The application program cannot be started if the screen resolution is set to below [1024×768 pixels] or the screen color is specified as [16 bits] or less.

2d. In the Personalization menu in Figure 2.2.7-19, click [Adjust font size (DPI)]. The window (User Account Control) shown in Figure 2.2.7-21 appears. Click the [Continue] button.

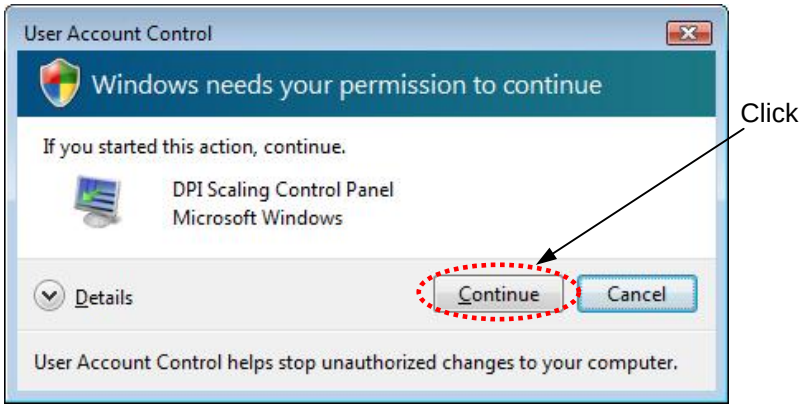


Figure 2.2.7-21 User Account Control Window

2e. A DPI scale is displayed. Verify that [Default scale (96 DPI) – fit more information] is selected. Click the [OK] button to close the window. If a DPI scale different from the above is selected, change it, and click the [Apply] button, and then the [OK] button.

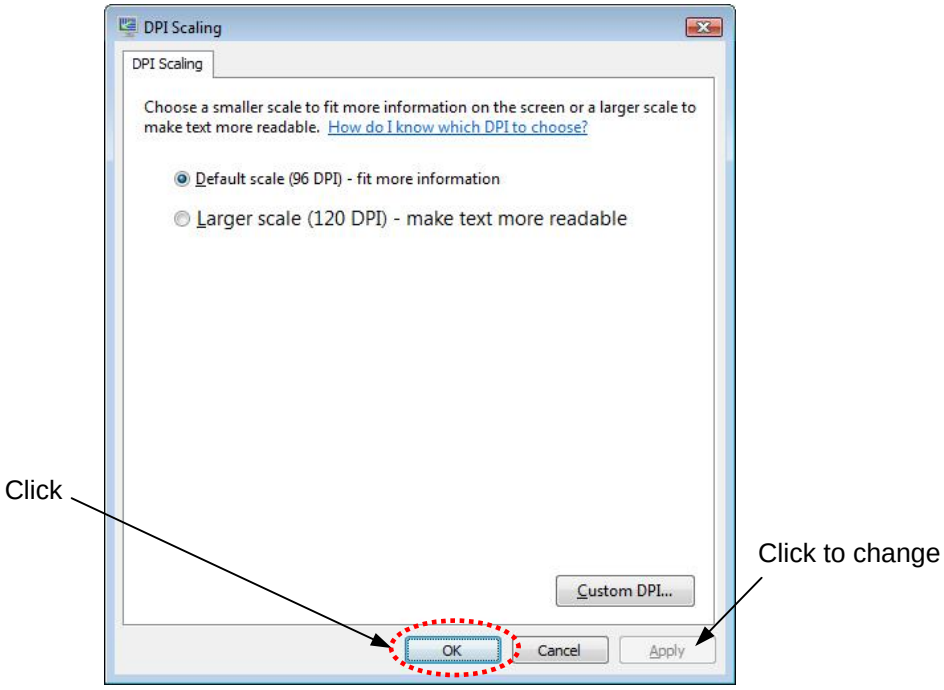


Figure 2.2.7-22 DPI Scaling Window

NOTE : The application program cannot be started if the DPI scale is different from [Default scale (96 DPI) – fit more information].

2f. From the Personalization menu in Figure 2.2.7-19, click [Screen Saver]. Screen saver settings appear. For Screen Saver, select [None]. Click the [Apply] button and then the [OK] button to close the window.

NOTE : -The case of using a Screen Saver-
USB connection becomes OFF at the time of Screen Saver start, and there is the case that the communication error of the application.

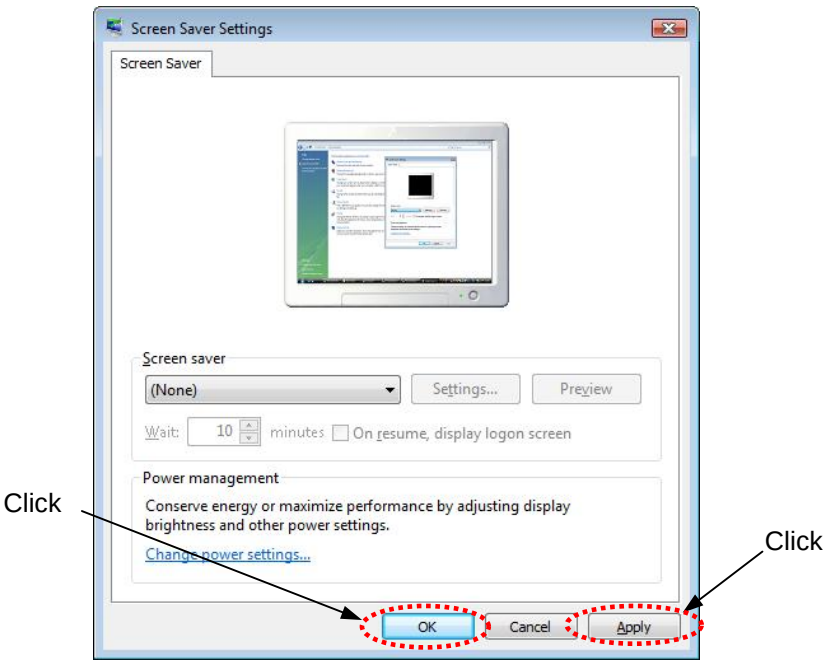


Figure 2.2.7-23 Screen Saver Settings

2g. From [Power Management], click [Change power settings ….]. A power options menu appears. Click [Change plan settings] for the currently selected mode.

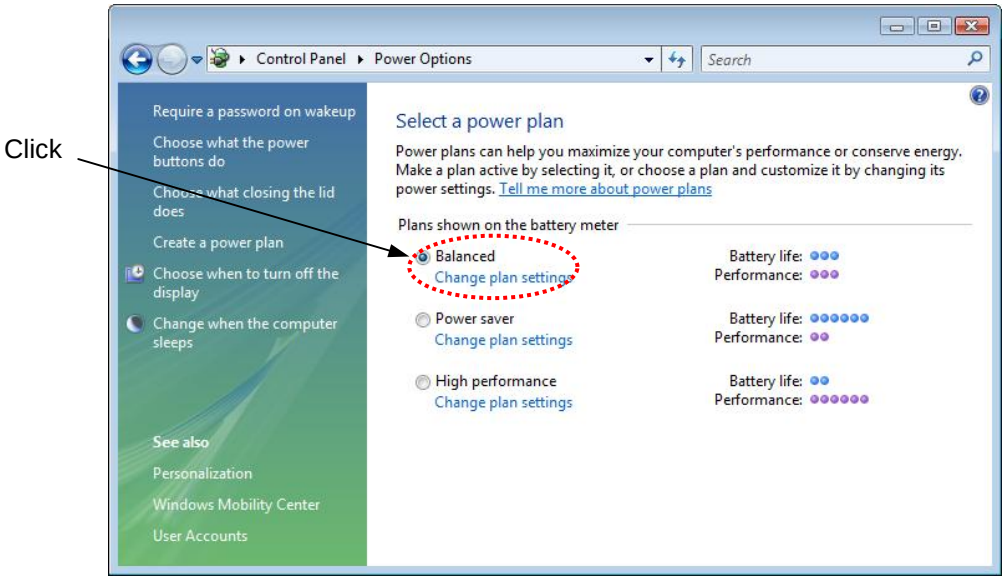


Figure 2.2.7-24 Power Options Window

2h. The [Edit Plan Settings] menu appears. On all of the options, [Turn off the display] and [Put the computer to sleep], select [Never], and click the [Save changes] button.

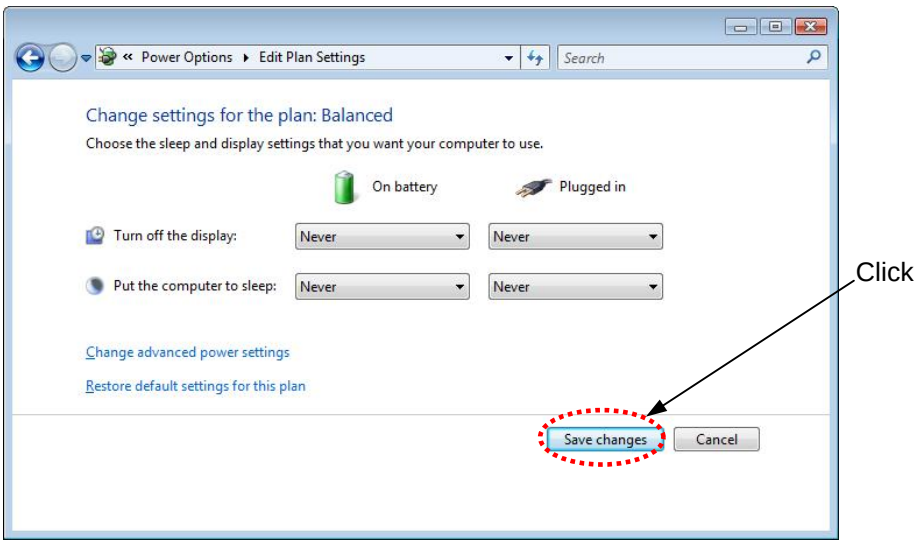


Figure 2.2.7-25 Change Settings for the Plan Window

NOTE : Specify the above settings in each of the Balanced, Power Saver, and High Performance modes.

2i. After verifying that [Balanced] is selected, click [Choose what closing the lid does].

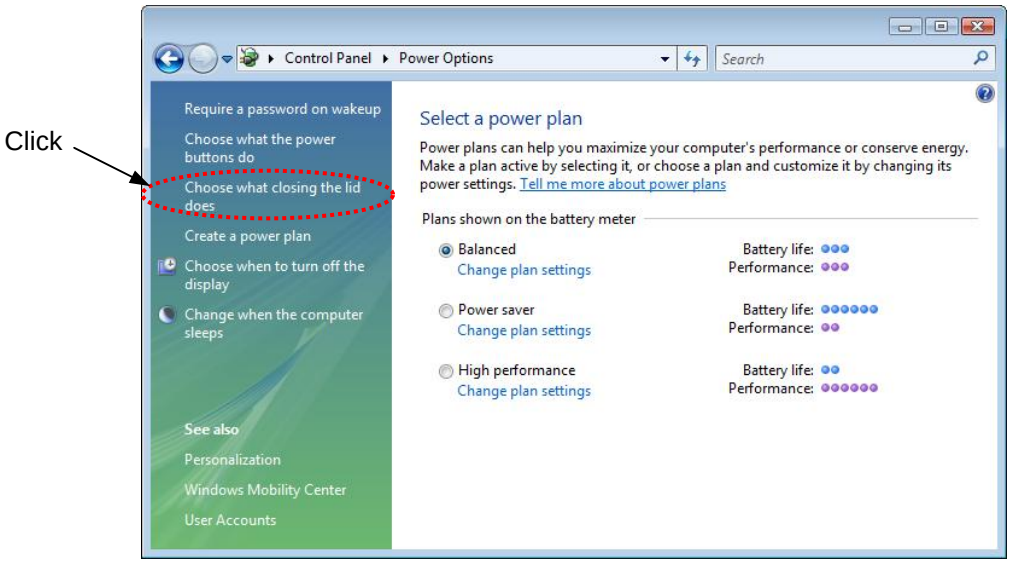


Figure 2.2.7-26 Power Options Settings

2j. The System Settings menu appears. Set [When power button is pressed] to [Run on battery], [When connected to power supply] to [Shut down], [When lid is closed] to [Run on battery], and [When connected to power supply] to [Do nothing]; click [Save changes]. When finished with saving the changes, close the Power Options window and the Screen Saver window.

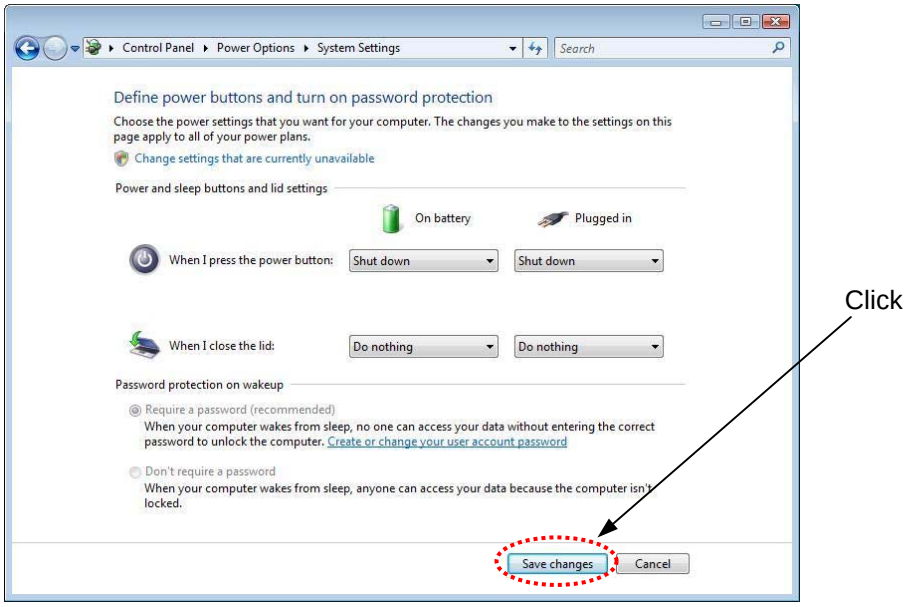


Figure 2.2.7-27 System Settings Window

NOTE : Do not start the window save when an application is running, do not put the PC in the System Standby status or in the Sleep status. If any of these actions are taken, USB communication is disrupted in Windows, causing the application to fail to start or run normally.

2k. On the Personalization menu, click [Window Color and Appearance]. A Window color and appearance menu appears.

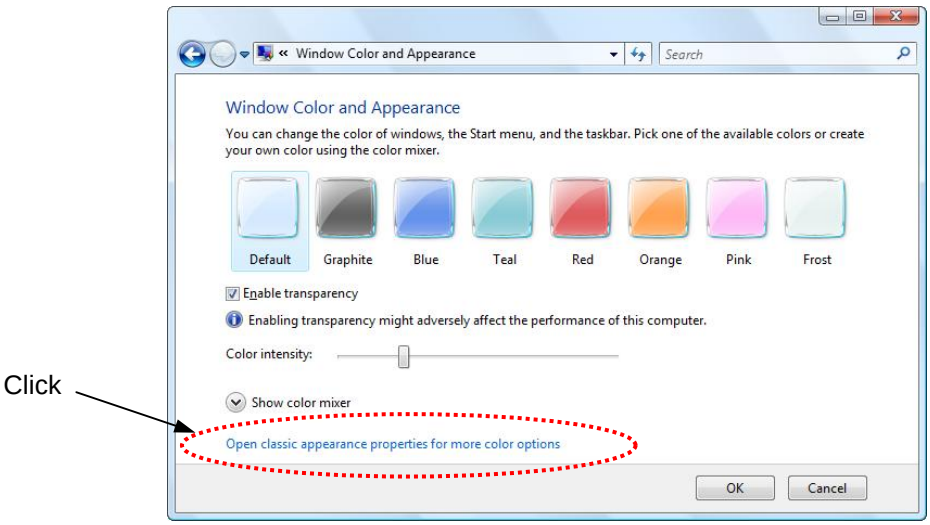


Figure 2.2.7-28 Window Color and Appearance Window

2l. On the Window Color and Appearance menu, click [Open the classic style [Appearance] property to set detailed color options]. The Appearance Settings window appears. For color scheme, select [Windows Vista basic], and click the [Apply] button. Click the [OK] button to close the window.

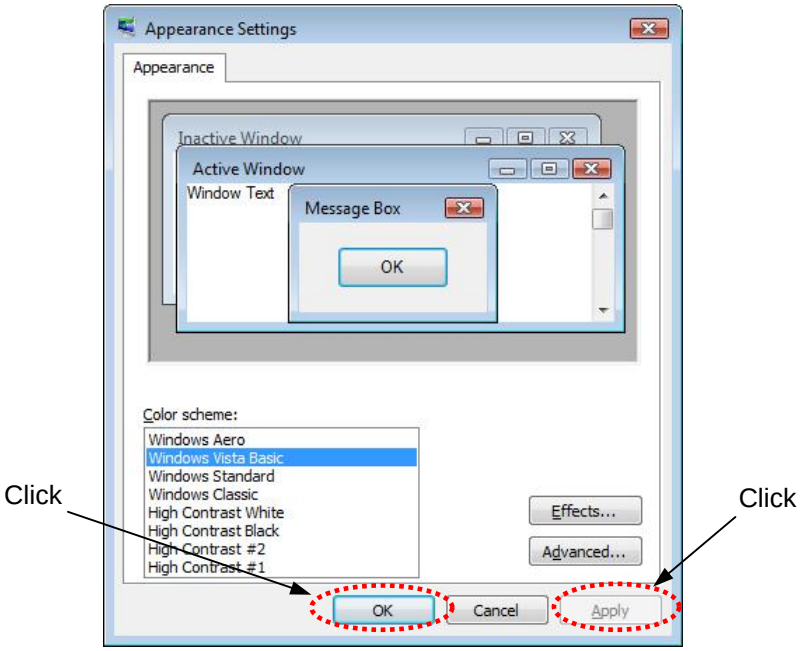


Figure 2.2.7-29 Appearance Settings Window

NOTE : For the application, the uses of the above settings are recommended. The use of the [Windows Aero] feature can potentially cause problems, such as slow observation window drawing or a failure to support normal observation.

2m. Close the Personalization menu.

2.2.8 Changing the Default Input Language

1. Click on the [Option] button of the Language Bar.

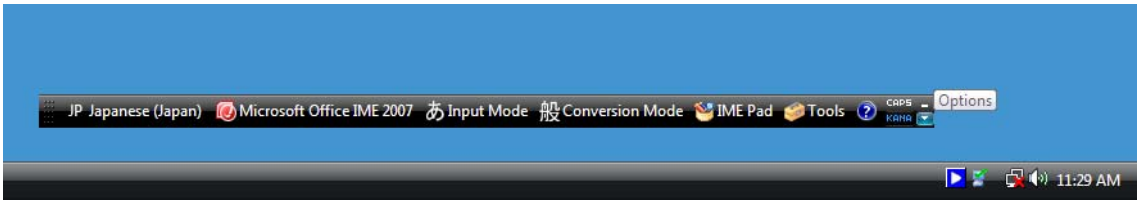


Figure 2.2.8-1 [Option] Button of the Language Bar

2. From the sub menu, click on [Settings…].

The Text Services and Input Languages dialog will be displayed.

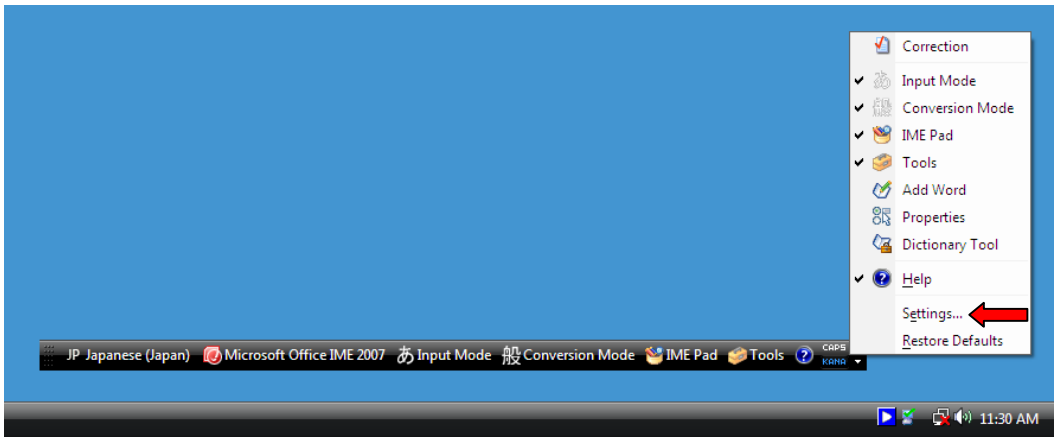


Figure 2.2.8-2 Languages Dialog

3. Click on the [Add…] button.

The Add Input Language dialog will be displayed.

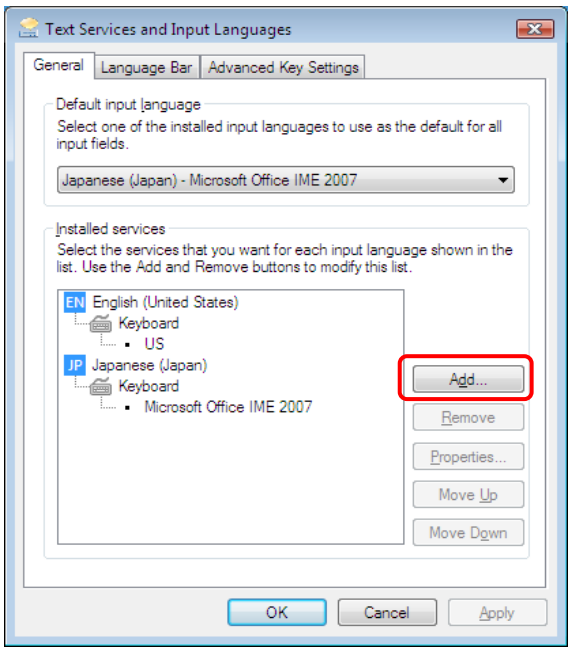


Figure 2.2.8-3 Add Input Language-General Dialog

4. From the list, select [Japanese (Japan)] – [Keyboard] – [Microsoft IME] and click on the [OK] button.

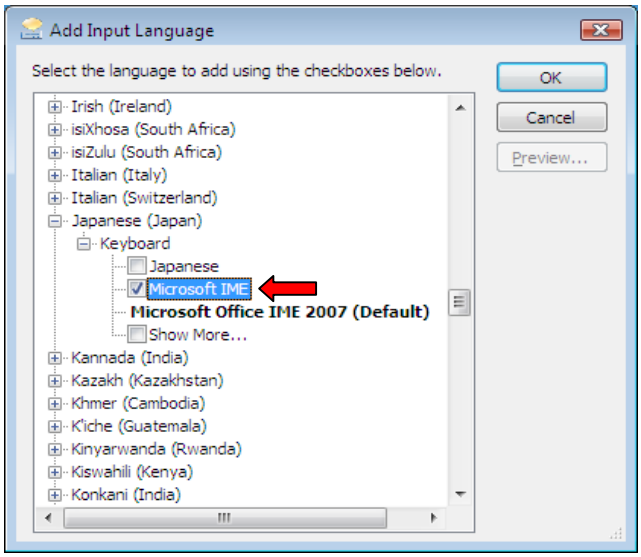


Figure 2.2.8-4 Add Input Language Dialog

5. From the pull down list of the “Default input language” in the “Text Services and Input Languages” dialog, select [Japanese (Japan) – Microsoft IME].

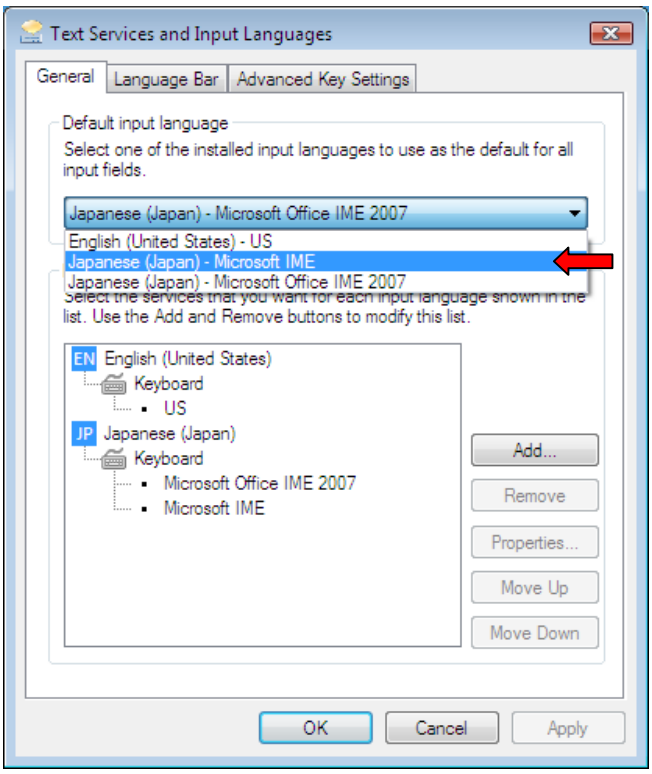


Figure 2.2.8-5 Select [Japanese (Japan) – Microsoft IME]

6. From the list of “Installed services,” select “Japanese (Japan) – Keyboard - Microsoft Office IME 2007,” and click on the [Remove] button.

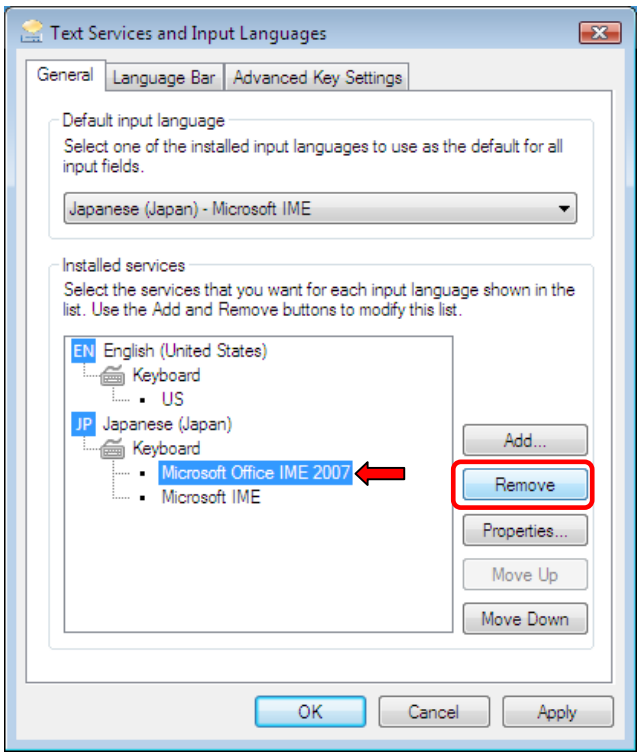


Figure 2.2.8-6 Remove [Microsoft Office IME 2007]

7. Click on the [OK] button, and close the Text Services and Input Languages dialog. This completes the change of the Default input language, and the deletion of the “Japanese (Japan) - Microsoft Office IME 2007.”

2.2.9 Setting an Observation Screen Size

NOTE : Before launching an application, check the following items:

1. Make sure the PC is connected to the main unit with a USB cable.
2. Start the application when the main unit is powered on. The application cannot be started if the main unit is turned off or the USB cable is unplugged (an initialization message will be displayed).
3. When the application is being started, do not turn off the main unit or unplug the USB cable.

1. Turn on the main unit. Double-click the application (the TM3000 shortcut) on Desktop.

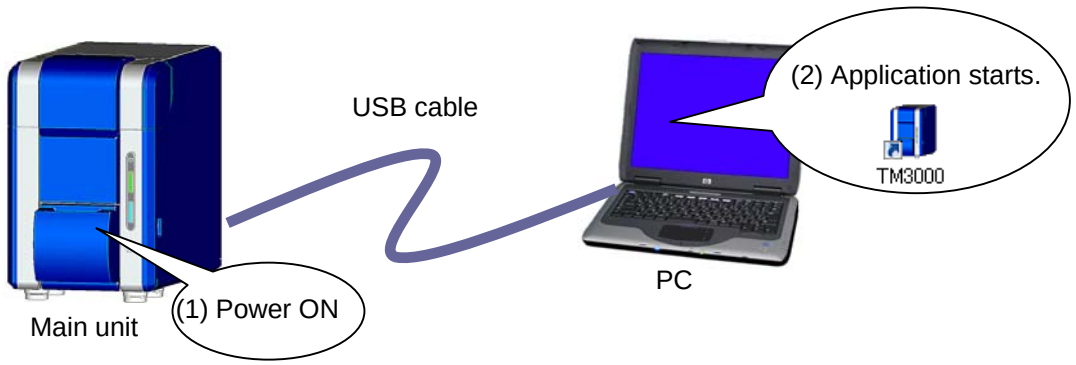


Figure 2.2.9-1 Connecting the Main Unit to the PC

2. The application starts up.

Figure 2.2.9-2 Application Startup Window

3. When the application is started for the first time after having been installed, a [No data found in Initial File. Do you default to start up PC?] message appears, as shown below. Click the [OK] button.

Figure 2.2.9-3 Initial Data File Setup Window

4. A [Set up the observation screen size when the application has started] message appears. Click the [OK] button.

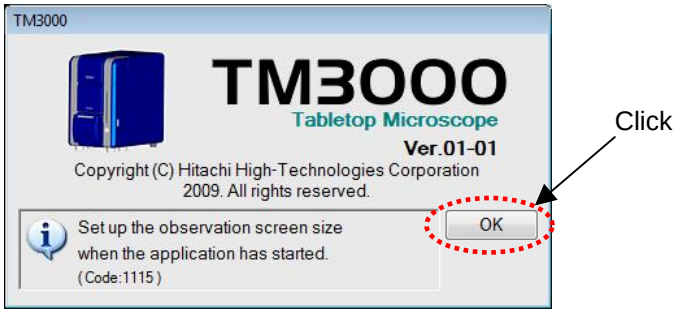


Figure 2.2.9-4 Observation Screen Size Verification Window

5. A message [No User Setting File found. Do you default to start up PC?] appears. Click the [OK] button.

Figure 2.2.9-5 User Setting File Window

NOTE : When initialization is in progress, do not turn off the main unit or unplug the USB cable.

6. When the application has started successfully, the operation window shown in Figure 2.2.9-6 appears.

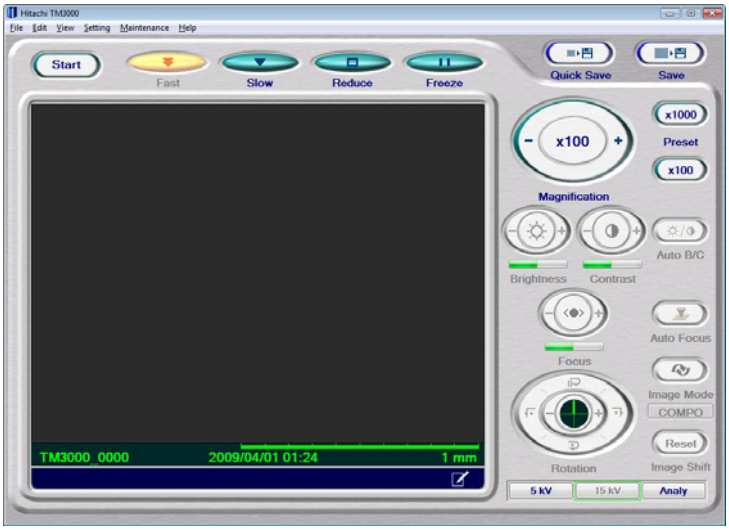


Figure 2.2.9-6 Operation Window

7. From the [Maintenance] menu on the Operation window, select [Observation Screen Size …].

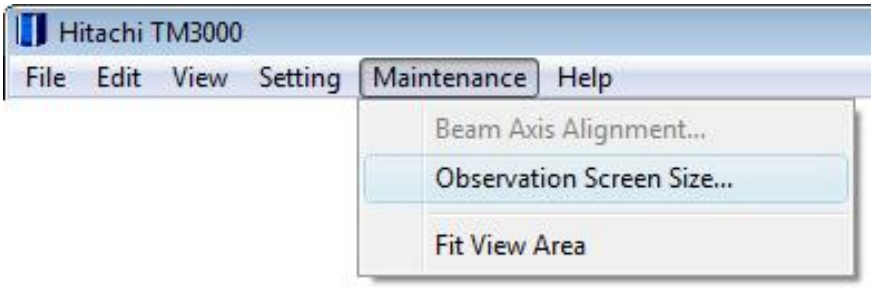


Figure 2.2.9-7 Maintenance Menu

8. On the Operation window, an [Observation Screen Size …] window and a red line are displayed.

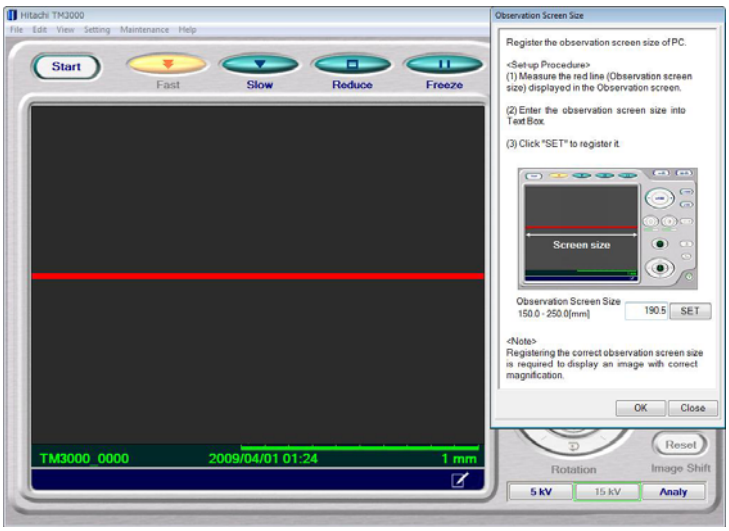


Figure 2.2.9-8 Observation Screen Size Setup Window

9. Using a ruler, measure the length of the red line displayed on the Operation window.

Figure 2.2.9-9 Measuring the Observation Screen Size

NOTE : Measure the length of the red line in units of mm. An inaccurate length of the red line may result in an inaccurate magnification factor on the observation screen.

10. In the observation screen size field of the [Observation screen size settings], enter the length of the red line that was measured, and click the [SET] button.

※ The observation screen size to be used depends on the particular PC environment to be used.

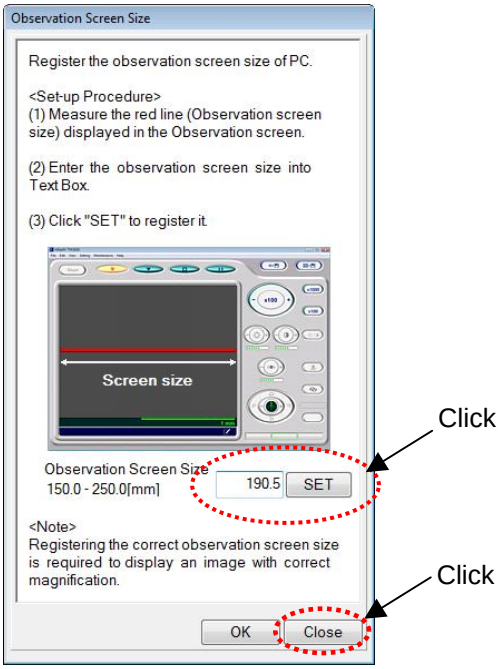


Figure 2.2.9-10 Observation Screen Size Settings Window

11. Click the [Close] button to close the [Observation Screen Size Setup] window.

12. Select either the [X] button at the right edge of the Operation window title bar or [Exit] from the [File] menu to close the application program.

13. When the closure verification window as shown in Figure 2.2.9-11 appears, click the [OK] button to close the application.

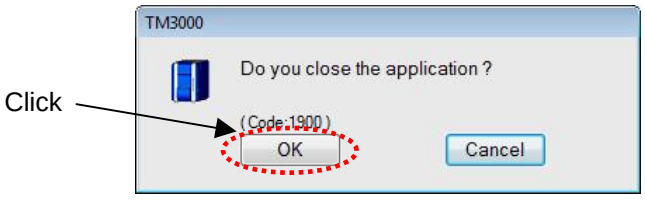


Figure 2.2.9-11 Application Closure Verification Window

2.2.10 Adding a User Account

1. When starting an application under a newly created Windows user account, for each user login, perform the steps described in [2.2.6 Screen settings]. For a description on how to create a Windows user account, see the instruction manual that is supplied with the PC.

2. Turn on the main unit. On Desktop, double-click the application (the TM3000 shortcut).

Figure 2.2.10-1 TM3000 Shortcut Icon

NOTE : Before launching an application, check the following items:

1. Make sure the PC is connected to the main unit with a USB cable.
2. Start the application when the main unit is powered on. The application cannot be started if the main unit is turned off or the USB cable is unplugged (an initialization message will be displayed).
3. When the application is being started, do not turn off the main unit or unplug the USB cable.

3. The application starts up.

Figure 2.2.10-2 Application Startup Screen

4. A [No data found in Initial File. Do you default to startup PC?] message appears. Click the [OK] button.

Figure 2.2.10-3 User Settings File Verification Window

5. When the application program has successfully started, the following operation window appears.
For a description of image observation operations, see Chapter 4.

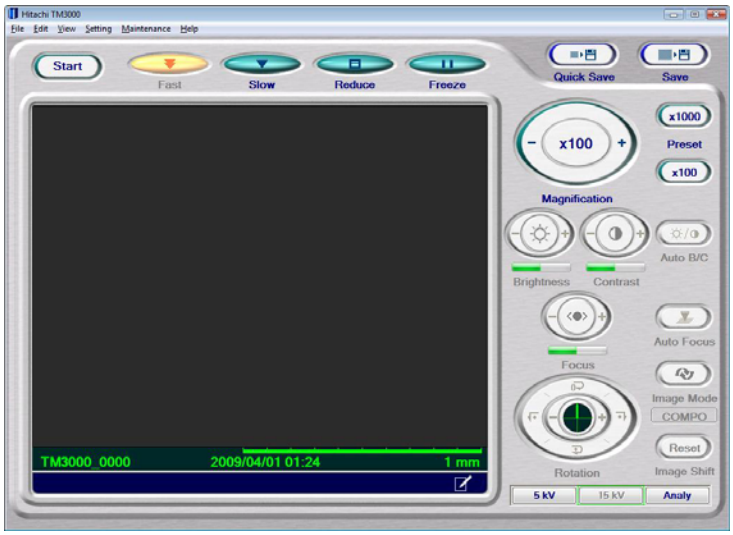


Figure 2.2.10-4 Operation Window

6. Select either the [X] button at the right edge of the Operation window title bar or [Exit] from the [File] menu to close the application program.

7. When the type of closure verification window shown below appears, click the [OK] button to close the application program.

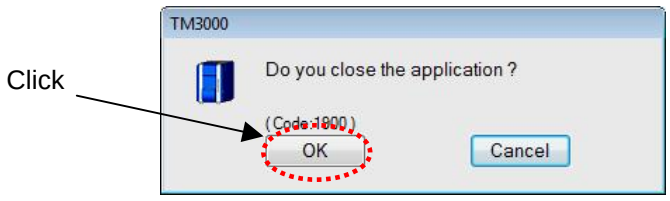


Figure 2.2.10-5 Application Closure Verification Window

2.2.11 Uninstalling an Application Program

NOTE : Uninstall an application by logging in under Administrator.

1. From the Start menu, open [Control Panel].

2. From [Control Panel], open [Programs and Features].

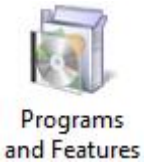


Figure 2.2.11-1 Programs and Features Icon

3. When the following window appears, specify [TM3000] and click [Uninstall].

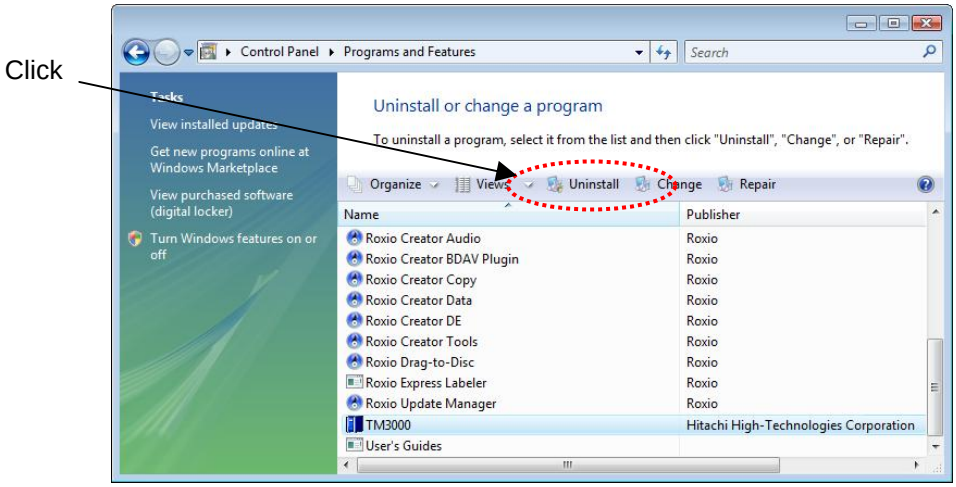


Figure 2.2.11-2 Programs and Features Window

4. When the following window appears, click the [Yes] button.

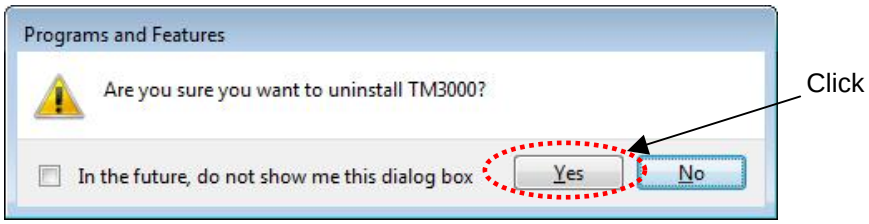


Figure 2.2.11-3 Application Program Uninstall Verification Window

5. The window shown in Figure 2.2.11-4 appears, and the uninstall process begins.

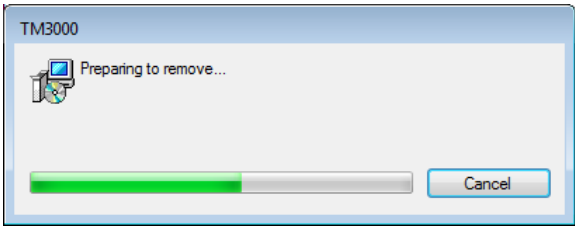


Figure 2.2.11-4 Application Program Uninstaller Startup Window

6. The following window (User Account Control) appears. Click [Allow].

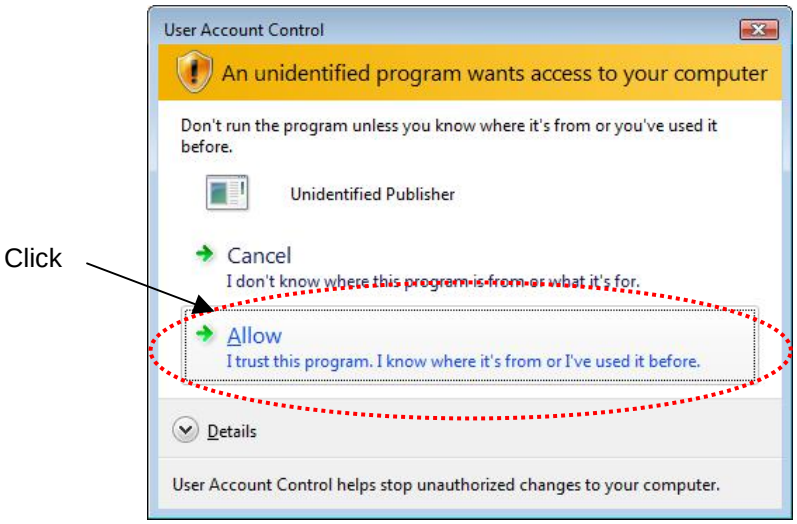


Figure 2.2.11-5 User Account Control Window

7. The window shown in Figure 2.2.11-6 appears, and the uninstall process begins.

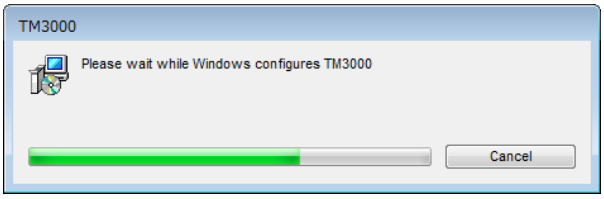


Figure 2.2.11-6 Application Program Uninstall Window

8. When finished with the uninstall process, verify that [TM3000] has been removed from the Programs and Features window.

9. Close the Programs and Features window.

2.2.12 Uninstalling an Instruction Manual

NOTE : Uninstall an application by logging in under Administrator.

1. From the Start menu, open [Control Panel].

2. From [Control Panel], open [Programs and Features].

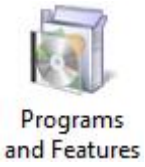


Figure 2.2.12-1 Programs and Features Icon

3. When the following window appears, specify [TM3000 Manual] and click [Uninstall].

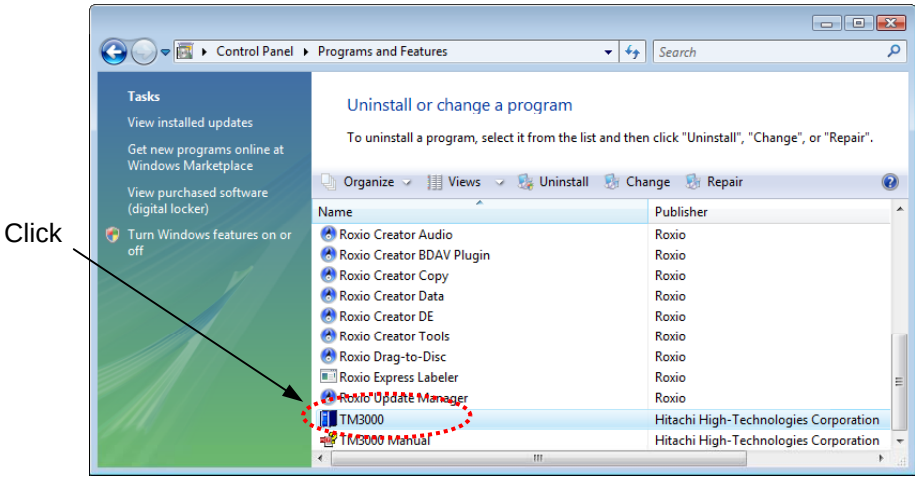


Figure 2.2.12-2 Programs and Features Window

4. When the following window appears, click the [Yes] button.

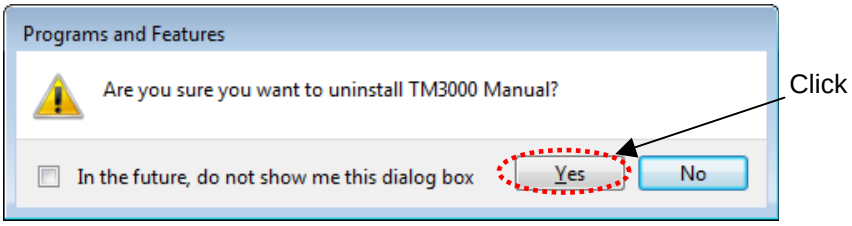


Figure 2.2.12-3 Application Program Uninstall Verification Window

5. The window shown in Figure 2.2.12-4 appears, and the uninstall process begins.

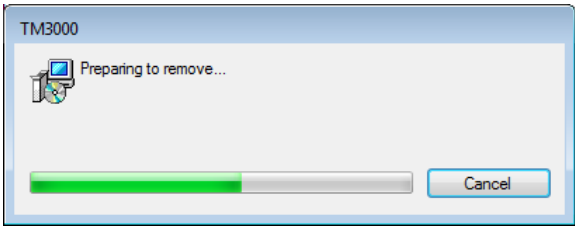


Figure 2.2.12-4 Application Program Uninstaller Startup Window

6. The following window (User Account Control) appears. Click [Allow].

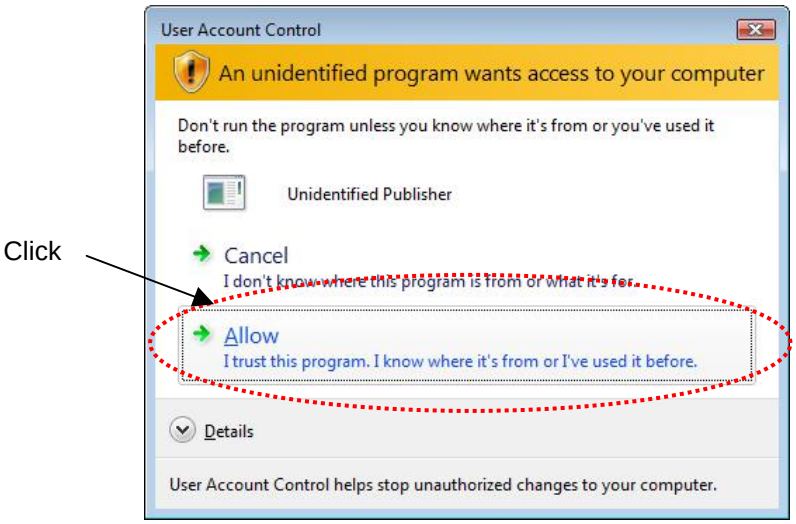


Figure 2.2.12-5 User Account Control Window

7. The window shown in Figure 2.2.12-6 appears, and the uninstall process begins.

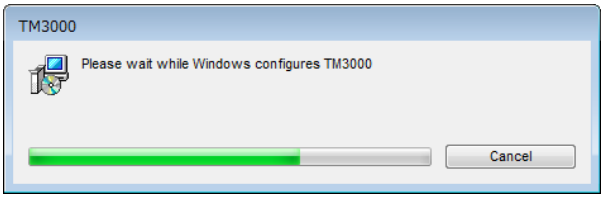


Figure 2.2.12-6 Application Program Uninstall Window

8. When finished with the uninstall process, verify that [TM3000 Manual] has been removed from the Programs and Features window.

9. Close the Programs and Features window.

2.3 Upgrade

2.3.1 Upgrade of an Application

When installing the application of the version that is newer than the application that was already installed, can be Upgrade by using a TM3000 Setup Tools.

NOTE : Confirm the version of the TM3000 application by choosing a [Upgrade for TM3000 application] in the TM3000 Setup Tools. And be able to confirm the version of TM3000 application that installed already from [Version Information] of HELP menu.

1. Click the button a [Upgrade for TM3000 application].

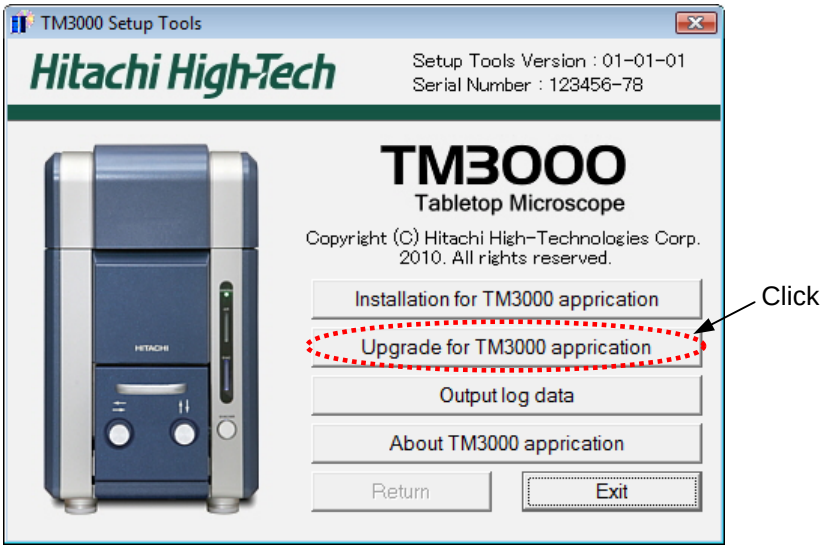


Figure 2.3.1-1 The Main Menu of TM3000 Setup Tools

2. The following window appears. Click the button [Upgrade of application program].

Figure 2.3.1-2 Upgrade of Application Program

3. The following window appears. Click the [OK] button.

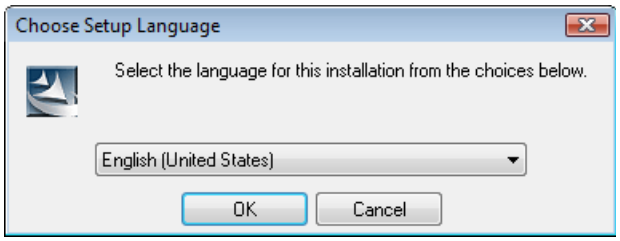


Figure 2.3.1-3 Choose Setup Language

4. The following window appears. Click the [Yes] button.

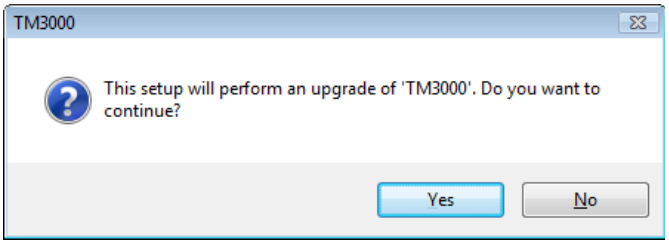


Figure 2.3.1-4 Message of Confirmation

5. The following window appears. Please wait slightly.

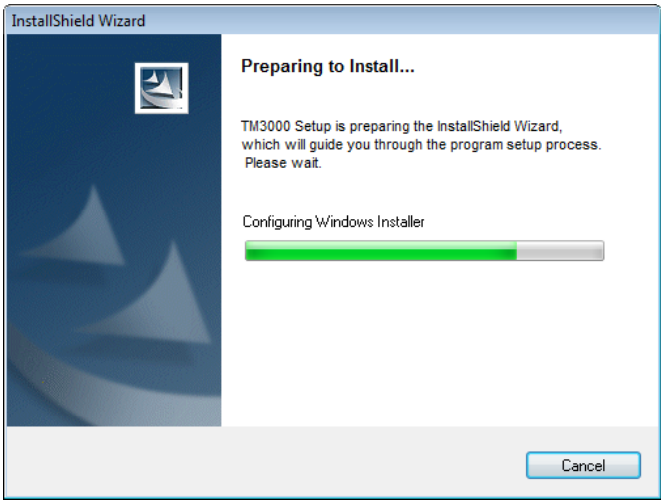


Figure 2.3.1-5 Preparing to Install

6. The following window appears. Click the [Next>] button.

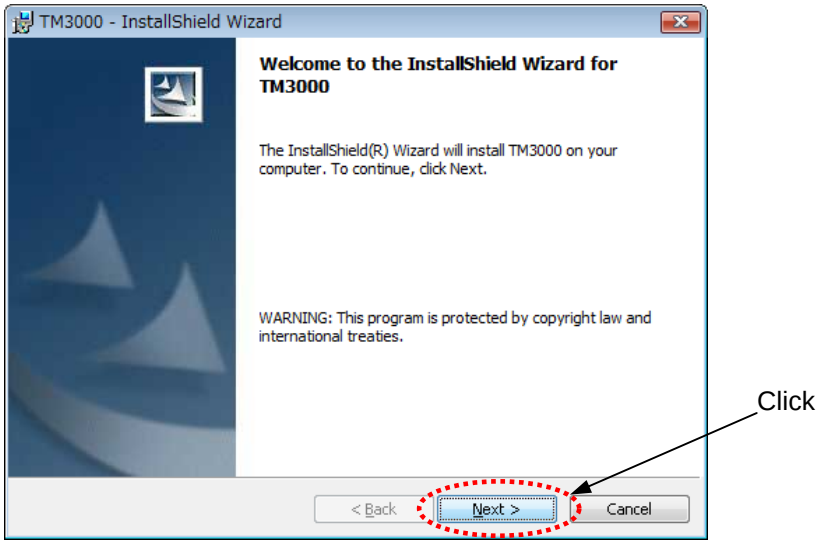


Figure 2.3.1-6 Install Shield Wizard

7. The following window appears. (Do not click the [Cancel;] button.)

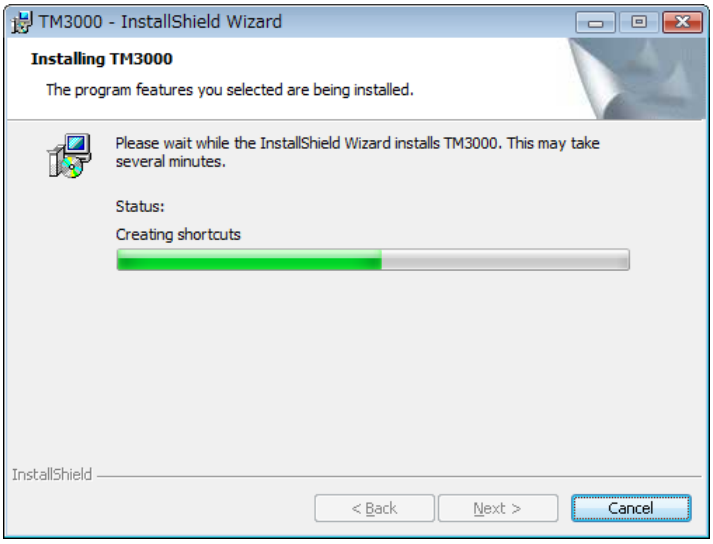


Figure 2.3.1-7 Application Install Window (a)

8. Operation stops with the following windows in a few seconds.

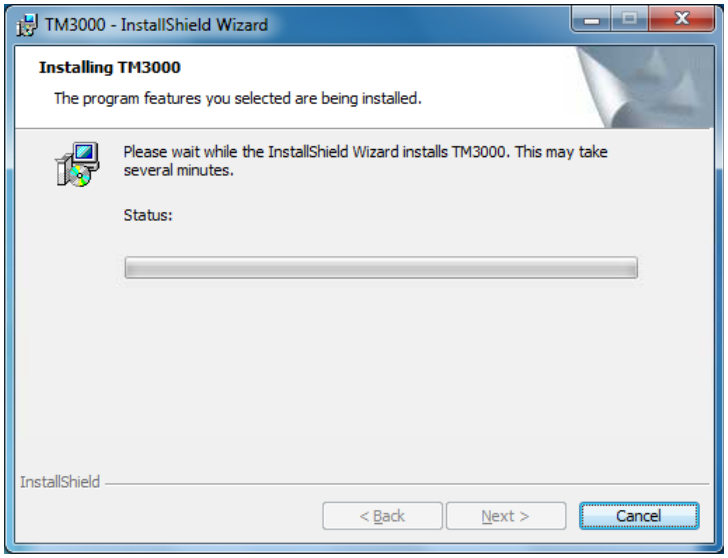


Figure 2.3.1-8 Application Install Window (b)

9. This is because a message of Figure 2.3.1-11 is covered on the back of the above window (Figure2.3.1-9). In this case because [Attach Your device] is displayed on task bar, and click it.

Figure 2.3.1-9 Task Bar (Windows VISTA)

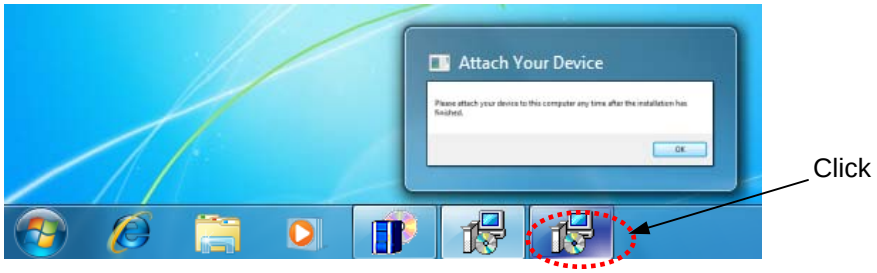


Figure 2.3.1-10 Task Bar (Windows 7)

10. The following [Attach Your device] is displayed. Click [OK] button.

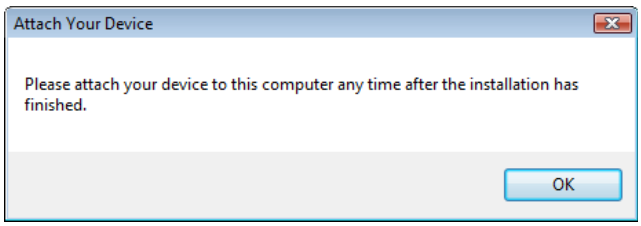


Figure 2.3.1-11 Attach Your Device

11. The following [InstallShield Wizard Completed] is displayed. Click [Finish] button.

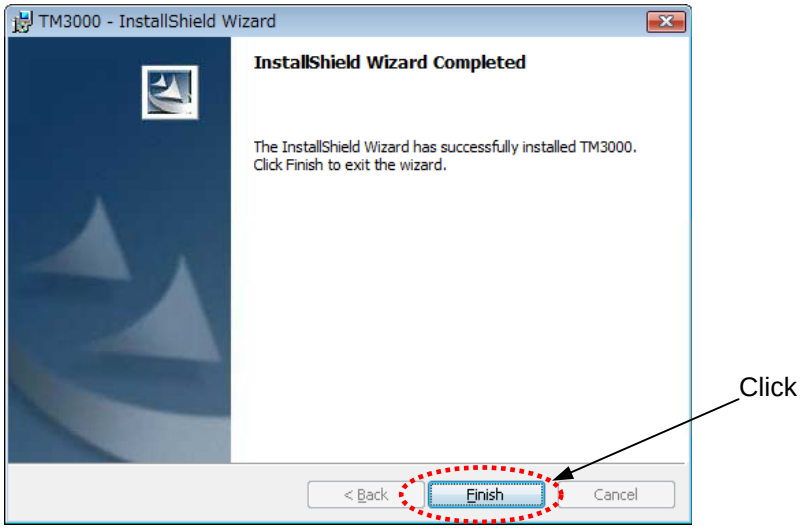


Figure 2.3.1-12 InstallShield Wizard Completed

2.3.2 Upgrade (Repair) of Application

When installing the application of the version that is same as the application that was already installed, can be [Repair] by using a TM3000 Setup Tools. Use this function when some trouble has occurred on application.

NOTE : Confirm the version of the TM3000 application by choosing a [Upgrade for TM3000 application] in the TM3000 Setup Tools. And be able to confirm the version of TM3000 application that installed already from [Version Information] of HELP menu.

1. Click the button a [Upgrade for TM3000 application].

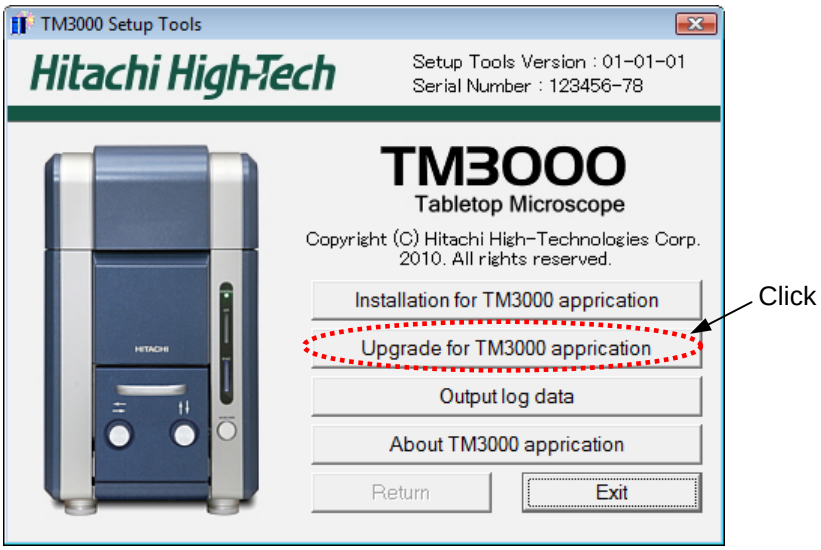


Figure 2.3.2-1 The Main Menu of TM3000 Setup Tools

2. The following window appears. Click the button [Upgrade of application program].

Figure 2.3.2-2 The Main Upgrade Menu of TM3000 Setup Tools

3. The procedure of a thing of the future is the same as [**2.3.1 Upgrade**] from now on. But there is one different point. The following windows are displayed between **6.** and **7.** procedure. Click [Repair] button. And go ahead to **7.** .

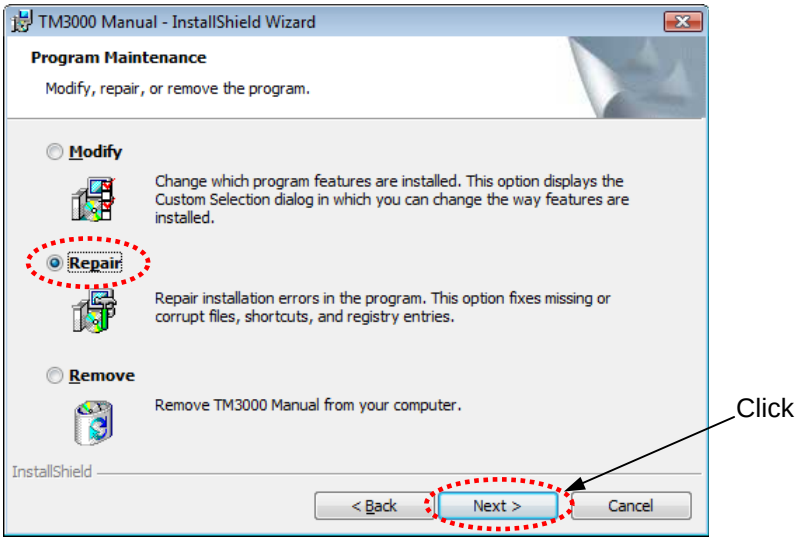


Figure 2.3.2-3 The [Repair] Setup

2.3.3 Downgrade of Application

When installing the application of the version that is lower than the application that was already installed, the following message is displayed.
In this case, uninstall the TM3000 application, which is installed already. After the uninstallation, can be install the new version.

NOTE : Confirm the version of the TM3000 application by choosing a [Upgrade for TM3000 application] in the TM3000 Setup Tools. And be able to confirm the version of TM3000 application that installed already from [Version Information] of HELP menu.

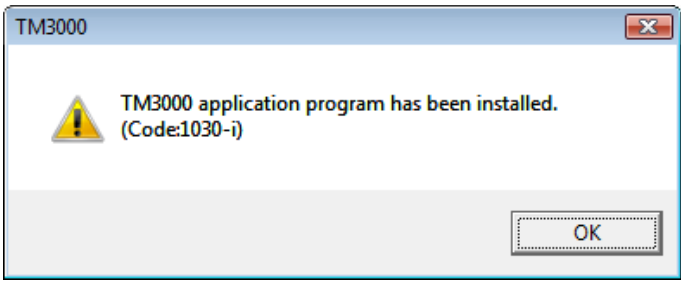


Figure 2.3.3-1 Downgrade Message

NOTE : Please execute the uninstallation of the program by "a program and the function" of "the Control Panel". Please refer to 2.2.12 for the uninstallation procedure of the application.

2.3.4 Upgrade of Instruction Manual

When installing the Instruction Manual of the version that is newer than the manual that was already installed, can be Upgrade by using a TM3000 Setup Tools.

NOTE : Confirm the version of the TM3000 application by choosing a [Upgrade for TM3000 application] in the TM3000 Setup Tools. And be able to confirm the version of TM3000 application that installed already from [Version Information] of HELP menu.

1. Click the button a [Upgrade for TM3000 application].

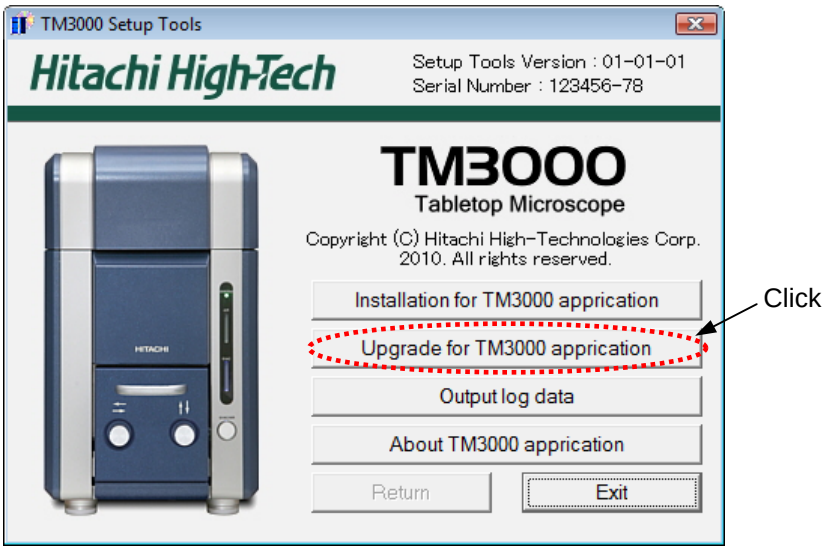


Figure 2.3.4-1 The Main Menu of TM3000 Setup Tools

2. The following window appears. Click the button [Upgrade of the instruction manuals].

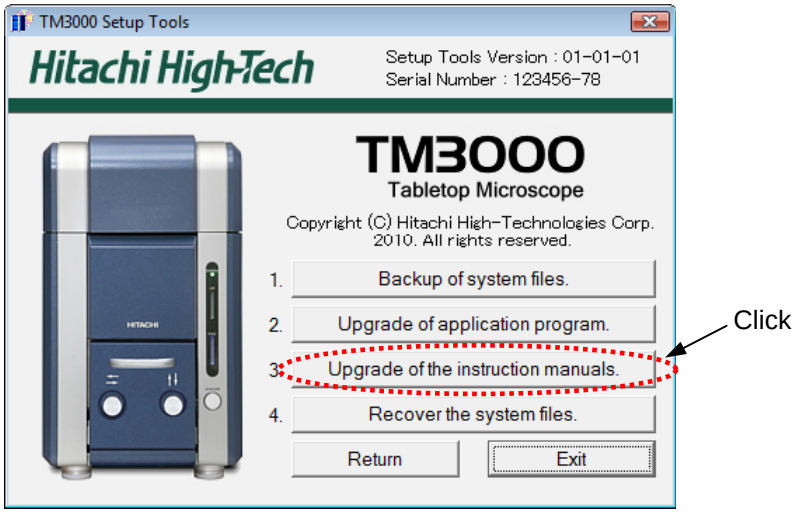


Figure 2.3.4-2 Upgrade of Application Program

3. The following window appears. Choose [English] and click [OK] button.

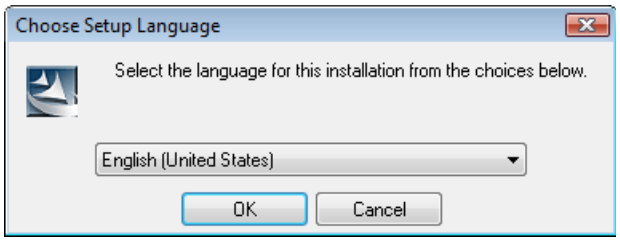


Figure 2.3.4-3 Choose Setup Language

4. The following window appears. Click the [Yes] button.

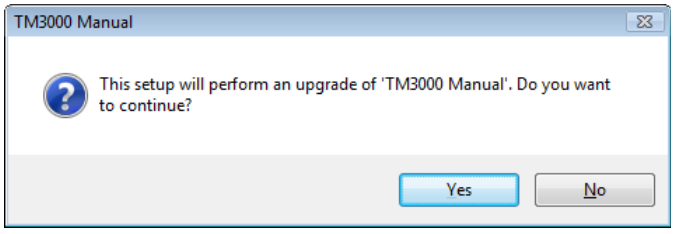


Figure 2.3.4-4 Message of Confirmation

5. The following window appears. Please wait slightly.

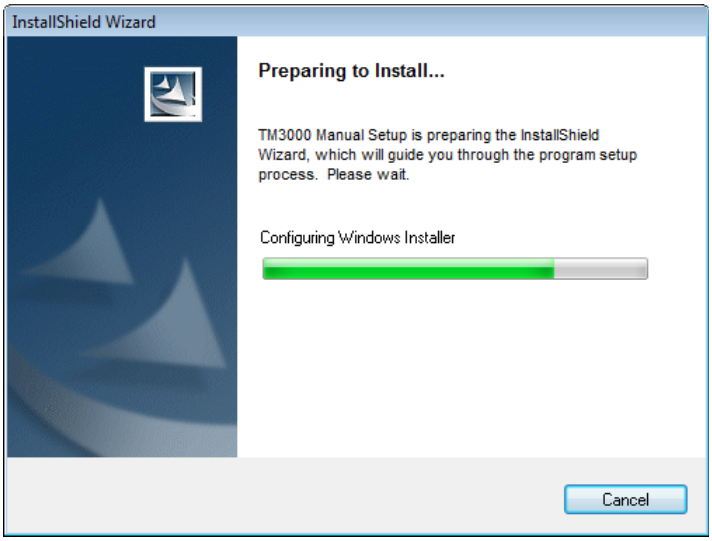


Figure 2.3.4-5 Preparing to Install

6. The following window appears. Click the [Next>] button.

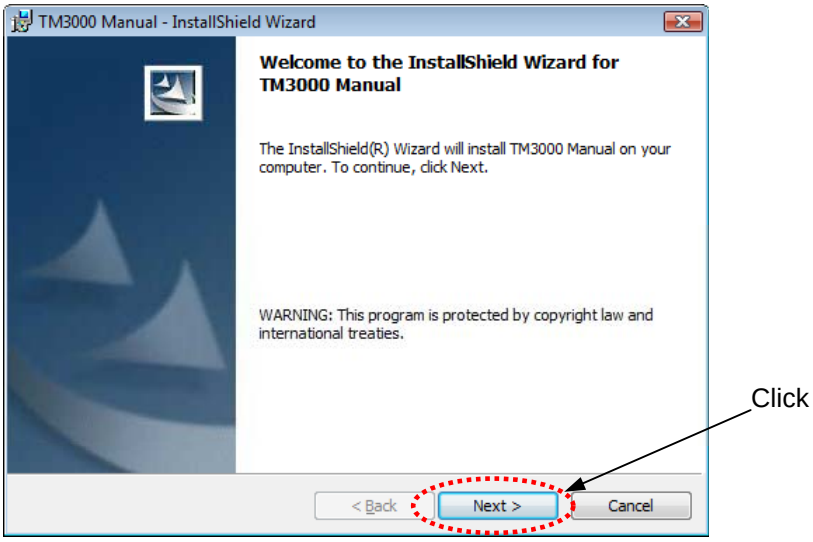


Figure 2.3.4-6 InstallShield Wizard

7. The following window appears. (Do not click the [Cancel;] button.)

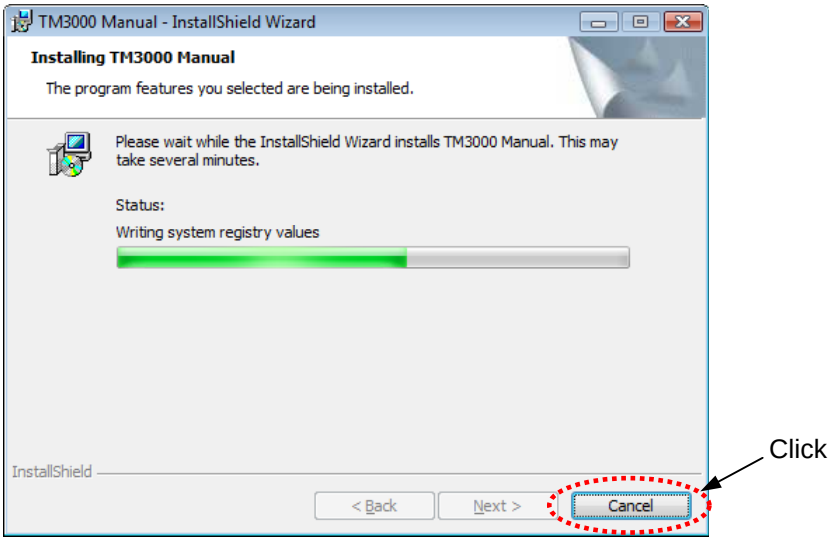


Figure 2.3.4-7 Application Install Window (a)

8. The following [InstallShield Wizard Completed] is displayed. Click [Finish] button.

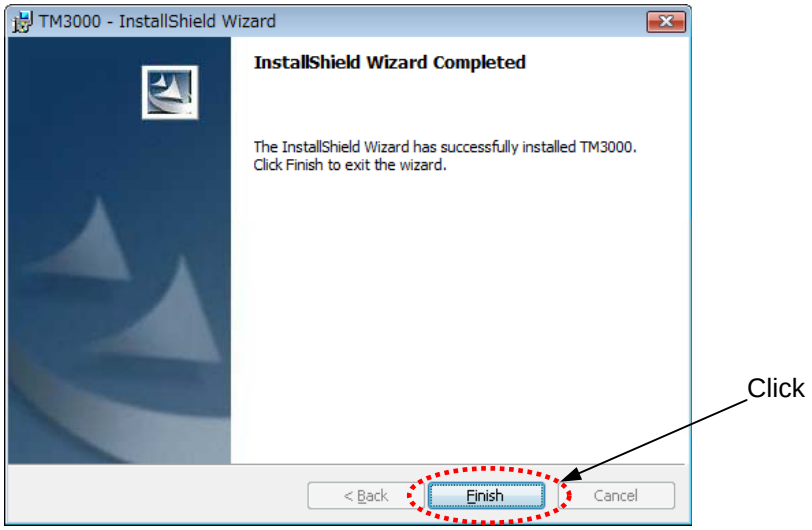


Figure 2.3.4-8 InstallShield Wizard Completed

2.3.5 Upgrade (Repair) of Instruction Manual

When installing the instruction manual of the version that is same as the manual that was already installed, can be [Repair] by using a TM3000 Setup Tools. Use this function when some trouble has occurred on an instruction manual.

1. Click the button a [Upgrade for TM3000 application].

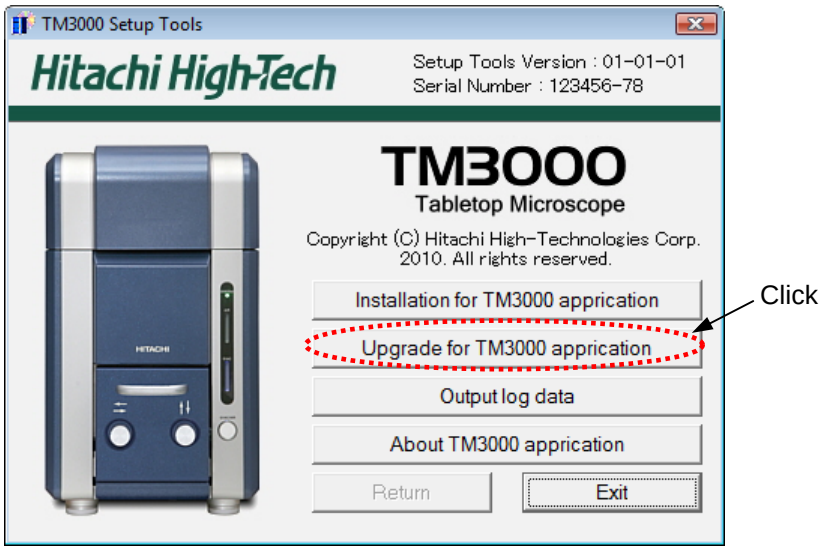


Figure 2.3.5-1 The Main Menu of TM3000 Setup Tools

2. The following window appears. Click the button [Upgrade of the instruction manuals].

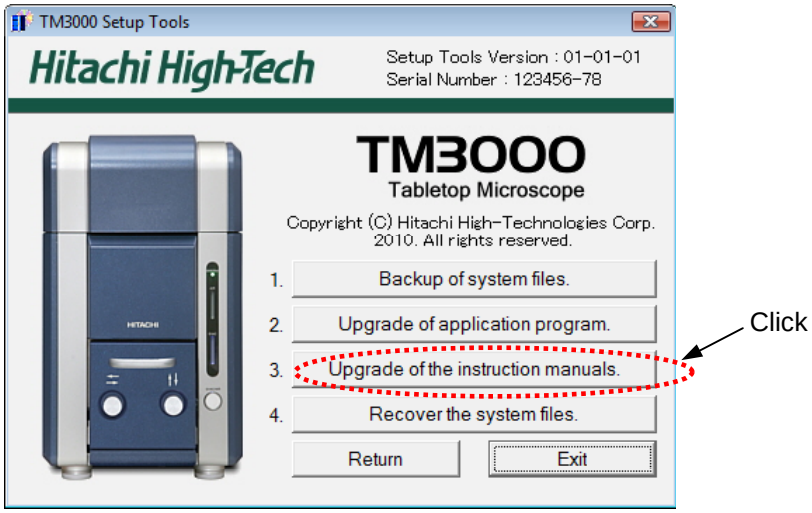


Figure 2.3.5-2 Upgrade of Application Manual

3. The procedure of a thing of the future is the same as [2.3.4 Upgrade of Instruction Manual] from now on.
But there is one different point. The following windows are displayed between **6.** and **7.** procedure. Click [Repair] and go ahead to **7.** .

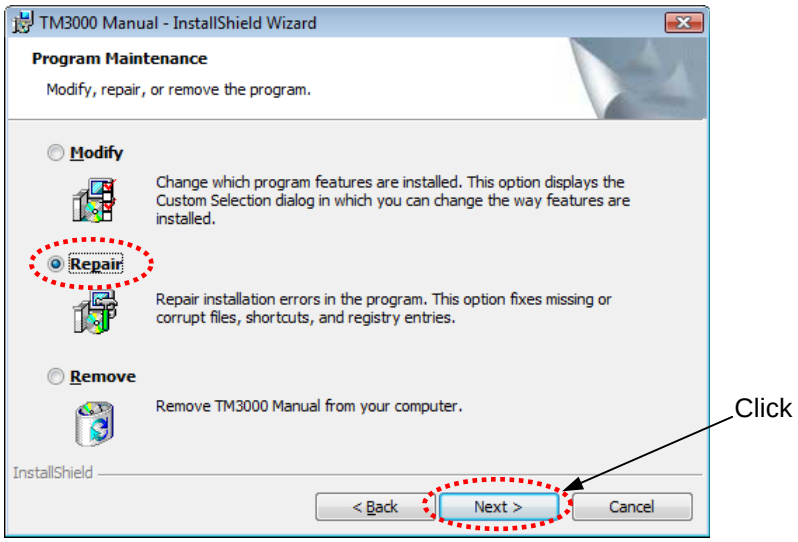


Figure 2.3.5-3 The [Repair] Setup

2.3.6 Downgrade of Instruction Manual

When installing the instruction manual of the version that is lower than that was already installed, the following message is displayed.
In this case, uninstall the instruction manual, which is installed already. After the uninstallation, can be install the new version.

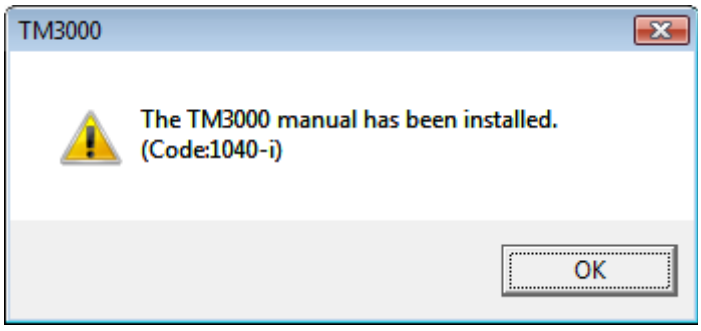


Figure 2.3.6 Downgrade Message

NOTE : Please execute the uninstallation of Instruction Manual by "a program and the function" of "the Control Panel". Please refer to [2.2.12 Uninstalling an Instruction Manual] for the uninstallation procedure of Instruction Manual.

2.4 About TM3000 Setup Disk (A Brief Explanation /Summary)

Before installing an application, check the following precautions:

1. For installation, log on as Administrator.

2. Install the application before connecting the system main unit to the PC via the USB.

3. Use one PC for one TM3000. When using some PC for one TM3000, cannot acquire the maintenance data of the device definitely.

4. Adjustment data peculiar to a device are included in the setup disk. When a serial number uses it in a different device, it is not got right data, and there is the case that a problem in the function produces.

5. Do not eject from optical drive, when using TM3000 Setup Disk. There is a possibility that a program is not installed normally.

Load the setup disk on the CD/DVD drive. Auto Play menu is displayed on the window. Click [Run SETUP.exe]. If User Account Control is displayed on the window, click [ALOW].

Figure 2.4 The Main Menu of TM3000 Setup Tools

2.4.1 Installing an Application

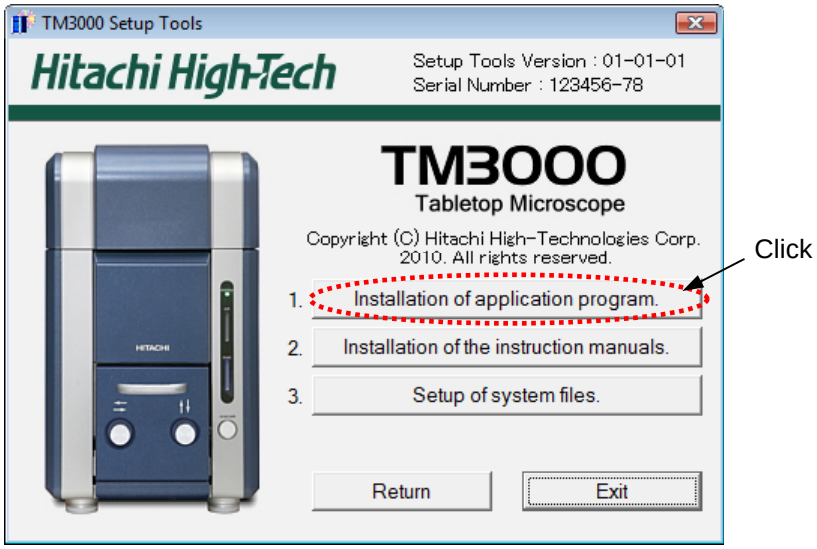


Figure 2.4.1 Installation for TM3000 Application

1. Installation of application program Use for installation of TM3000 application. If the TM3000 precision is installed already, cannot install. Uninstall the TM3000 application first, and install.

*Installation procedures of an application please refer to [2.2.1 Installing an Application Program].

*Uninstallation procedures of an application please refer to [2.2.11 Uninstalling an Application Program].

2. Setup of system files Use for installing the adjustment data of TM3000.

*In the case of not installing the adjustment data , TM3000 application is not start.

*System files are different data every devices such as factory adjustment data. Do not use it other than serial number device printed by the disk surface. When it is used for a different device, it is not worked device original performance. In addition, troubles may happen by that.

2.4.2 Upgrade for TM3000 Application

Clicking [Upgrade for TM3000 application] from main menu of TM3000 Setup disk, following window is displayed.

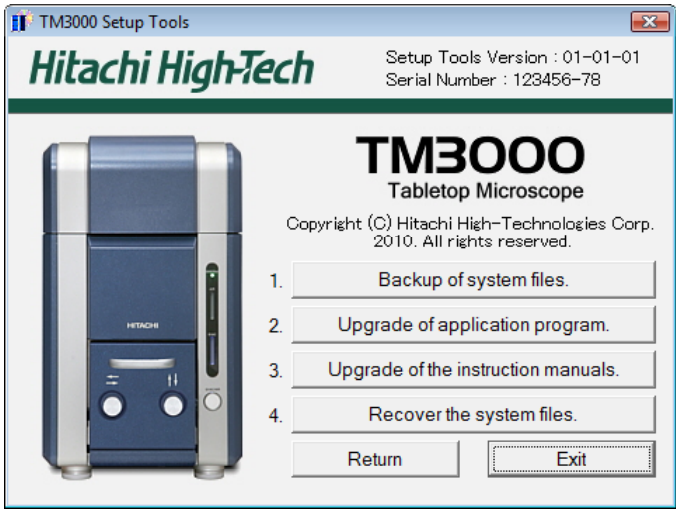


Figure 2.4.2 Upgrade for TM3000 Application

Use this function for Upgrade the TM3000 application program or Instruction manual. When TM3000 application program is installed already, it can be use. It cannot be used for downgrade.

1. Backup of system files Backup the system files maintaining it in a PC temporarily. System files are made in [TM3000_Backup] folder on desktop.
*Backup the system files, before upgrading the TM3000 application.

2. Upgrade of application program Upgrade (Repair) of application program is possible. When installing the application of the version that is newer than the application that was already installed, can be Upgrade by using a TM3000 Setup Tools.
When installing the application of the version that is same as the application that was already installed, can be [Repair] by using a TM3000 Setup Tools.
*Upgrade procedures of an application please refer to [2.3.1 Upgrade of an Application].

3. Upgrade of the instruction manuals Upgrade (Repair) of Instruction manual is possible.
When installing the Instruction manual of the version that is newer than the Instruction manual that was already installed, can be Upgrade by using a TM3000 Setup Tools.
When installing the Instruction manual of the version that is same as the Instruction manual that was already installed, can be [Repair] by using a TM3000 Setup Tools.

*Upgrade procedures of an Instruction manual please refer to [2.3.4 Upgrade of Instruction Manual].

4. Recover the system files Recover the system files to PC from [TM3000_Backup] folder on desktop.
*In the case of not installing the adjustment data, TM3000 application is not start.
*System files are different data every devices such as factory adjustment data. Do not use it other than serial number device printed by the disk surface. When it is used for a different device, it is not worked device original performance. In addition, troubles may happen by that.

2.4.3 Output Log Data

Click [Output log data] from main menu of TM3000 Setup disk, log data of TM3000 is output to desktop. Use the system log for a device to diagnose a device state when malfunction occurred.
The name of system log is [Log data YYYYMMDDHHMMSS] (the present time)

2.4.4 About TM3000 Application

Clicking [About TM3000 application] from main menu of TM3000 Setup disk, version note of TM3000 application program is displayed.
It can be confirm the version of TM3000 application program.

2.4.5 Exit

Clicking [Exit] from main menu of TM3000 Setup disk, exit the program of TM3000 Setup Tools.

3 SYSTEM CONFIGURATION

3.1 System Configuration

Figure 3-1 shows the external view of the TM3000 Tabletop Microscope.

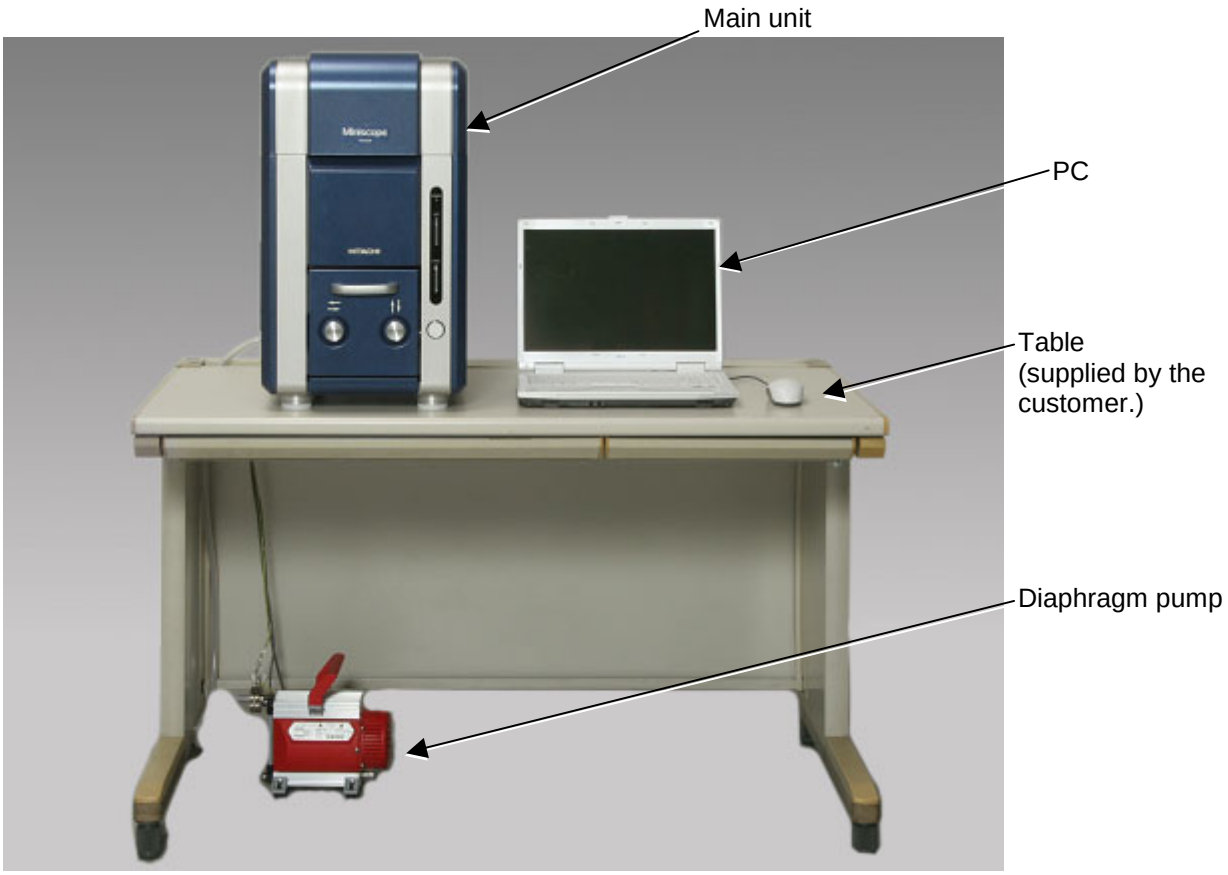


Figure 3.1 External View of the TM3000 Tabletop Microscope

3.2 Part Names

3.2.1 Main Unit

Figures 3.2.1-1, 3.2.1-2 and 3.2.1-3 show the front, back and right side of the main unit respectively.

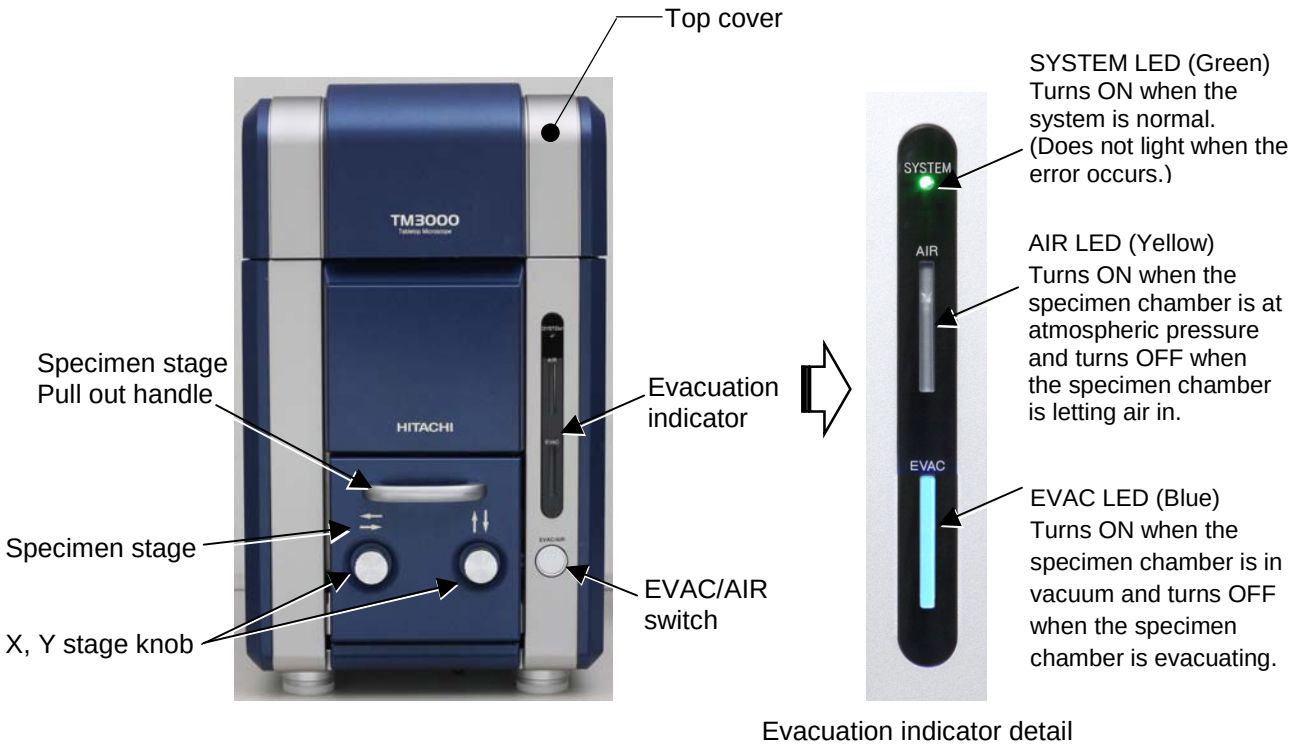


Figure 3.2.1-1 Main Unit (Front View)

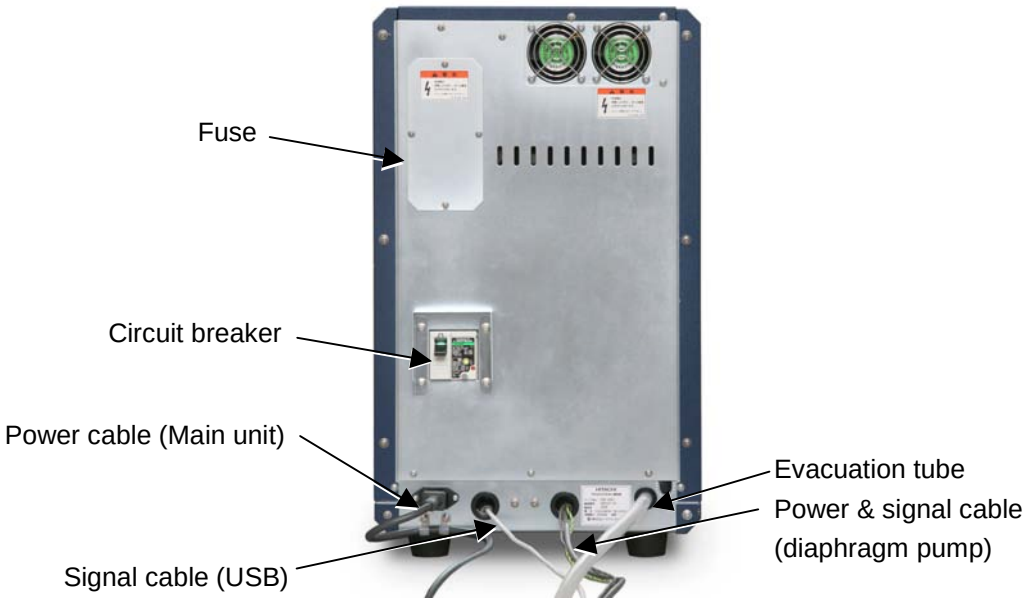


Figure 3.2.1-2 Main Unit (Back View)

Figure 3.2.1-3 Main Unit (Right Side View)

Figure 3.2.1-4 shows the electron gun section (under the top cover).

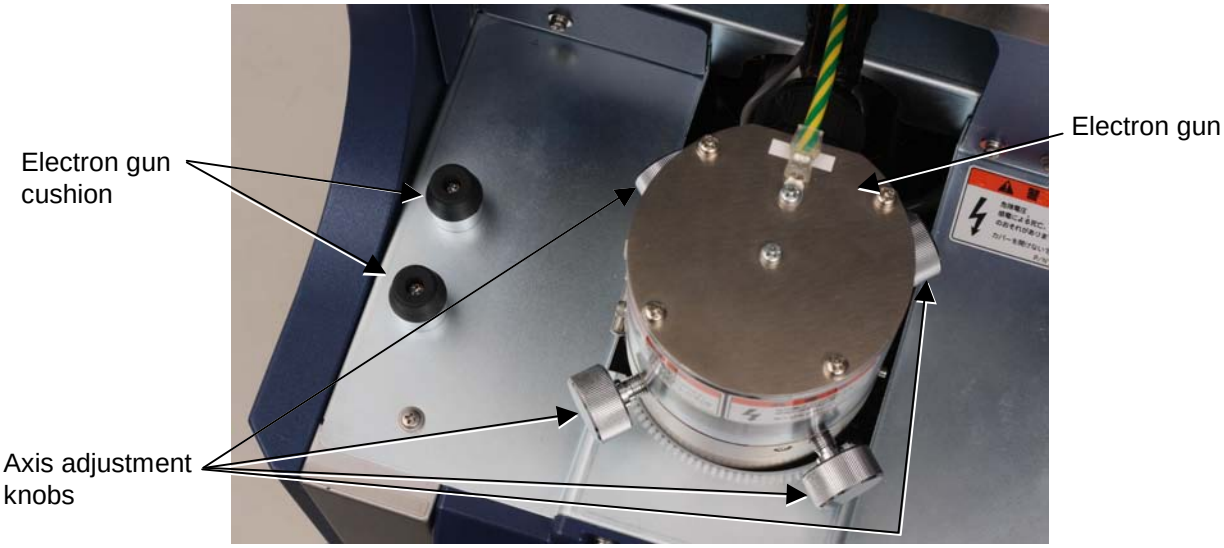


Figure 3.2.1-4 Electron Gun Section

3.2.2 Diaphragm Pump

Figure 3.2.2 shows the diaphragm pump.

Figure 3.2.2 Diaphragm Pump

3.3 PC

Figures 3.3-1 and 3.3-2 show the components of the notebook PC. Note that the location of the USB port may differ depending on the PC.

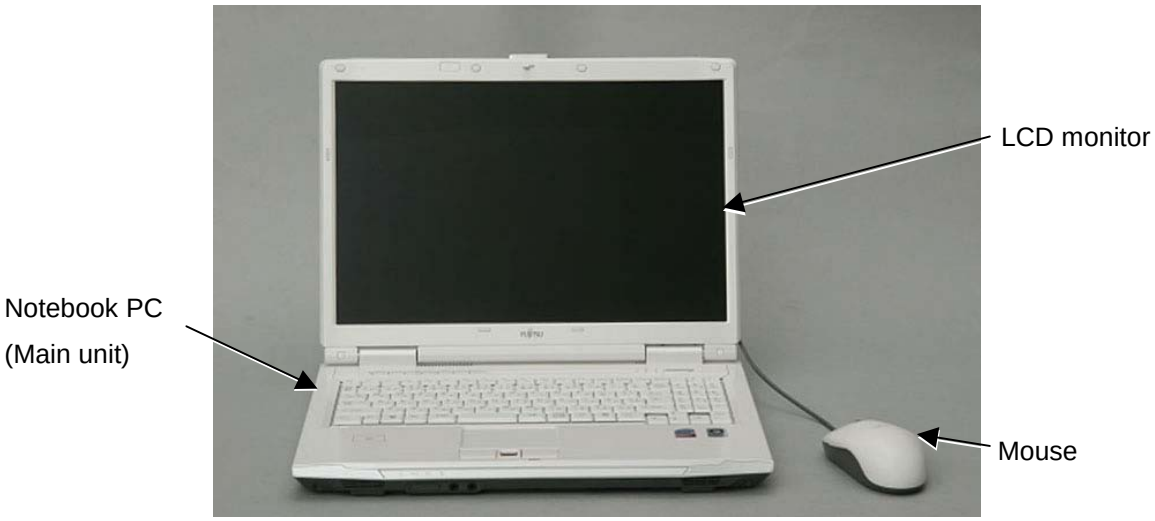


Figure 3.3-1 PC (Front View)

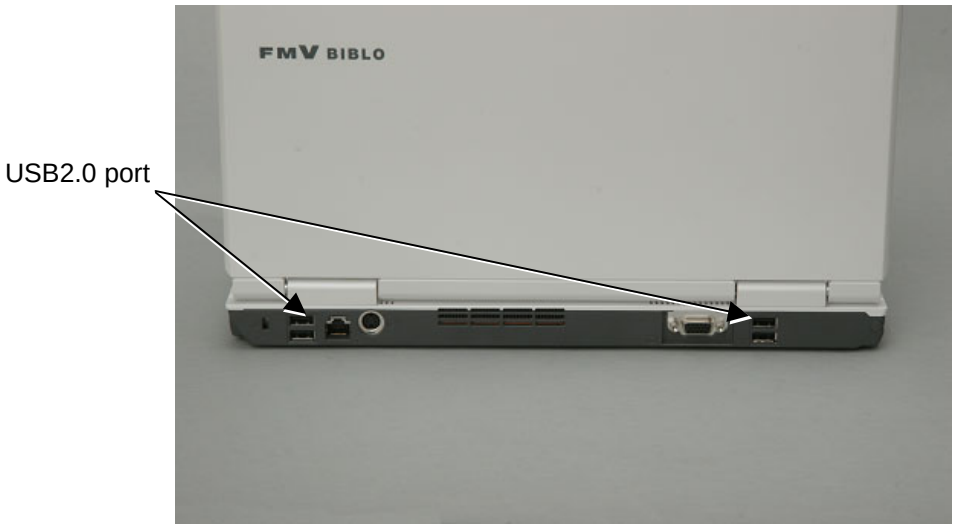


Figure 3.3-2 PC (Back View)

4 OPERATIONS

4.1 Summary of Operations

This section explains the basic operations and terminology necessary for the use of the system.

4.1.1 Operation Units

The principal operations of the system involve the use of the mouse and the keyboard.

1. Operating the Mouse Executes processing and specifies settings.

1a. Mouse Cursor Moving the mouse moves an arrow on the screen (hand-shaped mark or a micro-adjustment mark). Such a mark is referred to as a mouse cursor.

1b. Clicking Pressing and releasing a mouse button (either the right or left button) is called clicking. In the Instruction Manual, holding down a mouse button (either the right or left button) without moving the mouse is also referred to as clicking.

1c. Double-clicking Clicking a mouse button (either the right or left button) twice is referred to as double-clicking.

1d. Dragging Moving the mouse while holding down a mouse button (either the right or left button) is referred to as dragging.

2. Keyboard Operation The keyboard is used to type in characters, such as file names.

4.1.2 Operation Windows

The section explains operation windows used to control the model TM3000 Tabletop Microscope.
On the operation window, a button is provided for each function so that buttons can be switched and adjusted by clicking them.

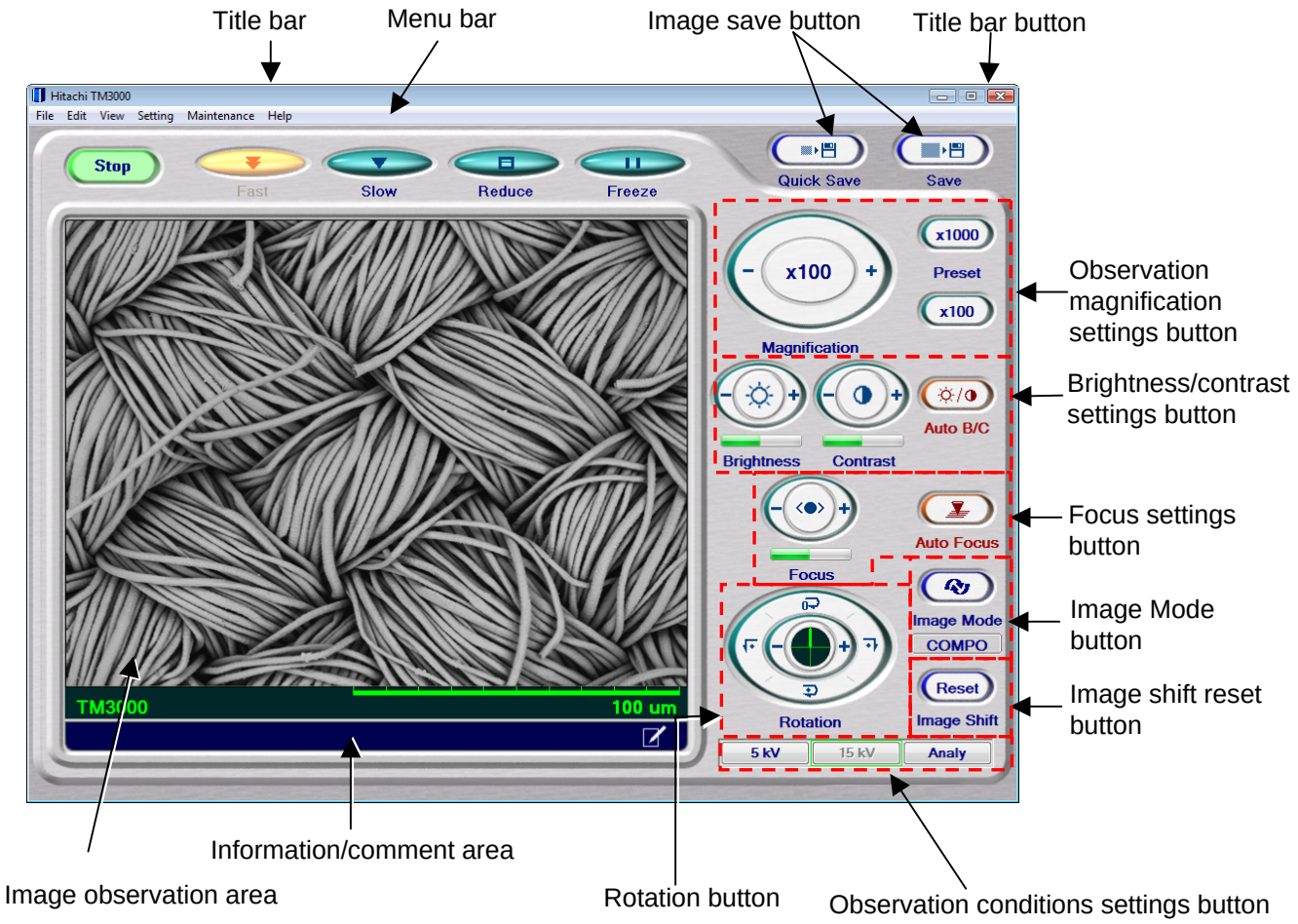


Figure 4.1.2 Operation Window

1. **Title bar** Displays the name of an application.

2. **Menu bar** Provides a classification of the functions of the application.
Select a given function to execute it.

3. **Image save button** A button to save observation images in a file.

4. **Title bar button** Closes or minimizes the window.

5. Image observation area Displays the image being observed.

6. Information/comment area
Upper row: Provides a data display of the image being observed.
Lower row: Displays comments on the observation image.

7. Observation conditions settings button Specifies observation conditions.

8. Observation magnification settings button Specifies an observation magnification rate.

9. Brightness/contrast settings button Specifies the brightness and contrast of the observation image.

10. Focus settings button Sets the focusing for the observation image.

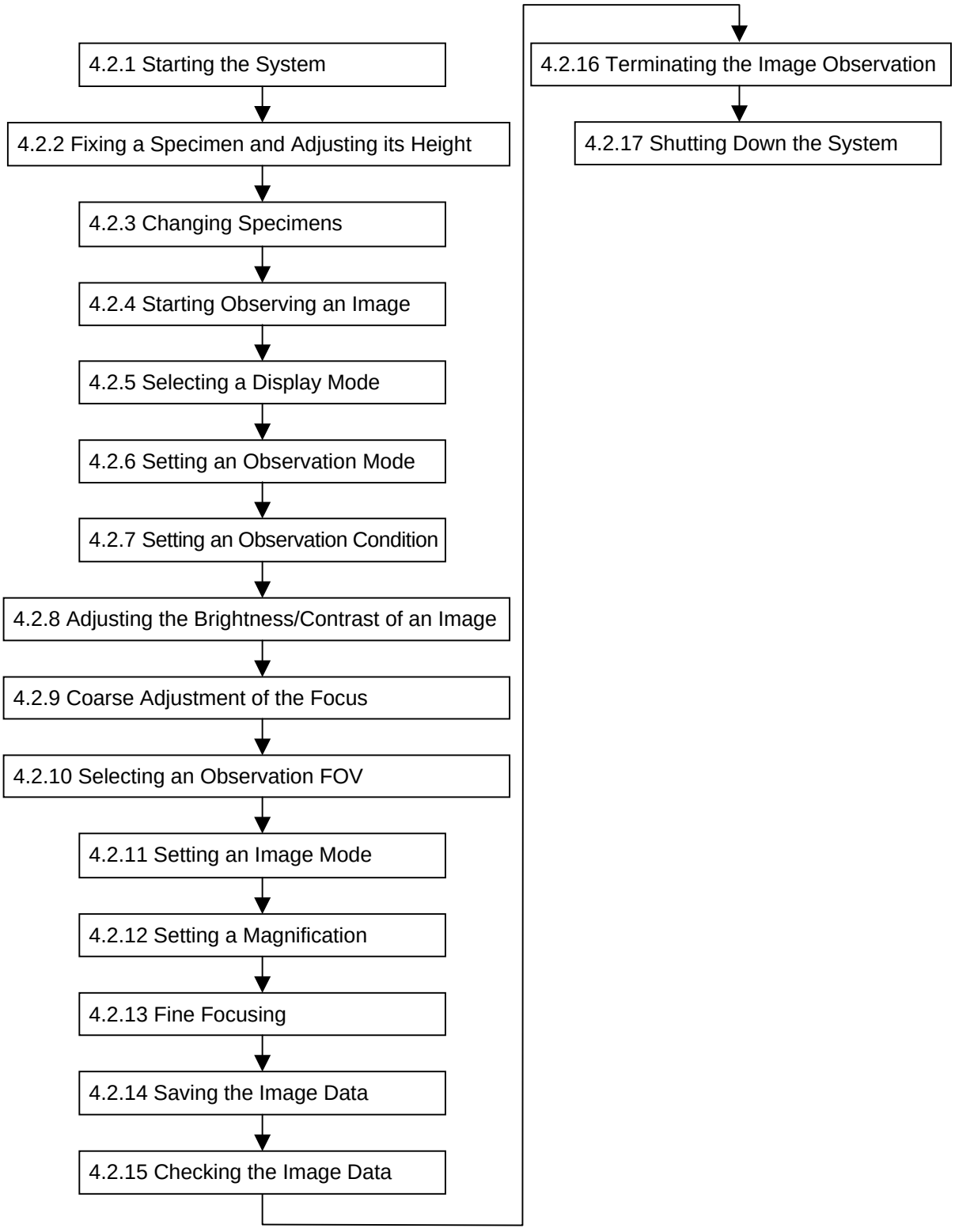
11. Rotation button Rotates the observation image in any direction.

12. Image Mode button Switches three image modes.

13. Image shift reset button When an image shift (see 4.2.10 **2. 3.**), this button can be used to reset it.

4.2 Basic Operations

The flowchart below depicts the flow of basic operations. Details on the items that make up the flowchart are provided in each subsection and in Section 4.3, Detailed Description of Functions.



4.2.1 Starting the System

1. Verify that the earth leakage breaker located on the back of the system is turned on.

Figure 4.2.1-1 Earth Leakage Breaker

2. Turn on the Power switch located on the right side of the system.

Figure 4.2.1-2 Starting the System (Pressing the Power Switch)

3. The LED indicator lights located in the lower right part on the front side of the main unit indicate the evacuation status of the system.

3a. AIR LED (yellow) solidly lit: Atmospheric state (ready for specimen changes).

3b. AIR LED (yellow) blinking: Air being introduced into the specimen chamber.

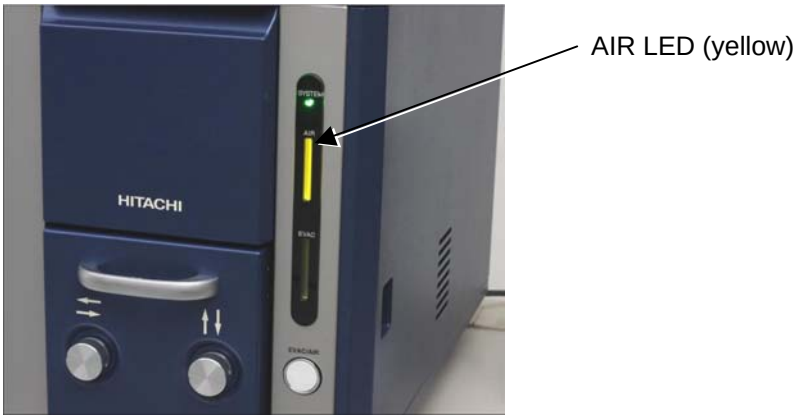


Figure 4.2.1-3 AIR LED (Yellow) Solidly Lit

3c. EVAC LED (blue) solidly lit: Vacuum status (observation enabled)

3d. EVAC LED (blue) blinking: Evacuation in progress from atmospheric to vacuum status

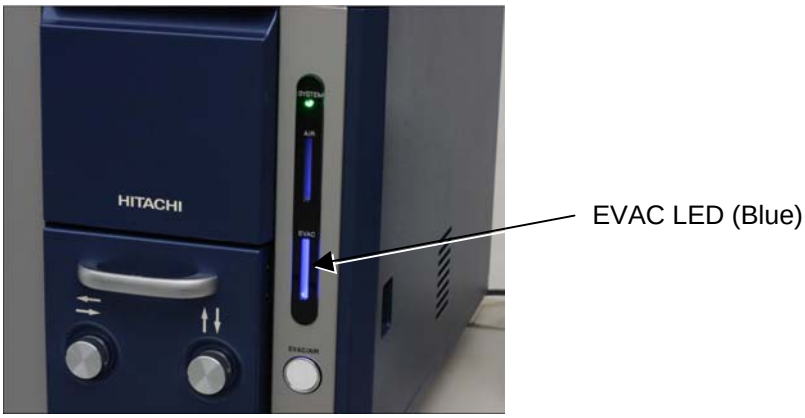


Figure 4.2.1-4 AIR LED (Blue) Solidly Lit

4. A blinking EVAC LED (blue) indicator light on the main unit shows that evacuation is in progress. If the EVAC LED (blue) is off and the AIR LED (yellow) is either solidly lit or blinking, pressing the EVAC/AIR switch starts the evacuation operation.

Figure 4.2.1-5 EVAC/AIR Switch Operation

5. Connect the USB cord for the main unit to the USB port on the back of the PC.

6. Turn on the PC.

7. Launch the application.

7a. On Desktop, double-click the [TM3000] shortcut icon  Or, from the menu select [TM3000] or right-click the shortcut icon to select [Open].

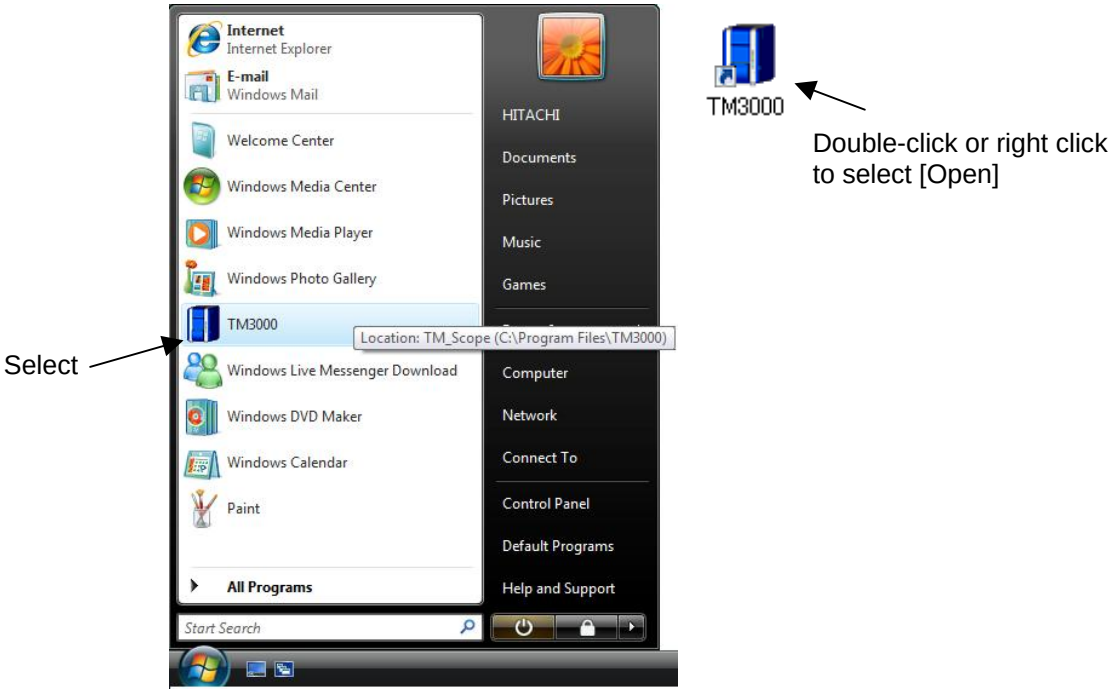


Figure 4.2.1-6 Launching the Application

7b. The application starts, and the Operation window appears.
A dialog indicating the application startup process appears on the operation window. Wait for a while. The dialog disappears automatically upon completion of the startup process.

Figure 4.2.1-7 Application Startup Screen

NOTE : Verify that the main unit is connected to the PC with a USB cable. The application will not start if the USB cable is not connected. Also, the application will not start if the Power switch on the main unit is turned off.

4.2.2 Fixing a Specimen and Adjusting its Height

1. Precautions to be Observed Before Loading a Specimen When setting a specimen, use caution on the following items:

1a. Specimens that can Blow Up When Placed in a Vacuum An object with a gas or liquid sealed in an outer skin, such as a balloon, can blow up when placed in a vacuum and damage internal components. These specimens can be observed by breaking the outer skin in advance.
Examples: Balloons (inflated and sealed), eggs (of any size or type), cherry tomatoes, citrus fruits, and living things such as insects and fish

1b. Liquids and Liquid-State Materials If a solution is placed in a vacuum, after the water has evaporated, the remaining substance can splash in the specimen chamber, potentially contaminating and damaging internal components. These specimens can be observed by removing water in advance.
Examples: Milk and pen ink

1c. Insulators When an insulator specimen is observed in the normal mode, the specimen can build up charge, resulting in image deviation and brightness/contrast change. In such a case, perform observation by switching to the charge-up reduction mode (see 4.2.6 **2.** and 4.3.6 **5.**).

1d. Magnetized Samples Magnetized samples not only can stick to the objective lens and damage internal components; they can also adversely affect the imaging. Such samples can be observed by completely demagnetizing them.
Examples: Magnets and magnetic recording media

1e. Miscellaneous Human bodies, substances harmful to the environment, materials that cannot be immobilized and living things should not be observed.

NOTE : Because the inside of the specimen chamber is evacuated, some specimens, when observed, can damage the system. Either avoid observing such specimens, or observe them after they are pre-treated appropriately.

2. The figure below shows an external view of a specimen stub (one set).

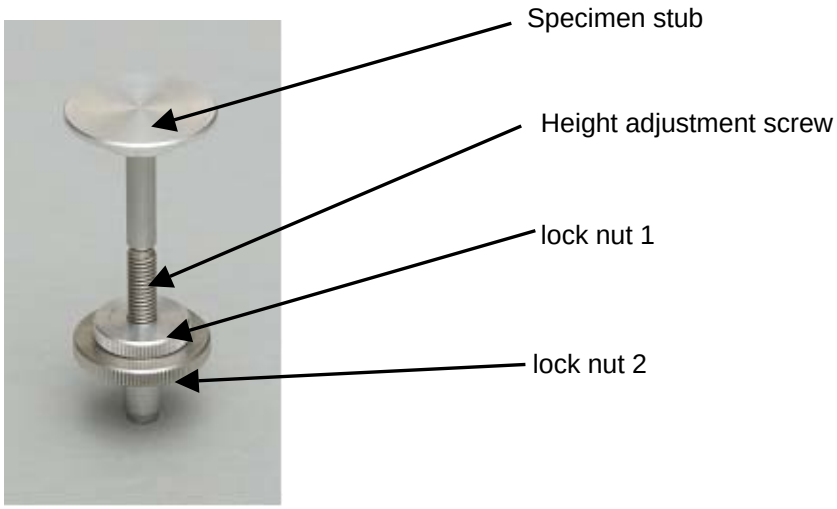


Figure 4.2.2-1 External View of the Specimen Stub

NOTE : When handling the specimen stub, wear clean gloves to keep the specimen stub free from particles and contaminants.

3. To the specimen stub, attach a conducting double-sided tape.

Figure 4.2.2-2 Attaching a Conducting Double-sided Tape to the Specimen Stub

NOTE : With water-rich specimens, such as organisms, plants, and food items, use glue or woodwork bond in small amounts. Set them in the specimen chamber after they have become thoroughly dry.

4. Affix the observation specimen on the conducting double-sided tape.

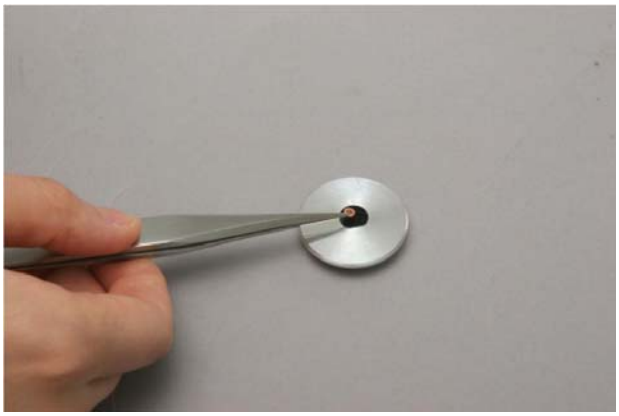


Figure 4.2.2-3 Affixing the Observation Specimen on the Specimen Stub

5. Attach the specimen stub to a height-adjustment screw.

Figure 4.2.2-4 Attaching the Specimen Stub to a Height Adjustment Screw

6. Place the specimen stub on the specimen height gauge to adjust its height.

7. As shown in Figure 4.2.2-5, adjust the height so that the gap between the specimen height gauge and the topmost surface of the specimen will be approximately 1 mm (0.5 to 1.5 mm). As shown in Figure 4.2.2-6, loosen the lock nut 1, adjust the height by turning the height adjustment screw, and then tighten the lock nut 1onto the lock nut 2 to secure the specimen stub. In addition, rotate the lock nut 2 once on the specimen height gauge to confirm the height.

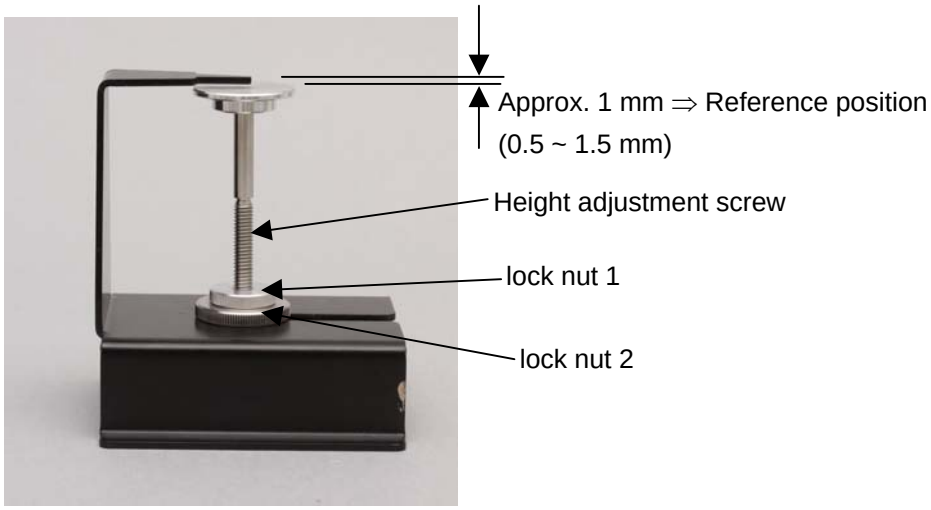


Figure 4.2.2-5 Specimen Height Gauge and Specimen Stub

Figure 4.2.2-6 Adjusting the Specimen Height

4.2.3 Changing Specimens

1. In the Midst of Observing a Specimen During the observation of a specimen, click the stop button on the Operation Window to terminate the observation process. Press the EVAC/AIR switch; wait for 3 minutes until the specimen chamber reaches the atmospheric pressure. The AIR LED (yellow) will blink, and then light up solidly.

2. When the specimen chamber has reached the atmospheric pressure, grasp the handle to pull out and specimen stage, and take out the specimen stub from the stage.

Figure 4.2.3-1 EVAC/AIR Switch Operation (Introducing the Air)

NOTICE: Introducing air before finishing observation can cause a blown filament or shorten its life.

3. When not Observing a Specimen If the EVAC LED (blue) is lit, press the EVAC/AIR switch and wait for about one minute until the specimen chamber reaches the atmospheric pressure.

4. After the specimen chamber has attained the atmospheric pressure, grasp the handle to pull out the specimen stage, and pull out the specimen stub straight up.

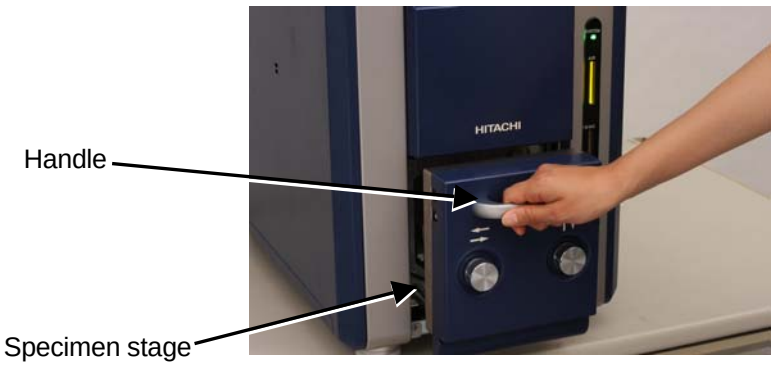


Figure 4.2.3-2 Pulling Out the Specimen Stage

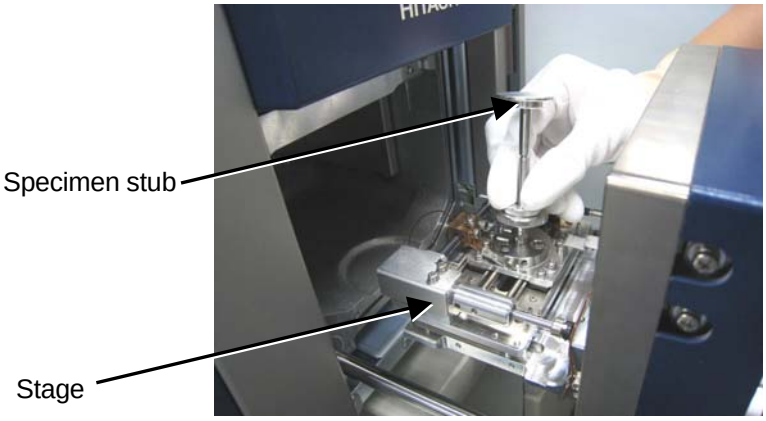


Figure 4.2.3-3 Taking Out the Specimen Stub Assembly

5. Insert the specimen stub assembly, with its height already adjusted, securely into the holder base for the stage until it stops.
Lock nut 2 can be fixed with the hexagon socket head screw outside of the holder base. Tighten the hexagon socket head screw with the ball wrench 2 when observing at high magnification or observing the heavy specimen.

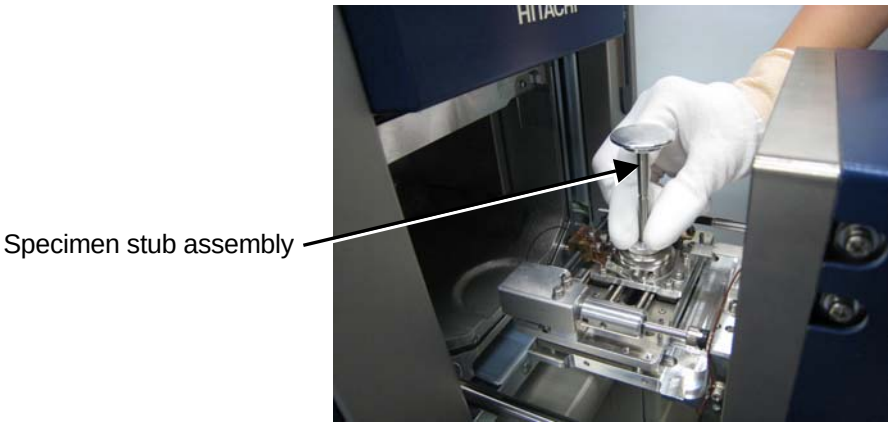


Figure 4.2.3-4 Attaching the Specimen Stub Assembly

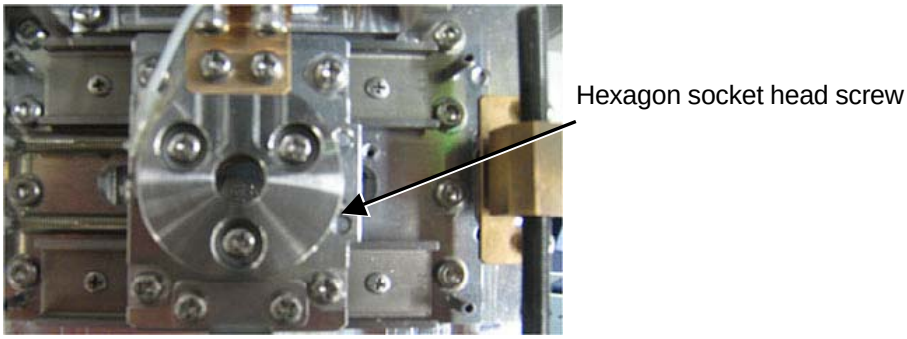


Figure 4.2.3-5 Hexagon Socket Head Screw That Fixes Lock Nut 2

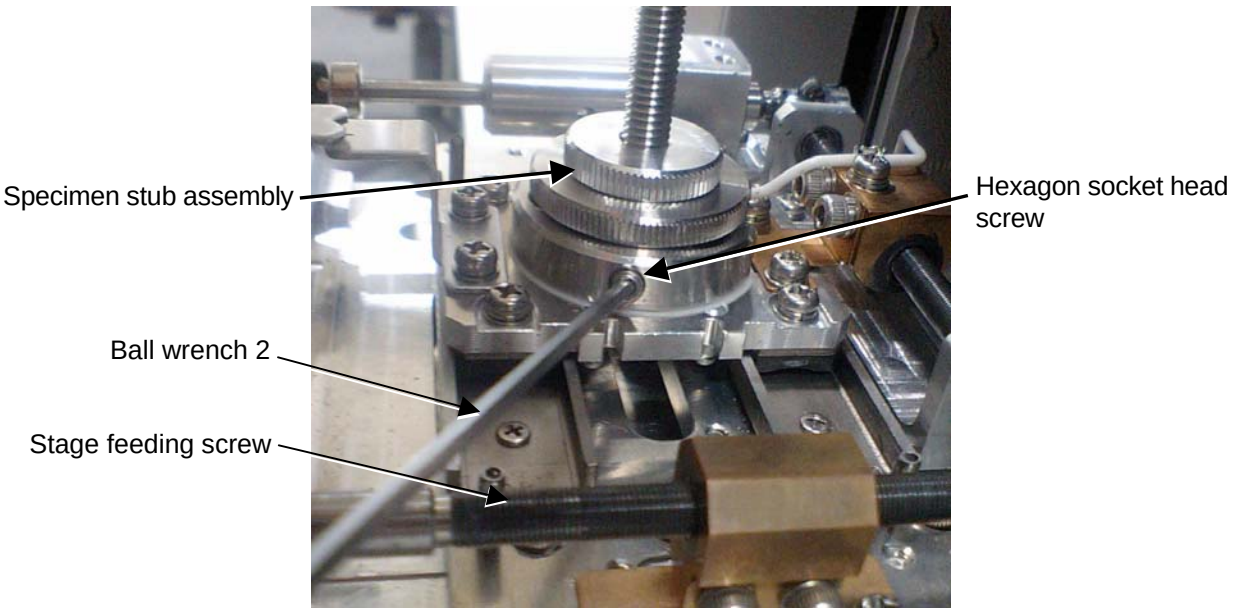


Figure 4.2.3-6 Hexagon Socket Head Screw for Fixing the Specimen Stub

NOTE : Specimen stub assembly can be fixed with the hexagon socket head screw outside of the holder base. The vibration trouble might occur when observing at high magnification or observing the heavy specimen. Therefore, tighten the hexagon socket head screw with the provided ball wrench 2 to fix the specimen holder. In that case, use the ball wrench 2 so that it does not touch the stage feeding screw. When removing the specimen stub assembly, loosen the hexagon socket head screw first, and remove it. Do not use the ball wrench other than the provided ball wrench 2.

NOTICE: When bringing you hand close to the motion mechanism of the specimen stage during specimen change, use caution not to touch any moving parts, such as gears and driving screws, and not to get your clothing caught.

6. Align the specimen with the center of the specimen stage. Turn the stage knobs X and Y to align the tip of the positioning guide with the center position mark (a cross mark) shown in Figure 4.2.3-7.

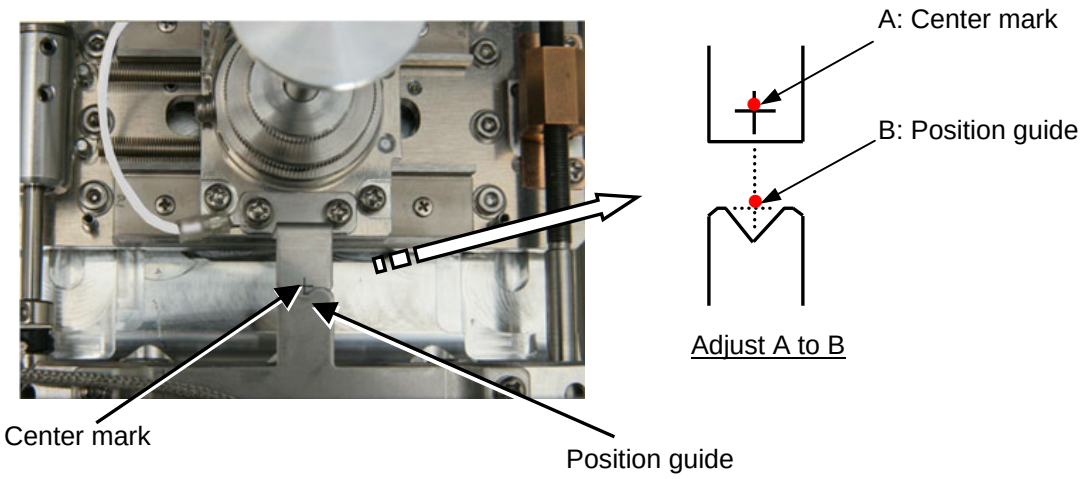


Figure 4.2.3-7 Aligning with the Center of the Stage

7. Insert the specimen stage. Insert the specimen stage gradually while checking to see that the specimen does not touch the front of the specimen chamber, as in the case of specimen change as shown in Figure 4.2.3-8.

Figure 4.2.3-8 Specimen Change

> ⚠ **CAUTION**: The specimen stage is a heavy object (weighing 5 kg). When changing specimens, securely grasp the handle, and use caution not to get you hand pinched.

NOTE : As shown in Figure 4.2.3-9 Specimen Change (Readjustment), if the specimen or the specimen stub touches the upper face of the frontage, re-adjust the height of the specimen stub with reference to 4.2.2 **6.**, **7.** so that the specimen does not touch the front of the specimen chamber.

Figure 4.2.3-9 Specimen Change (Readjustment)

8. While gently holding down on the specimen stage, press the EVAC/AIR switch to conduct evacuation. The EVAC LED (blue) will blink. When the evacuation process is finished, the EVAC LED (blue) changes from blinking to a solidly lit status.

Figure 4.2.3-10 EVAC/AIR Switching Operation (Evacuation)

9. The evacuation-in-progress status is also indicated as a dialog in the application operation window (the dialog disappears upon completion of the evacuation).

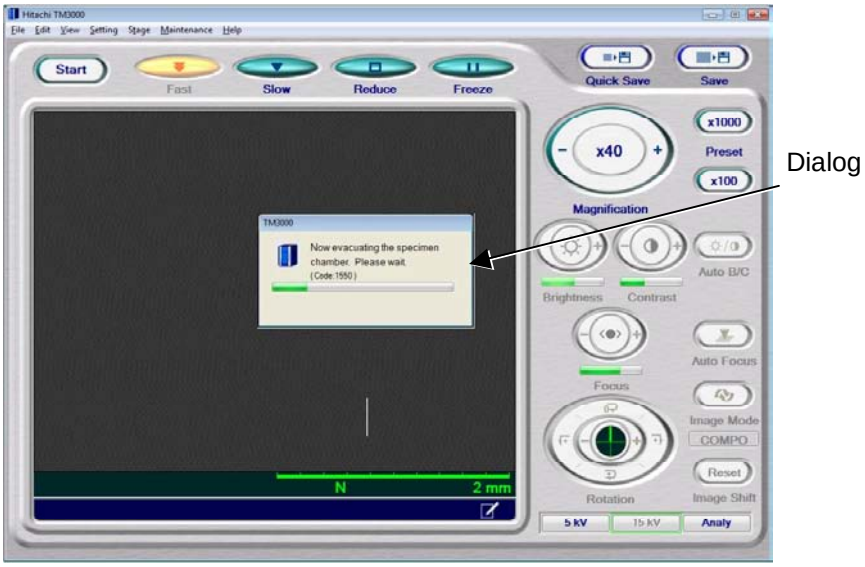


Figure 4.2.3-11 Evacuation-in-progress Screen

4.2.4 Starting Observing an Image

1. When the EVAC/LED (blue) on the main unit lights up solidly, the Start button on the operation window is enabled for clicking.

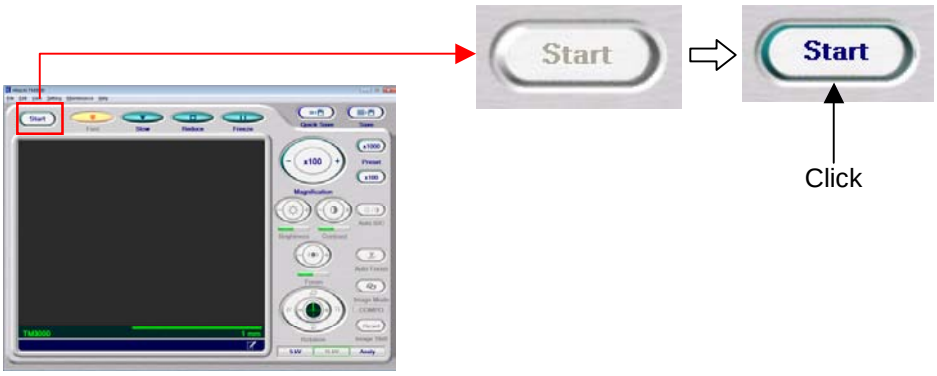


Figure 4.2.4-1 Starting Observing an Image

2. Either click the Start button on the operation window or on the menu operation unit click File Menu → Observation → Start (HV-ON) (O).
In Auto Start mode, auto-focusing and the Auto B/C function operate continuously and display an image (the Auto Start mode operates only after the system is started after specimen change or when the application is started).

Figure 4.2.4-2 Auto Start Activation Screen

4.2.5 Selecting a Display Mode

Change the display mode for the image observation area to the Fast mode and find the target observation FOV. In the next step, set the Reduce mode to adjust the brightness and the focus.
A display mode can be set by using the following methods:

1. Clicking the Display Mode Selection Button The selected display mode is indicated by a yellow button.

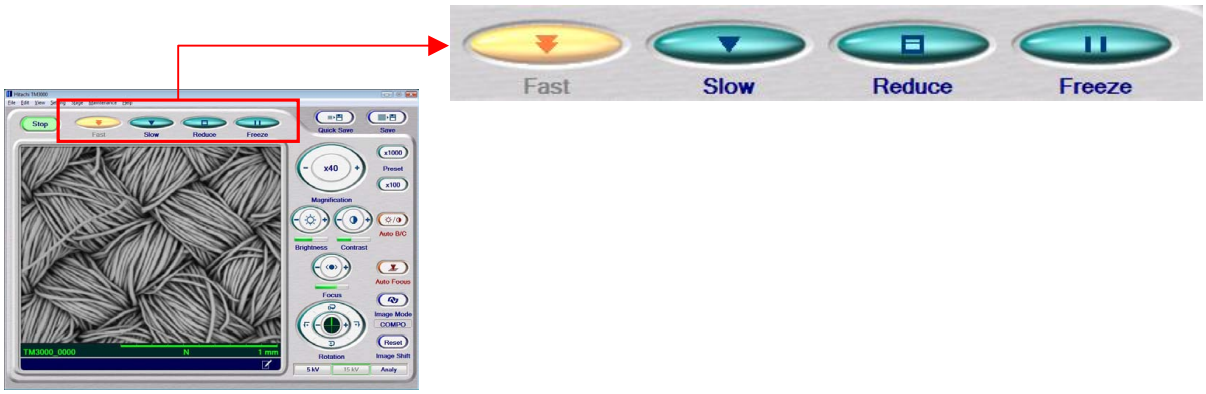


Figure 4.2.5-1 Display Mode Button

1a. Fast Mode This is a display mode well-suited for finding an observation position while moving the specimen.

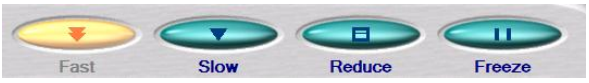


Figure 4.2.5-2 Display Mode Buttons (FOV Search)

1b. Slow Mode This is a display mode well-suited for verifying the image to be saved.

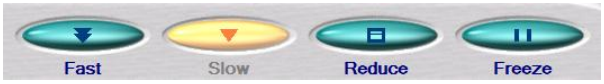


Figure 4.2.5-3 Display Mode Buttons (Image Check)

1c. Reduce Mode This is a display mode well-suited for the adjustment of the brightness or focus of the image being observed.

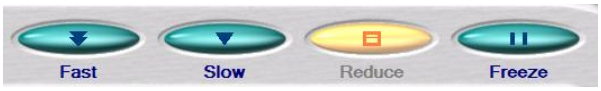


Figure 4.2.5-4 Display Mode Buttons (Image Adjustment)

1d. Freeze Mode This display mode allows the user to hold the image being observed still.

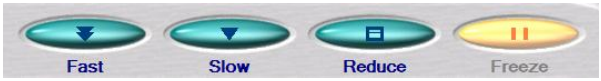


Figure 4.2.5-5 Display Mode Buttons (Freeze Image)

2. Selecting a Display Mode from the View Menu Click a Fast, Slow, Reduce, or Freeze among the available display modes.

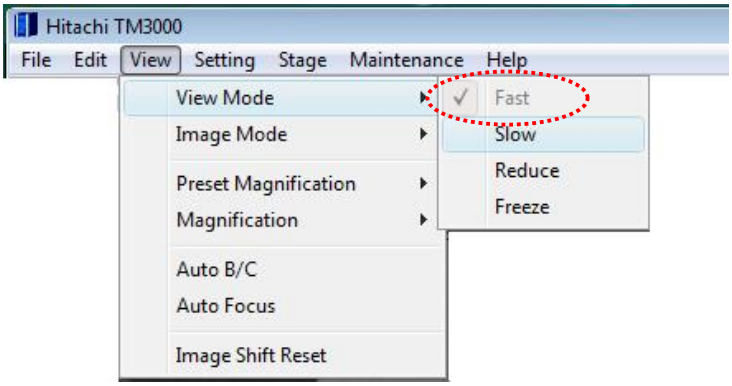


Figure 4.2.5-6 Selecting a Display Mode (Fast)

The selected display mode is check-marked.

4.2.6 Setting an Observation Mode

Select an observation mode from the Observation mode on the Settings menu.

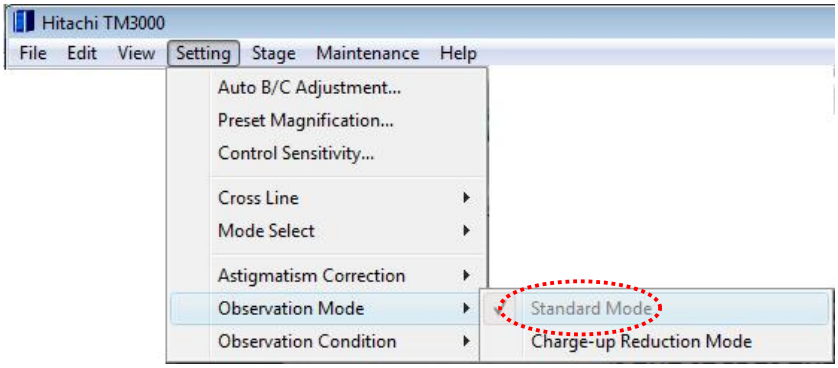


Figure 4.2.6 Setting an Observation Mode (Standard Mode)

In the observation mode in Figure 4.2.6, Setting an observation mode, the standard mode is check-marked.
Change to the observation mode well-suited for a given specimen.

1. Standard Mode This mode is well-suited for observing industrial materials, including metals such as gold, silver, copper, and iron. Among industrial materials, if fabrics, semiconductors, and polymer materials are to be observed, image shifts can occur as if the image was moving when there are brightness/contrast changes or the brightness changes with the passage of time when no operations are performed. In such a case, the use of the charge-up reduction mode is recommended.

2. Charge-up Reduction Mode When an observation is conducted in standard mode on water-rich materials, such as organisms and food items, image shifts can occur as if the image was moving when there are brightness/contrast changes or the brightness changes with the passage of time when no operations are performed. The charge-up reduction mode is well-suited for observing these specimens. However, for observing such specimens for a long time, an observation should be performed by dehydrating the specimens.

NOTE : The charge-up reduction mode can shorten the life of the filament.

4.2.7 Setting an Observation Condition

Select an observation condition either by operating the observation condition buttons in the observation condition setup unit or from the View menu. On the observation condition button, the part enclosed in a green frame represents the currently selected observation condition (when the system is started, the previous observation condition is displayed).

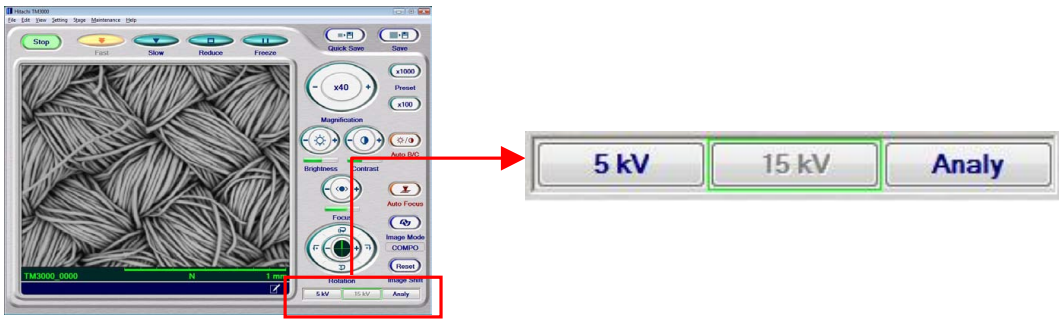


Figure 4.2.7 Setting an Observation Condition

For details on how to select an observation mode, see 4.3.13 Observation Condition Selection Button.

4.2.8 Adjusting the Brightness/Contrast of an Image

1. Manual Operation This operation allows the user to adjust the brightness and contrast of an observation screen.
For further details, see 4.3.18 Brightness Button and 4.3.19 Contrast Button.

Figure 4.2.8-1 Brightness/Contrast Adjustment Buttons

2. Auto Operation The Auto B/C mode automatically adjusts the brightness and contrast.

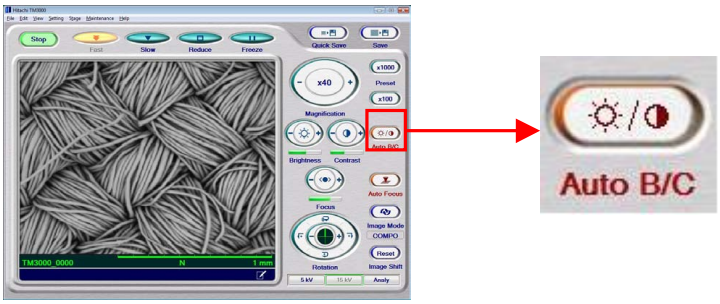


Figure 4.2.8-2 Adjusting the Brightness/Contrast of an Image (Auto B/C Operation)

Either clicking the Auto B/C button or selecting the Auto brightness/contrast adjustment option on the view menu executes the automatic adjustment of brightness and contrast.

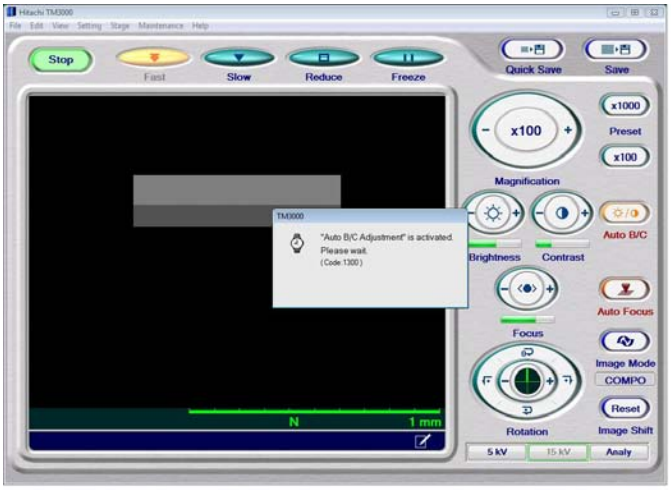


Figure 4.2.8-3 Image Brightness/Contrast Adjustment (Auto B/C Execution Screen)

Changing the FOV or the magnification on the specimen being observed can vary the brightness and contrast of the image.
When searching for the specific site on the specimen to be observed, press the Auto B/C button to adjust the balance between brightness and contrast to facilitate the search process. After determining the site to be observed and the magnification to be employed (see Section 4.2.12), use the brightness or contrast adjustment button for fine adjustments.

4.2.9 Coarse Adjustment of the Focus

Focusing can be adjusted by using both auto and manual modes.

1. Manual Operation

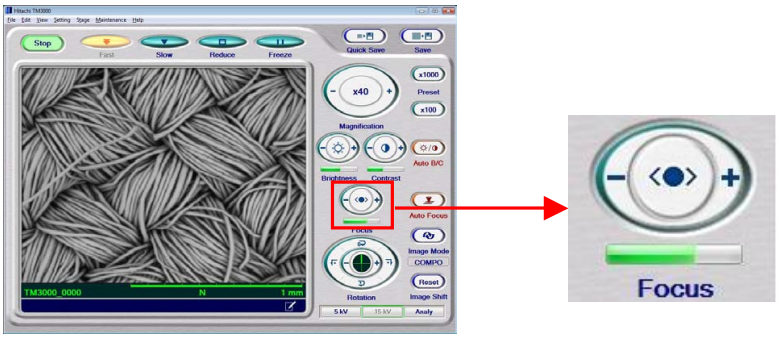
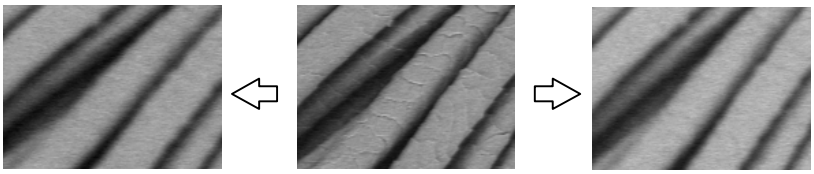


Figure 4.2.9-1 Coarse Adjustment of Focusing (Manual Operation)

The focus changes when the + or – side on the button is clicked. Clicking continuously causes the focus to vary continuously. If an appropriate focusing position is unknown, use auto focusing (see Section 4.2.9 **2.**) followed by manual operation for fine adjustment.



Focus (-) Focus (+)

Figure 4.2.9-2 Coarse Focusing

2. Auto Operation Auto-focusing automatically adjusts the focusing.

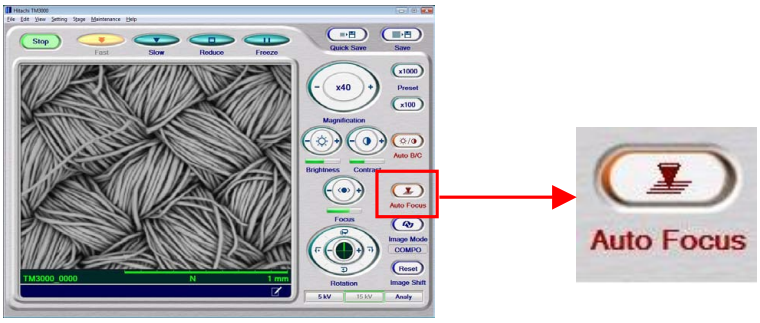


Figure 4.2.9-3 Coarse Focusing (Auto-Focusing)

Either click the auto-focus button or select Auto Focus on the View menu to execute auto focusing.

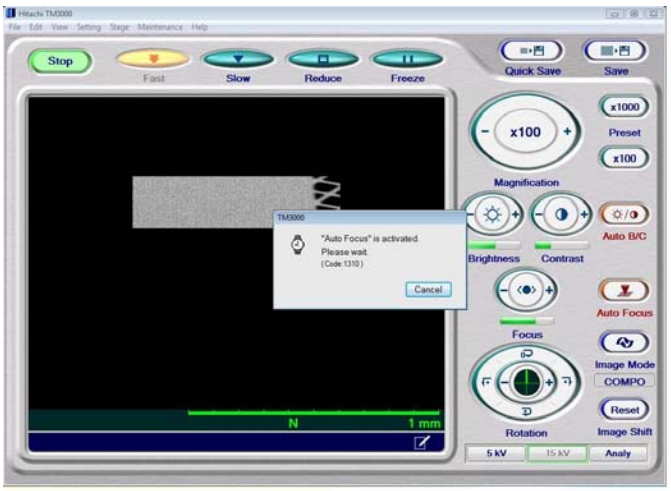


Figure 4.2.9-4 Coarse Focusing (Auto-focusing in Progress Screen)

The precision of auto-focusing can be affected by the surface structure of the specimen. Auto-focusing will not operate properly if the specimen surface contains few minute structural features, its contrast is low, or the specimen is liable to become charged. In such cases, manual focusing should be employed.

4.2.10 Selecting an Observation FOV

An FOV can be selected by two methods:

・ Searching for a target FOV by turning the XY motion knobs (see Section 3.2.1) on the manual stage. (For the manual stage)

・ Searching for a FOV by mouse operation on the observation screen. (For the motor drive stage)

・ Searching for a target FOV by using the image shift (see Section 4.2.10 **2.**).

(1) Manual Stage To move the FOV extensively, use the XY motion knobs for the manual stage. To move it finely, use the image shift. When moving the FOV for a high-magnification observation (x5,000 or higher), it would be difficult to move it to a target location by using the XY-motion knobs on the specimen stage, in which case the use of image shift is recommended. Image shift provides a maximum motion size of ±50 µm, which makes it a suitable tool for performing fine adjustments for conducting a high-magnification observation at x5,000 or higher.

NOTE : If the rotation is not 0°, the direction in which the image moves vary. Therefore, first set the rotation to 0°, move the FOV, and then use the rotation to rotate the image.

(2) Manual Stage To move the FOV extensively, adjust the mouse cursor to △ mark on the observation screen and hold the left mouse button down.
To move it finely, use the image shift.
When moving the FOV for a high-magnification observation (x5,000 or higher), using image shift is recommended. Image shift provides a maximum motion size of ±50 µm, which makes it a suitable tool for performing fine adjustments for conducting a high-magnification observation at x5,000 or higher.

1. Moving the FOV by Operating the XY Motion Knobs on the Manual Stage
Turning the X knob (on the left side when viewed from the front) on the manual stage to the right (clockwise) moves the observation image to the right; turning it to the left (counterclockwise) moves the observation image to the left.

Figure 4.2.10-1 Selecting an Observation FOV (X-Knob)

Turning the Y knob (on the right side when viewed from the front) on the manual stage to the right (clockwise) moves the observation image to downward; turning it to the left (counterclockwise) moves the observation image upward.

Figure 4.2.10-2 Selecting an Observation FOV (Y-Knob)

2. Moving the FOV by Motor Drive

Motor drive stage can move the FOV by mouse operation on the observation screen.

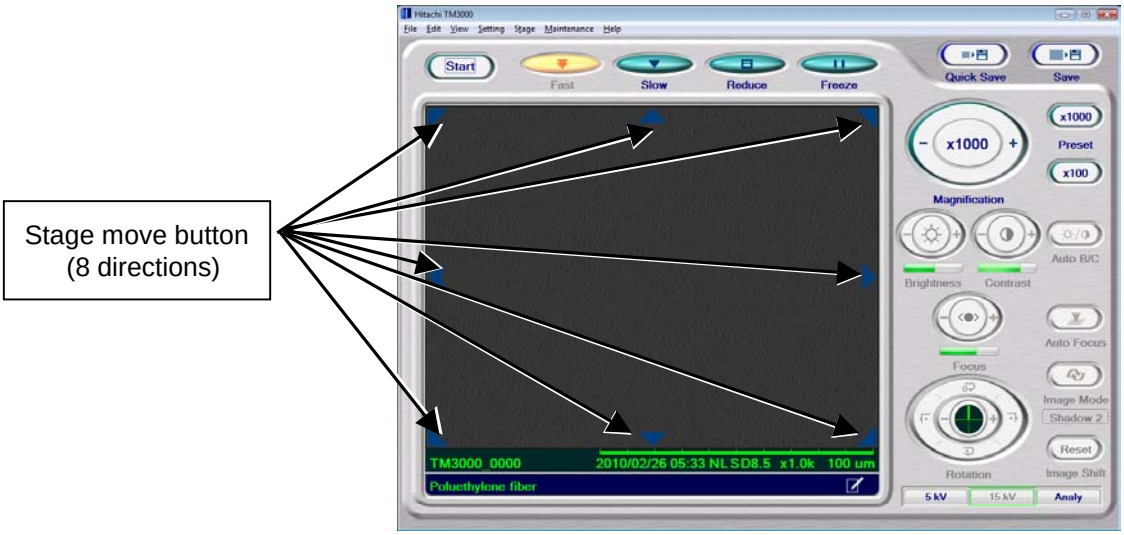


Figure 4.2.10-3 Selecting an Observation FOV (Motor Drive Stage Operation)

2a. Stage Move Button When matching the mouse cursor to △ mark displayed on the observation screen, the cursor is changed into . Under such a condition, when a mouse left button is clicked, FOV does step movement toward △ mark. FOV moves continuously when holding the left mouse button down.

2b. Click Center Function The double-clicked position moves to the center of the observation screen by the motor drive or the image shift function when double-clicking left mouse button when the mouse cursor is on the observation screen. Either the motor drive or the image shift is automatically decided by the amount of the movement and the observation magnification.

3. Moving the FOV by Image Shifting Image Shift is a function that moves the displayed image by moving the electron beam scanning position.

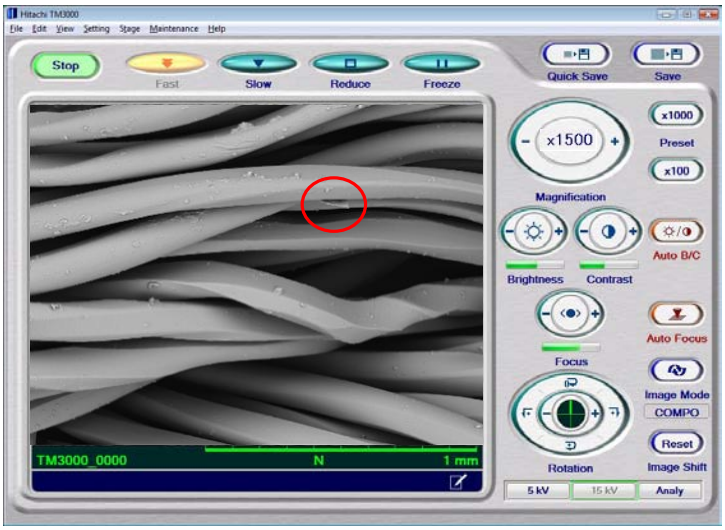


Figure 4.2.10-4 Selecting an Observation FOV (Image Shift Operation)

Place the mouse cursor on the spot (the red circle in Figure 1) to be moved to the center of the observation screen, and then double-click that spot.

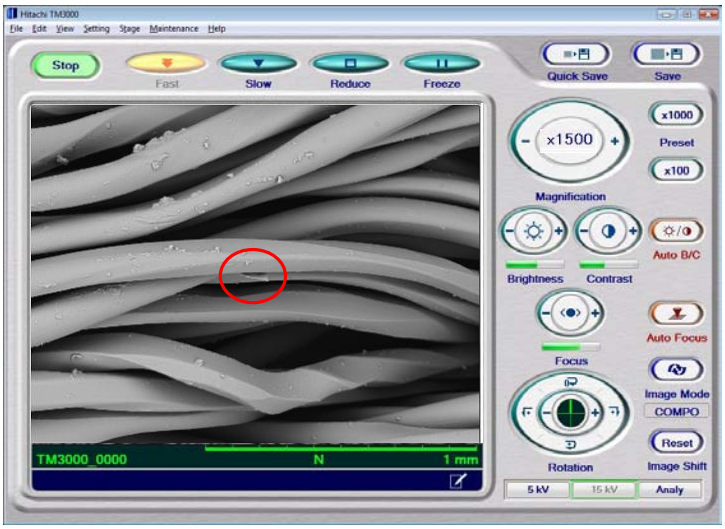


Figure 4.2.10-5 Selecting an Observation FOV (Image Shift Operation)

The double-clicked position moves to the center of the observation screen.

4. Resetting the Image Shift

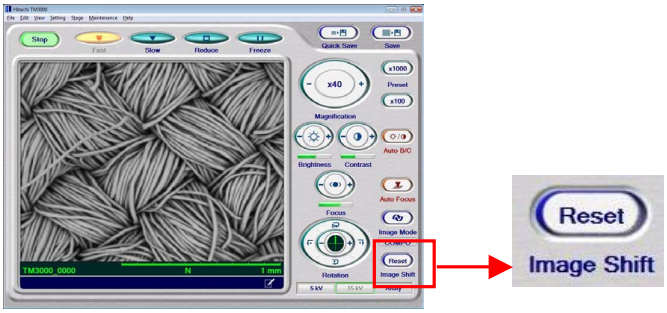


Figure 4.2.10-6 Selecting an Observation FOV (Image Shift Reset Operation)

Clicking the image shift reset button returns the FOV to the position that was in effect before image shifting was performed.

NOTE : Because the range over which the FOV can be moved by image shifting is limited (see Section 1.3), if the FOV ceases to move, press the Reset button once, move the FOV by manipulating the XY knobs, and then use the Image Shift again for fine adjustments.

5. Observation Image Rotation Operation Rotation is a function that rotates the display image by turning the direction in which electron beam scanning is performed.

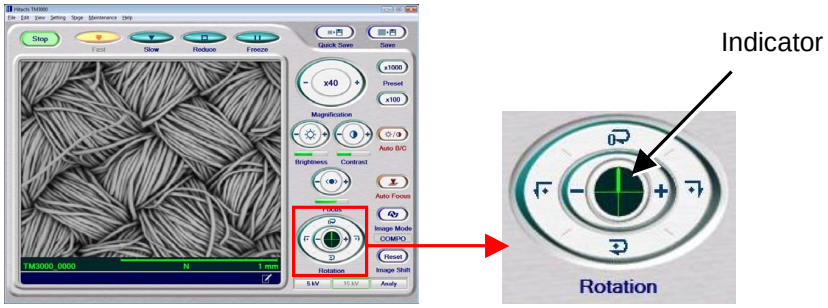


Figure 4.2.10-7 Selecting an Observation FOV (Rotation Operation)

For details, see 4.3.24 Rotation Button.

4.2.11 Setting an Image Mode

Image observation can be conducted in any of three image modes: COMPO, shadow, and TOPO.

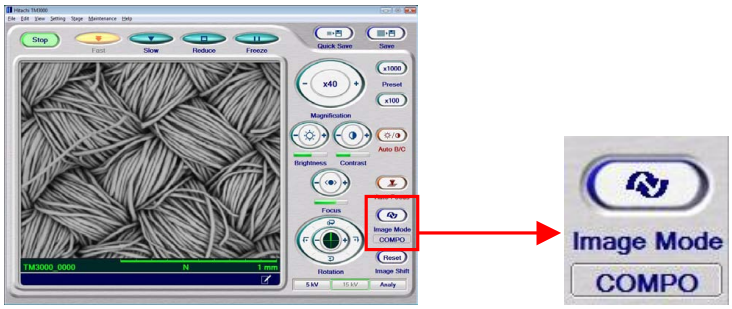


Figure 4.2.11 Setting an Image Mode (Changing Image Modes)

For details, see 4.3.12 Image Mode Button.

4.2.12 Setting a Magnification

A magnification can be set by any of the following methods:

1. Clicking the Magnification Button

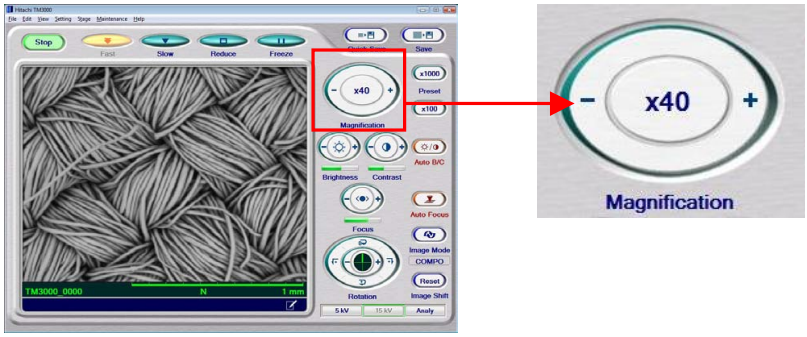


Figure 4.2.12-1 Setting a Magnification (Operating the Magnification Button)

To increase the magnification, click the + button; to reduce it, click the – button. The magnification changes by one stop at a time. Clicking the button continuously causes the magnification to change continuously one stop at a time. For the number of available stops, see Section 4.3.16 or 1.3.

2. Clicking the Preset Button

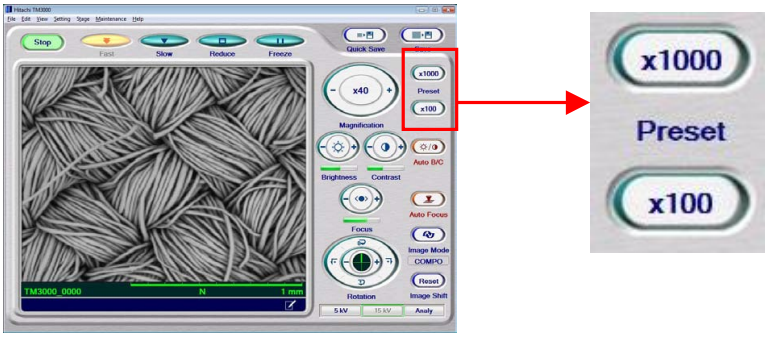


Figure 4.2.12-2 Setting a Magnification (Operating the Preset Button)

By registering magnifications (two magnifications can be registered) that facilitate the finding of an observation position or a magnification that is frequently used, the target magnification can be set by simply clicking the Preset button. (For a description of how to set a Preset magnification, see Section 4.3.33 Preset Magnification Window.)

NOTE : If two magnifications with a large magnification difference, such as a low magnification (for example, x100 or less) or a high magnification (for example, x10000 or higher) are set and switching is made between them, an observation FOV deviation can occur. In such a case, change magnifications by using the observation magnification button. Hitachi recommends that the Preset button is used at x5,000 or less.

3. Selecting a Magnification from the View Menu Select a magnification from Preset magnification values on the View menu. The current magnification changes to the selected magnification.

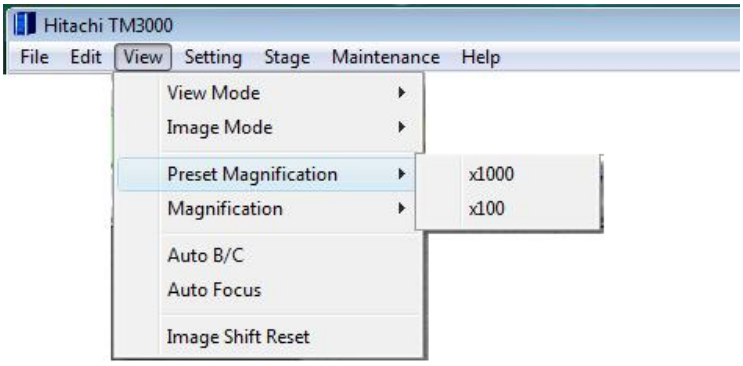


Figure 4.2.12-3 Setting a Magnification (View Menu Operation)

Select a magnification from magnification specifications values on the View menu. The current magnification changes to the selected magnification.

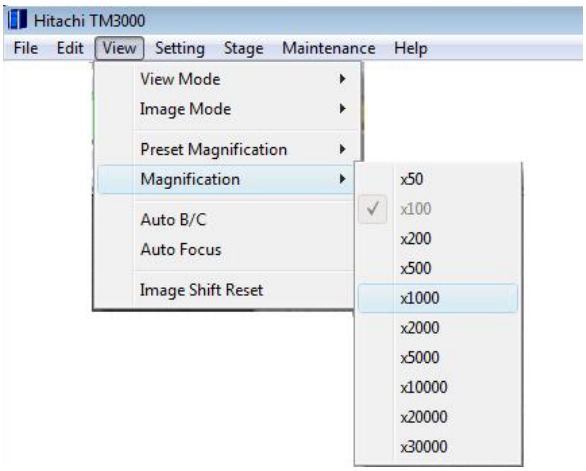


Figure 4.2.12-4 Setting a Magnification (View Menu Operation)

Change the magnification in order to adjust the observation position for the specimen. Although the specific magnification to be used depends on the size of the specimen, a magnification of 100x or less is generally suitable for adjusting the specimen position. Changing the magnification from a low to high levels narrows the FOV and at the same time changes the brightness, contrast, and focus. If changing the magnification makes the performance of observation difficult, appropriately operate the various auto buttons (Auto B/C (see 4.2.8 **2.**), auto focusing (see (4.2.9 **2.**) or manual adjustments to set conditions that facilitate observation.
Manual adjustments on focusing can also be performed by using the mouse. For those, see Sections 4.2.13 **1.** to **2.** .

4. Selecting a Magnification by Dragging the Mouse

4a. Moving the mouse cursor into the observation magnification button changes the cursor to a magnification adjustment view  .

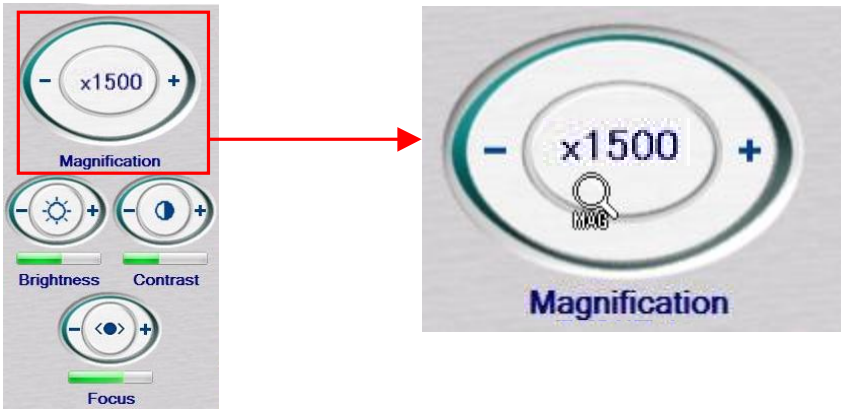


Figure 4.2.12-5 Setting a Magnification (Mouse-Dragging)

4b. Pressing the left button on the mouse and dragging it to the right and left changes the magnification. Dragging it to the right increases the magnification, and dragging it to the left decreases it. While viewing the image, perform adjustments until an appropriate magnification level is attained. Adjustment can be continued until the left button on the mouse is released even if the cursor moves outside of the observation Magnification button.

4.2.13 Fine Focusing

When conducting a high-magnification observation, manually perform fine-focusing.
The following methods can be employed to perform adjustments.

1. Dragging the Mouse in the Observation Image

1a. Move the particular site on the specimen to be focused on to the center of the image, and click the Reduce button for the View Mode. This limits the FOV to near the center of the screen.

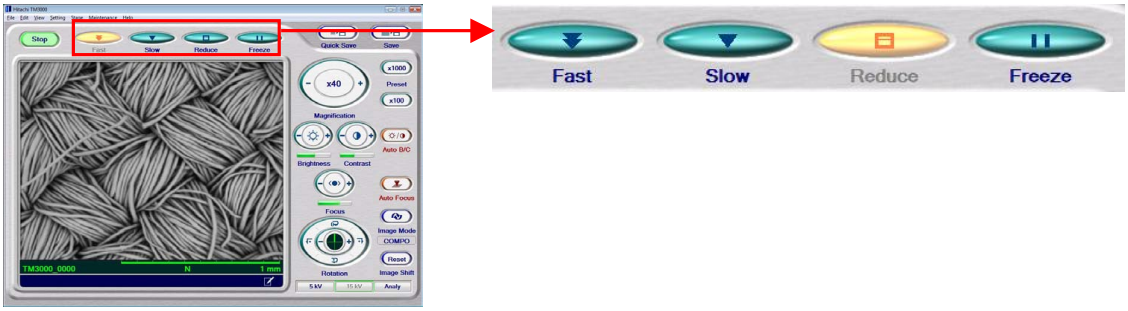


Figure 4.2.13-1 Fine Focusing (Mouse-Dragging)

1b. Move the mouse cursor into the image viewing area. The cursor changes to a focus adjustment display.

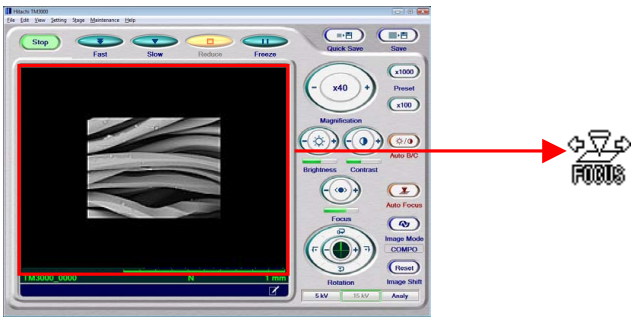


Figure 4.2.13-2 Fine Focusing (Mouse-Dragging)

1c. While pressing the left button on the mouse, drag it to the right and left for fine-focusing. While viewing the image, perform adjustment until an appropriate focusing level is attained.

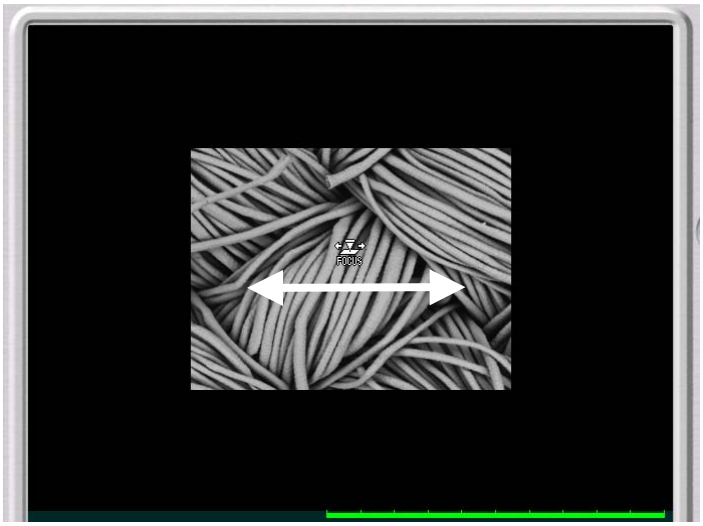


Figure 4.2.13-3 Fine Focusing (Mouse-Dragging)

2. Mouse-Dragging within the Focusing Button See Section 4.3.21 Focus Button. Fine focusing, however, is not enabled if the accelerating voltage is off or the View mode is in the freeze image mode.

3. Astigmatism Correction If the electron beam directed onto the specimen surface is not circular, the specimen that would normally appear circular may appear elliptic or when the specimen is focused on, it can appear blurred. This phenomenon is referred to as astigmatism.
In the absence of astigmatism, when the focus is moved back and forth from an optimal point (see (4.2.13 **1. 2.**), the image changes as shown in the figure below:

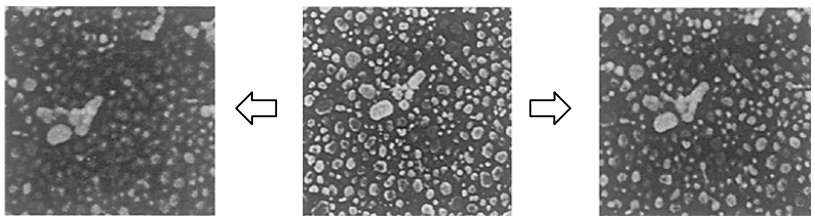
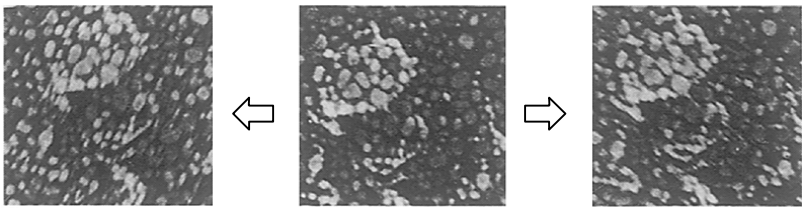


Figure 4.2.13-4 Astigmatism Correction Screen (1)

In the presence of astigmatism, moving the focus back and forth (see 4.2.13 **1. 2.**) produces an image that runs in one direction, as shown below:



(A)

Figure 4.2.13-5 Astigmatism Correction Screen (2)

If astigmatism is present, the problem can be corrected as described below. For ease of correction, astigmatism correction and focusing correction might be performed in alternating fashion.

3a. From astigmatism correction on the setting menu, select Yes.

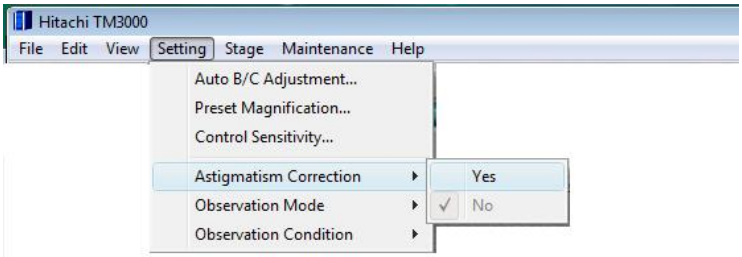


Figure 4.2.13-6 Astigmatism Correction Menu

An astigmatism correction operation unit is displayed in the Information/Comments area of the operation image.

Figure 4.2.13-7 Astigmatism Correction Display Area

3b. Using focusing adjustment, set the focus in the condition shown in Figure 4.2.13-5 (A). Position (A) is the middle position of the points through which the image runs vertically.

3c. By dragging the slider bars for astigmatism correction 1 and astigmatism correction 2, make the image more clearly visible. For verification, perform fine-focus the image up and down from the position where the image is most clearly visible. If the image ceases to run (in the condition depicted in Figure 4.2.13-5), the astigmatism correction is successful.

4.2.14 Saving the Image Data

After adjusting the focus according to the steps described above, click the image verification button for the View mode, and verify the entire image to be saved. For changing the brightness/contrast, perform adjustments by referring to Section 4.2.8 Adjusting the Brightness/Contrast of an Image.
After deciding upon the specific image to be saved, save the image data by performing the following steps:

1. In addition to the image, check any associated information to be saved (if the same information as the previous save is used, no checking is necessary).
To revise the information, see Steps **1a** to **1c** below.

1a. Either click the Edit button on the Information/Comments area or select Save Settings on the File menu.

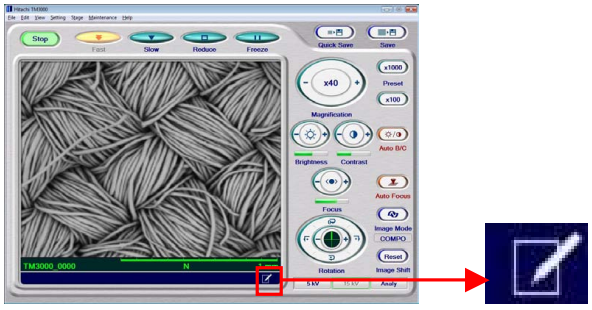


Figure 4.2.14-1 Edit Button

1b. A Setting for Save window appears. On this window, specify information view/hide settings, edit any comment entry, and select the type of image save to be performed.

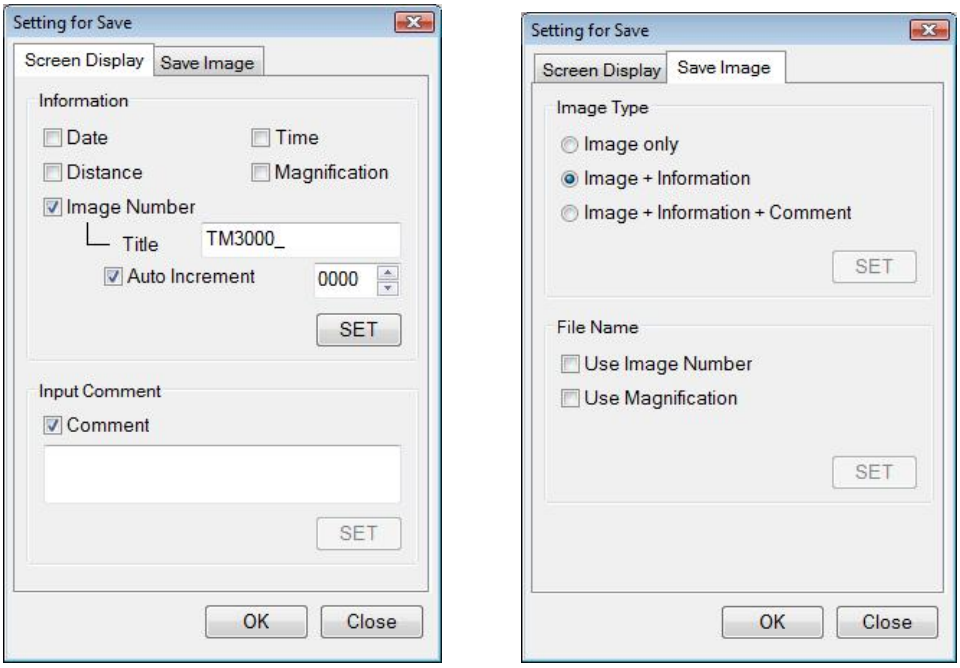


Figure 4.2.14-2 Setting for Save Window

Table 4.2.14-1 Image Save Type and Image Save Size (.jpg)

Image Save Type	Quick Save (size)	Save (size)
Images only	640x480 pixels (20~90 KB)	1280x960 pixels (100~250 KB)
Image + information	640x520 pixels (30~90 KB)	1280x1040 pixels (100~350 KB)
Image + info + comments	640x550 pixels (40~100 KB)	1280x1100 pixels (100~400 KB)

Table 4.2.14-2 Image Save Type and Image Save Size (.bmp)

Image Save Type	Quick Save (size)	Save (size)
Images only	640x480 pixels (301 KB)	1280x960 pixels (1,202 KB)
Image + information	640x520 pixels (327 KB)	1280x1040 pixels (1,302 KB)
Image + info + comments	640x550 pixels (345 KB)	1280x1100 pixels (1,377 KB)

Table 4.2.14-3 Image Save Type and Image Save Size (.tif)

Image Save Type	Quick Save (size)	Save (size)
Images only	640x480 pixels (303 KB)	1280x960 pixels (1,202 KB)
Image + information	640x520 pixels (328 KB)	1280x1040 pixels (1,302 KB)
Image + info + comments	640x550 pixels (346 KB)	1280x1100 pixels (1,377 KB)

1c. Click the [SET] button to commit the settings. After committing the settings by clicking the [OK] button, close the Setting for Save window.

2. Standard Save For details, see 4.3.15 Save Button.

3. Quick Save For details, see 4.3.14 Quick Save Button.

4.2.15 Checking the Image Data

Using Windows Explorer, display a list of saved images.

1. On the keyboard, press the [F9] key.

2. Open the folder in which an image was saved last.

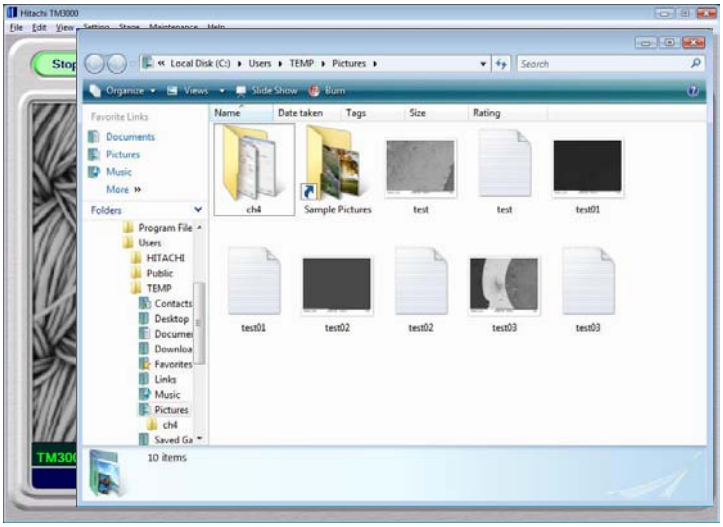


Figure 4.2.15 Image Data Save Folder Screen

NOTE : If reduced images are not displayed in the folder, click the [View] button on the Toolbar and select either [Medium Icons] or [Large Icons]. This displays a list of saved images in the folder.

4.2.16 Terminating the Image Observation

1. Click the [Stop] button to terminate the image observation process.

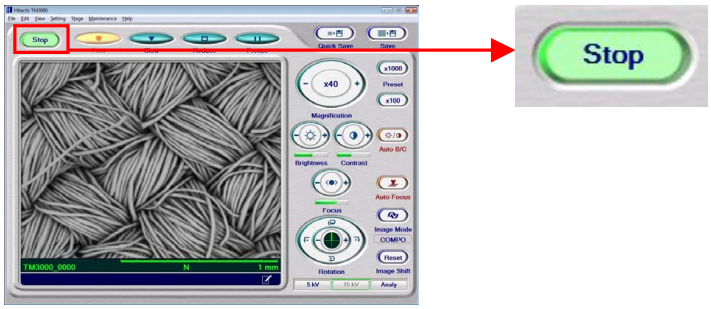


Figure 4.2.16-1 Terminating the Image Observation (Stop Button)

2. When continuing to observe an image, perform the steps described beginning in Section 4.2.4 Starting Observing an Image. When observing another image, perform the steps described beginning in Section 4.2.2 Fixing a Specimen and Adjusting its Height.

3. Close the application.

3a. Either click [X] on the Title bar button located in the upper right area of the operation screen or select [Exit] on the File menu.

3b. A termination confirmation dialog appears. Clicking the [OK] button closes the application. The [Cancel] button cancels the closing of the application.

Figure 4.2.16-2 Application Termination Confirmation Screen

4.2.17 Shutting Down the System

1. When stopping to observe other specimens on a continuing basis, press the EVAC/AIR switch to set the specimen chamber to the atmospheric pressure, and remove the specimen that had been loaded.

2. Press the EVAC/AIR switch to set the specimen chamber to a vacuum (observation-enabled) status.

Figure 4.2.17-1 Pressing the EVAC/AIR Switch (Evacuation Operation)

3. Close the application, and turn off the PC.

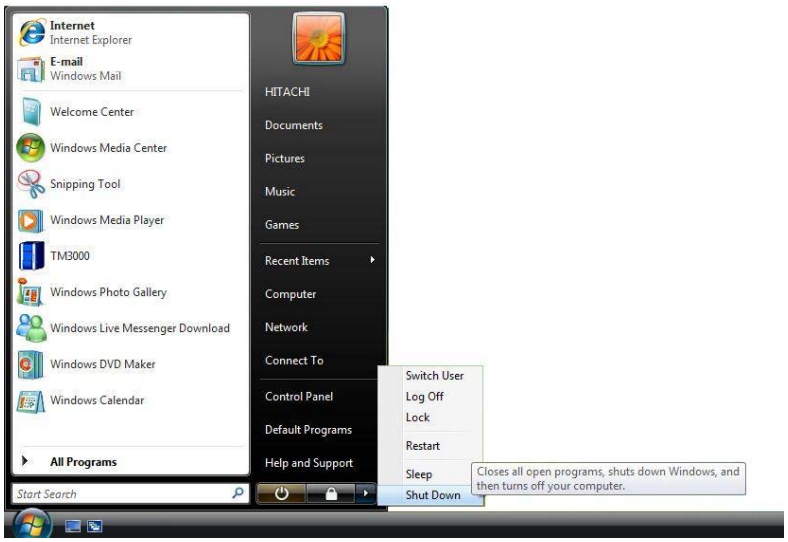


Figure 4.2.17-2 Turning the PC Off

4. Turn off the Power switch on the main unit to shut it off.

Figure 4.2.17-3 Shutting Down the System (Pressing the Power Switch)

NOTICE :	If image observation is not performed for a long time, in order to keep the specimen chamber in a vacuum condition, activate the main unit at least once every two weeks, set it in a vacuum state (observation-enabled condition) (with the EVAC indicator (blue) lit up solidly), and then shut down the system.

4.3 Detailed Description of Functions

4.3.1 Image Viewing Area

The image viewing area displays the observation image. System operations are performed by viewing the observation image displayed in this area.
By dragging the mouse by pressing the left button on the mouse on the image viewing area (see 4.2.13 **3.**), the observation image can be fine-focused on. When fine focusing is enabled on the image viewing area, the mouse pointer changes to the mark.
Fine focusing on the image viewing area is not enabled if the accelerating voltage is off or the display mode is in the freeze image mode.

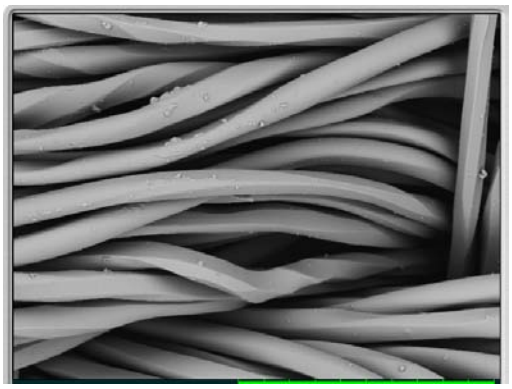


Figure 4.3.1 Image Observation Area

4.3.2 Information/Comments Area

The Information/Comments area displays the scale of the observation image, the image mode, information (image number, date, time, distance, and magnification), as well as comments.
The information items and comments can be specified in terms of view/hide. These items can be set by either clicking the Edit button or selecting Save Settings on the File menu.
For details on settings, see 4.3.28 Setting for Save Window.

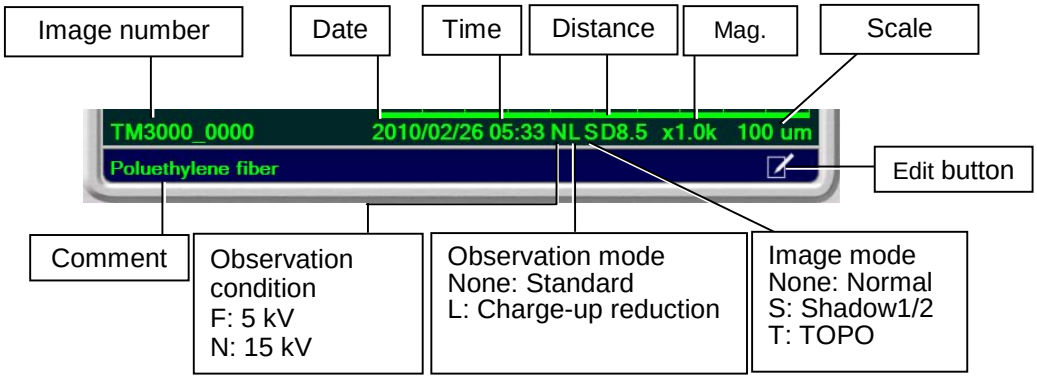


Figure 4.3.2 Information/Comments Area

NOTE : The scaling cannot be set in the hide mode. The observation mode (see Section 4.3.6 **5.**) is display when the charge-up reduction mode is selected in an observation-enabled status (when the specimen chamber is in a vacuum state). The Image mode (see Section 4.3.5 **2.**) is displayed in non-standard modes.

4.3.3 File Menu

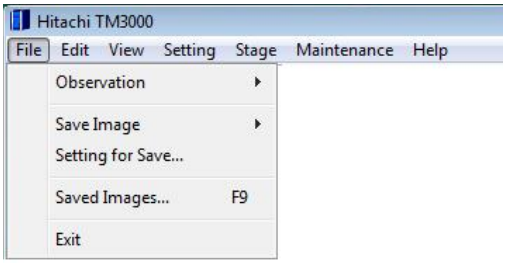


Figure 4.3.3-1 File Menu

1. Observation

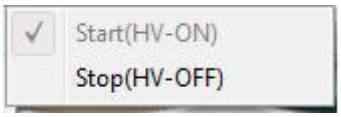


Figure 4.3.3-2 File Menu (Observation Menu)

1a. Start (HV-ON) To start the observation process, turn on the electron gun (HV-ON) and apply a current to the filament. During this process, which takes approximately 10 seconds, a process-in-progress window appears. The same operation can also be performed by pressing the Start button.

NOTE : This operation cannot be conducted when the Start button is in the [Stop] (HV-ON) status.

1b. Stop (HV-OFF) To terminate observation, turn off the electron gun (HV-OFF), and shut off the current to the filament. The same operation can also be performed by pressing the Stop button.

NOTE : This operation cannot be conducted when the Start button is in the [Start] (HV-OFF_) status.

2. Saving Image

Figure 4.3.3-3 File Menu (Image Save Menu)

2a. Quick save Depending on the particular View mode that is selected, this button captures the image being observed and saves it as an image file (image save size: 640x480 pixels (image only), 640x520 pixels (image + information), and 640x550 pixels (image + information + comments)). The amount of time required to capture the image varies from one view mode to another. A dialog indicating process-in-progress appears. On the Data Save screen that appears after the image capture, enter the destination of save and the file name, and select the file type, and save the image file. The same operation can be performed by pressing the Quick Save button.

2b. Save This button captures a high-definition image of the specimen being observed and saves the results as an image file (image save size: 1280x960 pixels (image only), 1280x1040 pixels (image + information), and 1280x1100 pixels (image + information + comments)). The capturing of the image takes 30 to 40 seconds. A dialog indicating process-in-progress appears. On the Data Save screen that appears after the image capture, enter the destination of save and the file name, and select the file type, and save the image file. The same operation can be performed by pressing the Save button.

3. Setting for Save… A Setting for Save window appears that displays a screen (for information and comment entry) for the image being observed and for selection of output conditions for the saved image (the type of the saved image, such as whether information and comments are to be included in the image file). When Quick Save or Save is executed, the specified conditions are incorporated into the created image file.

4. Saved Images…F9 Open the folder that saved the last image. For details, see 4.2.15 Checking the Image Data.

5. Exit Closes the program. The same operation can be performed by pressing the Close button.

4.3.4 Edit Menu

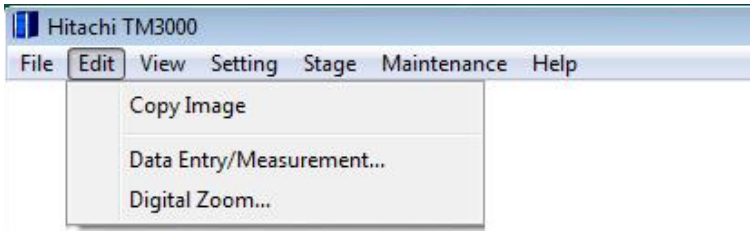


Figure 4.3.4 Edit Menu

1. Copy Image Copies the image being observed to the clipboard. This button is enabled when the View mode is the freeze mode.
The image size produced by the image copying process is 640x480 pixels for a freeze image, 1280x960 pixels for a freeze image after the execution of save, and 1280x960 pixels for a freeze image after the execution of the Digital Zoom screen.

2. Data Entry/Measurement… Displays the data entry/measurement screen. This screen is operable when the View mode is the Freeze image mode. A maximum of 50 characters and graphics can be written onto the image. In addition, the distance between two points can be measured on this screen. Edited images can be saved as image files (image save size: 640x480 pixels (image only), 640x520 pixels (image + information), and 640×550 pixels (image + information + comments)).

3. Digital Zoom… After capturing a detailed image during the observation process, displays a digital zoom screen. Images are captured in the same processing as the saving process. On the digital zooming screen, any part to be enlarged can be specified to display a digital zoom image (an image 2x or 4x relative to the image being displayed. Digital zoom images can be saved as image files (image save size: 640x480 pixels (image only), 640x520 pixels (image + information), and 640×550 pixels (image + information + comments)).

4.3.5 View Menu

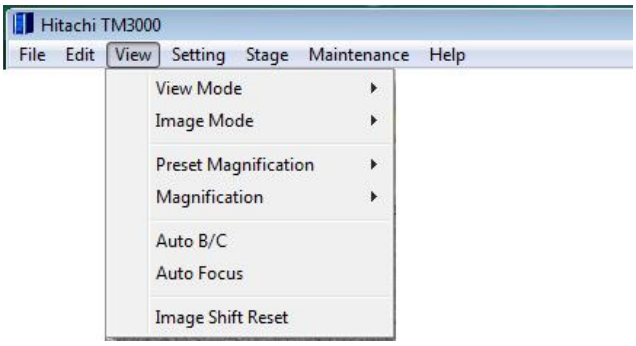


Figure 4.3.5-1 View Menu

1. View Mode

Figure 4.3.5-2 View Menu (View Mode Menu)

For details, see 4.3.11 View Mode Selection Button.

2. Image Mode

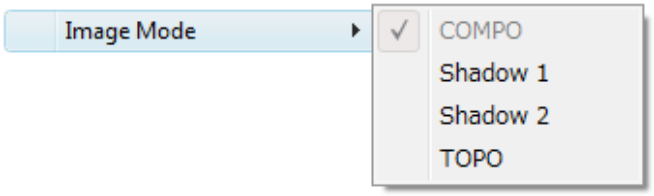


Figure 4.3.5-3 View Menu (Image Mode Menu)

For details, see 4.3.12 Image Mode Button.

3. Preset Magnification

Figure 4.3.5-4 View Menu (Preset Magnification Menu)

Selecting either of the two magnifications that were set on the Preset Magnification screen causes the direct switching to that magnification. The same operation can be performed by using the Preset Magnification button.

4. Magnification

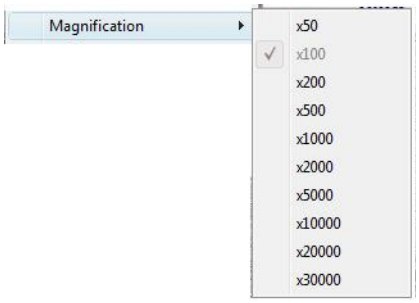


Figure 4.3.5-5 View Menu (Magnification Menu)

A change is made to the magnification selected on the menu.

5. Auto B/C Automatically adjusts the brightness and contrast of the image being observed. This function can automatically adjust according to the brightness and contrast levels that were set in advance using the Auto brightness/contrast adjustment settings screen. The Auto B/C button can also be used to perform the same operation.

6. Auto Focus This function automatically adjusts the image being observed to an appropriate focus. The Auto Focus button can also be used to perform the same operation.

7. Image Shift Reset This function resets the image being observed to a pre-set reference image shift value (shift amount: 0). The Image Shift Reset button can also be used to perform the same operation.

4.3.6 Setting Menu

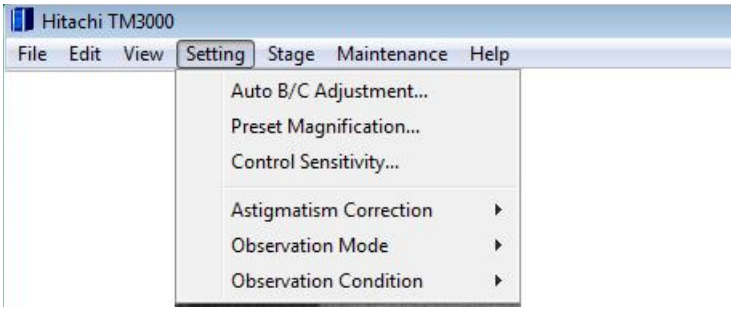


Figure 4.3.6-1 Setting Menu

1. Auto B/C Adjustment… This function displays the Auto B/C Adjustment window that presets conditions (brightness and contrast levels) for Auto B/C adjustment.

2. Preset Magnification… This function displays the Preset Magnification Settings screen that sets a preset magnification in advance.

3. Control Sensitivity… Displays the Control Sensitivity window that adjusts various operation buttons (the magnification button and the brightness button etc.).

4. Astigmatism Correction

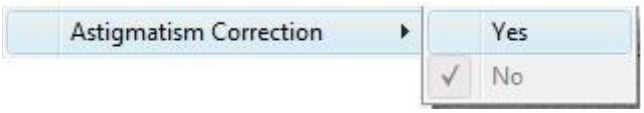


Figure 4.3.6-2 Settings Menu (Astigmatism Correction Menu)

4a. Yes This function displays on the operation screen the operation unit that provides an astigmatism correction. Use this function if an impact of astigmatism is visible on the image.

4b. No This function makes the operation unit that provides an astigmatism correction invisible on the operation screen.

5. Observation Mode

5a. Standard Mode

Figure 4.3.6-3 Settings Menu (Observation Mode Menu)

Ordinary specimens, such as industrial materials, should be observed in standard mode. This function changes the vacuum level of the specimen chamber to a relatively high vacuum level.

5b. Charge-up Reduction Mode ©

If there is brightness/contrast change or an image deviation in the standard mode, switch to the charge-up reduction mode, which changes the vacuum level of the specimen chamber to a lower level.
In the charge-up reduction mode, if observation is enabled (the specimen chamber is in a vacuum state), the Information/Comments area is indicated with an [L] mark.

NOTE : The charge-up reduction mode decreases the life of the filament.

※ When the View mode is in the freeze image mode, the observation mode is disabled.

6. Observation Condition

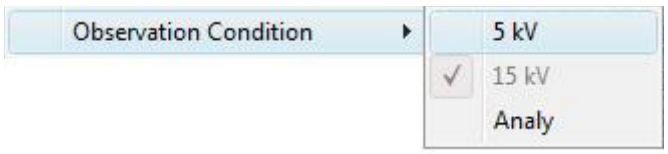


Figure 4.3.6-4 Settings Menu (Observation Condition Menu)

For details, see 4.3.12 Image Mode Button.

NOTE : Changing settings for the observation condition can significantly alter beam axis conditions. In such a case, perform beam axis adjustments. For details, see 5.2 Beam Axis Adjustment.

4.3.7 Stage Menu

The following menus are displayed when the motor drive stage is installed.

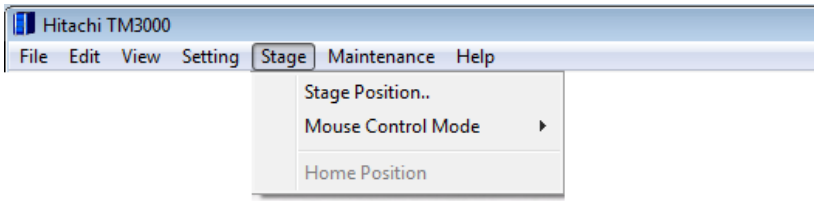


Figure 4.3.7-1 Stage Menu

1. Stage Position Displays the stage position display window to show the stage position on a present observation screen.

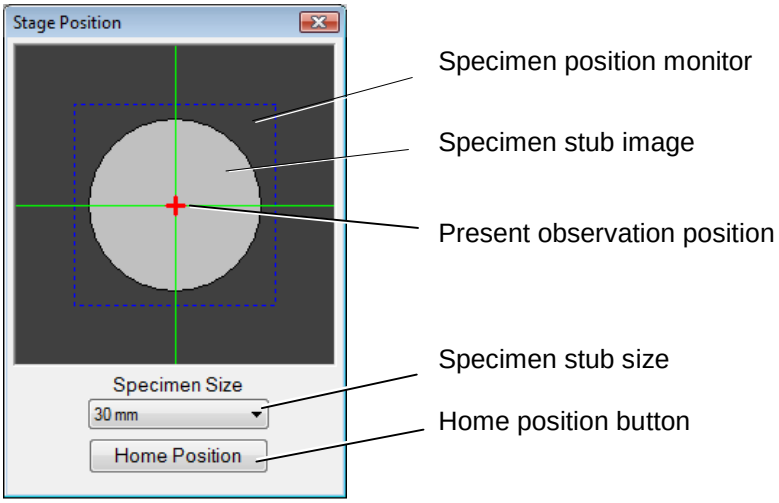


Figure 4.3.7-2 Stage Position Window

1a. Specimen position monitor The center of green cross mark shows the home position of the motor drive stage. A horizontal green line is X-axis, and a vertical green line is Y-axis.

1b. Speciman stub image Shows the image of the selected specimen stub. The specimen stub image moves according to the movement of the stage.

1c. Present observation position The red cross shows an electron beam irradiation position.

1d. Specimen stub size The pull-down list is displayed when pushing the button, and the specimen stub size can be selected.

1e. Home position button Moves the motor drive stage to home position.

NOTE : In the following cases, the following dialog is displayed until the initialization processing is completed. At this time, the operation screen cannot be operated.

- When the initialization of the stage position (starting point movement) isn't completed while the application program is starting
- When re-initialization of the stage is occurred.

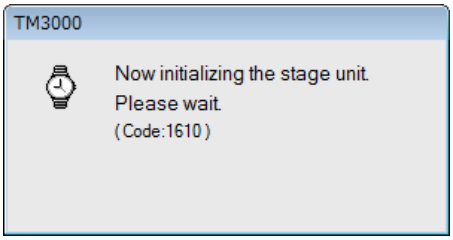


Figure 4.3.7-3 Stage Initialization

2. Mouse Control Mode Displays the triangular stage move button on the observation screen. The mouse control mode can select the following "8 Points", "4 Points", and "None".

2a. 8 Points Display the stage operation button in eight directions. (top/bottom/right/left/upper left/upper right/lower left/lower right)

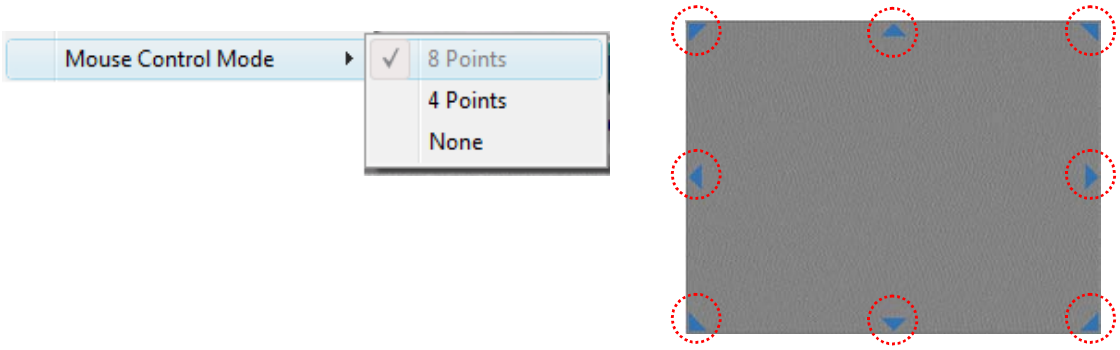


Figure 4.3.7-4 Mouse Control Mode 1

2b. 4 Points Display the stage operation button in four directions. (top/bottom/right/left)

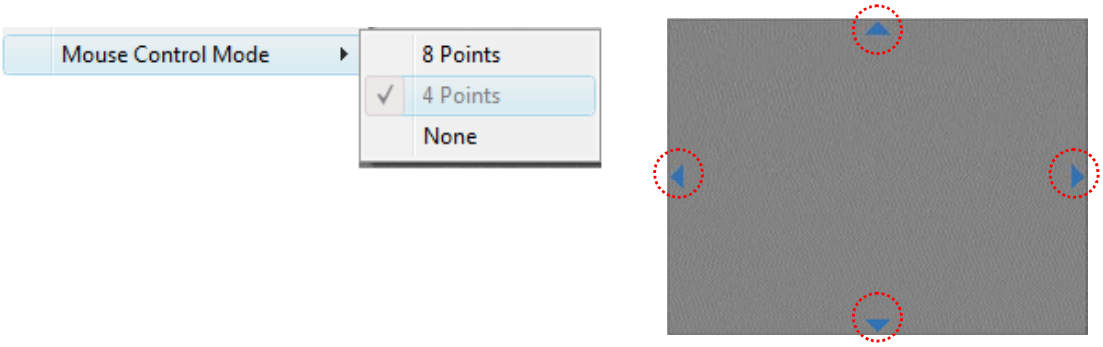


Figure 4.3.7-5 Mouse Control Mode 2

2c. None Hides the stage move button.

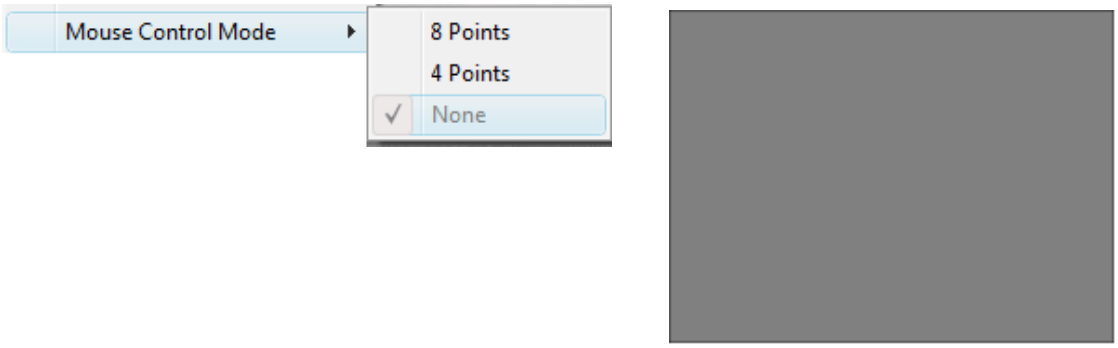


Figure 4.3.7-6 Mouse Control Mode 3

NOTE : While introducing the air into the specimen chamber, the stage cannot move.

4.3.8 Maintenance Menu

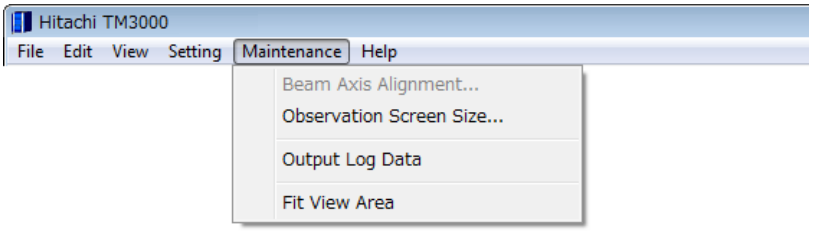


Figure 4.3.8 Maintenance Menu

1. Beam Axis Alignment … This function displays the Beam Axis Alignment window that allows the user to perform optical axis alignment on the electron beam. Use this window if beam axis conditions changed after filament change, maintenance operations, or a change in observation conditions.

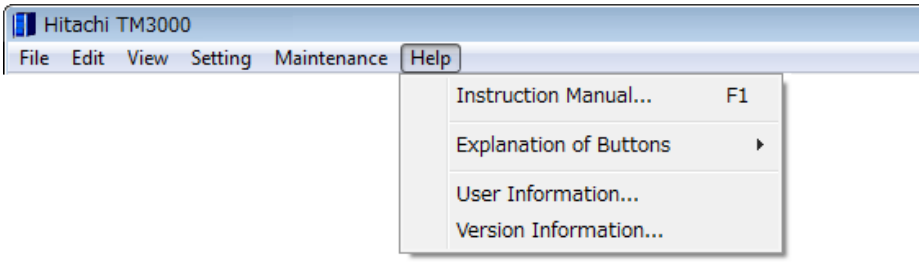
2. Observation Screen Size … This function displays the Observation Screen Size window that allows the user to save the size of the image observation area. After installing an application on the PC, an observation screen size must be set.

NOTE : The proper display of scales requires the correct registration of an observation screen size.

3. Output Log Data Output the operation information of the device to desktop as a log data. Use it when abnormality is found while the device is working.

4. Fit View Area This function resets the display position of the main screen to the center. Use this screen when the main screen has been moved.

4.3.9 Help Menu



4.3.9-1 Help Menu

1. Instruction Manual … F1 Displays the instruction manual of the TM3000 main unit.

2. Explanation of Buttons

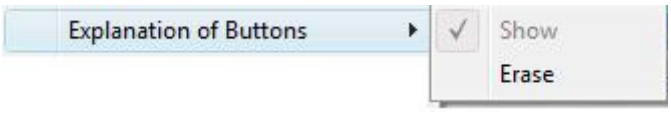


Figure 4.3.9-2 Help Menu (Explanation of Buttons Menu)

2a. Show Changes settings so that an explanation is displayed when the mouse cursor is moved to under the button which is the principal operation unit on the operation window.

2b. Erase Changes settings so that an explanation is not displayed when the mouse cursor is moved to under the button which is the principal operation unit on the operation window.

3. User Information Displays a user information window that allows the user to store user information for controlling the application. Use this function when it is necessary to keep track of the party that controls the program for operational purposes.

4. Version Information Displays a version information window that shows the version of the application and version information on the system.

4.3.10 Start/Stop Button

1. Start (HV-ON) Button

Figure 4.3.10-1 Start/Stop Button (Start)

[Start] means that electron beam irradiation is off (HV-OFF). Clicking the [Start] button turns on the power source for the electron gun in order to irradiate the specimen with the electron beam, and the process of heating by the filament commences, a process that requires approximately 10 seconds. As a window indicating processing in progress appears, begin observation operations after the window has disappeared. During the observation, the button remains lit, and the display changes to [Stop]. During this operation, change the View mode to an FOV search mode.

Figure 4.3.10-2 HV On Window

After launching the application or changing specimens, operate the Start button by executing Auto Start (after filament heating, run auto focusing and Auto B/C adjustment). In this case, set the observation magnification to 100x.

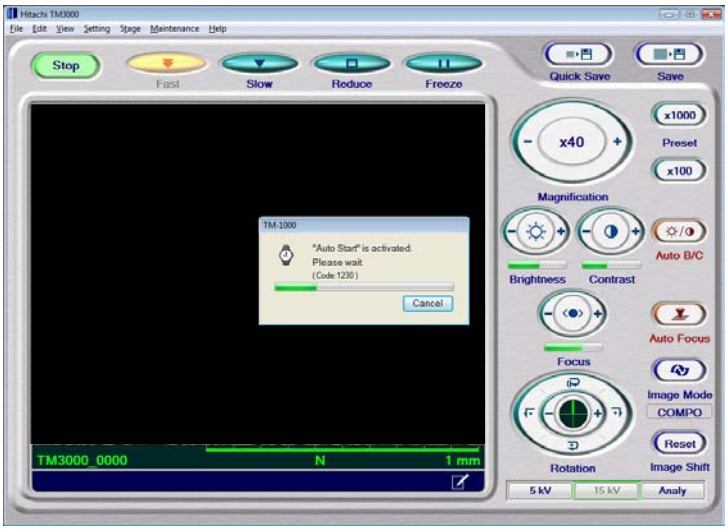


Figure 4.3.10-3 Auto Start Execution Window

NOTE : The Start button is not enabled until the specimen chamber becomes stable in an observation-enabled vacuum state. Normally, the Start button becomes operable after specimens are changed, the EVAC/AIR switch on the front side of the system main unit is pressed, and three minutes have elapsed.
If the Start button fails to be enabled in due time, see Troubleshooting.
Also see Troubleshooting if the window indicating processing in progress disappears and a message indicating a system failure is generated, or the display does not change to a Stop button.

2. Stop (HV-OFF) Button

Figure 4.3.10-4 Start/Stop Button (Stop)

The [Stop] display indicates that the electron beam irradiation is on (HV-ON). Clicking this button stops shuts off the electron gun power supply and stops the heating by the filament. In this case, the button turns off and changes to a [Start] display.

NOTE : If the condition of the specimen chamber or that of the filament changes to a state not suitable for observation, a message is displayed, and the button changes from [Stop] to [Start]. If this happens, see Troubleshooting.

4.3.11 View Mode Selection Button

This button changes view modes. The current view mode button is indicated by a solidly lit yellow button. Change to the view mode of your choice while viewing the image. The following view modes are available:

1. Fast

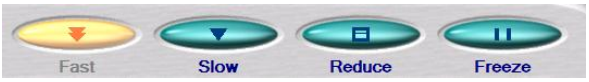


Figure 4.3.11-1 View Mode Selection Buttons (Fast)

This is a view mode well-suited for the operation in which you search for a target position while moving the observation position of the specimen.

2. Slow

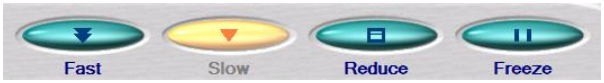


Figure 4.3.11-2 View Mode Selection Buttons (Slow)

This is a view mode well-suited for performing verification when saving an image.

3. Reduce

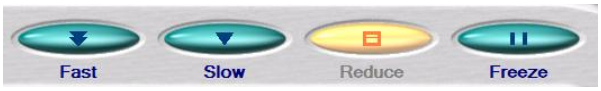


Figure 4.3.11-3 View Mode Selection Buttons (Reduce)

This is a view mode well-suited for the adjustment of the brightness or focus of an observation image.

4. Freeze

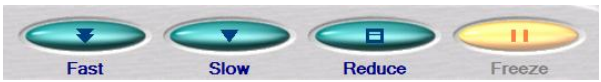


Figure 4.3.11-4 View Mode Selection Buttons (Freeze)

This is a view mode that renders the current image into a freeze image.

NOTE : Compared with the Slow mode, the Fast mode degrades image quality.

NOTE : To prevent damage to the specimen by the electron beam, if approximately 5 minutes elapses with electron beam irradiation on (HV-ON) and with Freeze selected in the View mode, the observation operation is canceled (HV-OFF), and a message is displayed.

4.3.12 Image Mode Button

Figure 4.3.12-1 Image Mode Button

At the time the system is powered on, the COMPO mode is set. Each pressing of the Image Mode button changes the settings from
[COMPO] → [Shadow 1] → [Shadow 2] → [TOPO] → [COMPO]→…
The current image mode is displayed below the Image Mode button.
An Image mode can also be selected from [Image mode] on the [View] menu.
For the current image mode, the Menu is check-marked.

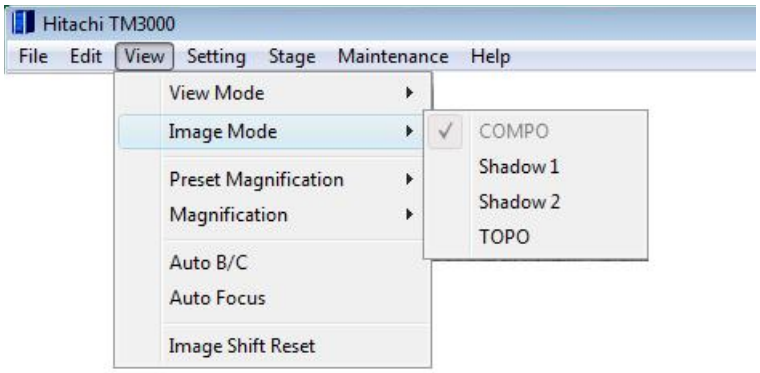


Figure 4.3.12-2 Setting an Image Mode (COMPO Mode)

1. COMPO Sets the observation image to the COMPO condition. This is a mode in which the system is turned on.

Figure 4.3.12-3 Setting an Image Mode (COMPO Mode)

2. Shadow 1 Sets the observation image to a shadow image (an image illuminated from the above).
This method is useful for observing specimen that would lack solidity when observed in standard mode.
When Shadow 1 is selected, the information area in the lower right part of the observation screen is indicated by an [S] mark (see 4.3.2).

Figure 4.3.12-4 Setting an Image Mode (Shadow 1 Mode)

3. Shadow 2 Sets the observation image to a shadow image (an image illuminated from the left).
This method is useful for observing specimen that would lack solidity in when observed COMPO mode.
When Shadow 2 is selected, the information area in the lower right part of the observation screen is indicated by a [D] mark (see 4.3.2).

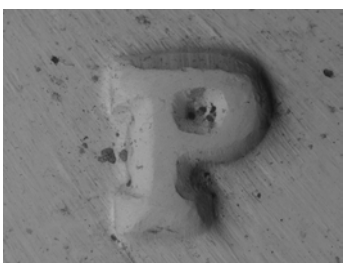


Figure 4.3.12-5 Setting an Image Mode (Shadow 2 Mode)

4. TOPO Sets the observation image to the topo display. This method is useful when the topographic information is to be exaggerated during the observation.
When TOPO is selected, the information area in the lower right part of the observation screen is indicated by a [T] mark (see 4.3.2).

Figure 4.3.12-6 Setting an Image Mode (TOPO Mode)

NOTE : If the View mode is in the Freeze mode, the image mode cannot be changed. In the Shadow 1, Shadow 2, and TOPO modes, turning the displayed image by using the rotation function causes the orientation of shadows also to change according to the angle of rotation. Changing the image mode with electron beam irradiation on causes the execution of Auto B/C adjustments. If the View mode is in the Freeze mode, the image mode cannot be changed.

NOTE : The greater the value of D (the distance from the specimen surface to the back-scattered electron detector, as displayed in the information area in the lower right part of the observation screen), the weaker is the contrast of the image. In particular, if the image mode is Shadow 1, Shadow 2, or TOPO, a large D value reduces contrast. To produce a favorable contrast, use the image in COMPO position (see 4.2.2 **6.**, **7.**).

4.3.13 Observation Condition Selection Button

Figure 4.3.13-1 Observation Condition Selection Button

Select an observation mode from the observation mode in the observation condition settings unit. Change observation modes to match the sample on hand and the prevailing observation condition. For the various observation conditions, see the explanations provided below.

1. 5 kV Mode

Figure 4.3.13-2 Setting an Observation Condition (5 kV Mode)

This is an observation condition well-suited for observing fine features on the specimen surface. This method can also minimize damage to biological samples during the observation. In the case of the charge-up reduction mode, the method can produce rough images.

2. 15 kV Mode

Figure 4.3.13-3 Setting an Observation Condition (15 kV Mode)

This observation condition tends to produce sharply defined images, suitable for high-magnification observations.

3. Analy Mode

Figure 4.3.13-4 Setting an Observation Condition (High Brightness/Contrast Mode)

This observation, well-suited for observing specimens that do not produce adequate brightness/contrast levels, yields smooth images.

4. Setting an Observation Condition from the View Menu On the View menu, select one of the following observation conditions: 5 kV, 15 kV, and Analy.

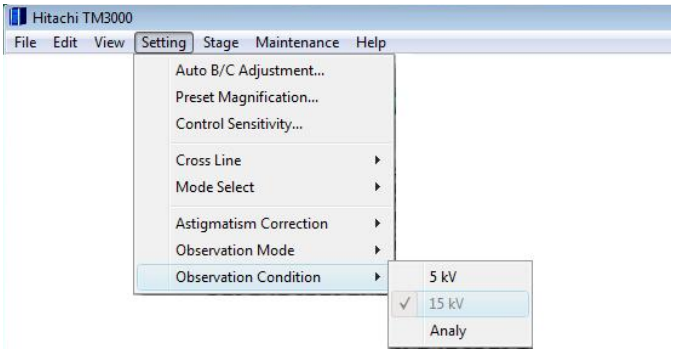


Figure 4.3.13-5 Setting an Observation Condition (15 kV Mode)

In Figure 4.3.13-5, the 15 kV observation condition is check-marked.

4.3.14 Quick Save Button

Figure 4.3.14-1 Quick Save Button

This button saves the currently displayed image as is.
Image save size: 640x480 pixels (image only), 640x520 pixels (image + information), 640x550 pixels (image + information + comments)
Image save format: JPEG (*.jpg), bitmap (*.bmp), TIFF (*.tif)

1. To save an image, either click the Save button or select Quick Save from Save Image on the File menu.

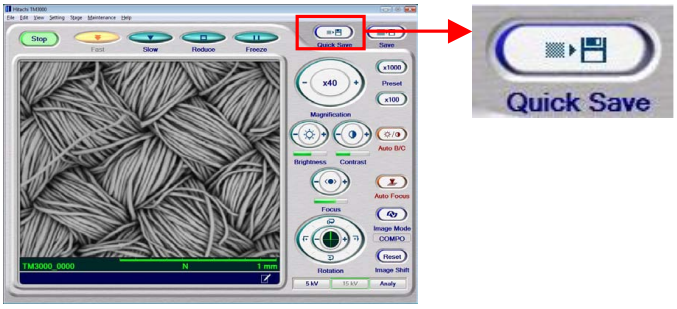


Figure 4.3.14-2 Quick Save Button for Image Data

2. The view mode changes to the Freeze mode (the observation image pauses).

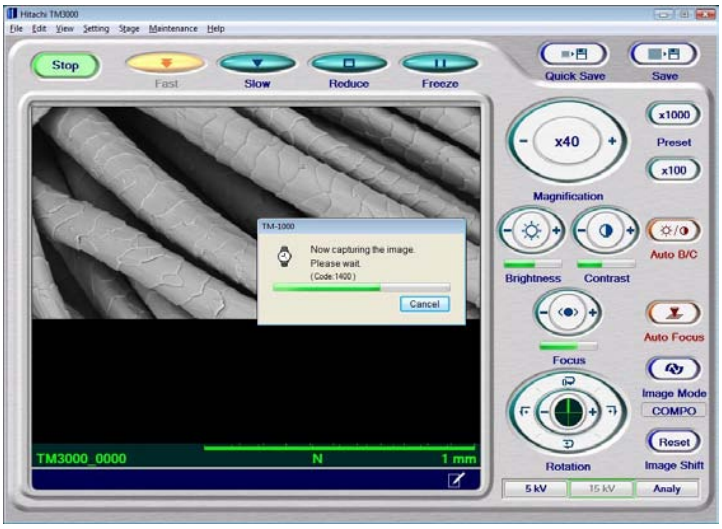


Figure 4.3.14-3 Image Data Pause Screen

When the image pauses, a dialog appears in the center of the window. When a freeze image is set, the dialog disappears. When canceling a Quick Save operation, click the [Cancel] button on the dialog.

NOTE : If Quick Save is executed in the View mode from either Fast or Reduce, the Quick Save operation cannot be canceled. If Quick Save is run from the Freeze mode, a dialog screen is not displayed.

3. The View mode changes to the Freeze mode, and a Save Image window appears. Enter the file name, and save the data by selecting the destination of save and the desired file type. If the image is not to be saved, click the [Cancel] button.

NOTE : Any of the following characters cannot be used in a file name: [\ / : ; * ? " < > | ! ' &] (half-width characters).

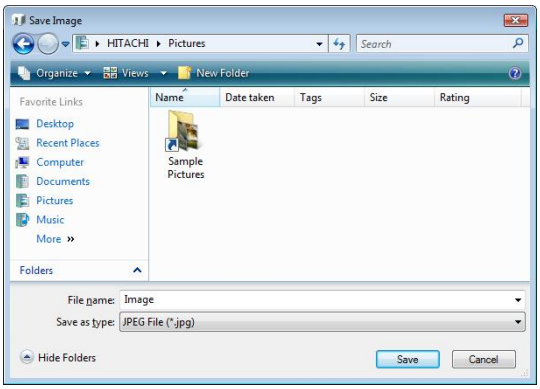


Figure 4.3.14-4 Save Image Window

NOTE : Image files are created under conditions that are pre-selected on the Setting for Save Window. By setting selected conditions and clicking Quick Save, images that match intended conditions can be saved.

After completion of Quick Save, the View mode becomes a Freeze mode.
Saved images can be verified by using Explorer. Clicking the [F9] key on the keyboard displays the folder in which the images are saved.

4.3.15 Save Button

Figure 4.3.15-1 Save Button

This button saves high-definition images.
Image Save size: 1280x960 pixels (image only), 1280x1040 pixels (image + information), 1280x1100 pixels (image + information + comments)
Image save format: JPEG (*.jpg), bitmap (*.bmp), TIFF (*.tif)

1. Either click the Save button or select [Save] from [Image Save] on the [File] menu.

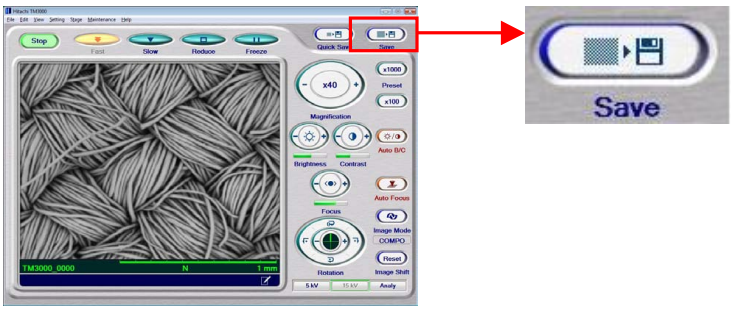


Figure 4.3.15-2 Image Data Save Button

2. The displayed image darkens, the mode changes to the Save Display mode, and the images to be saved are sequentially displayed (in image capture) from the top. The display process takes approximately 30 to 40 seconds.

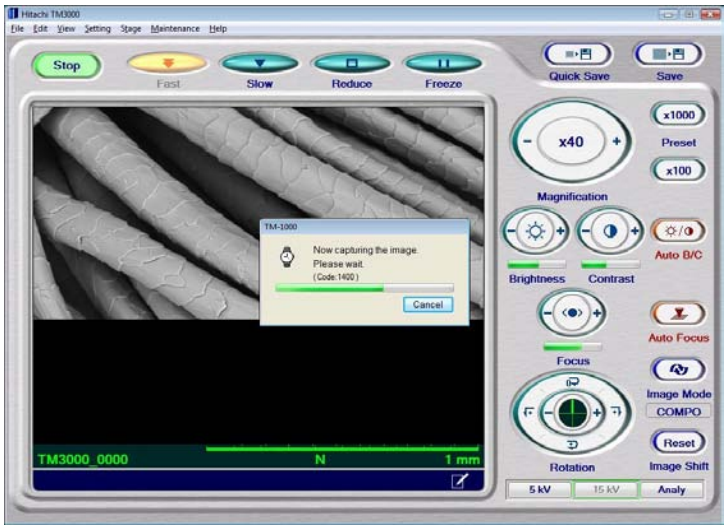


Figure 4.3.15-3 Image Data Capture Screen

During image capture, a dialog appears in the center of the window, indicating the progress of the image capture process. The dialog disappears when image capture is finished. To cancel saving the image, click the [Cancel] button on the dialog.

NOTE : To avoid noise in the saved image, be careful not to exert any vibration on the system main unit during the image capture process.

3. After image capture, a Save Image window appears. Enter the file name, and save the data by selecting the destination of save and the type of file. After the save processing, the View mode changes to the Freeze mode. When not saving the file, click the [Cancel] button.

NOTE : Any of the characters cannot be used in a file name: [\ / : ; * ? " < > | ! ' &] (half-width characters).

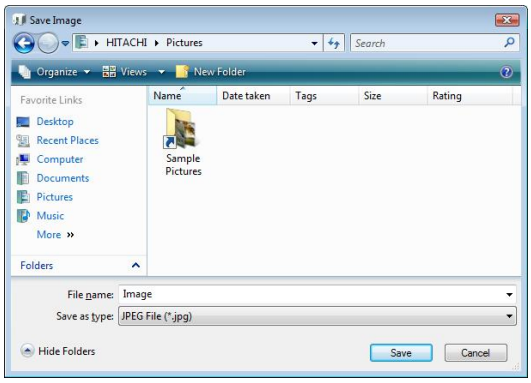


Figure 4.3.15-4 Save Image Window

NOTE : Image files are created under conditions that are pre-selected on the Save Settings screen. Save the file by setting selected conditions. In this manner, images that match intended conditions can be saved.

After completion of the save process, the View mode becomes a Freeze mode.

NOTE : Once an image is saved, it cannot be saved on a Quick Save basis. To do Quick Save, change the View mode to a mode other than Freeze mode, and then execute a Quick Save.

Saved images can be verified by using Explorer. Clicking the [F9] key on the keyboard displays the folder in which the images are saved.

4.3.16 Magnification Button

Figure 4.3.16-1 Magnification Button

This button allows the user to change the observation magnification. To increase the magnification from the current level, click the + side; to decrease it, click the – side. These operations change the current magnification to a level one step above or below the current level, and the image changes to the new magnification rate. The current magnification is displayed in the center of the button.
Continuing the click the button causes the magnification to change successively either upward or downward, one step at a time.
Observation magnification can also be adjusted by dragging the mouse on the magnification operation button. See Section 4.2.12 Setting a Magnification **4.** .
There is a total of 40 magnification steps, from x15 to x30000, consisting of the following magnification levels:

x15, x18, x20, x25, x30, x40, x50, x60, x80, x100, x120, x150,
x180, x200, x250, x300, x400, x500, x600, x800, x1000, x1200,
x1500, x1800, x2000, x2500, x3000, x4000, x5000, x6000, x7000,
x8000, x9000, x10000, x12000, x15000, x18000, x20000, x25000, x30000

NOTE : The magnifications x20 and x25 displayed only when the spacing between the topmost surface of the specimen and the gauge is set to approximately 6 mm or greater, in consideration of the thickness of the specimen, when the height of the specimen stub is adjusted (see 4.2.2 **6.**). In other cases, these levels are not displayed. Normally, the spacing between the topmost surface of the specimen and the gauge should be set to 1 mm.

4.3.17 Preset Buttons

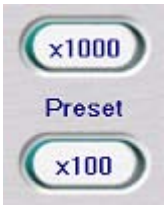


Figure 4.3.17 Preset Buttons

Clicking the Preset button changes the current magnification to the magnification that is display on the button.
Set two preset magnifications to one that facilitates finding an observation position and one to be used when saving the image. In this manner, switching to an intended magnification can be accomplished simply by clicking the Preset button.
Set a preset magnification by using the Preset Magnification window (see 4.3.33).

NOTE : The low magnifications x20 and x25 are set only when the spacing between the topmost surface of the specimen and the gauge is set to approximately 6 mm or greater during the specimen stub adjustment (see 4.2.2 **6.**). If the spacing between the topmost surface of the specimen and the gauge is 6 mm or less, the Preset Magnification button cannot be switched by setting preset magnifications x20 or x25. In reference to Section 4.3.32 Preset Magnification window, set a magnification other than x20 or x25.

4.3.18 Brightness Button

Figure 4.3.18-1 Adjusting the Brightness of the Image

This button adjusts the brightness of the observation image. To increase the brightness of the image, click the + side button; to decrease it click the – side button. To increase the contrast, click the + side button; to decrease it click the – side button. Continuing to click causes the contrast to change successively by one level at a time. The brightness and contrast levels of the current image are indicated below the button, subject to change depending on how strong or weak is the level.
The brightness can also be adjusted by dragging the mouse on the Brightness button.

1. Adjusting the brightness

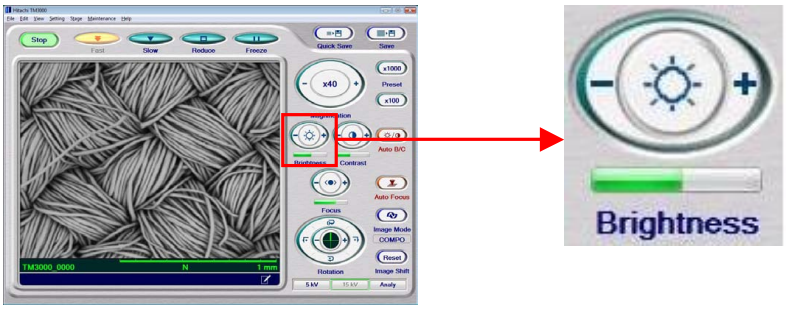


Figure 4.3.18-2 Adjusting the Brightness of the Image (Manual Operation)

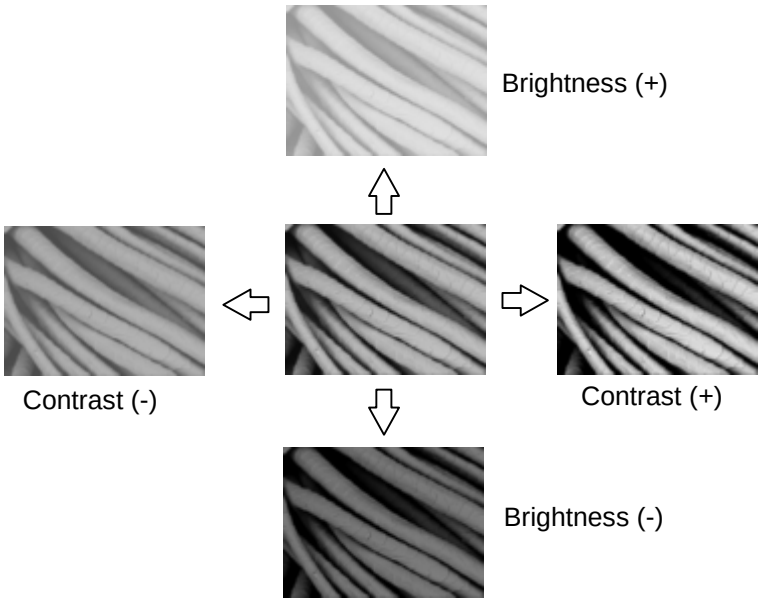


Figure 4.3.18-3 Adjusting the Brightness of the Image

2. Adjusting the Brightness (Mouse-Dragging)

2a. Moving the mouse cursor into the Brightness button changes the appearance of the cursor to a brightness adjustment display .

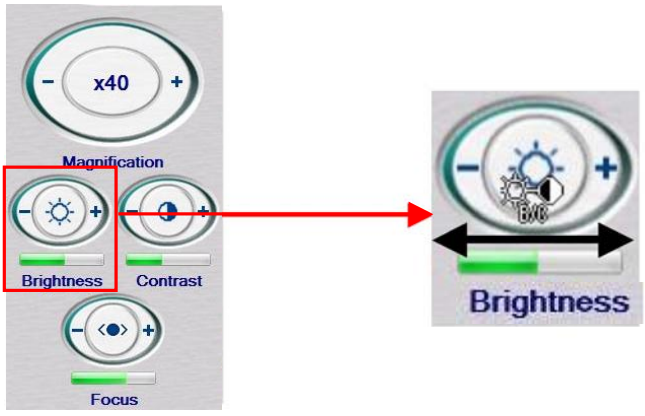


Figure 4.3.18-4 Adjusting the Brightness of the Image (Mouse-Dragging)

2b. Adjust the brightness by pressing the left button on the mouse and dragging it to the right and left. Dragging to the right on the Brightness button increases the brightness; dragging it to the left decreases it. While viewing the image, perform adjustments until an appropriate brightness is attained. Even when the cursor moves out of the button, the adjustment can be continued until the left button on the mouse is released.

NOTE : The brightness of an image varies from one specimen to another. For a given adjustment, the brightness changes with the specific site being observed and the particular magnification employed.

4.3.19 Contrast Button

Figure 4.3.19-1 Contrast Button

Adjust the contrast for the observation screen. To increase the contrast from the current adjustment value, click the + side of the button. On the other hand, to reduce it, click the – side. Continuing to click the button causes the contrast to change continuously. The current contrast is displayed by the indicator located below the button. The longer the green indicator, the stronger the contrast, and the shorter the indicator, the weaker it is.
In addition, the contrast can be adjusted by dragging the mouse on the contrast button.

1. Contrast Adjustment

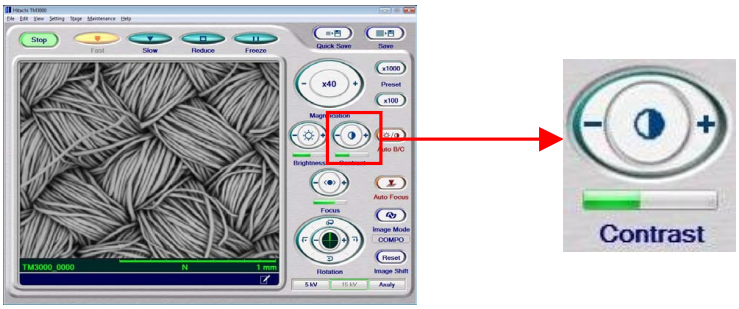


Figure 4.3.19-2 Contrast Adjustment

2. Contrast Adjustment (Mouse-Dragging)

2a. Moving the mouse cursor into the contrast adjustment button causes the cursor display to change to the contrast adjustment view  .

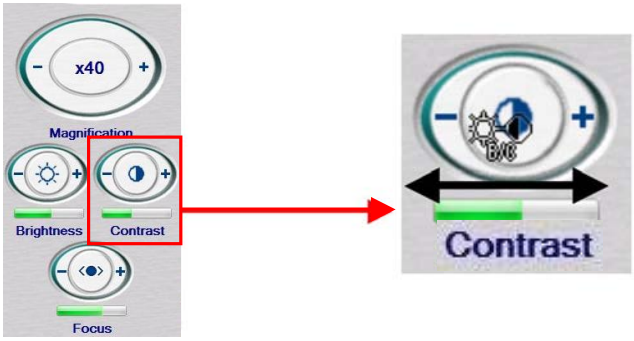


Figure 4.3.19-3 Mouse-Dragging (Dragging Operation)

2b. Perform adjustment by pressing the left button on the mouse and dragging it to the right and left. On the contrast button, dragging to the right increases the contrast, and dragging it to the left reduces it. While viewing the image, perform adjustment for an appropriate contrast. If the cursor moves outside the button range, adjustment can still be effected until the left button is released.

NOTE : The contrast of an image varies from one specimen to another. For a given adjustment, the contrast changes with the specific site being observed and the particular magnification employed.

4.3.20 Auto B/C Button

Figure 4.3.20-1 Auto B/C Button

This button automatically adjusts the brightness and contrast of the image being observed. Clicking the Auto B/C button starts the auto brightness/contrast adjustment process. A dialog appears while the processing is in progress. The dialog disappears when the processing is finished. The results of the processing are indicated in a brightness and contrast values.

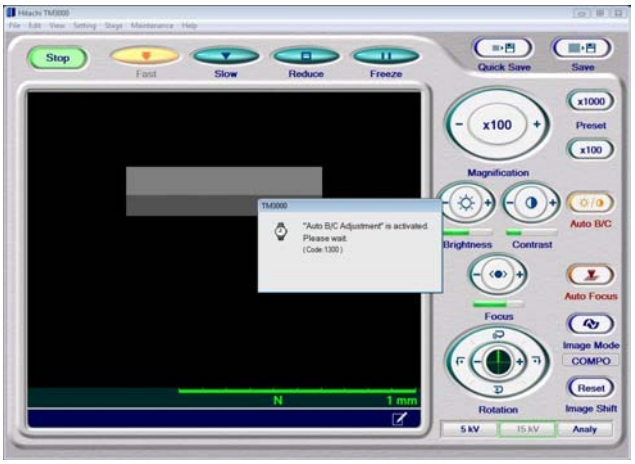


Figure 4.3.20-2 Auto B/C Execution Window

Changing the magnification or moving the specimen observation position can cause the image displayed on he observation screen to change from its optimal brightness/contrast. In such a case, the brightness/contrast can be adjusted quickly by pressing the Auto B/C button.

NOTE : Press the Auto B/C button to adjust the balance between brightness and contrast. Perform fine adjustments by using the brightness or contrast adjustment button and save the resulting image file.

NOTE : The brightness and contrast of an image varies from one specimen to another. For a given adjustment, the brightness and contrast changes with the specific site being observed and the particular magnification employed.

4.3.21 Focus Button

Figure 4.3.21-1 Focus Button

Adjust the focusing in the height direction of the specimen. To reduce the focal distance (the specimen is too high) from the current adjustment, click the + side. On the other hand, to increase the focal distance (the specimen is too low), click the – side. Clicking the button successively causes the focal distance to vary continuously. The current adjustment is indicated in the center of the button, in terms of up or down directions. An indicator green line on the + side represents a short focal distance, and the – side means a long focal distance. Fine focusing can be performed by dragging the mouse in the image observation area and by operating the mouse adjustment button.

1. Move the specimen site to be focused on to the center of the window, and click the Reduce button in view mode. The field of view is limited to near the center of the window.

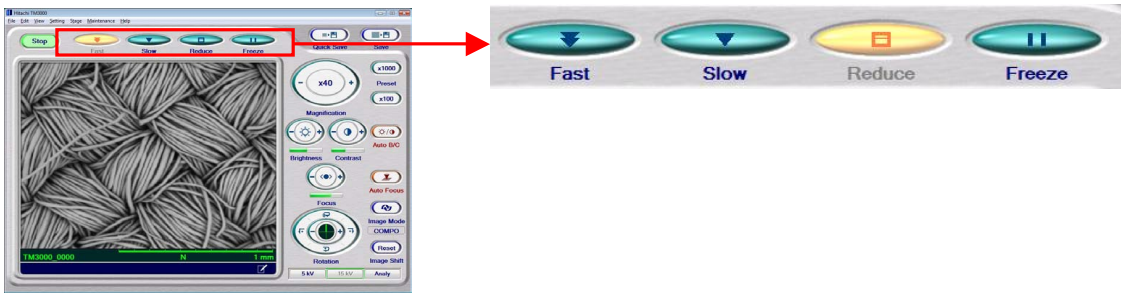


Figure 4.3.21-2 Fine Focusing (Dragging the Mouse)

2. Move the mouse cursor into the focusing button. The cursor display changes to a focus adjustment  display.

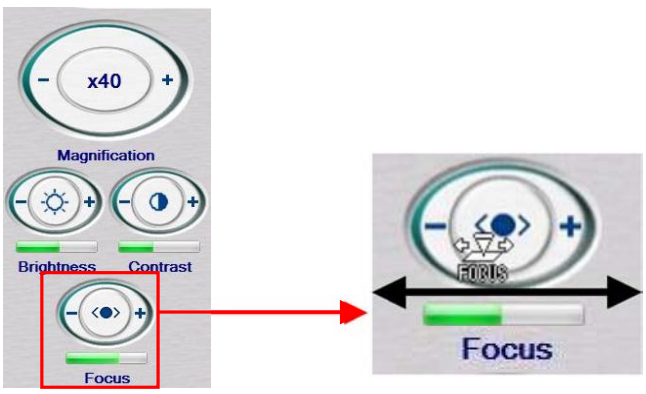


Figure 4.3.21-3 Fine Focusing (Mouse-Dragging)

3. Perform focus fine adjustment by pressing the left button on the mouse and dragging it to the right and left. While viewing the image, perform adjustment for an appropriate focusing. If the cursor moves outside the focus button range, adjustment can still be effected until the left button is released.

NOTE : The focal distance varies with the height of the specimen that is set on the stage. The greater the height of the specimen stub, the shorter the focal distance, and vice versa. Adjust the height of the specimen by using a height adjustment gauge.

4.3.22 Auto Focus Button

Figure 4.3.22-1 Auto Focus Button

This button automatically adjusts the focus according to the height of the specimen being observed. Clicking the Auto Focus button starts auto-focusing. A dialog appears during the processing. When the processing is finished, the dialog disappears. The results are indicated in a focus value.

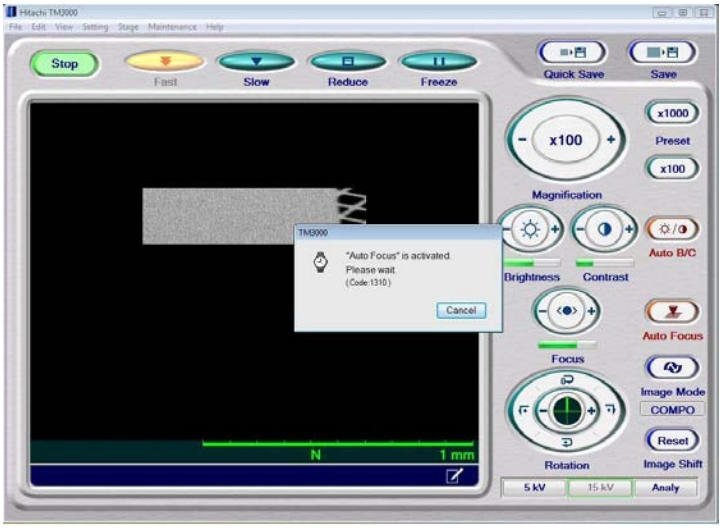


Figure 4.3.22-2 Auto Focus Execution Window

NOTE : With some specimens, it is possible that auto-focusing fails to operate properly, resulting in focusing deviation (see 4.2.9 **2.**). In such a case, adjust the focus by performing manual operation.

4.3.23 Image Shift Reset Button

Figure 4.3.23 Image Shift Reset Button

Clicking the Image Shift Reset button resets the FOV to the condition that existed before the Image Shift (see 4.2.10 **2.**) was performed.

NOTE : Because the range over which the FOV can be moved by image shifting is limited (see Section 1.3), if the FOV ceases to move, press the Reset button once, move the FOV by manipulating the XY knobs, and then use the Image Shift again for fine adjustments.

4.3.24 Rotation Button

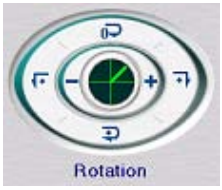


Figure 4.3.24-1 Rotation Button

1. Resetting to 0° Clicking the mark changes the image into a non-rotated image. The position orthogonal to the direction extending from the front of the system main unit to the back of it is 0° (reference position). This is the position in which the operation of the XY motion knobs on the specimen stage matches the direction of motion of the image.

2. Rotating the Image by 180° from the Current Position Clicking the mark rotates the image by 180° from the current position.

3. Rotating the Image Clockwise by 90° from the Current Position Clicking the mark rotates the image clockwise by 90° from the current position.

4. Rotating the Image Counterclockwise by 90° from the Current Position Clicking the mark rotates the image counterclockwise by 90° from the current position.

5. Fine-Adjusting the Rotational Position Clicking the + mark rotates the image clockwise; the – mark rotates it counterclockwise. Clicking it continuously produces continuous change one step at a time.

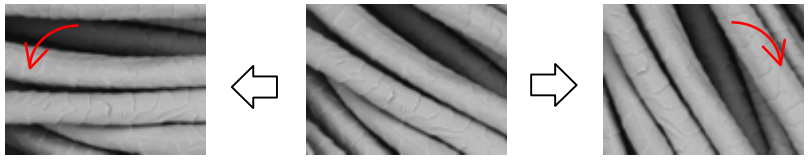


Image turns to (-) Image turns to (+)

Figure 4.3.24-2 Selecting an Observation FOV (Rotation Operation)

NOTE : If the rotation position is not 0° (the reference position), the operation of the motion knobs for the specimen does not match the direction of motion of the image.

The current angle of rotation is represented by the indicator provided in the center of the button. The 0°rotational angle (the reference position) means that the indicator shows a position directly above the button.

4.3.25 Edit Button

Figure 4.3.25-1 Edit Button

Displays the Setting for Save Window. Use this window to set an Information/Comments area on the image being observed or auxiliary information (the Save Image type that permits the inclusion of information and comments in the image file) in the saved image.
On this window, the user can set information show/hide, edit any comments that are entered, and select the desired image save type.

1. [Image View] Tab This tab allows the user to edit the contents of the Information/Comments area, and specify Show/Hide.

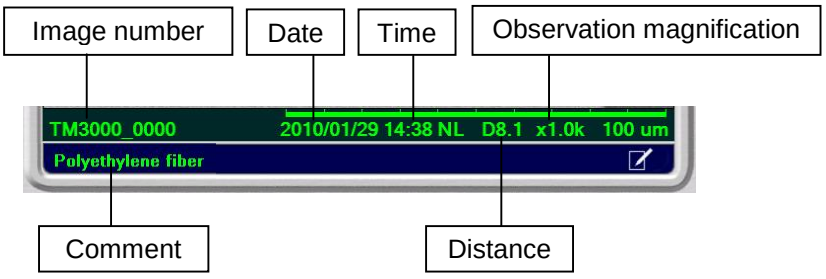


Figure 4.3.25-2 Save Settings Area

1a. Information

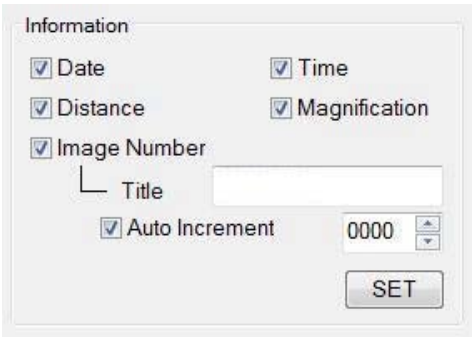


Figure 4.3.25-3 Information Block

(1) Date Specifies show/hide for the date in the information field. Placing a checkmark on the date imprints the date of capture on the saved image (Save Image type: other than Image Only).

(2) Time Specifies show/hide for the time in the information field. Placing a checkmark on the time imprints the time of capture on the saved image (Save Image type: other than Image Only).

(3) Distance Specifies show/hide for the distance in the information field. Placing a checkmark on the distance imprints the distance of capture on the saved image (Save Image type: other than Image Only).

NOTE : The distance means the distance from the back-scattered electron detector (D=0) to the specimen.

(4) Magnification

NOTE : The magnification shown in the information area is indicated in an [xMMM] format. A magnification greater than 1000 is represented by xM.Mk, and a value greater than 10000 by xMMk.

This screen sets the Show/Hide of the magnification in the information field. Placing a checkmark on Observation Magnification imprints the magnification used during the image capture on the saved image (Save Image type: other than Image Only).

(5) Image Number Specifies show/hide for the image number. Placing a checkmark on the image number imprints the image number of capture on the saved image (Save Image type: other than Image Only).
The image number consists of [title + auto increment]. Placing a checkmark on Auto Increment shows a number, which is incremented during capture. Numbers can be set in a 0000 to 9999 range. In Title, up to 10 half-width alphanumeric characters can be entered.

1b. Input Comment

Figure 4.3.25-4 Comment Entry Block

Specifies show/hide for the comments in the Comments area. Placing a checkmark on the comments imprints the comments on the saved image (Save Image type: image + information + comments). Up to 30 full-width characters can be entered.

2. [Image Save] Tab

2a. Image Type

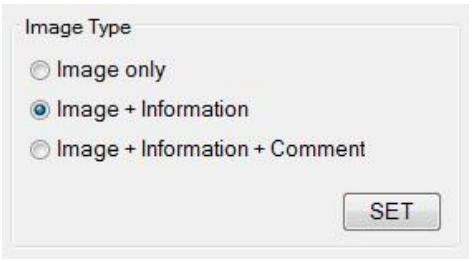


Figure 4.3.25-5 Image Type Block

By selecting the image save type, the user can enter the type of auxiliary information display for the saved image and the file name.

Table 4.3.25 Image Save Type and Image Save size

Image Type	Quick Save	Save
Image only	640x480 pixels	1280x960 pixels
Image + information	640x520 pixels	1280x1040 pixels
Image + information + comments	640x550 pixels	1280x1100 pixels

For each image save type, the following Information/Comments area display and saved image types are available.

(1) Image only

・Information/comments area

The characters in the information and comments areas are hidden.

Figure 4.3.25-6 Information/Comments Area (Characters Hidden)

・Save Image

The saved images are an image file consisting exclusively of observation images (Save Image size: standard save: 1280x1024 pixels, Quick Save: 640x480 pixels).

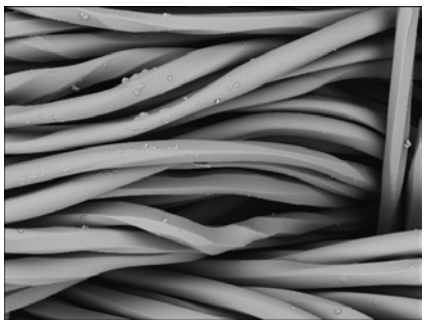


Figure 4.3.25-7 Save Settings Screen (Characters Hidden)

(2) Image + information

・Information/Comments area

Characters in the information area are displayed; those in the Comments area are hidden.

Figure 4.3.25-8 Information/Comments Area (Comments Area Characters: Hidden)

・Saved Image

The saved image is an image file in which information (the items applied using the [Screen Display] tab) is provided in the observed image (Save Image size: Standard Save: 1280x1040 pixels, Quick Save: 640x520 pixels).

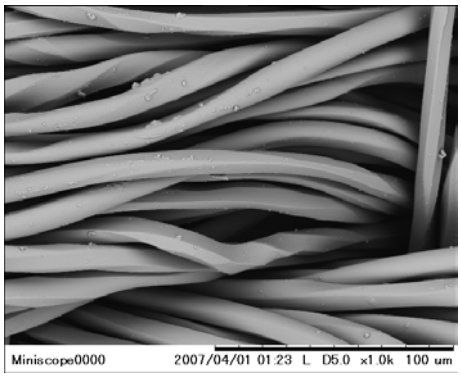


Figure 4.3.25-9 Save Settings Screen (Comments Area Characters: Hidden)

(3) Image + information + comments

・ Information/Comments area

Displays characters in the Information/Comments areas.

Figure 4.3.25-10 Information/Comments Area (Information/Comments Area Characters: Displayed)

・ Saved Image

The saved image is an image file in which information and comments (items that are applied using the [Screen Display] tab) are entered in the observed image (Save Image size: Standard Save: 1280x1100 pixels, Quick Save: 640x550 pixels).

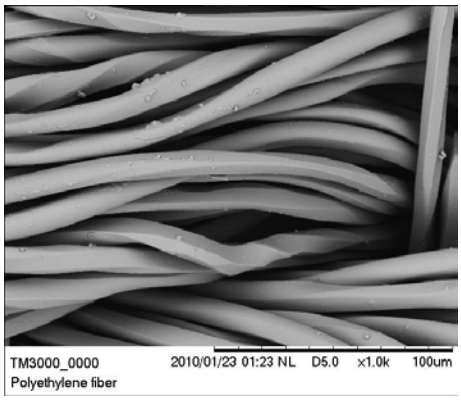


Figure 4.3.25-11 Save Settings Screen (Information/Comments Area Characters: Displayed)

NOTE : The magnification embedded in the saved image is a magnification based on the observation image display on the observation screen.

NOTE : If the observation mode [L] mark (see 4.3.6 **5.**) or the image mode [S] [D] [T] mark (see 4.3.5 **2.**) is displayed in the information area, similarly those marks are also embedded in the saved image.

2b. File name

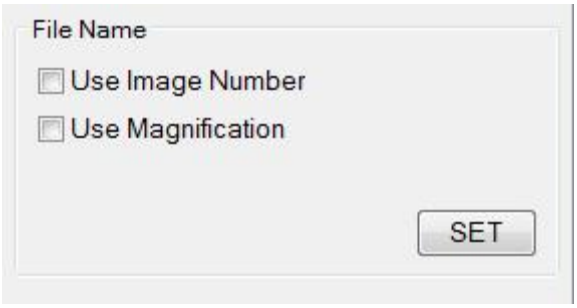


Figure 4.3.25-12 File Name Block

When saving an image, an image number or an observation magnification can be used as a file name.

(1) Use Image Number

Uses the image number displayed in the information area as the file name for a saved image. If a check mark is not placed or an image number is not displayed in the information area, the file name will be [Image].

(2) Use Magnification

Appends a magnification to the file name for a saved image. If either Quick Save or Save is executed, the file name on the Data Save screen is indicated as [file name + (xMMM)]. If the Save is executed from Digital Zoom, the file name on the Data Save screen is indicated as [file name + (D xMMM)]. A magnification value higher than 1000 is denoted by xM.Mk; that higher than 10000 is indicated as xMMk.

NOTE : The file name for a saved image can be edited and specified on the Save Image window.

4.3.26 Minimize Button

Figure 4.3.26-1 Minimize Button

Minimizes the application program. The minimized application program is stored in [Hitachi TM3000] on the Taskbar.

Figure 4.3.26-2 Taskbar

To deminimize, click [Hitachi TM3000] on the Taskbar. This displays the application program.

4.3.27 Exit Button

Figure 4.3.27-1 Exit Button

Terminates the application program. Clicking [OK] on the Application Termination Confirmation screen terminates the application program.

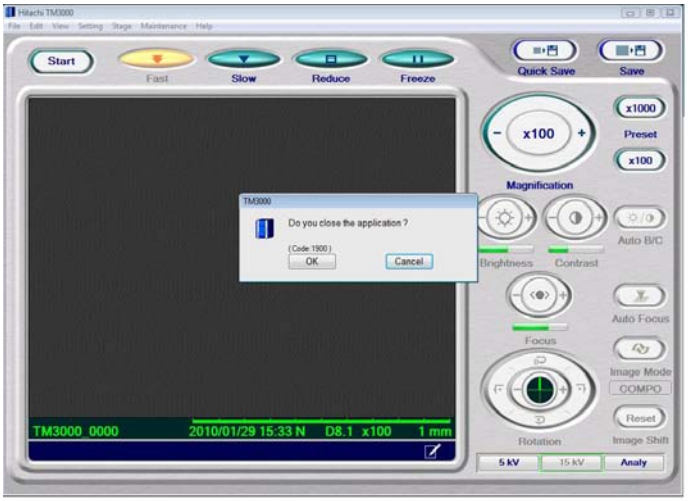


Figure 4.3.27-2 Application Termination Confirmation Window

4.3.28 Setting for Save Window

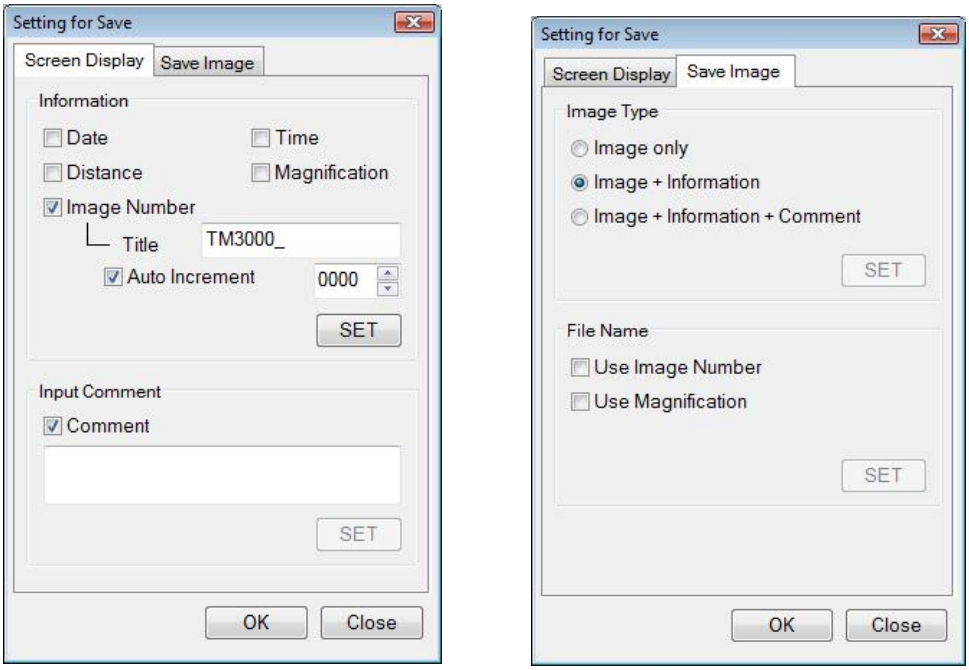


Figure 4.3.28 Setting for Save Window

For details on settings, see 4.3.25 Edit Button.

4.3.29 Save Image Window

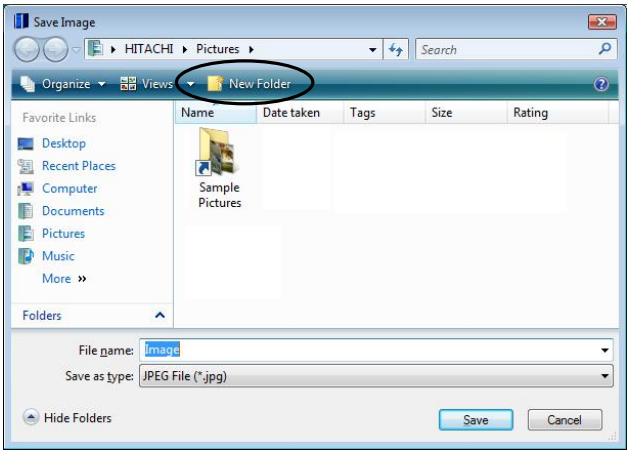


Figure 4.3.29 Save Image Window

This window allows the user to save an image file by specifying a destination and a file name.

1. Location of Save Upon termination of the capture of the observation screen using [Save] and [Quick Save], a list of available drives and folders is displayed. Select the drive and the folder in which the image is to be saved. Details (a list of files and folders) on the selected save location are displayed.
When creating a new folder, click [New Folder].

NOTE : The Save image window shows the previously used save location. If a previously saved location does not exist, My Picture is specified and displayed.

2. File Name In the [File Name] box, enter the file name for the image to be saved.

NOTE : Any of the following characters cannot be used in a file name: [\ / : ; * ? " < > | ! ' &] (half-width characters).

NOTE : If [Use Image Number] is selected for a file name block, an image number is displayed as a file name. If [Use Magnification] is selected, a magnification is appended to the file name.

3. File Type Three image file types are supported:

Table 4.3.29 File Types

File Type	Format
JPEG file (∗.jpg)	JPEG compatible image file (images saved by compression)
Bitmap file (∗.bmp)	Bitmap image file (images saved without compression)
TIFF file (∗.tif)	Tagged image file format (images saved without compression)

※ The compression ratio for JPEG files cannot be changed.

4. Save Button Saves the image file.

5. Cancel Button Cancels the saving of the image file.

NOTE : When an image file is saved, an auxiliary condition file containing various settings in the system is created with the same name as the image file, with an extension *.txt.

NOTE : Do not turn off the main unit or unplug the USB cable when the save processing is in progress. Doing so can result in a failed image save operation or a time-consuming save operation.

4.3.30 Digital Zoom Window

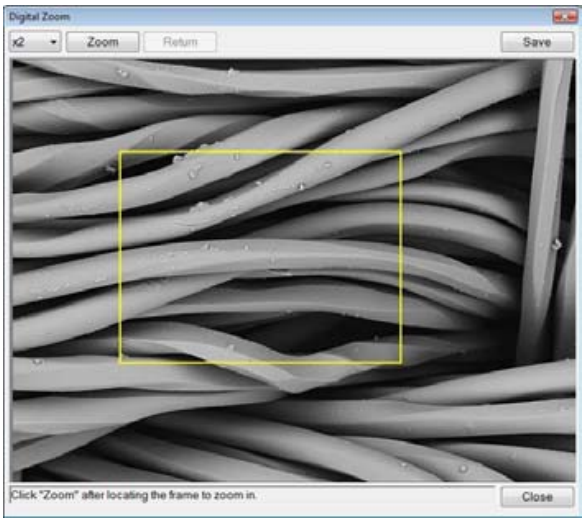
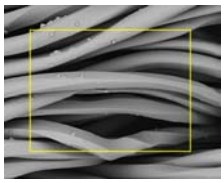


Figure 4.3.30-1 Digital Zoom Window

Digital zooming operation can be performed for the observation image.

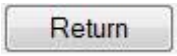
Zoom magnification: Select a digital zoom magnification (x2 or x4) from the box.



Zooming location specification frame: Using a frame, specify the location where digital zooming is to be performed. Because the frame is displayed on the Digital Zoom window, it can be moved by mouse-dragging operation.

NOTE : The size of the frame varies with the zooming magnification.

Zoom button: Executes digital zooming. This button is disabled when the display image is being zoomed.



Return button: Resets the Digital Zoom screen to the original magnification. This button is enabled when the display image is being zoomed.

Save

Save button: This button performs a Quick Save in the condition of the displayed image (Image Save size: 640x480 pixels) on the Digital Zoom window.

Close

Close button: Closes the Digital Zoom window.

Digital Zoom operation

1. Selecting digital zoom on the Edit menu starts the capturing of high-definition images (image capture), irrespective of the current View mode. When image capture is in progress, a dialog is displayed (it takes 30 to 40 seconds from the time the capture process is finished until the saved image is applied).

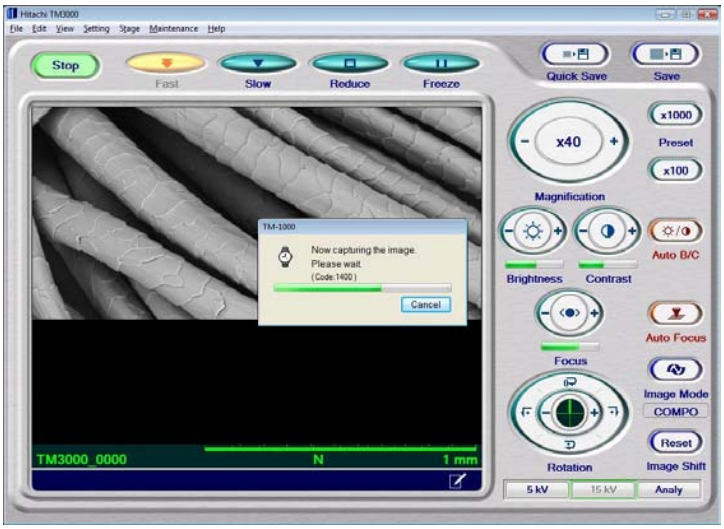


Figure 4.3.30-2 Image Capture Execution Window

NOTE : To prevent noise in the saved image, be careful not to exert vibrations on the system main unit during the image capture process.

2. Upon termination of the image capture process, the dialog disappears, and the Digital Zoom screen is displayed.

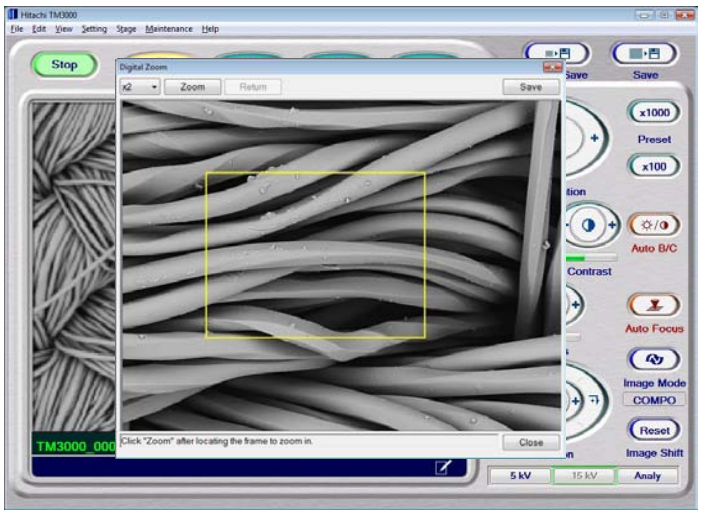


Figure 4.3.30-3 Digital Zoom Window

3. Clicking [Zoom] by specifying a zoom magnification and a zoom location displays a digital zoom image.

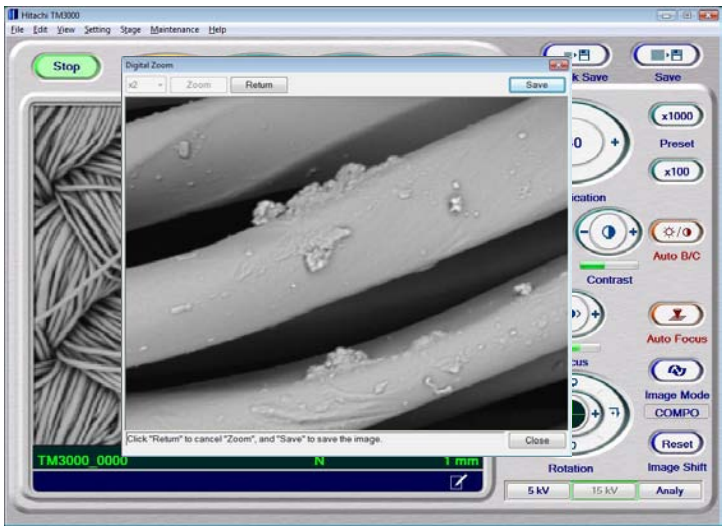


Figure 4.3.30-4 Digital Zoom Execution Window

4. Click [Save] to save the digital zoom image. As a Save Image window appears, enter the file name, and save the image by selecting the destination of save and the file type. If not saving the image, click the [Cancel] button.

NOTE : Any of the following characters cannot be used in a file name: [\ / : ; * ? " < > | ! ' &] (half-width characters).

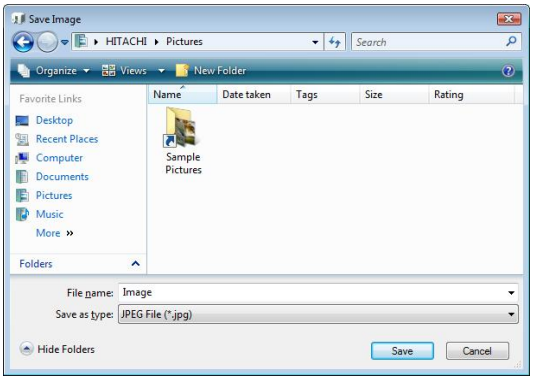


Figure 4.3.30-5 Save Image Window

NOTE : Image files are created under conditions that are pre-selected on the Setting for Save window. By setting selected conditions and performing digital zooming, images that match intended conditions can be saved.

Table 4.3.30 Image Type and Digital Zoom Image Save Size

Image Type	Image Save Size
Image only	640x480 pixels
Image + information	640x520 pixels
Image + information + comments	640x550 pixels

After digital zooming is finished, the View mode changes to the Freeze mode.

NOTE : After digital zooming, Quick Save cannot be saved. To perform a Quick Save, change the View mode to the Freeze mode.

Saved images can be verified by using Explorer. Clicking the [F9] key on the keyboard displays the folder in which the images are saved.

NOTE : If a magnification is embedded in the information area and the saving of a digital zoom image is executed, the magnification is also embedded in the saved image. The embedded magnification will be the virtual magnification [D x MMM] used during the execution of digital zooming. If the magnification value is 1000 or higher, the notation xM.Mk will be used, or if it is 10000 or higher, xMMk will be used.

4.3.31 Data Entry/Measurement Window

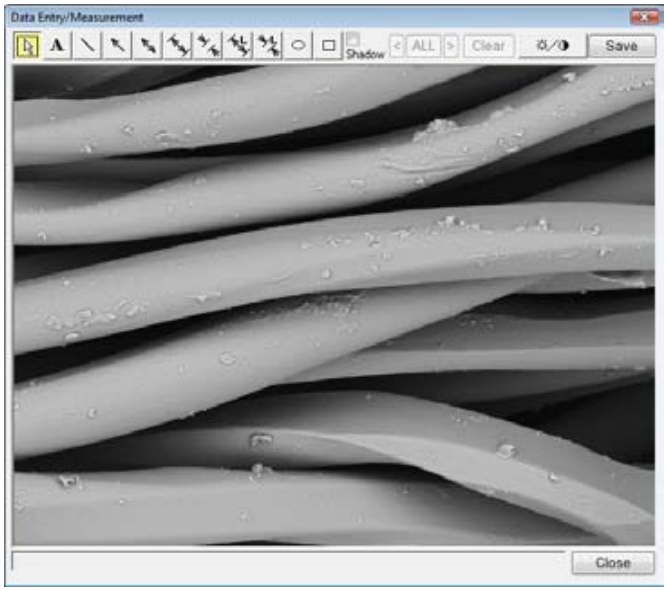


Figure 4.3.31-1 Data Entry/Measurement Window

A maximum of 50 characters and graphics can be written onto an observed screen. In addition, the distance between two points can be measured (using the Quick Measurement function).

1. Data Entry Operation

1a. Set the observation mode to the freeze mode. From the Edit menu, select Data Entry/Measurement.

NOTE : To write characters and graphics on the observation screen, use an image that has undergone the execution of the [Freeze Image] mode (see 4.3.11) or [Quick Save] (see 4.3.14). Data cannot be entered in [Fast], [Slow], or [Reduce] modes.

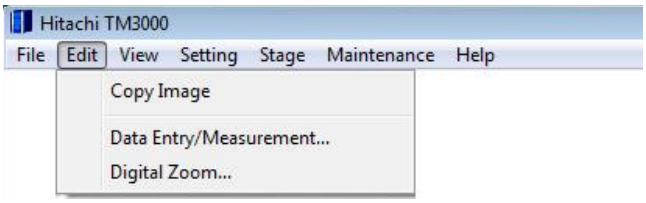


Figure 4.3.31-2 Choosing the Data Entry/Measurement from a Pull-Down Menu

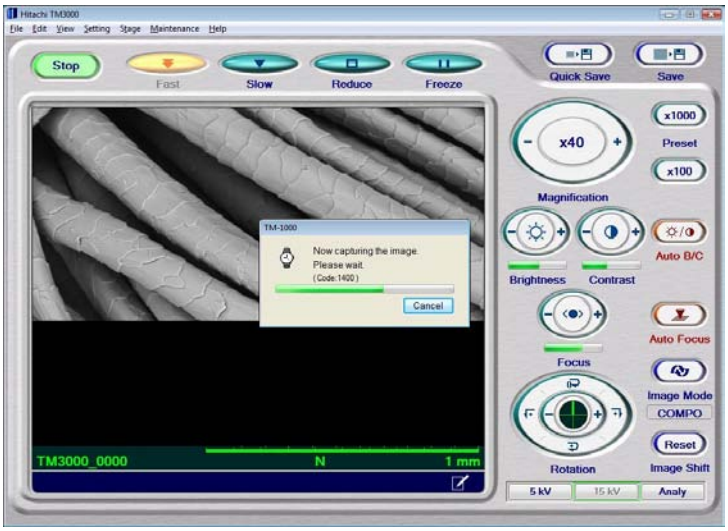


Figure 4.3.31-3 Image Capture Execution Window

1b. The Data Entry/Measurement window is displayed.

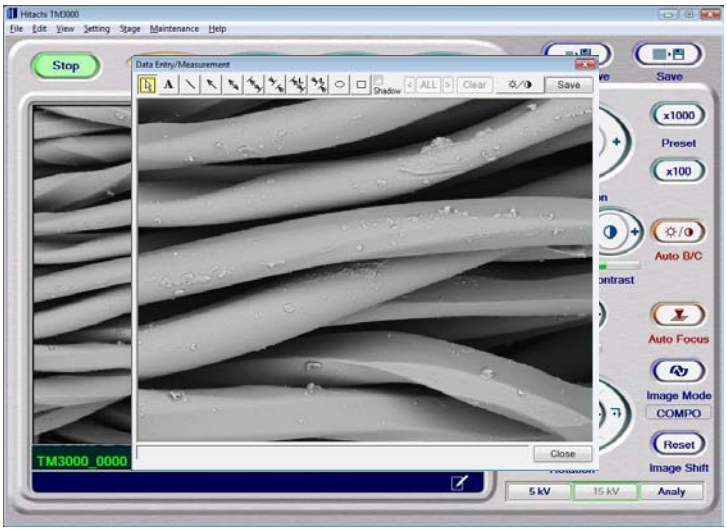


Figure 4.3.31-4 Data Entry/Measurement Window

1c. From the entry mode selection button, select the data to be entered (characters and graphics) to enter data.

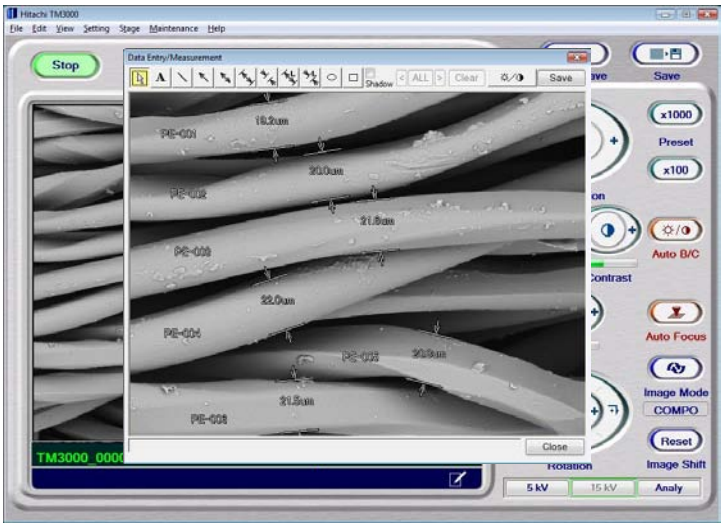


Figure 4.3.31-5 Data Entry/Measurement Window

NOTE : Entered data (characters and graphics), once it is saved, cannot be re-edited. To change data, before it is saved, delete it by pressing the Clear button and re-enter it. Any deleted data cannot be recovered.
If a given specimen is observed under the same magnification, values obtained from a quick measurement may vary due to differences in specimen height (differences in focal positions). Also, size measurements can yield different results between the center and the edges of the image.

NOTE : Image files are created under conditions that are pre-selected on the Setting for Save Window. By setting selected conditions and performing data entry and measurement, images that match intended conditions can be saved.

Table 4.3.31 Image Types and Image Save Sizes

Image Type	Image Save Size
Image only	640x480 pixels
Image + information	640x520 pixels
Image + information + comments	640x550 pixels

Saved images can be checked by using Explorer. Clicking the [F9] key on the keyboard displays the folder in which the images are saved.

2. Entry Mode Selection Buttons The following data entry modes are available for selection:

 Entry cancellation button: Cancels the input of data.

 Character entry button: Allows the input of characters. Left-clicking any location on the screen where text is to be inserted, the text insertion part is displayed black-on-white. From the keyboard, enter text, and press the ENTER key to commit it. Clicking any other spot on the window during character input causes the text insertion part to move to that spot.

 Straight line button: Draws a straight line. At the starting point of the straight line, left-click the mouse, and without releasing the left button move to the end point and release the button to draw the line.

 Arrow button: Draws an arrow. At the starting point of the arrow, left-click the mouse, and without releasing the left button move to the end point and release the button to draw the arrow.

 Two-end arrow button: Draws a two-end arrow. At the starting point of the arrow, left-click the mouse, and without releasing the left button move to the end point and release the button to draw the two-end arrow.

 Inner-size arrow button: Draws an inner-size line without displaying a numerical value. Left-click the mouse at the starting point of the size line, move the mouse while holding down on the button, and release the button to draw the line.

 Outer-size arrow button: Draws an outer -size line without displaying a numerical value. Left-click the mouse at the starting point of the size line, move the mouse while holding down on the button, and release the button to draw the line.

 Inner-size display button: Draws an inner-size line by displaying a numerical value. Left-click the mouse at the starting point of the display line, move the mouse while holding down on the button, and release the button to draw the line.

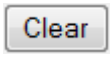
 Outer-size display button: Draws an outer-size line by displaying a numerical value. Left-click the mouse at the starting point of the display line, move the mouse while holding down on the button, and release the button to draw the line.

Circle button: Draws a circle. Left-click the mouse at the starting point of the circle, move the mouse while holding down on the button, and release the button to draw the circle.

Square button: Draws a square. Left-click the mouse at the starting point of the square, move the mouse while holding down on the button, and release the button to draw the square.

Image adjustment screen: Calls an image adjustment screen. The brightness and contrast can be adjusted on this screen. For details, see 4.3.32 Image adjustment screen.

Delete selection button: Allows the user to select the data to be deleted. The data can be selected in sequence by pressing the [＜] and [＞] keys (the selected data ia highlighted in red.) [ALL] selects all input data.



Clear button: Deletes the input data that was selected using the above Delete Select button.

Saves the image for which data was entered. As the Save Image Window appears, enter the file name, and save the image by selecting the destination of save and the file type. If not saving the image, click he [Cancel] button.

NOTE : Any of the following characters cannot be used in a file name: [\ / : ; * ? " < > | ! ' &] (half-width characters).

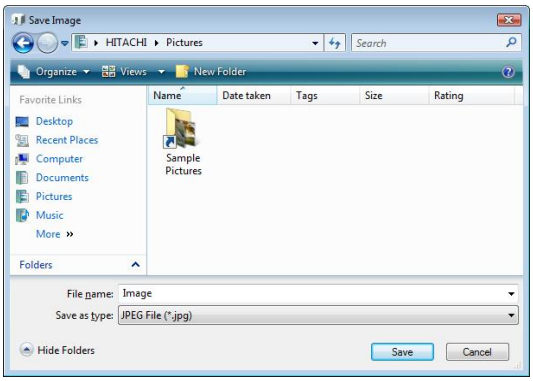


Figure 4.3.31-6 Save Image Window

Closes the window

4.3.32 Image Balance Window

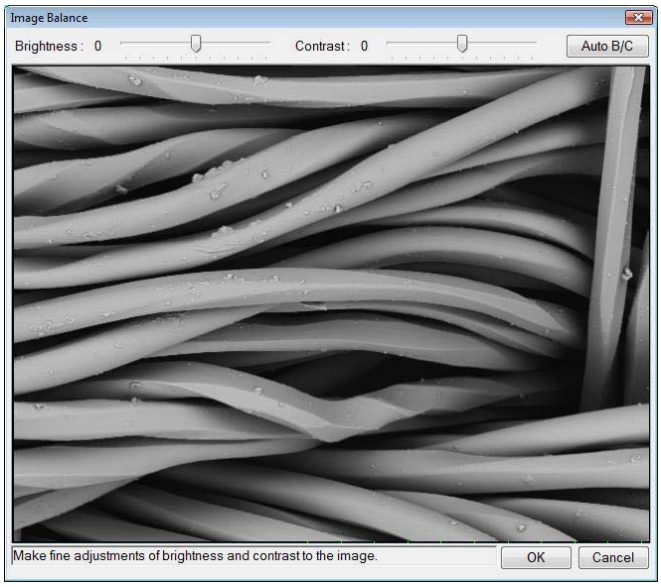
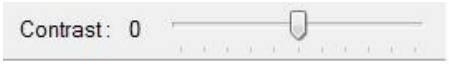


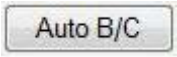
Figure 4.3.32 Image Balance Window

This window allows the user to adjust the image on the Data Entry window.

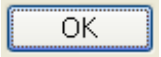
Brightness slider: Adjusts the brightness. Dragging the slider to the right increases the brightness; dragging it to the left decreases it.



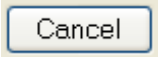
Contrast slider: Adjusts the contrast. Dragging the slider to the right increases the contrast; dragging it to the left decreases it.



Auto B/C button: Automatically adjusts the brightness and contrast based on the image on the Data Entry window.



OK button: Applies the results of adjustments to the image on the Data Entry screen and closes the Adjustment screen.



Cancel button: Closes the Adjustment screen without applying the results of adjustments to the image on the Data Entry window.

NOTE : Only the image on the Data Entry window can be adjusted; freeze images and images being observed on the Observation screen cannot be adjusted.

4.3.33 Preset Magnification Window

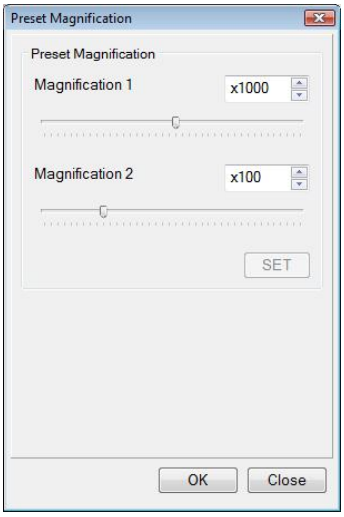


Figure 4.3.33 Preset Magnification Window

Registers preset magnifications. Magnifications can be registered independently in Preset Magnifications 1 and 2. Using the slider or the up/down button on the Preset Magnification window, preset magnifications can be specified. Clicking the [SET] or [OK] button registers the preset magnifications. The results are applied to the magnification on the Preset button on the Operation screen.

NOTE : If two magnifications with a large magnification difference, such as a low magnification (for example, x100 or less) or a high magnification (for example, x10000 or higher) are set and switching is made between them, an observation FOV deviation can occur. In such a case, change magnifications by using the observation magnification button. Hitachi recommends that the Preset button be used at x5,000 or less.

4.3.34 Auto B/C Adjustment Window

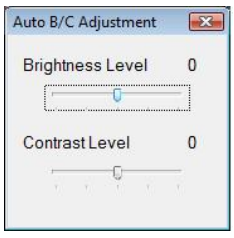


Figure 4.3.34 Auto B/C Adjustment Window

This button allows the user to set a brightness or contrast level for auto brightness/contrast adjustment. Selecting Auto B/C Adjustment Settings on the Settings menu displays the Auto B/C Adjustment window. On this window, set the brightness and contrast levels to desired levels.

1. Brightness Level Adjusts the brightness level (-2 to +2) during the execution of Auto B/C adjustment. The level can be changed by manipulating the slider. Raising the level increases the brightness of the observation image after Auto B/C adjustment. Conversely, lowering the level decreases the brightness.

2. Contrast Level Adjusts the contrast level (-2 to +2) during the execution of Auto B/C adjustment. The level can be changed by manipulating the slider. Raising the level increases the contrast of the observation image after Auto B/C adjustment. Conversely, lowering the level decreases the contrast.

4.3.35 Control Sensitivity Window

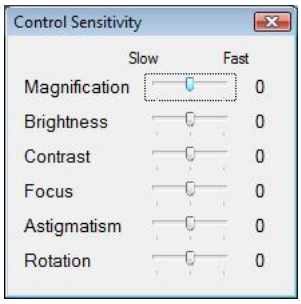


Figure 4.3.35 Control Sensitivity Window

This button allows the user to adjust the sensitivity of operation of the operation buttons (such as magnification and brightness buttons). Selecting Control Sensitivity on the Settings menu displays the Control Sensitivity window. Using this window, set the sensitivities of the buttons to desired levels.
On each button, the level can be specified in three steps (-1: slow, 0: standard, +1: fast).

1. Magnification With respect to the Magnification button on the operation window, specifies the sensitivity of operation (the speed of continuous magnification change) when the button is clicked continuously.

2. Brightness With respect to the Brightness button on the operation screen, specifies the sensitivity of operation (the speed of continuous brightness change) when the button is clicked continuously.

3. Contrast With respect to the Contrast button on the operation window, specifies the sensitivity of operation (the speed of continuous contrast change) when the button is clicked continuously.

4. Focus With respect to the Focus button on the operation window, specifies the sensitivity of operation (the speed of continuous focus change) when the button is clicked continuously.

5. Astigmatism With respect to the Scrollbar on the Astigmatism Operation unit, specifies the sensitivity of operation (the speed of continuous astigmatism change) when the Scrollbar is clicked continuously.

6. Rotation With respect to the Rotation button (fine adjustment button) on the operation window, specifies the sensitivity of operation (the speed of continuous change) when the button is clicked continuously.

4.3.36 Beam Axis Alignment Window

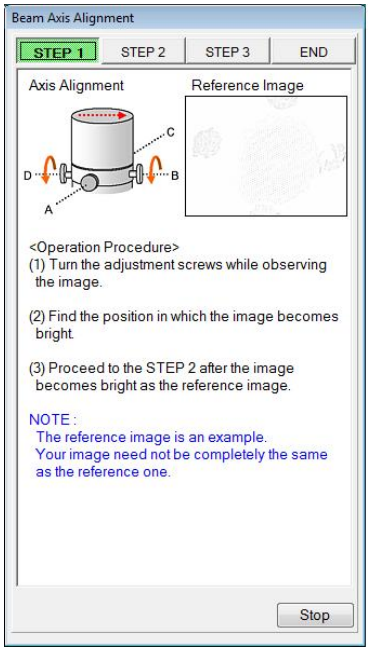


Figure 4.3.36 Beam Axis Alignment Window

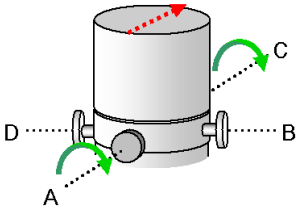
Use this screen when performing beam axis alignment after completion of column maintenance, including filament change, or when the beam axis becomes mis-aligned due to aging. Beam axis alignment can be performed easily by viewing the step-by-step guide provided on the Beam Axis Alignment window. In addition, for each step, an accelerating voltage and a filament current are set. Selecting Beam Axis Alignment on the Maintenance

menu activates the Beam Axis Alignment window.
Before performing a beam axis alignment, set the supplied image verification specimen on the specimen stage. For details, see Section 5.2 Beam Axis Alignment Methods.

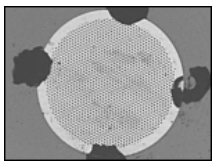
NOTE : The Beam Axis Alignment window appears only when electron beam irradiation is on (HV-ON). Any electron gun error occurring during beam axis alignment cancels the beam axis alignment process.

Operation Step button: Sets an accelerating voltage and a filament current matching the steps of the beam axis alignment process. This button also shows the condition of the current operation step.

NOTE : [STEP 1] is displayed when the Beam Axis Alignment window is activated.



Axis alignment: Shows to align the axis for the electron gun in animation.



Reference image: Displays reference images after axis alignment in each step.

<Operation Procedure>
(1) Turn the adjustment screws while observing the image.

(2) Find the position in which the image becomes bright.

(3) Proceed to the STEP 2 after the image becomes bright as the reference image.

NOTE :
The reference image is an example.
Your image need not be completely the same as the reference one.

Operation Procedure: Displays the operation procedure and the adjustment point of the beam axis adjustment in each step.

Stop button: Cancels the beam axis alignment process and closes the Beam Axis Alignment window.

4.3.37 Observation Screen Size Window

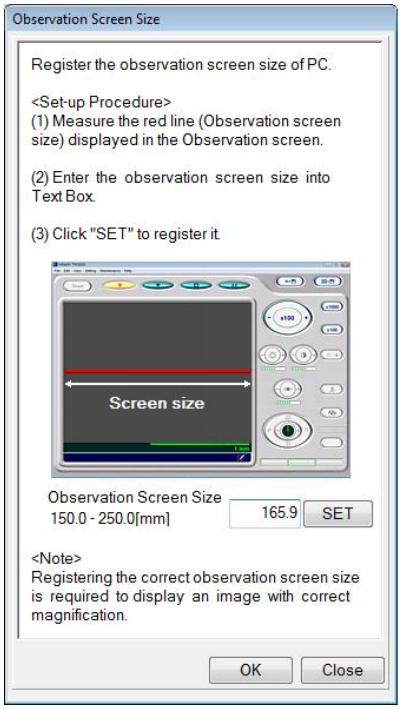


Figure 4.3.37 Observation Screen Size Window

Displays an observation screen size window for registering the size of the image observation area (see 2.2.7). An observation screen size must be set after an application is installed. On the Save menu, selecting the setting of an observation screen size activates the Observation Screen Size window. Once a size is set, no further setting is required unless the application is re-installed.

NOTE : A failure to register the observation screen size properly may result in an incorrect scale display.

Use a ruler to measure the image observation area, and enter the results in the Observation Screen Size field. Clicking the [SET] or [OK] button stores the screen size.

4.3.38 Astigmatism Correction

Figure 4.3.38 Astigmatism Correction

An astigmatism correction (to correct any electron beam distortion) on the observation screen can be performed here. Perform this adjustment if focusing becomes difficult to adjust due to aging or after the column is serviced, including filament replacement. An astigmatism correction operation unit can be displayed in the information/comments area on the operation window by selecting astigmatism correction on the settings menu.

NOTE : Astigmatism correction is enabled only when electron beam irradiation is on (in the HV-ON status).

Astigmatism 1 slider and Astigmatism 2 slider: Corrects the aberration.

Reset button: Returns the Astigmatism 1 slider and the Astigmatism 2 slider to the center (to an uncorrected condition).

Close button: From the operation window, hides the astigmatism operation unit and displays the information/comments area.

4.3.39 User Information Window

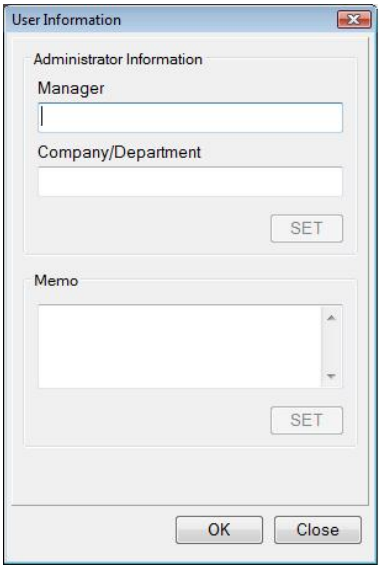


Figure 4.3.39 User Information Window

On this window, user information for the management of applications can be recorded. Use this window if the party responsible for controlling this program for operational purposes must be tracked. On the Help menu, selecting user information displays the user information window.
The records stored on the user information window can be checked on the version information window.

1. Management Information

1a. Manager Enter the name of the manager for the system.

1b. Company Name/Controlling Department Enter the name of the department responsible for controlling the system.

1c. Notes System information can be entered here.

4.3.40 Version Information Window

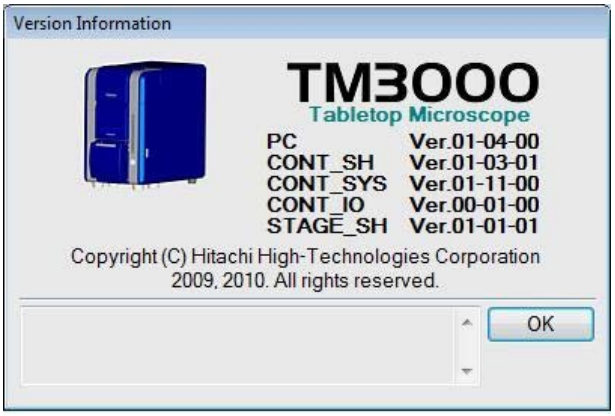


Figure 4.3.40 Version Information Window

The Version Information window displays the product logo, the software version, and copyright declarations. The lower part of the window shows the information that was registered on the user information window. Selecting version information on the Help menu displays a version information window.

5 MAINTENANCE

Periodically perform inspection and maintenance of the following items to keep the system in good working condition to extend the lifetime of the instrument.

1. After reading this instruction manual carefully, perform the maintenance according to the procedures described in this manual.

2. Do not disassemble, assemble or repair items which are not described in this instruction manual.

3. Contact the nearest service office if the Turbo Molecular Pump (TMP) or Diaphragm Pump (DFP) maintenance message appears.
The inspection and maintenance list is shown in Table 5.

Table 5 Inspection and Maintenance List

Item	Task	Interval	Notes
Filament	Filament replacement	When the filament is broken	See Section 5.1.
Wehnelt	Cleaning	When the filament is replacements	See Section 5.1 **9.** .
Anode	Cleaning	Once every 5 to 6 filament replacements	See Section 5.1 **9.** .
Condenser lens aperture	Condenser lens aperture replacement	Every 6 months (or when image quality deteriorates)	See Section 5.3.
Objective aperture	Objective aperture replacement	Every 6 months (or when image quality worsens)	See Section 5.4.
TMP (Turbo molecular pump)	TMP replacement	3 to 5 years	The work is performed by a service engineer.
DFP (Diaphragm pump)	Diaphragm replacement		

5.1 Filament Replacement

If an image does not appear when an application button is pressed or a filament-related error message appears, a blown filament must be suspected. Any blown filament, which provides a light source that permits observation, must be replaced.

1. Close the application. Turn off the power switch located on the right side of the main unit. Wait for a minimum of 30 minutes, and then open the top cover.

2. As shown in Figure 5.1-1, holding onto the lower part of the top cover with your finger tips, gently lift it.

Figure 5.1-1 Opening and Closing the Top Cover (1)

> ⚠ **CAUTION**: If the system was in use until immediately before the cover was opened, the Wehnelt and the anode around the filament could still be hot. To avoid burns from touching it, perform filament replacement work by allowing a minimum of 30 minutes after the power switch was turned off.

> ⚠ **WARNING**: A maximum of AC 240 V, DC 15 kV prevails in the interior of the system. Opening the cover for the main unit and touching the interior parts or circuits when the system is still powered on can cause severe injury or death from electric shock.
> Do not remove the cover from the system. If the electron gun must be opened for maintenance, be sure to turn off the leak breaker and the power switch, and unplug the power cord before commencing work.

> ⚠ **CAUTION**: When opening or closing the cover, use caution not to get your fingers caught to avoid injury.

3. Introduce air into the specimen chamber.
Turn on the power switch, and press the [EVAC/AIR] button to introduce air into the specimen chamber.

4. When the blue LED lights up, it is an indication that the specimen chamber has reached the atmospheric pressure, in which case turn off the power switch.

5. There is a rubber cushion on the left side of the electron gun. Tilt the electron gun to the left side of the system until it touches the cushion, and then gradually open the electron gun.

Figure 5.1-2
Opening/Closing the Electron Gun (1)

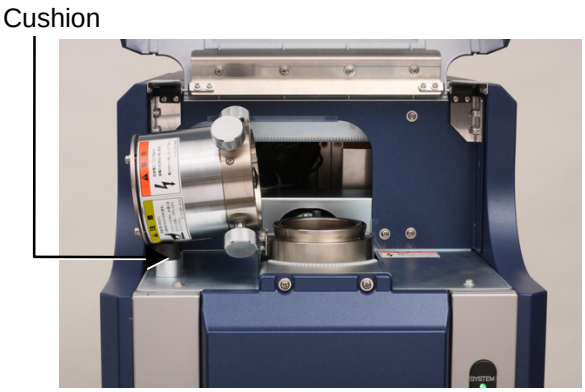


Figure 5.1-3
Opening/Closing the Electron Gun (2)

> ⚠ **CAUTION**: The electron gun weighs 2.5 kg. When opening the electron gun, do not release your hand until the electron gun comes to a halt. Releasing your hand mid-way can potentially cause pinched fingers and injury.

6. Remove the cap by turning it counterclockwise.

Figure 5.1-4 Cap

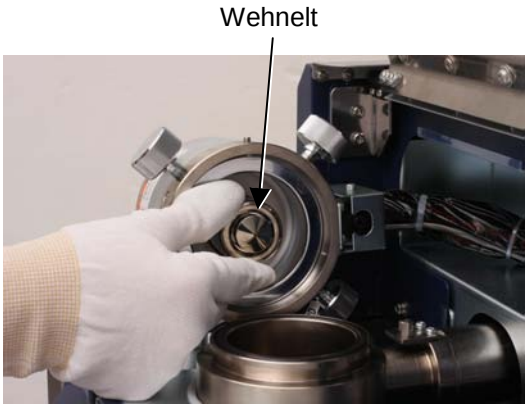


Figure 5.1-5 Removing the Cap

7. Remove the Wehnelt as well as the cartridge filament. By pulling the Wehnelt, the Wehnelt can be removed together with the cartridge filament.

NOTE : When handling the components inside the electron gun (the cap, the Wehnelt, the anode, and the cartridge filament), use clean gloves to keep them free of particles and smudges.

Figure 5.1-6 Removing the Welnelt and the Cartridge Filament

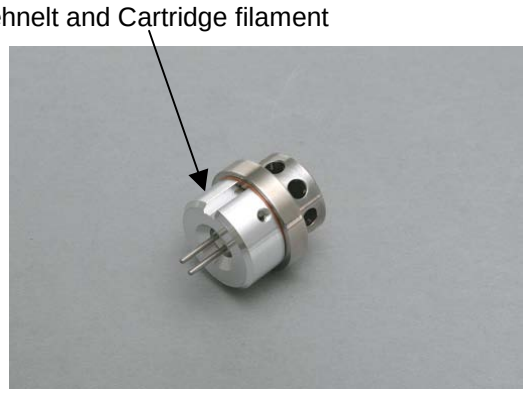


Figure 5.1-7 Welnelt and Cartridge Filament

8. Remove the Wehnelt from the cartridge filament by turning the former counterclockwise.

Figure 5.1-8 Removing the Wehnelt (1)

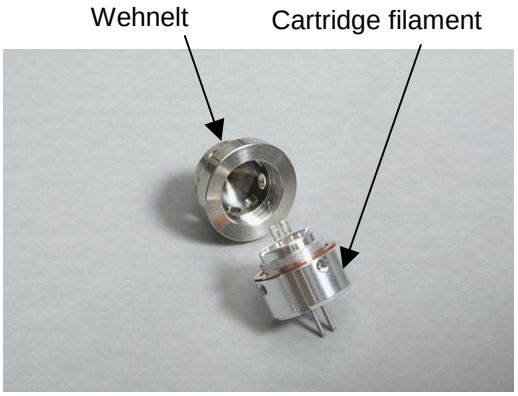


Figure 5.1-9 Removing the Wehnelt (2)

9. Clean the removed Wehnelt.

Clean the Wehnelt once every time the filament is replaced.

⚠ **WARNING**:When using a volatile solvent during the cleaning of parts for the system, verify information (MSDS and the like) on the nature and handling of the solvent, and be sure to handle it properly.

- Do not such chemicals near an open fire.
- Ventilate a room.
- Wear the directed protection tool.

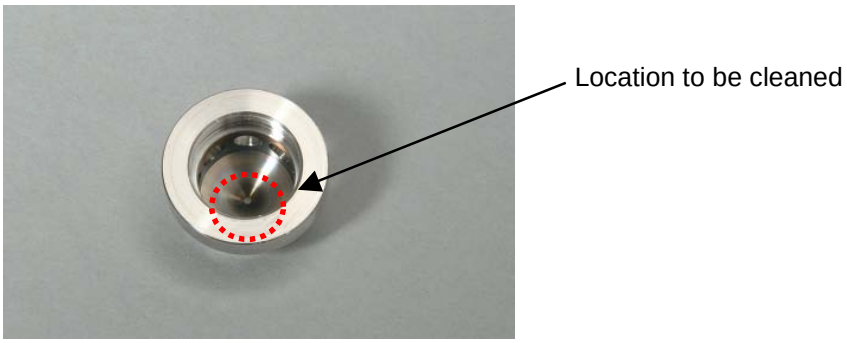


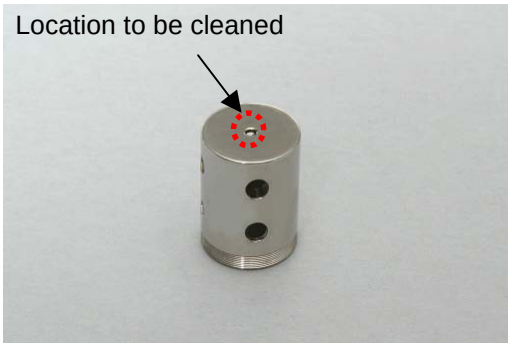
Figure 5.1-10 Cleaning the Wehnelt 1

Dissolve the supplied metal polishing agent in alcohol, apply it to the tip of a cotton swab, and clean the spots shown in Figure 5.1-10. Finally, thoroughly wipe the cleaned spots with alcohol to remove any residual metal polishing agent or particles, and remove lint and particles with an air blower. Using the system with such particles still remaining can result in image distortion, such as stigma spots on the observation image. See Section 4.2.13 (3) for stigmatism.

Figure 5.1-11 Metal Polishing Agent

Figure 5.1-12 Cleaning the Wehnelt 2

With respect to the anode, clean the spots shown in Figure 5.1-13, as in the case of the Wehnelt. To preclude any occurrence of stigma points, finally, thoroughly wipe the cleaned spots with alcohol to remove any residual metal polishing agent or particles, and remove lint and particles with an air blower. See Section 5.3 **4.** for the removal procedure.



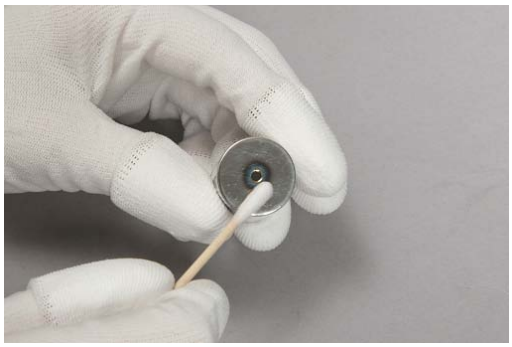


Figure 5.1-13 Cleaning the Anode 1 **Figure 5.1-14 Cleaning the Anode 2**

10. Fasten the Wehnelt onto the new cartridge filament.

The tip of the filament is like an extremely thin wire. Touching it ever slightly can deform it, rendering it unusable. Fasten the Wehnelt with great care. Insert the copper spacer ring, supplied with each cartridge filament, between the cartridge filament and the Wehnelt, and attach the Wehnelt by turning it clockwise.

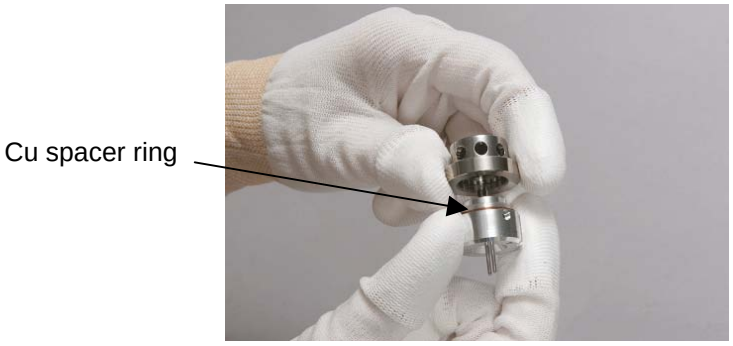


Figure 5.1-15 Fastening the Wehnelt onto the Cartridge Filament

NOTE : Each cartridge filament is supplied with a spacer for adjusting the height of the filament. When replacing the cartridge filament and if a spacer is provided with the new cartridge filament, be sure to mount the spacer.

NOTE : The brightness of the image can vary to some extent from adjustment guidelines due to the particular combination of filament and Wehnelt.
If the image is dark, reduce the number of spacers supplied with the cartridge filament by one. Conversely, if the image is too bright, increase the number of spacers by one. Two adjustment spacers are provided on the lid of the cartridge filament. Using fewer spacers could reduce the life length of the filament.

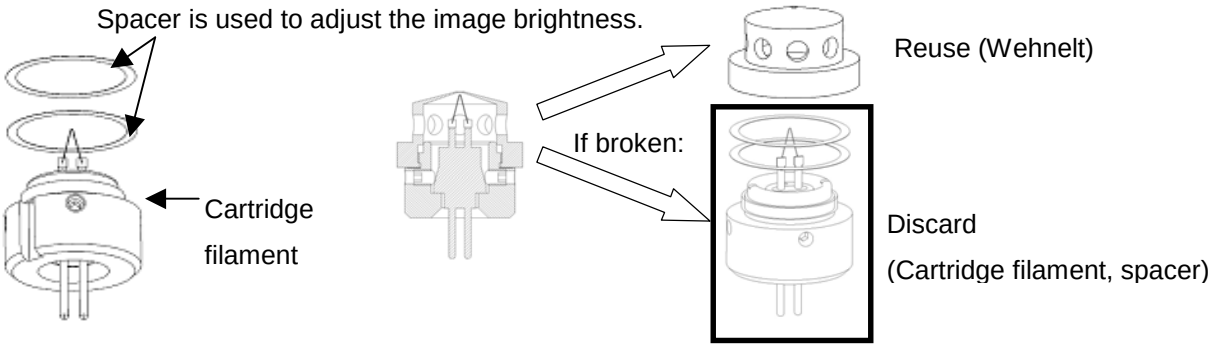


Figure 5.1-16 Replacing the Cartridge Filament Spacer

Fasten the Wehnelt onto the cartridge filament clockwise. Incorporate it into the electron gun by verifying it that there is not play. Align the guard ring pin with the holder groove of the cartridge filament, and insert it vertically.

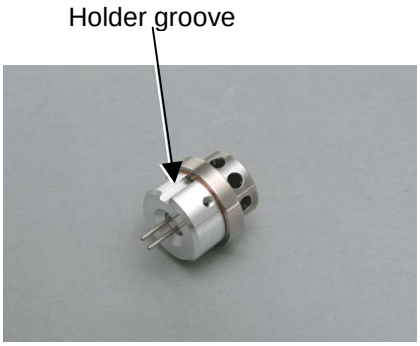


Figure 5.1-17
Wehnelt and Cartridge Filament

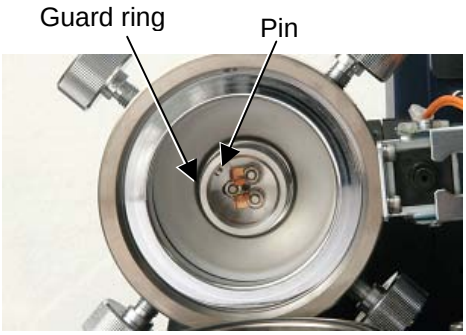


Figure 5.1-18
Cartridge Filament Insertion Inlet

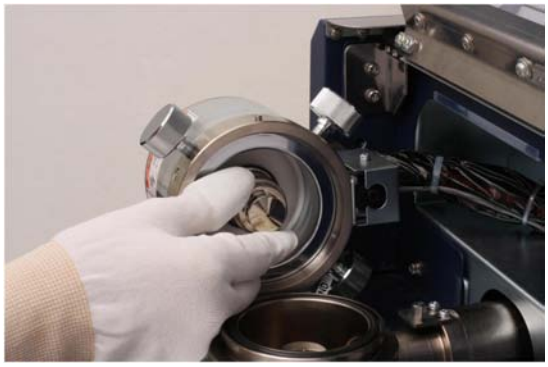


Figure 5.1-19 Inserting the Cartridge Filament

11. Attaching the cap Secure the cap, by turning it clockwise, onto the cartridge filament that was attached in Section 5.1 **10.** .

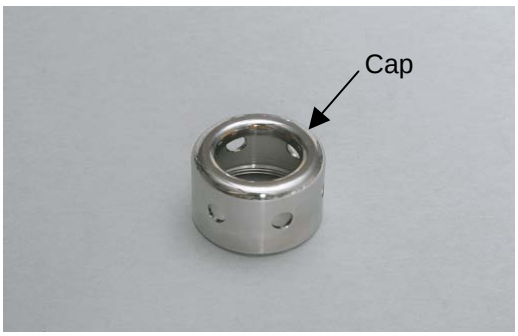


Figure 5.1-20 Cap

Figure 5.1-21 Attaching the Cap

12. Verify that grease is applied to the o-ring and is free of particles, then attach the o-ring to the groove.

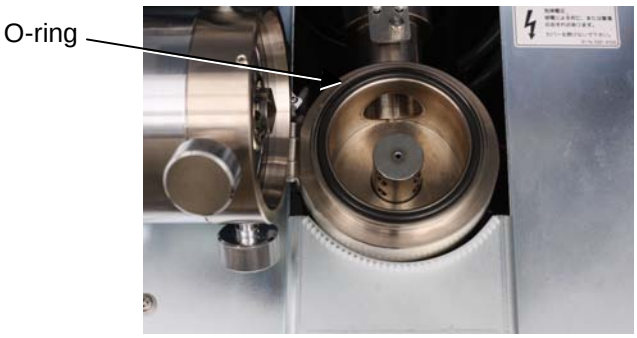


Figure 5.1-22 Electron Gun O-ring

NOTE : Thinly apply the supplied vacuum grease to the entire o-ring. Failure to properly apply grease to the o-ring can cause the air, trapped in the o-ring groove, to enter the electron gun when the electron gun is moved during the beam axis adjustment process, resulting in the beam being turned off automatically.

13. Press the [EVAC/AIR] switch. The filament replacement process is complete when the evacuation is finished. In the next step, perform beam axis adjustments (see Section 5.2).

Figure 5.1-23 Filament Replacement Finished

5.2 Beam Axis Adjustment

1. Press the [EVAC/AIR] switch. Verify that the evacuation of the specimen chamber is finished. After replacing the filament (see Section 5.1), set the supplied standard specimen (see Sections 4.2.2 and 4.2.3) in the center of the stage, press the [EVAC/AIR] switch, and verify that the evacuation of the specimen chamber is finished. When the blue LED lights up, it is an indication that the evacuation is complete.

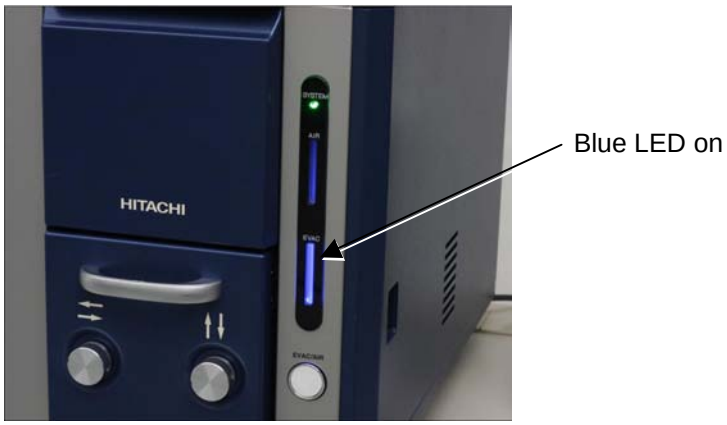


Figure 5.2-1 Verifying the Evacuation of the Specimen Chamber

2. Activate the application.

From the Operation Window for the application, click the Start button to commence the irradiation by the electron beam (with HV-ON).

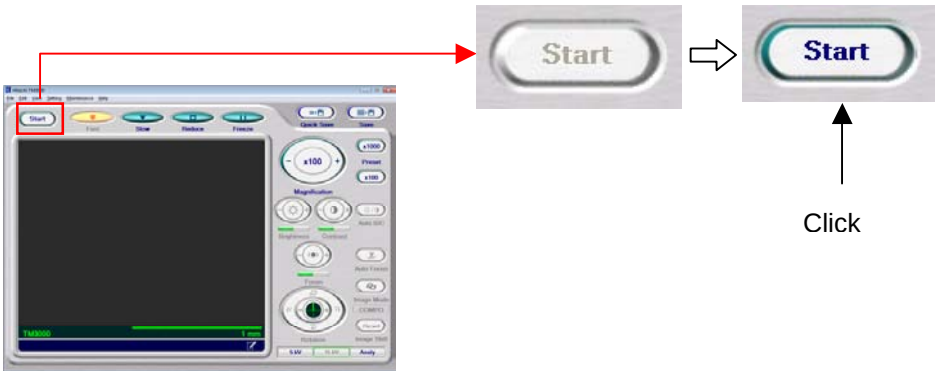


Figure 5.2-2 Starting the Application

3. Start the beam axis adjustment mode.

Beam axis adjustment is a three-step process, involving a gradual adjustment of the beam irradiation position to the center of the lens. From the [Maintenance] menu, select [Beam axis adjustment] to bring up the Beam Axis Adjustment window.

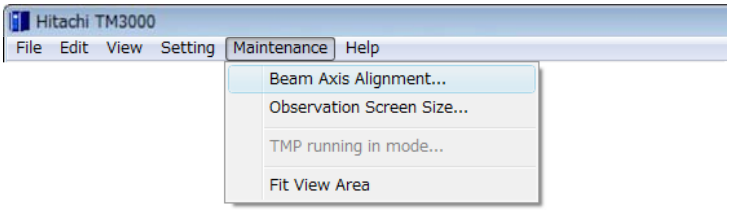


Figure 5.2-3 Starting the Beam Axis Adjustment Mode

NOTE : Beam axis adjustment can be performed only when electron beam irradiation is on (with HV-ON). During the execution of beam axis adjustment, do not operate the specimen stage for the main unit, as operating the specimen stage can hamper the beam axis adjustment process.

Click the [OK] button as the following confirmation message is displayed. A Beam Axis Adjustment window appears.

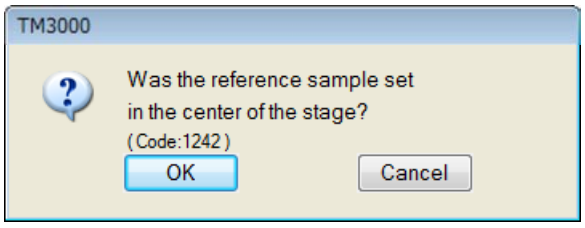


Figure 5.2-4 Image Verification Specimen Loading Confirmation Window (1)

Specify electron beam conditions.

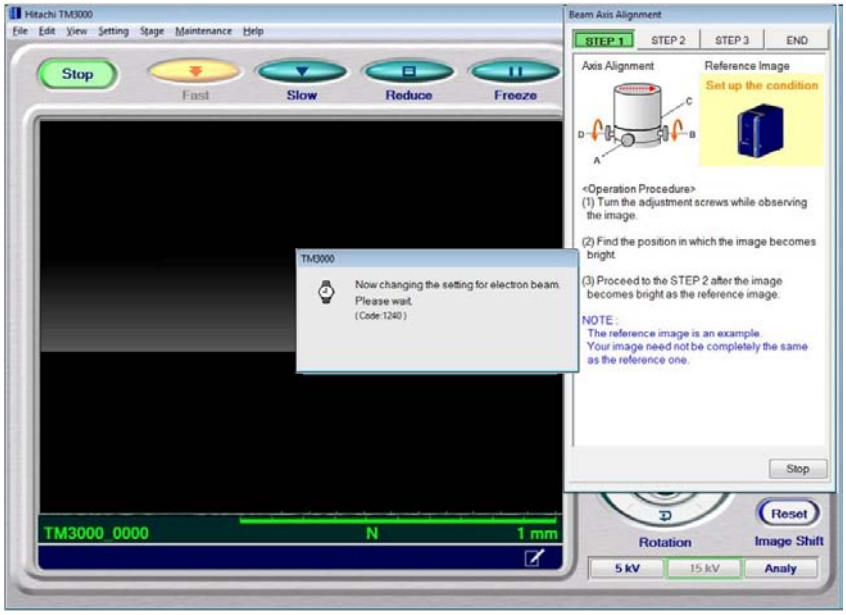


Figure 5.2-5　Electron Beam Condition Setup Window (1)

※　If the supplied image verification specimen is not loaded, in the confirmation message shown in Figure 5.2-4, click the [Cancel] button. When the following message appears, click the [OK] button, and by following the message, load the supplied image verification specimen and perform the beam axis adjustment procedure again.

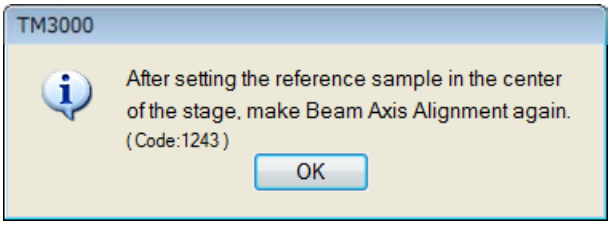


Figure 5.2-6　Image Verification Specimen Loading Confirmation Window (2)

4.　Beam axis adjustment, STEP 1　Turn the four axis adjustment knobs, A, B, C, and D, for the electron gun to move the electron gun, and adjust it so that the image will be the brightest.

NOTE : Moving the electron gun by turning the axis adjustment knobs can cause the air trapped in the o-ring groove to leak into the electron gun chamber and the beam to be turned off automatically, resulting in an error message. In such a case, close the message window, press the Start button again, and then perform axis adjustments.

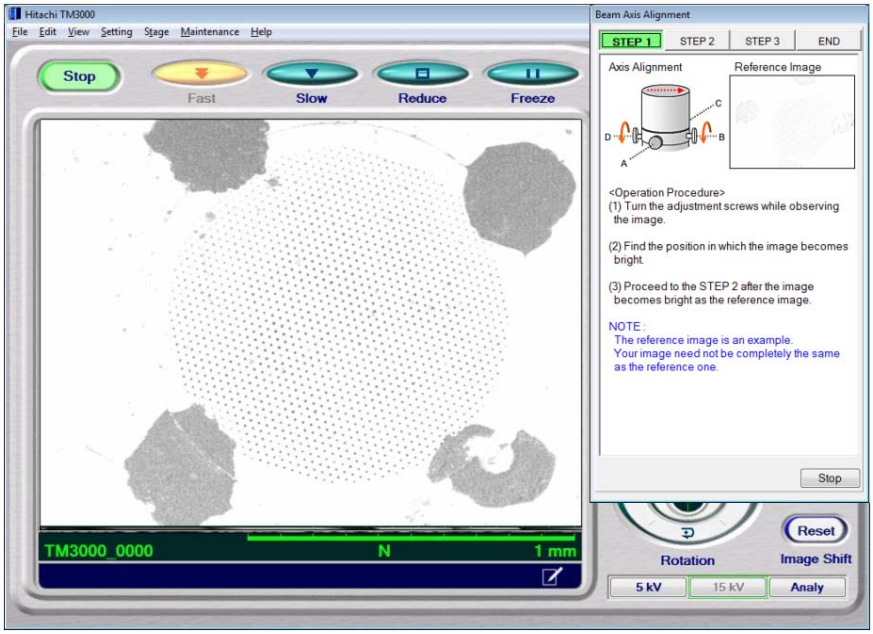


Figure 5.2-7 Beam Axis Adjustment STEP 1, an Example

4a. First, loosen the four axis adjustment knobs, A, B, C and D, by approximately one turn.

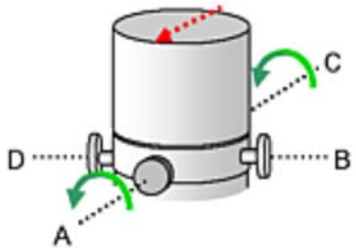


Figure 5.2-8 Operating the Electron Gun Axis Adjustment Knobs (1)

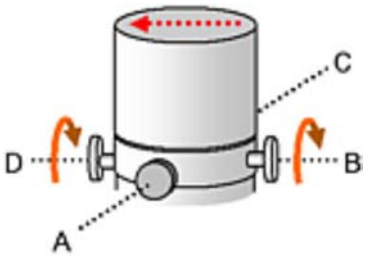


Figure 5.2-9 Operating the Electron Gun Axis Adjustment Knobs (2)

4b. In the next step, turn one of the knobs (for example, Screw A in Figure 5.2-8) in a fastening direction. When it becomes tight, loosen the knob in the opposite direction (in Figure 5.2-8, Screw C), and then turn Screw A further in the tightening direction. During this operation, turn the knob while paying attention to the image. When an image appears, adjust the knobs in the direction of a brightening image.

4c. When the image on the observation screen turns into an image as shown in Figure 5.2-10, click the [STEP 2] tab.

Figure 5.2-10 STEP 1 Reference Image

NOTE : Figure 5.2-10 is only an example. Don't be alarmed if the same image does not appear; it is not a problem.

The following window appears during the setting of conditions. Axial adjustment should not be performed until the window disappears.

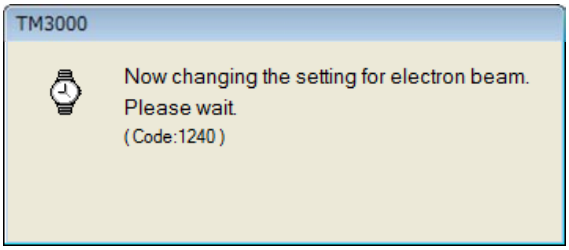


Figure 5.2-11 Electron Beam Condition Setup Window (2)

5. Beam Axis Adjustment STEP 2 Turn the four axis adjustment knobs, A, B, C, and D, for the electron gun to move the electron gun, and adjust it so that the window will be the brightest.

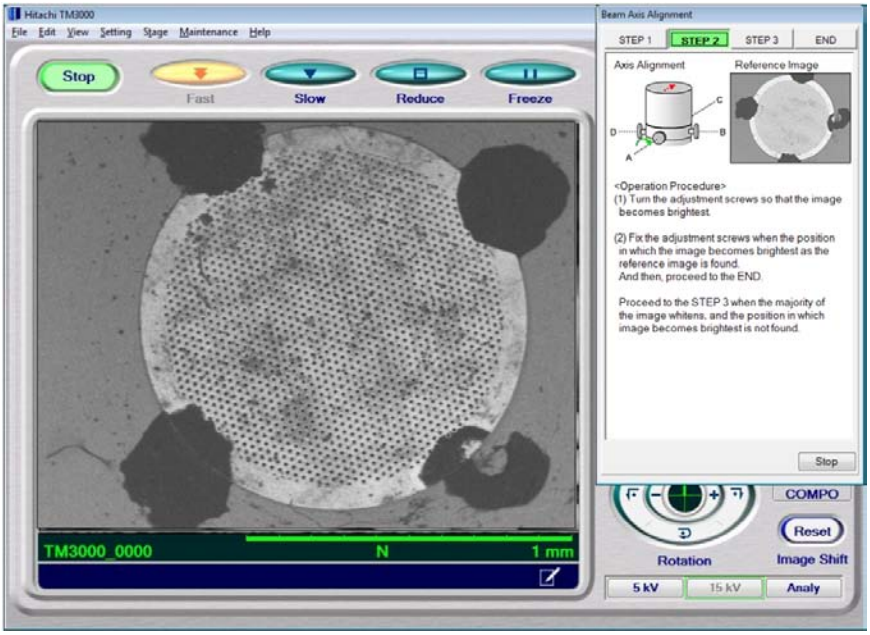


Figure 5.2-12 Beam Axial Adjustment STEP 2

5a. In a manner similar to STEP 1, adjust the axis so that the image on the observation screen is the brightest. When the position in which the image on the observation screen is the brightest is determined, go to Step 2). If a position in which most of the image turns white cannot be found, click the [STEP 2] tab to return to STEP 2; if the image becomes dark, click the [STEP 1] tab to perform axis adjustments.

5b. Gently tighten the axis adjustment knob to secure the electron gun. When tightening the knob, use caution so that the brightness does not change, and tighten the four directional knobs evenly, a little at a time.

5c. Click the [END] tab.

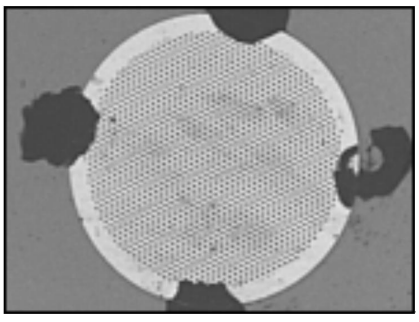


Figure 5.2-13 STEP 2 Reference Image

NOTE : Figure 5.2-13 is only an example. Don't be alarmed if the same image does not appear; it is not a problem.

6. Beam Axial Adjustment STEP 3 (if STEP 2 was Not Successful) Turn the four axis adjustment knobs, A, B, C, and D, for the electron gun to move the electron gun, and adjust it so that the image will be the brightest.

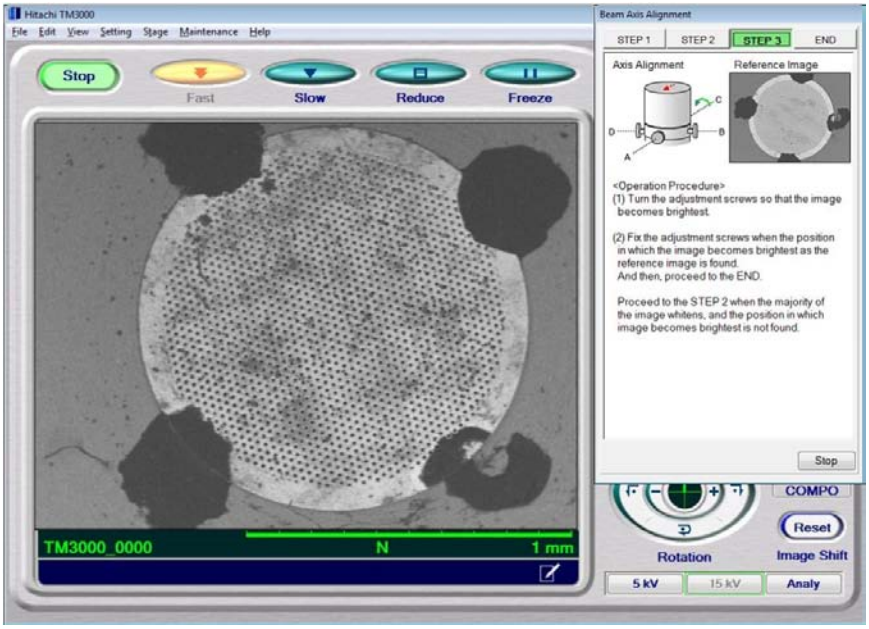


Figure 5.2-14 Beam Axis Adjustment STEP 3

6a. In a manner similar to STEP 2, adjust the axis so that the image on the observation screen is the brightest. When the position in which the image on the observation screen is the brightest is determined, go to Step 2). If a position in which most of the image turns white cannot be found, click the [STEP 2] tab to return to STEP 2; if the image becomes dark, click the [STEP 1] tab to perform axis adjustments.

6b. Gently tighten the axis adjustment knob to secure the electron gun. When tightening the knob, use caution so that the brightness does not change, and tighten the four directional knobs evenly, a little at a time.

6c. Click the [END] tab.

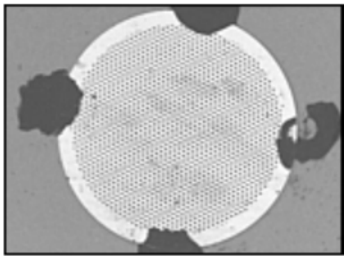


Figure 5.2-15 STEP 3 Reference Image

NOTE : Figure 5.2-15 is only an example. Don't be alarmed if the same image does not appear; it is not a problem.

7. The END of Beam Axis Adjustment Set the electron beam irradiation conditions in the observation conditions. Upon completion of the setting step, the beam axis adjustment window disappears, marking the conclusion of the process.

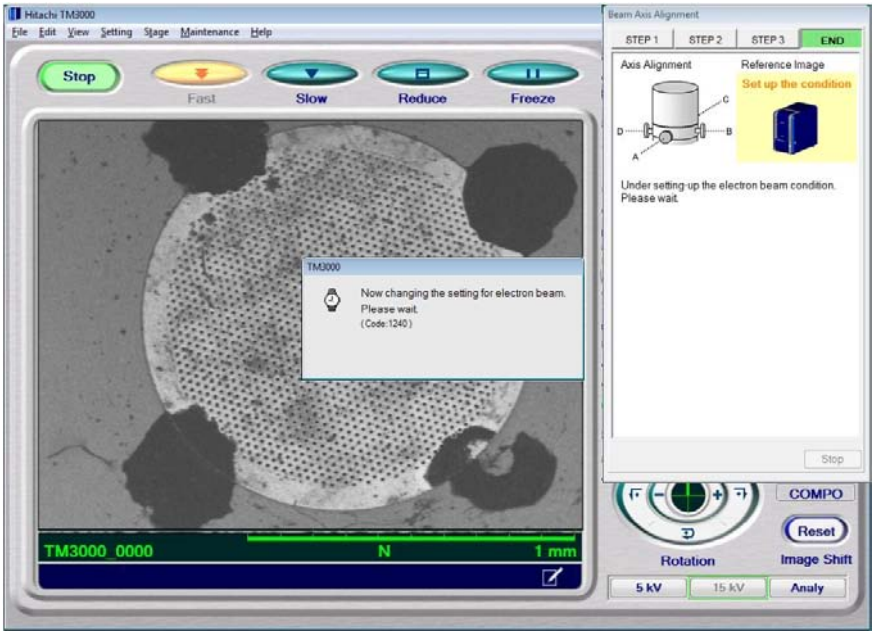


Figure 5.2-16 Electron Beam Condition Setup Window (3)

8. Gently close the top cover.

Figure 5.2-17 Opening and Closing the Top Cover (2)

⚠ **CAUTION**: To avoid injury (like a pinched finger), use caution when opening/closing the top cover.

9. Checking Performance After replacing the filament, check image quality by using the supplied image verification specimen. Use the same method if image deterioration becomes apparent after the system is used.

9a. Set the supplied image verification specimen in the standard position.
See Section 4.2.3 Changing Specimens.

9b. Perform auto-brightness adjustments, focusing adjustments, and stigma aberration corrections. At 5,000x, an observation image on the image verification specimen is produced, as shown in the figure. Perform brightness and focusing adjustments according to Sections 4.2.8 to 4.2.13.

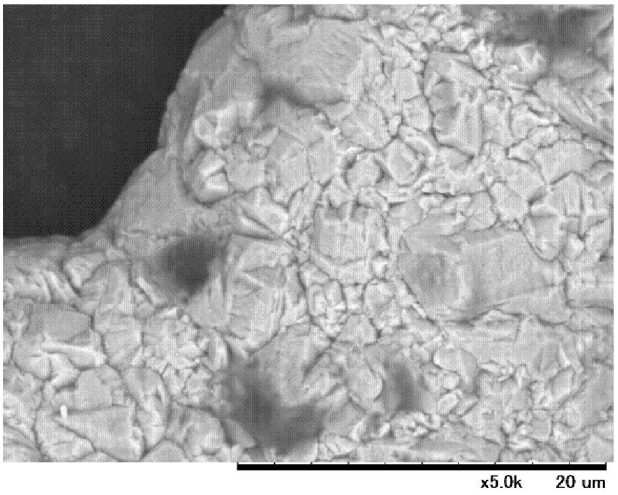


Figure 5.2-18 Image Verification Specimen, 5,000x Reference Screen

NOTE : The brightness of the image can vary to some extent from adjustment guidelines due to the particular combination of filament and Wehnelt.
If the image is dark, reduce the number of spacers supplied with the cartridge filament by one. Conversely, if the image is too bright, increase the number of spacers by one. Two adjustment spacers are provided on the lid of the cartridge filament. Using fewer spacers could reduce the life length of the filament.

A dirty objective aperture or condenser lens aperture can cause an increase in stigma aberration with an inability to produce the type of image shown in Figure 5.2-18. In such a case, replace the condenser lens aperture (see Section 5.3) and the objective aperture (see Section 5.4).

5.3 Condenser lens Aperture Replacement

The condenser lens aperture is built into the liner tube and it is located underneath the anode. After the system has been in use for about 6 months and it appears that there is image deterioration (an out-of-focus condition), replace the condenser lens aperture. When replacing the condenser lens aperture, it is recommended that the objective aperture be also replaced at the same time.

1. Introduce air into the specimen chamber.
Close the application program, and press the [EVAC/AIR] button to introduce air into the specimen chamber.

2. When the blue LED lights up as shown in Figure 5.2-1, it is an indication that the evacuation is complete; turn off the power switch.

> ⚠ **CAUTION**: If the system was in use until immediately before the cover was opened, the Wehnelt and the anode around the filament could still be hot. To avoid burns from touching it, perform filament replacement work by allowing a minimum of 30 minutes after the power switch was turned off.

3. Wait for a minimum of 30 minutes, and then open the top cover. Holding onto the lower part of the top cover with your finger tips, gently lift it.

4. There is a rubber cushion on the left side of the electron gun. Tilt the electron gun to the left side of the system until it touches the cushion, and then gradually open the electron gun, as shown in Figure 5.3-1.

The anode has a screw-in structure. Put on gloves, and remove the anode by turning it counterclockwise. Cove the removed anode with clean aluminum foil or place it in a vinyl bag to protect it from particles or scratches.

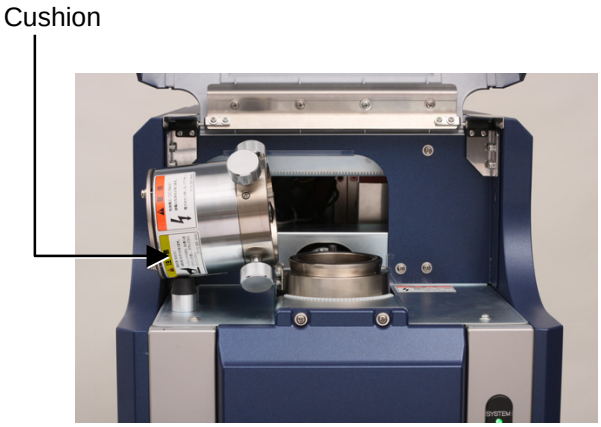


Figure 5.3-1
Opening and Closing the Electron Gun

Figure5.3-2 Removing the Anode

NOTE : When handling the components inside the electron gun (the cap, the Wehnelt, the anode and the cartridge filament), use clean gloves to keep them free of particles and smudges.

CAUTION: The electron gun weighs 2.5 kg. When opening the electron gun, do not release your hand until the electron gun comes to a halt. Releasing your hand mid-way can potentially cause pinched fingers or injury.

5. Pull out the liner tube straight up.

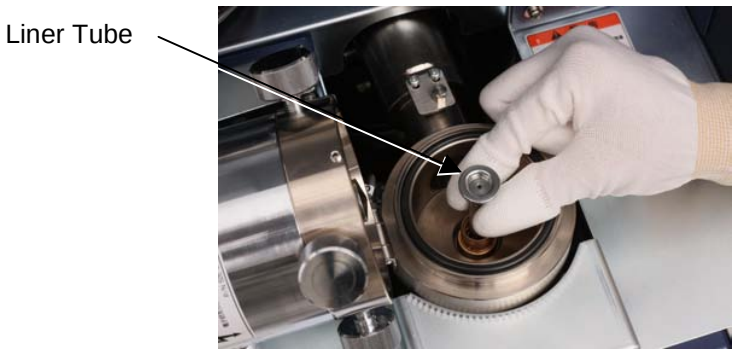


Figure 5.3-3 Removing the Liner Tube

6. Remove the liner tube; replace the condenser lens aperture.

Figure 5.3-4 External View of the Liner Tube

7. Grasping the top holder, remove the pipe by turning it counterclockwise. A condenser lens aperture and a holder are built between the pipe and the top holder, and between the pipe holder and the pipe. Replace them with new condenser lens aperture. As the condenser lens aperture and the holder are small parts, when removing them use caution so that they are not accidentally dropped.

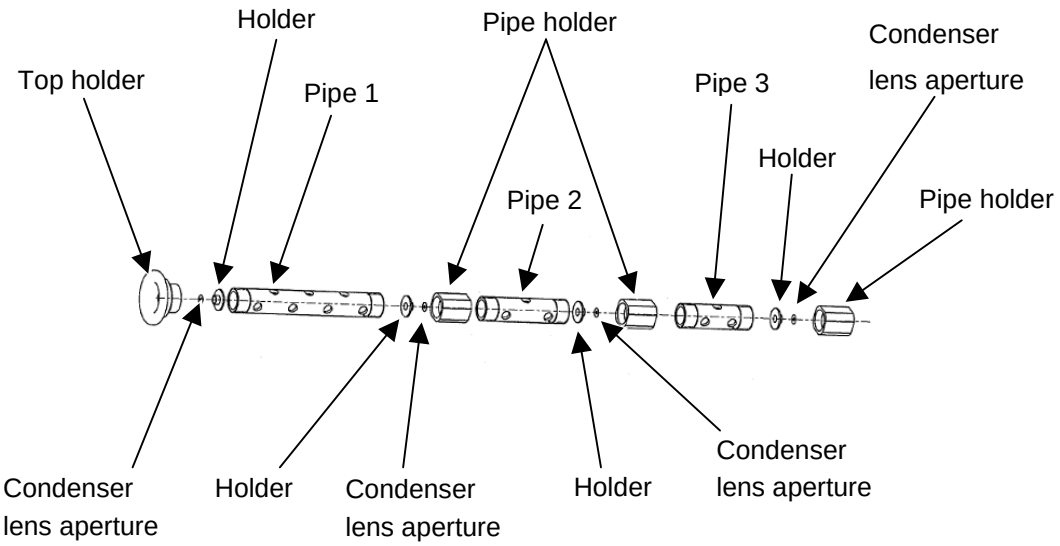


Figure 5.3-5 Disassembling the Liner Tube

8. When handling the condenser lens aperture, use caution since it is thin and easily to deform. Scratches and particles present on the edge of the open hole can cause a decline in image quality. Grasp the periphery of the aperture with tweezers so prevent any scratch in the center hole.

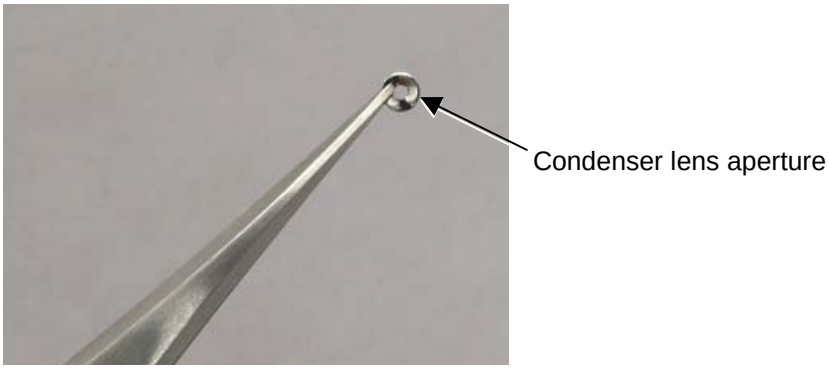


Figure 5.3-6 Condenser lens Aperture

9. Place the top holder as shown in the photograph below. Drop down the aperture from the above into the center of the top holder. Use caution so that the aperture is not tilted. In the next step, mount the holder, and secure the pipe by tightening it onto the top holder screw thread.

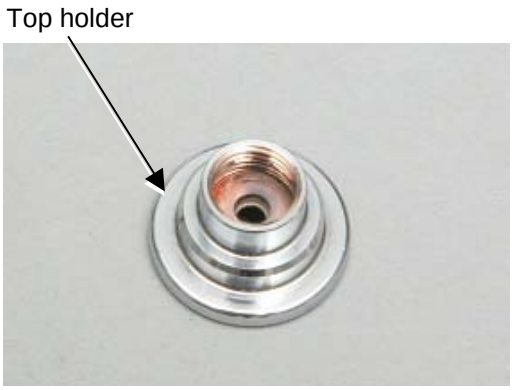


Figure 5.3-7 Top Holder

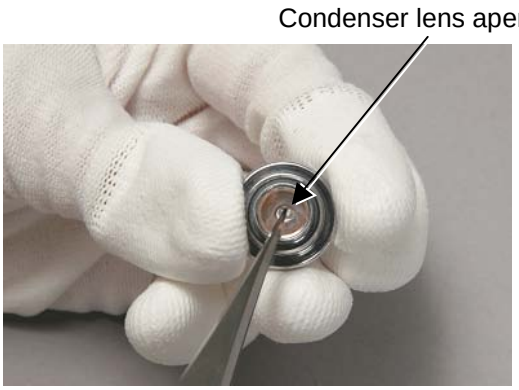


Figure 5.3-8
Replacing the Condenser lens Aperture (1)

Figure 5.3-9 Replacing the Condenser lens Aperture (2)

10. After assembling the liner tube into its original condition, use an air blower to remove any lint or particles.

Figure 5.3-10 Replacing the Condenser lens Aperture (3)

11. Insert the liner tube into the liner pipe. Mount the anode by turning it clockwise, and replace the electron gun to its original position. This concludes the condenser lens aperture replacement process.

Figure 5.3-11 Replacing the Condenser lens Aperture (4)

5.4 Objective Aperture Replacement

The objective aperture is built into the liner tube. After the system has been in use for about 6 months and it appears that there is image deterioration (an out-of-focus condition), replace the objective aperture. When replacing the objective aperture, it is recommended that the condenser lens aperture be also replaced at the same time.

1. Introduce air into the specimen chamber.
Close the application program, and press the [EVAC/AIR] button to introduce air into the specimen chamber.

2. When the blue LED lights up as shown in Figure 5.2-1, it is an indication that the evacuation is complete; turn off the power switch.

> ⚠ **CAUTION**: If the system was in use until immediately before the cover was opened, the Wehnelt and the anode around the filament could still be hot. To avoid burns from touching it, perform filament replacement work by allowing a minimum of 30 minutes after the power switch was turned off.

3. Wait for a minimum of 30 minutes, and then open the top cover. Holding onto the lower part of the top cover with your finger tips, gently lift it.

4. There is a rubber cushion on the left side of the electron gun. Tilt the electron gun to the left side of the system until it touches the cushion, and then gradually open the electron gun, as shown in Figure 5.3-1.

NOTE : When handling the components inside the electron gun (the cap, the Wehnelt, the anode, and the cartridge filament), use clean gloves to keep them free of particles and smudges.

⚠ **CAUTION**: The electron gun weighs 2.5 kg. When opening the electron gun, do not release you hand until the electron gun comes to a halt. Releasing your hand mid-way can potentially cause pinched fingers or injury.

The anode has a screw-in structure. Put on gloves, and remove the anode by turning it counterclockwise. Cover the removed anode with clean aluminum foil or place it in a vinyl bag to protect it from particles or scratches.

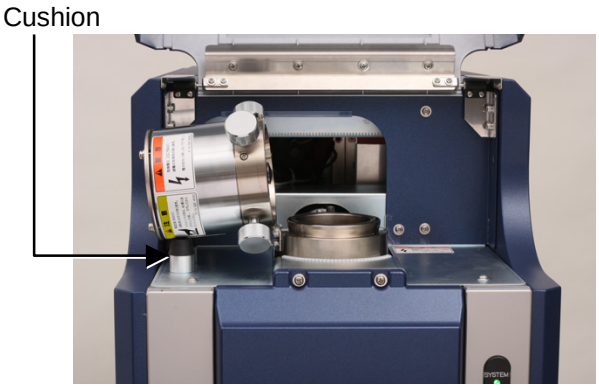


Figure 5.4-1
Opening and Closing the Electron Gun

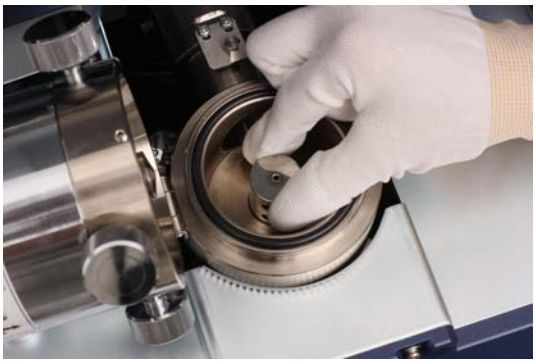


Figure5.4-2 Removing the Anode

5. Remove the liner pipe.

To take out the liner pipe, first pull out the liner tube.

For a description on how to pull out the liner tube, see Section 5.3 Replacing the condenser lens aperture. After removing the liner tube, pull out the liner pipe. Clean a tool, such as a hex wrench, insert the tool through the pipe head, and pull it straight up.

Figure 5.4-3 Pulling the Liner Pipe Out (1)

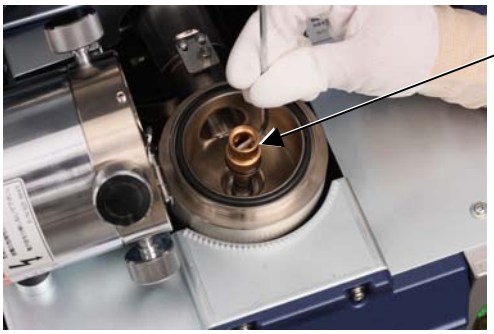


Figure 5.4-4 Pulling the Liner Pipe Out (2)

NOTE : Since the liner pipe is thin and easily bent, when pulling it out, pull it straight up.

6. Remove the objective aperture unit; replace the objective aperture unit.
Grasp the center of the liner pipe, and using a slotted screwdriver, turn the stopper at the tip counterclockwise to take out the objective aperture unit. Use the slotted screwdriver by cleaning its tip in advance with alcohol. In the next step, disassemble the objective aperture unit, and install a new objective aperture unit. Because it is thin and easily deformed, use adequate care in installing it. Also, since the open hole on the objective aperture is extremely small, scratches and the adhesion of particles can reduce image quality. When handling the objective aperture unit, exercise adequate so that dust and particles will not get onto it.

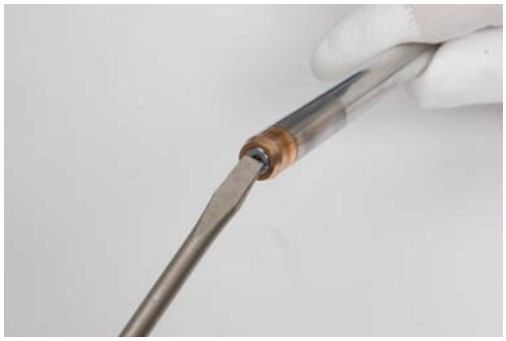


Figure 5.4-5
Removing the Objective Aperture Unit

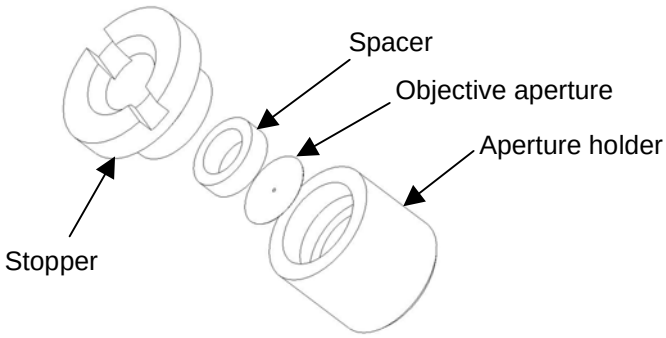
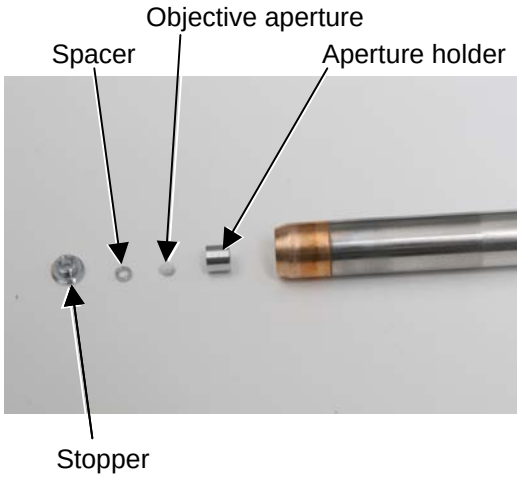


Figure 5.4-6
Disassembling the Objective Aperture Unit

7. Install the objective aperture unit into the liner pipe.
When finished with replacing the objective aperture, use a slotted screwdriver to attach the objective aperture unit to the tip of the liner pipe by performing the reverse procedure of Step **6.** above. Finally, apply a small amount of the supplied vacuum grease by thinly spreading it onto the o-ring on the liner pipe.



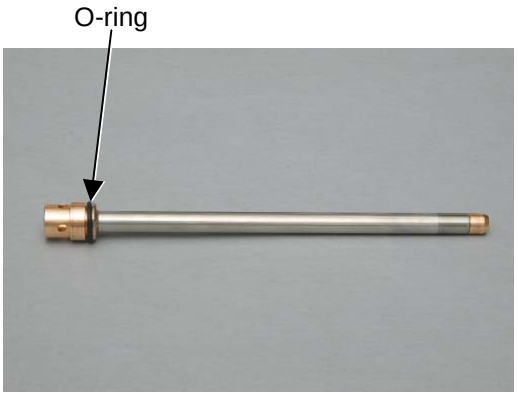


Figure 5.4-7
Objective Aperture Unit and Liner Pipe

Figure 5.4-8 Liner Pipe

8. Install the liner pipe.

Insert the liner pipe into the hole from which it was pulled out, and with fingers push it all the way in.

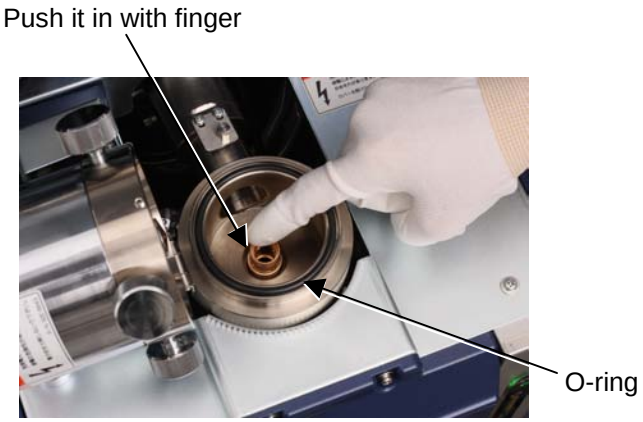


Figure 5.4-9 Installing a Liner Pipe

NOTE : If the liner pipe is not pushed all the way in, the anode cannot be fully inserted, and the EVAC LED (blue) indicator on the front side of the main unit may fail to light up, and observation cannot be conducted.

Insert the liner tube and attach the anode in the reverse procedure of Section 5.3 Steps **5.** - **11.** .
Finally, verify that the o-ring is properly fitted into the groove, and close the electron gun.
Press the [EVAC/AIR] switch to conduct evacuation.
After that, with reference to Section 5.2, perform beam axial adjustments.

5.5 Error Messages

5.5.1 Messages That are Displayed When a Given Application is Started

Listed below are principally error messages that are displayed after an application is started.

＜＜Error Messages List＞＞

Code	Error Message	Countermeasure
1000	Failed to access the memory. Could not start up the application.	Click the [OK] button to close the program. When an access error occurs on the hard disk, this message appears. Make sure PC is normal and the application file has been installed properly.
1001	Memory size is inadequate. Could not start up the application.	Click the [OK] button to close the program. When free space in the hard disk is less than 100 MB, this message appears. Increase the free space to 100 MB or more by deleting unnecessary files.
1004	No USB driver found. Could not start up the application.	Click the [OK] button to close the program. Some of the files required to run this program may be missing. Install the USB driver. For installation of the USB driver, refer to 2.5.4 to 2.5.5 in the instruction manual.
1050	Could not start up the application. Please check "Display Setting".	Click the [OK] button to close the program. This message appears when “display resolution” is not set at 1024 x 768 pixels or more and “display color” is set below 16-bit color level. Change display setting to meet the condition. For display setting, refer to 2.5.6 in the instruction manual.
1080	Failed to access Initial File. Could not start up the application.	Click the [OK] button to close the program. Access to this program is not authorized. Log on to the computer as an Administrator and start the program.

Code	Error Message	Countermeasure
1081	No application files found, or failed to access these files. Could not start up the application.	Click the [OK] button to close the program. If application files access error occurs, this message appears. When the account type into computer is Limited user, switch to the other account as Computer Administrator again. Set the observation window size referring to 2.5.7 in the instruction manual. Then it is possible to start this application for Limited user.
1082	Failed to access User Setting File. Could not start up the application.	Click the [OK] button to close the program. Access to User setting file is not authorized. Log on the computer at an authorization level of Administrator, and set the permissions for the user profiles from the security setting.
1083	Failed to access Temporary Folder. Could not start up the application.	Click the [OK] button to close the program. Access to Temporary folder is not authorized. Log on the computer at an authorization level of Administrator, and set the permissions for the user profiles from the security setting.

5.5.2 Initial Startup Window (During Initialization)

Listed below are principally messages that are displayed when an application is being started (when the initial window is being displayed).

＜＜Error Message List＞＞

Code	Error Message	Countermeasure
1101	The data in Adjust File are wrong. Cannot start up the application.	Click the [OK] button to close the program. Adjustment file “TM_Adjust.ini” contains no data, or some of the data are missing. Copy the adjustment file. For adjustment file copying, refer to 2.5.3 in the instruction manual.
1111	No data found in Initial File. Do you default to start up PC?	Initial file contains no data or some of the data are missing. To start this application in default setting, click the [OK] button, or the [Cancel] button to terminate this application. After the application starts, set observation screen size (referring to 2.5.7 in instruction manual).
1112	The data in Initial File are wrong. Do you default to start up PC?	Initial file contains abnormal data or some of the data are missing. To start this application in default setting, click the [OK] button, and the [Cancel] button to terminate this application. After start of the application, set observation window size (referring to 2.5.7 in instruction manual).
1113	Cannot start up the application. Failed to access Initial File.	If this application could not be started in default setting, this message is displayed. When the account type into computer is Limited user, switch to the other account as Computer Administrator again. Set the observation window size referring to 2.5.7 in the instruction manual. Then it is possible to start this application for Limited user.
1115	Set up the observation screen size when the application has started.	Click the [OK] button to close the program. Set the observation window size. For details, refer to 2.5.7 in the instruction manual.

Code	Error Message	Countermeasure
1120	No User Setting File found. Do you default to start up PC?	User setting file “TM_User.ini” is not found. To start this application in default setting, click the [OK] button, and the [Cancel] button to terminate this application.
1121	No data found in User Setting File. Do you default to start up PC?	User setting file “TM_User.ini” contains no data or some of the data are missing. To start this application in default setting, click the [OK] button, and the [Cancel] button to terminate this application.
1122	The data in User Setting File are wrong. Do you default to start up PC?	User setting file “TM_User.ini” contains abnormal data or some of the data are missing. To start this application in default setting, click the [OK] button, and the [Cancel] button to terminate this application.
1140	Cannot start up the application. Please confirm if PC is supporting USB2.0.	It appears that the port on the PC to which the USB cable is connected is not a USB 2.0 port. To operate the system, use a PC that is compatible with USB 2.0.
1150	Time has run out. Start up the main unit and application again.	A time-out has occurred during start processing. Make sure the USB cable is connected properly and the main power supply is turned on. Restart the system in the following procedure. **1.** Turn off the PC power. **2.** Turn off the main unit power. **3.** Restart the PC. **4.** Turn on the main unit power and start the application. If the same message appears repeatedly after restart of the system, contact the nearest service representative.
1160	Main Power Switch is off, or the USB cable is not connected.	The TM3000 main unit may be de-energized or the USB cable may be disconnected. Restart the system in the following procedure. **1.** Turn off the PC power. **2.** Turn off the main unit power. **3.** Restart the PC. **4.** Turn on the main unit power and start the application. If the same message appears repeatedly after restart of the system, contact the nearest service representative.

5.5.3 Normal Observation Screen

Listed below are principally messages that are displayed when an error is found on the normal observation screen.

＜＜Error Messages List＞＞

Code	Error Message	Countermeasure
1201	Time has run out. The high voltage cannot be applied. Start up the main unit and application again. Contact service if the failure occurs repeatedly.	This message appears if a time-out has occurred during a gradual-increase process of electron beam. This process will be terminated. Restart the system in the following procedure. **1.** Turn off the PC power. **2.** Turn off the main unit power. **3.** Restart the PC. **4.** Turn on the main unit power and start the application. If the same message appears repeatedly after restart of the system, contact the nearest service representative.
1202	The high voltage power supply is wrong. Start up the main unit and application again. Contact service if the failure occurs repeatedly.	Displays the message if an error in the high-voltage power supply unit is found during the application of a high voltage; the program cancels starting the high voltage. Restart the system in the following procedure. **1.** Turn off the PC power. **2.** Turn off the main unit power. **3.** Restart the PC. **4.** Turn on the main unit power and start the application. If the same message appears repeatedly after restart of the system, contact the nearest service representative.

Code	Error Message	Countermeasure
1209	The electron gun or the high voltage power supply stopped due to the failure. Start up the main unit and application again. Contact service if the failure occurs repeatedly.	Abnormality on the high voltage power supply has been detected. It is possible that an emission current greater than 200 µA (an overcurrent) was detected. Click the [OK] button to dismiss the message. Verify that no particles are present at the tip of the filament or in the opening on the Wehnelt, and then restart the system in the following procedure. **1.** Turn off the PC power. **2.** Turn off the main unit power. **3.** Restart the PC. **4.** Turn on the main unit power and start the application. If the same message appears repeatedly after restart of the system, contact the nearest service representative.
1210	The high voltage power supply is wrong. Start up the main unit and application again. Contact service if the failure occurs repeatedly.	Abnormality on the high voltage power supply has been detected. Click the [OK] button to dismiss the message. Restart the system in the following procedure. **1.** Turn off the PC power. **2.** Turn off the main unit power. **3.** Restart the PC. **4.** Turn on the main unit power and start the application. If the same message appears repeatedly after restart of the system, contact the nearest service representative.
1211	The electron gun is wrong. Start up the main unit and application again. Contact service if the failure occurs repeatedly.	An emission current of 7 µA or more has been detected at a filament current of 0.0 A. Click the [OK] button to dismiss the message. Restart the system in the following procedure. **1.** Turn off the PC power. **2.** Turn off the main unit power. **3.** Restart the PC. **4.** Turn on the main unit power and start the application. If the same message appears repeatedly after restart of the system, contact the nearest service representative.

Code	Error Message	Countermeasure
1212	Beam current is too high. Please check the filament setting.	An emission current of 200 µA or more (overcurrent) has been detected during a gradual-increase process of high voltage. Click the [OK] button to dismiss the message. Make sure there are no particles on the filament tip and Wehnelt opening. Also confirm that the specified spacer ring is properly mounted. For filament replacement, refer to 5.1 in the instruction manual.
1213	Beam current is too low. Please check the filament setting.	An emission current level higher than 10 µA or lower than 20µA has been detected during a gradual-increase process of high voltage. Click the [OK] button to dismiss the message. The filament may have burned out. Replace the filament with a new one. For filament replacement, refer to 5.1 in the instruction manual.
1214	The filament has burned out. Or, it is not set right. Please check the filament setting.	An emission current level lower than 10 µA has been detected during a gradual-increase process of high voltage. Click the [OK] button to dismiss the message. Make sure there are no particles on the filament tip and Wehnelt opening. Also, the filament may have burned out. Replace the filament with a new one. For filament replacement, refer to 5.1 in the instruction manual.
1222	Beam current is too high. Please check the filament setting.	An emission current of 200 µA or more (overcurrent) has been detected while the electron beam is being emitted. Click the [OK] button to dismiss the message. Make sure there are no particles on the filament tip and Wehnelt opening. Also confirm that the specified spacer ring is properly mounted. For filament replacement, refer to 5.1 in the instruction manual.

Code	Error Message	Countermeasure
1223	Beam current is too low. Please check the filament setting.	An emission current level higher than 10 µA or lower than 20 µA has been detected while the electron beam is being emitted. Click the [OK] button to dismiss the message. The filament may have burned out. Replace the filament. For filament replacement, refer to 5.1 in the instruction manual.
1224	The filament has burned out. Or, it is not set right. Please check the filament setting.	An emission current level lower than 10 µA has been detected while the electron beam is being emitted. Click the [OK] button to dismiss the message. Make sure there are no particles on the filament tip and Wehnelt opening. Also, the filament may have burned out. Replace the filament with a new one. For filament replacement, refer to 5.1 in the instruction manual.
1231	Time has run out. “Auto Start” cannot be started.	This message appears if a time-out (40 s) has occurred during HV auto start (HV interlink: HV-ON/AFC/ABC). Then, auto start will stop. Click the [OK] button to dismiss the message. Restart the system in the following procedure. **1.** Turn off the PC power. **2.** Turn off the main unit power. **3.** Restart the PC. **4.** Turn on the main unit power and start the application. If the same message appears repeatedly after restart of the system, contact the nearest service representative.
1241	Time has run out. “Condition Setting” cannot be executed.	This message appears if a time-out (60 s) has occurred during setting of beam axis alignment conditions. Then, beam axis alignment stops. Click the [OK] button to dismiss the message. Restart the system in the following procedure. **1.** Turn off the PC power. **2.** Turn off the main unit power. **3.** Restart the PC. **4.** Turn on the main unit power and start the application. If the same message appears repeatedly after restart of the system, contact the nearest service representative.

Code	Error Message	Countermeasure
1242	Was the reference sample set in the center of the stage?	This message appears to confirm that the furnished reference sample is set to the center of specimen stage before start of beam axis alignment. If the specimen is already set, click the [OK] button. Beam axis alignment starts. If the specimen is not yet set, click the [Cancel] button.
1243	After setting the reference sample in the center of the stage, make Beam Axis Alignment again.	This message appears when the “Cancel” button is clicked in response to the message 1242. After setting the furnished reference sample on the specimen stage, retry beam axis alignment.
1244	Do you change the setting for Beam Emission? After the setting, make Beam Axis Alignment.	This message appears when the setting for electron beam emission is changed. Clicking the [OK] button changes the setting. To cancel change, click the [Cancel] button.
1246	Electron gun has been warmed up. Click the Start button.	This message appears when the electron gun has been warmed up normally. Click the [OK] button to dismiss the message. After turning on the electron beam, image observation can be started.
1247	Could not change the setting for Beam Emission.	This message appears when the operation cannot be completed because the HV changes to the off state while the electron beam conditions are being changed.
1249	Time has run out. “Observation Condition” cannot be changed.	This message appears if a time-out (60 s) has occurred while observation conditions are being changed. Click the [OK] button to dismiss the message.
1250	The image observation was stopped. Now ventilating the specimen chamber.	When [HV not Ready] is detected in the HV-ON slow-up condition, the program turns off the HV and displays the message. Click the [OK] button to dismiss the message. Restart the system in the following procedure. **1.** Turn off the PC power. **2.** Turn off the main unit power. **3.** Restart the PC. **4.** Turn on the main unit power and start the application. If the same message appears repeatedly after restart of the system, contact the nearest service representative.

Code	Error Message	Countermeasure
1251	The image observation was stopped. Now ventilating the specimen chamber.	When [HV not Ready] is detected in the HV-ON condition, the program turns off the HV and displays the message. Click the [OK] button to dismiss the message. Restart the system in the following procedure. **1.** Turn off the PC power. **2.** Turn off the main unit power. **3.** Restart the PC. **4.** Turn on the main unit power and start the application. If the same message appears repeatedly after restart of the system, contact the nearest service representative.
1255	“Freeze” condition had continued for 5 minutes or more. The image observation was stopped.	With the HV-ON, to prevent damage to the specimen by the electron beam when a still image is displayed for 5 minutes in the Still Image display mode, the program turns off the electron beam and displays the message. Click the [OK] button to dismiss the message. After turning on the electron beam, image observation can be started.
1256	“SPOT” condition has continued for 4 minutes. Change the mode to the other view modes, otherwise Electron beam will be turned off in one minute.	This message appears when 4 minutes have passed in the “SPOT” mode during electron beam irradiation (HV-ON status). Because the specimen must be protected from beam damage, the electron beam will be turned off in one minute. Click the [OK] button to dismiss the message. After turning on the electron beam, image observation can be started.
1257	“SPOT” condition had continued for 5 minutes or more. The image observation was stopped.	This message appears when 5 minutes have passed in the “SPOT” mode during electron beam irradiation (HV-ON status). Because the specimen must be protected from beam damage, the electron beam was turned off. Click the [OK] button to dismiss the message. After turning on the electron beam, image observation can be started.

Code	Error Message	Countermeasure
1265	The image is being observed. Do you shut down the application?	When shutdown of the application was tried during electron beam irradiation (HV-ON status), this message will open to confirm your intention of shutdown. If you click the [OK] button, the electron beam will be turned off and the application will be shutdown. If you click the [Cancel] button, the shutdown will be canceled.
1301	Time has run out. “Auto B/C Adjustment” cannot be executed.	This message appears if a time-out (50 s) has occurred during auto B/C adjustment. Auto B/C adjustment stops, and brightness and contrast are reset to the levels before this adjustment. If auto B/C adjustment remains unsuccessful, brightness and contrast should be adjusted manually.
1311	Time has run out. “Auto Focus” cannot be executed.	This message appears if a time-out (50 s) has occurred detected during auto focus. Auto focus stops, and focus condition is reset to the level before auto focus. If auto focus remains unsuccessful, manual focus adjustment is required.
1390	The focus position is not within a proper range. Adjust the specimen stub height to proper height.	This message appears when the following condition lasts for 2 minutes; electron beam is projected (HV-ON status) and focus position is not proper because the specimen holder position is too low. Click the [OK] button to dismiss the message. Stop image observation once and readjust the height of specimen holder properly. For specimen preparation and height adjustment, refer to 4.2.2 in the instruction manual.
1395	The focus position is not within the proper range. Adjustment of the specimen stub height is recommended. Do you continue the processing?	This confirmation message appears if the focus position is not proper for this operation (causing a large magnification error) while trying to perform quick save, standard save or digital zoom. Clicking the [OK] the button continues the current process; clicking the [Cancel] button cancels the process. It is recommended to stop image observation once and readjust the height of specimen holder properly. For specimen preparation and height adjustment, refer to 4.2.2 in the instruction manual.

Code	Error Message	Countermeasure
1401	Time has run out. “Image Capture” cannot be executed. Start up the main unit and application again. Contact service if the failure occurs repeatedly.	This message appears if a time-out (50 s) has occurred during image capturing. Image capturing stops and the view mode returns to the one before the image capturing. If the message appears repeatedly, contact the nearest service representative.
1411	Time has run out. “Quick Save” cannot be executed. Start up the main unit and application again. Contact service if the failure occurs repeatedly.	This message appears if a time-out (30 s) has occurred during quick saving. Quick saving stops and the view mode returns to the one before the quick saving. If the message appears repeatedly, contact the nearest service representative.
1420	Something wrong in Disk. Failed to save the image. Start up the main unit and application again. Contact service if the failure occurs repeatedly.	Access to the hard disk or data saving medium failed during image data saving. Image could not be saved normally. Click the [OK] button to dismiss the message. Restart the system in the following procedure. **1.** Turn off the PC power. **2.** Turn off the main unit power. **3.** Restart the PC. **4.** Turn on the main unit power and start the application. If the same message appears repeatedly after restart of the system, contact the nearest service representative.
1421	Memory size is inadequate. Failed to save the image.	This message appears when free space of the hard disk or data saving medium is not adequate for image data saving. Image could not be saved normally. Click the [OK] button to dismiss the message. Secure adequate free space in the hard disk or data saving medium.
1422	The same File Name has been found. Do you replace it by a new file?	A file with the same name as the one you want to save as is found in the destination folder to save. Click the [OK] button to overwrite the existing file with the new one. If the [Cancel] button is clicked, the data saving window reappears.

Code	Error Message	Countermeasure
1423	Memory size is inadequate. Change the destination of an image to save.	During image data saving, it was detected that a free space in the hard disk or data saving medium is not adequate. Image could not be saved normally. Click the [OK] button to dismiss the message. Secure an adequate free space in the hard disk or data saving medium. Saving image data requires approximately 350 kB for quick save, and approximately 1.3 MB for standard save (in the case of BMP format images).
1425	File Name is not valid. Use a different File Name.	The following characters such as ¥, /, :, ;, *, ?, “, <, >, |, !, ‘, or & cannot be used for file names. Clicking the [OK] button displays the data saving window again. Save the image by renaming the file.
1430	The image cannot be saved directly from a shared network folder. Assigning a drive letter to the connection is required to save the image using My Computer.	This message appears if you attempt to save an image directly from My Network. Clicking the [OK] button displays the data saving window again. No image can be saved directly from My Network. For image saving, assign a network drive on My Computer and specify the network drive on the data saving window.
1450	Failed to save the image.	Image saving failed because any error occurred during image saving. Click the [OK] button to dismiss the message. Make sure the saving destination allows your access and it is not write-protected (not a read-only memory). If the same error reoccurs, contact the nearest service representative.
1470	Added items exceed the maximum number of the items that can be added on an image. No more items can be added.	This message appears when the number of data items exceeds 50. Click the [OK] button to dismiss the message. To add new items, delete unnecessary items first.
1471	Proceeding with this operation will delete all the items. Do you want to delete?	This message appears to confirm the operation. Clicking the [OK] button deletes all items, and clicking the [Cancel] button cancels the operation.

Code	Error Message	Countermeasure
1510	Cannot evacuate. Check if the stage is closed right. Check if the diaphragm pump is working. Start up the main unit and application again. Contact service if the failure occurs repeatedly.	A time-out (120 s) has occurred during evacuation. Click the [OK] button to dismiss the message. Restart the system in the following procedure. **1.** Turn off the PC power. **2.** Turn off the main unit power. **3.** Restart the PC. **4.** Turn on the main unit power and start the application. Make sure the specimen stage and the electron gun are securely closed. Turn on power for the main unit while pressing the electron gun against the specimen stage. Also, make sure the vacuum tube for the diaphragm pump is not bent or kinked.
1511	The rotation speed of TMP does not reach the normal level. Check if there is no vacuum leakage. Start up the main unit and application again. Contact service if the failure occurs repeatedly.	A time-out (300 s) has occurred during evacuation. Click the [OK] button to dismiss the message. Restart the system in the following procedure. **1.** Turn off the PC power. **2.** Turn off the main unit power. **3.** Restart the PC. **4.** Turn on the main unit power and start the application. Make sure the specimen stage and the electron gun are securely closed, and no particles, such as dust, are trapped.
1512	The vacuum does not reach the normal level. Check if there is no vacuum leakage. Start up the main unit and application again. Contact service if the failure occurs repeatedly.	A time-out (300 s) has occurred during evacuation. Click the [OK] button to dismiss the message. Restart the system in the following procedure. **1.** Turn off the PC power. **2.** Turn off the main unit power. **3.** Restart the PC. **4.** Turn on the main unit power and start the application. One of the following factors has occurred: the specimen chamber is under 1Pa, the TMP READY signal is not on, or the required rpm for the TMP has not been attained. If the same message appears repeatedly after restart of the system, contact the nearest service representative.

Code	Error Message	Countermeasure
1513	TMP stopped due to the exceeded temperature or current. Check if the diaphragm pump is working right and there is no vacuum leakage. Start up the main unit and application again. Contact service if the failure occurs repeatedly.	Turn off the power switches for the PC and the control unit; let the system stand inactive for about 1 hour to cool down. Also, check the following items **1.** to **4.** : **1.** The room temperature is 35°C or below. **2.** The vacuum tube is not bent or kinked. **3.** The o-ring contact surface of the specimen stage is free of particles. **4.** The o-ring contact surface of the electron gun is free of particles. Restart the system in the following procedure. **1.** Turn off the PC power. **2.** Turn off the main unit power. **3.** Restart the PC. **4.** Turn on the main unit power and start the application. If the message appears repeatedly, contact the nearest service representative.
1514	The vacuum does not reach 3,000Pa. Check if there is any vacuum leakage. Start up the main unit and application again. Contact service if the failure occurs repeatedly.	A time-out (120 s) has occurred after the TMP was started. Click the [OK] button to dismiss the message. Restart the system in the following procedure. **1.** Turn off the PC power. **2.** Turn off the main unit power. **3.** Restart the PC. **4.** Turn on the main unit power and start the application. Make sure the specimen stage and the electron gun are securely closed, and no particles, such as dust, are trapped.
1520	The cooling fan of TMP stopped. Start up the main unit and application again. Contact service if the failure occurs repeatedly.	Either the FAN that cools the TMP is not running due to a malfunction or the F11 or F9 fuse on the IO-DRV00 board is blown. If the same message appears repeatedly after restart of the system, contact the nearest service representative.
1521	The cooling fan in Main Unit stopped. Start up the main unit and application again. Contact service if the failure occurs repeatedly.	Either the FAN (one of the two fans) that cools the system is not running due to a malfunction or the F4, F10, or F9 fuse on the IO-DRV00 board is blown. If the same message appears repeatedly after restart of the system, contact the nearest service representative.

Code	Error Message	Countermeasure
1530	Evacuation System is wrong. Start up the main unit and application again. Contact service if the failure occurs repeatedly.	This message appears when the evacuation SEQ did not run successfully due to an error other than the above (1510 ~ 1514) in the evacuation system. If the same message appears repeatedly after restart of the system, contact the nearest service representative.
1570	The power supply of -15V for VA was shut down. Start up the main unit and application again.	An overcurrent in the power supply or a blown fuse (F5 on the CONTROL0 board) was found. Click the [OK] button to dismiss the message. Restart the main unit. If the message appears repeatedly, contact the nearest service representative.
1571	The power supply of +15V for VA was shut down. Start up the main unit and application again.	An overcurrent in the power supply or a blown fuse (F4 on the CONTROL0 board) was found. Click the [OK] button to dismiss the message. Restart the main unit. If the message appears repeatedly, contact the nearest service representative.
1572	The power supply of -15V for SG was shut down. Start up the main unit and application again.	An overcurrent in the power supply or a blown fuse (F3 on the CONTROL0 board) was found. Click the [OK] button to dismiss the message. Restart the main unit. If the message appears repeatedly, contact the nearest service representative.
1573	The power supply of +15V for SG was shut down. Start up the main unit and application again.	An overcurrent in the power supply or a blown fuse (F2 on the CONTROL0 board) was found. Click the [OK] button to dismiss the message. Restart the main unit. If the message appears repeatedly, contact the nearest service representative.
1574	The power supply of +24V was shut down. Start up the main unit and application again.	An overcurrent in the power supply or a blown fuse (on the IO-DRV00 board, F5, F6, F7, F8, or F9, or more than one fuse) was found. Click the [OK] button to dismiss the message. Restart the main unit. If the message appears repeatedly, contact the nearest service representative.

Code	Error Message	Countermeasure
1575	The power supply of +18V for C2 was shut down. Start up the main unit and application again.	An overcurrent in the power supply or a blown fuse (F14 on the COLHVC00 board) was found. Click the [OK] button to dismiss the message. Restart the main unit. If the message appears repeatedly, contact the nearest service representative.
1576	The power supply of +18V for C1 was shut down. Start up the main unit and application again.	An overcurrent in the power supply or a blown fuse (F13 on the COLHVC00 board) was found. Click the [OK] button to dismiss the message. Restart the main unit. If the message appears repeatedly, contact the nearest service representative.
1577	The power supply of +18V for OBJ was shut down. Start up the main unit and application again.	An overcurrent in the power supply or a blown fuse (F12 on the COLHVC00 board) was found. Click the [OK] button to dismiss the message. Restart the main unit. If the message appears repeatedly, contact the nearest service representative.
1578	The power supply of -15V for STG was shut down. Start up the main unit and application again.	An overcurrent in the power supply or a blown fuse (F11 on the COLHVC00 board) was found. Click the [OK] button to dismiss the message. Restart the main unit. If the message appears repeatedly, contact the nearest service representative.
1579	The power supply of +15V for STG was shut down. Start up the main unit and application again.	An overcurrent in the power supply or a blown fuse (F10 on the COLHVC00 board) was found. Click the [OK] button to dismiss the message. Restart the main unit. If the message appears repeatedly, contact the nearest service representative.
1580	The power supply of -15V for DEF was shut down. Start up the main unit and application again.	An overcurrent in the power supply or a blown fuse (F9 on the COLHVC00 board) was found. Click the [OK] button to dismiss the message. Restart the main unit. If the message appears repeatedly, contact the nearest service representative.

Code	Error Message	Countermeasure
1581	The power supply of +15V for DEF was shut down. Start up the main unit and application again.	An overcurrent in the power supply or a blown fuse (F8 on the COLHVC00 board) was found. Click the [OK] button to dismiss the message. Restart the main unit. If the message appears repeatedly, contact the nearest service representative.
1582	The power supply of +12V for HVT was shut down. Start up the main unit and application again.	An overcurrent in the power supply or a blown fuse (F7 on the COLHVC00 board) was found. Click the [OK] button to dismiss the message. Restart the main unit. If the message appears repeatedly, contact the nearest service representative.
1583	The power supply of -15V for HVC was shut down. Start up the main unit and application again.	An overcurrent in the power supply or a blown fuse (F6 on the COLHVC00 board) was found. Click the [OK] button to dismiss the message. Restart the main unit. If the message appears repeatedly, contact the nearest service representative.
1584	The power supply of +15V for HVC was shut down. Start up the main unit and application again.	An overcurrent in the power supply or a blown fuse (F5 on the COLHVC00 board) was found. Click the [OK] button to dismiss the message. Restart the main unit. If the message appears repeatedly, contact the nearest service representative.
1600	The amount of the image shift movement exceeds 50 um. Reset the image shift, and move the stage.	The message appears when the image shift did not proceed to a specified position. Click the [OK] button to dismiss the message. The range over which the FOV can be moved by image shift is limited; if the FOV cannot be move further, press the [Reset] button once, and use the XY knob to move the FOV to conduct an observation.
1611	Time has run out. “Stage initialized” cannot be executed. Start up the main unit and application again. Contact service if the failure occurs repeatedly.	This message appears if a time-out (300 s) has occurred during the initialization of the motor stage. Click the [OK] button to dismiss the message.

Code	Error Message	Countermeasure
1690	The instruction manual does not exist. Install the instruction manual.	This message appears if the TM3000 manual (in PDF format) is not installed on the PC, preventing the display of the manual. Install the TM3000 manual from the supplied Manual CD.
1691	The instruction manual cannot be displayed. Confirm if the PDF file browser has been installed.	This message appears if the PDF file read software (Adobe Acrobat Reader) not installed on the PC, preventing the display of the manual. Install the PDF file read software (Adobe Acrobat Reader) from the supplied Manual CD.
1706	Observation screen size is changed. Do you save this setting?	This confirmation message appears when the [Close] button is clicked without clicking the [SET] button after changing the observation screen size. Clicking the [OK] button changes the size and closes the [Setup] screen. Clicking the [Cancel] button closes the [Setup] screen without changing the size.
1707	The input value of the observation screen size is unacceptable. This size returns to the previous registered value.	This message appears when the observation screen size that was entered is out of range. Clicking the [OK] button resets the observation screen size to the currently stored settings.
1720	Re-starting up the program is required for changing the language. Do you exit the application?	This message appears when the modification of display language is selected. Clicking the [OK] button applies the change in display language and starts the termination processing. Clicking the [Cancel] button cancels the modification of display language.
1721	Re-starting up the program is required for changing the option setting. Do you exit the application?	This message appears when option settings are modified. Clicking the [OK] button applied the change in option settings and starts the termination processing. Clicking the [Cancel] cancels the modification of option settings.
1735	It is time to maintain the Turbo Molecular Pump. It is recommended to replace it with a new one.	This message appears when the turbo molecular pump run time has reached a specified limit (720 hours). Click the [OK] button to dismiss the message.

Code	Error Message	Countermeasure
1736	It is time to maintain the Diaphragm Pump. It is recommended to replace it with a new one.	This message appears when the diaphragm pump run time has reached a specified limit (720 hours). Click the [OK] button to dismiss the message.
1800	Main Power Switch is off, or the USB cable is not connected.	This message appears when the power supply for the SEM main unit is OFF or a communication error is detected due to an unplugged USB cable. Click the [OK] button to dismiss the message.

5.5.4 Wait Message Window

These messages are principally displayed during the processing of an application.

＜＜Error Messages List＞＞

Code	Error Message	Countermeasure
1200	Now turning on accelerating voltage. Please wait.	This [Wait] message appears when the HV-ON ramp-up is started. The [Wait] message is dismissed when the HV-ON state is set or the [Cancel] button is clicked.
1230	“Auto Start” is activated. Please wait.	This [Wait] message appears when the HV auto start operation (HV interlock: HV-ON/AFC/ABC) is started. The [Wait] message is dismissed when AFC or ABC is finished in the HV-ON state is set, or the [Cancel] button is clicked.
1240	Now changing the setting for electron beam. Please wait.	This [Wait] message appears when the setting of beam axis adjustment conditions is started. The [Wait] message is dismissed upon completion of beam axis adjustment settings or when an internal cancellation processing occurs.
1245	Now warming up Electron Gun as it is humid. Please wait. (It takes about 3 minutes.)	This [Wait] message appears when the warming up of the electron gun is started. The [Wait] message is dismissed upon termination of the electron gun warm-up process or when the [Cancel] button is clicked.
1248	Now changing the setting for Observation Condition. Please wait.	This [Wait] message appears when the modification of observation conditions is started. The [Wait] message is dismissed upon termination of the modification of observation conditions or when an internal cancellation processing occurs.
1300	“Auto B/C Adjustment” is activated. Please wait.	This [Wait] message appears when an auto B/C adjustment is started. The [Wait] message is dismissed upon termination of the auto B/C adjustment process.

Code	Error Message	Countermeasure
1310	“Auto Focus” is activated. Please wait.	This [Wait] message appears when auto focusing is started. The [Wait] message is dismissed upon completion of auto focusing or when the [Cancel] button is clicked.
1400	Now capturing the image. Please wait.	This [Wait] message appears when capture save is started. The [Wait] message is dismissed upon termination of the capture process, resulting in a Freeze state or when the [Cancel] button is clicked.
1410	Now quick saving the image. Please wait.	This [Wait] message appears when memory save is started. The [Wait] screen is dismissed when a Freeze state arises when the [Cancel] button is clicked.
1550	Now evacuating the specimen chamber. Please wait.	This [Evacuation Wait] message appears when the EVAC button is selected. The progress bar indicates the current progress in the evacuation process, based on the value of the Pi gauge. The [Evacuation Wait] message is dismissed if the SEQ processing is successful and a HV Ready condition is detected. Also, the [Evacuation Wait] message is dismissed and a message screen appears when an error is found during the SEQ processing.
1560	Now ventilating the specimen chamber. Please wait.	This [Evacuation Wait] message appears when the AIR button is selected. The progress bar indicates the current progress in opening the specimen chamber to air, based on the value of the Pi gauge. The [Evacuation Wait] message is dismissed if the SEQ processing is successful and an Air condition is detected. Also, the [Evacuation Wait] screen is dismissed and a message screen appears when an error is found during the SEQ processing.

Code	Error Message	Countermeasure
1610	Now initializing the stage unit. Please wait.	This [Wait] message appears during the initialization of the motor drive stage system. This [Wait] message is dismissed upon termination of the initialization of the stage system.

5.5.5 Termination Process

These are principally messages that are displayed upon termination of an application.

＜＜Error Message List＞＞

Code	Error Message	Countermeasure
1900	Do you close the application?	A termination confirmation message appears. Clicking the [OK] button starts the termination process; the [Cancel] button cancels the termination process.
1950	Now closing the application. Please wait.	A message indicating a termination process is in progress appears. The mouse cursor changes to an hour glass. This screen is dismissed when the Main Operation screen appears.

6 REPLACEMENT PARTS

6.1 Consumables

Obtain the following consumables as needed to operate the system. (See Table 6.1.)

Table 6.1 Consumables

Part No.	Part Name	Usage	Notes
G370009	Electrically conductive coating	To prevent charge on nonconductive specimen	30 g pack
50E-6159	Carbon seal	Fixing specimen	20 sheet pack
52E-6656	Metal abrasive	For vacuum parts cleaning	10 g pack
G743002	Bamboo sticks	For vacuum parts cleaning	10 sticks per package
S370057	Gauze	For vacuum parts cleaning	—
S269003	Aluminum foil	For vacuum parts cleaning	—
50E-1991	Vacuum grease	For vacuum sealing	—
52E-1602	Objective aperture plate	0.15 mm diameter	1 piece
535-1289	Mono-porosity mesh (made of MO)	For focusing aperture	20 sheet pack
51E-0240	Cartridge Filament	Filament	10 piece pack
—	Ethyl alcohol	For vacuum parts cleaning	—
52E-6657	Fitting gloves	For vacuum parts handling	—
55E-1122	Objective lens unit	For objective aperture	—
55E-1123	Liner Tube	For focusing aperture	—

6.2 Limited Life Parts

The parts which are regarded as limited life parts (See Table 6.2) must be replaced in the specified interval. If the system is continuously used without properly replacing the limited life parts, it may not only damage the system but cause safety problems. Contact the nearest service office to schedule the replacements.

Table 6.2 Limited Life Parts List

Part No.	Part Name	Usage	Replacement Interval
55E-1275	P Turbo molecular pump	Turbo molecular pump	5 years
52E-6688	DFP maintenance kit	For DFP maintenance	5 years
55E-1642	SR exhaust tube N assy	Exhaust tube between turbo molecular pump and diaphragm pump	5 years
55E-1692	Exhaust tube	Exhaust tube and sealing component between turbo molecular pump and specimen chamber	5 years
K433004	Pirani gauge	Vacuum level measurement detector	3 years
51E-1492	Element	Leak valve (V1) filter	5 years
55E-1317	Element (5)	Slow leak valve (V2) filter	5 years
55E-1171	Spring	Specimen stage (For lock nut)	4 years
52E-6980	Diaphragm pump	Evacuation System	5 years
55E-1118	Deflection coil	Column	5 years
55E-2810	ACWHND00SP assy	—	5 years
55E-2811	CONTROL0SP assy	—	5 years
55E-2812	COLHVC00SP assy	—	5 years
55E-2803	5CHAMP00SP assy	—	5 years
55E-2814	IO-DRV00SP assy	—	5 years
55E-2805	LED00SP assy	—	5 years
55E-2806	ISAL00SP assy	—	5 years
55E-2807	TMPMCONT00SP assy	—	5 years
55E-2808	REGOUT00SP assy	—	5 years
55E-2835	HVT SP assy	—	5 years
55E-2602	NF cord assy	—	5 years

Table 6.2 Limited Life Parts List (Continued)

Part No.	Part Name	Usage	Replacement Interval
55E-2611	Electron gun SW cord assy	—	5 years
55E-2612	EVAC SW cord assy	—	5 years
55E-2321	V1 cord assy	—	5 years
55E-2322	V2 cord assy	—	5 years
55E-2324	V3 cord assy	—	3 years
55E-2326	FAN1 assy	—	3 years
55E-2327	FAN2 assy	—	3 years
55E-2339	TMP cord assy	—	5 years
55E-2340	FAN3 assy	—	3 years
55E-2355	ELB_EG32AC	—	5 years
55E-2358	C lens cord assy	—	5 years
55E-2359	OBJ lens cord assy	—	5 years
55E-2375	AL coil assy	—	5 years
55E-2354	Multi-channel DC power supply	—	5 years

The number of years listed in the Replacement Interval column does not represent the warranty period.
Although the lifespan for limited life parts may vary depending on how the system is used, perform replacement based on the specified replacement interval.
Contact a Hitachi service office to schedule the replacements. The customer must not perform the replacement.

6.3 Spare Parts

The spare parts shown below must be obtained when the system is operated for a long time. The number of spare parts you need to stock differs depending on your usage. (See Table 6.3.)

Table 6.3 Spare Parts

Part No.	Name	Remarks	Quantity Used
J821153	Fuse	For maintenance (0.3 A)	2
J821154	Fuse	For maintenance (0.5 A)	2
J821156	Fuse	For maintenance (1.6 A)	2
J821157	Fuse	For maintenance (2 A)	2
J821158	Fuse	For maintenance (3.2 A)	2
J821159	Fuse	For maintenance (5 A)	2
J821591	Alarm Fuse	For maintenance (2 A)	2
J821594	Alarm Fuse	For maintenance (5 A)	2
J821055	Fuse	For maintenance (6.3 A)	2
55E-1392	Specimen stage	∅70 mm	—
55E-1682	Specimen stage	∅30 mm	—
L456819	O-ring	For electron gun	1
L456111	O-ring	For inner pipe	1
L456850	O-ring	For specimen chamber port (front)	1
L456824	O-ring	For specimen chamber port (side)	1

REQUIREMENTS FOR CONFORMITY

1. For the Customer in the EU Area

This instrument requires the following conditions to conform with the LVD directive and EMC directive of the EU.

(1) Connect to the power supply with the below specifications

Power voltage: Single phase 100 – 240 V (Min. 90 V, Max. 250 V)
Frequency : 50/60 Hz
Capacity : 500 VA
Grounding resistance of less than 100 Ω

2. For the Customer Except for the EU Area

CE Marking is not applied.

DECLARATION OF CONFORMITY

We, Hitachi High-Technologies Corporation
882 Ichige, Hitachinaka-shi, Ibaraki-ken,
312-8504 Japan

declare under our sole responsibility that the product:

Product: Tabletop Microscope
Model: TM3000

to which this declaration relates is in conformity with the following Directives and Standards:

Council Directives: EMC Directive 2006/95/EC
Applicable Standards: EN61326-1: 2006 Class A
EN61010-1: 2001

CE Marking is affixed in 2010.

Authorized representative in EU:

Name: Hitachi High-Technologies Europe GmbH
Address: Europark Fichtenhain A12, 47807 Krefeld,
F. R. Germany

Place: Japan
Date: Mar 2, 2010

Masanori Maki
Senior Engineer
Quality Assurance Dept.

P/N 55E-7750