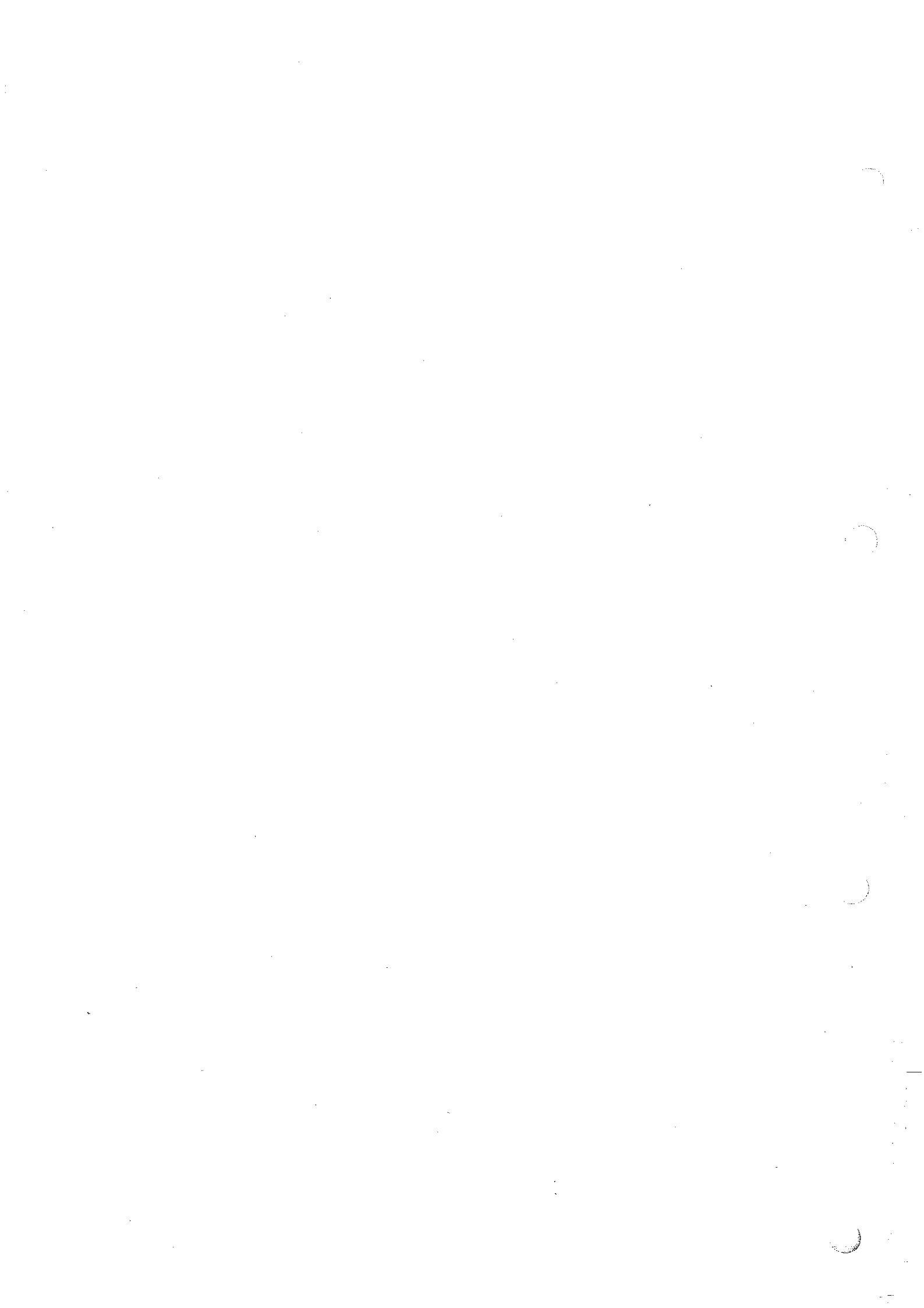


**JSM-IT300, JSM-IT300LV**  
**JSM-IT300A, JSM-IT300LA**

**SCANNING ELECTRON MICROSCOPE**  
**ANALYTICAL SCANNING ELECTRON MICROSCOPE**

Please be sure to read this instruction manual carefully, and fully understand its contents prior to the operation or maintenance for the proper use of the instrument.



## NOTICE

- This instrument generates, uses, and can radiate the energy of radio frequency and, if not installed and used in accordance with the instruction manual, may cause harmful interference to the environment, especially radio communications.
- The following actions must be avoided without prior written permission from JEOL Ltd. or its subsidiary company responsible for the subject (hereinafter referred to as "JEOL"): modifying the instrument; attaching products other than those supplied by JEOL; repairing the instrument, components and parts that have failed, such as replacing pipes in the cooling water system, without consulting your JEOL service office; and adjusting the specified parts that only field service technicians employed or authorized by JEOL are allowed to adjust, such as bolts or regulators which need to be tightened with appropriate torque. Doing any of the above might result in instrument failure and/or a serious accident. If any such modification, attachment, replacement or adjustment is made, all the stipulated warranties and preventative maintenances and/or services contracted by JEOL or its affiliated company or authorized representative will be void.
- Replacement parts for maintenance of the instrument functionality and performance are retained and available for five years from the date of installation. Thereafter, some of those parts may be available for a certain period of time, and in this case, an extra service charge may be applied for servicing with those parts. Please contact your JEOL service office for details before the period of retention has passed.
- In order to ensure safety in the use of this instrument, the customer is advised to attend to daily maintenance and inspection. In addition, JEOL strongly recommends that the customer have the instrument thoroughly checked up by field service technicians employed or authorized by JEOL, on the occasion of replacement of expendable parts, or at the proper time and interval for preventative maintenance of the instrument. Please note that JEOL will not be held responsible for any instrument failure and/or serious accident occurred with the instrument inappropriately controlled or managed for the maintenance.
- After installation or delivery of the instrument, if the instrument is required for the relocation whether it is within the facility, transportation, resale whether it is involved with the relocation, or disposition, please be sure to contact your JEOL service office. If the instrument is disassembled, moved or transported without the supervision of the personnel authorized by JEOL, JEOL will not be held responsible for any loss, damage, accident or problem with the instrument. Operating the improperly installed instrument might cause accidents such as water leakage, fire, and electric shock.
- The information described in this manual, and the specifications and contents of the software described in this manual are subject to change without prior notice due to the ongoing improvements made in the instrument.
- Every effort has been made to ensure that the contents of this instruction manual provide all necessary information on the basic operation of the instrument and are correct. However, if you find any missing information or errors on the information described in this manual, please advise it to your JEOL service office.
- In no event shall JEOL be liable for any direct, indirect, special, incidental or consequential damages, or any other damages of any kind, including but not limited to loss of use, loss of profits, or loss of data arising out of or in any way connected with the use of the information contained in this manual or the software described in this manual. Some countries do not allow the exclusion or limitation of incidental or consequential damages, so the above may not apply to you.
- This manual and the software described in this manual are copyrighted, all rights reserved by JEOL and/or third-party licensors. Except as stated herein, none of the materials may be copied, reproduced, distributed, republished, displayed, posted or transmitted in any form or by any means, including, but not limited to, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of JEOL or the respective copyright owner.
- When this manual or the software described in this manual is furnished under a license agreement, it may only be used or copied in accordance with the terms of such license agreement.

### Copyright © 2016 JEOL Ltd.

- In some cases, this instrument, the software, and the instruction manual are controlled under the "Foreign Exchange and Foreign Trade Control Law" of Japan in compliance with international security export control. If you intend to export any of these items, please consult JEOL. Procedures are required to obtain the export license from Japan's government.

### TRADEMARK

- Microsoft and Windows are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.
- All other company and product names are trademarks or registered trademarks of their respective companies.

### SELLING

JEOL Ltd.

1-2, Musashino 3-chome, Akishima, Tokyo 196-8558 Japan  
Telephone: 81-42-543-1111 Facsimile: 81-42-546-3353

URL: <http://www.jeol.co.jp/>

### MANUFACTURE

JEOL TECHNICS Ltd.

6-38 Musashino 2-chome, Akishima-Shi, Tokyo, 196-0021 Japan

Note: For servicing and inquiries, please contact your JEOL service office.





*Please be sure to read carefully the following Software License Agreement before using the software supplied by JEOL Ltd. If you do not agree to the terms and conditions of the Agreement, please do not use the software and contact JEOL Ltd.*

A rectangular box with a dark, textured background. The words "Software License Agreement" are written in a white, serif font, stacked vertically in the upper right corner of the box.

Software  
License  
Agreement

This Software License Agreement is made and entered into by and between you, the end-user customer, and JEOL Ltd. (hereinafter referred to as JEOL) in witness of agreement between both parties upon licensing of the right to use the software (which is hereinafter referred to as the Licensed Software) owned by JEOL.

**Article 1. (Right to Use Licensed Software)**

"Right to Use the Licensed Software" means your right to use the Licensed Software in the country where the JEOL product you purchased is installed (hereinafter referred to as Country of Installation).

**Article 2. (Grant of License)**

JEOL grants you the non-exclusive and non-assignable right to use the Licensed Software in the Country of Installation.

You may install and use the Licensed Software on a single computer limiting the purpose to carrying out of your job.

You may not cause any third party to use the Licensed Software by establishing a sublicense or other means, and shall not disclose the Licensed Software to any third party.

You may not take the Licensed Software out of the Country of Installation under any circumstances.

**Article 3. (Prohibition of Assignment and Other Acts)**

1. You may not assign, rent or lease the right to use the Licensed Software, disclose the content of the right, or transfer possession of the Licensed Software to any third party.

You may not modify, translate, carry out reverse engineering, decompile, and disassemble the Licensed Software in whole or in part.

**Article 4. (Prohibition of Reproduction)**

You may not reproduce the whole or any part of the Licensed Software.

**Article 5. (Rights to Licensed Software)**

All rights related to the Licensed Software including copyrights belong to JEOL.

**Article 6. (Warranty)**

1. JEOL does not guarantee proper performance of the Licensed Software if it is modified or translated.

JEOL does not warrant that the Licensed Software is free from defects or fit and useful for your particular purpose.

**Article 7. (Exemption from Liability)**

JEOL shall not be liable for any damages or losses incurred by you or any third party or for any claim of a third party against you arising out of or in relation to the use of the Licensed Software.

**Article 8. (Confidentiality)**

You shall keep confidential the content of the Licensed Software supplied hereunder by JEOL and the terms and conditions of this Agreement, and shall not divulge or disclose them to any third party without the prior written consent of JEOL.

**Article 9. (Term of Validity)**

1. This Agreement shall become effective as of the day you accept the terms hereof and so remain unless it is terminated pursuant to the next Article.

Notwithstanding the item above, the provisions set forth in the Article 8 (Confidentiality) shall remain effective even after the termination hereof.

**Article 10. (Termination)**

In any of the following event, JEOL may forthwith terminate this Agreement by so notifying you without any prior notification and may claim the damages incurred:

- (1) Any breach on your part of any of the provisions hereof,
- (2) Occurrence of seizure or provisional seizure or provisional injunction on your property; auctioning of your property; bankruptcy, corporate liquidation, and filing for corporate reorganization on your part; or proceedings taken against you for collection of tax delinquency.

**Article 11. (Steps to Be Taken after Termination)**

Upon the termination of this Agreement pursuant to the Item 1 of Article 9 and Article 10, you shall destroy the Licensed Software and notify JEOL of such destruction.

**Article 12. (Discussion in Good Faith)**

Matters not stipulated herein shall be discussed in good faith and settled between you and JEOL.

# WARRANTY INFORMATION

## 1. Limited Warranty

Products manufactured by JEOL Ltd. (hereafter "JEOL products") that fail under normal use by the customer during the warranty period will be repaired or replaced, at JEOL's discretion, without charge.

The components, modules and devices that are provided as replacements will be new parts or refurbished parts that provide the same performance as new parts. All components, modules and devices removed under this warranty become the property of JEOL.

### 1.1 Applicable Products

- This warranty applies only to hardware and software products manufactured by JEOL Ltd.
- For components that are not JEOL products, such as the computer, HDD, memory device, and the like, the warranty provisions of the respective manufacturers shall apply.

### 1.2 Warranty Period

- In the case of products for which the warranty period is recorded in the contract documentation, the recorded warranty period shall take precedence.
- If not specifically stated elsewhere, the warranty period is 12 months or a separately specified period from the date on which the acceptance test is completed after delivery to the customer.
- For components that are not JEOL products, like the computer, HDD, memory device, and the like, the warranty start date shall be the date on which the acceptance test is completed after delivery to the customer and the warranty periods established by the respective makers shall apply.
- In the event that parts are replaced or repaired free of charge during the warranty period, there is no change to the warranty start date or the warranty period for the product.

### 1.3 Scope of the Warranty

#### ■ Failure diagnosis

If a problem occurs, contact your JEOL service office and describe the conditions and content of the problem. JEOL will assess the problem based on the situation and content of the problem.

#### ■ Repair method

If it is determined that the problem is caused by a fault or defect of a JEOL product, repair or replacement will be performed free of charge. The choice of whether to repair or replace a component is entirely at the discretion of JEOL.

#### ■ Warranty exclusions

This limited warranty does not extend to products for which any of the following situations apply. Even within the warranty period, in the situations listed below, a fee will be charged to repair the product.

- Product is operated or stored in an environment or under conditions that do not satisfy the specified installation requirements.
- The installation environment has changed (temperature, humidity, magnetic fields, etc.) since the time of installation.
- There is significantly accelerated deterioration of components and/or corrosion of electrical circuitry as a result of exposure to extreme temperature, humidity, or an environment containing highly-corrosive gases or excessive dust.
- The quality of the utilities (including electricity, water, gas, air quality) has worsened.
- The customer has relocated an installed instrument.
- Even in the case of a portable or movable instrument designed to be transported to a remote location or moved around for use by the user, damage or failures caused during the instrument relocation by the customer.
- Product has not been properly maintained.

- Consumable items or parts with the specified replacement period have not been replaced as specified.
- Corrupted operating system or application software, or damaged computer used with the instrument, caused by shutting down the main power to the computer without performing the proper shutdown sequence.
- Products that have been disassembled, modified or repaired by the customer in ways other than those specified in the instruction manuals provided with the instrument.
- Products with damage or failure caused by using them in combination with hardware, software, peripheral devices, and accessories that have not been provided or approved by JEOL.
- Damage or failure resulting from a situation caused by the customer, such as failing to properly manage the instrument, for which JEOL cannot be held responsible.
- Corruption of the operating system or application software, or damage to a computer used with the instrument, caused by fluctuations in the electricity or power failure.
- Product damaged as a result of fire, earthquake, flooding, lightning or other natural disaster, or due to local conflict or war.
- Damage or malfunction of operating system, application software, or the instrument itself as a result of infection by a computer virus.
- Instruments that have been restored after being disposed of or re-sold without prior written notice to and agreement from JEOL.

#### **1.4 Items Not Covered by Warranty**

- cover losses or damage to devices made by any other manufacturer at the customer site even if they are damaged by a malfunction of the JEOL product.
- JEOL is not responsible for any loss or damage to data recorded onto storage media, or to storage units. The customer is responsible for making back-up copies of their own data.
- Replacement parts for maintenance of the instrument functionality and performance are retained and available for seven years from the date of installation. Thereafter, some of those parts may be available for a certain period of time. Please contact your JEOL service office for details before the period of retention has passed.
- For items that are frequently updated, remodeled, or disappear from the market, like the computers used with the JEOL products, it may not be possible to obtain an exact replacement.

## **2. Repairs for a Fee**

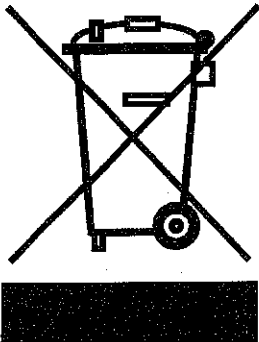
Repairs of JEOL products are available with charges after the end of the warranty period, or at anytime a customer requests. The components, modules and devices that are provided as replacements during the paid repair work will be new parts or refurbished parts that provide the same performance as new parts. All components, modules and devices removed during such repairs will become the property of JEOL.

- The warranty period for parts replaced and the service during paid repair work is a period of 3 months after the completion of the repairs; or, in the case of parts that must be periodically replaced, the warranty period is the length of the specified replacement period.
- In the event that repairs are performed again during the warranty period, there is no change to the warranty start date or the warranty period.

## Notes on Disposal for Business Users

### Attention:

Your product is marked with this symbol. It means that used electrical and electronic products should not be mixed with general household waste. There is a separate collection system for these products.



### ■ In the European Union

This symbol means that electrical and electronic equipment, at the end of its life, should be disposed of correctly.

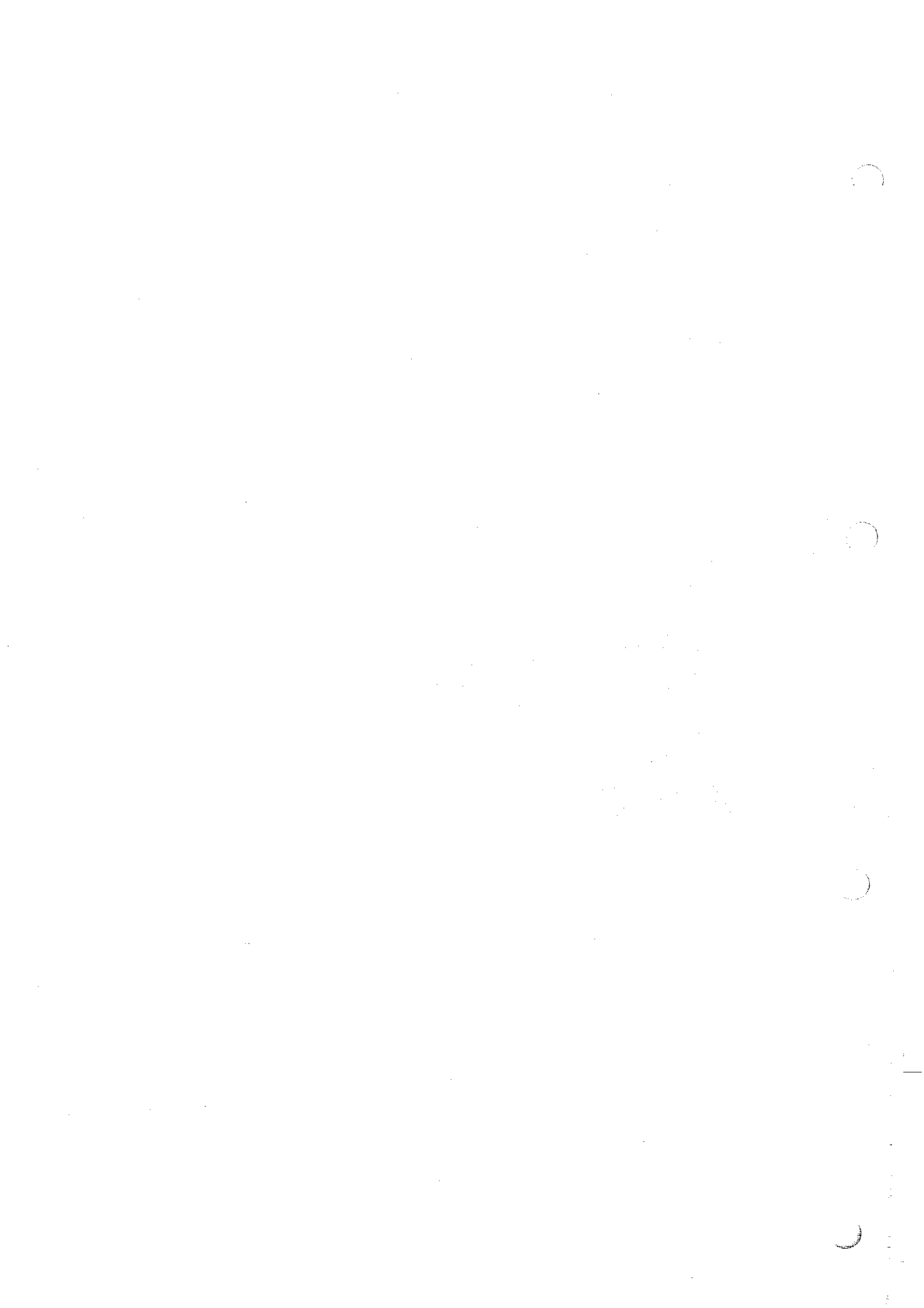
In the European Union there is a separate collection system for used electrical and electronic products. Please help us to conserve the environment we live in!

Electrical and electronic appliances and machines often contain materials which, if handled or disposed of incorrectly, are potentially hazardous to human health and to the environment. They are, however, essential for the correct functioning of your appliance or machine. Therefore, please do not dispose of your old machine or appliance together with your household waste.

Your JEOL product is designed and manufactured with high-quality materials and components which can be recycled and reused. If the product is used for business purposes and you want to discard it, please contact your JEOL dealer, who will advise you about the end-of-life disposal arrangements.

### ■ Outside the European Union

If you wish to discard this product, please contact your local authorities and ask for the correct method of disposal.



## 遵照《电器电子产品有害物质限制使用管理办法》的相关信息

日本电子株式会社(JEOL Ltd.)遵照如下所示的规则及规定，公开产品的有关信息

产品名称：SCANNING ELECTRON MICROSCOPE / ANALYTICAL SCANNING ELECTRON MICROSCOPE

型号：JSM-IT300 · JSM-IT300LV · JSM-IT300A · JSM-IT300LA

规则：中华人民共和国

《电器电子产品有害物质限制使用管理办法》（工业和信息化部令第32号）

本信息是按照SJ/T11364-2014所要求的格式制作而成，记载了有关产品中所含有的有毒有害物质的含有量的信息。

部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr6+)	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
ELECTRON OPTICS (1)	×	○	×	×	○	○
ELECTRON OPTICS (2)	×	○	×	×	○	○
SPECIMEN CHAMBER	×	○	×	×	○	○
SPECIMEN STAGE	×	○	×	×	○	○
SPECIMEN HOLDERS	×	○	×	×	○	○
ELECTRON DETECTOR	×	○	×	×	○	○
EVACUATION PIPE	×	○	×	×	○	○
VALVE PARTS	×	○	×	×	○	○
PUMP PARTS	×	○	×	×	○	○
WEIGHT	×	○	×	×	○	○
EVAC CPU PB	×	○	×	×	○	○
BU V DR PB	×	○	×	×	○	○
EVAC SWITCH	×	○	×	×	○	○
BU MAIN VALVE	×	○	×	×	○	○
LV MAIN VALVE	×	○	×	×	○	○
LV CONTROLLER	×	○	×	×	○	○
ACCESSORIES	×	○	×	×	○	○
BU HOSES	×	○	×	×	○	○
LV HOSES	×	○	×	×	○	○
LV SPEC HOLDERS	×	○	×	×	○	○

部件名称		有毒有害物质或元素					
		铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr6+)	多溴联苯 (PBB)	多溴二苯 (PBDE)
LV V DR PB		x	○	x	x	○	○
MAIN FRAME		x	○	x	x	○	○
VIB ISLN FRAME		x	○	x	x	○	○
HUB		x	○	x	x	○	○
LV-PS		x	○	x	x	○	○
CONTROL PB		x	○	x	x	○	○
DRIVE PB		x	○	x	x	○	○
HV TANK		x	○	x	x	○	○
ROTARY PUMP		x	○	x	x	○	○
VIB ISLN PLATE		x	○	x	x	○	○
SOFTWARE		x	○	x	x	○	○
COVERS		x	○	x	x	○	○
BACKSCATTERED ELECTRON DETECTOR	MP-94240BEIW	x	○	x	x	○	○
MOVABLE APERTURE	MP-90030MAP	x	○	x	x	○	○
OPERATION UNIT	MP-97080OUE	Please contact the maker for local procurement.					
OPERATION UNIT	MP-97081OUE	Please contact the maker for local procurement.					
LIQUID CRYSTAL DISPLAY	MP-07072LCD	Please contact the maker for local procurement.					
LIQUID CRYSTAL DISPLAY	MP-07073LCD	Please contact the maker for local procurement.					
DRY SDD ACCESSORY	EX-54280ACSS	Please refer to the attached document					
DRY SD EXTRA DETECTOR	EX-94300S4L1Q	Please refer to the attached document					
COMPACT DXP	EX-36100DXPC	Please refer to the attached document					
PTS CABLE	EX-35150PTS	Please refer to the attached document					
STANDARD SOFTWARE	EX-37001	Please refer to the attached document					
DIGITAL MAPPING SOFTWARE	EX-35000	Please refer to the attached document					



## ATTACHMENTS

部件名称		有毒有害物质或元素					
		铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr6+)	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
PROBE CURRENT DETECTOR	MP-90010PCD	x	○	x	x	○	○
LAB6 Unit	MP-90020LAB6	x	○	x	x	○	○
STAGE NAVIGATION SYSTEM	MP-91110SNS	x	○	x	x	○	○
LOAD LOCK CHAMBER	MP-91120LLC	x	○	x	x	○	○
LOAD LOCK SYSTEM	MP-91130LLS	x	○	x	x	○	○
EBSO SPECIMEN HOLDER	MP-91260ESH	x	○	x	x	○	○
SPECIMEN HOLDER ADAPTER	MP-91270SHA	x	○	x	x	○	○
SPECIMEN COOLING UNIT	MP-91290SCU	x	○	x	x	○	○
VACUUM MONITOR INTERFACE UNIT	MP-93010VMIU	x	○	x	x	○	○
LOW VACCUM SECONDARY ELECTRON	MP-94250LSED	x	○	x	x	○	○
CHAMBER SCOPE	MP-94260CS	x	○	x	x	○	○
CHAMBER SCOPE POWER	MP-94270CSP	x	○	x	x	○	○
OPERATION PANEL	MP-95040OP	x	○	x	x	○	○
EXTERNAL SCAN INTERFACE	MP-95050ESIU	x	○	x	x	○	○
OPERATION PANEL	MP-95080OP2	x	○	x	x	○	○
EXTERNAL CONTROL SOFTWARE	MP-96040EXCS	x	○	x	x	○	○
TABLE	MP-98010TBL1	x	○	x	x	○	○
TABLE	MP-98020TBL2	x	○	x	x	○	○

部件名称		有毒有害物质或元素					
		铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr6+)	多溴联苯 (PBB)	多溴二苯 (PBDE)
SMILE VIEW LICENSE1	SM-35090(SMVL1)	Please refer to the attached document					
SMILE VIEW LICENSE10	SM-35091(SMVL10)	Please refer to the attached document					
SINGLE CRYSTAL LAB6 K-TYPE FILAMENT	SM-LKS	Please refer to the attached document					
STANDARD TOOL KIT 2	SM-TOOL2	Please refer to the attached document					
SMILE STATION2	EX-35040	Please refer to the attached document					
PARTICLE ANALYSIS SOFTWARE2	EX-35110	Please refer to the attached document					
BEAM CURRENT CORRECTION UNIT	EX-36030	Please refer to the attached document					
EDS DATA DIVIDER	EX-36080	Please refer to the attached document					
DIGITAL PULSE PROCESSOR 3A	EX-36180D3A	Please refer to the attached document					
JED-2300 LICENSE	EX-37100	Please refer to the attached document					
PHI-RHO-Z QUANTITATIVE ANALYSIS	EX-37120	Please refer to the attached document					
JED-2300 LICENSE	EX-37160L1	Please refer to the attached document					
19 INCH LIQUID CRYSTAL DISPLAY	EX-37220LD19	Please refer to the attached document					
VERSION UP SOFTWARE	EX-37270VUP	Please refer to the attached document					
SDD DATA	EX-37320SDD	Please refer to the attached document					
DRY SDD ACCESSORY	EX-54280ACGW	Please refer to the attached document					
DRY SD EXTRA DETECTOR	EX-94420G4L13	Please refer to the attached document					
STAGE NAVIGATION SYSTEM	MP-94290SNS2 (Add.date:21,JUN,2016)	x	○	x	x	○	○
CHAMBER SCOPE	MP-94310CS2 (Add.date:21,JUN,2016)	x	○	x	x	○	○
OPERATION UNIT	MP-97082OUE (Add.date:21,MAR,2017)	Please contact the maker for local procurement.					
MULTIVIEWSYSTEM	MP-07150MVS (Add.date:21,MAR,2017)	x	○	x	x	○	○
THREE-DIMENSIONAL IMAGE SOFTWARE	MP-45030TDI (Add.date:21,MAR,2017)	x	○	x	x	○	○
STEP DOWN TRANSFORMER	MP-48010 (Add.date:21,MAR,2017)	x	○	x	x	○	○
SIGNAL SWITCHING UNIT	MP-54050SSU (Add.date:21,MAR,2017)	x	○	x	x	○	○
DMA CABLE	MP-86010(DMACB) (Add.date:21,MAR,2017)	x	○	x	x	○	○

本表格依据 SJ/T 11364-2014 的规定编制。

○：表示该有毒有害物质在该部件所有均质材料中的含量均在GB/T26572-2011标准规定的限量要求以下。

\*：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出GB/T26572-2011标准规定的限量要求。

(企业可在此处，根据实际情况对上表中打“\*”的技术原因进行进一步说明。)

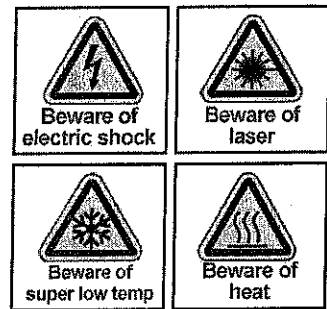
Although this instrument is protected with safety device which prevents the occurrence of accident that could result in an injury, harm, and damage to the users or instrument itself, the safety feature may not work properly if you use the instrument for the purpose of use not intended or in an improper usage. For the proper use of the instrument, please be sure to read all of the instructions, descriptions, notices, and precautions contained in this manual carefully to understand them fully prior to the operation or maintenance. This section, "Safety Precautions", contains important information related to safety for using of the instrument.

## SAFETY PRECAUTIONS











Labels bearing the following symbols are attached to dangerous locations on the instrument. Do not touch any of these locations with your hands or anything else.

The safety indications and their meanings are as follows:


<b>DANGER</b>	An imminently hazardous situation which, if not avoided, will result in death or serious injury.
<b>WARNING</b>	A potentially hazardous situation which, if not avoided, could result in death or serious injury.
<b>CAUTION</b>	A potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or a situation that could result in serious damage to facilities or acquired.

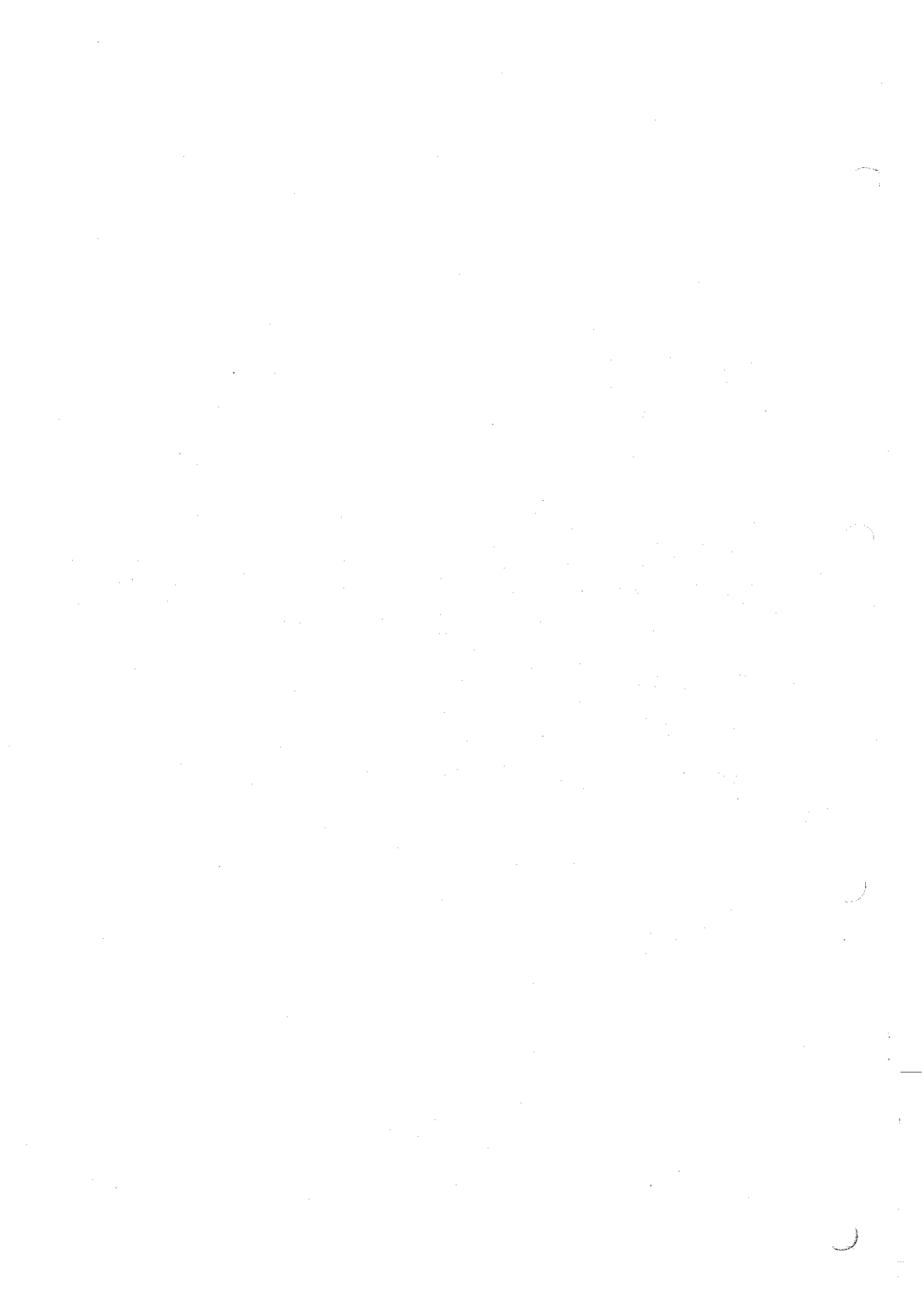


*Examples of symbols*

-  Use the instrument properly within the scope of the purpose and usage described in its brochures and manuals.
-  Never open/remove protective parts (exterior panels) and parts that can't be opened/removed without use of tool (including key), or disconnect/ connect the cables/connectors that are not described in this manual.
-  Never attempt to do any works of disassembling/assembling the instrument other than those described in this manual.
-  Never make modifications that include installing substitute parts and disabling safety devices or other safety features.
-  Never disconnect the grounding wire or move it from the prescribed position. Failure to follow this instruction could result in electric shock.
-  The AC power cord provided with this system is supplied for the particular device so that never use it for any other equipment.
-  To avoid falling, do not climb onto the operation table and console during daily operation or during maintenance or inspection.
-  When you dispose of the instrument or liquid or other waste, follow all applicable laws and regulations, and dispose of it in a proper manner without polluting the environment.
-  Be sure to read the "Safety Precautions" section of the manuals for the accessories attached to or built into the instrument.
-  If anything is unclear, please contact your JEOL service office.

### **WARNING for Installation**

-  Do not attempt to install the instruments by yourself. Installation work requires professional expertise and JEOL is responsible for the installation of the instruments and related attachments purchased from JEOL. Consult your JEOL service office.



## **General warnings**

- Do not unlock or remove any covered parts, modify or remove component parts, or dismantle these parts in any way other than their intended use, due to a risk of thermal, electrical or emissive hazards taking place.
- Never removing the grounding wire or connect it to any other location than that specified, due to a risk of electric shock.
- Never remove the rear panel for maintenance such as replacement of fuses or any other electric parts; otherwise you may get an electric shock. Be sure to ask JEOL service personal for such work.
- When moving the instrument is required, various hazards are expected. Confirm the specifications and installation requirements for the instrument, check the state of the new installation site and contact your local service center
- When performing maintenance, checks, or routine operations, never stand on the operation table, a stool or instrument frame. The instrument might fall over and cause damage.
- Do not remove the rear panel and replace electric parts (for example, fuse). These might cause electrical shock and harm you. Service staffs are the only ones who can remove the rear panel and replace electrical parts. No one else should do these.
- There are potential hazards, concerning the high voltage and magnetic field, which may take place while a service engineer is disassembling or replacing the instrument for maintenance. Keep well away from the instrument on such occasions.

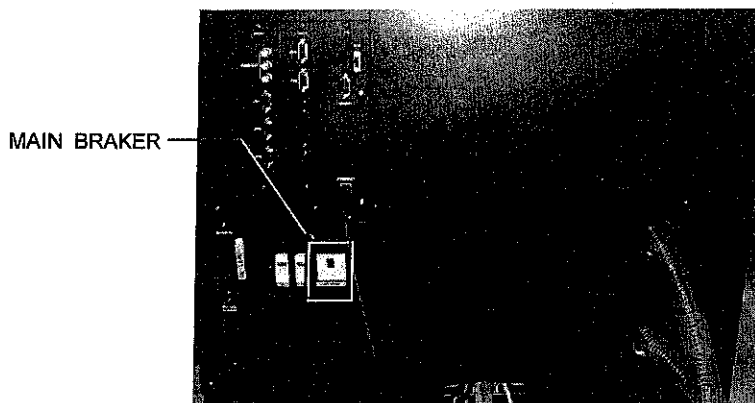
## Warning for the filament

The wehnelt is very hot immediately after the filament burnt out. Do not touch the wehnelt. Allow it to cool down sufficiently (about one hour), then replace the filament with the removal tool.



## General cautions

- If anything abnormal occurs with the instrument, immediately stop operation. Then, contact your local service center.
- When installing the specimen holder or inserting the objective lens aperture, take care not to get your fingers caught in the space between the specimen exchange chamber and the specimen exchange rod, and the space between the selecting knobs. And, since the EOS and IOS column is placed on the frame via the anti-vibration mount, the EOS and IOS column will sway a little even when you operate the knobs. Take care not to get your fingers caught in any space that results from this sway.
- An instrument that has been installed properly will usually not vibrate or give off annoying noises. Should this occur, stop the instrument immediately and contact your local service center.
- A person who wears a medical appliance such as a pacemaker may be affected by magnetic fields and must therefore keep well away from the instrument.
- Do not keep watching the screen or continue keyboard operation for a long time. If you do so, disorder due to fatigue may result. Establish a health control standard or VDT work and make it a rule to conduct health check-up periodically.
- Only use a circuit breaker (over current and ground fault interrupters) in cases of emergencies. Do not touch the breaker unless you need to.
- If the breaker trips, it indicates a malfunction in the system and you must contact the JEOL service center immediately.



Column console Rear view

## **Cautions concerning oil rotary pump**

- Do not disconnect the vacuum hose from the oil rotary pump during operation. If you do, causing serious damage to the instrument.
- Do not let the oil level of the oil rotary pump fall below the lower limit. If the pump operates with only a small quantity of oil, trouble may occur.
- Do not continue to run the oil rotary pump if the oil level has reached the lower limit. If you do, you might damage the pump.
- Replace the rotary pump oil with new oil once a year.
- Consult your JEOL service office for instructions for replacing the oil or the oil mist trap.
- When vacuum pump oil is replaced or vacuum pump is repaired, process the oil in the proper way.
- The instrument may not be started when the oil temperature of the oil rotary pump is low. The room temperature must be kept to 15°C or more when you start the instrument.

## **Cautions on the specimen stage movement**

When you install the specimen holder on the specimen stage, be sure to perform the selection of the specimen holder and inputting of the specimen height.

Before moving the specimen stage, please check the setting parameters in advance.

If you do not perform the setting of these parameters, the stage moves beyond the movement limitations, and might be break the objective lens or the backscattered electron detector.

## **Cautions concerning the filament**

Never remove the top of the EOS cover while supplying a high voltage (HT ON).



## **Disassembly and cleaning**

Do not disassemble or reassemble the EOS column. Such work requires great experience and skills. Contact your JEOL service office for assistance whenever such works are required.

### **Follow the precautions described below in order to carry out the cleaning**

- Wear thin and lint-free gloves to handle any parts inside the column in order to prevent contamination by perspiration, etc., which could cause charging of electron beam due to oxidization of the parts.
- Complete the cleaning or cleaning of the parts inside the column as quickly as possible. Leaving the parts in the atmosphere oxidizes their surfaces.
- Use as a cleaning agent a nonflammable highly volatile highly efficient solvent that is free room impurities and is not harmful to the human body to clean the parts inside the column. Be sure to use the solvent in a location free from combustible material and sources of ignition and with open windows or proper ventilation, regardless of the quantity. When you use the cleaning agent, be sure to wear protective gloves that are resistant to the solvent.
- Keep the O-rings and the O-ring contact surfaces free room scratches, dust, lint, etc. Even a slight scratch, fine dust or lint may cause the poor vacuum. Also, be sure to use the specified vacuum grease.

## **Cautions concerning Personal Computer (PC)**

### **Hardware**

- Never modify the hardware settings and also never install additional boards.  
If you do, the PC or the SEM may not work normally.
- Never connect devices other than the recommended ones.  
If you do, the PC or the SEM may not work normally.
- Make sure not to locate a monitor in the vicinity of the electron optical column.  
If you do, the fluctuation of stray magnetic fields may disturb SEM images.
- Do not turn off the power switch of the PC while accessing to the HDD or other memory device.  
If you do, the PC breaks down, the data and software may damage.

### **Software**

- Never install application software other than the recommended software.  
If you do, the PC or SEM may not work normally.
- Never delete application software or files, which have been installed.  
If you do, the control software may not work normally.
- When an error message appears while operating the control software, close Windows, switch off the PC and reset the operation power (MAIN POWER key switch) of the SEM, and then switch on the PC again.
- When the control software has not finished normally, the present data vanishes.
- Never operate the other application while the control software is being executed.  
The SEM may not work normally.



- About preparations of a virus detection program, antivirus program, vaccine program and computer virus removal, please prepare these by the visitor itself.
- When the virus detection/removal program is operated residentially, the SEM may not work normally. If the trouble occurs after installing these programs, uninstall the program or uses it without resident.

### Network

- Do not connect the PC directly to the intranet.  
The SEM may not work normally.

### OS

- Never upgrade the OS and driver software other than the offered updating program.  
If you do, the PC or SEM may not work normally.
- Never change the settings of the **Screen Resolution** while the control software is being executed. If you do, the control software may not work normally.
- Never change the settings of **Screen refresh rate** and **Colors**.
- Do not activate the screen saver.  
If the screen saver becomes active when the control software is being executed, the image may not be displayed.
- Do not activate the **Sleep** and **Hibernate** of the Power Options.  
When the PC was recovered from the **Hibernate**, the control software may not work normally.  
In that case, reboot the PC.
- Never change the "User" of the Windows while the control software is being executed.  
If you do, the Windows screen may be distracted. When changing the "User" of the Windows, execute it after the control software is exited.
- Never execute the "log off" of the user while the control software is being executed.  
If you do, the Windows screen may be distracted. When executing the "log off" of user, execute it after the control software is exited.
- Never validate the **Windows Firewall** and **Automatic Updates** functions.  
If you do, the SEM may not work normally.
- The **User Account Control Settings** do not set other than **Never notify**.  
If you do, the control software may not work normally.

Windows/display is normally set as follows;

When the new user account is created, confirm the settings as follows using the control panel.

[Screen Resolution]

Resolutions : 1680×1050

[Advanced settings]→[Monitor]

Colors : True Color (32 bit)

[Personalize]

Screen Saver : None

[Power Options]

Turn off the display : Never

Put the computer to sleep : Never

[Change advanced power settings]

Hard disk

Turn off hard disk after : Never

Sleep

Sleep after : Never

Allow hybrid sleep : Off

Hibernate after : Never

Power buttons and lid

Power button action: Shut down

[Windows Firewall]

Home or work(private) network location settings : Turn off Windows Firewall

Public network location settings : Turn off Windows Firewall

## **EDS unit**

Refer to the EDS detector instruction manuals for cautions of EDS.



## **Safety Instructions for Using JEOL Products**

- **Products using materials hazardous for operators or equipment**  
When measuring, indicating, or detecting harmful or corrosive substances, or voltages or other electrical quantities that may cause electric shock, read the instruction manual carefully to assure proper operation. Ensure that all operators of the instrument receive training on the operation method.  
If there is a problem in the product, take appropriate measures in accordance with the instruction manual and contact a JEOL service office immediately.
- **Products having accessible parts that reach high temperatures**  
If an accessible part of the product reaches a high temperature while it functions, notify all the operators to exercise cautions whenever they will be near any such parts.  
It is recommended to take measures to restrict the access to the instrument by enclosing with rope or chain.
- **Using JEOL product for an integrated system with other manufacturer's product**  
Consult your JEOL office. We assume no responsibility for any damages resulting from using the product in combination with other manufacturer's product without consultation.
- **Using product in an environment that does not satisfy the installation requirements**  
Consult your JEOL office. We assume no responsibility for any damages resulting from using the product in an environment other than one specified by JEOL without consultation.
- **Attachment used for JEOL product**  
For safety reasons, only use the accessories or attachments that are supplied or designated by JEOL. We assume no responsibility for any damages resulting from using any accessory or attachment other than those specified by JEOL.  
Do not replace detachable main power supply cords with inadequately rated cords.



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- 4 APPLICATION OPERATION
- 5 DESCRIPTION OF THE OPERATION SECTION
- 6 PREPARATION OF REPORT
- 7 MAINTENANCE
- 8 SPECIFICATION
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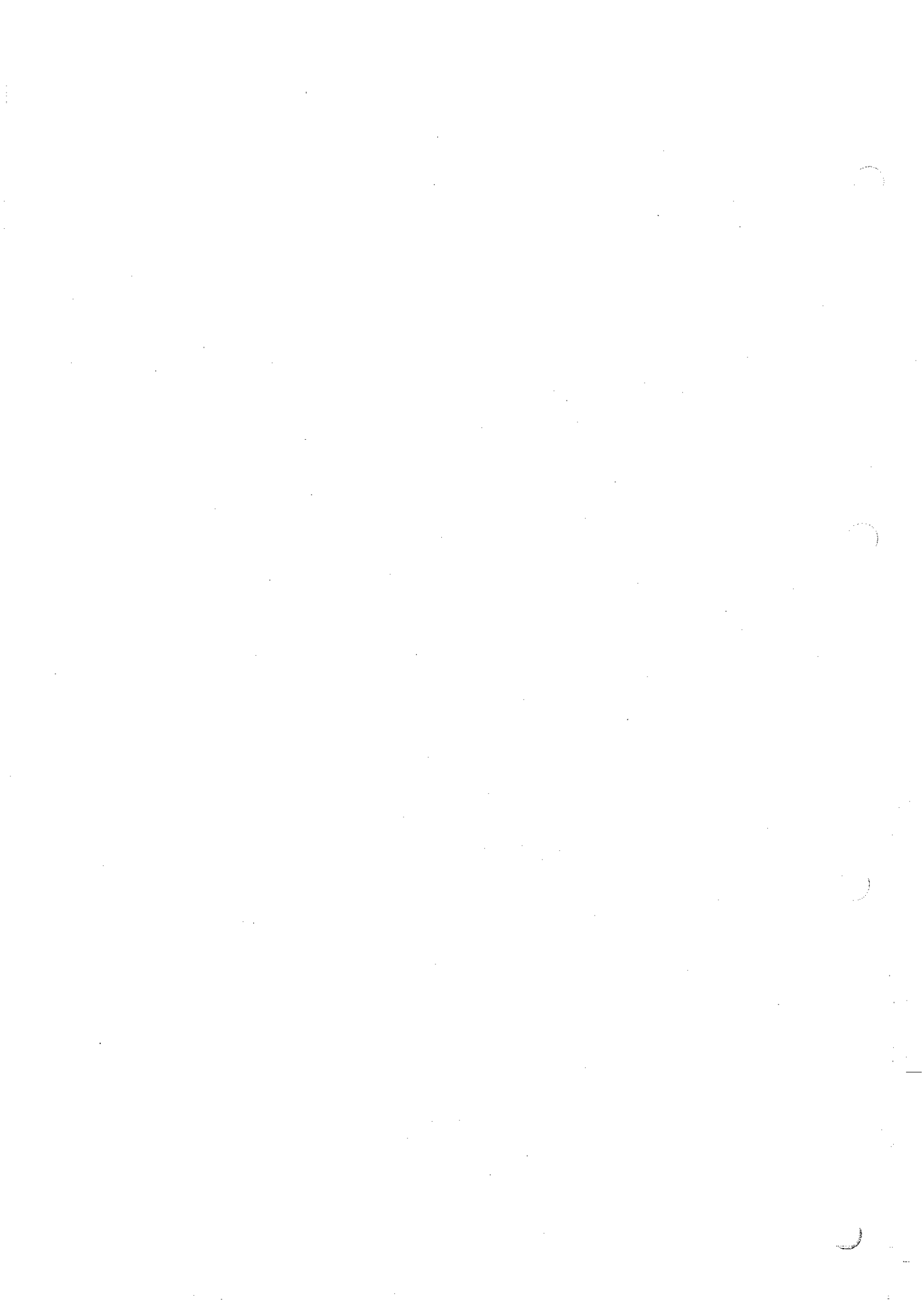






1

**GENERAL**

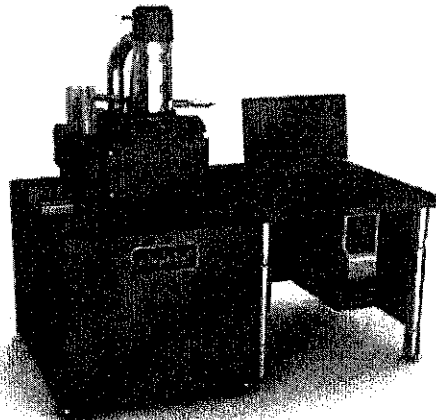


## 1.1 GENERAL

The low vacuum scanning electron microscope has been designed with features that allow you to operate the system sensuously and with high throughput using the touch panel together with the high speed stage. In addition, improvements in the electron optics system, vacuum, and signal processing offer you a higher quality image observation.

### Main features

- The maximum resolution of 3.0 nm (at accelerating voltage 30 kV) is guaranteed; whilst at low accelerating voltage a resolution of 8 nm (at acc. 3.0 kV) and 15 nm (at acc. 1 kV) is obtainable, the highest resolution in its class.
- The high precision zoom condenser lens allows you to easily operate probe current from low to high with flexible lens control.
- The clean and high throughput vacuum system obtained through a high pumping capacity turbo molecular pump (TMP) and two rotary pumps (RP), is fitted as standard.  
※BU/A model: RP 1 set, LV/LA model: RP 2 set
- In the low vacuum mode, the newly developed objective lens with differential pumping enables you to observe sharper images of nonconductive samples uncoated.
- By employing charge free scan (CF scan), it becomes possible to reduce the charge-up of nonconductive samples.
- A touch panel with 23 inch display offers high response operation sensuously.
- By simply following the Operation Guide Function, observation, functional operation, and operation setting, are easily performed.
- To search the field of view is simple thanks to a minimum magnification of x 5 (at WD 48 mm) and the stage navigation system (optional attachment).
- Observation procedure and the dynamic behavior of the sample are able to be saved in the PC.
- The new specimen chamber has been designed to optimize the installation of the dedicated detectors such as EDS, WDS, EBSP, etc. and their related options using multi-purpose ports. This enables the high resolution observation and a variety of analyses at WD 10 mm. The Dual EDS system (Detectors fitted on opposite ports) provides X-ray analyses at WD 10 mm with shadowless conditions and higher throughput.
- The frame of the main console is the smallest size in its class, and this gives more flexibility to the installation location.





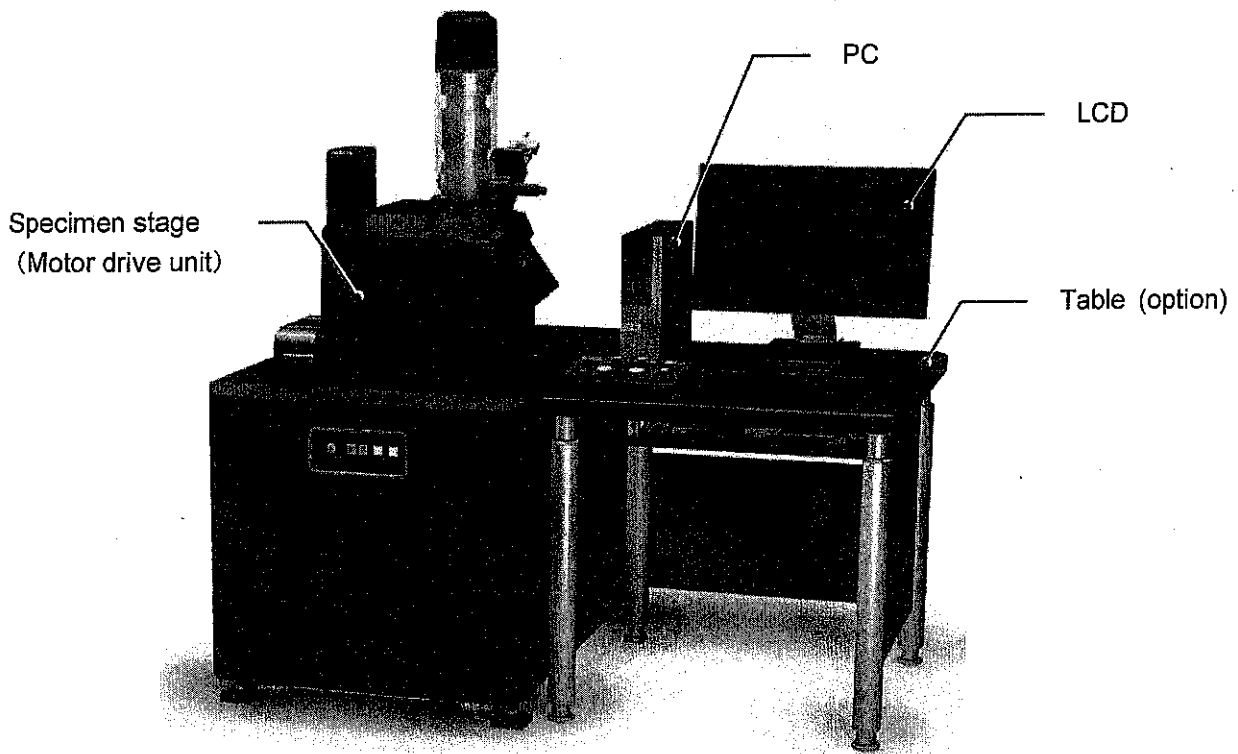
# 2

## NAME AND EXPLANATION

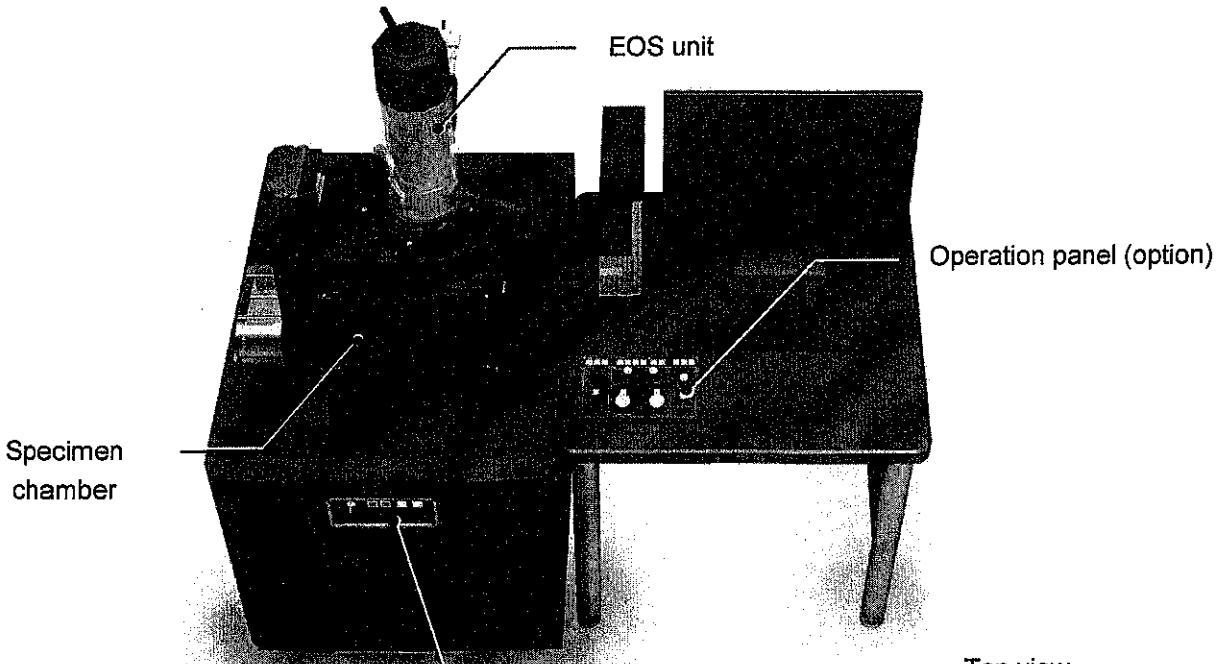
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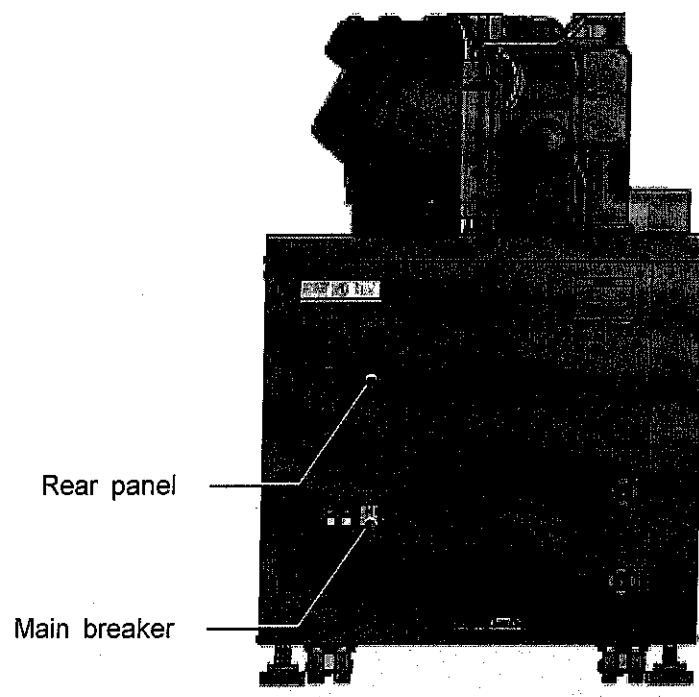
# 2.1 APPEARANCE



Front view



Top view

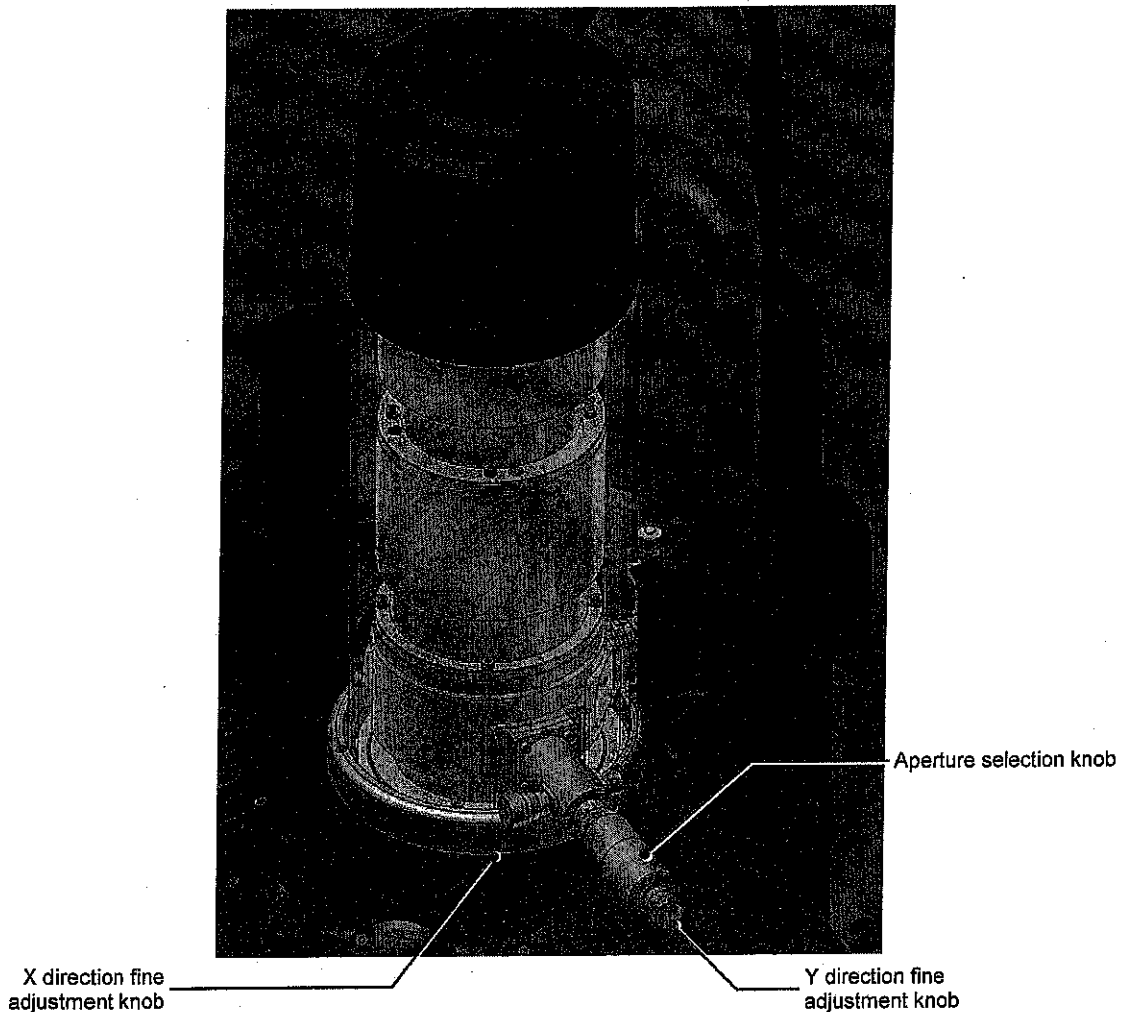


Rear view



## 2.2 EOS UNIT

### 2.2.1 Movable Aperture



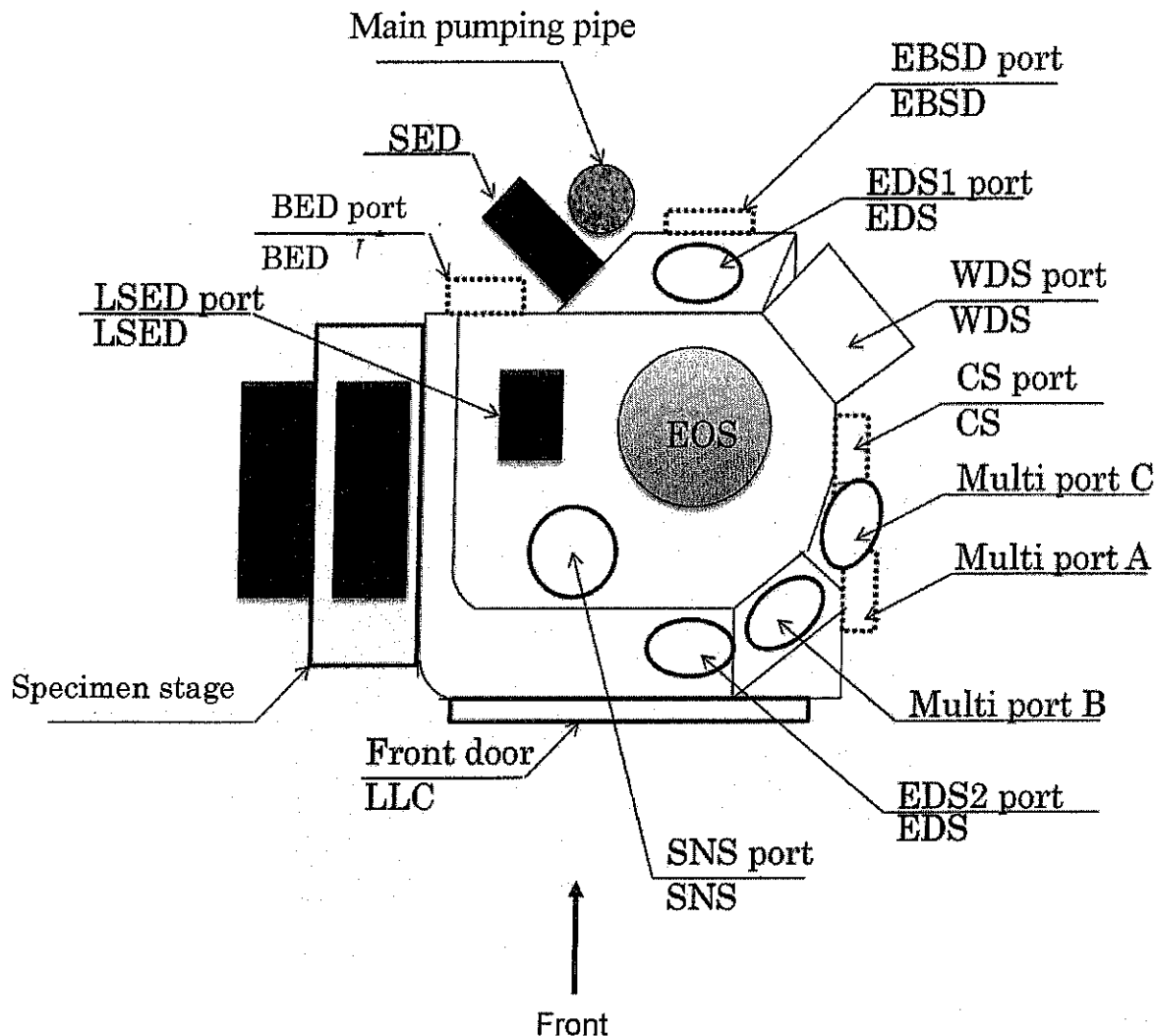
- The X and Y direction fine adjustment knobs are used for axis adjustment of the movable aperture.
- Turning the aperture selection knob in the clockwise direction as 0 → 1 → 2 → 3 allows you to select the aperture to which the number corresponds.
- To change the aperture from 3 → 2 → 1 → 0, pull the selection knob toward you until it stops and turn it in the counterclockwise direction, and then repeat step by step.

Table 2-1 Aperture number and application purpose

Number	Aperture ( $\mu\text{m}\Phi$ )	Application purpose
3	60	For large probe current such as WDS analysis
2	30	For ordinary observation and EDS analysis
1	20	For high resolution observation
0	none	For maintenance purpose

## 2.2.2 Specimen Chamber

The standard equipment and optional attachments are arranged as shown in the illustration below.



- SED : Secondary electron detector
- BED : Backscatter electron detector
- LSED : Low vacuum secondary electron detector
- LLC : Load lock chamber
- SNS : Stage navigation system
- EDS : Energy dispersive X-ray spectrometer analyzer
- CS : Chamber scope
- WDS : Wavelength dispersive X-ray spectrometer analyzer
- EBSD : Electron backscatter diffraction detector

## 2.2.3 Specimen stage

< Movement of each axis in the specimen stage >

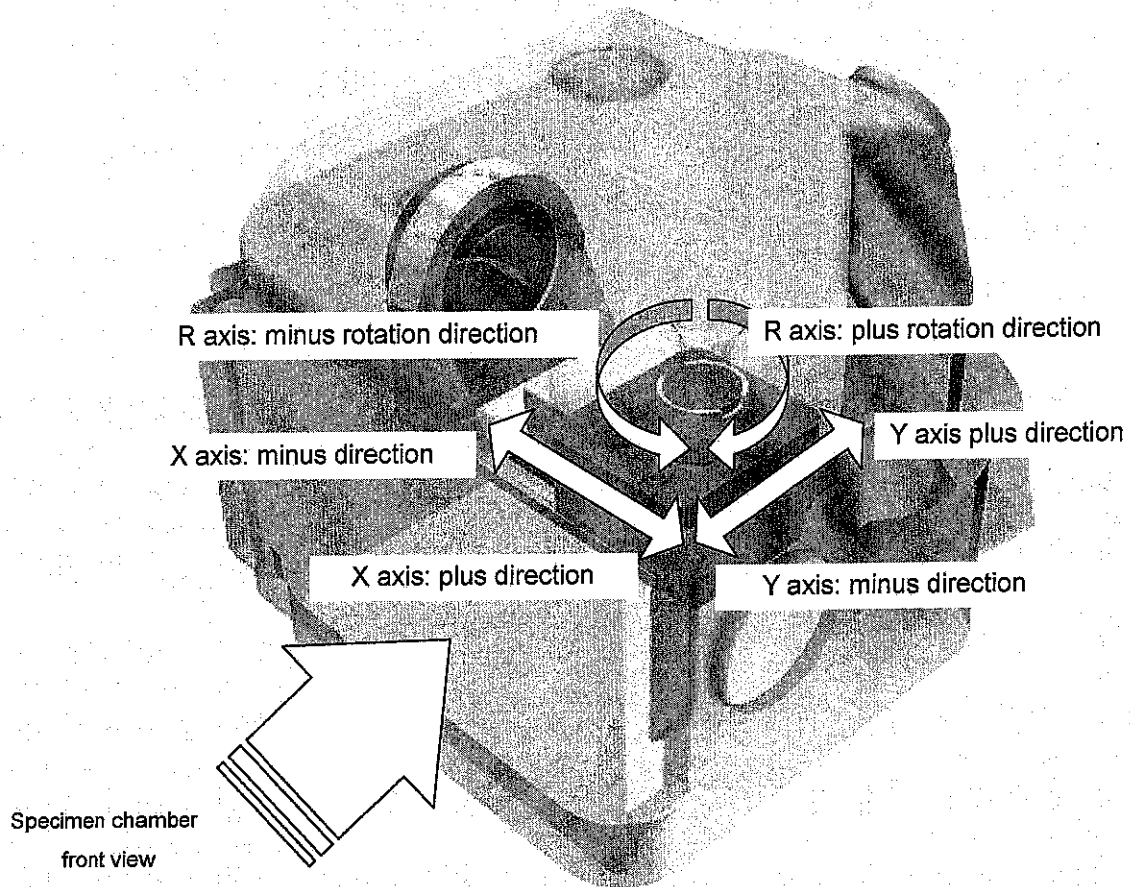


Fig. 2-1 Each stage axis movement (XYR axes)

Table 2-2 Coordinate polarity for each axis and Field of view movements

Name	Polarity of coordinates	Field of view (Stage) movement
X-axis	+ direction	The field of view moves toward the right
	- direction	The field of view moves toward the left
Y-axis	+ direction	The field of view moves upward
	- direction	The field of view moves downward
R-axis	+ direction	The field of view rotates in a clockwise direction
	- direction	The field of view rotates in a counter-clockwise direction

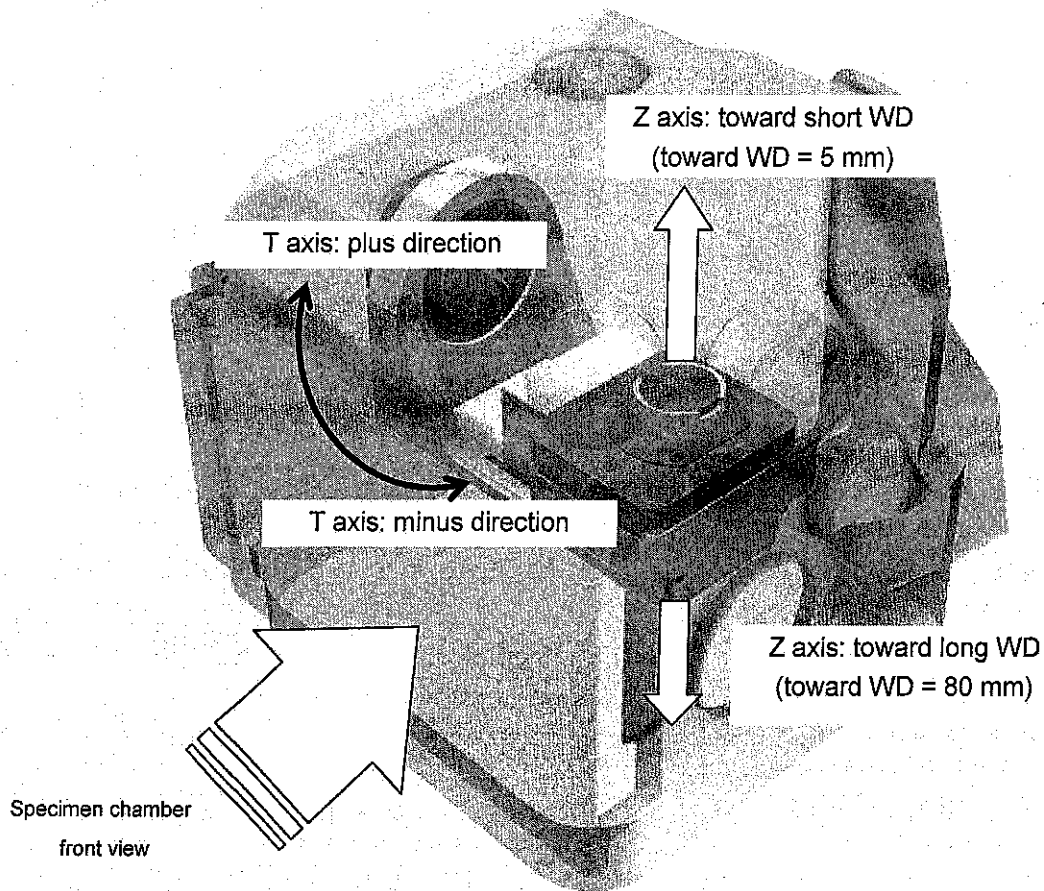


Fig. 2-2 Each stage axis movement (TZ axes)

Name	Polarity of coordinates	Field of view (Stage) movement
Z-axis	Direction in which the numerical value decreases	The stage moves upward, and the working distance becomes shorter
	Direction in which the numerical value increases	The stage moves downward, and the working distance becomes longer
T-axis	+direction	The specimen surface is tilted toward the back of the specimen chamber
	-direction	The specimen surface is tilted toward the front of the specimen chamber

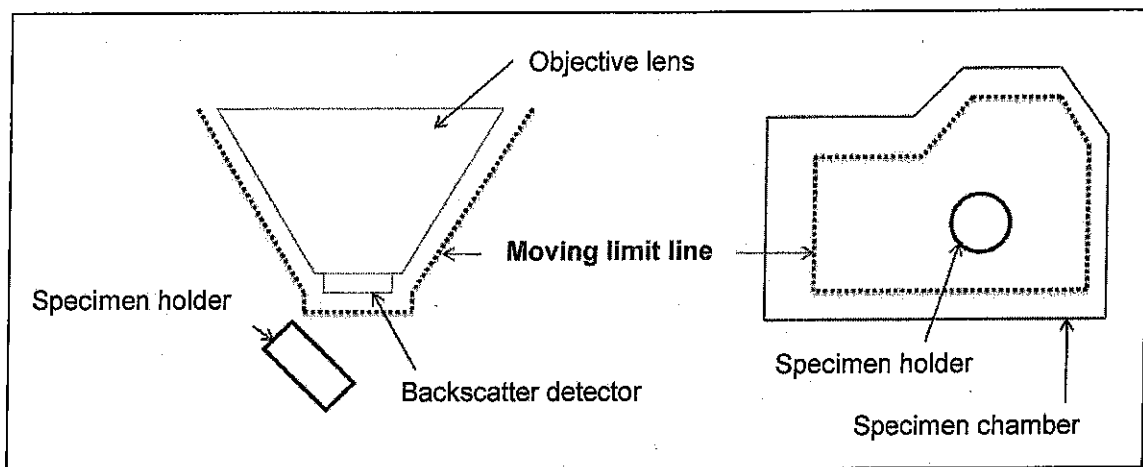
## 2.2.4 Specimen Holder and Stage Moving Range

### <General>

For the purpose of protecting the specimen holder from colliding with the backscatter detector or the objective lens, the following moving limit is provided. Therefore, moving the stage beyond the limit is not possible.

### <Schematic drawing>

When the specimen holder moves over the dotted lines (moving limit line), the specimen stage will give the notice that the stage is beyond the moving range.

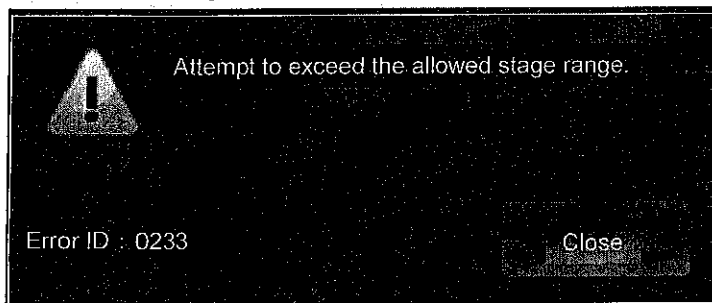


### <Message>

With the specimen holder crossing the limit line, the following message is displayed, and the specimen stage will stop its motion. In case of the message displayed, drive the stage in the opposite direction.

#### Example) With the Z axis moving over 80 mm

Close the message, and move the stage to the direction 80mm or less.



**<The moving range of the  $\Phi$ 51mm specimen holder>**

The moving range of the  $\Phi$ 51mm specimen holder is listed below:

**◆ CAUTION ◆**

- **Note that the figures listed below are considered with the exclusion of the specimen protrusion above the holder surface.**

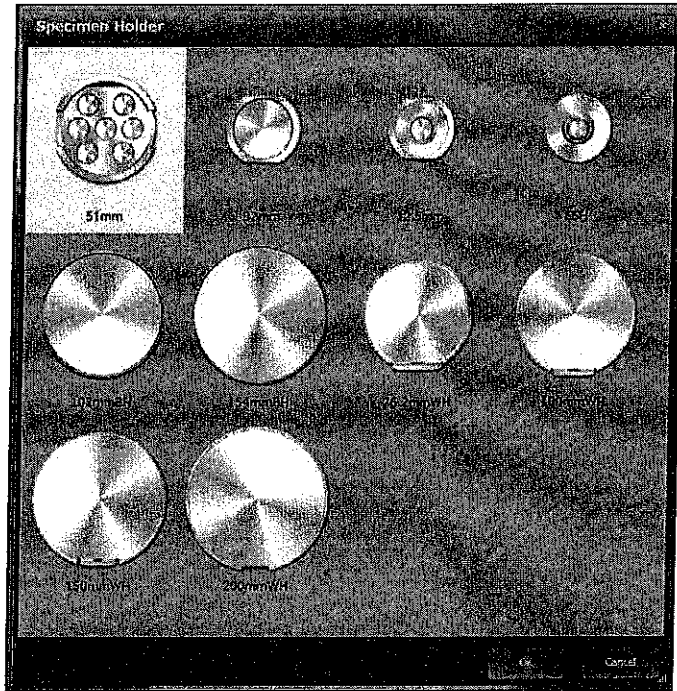
The listed figures are simulated based on the assumption that the top of the specimen is within the top of the specimen holder as well as the specimen width does not protrude out from the specimen holder. Please be sure that the figures are not guaranteed if the sample protrudes from the specimen holder vertically and/or horizontally.

- **Make sure that the figures below are rough and not precise.**

Z (mm)	T (°)	X (mm)	Y (mm)
5	-4 ~ 4	-75 ~ +50	-50 ~ +50
8	-10 ~ 24	-75 ~ +50	-50 ~ +50
10	-10 ~ 34	-75 ~ +50	-50 ~ +50
15	-10 ~ 49	-75 ~ +50	-50 ~ +50
20	-10 ~ 54	-75 ~ +50	-50 ~ +50
25	-10 ~ 59	-75 ~ +50	-50 ~ +50
30	-10 ~ 58	-75 ~ +50	-50 ~ +50
40	-10 ~ 64	-75 ~ +50	-50 ~ +50
48	-10 ~ 67	-75 ~ +50	-50 ~ +50
80	-10 ~ 80	-75 ~ +50	-50 ~ +50



Kind of specimen holder (Software version 1.16 onward.)



Notation on the GUI	Remarks	
12.5mm	P/N : 804414131	12.5mm SPECIMEN HOLDER
32mm	SM-71130	32mm SPECIMEN HOLDER
51mm	Standard accessory	
ESH	MP-91260ESH	EBSD SPECIMEN HOLDER
76.2mmWH	SM-71041WH	76.2mm WAFER HOLDER
100mmWH	SM-71051WH	100mm WAFER HOLDER
102mmBH	SM-71090	4-INCH BULK HOLDER (10.2cm)
150mmWH	SM-71071WH	150mm WAFER HOLDER
154mmBH	SM-71120	6-INCH BULK HOLDER (15.3cm)
200mmWH	SM-71081WH	200mm WAFER HOLDER

WH : Wafer holder / BH : Bulk holder

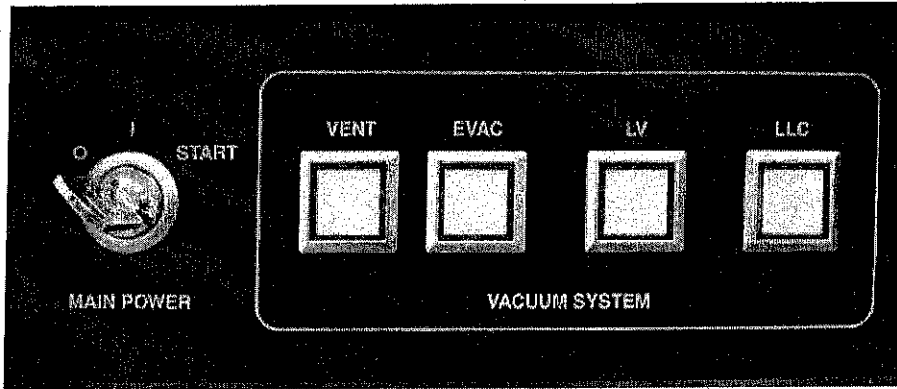
Table 2-3 Stage moving range

	SM-71051WH SM-71090	SM-71071WH SM-71120	SM-71081WH	Remarks
X	-75mm ~ +50mm	-75mm ~ +30mm	-75mm ~ +5mm	(For Y=0) Depend on Y coordinates
Y	-50mm ~ +50mm	-50mm ~ +50mm	-50mm ~ +21mm	(For X=0) Depend on X coordinates
Z	5mm ~ 80mm	5mm ~ 80mm	5mm ~ 80mm	
R	360°	360°	360°	
T	-10° ~ +33°	-10° ~ +33°	-10° ~ +33°	(For X=0, Y=0, Z=10mm) Depend on Y and Z coordinates

※About the MP-91260ESH, please refer to the MP-91260ESH instruction manual.

## 2.3 EOS CONSOLE

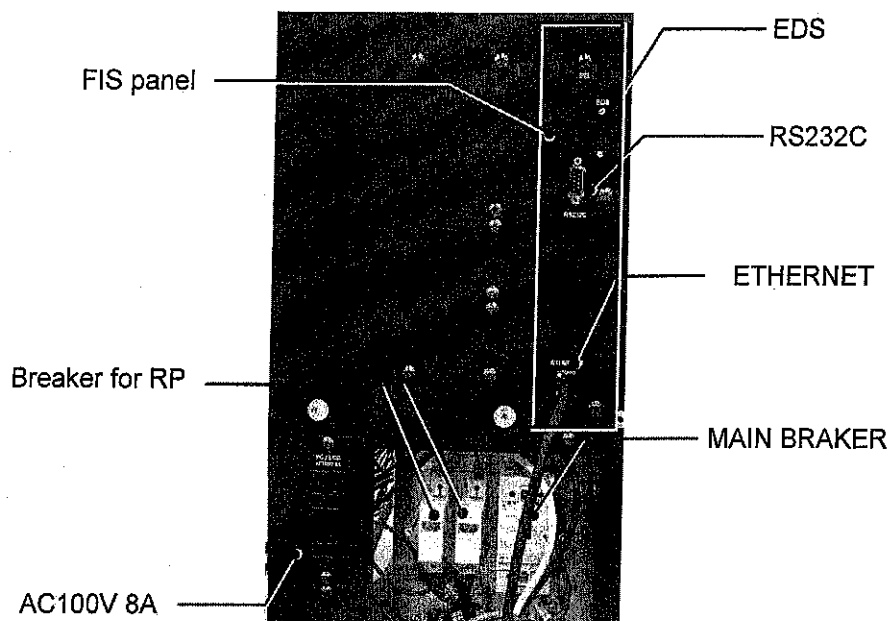
### 2.3.1 Main Control Panel



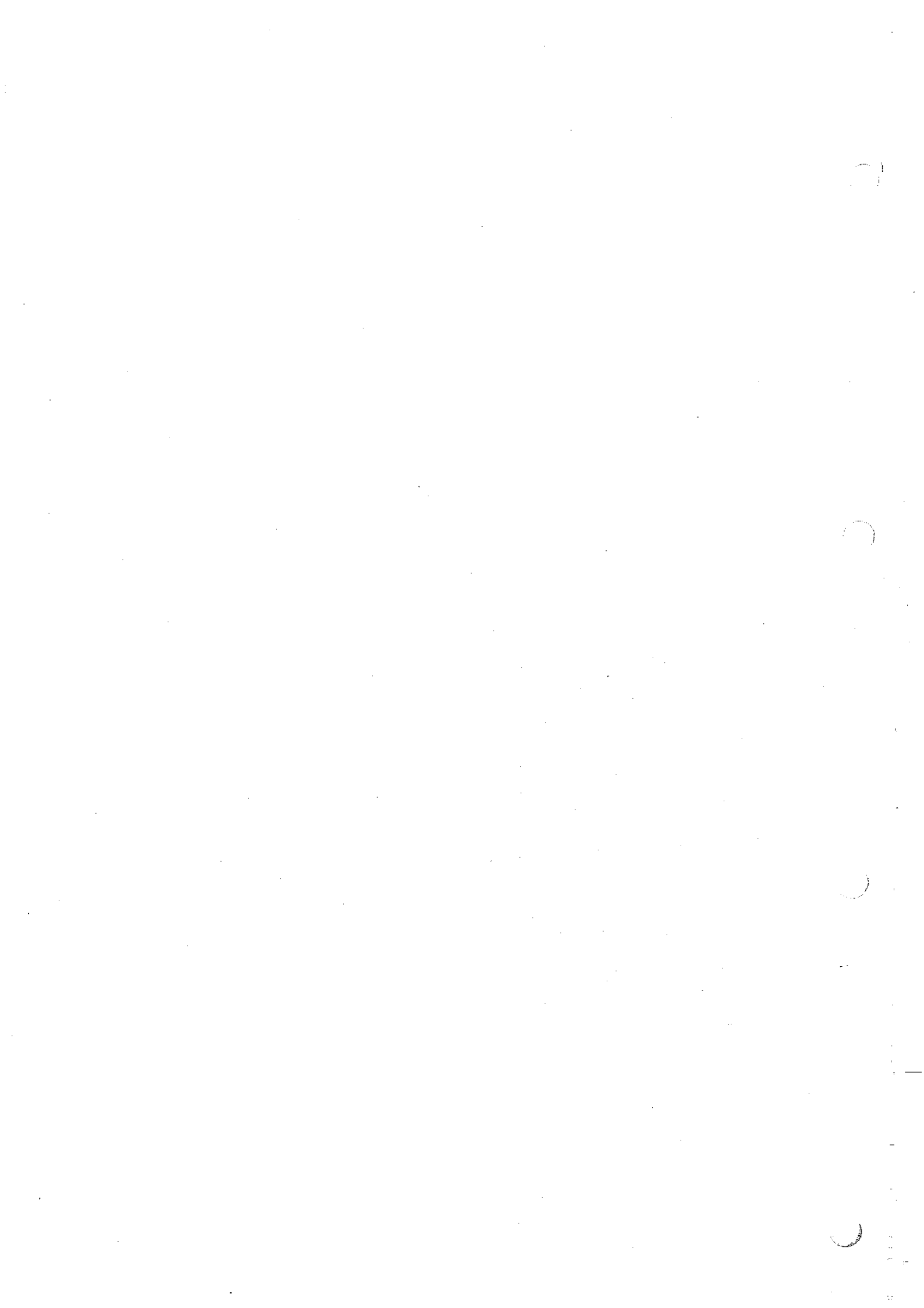
Name	Description	Remarks
MAIN POWER key switch	Turns on or off of the main power	
VACUUM SYSTEM VENT switch	Vents the specimen chamber/EOS to atmospheric pressure. Pressing the switch starts blinking, and the light of the switch turns on when the pressure in the specimen chamber and EOS reaches atmospheric pressure.	
VACUUM SYSTEM EVAC switch	Evacuates the specimen chamber and EOS. Pressing the switch starts blinking, and the light of the switch turns on when pumping the specimen chamber and EOS completes.	
VACUUM SYSTEM LV switch	Selects high or low vacuum mode. If the switch is turned on, the low vacuum (LV) mode is selected. Turning the switch off selects the high vacuum (HV) mode.	Is used in JSM-IT300LV/LA.
VACUUM SYSTEM LLC switch	Pumps the load lock chamber (LLC)	Is used when LLC (optional attachment) is installed.



## 2.3.2 Rear Panel



Name	Description	Remarks
AC100V 8A	Is used as a service outlet.	JSM-IT300/LV: 2 outlets (for PC, LCD) JSM-IT300A/LA: 4 outlets (for PC, LCD, EDS)
MAIN BRAKER	Is the power supply breaker for the whole system. An overcurrent to the system will shut the power automatically.  <div style="border: 1px solid black; padding: 5px;"> <p>◆ <b>CAUTION</b> ◆ The MAIN BRAKER shall not be touched in the normal operation except emergency use. In case the breaker is thrown, abnormal malfunction is supposed to be involved and your contact to the local JEOL support center is requested.</p> </div>	The breaker needs not to be operated in the normal work.
Breaker for RP	Is prepared for RP. If an overcurrent flows, the power automatically shuts.  <div style="border: 1px solid black; padding: 5px;"> <p>◆ <b>CAUTION</b> ◆ In case the breaker is thrown, abnormal malfunction is supposed to be involved and your contact to the local JEOL support center is requested.</p> </div>	JSM-IT300/A: 1 set JSM-IT300LV/LA: 2 sets
FIS panel EDS	Is prepared to connect to JEOL-made EDS digital pulse processor.	Is used in JSM-IT300A/LA.
FIS panel RS232C	Is used for the options that need serial connection.	
FIS panel ETHERNET	Is connected to the HUB (inside the main console).	



# 3

## BASIC OPERATION

Refer to the EDS detector instruction manuals regarding EDS operation

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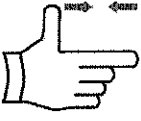
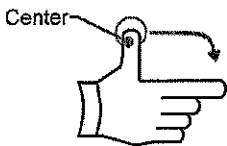
## 3.1 UI OPERATION

Two operation modes for the user interface (UI) are available for operating the icon selection, moving the field of view and the Tools.<sup>1</sup>





Touch mode (touch operation by a finger or a touch pen)

Mouse mode (operation by the mouse)

Please note that this manual is described on the precondition that the Touch mode is used.

Operation		Action
Tap		Tap the screen once with a fingertip (select).
Double-tap		Tap the screen twice with a finger tip (execute).
Press and tap		Press the screen with one finger and tap with another finger quickly. ※Same action as mouse right-click
Touch and hold		Continue to press the screen. ※Same action as mouse right-click
Swipe		Slide the fingertip while pressing the screen.
Flick		Slide your finger across the screen quickly.
Drag		Press with a finger while sliding it on the screen.
Pinch out		Press the screen with 2 fingers and move them outward with a pinching motion. Example) Up magnification
Pinch in		Press the screen with 2 fingers and move them inward with a pinching motion. Example) Down magnification
Rotate		Press the image with 2 fingers and move one finger in an arc, while keeping the other finger fixed at the center of rotation. An image can be rotated to the right or left by sliding the moving finger either clockwise or counterclockwise.

<sup>1</sup> To change the operation mode, select Settings in the menu bar, then SETTINGS window—Operation (Touch or Mouse).

Mouse operation		Action
Click		Press and release the left mouse button.
Double click		Click the left mouse button twice in quick succession.
Right click		Click the right mouse button.
Drag		Press and hold the left mouse button while moving the mouse.

**◆CAUTION◆**

In the UI operation, such as screen switching and icons switching at high speed, please do not implement it can cause communication error.

Screen freezes: it may not accept the operation is not a malfunction of the device. Please operate from at a later time. If the freeze is not released, restart the UI, or restart your PC.

## 3.2 OPERATION FLOW

The basic operation of this instrument is based on observation by auto functions, the usual operation flow is as follows.

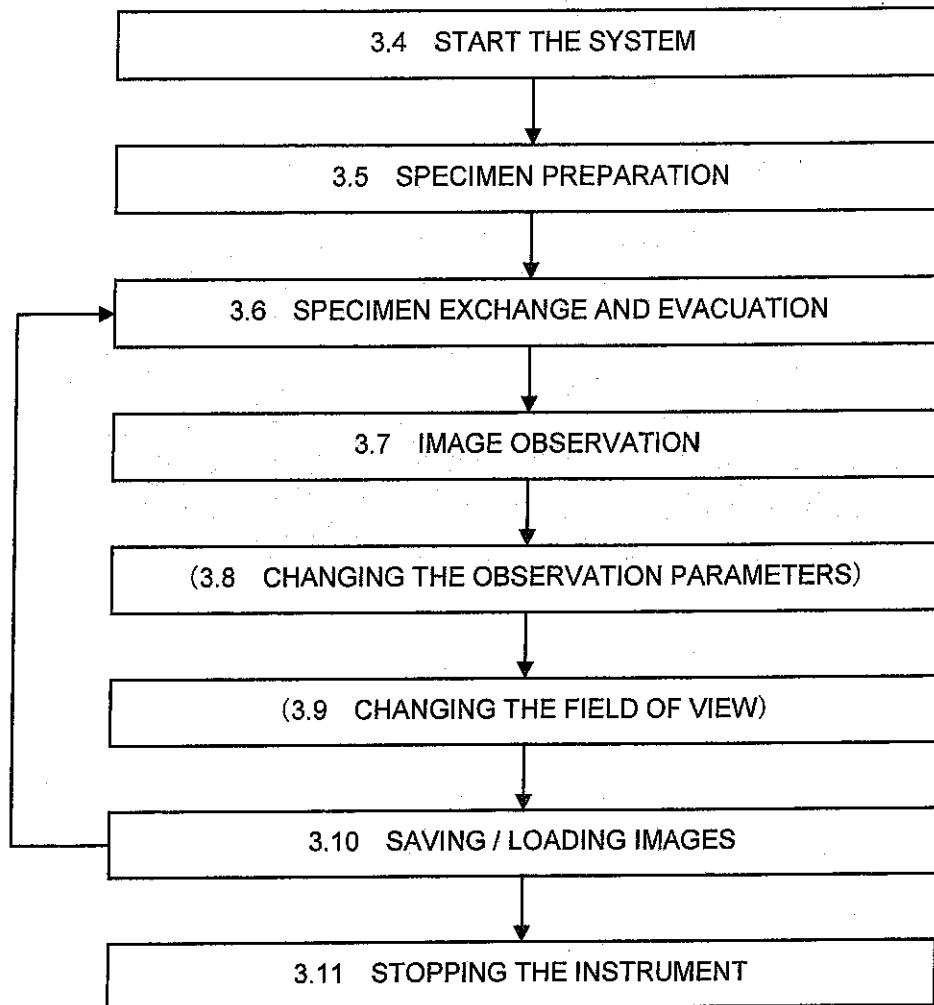


Fig. 3-1 Basic operation flow

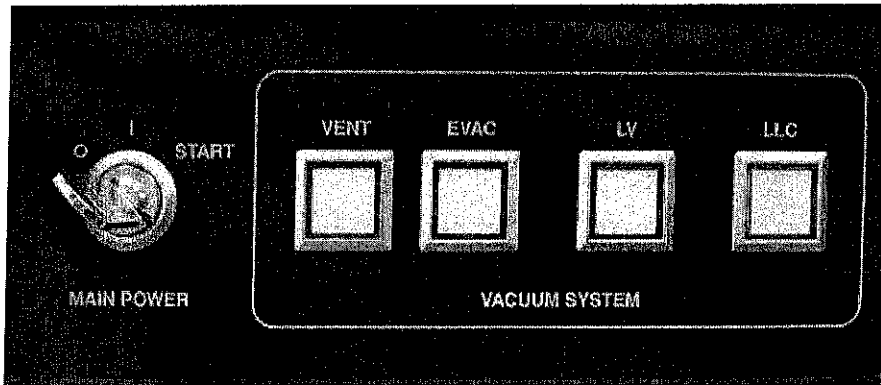
### 3.3 EMERGENCY OPERATION (SYSTEM ERROR, POWER FAILURE, NATURAL DISASTER)

When an error (allophone, nasty smell) occurs or the system needs to be shut down due to a natural disaster,

**Turn the MAIN POWER key switch to  $\circ$  (OFF) and the switch board (breaker) OFF.**

\* The system is designed to shut down in a safe mode during a power failure.

Refer to "3.4 STARTING THE SYSTEM" to restart after an emergency shut-down or automatic shut-down.





## 3.4 START THE SYSTEM

### 1. Daily checkup

Check the installation conditions and the RP oil level before starting the instrument.

#### ◆ CAUTION ◆

- **When the instrument is started, be sure that the room temperature is within the range specified in the installation requirements (15 to 25°C).**  
If the room is not within the specified temperature range, use the heating/ cooling facilities to bring the room temperature to within the specified range before starting the instrument.
- **Be careful that the oil level does not drop below the lower limit.**  
If the instrument is operated while the RP oil level is low, the pump may be damaged. Be sure to check the oil level and degree of contamination (discoloration) using the RP oil level indicator.
- **When it is necessary to refill or replace the oil, contact your local JEOL support office.**

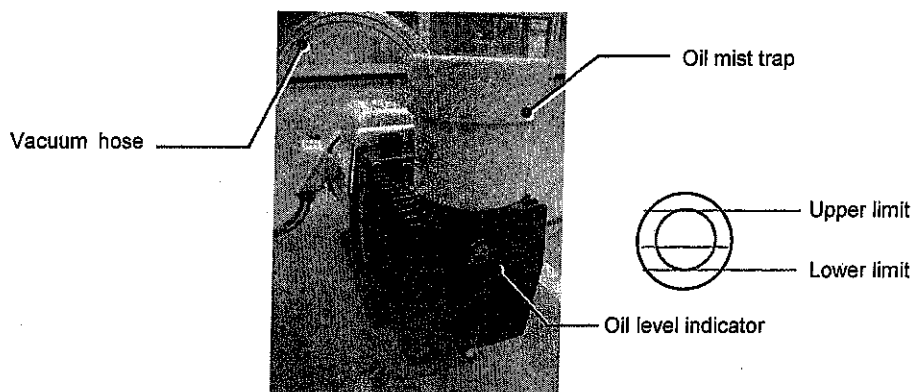


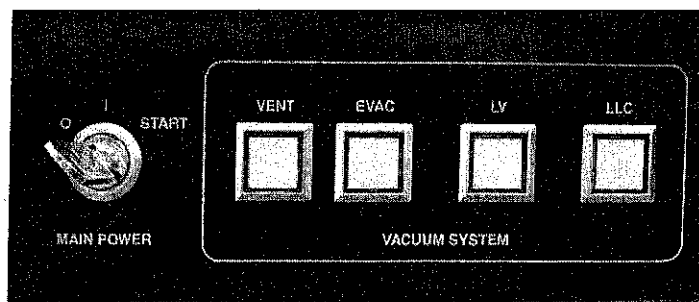
Fig. 3-2 RP (Rotary pump)

2. Turn the power switch (breaker) ON the switchboard.

3. Make sure that the MAIN BRAKER on the back of the microscope column is ON.

4. Turn the MAIN POWER key switch on the main control panel ON ( | ).

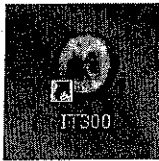
Insert the key, turn it to START and release the key. The key automatically moves back to the | (ON) position.



5. Turn ON the power for the monitor and printer.  
Wait about 10 seconds after the system is started before turning on the power.
6. Turn ON the power for the PC.  
Windows will start after a few moments.
7. Start the SEM Control program.  
Tap START on the desktop and then IT300 from the pull-up menu.  
The start-up screen is displayed, the SEM control program is launched, and the UI is displayed.



Or, double-tap the short-cut icon on the desktop to start the system.



## 3.5 SPECIMEN PREPARATION

### ◆ CAUTION ◆

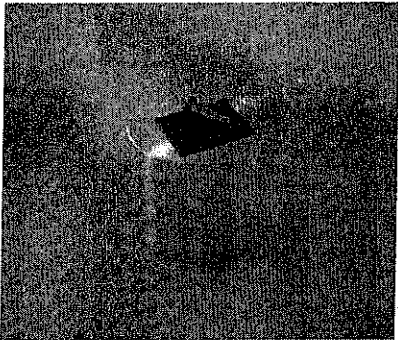
Be sure that the specimen is set so that it does not protrude higher than the upper surface of the specimen holder.

If the specimen protrudes above the upper surface of the specimen holder, there is a risk that the specimen will collide with the objective lens or backscattered electron detector resulting in damage, even if the stage is moved within the allowed movement range.

#### 1. Affix the specimen onto the specimen stub.

Use conductive tape or adhesive to affix the specimen onto the specimen stub.

- \* Apply a conductive coating to prevent the specimen from becoming electrically charged, if necessary.
- \* Do not use a specimen containing too much water or oil in order to prevent the optical column from becoming contaminated.



#### 2. Attach the specimen stub with the specimen affixed to the adaptor.



#### 3. Attach the adaptor with the specimen stub to the specimen holder



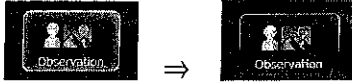
If the observation surface protrudes above the holder, be sure to measure the height and note the value. Enter the value when the specimen is exchanged in order to prevent damage due to parts colliding. (⇒ See page 3-10)



Measure the protrusion height.

## 3.6 SPECIMEN EXCHANGE AND EVACUATION

1. Tap the **Observation** icon to turn it OFF.

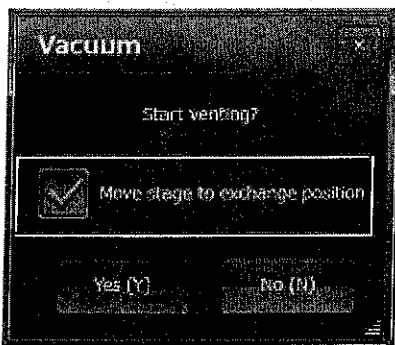


2. Tap **VENT** to return the specimen chamber to atmospheric pressure.

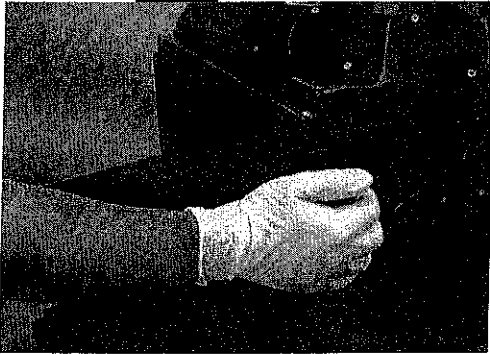
The **VENT** button starts flashing and the evacuation progress bar moves from READY to WAIT.

Specimen stage moves to X: 0 mm, Y: 0 mm, Z: 48 mm.

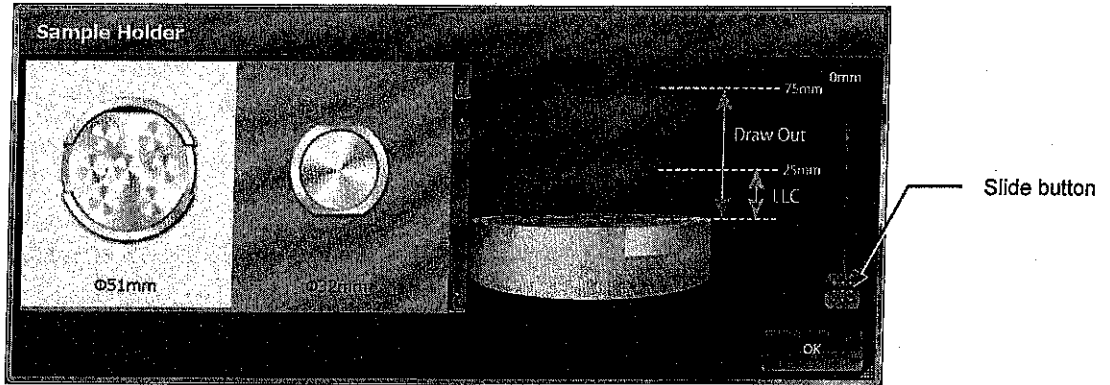
When tapping **VENT** button and open the 『Move stage to exchange position』 check box, the present stage position is maintained.



3. When the **VENT** button stops flashing, open the door and take out the specimen holder.



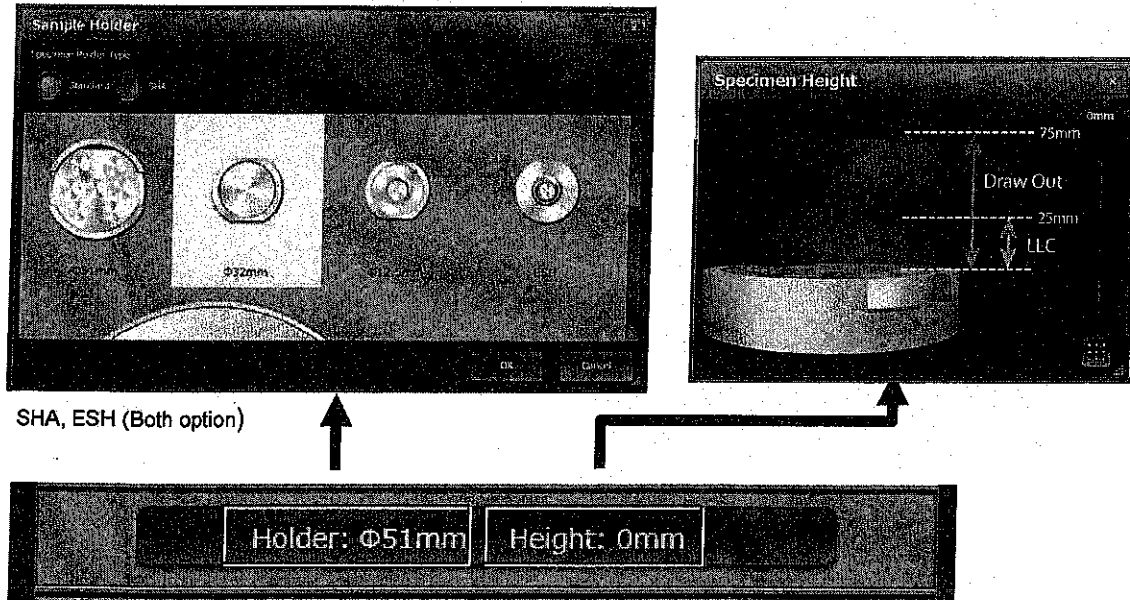
4. Select specimen holder and set the specimen height, and mount a new specimen on the stage. Sample Holder window is displayed when the pressure inside the chamber reaches atmospheric pressure.
- Select the specimen holder on the Specimen holder change window.
  - Use the slide button to set the height of the specimen that protrudes above the top of the holder. The height is indicated in 1 mm increments such as "Height : \* \* mm". (⇒ See page 3-8.)



◆ **CAUTION** ◆

- **Be sure to select the specimen holder you plan to use from the specimen holder dialog.**  
If the specimen holder is not properly selected, the specimen stage may be permitted to move beyond the acceptable limits, creating a risk of collision with the objective lens or backscattered electron detector, resulting in damage.
- **Be sure to set the specimen height each time that the specimen is exchanged.**  
If the height is not adjusted correctly there is a danger of damage to the detector.

Selection of the specimen holder and entry of a specimen height can be performed also in "Area for specimen holder and specimen height"

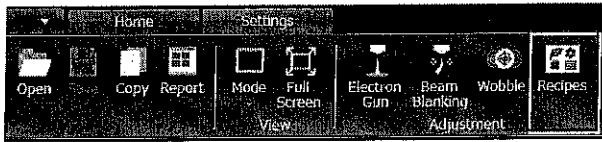


**Specimen Height**

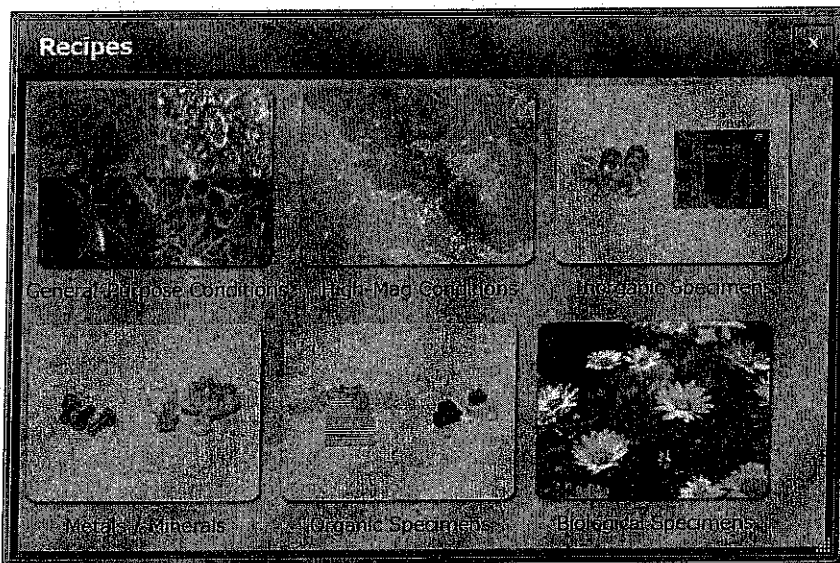
The specimen exchange is performed by **DrawOut** (basis) or **LLC** (option). The numerical value (**75mm/25mm**) in the window indicates the maximum specimen height (protrusion height) which can be mounted.

5. Set the observation condition by the recipe.

- a. Tap **Recipes** icon from Home.  
The Recipes window is displayed.



- b. Choose an appropriate recipe for the sample.  
Select General-Purpose Conditions when you don't know which recipe is suitable for observing the specimen.



General-Purpose Conditions:	Standard	H-Mag Conditions:	High magnification
Inorganic Specimens:	Glass, ceramics, semiconductor	Metals/Minerals	
Organic Specimens:	Fiber, plastic	Biological Specimens:	Living organism, plant

- c. Check the required items and tap the **Execute** button.  
The settings shown in Table 3-1 will be set according to which items are chosen.

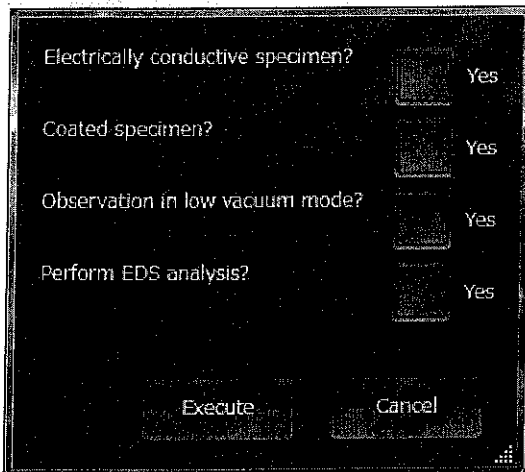


Table 3-1 Recipe settings

	Magnification	Coated			Not coated					
		AccV	P.C.		Low acceleration observation		Low-vacuum observation			
			View	EDS	AccV	P.C. View	AccV	P.C.		Pa
General-purpose Conditions	Minimum magnification	15	50	60	1.0	50	15	60	65	30
High-Mag Conditions		20	35	-	-	-	-	-	-	-
Inorganic Specimens		15	50	60	1.0	50	15	60	65	40
Metal/Mineral		20	50	60	1.5	50	15	50	50	30
Organic Specimens		10	50	60	1.0	50	10	60	65	40
Biological Specimens		10	50	60	1.0	50	10	60	65	50

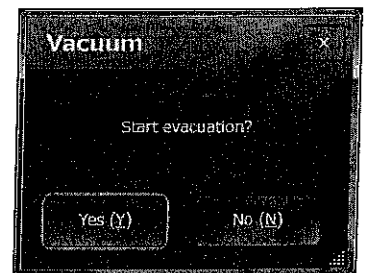
AccV: Acceleration voltage

P.C.: Probe current

Pa: Specimen chamber pressure

- Coated : Secondary electron image is displayed.
- Not-coated (Low-acceleration observation) : Secondary electron image is displayed.
- Not-coated (Low-vacuum observation) : Backscattered electron image is displayed.

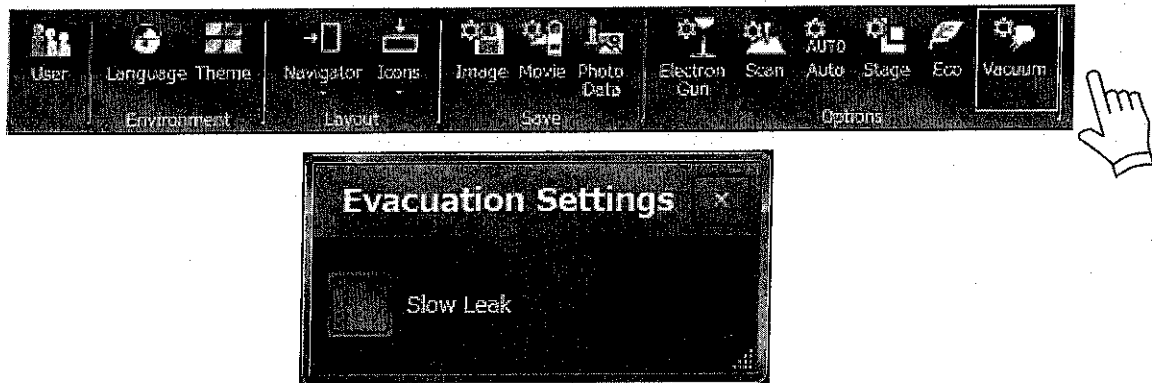
6. Close the specimen chamber door, and tap the **EVAC** button for evacuating the specimen chamber.  
Tap the **Yes** button of the message that is displayed. The **EVAC** button will start blinking.



**◆ CAUTION ◆**  
When the specimen chamber door is closed, be careful to prevent your fingers or hand from being caught between the door and the specimen chamber.

If the set specimen is easy to disperse such as powder sample, set the evacuation mode to slow leak in accordance with the following procedure:

- a. Tap the **Vacuum** icon from Settings.  
The Evacuation Settings window appears.
- b. Check **Slow Leak**.  
Slow leak mode is set.



※ Only JSM-IT300LV and JSM-IT300LA can use a Slow Leak mode.

7. Check that the evacuation progress bar has reached READY, and that the **EVAC** button is lit.



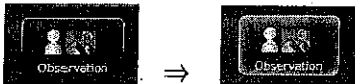
## 3.7 IMAGE OBSERVATION

### 3.7.1 High vacuum mode Observation (SE image)

For image observation in the high vacuum mode, non-conductive specimens must either be coated with a metal using evaporation deposition, or observed with a low accelerating voltage (about 1.0kV) if they are not coated with a metal.

1. Choose a recipe to set the observation parameters  
Depending on the type of the specimen, check "Electrically conductive specimen?" and "Coated specimen?". Do not check "Observation in low vacuum mode?". The required parameters will be automatically set when the **Execute** button is tapped. ⇒ See page 3-11 and 3-12.
2. Start evacuation after the specimen is set.  
Tap the **EVAC** button and follow the displayed messages to start evacuation.

3. Tap the **Observation** icon to turn it ON.



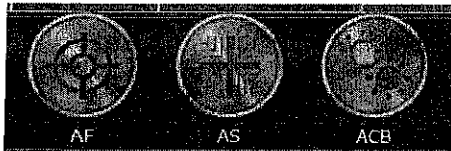
4. Adjust the image.

Tap the **ACB** icon when the image is too dark. Brightness will be automatically adjusted.

Tap the **AF** and **AS** icons when the image is out of focus.

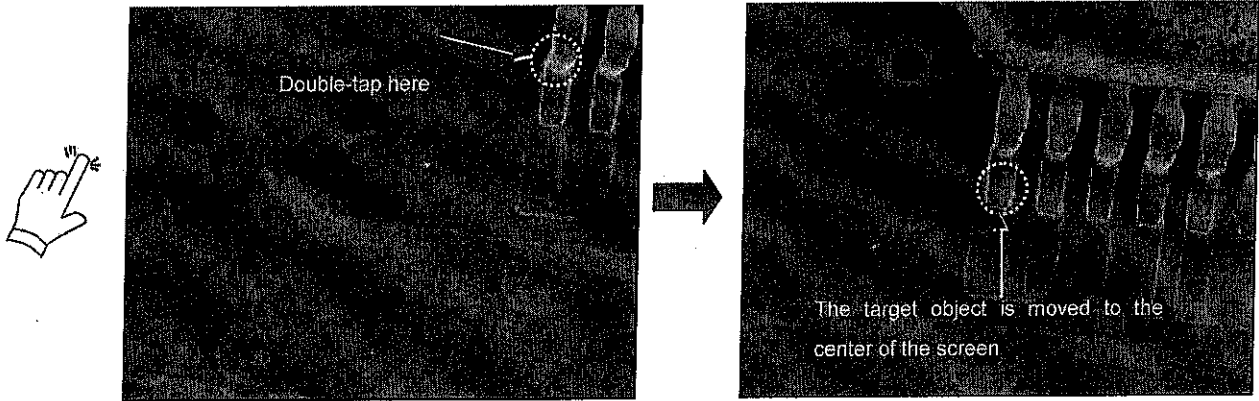
The image focus will be adjusted automatically. If **AF** and **ACB** don't work well, increase the magnification level a little and try again.

※ The above auto icons cannot be operated in a static image.



5. Adjust the accelerating voltage, probe current, magnification level and brightness if needed.  
Use the Photo data or Manual adjustment tools for additional adjustments.  
⇒ See sections 3.8.2 to 3.8.7.

6. Use Click Center to move the target area to the center of the screen.  
Double-tap the target area of an image on the display.  
The selected area is moved to the center of the screen automatically.



7. Increase the magnification level gradually and move the target area to the center of the screen by using the Click Center.
8. Adjust the focus and brightness in accordance with the magnification level.  
Use the auto-start icons (ACB, AF, AS) or Manual adjustment tools for additional adjustments.  
⇒ See sections 3.8.5 to 3.8.7.

## 3.7.2 High vacuum mode observation (BE image)

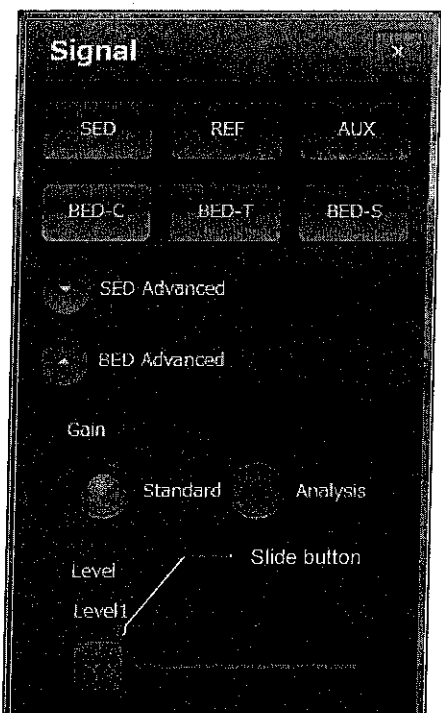
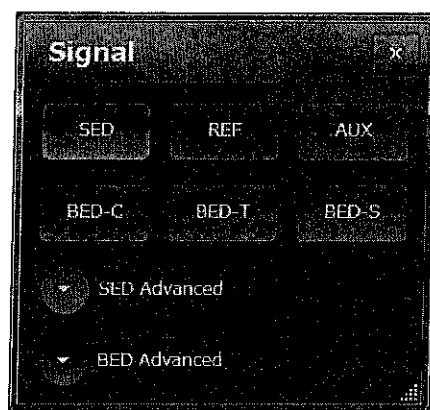
The surface topology and composition distribution of a specimen can be observed by detecting the backscattered electrons (BE) that contain the information about the specimen surface. Display the secondary electron image first. Then, the BE image can be displayed smoothly.

The characteristics of the BE images are...

- In the composition images, the light elements are displayed darker and the heavy elements are brighter.
- For topology images, the surface features appear to be illuminated from the right side.
- The convex portions are displayed brighter on the right side and darker on the left side. The concave portions are displayed in an opposite manner.

1. Mount a specimen and display the secondary electron image (SEI).  
⇒ See section 3.7.1.
2. Tap the  $\Delta$  mark under Signal of photo data.  
In the below figure, tap the  $\Delta$  mark under 『SED』, and Signal window is displayed.
3. Select a BE image.  
Tap one of the 3 modes; **BED-C**, **BED-T**, or **BED-S**.  
The Gain setting and Level setting<sup>2</sup> tools are displayed by tapping the 『BED Advanced』 button.

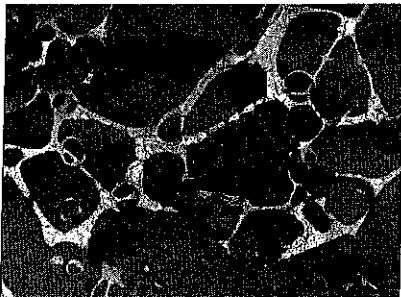
BED-C : Composition image  
BED-T : Topographic image  
BED-S : Stereotopic image



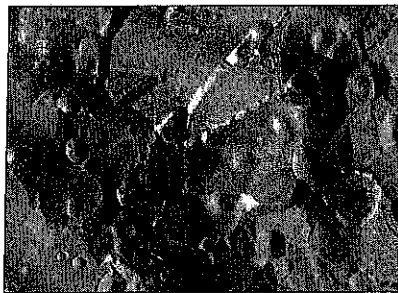
<sup>2</sup> Effective only when the BED-S is selected. The image can be displayed with a more three-dimensional appearance as the slide button is dragged to the right.

<BED Advanced>

- Gain: Used to set the probe current for either Standard or Analysis modes
- Standard: Used for general image observation.
- Analysis: When the probe current is too strong, the obtained BE image is too bright to observe. Both contrast and brightness can be automatically adjusted by selecting Analysis for Gain.
- Level: Used for BED-S (Solid image). The image can be displayed with a more three-dimensional appearance as the slide button is dragged to the right.



BED-C (Composition image)



BED-T (Topographic image)



BED-S (Solid image)

4. Set the observation parameters referring to the table below.  
⇒ Refer to sections 3.8.2 to 3.8.4.

Table3-2 Guidelines for observation conditions

	Recommended	Tendencies and Cautions
WD	10 to 20 mm	The shorter WD, the brighter the image. * When WD is changed, make sure that the BE detector doesn't collide with the specimen.
Acceleration voltage	15 to 20 kV	The higher the accelerating voltage, the brighter the image. * Note that some specimens may be damaged by the electron beam.
Probe current (P.C.)	30 to 50	The stronger the probe current, the brighter the image. * Note that some specimens may be damaged by the electron beam.
Movable aperture	1/2 (Aperture number)	Choosing 2 makes the image brighter than aperture number 1.

5. Adjust the image.  
Use the auto-start icons (ACB, AF, AS) or the Manual adjustment tools.  
⇒ See sections 3.8.5 to 3.8.7

- The image may gradually become brighter immediately after the system is started, or the accelerating voltage and WD are substantially changed. The variation in the brightness will eventually subside, but, this tendency should be considered when performing a slow scan in Slow or Photo mode.
- If the CHAMBER SCOPE (MP-94260CS) is used during BE image observation, a noise may go into the BE image.

<Reference> Principles of Backscattered Electron Image Formation

Composition image and Topology image

The figure below is a block diagram showing the basic signal paths for image formation. The emitted electron beam is scanned across the surface of the specimen, and backscattered electrons are released, providing information about the specimen topology, as well as the physical and chemical characteristics.

The backscattered electrons that provide the information about the specimen are detected from different directions by a pair of semiconductor detector elements A and B that are arranged symmetrically relative to the optical axis. The quantitative variation in the detected electrons is converted into electrical signals, which are individually amplified by the preamplifier and supplied to the operational amplifiers.

The operational amplifiers not only further amplify the signal, but also perform arithmetic operations. That is, in one place, the signal from detector element A is added to the signal from B and output; and in another place, the signal from A is subtracted from the signal from B and output. The sum of the input signals becomes the signal for creating the composition image, while the difference between the input signals is used to generate the topology image (refer to the figure on the following page.) These signals are displayed on the screen.

Solid image formation

The signal from another semiconductor detector element C is added to the composition image signal generated by adding the A and B signals from the pair of semiconductor detector elements to obtain an image that combines both the topology and composition information about the specimen surface displayed with a solid, 3-dimensional appearance (shadows).

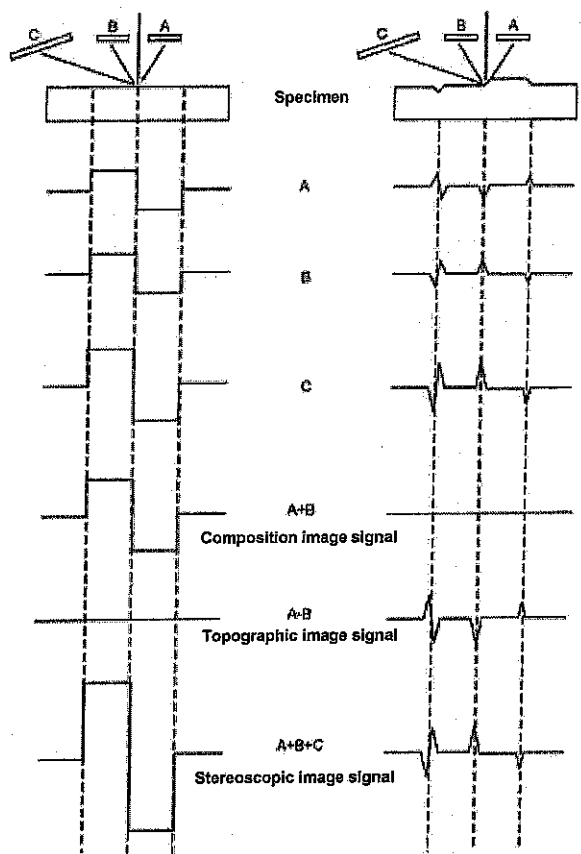
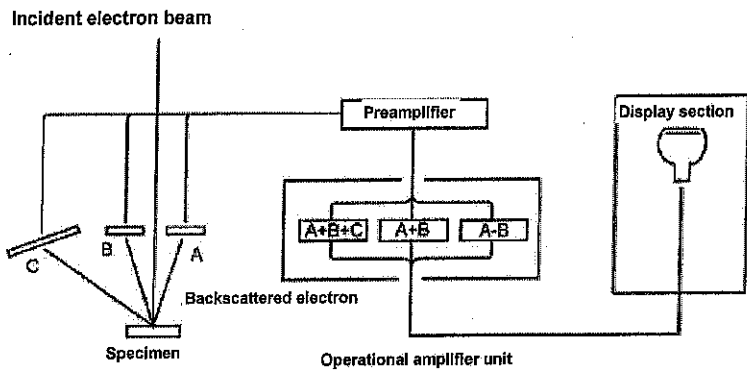


Fig.3-3 Principles of Backscattered Electron Image Formation

### 3.7.3 Low vacuum mode observation

- ◆ In the low vacuum mode, a charge-up<sup>3</sup> may occur depending upon the voltage level. In such a case, countermeasures like setting the voltage a little higher must be taken.
- ◆ The images that can be observed in low-vacuum mode are the BE images or low vacuum secondary electron images. (Note that an optional low vacuum secondary electron detector is necessary.)

1. Choose a recipe to set the observation parameters.

Choose a recipe suitable for the specimen, and check Observation in low vacuum mode?.

The required parameters will be automatically set when the Execute button is tapped.

⇒ See page 3-11 and 3-12.

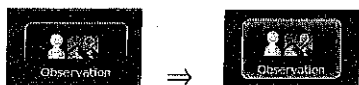
2. Mount a dry specimen (paper or cloth).

When observing a specimen that contains moisture (organism or plant), observe a dry specimen (such as the specimen holder) first. Then, mount the specimen that contains moisture.

3. Start evacuation.

Tap the EVAC button and follow the displayed messages to start evacuation. Evacuation is performed as shown in Table 3-1 (page 3-12). This process takes a few minutes to complete.<sup>4</sup>

4. Tap the Observation icon to turn it ON after the evacuation is completed.



5. Adjust the image.

Tap the ACB icon when the image is too dark. Brightness will be automatically adjusted.

Tap the AF and AS icons when the image is out of focus. The image focus will be adjusted automatically. If AF and ACB don't work well, increase the magnification level a little and try again.

6. Adjust the accelerating voltage, probe current, magnification level and brightness if needed.

Use the Photo data display or Manual adjustment tools for additional adjustments.

⇒ See sections 3.8.2 to 3.8.7.

Refer to sections 3.8.10 and 3.8.11 to change the vacuum mode or adjustment the pressure in the specimen chamber.

<sup>3</sup> A phenomena in which the observed images have uneven brightness or shifting of the field of view during the scan.

<sup>4</sup> An error message is displayed if evacuation is not completed within 10 minutes or a valve lock occurs. Close the message and reset the pressure again

Tips: For easier observation...

- a. Change the scanning speed  
Press and hold the **[Fast]** icon and choose either 0.5 s or 1.0 s for the scanning speed.  
The image gets clearer as the scanning speed becomes slower.
- b. Change the probe current (P.C.)  
The image gets clearer as the P.C. value becomes higher. (Brightness may change as well.  
Use the **[ACB]** icon to adjust the brightness.)
- c. Increase the accelerating voltage  
Contrast can be enhanced by increasing the accelerating voltage to 20 kV.

7. Use Click Center to move the target area to the center of the screen.

Double-tap the target area of an image on the display.

The selected area is moved to the center of the screen automatically.

8. Check whether the specimen has become charged.

Increase the magnification and check to see if the specimen has become charged-up.

If the specimen is charged up, remove the charge either by increasing the pressure, or lowering the accelerating voltage and the probe current.

Table 3-3 Relationship between pressure – specimen charging – brightness

Low ←	Pressure	→ High
More ←	Charging	→ Less
Bright ←	Brightness	→ Dark



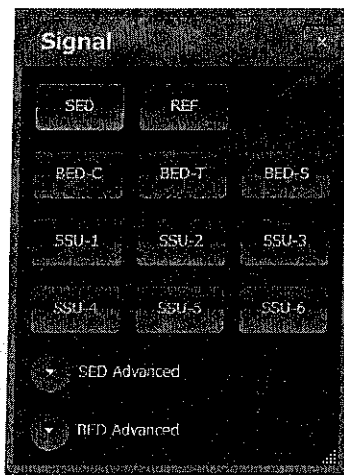
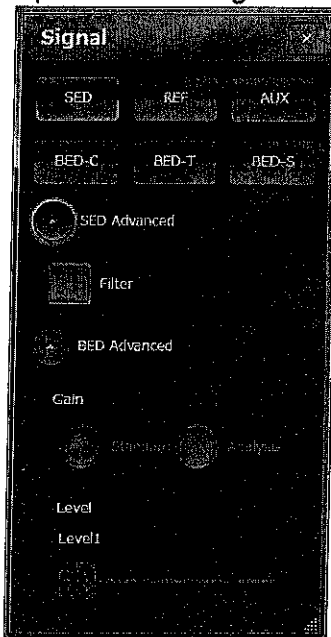
## 3.8 CHANGING THE OBSERVATION PARAMETERS

### 3.8.1 Signal selection

1. Tap  $\Delta$  mark under signal of the Photo data.  
In the below figure, tap the  $\Delta$  mark under 『SED』, and Signal window is displayed.



2. Tap the desired signal button.



Button layout  
SIGNAL SWITCHING UNIT (OPTION)

#### Signal button

<b>SED</b> <sup>5</sup> : Secondary electron image	<b>REF</b> : REF image
<b>AUX</b> : AUX	<b>BED-C</b> : BE image - Composition
<b>BED-T</b> : BE image – Topographic	<b>BED-S</b> : BE image – Solid

#### When Signal switching unit is applied

SSU-1, SSU-2, SSU-3 : Deetctor of input impedance is 1.8k  $\Omega$ .

SSU-4, SSU-5, SSU-6 : Detector of input impedance is 75  $\Omega$ .

Consult the detector manufacturer or service office for input impedance.

#### SED Advanced

**Filter:** Decrease the brightness when a portion of the image is too bright due to an edge-effect.

#### BED Advanced

**Gain:** Used to set the probe current for either Standard or Analysis modes

**Standard:** Used for general image observation.

**Analysis:** When the probe current is too strong, the obtained BE image is too bright to observe. Both contrast and brightness can be automatically adjusted by selecting Analysis for Gain.

**Level:** Used for BED-S (Solid image). The image can be displayed with a more three-dimensional appearance as the lever is dragged to the right.

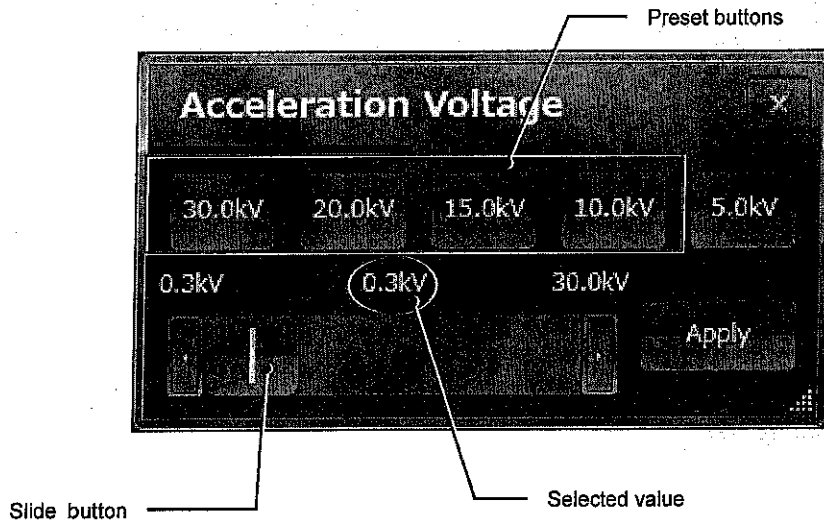
<sup>5</sup> In the low vacuum mode, changes to the **LSED** (Low-vacuum secondary electron detector) button. (When the LSED of option is installed)

## 3.8.2 Acceleration voltage setting

1. Tap  $\Delta$  mark under acceleration voltage of the Photo data.  
In the below figure, tap the  $\Delta$  mark under 『1.0kV』, and Acceleration Voltage window is displayed.



2. Set the acceleration voltage.  
Tap the preset button or use the slide button for setting.  
The value set by using the slide button is displayed in the upper middle of the slide bar.  
The selected value is applied by tapping the **Apply** button.



### Changing the preset button

Drag the value selected by using the slide button (upper middle of the slide bar) and drop it on the preset button desired to change. The value of the preset button changes.

### 3.8.3 Probe current setting

Set the probe current to one that is appropriate for the purpose.

- Set the probe current to about P.C. 30 for a standard image observation.
- Set it lower than P.C. 30 for a high resolution image observation.
- Set it to higher than P.C.30 for analysis.

1. Tap  $\Delta$  mark under P.C. of the Photo data.

In the below figure, tap the  $\Delta$  mark under 『Std.-P.C.50.0』, and Probe Current window is displayed.

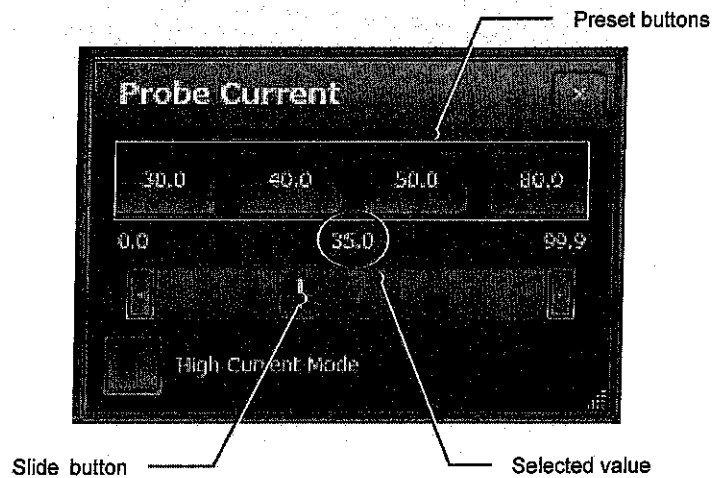


2. Set the probe current.

Tap the preset button or use the slide button for setting.

The value set by using the slide button is displayed in the upper middle of the slide bar.

※ About "High Current Mode", refer to the Section 4.2.5 in Chapter 4.



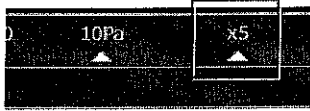
#### Changing the preset button

Drag the value selected by using the slide button (upper middle of the slide bar) and drop it on the preset button desired to change. The value of the preset button changes.

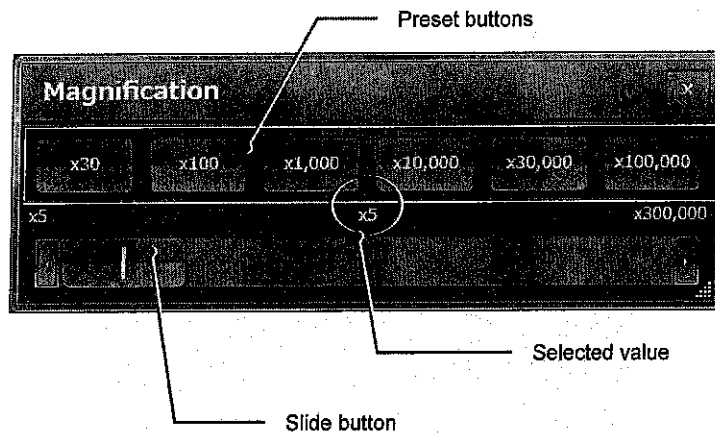
## 3.8.4 Switching the magnification

<Using the Magnification window>

1. Tap  $\Delta$  mark under magnification of the Photo data.  
In the below figure, tap the  $\Delta$  mark under 『 $\times 5$ 』, and Magnification window is displayed.



2. Set the magnification.  
Tap the preset button or use the slide button for setting.  
The value set by using the slide button is displayed in the upper middle of the slide bar.



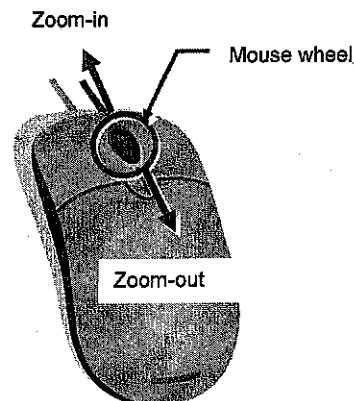
### Changing the preset button

Drag the value selected by using the slide button (upper middle of the slide bar) and drop it on the preset button desired to change. The value of the preset button changes.

<Using the mouse wheel>

When the mouse cursor is located on the main screen, magnification can be changed by rotating the mouse wheel.

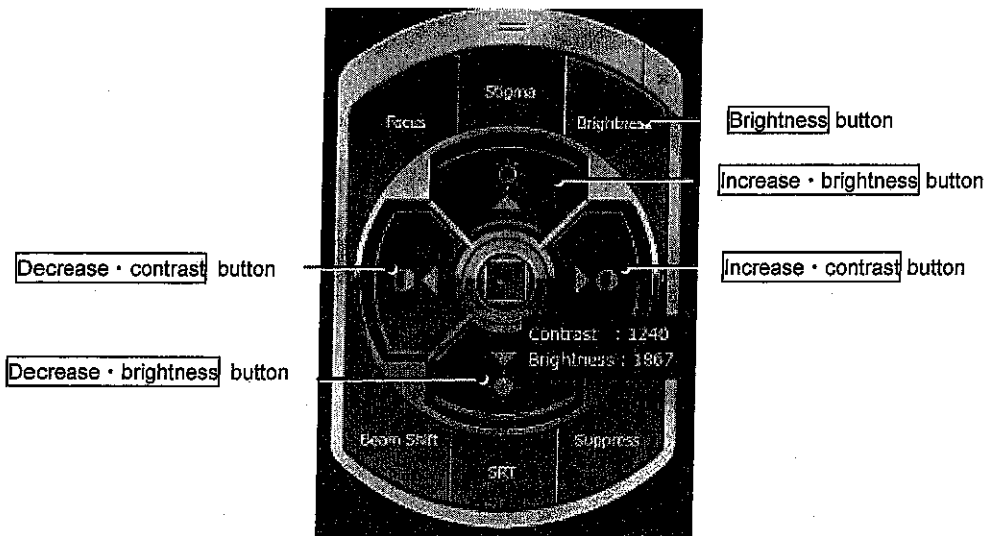
- Zoom-in : Rotate the wheel forward (away from you).
- Zoom-out : Rotate the wheel backward (toward you)



### 3.8.5 Image brightness adjustment

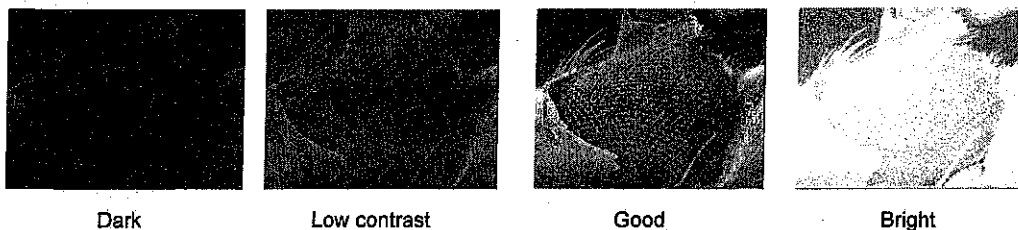
<Brightening (darkening) the image>

1. Tap the **Manual** icon.
2. Tap the **Brightness** button of the manual adjustment tool.
3. Tapping the **Increase · brightness** or **Decrease · brightness** button brightens (darkens) the image. Pressing and holding down these buttons, the brightness can be changed continuously. The **Brightness** button is selected, and put the mouse cursor on the center of manual tool, the contrast and brightness set value appears as below. (Min : 0, Max : 4095).



<Increasing (decreasing) the image contrast>

1. Tap the **Manual** icon.
2. Tap the **Brightness** button of the manual adjustment tool.
3. Tapping the **Increase · contrast** or **Decrease · contrast** button brightens (darkens) the image. Pressing and holding down these buttons, the contrast can be changed continuously.



#### When using the mouse

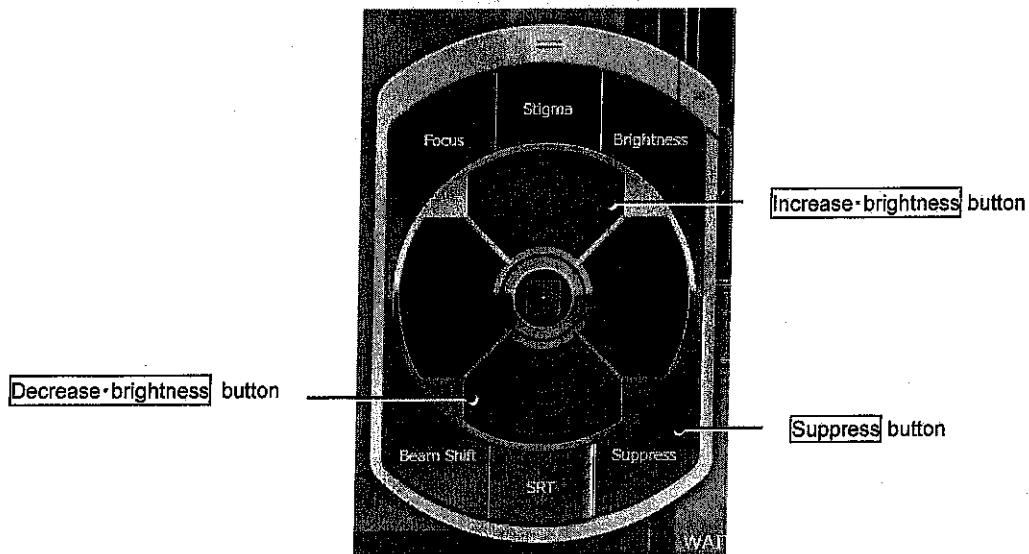
- Keep pressing the left mouse button or turning the mouse wheel with the mouse cursor placed on each button brightens (darkens) the image continuously.
- When you use the mouse wheel, you can adjust the image in both directions of brightening/darkening and increasing/decreasing contrast by one button.  
Ex.) Place the mouse cursor on the **Increase · brightness** button, and turn the mouse wheel.  
⇒ The direction of brightening/darkening can continuously be adjusted.

Brightening (darkening) the BE image (rough adjustment)

1. Tap the **Manual** icon.
2. Tap the **Suppress** button of the manual adjustment tool.
3. Tapping the **Increase · brightness** or **Decrease · brightness** button brightens (darkens) the image. Pressing and holding down these buttons, the contrast can be changed continuously.



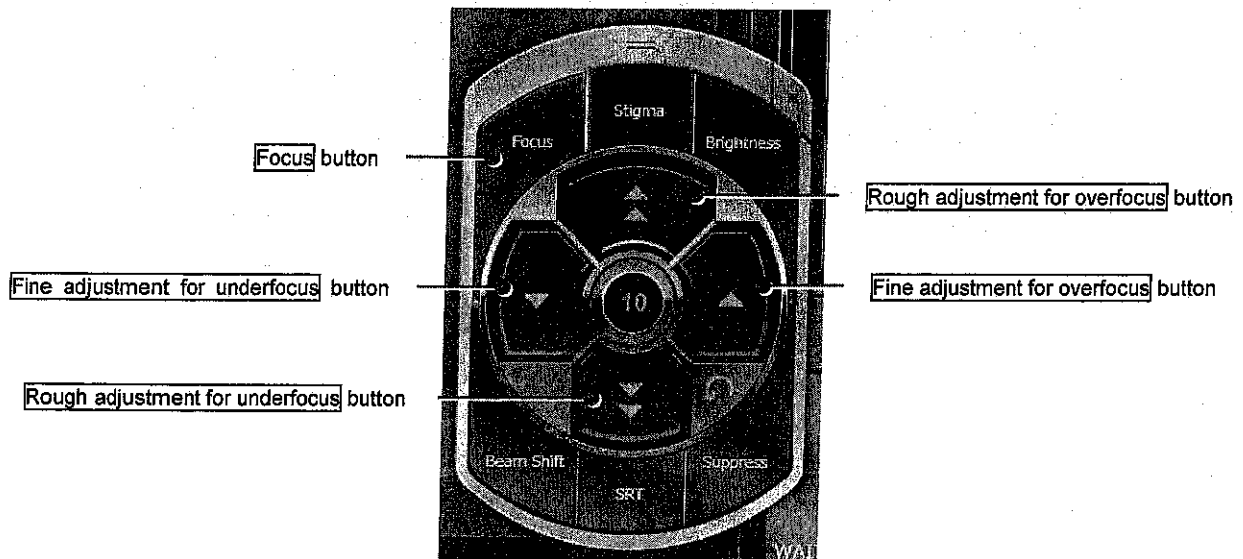
The **Suppress** button is selected, and put the mouse cursor on the center of manual tool, the suppress set value appears as below. (Min : 0、 Max : 4095)



### 3.8.6 Focus adjustment

When the image is completely out of focus, use the rough adjustment to approximately adjust the focus. Follow the procedure from Step 1. If the focus is already good enough to obtain an image, it can be fine-tuned using Fine Adjustment. Follow the procedure from Step 5.

1. Tap the **Manual** icon.
2. Tap the **Focus** button of the Manual adjustment tools.
3. Tap or press and hold the **Rough adjustment for overfocus** or **Rough adjustment for underfocus** button.
4. The image focus changes quickly, so release the button as soon as the image becomes sharper.  
If the image focus is corrected too much, press the opposite button. (Press Under-focus when the image becomes over-focused. Press Over-focus when the image becomes under-focused.)



5. Tap or press and hold the **Fine adjustment for overfocus** or **Fine adjustment for underfocus** button
6. The image focus will change, so release the button when the image becomes sharper.  
If the image focus is corrected too much, press the opposite button. (Press Under-focus when the image becomes over-focused. Press Over-focus when the image becomes under-focused.)
7. Continue fine adjustment to obtain the sharpest image



Image focus can be adjusted continuously by rotating the mouse wheel, while the mouse cursor is positioned over the corresponding button. In this case, both Over-focus and Under focus adjustment can be done by rotating the wheel.

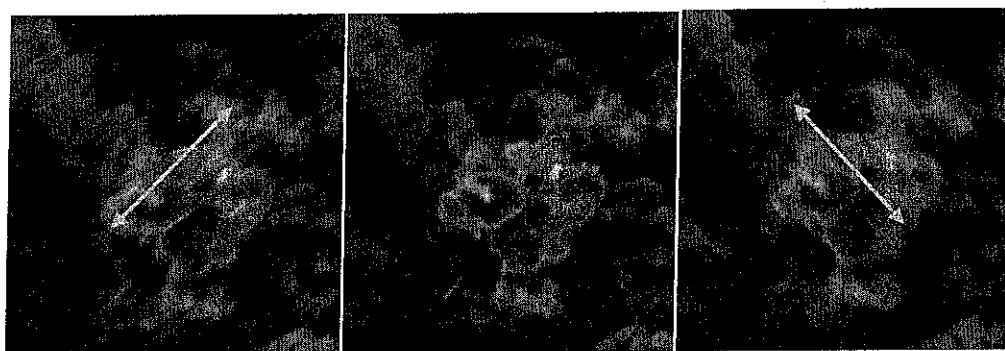
Example) Place the cursor over the **Over-focus** button and rotate the mouse wheel.

⇒ Both Over-focus and Under-focus can be continuously adjusted by rotating the wheel.

### 3.8.7 Astigmatism correction

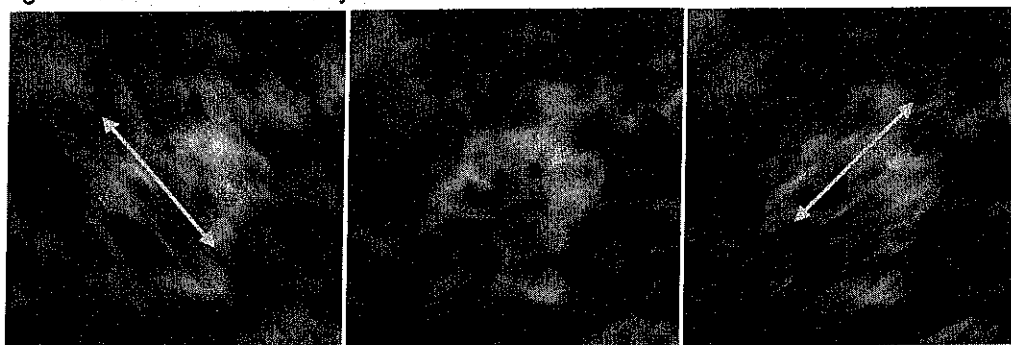
When the electron beam hits the specimen surface and doesn't create a perfect circle, this is called astigmatism. Adjustment of this circle is called astigmatism correction. A sharp image cannot be obtained at a high magnification without this correction. Follow the procedure below in order to correct astigmatism manually.

1. Tap the **Manual** icon.
2. Tap the **Focus** button of the Manual Adjustment tools.
3. Referring to the previous page, adjust the image so that it is in between the Underfocus and Overfocus state.  
This should be the justfocus point, in general. (The image is not sharp enough because of astigmatism.)



← **Under-focused** (Image appears to be shifted toward the direction of this arrow..) — **Just Focus** (Still blurred due to astigmatism) — **Over-focused** (Image appears to be shifted toward the direction of this arrow..) →

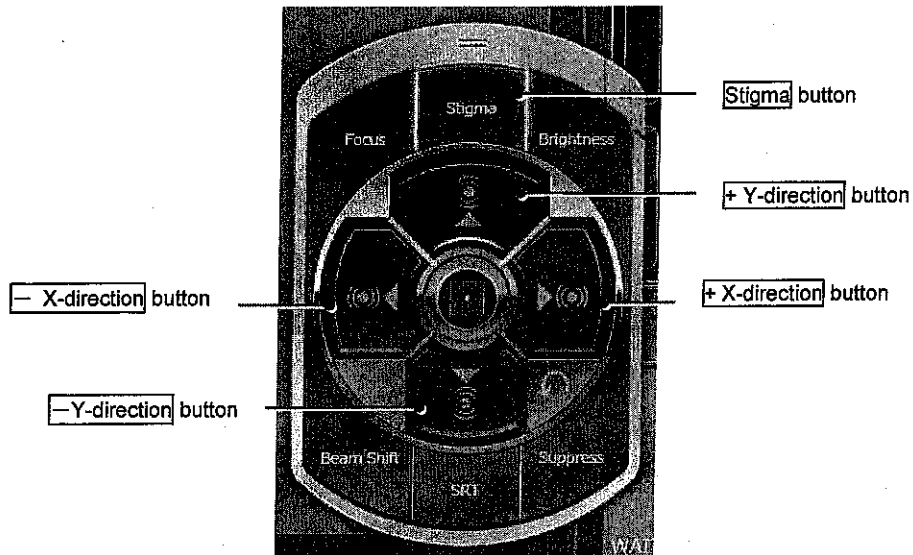
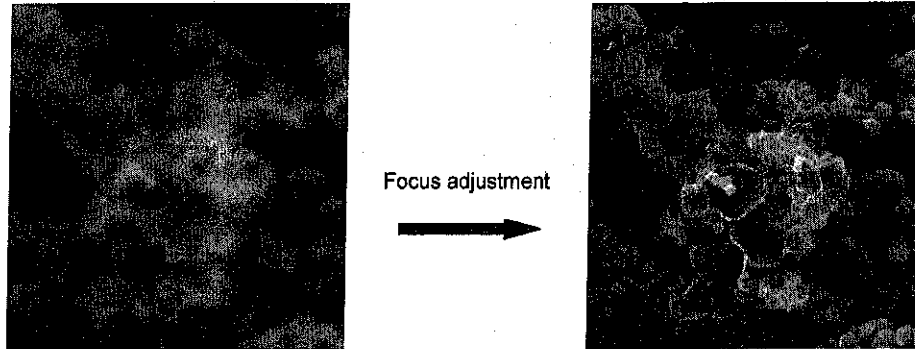
4. Tap the **Stigma** button.  
In this example, astigmatism correction is done in the X-direction.  
(The result is the same even if correction is performed in the Y-direction.)
5. Keep pushing the **+X** or **-X** buttons.  
The blurriness of the image changes as the button is pressed. Release the button when the edges of the image features can be seen more clearly.  
Then press the button for the other direction (If +X was first, switch to -X. If -X was used first, switch to +X) Repeat pressing the button for one direction and then the other in turns until the outline edges in the image can be seen most clearly.



← **Over-corrected (-X)** (Appears blurred in the arrow direction) — **Just-focus position** (Astigmatism is corrected, but still out of focus) — **Over-corrected (+X)** (Appears blurred in the arrow direction) →



6. Perform the same correction for the Y direction.
7. Repeat steps 4 and 5 several times in both the X and Y directions to correct the astigmatism. Then, adjust the focus so that the image appears as sharply defined as possible.



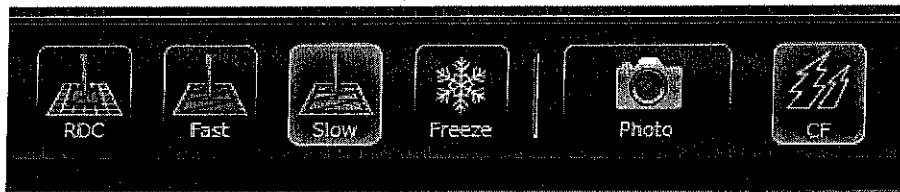
The astigmatism correction can be performed by positioning the mouse cursor over one of the buttons above and rotating the mouse wheel. You can adjust the astigmatism continuously in both directions very easily.

Example) Put the cursor over the **+X direction** button and rotate the mouse wheel.

⇒ It is possible to adjust in either the +X direction or -X direction.

### 3.8.8 Selecting the Scan Mode

Tap the icon for the scan mode best suited for your purpose.



#### RDC icon

The electron beam scanning range is limited. \* Screen resolution (320×240 pixels)

This is suitable for electron gun alignment, to locate a field of view, or for image quality adjustment.

#### Fast icon

A live image is displayed at a high speed. This is suitable for locating a field of view, and image quality adjustment.

#### Slow icon

A live image is displayed at a slow speed. This is suitable for observing images with a high resolution.

#### Freeze icon

The live image motion is stopped, to display a static image.

#### Photo icon

Imaging begins and a file is saved after a scan is completed. (The Auto Save in the Save Image Settings window must be checked).

The Imaging parameters are saved as a text file along with the image data.

After imaging, the screen displays a static image. This can be changed to the live image by tapping a button.



When imaging a specimen that is easily charged, select "Integration" for the Photo Mode in the Scan Settings window. The icon changes to "Integ."

#### CF icon

It reduces the amount of charge-up<sup>6</sup> of the specimen

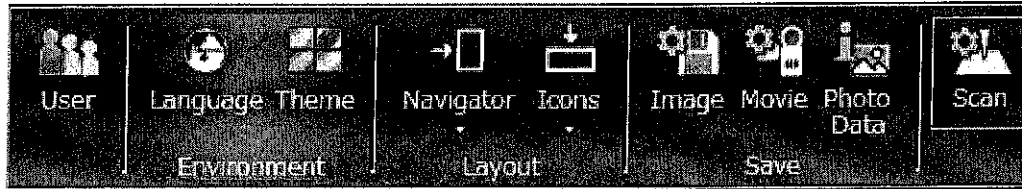
This can be used only for the Slow or Photo icons.

<sup>6</sup> A phenomena in which the observed images have uneven brightness or shifting of the field of view during the scan.

## 3.8.9 Changing the Scan Speed

Detailed setting of the scan speed can be made.

1. Tap the **Scan** icon from Settings.  
The Scan Settings window is displayed.

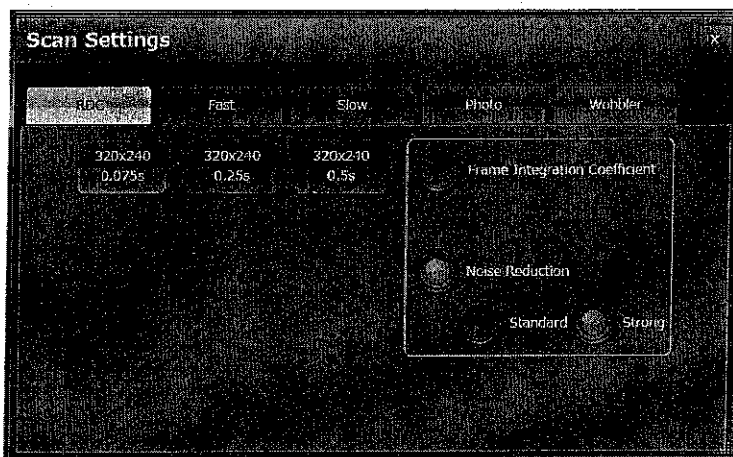


### RDC

You can select from among 3 combinations of speed & resolution.

A larger Frame Integration Coefficient will provide a brighter observed image.

When you selected "0.075s", noise reduction filter can use, and the intensity of filter an select one of "standard" or "strong".

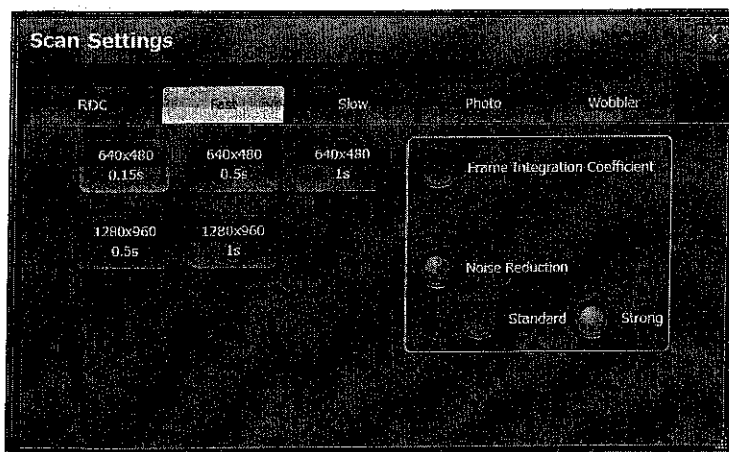


### Fast

You can select from among 5 combinations of speed & resolution.

A larger Frame Integration Coefficient will provide a brighter observed image.

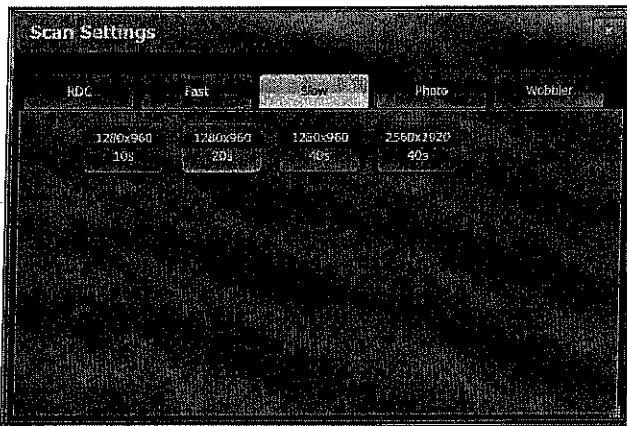
When you selected "0.15s", noise reduction filter can use, and the intensity of filter an select one of "standard" or "strong".



The image on the screen will be a little dark until the selected number of Frame Integration Coefficient is reached (Selectable range 1 to 255). Note that it is not a malfunction.

**Slow**

You can select from among 4 combinations of speed & resolution.



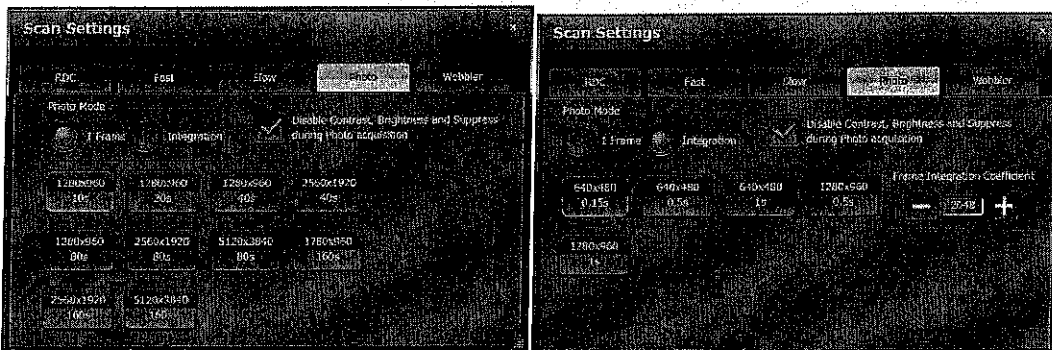
**Photo**

1 Frame: Select from among 10 combinations of speed & resolution.

Integration: Select from among 5 combinations of speed & resolution.

This is effective with specimens likely to be charged up.

The Frame Integration Coefficient can be set according to the level of charge-up.



**Disable Contrast, Brightness and Suppress during Photo acquisition**

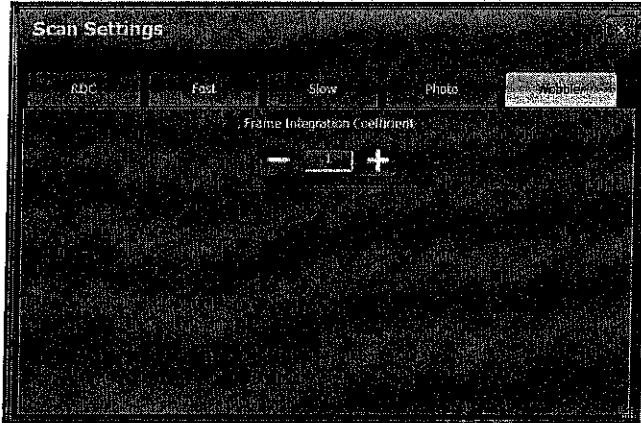
Check: Contrast, Brightness and Suppress cannot adjust during Photo acquisition

Open: Contrast, Brightness and Suppress can adjust during Photo acquisition

Wobbler

When the amount of irradiation current (P.C) is small, an image moves smoothly by increasing the "Frame Integration Coefficient", and the adjustment of movable aperture becomes easy.

(Selectable range 1 to 16)

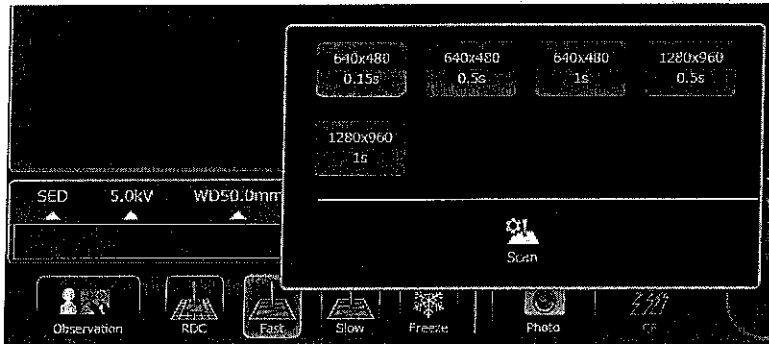




Touch and hold<sup>7</sup> (right-click) of fixation icon

Touch and hold the RDC, Fast, Slow icon, the following window appears.

**Scan** icon: Tap this icon, Scan Settings window can display.



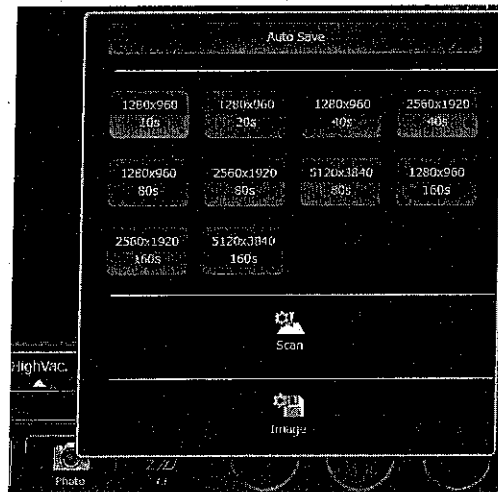
Touch and hold the **Photo** icon, the following window appears.

**Scan** icon: Tap this icon, Scan Settings window can display.

**Image** icon: Tap this icon, Save Image Settings window can display. (Refer to 3.10.1)

**Auto Save** button: Tap this icon, Auto Save checkbox in the Save Image Settings window is marked. (Refer to 3.10.1)

(The edge of this button becomes blue, Auto Save is enabled)

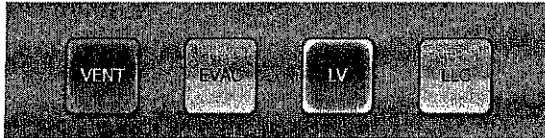


<sup>7</sup> Touch and hold: Continue to press

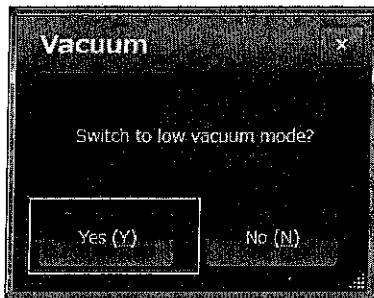
### 3.8.10 Switching the Vacuum Mode

There are 3 ways to change to the low-vacuum mode.

1. Switch from an evacuation button on the UI.  
Tap the **LV** button.

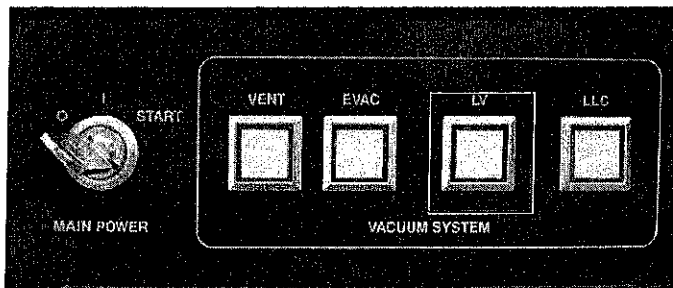


Tap the **YES** button.



2. Use the Main control panel.  
Press the **LV** switch.

Evacuation starts for the low-vacuum mode and the **LV** switch lit when evacuation is completed.

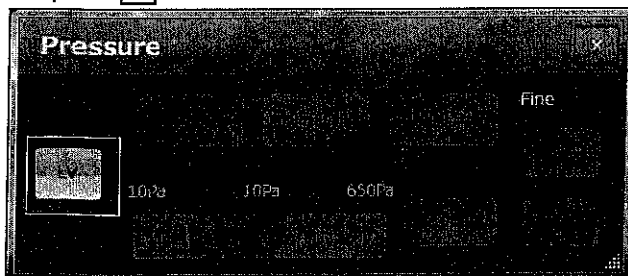


3. Use the Photo data.

In the below figure, tap the  $\Delta$  mark under 『HighVac.』, and Pressure window is displayed.



Tap the **LV** button in this window.





The Photo data become different by the vacuum mode.

### High-vacuum mode

SED	10.0kV	WD10.0mm	Std.-PC.50.0	HighVac.	x100	100um	0000	2013 06 27
-----	--------	----------	--------------	----------	------	-------	------	------------

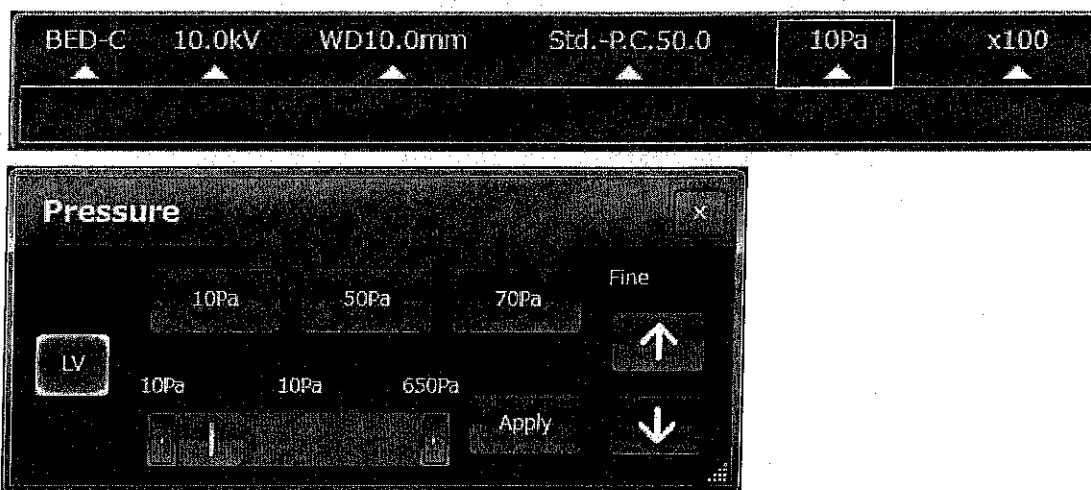
### Low-vacuum mode

BED-C	10.0kV	WD10.0mm	Std.-PC.50.0	10Pa	x100	100um	0000	2013 06 27
-------	--------	----------	--------------	------	------	-------	------	------------

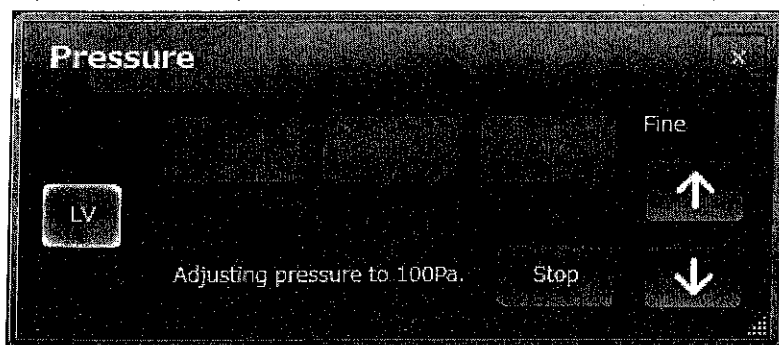


### 3.8.11 Adjusting the Pressure in the Specimen Chamber

1. Change the vacuum mode to the low-vacuum mode.  
⇒ See section 3.8.10.
2. Tap the pressure indication in the Photo data.  
In the below figure, tap the  $\Delta$  mark under 『10Pa』, and Pressure window is displayed.



3. Set the pressure.  
Select by either pressing a preset button or moving the slide button.  
When using the slide button, the selected value is indicated above the center of the slider. Tap the **Apply** button to set the value.  
The automatic adjustment of the pressure begins. During the pressure adjustment, the appearance of pressure level window changes as shown below. (In this example, the pressure is being automatically adjusted to 100 Pa.)

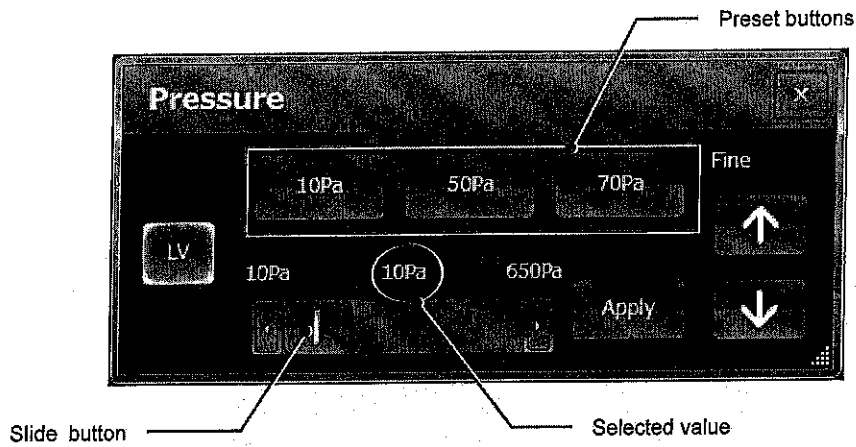


4. After the automatic adjustment is completed, if needed, finely adjust the pressure  
If there is specimen charge-up after the auto adjustment is completed, use the **Fine ↑** to increase the pressure and prevent charge-up.

If the image is not clear after the **RDC** or **Fast** scan, retry scanning at a slower speed  
⇒ See section 3.8.9.



## Pressure window



- LV button:** Switches between the LV and HV.
- Preset buttons:** Tap one of 3 buttons. The pressure is automatically adjusted to the selected value.
- Slider bar:** The pressure can be manually adjusted by dragging the slide button. The specified value is indicated above the center of the slider bar.
- Apply button:** Press this button to start auto adjustment. It changes to the **Stop** button.  
\* Tap the **Stop** button to stop auto adjustment. The button changes back to the **Apply** button. Tap the **Apply** button to restart the auto adjustment.
- Fine ↑ button:** Can be used after the auto adjustment. (Manual adjustment)  
It decreases the value and the pressure goes down.
- Fine ↓ button:** Can be used after the auto adjustment. (Manual adjustment)  
It increases the value and the pressure goes up.

### 3.9 CHANGING THE FIELD OF VIEW

<Movement of each axis in the specimen stage>

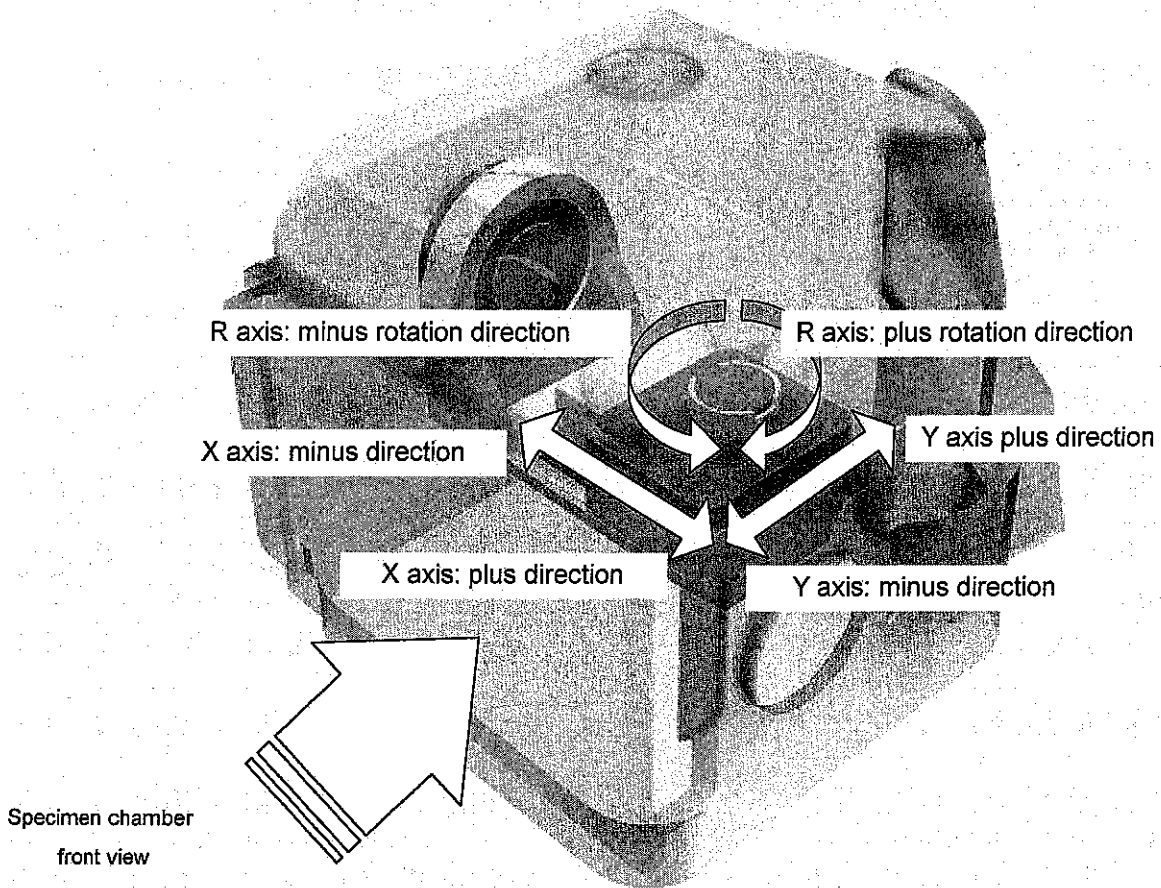
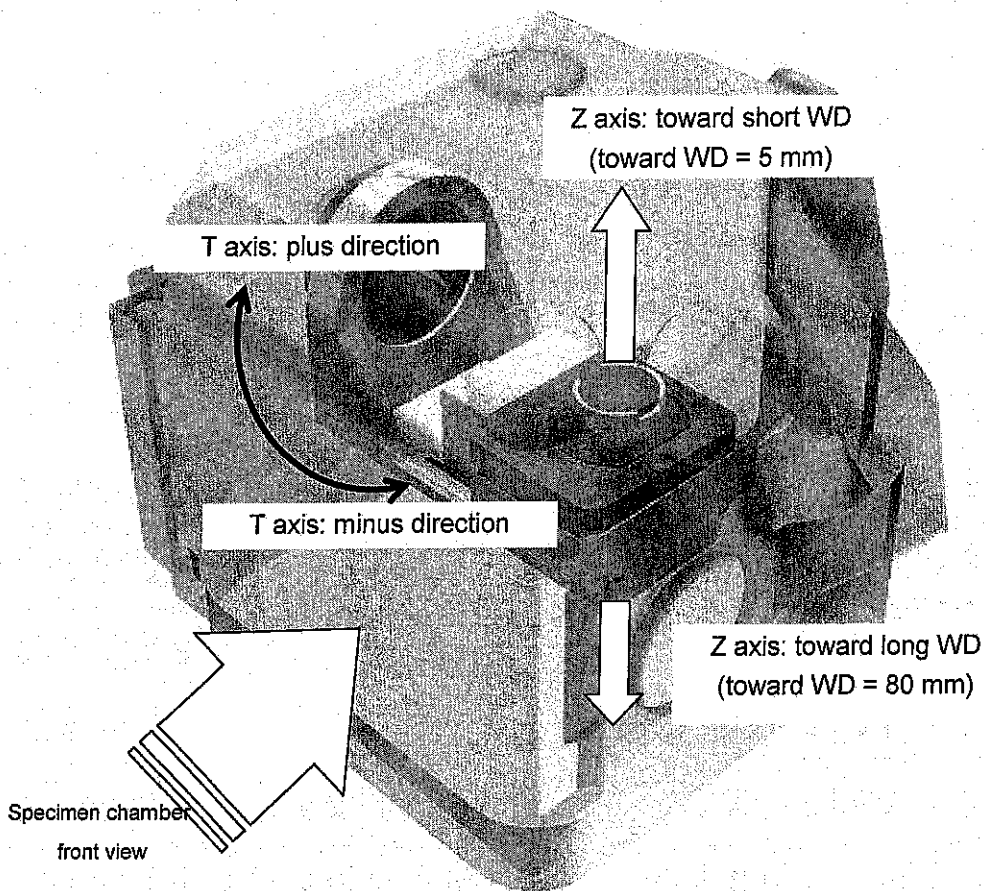


Table3-4 Coordinate polarity for each axis and Field of view movements

Name	Polarity of coordinates	Field of view (Stage) movement
X-axis	+ direction	The field of view moves toward the right
	- direction	The field of view moves toward the left
Y-axis	+ direction	The field of view moves upward
	- direction	The field of view moves downward
R-axis	+ direction	The field of view rotates in a clockwise direction
	- direction	The field of view rotates in a counter-clockwise direction



Name	Polarity of coordinates	Field of view (Stage) movement
Z-axis	Direction in which the numerical value decreases	The stage moves upward, and the working distance becomes shorter
	Direction in which the numerical value increases	The stage moves downward, and the working distance becomes longer
T-axis	+ direction	The specimen surface is tilted toward the back of the specimen chamber
	- direction	The specimen surface is tilted toward the front of the specimen chamber

---

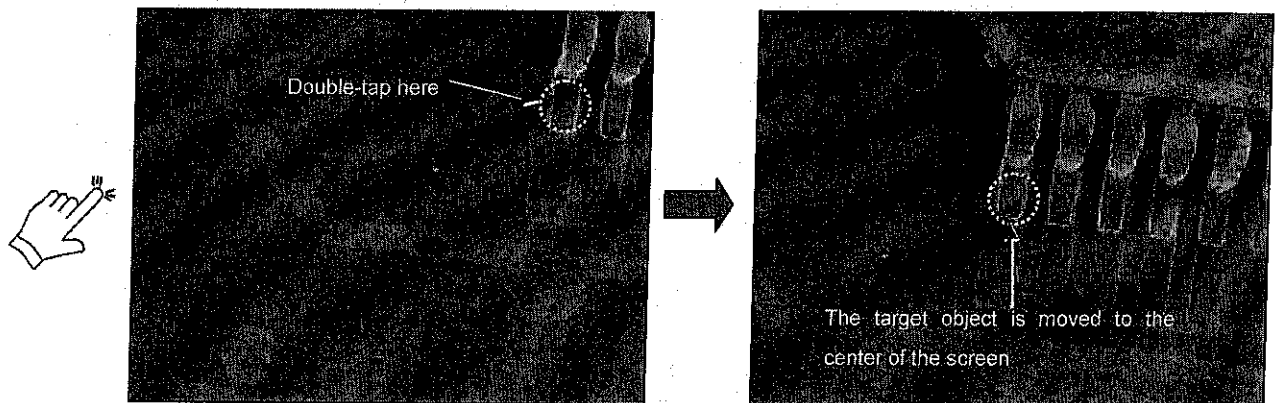
### 3.9.1 Moving the target location to the center of the screen

---

Double-tap the target position.

The position that is double-tapped is moved to the center of the screen.

- \* For magnification of  $\times 4500$  or less, the stage is moved.
- \* For magnification of  $\times 5000$  or more, the movement is performed using beam shift.



---

### 3.9.2 Moving the target position to a desired location

---

Touch the target object on the screen with your finger, and drag it to the desired position.

- \* For magnification of  $\times 4500$  or less, the stage is moved.
- \* For magnification of  $\times 5000$  or more, the movement is performed using a beam shift.

### 3.9.3 Shifting the stage horizontally (X) and vertically (Y)

#### Main screen

Touch an edge of the main screen and use a finger to press the movement buttons that are displayed. The stage moves while a button is pressed. To stop the movement, remove your finger from the screen.

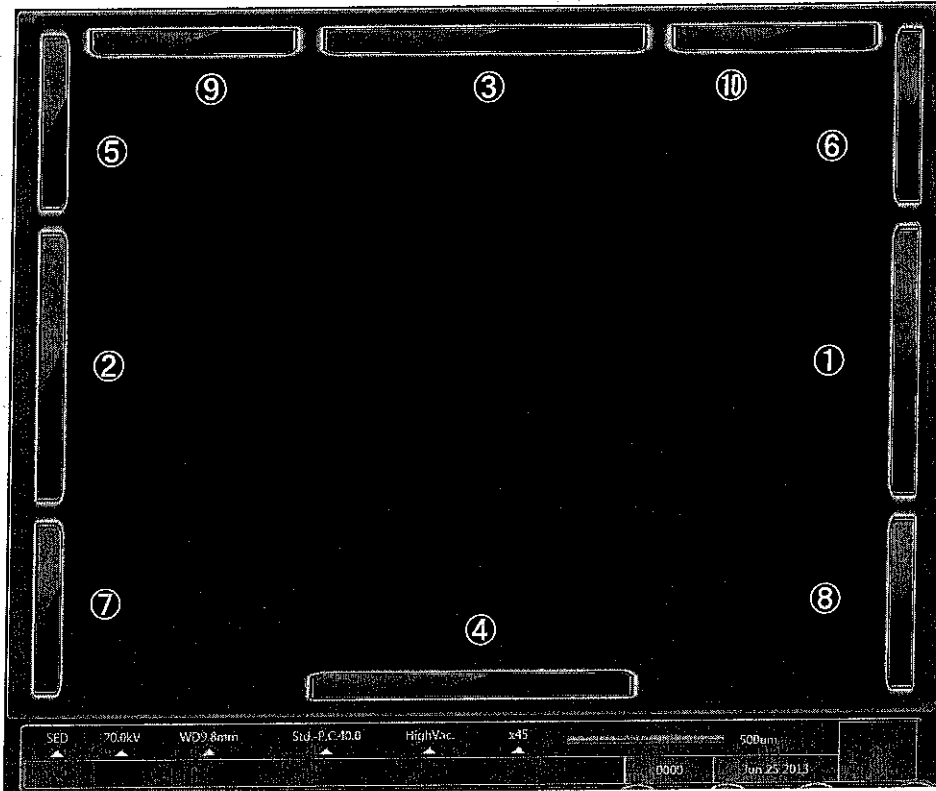


Table3-5 Movement buttons and Movement directions

Movement button	Stage movement direction	Field of view movement direction
①	X-axis positive direction	The field of view moves toward the right
②	X-axis negative direction	The field of view moves toward the left
③	Y-axis positive direction	The field of view moves upward
④	Y-axis negative direction	The field of view moves downward
⑤	Oblique direction	The field of views moves toward the upper left
⑥		The field of views moves toward the upper right
⑦		The field of views moves toward the lower left
⑧		The field of views moves toward the lower right

For ⑨ and ⑩, refer to section 3.9.5.

Refer to section 4.2.7 regarding the stage frame shift settings and operation

Graphic screen

(Refer to Table 3-5 on the previous page regarding the movement directions)

Press and hold the **XY**, **X** and **Y** buttons on the graphic screen.  
To stop the stage movement, remove your finger from the button.

When the operations are performed using a mouse, you can differentiate between fast movement and slow movement.

Fast movement: Right mouse button  
Slow movement: Left mouse button

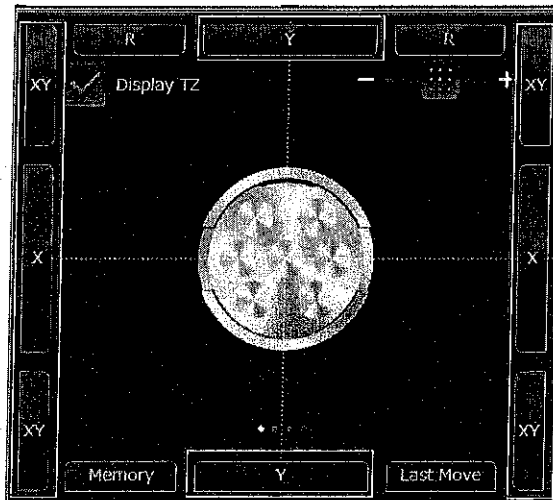


Table 3-6 Movement buttons and Movement directions



Button position	Stage movement direction	Field of view movement direction
X (right)	X-axis positive direction	The field of view moves toward the right
X (left)	X-axis negative direction	The field of view moves toward the left
Y (up)	Y-axis positive direction	The field of view moves upward
Y (down)	Y-axis negative direction	The field of view moves downward
XY (upper left) XY (upper right) XY (lower left) XY (lower right)	Oblique direction	The field of views moves toward the upper left The field of views moves toward the upper right The field of views moves toward the lower left The field of views moves toward the lower right

Double-tap on the graphic screen

When the graphic screen is double-tapped, the tapped position becomes the center of the screen.

### 3.9.4 Changing the stage height (Z) and tilt (T)

You can switch the view on the screen between a view from above the specimen holder and a view from the side by swiping<sup>8</sup> anywhere within the graphic, except on a movement button. Alternatively, the page advanced button can be tapped to switch the view.

Press and hold a  or  button on the graphic screen.  
To stop the stage movement, remove your finger from the button.

When the operations are performed using a mouse, you can differentiate between fast movement and slow movement.

- Fast movement: Right mouse button
- Slow movement: Left mouse button

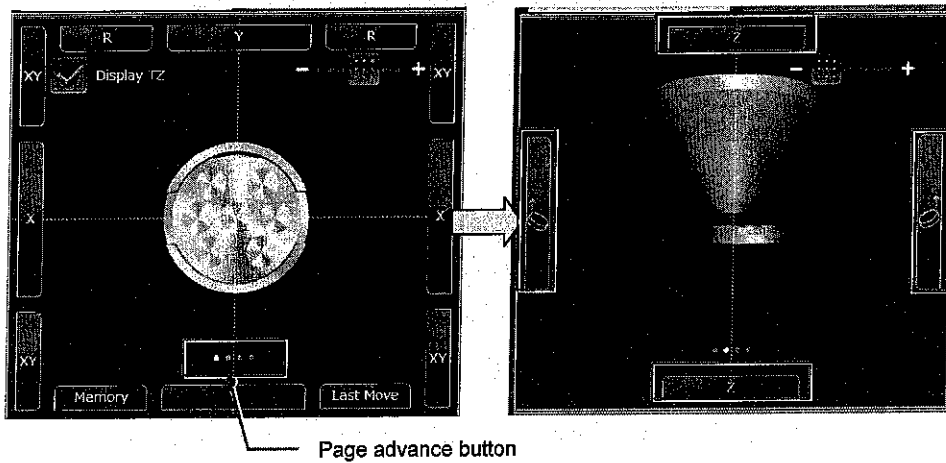






Table 3-7 Movement buttons and Movement directions

Movement button	Stage movement direction
 Z (top)	The stage moves upward, and the working distance becomes shorter
 Z (bottom)	The stage moves downward, and the working distance becomes longer
 T (right)	T-axis negative direction The specimen surface is tilted toward the front of the specimen chamber
 T (left)	T-axis positive direction The specimen surface is tilted toward the back of the specimen chamber

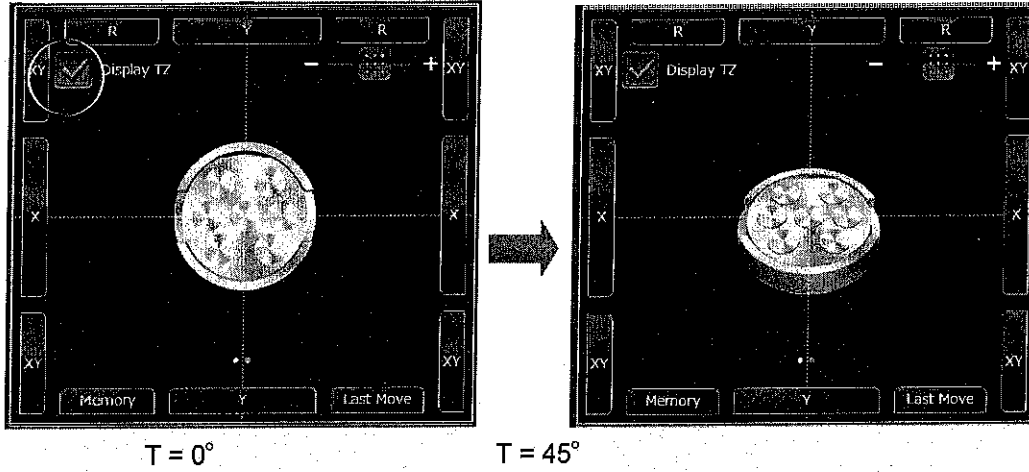
<sup>8</sup> Swipe means to slide the fingertip while pressing the screen.



< Handy tools >

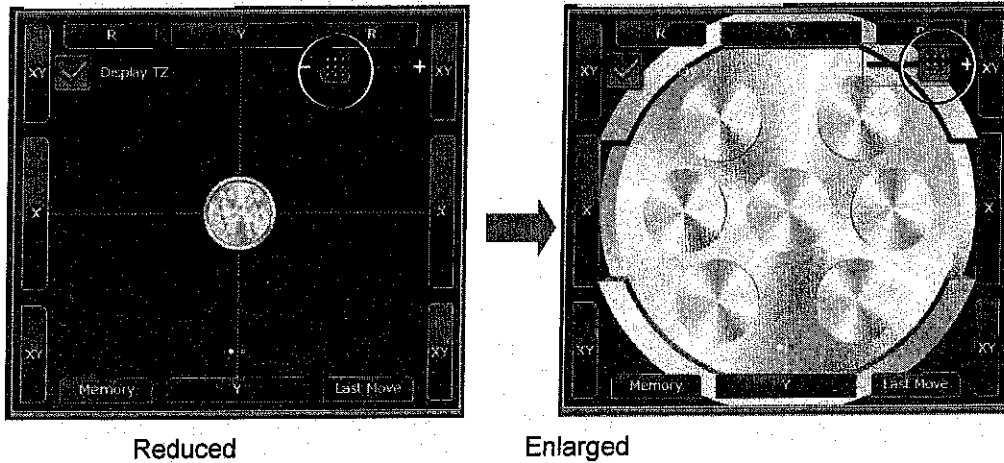
Display TZ

When the T-axis and Z-axis operations are performed, the tilting as seen from above be reflected in the graphic.



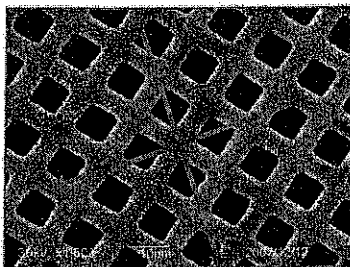
Zoom function

The slide button can be used to enlarge and reduce the graphic.

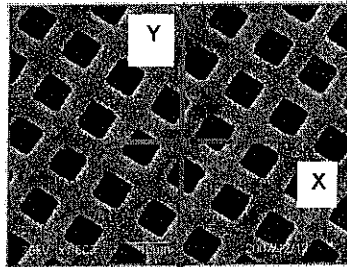


The field of view will rotate when the WD is changed by the Z axis and the image moving direction changes a little.

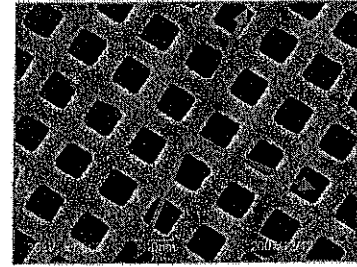
- WD shorter than WD 10 mm (toward WD5 mm): The field of view will rotate a little in the counterclockwise.
- Vicinity of WD10 mm: The X direction will move in the right or left while Y direction will move up or down.
- WD longer than WD10 mm (toward WD48 mm): The field of view will rotate a little in the clockwise.



Toward WD5 mm



Vicinity WD10 mm



Toward WD80 mm

### 3.9.5 Rotating (R) the stage

#### Main screen

Touch an edge of the main screen and use a finger to press the movement buttons that are displayed. The stage moves while a button is pressed. For this operation, the center of the field of view is fixed and eucentric rotation is performed around this fixed center. (The X and Y axes are shifted at the same time that the R-axis rotation is performed.)

To stop the movement, remove your finger from the screen.

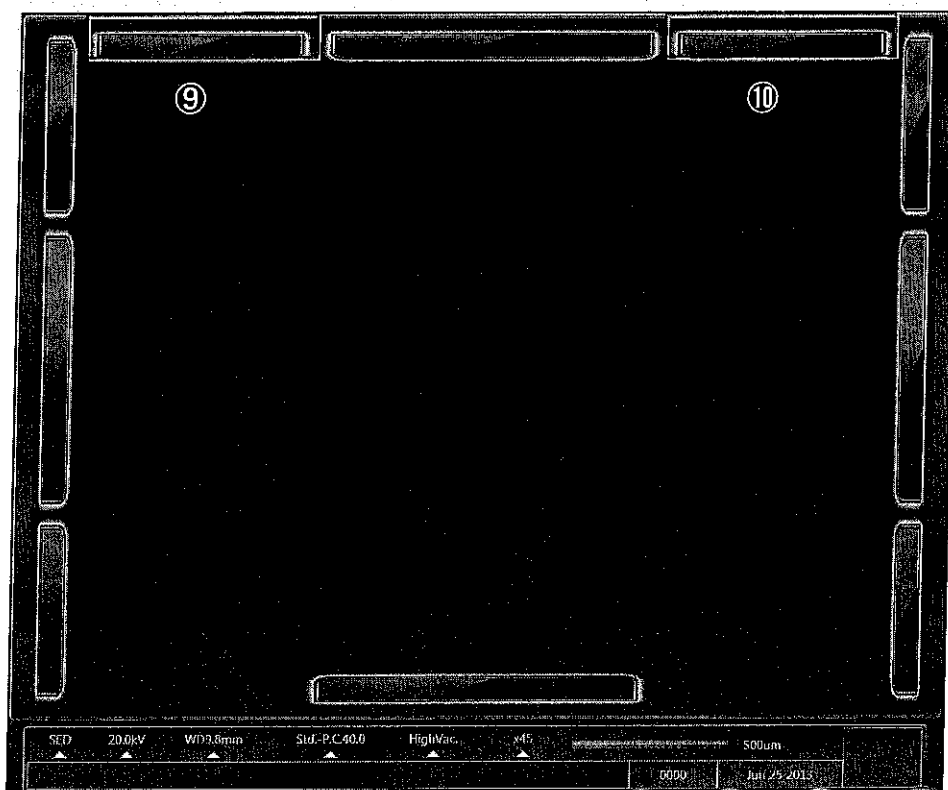


Table 3-8 Movement buttons and Movement directions

Movement button	Stage movement direction	Field of view movement direction
⑨	R-axis negative direction	The field of view rotates in a counterclockwise direction
⑩	R-axis positive direction	The field of view rotates in a clockwise direction

Graphic screen

Press and hold the **R** button on the graphic screen.

For this operation, only the R-axis rotation is performed.

To stop the stage movement, remove your finger from the screen.

When the operations are performed using a mouse, you can differentiate between fast movement and slow movement.

Fast movement: Right mouse button

Slow movement: Left mouse button

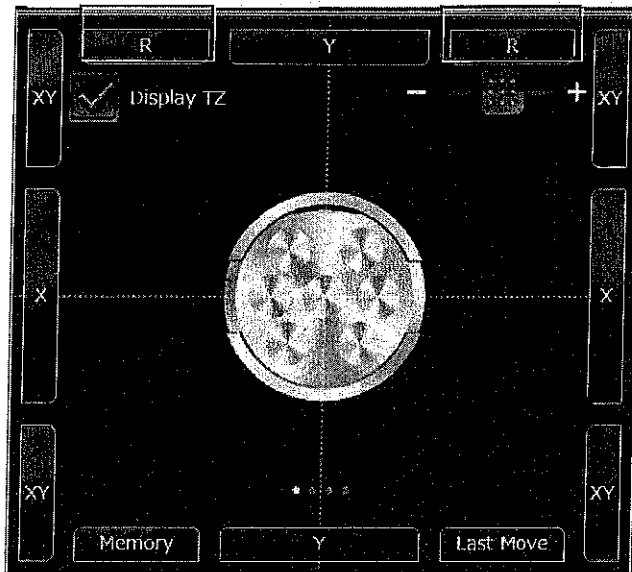
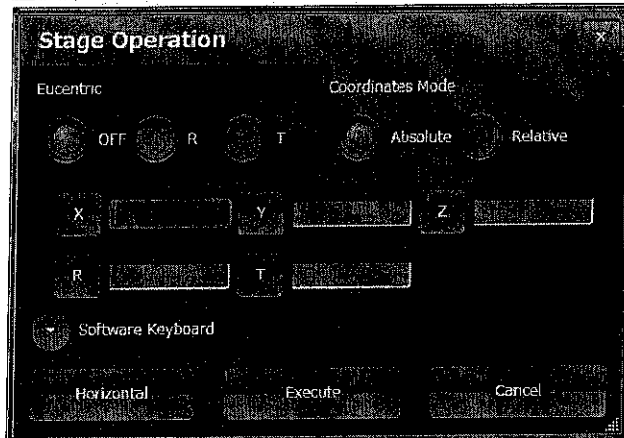
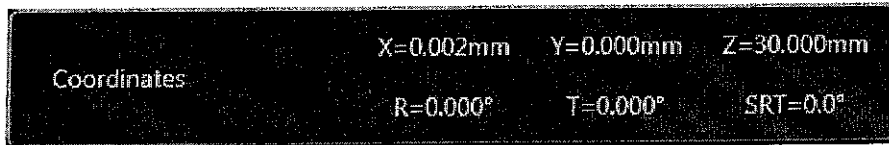


Table 3-9 Movement buttons and Movement directions

Movement button	Stage movement direction	Field of view movement direction
R (left)	R-axis negative direction	The field of view rotates in a counterclockwise direction
R (right)	R-axis positive direction	The field of view rotates in a clockwise direction

## 3.9.6 Moving the stage to specified coordinates

1. Tap a coordinate display other than the SRT=\* \* display  
The Stage Operation window is displayed.



2. Select the coordinate setting mode.  
Absolute value setting: The stage is moved to the specified values, regardless of the current coordinate position.  
Relative value setting: The stage is moved to the specified values assuming that the current coordinate position is the zero (0) point.
3. Enter numerical values for the axes for the coordinate setting
4. Move the stage  
When the **Execute** button is tapped, the stage will move. When the specified coordinate position is reached, the stage movement stops.  
While the stage is moving, a message like the one below will be displayed. If the **Stop** button is tapped, the stage will forcibly stop at that position.

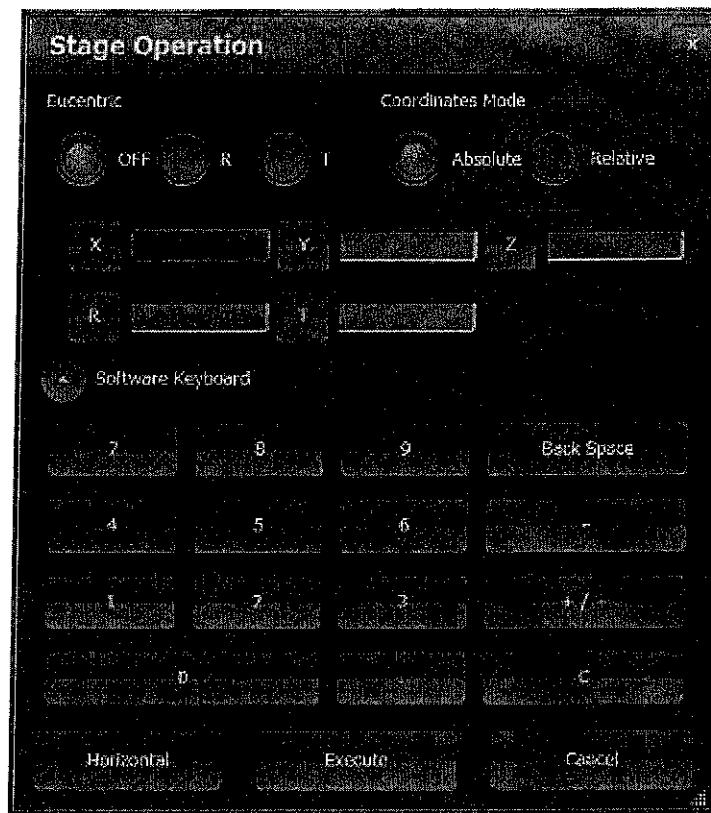


When the **Cancel** button is tapped, the stage operation window will close.  
About the explanation of the **Horizontal** button, please see 4.2.10.b.

### ◆ CAUTION ◆

To stop the stage during moving the stage by the external control device such as EDS, be sure to stop the stage by using the external control device. ※ Do not use **Stop** button of the above window.

Stage operation window details (Tap the soft keyboard buttons)



**Eucentric**

OFF

The eucentric R/T function is set to OFF

R

The stage can be rotated with the observation field of view as the center, regardless of the stage position. (⇒ refer to section 4.2.10.a)

T

The field of view can be maintained for T-axis tilting, even for a specimen that is tall relative to the eucentric surface (⇒ refer to section 4.2.11)

**Coordinates Mode**

Absolute

The stage is moved to the specified values, regardless of the current coordinate position.

Relative

The stage is moved to the specified values assuming that the current coordinate position is the zero (0) point.

**Coordinate input box**

A value with 3 decimal places can be entered.

**Software keyboard**

Numerical values can be entered into the coordinate input boxes.

Back Space

Deletes 1 character

+/-

After input, you can invert the +, - setting

C

Clears the entered value.

Horizontal

Specify the desired plane, and the stage will be moved so that the indicated surface is parallel to the X-axis (⇒ refer to section 4.2.10.b)

Execute

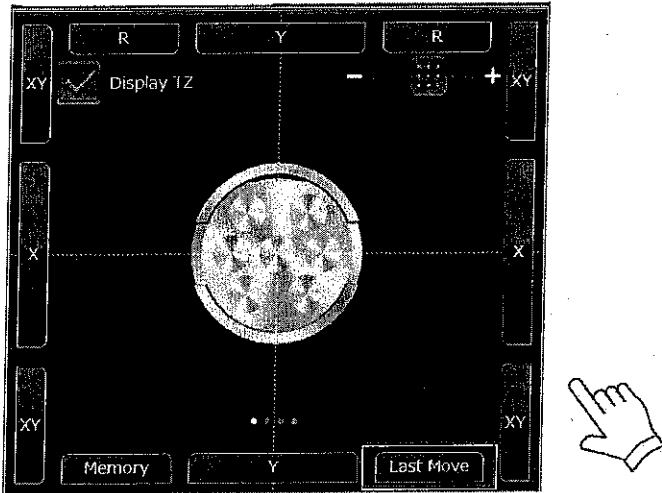
The stage movement is executed.

Cancel

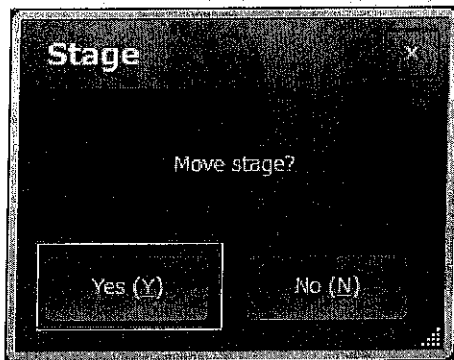
The stage operation window is closed.

### 3.9.7 Moving the stage to the previous coordinates

1. Tap the **Last Move** button on the graphic screen.



A confirmation message is displayed.



2. Move the stage

When the **Yes** button in the displayed message is tapped, the stage is moved to the coordinates specified for the Move to Previous coordinate setting.

What coordinates are used for Last Move? (example)

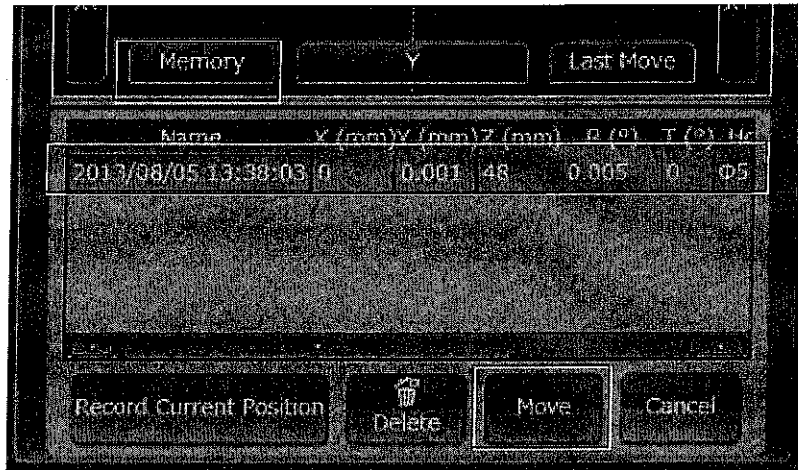
1. The stage is moved to a certain specified set of coordinates (Call this point "a")
2. After moving to point "a", other coordinates are set, and the stage is moved using the operation panel joystick or Click Center. Then, **Last Move** is tapped. The stage returns to point "a".
3. From point "a", the stage is moved to specified coordinates, "b". After moving to point "b", the stage is moved to point "c", and then **Last Move** is tapped. The stage returns to point "b". Even if **Last Move** is tapped again at this point, the stage does not move.

#### ◆ CAUTION ◆

For Move to Previous, the movement is only for the X, Y and R axes. There is no movement to the previous positions of the T and Z axes.

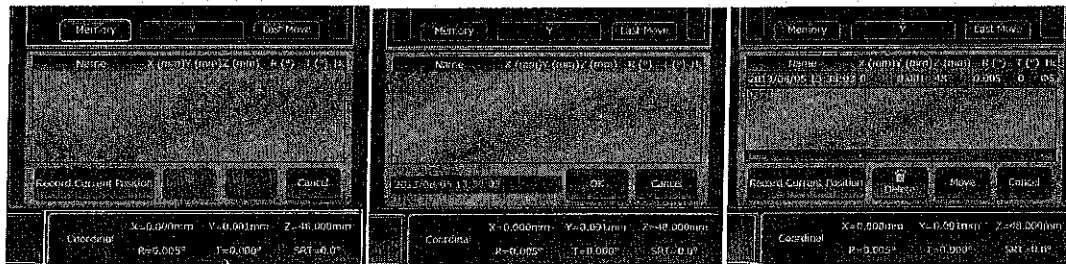
### 3.9.8 Moving the stage using a coordinate file

1. Tap the **Memory** button.
2. Select the file with the desired coordinates.
3. Tap the **Move** button; then, tap the **Yes** button in the message box that is displayed.  
The stage moves to the specified coordinate position.



#### Saving coordinates

1. Move the stage to the coordinates that you wish to save.  
Check the coordinate position in the coordinate display area.
2. Tap the **Memory** button and **Record Current Position** button.  
The filename will be displayed (date and time). If necessary, change the filename.
3. Tap the **OK** button to save the coordinates.



Coordinate display area

## 3.10 SAVING / LOADING IMAGES

### 3.10.1 Automatically Saving Images

1. Use the Settings – **Image** icon to make the settings related to image saving.  
Select to enter a check mark in the check box for Auto Save.  
For additional details, refer to the next page.
2. Display an image and adjust the focus and image quality.
3. Tap the **Photo** icon.  
When the scan is completed, the image is saved automatically.



#### About the save filename

The filename is generated automatically according to the image display mode, as described below.

For Standard view mode

Filename: *Entered filename\_Count.Extension*

For Multi mode (2 files are generated simultaneously)

Filename (left image): *Entered filename\_Signal name\_1\_Count.Extension*

Filename (right image): *Entered filename\_Signal name\_2\_Count.Extension*

For Flexible view mode (3 files are generated simultaneously)

Filename (composition image): *Entered filename\_FX1\_Count.Extension*

Filename (signal 1): *Entered filename\_Signal name\_Count.Extension*

Filename (signal 2): *Entered filename\_Signal name\_Count.Extension*

For Add signal mode (3 files are generated simultaneously)

Filename (composition image): *Entered filename\_ADD\_Count.Extension*

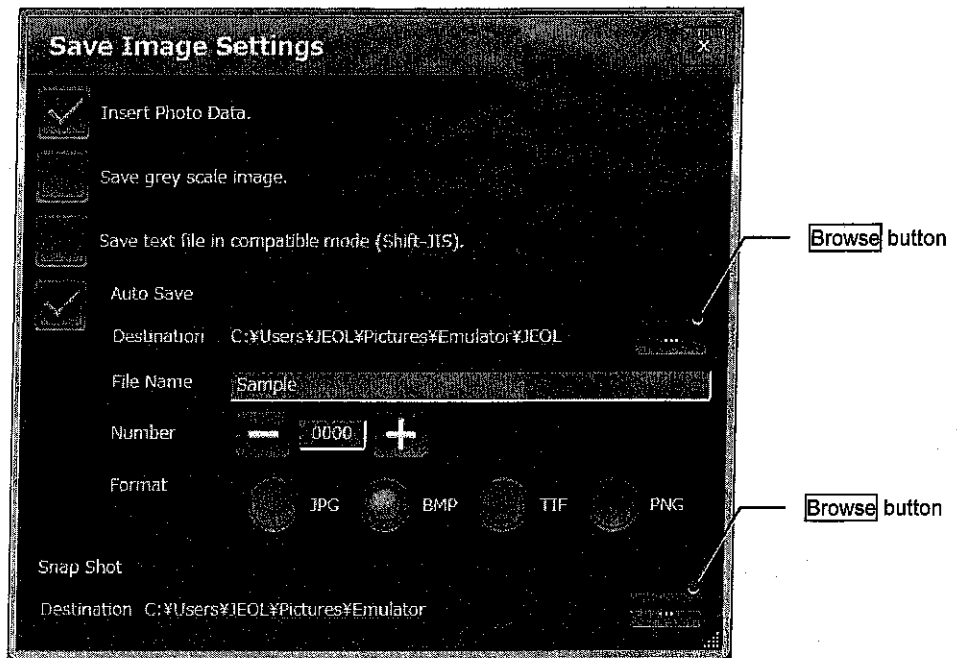
Filename (signal 1): *Entered filename\_Signal name\_Count.Extension*

Filename (signal 2): *Entered filename\_Signal name\_Count.Extension*





## Details of the Save Image Settings window



### Insert Photo Data

Photo data is appended to the saved image.

### Save grayscale image

The space required to save the image can be reduced by saving as grayscale.

### Save text file in compatible mode (Shift-JIS)

Select this if the images will be handed in standard-compatible document creation tools. Note that the text in the Photo data may not be loaded correctly in some languages.

### Auto Save

Saving is performed automatically when the **Photo** button is tapped.

Destination:

Use the **Browse** button to select the save destination

File Name:

Specify the filename to be used for automatic save

Number:

Specify a number to be used for automatic save. Each time an automatic save is performed, the number will be incremented.

Format:

Select the format of the saved images

### Snapshot

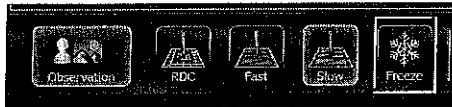
Destination:

Use the **Browse** button to select the save destination

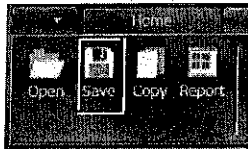
## 3.10.2 Specifying a Save Destination and Saving Images

Confirm that the Auto Save function is disabled. (⇒refer to the previous page.)

1. Display an image and adjust the focus and image quality.
2. Display a Freeze image.  
Tap the **Freeze** icon.



3. Tap the **Save** icon from Home.  
A "Save As.." window is displayed (window to enter a file name and save.)



4. Specify the save location, and enter a file name.
5. Tap the **Save** button.  
The image is saved in the location specified with the file name that you entered.

### About the save filename

The filename is generated automatically according to the image display mode, as described below.

For Standard view mode

Filename: *Entered filename\_Count.Extension*

For Multi mode (2 files are generated simultaneously)

Filename (left image): *Entered filename\_Signal name\_1\_Count.Extension*

Filename (right image): *Entered filename\_Signal name\_2\_Count.Extension*

For Flexible view mode (3 files are generated simultaneously)

Filename (composition image): *Entered filename\_FXI\_Count.Extension*

Filename (signal 1): *Entered filename\_Signal name\_Count.Extension*

Filename (signal 2): *Entered filename\_Signal name\_Count.Extension*

For Add signal mode (3 files are generated simultaneously)

Filename (composition image): *Entered filename\_ADD\_Count.Extension*

Filename (signal 1): *Entered filename\_Signal name\_Count.Extension*

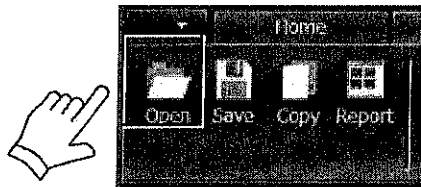
Filename (signal 2): *Entered filename\_Signal name\_Count.Extension*

---

### 3.10.3 Loading Saved Images

---

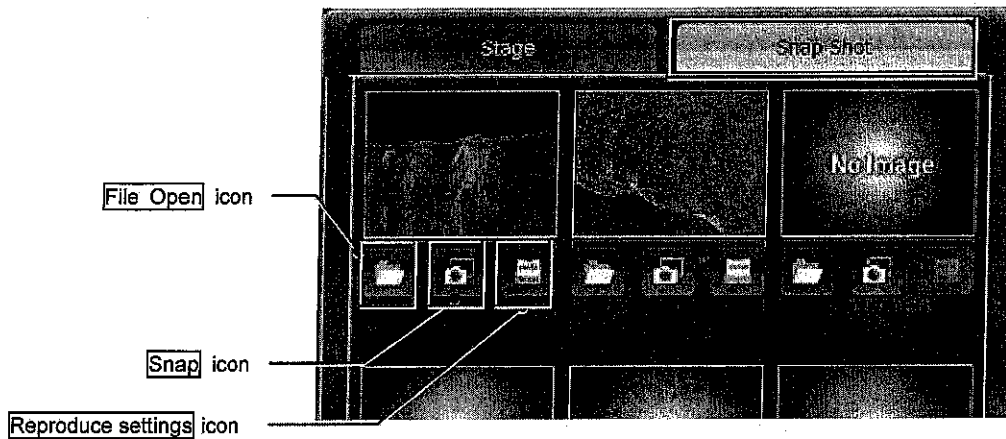
1. Tap the **Open** icon from Home.  
The Open window will be displayed.



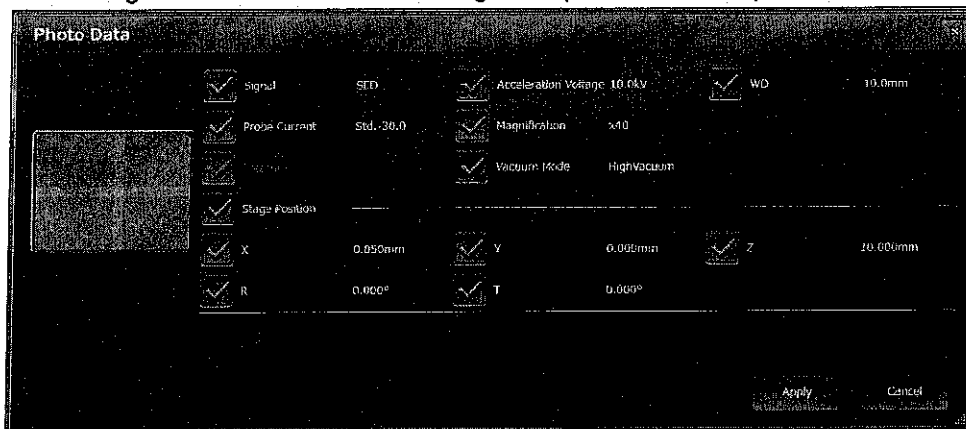
2. Select an image and tap the **Open** button.  
The selected image is displayed on the main screen.

### 3.10.4 Image Save from a Snapshot and Condition Setting

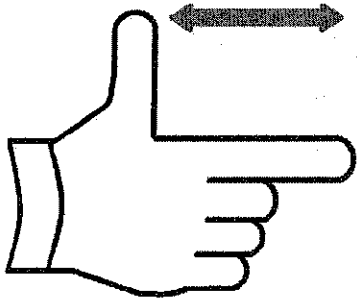
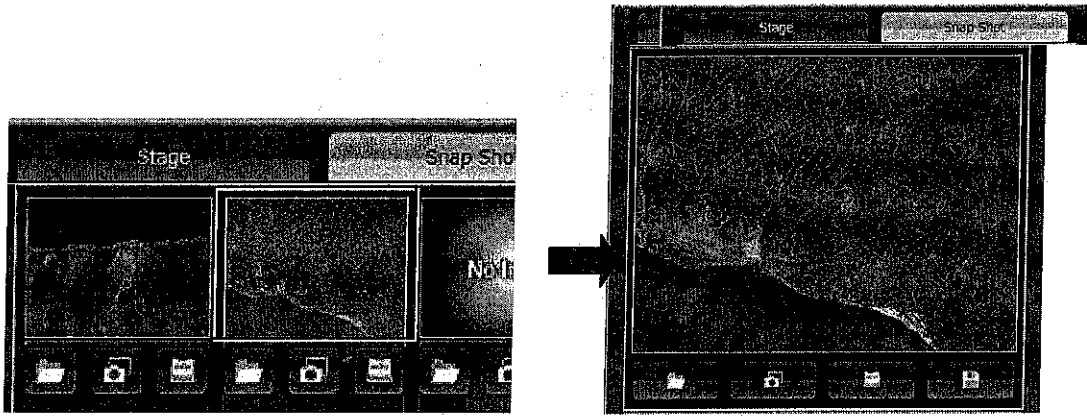
1. Display an image and adjust the focus and image quality.
2. Tap the **Snap Shot** tab in the Navigator area.  
The Snapshot screen is displayed.
3. Paste the image that being displayed.  
Tap the **Snap** icon. The image being displayed in the main screen is pasted into the Snapshot screen.  
Both live images and freeze images can be pasted.  
The pasted image is saved automatically. The Save destination is set in the Save Image Settings window (see section 3.10.1).  
The filename is generated automatically. For an image pasted on July 31, 2013 at 15:10:25 (hh:mm:ss), the file name will be 20130731151025.jpg
4. Load and paste a saved image.  
Tap the **File Open** icon to load a saved image from a specified folder.



5. Reproduce the observation conditions in effect at the time that the loaded image was saved.  
Tap the **Reproduce Settings** icon, and the Photo Data window will be displayed.  
Enter check marks for the conditions that you want to reproduce, then, tap the **Apply** button.  
The condition settings in effect at the time the image was pasted will be reproduced.

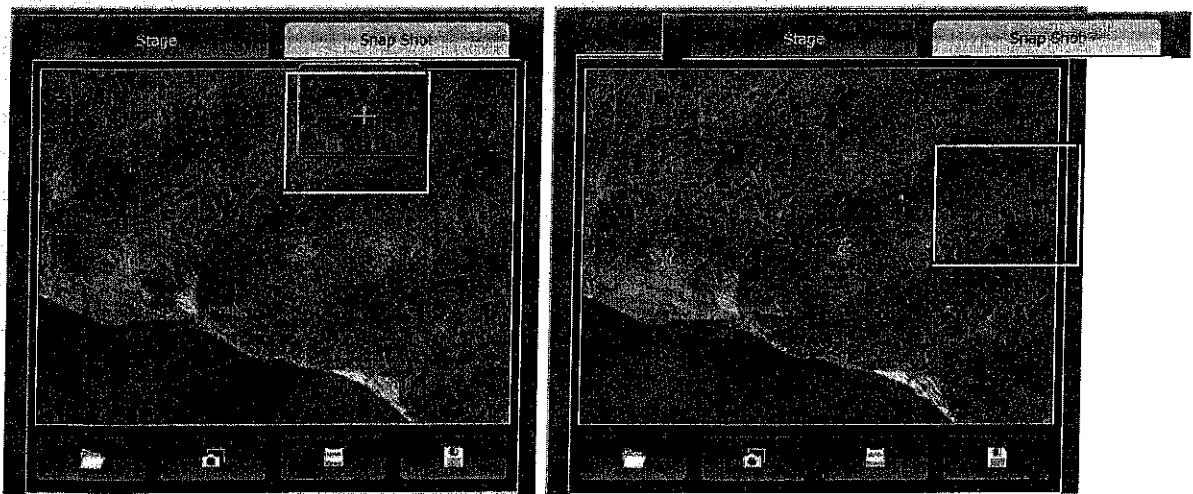


6. Use the navigation function in the single screen mode.
- Carry out the pinch-out on the image.  
The screen mode changes to the single screen.



Pinch – out

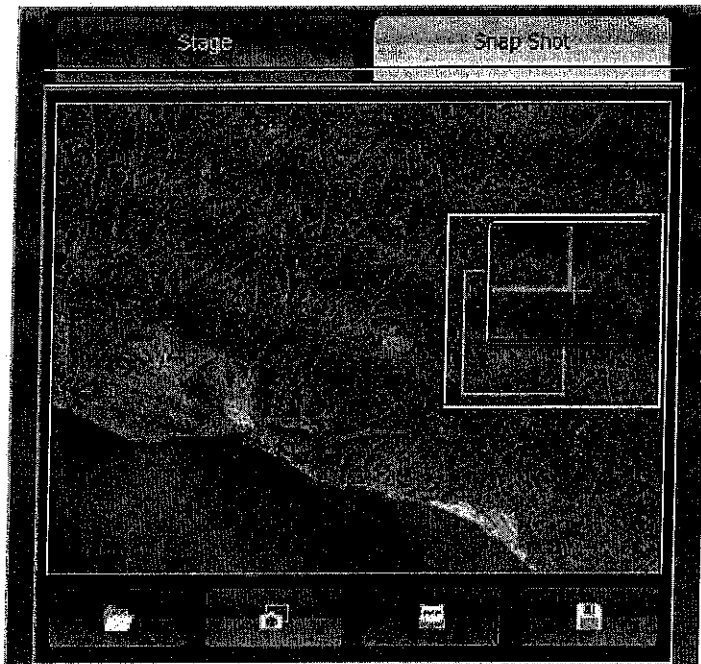
- Drag one-side of the rectangle frame.  
The position will be enlarged. When you stop the drag, green point is displayed on that place.



Dragging

Drag stop

- c. Drag the opposite side of Step b.  
The position will be enlarged, and temporary frame are displayed.



- d. Stop the drag and decide the area.  
The stage moves so that the center of area becomes image center. The magnification is enlarged depending on the frame size, and it is displayed on the observation area.





At the single screen mode, snap image and area frame can save to arbitrary location. Tap **Save** icon.



Save as icon

※ It is necessary that the check mark of Auto Save checkbox in the Save Image Settings window is cleared.

### 3.10.5 Recording Live Images (Save Movie)

The observation procedure for saving dynamic images as well as the recording and replay of the dynamic behavior of a specimen can be performed, but the following limitations apply.

- Recording is not possible in the Full Screen.
- Only images with a size of 640×480 (Pixel) can be recorded.
- The display mode cannot be switched during recording.

<Recording live images>

1. Display an image and adjust the focus and image quality.
2. Use the Settings – **Movie** icon to make the settings for video images.  
⇒Refer to the following page.

3. Start recording.

Tap the **Movie** icon from Home.

The recording starts.

A message indicating that recording is in progress will be displayed on the upper left of the screen during recording.

There is no limit to the length of the recording (depends on the capacity of the recording media)



4. Stop recording.

Tap the Home – **Movie** icon again.

#### About the saved file

- The filenames are generated automatically. For a movie recorded on July 31, 2013 at 15:10:25 (hh:mm:ss), the file name will be 20130731151025\_0000.avi. The \_0000 portion is a count value. This value is incremented by 1 each time the recorded data reaches 2 GB. The maximum value is 9999.
- The movie file name is assigned automatically continuing with a new file with the incremented count value.

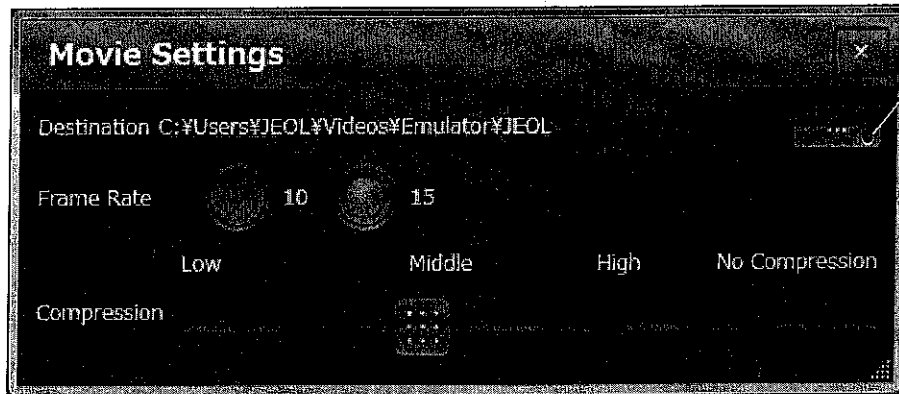
<Replaying a movie>

1. Open the folder that contains the movie file, and tap the movie file.  
The media is opened and the replay begins.





## Movie Settings window



**Browse** button

- |             |   |
|-------------|---|
| Destination | Use the <b>Browse</b> button to select the save destination   |
| Frame Rate  | Select the number of frames per second<br>The image will be more detailed for a higher number                     |
| Compression | Setting Compression (No Compression) creates a large file<br>Setting Compression (High) creates the smallest file |

## 3.11 STOPPING THE INSTRUMENT

### ◆ CAUTION ◆

**When the instrument will be stopped, be sure to save image data, etc. into files.**

If the data is not saved into a file, it will be lost.

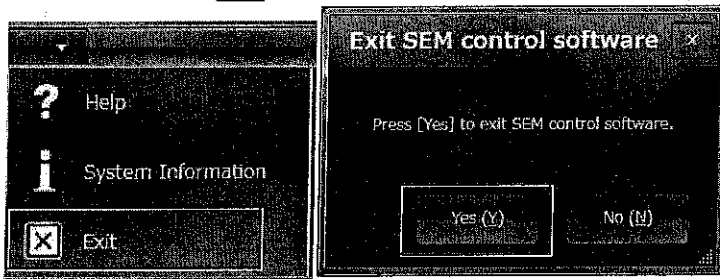
#### 1. Evacuate the specimen chamber

When the specimen chamber is at atmospheric pressure, tap the **EVAC** button to evacuate the specimen chamber.

If the specimen chamber is already at a vacuum state, this procedure can be omitted.

#### 2. Close the SEM control software.

Tap the **Pulldown** ▾ ⇒ **Exit**. Alternatively, you can tap the **X** button at the upper right corner of the UI. Tap the **Yes** button in the Exit SEM control software window.



#### 3. Close Windows.

Tap the **Start** on the Windows desktop screen.

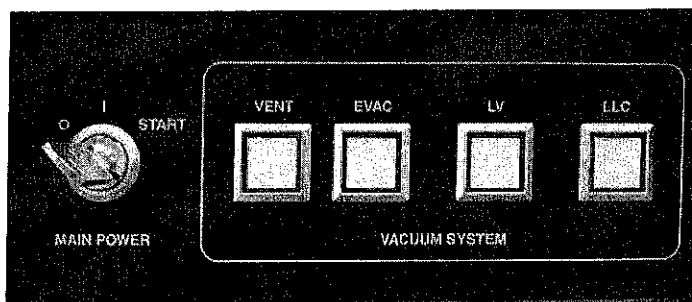
Select **Shutdown** ⇒ **Windows shutdown** ⇒ **Shutdown** ⇒ **Yes**

#### 4. Turn OFF the power supplies for the monitor, printer, and other devices (set to ○).

#### 5. Turn OFF the power supply for the personal computer (set to ○).

#### 6. Stop the instrument.

Set the key switch for the MAIN POWER on the main console panel to ○ (OFF).



#### 7. Turn the power switch (breaker) OFF on the switch board.

## 3.12 DAILY MAINTENANCE

### 3.12.1 Electron Gun Axis Alignment

(An optical axis shift adjustment)

When the filament is replaced with a new one, there may be a difference in the direction of the emitted electron beam after the replacement due to slight mechanical shifting of the filament and Wehnelt, and it may not be possible to obtain the same probe current as before the replacement, so variations in the images may appear.

Furthermore, as the instrument is used, the filament is repeatedly heated and cooled, which can cause mechanical shifting of the filament and Wehnelt. The electromagnetic correction of this shifting is performed by the optical axis adjustment (alignment).

#### 3.12.1.a Automatic adjustment

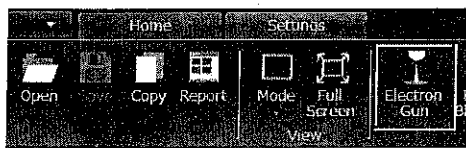
Automatic adjustment is recommended as a way to easily adjust the shifting of the optical axis.

(When the probe current is extremely large or extremely small, there may be cases where it is not possible to perfectly correct the optical axis shift. In such a case, refer to section 3.13.1b to perform manual adjustment.)

With the automatic adjustment<sup>9</sup> it is possible to automatically adjust both the filament heating and alignment (AGC), or just the filament heating (AFS). You can select the desired adjustment method.

1. Mount a specimen and evacuate the specimen chamber.
2. Confirm that the evacuation progress bar reaches READY, and that the **EVAC** button is lit.
3. Tap the **Observation** icon to turn it ON.
4. Tap the **Electron Gun** icon from Home.

The Electron Gun window is displayed.



5. Tap either the **ACG** or **AFS** icon.

After several dozen seconds, the automatic adjustment is completed, and the accelerating voltage returns to the original level.

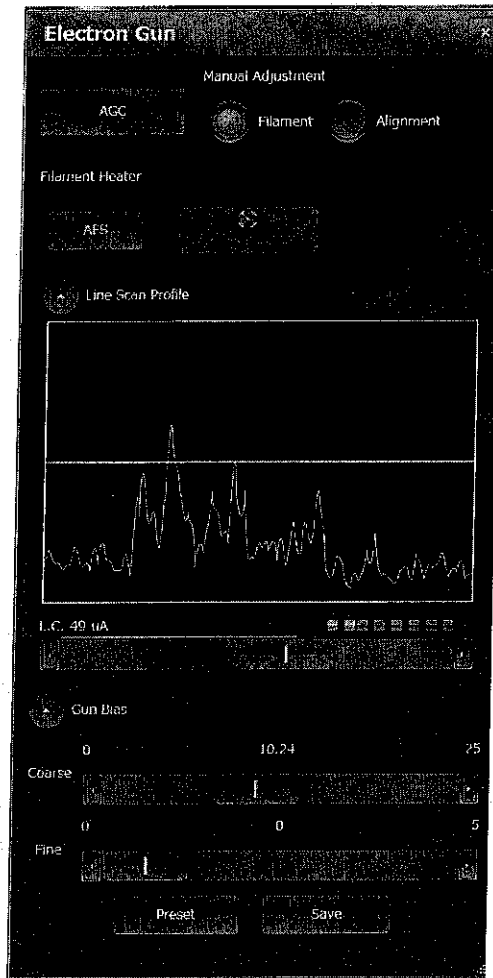
AGC: Automatic adjustment of filament heating and both alignment directions (tilt and shift)

AFS: Automatic adjustment of filament heating

<sup>9</sup> Cannot be used with LV mode

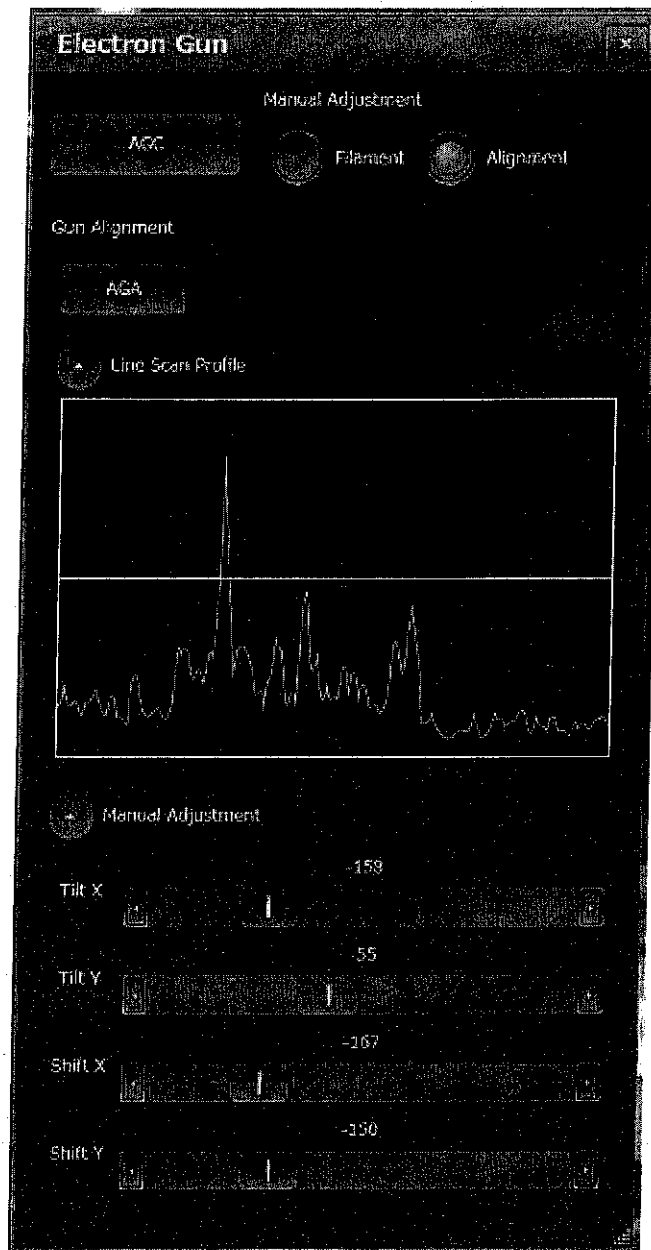
When the accelerating voltage is less than 5kV, execute at 5 kV, and then restore the original accelerating voltage after the operation is completed.

## Electron Gun window Details – Manual adjustment [Filament] selection



AGC:	Automatic adjustment of filament heating and both alignment directions (tilt and horizontal)
Manual adjustment:	
Filament:	Manually adjust filament heating and gun bias
Alignment:	Manually adjust the electron beam axis. (⇒See 3.12.1.b)
Filament Heater	
AFS:	Automatic adjustment of filament heating
Emission Pattern	About how to use the emission pattern, refer to the instruction manual of LAB6 unit
Line Profile	Image brightness is displayed as a line profile. Used to find the saturation point for filament heating.
Filament heating bar	Adjusts the filament heating current
L.C.** $\mu$ A:	Displays the Load Current (Indicates electron dose emitted from the gun)
Gun bias	
Coarse /Fine :	Rough and Fine adjustment of the load current
Preset:	The value selected with the slider is displayed over the center of the slide bar
Save:	You can set previously saved gun bias values
Save:	You can save the rough adjustment and fine adjustment values for the gun bias that were set using the slide bars. One set of adjustment values can be saved for each accelerating voltage.

Electron gun window Details – Manual adjustment [Alignment] selection



Tilt X, Y: The electron beam can be tilt-deflected (deflected at an angle)  
Shift X, Y: The electron beam can be horizontally deflected

### 3.12.1.b Manual adjustment

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Perform manual adjustment to observe images under the following conditions

- When you want to increase the probe current for analysis.
  - When you want to increase the probe current for LV mode observations.
  - When you want to decrease the probe current to obtain sharp images.
1. Mount one of the items indicated below, and evacuate the specimen chamber
    - Conductive specimen (metal or specimen stub)
    - Specimen holder (no specimen)
  2. Confirm that the evacuation progress bar reaches READY, and that the **EVAC** button is lit.
  3. Tap the **Electron Gun** icon from Home.
  4. Tap the **Observation** icon to turn it ON.  
An image will appear on the observation screen. It is not necessary to adjust the focus here.
  5. Tap the **RDC** icon.
  6. Perform the alignment adjustments.
    - a. Set the filament heating bar in the Electron Gun Adjustment window to a position that is just before the saturation point.
    - b. Set the P.C. (probe current) to 30. (⇒ See 3.8.3)
    - c. Select Manual adjustment - Alignment
    - d. Adjust with Tilt X, Y so that the image is as bright as possible.
  7. Set the filament heating button.
    - a. Select Manual adjustment - Filament
    - b. Return the filament heating button to the left end.
    - c. Slowly drag the filament heating button toward the right. The image will suddenly become bright when you are near the center (1<sup>st</sup> peak).
    - d. As you continue to drag toward the right, the image will appear, the L.C. (Load Current) value will stabilize, and the brightness of the image will stop changing (2<sup>nd</sup> peak , saturation point).
    - e. Set the filament heating button to a position that is slightly to the left of the saturation point (point where the image brightness drops slightly.)

◆ **CAUTION** ◆

**Do not set the filament heating button into the orange area.**

If the filament heating button is set farther right than the saturation position (in the orange area), an overcurrent will be applied and the filament service life will be shortened.



- Use the line scan profile to find the saturation point.
- If the image brightness is too strong, tap the **ACB** icon to correct the brightness.

8. Adjust a value for L.C (Load Current)

Adjust using the Gun Bias Coarse and Fine adjustments to set the values indicated in the table below.

Acceleration voltage (kV)	L.C ( $\mu$ A)
30, 25, 20, 15	Approx. 85
10	Approx. 90
5	Approx. 140
3.0	Approx. 120
2.5	Approx. 110
2.0	Approx. 100
1.5	Approx. 80
1.0	Approx. 70

9. Use Click Center to move the target area to the center of the screen.

10. Adjust the focus while gradually increasing the magnification.

11. Find the target object at x10,000 and adjust the focus.

12. Perform axis alignment

- a. Tap the **Wobbler** icon from Home. (Turn the Wobbler ON.)
- b. The image will wobble up/down and left/right.
- c. Use the X/Y knobs for the movable aperture to adjust so that the wobbling of the image is minimized (try to eliminate the movement up/down and left/right).
- d. Tap the **Wobbler** icon from Home again. (Turn the Wobbler OFF.)

If you will use the instrument while greatly varying the probe current, continue by performing the adjustments in step 13 and after.

13. Gradually increase the P.C. (probe current) from 30 to 90.

If the image disappears while the P.C. is being increased (for example, near 60), as needed, use the alignment Shift X, Y buttons to adjust so that the image becomes brighter.

If necessary, tap the **ACB** icon to adjust the brightness.

14. Adjust the Shift X and Y buttons so that the image is the brightest.

15. Return the P.C. (probe current) to 30.

16. Adjust the Tilt X and Y buttons so that the image is the brightest.

17. Perform steps 13 through 16 again.

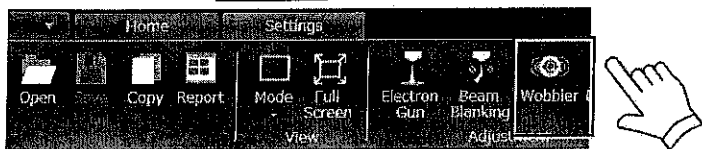
### 3.12.2 Movable Aperture Adjustment

If the movable aperture is shifted off the optical axis, sharp images will not be obtained, even when the focus is adjusted, and there may be limitations on the field of view (shadows in the field of view).

Also, check the movable aperture after work like the following is performed; and, if necessary, adjust the movable aperture.

- Movable aperture number is switched, and the aperture foil is replaced.
- When the viewing conditions (acceleration voltage, WD, P.C., etc.) have been significantly changed

1. Set the magnification to about  $\times 10,000$ , and adjust the image focus.
2. Tap the Home—Wobbler icon.



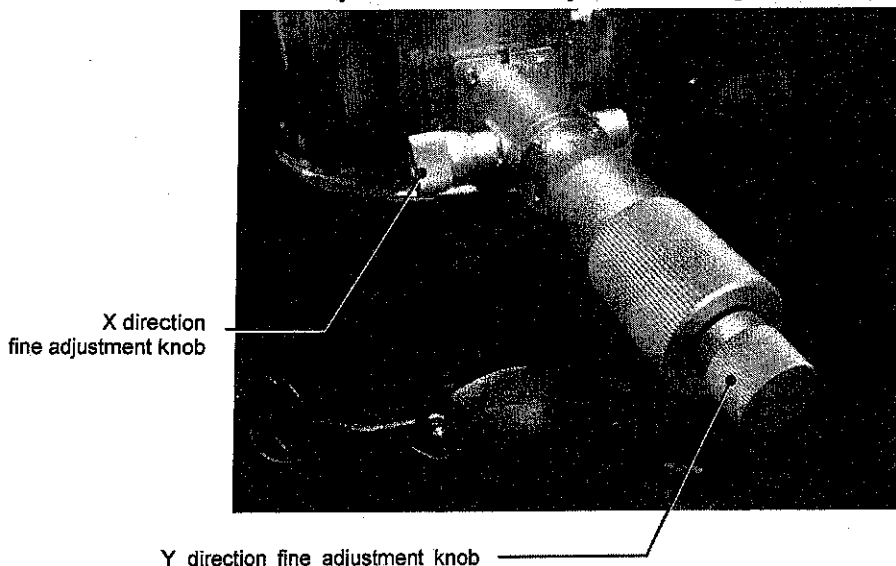
At this time, if there is no wobbling of the image up/down or left/right, there is no need to perform any adjustment.

If the image does wobble up/down or left/right, perform the procedure below.

3. Use the X/Y direction fine adjustment knobs for the movable aperture to adjust so that the wobbling of the image is minimized.

X direction fine adjustment knob: Adjusts the up/down wobbling of the image

Y direction fine adjustment knob: Adjusts the left/right wobbling of the image



4. Tap the Wobbler icon from Home again.



### 3.12.3 Stage Calibration

Although it will depend on how frequently the instrument is used, it is recommended to calibrate the stage at least once per week. In addition, perform stage calibration if the following phenomena appear.

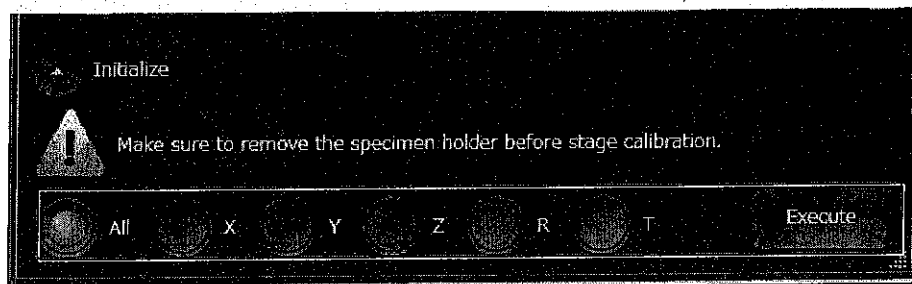
- Stage coordinate display is different from the graphic display position
- The specimen exchange position is shifted and the specimen cannot be exchanged

1. Vent the specimen chamber to atmospheric pressure, and remove the specimen holder.
2. Tap Settings—**Stage** icon.

The Stage Settings window is displayed.



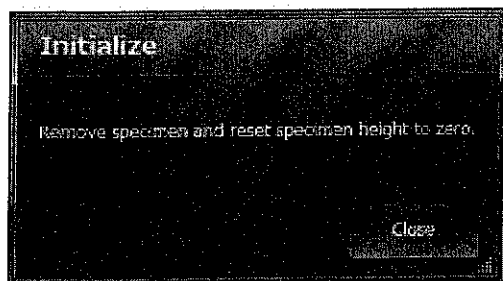
3. Select the axis to be calibrated, and tap the **Execute** button.  
The selected axis will start to move. The calibration is completed when the movement stops. It is recommended to usually select **All** (all axes) and then execute the calibration..



#### ◆ CAUTION ◆

**Remove the specimen, set the specimen height to 0mm**

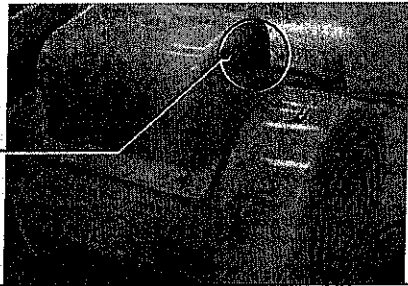
If you do not, the following message appears, the stage calibration is not performed.



Set the specimen height to 0mm, and tap the **Execute** button.

## 3.13 TROUBLESHOOTING

### 3.13.1 Evacuation Trouble

Symptom	Cause	Response
Power is not supplied to the evacuation system	The power switch (breaker) on the switch board is OFF	Turn the power switch (breaker) ON on the switch board.
	AC100V is not supplied	Stop the instrument and contact your local JEOL support center.
	The safety mechanisms are operating due to a power failure	Set the MAIN POWER key switch to OFF, Wait for power to be restored. After power is restored, start the instrument (See 3.4)
<ul style="list-style-type: none"> <li>RP does not start when the instrument is started.</li> <li>The VENT and EVAC switches on the main control panel are flashing</li> </ul>	The thermal protector operated because an excessive current was applied to the RP (when the room temperature is too low)	Stop the instrument and contact your local JEOL support center.  * Depending on the situation, the customer may be asked to perform the following. <ol style="list-style-type: none"> <li>Stop the instrument</li> <li>Check the room temperature (15 to 25°C)</li> <li>Press the RP manual reset button</li> <li>Start the instrument</li> </ol>
	<div style="text-align: center;">  <p>RP manual reset button</p> </div>	
	The fuse blew because an excessive current was applied to the RP	Stop the instrument and contact your local JEOL support center.
<ul style="list-style-type: none"> <li>RP stopped while the instrument is starting up</li> <li>The VENT and EVAC switches on the main control panel are flashing</li> <li>Images are not displayed</li> <li>A message is displayed</li> </ul>	The thermal protector operated because an excessive current was applied to the RP, and the fuse has blown.	Stop the instrument and contact your local JEOL support center.


#### ◆ WARNING ◆

**If the RP stops while the instrument is operating, do not touch the RP with bare hands.**

The sections around the RP motor become very hot, and there is a danger you will be burned.

Symptom	Cause	Response
Evacuation is not possible, or evacuation takes a long time.	Components are loose	Contact your local JEOL support center.
	A specimen containing a large amount of gas or water is mounted.	Process to remove the moisture, or replace the specimen
	Problem with the O-rings or packing of the stage or electron gun. (Twisted, out of place, dust or debris attached, or torn)	Check whether there is twisting, shifting of the position, damage or debris attached. As needed, correct the twisting or positioning, and remove any dust or debris. If the item is damaged, contact your local JEOL support center.
	The Wehnelt or other component has just been cleaned.	Wait for a while
	RP oil deterioration (black discoloration)	Contact your local JEOL support center.


### 3.13.2 Image Display Trouble

Symptom	Cause	Response
L.C value is unstable	The electron beam axis is not adequately aligned	Perform axis alignment of the electron gun (See 3.12.1)
	There are whiskers on the filament	Replace the filament (See 7.6)
	The filament centering is shifted	Perform centering again (See 7.6)
	The Wehnelt is dirty.	Clean the Wehnelt (See 7.6)
	The Wehnelt or other component has just been cleaned.	Wait for a while
L.C. value is not appropriate; too large / too small	Gun bias adjustment has not been performed	Perform gun bias adjustment (See 3.12.1.b)
No image	<b>Observation</b> icon is OFF	Switch the <b>Observation</b> icon to ON 
	Auto function does not work	Switch the <b>Observation</b> icon to ON Check that the filament is being heated. Then, try to run the auto function again (ACB, etc.) (See 3.7.1)
	The signal is not set to SED	For high vacuum mode, first set the signal to SED and start observation. (See 3.8.1)
	Too much or too little contrast and/or brightness	First, perform adjustment using the <b>ACB</b> icon. As needed, use the manual adjustment tool to make the adjustment (See 3.8.5)
	The electron beam axis is not adequately aligned	Perform axis alignment of the electron gun (See 3.12.1)
	Filament heating is insufficient	Perform gun alignment and gun bias adjustment (See 3.12.1.b)
	The moveable aperture axis is shifted	Turn the <b>Wobbler</b> ON. Adjust the axis using the X and Y knobs of the moveable aperture (See 3.12.2)
	Filament is broken	Replace the filament (See 7.6)
No image in LV mode		First, perform electron gun adjustment in HV mode, and check the images (See 3.12.1) Switch to LV mode. Set the magnification to x 100 or less, use <b>ACB</b> , <b>AF</b> to display the images (See 3.7.3) * If the images are hard to see, set the accelerating voltage to about 20 kV and P.C. to about 50. Set the pressure to 10 to 30 Pa

Symptom	Cause	Response
Image is not sharp	Astigmatism	Correct the astigmatism using the <b>AS</b> icon or the manual adjustment tools. (See 3.8.7)
	Insufficient contrast or brightness	Perform adjustment using the <b>ACB</b> icon or the manual adjustment tools. (See 3.8.5)
	Probe current is too high	Set a smaller P.C. (probe current) (See 3.8.3)
	The electron beam axis is not adequately aligned	Perform axis alignment of the electron gun (See 3.12.1)
	Accelerating voltage is too low	Increase the accelerating voltage (See 3.8.2)
	The aperture foil of the movable aperture has deteriorated	Replace the aperture foil of the moveable aperture (See 7.7)
	Parts inside the microscope column are dirty	Contact your local JEOL support center.
The upper and lower portions of the image are out of focus	The specimen is tilted at a high tilt angle	Decrease the tilt angle of the specimen. Or, correct using the Dynamic Focus function (See 4.2.8.a)
There is noise, variation or warping of the images	The specimen has become charged	Re coat the specimen Decrease the accelerating voltage (See 3.8.2) Set a smaller P.C. (probe current) (See 3.8.3) Finely adjust the pressure inside the specimen chamber (raise the pressure) (See 3.8.11)
	Probe current is too small	Set a larger P.C. (probe current) (See 3.8.3)
	Inappropriate acceleration voltage	Change the acceleration voltage (See 3.8.2)
	Astigmatism	Correct the astigmatism using the <b>AS</b> icon or the manual adjustment tools. (See 3.8.7)
	Too much or too little contrast and/or brightness	Perform adjustment using the <b>ACB</b> icon or the manual adjustment tools. (See 3.8.5)
	The specimen is not securely mounted	Securely fasten the specimen using conductive tape or a conductive adhesive.
	Components are loose	Contact your local JEOL support center.
	External magnetic field	Move the source of the external magnetic field farther away from the instrument. If the cause cannot be identified, contact your local JEOL support center.
	The aperture foil of the moveable aperture has deteriorated	Replace the aperture foil of the moveable aperture (See 7.7)
Parts inside the microscope column are dirty	Contact your local JEOL support center.	
<ul style="list-style-type: none"> <li>Image brightness is darker than before</li> <li>Image brightness changes periodically</li> </ul>	The scintillator chip has deteriorated	Contact your local JEOL support center.
Images is white and blurred	Strong display of edge effects	Perform adjustment using the <b>ACB</b> icon or the manual adjustment tools. (See 3.8.5) Or, Enter a check mark for Filter (only SEI enabled) in the SED Advanced in the Signal window. (See 3.8.1)
Cannot record live images	The observation window is not displayed on the full screen	Tap the <b>Mode</b> icon from home, and select a Standard View.
	The image size is not 640 × 480 pixels	Select a scan speed of 10 s or less for the Fast scan mode
<ul style="list-style-type: none"> <li>The stage coordinate display is different from the graphic display</li> <li>The exchange position is shifted and the specimen cannot be exchanged</li> </ul>	Stage calibration has not be performed	Perform stage calibration (See 3.12.3)

## 3.14 WARNING MESSAGES

### 3.14.1 Electron Gun Messages

Error Message	Response
<b>Filament burn-out.</b> (When the L.C. value does not increase even when the filament is heated for 80h or more.)	Replace the filament. ⇒ See 7.6
<b>Observation button is set to off or filament is not heated.</b> (When an auto function is operated while Observation button is off, or the filament is heated for 80h or less.)	Switch the <b>Observation</b> icon to ON, and operate the auto function (ACB, etc.) again.
<b>Filament failure</b> (When the L.C value is 150 $\mu$ A or more)	Remove the filament and check whether "whiskers" have formed.   Whiskers  If whiskers have formed, this will cause emission problems, so replace the filament. ⇒ See 7.6

### 3.14.2 Evacuation System Messages

Error Message	Response
<b>Please contact your local JEOL support center.</b> Error ID: 03**	Immediately halt the instrument and contact your local JEOL support center.
<b>Evacuation in progress</b> Error ID: 0331	Wait for a while.
<b>Close the gun chamber before evacuation.</b> Error ID: 0351	Close the gun chamber and then press the <b>EVAC</b> button
<b>Automatic pressure adjustment failure.</b> <b>Please use the manual adjustment buttons.</b> Error ID: 0360	Re-do the automatic settings, or perform the adjustment manually. ⇒ See 3.8.11
<b>VENT unable</b> <b>Please use it after remove VENT-Lock signal.</b> (When the VMIU of option has been used.) Error ID: 0380	Remove the Vent-Lock signal and try again.

※ VMIU : vacuum monitor interface unit

### 3.14.3 Specimen Stage Messages

Error Message	Cause & Response
Please contact your local JEOL support center. Error ID: 0200~0205	Displayed when a motor driver (motherboard) overheats. The motors for all axes become inoperable. Turn OFF the instrument power and contact your local JEOL support center
Please contact your local JEOL support center. Error ID: 0240~0245	Displayed when the mechanical movement limits are exceeded. Turn OFF the instrument power and contact your local JEOL support center
Please contact your local JEOL support center. Error ID: 0261	Displayed when the R-axis continues to rotate for some reason. Turn OFF the instrument power and contact your local JEOL support center
Attempt to exceed the allowed stage range. Error ID: 0230~0235	Displayed when the software movement limitations are exceeded. Movements for all axes are stopped. Move back toward the origin (X, Y) = (0, 0)
Stage stopped due to motor failure Error ID: 0250~0255	Displayed when the stage position cannot be read correctly. Press the [VENT] button. After complete chamber venting execute stage initialization (all axes). ⇒ See 3.12.3
Stage contact with lens detected. Error ID: 0260	Vent the specimen chamber to atmospheric pressure, and check whether there is any damage to the specimen, objective lens, or detectors. Damage occurred... Contact your local JEOL support center. No damage... Recheck the specimen shape and height * If the specimen protrudes above the specimen holder, be sure to enter the amount of the protrusion (specimen height) ⇒ See 3.5 and 3.6

### 3.14.4 Messages about General Functions

Error Message	Cause & Response
Please stop recording before quitting SEM control software.	Wait for the image recording to finish.
Please stop recording before switching the view mode. Stop recording now?	Tap either the <input type="checkbox"/> Yes or <input type="checkbox"/> No button.
Recording failure. The memory capacity might be insufficient or the specified directory might be set to read-only mode.	Check that the save destination exists, whether it has been set as Read Only, and whether there is enough space available. Set a save destination with adequate space.
Please stop recording before activating Halt Image. Stop recording now?	Tap either the <input type="checkbox"/> Yes or <input type="checkbox"/> No button.

### 3.14.5 Messages about Options

Error Message	Cause & Response
Please take a navigation image before stage control.	Displayed when the click-center function is executed while the stage navigation image is in the live image status.
SNS image acquisition failure. Readjustment required. Please contact your local JEOL support center.	There is no adjustment data for stage navigation control. Contact your local JEOL support center.

