

Nikon

DS-L4

Microscope Camera Control Unit

Instructions

———— **Camera Operation** ————

Please Read
First

Photographing
Basics of DS-L4

Photographing and
Replaying Images

Scale, Annotation,
and Measurement
Functions

Changing
Settings

Other
Information

Introduction

Thank you for purchasing a Nikon product.

This instruction manual has been prepared for users of the Nikon DS-L4 Microscope Camera Control Unit. To ensure correct usage, read this manual carefully before operating this product.

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- The contents of this manual are subject to change without notice.
- The equipment described in this manual may differ from the actual product in its appearance.
- Although every effort has been made to ensure the accuracy of this manual, errors or inconsistencies may remain. If you note any points that are unclear or incorrect, please contact your nearest Nikon representative.
- Some of the equipment described in this manual may not be included in the set you have purchased.
- If you intend to use any other equipment with this product, read the manual for that equipment too.
- If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Symbols used in this manual

This manual uses the following symbols.



This icon marks precautions or information that should be observed for safety. Depending on the severity of the risk, "WARNING" and "CAUTION" are indicated together with this icon.



This icon marks precautions or information that should be observed to avoid malfunction and failure of this product.



This icon marks notes or information that should be read before use. It also marks tips or additional information that may be helpful when using this product.

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- Products and brand names are trademarks or registered trademarks of their respective companies.
- In this manual, "TM" and ® marks are not used to identify registered trademarks and trademarks.
- DICOM is a standard that defines medical image formats and communication protocols.

About the screen shots

The screen shots in this manual are examples. Actual screens may differ from examples depending on the settings and the model of the connected camera.

Manuals

The documentation for the DS-L4 Microscope Camera Control Unit consists of the following three manuals:

- ◆ **Camera Operation** (this manual) Explains how to install and connect DS-L4, the operation of the touch panel, and the operation of the microscope camera connected to DS-L4.
- ◆ **Quick Reference**
Provides a brief explanation on how to operate the DS-L4.
- ◆ **Microscope Operation**
Explains how to operate and check the status of the microscope on the DS-L4 screen.

Features of This Product

The Nikon DS-L4 Microscope Camera Control Unit is a device to photograph or replay images with a Nikon microscope camera connected.

The live image displayed on the touch panel LCD display can be captured and saved as a still image or motion image to a storage media device such as a microSD card or USB drive. You can replay captured images, add annotations, or apply measurements on the screen.

This device is equipped with a microscope control function, providing both on-screen electric control and status display of motorized accessories of a Nikon microscope.

- **Built-in touch panel LCD display**

This product is equipped with a 10.1-inch wide touch panel LCD display enabling on-screen operation for viewing and capturing live images, replaying captured images, and configuring camera and microscope settings. A commercially available USB mouse or Bluetooth mouse can be used for operation. A user-friendly, button-based interface provides access to various DS-L4 functions.

- **Support for internal drives, microSD cards, USB memory drives, and network drives**

Captured still images and motion images can be saved to an internal drive, network drive, microSD card, or USB memory drive. You can specify the drive (or media) and folder in which you want to save images.

- **Output to an external display**

Images can be output to any commercially available WUXGA or FullHD external display via the DisplayPort, microHDMI, or analog RGB connector.

- **Consecutive capture with an interval timer**

Multiple images can be automatically captured at intervals by specifying the number of images and the interval length. This function allows you to observe how a subject changes or to photograph a subject consecutively with different photographing conditions.

- **Interval recording with an interval timer**

Motion images can be recorded automatically at regular intervals by specifying the recording time, the interval length, and the number of motion images to be recorded. This function allows you to observe how a subject changes.

- **Annotations to images**

You can add scales (such as a scale bar and grid) and annotations (such as text, lines, and count markers) to live and playback images. Images can be captured with annotations added.

- **Easy on-screen measurement**

Lengths and angles can be measured easily by on-screen operation.

- **Networking**

By connecting the DS-L4 to a network, images can be saved to a network drive. Images saved on a network drive can also be retrieved from a viewer terminal.

- **Microscope control**

This device is equipped with a microscope control function, providing both on-screen control and status display of motorized accessories of a connected Nikon microscope. For details, refer to the section "Microscope Operation".

- The hardware of this product is a tablet terminal, ARROWS Tab Q555/K64, manufactured by Fujitsu Limited.

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Part 1

Please Read First

This part explains what the user should know in advance about DS-L4 operation.

Before using the DS-L4 for the first time, please read this part. Also refer to this part whenever you want to confirm basic operations during installation and connection of the DS-L4, or during actual operation of the DS-L4.

This part consists of the following chapters:

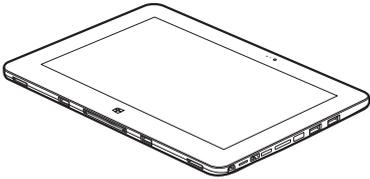
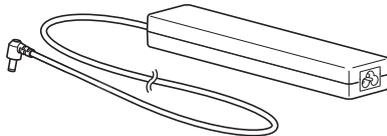
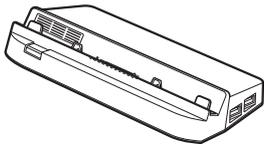
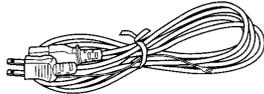
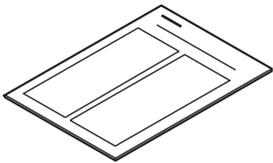
- Chapter 1 Before Use
- Chapter 2 Names of Parts
- Chapter 3 Installation and Connection
- Chapter 4 Preparing for Use
- Chapter 5 Using Menus

This chapter provides a checklist of the accessories supplied with the DS-L4, and explains which microscope cameras and peripheral devices can be connected to the DS-L4.

1.1 Confirmation of Accessories

The following items should be contained in the packing box. Please make sure that you have everything.

If any items are missing, contact your nearest Nikon representative immediately.

No.	Item	No.	Item
1	DS-L4 Microscope Camera Control Unit (Tablet main body) 	4	AC adapter for the cradle (supplied with the cradle) 
2	Cradle (supplied separately from the tablet main body) 	5	Power cord for the cradle (supplied with the cradle) 
3	Quick Reference 		

1.2 Microscope Cameras Supported by the DS-L4

The following models of microscope cameras can be connected to the DS-L4.

The characteristics of the microscope camera differ depending on the model. Before using a camera, confirm that it is a supported model.

Supported Microscope Cameras

Model	Image Pickup Device	Mount	Cooling	Body Color
DS-Fi3	1/1.8-inch color 5.9 M pixels	C mount	–	Black
DS-Ri2	Nikon FX-format color 16.25 M pixels	F mount	–	White

Note: For the specifications of each individual microscope camera, refer to the respective manual.

1.3 Peripheral Devices That Can Be Used

The following peripheral devices (sold separately) can be used with the DS-L4:

(1) External display

The DS-L4 has a built-in 10.1-inch wide LCD display with a resolution of 1920 x 1200 pixels (WUXGA). An external display can be used for larger image observation.

An external display to be used must be a PC display supporting an output resolution of 1920 x 1200 pixels (WUXGA) or 1920 x 1080 pixels (FullHD).

The microHDMI connector is on the tablet, and the DisplayPort and analog display connectors are on the cradle.

(2) microSD card

Commercially available microSD cards can be used as image storage media.

Please use a model whose operation is verified by Nikon. Not every microSD card is compatible with the DS-L4.

(3) USB memory drive

USB memory drives can be used as image storage media.

Please use a model whose operation is verified by Nikon. Not every USB memory drive is compatible with the DS-L4.

(4) USB mouse

A connected USB mouse can be used to perform operations equivalent to those of the touch panel.

For operation of menus on an external display, a mouse is required.

Use mouse operation for adding lines and comments to images (Annotation function), and measuring lengths and angles on the screen (Measurement function).

Please use a model whose operation is verified by Nikon. Not every USB mouse is compatible with the DS-L4.

(5) USB keyboard

A connected USB keyboard can be used to directly enter values, comments, and other information.

Please use a USB keyboard whose operation is verified by Nikon. Not every USB keyboard is compatible with the DS-L4.

(6) USB hub

You will need a USB hub to connect a USB drive, USB mouse, USB keyboard, and other USB devices at the same time.

Please use a model whose operation is verified by Nikon. Not every USB hub is compatible with the DS-L4.

Note 1: The DS-L4 does not support cascading of hubs.

Note 2: If the USB keyboard you use has a USB hub, use the hub of the keyboard.

(7) Bluetooth mouse

A connected Bluetooth mouse can be used to perform operations equivalent to those of the touch panel.

For operation of menus on an external display, a mouse is required.

Use mouse operation for adding lines and comments to images (Annotation function), and measuring lengths and angles on the screen (Measurement function).

Please use a model whose operation is verified by Nikon. Not every Bluetooth mouse is compatible with the DS-L4.

(8) Bluetooth keyboard

A connected Bluetooth keyboard can be used to directly enter values, comments, and other information.

Please use a model whose operation is verified by Nikon. Not every Bluetooth keyboard is compatible with the DS-L4.

(9) Network connection cable

A network connection cable is used for connecting the DS-L4 to a network (LAN). Use a 10 Base-T, 100 Base-TX, or 1000 Base-T cable (category 5e or higher).

With the DS-L4 connected to the network, you can save image files in a PC through the network and control the DS-L4 from a PC.

✔ Network cables

- Use a shielded cable that satisfies EMC standards.
- When connecting the DS-L4 to a LAN, use a straight cable. When connecting the DS-L4 to a PC, use a crossover cable.

ⓘ Tightly connect the network cable

If the network cable is removed while the DS-L4 is being used, the DS-L4 may freeze for one minute or more. In such a case, please wait until the freeze state ends.

(10) Personal computer (PC)

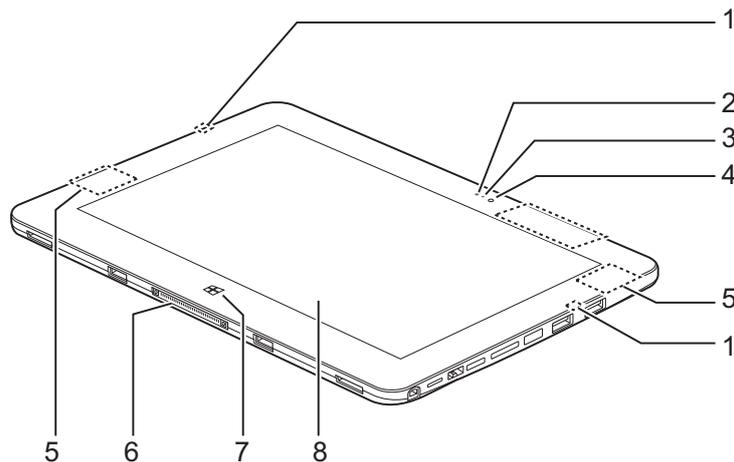
A PC is necessary to process image data photographed by the DS-L4 or to control the DS-L4 remotely.

This chapter shows the part names of the DS-L4.

2.1

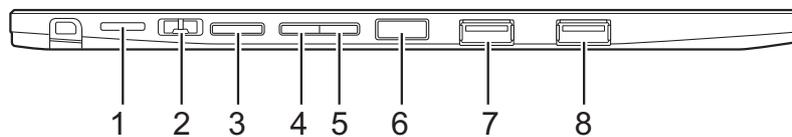
DS-L4 Microscope Camera Control Unit

Tablet (front view)



1. Built-in microphone (not used)
2. Ambient light sensor (not used)
3. LED indicating the status of the Web camera (not used)
4. Web camera (not used)
5. Wireless antenna
6. Docking connector
7. Windows button (not used)
8. LCD display/touch panel

Tablet (right view)



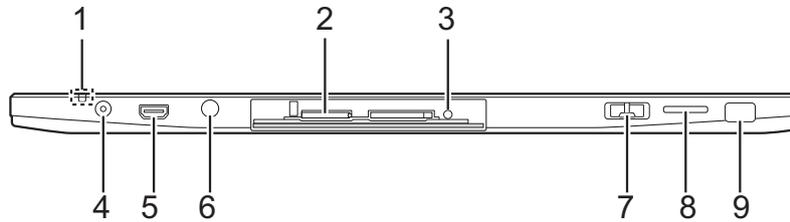
1. Speaker
2. Hole for attaching a stylus string
3. Shortcut button (used only to open the BIOS menu)
4. Volume Down button (-) (not used)
5. Volume Up button (+) (not used)
6. Power button (Used only to turn on the power. To turn off the power, tap [SETTINGS] and then [SHUT DOWN].)

! Turning the power forcibly

While the power to the DS-L4 is ON, holding down the power button for over ten seconds forcibly turns off the DS-L4. Do not use this operation unless the DS-L4 has frozen for some reason; otherwise, the DS-L4 might fail to start. If such failure occurs, please contact your nearest Nikon representative and request repairs

- 7. USB 2.0 connector
- 8. USB 3.0 connector

Tablet (left view)



- 1. Battery charge lamp
- 2. Direct memory slot (microSD slot)
- 3. Forced termination switch
- 4. DC-IN connector (not used)
- 5. microHDMI connector
- 6. Mic/line-in/headphone/line-out/headset terminal (not used)
- 7. Hole for attaching a stylus string
- 8. Speaker
- 9. Hole for attaching an anti-theft lock

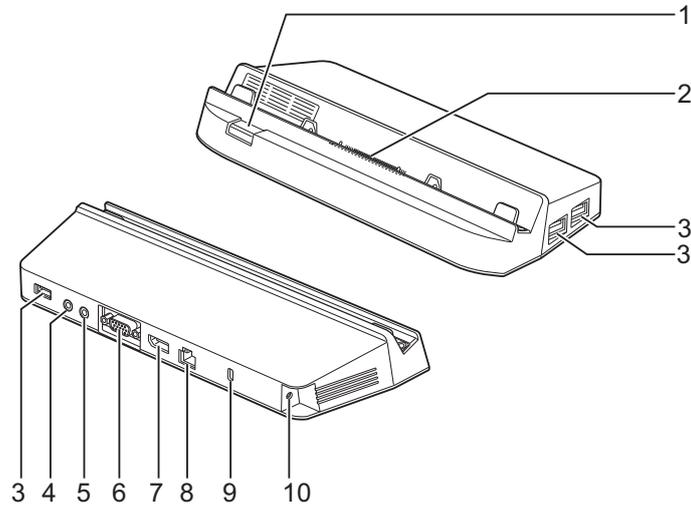
⚠ Cautions on cable connections

Make sure that the power of the device is off when you connect or disconnect a cable. Plugging or unplugging a cable with the power on may cause malfunction.

2.2

Cradle

Cradle (front and rear views)



1. Unlock button
2. Main connector
3. USB 2.0 connector
4. Mic/line-in terminal (not used)
5. Headphone/line-out terminal (not used)
6. Analog display connector
7. DisplayPort connector
8. LAN connector
9. Hole for attaching an anti-theft lock
10. DC IN connector

✔ About the external display connectors

More than one external display connector cannot be used concurrently.

This chapter explains how to install and connect the DS-L4 and a microscope camera.

3.1 Installing the DS-L4

⚠ Cautions on installation

When you install the DS-L4, allow at least 10 cm between it and other objects for adequate heat dissipation.

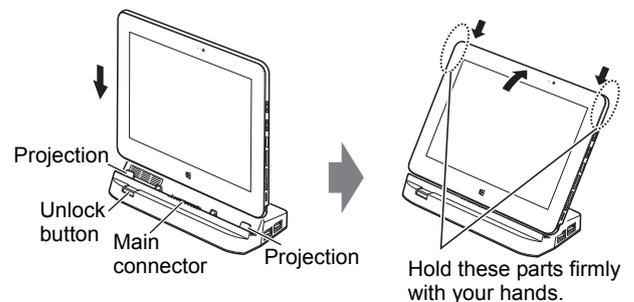
3.1.1 Connecting the DS-L4 to the Cradle

- 1 Make sure that no peripheral devices are connected to the connectors on the tablet.
- 2 Make sure that the Unlock button of the cradle is pressed (red mark is visible).
- 3 Connect the tablet to the cradle.
 - 1 Place the tablet squarely on the cradle, aligning the two projections of the cradle with their corresponding holes.
 - 2 Incline the tablet towards the cradle slightly.
 - 3 Holding the tablet's top corners, push the tablet forward until you hear a click.

Make sure that the tablet and cradle are connected securely (the tablet is inclined at the angle of the cradle front panel).

Place the cradle on a stable, horizontal surface. If you place the cradle on an unstable surface, such as a sofa, the tablet might incline or fall down.

Do not place any objects around the cradle. Objects around the cradle might prevent the tablet from being set correctly.



Connecting the DS-L4 to the cradle

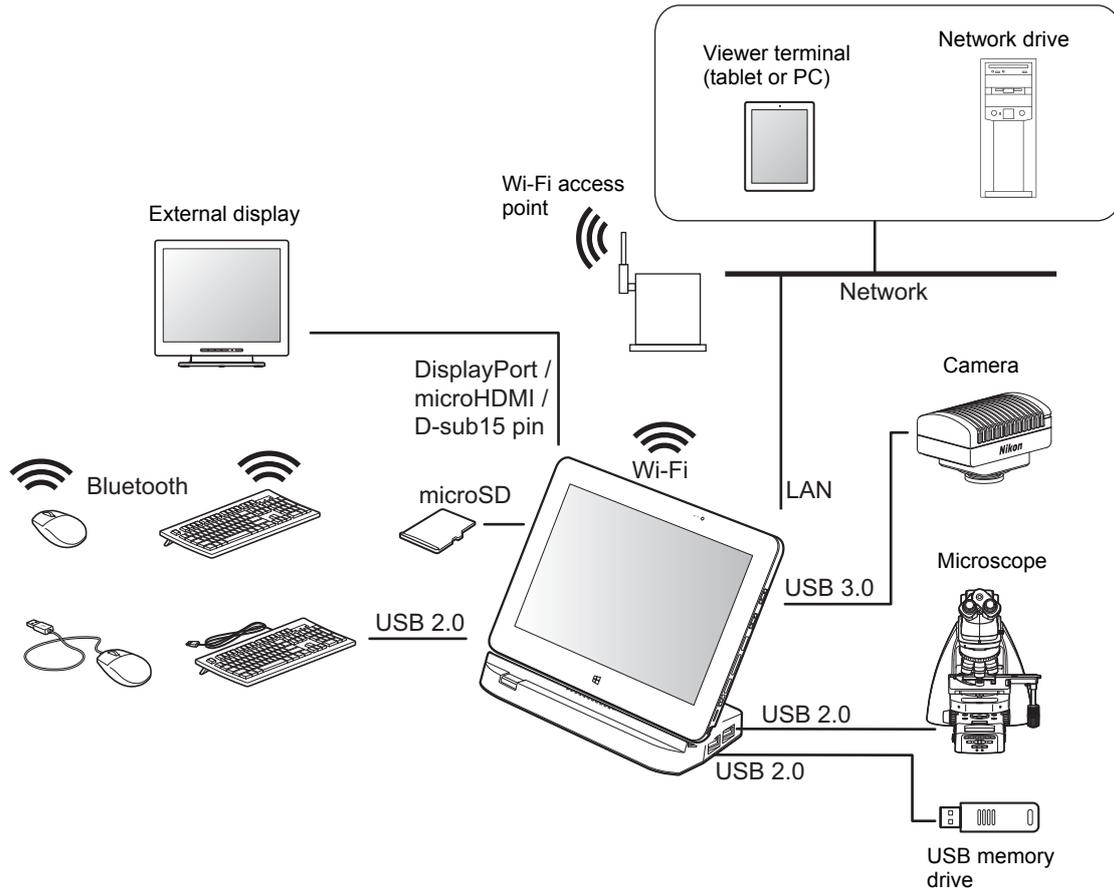
3.2 Connecting the DS-L4 and Peripheral Devices

! Always turn the power off before plugging or unplugging cables.

Confirm that the power of devices is turned off before plugging or unplugging cables.

Connecting a cable when the power is on may cause electric shock, or malfunction or failure of the device.

3.2.1 Connection Overview



Connection overview (The camera and microscope in this figure are examples.)

✔ Character entry in Ti2Control

The software keyboard is not displayed while the Ti2Control application is used on the DS-L4 tablet. Use a USB or Bluetooth keyboard instead.

3.2.2 Connecting a Microscope Camera to the DS-L4

⚠ Cautions on connecting a USB 3.0 cable

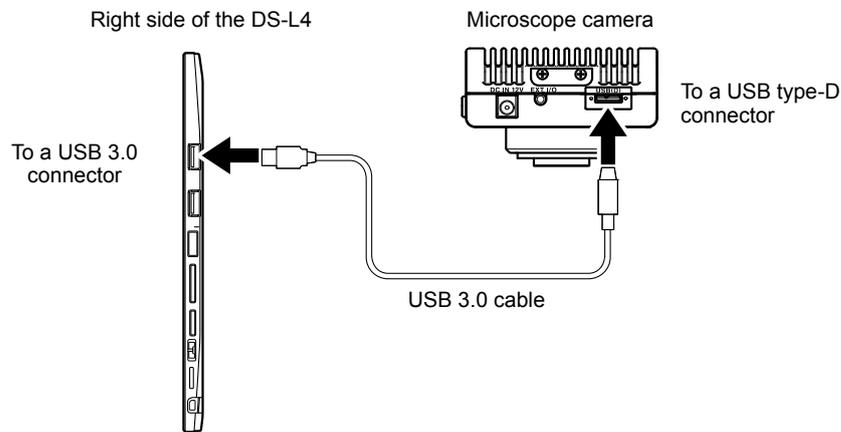
- Connect a microscope camera to the optical device before connecting a USB 3.0 cable.
- Before connecting a USB 3.0 cable, turn off the power of the DS-L4. Plugging or unplugging a USB 3.0 cable while the DS-L4 is active may cause malfunction.

1 Make sure that the DS-L4 power is turned off.

2 Use a commercially available USB 3.0 cable to connect the USB 3.0 connector of the tablet and the USB type-D connector of the microscope camera.

⚠ Use a USB 3.0 interface to connect the camera

The camera must be connected to the USB 3.0 connector on the upper-right side of the DS-L4 main body.



Connecting a microscope camera to the DS-L4

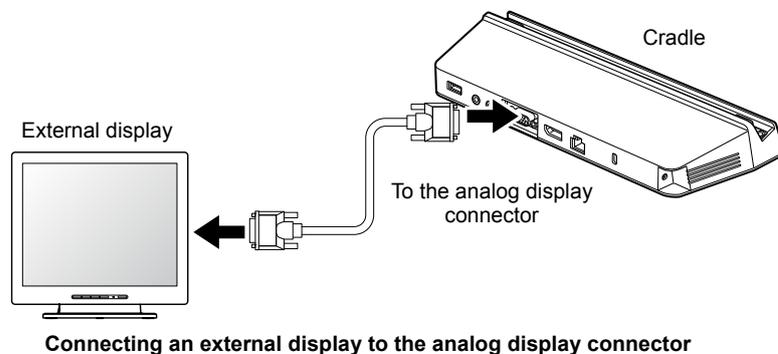
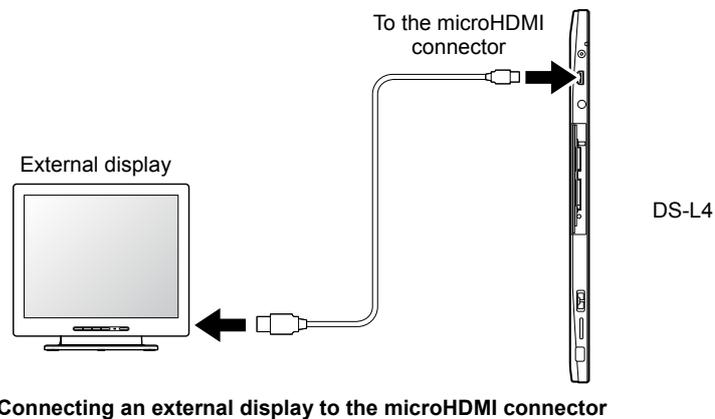
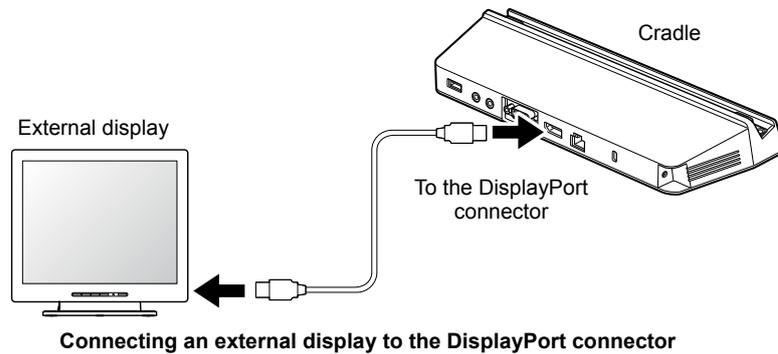
3.2.3 Connecting an External Display

Video signals from the DS-L4 can be output to an external display connected to it.

! Specifications of the external display

The display to be used must be a PC display supporting an output resolution of 1920 x 1200 pixels (WUXGA) or 1920 x 1080 pixels (FullHD).

- 1 Make sure that power to the DS-L4 and the external display to be connected is turned off.
- 2 Use a commercially available cable to connect the DS-L4 or the cradle with the video input terminal of the external display.



✓ About the external display connectors

- More than one external display connector cannot be used concurrently.
- Make sure that the power of the device is turned off when you connect an external display. Connecting the cable with the power on may result in display corruption.

3.2.4 Connecting USB Peripheral Devices

The DS-L4 provides one USB 2.0 connector, and the cradle provides three USB 2.0 connectors. You can connect USB devices (such as a USB mouse or USB keyboard), or you can connect a Nikon microscope and electrically control motorized accessories on the microscope. USB memory drives can be connected as image storage media.

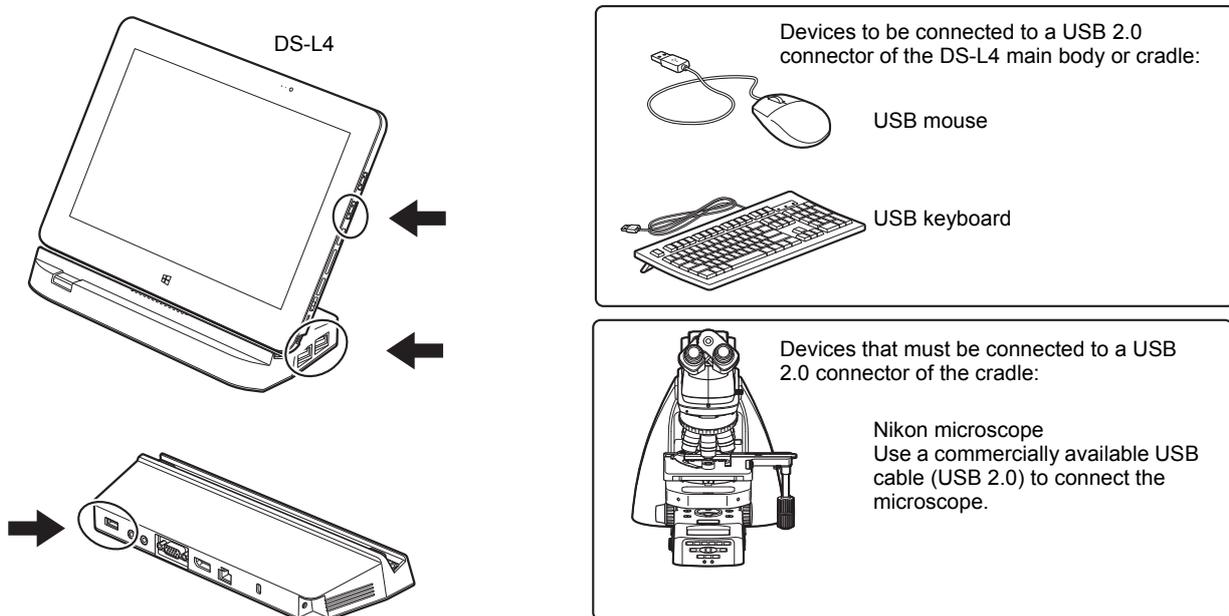
✔ Connecting USB memory drives

For connection of USB memory drives, refer to "4.4.3 Connecting USB Memory Drives".

1 Make sure that the DS-L4 power is off.

2 Connect the desired USB devices.

Plug the connector of each device squarely into a connector of the cradle.



Connecting USB peripheral devices

✔ Connecting USB devices

- Cascading of USB hubs is not supported. USB devices connected to cascaded USB hubs are not recognized. If the USB keyboard you use has a USB hub, use the hub of the keyboard.
- For Nikon microscopes that can be connected to the DS-L4, refer to "20.1 DS-L4 Microscope Camera Control Unit".

✔ Mouse speed

- The mouse pointer speed of the connected USB mouse can be specified in the [DS SETUP] menu. For details, refer to "13.2.5 (2) Setting the mouse pointer speed".

✔ Using a keyboard

- Using a USB keyboard allows you to directly enter values, comments, and other information from the keyboard while a software keyboard for character input is displayed on the screen.
- One-byte alphanumeric characters and symbols displayed on the software keyboard on the screen can be entered from the USB keyboard.
- The software keyboard is not displayed while the Ti2Control application is used on the DS-L4 tablet. Use a USB or Bluetooth keyboard instead.

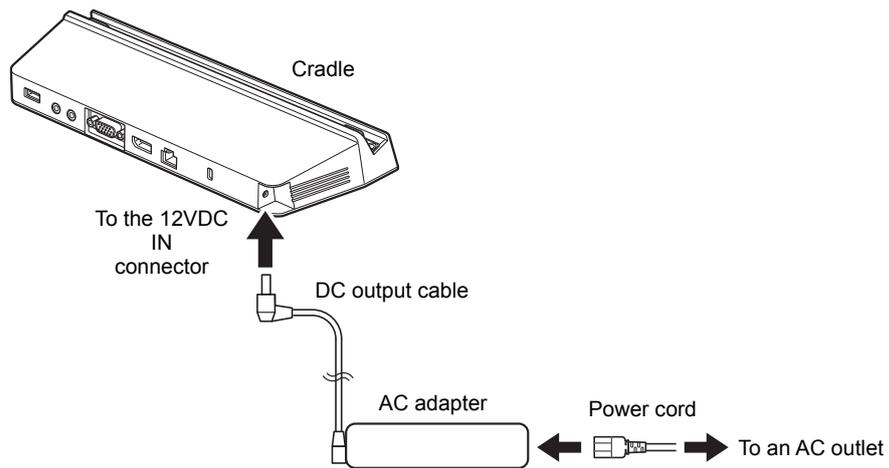
3.3 Connecting the AC Adapter

To supply external power to the DS-L4, use the cradle and the cradle's AC adapter.

⚠ CAUTION: Connection of the AC adapter and power cord

- To avoid electric shock, confirm that the DS-L4 power is turned off before connecting the AC adapter.
 - Connect the AC adapter after all other connections are finished.
 - Be sure to use the AC adapter dedicated to the DS-L4 cradle.
 - Use a power cord that is specified by this manual. Using any other power cord may cause malfunction or fire. For details on the power cord that can be used, refer to "Chapter 20 Main Specifications".
- This device is designated under electric shock protection class I, and, therefore, must only be connected to an AC outlet that has a protective ground terminal. If the power cord is lost or damaged, contact the place of purchase.

- 1 Make sure that the DS-L4 power is turned off.
- 2 Connect the DC output cable of the AC adapter to the VDC-IN connector of the cradle.
- 3 Connect the specified power cord to the AC adapter.
- 4 Connect the plug of the power cord to the AC outlet.



Connecting the AC adapter

This chapter explains the accessory preparations for using the DS-L4 for observation or photographing.

4.1 Starting/Closing DS-L4

⚠ CAUTION: Power supply for the DS-L4

- When you turn off the DS-L4 power, in the login screen, LIVE menu, or VIEW menu, be sure to tap [SETTINGS], and then [SHUT DOWN].
- Use only a 100 to 240 VAC (50 to 60 Hz) power supply, and to which the AC adapter is directly connected.
- Be sure to use the specified power cord.
- Be sure to use the specified AC adapter.

4.1.1 Starting the DS-L4

The following describes the procedure for starting the DS-L4.

✔ When using the microscope control function

When you connect a Nikon microscope to the DS-L4 and use the microscope control function of the DS-L4, switch on the microscope before switching on the DS-L4. For details on how to switch on the microscope, refer to the manual of the microscope.

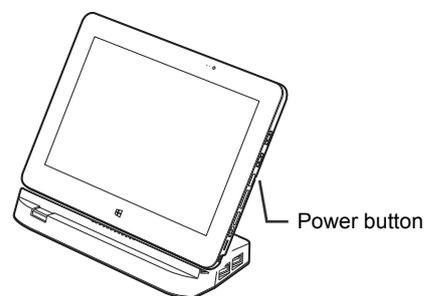
1 Press the power button to turn on the DS-L4 power.

Hold down the power button for about two seconds until the button vibrates.

Before the login screen or a live image with a menu is displayed, a black screen may appear, or the screen may freeze temporarily. Wait for a while.

When the DS-L4 is switched on, the start screen appears in the display.

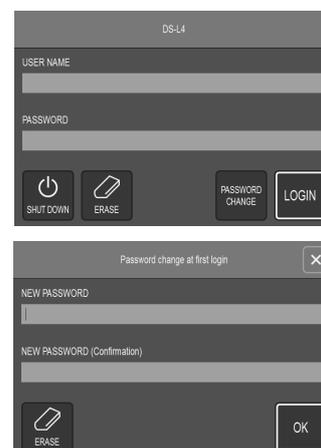
After the power is turned off, the DS-L4 power cannot be turned on for about 15 seconds. Wait for at least 15 seconds, and then press the power button.



2 Turn on the microscope camera.

3 (If the DS-L4 user has already been registered) Enter the user ID and password, and then tap [LOGIN].

If you attempt to log in for the first time with a temporary password, you will be prompted to set a new password. Set a new password, and then tap [OK].



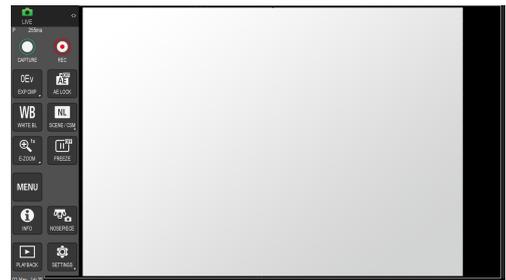
4 Confirm that the menu and live image are displayed on the monitor.

Depending on the status of the optical device, you may not be able to determine if the image displayed on the monitor is the live image.

Especially when a camera is connected to a microscope, if the subject is insufficiently illuminated or out of focus, the camera gain may increase to the maximum, degrading the image quality.



Start screen



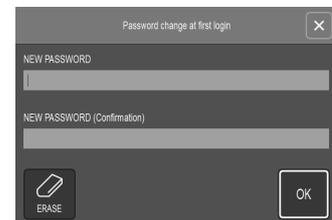
DS-L4 Screen

✔ User types

- In the DS-L4, users are managed in three levels: Supervisor, User, and Terminal User. Only Supervisors can change the settings in the [DS SETUP] and [MIC SETUP] menus.
- If no user account is registered, no one can connect to the DS-L4 and retrieve images from a viewer terminal.

✔ Changing the password

In the login screen, enter your ID and password, and then tap [PASSWORD CHANGE]. You can then set a new password.



✔ If you enter an incorrect password five times

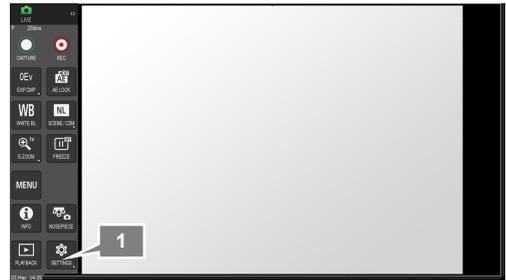
If you enter an incorrect password five times, your account will be locked to prevent login. Supervisors can unlock user accounts in the [ACCOUNT: USER MANAGEMENT] screen of the [DS SETUP] menu.

✔ Resetting a Supervisor password

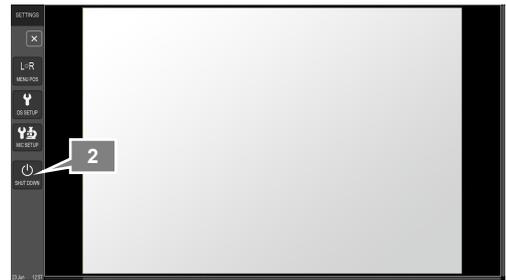
If a Supervisor forgets his or her password, he or she can log in as a special user to reset the Supervisor's password. For the user ID and password of a special user, contact your Nikon representative.

4.1.2 Switching Off

1 In the LIVE menu or VIEW menu, tap [SETTINGS].



2 Tap [SHUT DOWN].
The power is turned off.



3 Turn off the microscope camera.

✔ **If a blue or black screen appears**

Infrequently, a blue or black screen may appear for one minute or a longer time before the power is turned off. Please wait a while.

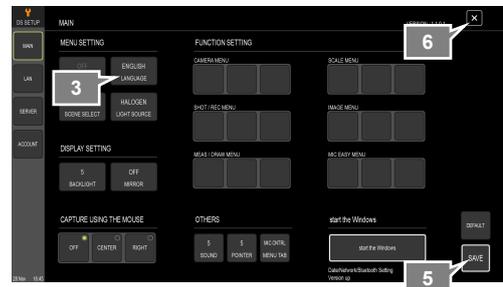
4.2 Setting the Display Language

The minimum necessary settings for operating the DS-L4 are explained here.

Note: For other initial setting items, refer to "Chapter 13 Changing Settings".

4.2.1 Setting the Display Language

- 1 Tap [SETTINGS].
- 2 Tap [DS SETUP].
The [MAIN] screen appears.
- 3 Tap [LANGUAGE].
- 4 Select the desired language.
The selected language will be indicated on the [LANGUAGE] button.
- 5 Tap [SAVE] to save the setting.
The display language is changed.
- 6 To close the [DS SETUP] screen, tap [x] in the top right of the screen.



Setting the display language

Please Read First

4.3 Setting the Field of View (for the DS-Ri2 Only)

The appropriate FOV differs depending on the F-mount adapter that is used to connect a camera to the camera pot of the microscope. The following describes how to set the FOV. Note that the sizes of images that can be recorded may change according to this setting.

- 1 Tap [SETTINGS].
- 2 Tap [FOV].
- 3 Select the FOV setting that is appropriate for the adapter.

Each selectable FOV setting is a combination of the FOV diameter and adapter magnification.

(For example, [ϕ 16 - 2.5x] means that the diameter of the FOV to be used is 16 mm and the magnification of the attached adapter is 2.5x.)

If you use a DS-F F-mount adapter for DS series (direct), select [ϕ 16 - 1x], [ϕ 22 - 1x], or [ϕ 25 - 1x]. The appropriate FOV setting depends on the combination of the optical components used in the microscope to be used. For details on the FOV, refer to the applicable manual of the microscope.

If you use the DS-F2.5/DS-F2.5R F-mount adapter for DS series, select [ϕ 16 - 2.5x].



Setting the FOV

✓ Notes on changing the FOV setting

If you use a DS-Ri2 or another camera whose FOV setting can be changed and you change its FOV setting, you must perform the following operations:

- Register the calibration settings of the MANUAL calibration mode again.
- Set the metering area again.

4.4 Preparing Recording Media

Images captured by the DS-L4 can be saved to either of the media described below.

- **MicroSD card**

MicroSD cards are card-type storage media used for digital cameras and other devices. A microSD card can be inserted in the direct memory slot on the left side of the tablet.

MicroSD, microSDHC, and microSDXC cards are supported. Copyright protection is not supported. Multimedia cards (MMC) and secure multimedia cards are not supported.

- **USB memory drive**

USB memory drives must be FAT-formatted recording media equipped with a USB interface. A USB memory drive can be connected to the USB 2.0 connector of the DS-L4.



MicroSD card (example)



USB memory drive (example)

! Operation assignment for capturing

You can specify the location where images captured with the DS-L4 are to be saved. Check the operation assignment settings in advance to make sure that images will be saved to the desired location. For details about the settings, refer to "8.2.3 (7) Specifying the destination media and save folder".

4.4.1 Handling Recording Media

Cautions on handling recording media

! Handling recording media

Note the following when you use external recording media such as a microSD card or USB memory drive:

- Carefully read the instructions for the recording media to be used.
- Insert the recording media in the correct orientation.
- Do not remove the recording media or turn off the power while data is being written. Doing so may cause loss of data or malfunction of the media.
- Some types of recording media might not operate properly. Use media whose operation has been verified by Nikon.
- If the recording media is not recognized, remove it, and then re-insert it. If it is still not recognized, replace the media with another one.
- Do not touch the contacts of the microSD card with your hand or a metal object.

✓ Discarding or sharing recording media

Note that data recorded on recording media (such as microSD cards and USB memory drives) cannot be completely erased by deletion or initialization performed by the DS-L4 or a PC. Data deleted from recording media might be restored by using commercially available software after the media is discarded, potentially resulting in malicious use of confidential data.

Before discarding recording media or transferring ownership to another person, erase all data by using commercially available data deletion software. Alternatively, initialize the media, and then completely fill it with non-confidential images.

You can also physically destroy storage media to prevent data recovery. Take care to avoid injury or damage when physically destroying recording media.

Initializing recording media

Before you can use a microSD card, USB memory drive, or other recording media with the DS-L4, you must initialize (format) the media by using a PC.

When initializing recording media, you can specify a volume label, which is displayed in the screen for setting image save destinations, and can be used to identify the media. We recommend that you specify a volume label when initializing recording media. For recording media devices for which no volume labels are set, strings EXT1, EXT2, EXT3, ... are displayed.

⚠ Backing up data

Note that, initializing storage media renders any data saved on the media unusable. Back up any important data (to a PC, etc.) stored on the media before initializing it.

Setting the image storage and playback folders

The DS-L4 allows you to connect multiple recording media devices, and to switch the storage folder and playback folder. Before you start capturing images, you must specify the recording media and folder as the storage location for the captured images.

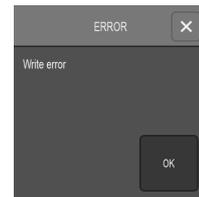
For details about setting the image storage location, refer to "8.2.3 (7) Specifying the destination media and save folder".

Errors with media

Make sure that recording media is inserted to the DS-L4 before saving or playback data.

If an image is not saved or replayed correctly for any reason, a warning message is displayed.

If you see such a message, remove the media once, and then re-insert it. If the message persists, that recording media may be no longer usable. In such a case, use other recording media or initialize the failed media by using a PC. An error may be displayed when the amount of free space on the recording media is low. Check the number of images that can be captured in [STILL IMAGE SETTING] of [CAMERA MENU: SHOT/REC]. For the remaining recording time, see [MOTION IMAGE SETTING] in [CAMERA MENU: SHOT/REC].



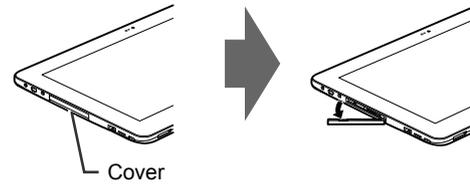
Warning message for recording media (example)

4.4.2 Using a microSD Card

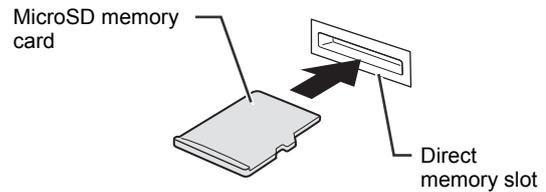
To use a microSD card as recording media, insert it in the direct memory slot on the right side of the tablet.

(1) Inserting a microSD card

- 1 **Make sure that the DS-L4 power is turned off.**
- 2 **Open the slot cover with your fingertip.**
Be careful when opening or closing the slot cover, and do not apply excessive force on it.
- 3 **Insert the microSD memory card into the direct memory slot in the direction as marked on the slot cover.**
If a message appears in the top right of the screen, tap the message, and then select the necessary action or close the message.
- 4 **Close the slot cover.**



Inserting a microSD card

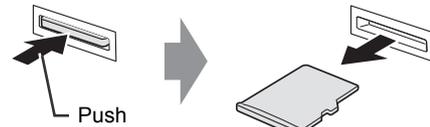


⚠ Be careful about the direction when inserting the microSD card.

Do not insert a microSD card inserted in the reverse direction. Note that doing so forcefully might damage the microSD card or DS-L4.

(2) Removing a microSD card

- 1 **Switch off the DS-L4.**
- 2 **Open the cover of the direct memory slot with your fingertip.**
- 3 **Push the microSD memory card once to unlock it, and then pull it out from the slot.**
Do not push the memory card forcefully. Doing so may inadvertently eject the memory card, resulting in damage or loss of the memory card. Do not direct the memory slot at other people or move your face close to it. If a memory card is ejected, it might cause injuries.
- 4 **Close the slot cover.**



Removing the microSD card

4.4.3 Connecting USB Memory Drives

Multiple USB memory drives can be connected to the DS-L4, and used for storing or replaying images. You can connect any type of USB 2.0-compatible FAT-formatted storage device (including a USB memory drive).

⚠ Do not remove a USB memory drive while it is being accessed.

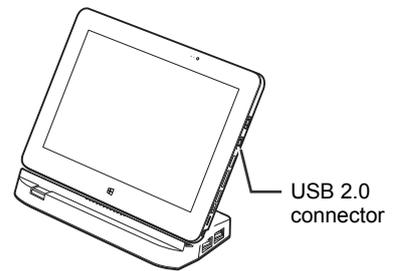
Even while the DS-L4 is switched on, you can connect or disconnect a USB memory drive.

Note that the access lamp of a USB memory drive lights up when the drive is being accessed (storing, deleting, or reading data). While the access lamp is lit, never remove a USB memory drive or switch off the DS-L4. Doing so might result in lost data or damage to the USB drive.

(1) Connecting and removing a USB memory drive

Connect a commercially available USB memory drive to the USB 2.0 connector on the right side of the DS-L4 (or to a USB 2.0 connector on the right side or back of the cradle).

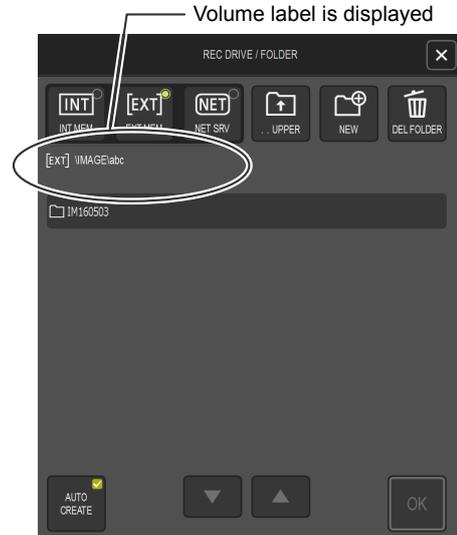
When you remove a USB memory drive, make sure access to the memory (for saving or playing back an image) is complete (the access lamp of the USB memory drive is off). Alternatively, switch off the DS-L4. Remove the USB memory drive in a straight direction.



Inserting/removing a USB memory drive

✓ About the volume label of a USB memory drive

If a volume label is specified during initialization of a USB memory drive, the volume label is displayed in the screen on the DS-L4 (for setting the image storage destination). We recommend that you specify a volume label when initializing recording media. For recording media devices for which no volume labels are set, strings EXT1, EXT2, EXT3, ... are displayed.



Drive allocation example (for setting the save folder)

(2) Initializing a USB memory drive

Use a PC to initialize a USB memory drive as necessary.

4.5 Preparing A Network Drive

Images captured by the DS-L4 can be saved to a network drive (a shared drive or folder of an external PC) connected via wired LAN. To use a network drive, perform the following preparations.

- 1 Connect the PC to save the images and DS-L4 via wired LAN.**
For details on how to connect a PC, refer to “15.1 Connection Methods”.
- 2 Specify file sharing settings on the PC to allow DS-L4 to access folders on the PC via the network.**
For details on configuration, refer to “15.7 Specifying the File Sharing Settings on the PC”.
- 3 Specify the network settings using the DS-L4 Administration Tool.**
For details on configuration, refer to “13.6.2 Specifying the Network Settings”.
- 4 Specify settings on the DS-L4 so that it can access to the network drive.**
For details on configuration, refer to “13.4 Specifying Network Drive Settings”.

To save image data to a network drive when an image is captured, settings for storage destination must be specified. For details on how to specify image data storage destination, refer to “8.2.3 (7) Specifying the destination media and save folder”.

This chapter explains how to use the menus of the DS-L4.

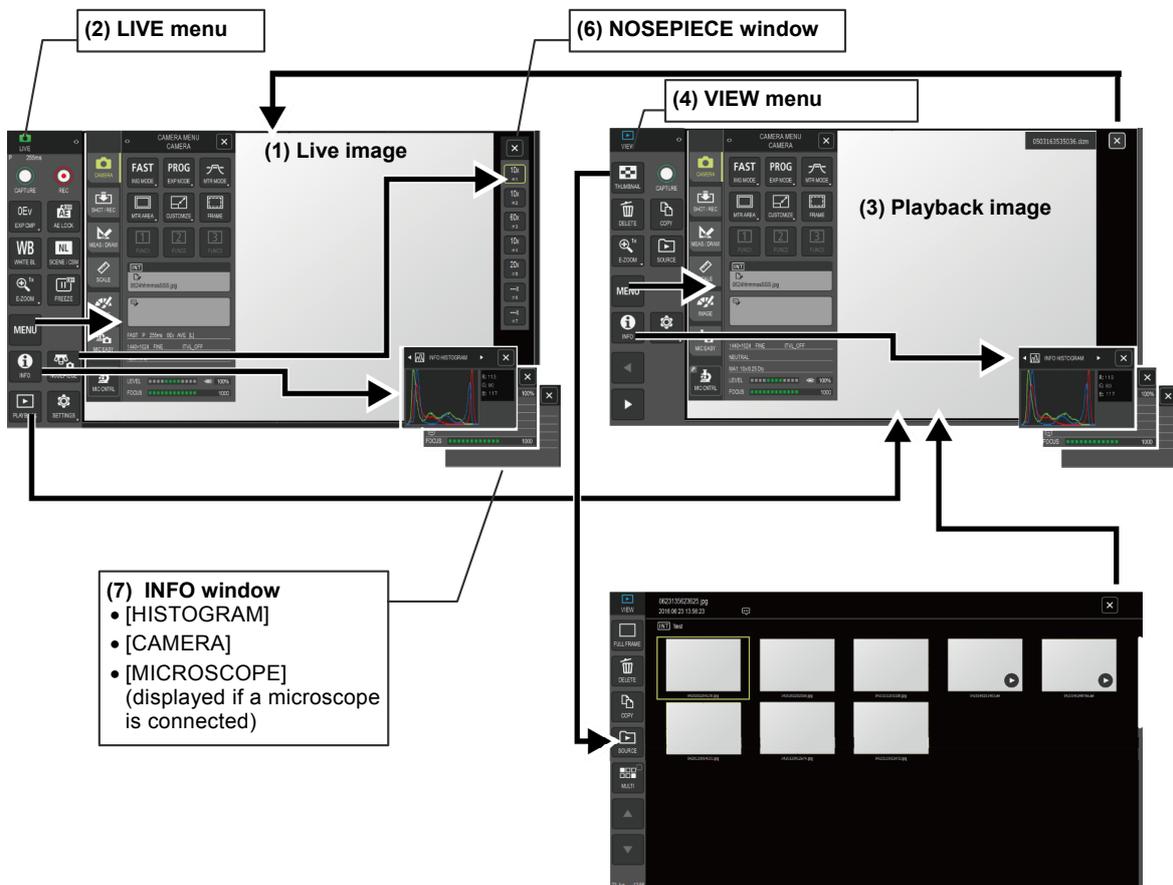
5.1 Navigating through Screen Menus

This section explains the configuration of the DS-L4 operation menus, and includes some basics on how to use them.

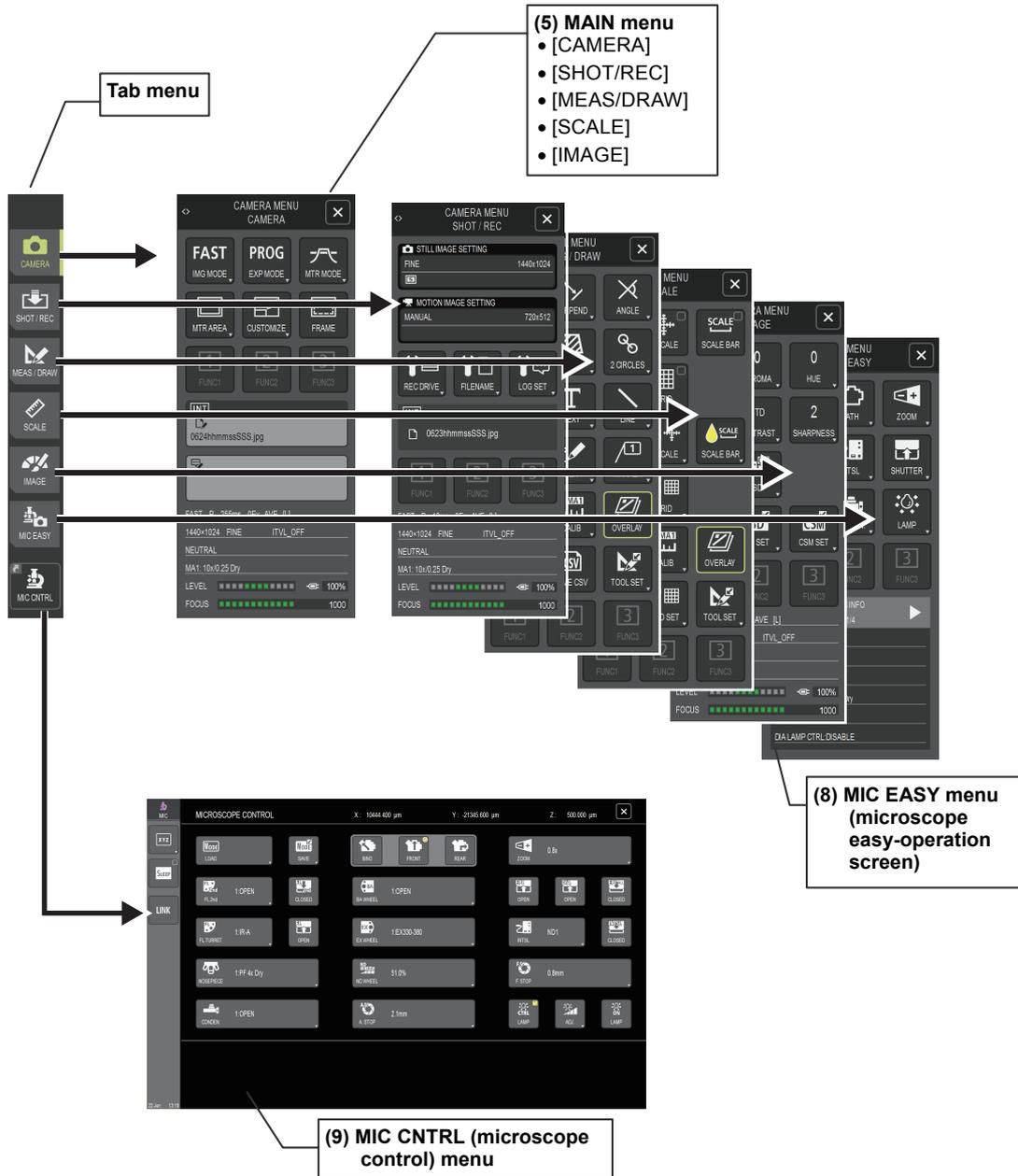
5.1.1 Menu Configuration and Method of Displaying Menus

The configuration of the DS-L4 operation menus is illustrated below.

The LIVE menu or VIEW menu is displayed on the left side of the screen. Each button displayed in these menus displays the respective menu screen.



Please Read First

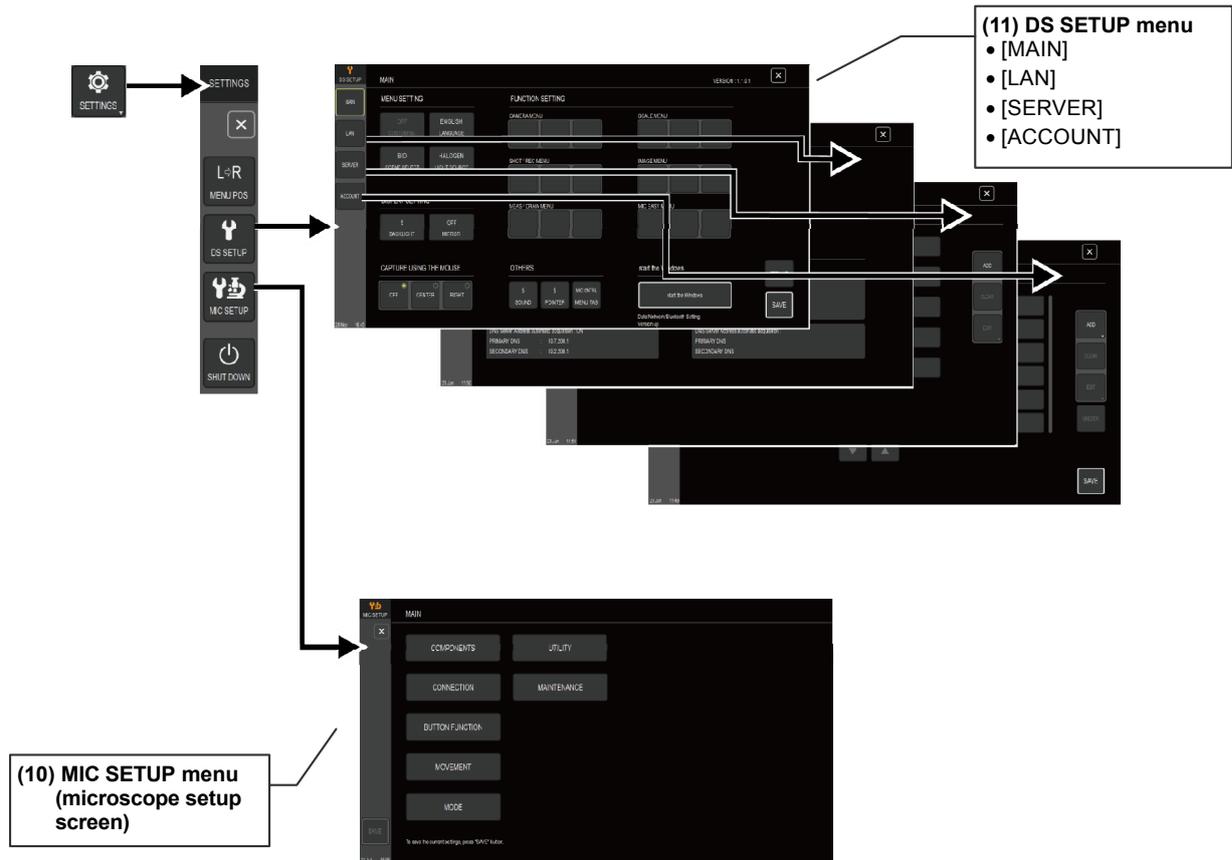


Operations and status display of the Ti2-E/Ti2-A microscope

- If the microscope being used is Ti2-E or Ti2-A, you can start the Ti2Control application by tapping the [Ti2 CNTRL] button in the tab menu.
- To display the [Ti2 CNTRL] button, tap [DS SETUP] > [MAIN] > [MENU TAB], and then select [Ti2 CNTRL]. If the [Ti2 CNTRL] button is displayed, the NOSEPIECE window, MIC EASY menu, MIC CNTRL menu, and MIC SETUP menu are not displayed.
- For details on Ti2Control, refer to "Application for Inverted Research Microscope ECLIPSE Ti2 series Ti2Control Instruction Manual (for Android)".
- To switch from the Ti2Control application to the DS-L4 application, tap [DS-Camera].
- The software keyboard is not displayed while the Ti2Control application is used on the DS-L4 tablet. Use a USB or Bluetooth keyboard instead.



Button to launch Ti2Control



Please Read First

Operation menu composition and presentation

(1) Live image

If a microscope camera is connected to the DS-L4, the camera image (live image) is automatically displayed when the DS-L4 is switched on.

(2) LIVE menu

Frequently used buttons (including the status of live view and numeric values of photography settings) are displayed here. Tapping the <> button hides the second column. To show it again, tap the button again. Tapping [SETTINGS] > [MENU POS] changes the display position of the menu (from left to right, or vice versa).

(3) Playback image

When you tap [PLAYBACK] in the LIVE menu, you can display a captured image (playback image). To change the captured image to the previous or next one, swipe the screen to the left or right.

(4) VIEW menu

This menu is displayed while the DS-L4 is in playback mode.

Tapping the <> button hides the second column. To show it again, tap the button again. Tapping [SETTINGS] > [MENU POS] changes the display position of the menu (from left to right, or vice versa).

(5) MAIN menu

Use this menu to specify the settings of the microscope camera. This menu is displayed when you tap [MENU] in the LIVE or VIEW menu. From this menu, you can select to open the [CAMERA], [SHOT/REC], [MEAS/DRAW], [SCALE], [IMAGE], [MIC EASY], or [MIC CNTRL] menu. (Note that some of these menus might be unavailable depending on the connection or operating status. Unavailable menus are grayed out.)

Tapping the <> button shows or hides the tab menu.

(6) NOSEPIECE window

This menu is displayed only when a Nikon microscope is connected to a USB connector. While viewing the image, you can use this menu to control (from the DS-L4) the microscope's motorized nosepiece. (The NOSEPIECE window cannot be used if [Ti2 CNTRL] ([DS SETUP] > [MAIN] > [MENU TAB]) is selected. Use the [Ti2 CNTRL] button instead.)

(7) INFO window

This menu displays a histogram (showing brightness/darkness distribution in an image), and camera and microscope information. This menu is displayed when you tap [INFO] in the LIVE or VIEW menu. You can change the screen by swiping the screen to the left or right.

(8) MIC EASY menu (microscope easy-operation screen)

This menu is displayed only when a Nikon microscope is connected to a USB connector. You can use this screen for electric control (from the DS-L4) of motorized accessories on the microscope while you are observing the image. (The MIC EASY menu cannot be used if [Ti2 CNTRL] ([DS SETUP] > [MAIN] > [MENU TAB]) is selected. Use the [Ti2 CNTRL] button instead.)

(9) MIC CNTRL (microscope control) menu

This menu is displayed only when a Nikon microscope is connected to a USB connector. You can use this screen for electric control (from the DS-L4) of motorized accessories on the microscope. (The MIC CNTRL menu cannot be used if [Ti2 CNTRL] ([DS SETUP] > [MAIN] > [MENU TAB]) is selected. Use the [Ti2 CNTRL] button instead.)

(10) MIC SETUP (microscope setup) menu

This menu is displayed only when a Nikon microscope is connected to a USB connector. Use this menu to set up the microscope that is connected to the DS-L4.

After completing setup, tap [SAVE] to save settings, and then tap [X] to close the MIC SETUP screen. Changes made on the screen are not reflected if you close the screen without saving them. (The MIC SETUP menu cannot be used if [Ti2 CNTRL] ([DS SETUP] > [MAIN] > [MENU TAB]) is selected. Use the [Ti2 CNTRL] button instead.)

(11) DS SETUP menu

Use this menu to set up the DS-L4. To display this menu, tap [DS SETUP] in the tab menu. From this menu, the following four screens can be displayed: [MAIN], [LAN], [SERVER], and [ACCOUNT].

To close the MIC SETUP menu, tap [X] in the top right corner of the screen. Before closing the screen, tap [SAVE] in the bottom right of the screen to save settings. Changes made on the menu are not reflected if you close the screen without saving them.

5.1.2 Using the LIVE Menu

You can perform operations on the DS-L4 from the menu screens.

Display the necessary menu screen from the LIVE or VIEW menu on the left side of the screen.

Exposure mode
P (program AE), M (manual), or F (focus-priority AE) is displayed as the exposure mode.

[CAPTURE] button
This button saves the data of the image currently displayed on the screen as a still image.

[EXP CMP] / [CAM GAIN] buttons
Use [EXP CMP] to change the auto-exposure value to brighten or darken the entire screen. Use [CAM GAIN] to adjust the camera sensitivity if the exposure mode is set to M (manual).

[WHITE BL] button
Obtain and set white balance.

[E.ZOOM] button
Magnify the image. The selected magnification is displayed on the button. The section to be enlarged in the image can be changed.

[MENU] button
Displays the MAIN menu.

[INFO] button
Displays the INFO window.

[PLAYBACK] button
Places the DS-L4 in playback mode, for displaying recorded images. The image taken or accessed last is displayed.

Exposure time
If capturing requires two seconds or longer, the DS-L4 performs a countdown in seconds.

Start/stop recording
When you tap this button, the DS-L4 starts recording a motion image. To stop the recording, tap this button again.

[AE LOCK] button
This button fixes the exposure value at the current exposure value. To release the AE lock, tap the button again.

[SCENE/CSM] button
Use this button to select the scene mode or custom setting.

[FREEZE] button
When you tap this button, the DS-L4 continues to display the still image that was displayed when the button was tapped. To stop displaying the still image, tap the button again.

[NOSEPIECE] button
Displays the NOSEPIECE window. In the window, you can rotate the motorized nosepiece of the microscope to switch the objective.

[SETTINGS] button
Tapping this button displays the buttons:

- **[MENU POS] button**
Switches the menu display position between left and right.
- **[FOV] button** (displayed if the connected camera is DS-F13)
- **[DS SETUP] button**
Allows you to set up the microscope.
- **[MIC SETUP] button**
Electrically controls motorized accessories of the microscope from the DS-L4.
- **[SHUT DOWN] button**
Terminates the DS-L4 application.

Hides/shows the second menu column

Items displayed in the LIVE menu

5.1.3 Operating the VIEW Menu

You can perform operations on the DS-L4 from the menu screens.

Display the necessary menu screen from the LIVE or VIEW menu on the left side of the screen.

Please Read First

[THUMBNAIL] button
Displays the thumbnails of the recorded images.

[DELETE] button
Deletes the selected image.

[E.ZOOM] button
Magnify the image. The selected magnification is displayed on the button. The section to be enlarged in the image can be changed.

[MENU] button
Displays the MAIN menu.

[INFO] button
Displays the INFO window.

[◀] button
Displays the previous image. If the magnification of electronic zoom is 1x, you can also display the previous image by swipe the screen to the right.

[▶] button
Displays the next image. If the magnification of electronic zoom is 1x, you can also display the next image by swipe the screen to the left.

Hides/shows the second menu column

[CAPTURE] button
This button re-captures the data of a displayed image and saves it as a still image.

[COPY] button
Use this button to copy or move the selected image.

[SOURCE] button
Use this button to specify or change the playback folder.

[SETTINGS] button
Tapping this button displays the two buttons:

- **[MENU POS] button**
Switches the menu display position between left and right.
- **[DS SETUP] button**
Allows you to set up the microscope.
- **[MIC SETUP] button**
Electrically controls motorized accessories of the microscope from the DS-L4.
- **[SHUT DOWN] button**
Terminates the DS-L4 application.

Items displayed in the VIEW menu

5.1.4 Switching the Tab of the MAIN Menu

When you tap [MENU] in the LIVE or VIEW menu, the MAIN menu is displayed. You can open the desired menu by tapping its tab.

1 In the LIVE menu or VIEW menu, tap [MENU].

2 Tap the tab of the desired menu (submenu).

If the tabs are not displayed, tap the <> button to display them.

(Some tabs might not be selected or displayed, depending on the connection or operating status. The icons of tabs that cannot be selected or displayed are grayed out.)



Switching the menu

5.1.5 Using Operation Menu Buttons and Configuration Screens

You can perform a variety of operations by tapping the operation menu buttons. The buttons can be categorized into the following types, based on functionality.

Buttons for immediately executing functions

Use these buttons to immediately execute, enable, or disable functions.

- For example, you can display the following buttons: [CAPTURE], [FREEZE], [AE LOCK], [PLAYBACK], and [WHITE BL]

When you tap the [CAPTURE] button, the image displayed when the button was tapped is captured.

When you tap the [FREEZE] button, the DS-L4 continues to display the still image that was displayed when the button was tapped. Alternatively, the DS-L4 stops displaying the still image. While a still image captured from the live image is displayed, the button is framed in yellow. When the button is tapped again, the yellow frame disappears, and then the live image is displayed again.

Buttons immediately executing functions
Example:
[CAPTURE]



Buttons enabling/disabling functions
Example:
[FREEZE]

Buttons immediately executing functions

Buttons displaying a submenu for selecting an option

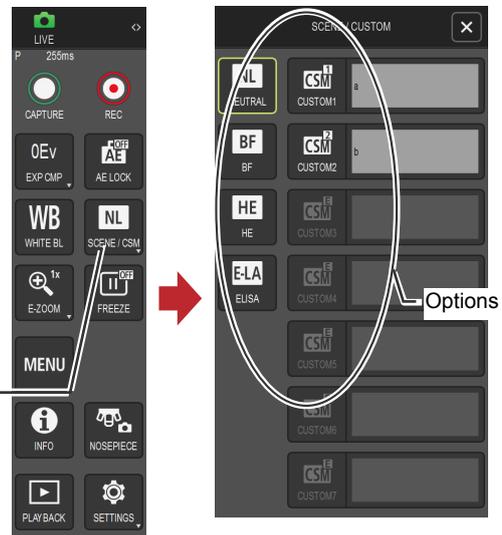
These buttons display a submenu that allows you to select a setting or operation option by tapping a button displayed in the submenu.

- Example: [SCENE/CSM]

Tapping the [SCENE/CSM] button displays a submenu that consists of buttons, allowing you to select a desired scene mode or custom setting.

Some submenus of this type provide the [X] button. Tapping [X] on a submenu closes it without applying any changes made with the submenu.

Buttons displaying a submenu consisting of options
Example:
[SCENE/CSM]



Selecting an option from a submenu

Please Read First

Buttons displaying a submenu for setting values

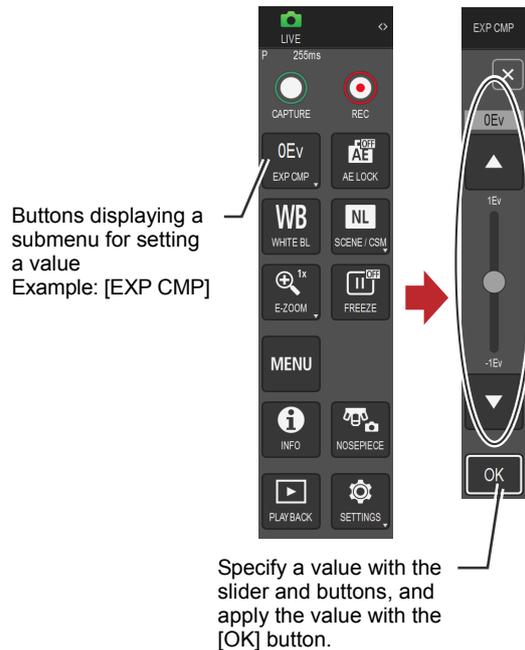
These buttons display a submenu that consists of buttons and sliders, allowing you to set the values of photographing conditions, image adjustments, and other items.

• **Example: [EXP CMP]**

When you tap this button, the submenu for setting a value is displayed. With this submenu, you can use the following operations to set a value:

- **Moving a slider**
You can intuitively change the value to be set. Various degrees of change are possible.
- **Tapping the rail above or below the slider**
You can incrementally increase or decrease a value coarsely. ("Jump")
- **Tapping [▲] or [▼]**
You can incrementally increase or decrease a value precisely. ("Step") This operation is useful when you want to make small adjustments to a value.

Tap the [OK] button to apply the value. The submenu closes and the value you have just set is displayed on the button.



Setting a value from a submenu

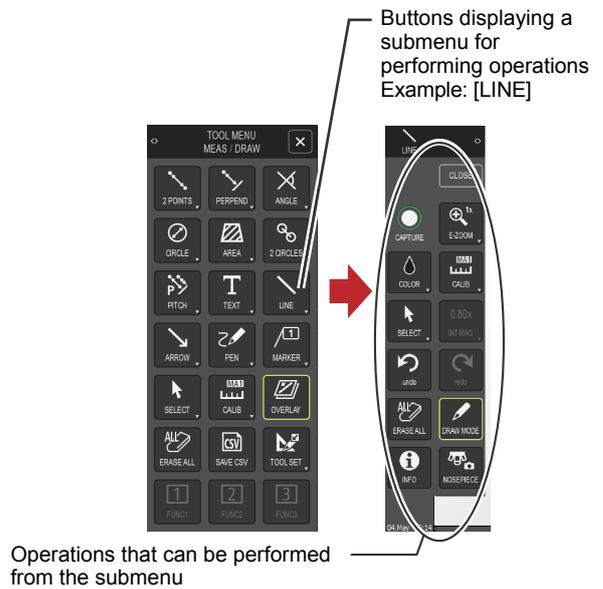
Buttons displaying a submenu for performing operations

These buttons display submenus, allowing you to perform a variety of operations.

• **Example: [LINE]**

With the submenu displayed by tapping the [LINE] button, you can, for example, change the color and the electronic zoom magnification.

Some submenus of this type provide a [CLOSE] button to close the submenu. Drawn lines do not disappear after a submenu is closed.



Performing operations from a submenu

Please Read First

Buttons for entering text or values

When you tap an area in which text or a value can be entered, a keypad is displayed.

To enter uppercase letters, enable the [↑] button.

To display the software keyboard for entering symbols and numbers, select the [&123] button.

To apply the entered string, tap [Enter] on the software keyboard or tap [OK] in the entry screen.



✔ Character entry in Ti2Control

The software keyboard is not displayed while the Ti2Control application is used on the DS-L4 tablet. Use a USB or Bluetooth keyboard instead.

✔ Notes on entry using the software keyboard

- Do not tap the keyboard icon (which changes the keyboard layout) in the bottom right of the software keyboard. If you do so, entered text may be corrupted.
- Symbols or pictographs are not supported.
- If you enter more characters than the maximum, the excess characters are discarded.
- If you inadvertently close the software keyboard by tapping the [X] button, you can redisplay the software keyboard by tapping the entry area.
- When you tap [X] in the entry area, the entered value is discarded, and the previous value is restored.
- If a hardware keyboard is connected, pressing any key on it hides the software keyboard.
- In areas in which numeric values must be entered, use only numeric characters in the ASCII code set. When entering numeric values, place the software keyboard in Alphanumeric mode. To change the input mode from Japanese mode to Alphanumeric mode, tap [あ] at the bottom of the software keyboard.

Part 2

Photographing Basics of the DS-L4

This part explains basic operations of the DS-L4 for photographing (capturing) images.

This part consists of the following chapters:

- Chapter 6 Capturing Images with Simple Operations
- Chapter 7 Tips on Photographing

Capturing Images with Simple Operations

This chapter explains the operations for capturing images by using the LIVE menu and the [CAMERA MENU: CAMERA] screen.

✔ What is "capturing"?

"Capturing" is an operation to save the currently displayed image on to a storage media device as a still image.

With the DS-L4, you can capture the live image viewed through a microscope camera or the recorded image displayed in playback mode. You can also add annotations or measurements to the live image or playback image that you capture.

6.1 Operation of Capturing Images

Images are captured in the following steps:

1 Set the white balance (only for a color camera). ⇒ 6.2

2 Check the status of the subject by the live image. ⇒ 6.3

3 Adjust the exposure. ⇒ 6.4

4 Capture an image. ⇒ 6.5

6.2 Setting the White Balance

White balance is the process of correcting color bias due to light source variations, and adjusting white color so that whiteness of objects appears correctly in the photograph. With the DS-L4, you can set the white balance manually when a color camera is connected.

✓ Adjusting the white balance when observing by a microscope

- When using diasopic illumination for microphotography, adjust the white balance while you are photographing a transparent part of the preparation.
- When episcopic illumination for microphotography is used or a camera lens (instead of a microscope) is attached to the camera, adjust the white balance using a white object.
- For fluorescent photographing, we recommend that white balance be adjusted under normal light conditions before photographing. If the screen is excessively dark or bright, adjust the iris diaphragm or brightness of the light source, or use an ND filter to obtain the appropriate white balance.

- 1 Prepare an evenly white object, such as a sheet of paper, and adjust the camera head position so that the object covers the entire view of the DS camera.**

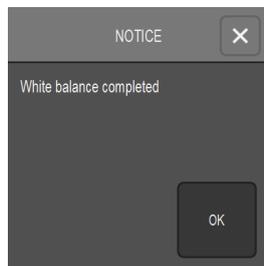
Configure the illumination for observation or capturing.

- 2 In the LIVE menu, tap [WHITE BL].**

A confirmation message appears.

- 3 Tap [OK].**

The new white balance is obtained, and a message appears to notify that the white balance setting is completed.



White balance setting completed

- 4 Tap [OK].**

✓ Settings at the power-on time

The white balance setting is saved when the power is turned off. It is resumed the next time the power is turned on. However, if a custom setting ([SETTINGS] > [DS SETUP] > [MAIN] > [CUSTOM No.]) is selected, the white balance specified in that custom setting is used.

✓ White balance measurement area

The metering area that is currently set is also used to measure the white balance.

For details about setting the metering area, refer to "8.2.1 (3) Switching the metering mode".

✓ Failure in white balance adjustment

White balance adjustment may fail if the object used for adjustment is not evenly white.

In such cases, a confirmation message appears, and you must adjust white balance again following the above procedure.



Set an evenly white object so that it covers the entire view.

Setting white balance

Using a scene mode or custom setting

You may want to adjust the contrast or hue accordingly for the photographed subject, or use your own desired settings.

The DS-L4 provides a choice of scene modes, each comprising of a set of photographing parameters, allowing for appropriate adjustment for a given subject. You can register any set of photographing conditions as a "custom setting". Any of the registered custom settings can be used in the same way as a scene mode.

To use a scene mode or custom setting, tap [SCENE/CSM] in the LIVE menu. When the submenu appears, select the desired scene mode or custom setting by tapping the corresponding button.

Note: The name of the selected scene mode or the number of the selected custom setting is reflected to the [SCENE/CSM] button in the LIVE menu. The name of the selected scene mode or the number of the selected custom setting (and any comment about it) is also displayed in the information area of the [CAMERA MENU: CAMERA] screen and in the [INFO: CAMERA] window.



Select a scene mode or custom setting

Using a scene mode or custom setting

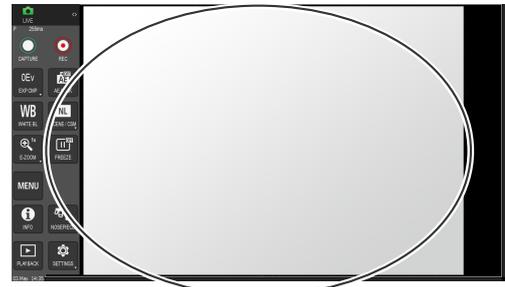
✔ Details on scene modes and custom settings

- For details on scene modes and custom settings, refer to "8.1.1 Using a Scene Mode or Custom Setting".
- The scene modes displayed on the menu change according to the type of scenes you select ([SETTINGS] > [DS SETUP] > [MAIN] > [SCENE SELECT]). For details, refer to "13.2.1 Specifying the Menu-related Settings".

6.3 Checking the Subject Conditions of a Live Image

When you have completed white balance adjustment, check the subject conditions of the live image and adjust the layout and focus.

- 1 Adjust the layout so that the desired part of the subject is photographed.**
Adjust the orientation of the subject and magnification of the optical element.
- 2 Adjust the illumination to the appropriate brightness for the subject while looking into the eyepiece.**
- 3 Focus the camera on the desired part of the subject.**
Use the [FOCUS] indicator to check the focus as necessary.



Adjust the layout, brightness, and focus.

Checking the subject conditions of a live image

How to read the focus indicator

The focus indicator is displayed in the following screens:

- [CAMERA MENU: CAMERA]
- [CAMERA MENU: SHOT/REC]
- [CAMERA MENU: IMAGE]
- [INFO: CAMERA]

The [FOCUS] indicator displays the degree of focusing with a 12-level meter and numeric value based on the detected contrast of the image.

The [FOCUS] indicator lights according to the contrast of the image; it may not reflect the actual focus condition. When you actually focus the camera on the subject, do it by looking at the screen.

The maximum value shown in the [FOCUS] indicator depends on the image mode and other conditions. Generally, the higher the contrast, the greater the value.



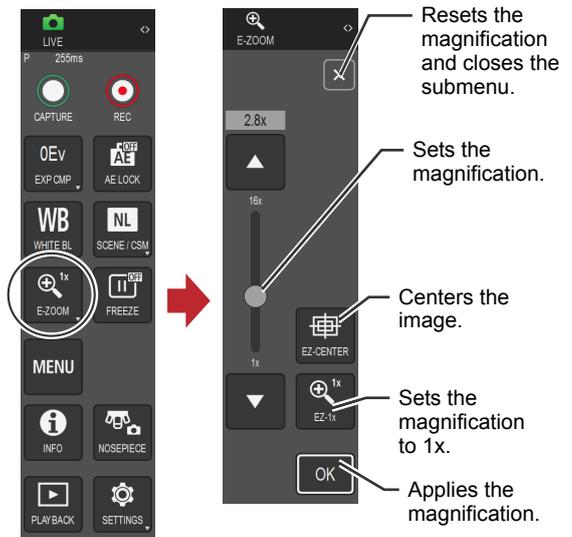
[FOCUS] indicator

Enlarging the subject by electronic zoom

When the subject cannot be enlarged on the screen due to limitations of the optical device or the subject itself, you can enlarge the image using the electronic zoom of the DS-L4.

You can perform the following operations when using the electronic zoom:

- Use pinch-in, pinch-out, or swipe operations on the image to change the magnification or position.
- Tap [E.ZOOM] in the menu to display a submenu.
- Rotate the wheel of the mouse or drag the mouse to change the magnification or position.



Using electronic zoom

✔ **Using electronic zoom**

- Electronic zoom is a function to enlarge a section of an image. Note that, image quality decreases with larger magnification.
- Electronic zoom can only magnify images. It cannot reduce the display size.
- You can also capture an image enlarged by electronic zoom ([SCREEN CAP MODE] in [CAMERA MENU: SHOT/REC]).
- Enlargement by electronic zoom is automatically canceled when you switch between LIVE mode and VIEW mode, or switch the playback image.

6.4 Exposure Compensation

Exposure compensation is a function that allows you to make the entire screen brighter or darker than the exposure automatically determined by the DS-L4.

You can perform exposure compensation if the DS-L4 is in an automatic exposure mode (program AE or focus-priority AE mode).

If the exposure mode is M (manual), the [EXP CMP] button is not displayed. In this case, tap [EXP TIME] or [CAM GAIN] to adjust the exposure.

✔ Note on exposure compensation

When exposure is deemed correct by automatic exposure, the four elements in the center of the [Level] meter are lit.

Note that this condition does not necessarily mean that exposure in the desired position is correct. You can use exposure compensation to tune the exposure of the subject as desired.

- 1 In the LIVE menu, tap [EXP CMP].
- 2 Use the [EXP CMP] submenu to perform exposure compensation.

When you perform exposure compensation, view the live image to check the exposure of the subject.

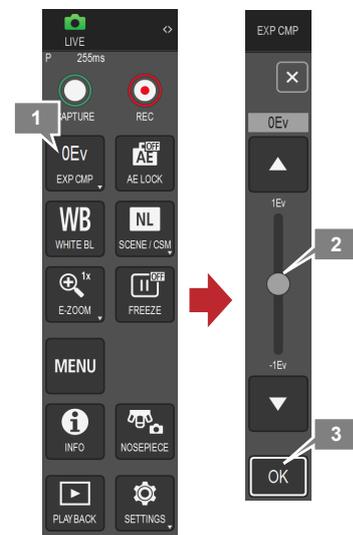
The range of exposure compensation is as follows. The exposure value can be adjusted in 1/6 EV steps.

Contrast Setting	Valid Range
WIDE D	-1 EV to +1 EV
WEAK	-1 EV to +1 EV
STANDARD	-1 EV to +1 EV
STRONG	-1 EV to +2/3 EV
LINEAR	-1 EV to +1/2 EV
METAL	-1 EV to +2/3 EV
ENHANCE	-1 EV to +1/2 EV

- 3 Tap [OK] to confirm the setting.

✔ Settings at the power-on time

The exposure compensation setting is saved when the power is turned off. The next time the power is turned on, the saved exposure compensation value is used as the initial value. However, if a custom setting ([SETTINGS] > [DS SETUP] > [MAIN] > [CUSTOM No.]) is selected, the exposure compensation value specified in that custom setting is used.



Operations of exposure compensation

How to read the level meter

The level meter is displayed in the following screens:

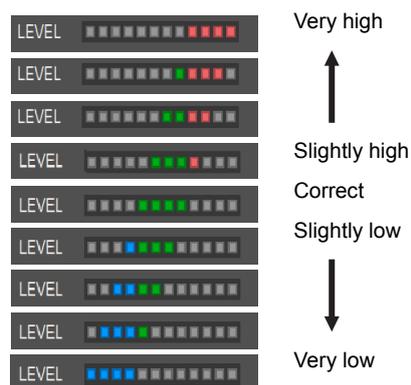
- [CAMERA MENU: CAMERA]
- [CAMERA MENU: SHOT/REC]
- [CAMERA MENU: IMAGE]

The [LEVEL] meter shows the exposure condition.

The meter consists of 12 elements: four in the green zone (center), four in the red zone (right), and four in the blue zone (left). The elements to be lit change according to the exposure level.

Four elements are always lit. When the exposure level is correct, the four elements in the green zone (center) are lit.

The position of the lit elements moves to the right as exposure increases, and to the left as exposure decreases. To change the exposure compensation value, tap the [EXP CMP] button.



Level meter display

6.5 Re-capturing Displayed Images

You can save the image displayed in the screen as a still image file.

! Cautions on saving an image

Do not remove the storage media device while an image is being saved. If you do so, the image might not be stored correctly. Alternatively, the DS-L4 or the storage media device might be damaged. While saving is in progress, the icon indicating the wait state appears. Do not remove the recording media device while this icon is displayed.

If you use a USB memory drive as the recording media, do not remove it while its access lamp is lit.

✔ Settings for saving image files

Before you start photographing, make sure that the following settings are specified:

- **Storage destination**
With the DS-L4, captured images can be saved to the internal memory, microSD card, USB memory drive, or network drive.
- **Destination drive and folder**
If you use a recording media device as the storage destination, set the destination drive (recording media) and folder. For the setting procedure, refer to "8.2.3 (7) Specifying the destination media and save folder".
- **Setting the file type and image size**
Set the details of images to be saved. Specify the necessary settings so that images will be saved in the desired conditions. For details, refer to "Chapter 8 Capturing Images with Advanced Setting Menu".

✔ File names to be assigned to images

- A file name is automatically assigned each time image data is saved. You can select the file naming format. To do so, in the [CAMERA MENU: SHOT/REC] screen, tap [FILENAME], and then select [DATE&TIME] or [CONT. No.]. For details, refer to "8.2.3 (10) Selecting the image file naming format".
- In the file name display area of the [CAMERA MENU: CAMERA] screen, you can check the file name to be assigned to the image that will be captured next. You can also set any image file name in that area. For the operation procedure, refer to "8.2.3 (9) Checking/temporarily specifying the file name to be assigned".

✔ Consecutive capture with the interval timer

"Consecutive capture" is a DS-L4 function that automatically captures images at regular intervals. To perform consecutive capture, refer to "8.2.3 (1) Setting the shot mode (still image)".

✔ Capture sound

With the sound volume set to [1] or higher, the capture sound is heard twice: once at the time of capturing operation and once at completion of image data saving. To change the volume setting for the sound, refer to "13.2.5 (1) Setting the capture sound volume".

✔ Saving annotations and measurement results

Annotations (such as free-hand drawings or text comments) or measurement results (such as lengths or angles) can be embedded into an image to be saved.

For details on the scale, annotation, and measurement functions, refer to "Chapter 11 Adding scales and annotations to images" and "Chapter 12 On-Screen Measurement".

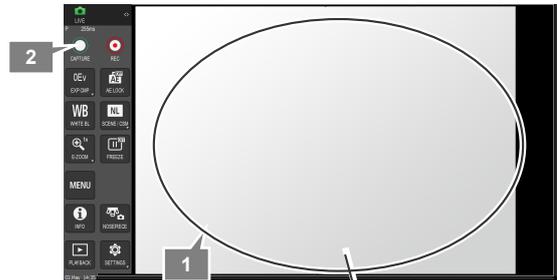
When an image is captured, a log comment is written to the Exif information. For details on how to set a log comment, refer to "8.2.3 (8) Saving a log comment to Exif information".

When you capture an image, you can export the measurement results to a CSV file. For details, refer to "10.1.2 Specifying the Basic Settings of the Annotation and Measurement Functions" and "12.3.2 Exporting Measurement Results to a CSV File".

6.5.1 Capturing a Live Image

You can capture the displayed image, and save it as an image file in a specified location.

- 1 **Check the live image.**
Check that the subject is displayed at the correct brightness and with focus on the desired part.
- 2 **In the LIVE menu, tap [CAPTURE].**
The captured image is saved as an image file in the specified storage location. For details on how to set the storage location, refer to "8.2.3 (7) Specifying the destination media and save folder".



Check the live image.

Checking the live image

✔ **Using a mouse button to capture an image**

By assigning the capture function to the mouse ([SETTINGS] > [DS SETUP] > [MAIN] > [CAPTURE USING THE MOUSE]), you can also capture an image by clicking the right or middle button of the mouse.

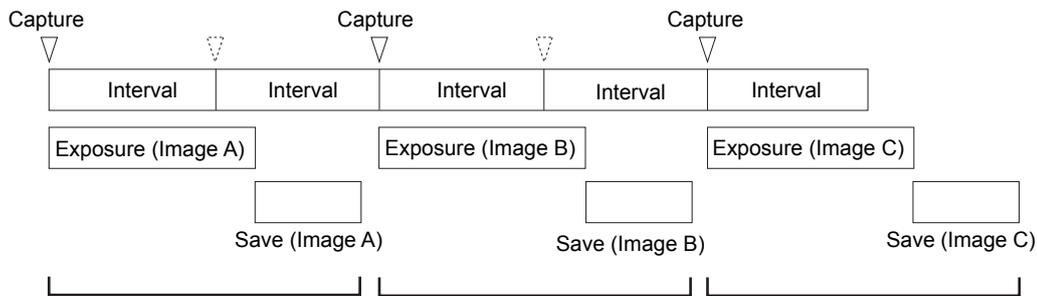
✔ **Image mode and image file size to be saved**

The DS-L4 constantly receives data of the live image from the camera. Sequence of capture operation depends on the settings for the image mode (which affects resolution of the live image) and for the size of image file to be saved.

- When the FAST image mode and the largest image size is selected

The size of the live image data being smaller than the size of a file to be saved, change the image mode to [FULL] to start exposure and capture an image, and then save the image data after exposure is completed. Time required from capturing operation to completion of saving data is constant.

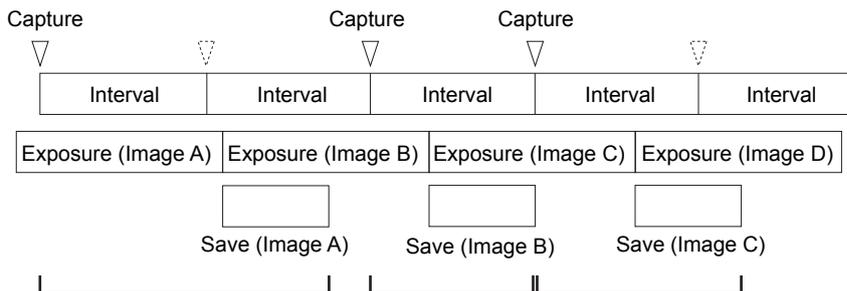
Example of sequence for continuous capturing:



- Settings other than the above

When exposure is complete for an image continuously being under exposure by the camera, data of the image is saved. Time required from capturing operation to completion of saving data is not constant.

Example of sequence for continuous capturing:



6.5.2 Freezing and Capturing an Image

You can temporarily freeze a live image to display a still image, and then capture and save it as an image file.

- 1 **Check the live image.**
- 2 **In the LIVE menu, tap [FREEZE].**
The [FREEZE] button is framed in yellow, and the [OFF] icon disappears.
When you tap [FREEZE] again, the DS-L4 stops displaying a still image, and redisplayes the live image.
- 3 **To save the still image that is displayed, tap [CAPTURE].**



Freezing an image

This chapter provides useful tips for photographing.

7.1 Checking the INFO Window

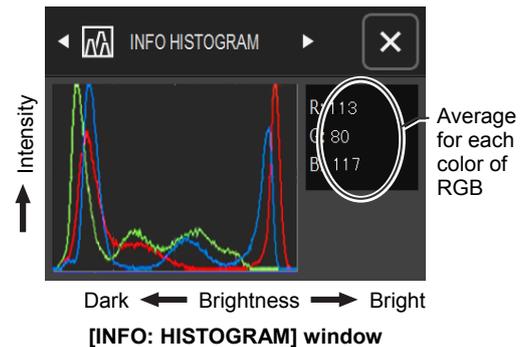
7.1.1 Checking the Histogram of the Image

In the LIVE menu, tap [INFO] to display the [INFO: HISTOGRAM] window in the bottom right of the display. If the [INFO: HISTOGRAM] window does not appear, use the ◀ or ▶ button (or swipe the screen) to switch the screen.

In the [INFO: HISTOGRAM] window, the distribution of brightness of the displayed image (as calculated by the DS-L4) is displayed as a histogram.

The histogram indicates distribution of brightness for each RGB color, allowing for fine adjustment of the exposure level.

- The horizontal axis indicates brightness (dark (left) to bright (right)).
- The vertical axis indicates RGB color intensity.
- To the right of the histogram, average RGB values are shown.



✔ Reading and compensating for exposure

When the distribution reaches the right end of the histogram, bright regions of the image are saturated (white-out). When the distribution reaches the left end of the histogram, dark regions of the image are crushed (black-out).

Ideally, no white-out and black-out should occur in the entire image. However, in some cases, adjustment is necessary.

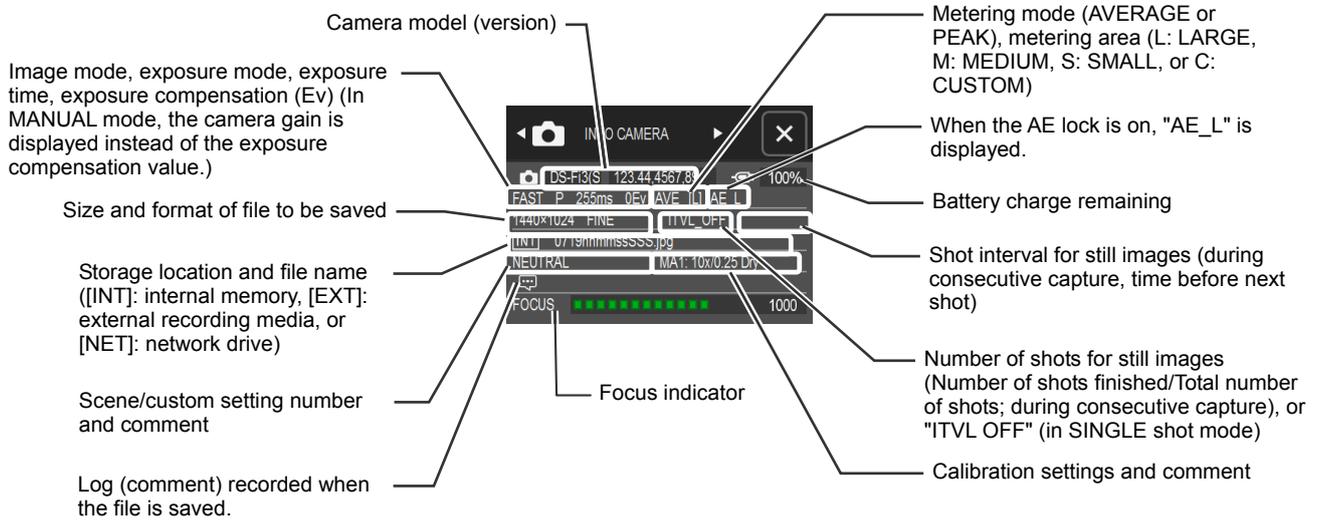
If bright areas of the image are important, adjust the distribution to the left. If dark areas are important, adjust the distribution to the right.

By adjusting the distribution appropriately for the image, insufficient gradation during image processing can be avoided.

7.1.2 Checking the Camera Status

If the [INFO: HISTOGRAM] or [INFO: MICROSCOPE] window is displayed, tap the ◀ or ▶ button (or swipe the screen) to switch the window to [INFO: CAMERA].

The [INFO: CAMERA] window displays the camera information, with which you can check the current status of the camera.



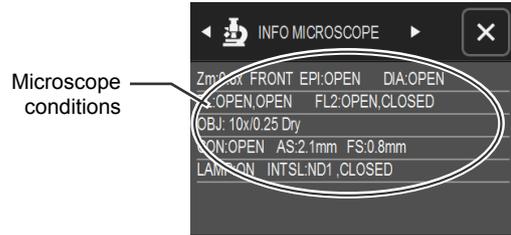
[INFO: CAMERA] window

7.1.3 Checking the Microscope Status

If a Nikon microscope is connected to the DS-L4 via a USB cable, the [INFO: MICROSCOPE] window can be displayed. If the [INFO: HISTOGRAM] or [INFO: CAMERA] window is displayed, tap the ◀ or ▶ button on the title bar (or swipe the screen) to switch the window to [INFO: MICROSCOPE].

The [INFO: MICROSCOPE] window displays the microscope information, with which you can check the current status of the microscope.

For the information displayed in the [INFO: MICROSCOPE] window, refer to the separate volume of this manual, "Microscope Operation".



[INFO: MICROSCOPE] screen

✔ Information displayed in the [INFO: MICROSCOPE] window

- The information displayed in the [INFO: MICROSCOPE] window varies depending on the connected microscope.
- If a Nikon microscope is not connected to the DS-L4, the [INFO: MICROSCOPE] window is not displayed.

7.2 Setting the Environment for Microscope Photographing

If you connect a camera to the microscope, set up the environment for microscope photographing as described below.

7.2.1 Setting up the Ambient Environment

(1) Adjusting the ambient brightness

When you photograph a dark specimen by using a fluorescent microscope, room illumination might enter the optical path of the microscope. For this reason, perform photographing in a dark room.

Place caps on the binocular eyepieces to prevent light from entering.

(2) Preventing tremor

During microscope photographing, because resolution is high, image quality is affected by even the slightest vibration. Place the microscope on a sturdy, vibration-free surface, supported by a stable floor, to isolate the microscope from vibration.

You can reduce the impact of vibration by using a vibration isolation table suitable for your microscope. Especially during photographing, try to avoid touching the surface on which the microscope is placed.

7.2.2 Setting up the Microscope

(1) Using an appropriate filter

For color images

Insert an NCB filter in the optical path.

For monochrome images

Insert a filter (suitable for the photographing purpose) in the optical path.

Generally, a GIF (Green Interference) filter provides good contrast. Using a filter of a complementary color to the specimen enhances contrast.

✔ Using a filter

- The way to insert and remove filters is different depending on the microscope. Refer to the manual of your microscope.
- A third-party color compensation filter (CC filter) can be inserted into the optical path of the microscope to compensate for differences in color balance caused by different exposure times.
- When using a phase contrast microscope or an interference microscope (two luminous fluxes or multiple luminous fluxes), you can enhance contrast by using a green interference filter (GIF) or a monochrome interference filter (IF).
- Some microscope models may require a heat-absorbing filter.

✔ What is an NCB filter?

An NCB (neutral color balance) filter is a color-balancing compensation filter used to adjust color temperature to daylight values in microscopes that use a halogen bulb as a light source.

✔ What is a complementary color?

For example, green and magenta, red and cyan, and blue and yellow are all pairs of complementary colors. When complementary colors overlap, their respective hues cancel each other out.

(2) Setting the field diaphragm

Adjust the field diaphragm so that it circumscribes the viewfield. The field diaphragm has a significant impact on contrast, especially for fluorescent specimens against dark backgrounds.

Note: For details on how to adjust the field diaphragm, refer to the manual of your microscope.

(3) Setting the aperture diaphragm

Adjust the aperture diaphragm in the following way according to the lighting.

For diascope illumination

Generally, the numeric value of the condenser aperture diaphragm should be adjusted to approximately 70% to 80% of the numerical aperture (NA) of the objective.

For episcopic illumination

Generally, the aperture diaphragm should be adjusted to approximately 70% to 80% of the size of the pupil of the objective. (Check pupil size by removing the eyepiece and looking into the eyepiece tube.)

✔ Adjustment of the aperture diaphragm

- For details on aperture diaphragm adjustment, refer to the manual of your microscope.
- For photographed images that have greater depth of focus, reduce the aperture diaphragm. Note that reducing the aperture may limit the performance of the objective.

✔ What is depth of focus?

"Depth of focus" refers to the in-focus range along the direction vertical to the specimen surface. Although reducing the aperture diaphragm extends the depth of focus, doing so will also reduce resolution. Adjust the aperture diaphragm as needed.

(4) Adjusting the focus on the subject

Adjust the focus of the microscope so that the image can be clearly seen on the display panel.

(5) Adjusting the lighting

When photographing a color image, the color reproducibility of the image depends on the lamp voltage.

When a halogen lamp is used as the light source, increasing the lamp voltage produces a bluish light, and decreasing the lamp voltage produces a reddish light.

Except in cases where it is specifically necessary to adjust the tone, the voltage should be set to the correct level for microphotography, which depends on the microscope being used. Since this level varies for each type of microscope, refer to your microscope's instruction manual.

Note: If the lamp voltage changes, adjust the white balance once again.

✔ White balance when observing by a microscope

Consider the following when you adjust the white balance while viewing on the microscope.

- When using diasopic illumination for microphotography, adjust the white balance while you are photographing a transparent part of the preparation.
- When episcopic illumination for microphotography is used or a camera lens (instead of a microscope) is attached to the camera, adjust the white balance using a white object.
- For fluorescent photographing, we recommend that white balance be adjusted under normal light conditions before photographing. If the screen is excessively dark or bright, adjust the iris diaphragm or brightness of the light source, or use an ND filter to obtain the appropriate white balance.

(6) Adjusting the exposure time

An exposure time in the range of 4 ms to 60 ms is appropriate for a normal photographing. To obtain an appropriate exposure time, adjust the light intensity for the microscope by using an ND filter.

If the DS-L4 is set for automatic exposure, the camera gain and the exposure time are automatically changed to obtain an appropriate exposure. Consequently, insufficient light increases camera gain, resulting in coarser images and longer exposure time, which makes focusing difficult.

✔ What is an ND filter?

An ND filter is a filter that affects only the amount of light passed, not the color balance of the light. For example, an "ND2" filter cuts transmitted light in half, while an "ND16" filter reduces transmitted light to 1/16th of the actual level.

7.3 Calculating the Display Magnification for Microscopic Observation

✔ Pixel sizes of image pickup device on microscope cameras

The table below shows the pixel size (the maximum number of pixels stored) of image pickup device and the effective area (area for the effective number of pixels stored) of each camera.

Camera	Pixel size (μm)		FOV	Recorded pixel count		Effective area (mm)		
	Width	Height		Width	Height	Width	Height	Diagonal
DS-Fi3	2.4	2.4	–	2880	2048	6.91	4.92	8.48
DS-Ri2	7.3	7.3	φ16 - 1x	1608	1608	11.74	11.74	16.60
			φ22 - 1x	2136	2136	15.59	15.59	22.05
			φ25 - 1x	2424	2424	17.70	17.70	25.02
			φ16 - 2.5x	4908	3264	35.83	23.83	43.03

Use the following formula for calculating the magnification of the subject on the display panel.

• Magnification on the display panel

$$= \frac{\text{Optical magnification (objective lens magnification x relay lens magnification) x height of display}}{\text{Height of effective area for image pickup device}}$$

*: The dot pitch of the LCD panel of the DS-L4 is 0.1128 mm/pixel. In normal cases (display resolution: 1920 x 1200 pixels), the number of vertical pixels is 1,180. Therefore, the height of the display area is 0.1128 x 1,180 = 133.1 mm. If an external display with resolution of 1920 x 1080 pixels is connected to the DS-L4, display resolution on the DS-L4's LCD panel becomes the same, in which case the number of vertical pixels is 1,060. Therefore, the height of the display area is 0.1128 x 1,060 = 119.6 mm.

Camera	Magnification of optical device (example)	Magnification of the subject on the DS-L4 display panel
DS-Fi3	Objective: 40x Relay lens: 0.55x Electronic zoom: 1x	With a display resolution of 1920 x 1200 pixels: 40 x 0.55 x 133.1 mm / 4.92 mm = approximately 600
		With a display resolution of 1920 x 1080 pixels: 40 x 0.55 x 119.6 mm / 4.92 mm = approximately 530
DS-Ri2	Objective: 40x Relay lens: 1x Electronic zoom: 1x FOV: φ16 -1x	With a display resolution of 1920 x 1200 pixels: 40 x 1 x 133.1 mm / 11.74 mm = approximately 450
		With a display resolution of 1920 x 1080 pixels: 40 x 1 x 119.6 mm / 11.74 mm = approximately 410
	Objective: 40x Relay lens: 1x Electronic zoom: 1x FOV: φ22 -1x	With a display resolution of 1920 x 1200 pixels: 40 x 1 x 133.1 mm / 15.59 mm = approximately 340
		With a display resolution of 1920 x 1080 pixels: 40 x 1 x 119.6 mm / 15.59 mm = approximately 310
Objective: 40x Relay lens: 1x Electronic zoom: 1x FOV: φ25 -1x	With a display resolution of 1920 x 1200 pixels: 40 x 1 x 133.1 mm / 17.70 mm = approximately 300	
	With a display resolution of 1920 x 1080 pixels: 40 x 1 x 119.6 mm / 17.70 mm = approximately 270	
Objective: 40x Relay lens: 2.5x Electronic zoom: 1x FOV: φ16 -2.5x	With a display resolution of 1920 x 1200 pixels: 40 x 2.5 x 133.1 mm / 23.83 mm = approximately 560	
	With a display resolution of 1920 x 1080 pixels: 40 x 2.5 x 119.6 mm / 23.83 mm = approximately 500	

Part 3

Photographing and Replaying Images

This part explains how to configure various settings to observe and capture images with desired conditions, how to replay the captured images on the display panel, and how to delete them.

This part consists of the following chapters:

- Chapter 8 Capturing Images with Advanced Setting Menu
- Chapter 9 Playing Back and Deleting Images

This chapter explains how to use the LIVE menu and [CAMERA MENU] screens to observe and capture images with desired conditions.

8.1 Basic Operations of Photographing

This section explains operations common among different camera menus.

8.1.1 Using a Scene Mode or Custom Setting

The DS-L4 provides some scene modes, each of which is a set of photographing conditions suited for a typical subject. By selecting a scene mode, you can perform photographing with the settings appropriate for the subject.

The DS-L4 also provides custom settings. You can register a maximum of seven sets of photographing conditions (such as the image mode, exposure mode, white balance) as custom settings. You can use one of these custom settings as you would a scene mode.

If you do not use a scene mode or custom setting, select [NEUTRAL].

(1) Using a scene mode

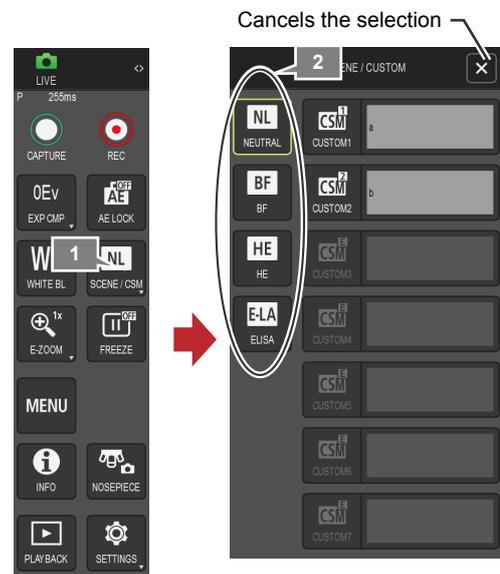
You may want to adjust the contrast or hue in accordance with the photographed subject, or may want to photograph with desired settings.

The DS-L4 provides some scene modes, each of which is a set of photographing conditions suited for a typical subject. By selecting the scene mode, you can perform photographing with the settings appropriate for the subject.

- 1 In the LIVE menu, tap [SCENE/CSM].
- 2 Select the desired scene mode by tapping the button.

Note: The scene modes displayed on the submenu change according to the type of scenes you select ([SETTINGS] > [DS SETUP] > [MAIN] > [SCENE SELECT]). For how to change the scene mode, refer to "13.2.1 (3) Changing the preset type of scene modes".

The selected scene mode is also displayed in the information display area of the [CAMERA MENU] screen, and in [INFO: CAMERA] in the information window.



Using a scene mode

✔ Settings at the power-on time

The selected scene mode is saved when the power is turned off, and restored the next time the power is turned on. However, if the DS-L4 is set to enable the custom setting at the time of startup, selection of the custom setting takes precedence.

For details, refer to "13.2.1 (1) Calling a custom setting at startup".

✔ Changing the scene mode setting

Even if a scene mode is selected, you can change the photographing conditions, such as the exposure mode, exposure compensation, camera gain, and exposure time. However, those changes cannot be saved to a scene mode. If you often use a certain set of photographing conditions different from any of the scene modes, you can save them as a "custom setting". The custom settings you create can be handled as your own scene modes. You can switch a custom setting in the same way as you switch a scene mode. For details on how to register a custom setting, refer to "8.2.2 (4) Registering custom settings".

- You can initialize the settings listed below all at one time by tapping [NEUTRAL] in the [SCENE/CUSTOM] menu.
[IMG MODE], [EXP MODE], [EXP CMP], [EXP TIME], [CAM GAIN], [MTR MODE], [MTR AREA], [BK LEVEL], [SHARPNESS], [HUE], [CHROMA], [RB ADJ], and [EFFECT]
In addition to the above settings, the shading compensation is initialized by tapping [CAMERA MENU: IMAGE] > [CLR SET].

List of scene modes

The scene modes displayed in the [SCENE/CUSTOM] menu change according to the type of scenes you select ([DS SETUP] > [MAIN] > [SCENE SELECT]). The following shows the scene modes that are available for each type of scene selected with [SCENE SELECT].

If [IND] is selected:

Button	Scene mode	Description
 WAFER / IC	WAFER / IC	Suitable for a wafer or IC chip.
 METAL	METAL	Suitable for capturing a metal specimen. Bright parts of a metal specimen are expressed as white, and dark parts are expressed as transparent. This mode is also suitable for ceramic and plastic specimens.
 CIR BOARD	CIR BOARD	Suitable for capturing a circuit board, etc. This mode can reduce white-out in bright parts of an object, such as component leads and solder joints, thereby enabling defects to be detected easily. This mode is also suitable for high-contrast objects such as gears and other metal components.
 FPD	FPD (Flat Panel Display)	Suitable for the color filters for flat display devices, such as LCD displays and plasma displays.

If [BIO] (Initial setting) is selected:

Button	Scene mode	Description
 BF	BF	The BF (bright field) mode can be used for general stained specimens.
 HE	HE	This mode is suitable for photographing of specimens stained with hematoxylin and eosin (HE). The color reproducibility in this mode is optimized for HE-stained specimens. Note: This mode is displayed if [HALOGEN] is selected as the light source on the [SETTINGS] > [DS SETUP] > [MAIN] screen. (Not displayed if [LED (BIO)] is selected.)
 E-LA ELISA	ELISA	This mode is suitable for photographing of specimens for which the ELISA (enzyme-linked immunosorbent assay) method is applied. The color reproducibility in this mode is optimized for DAB (diamino benzidine). Note: This mode is displayed if [HALOGEN] is selected as the light source on the [SETTINGS] > [DS SETUP] > [MAIN] screen. (Not displayed if [LED (BIO)] is selected.)

If [OTHERS] is selected:

Button	Scene mode	Description
	ASBESTOS	This mode is suitable for photographing of asbestos specimens. The color reproducibility in this mode is optimized for chrysotile (immersed in a liquid with refractive index of 1.550), crocidolite (immersed in a liquid with refractive index of 1.680 or 1.700), and amosite (immersed in a liquid with refractive index of 1.680).

✔ About [SCENE SELECT]

For details on [SCENE SELECT], refer to "13.2.1 (3) Changing the preset type of scene modes".

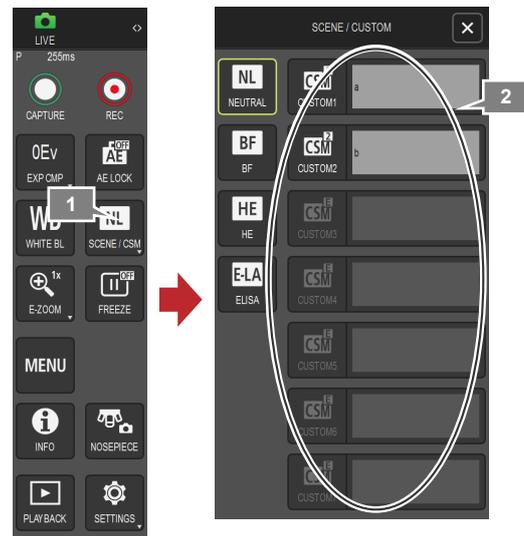
(2) Using a custom setting

In the DS-L4, a set of specific photographing conditions can be registered as a "custom setting". A maximum of seven custom settings can be registered.

By registering custom settings, you can change the photographing settings in the same manner as you would switch a scene mode.

- 1 In the LIVE menu, tap [SCENE/CSM].
- 2 Tap one of the [CUSTOM1] to [CUSTOM7] buttons to select the custom setting you want to use.

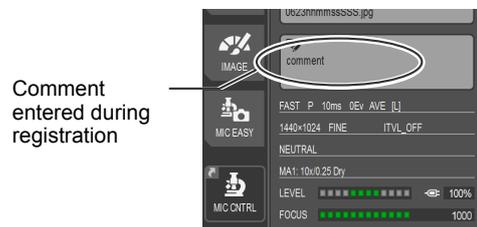
Note: The scene modes displayed on the submenu change according to the type of scenes you select ([SETTINGS] > [DS SETUP] > [MAIN] > [SCENE SELECT]). For how to change the scene mode, refer to "13.2.1 (3) Changing the preset type of scene modes".



Using a custom setting

✔ Comments of custom settings

You can add a comment to each custom setting. The comment of the selected custom setting is displayed in the comment display area of the [CAMERA MENU] screen and information window.



Comment of a custom setting

✔ Custom setting registration and automatic selection at the time of startup

- For how to register custom settings, refer to "8.2.2 (4) Registering custom settings".
- You can configure the DS-L4 to start up with the desired custom setting selected, when the power is turned on. For how to set this function, refer to "13.2.1 (1) Calling a custom setting at startup".

8.1.2 Adjusting the Exposure

(1) Using the AE lock

If the exposure mode is [P] (program AE) or [F] (focus-priority AE), after determining the exposure in the desired region of the subject, you can lock the exposure.

Use this function when you want to observe the specimen constantly at the same exposure level or when the subject's region you want to observe is much brighter or darker than other regions.

- 1 In the LIVE menu, make sure that the exposure mode is [P] (program AE) or [F] (focus-priority AE).

Note: The AE lock function is unavailable in [M] (manual) exposure mode.

- 2 Position the metering area at the target position, and then tap [AE LOCK].

The current exposure is locked. The [AE LOCK] button is framed in yellow, and "OFF" disappears.

To release the AE lock, tap [AE LOCK] again.



Using the AE lock ([P] or [F] mode)

✔ Automatic release of the AE lock

The AE lock is released when the DS-L4 is turned off. The AE lock is also released when the exposure mode is changed in the [CAMERA MENU] screen.

(2) Setting the exposure time

In manual exposure mode, you can set any exposure time (shutter speed).

✔ How to adjust the exposure

In the DS-L4, the exposure is determined by the combination of exposure time and camera gain.

- 1 In the LIVE menu, make sure that the exposure mode is [M] (manual).**

Note: In [P] (program AE) or [F] (focus-priority AE) mode, you cannot set the exposure time.

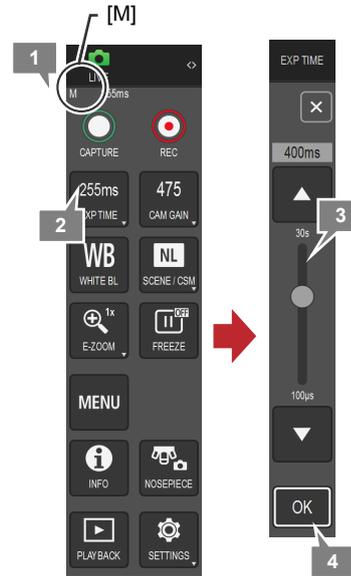
- 2 In the LIVE menu, tap [EXP TIME].**

- 3 Adjust the value of the exposure time.**

The range of values that can be set differs depending on the camera.

Set the desired value, viewing the live image.

- 4 Tap [OK].**



Setting the exposure time ([M] mode)

✔ Range of values that can be set

The following shows the range of values that can be set as the exposure time:

If the DS-Fi3 connected	100 μ s, 200 μ s, 300 μ s, 400 μ s, 600 μ s, 800 μ s, 1 ms, 1.5 ms, 2 ms, 3 ms, 4 ms, 6 ms, 8 ms, 10 ms, 15 ms, 20 ms, 30 ms, 40 ms, 60 ms, 80 ms, 100 ms, 150 ms, 200 ms, 300 ms, 400 ms, 600 ms, 800 ms, 1 s, 1.5 s, 2 s, 3 s, 4 s, 6 s, 8 s, 10 s, 15 s, 20 s, and 30 s (38 steps)
If the DS-Ri2 connected	100 μ s, 200 μ s, 300 μ s, 400 μ s, 600 μ s, 800 μ s, 1 ms, 1.5 ms, 2 ms, 3 ms, 4 ms, 6 ms, 8 ms, 10 ms, 15 ms, 20 ms, 30 ms, 40 ms, 60 ms, 80 ms, 100 ms, 150 ms, 200 ms, 300 ms, 400 ms, 600 ms, 800 ms, 1 s, 1.5 s, 2 s, 3 s, 4 s, 6 s, 8 s, 10 s, 15 s, 20 s, 30 s, 40 s, 60 s, 80 s, 100 s, and 120 s (43 steps)

✔ Setting at the power-on time

The exposure time setting is saved when the power is turned off, and restored the next time the power is turned on. However, if a custom setting is selected ([SETTINGS] > [DS SETUP] > [MAIN] > [CUSTOM No.]), the exposure time value specified in that custom setting is used.

(3) Setting the camera gain

In [M] (manual) exposure mode, you can set the desired exposure by adjusting the shutter speed and camera gain (sensitivity).

The camera gain sets the sensitivity of the image pickup device. The higher the value you set for camera gain, the darker the objects that can be captured. However, higher sensitivity is likely to cause more noises in the image.

✔ How to adjust the exposure

In the DS-L4, the exposure is determined by the combination of exposure time and camera gain.

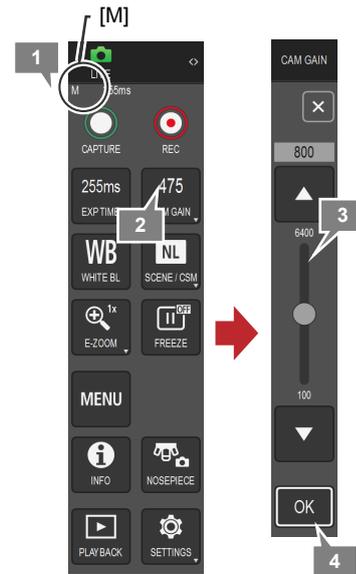
- 1 In the LIVE menu, make sure that the exposure mode is [M] (manual).
- 2 Tap [CAM GAIN].
- 3 Adjust the value of the camera gain.

The following shows the range of values that can be set as the camera gain:

- **Range of values that can be set**
100, 120, 140, 170, 200, 240, 280, 340, 400, 480, 560, 680, 800, 960, 1130, 1360, 1600, 1920, 2250, 2700, 3200, 3840, 4600, 5520, and 6400 (25 steps)

Set the desired value, viewing the live image.

- 4 Tap [OK].



Setting the camera gain ([M] mode)

✔ Settings at the power-on time

The camera gain setting is saved when the power is turned off, and restored the next time the power is turned on. However, if a custom setting is selected ([SETTINGS] > [DS SETUP] > [MAIN] > [CUSTOM No.]), the camera gain value specified in that custom setting is used.

8.1.3 Capturing Displayed Images

(1) Performing consecutive capture with the interval timer

If the shot mode is set to [CONT.] (continuous shot), you can capture multiple images sequentially (based on the interval timer) by simply tapping the [CAPTURE] button in the LIVE menu.

✔ Shot mode setting

The continuous shot mode can be set on the [CAMERA MENU: SHOT/REC] screen. For details on how to set this function, refer to "8.2.3 (1) Setting the shot mode (still image)".

1 To start consecutive capture, tap [CAPTURE] in the LIVE menu.

When the first image is captured, the label of the [CAPTURE] button icon changes to [STOP].

The second and subsequent images are captured at the specified interval until the specified number of images are captured.

2 To stop consecutive capture before it finishes, tap [STOP].

Note: The consecutive capture settings (continuous shot mode, number of shots, and shot interval) are maintained. Therefore, you can re-perform consecutive capture with the same settings by tapping the [CAPTURE] button again.



Starting and stopping consecutive capture

✔ Changing the photographing conditions during consecutive capture

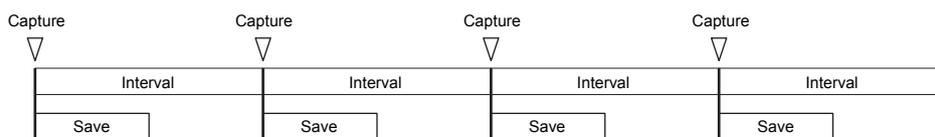
You can change the photographing conditions by using the operation menu on the screen even when consecutive capture is in progress.

- For example, if you change the exposure or focus while capturing sequential images, you will be able to record the change of the object's appearance.
- Note, however, that if you perform photographing under the same conditions constantly (when, for example, observing the chronological change of an object), do not change the photographing conditions during consecutive capture.

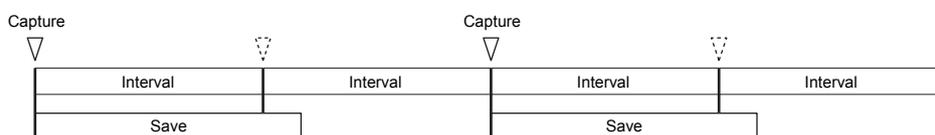
If the specified shot interval cannot be maintained

If a data write to the recording media takes time, the specified shot interval may be too short to save all captured images. In such a case, some captured images may be discarded. If the images captured by consecutive capture will be used for an important purpose, perform a prior test to ensure that all images are captured at the specified interval.

• Case where all images are captured



• Case where some images are discarded



Restrictions on consecutive capture

When consecutive capture is in progress, you cannot replay any images or record motion images. You cannot use the [DS SETUP] and [MIC SETUP] menus, either.

(2) Re-capturing a replayed image

While a captured image is displayed (replayed), you can re-capture it by tapping [CAPTURE] in the LIVE menu.

✓ Replaying captured images

For details on how to replay a captured image, refer to 9.1 Playing Back an Image".

- 1 In the LIVE menu, tap [PLAYBACK], and then display the desired image.

While an image is replayed, the VIEW menu is displayed.

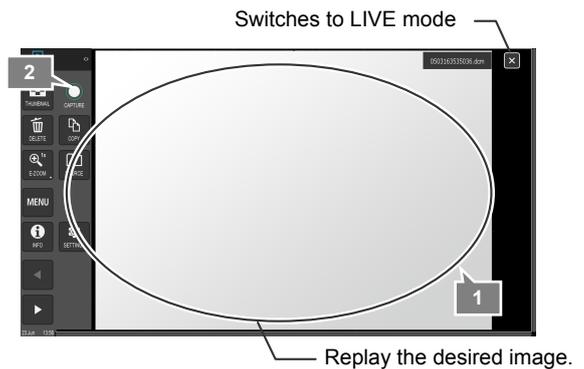
Note: Operations on [CAMERA MENU] are restricted while an image is replayed. Disabled buttons are grayed out.

- 2 In the VIEW menu, tap [CAPTURE].

The replayed image is saved as a new file.

✓ Capturing a replayed image

A re-captured image is saved in the same size as the original file.



Replaying photographed images

(3) Capturing an image together with scales, annotations, and measurement results

For the image displayed with the DS-L4, you can display scales, add lines and comments, and measure lengths and angles. When you capture an image, you can embed such additional information in the image.

✔ Using the scale, annotation, and measurement functions

For details on the scale, annotation, and measurement functions, refer to "Chapter 11 Adding scales and annotations to images" and "Chapter 12 On-Screen Measurement".

- 1 From the [TOOL MENU: MEAS/DRAW] or [TOOL MENU: SCALE] screen, display the [TOOL SETTING] screen, and then, in the [PASTE TO IMAGE] area, select the types of items to be embedded in the image.

The types of items that can be embedded in an image are as follows. You can select the types of items to be embedded.

- [MEAS/DRAW] (measurement results, straight lines, free-hand lines, and text)
- [XY MEAS]
- [X SCALE]
- [SCALE BAR]
- [X HAIRS]
- [GRID]

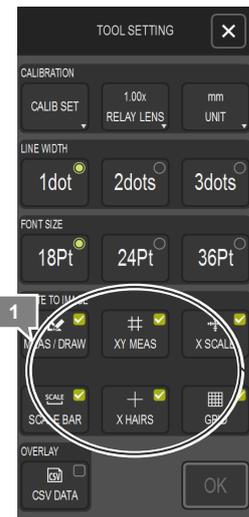
Note: For details on how to operate the [TOOL SETTING] screen, refer to "10.1.2 Specifying the Basic Settings of the Annotation and Measurement Functions".

- 2 Display the desired image on the display panel.
- 3 Add annotations or measure lengths and angles.

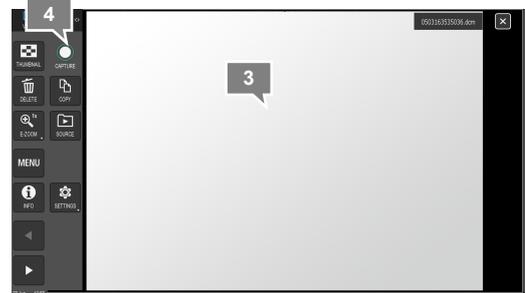
You can add annotations and perform measurement by using the [TOOL MENU: MEAS/DRAW] screen.

- 4 Tap [CAPTURE].

Among the scales, annotations, and measurement results that are displayed, those selected in step 1 will be embedded without change when the image is saved to an image file.



Operating the scale and annotation buttons



Capturing an image with [TOOL MENU]

(4) Capturing images by operations from a viewer terminal (including a PC)

✔ What is a "viewer terminal"?

In this manual, a PC or tablet on which DS-L4 Viewer is installed is called a "viewer terminal".

Capturing images from a viewer terminal over a network

If the DS-L4 is connected to a network, you can operate the DS-L4 from a viewer terminal to capture images over the network. To operate the DS-L4 from an external information terminal, the viewer application (DS-L4 Viewer) must be installed on the terminal. You can download images from the DS-L4 to the viewer terminal.

✔ Connecting to and using a network

- For details on how to connect to a viewer terminal, refer to "Chapter 15 Connecting to a Network (LAN)".
- For details on use of DS-L4 Viewer, refer to the manual of DS-L4 Viewer.

8.2 Setting Detailed Photographing Conditions

[CAMERA MENU] includes the [CAMERA], [SHOT/REC], and [IMAGE] setting screens allowing you to configure various settings for viewing and capturing images.

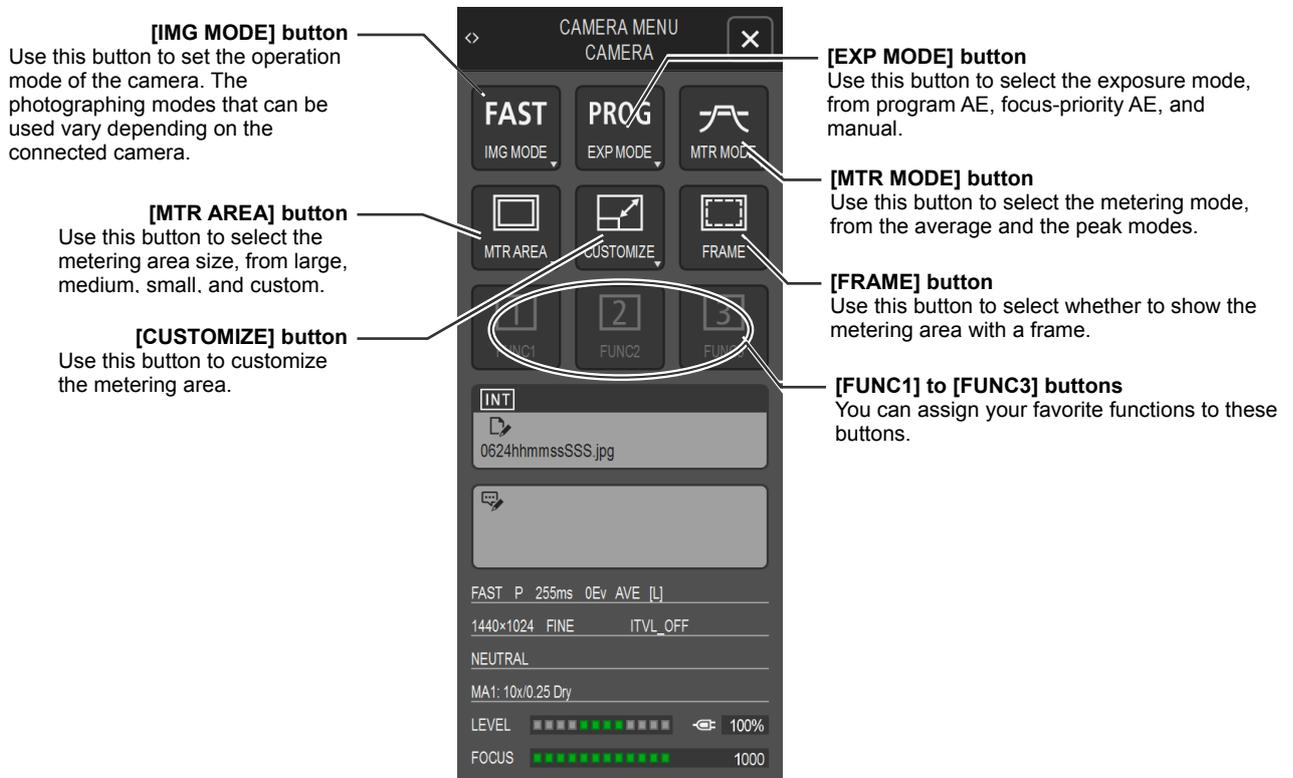
This section explains setting items of each screen in detail.

✔ Common setting items in [CAMERA MENU]

For details on the level meter and focus indicator, refer to "6.3 Checking the Subject Conditions of a Live Image" and "6.4 Exposure Compensation".

8.2.1 Setting Items of the [CAMERA MENU: CAMERA] Screen

The following shows the buttons on the [CAMERA MENU: CAMERA] screen. These buttons can be used to set photographing conditions.



[CAMERA MENU: CAMERA] screen

(1) Switching the image mode (operation mode of the image pickup device)

You can set the operation mode of the image pickup device for capturing images.

- 1 Display the [CAMERA MENU: CAMERA] screen.
- 2 Tap [IMG MODE].
- 3 Select the image mode to be used.



Setting the image mode

! Saved image size

The size of the image actually saved varies depending on the settings specified by [STILL IMAGE SETTING] (of the [CAMERA MENU: SHOT/REC] screen) and [IMG MODE].

! Image display speed

Selection of the image mode significantly affects the display speed (refresh frequency) of the live image. If you photograph a moving subject or perform an operation (such as focusing) during photographing, selecting [FAST] mode is recommended.

Image mode options

Mode	Description	Use
FULL	Obtains image information from all pixels of the image pickup device. High-definition images are obtained with the maximum resolution of the connected camera.	Recording/displaying high-definition images
FAST	This mode is effective for moving objects because of high display speed.	Recording/displaying images

✓ When the image mode is changed automatically

The image mode may be changed automatically in the following cases:

- **When [SCENE/CSM] is selected**
The image mode changes to the one specified in the selected scene mode or custom setting.
- **When [CLR SET] is executed**
The image mode is set to [FAST] when [CLR SET] is executed from the [CAMERA MENU: IMAGE] screen.
- **When the FAST image mode and the largest image size is selected**
Each time an image is to be captured, the image mode is temporarily changed to [FULL], and is changed back to [FAST] after the image is captured. This is because images in the largest size cannot be captured in FAST mode.

For details on the image modes that can be selected, refer to "Chapter 14 About Microscope Digital Cameras".

(2) Changing the exposure mode

The DS-L4 provides three exposure modes: the program AE mode, manual mode, and focus-priority AE mode. You can switch the mode as required.

All scene modes use the program AE mode.

- 1 Display the [CAMERA MENU: CAMERA] screen.
- 2 Tap [EXP MODE].
- 3 Select the desired exposure mode. The exposure modes that can be selected are described below.



Setting the exposure mode

Exposure modes that can be selected

Mode	Description
PROG	Program AE mode. The exposure time and camera gain are automatically set according to the brightness of the subject. Suitable for subjects that are comparatively bright. (Initial setting)
MANU	Manual exposure mode. The user sets both the exposure time and camera gain manually. Suitable when capture is repeated under a specific exposure setting or for a specific purpose such as fluorescence microscopy and observation under a stereoscopic or metallurgical microscope.
F.AE	Focus-priority AE mode. The camera gain automatically increases to keep the exposure time short so that a dark subject can be focused more easily. Bright spots or banding noise may increase in this mode.

✔ When the exposure mode is changed automatically

The exposure mode may be changed automatically in the following cases:

- **When [SCENE/CSM] is selected**
The image mode changes to the one specified in the selected scene mode or custom setting.
- **When [CLR SET] is executed**
The exposure mode is set to [PROG] when [CLR SET] is executed from the [CAMERA MENU: IMAGE] screen.

✔ Limits of program AE mode

The table below shows the maximum camera gain and the lowest exposure time in program AE mode.

Camera	Camera gain	Exposure time
DS-Fi3, DS-Ri2	1600	1 s

(3) Switching the metering mode

Select the mode to measure the brightness of the subject (the metering mode).

Note: Normally, use the average metering mode. Use the peak-hold metering mode when you observe a bright region of a subject that has regions whose luminance differs largely.

- 1 Display the [CAMERA MENU: CAMERA] screen.
- 2 Tap [MTR MODE].
- 3 Select the desired metering mode. The metering modes that can be selected are described below.



Selecting the metering mode

Metering mode options

Mode	Description
Average	Average metering mode. The average exposure level in the metering area is used as the measurement value. This mode is used typically in bright-field microscopy and is suitable for a subject with even brightness over the entire surface when viewed on the monitor. Normally, select the average metering mode. (Initial setting)
Peak	Peak-hold metering mode. The highest (peak) exposure level in the metering area is used as the measurement value. This mode is suitable for a subject that is mostly dark except for some bright regions.

✔ When the metering mode is changed automatically

The metering mode may be changed automatically in the following cases:

- **When [SCENE/CSM] is selected**
The image mode changes to the one specified in the selected scene mode or custom setting.
- **When [CLR SET] is executed**
The metering mode is set to [AVERAGE] when [CLR SET] is executed from the [CAMERA MENU: IMAGE] screen.

(4) Switching the metering area

Select the size of the metering area, in which brightness of the subject is measured. If necessary, move the metering area to any position on the screen.

- 1 Display the [CAMERA MENU: CAMERA] screen.
- 2 Tap [MTR AREA].
- 3 Select the size of the metering area.

If you select [LARGE], [MEDIUM], or [SMALL] as the size of the metering area, the position of the metering area is fixed at the center of the screen.

If you select [CUSTOM], the custom metering area is set at the position at which the custom metering area was used previously.

Note: The metering area is also used to set white balance.

- 4 Tap [OK].



Switching the size of the metering area

Metering area options

Option	Description
LARGE	In this mode, about 90% of the image field is used to measure the exposure. (Initial setting)
MEDIUM	In this mode, about 50% of the image field is used to measure the exposure.
SMALL	In this mode, about 20% of the image field is used to measure the exposure.
CUSTOM	In this mode, the user can set a metering area of any size at any position. For how to set the custom metering area, refer to "Customizing the metering area".

✔ Settings at the power-on time

- The size and position settings of the metering area are saved when the power is turned off.
- If [CUSTOM No.] ([SETTINGS] > [DS SETUP] > [MAIN]) is OFF, the metering area is reproduced with the saved settings the next time the power is turned on.
- If a custom setting is selected ([SETTINGS] > [DS SETUP] > [MAIN] > [CUSTOM No.] is not [OFF]), the metering area setting specified in that custom setting is used.

✔ When the metering area setting is changed automatically

The metering area setting may be changed automatically in the following cases:

- **When [SCENE/CSM] is selected**
The metering area setting changes to the one specified in the selected custom setting.
- **When [CLR SET] is executed**
The [LARGE] metering area appears at the center when [CLR SET] is executed from the [CAMERA MENU: IMAGE] screen.

Showing the frame of the metering area

You can show the frame of the metering area to clarify the metering area range. The frame does not affect any operations you perform.

1 Display the [CAMERA MENU: CAMERA] screen.

2 Tap [FRAME].

To hide the frame, tap the button again.



Showing/hiding the metering area

✔ Note on the frame of the metering area

The frame of the metering area disappears when one of the following operations is performed:

- **Turning off the power**

The frame display status (shown/hidden) is not saved. The frame of the metering area is hidden initially when the power is turned on.

- **Displaying a playback image**

If you place the DS-L4 in VIEW mode, the frame disappears. When you change the mode back to LIVE, the frame re-appears.

Customizing the metering area

In the DS-L4, you can customize the metering area. You can set a metering area of any size at any position. You can also move it to the center directly.

- 1 Display the [CAMERA MENU: CAMERA] screen.
- 2 Tap [CUSTOMIZE].
- 3 Set the custom metering area.

From the [CUSTOMIZE] menu, you can perform the following operations:

- **Setting a new metering area**
Turn on [NEW AREA], and then use a drag operation to draw a rectangle, which becomes the metering area.
If you turn on [FROM THE CENTER], the drag start point is used as the center of the rectangle.
- **Moving the metering area**
To move the metering area, turn off [NEW AREA], and then drag the metering area. The size of the area is maintained.
Note: You cannot move the metering area outside the screen.
- **Resizing the metering area**
To resize the metering area, turn off [NEW AREA], and then drag the frame of the metering area.
- **Centering the metering area**
Tapping [CENTERING] moves the metering area to the center of the screen without changing its size.

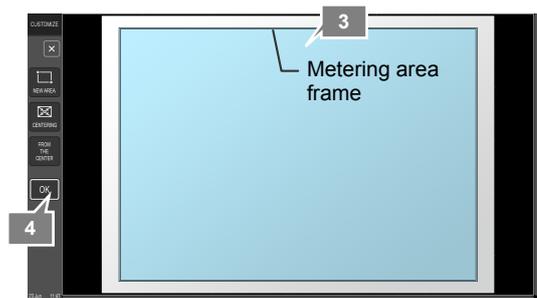
- 4 When you have completed the metering area settings, tap [OK].

The custom metering area you created by tapping [NEW AREA] immediately takes effect.

Note: By showing the metering area frame, you can check the actual range of the metering area on the screen.

Notes on metering area setting

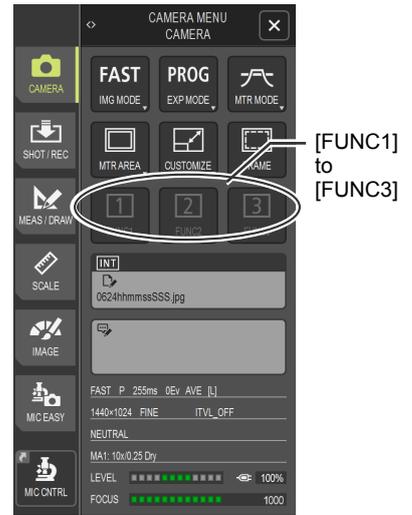
- The size and position settings of the metering area are saved when the power is turned off.
- If [CUSTOM No.] ([SETTINGS] > [DS SETUP] > [MAIN]) is OFF, the metering area is reproduced with the saved settings the next time the power is turned on.
- If a custom setting is selected ([SETTINGS] > [DS SETUP] > [MAIN] > [CUSTOM No.] is not [OFF]), the metering area setting specified in that custom setting is used.
- If you use a DS-Ri2 or another camera whose FOV setting can be changed and you change its FOV setting, respecify the metering area settings.



Customizing the metering area

(5) How to use the function buttons

There are three function buttons ([FUNC1] to [FUNC3]) in the center of the [CAMERA MENU] screen. You can assign favorite functions to these buttons.



Function buttons

✔ How to assign functions

For how to assign functions to the function buttons, refer to "13.2.4 Setting the Function Buttons".

8.2.2 Setting Items of the [CAMERA MENU: IMAGE] Screen

There are the following setting items on the [CAMERA MENU: IMAGE] screen:

The screenshot shows the [CAMERA MENU: IMAGE] screen with the following settings and callouts:

- [RB ADJ] button**: Adjusts the hue of the image by the intensity of R (red) and B (blue). (R: 100, B: 100)
- [CHROMA] button**: Adjusts the chroma of the image. (0)
- [HUE] button**: Adjusts the hue of the image. (0)
- [SHARPNESS] button**: Adjusts the highlighting effect on the edge of the image. (2)
- [BK LEVEL] button**: Adjusts the black level (brightness of black) of the image. (0)
- [CONTRAST] button**: Allows you to select the contrast (bright/dark contrast) of the image from seven preset options. (STD)
- [EFFECT] button**: Allows you to select the color effect to be applied to the image from the three preset effects. (COLOR)
- [SD] button**: Selects one of seven shading compensation settings. (SD)
- [CLR SET] button**: Returns the settings of photographing and others to the initial values. (R)
- [CSM SET] button**: Registers custom settings. You can register a maximum of seven sets of photographing conditions as "custom settings". (CSM)
- [SDSET] button**: Registers shading compensation settings. (SD SET)

Additional screen details include: FAST P 255ms 0Ev AVE [L], 1440x1024 FINE ITVL OFF, NEUTRAL, MA1: 10x0.25 Dry, LEVEL 100%, and FOCUS 1000.

Displayed items of the [CAMERA MENU: IMAGE] screen

(1) Adjusting the image

The [CAMERA MENU: IMAGE] screen allows you to adjust the brightness, hue, contrast, and other details of the image.

- 1 Display the [CAMERA MENU: IMAGE] screen.
- 2 This screen provides the settings you can select to adjust the image. Specify your desired settings.



Adjusting image quality

✔ Settings at the power-on time

The settings in the [CAMERA MENU: IMAGE] screen are saved when the power is turned off, and restored the next time the power is turned on. However, if a custom setting is selected ([SETTINGS] > [DS SETUP] > [MAIN] > [CUSTOM No.]), the settings specified in that custom setting are used.

✔ When the settings are changed automatically

The settings specified on the [CAMERA MENU: IMAGE] screen are changed automatically in the following cases:

- **When [SCENE/CSM] is selected**
The settings change to those that are specified in the selected scene mode or custom setting.
- **When [CLR SET] is executed**
The settings are reset to their initial values when [CLR SET] is executed from the [CAMERA MENU: IMAGE] screen.

Setting items of the [CAMERA MENU: IMAGE] screen

Button	Description	Initial Value	Setting Range
[RB ADJ]	Adjusts the hue of the image by the intensity of R (red) and B (blue).	100	50 to 150
[CHROMA]	Adjusts the chroma of the image.	0	-50 to 50
[HUE]	Adjusts the hue of the image.	0	-50 to 50
[EFFECT]	Allows you to select the color effect of the image from three preset options.	Color	Color / Black and white / Negative
[BK LEVEL]	Adjusts the black level (brightness of black) of the image.	0	-50 to 50
[CONTRAST]	Allows you to select the contrast (bright/dark contrast) of the image from seven preset options.	Standard	(See next table.)
[SHARPNESS]	Adjusts the highlighting effect on the edge of the image.	2	-3 to 5
SD	Uses a user-registered shading compensation setting.	SD OFF	SD1 to SD7 (registered settings)

- **[CONTRAST]**

Select a tone curve for adjusting the contrast of the image from the following preset options (initial value: STANDARD). Select a setting that is appropriate for observing the subject.

Option	Description
WIDE D (Wide dynamic range)	Use this option when you need a gradation covering from the darkest region to the brightest region for a subject that is highly reflective. Recommended for: IC chips, substrates, gears, etc.
WEAK (Weak contrast)	Use this option to reduce the contrast. Recommended for: cells, tissue, and other ordinary subjects.
STD (Standard contrast)	Use this option for ordinary photographing. Recommended for: cells, tissue, and other ordinary subjects.
STRONG (Strong contrast)	Use this option to obtain strong contrast in the image. Recommended for: cells, tissue, and other ordinary subjects.
LINEAR	Use this option to obtain an output that is straight (linear) relative to the input. Use this option to study the light intensity differences from the photographed data. Recommended for: DIC observation, PH observation.
METAL	Use this option to obtain a high-contrast image while suppressing the irregularity in brighter sections. Recommended for: metal tissue, ceramic materials.
ENHANCE	Use this option to make observation with high contrast. Recommended for: metal tissue, ceramic materials, documentation.

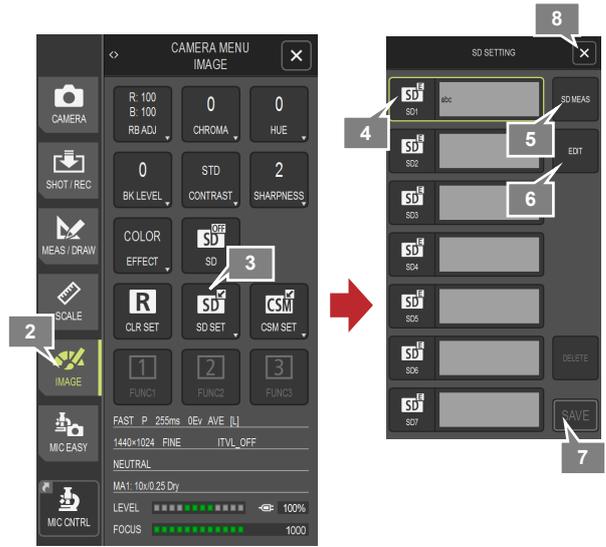


[CONTRAST] menu

(2) Registering SD (shading) compensation setting

"Shading" is a phenomenon that makes the edge of an image darker than the center, resulting in uneven exposure. You can compensate the shading if you have registered shading (SD) compensation settings. For the DS-L4, you can register a maximum of seven SD compensation settings.

- 1 Prepare an evenly colored object, and set it on the stage so that the object covers the entire image area. Make sure that there is nothing to obstruct the light.
- 2 Display the [CAMERA MENU: IMAGE] screen.
- 3 Tap [SD SET].
- 4 Tap one of the [SD1] to [SD7] buttons as the SD setting in which to register shading compensation settings.
For the buttons for which no conditions are registered, [E] (empty) is displayed.
For the SD compensation setting that is currently used, a check mark is displayed.
- 5 Tap [SD MEAS].
If shading compensation settings have already been registered in the selected custom setting, you are asked whether to update the existing settings. To update the SD setting, tap [OK].
- 6 Tap [EDIT], and then add a comment (16 or fewer characters) to the SD setting.
- 7 Tap [SAVE].
The SD compensation value is saved.
- 8 Tap [X] to close the [SD SETTING] menu.
To apply one of the registered SD compensation settings, open the [SD] menu, and then select the desired setting.



SD setting

(3) Selecting the desired SD compensation setting

- 1 Display the [CAMERA MENU: IMAGE] screen.
- 2 Tap one of the [SD1] to [SD7] buttons.



Selecting an SD compensation setting

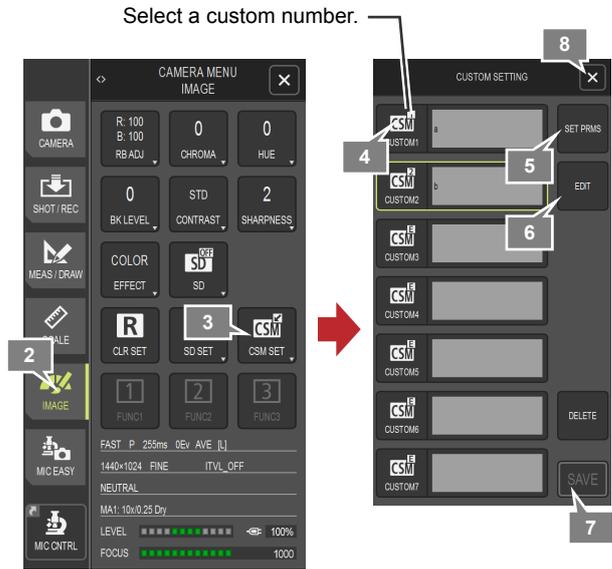
✓ About SD compensation settings

- If the degree of shading is large, shading compensation may not have the desired effect.
- The default SD compensation setting is [SD OFF] (no compensation).
- Only the SD compensation settings registered on the current camera can be selected.
- The selected SD compensation setting cannot be saved in custom settings.
- All SD compensation settings are initialized to [SD OFF] when [CLR SET] is executed from the [CAMERA MENU: IMAGE] screen.

(4) Registering custom settings

You can save the current photographing conditions as a "custom setting". You can have a maximum of seven custom settings.

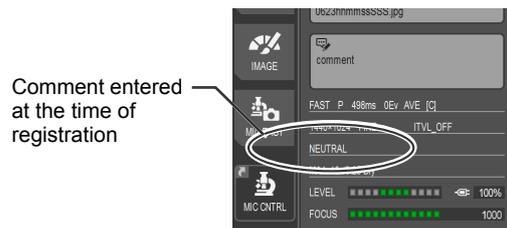
- 1 Set the DS-L4 photographing conditions as desired.**
Set the desired photographing conditions by referring to the descriptions in this chapter.
- 2 Display the [CAMERA MENU: IMAGE] screen.**
- 3 Tap [CSM SET].**
- 4 Tap one of the [CUSTOM1] to [CUSTOM7] buttons to register photographing conditions as custom setting.**
For the buttons for which no conditions are registered, [E] (empty) is displayed.
- 5 Tap [SET PRMS] (set parameters).**
If photographing conditions have already been registered in the selected custom setting, you are asked whether to update the existing conditions. To update the contents of the custom setting, tap [OK].
- 6 Tap [EDIT], and then add a comment (with 16 or fewer characters) to the custom setting.**
- 7 Tap [SAVE].**
The current photographing conditions are saved as a custom setting.
- 8 Tap [X] to close the [CUSTOM SETTING] menu.**
The photographing conditions you registered or updated immediately take effect.



Registering custom setting

- ✔ **Recalling a custom setting at any time manually and at startup automatically**
 - For how to recall a custom setting, refer to "8.1.1 (2) Using a custom setting".
 - You can configure the DS-L4 to start up with the desired custom setting selected, when the power is turned on. For how to set this function, refer to "13.2.1 (1) Calling a custom setting at startup".

- ✔ **Comments of custom settings**
 When a custom setting is selected with the [SCENE/CSM] button, a comment entered when the custom setting was registered is displayed in the bottom of [CAMERA MENU] and in the [INFO] window.



Comment of a custom setting

✔ **Photographing conditions registered as custom settings**

- Image mode (FULL or FAST)
- Exposure mode (program AE, manual, or focus-priority AE)
- Exposure time setting value
- Camera gain setting value
- Exposure compensation value
- White balance
- Metering mode and metering area (size and coordinates for custom setting)
- Image adjustment settings (RB adjustment, chroma, hue, color effect, black level, contrast, and sharpness)

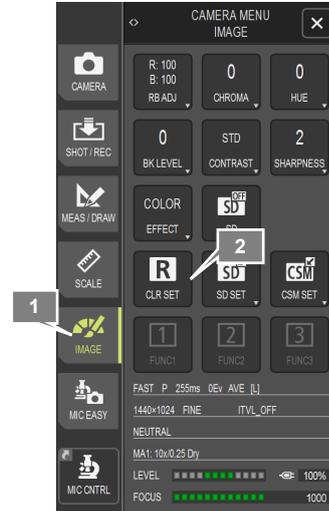
(5) Initializing the photographing conditions

You can reset the photographing conditions configured in [CAMERA MENU] to the initial values with a simple operation. To do this:

- 1 Display the [CAMERA MENU: IMAGE] screen.
- 2 Tap [CLR SET].
A message asks you whether you really want to initialize the photographing conditions.
- 3 To initialize the photographing conditions, tap [Yes]. To not initialize them, tap [No].
If you tap [Yes], the photographing conditions are reset to the initial values.

✔ White balance setting

Executing [CLR SET] does not reset the current white balance setting. Set white balance again as needed.



Initializing the photographing conditions

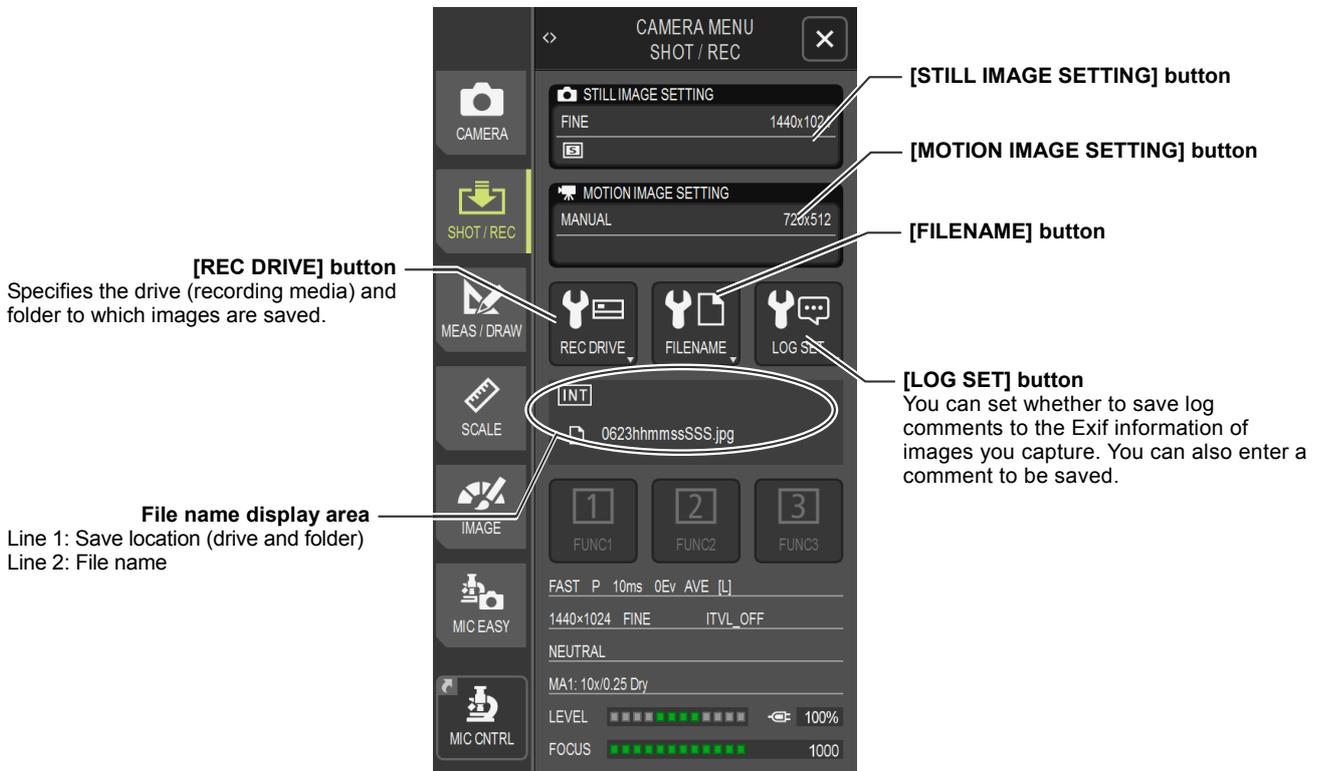
Items that can be initialized by [CLR SET]

Screen	Function	Description
[CAMERA MENU: CAMERA]	Scene mode/custom setting	NEUTRAL
	Exposure compensation	0
	Camera gain	Canceled (because exposure mode is reset to PROG)
	Image mode	FAST
	Exposure mode	PROG
	Metering mode	Average
	Metering area size	Large
	Frame	No change
	Custom metering area (position)	The size and position of the custom metering area are not changed.
	AE lock	Off
	FUNC1 to FUNC3	Assigned functions do not change.
[CAMERA MENU: IMAGE]	RB adjustment	100, 100
	Chroma	0
	Hue	0
	Black level	0
	Contrast	Standard
	Sharpness	2
	Color effect	Color
	SD	OFF

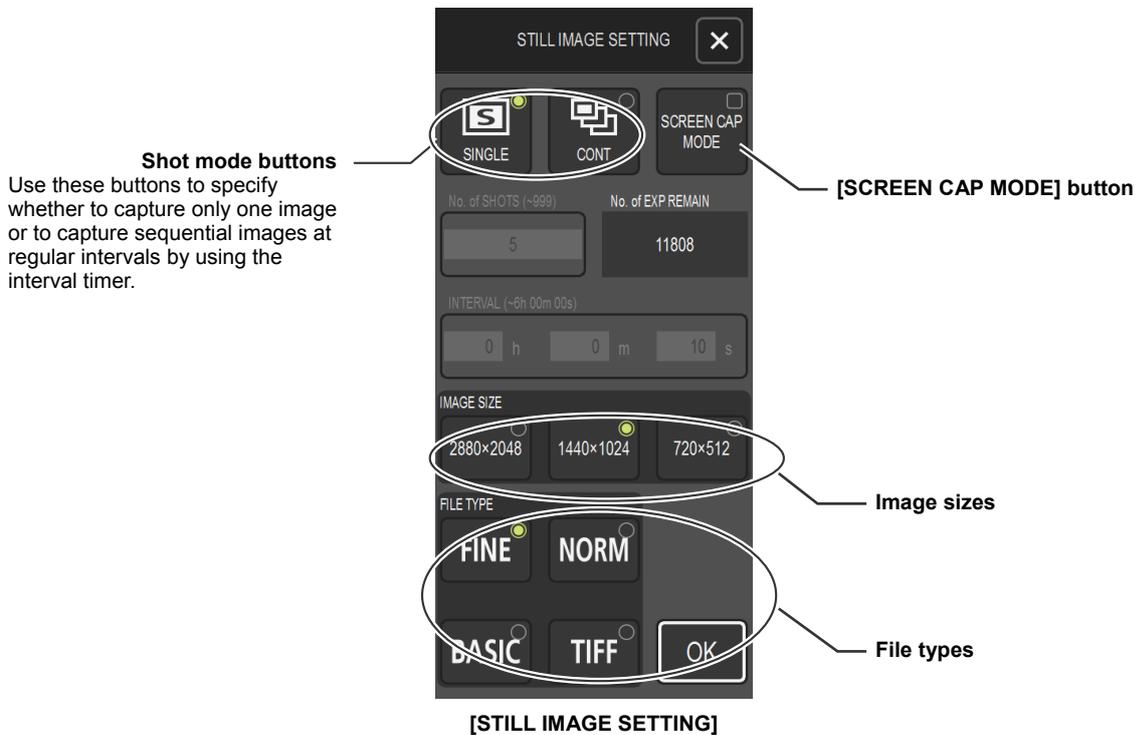
Note: The settings specified on the [CAMERA MENU: SHOT/REC], [TOOL MENU], and [DS SETUP] screens are not initialized by executing [CLR SET].

8.2.3 Setting Items of the [CAMERA MENU: SHOT/REC] Screen

There are the following setting items on the [CAMERA MENU: SHOT/REC] screen:



Items displayed on the [CAMERA MENU: SHOT/REC] screen



Photographing mode buttons
If [AUTO STOP] is selected, photographing ends when a specified time elapses. If [ITVL REC] is selected, images are captured for a specified time at a specified interval.

REC TIME
Set the photographing time if [AUTO STOP] or [ITVL REC] is set.

INTERVAL
Set the interval at which images are to be captured.

SET No.
Set the number of shots to be taken if [ITVL REC] is set.

RECORDING SIZE

RECORDING TIME
Displays the time for which recording can be performed. This is displayed if the save location is internal memory or external recording media.

[MOTION IMAGE SETTING]

(1) Setting the shot mode (still image)

You can select [SINGLE] (captures a single image at one time) or [CONT.] (captures sequential images using the interval timer) as the shot mode. To do this:

- 1 Display the [CAMERA MENU: SHOT/REC] screen.
- 2 Tap [STILL IMAGE SETTING].
- 3 Select the shot mode.
If you select [CONT.], the [No. of SHOTS] and [INTERVAL] buttons appear on the [STILL IMAGE SETTING] screen.
- 4 If the mode you selected is [CONT.], tap [No. of SHOTS] to set the number of shots to be taken, and tap [INTERVAL] to set the shot interval.
- 5 Tap [OK].



Setting the shot mode

Starting and stopping consecutive capture

- To start consecutive capture, tap [CAPTURE] in the LIVE menu.
- While consecutive capture is in progress, the label of the [CAPTURE] button changes to [STOP]. To stop consecutive capture before it finishes, tap [CAPTURE] ("STOP") again. For details, refer to "8.1.3 (1) Performing consecutive capture with the interval timer".

Information displayed during consecutive capture

During consecutive capture, the information about the number of shots is displayed in [CAMERA MENU] and the information window.

- For example, if the number of shots is 10 and the fifth shot is taken, "5/10" is displayed.

The number of additional shots that can be taken is displayed, based on the amount of free space on the storage destination drive. Note that this is an approximate value because the image data size differs depending on the subject. Also note that this value is not displayed while an image is replayed or for image data stored in a network drive.

Shot mode options

Mode	Description	
SINGLE	A single image is captured at one time.	
CONT.	No. of SHOTS	2 to 999 (minimum step: 1; initial setting: 2)
	INTERVAL	Any length of time in the range from 10 seconds to 6 hours (initial setting: 10 seconds)

(2) Using the screen capture mode (still image)

The screen capture mode allows you to save the currently displayed image in a size of 1770 x 1180 pixels. The [IMG MODE] and [IMAGE SIZE] settings are not applied.

- 1 Display the [CAMERA MENU: SHOT/REC] screen.
- 2 Tap [STILL IMAGE SETTING].
- 3 Tap [SCREEN CAP MODE], and then select whether to enable the screen capture mode.
- 4 To redisplay the [CAMERA MENU: SHOT/REC] screen, tap [OK].

If you tap [X], the [STILL IMAGE SETTING] submenu closes without saving the settings.



Screen capture mode

(3) Selecting the image size (still image)

You can specify the size of the image to be saved.

- 1 Display the [CAMERA MENU: SHOT/REC] screen.
- 2 Tap [STILL IMAGE SETTING].
- 3 Select the size of the image.
- 4 Tap [OK].



Selecting the image size

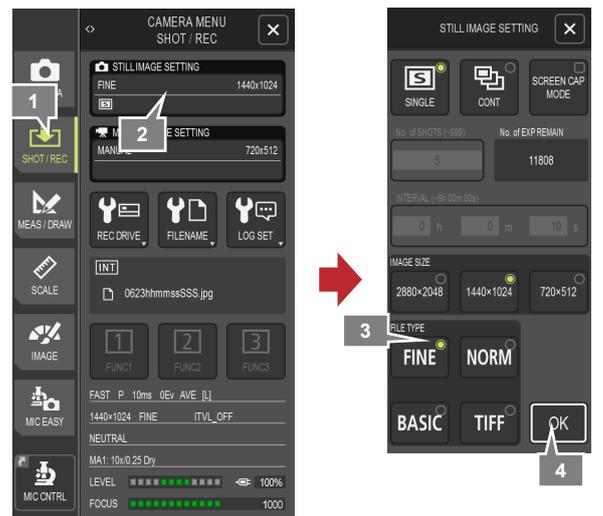
✔ Size of re-captured images

When a live image is re-captured in the screen capture mode, the re-captured image is saved in the same size as the original image. You cannot change the image size by using the [STILL IMAGE SETTING] screen.

(4) Selecting the file type of the image to be saved (still image)

You can specify the file type of the image to be saved.

- 1 Display the [CAMERA MENU: SHOT/REC] screen.
- 2 Tap [STILL IMAGE SETTING].
- 3 Select the file type of the image to be saved.
- 4 Tap [OK].



Selecting the file type

File type options

File type	Description
FINE	Images are saved in JPEG format with a compression ratio of about 4:1.
NORM	Images are saved in JPEG format with a compression ratio of about 8:1.
BASIC	Images are saved in JPEG format with a compression ratio of about 16:1.
TIFF	Images are saved in uncompressed 24-bit TIFF (RGB) format.

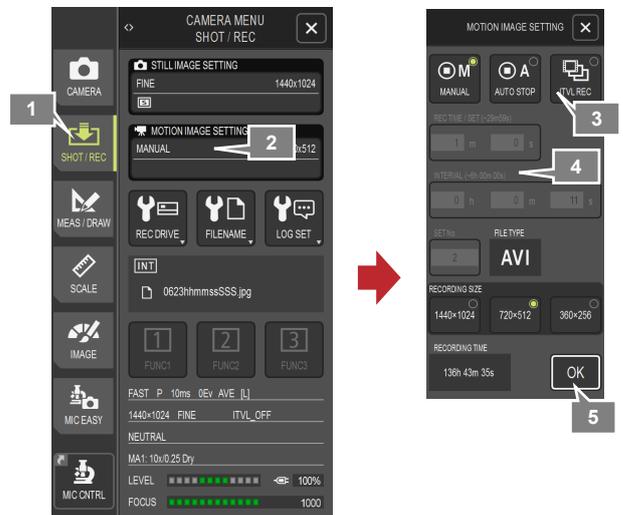
Image files

Exif data (Exif 2.3) is added to each image file.

(5) Setting the motion-image recording mode (motion image)

Select the motion-image recording mode.

- 1 Display the [CAMERA MENU: SHOT/REC] screen.
- 2 Tap [MOTION IMAGE SETTING].
- 3 Select the motion-image recording mode.
- 4 If you select [AUTO STOP], set the recording time by tapping its entry area.
If you select [ITVL REC], set the recording time, recording interval, and number of sets (recordings), by tapping their respective entry areas.
- 5 Tap [OK].



Selecting the motion-image recording mode

Photographing and Replaying Images

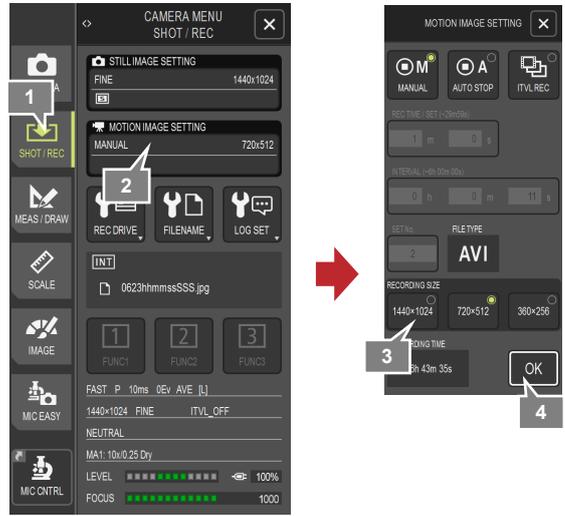
Motion-image recording mode options

Option	Description												
MANUAL	When you tap [REC], recording starts. When you tap [STOP REC], recording stops.												
AUTO STOP	When you tap [REC], recording starts. When the time specified for [REC TIME/SET] elapses, recording automatically stops.												
	REC TIME/SET 1 sec. to 29 min. 59 sec. (initial value: 1 min.)												
ITVL REC	When you tap [REC], recording starts. When the time specified for [REC TIME/SET] elapses, recording automatically stops. A recording is performed at the interval specified for [INTERVAL], the number of times specified for [SET No.].												
	<table border="1" style="margin: auto;"> <tr> <td style="width: 25%;">Interval</td> <td style="width: 25%;">Interval</td> <td style="width: 25%;">Interval</td> <td style="width: 25%;">Interval</td> </tr> <tr> <td style="text-align: center;">Recording</td> <td style="text-align: center;">Recording</td> <td style="text-align: center;">Recording</td> <td style="text-align: center;">Recording</td> </tr> <tr> <td style="text-align: center;">Set 1</td> <td style="text-align: center;">Set 2</td> <td style="text-align: center;">Set 3</td> <td style="text-align: center;">Set 4</td> </tr> </table>	Interval	Interval	Interval	Interval	Recording	Recording	Recording	Recording	Set 1	Set 2	Set 3	Set 4
	Interval	Interval	Interval	Interval									
	Recording	Recording	Recording	Recording									
	Set 1	Set 2	Set 3	Set 4									
REC TIME/SET 1 sec. to 29 min. 59 sec. (initial value: 1 min.)													
INTERVAL 11 sec. to 6 hours (initial value: 2 min.)													
SET No. 2 to 999 (initial value: 2)													

(6) Selecting the frame size (motion image)

Select the motion-image frame size.

- 1 Display the [CAMERA MENU: SHOT/REC] screen.
- 2 Tap [MOTION IMAGE SETTING].
- 3 Select the frame size.
- 4 Tap [OK].



Selecting the image size

(7) Specifying the destination media and save folder

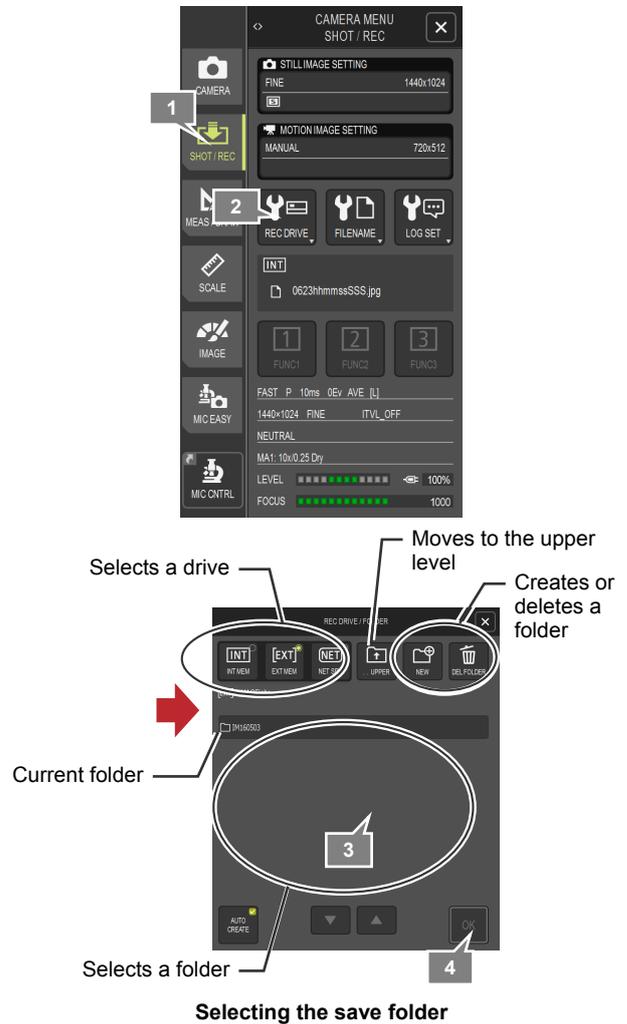
Before you can capture images, you must specify the drive (recording media device) and folder to which the captured images will be saved. The folder specified as the save destination is called the "save folder".

- 1 Display the [CAMERA MENU: SHOT/REC] screen.
- 2 Tap [REC DRIVE].
- 3 Specify the drive (recording media device) and folder to which images will be saved.

For the drive, you can select [INT] (internal memory), [EXT] (external recording media), or [NET] (network drive).

- **To create a new folder:**
To create a new folder in the folder selected in the list, tap [NEW]. When the software keyboard appears, enter any folder name (16 or fewer characters), and then tap [ENTER].
- **To delete a folder:**
To delete the current folder, tap [DEL FOLDER]. When a confirmation message appears, tap [Yes] or [No].

- 4 Select the desired drive and folder, and then tap [OK] to apply the settings.



! Finishing the setting

If you have changed the save destination settings, be sure to tap [OK] when you close the [REC DRIVE/FOLDER] submenu. If you tap [X] to close the submenu, the new settings are not applied.

! If the connected recording media devices change

- If you change the connected recording media devices, be sure to review the save destination settings.
- If you attempt to capture an image when no recording media is connected, a warning message notifies you that a write error occurred.

✓ Automatic folder creation

If automatic folder creation is enabled, images will be saved to the subfolders that will be automatically created in the save folder. For any folders that are created automatically, a name consisting of the string "IM" and the date is assigned. For example, if the date is October 1, 2016, the name to be assigned is "IM161001".

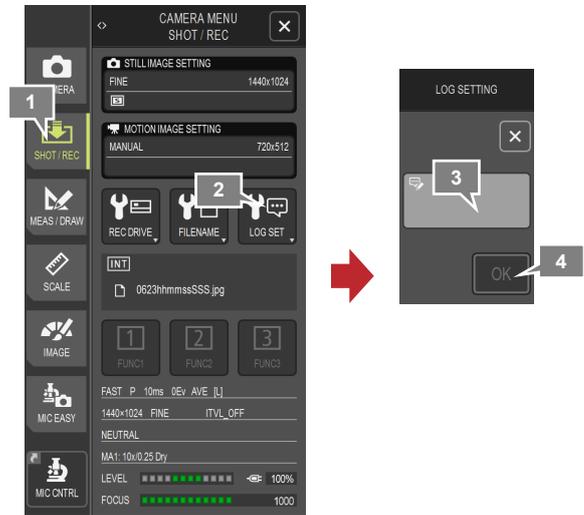
✓ Saving motion images to a network drive

It is possible to save motion images to a network drive. However, depending on the network environment, frames may drop. We do not recommend that you save motion images to a network drive.

(8) Saving a log comment to Exif information

With the DS-L4, you can save a log comment to the Exif information of each image you capture.

- 1 Display the [CAMERA MENU: SHOT/REC] screen.
- 2 Tap [LOG SET].
- 3 Tap anywhere in the text entry area, and then enter a comment (32 or fewer characters).
- 4 Tap [OK].



Saving and entering a log comment

Temporarily changing a log comment

To change a log comment temporarily, tap the log comment display area in the [CAMERA MENU: CAMERA] screen. The temporarily changed comment is applied to the next shot only. During consecutive capture, the temporarily changed log comment is applied to the first shot only.

(9) Checking/temporarily specifying the file name to be assigned

The file name to be assigned according to the selected file naming format is displayed in the file name display area in the center of the [CAMERA MENU: CAMERA] screen and the [CAMERA MENU: SHOT/REC] screen. For details on the file naming format, refer to "8.2.3 (10) Selecting the image file naming format".

Checking the image file name

In the file name display area, you can check the file name to be assigned the next time an image is captured and saved.

- 1 Display the [CAMERA MENU: CAMERA] or [CAMERA MENU: SHOT/REC] screen. (Alternatively, display the [INFO: CAMERA] window.)
- 2 Check the file name in the file name display area.

The file name display area displays the file name to be assigned the next time an image is captured and saved.



Checking image file name

✓ Displayed and actually assigned file names

- The file naming format can be selected by tapping [FILENAME] in the [CAMERA MENU: SHOT/REC] screen. If [DATE&TIME] is selected, the date and time is used as the file name to be assigned. For example, on March 1, "0301hhmssSSS.JPG" is displayed in the file name display area.
- If [CONT. No.] is selected, a sequence number is used as the file name to be assigned. In this case, there is no difference between the displayed and actually assigned file names.

Temporarily specifying the file name to be assigned

You can specify any file name that is to be assigned to the next captured image. For consecutive capture of still images or interval recording of motion images, the temporarily specified file name is assigned to the first file only.

The temporarily specified file name is reset when a still image is captured or motion image is recorded.

- 1 Display the [CAMERA MENU: CAMERA] screen.
- 2 Tap anywhere in the file name display area, and then enter the desired file name except the extension (16 or fewer characters).

The entered file name is displayed in the file name display area.



Temporarily specifying the file name to be assigned

✔ Setting of a user-specified file name

The file name you specify on the [CAMERA MENU: CAMERA] screen is applied to only the image captured the next time. When an image is captured the next time, the image is saved with the specified file name, and the file name display area displays an image file name according to the selected file naming convention. If you want to assign any file names to multiple image files, you must perform file name specification each time you capture an image.

To reset a temporarily specified file name to a file name to be assigned automatically, follow the steps below:

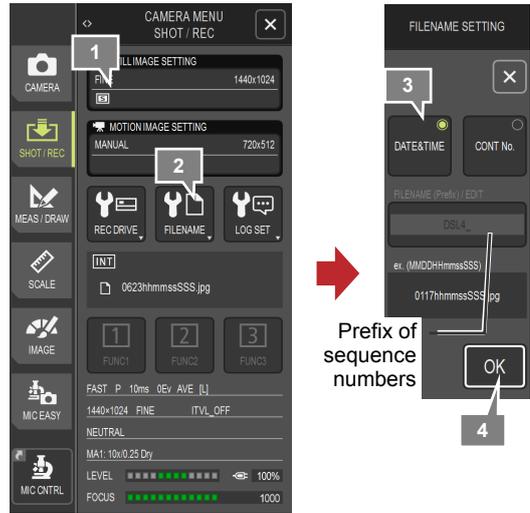
- (1) On the [CAMERA MENU: SHOT/REC] screen, change the setting for [FILENAME], and then tap [OK].
- (2) On the [CAMERA MENU: SHOT/REC] screen, change the setting for [FILENAME] back to the previous setting, and tap [OK].

✔ If a file with the same name exists in the save destination

When an image file is saved to a recording media device or network drive, if a file with the same name already exists, the image file is renamed by adding a one-digit number (1 to 9) at the end of the file name. At this time, if addition of any number (from 1 to 9) produces the same name as an already existing file name, the existing file whose name ends with "9" is overwritten.

(10) Selecting the image file naming format

- 1 Display the [CAMERA MENU: SHOT/REC] screen.
- 2 Tap [FILENAME].
- 3 Select [DATE&TIME] or [CONT. No.].
- 4 Tap [OK].



Selecting the image file naming format

Option	Description
DATE&TIME	The file name is composed of the date and time that the image is captured: month, day, minute, and seconds (two digits), and milliseconds (three digits). For example, if an image is captured at 15:00:47:010 on March 1, the file name to be assigned is "0301150047010.JPG".
CONT. No.	The file name is composed of a user-specified prefix (any string of 12 or fewer characters) and a four-digit sequence number. The assignable sequence range is from 0001 to 9999 (which then returns to 0001).

This chapter describes how to play back images that have been captured and saved on recording media.

9.1 Playing Back an Image

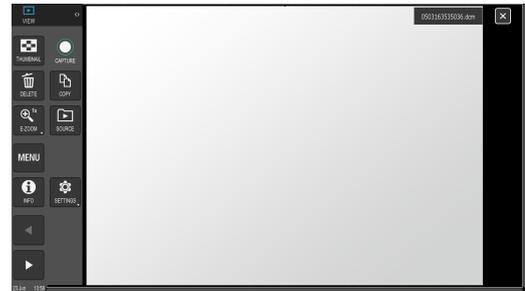
(1) Playing back an image

1 In the LIVE menu, tap [PLAYBACK].

The image is played back. To play back a motion image, tap ► in the center of the screen.

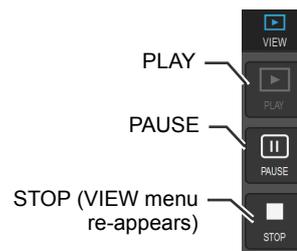
2 To close the playback image, tap [X] in the top right corner of the screen.

The DS-L4 re-enters the LIVE mode.



Playing back an image file

During playback of a motion image, the motion image playback menu is displayed.



Motion image playback menu

✓ Re-capturing a playback image

While a still image is replayed, you can re-capture it.

- When you re-capture a playback image, if annotations or measurement results have been added, the image is re-captured including the annotations or measurement results.
- A re-captured image is saved in the same size as the original file.

✓ Annotations and measurement results in VIEW mode

When playback of an image starts, all annotations and measurement results added in LIVE mode are hidden. All scales (scale bar, crossed scales, cross-hairs, grid, and bars for XY measurement) are also hidden.

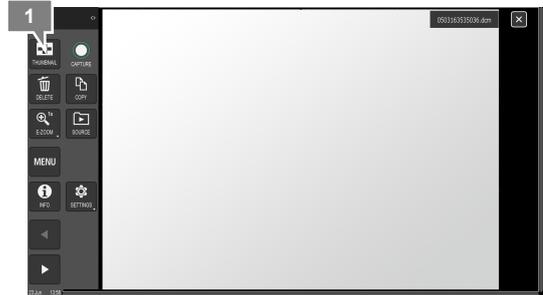
✓ Playback of images saved on a network drive

If an attempt is made to replay an image saved on a network drive when a network cable is not connected, the image may be replayed if it has been cached.

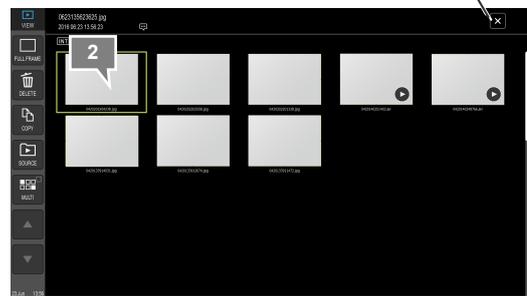
(2) Selecting an image to be replayed from the thumbnail list

The image to be replayed can be selected from the thumbnail list.

- 1 Tap [THUMBNAIL].
- 2 Select a thumbnail and tap [FULL FRAME]. Alternatively, double-tap a thumbnail.



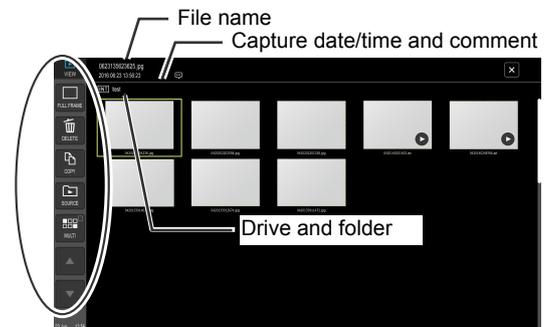
Closes the thumbnail list.



Displaying thumbnails of images

Operating the thumbnail window

- **[FULL FRAME]:** Replays the selected image.
- **[DELETE]:** Deletes the selected image.
- **[COPY]:** Tap this button to copy the selected image to another folder.
- **[SOURCE]:** Tap this button to change the playback folder.
- **[MULTI]:** To copy or delete multiple images, tap this button before selecting them.
- **▲:** Displays the previous page.
- **▼:** Displays the next page.
- **Swiping up or down:** Displays the previous or next page.



Buttons in the thumbnail screen

✔ Operating multiple images collectively

- Tap [MULTI] to enter multi-image selection mode. In this mode, you can select two or more images to be deleted or copied. After selecting the target images, tap [DELETE] or [COPY] to delete or copy them all at one time.
- When multi-image selection mode starts, the current selection is canceled.
- However, when you stop multi-image selection mode after deleting or copying (moving) images, the image selected previously is re-selected. If the previously selected image no longer exists (as a result of deletion or move), the next image (image on the right of the previously selected image) is selected. If there are no images on the right of that image, the image on the left is selected. If the folder contains no image, [No Image] is displayed.

(3) Switching the playback folder

1 Tap [SOURCE].

2 Select the drive and folder where the images to be replayed exist.

Tapping [SOURCE] displays the [SOURCE] submenu. Confirm the name of the selected folder.

Selecting a drive (recording media):

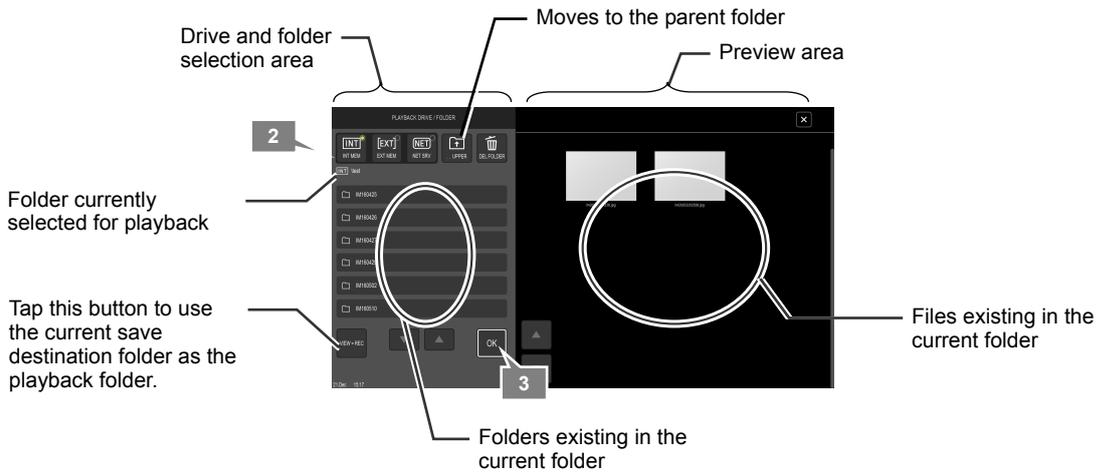
Select one of the drive icons displayed at the top of the submenu. Selectable drive icons are highlighted.

Selecting a folder:

When you select a folder, the thumbnails of the images in the folder are displayed.

3 Tap [OK].

The files in the selected folder are displayed.



(4) Enlarging an image by electronic zoom (still images only)

You can enlarge the playback image by using the electronic zoom function.

1 In the VIEW menu, tap [E.ZOOM].

2 Use the [E.ZOOM] submenu to enlarge the playback image on the screen.

The electronic zoom magnification is displayed on the [E.ZOOM] button in the VIEW menu.

You can use pinch-in and pinch-out operations to change the magnification, or use drag operations to move the position to be enlarged.

- **Centering**

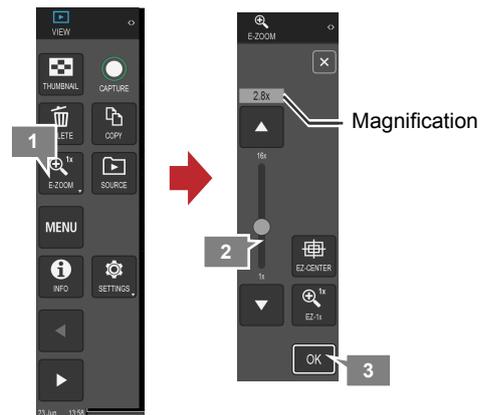
To move the center of the image to the center of the screen, tap [EZ-CENTER].

- **Canceling the centering**

To reset the magnification to 1x, tap [EZ-1x].

3 Tap [OK].

To cancel changing the magnification, tap [X].



Enlarging the playback image (electronic zoom)

9.2

Deleting Images

To delete images, use the VIEW menu. Images can be deleted by any of the following three methods.

- (1) Deleting an image directly
- (2) Using the thumbnail list
- (3) Deleting a folder (including all images contained in the folder)

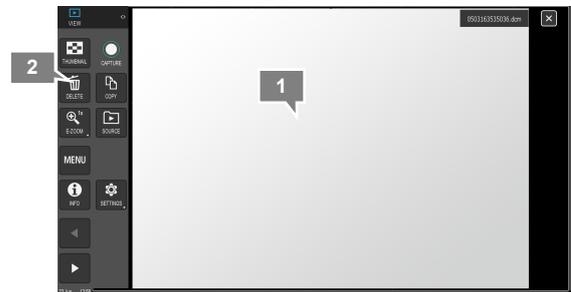
! Deleting images

- A deleted image cannot be restored. Be careful not to delete important images by mistake. It is recommended that important images be transferred and saved to a PC or other external device.
- If you connect recording media to a PC, you can set each image as read-only on the PC. Read-only images cannot be deleted by using any operations of the DS-L4. If you attempt to delete such images, a warning message appears.
- If you have saved the measurement result CSV file for an image file that you want to set as read-only, also set the CSV file as read-only.
- When motion image or DICOM image data is saved, multiple JPEG files for preview are saved under the same name. If a JPEG file for preview is deleted on the PC via the explorer, etc., the image will no longer be able to be viewed on the DS-L4.

(1) Deleting an image directly

You can delete a specific image directly. To do this:

- 1** In the VIEW menu, display the image that you want to delete.
- 2** Tap [DELETE].
A confirmation for deletion message appears.
- 3** To continue deletion, tap [Yes]. To cancel deletion, tap [No].
When [Yes] is selected, the image is deleted.



Deleting an individual image

! The case where an image cannot be deleted

You cannot delete a read-only image, or an image contained on locked recording media. A warning message appears in such cases.

(2) Using the thumbnail list

You can use the thumbnail list to select the images to be deleted. To do this:

- 1 In the thumbnail list, select the thumbnails of the images that you want to delete.**

Selected thumbnails are indicated accordingly.

To select multiple thumbnails, tap [MULTI] beforehand.

If there are thumbnails you want to delete on another page, tap the ▲ or ▼ button to change the page.

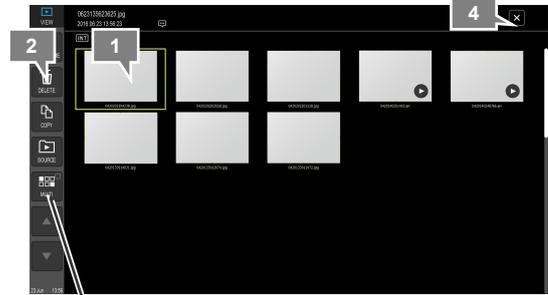
- 2 Tap [DELETE].**

A confirmation for deletion message appears.

- 3 To continue deletion, tap [Yes]. To cancel deletion, tap [No].**

When [Yes] is selected, the selected images are deleted.

- 4 To close the thumbnail list, tap [X] in the top right corner of the screen.**



To select multiple images, tap this button.

Using the thumbnail list to select the images to be deleted

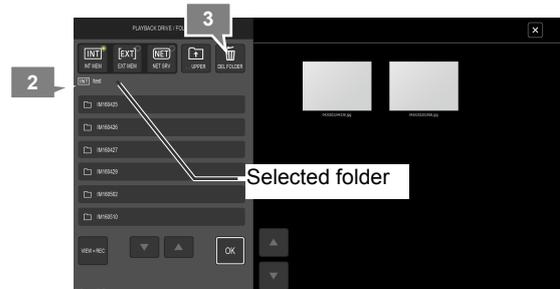
! In the case where an image cannot be deleted

You cannot delete a read-only image, or an image contained on locked recording media. A warning message appears in such cases.

(3) Deleting a folder (including all images contained in the folder)

You can delete all images contained in a folder, including the folder. To do this:

- 1 In the VIEW menu, tap [SOURCE].**
- 2 Select the drive (recording media) that contains the target folder, and then select the target folder.**
Confirm the name of the selected folder.
- 3 Tap [DEL FOLDER].**
A confirmation for deletion message appears.
- 4 To continue deletion, tap [Yes]. To cancel deletion, tap [No].**
When [Yes] is selected, the selected folder is deleted.
- 5 Tap [OK] to close the submenu.**



Deleting a folder (including all images contained in the folder)

! In the case where an image cannot be deleted

A confirmation message appears in the following cases:

- You cannot delete a folder on locked recording media or a read-only folder.
- If the selected folder contains read-only image files, the folder and the image files are not deleted. However, the other image files are deleted.

Part 4

Scale, Annotation, and Measurement Functions

This part describes how to perform operations when using the scale function, annotation function, and measurement function of the DS-L4.

This part consists of the following chapters:

- Chapter 10 Preparation for Using the Scale, Annotation, and Measurement Functions
- Chapter 11 Adding scales and annotations to images
- Chapter 12 On-Screen Measurement

This chapter provides notes on, and describes the settings required for, using the annotation and measurement functions.

10.1

Before Use

With the DS-L4, the following functions can be used for images:

- **Displaying scales**

A variety of scales can be displayed on a live image or playback image. The scales that can be displayed include a scale bar, crossed scales, cross-hairs, grid, and bars for XY measurement. Use the [SCALE] menu to operate these scales. Unlike annotations and measurement results, the user can select the types of scales to be embedded in image files.

- **Adding annotations**

You can add annotations to a live or playback image. The annotations that can be added include arbitrary text, straight lines, arrows, free-hand lines, and markers (numbers). Use the [MEAS/DRAW] menu to perform measurement.

- **Measurement function**

You can measure the approximate length, angle, and diameter of an object in a live or playback image. Use the [MEAS/DRAW] menu to perform measurement.

10.1.1

Notes on Annotation and Measurement Functions

! Notes on scale, annotation, and measurement functions

Note the following when you use the scale, annotation, and measurement functions.

- **Calibration:**

Before you use annotation and measurement functions to measure an object, be sure to check the calibration setting. The DS-L4 provides two calibration modes: OPTICAL and MANUAL. Select one of these calibration modes.

- Normally, select OPTICAL. In this case, the measurement scale calculated from the magnification of the optical device is applied.
- Select MANUAL only when you want to perform measurement based on a specific measurement scale.

- **Switching of the calibration setting:**

Switching of the calibration setting affects the annotation and measurement functions as follows:

- For the scales (scale bar, crossed scales, cross-hairs, and bars for XY measurement), the values based on the selected calibration mode are displayed.
- For the measurement results, the values based on the selected calibration mode are displayed.
- For the annotations, the displayed information does not change.

- **Annotations and measurement results for a playback image:**

- While you are viewing an image saved in TIFF or JPEG format, if you display a scale or perform measurement, the unit and calibration settings that were specified when the image was saved are applied.
- You cannot add annotations or perform measurement for the motion image that is being replayed. (You cannot perform these operations even when you freeze the motion image.)

- **Precision:**

Measurement of the DS-L4 is approximate. Precision cannot be guaranteed.

- **Electronic Zooming:**

Although electronic zoom enlarges an image, it does not enlarge scales. When you swipe to move an enlarged image, the displayed scales do not move together with the image.

When the scales, annotations, and measurement results are cleared

The displayed scales, annotations, and measurement results are automatically cleared (erased) in the following cases:

- **When the live image is flipped**

When a live image is flipped ([SETTINGS] > [DS SETUP] > [MAIN] > [MIRROR]), the annotations and measurement results are cleared.

- **When [ERASE ALL] is performed**

- In LIVE mode, when [ERASE ALL] is executed from [TOOL MENU: MEAS/DRAW], the annotations and measurement results displayed on the live image are cleared.
- In VIEW mode, when [ERASE ALL] is executed from [TOOL MENU: MEAS/DRAW], the annotations and measurement results displayed on the playback image are cleared.
- If you use a DS-Ri2 or another camera whose FOV setting can be changed and you change its FOV setting, the annotation and measurement results are automatically cleared.

Adding annotations and performing measurement

The scale, annotation, and measurement functions can be performed for both live and playback images.

- **Live image**

You can add annotations and measurement results to a live image that you are viewing. The annotations and measurement results can be saved when an image is captured.

- **Playback image**

You can add annotations and measurement results to a still image that has been captured. The annotations and measurement results you added can be saved by re-capturing the image. You cannot add annotations or perform measurement for the motion image that is being replayed. (You cannot perform these operations even when you freeze the motion image.)

Note: While you are viewing an image saved in TIFF or JPEG format, if you display a scale or perform measurement, the unit and calibration settings that were specified when the image was saved are applied.

Saving the results

To obtain an image with scales, annotations, and measurement results embedded, re-capture the image. You can specify the settings for embedding annotations and measurement results by tapping [TOOL SET] in the [TOOL MENU: MEAS/DRAW] or [TOOL MENU: SCALE] screen. For details, refer to "10.1.2 Notes on Annotation and Measurement Functions".

- **Pasting ([PASTE TO IMAGE] area)**

You can save an image, pasting (embedding) the displayed annotations, measurement results, and scales in the image. The information embedded to an image cannot be deleted or changed, and is always displayed when the image is replayed.

- **No saving**

If you do not want to embed any items in images, clear all options in the [PASTE TO IMAGE] area. If none of these options are selected, the displayed annotations and measurement results are not saved.

Even if options in the [PASTE TO IMAGE] area are selected, annotations and measurement results are not saved unless [OVERLAY] is enabled.

! About pasted results

If you capture an image with items (scales, annotations, and measurement results) embedded, you cannot delete the embedded items from the image.

If an image is saved with items embedded in JPEG format, lines (of scales, annotations, and measurement results) may be broken. To avoid broken lines, save the image in TIFF format.

✔ **Export to a CSV file**

When you capture an image, you can export the measurement results to a CSV file. For details, refer to "10.1.2 Specifying the Basic Settings of the Annotation and Measurement Functions" and "12.3.2 Exporting Measurement Results to a CSV File".

10.1.2 Specifying the Basic Settings of the Annotation and Measurement Functions

You can specify the following settings with the [TOOL SETTING] screen.

- **[CALIB SET] button**

Tap this button to specify the calibration setting that is used for the basis of the scales to be displayed and the lengths to be measured.

- **[RELAY LENS] button**

Tap this button to set the magnification of the relay lens attached to the camera port of the microscope.

- **[LINE WIDTH] area**

Tap this button to set the thickness of the lines that can be drawn with the scale, annotation, and measurement functions.

- **[FONT SIZE] area**

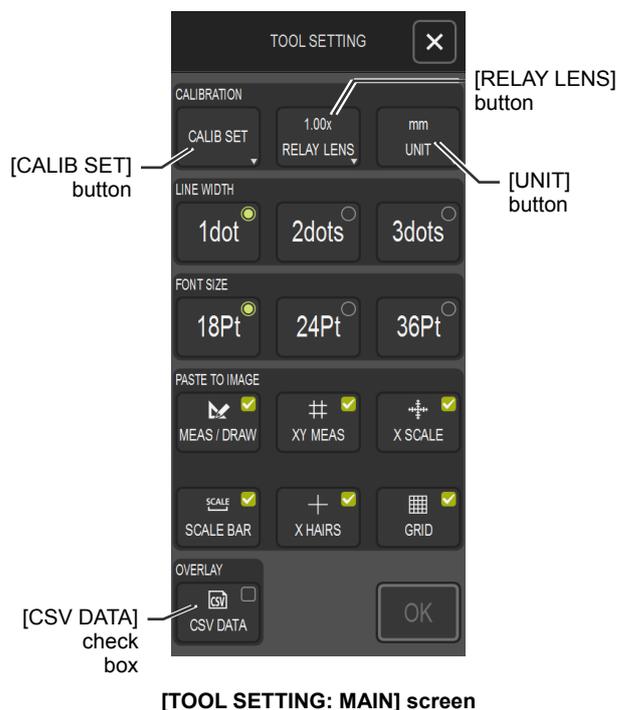
Tap this button to set the font size of the text that can be drawn with the scale, annotation, and measurement functions.

- **[UNIT] button**

Tap this button to set the unit used for the scale, annotation, and measurement functions.

- **[PASTE TO IMAGE] area**

This area contains the options for selecting the types of items to be embedded in captured images. There are the following six options: [MEAS/DRAW], [XY MEAS], [X SCALE], [SCALE BAR], [X HAIRS], and [GRID]. The settings in this area are also applied when a live image is captured from a viewer terminal over a network.



- **✔ About pasting annotations and measurement results**

Scales and overlay items (annotations and measurement results) pasted (embedded) in an image cannot be deleted.

- **✔ About pasting scales (when the screen capture mode is not used)**

- Scales are embedded at a location where they are at the time image capturing.
- Scale bar length is automatically adjusted to one-eighths of the image size.
- Location of the scale shifts on the motion image as you change the magnification or position using the electronic zoom while recording a motion image. If you want to fix the position of a scale, avoid operating the electronic zoom for capturing motion images.

- **[CSV DATA] checkbox**

Select whether to save measurement results (and the number of markers for each color) in a CSV file. If you select the checkbox, the measurement results are automatically saved to a CSV file when an image is saved. The file will have the same name as the image and an extension of ".csv". Annotations are not saved to the CSV file.

When [SCREEN CAP MODE] is turned on for the still image setting, image data is not saved to a CSV file. Additionally, a CSV file is not saved when a motion image is saved.

Format of the CSV file

The following is an example of a CSV file that can be generated.

	A	B	C	D	E	F
1	Title	No.	Result1	Result2	Unit	
2	Distance between Two Points	1	5.07E-02		mm	
3	Diameter	2	6.64E-02		mm	
4	Area	3	6.49E-04		mm ²	
5	Distance between Two Circles	4	9.44E-02		mm	
6	Angle	5	72.35		°	
7	Angle	6	52.32		°	
8	Distance between Line & Point	7	1.37E-02		mm	
9		8	1.17E-02		mm	
10		9	8.28E-03		mm	
11	Pitch	10	1.30E-02		mm	
12		11	1.19E-02	7.70E-03	mm	
13		12	9.80E-03	7.41E-03	mm	
14		13	8.49E-03	8.05E-03	mm	
15	Green Marker			5		
16						
17						

Example of the CSV file

10.1.3 Unit and Calibration Settings

Before you display scales and measurement results on the screen, it is important to specify the proper unit and calibration settings, which are used as the basis for the displayed information.

✔ About the unit and calibration settings

The unit and calibration settings are applied to both scales and measurement results.

- You can specify the unit and calibration settings by tapping [TOOL SET] in the [TOOL MENU: MEAS/DRAW] or [TOOL MENU: SCALE] screen. The settings specified here are shared by the Measurement & Drawing function and the Scale function.
- You can switch the calibration setting by selecting [CALIB] from the [TOOL MENU: MEAS/DRAW] or [TOOL MENU: SCALE] screen, or by selecting [CALIB] on a submenu displayed from the [TOOL MENU: MEAS/DRAW] screen.

✔ Annotations and measurement results for a playback image

While you are viewing an image saved in TIFF or JPEG format, if you display a scale or perform measurement, the unit and calibration settings that were specified when the image was saved are applied.

(1) Switching the unit setting

You can select one of the following units of length: nm, μ m, mm, cm, mil or inch.

- 1 In the [TOOL MENU: MEAS/DRAW] screen, tap [TOOL SET]. Alternatively, in the [TOOL MENU: SCALE] screen, tap [TOOL SET].
- 2 Tap [UNIT], and then select the unit to be used.
 - Units that can be selected (initial setting: mm)
nm, μ m, mm, cm, mil, inch (six types)

To redisplay the previous screen without changing the setting, tap [X].
- 3 Tap [OK] to close the [TOOL SETTING] menu.



Switching the unit

! Switching of the unit and overlay information

Switching of the unit affects the scale, annotation, and measurement functions as follows:

- The scales (scale bar, cross-hairs, crossed scales, and bars for XY measurement) are redrawn in accordance with the new unit setting.
- The annotations do not change.
- For the measurement results, the unit is changed.

(2) Registering local calibration settings

You can use the [CALIBRATION SETTING] screen to register local calibration settings (calibration settings that are locally saved in the DS-L4) as the basis for displayed scales and measured lengths.

Local calibration can be set in OPTICAL or MANUAL mode. You can register a maximum of 14 local calibration settings (from M1 to M14). You can use any one of these settings.

Registration modes of local calibration settings

You can register a calibration setting in one of two modes: MANUAL and OPTICAL.

- **MANUAL:** In this mode, you display an object of known length, and specify the length on the screen. The specified value is used as the calibration value.
- **OPTICAL:** In this mode, you enter the magnification of the optical device (such as a microscope). The DS-L4 then calculates the calibration value from the entered value.

Required tools

Prepare the following tools for registration using the [MANUAL] setting.

- **Object of known length**

Registration in MANUAL mode

To perform calibration by displaying an object of known length and specifying its length:

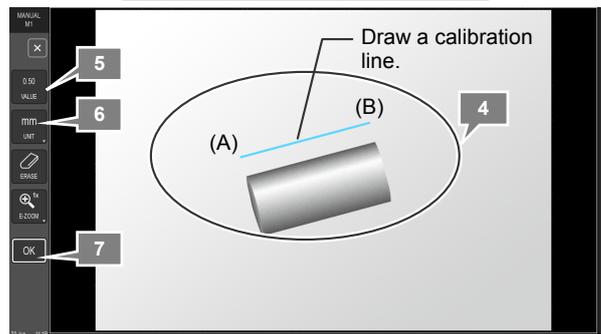
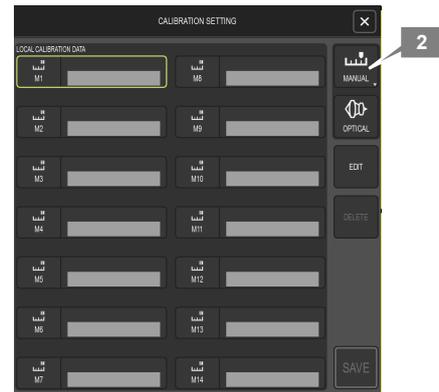
- 1 In the [TOOL SETTING] screen, tap [CALIB SET].
- 2 Select one of the local calibration setting numbers (M1 to M14) as the container of local calibration data, and then tap [MANUAL].
- 3 Display an object of known length on the screen.
- 4 Draw a calibration line ((A)-(B) in the figure) along the object on the screen.

Use a mouse to perform this operation.

Specify the starting and ending points. A line is drawn between them. To try again, tap [ERASE], and then redraw a line.

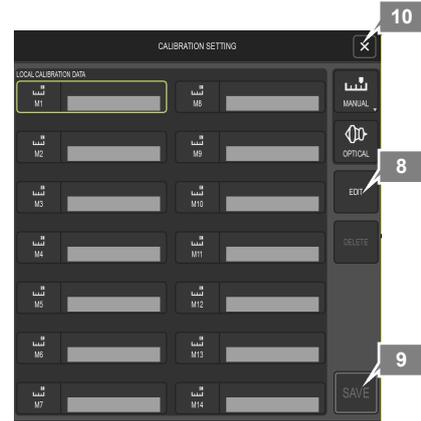
- 5 Tap [VALUE], and then enter the length of the object.
Range of values that can be entered: 0.01 to 99999.99
To use the software keyboard, tap [123] and show number keys.
Do not tap [X] on the software keyboard. If you do so, the software keyboard disappears with the entry field displayed. To redisplay the software keyboard, select the entry field.
- 6 Tap [UNIT], and then select the unit to be used.
To clear the value that has been entered or calibration line that has been drawn, tap [ERASE].
- 7 Tap [OK].

Registration in MANUAL mode



Entering a value in MANUAL mode

- 8 Tap [EDIT], and then enter a comment.**
The entered comment is displayed in the comment display area.
- 9 Tap [SAVE] to register the calibration setting.**
Setting cannot be saved unless a value is entered correctly.
- 10 Tap [X] to close the [CALIBRATION SETTING] screen.**
If a calibration value is not saved, the setting is discarded.



Entering a comment

✓ FOV setting and calibration

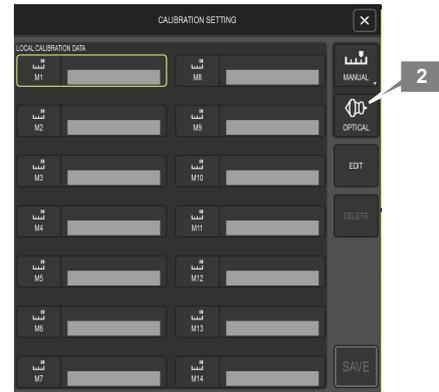
If you use a camera whose FOV setting can be changed and you change its FOV setting, you must re-register the settings of the MANUAL calibration mode.

Registration in OPTICAL mode

To use the calibration value calculated from the magnification of the optical device (such as a microscope) that you enter:

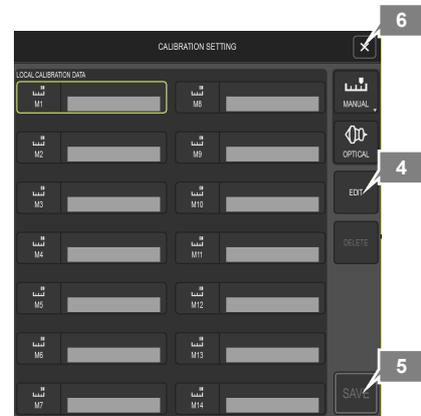
- 1 In the [TOOL SETTING] screen, tap [CALIB SET].**
- 2 Select the calibration data container (M1 to M14), and then tap [OPTICAL].**
- 3 Enter the magnification of the objective, and then tap [OK].**
Range of values that can be entered: 0.1 to 999.9
To use the software keyboard, tap [&123] and show number keys.
Do not tap [X] on the software keyboard. If you do so, the software keyboard disappears with the entry field displayed.
To redisplay the software keyboard, select the entry field.

[OPTICAL] mode



Entering a value in OPTICAL mode

- 4 Tap [EDIT], and then enter a comment.**
The entered comment is displayed in the comment display area.
- 5 Tap [SAVE] to register the calibration setting.**
Setting cannot be saved unless a value is entered correctly.
- 6 Tap [X] to close the [CALIBRATION SETTING] screen.**
If a calibration value is not saved, the setting is discarded.



Entering a comment

Scale, Annotation, and Measurement Functions

✔ If the selected calibration setting is deleted

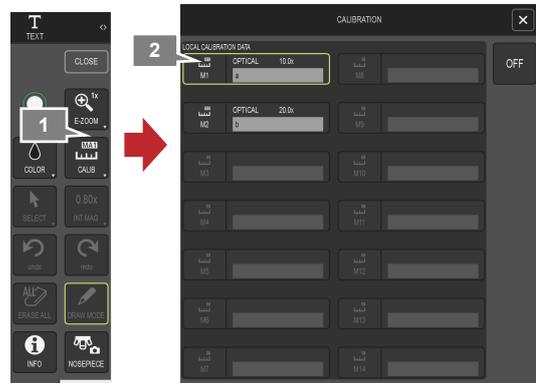
If the calibration setting that is currently selected is deleted by using the [MEAS/DRAW] or [SCALE] menu, the DS-L4 behaves as follows.

- If the microscope is connected to the DS-L4 using a USB cable, the calibration value is initialized with the information of the objective that has been registered in the microscope ([MIC CALIB]). For details on registering the information about the objectives with the motorized microscope, refer to the documentation for the microscope or its setup tool. Also, refer to "10.1.3 (3) Switching the calibration setting".
- If the microscope is connected to the DS-L4 without using a USB cable, calibration is disabled.

(3) Switching the calibration setting

If the microscope is connected without using a USB cable

- 1 Display the [TOOL MENU: MEAS/DRAW] or [TOOL MENU: SCALE] screen, and tap [CALIB]. Alternatively, tap the desired measurement or drawing button, and then tap [CALIB].**
- 2 Select the desired calibration setting.**
 - OFF: No calibration setting is used.
 - [M1] to [M14]: Local calibration settings that have been registered
The icon for the selected calibration setting is displayed.



Switching the calibration setting

! Switching of the calibration setting and overlay information

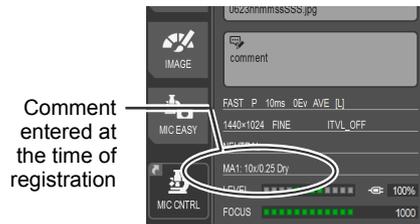
Switching of the calibration setting affects the scale, annotation, and measurement functions as follows:

- The scales (scale bar, cross-hairs, crossed scales, and bars for XY measurement) are redrawn in accordance with the new calibration setting.
- The annotations do not change.
- The measurement results are updated in accordance with the new calibration setting.

✔ Comments on calibration settings

Add a comment for each calibration setting.

In the [CALIBRATION] submenu, the comments entered when calibration settings are registered are displayed on the icons for the [M1] to [M14] settings. When one of the [M1] to [M14] settings is selected, the comment on the selected setting is displayed in the command display areas at the bottom of the [CAMERA MENU] and [INFO: CAMERA] windows.



Comment on a calibration setting

If a motorized microscope is connected to the DS-L4 with a USB cable

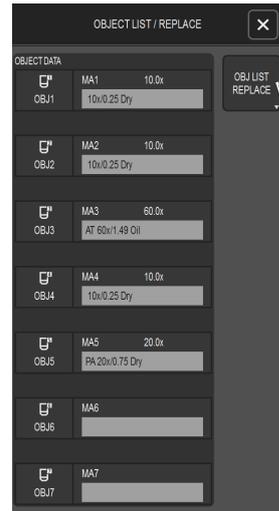
When the nosepiece is rotated, the DS-L4 detects the address of the selected objective to switch the calibration setting automatically.

Make sure that the information about the objectives has been registered in the motorized microscope. The information about the objectives is used as calibration settings. (To check the information about the currently selected objective, tap [CALIB] on the DS-L4.) For details on how to register the information about the objectives, refer to the documentation for the microscope or its setup tool.

✔ To use calibration settings of the DS-L4 (instead of the microscope's objective information)

If necessary, you can use calibration settings that are locally registered in the DS-L4, instead of the objective information registered in the motorized microscope. For example, you may want to attach infrequently used objectives to the microscope temporarily. In such a case, by replacing the DS-L4 local calibration data with the information about those objectives, the calibration settings can be automatically changed by simply changing the nosepiece. (The calibration settings must have been registered before use. For details on how to register them, refer to "10.1.3 (2) Registering local calibration settings".)

- (1) Display the [MEAS/DRAW] menu. Tap the desired measurement or drawing button.
- (2) Tap [CALIB].
- (3) Tap [OBJ LIST REPLACE].
- (4) Select the address of the objective whose calibration setting you want to replace, and the number of the local calibration setting registered in the DS-L4. Then, tap [REPLACE]. The calibration data is replaced.
 To reset the calibration data to the microscope's objective data, select the address of the relevant objective, and then tap [MIC CALIB].
 To reset the calibration data of all objectives, tap [ALL MIC CALIB].
- (5) Tap [SAVE] to save the new settings.



Tap this button to replace a calibration setting.



Current assignment of objective addresses

Calibration data registered in the microscope

Calibration data locally saved in the DS-L4

Select an objective address and local calibration setting number, and then tap [REPLACE].

When you turn on the microscope after replacing the calibration data, a message "The calibration data has been changed. Reset to the MIC CALIB?" appears on the DS-L4. To use the microscope's objective data, select [Yes]. To use the local calibration settings saved in the DS-L4, select [No].

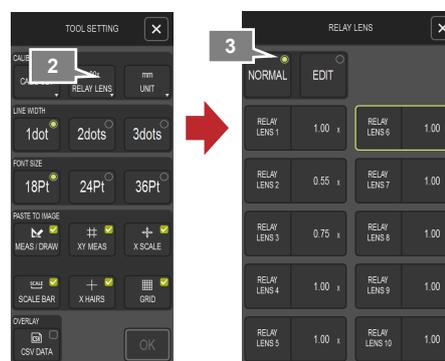
✔ Notes on registering calibration settings

- If the nosepiece is not set at a click-stop position, calibration is disabled.
- If the SMZ1270i or SMZ18 microscope is connected, depending on the position of the zoom knob, the DS-L4 may not be able to detect the zoom magnification correctly. As a result, the displayed measurement value may vary constantly. In such a case, rotate the zoom knob until variation stops.

(4) Setting the magnification of the relay lens

You can set the magnification of the relay lens attached to the camera port of the microscope. Note that the magnification set here is not applied when MANUAL calibration mode is selected.

- 1 From the [TOOL MENU: MEAS/DRAW] screen, display [TOOL SETTING]. Alternatively, from the [TOOL MENU: SCALE] screen, display [TOOL SETTING].
- 2 Tap [RELAY LENS].
- 3 Tap [NORMAL], and then select the magnification of the relay lens that is being used.
- 4 Tap [X] to close the [TOOL SETTING] screen.



Setting the magnification of a relay lens

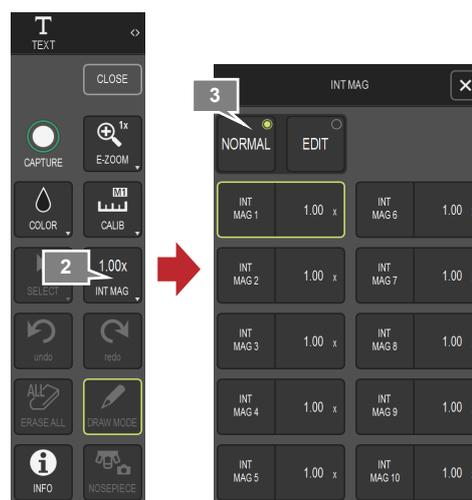
✔ To edit the list of relay lenses

- (1) Tap [EDIT], and then tap the button for the lens whose data you want to edit.
- (2) Enter the magnification.
 - If you use a DS-Fi3, set the relay lens magnification to 0.55x.
 - If you use a DS-Ri2, specify a magnification of 1x or 2.5x in accordance with the magnification of the F-mount adapter to be attached.
- (3) Tap [SAVE].

(5) Setting the magnification of the intermediate magnification lens

If the microscope is connected to the DS-L4 without using a USB cable, you can set the magnification of the zoom/intermediate magnification lens. The magnification set here is applied only in OPTICAL calibration mode when the microscope is connected to the DS-L4 without using a USB cable. If you change the zoom magnification, select the appropriate magnification accordingly to display correct measurement results.

- 1 In the [TOOL MENU: MEAS/DRAW] menu, tap the desired measurement or drawing button to display the corresponding submenu.
- 2 Tap [INT MAG].
- 3 Tap [NORMAL], and then select the magnification of the intermediate magnification lens being used.
- 4 Tap [X] to close the [TOOL SETTING] screen.



Setting the magnification of an intermediate magnification lens

✔ To edit the list of intermediate magnification lenses

- (1) Tap [EDIT], and then tap the button for the lens whose data you want to edit.
- (2) Enter the magnification.
- (3) Tap [SAVE].

10.1.4 Overlay

Annotations and measurement results are drawn on a layer called an "overlay".

(1) Overview of the overlay

You can think of the overlay as a transparent sheet covered over a captured image.

Annotations (text, straight lines, arrows, free-hand lines, and markers) and measurement results are rendered on the overlay. You can hide them temporarily or redisplay them by hiding or showing the overlay.

- The overlay allows you to add annotations and perform measurement without modifying an original image.
- You can save the items drawn on the overlay to an image by re-capturing the image.

✔ Overlay and scales (scale bar, crossed scales, cross-hairs, grid, and bars for XY measurement)

The results of the functions executed from the [TOOL MENU: MEAS/DRAW] screen are drawn on the overlay. However, the results of the functions executed from the [TOOL MENU: SCALE] screen are not drawn on the overlay. You can show or hide each scale item individually.

(2) Using the overlay

Showing/hiding the overlay

You can use the [OVERLAY] button in the [TOOL MENU: MEAS/DRAW] or [TOOL MENU: SCALE] screen to show or hide the overlay.

- 1 Display the [TOOL MENU: MEAS/DRAW] or [TOOL MENU: SCALE] screen.
- 2 Tap [OVERLAY].

Tapping this button hides the overlay. To show the overlay again, tap the button again.

✔ When the overlay is automatically displayed

A hidden overlay is automatically displayed when any measurement or drawing button is tapped in the [TOOL MENU: MEAS/DRAW] menu.

✔ Showing/hiding annotations

Since annotations (text, straight lines, arrows, free-hand lines, and markers) are drawn on the overlay, they can be shown or hidden by showing or hiding the overlay.



Showing/hiding the overlay

Erase the overlay content

You can erase the overlay content in one operation. To do this:

- 1 Display the [TOOL MENU: MEAS/DRAW] screen.
 - 2 Tap [ERASE ALL].
- A confirmation message appears.
- 3 If you are sure you want to erase all overlay content, tap [Yes]. If you are not, tap [No].

Information rendered in the overlay is cleared.

✔ About the erased overlay content

- The content will not be restored once cleared.
- Tapping [ERASE ALL] erases all annotations and measurement results that have been drawn. You cannot partially erase the overlay content. However, you can erase only a specific type of item drawn on the overlay. To do so, in [MEAS/DRAW MENU], tap the button for the desired type of measurement or drawing, and then, in the submenu that appears, tap [ERASE ALL].



Erasing all the overlay content

To display a scale, use [TOOL MENU: SCALE]. To add annotations, use [TOOL MENU: MEAS/DRAW].

✓ **Mouse**

To perform fine operations, use a commercially available USB or Bluetooth mouse.

11.1 Displaying the [MEAS/DRAW] Menu

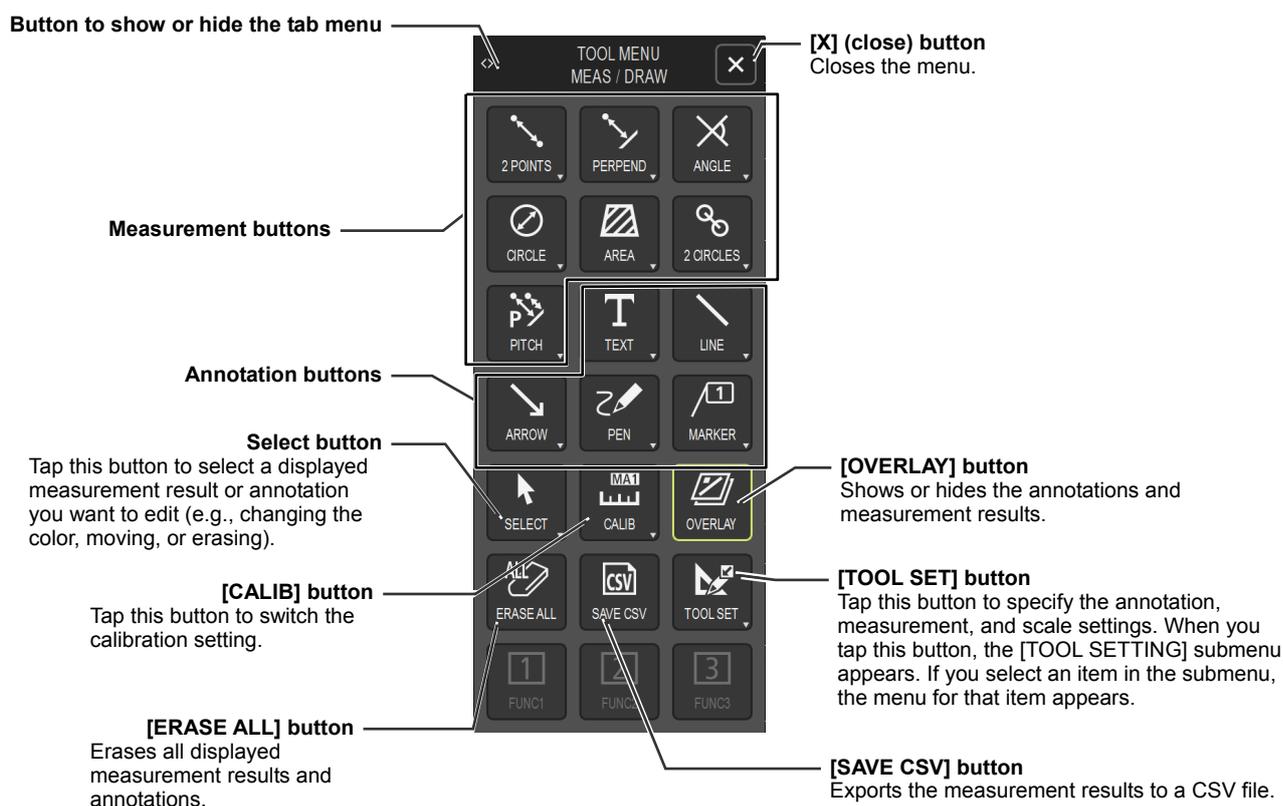
Tap [MENU], and then tap the [MEAS/DRAW] tab in the tab menu.

✓ **Displaying the tab menu**

If the tab menu is not displayed, tap the <> button in a menu screen.

Items displayed in [TOOL MENU: MEAS/DRAW]

The following shows the items displayed in [TOOL MENU: MEAS/DRAW].



Items displayed in [TOOL MENU: MEAS/DRAW]

11.2 Displaying the [SCALE] Menu

Tap [MENU], and then tap the [SCALE] tab in the tab menu.

✓ Displaying the tab menu

If the tab menu is not displayed, tap the <> button in a menu screen.

Items displayed in [TOOL MENU: SCALE]

The following shows the items displayed in [TOOL MENU: SCALE].

The screenshot shows the [TOOL MENU: SCALE] interface. At the top, there is a title bar with 'TOOL MENU' and 'SCALE' and a close button (X). Below this are several rows of buttons and settings:

- Row 1:** Three buttons: 'XY MEAS' (with a grid icon), 'X SCALE' (with a crosshair icon), and 'SCALE BAR' (with a scale bar icon). Each has a small checkbox in the top right corner.
- Row 2:** Two buttons: 'X HAIRS' (with a crosshair icon) and 'GRID' (with a grid icon). Each has a small checkbox in the top right corner.
- Row 3:** Three buttons: 'XY MEAS' (with a water drop icon and a grid icon), 'X SCALE' (with a water drop icon and a crosshair icon), and 'SCALE BAR' (with a water drop icon and a scale bar icon). Each has a dropdown arrow below it.
- Row 4:** Two buttons: 'X HAIRS' (with a water drop icon and a crosshair icon) and 'GRID' (with a water drop icon and a grid icon). Each has a dropdown arrow below it.
- Row 5:** Three buttons: 'SELECT' (with a mouse cursor icon), 'CALIB' (with a 'MAT' icon and a scale bar icon), and 'OVERLAY' (with a grid icon and a diagonal line icon). The 'OVERLAY' button is highlighted with a yellow border.
- Row 6:** Three buttons: 'X HAIRS SET' (with a wrench icon and a crosshair icon), 'GRID SET' (with a wrench icon and a grid icon), and 'TOOL SET' (with a wrench icon and a scale bar icon).
- Row 7:** Three buttons: '1 FUNC1' (with a '1' icon), '2 FUNC2' (with a '2' icon), and '3 FUNC3' (with a '3' icon).

Annotations and descriptions for the interface elements:

- Button to show or hide the tab menu:** Points to the left arrow in the top bar.
- [X] (close) button:** Points to the 'X' icon in the top bar. Description: Closes the menu.
- Checkboxes of the types of items to display:** Points to the checkboxes in the first two rows.
- Scale color settings:** Points to the water drop icons in the third and fourth rows. Description: You can select the color of scales (scale bar, crossed scales, cross-hairs, grid, and bars for XY measurement).
- Select button:** Points to the 'SELECT' button. Description: Tap this button to select a displayed measurement result or annotation you want to edit (e.g., changing the color, moving, or erasing).
- [OVERLAY] button:** Points to the 'OVERLAY' button. Description: Shows or hides the annotations and measurement results.
- [CALIB] button:** Points to the 'CALIB' button. Description: Tap this button to switch the calibration setting.
- [X HAIRS SET] button:** Points to the 'X HAIRS SET' button. Description: Tap this button to specify the cross-hairs settings.
- [GRID SET] button:** Points to the 'GRID SET' button. Description: Tap this button to specify the grid settings.
- [TOOL SET] button:** Points to the 'TOOL SET' button. Description: Tap this button to specify the annotation, measurement, and scale settings. When you tap this button, the [TOOL SETTING] submenu appears. If you select an item in the submenu, the menu for that item appears.

Items displayed in [TOOL MENU: SCALE]

Scale, Annotation, and Measurement Functions

11.3

Changing the Settings of the Scale and Measurement Functions

You can specify the settings of the scale and measurement functions by tapping [TOOL SET] in the [TOOL MENU: MEAS/DRAW] or [TOOL MENU: SCALE] screen.

1 Display the [TOOL MENU: MEAS/DRAW] or [TOOL MENU: SCALE] screen.

2 Tap [TOOL SET].

The [TOOL SETTING] submenu appears. For details about the settings that can be specified in each menu, refer to the following pages.

11.4 Using Scales

You can measure the dimensions of an object by displaying crossed scales, a scale bar, cross-hairs (with concentric circles), or a grid on the screen. You can also display a pair of bars in the X and Y directions.

✔ When adding scales to the live image

When you add a scale to a live image, depending on the status of the subject, you may fail to position the scale at the appropriate location. In such a case, tap [FREEZE], capture a still image, and then display the scale.

✔ Displaying scales on a replayed image

- For the scales displayed over an image saved in TIFF or JPEG format, the calibration setting specified when the image was saved is applied.
- You cannot display scales on a motion image.

✔ Displayed measurement values

- You can change the thickness of measurement lines and the font size of dimension values by using the [TOOL SETTING] screen.
- To change the scale color, tap the desired scale color setting button in the [TOOL MENU: SCALE] screen. You can also change the scale color by tapping [SELECT] to select the target scale.
- Whether to show or hide the scale is retained for each type of scale even when the power is turned off.

✔ Modification of scales and undo/redo operations

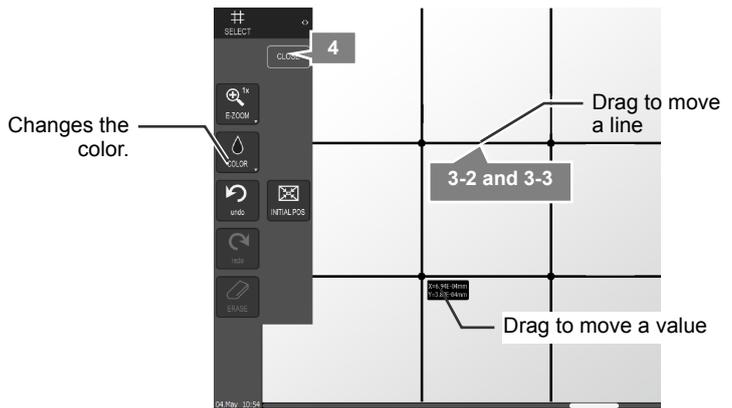
You can change the position and color of a scale by tapping [SELECT], and then selecting the scale. You can also undo or redo the change before closing the selection menu.

To perform operations on a scale, use [TOOL MENU: SCALE]. You can perform the following operations.

11.4.1 Performing XY Measurement

In XY measurement, a pair of vertical bars and a pair of horizontal bars displayed on the screen are used to measure the length between each pair of bars. You can measure the lengths in the X and Y directions at the same time. To do this:

- 1** Display the [TOOL MENU: SCALE] screen.
- 2** Select [XY MEAS].
The X-direction length between vertical bars and the Y-direction length between horizontal bars are displayed beside a bar intersection point.
- 3** Move the measurement bars to the desired positions.
 - 1** Tap [SELECT].
 - 2** Tap and select a bar.
 - 3** Drag the bar to the desired position.
You can move two crossed bars by dragging their intersection.
- 4** Tap [CLOSE] to commit the operation.



Operations for XY measurement

✔ Displayed measurement values

The unit and calibration settings are applied to the displayed measurement values. If you change the settings, the measurement results are updated but the positions of measurement bar do not change.

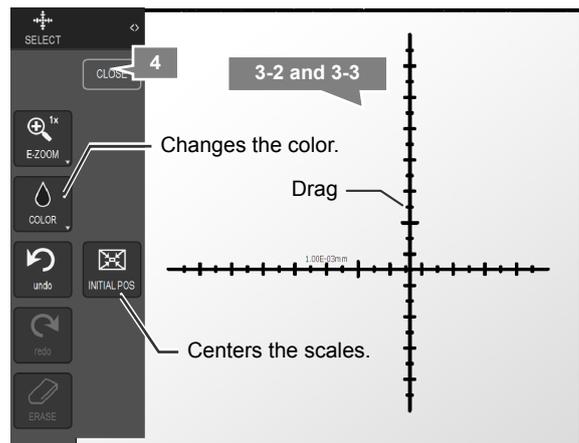
Scale, Annotation, and Measurement Functions

11.4.2 Displaying Crossed Scales

You can display crossed scales (X and Y scales) on the screen.

The crossed scales can be used to measure an approximate size of an object. X- and Y-scale movements are independent, and can be precisely positioned on an object. To do this:

- 1 **Display the [TOOL MENU: SCALE] screen.**
- 2 **Select [X SCALE].**
A scale in the X direction and a scale in the Y direction are displayed.
- 3 **Move each scale to a desired position.**
 - 1 Tap [SELECT].
 - 2 Tap and select a scale.
 - 3 **Drag the scale to the desired position.**
You can move two scales by dragging their intersection.
- 4 **Tap [CLOSE] to apply the measurement result.**



Operations on the crossed scales

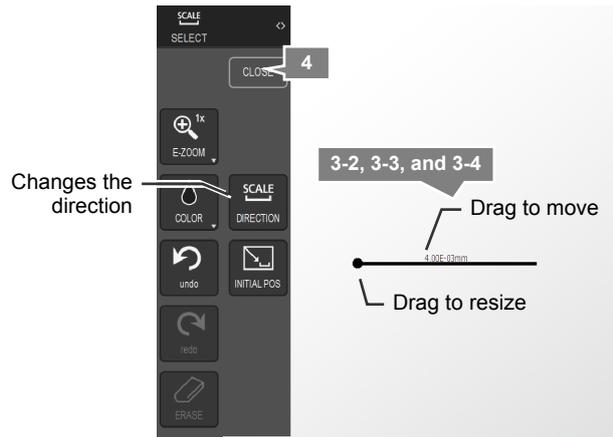
11.4.3 Displaying the Scale Bar

The following describes how to display the scale bar. With the scale bar, you can obtain an approximate size of a subject. To do this:

- 1 Display the [TOOL MENU: SCALE] screen.
- 2 Select [SCALE BAR].
- 3 Move and resize the scale bar as desired.
 - 1 Tap [SELECT].
 - 2 Tap and select the scale bar.
 - 3 Use the mouse to drag an end point of the scale bar to change the length of the scale bar.
 - 4 Use the mouse to drag the scale bar to the desired position.
- 4 Tap [CLOSE] to commit the operation.



[SCALE] Menu



Scale bar operations

✔ Display of the scale bar

- The length of the scale bar is adjusted to provide one significant figure. The minimum length is 1/8 of the width of the image display area.
- The scale bar cannot be rotated at a desired angle.

11.4.4 Displaying Cross-Hairs (with Concentric Circles)

Cross-hairs with concentric circles can be displayed on the screen.

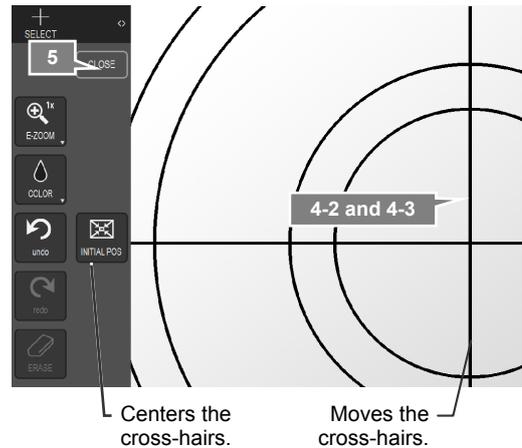
You can use the cross-hairs to make sure that an object is centered, or placed at the correct direction vertically and horizontally. You can move the cross-hairs to a desired position for ease of viewing an object. To do this:

- 1 **Display the [TOOL MENU: SCALE] screen.**
- 2 **Select [X HAIRS].**
The [X HAIRS] menu appears, and cross-hairs (with concentric circles) are displayed on the screen based on the settings specified in the [X HAIRS SETTING] screen.
- 3 **To change the cross-hairs settings, open the [X HAIRS SETTING] screen. For details, refer to "11.4.5 Specifying the Cross-Hairs Settings".**



Displaying cross-hairs (with concentric circles)

- 4 **To move the cross-hairs, perform the following procedure:**
 - 1 Tap [SELECT].
 - 2 Tap and select the cross-hairs.
 - 3 Use the mouse to drag the cross-hairs to a desired position.
- 5 **Tap [CLOSE] to commit the operation.**



Moving the cross-hairs (with concentric circles)

Scale, Annotation, and Measurement Functions

11.4.5 Specifying the Cross-Hairs Settings

Use the [X HAIRS SETTING] screen of [TOOL MENU: SCALE] to specify the cross-hairs settings. With this screen, you can specify the following settings.

- **Concentric circle settings area**

Use the items in this area to specify the settings of concentric circles displayed with cross-hairs.

If [EDIT] is selected:

By tapping a button, you can enter the radius of the corresponding concentric circle (in pixels) to be displayed on the screen.

Minimum: 30

Maximum: 1000

If [NORMAL] is selected:

By tapping a button, you can select whether to display the corresponding concentric circle.

After completing the settings, tap [OK]. The [TOOL MENU: SCALE] screen appears again.

- **[CENTERING] button**

Repositions the cross-hairs and circles to the center.

- **[DASHED] checkbox**

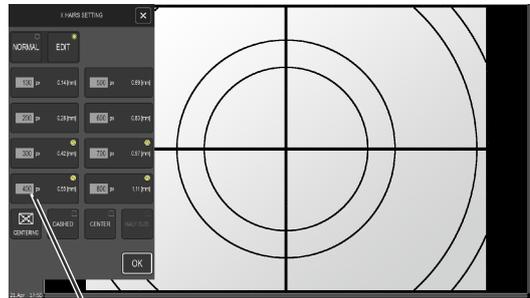
The cross-hairs can be displayed with solid or dashed lines. To display the cross-hairs with dashed lines, select this checkbox. Circles are always displayed with solid lines.

- **[CENTER] checkbox**

To highlight the intersection point of cross-hairs, select this checkbox.

- **[HALF SIZE] checkbox**

To display the cross-hairs in half the normal size, select this checkbox. The size of each concentric circle does not change.



Concentric circle settings area

[X HAIRS SETTING] screen

11.4.6 Displaying a Grid on the Screen

A grid (grid lines) can be displayed on the screen.

The spacing of grid lines can be changed as desired, for example, to place an object in the correct position and orientation.

- 1 Display the [TOOL MENU: SCALE] screen.
- 2 Select the [GRID] checkbox.
A grid is displayed on the screen based on the settings specified in the [GRID SETTING] menu.
- 3 To change the spacing of grid lines, use the [GRID SETTING] menu. For details, refer to "11.4.7 Specifying the Grid Line Settings".



Displaying a grid

11.4.7 Specifying the Grid Line Settings

Use the [GRID SETTING] menu of the [TOOL MENU: SCALE] screen to specify the grid (grid lines) settings. Grid can be set in a horizontal range of 30 to 1000 pixels, and a vertical range of 30 to 1000 pixels.

- **Drawing mode area**

Select a grid drawing mode. You can select [DIRECT CLICK] or [INPUT VALUE] mode.

- **[DIRECT CLICK]**

In this mode, you specify two points on the screen, creating a diagonal traversing line within a rectangle. Grid lines are drawn vertically and horizontally at the spacing determined by the rectangle's width and height.

To redraw grid lines, tap [CLEAR] to clear the grid, and then respecify the two points.

- **[INPUT VALUE]**

In this mode, you specify the vertical spacing and horizontal spacing of grid lines with numerical values, and then select [LEFT UPPER] or [CENTER] as the reference position.

- **[CLEAR] button**

Clears the grid settings. This button appears only in [DIRECT CLICK] mode.

- **[WIDTH] field**

Enter a numerical value (in pixels) as the spacing of vertical grid lines. When you tap this field, a software keyboard appears. This field appears only in [INPUT VALUE] mode.

- **[HEIGHT] field**

Enter a numerical value (in pixels) as the spacing of horizontal grid lines. When you tap this field, a software keyboard appears. This field appears only in [INPUT VALUE] mode.

- **Tap [OK] to apply the values you entered.**

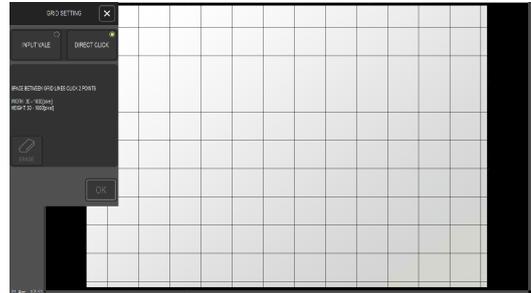
- **Unit displayed**

In the unit display area, the length in the unit specified in the [TOOL SETTING] screen is displayed. If a digit overflow occurs, the unit is automatically changed.

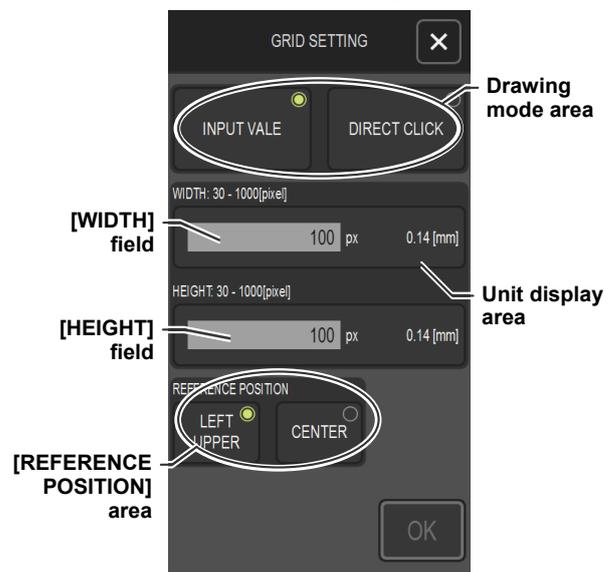
- **[REFERENCE POSITION] area**

Select [LEFT UPPER] or [CENTER] as the reference position of grid lines. This area is available only in [INPUT VALUE] mode.

If you select first the DIRECT CLICK mode and then change the mode to INPUT VALUE, reference position may not be set to either of the above. In that case, reference position (coordinate of the intersection at the upper-left most point) of a grid set by a direct click is applied.



[TOOL SETTING: GRID] screen



[TOOL SETTING: GRID] Screen ([INPUT VALUE] mode)

11.5 Adding Annotations to Images

You can add lines, comments, and other annotations to images.

✔ For live images

When adding an annotation to an object in a live image, you may fail to add it at the desired position, depending on the status of the object. In such a case, tap [FREEZE], capture a still image, and then add the annotation to the still image.

✔ Display of annotations

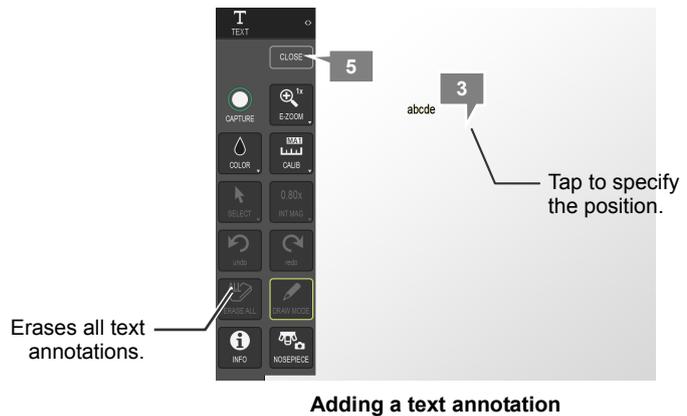
- Display of annotations is not affected by changes to the unit and calibration settings.
- The line thickness and font size settings can be changed by using the [TOOL SETTING] screen. Note that these settings are applied to all annotations displayed by the annotation and measurement functions.
- To select the color of annotations to be added, select the desired annotation tool, and then tap [COLOR]. To change the color of annotations that have already been drawn, select the target annotation from the [SELECT] menu, and then tap the desired color.
- You cannot selectively show or hide only annotations. You can only display or hide added information on an overlay basis.
- We recommend that you use a mouse.

To operate the annotation function, use [TOOL MENU]. You can perform the following operations.

11.5.1 Adding a Text Annotation

You can add a text annotation at any position on the screen.

- 1 Display [TOOL MENU: MEAS/DRAW].
- 2 Tap [TEXT].
- 3 On the screen, specify the position at which you want to add a text annotation.
- 4 Enter text (a maximum of 32 characters), and then tap [OK].
To add another text annotation, repeat steps 3 and 4.
- 5 Tap [CLOSE] to close the [TEXT] menu.



Adding a text annotation

✓ To move or rotate an existing text annotation

To move or rotate an existing text annotation, use the [TEXT] menu to perform the following procedure:

- (1) Tap [SELECT].
- (2) Tap and select the text annotation you want to edit.
- (3) Move or rotate the text annotation. (You cannot change the text itself.)
 - You can move the text annotation by mouse dragging.
 - You can rotate the text annotation by mouse-dragging an end point of the text annotation.
- (4) To display the [TEXT] menu again, tap [X] on the [SELECT] menu.

11.5.2 Drawing Straight Lines and Arrows

By specifying two points on the screen, you can draw a straight line or arrow between the two points.

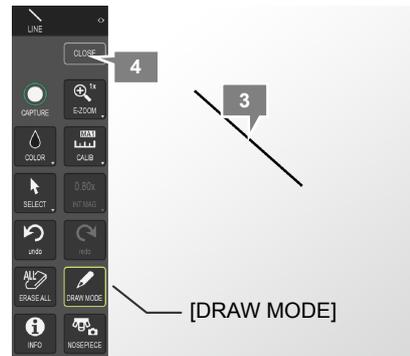
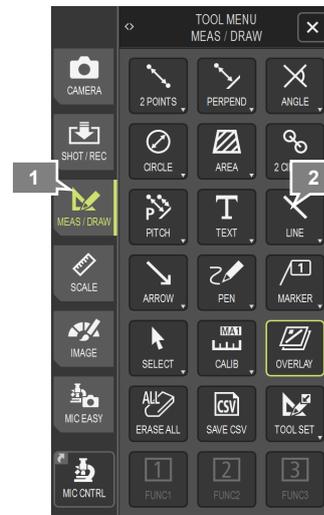
- 1 Display [TOOL MENU: MEAS/DRAW].
- 2 Tap [LINE] or [ARROW].
- 3 On the screen, draw a straight line or arrow by dragging the mouse pointer from the starting point to the end point.

To use a drag or swipe operation to move an image enlarged by electronic zoom, tap [DRAW MODE], and then select [MOVE MODE].

If an image has been enlarged by electronic zoom, you cannot draw a line beyond the image display area.

To draw another straight line or arrow, repeat the above steps.

- 4 Tap [CLOSE] to close the [LINE] or [ARROW] menu.



Drawing a straight line

✔ To edit an existing straight line or arrow

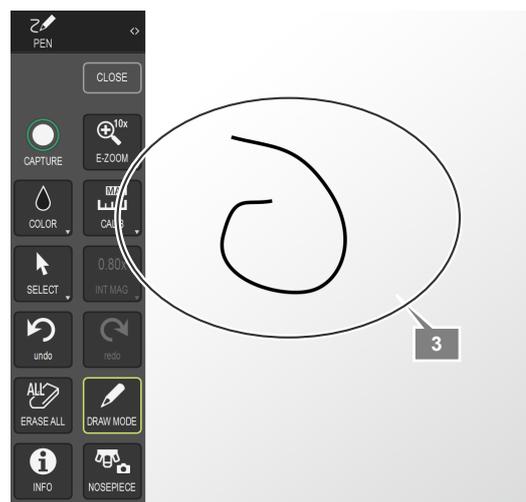
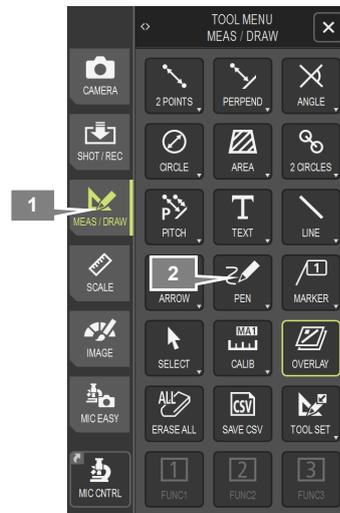
You can change the length or rotation angle of an existing straight line or arrow. To do this:

- (1) Tap [SELECT].
- (2) Tap and select the straight line or arrow that you want to edit.
- (3) Edit the straight line or arrow.
 - You can move the straight line or arrow by mouse dragging.
 - By mouse-dragging an end point of the straight line or arrow, you can change its length or rotation angle.
- (4) To redisplay the [LINE] or [ARROW] menu, tap [X] on the [SELECT] menu.

11.5.3 Drawing Free-hand Lines

You can draw a free-hand line on the screen. To do this:

- 1 **Display [TOOL MENU: MEAS/DRAW].**
- 2 **Tap [PEN].**
- 3 **Drag the mouse pointer to draw a line.**
 To use a drag or swipe operation to move an image, tap [DRAW MODE] to enter MOVE mode.
 To draw another line, repeat the above steps.
 If an image has been enlarged by electronic zoom, you cannot draw a line beyond the image display area.
- 4 **Tap [CLOSE] to close the [PEN] menu.**



Drawing a free-hand line

✔ To move an existing free-hand line

You can move an existing free-hand line. To do this:

- (1) Tap [SELECT].
- (2) Tap and select the line that you want to move.
- (3) Move the line by mouse dragging.
- (4) To redisplay the [PEN] menu, tap [X] on the [SELECT] menu.

11.5.4 Using Markers to Number Points

You can add numbered markers at any points on the screen to count the number of points.

Markers are sequentially numbered for each color. You can use a maximum of six colors. If some numbered markers of the same color are deleted, the remaining markers are renumbered.

- 1 Display the [TOOL MENU: MEAS/DRAW] screen.
- 2 Tap [MARKER].
- 3 Tap [COLOR], and then select the color of markers to be added.

A marker counter is provided for each color.

- 4 Sequentially specify points on the screen.

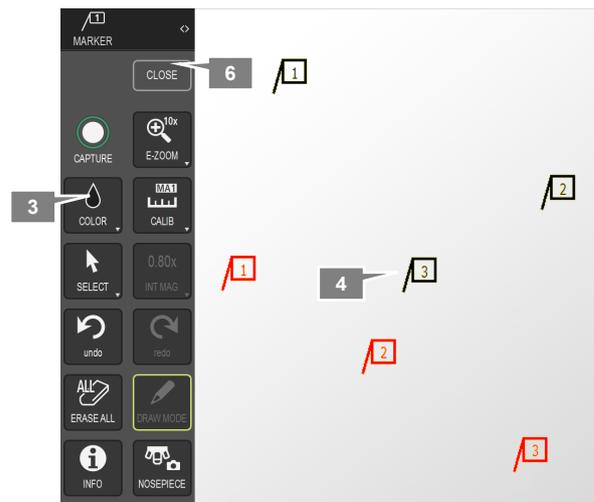
Sequentially numbered markers are displayed at the specified points.

- 5 To change the marker color, on the [MARKER] menu, tap the [COLOR] button, and then select the desired color.

The counter of each color starts with 1.

The counter value of each color is retained and is not reset when the color is changed.

- 6 Tap [CLOSE] to close the [MARKER] menu.



Adding markers

✔ To move an existing marker

You can move an existing marker. To do this:

- (1) Tap [SELECT].
- (2) Select the marker that you want to move.
- (3) Move the marker by mouse dragging.
- (4) To redisplay the [MARKER] menu, tap [X] on the [SELECT] menu.

Use the [TOOL MENU: MEAS/DRAW] screen to perform measurement operations. This chapter describes the operations that can be performed by using the measurement function.

✔ Mouse

To perform fine operations, use a commercially available USB or Bluetooth mouse.

✔ Measurement and operability

Operability of the measurement and annotation functions is degraded if the number of times measurement is performed exceeds 50. Make sure that you perform no more than 50 measurement operations for one image.

✔ When the measurement results are cleared

Measurement results on the screen are automatically cleared (erased) when the following operations are performed:

- **Changing the displayed image:** After you have added annotations and measurement results to a playback image, if you change the image, the annotations and measurement results displayed on the playback image are cleared. Also, after you have added annotations and measurement results to a playback image, if you switch to LIVE mode and capture a live image, the annotations and measurement results displayed on the playback image are cleared.
- **Flipping a live image:** If you use the [MAIN] screen of the [DS SETUP] menu to flip a live image, the annotations and measurement results are cleared.
- **Erasing all:** In LIVE mode, when [ERASE ALL] is executed from [TOOL MENU: MEAS/DRAW], the annotations and measurement results displayed on the live image are cleared. In VIEW mode, when [ERASE ALL] is executed from [TOOL MENU: MEAS/DRAW], the annotations and measurement results displayed on the playback image are cleared.
- If you use a DS - Ri2 or another camera whose FOV setting can be changed and you change its FOV setting, the annotation and measurement results are automatically cleared.

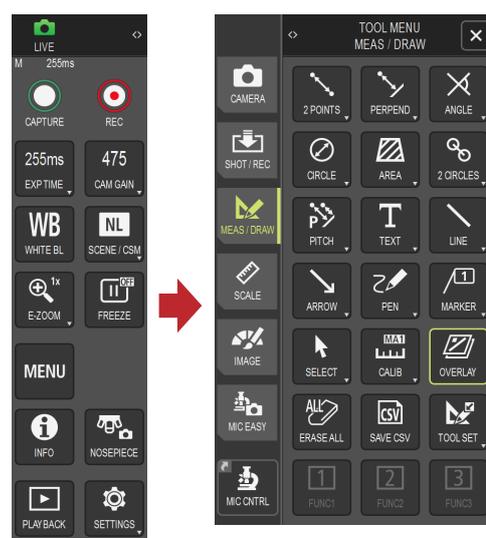
12.1

Displaying the [MEAS/DRAW] Menu

Tap [MENU], and then tap the [MEAS/DRAW] tab in the tab menu.

✔ Displaying the tab menu

If the tab menu is not displayed, tap the <> button in a menu screen.



Displaying the [MEAS/DRAW] menu

12.2 On-Screen Measurement

With on-screen measurement, you can measure, for example, a length, angle, circle diameter, and the area of a polygon in an image.

! Calibration setting

- Before starting the measurement, make sure that you have selected the correct calibration setting. If you change the calibration setting during measurement, the measurement results are updated based on the new calibration setting.
- The number and comment on the selected calibration setting are displayed in the comment display area in the bottom of the [INFO: CAMERA] window.
- If you use a DS-Ri2 or another camera whose FOV setting can be changed and you change its FOV setting, you must re-register the settings of the MANUAL calibration mode.

✔ Measurement for a live image

When you perform measurement for a live image, depending on the subject, the measurement result may not be placed appropriately. In such a case, tap [FREEZE], capture a still image, and then perform measurement by using the still image.

✔ Measurement for a playback image

While you are viewing an image saved in TIFF or JPEG format, if you perform measurement, the calibration setting that was specified when the image was saved is applied.

✔ Displayed measurement values

- The unit and calibration settings are dynamically applied to the displayed measurement values. If you change the settings, the measurement results are updated but the positions of scales do not change. Note that the measurement values and units embedded in images are not updated.
- While the [SELECT] menu is displayed, you can move measurement results by mouse dragging.
- If you move a scale line, the position of a measurement value is reset to the default position.
- You can change the thickness of scale lines and the font size of dimension values by using the [TOOL SETTING] screen.
- To change the color of scale lines to be drawn, select the desired measurement tool, and then tap [COLOR]. To change the color of scale lines that have already been drawn, select the target measurement tool from the [SELECT] menu, and then tap the desired color.

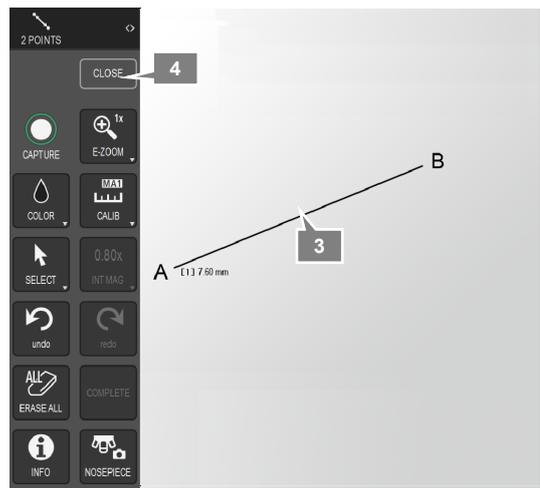
✔ Undo and redo operations

You can undo and redo measurement operations performed with a measurement submenu before you close the submenu. To undo a measurement operation, tap the [undo] button. To repeat a measurement operation, tap the [redo] button.

12.2.1 Measuring the Length Between Two Points

You can measure the length between two points specified on an image.

- 1 Display the [TOOL MENU: MEAS/DRAW] screen.
- 2 Tap [2 POINTS].
- 3 On the screen, specify two arbitrary points (A and B in the figure), and check the length between the two points.
To continue measurement, repeat the above steps.
- 4 To terminate measurement, tap [CLOSE] to redisplay the [TOOL MENU: MEAS/DRAW] screen.



Measuring the length between two points

✔ Adjusting measurement results

You can adjust a measurement result that you have added to an image. To do this:

- (1) Tap [SELECT].
- (2) Select a desired measurement result.
- (3) Adjust the measurement result.
 - You can move the displayed value of a measurement result by mouse dragging.
 - You can move scale lines by mouse dragging.
 - You can resize or rotate a scale line by mouse-dragging a line end point.
- (4) To redisplay the [2 POINTS] menu, tap [X] in the [SELECT] menu.

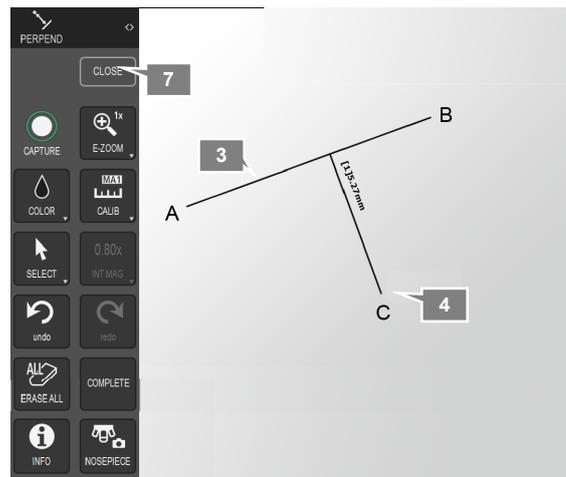
12.2.2 Measuring the Length of a Perpendicular Line

You can measure the length of a line that is perpendicular to a base line drawn between two points that you specify on the screen.

- 1 Display the [TOOL MENU: MEAS/DRAW] screen.
- 2 Tap [PERPEND].
- 3 Draw a measurement base line by specifying its end points (A and B in the figure).
- 4 Specify the point to which you want to measure the distance from the base line (C in the figure).
When this point is specified, a perpendicular line is drawn from the point to the base line, and the length of the line is displayed.
- 5 Repeat step 4 to continue measuring another perpendicular line from the same base line.
- 6 To perform measurement by using a new base line, tap [COMPLETE] or click the right mouse button to terminate measurement using the current base line. Then, repeat the procedure from step 3.

If the Capture function is assigned to the right mouse button, tap [COMPLETE], instead of clicking the right mouse button.

- 7 To terminate measurement, tap [CLOSE] to redisplay the [TOOL MENU: MEAS/DRAW] screen.



Measuring a distance from the base line

✓ Adjusting measurement results

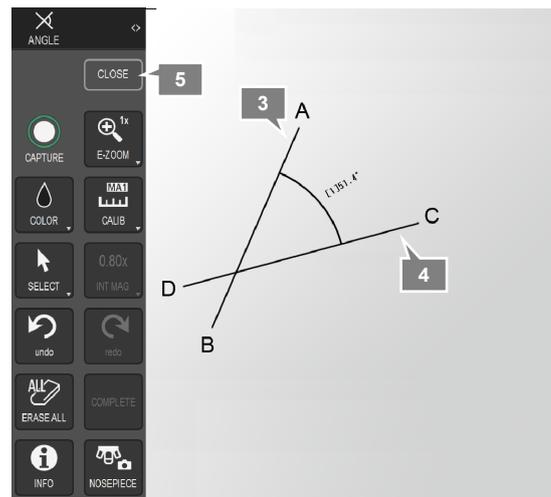
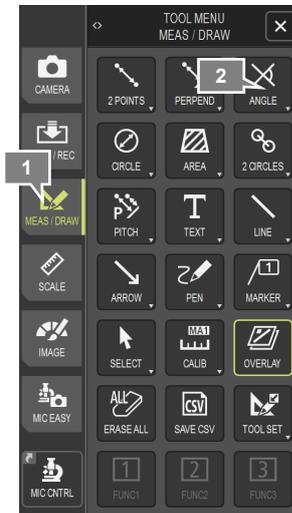
You can adjust a measurement result that you have added to an image. To do this:

- (1) Tap [SELECT].
- (2) Select a desired measurement result.
- (3) Adjust the measurement result.
 - You can move the displayed value of a measurement result by mouse dragging.
 - You can move scale lines by mouse dragging.
 - You can change the length of a scale line or the angle between scale lines by mouse-dragging a line end point.
- (4) To redisplay the [PERPEND] menu, tap [X] in the [SELECT] menu.

12.2.3 Measuring an Angle

You can measure an angle between two straight lines drawn on the screen. To do this:

- 1 Display the [TOOL MENU: MEAS/DRAW] screen.
- 2 Tap [ANGLE].
- 3 Specify two arbitrary points (A and B in the figure) on the screen so that the first line is drawn.
The two points you specify become the starting and end points of a line.
- 4 Specify two arbitrary points (C and D in the figure) on the screen so that the second line is drawn.
When the second line is drawn, the angle between two lines is displayed.
In cases such as if the two lines are completely overlapped or parallel, the angle cannot be measured and "NG" is displayed.
To continue measurement, repeat steps 3 and 4.
- 5 To terminate measurement, tap [CLOSE] to redisplay the [TOOL MENU: MEAS/DRAW] screen.



Measuring an angle

✓ Adjusting measurement results

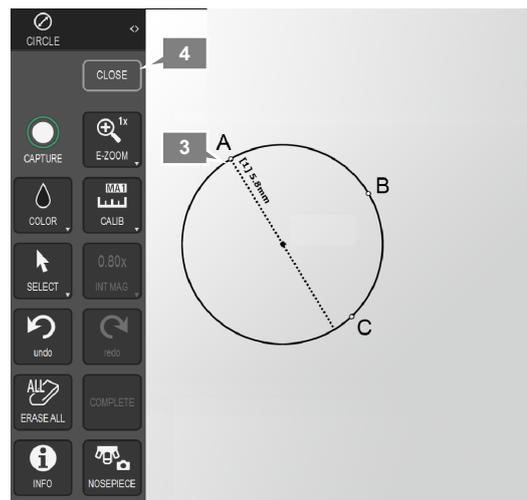
After measuring an angle, you can adjust the measurement result. To do this:

- (1) Tap [SELECT].
- (2) Select a desired measurement result.
- (3) Adjust the measurement result.
 - You can move the displayed value of a measurement result by mouse dragging.
 - You can move scale lines by mouse dragging.
 - You can resize or rotate a scale line by mouse-dragging a line end point.
- (4) To redisplay the [ANGLE] menu, tap [X] in the [SELECT] menu.

12.2.4 Measuring the Diameter of a Circle

You can measure the diameter of a circle that you draw on the screen. To do this:

- 1 Display the [TOOL MENU: MEAS/DRAW] screen.
- 2 Tap [CIRCLE].
- 3 On the screen, specify three points (A, B, and C in the figure) to draw a circle determined by those points.
A circle whose circumference passes through the three points is drawn, and the diameter of the circle is displayed.
To continue measurement, repeat the above steps.
- 4 To terminate measurement, tap [CLOSE] to redisplay the [TOOL MENU: MEAS/DRAW] screen.



Measuring the diameter of a circle

✓ Adjusting measurement results

After measuring the diameter of a circle, you can adjust the measurement result. To do this:

- (1) Tap [SELECT].
- (2) Select a desired measurement result.
- (3) Adjust the measurement result.
 - You can move the displayed value of a measurement result by mouse dragging.
 - You can move a circle by mouse-dragging its circumference.
 - You can resize a circle by mouse-dragging one of the three points on the circumference of the circle.
- (4) To redisplay the [CIRCLE] menu, tap [X] in the [SELECT] menu.

12.2.5 Measuring the Area of a Polygon

You can measure the area of a polygon drawn on the screen. To do this:

- 1 Display the [TOOL MENU: MEAS/DRAW] screen.
- 2 Tap [AREA].
- 3 On the screen, specify points as the vertexes of a polygon. (The figure shows an example of drawing a four-sided figure by specifying four points, A, B, C, and D.)
- 4 Tap [COMPLETE] or click the right mouse button.

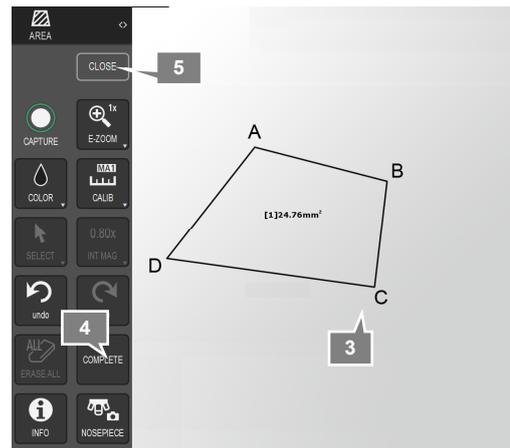
If the Capture function is assigned to the right mouse button, tap [COMPLETE], instead of clicking the right mouse button.

As you specify points, sides are drawn sequentially. When the ending point (D in the figure) and the starting point (A in the figure) are connected, a polygon is produced, and the area of the polygon is displayed.

Note: Do not draw a figure where sides cross each other.
For such a figure, the area cannot be measured correctly, and "NG" is displayed.

To continue measurement, repeat steps 3 and 4.

- 5 To terminate measurement, tap [CLOSE] to redisplay the [TOOL MENU: MEAS/DRAW] screen.



Measuring the area of a polygon

✔ Adjusting measurement results

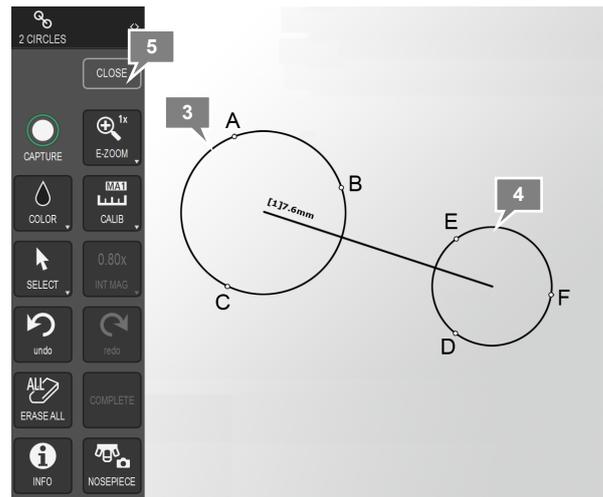
After measuring the area of a polygon, you can adjust the measurement result. To do this:

- (1) Tap [SELECT].
- (2) Select a desired measurement result.
- (3) Adjust the measurement result.
 - You can move the displayed value of a measurement result by mouse dragging.
 - You can move a polygon by mouse-dragging a side of the polygon.
 - You can change the shape of a polygon by mouse-dragging a vertex.
- (4) To redisplay the [AREA] menu, tap [X] in the [SELECT] menu.

12.2.6 Measuring the Length Between the Centers of Two Circles

You can measure the length between the centers of two circles drawn on the screen. To do this:

- 1 Display the [TOOL MENU: MEAS/DRAW] screen.
 - 2 Tap [2 CIRCLES].
 - 3 On the screen, specify three points (A, B, and C in the figure) to draw a circle (as the first circle) determined by those points.
A circle whose circumference passes through the three points is drawn.
 - 4 On the screen, specify three points (D, E, and F in the figure) to draw a circle (as the second circle) determined by those points.
Another circle whose circumference passes through the three points is drawn. Then, a straight line is drawn between the centers of two circles, and the length of the straight line is displayed.
- To continue measurement, repeat steps 3 and 4.
- 5 To terminate measurement, tap [CLOSE] to redisplay the [TOOL MENU: MEAS/DRAW] screen.



Measuring the length between the centers of two circles

✓ Adjusting measurement results

After measuring the length between the centers of two circles, you can adjust the measurement result. To do this:

- (1) Tap [SELECT].
- (2) Select a desired measurement result.
- (3) Adjust the measurement result.
 - You can move the displayed value of a measurement result by mouse dragging.
 - You can move the two circles by mouse-dragging the straight line between the centers of the circles.
 - You can resize a circle by mouse-dragging one of the three points on the circumference of the circle.
- (4) To redisplay the [2 CIRCLES] menu, tap [X] in the [SELECT] menu.

12.2.7 Measuring a Pitch

First, specify two points to draw a base line between them. Then, specify each point to which you want to measure the length from the base line. For the points except the first one, the point pitch (length from the previous point on the base line) is displayed.

- 1 Display the [TOOL MENU: MEAS/DRAW] screen.
- 2 Tap [PITCH].
- 3 On the screen, specify two arbitrary points (A and B in the figure) to draw a base line.

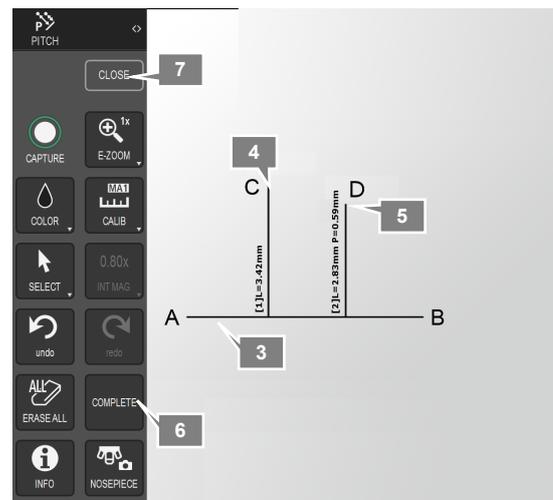
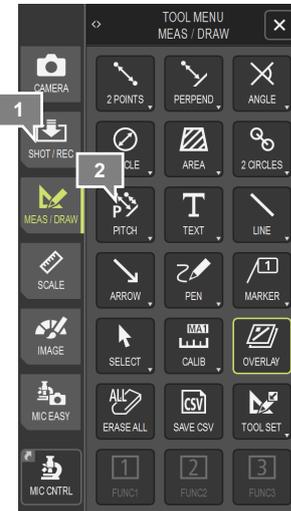
The two points you specify become the starting and end points of a base line.

- 4 Specify points to which you want to measure the length from the base line. (The figure shows an example of specifying two points, C and D.)

Each time you specify a point, a perpendicular line is drawn from the point to the base line, and the length of the perpendicular line is displayed.

For the points except the first one, the point pitch (length from the previous point on the base line) is also displayed.

- 5 To continue measurement using the same base line, repeat step 4.
 - 6 To perform measurement using a new base line, tap [COMPLETE] or click the right mouse button. Then, restart the procedure from step 3.
- If the Capture function is assigned to the right mouse button, tap [COMPLETE], instead of clicking the right mouse button.
- 7 To terminate measurement, tap [CLOSE] to redisplay the [TOOL MENU: MEAS/DRAW] screen.



Measuring a pitch

✓ Adjusting measurement results

After measuring the pitch between points, you can adjust the measurement result. To do this:

- (1) Tap [SELECT].
- (2) Select the desired measurement result.
- (3) Adjust the measurement result.
 - You can move the displayed value of a measurement result by mouse dragging.
 - You can move scale lines by mouse dragging.
 - You can resize or rotate a scale line by mouse-dragging a line end point.
- (4) To redisplay the [PITCH] menu, tap [X] in the [SELECT] menu.

12.3 Operations That Can Be Performed for Measurement Results

12.3.1 Erasing All Measurement Results

You can erase all drawings, including measurement results, from the overlay. To do this, tap the [ERASE ALL] button in the [TOOL MENU: MEAS/DRAW] screen.

When you tap the button, a confirmation message is displayed. If you are sure you want to erase all drawings, tap [Yes]. To cancel the operation, tap [No].

Tapping [Yes] erases all drawings, including all measurement results, annotations, straight lines, arrows, free-hand lines, and markers.



Erasing all measurement results

✓ [ERASE ALL] button of a specific measurement or drawing menu

If you tap [ERASE ALL] in a specific measurement or drawing menu, only the relevant measurement or drawing result is erased.

12.3.2 Exporting Measurement Results to a CSV File

You can export measurement results to a CSV file (a text file with an extension of ".csv") by tapping [SAVE CSV] in the [TOOL MENU: MEAS/DRAW] screen. The save destination of CSV files is the same as that of images.

For details about the items that are output to a CSV file, refer to "10.1.2 Specifying the Basic Settings of the Annotation and Measurement Functions".



Export to a CSV file

✓ Automatic export of a CSV file

You can set the DS-L4 to export measurement results to a CSV file automatically when you capture an image. For details, refer to "10.1.2 Specifying the Basic Settings of the Annotation and Measurement Functions". When [SCREEN CAP MODE] is turned on for the still image setting, image data is not saved to a CSV file. Additionally, a CSV file is not saved when a motion image is saved.

Part 5

Changing Settings

This part describes how to change the initial settings of the DS-L4 by using the [DS SETUP] menu.

This part consists of the following chapters:

- Chapter 13 Changing Settings

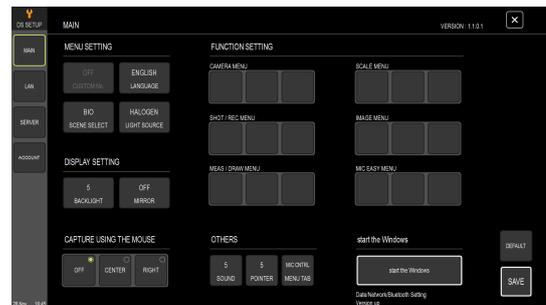
This chapter describes how to change settings of the DS-L4.

13.1 Using the [DS SETUP] Menu

Displaying the [DS SETUP] Menu

To display the [DS SETUP] menu, from the LIVE or VIEW menu, tap [SETTINGS], and then [DS SETUP].

The buttons displayed on the left side of the [DS SETUP] menu can be used to change the setup screen.



[DS SETUP] menu

[DS SETUP] screens

The following table describes the screens of the [DS SETUP] menu.

Item	Description	See
MAIN	Use this screen to specify the basic settings of the DS-L4. You can specify the custom setting to be applied at startup, menu-related settings, display settings, function button settings, capture settings, and other settings. You can also start Windows when you want to specify the system settings.	13.2
LAN (NETWORK)	This screen displays the network settings when the DS-L4 is connected to a network. The displayed information includes the SoftAP (software access point), wired LAN, and wireless LAN settings. The information displayed on this screen cannot be changed. To specify the settings displayed on this screen, you must start Windows by tapping [DS SETUP] > [MAIN] > [Start the Windows].	13.3
SERVER (NETWORK DRIVE LIST)	Use this screen to specify the settings for connection to network drives (SMB servers) as image save locations. You can register a maximum of five network drives.	13.4
ACCOUNT (USER MANAGEMENT)	Use this screen to register, change, and delete users of the DS-L4 or users who use viewer terminals to obtain images from the DS-L4.	13.5

Saving and initializing the settings

In the [MAIN] screen, you can save the settings by tapping [SAVE] or initialize the settings by tapping [DEFAULT]. In the [ACCOUNT: USER MANAGEMENT] screen, you can save the settings by tapping [SAVE].

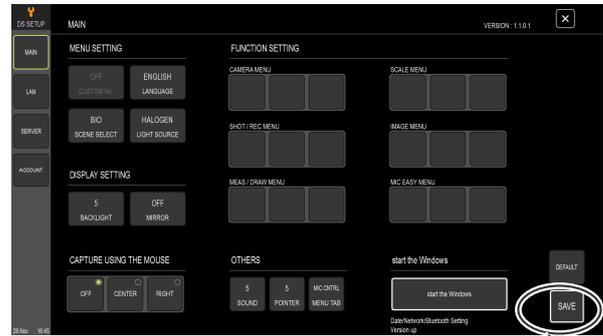
- **Saving the settings**

When you have specified the settings on a screen, tap the [SAVE] button on the screen. If you tap [x] without tapping [SAVE], a confirmation message appears. If you respond with [Yes] to the message, the changes to settings are lost.

! Save the settings on each screen.

If you change the settings on a screen of the [DS SETUP] screen, save the settings before you change the screen.

If you change or close the screen without saving the settings, the changes to the settings are lost, and the previous settings are restored.



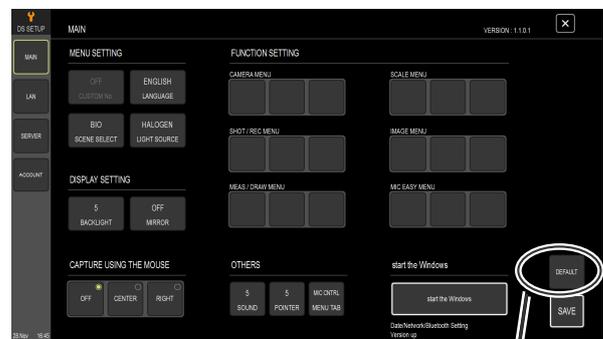
Saves the settings.

Saving the settings

- **Initializing the settings**

To initialize the settings of the [MAIN] screen, tap [DEFAULT]. A confirmation message appears. To initialize the settings, select [Yes]. The changes to the settings are lost, and all settings on all screens are initialized and saved.

To close the confirmation message without initializing the settings, select [no].



Initializes the settings.

Initializing the settings

13.2 Specifying the Basic Settings

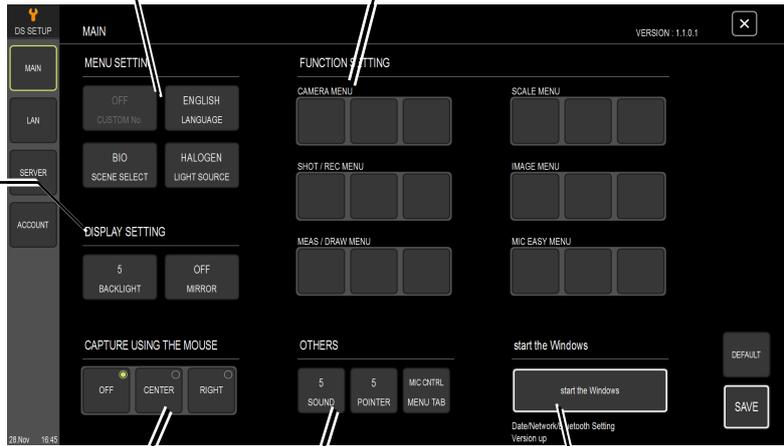
— [MAIN] screen —

Items displayed in the [MAIN] screen

[MENU SETTING] area
 You can specify the custom setting to be applied at startup, scene mode, light source of the microscope, and display language.

[FUNCTION SETTING] area
 Select the functions to be assigned to the function buttons ([FUNC1] to [FUNC3]) in the bottom of the following menu screens: CAMERA MENU, SHOT/REC MENU, MEAS/DRAW MENU, SCALE MENU, IMAGE MENU, and MIC EASY MENU.

[DISPLAY SETTING] area
 You can specify the display backlight settings and settings for flipping images.



[CAPTURE USING THE MOUSE] area
 You can assign the capture function to the center or right mouse button.

[Start the Windows] area
 You can terminate the DS-L4 application and display the Windows login window. By logging in as a Windows administrator, you can, for example, set the date and time, specify the network settings, connect a Bluetooth device, and update the DS-L4 application by using the DS-L4 Administration Tool on the desktop.

[OTHERS] area
 You can set the volume of capture sound and speed of the mouse pointer. You can also specify the settings related to the tab menu.

Items displayed in the [MAIN] screen

13.2.1 Specifying the Menu-related Settings

— [MENU SETTING] area —

The menu settings that can be specified ([SETTINGS] > [DS SETUP] > [MAIN] > [MENU SETTING]) are described below.

(1) Calling a custom setting at startup

A desired custom setting can be automatically called when the DS-L4 is turned on. To do this:

- 1 Display the [MAIN] screen.
- 2 in the [MENU SETTING] area, tap [CUSTOM No.].
- 3 Select the number of the custom setting to be called at startup.
- 4 Tap [SAVE].



Custom setting to be called at startup

Custom setting options

Option	Description
OFF	No custom setting is used at startup. The photographing conditions existing when the DS-L4 was previously turned off are restored. (Initial setting)
CUSTOM1 to CUSTOM7	When the DS-L4 power is turned on, the selected custom setting is called. The custom setting that is used is displayed on the [SCENE/CSM] button in [CAMERA MENU].

(2) Switching the language

You can switch the display language between English and Japanese. The key layout of the software keyboard is changed according to the selected language.

- 1 Display the [MAIN] screen.
- 2 In the [MENU SETTING] area, tap the [LANGUAGE] button.
The [LANG] submenu appears.
- 3 Select the desired language.
- 4 Tap [SAVE].



Switching the display language

Language options

Option	Description
ENGLISH	Switches the display language to English. (Initial setting)
日本語	Switches the display language to Japanese.

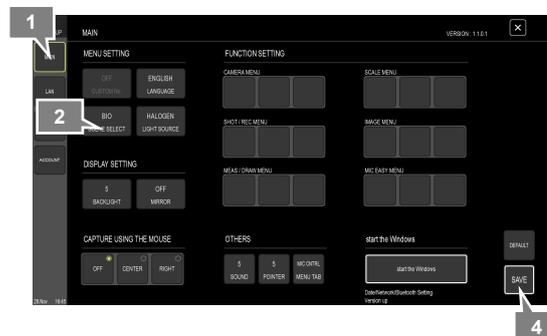
✔ USB or Bluetooth keyboard layout

If a USB or Bluetooth keyboard is connected, selection of the display language affects the keyboard layout. If English is selected, the DS-L4 recognizes that a US keyboard is connected. If Japanese is selected, the DS-L4 recognizes that a Japanese (JIS-compliant) keyboard is connected. The positions of some keys on the English and Japanese keyboards are different. Therefore, the input method for some symbols differ depending on the keyboard.

(3) Changing the preset type of scene modes

The scene modes available to the user can be changed by selecting the type of scenes ([IND], [BIO], or [OTHERS]) according to the object to be observed. You can preset selection of the scene type. To do this:

- 1 Display the [MAIN] screen.
- 2 In the [MENU SETTING] area, tap [SCENE SELECT].
- 3 Select the type of scenes.
- 4 Tap [SAVE].



Selecting the type of scenes

Types of scenes

Type	Description
IND	Scene modes suitable for industrial microscopes are available.
BIO	Scene modes suitable for biological microscopes are available. (Initial setting)
OTHERS	Scene modes suitable for observation of asbestos are available.

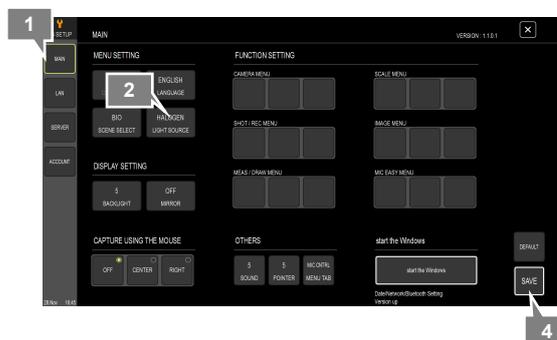
✔ Selecting a scene mode

To select a desired scene mode, tap [SCENE/CSM] in the LIVE menu. For details on scene modes, refer to "8.1.1 Using a Scene Mode or Custom Setting".

(4) Setting the light source of the microscope

You can select [HALOGEN] or [LED] as the light source used by the microscope. To do this:

- 1 Display the [MAIN] screen.
- 2 In the [MENU SETTING] area, tap [LIGHT SOURCE].
- 3 Select the type of light source used by the microscope.
- 4 Tap [SAVE].



Setting the microscope light source

Light source options

Option	Description
HALOGEN	Select this when a halogen lamp is used for the light source of the microscope. (Initial setting)
LED	Select this when LED illumination is used for the light source of the microscope.

✔ Light source setting and scene mode

If [LED (BIO MIC)] is selected as the light source, [HE] and [ELISA] are not displayed as scene modes of the [BIO] type. If you want to stain an object by the HE or ELISA method during observation using the LED light source, select [BF] as the scene mode.

✔ Before selecting [LED]

If [LED (BIO MIC)] is selected, the DS-L4 settings are optimized for the eco-illumination system, the high-intensity LED used for Nikon ECLIPSE Ci-E/Ci-L, E100, E200, and other microscope models.

For details on the supported models, contact your nearest Nikon representative.

13.2.2 Specifying the Display Settings

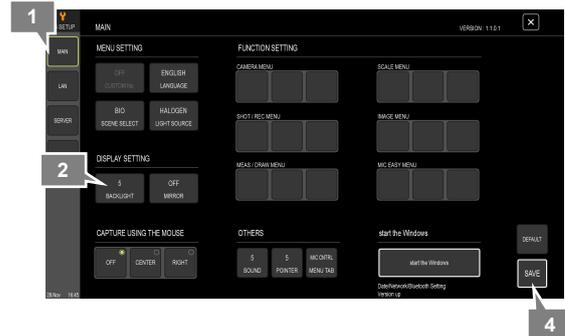
— [DISPLAY SETTING] area —

The display settings that can be specified ([SETTINGS] > [DS SETUP] > [MAIN] > [DISPLAY SETTING]) are described below.

(1) Specifying the display backlight setting

You can set the brightness of the display backlight. To do this:

- 1 Display the [MAIN] screen.
- 2 In the [DISPLAY SETTING] area, tap [BACKLIGHT].
- 3 Adjust the brightness of the backlight of the built-in display.
- 4 Tap [SAVE].



Backlight setting

Backlight options

Option	Description
0 to 10	Set the appropriate value for brightness in accordance with the operating environment. (Initial setting: 5)

(2) Flipping the image

You can flip or invert the live image. If necessary, flip or invert the image according to the position or condition of the camera.

- 1 Display the [MAIN] screen.
- 2 In the [DISPLAY SETTING] area, tap [MIRROR].
- 3 Tap one of the displayed option buttons to select the mode in which you want to display the live image.
- 4 Tap [SAVE].



Settings for flipping or inverting the image

Image flip options

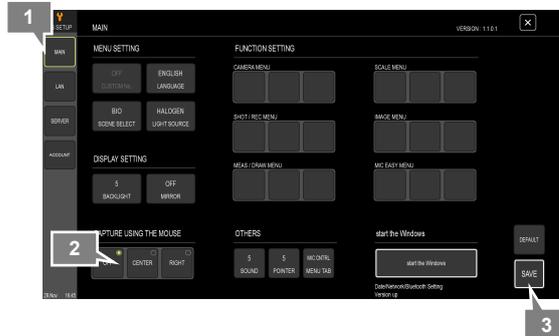
Option	Description
OFF	The image is not flipped or inverted. (Initial setting)
H	The image is flipped horizontally.
V	The image is flipped vertically.
180°	The image is rotated by 180 degrees.

13.2.3 Assigning the Capture Function to the Center/Right Mouse Button

— [CAPTURE USING THE MOUSE] area —

You can assign the Capture function to a mouse button ([SETTINGS] > [DS SETUP] > [MAIN] > [CAPTURE USING THE MOUSE]). To do this:

- 1 Display the [MAIN] screen.
- 2 In the [CAPTURE USING THE MOUSE] area, tap one of the displayed option buttons.
- 3 Tap [SAVE].



Assigning the Capture function to a mouse button

Capture function assignment options

Option	Description
OFF	The Capture function is not assigned to a mouse button. (This is the initial setting.)
CENTER	Captures and saves a still image when the center mouse button is clicked.
RIGHT	Captures and saves a still image when the right mouse button is clicked.

✔ Notes on assigning the Capture function to a mouse button

- Only a single image is captured even if [CONT.] is selected as the shot mode.
- No image can be captured in the following cases:
 - Thumbnails are displayed.
 - A motion image is being replayed.
 - The [MIC SETUP] or [DS SETUP] screen is displayed.
 - Consecutive capture is in progress.

13.2.4 Setting the Function Buttons

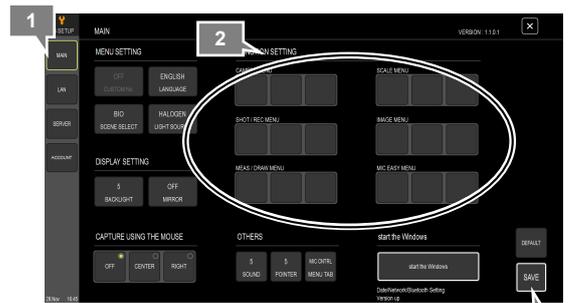
— [FUNCTION SETTING] area —

The function settings that can be specified ([SETTINGS] > [DS SETUP] > [MAIN] > [FUNCTION SETTING]) are described below.

Item	Option
[FUNC1], [FUNC2], and [FUNC3]	<p>[OFF] (No function is assigned.)</p> <p>[EZ-CENTER] (centers the enlarged image), [EZ-1x], [NOSEPIECE], [AE LOCK], [CAM GAIN], [SCENE/CSM], [FREEZE],[FOV]</p> <p>[IMG MODE], [EXP MODE], [MTR MODE], [MTR AREA], [CUSTOMIZE] (metering area), [FRAME] (shows/hides the metering frame), [INFO HISTOGRAM], [INFO CAMERA], [INFO MICROSCOPE]</p> <p>[STILL IMAGE SETTING], [MOTION IMAGE SETTING], [REC DRIVE], [FILENAME], [LOG SET] (sets a permanent comment), [SCREEN CAP MODE], [SINGLE]/[CONT.] (shot mode)</p> <p>[2 POINTS], [PERPEND], [ANGLE], [CIRCLE], [AREA], [2 CIRCLES], [PITCH], [TEXT], [LINE], [ARROW], [PEN], [MARKER], [SELECT (ALL)] ([MEAS/DRAW]/[SCALE]), [ERASE ALL], [OVERLAY], [SAVE CSV], [TOOL SET], [CALIB], [INT MAG]</p> <p>[SELECT ALL] ([MEAS/DRAW]/[SCALE]), [XY MEAS] (show/hide), [X SCALE] (show/hide), [SCALE BAR] (show/hide), [X HAIRS] (show/hide), [GRID] (show/hide), [VERTICAL] (scale bar display direction)</p> <p>[CSM SET], [RB ADJ], [CHROMA], [CONTRAST], [SHARPNESS], [HUE], [EFFECT], [BK LEVEL], [CLR SET], [SD], [SD SET]</p> <p>[LOAD] (mode reloading), [SAVE] (mode saving), [NOSEPIECE], [FL TURRET], [FL 2nd] (2nd FL turret), [INTSL], [CONDEN.], [EX WHEEL], [BA WHEEL], [SHUTTER], [PATH], [XYZ], [ZOOM], [A. STOP], [F. STOP], [ND WHEEL], [LAMP] (for diascopic illumination)</p>

The [CAMERA MENU], [SHOT/REC MENU], [MEAS/DRAW MENU], [SCALE MENU], [IMAGE MENU], and [MIC EASY MENU] screens provide three function buttons (at the bottom). If you use specific functions frequently, you can assign them to those buttons. To do this:

- 1 Display the [MAIN] screen.
- 2 In the [FUNCTION SETTING] area, tap one of the function buttons.
- 3 In the right pane, tap the function that you want to assign.
To re-assign a function, perform steps 2 and 3 again. To clear assignment of a function, select [OFF].
- 4 If you continue assignment, use the menu area in the left pane to tap another function button.
- 5 Tap [OK].
- 6 Tap [SAVE].



Setting function buttons

13.2.5 Specifying Other Functions

— [OTHERS] area —

In the [OTHERS] area, you can specify the settings related to general operations of the DS-L4.

(1) Setting the capture sound volume

You can set the capture sound volume of the DS-L4. To do this:

- 1 Display the [MAIN] screen.
- 2 In the [OTHERS] area, tap [SOUND], and then adjust the volume of operation sound.
- 3 Tap [OK] to commit the operation.
- 4 Tap [SAVE].



Setting the capture sound volume

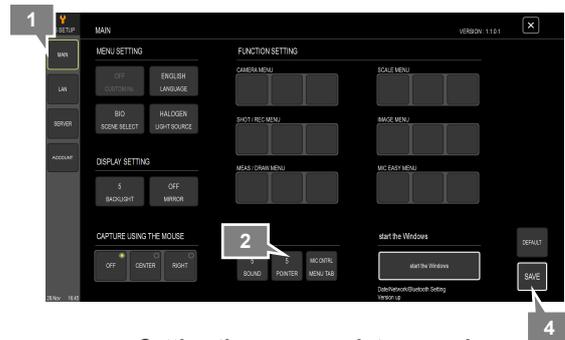
Capture sound options

Option	Description
0 to 10	Select an appropriate value for the volume. To disable operation sound, set [0]. (Initial setting: 5)

(2) Setting the mouse pointer speed

You can set the mouse pointer speed when a mouse is connected to the DS-L4. To do this:

- 1 Display the [MAIN] screen.
- 2 In the [OTHERS] area, tap [POINTER], and then adjust the speed at which the mouse pointer moves.
- 3 Tap [OK] to commit the operation.
- 4 Tap [SAVE].



Setting the mouse pointer speed

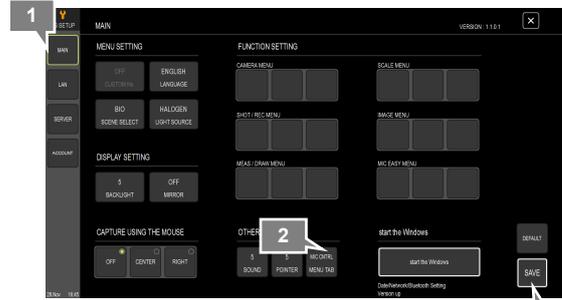
Mouse pointer speed options

Option	Description
1 to 10	Set an appropriate value for ease of operation. (Initial setting: 5)

(3) Specifying the settings for the tab menu

You can specify the settings for the tab menu. You do not need to change these settings if the microscope being used is not Ti2-E or Ti2-A.

- 1 Display the [MAIN] screen.
 - 2 In the [OTHERS] area, tap [MENU TAB].
 - 3 Select the option for the tab menu.
 - 4 Tap [SAVE].
- Restart the DS-L4 as indicated on the screen.



Specifying the tab menu settings

Options for the tab menu

Option	Description
MIC CNTRL	Select this option if you use a motorized microscope whose model is not Ti2-E or Ti2-A. If this option is selected, the following functions can be used: [MIC EASY] and [MIC CNTRL] (on the tab menu), [NOSEPIECE] (on the LIVE menu), and [SETTINGS] > [MIC SETUP] (on the LIVE and VIEW menus)
Ti2 CNTRL	Select this option if you use a Ti2-E or Ti2-A. If this option is selected, [Ti2 CNTRL] on the tab menu can be used. [MIC EASY], [MIC CNTRL], [NOSEPIECE], and [MIC SETUP] cannot be used.

13.2.6 Logging in to Windows Again

— [Start the Windows] area —

By tapping the [Start the Windows] button, you can start Windows as an administrator to use DS-L4 Administration Tool. With DS-L4 Administration Tool, you can specify several settings and update applications.

For details, refer to "13.6 Using DS-L4 Administration Tool".

! After logging in to Windows, perform specified operation only.

While you are logged in to Windows, perform operations specified below only but never those not listed. Or, DS-L4 may become unable to operate normally.

- Operation on DS-L4 Administration Tool
- Specifying a wireless LAN access point from the Windows charm bar
- Enabling or disabling all wireless communication from the Windows charm bar

13.3 Viewing the Network Settings

— [LAN: NETWORK] screen —

When you select [LAN] in the [DS SETUP] menu, the [LAN: NETWORK] screen appears.

You can only view settings in this screen. To change the settings, use DS-L4 Administration Tool.

For details on the settings in SoftAP mode, refer to "13.6.3 Specifying the SoftAP Settings".

[SOFTAP] area

- Status of SoftAP mode (ON/OFF)
 - IP address
 - SSID
 - Security key
- (The information displayed in this area is used when DS-L4 Viewer connects to the DS-L4 by using the SoftAP function.)



[CLOSE] button

Closes the [DS SETUP] menu.

[NETWORK (Wired)] area

- Status of automatic IP address acquisition (ON/OFF)
- IP address
- Subnet mask
- Gateway
- Primary DNS
- Secondary DNS

[NETWORK (Wireless)] area

- Status of automatic IP address acquisition (ON/OFF)
- IP address
- Subnet mask
- Gateway
- Primary DNS
- Secondary DNS

Items displayed in the [LAN: NETWORK] screen

✓ Refreshing the [LAN: NETWORK] screen

When the [LAN: NETWORK] screen is displayed, the information in the screen cannot be refreshed. To refresh the information, move to another screen by tapping [MAIN], [SERVER], or [ACCOUNT], and then move back to the [LAN: NETWORK] screen.

13.4 Specifying Network Drive Settings

— [SERVER: NETWORK DRIVE LIST] screen —

When you select [SERVER] in the [DS SETUP] menu, the [SERVER: NETWORK DRIVE LIST] screen appears. Set the servers (network drives) on which images can be saved. Note that to set a network drive, you must have the information shown below. If in doubt, contact a network administrator.

- Server name or IP address (1 to 63 characters)
- Path of a shared folder to be used as the network drive (1 to 127 characters)
- User ID (1 to 20 characters) (You cannot connect to a network drive that can be accessed without a user ID.)
- Password (1 to 127 characters) (You cannot connect to a network drive for which no password is set.)

Network drive list
You can register a maximum of five network drives on which images can be saved.

Adds a network drive
To add a network drive, tap this button, and then enter the necessary connection information.

Deletes a network drive

Edits network drive information

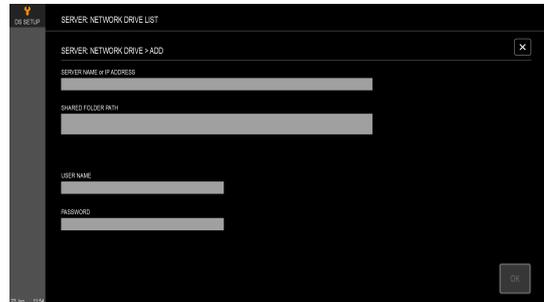
Items displayed in the [SERVER: NETWORK DRIVE LIST] screen

(1) Adding or editing a network drive

1 To add a new network drive, tap **[ADD]**. To change settings of an existing network drive, tap the drive to change and then **[EDIT]**.

2 Tap each entry field to enter information required.

- **SERVER NAME or IP ADDRESS**
 - A computer name (example: mypc), or an IP address (example: 128.31.20.1)
 - Access may not be allowed with a PC name depending on the network environment. In such a case, enter the IP address instead.
 - Do not add “\\”.
- **SHARED FOLDER PATH**
 - Enter the name of the shared folder specified in “15.7 Specifying the File Sharing Settings on the PC” (example: share)
 - Normally, folder name specified is used as the shared name unless otherwise specified on the PC.
 - Do not add “\”.
- **USER NAME**
 - Enter the user name specified in “15.7 Specifying the File Sharing Settings on the PC”. Enter the domain name before the user name, if any.
- **PASSWORD**
 - Enter the password specified in “15.7 Specifying the File Sharing Settings on the PC”.



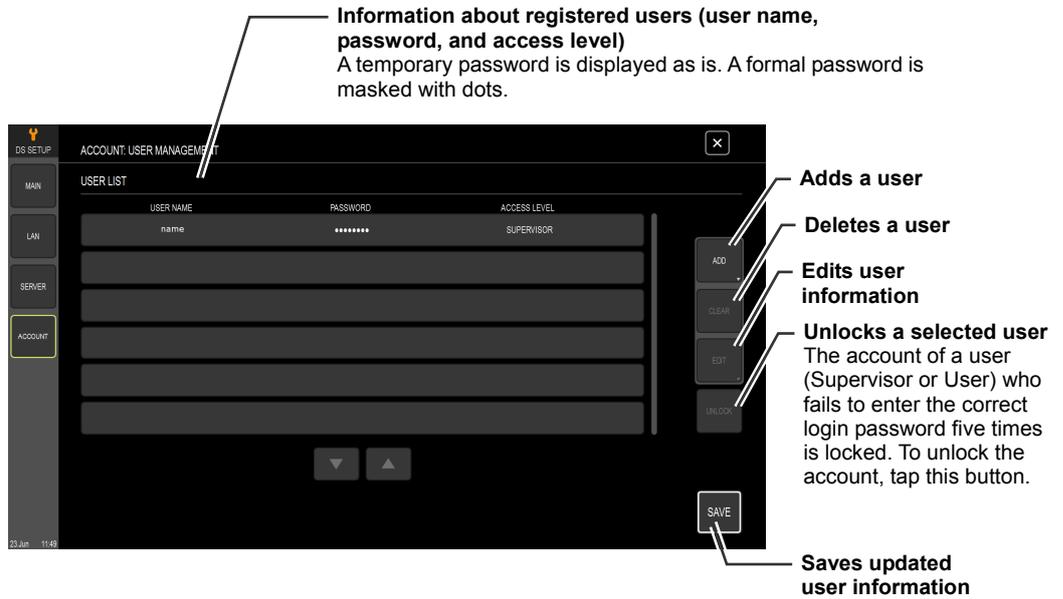
Entering network drive information

3 Tap **[OK]**.

13.5 Managing Users

— [ACCOUNT: USER MANAGEMENT] screen —

When you select [ACCOUNT] in the [DS SETUP] menu, the [ACCOUNT: USER MANAGEMENT] screen appears. The [ACCOUNT: USER MANAGEMENT] screen can be used to manage users who can use the DS-L4, and users who can access the DS-L4 from viewer terminals.



Items displayed in the [ACCOUNT: USER MANAGEMENT] screen

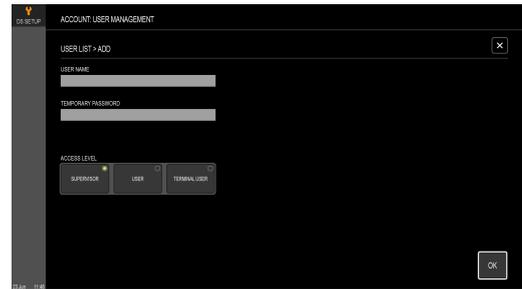
User management of the DS-L4 uses the three access levels described below.

Access Level	Description	Remarks
Supervisor	<ul style="list-style-type: none"> • Can manage users. • Can use all menus. • Can capture a live image from a viewer terminal (after the formal password has been registered). 	The user who is registered first is always registered as Supervisor.
User	<ul style="list-style-type: none"> • Cannot display the [DS SETUP] and [MIC SETUP] menus. • Can capture a live image from a viewer terminal (after the formal password has been registered). 	
Terminal User	<ul style="list-style-type: none"> • Cannot directly use the DS-L4. • Can capture a live image from a viewer terminal. 	

Adding a user or changing user Information

- 1 Display the [ACCOUNT: USER MANAGEMENT] screen.
- 2 To add a new user, tap [ADD]. To change the information about an existing user, tap the user, and then [EDIT].
- 3 (When adding a new user) Set the user name.

You can use 1 to 16 alphanumeric characters to set the user name. Once a user name is set, it cannot be changed. To change a user name, add a user with a desired user name.



Editing user information

- 4 Set a password.

! Notes on setting a password

For registration of a Supervisor or User:

The password you set here is a temporary password. A temporary password can consist of 1 to 16 alphanumeric characters. When a supervisor or user logs in to the DS-L4 for the first time, the DS-L4 asks you to change the temporary password to the formal password.

For registration of a Terminal User:

A password must consist of 8 to 16 characters that include lowercase alphabetic, uppercase alphabetic, and numeric characters.

- 5 Select the access level.

The access level of the user registered first must be set to Supervisor.

The access level of a user who has already been registered as Supervisor or User cannot be changed to Terminal User.

- 6 Tap [OK].
- 7 Tap [SAVE].

Deleting a user

- 1 Display the [ACCOUNT: USER MANAGEMENT] screen.
- 2 Tap the user to be removed, and then tap [CLEAR].
A confirmation message appears.
- 3 Tap [Yes].
- 4 Tap [SAVE].

✔ Note on deleting accounts

If at least one user is registered, at least one user must be Supervisor. If you delete all users including Supervisors, the last user you delete must be a Supervisor.

13.6 Using DS-L4 Administration Tool

You can use DS-L4 Administration Tool to perform the operations listed below. To use DS-L4 Administration Tool, you need to start Windows on the DS-L4.

- Setting the date and time of the DS-L4
- Specifying the network settings (when connecting to a network for the first time)
- Enabling or disabling SoftAP (software wireless access point)
- Specifying the Bluetooth mouse and keyboard connection settings (when using a Bluetooth mouse and keyboard for the first time)
- Updating the DS-L4 application (Refer to the manual of the updater.)
- Updating the firmware of cameras supported by the DS-L4 (Refer to the manual of the updater.)

✔ Mouse

The operations of DS-L4 Administration Tool described below assume that a mouse is connected. If you use screen touch operations instead of using a mouse, in the following subsections, replace any "click" operations with "tap" operations, and "right-click" operations with "tap-and-hold" operations.

(1) Starting DS-L4 Administration Tool

- 1 If you have changed settings in the [DS SETUP] menu, tap [SAVE] to save the changes.**

If you close the screen or move to another screen without saving the changes, the changes will be lost.

- 2 Display the [MAIN] screen.**

- 3 In the [start the Windows] area, tap [start the Windows].**

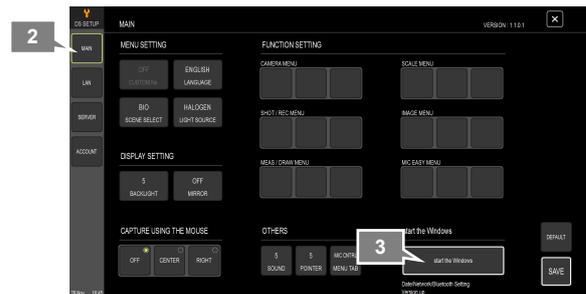
A confirmation message appears. If you want to start Windows, select [Yes].

The DS-L4 application terminates, and the Windows login window appears.

- 4 Select "DSL4Adm" as a Windows administrator, and enter "root" as the password.**

If the on-screen keyboard for entering a password does not appear, tap the password entry field.

If you log in as a general user, you cannot start DS-L4 Administration Tool.



Logging in to Windows again

⚠ After logging in to Windows, perform specified operation only.

While you are logged in to Windows, perform operations specified below only but never those not listed. Or, DS-L4 may become unable to operate normally.

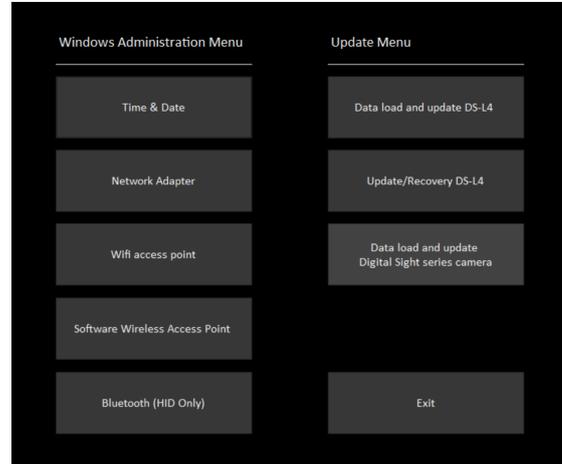
- Operation on DS-L4 Administration Tool
- Specifying a wireless LAN access point from the Windows charm bar
- Enabling or disabling all wireless communication from the Windows charm bar

- 5 On the desktop, double-click the DS-L4 Administration Tool icon to start it.

When a confirmation message “Do you want to allow the following program from an unknown publisher to make changes to this computer?” appears, click [Yes].
The DS-L4 Administration Tool main window appears.



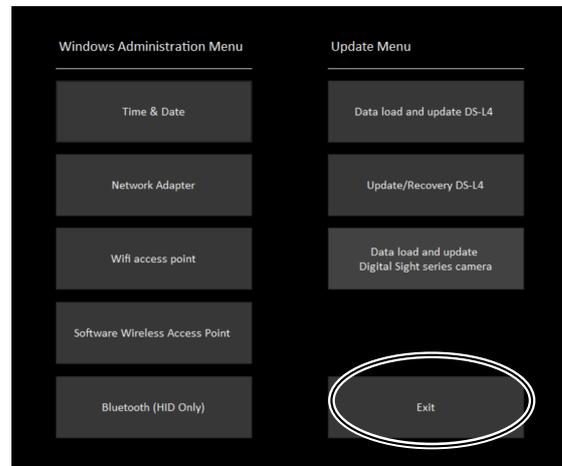
DS-L4 Administration Tool icon



DS-L4 Administration Tool main window

(2) Terminating DS-L4 Administration Tool

- 1 In DS-L4 Administration Tool, click [Exit].

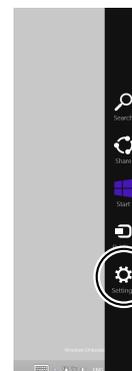


Terminating DS-L4 administration tool

- 2 Place the mouse pointer to the upper right or lower right corner of the screen (or swipe from right end to the center of the screen) to display the charms bar as shown in the figure on the right.

- 3 Tap [Settings], [Power], and then [Restart] to restart the DS-L4.

After restarting the DS-L4, it may take about a minute for the login screen (or the live image with a menu) to appear. Wait for a while.



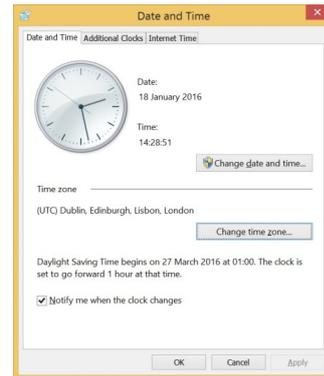
✔ If using SoftAP mode

To use the SoftAP function, log out, and then re-execute the DS-L4 application.

- (1) Click the Windows button in the bottom left of the task bar to display the Start screen.
 - (2) Click the user name (DSL4Adm) displayed in the top right of the Start screen, and then select [Sign out].
 - (3) When the Windows login window appear, select "DSL4Usr" (general Windows user), and enter "user" as the password. If the on-screen keyboard for entering a password does not appear, tap the password entry field.
- When login is successful, the DS-L4 application starts automatically.

13.6.1 Setting the Date and Time

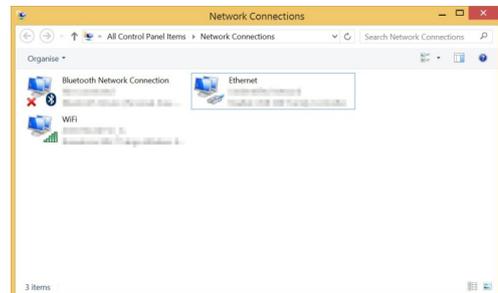
- 1 In DS-L4 Administration Tool, click [Time & Date].
- 2 Click [Change date and time], and then set the date and time.
- 3 Click [Change time zone], and then set the time zone.
- 4 Click [OK].



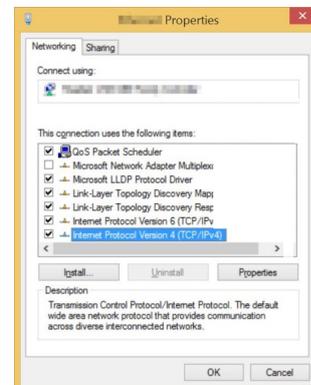
Setting the date and time

13.6.2 Specifying the Network Settings

- 1 In DS-L4 Administration Tool, click [Network Adapter].
- 2 To set an IP address in an Ethernet network (wired LAN), right-click the [Ethernet] icon. To set an IP address in a Wi-Fi network (wireless LAN), right-click the [WiFi] icon. Then, select [Properties].
- 3 Select and double-click [Internet Protocol Version 4 (TCP/IPv4)].



Network connection

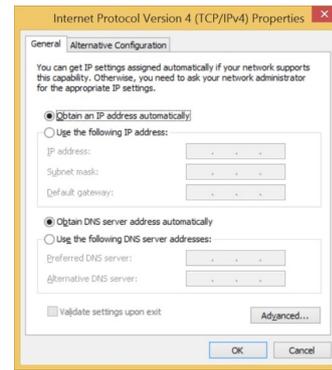


Network properties

4 Set the IP address acquisition method, and then click [OK].

To acquire an IP address automatically, select [Obtain an IP address automatically] and [Obtain DNS server address automatically].

To set an IP address manually, select [Use the following IP address] and [Use the following DNS server address], and then specify the settings according to your network environment.



Internet protocol properties

5 Click [OK].

13.6.3 Specifying the SoftAP Settings

The DS-L4 provides SoftAP mode, which allows the DS-L4 to be used as a Wi-Fi access point. With this mode, you can connect a viewer terminal to the DS-L4 in an environment where no wireless LAN access point exists and use DS-L4 Viewer.

Notes on using SoftAP mode

- SoftAP mode is disabled when the DS-L4 is turned off or restarted. To use the SoftAP function again, you need to re-enable SoftAP mode by using DS-L4 Administration Tool.
- Note that SoftAP mode uses the functions of the Wi-Fi adapter. Therefore, if SoftAP mode is enabled, you cannot use any Wi-Fi functions. Also note that you cannot specify the SoftAP settings if the Wi-Fi adapter is disabled. Before you specify the SoftAP settings, make sure that the Wi-Fi adapter is enabled.
- When SoftAP mode is enabled, you cannot save images from the DS-L4 to network drives.

1 In DS-L4 Administration Tool, click [Software Wireless Access Point].

2 Specify the necessary settings.

SoftAP Mode: Set SoftAP mode on or off.

SSID: Set the name of the DS-L4 to be used when the DS-L4 operates as an access point. The string you set can have a maximum of 32 characters, and can use lowercase letters (a-z), uppercase letters (A-Z), numbers (0-9), hyphens (-), and underscores (_).

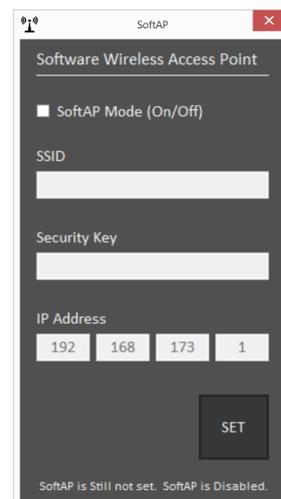
Security Key: Set a security key that is used for connection from a viewer terminal to the DS-L4 operating as an access point. The string you set can have a maximum of 16 characters, and can use lowercase letters (a-z), uppercase letters (A-Z), and numbers (0-9).

IP Address: Displays the IP address of the DS-L4 operating as an access point. This item cannot be changed.

The SSID, security key, and IP address are required for connection from a viewer terminal. Place strict control on these items so that they are not lost or revealed to any third party. (You can check these items in the SoftAP window.)

3 Click [SET].

4 Terminate DS-L4 Administration Tool.



SoftAP settings

5 Log off from Windows, log in as a general user, and then restart the DS-L4 application.

- (1) Click the Windows button in the bottom left of the task bar to display the Start screen.
- (2) Click the user name (DSL4Adm) displayed in the top right of the Start screen, and then select [Sign out].
- (3) When the Windows login window appears, select "DSL4Usr" (general Windows user), and enter "user" as the password. If the on-screen keyboard for entering a password does not appear, tap the password entry field.



6 On the viewer terminal, specify the SSID and security key to set the DS-L4 as a wireless LAN access point.

For details on how to specify the wireless LAN access point settings on a viewer terminal, refer to the documentation (such as the manual or help) of the terminal.

After the above procedure is completed, you can use DS-L4 Viewer on a viewer terminal to capture live images from the DS-L4.

✔ Note on using SoftAP mode

In SoftAP mode, you cannot save images from the DS-L4 to network drives.

13.6.4 Setup (Pairing) of Bluetooth Devices

A Bluetooth mouse and keyboard can be used with the DS-L4. Setup (pairing) is required before using a Bluetooth mouse and keyboard.

✔ Bluetooth devices that can be used

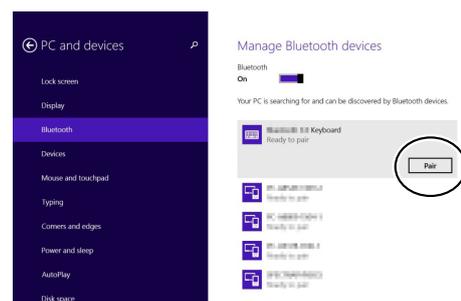
- The DS-L4 supports only mice and keyboards as Bluetooth devices. Pairing of other devices is not guaranteed.
- Although the HID profile is used for connecting a mouse and keyboard, we do not guarantee connection of all HID-based Bluetooth devices.

1 Prepare a Bluetooth mouse or keyboard you want to use with the DS-L4, and place it in Pairing mode. For details on this operation, refer to the manual of the mouse or keyboard.

2 In DS-L4 Administration Tool, click [Bluetooth (HID Only)].

3 Select the device that you want to pair with the DS-L4, and then click [Pair].

Subsequent operations differ depending on the Bluetooth device. Refer to the manual of the device.



Pairing

4 Redisplay the desktop.

Swipe from the right end to the center of the screen to display the charms bar (see the figure on the right), and then click [Start] and then [Desktop].



✔ If a Bluetooth device cannot be used

If a Bluetooth device that has been successfully paired with the DS-L4 cannot be used, the power of the device may be off. Alternatively, the DS-L4 may be in Flight mode.

✔ About the pairing procedure

The pairing procedure described above may not be applied to some Bluetooth devices. If pairing fails with the above procedure, try pairing as described in the manual of the device to be used.

13.6.5 Updating the DS-L4 Application

1 From your PC, download the DS-L4 application from the Nikon download site.

URL of the Nikon download site:

<http://www.nikon-instruments.jp/jpn/support/software-update/bioscience-products/camera/index.html>

2 Connect a USB memory drive or microSD card to your PC, and then create a new folder on the media. Assign any name you like to the folder.

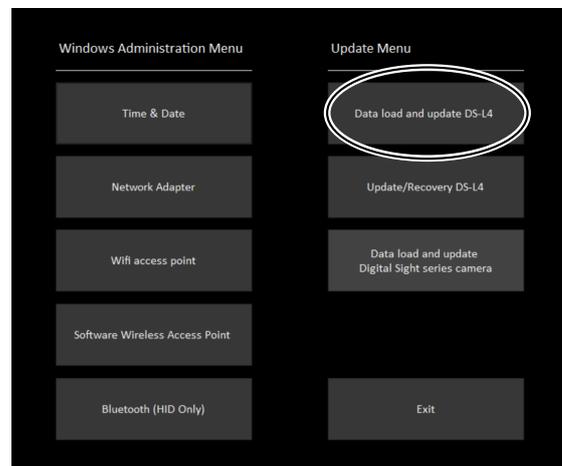
3 Uncompress the downloaded file, and then copy the DSL4Setup.msi file to the folder that you created in step 2.

4 Insert the USB memory drive or microSD card into the DS-L4.

5 In DS-L4 Administration Tool, click [Data load and update DS-L4].

6 In the USB memory drive or microSD card, select the folder that you created in step 2.

The installer starts updating the software. For details, refer to the "DS-L4 Software Update Manual" that is included in the file you downloaded.



Data load and update DS-L4

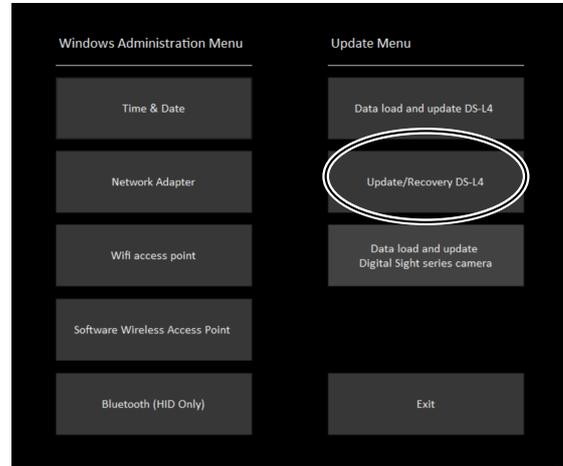
13.6.6 Re-Installing the DS-L4 Application (for Restoration)

If you inadvertently delete files that the DS-L4 application internally uses, the application may not be able to start or an application error may occur. In such a case, you may be able to restore the application by re-installing it.

To re-install the DS-L4 application:

In DS-L4 Administration Tool, click [Update/Recovery DS-L4].

The installer starts, and re-installs the same DS-L4 application that is installed currently. For details, refer to the "DS-L4 Software Update Manual" that is included in the file you downloaded.



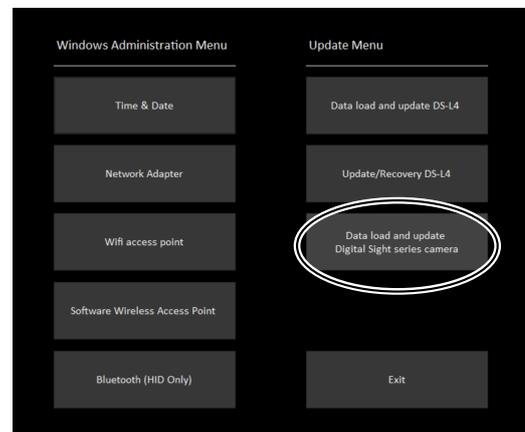
Update/Recovery DS-L4

13.6.7 Updating the Firmware of the Camera

You can update the firmware of a camera that supports the DS-L4 by using the DS-L4.

To update the firmware:

- 1 From your PC, download the firmware of the target camera from the Nikon download site:
<http://www.nikon-instruments.jp/jpn/support/software-update/bioscience-products/camera/index.html>
- 2 Uncompress the downloaded file, and then copy the folder that contains the DSCAMUpdate.exe file to a USB memory drive or microSD card.
- 3 Use a USB 3.0 cable to connect the DS-L4 and camera.
- 4 Turn on the power of the camera.
- 5 Insert the USB memory drive or microSD card into the DS-L4.
- 6 In DS-L4 Administration Tool, click [Data load and update Digital Sight series camera].
- 7 In the USB memory drive or microSD card, select the folder that you copied in step 2 (the folder containing the DSCAMUpdate.exe file).



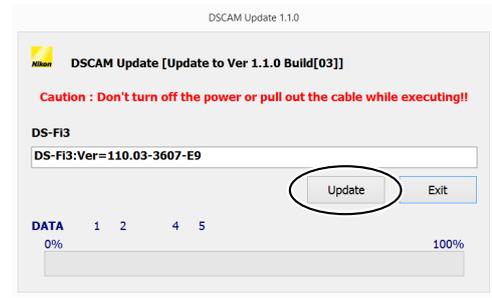
Data load and update Digital Sight series camera

8 When a confirmation message appears, tap [Yes].

The DSCAMUpdate window appears.

9 Click [Update].

Installation starts.



DSCAMUpdate window

Note

Observe the following instructions until installation finishes:

- Do not turn off the power of the camera.
- Do not disconnect the USB cable.
- Do not forcibly terminate the update.

10 When a termination message appears, tap [OK].**11 Turn off the power of the camera.**

13.7 Specifying Wireless LAN Settings

To use wireless LAN, you need to specify settings for access point connection.

1 Start Windows, and log in as an administrator.

For details on how to start, and log in to, Windows, refer to "13.2.6 Logging in to Windows Again".

! After logging in to Windows, perform specified operation only.

While you are logged in to Windows, perform operations specified below only but never those not listed. Or, DS-L4 may become unable to operate normally.

- Operation on DS-L4 Administration Tool
- Specifying a wireless LAN access point from the Windows charm bar
- Enabling or disabling all wireless communication from the Windows charm bar

2 Place the mouse pointer to the upper right or lower right corner of the screen (or swipe from right end to the center of the screen) to display the charms bar as shown in the figure on the right, and then click [Settings].



Displaying [Settings]

3 Click the wireless LAN antenna icon.



Wireless LAN icon

- 4 Make sure that [Flight mode] is disabled and [Wi-Fi] is enabled. Then, select the access point to be used.



- 5 Select [Connect automatically], and then click [Connect].

If you are prompted to enter a security key, enter the security key for the selected access point, and then click [Next].

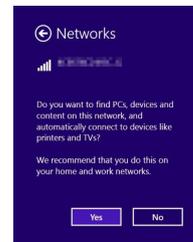
✔ If the access point supports WPS or AOSS

If the device to be used as an access point supports WPS or AOSS, you can omit the security key. For details, refer to the manual of the device to be used as an access point.



Connecting to an access point

If you see a message that asks you whether to perform connection by detecting network devices, we recommend that you select [No].



Check the wireless LAN antenna icon on the task bar to see if a connection has been established successfully. (If a connection has been established, an icon such as shown in the figure is displayed.)



LAN connection is established

You can also check the connection status with the wireless LAN antenna icon in the [Settings] menu.

13.8 Disabling All Wireless Communications

For the DS-L4 not to emit electric waves, place it in Flight mode. In Flight mode, wireless LAN connections and Bluetooth devices are unavailable.

1 Start Windows, and log in as an administrator.

For details on how to start, and log in to, Windows, refer to "13.2.6 Logging in to Windows Again".

! After logging in to Windows, perform specified operation only.

While you are logged in to Windows, perform operations specified below only but never those not listed. Or, DS-L4 may become unable to operate normally.

- Operation on DS-L4 Administration Tool
- Specifying a wireless LAN access point from the Windows charm bar
- Enabling or disabling all wireless communication from the Windows charm bar

2 Place the mouse pointer to the upper right or lower right corner of the screen (or swipe from right end to the center of the screen) to display the charms bar as shown in the figure on the right, and then click [Settings].



Displaying [Settings]

3 Click the wireless LAN antenna icon.



Wireless LAN icon

4 Turn on [Flight mode].

All wireless communications are disabled.



Flight mode is on

Part 6

Other Information

This part provides various kinds of information required to operate the DS-L4.

This part consists of the following chapters:

- Chapter 14 About Microscope Digital Cameras
- Chapter 15 Connecting to a Network (LAN)
- Chapter 16 Troubleshooting
- Chapter 17 Performing Captures from an External Device
- Chapter 18 Using the Diagnostic Program
- Chapter 19 Daily Maintenance
- Chapter 20 Main Specifications

The following models of microscope cameras can be connected to the DS-L4.
Some menus vary depending on the camera to be used.

14.1

DS-Fi3

The DS-Fi3 is a color camera that has a 1/1.8-inch image pickup device of 5.9 megapixels.

Image modes available for the DS-Fi3

Image modes and frame rates

Image Mode	Read Mode	Max. Frame Rate for Display on DS-L4*	Recommended Number of Recording Pixels
FULL	All pixels	10 fps	2880 x 2048
FAST (Initial setting)	2 x 2 pixels are averaged	30 fps	1440 x 1024

* The frame rate varies according to the exposure time.

Image sizes and file types available with the DS-Fi3 (still image)

Image size settings

Image Mode	Live Image	Live Image (when [FREEZE] tapped)	Screen capture mode
FULL	2880 x 2048	2880 x 2048	1770 x 1180 ^{*3}
	1440 x 1024	1440 x 1024	
	720 x 512	720 x 512	
FAST (Initial setting)	2880 x 2048 ^{*1}	1440 x 1024 ^{*2}	
	1440 x 1024	1440 x 1024	
	720 x 512	720 x 512	

- *1: If you attempt to capture a live image in FAST image mode and 2880 x 2048 image size, the image mode changes to FULL temporarily.
- *2: If you freeze a live image and attempt to capture it in FAST image mode, the image is saved in the size 1440 x 1024, even if 2880 x 2048 is selected.
- *3: If you capture an image in the screen capture mode, the image is saved in the size 1770 x 1180, irrespective of the selected image size.

File size of each file type

Image Size	JPEG Fine	JPEG Normal	JPEG Basic	TIFF	DICOM 2014a
2880 x 2048	3.75 MB	1.7 MB	1.15 MB	18 MB	7.5 MB
1440 x 1024	1.25 MB	0.6 MB	0.4 MB	5 MB	2.5 MB
720 x 512	0.4 MB	0.2 MB	0.2 MB	1.3 MB	0.8 MB
Screen capture mode (1770 x 1180)	1.6 MB	0.8 MB	0.5 MB	7.0 MB	3.2 MB

✓ JPEG image file size

The size of an image file in JPEG format greatly depends on the object. Use the file size values in this table as a guideline.

✓ DICOM 2014a format

To output images in DICOM 2014a format, you must modify the parameter file that is used by the DS-L4 application. For details, contact your nearest Nikon representative. After you modify the parameter file settings, you will be able to output images as microscopic or photographic images.

To input medical information to DICOM images, use a DICOM-compliant system. The DS-L4 cannot be used for this purpose.

Image sizes and file types available with the DS-Fi3 (motion image)

Image size settings

Image Mode	Live Image (Motion images cannot be recorded when the DS-L4 freezes and during consecutive capture.)	Recording Frame Rate
FULL/FAST (Initial setting: FAST)	1440 x 1024	3 fps
	720 x 512	5 fps
	360 x 256	5 fps

File size

Image Size	Motion Image File Size
1440 x 1024	0.4 + (0.23 x recording time (sec.)) MB
720 x 512	0.2 + (0.10 x recording time (sec.)) MB
360 x 256	0.1 + (0.04 x recording time (sec.)) MB

✔ File size of a motion image

The file size greatly depends on the object. Use the file size values in this table as guideline.

14.2 DS-Ri2

The DS-Ri2 is a color camera that has a 36.0 x 23.9 mm image pickup device of 16.25 effective megapixels.

Image modes available for the DS-Ri2

Image modes and frame rates

FOV	Image Mode	Read Mode	Max. Frame Rate for Display on DS-L4*	Recommended Number of Recording Pixels
φ16 mm-1x	FULL	All pixels	19 fps	1608 x 1608
	FAST	3 x 3 pixels are averaged	45 fps	536 x 536
φ22 mm-1x	FULL	All pixels	12 fps	2136 x 2136
	FAST	3 x 3 pixels are averaged	45 fps	712 x 712
φ25 mm-1x	FULL	All pixels	8 fps	2424 x 2424
	FAST	3 x 3 pixels are averaged	45 fps	808 x 808
φ16 mm-2.5x	FULL	All pixels	3.5 fps	4908 x 3264
	FAST	3 x 3 pixels are averaged	30 fps	1636 x 1088

* The frame rate varies according to the exposure time.

Image sizes and file types available with the DS-Ri2 (still image)

Image size settings

FOV	Image Mode	Live Image	Live Image (when [FREEZE] tapped)	Screen Capture Mode
φ16 mm-1x	FULL	1608 x 1608	1608 x 1608	1770 x 1180 ³
		536 x 536	536 x 536	
	FAST	1608 x 1608 ¹	1608 x 1608	
		536 x 536	536 x 536	
φ22 mm-1x	FULL	2136 x 2136	2136 x 2136	
		712 x 712	712 x 712	
	FAST	2136 x 2136 ¹	2136 x 2136	
		712 x 712	712 x 712	
φ25 mm-1x	FULL	2424 x 2424 ¹	2424 x 2424	
		808 x 808	808 x 808	
	FAST	2424 x 2424	2424 x 2424	
		808 x 808	808 x 808	
φ16 mm-2.5x	FULL	4908 x 3264	4908 x 3264	
		1636 x 1088	1636 x 1088	
		818 x 544	818 x 544	
	FAST	4908 x 3264 ¹	1636 x 1088 ²	
		1636 x 1088	1636 x 1088	
		818 x 544	818 x 544	

*1: If you attempt to capture a live image, the image mode changes to FULL temporarily during exposure and save.

*2: If you freeze a live image and attempt to capture it in FAST image mode, the image is saved in the size 1636 x 1088, even if 4908 x 3264 is selected.

*3: If you capture an image in the screen capture mode, the image is saved in the size 1770 x 1180, irrespective of the selected image size.

File size of each file type

Image Size	JPEG Fine	JPEG Normal	JPEG Basic	TIFF	DICOM 2014a
4908 x 3264	10.4 MB	4.8 MB	3.2 MB	47.2 MB	20.8 MB
2424 x 2424	5.0 MB	2.5 MB	1.7 MB	17.4 MB	10.0 MB
2136 x 2136	4.0 MB	2.0 MB	1.4 MB	13.7 MB	8.0 MB
1636 x 1088	1.6 MB	0.85 MB	0.6 MB	5.4 MB	3.2 MB
1608 x 1608	2.4 MB	1.2 MB	0.85 MB	7.8 MB	4.8 MB
818 x 544	0.5 MB	0.3 MB	0.2 MB	1.5 MB	1.0 MB
808 x 808	0.8 MB	0.45 MB	0.3 MB	2.1 MB	1.6 MB
712 x 712	0.65 MB	0.35 MB	0.25 MB	1.7 MB	1.3 MB
536 x 536	0.4 MB	0.25 MB	0.2 MB	1.0 MB	0.8 MB
Screen capture mode (1770 x 1180)	1.6 MB	0.8 MB	0.5 MB	7.0 MB	3.2 MB

✔ **JPEG image file size**

The size of an image file in JPEG format greatly depends on the object. Use the file size values in this table as a guideline.

✔ **DICOM 2014a format**

To output images in DICOM 2014a format, you must modify the parameter file that is used by the DS-L4 application. For details, contact your nearest Nikon representative. After you modify the parameter file settings, you will be able to output images as microscopic or photographic images.

To input medical information to DICOM images, use a DICOM-compliant system. The DS-L4 cannot be used for this purpose.

Image sizes and file types available with the DS-Ri2 (motion image)

Image size settings

FOV	Image Mode	Live Image (Motion images cannot be recorded when the DS-L4 freezes and during consecutive capture.)	Recording Frame Rate
φ16 mm-1x	FULL/FAST (Initial setting: FAST)	536 x 536	5 fps
φ22 mm-1x	FULL/FAST (Initial setting: FAST)	712 x 712	5 fps
φ25 mm-1x	FULL/FAST (Initial setting: FAST)	808 x 808	5 fps
φ16 mm-2.5x	FULL/FAST (Initial setting: FAST)	1636 x 1088	3 fps
		818 x 544	5 fps
		408 x 272	5 fps

File size

Image Size	Motion Image File Size
1636 x 1088	0.60 + (0.30 x recording time (sec.)) MB
818 x 544	0.20 + (0.10 x recording time (sec.)) MB
808 x 808	0.30 + (0.16 x recording time (sec.)) MB
712 x 712	0.25 + (0.12 x recording time (sec.)) MB
536 x 536	0.2 + (0.08 x recording time (sec.)) MB
408 x 272	0.10 + (0.04 x recording time (sec.)) MB

✔ File size of a motion image

The file size greatly depends on the object. Use the file size values in this table as guideline.

If you connect the DS-L4 to a network (LAN: Local Area Network), the following operations are available via the network.

Saving images to, and viewing images on, a network drive

- Saving images to a network drive during photographing
- Displaying (on the DS-L4) captured images that have been saved on a network drive

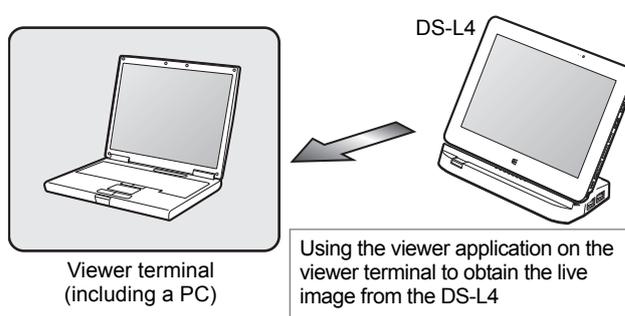
! Connect a network drive using wired LAN

To save images to a network drive, be sure to connect the network drive and the DS-L4 via wired LAN.

Obtaining images from a viewer terminal (including a PC)

You can view the live image of the DS-L4 via a wired or wireless LAN from a viewer terminal (iMac, Windows PC, Windows tablet, or Android tablet) on which the viewer application DS-L4 Viewer is installed. The following operations can be performed from a viewer terminal:

- Obtaining a live image
- Downloading images from the DS-L4 to the viewer terminal



Setting up the Ti2-E/Ti2-A, controlling the Ti2-E, and displaying the status of the Ti2-A via a network

You can set up the Ti2-E or Ti2-A inverted research microscope from the DS-L4 via a network. You can also control the Ti2-E and display the status of the Ti2-A from the DS-L4 via a network.

You can connect the DS-L4 to a network by either of two methods, which are described in "15.3 Connecting to LAN via a Network Hub" and "15.5 Connecting the DS-L4 to a LAN via a Wireless Access Point".

For details on how to connect a LAN cable to the Ti2-E or Ti2-A microscope, refer to the applicable manual of the respective microscope. For details on how to connect multiple microscope systems, refer to "Application for Inverted Research Microscope ECLIPSE Ti2 series Ti2Control Instruction Manual (for Android)".

15.1 Connection Methods

The DS-L4 can be connected to a network in one of the following four ways:

- Connecting to a LAN via a network hub (refer to "15.3")
- Connecting to a network drive or viewer terminal (including a PC) directly without using a LAN connection (refer to "15.4")
- Connecting to a LAN via a wireless access point (refer to "15.5")
- Connecting to a viewer terminal with a wireless connection without using an access point (refer to "15.6")

! Network settings

You need to configure network-related settings correctly in order to connect the DS-L4 to the network. Before doing so, you must consult the network administrator of your organization for correct setup information.

✔ LAN communication speed

- The more viewer terminals simultaneously access the DS-L4, the slower the communication becomes. Normally, simultaneous access from three or fewer terminals does not adversely affect performance.
- If the viewer terminals to be connected to the DS-L4 have a wired LAN connector, wired LAN connection is recommended. Communication using wired LAN connection is faster than using wireless LAN connection.

For the models and OSs of supported viewer terminals, refer to "15.2 (3) OSs and models of viewer terminals".

For details on how to set up and use a viewer terminal, refer to the applicable manual of DS-L4 Viewer.

Instruction manual of DS-L4 Viewer can be downloaded from the following URL:

http://www.nikon-instruments.jp/eng/software-update/camerasfor/pdf/M669_E_DS-L4_Viewer.pdf

15.2 Items to Check

Before connecting the DS-L4 to the network, check the following items:

- (1) **Network environment**
- (2) **Network drive (only when using network drives)**
- (3) **OSs and models of viewer terminals (only when using viewer terminals)**

(1) Network environment

Verify the following items with your system administrator before configuring the network.

- Whether Image transfer on LAN is permitted (only when using network drives or viewer terminals)
- IP address management scheme
 - Whether use of a static IP address is permitted
 - Whether the DHCP server is running (if you plan to obtain IP address automatically)

! Network settings on viewer terminals

This document assumes that network configuration for the viewer terminal is complete. For details on the network settings to be specified, consult the network administrator of your organization.

✓ Obtaining a static IP address

- Consult the network administrator of your organization if you plan to use a static IP address.
- You can determine the subnet mask if you obtain a static IP address.
- You may need to report the MAC address of a product in order to apply for an IP address. The MAC address of the DS-L4 is displayed in the [LAN: NETWORK] screen.

✓ Using a DHCP server

If the DS-L4 is set to use automatic address acquisition from a DHCP server, the IP address of the DS-L4 is dynamically changed. The IP address of the DS-L4 is displayed in the [LAN: NETWORK] screen.

! Network cable

- Use a 10Base-T, 100Base-TX, or 1000Base-T cable (Category 5e or higher) for wired network connection.
- Use a shielded network cable that satisfies EMC standards.
- For connection to a LAN, use a straight cable. For direct connection to a PC, use a crossover cable.

(2) Network drive (only when using network drives)

To connect the DS-L4 to a network drive, the network drive must satisfy the following conditions:

- The network drive is on a server that performs communication using the SMB (Server Message Block) protocol. (For example, the file sharing function of Windows or Mac OS X, or file sharing using Samba uses this communication method.)
- User registration and file sharing setup have been completed on the server side.

(3) OSs and models of viewer terminals (only when using viewer terminals)

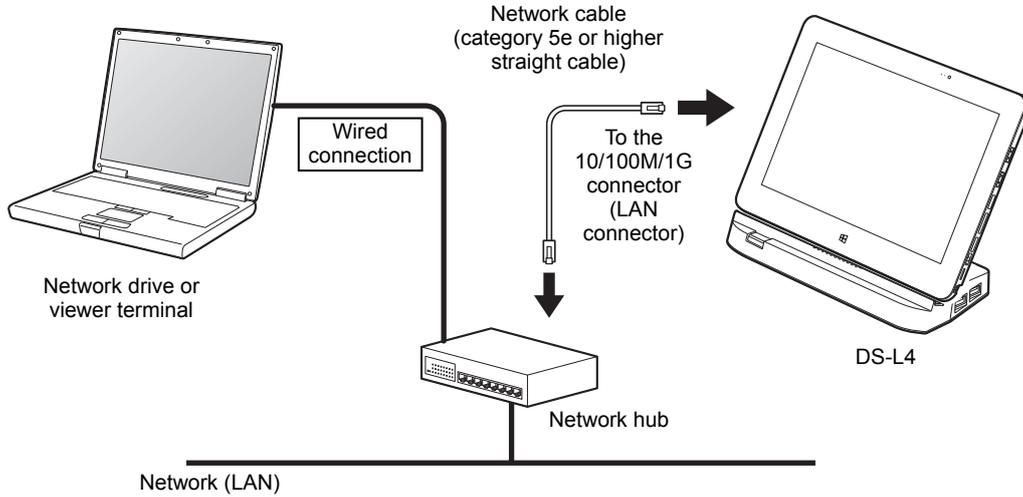
The OSs and models of viewer terminals that can be used to obtain images from the DS-L4 via a wired or wireless LAN connection are as follows:

- Windows 7 or later (except Windows RT)
- Android 5.0 or later
- Mac OS X

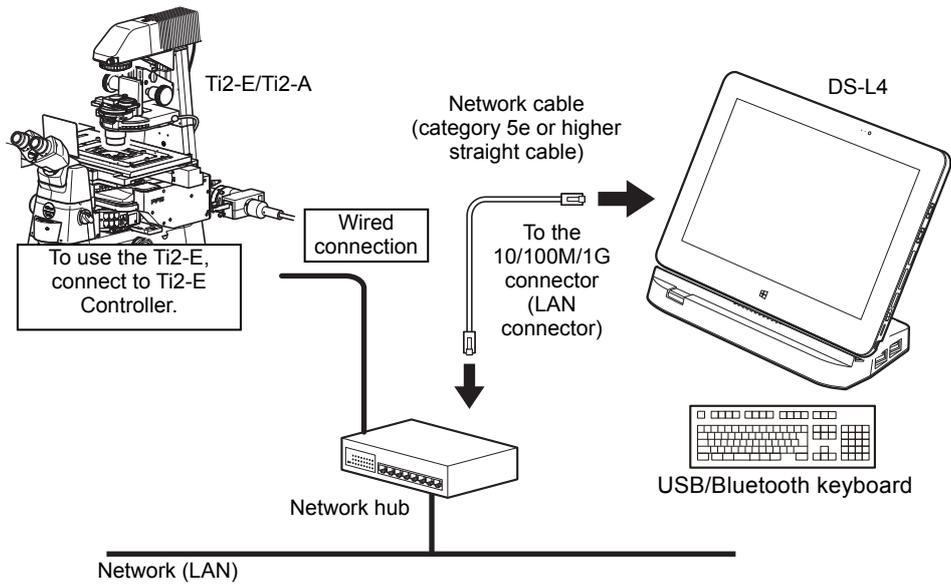
(We do not guarantee operation with all models that run any of the above OSs.)

15.3 Connecting to LAN via a Network Hub

The following explains how to connect the DS-L4 to your network (LAN) through a network hub. Connect the network cables as illustrated in the following figure.



Connection to a network drive or viewer terminal (via a network hub)

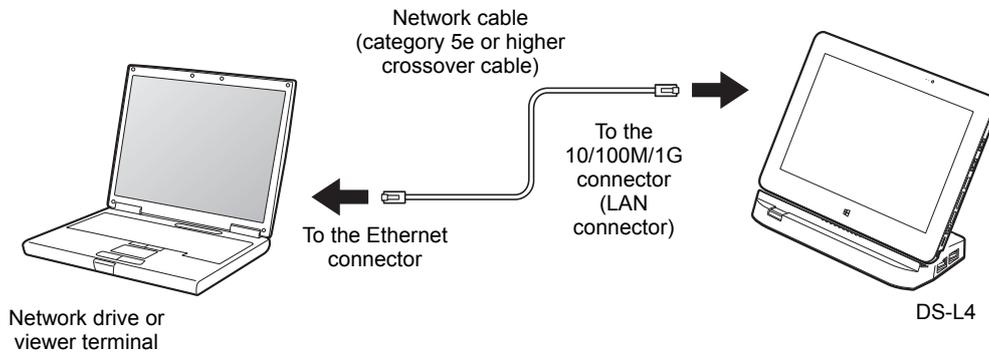


Connection to the Ti2-E or Ti2-A (via a network hub)

15.4

Connecting to a Network Drive or Viewer Terminal (Including a PC) Directly without Using a LAN Connection

To connect the DS-L4 without using a LAN connection, use a crossover network cable to connect the DS-L4 to a PC.



Connecting to a viewer terminal directly without using a LAN connection

! IP address settings

If you connect the DS-L4 to a network drive or viewer terminal using a crossover cable, use a static IP address for either.

Use DS-L4 Administration Tool to specify the settings. For details, refer to "13.6.2 Specifying the Network Settings".

15.5 Connecting the DS-L4 to a LAN via a Wireless Access Point

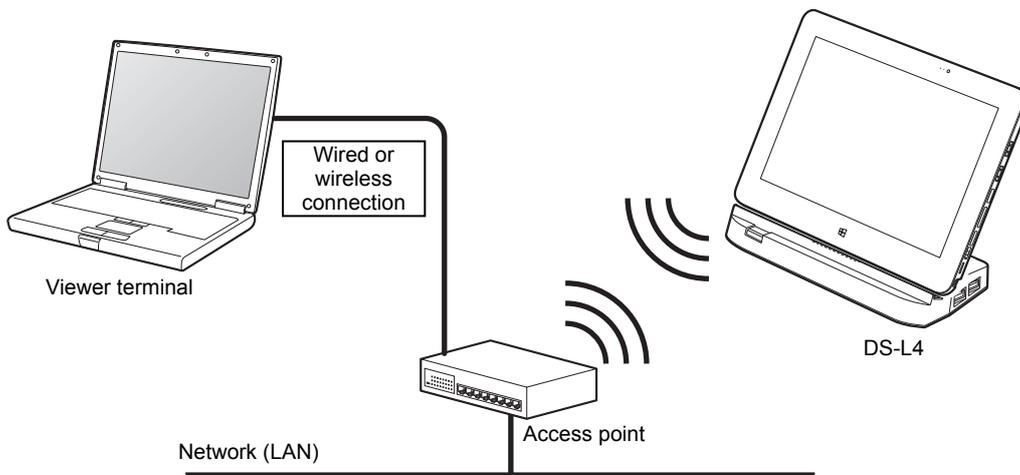
! Before connecting to the network

Before connecting the DS-L4 to a network, configure the necessary network settings according to the configuration of the network. Consult the network administrator of your organization for details.

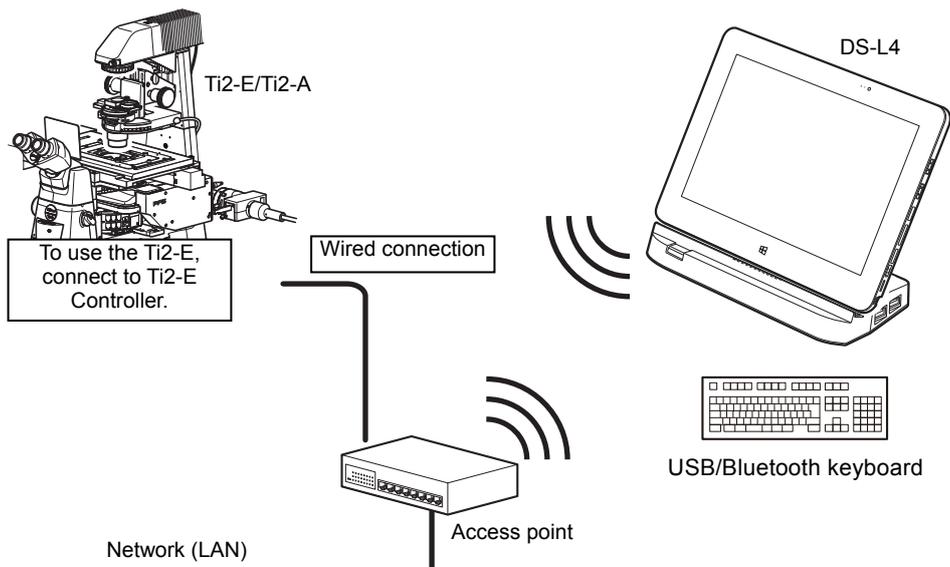
! Connect a network drive using wired LAN

To save images to a network drive, be sure to connect the network drive and the DS-L4 via wired LAN.

The following explains how to connect the DS-L4 to your network (LAN) via an access point.



Connection to a network drive or viewer terminal (via a wireless access point)



Connection to the Ti2-E or Ti2-A (via a wireless access point)

Use DS-L4 Administration Tool to specify the settings. For details, refer to "13.6.2 Specifying the Network Settings" and "13.7 Specifying Wireless LAN Settings".

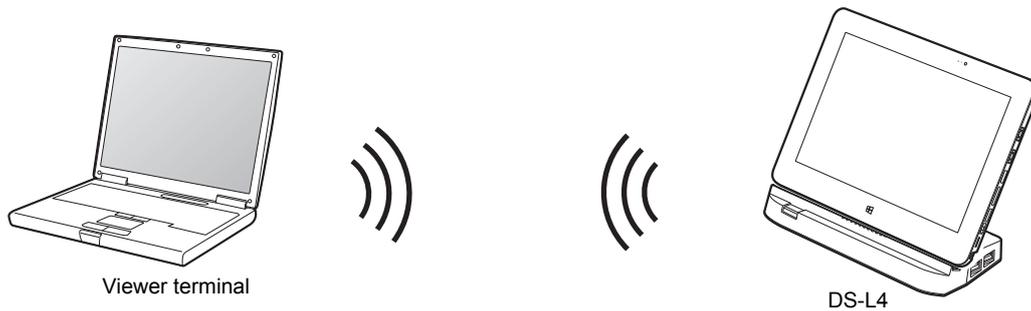
✔ **Wireless LAN access point**

- Use a commercially available wireless LAN access point device that is conformable to the radio law in the region where the device is used.
- The DS-L4 supports IEEE 802.11 a/b/g/n. Use an access point device that supports IEEE 802.11 a/b/g/n.

15.6

Connecting to a Viewer Terminal with a Wireless Connection without Using an Access Point

If there are no wireless LAN access points nearby, the DS-L4 itself can work as an access point, and you can work with the DS-L4 from DS-L4 Viewer installed on the viewer terminal connected to the DS-L4 (SoftAP function).



Using the DS-L4 as an access point

Use DS-L4 Administration Tool to specify the settings. For details, refer to "13.6.3 Specifying the SoftAP Settings".

15.7 Specifying the File Sharing Settings on the PC

To save images from the DS-L4 to a PC, the file sharing settings must be specified on that PC. The DS-L4 treats a shared folder as a network drive.

This document describes only basic settings. For details on how to specify the settings, refer to the Help or other documentation for the OS.

! Connect a network drive using wired LAN

To save images to a network drive, be sure to connect the network drive and the DS-L4 via wired LAN.

✓ Note on using SoftAP mode

In SoftAP mode, you cannot save images from the DS-L4 to network drives.

(1) In Windows

Enabling the file sharing function

- 1 In the Control Panel, click [Choose homegroup and sharing options].
- 2 Click [Change advanced sharing settings], and then specify the detailed settings.
Select [Turn on network discovery].
Select [Turn on file and printer sharing].
Select [Turn on password protected sharing]. (This item may not be displayed in some environments.)
- 3 Save the changes to the settings.

Adding a user

Create a new user account.

- 1 In [Control Panel], click [System and Security].
- 2 Select [Administrative Tools], and then open [Computer Management].
- 3 In the tree view, select [Computer Management (Local)], [System Tools], and then [Local Users and Groups].
- 4 Right-click [Users], and then select [New User].
- 5 Enter a user name and password.
Enter a user name of no more than 20 characters, and a password of no more than 127 characters. (For a password, enter at least one character. If you enter nothing for a password, you cannot access the DS-L4.)
Clear the [User must change password at next logon] checkbox.

Set the image storage folder to be shared

- 1 Create a folder.
- 2 Right-click the folder, select [Share with], and then select [Specific people].
- 3 Click the blank box, select the account of the user you created, and then click [Add].
If you select [Everyone], the folder can be accessed by all users who can access the external information terminal.
- 4 Change the access permission level of the user to [Read/Write].
- 5 Click [Share].
- 6 Confirm the name of the shared folder, and then click [Done].

(2) In Mac OS X

Enabling the file sharing function

- 1 In the [System Preferences] window, click [Sharing].
- 2 Select the [File Sharing] checkbox.
- 3 Closes the window.

Adding a user

- 1 In the [System Preferences] window, click [Accounts] or [Users & Groups].
- 2 In the [Accounts]/[Users & Groups] window, click the [+] (add) button, and then set the user ID and password.
- 3 Close the [Accounts]/[Users & Groups] window.

Set the image storage folder to be shared

- 1 In [Finder], click the [Action] menu, and then click [New Folder] to create a folder.
- 2 In the [System Preferences] window, click [Sharing].
- 3 Under the [Shared Folders] box, click [+].
- 4 In the window that appears, select the folder to be shared, and then click [Add].
- 5 Click [Options], and then specify the detailed settings.
Select the [Share files and folders using SMB] checkbox.
Select the checkbox of the registered account. When the [Authenticate] window appears, enter a password, and then click [OK].
Click [Done].
- 6 Under the [Users] box, click [+].
- 7 In the window that appears, select the user you want to add, and then click [Add].
- 8 Change the access permission level of the user to [Read & Write].
- 9 Close the [Sharing] window.

This chapter describes items to check if the system does not function as you expected, and meaning and handling of the warning messages.

Incorrect use might prevent this system from providing primary performance even though the system is not damaged. If a symptom such as those in the following table occurs, take action as described in the table before requesting repair.

If a problem that is not listed in the table occurs or if a problem that occurred is not resolved by taking action as described in the table, disconnect the power cable of the device, and then contact your nearest Nikon representative.

Note that the tables in the following subsections cover only issues on operating the DS-L4 and a microscope camera. For issues on using the DS-L4 connected to the Nikon microscope, refer to the separate volume of this manual, "Microscope Operation".

16.1

Power Supply

Symptom	Possible Cause	Action
The power does not come on.	The AC adapter is not connected.	Connect the DC output cable of the cradle's AC adapter to the DC IN connector of the cradle.
	The power supply cord is connected incorrectly to the AC adapter.	Use the specified power supply cord to plug the AC inlet of the AC adapter into the AC outlet.
	The power is off.	Press the power button to turn on the DS-L4 power.
The DS-L4 is hot when touched.	The DS-L4 is used in a hot or confined space.	Use the DS-L4 within the operating environment described in "Chapter 20 Main Specifications". If an unusual odor (burning, etc.) occurs, turn off the power, disconnect the power plug of the AC adapter, and request repairs.

16.2

Image Output

Symptom	Possible Cause	Action
Images are not displayed on the display panel.	The subject image is not incident in the optical device.	Set the subject image to be captured correctly.
	The optical path of the optical device is not set in the camera side.	Set the optical path correctly.
	The illumination or exposure setting of the optical device is improper.	Use illumination appropriate for the subject to adjust exposure properly.
"No Camera" is displayed.	The microscope camera is not connected.	Turn off the DS-L4, and using a USB 3.0 cable, securely connect the camera and the DS-L4.
Images are not displayed on the external display.	Cables are connected incorrectly.	Connect a commercially available cable between the DS-L4 and the external display. (The microHDMI connector is on the tablet, and the DisplayPort and analog display connectors are on the cradle. More than one external display connector cannot be used concurrently.)
	The external display does not support the video format of the DS-L4.	Use an external display that supports the 1920 x 1200 or 1920 x 1080 video format.

16.3

View of Images

Symptom	Possible Cause	Action	
The image blurs.	The optical device is out of focus.	Bring the optical device into focus by operating the focus drive or focusing ring.	
	The aperture diaphragm is closed too much when using the microscope.	Adjust the aperture diaphragm to 70 to 80 percent of the numerical aperture of the objective, or 70 to 80 percent of the pupil of the objective.	
	The magnifying power of the optical device is too much.	As a guide, use a magnification 500 to 1000 times the numerical aperture of the objective.	
	The electronic zoom is being used for observation.	Use of the electronic zoom may cause an image to blur depending on the magnification.	
	The sharpness setting is low.		Revise the setting of [SHARPNESS] in the [CAMERA MENU : IMAGE] window.
			If an external display is connected, adjust the sharpness setting for the display.
	The DS-L4 is used in a place subject to frequent vibration.	Use the system in a stable, vibration-free place.	
The image blurs.	The exposure time is too long.	A moving subject will appear blurred if the exposure time is too long. Change the exposure mode to shutter priority or manual, and set the exposure time to a fast value. If a dark subject is difficult to focus, it is recommended to use focus priority.	
The image is too dark or too bright.	Illumination for the subject is incorrect.	Adjust the illumination appropriately.	
		Adjust the surrounding illumination appropriately.	
	The exposure is not adequate.	In program AE or focus priority mode, perform exposure compensation. Alternatively, set the metering area and metering mode properly.	
		Set the metering area and metering mode properly.	
	In manual exposure, set the exposure time and camera gain properly.		
	The image adjustment is incorrect.	Set the CHRM, HUE, or contrast properly in the [CAMERA MENU: IMAGE] window.	

Symptom	Possible Cause	Action
The contrast is low.	The illumination is too bright or too dark.	Adjust the brightness of the illumination properly.
		Adjust the exposure.
	Light around the subject affects contrast.	Darken the interior, or place caps on the binocular eyepieces of the microscope.
	In the optical device (microscope) side, the setting of field diaphragm and aperture diaphragm is incorrect.	Adjust the field diaphragm to a size that circumscribes the field of view. Adjust the aperture diaphragm to 70 to 80 percent of the numerical aperture of the objective.
	In the optical device (microscope) side, filter selection is incorrect.	For a phase contrast microscope or interference microscope (dual beam or multiple), insert the specified filter. For negative-positive images, generally, inserting a green interference filter (GIF) improves contrast. Inserting a complementary color filter of the color of the specimen increases contrast.
	The contrast of the subject itself is low.	Consider the illumination or microscopy method.
	The image adjustment is incorrect.	Set the CHRM, HUE, contrast, or SFT properly in the [CAMERA MENU: IMAGE] window.
The image quality is poor.	The camera gain is set too high.	Noise due to high camera gain results in a coarse image. Adjust the brightness adequately, and then adjust the camera gain and the exposure time.

16.4 Saved Image Quality

Symptom	Possible Cause	Action
The saved image size is too small.	The image mode (control mode of the image pickup device) is set other than [FULL].	Change the image mode with settings that provide a high-definition image.
	The screen capture mode ([SCREEN CAP MODE]) is enabled.	Turn off screen capture mode in the [STILL IMAGE SETTING] menu of the [CAMERA MENU: SHOT/REC] screen.
	A small image size has been set.	Change the image size to a larger size in the [STILL IMAGE SETTING] menu of the [CAMERA MENU: SHOT/REC] screen.
	The image file type is set to BASIC.	In the [STILL IMAGE SETTING] menu of the [CAMERA MENU: SHOT/REC] screen, select TIFF as the file type. To use JPEG format, select NORMAL or FINE.
The overlay information cannot be read because the resolution of an acquired image is low.	The resolution of the saved image is low.	Change the image mode, image size, and file type settings.
An image is not captured at the desired moment even if the live image is temporarily frozen.	The refresh frequency of the live image is slow.	Select the image mode, and set the image size and file type appropriately so that the image is refreshed at a higher frequency (frame rate).

16.5 Image Saving

Symptom	Possible Cause	Action	
An image cannot be saved onto the recording media.	The recording media is not inserted correctly.	If you use a microSD card, insert it in the direct memory slot of the tablet main body correctly. If you use a USB memory drive, connect it to a USB port of the tablet main body or cradle correctly.	
	The inserted microSD card is not supported.	Use a supported microSD card.	
	The microSD card or USB memory drive is not formatted.	Use a microSD card or USB memory drive that has been initialized.	
	The type of recording media is not supported by the DS-L4.	Use a supported recording media.	
	The free space remaining on the recording media is insufficient.		Replace the media with media having sufficient free space.
			Increase the amount of free space by deleting unnecessary images or moving them to other recording media.
	The save folder is set incorrectly.	Make sure that the desired folder is set as the save folder correctly.	
The saved image cannot be read.	The settings of the save folder and the playback folder are incorrect.	Check that the folder is correctly set as a playback folder.	
	The recording media is damaged.	Replace the recording media.	

16.6 System Operation

Symptom	Possible Cause	Action
The mouse or keyboard does not work properly or does not work at all.	Operation of the component has not been verified by Nikon.	Use a component whose operation has been verified by Nikon.
	(For USB) USB hubs are cascaded.	Use only a single-tier hub.
	(For Bluetooth) Battery is low.	Charge or replace the battery.
	(For Bluetooth) Pairing has not finished yet.	Perform pairing.
The keyboard does not work properly or does not work at all.	The DS-L4 language setting is not compatible with the keyboard.	To use a Japanese keyboard, set the DS-L4 language to Japanese. To use an English keyboard, set the DS-L4 language to English.

16.7 Network

Symptom	Possible Cause	Action
The system cannot access the network.	(If a wired connection is used) The network cable is not connected correctly.	Connect it correctly.
	The network cable is not correct.	Make sure that the category of the network cable is correct for the network.
		To connect the DS-L4 via a hub, use a straight cable.
		To connect the DS-L4 directly to the network port of the PC without using a hub, use a crossover cable.
	The network settings are not correct.	Specify the network settings correctly. Take particular note of the IP address or network enablement settings. To perform data transmission and reception between different network groups, be sure to specify the gateway address.
	DHCP is set in an environment where no DHCP server exists.	For IP addresses to be assigned dynamically via the DHCP protocol, a DHCP server is required in the network.
(If a wireless connection is used) Connection to a wireless LAN access point is not established.	Use DS-L4 Administration Tool to specify wireless LAN or SoftAP settings.	

16.8 Warning Messages

Message Text	Description	Action
Cannot be executed.	The tablet on which the application is being executed is not the DS-L4.	Use the tablet model that was released as the DS-L4. (The DS-L4 application does not operate on other tablets.)
Incorrect User ID or password	The entered user ID or password is incorrect.	Enter the correct user ID and password.
This User ID is locked.	The entered user ID is locked.	Log in to the DS-L4 with an administrator ID, and then unlock the user ID.
This User ID has been locked.	Entry of the correct password failed five times.	Log in to the DS-L4 with an administrator ID, and then unlock the user ID.
Enter 8 to 16 characters.	The string entered as a password had 7 or fewer characters.	Set a password with 8 to 16 characters.
Enter alphanumeric characters.	The string entered as a password included characters other than alphanumeric characters.	Set a password with alphanumeric characters only.
Include numbers, uppercase, and lowercase letters.	The string entered as a password did not include a numeric number, uppercase letter, or lowercase letter.	Set a password that includes numeric numbers, uppercase letters, and lowercase letters.
The entered characters do not match.	The first and second strings entered as a password did not match.	Re-enter the password.
Write error	Writing to the recording media failed.	Check the setting of the destination to save images, and select recording media having sufficient space. When the recording media approaches the end of its life, replace it with new recording media.
Cannot be deleted.	Because the protection switch of the recording media is on (write inhibit), the file or folder cannot be deleted, or the media cannot be formatted.	Set the protection switch of the recording media to off.
The folder already exists.	A folder having the same name already exists.	Set a unique folder name.
The following characters cannot be used: \\ : * ? " < >	The entered file name or folder name includes characters that cannot be used.	Set a name that does not include the following characters: \\ : * ? " < >
Camera setting error	A command issued to the microscope camera failed.	Make sure that cable connection between the camera and DS-L4 is correct, and then restart the camera and DS-L4.
Microscope setting error	A command issued to the microscope failed.	Make sure that the cable connection with the microscope is correct, and then restart the microscope and DS-L4.
Read error	A list of folders cannot be obtained.	Initialize the recording media or use other recording media.
The camera is disconnected.	The camera was disconnected when a [CAMERA MENU] screen was displayed.	Make sure that cable connection to the camera is correct, and then restart the camera and DS-L4.
The microscope is disconnected.	When the [MIC EASY], [MIC CNTRL], or [MIC SETUP] menu was displayed, the cable connected to the microscope was unplugged.	Make sure the cable is correctly connected to the microscope, and then restart the microscope and DS-L4.

Message Text	Description	Action
Input error	An invalid value was entered for the radius of the concentric circle. An invalid value was entered for the vertical or horizontal spacing of grid lines.	Enter a value within the specifiable range.
File reading failed.	The specified file could not be refreshed due to a problem.	Specify files supported by the system.
White balance failed.	The white balance could not be obtained correctly.	Prepare a uniform subject and set the white balance again.
Could not continue.	Connection to a network drive failed.	Check the network connection.
This user name already exists.	A user having the same name already exists.	Specify a unique user name.
The DS-L4 will shut down. Reboot required.	The information about the logged-in user was changed. All users were deleted.	–
This external display is not supported.	The external display does not support display with a resolution of 1920 x 1920 or 1920 x 1080 pixels.	Use an external display that supports display with a resolution of 1920 x 1920 or 1920 x 1080 pixels.
Connect an AC power supply.	The remaining battery charge is low.	Connect the tablet to the cradle and connect the cradle's AC adapter to an AC outlet to charge the battery.
Set the recording interval the recording time + 10 sec or longer.	The recording interval of motion images is too short.	Set the recording interval to a value that is equal to or larger than the recording time + 10 seconds.
Password cannot be changed.	An attempt was made to change the password by logging in as a special user or default user.	Only Supervisors can change passwords.
Cannot be copied.	An attempt to copy files or folders failed.	Select recording media that has sufficient free space as the image save location. When the recording media approaches the end of its life, replace it with new recording media.
Enter a number between 2 and 999.	A value not within the range from 2 to 999 was entered as the number of shots.	Enter a value within the range of values that can be entered (2 to 999).
The camera is connected by a low-speed mode. Please reconnect the camera. If this problem is not resolved, please turn off the camera and reboot the DS-L4.	The camera is connected via USB 2.0.	Turn off the camera power, and then connect the camera to a USB 3.0 connector of the DS-L4. If this message still remains on the screen, turn off the power and re-start the DS-L4.
Start the Windows. Please revert the display resolution to 1920x1200.	Resolution of the built-in display was changed to other than 1920 x 1200.	When the Windows login screen appears, login to Windows as an administrator. Reset the display resolution setting to the default value of 1920 x 1200, and restart the DS-L4.

Performing Captures from an External Device

In addition to tapping the [CAPTURE] button on the DS-L4 screen, you can capture still images with the DS-L4 by using one of the following three methods:

- Sending a communication command from the USB connector of the microscope (available with the Ni-E and Ni-U only). For details, refer to the separate volume of this manual, "Microscope Operation". Note that this method cannot be used if the microscope is set to output trigger signals from the DSC connector.
- Connecting an external device (external capture output device) to the camera's EXT I/O connector, inputting a signal from the external device to the camera, and sending a communication command from the camera to the DS-L4. For details, refer to the manual of the camera.
- Clicking the center or right button of the mouse connected to the DS-L4. The necessary settings must be specified beforehand ([SETTINGS] > [DS SETUP] > [MAIN]).

✓ Notes on performing captures from an external device

- Consecutive capture cannot be performed from an external device. Even if [CONT.] is selected as the shot mode from the [STILL IMAGE SETTING] menu of the [CAMERA MENU: SHOT/REC] screen, single shot mode is enabled.
- Capture is not possible in the following cases: when no camera is connected, when thumbnails are displayed, when the [DS SETUP] menu is displayed, and when the [MIC SETUP] menu is displayed.

The diagnostic program can be executed from the BIOS menu to check whether hardware errors have occurred. If error codes are displayed after diagnosis, notify your nearest Nikon representative of the error codes.

! **Notes on executing the diagnostic program**

- Before you execute the diagnostic program, turn off the DS-L4 power completely. To turn off the DS-L4 power, in the LIVE or VIEW menu, tap [SETTINGS], and then select [SHUT DOWN].
- You need to disconnect peripheral devices before executing the diagnostic program. Disconnect USB memory drives, external hard disks, and other peripheral devices that are recognized as hard disks or removable disks.

1 Hold down the shortcut button and press the power button of the DS-L4.

Continue to press the shortcut button (for about 10 seconds) until the boot menu appears.

2 When the boot menu appears, release the shortcut button.

3 Tap [Tab] to display the application menu.

4 Tap and select [Diagnostic Program], and then tap it again.

5 Tap [Run].

Hardware diagnosis starts. When hardware diagnosis ends, the results of diagnosis appears.

6 If no problems are detected, tap [Reboot].

The DS-L4 is restarted.

If problems are detected, record the displayed information. Then, press the power button to turn off the tablet power.

Notify your nearest Nikon representative of the displayed information.

This chapter describes how to maintain the DS-L4. To prolong the performance of the DS-L4, Nikon recommends that you perform daily maintenance.

19.1 Cleaning Utensils and Consumables

Cleaning utensils

- Soft cloth (non-woven cloth, cotton cloth, or gauze)*
- Lens cloth

* In a cleanroom, use a cleanroom wiper.

Consumables

- Neutral detergent (only when the product main body is very dirty)

19.2 Cleaning of the Tablet, Cradle, and Display

To clean the tablet main body or cradle, use a dry soft cloth. If the tablet or cradle is very dirty, use a cloth moistened with water or diluted neutral detergent. If diluted neutral detergent is used for cleaning, remove any residue with a cloth moistened with water.

If the display panel surface is dirty, use a dry soft cloth or a lens cloth to wipe off the surface gently, taking care not to scratch the surface with a nail or ring. Never use water or detergent for cleaning.

! Notes on cleaning an LCD display or touch panel

Do not rub or forcibly push on the surface of an LCD display or touch panel. Doing so may damage the LCD display or touch panel. Some wipes or commercially available cleaners may chemically damage the coating of the surface. Do not use:

- Anything that contains an alkaline component
- Anything that contains a surface-activating agent
- Anything that contains an alcohol component
- Anything that is highly volatile (e.g., thinner or benzine)
- Anything that contains abrasives

19.3 Cleaning a Microscope Camera

When you clean the main body of a microscope camera, make sure that the mount is covered with a mount cap, and then wipe off stains with a soft cloth. If the product is very dirty, gently wipe stains using gauze moistened with a small amount of diluted neutral detergent.

Do not use organic solvent (such as alcohol, ether, and thinner) on coated parts, plastic parts, or printed parts. Doing so may cause surface discoloration or removal of printed characters.

Remove any dust inside the camera mount with an air blower.

! Cleaning of the inside of a camera

Use only an air blower to remove dust from inside the camera mount, so as to minimize the risk of contact with internal components. Especially, never touch the glass filter on the front of the image pickup device.

If you have touched the glass filter of the image pickup device, or accumulated dust on the glass filter cannot be removed, inquire about cleaning to your nearest Nikon representative.

19.4 Cleaning Optical Devices

Prevent dust or fingerprints from being attached to the lenses of the optical device. Stains on a lens degrade the visibility of images.

For details on how to clean optical devices, see the instructions of your optical device.

19.5 Storage

- Turn off the product whenever you do not use it. If you do not intend to use the product for a long period of time, unplug the power supply cord of the AC adapter.
- Store the product in a location satisfying the storage environment conditions described in user guide of ARROWS Tab Q555/K64.
- Store this system in a location with low humidity, where mold is unlikely to form.
- When you store a microscope camera, make sure that the mount is covered with a mount cap.
- During storage, place a plastic cover over the equipment to prevent dust accumulation. Before putting a plastic cover on the DS-L4, turn off the DS-L4 power, and wait for the DS-L4 to cool down.

This chapter provides a summary of the major specifications of the DS-L4.

20.1

DS-L4 Microscope Camera Control Unit

Model	DS-L4 Microscope Camera Control Unit
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Image recording

Still image capturing modes	Single shot mode and continuous shot mode (number of shots: 2 to 999, shot interval: 10 sec. to 6 hours)
Motion image recording modes	Manual stop (When 29 min. 59 sec. elapses, recording is forcibly stopped.) Automatic stop (1 sec. to 29 min. 59 sec.) Interval recording (number of recordings: 2 to 999, recording time: 1 sec. to 29 min. 59 sec., recording interval: 11 sec. to 6 hours)
Recording media	Internal drive (NTFS 64 GB (user space: about 28 GB)) MicroSD card: SD (2 GB max.), SDHC (32 GB max.), or SDXC (64 GB max.) card formatted in in FAT16, FAT32, NTFS, or exFAT USB memory drive (formatted in FAT16, FAT32, NTFS, or exFAT)
File format	TIFF: Uncompressed 24 bits JPEG FINE: Compression ratio of about 4:1 JPEG NORMAL: Compression ratio of about 8:1 JPEG BASIC: Compression ratio of about 16:1 DICOM: Microscopic or photographic images compliant with DICOM 2014a
Exif information	Exif 2.3 compliant
Comment logging	Text-format comment, no more than 32 characters

Camera control

Scene modes	[IND]: 5 modes ([NEUTRAL], [WAFER/IC], [METAL], [CIR.BOARD], [FPD]) [BIO] (halogen lamp): 5 modes ([NEUTRAL], [BF], [HE], [ELISA]) [BIO] (LED): 2 modes ([NEUTRAL], [BF]) [OTHERS]: 2 modes ([NEUTRAL], [ASBESTOS])																
Custom settings	Up to 7 sets of user-specified photographing conditions can be registered as CUSTOM1 to CUSTOM7.																
Exposure modes	P (program AE), F (focus-priority AE), and M (manual)																
Metering modes	Average and peak (AE lock available)																
Metering area	Large, medium, small, custom The metering area can be moved, resized, and framed.																
Exposure compensation	Adjustable in units of 1/6 EV The range of values that can be set varies depending on the metering mode and contrast setting. Average mode: <table style="margin-left: 20px;"> <tr><td>[WIDE D]:</td><td>-1 to +1 EV</td></tr> <tr><td>[WEAK]:</td><td>-1 to +1 EV</td></tr> <tr><td>[STANDARD]:</td><td>-1 to +1 EV</td></tr> <tr><td>[STRONG]:</td><td>-1 to +2/3 EV</td></tr> <tr><td>[LINEAR]:</td><td>-1 to +1/2 EV</td></tr> <tr><td>[METAL]:</td><td>-1 to +2/3 EV</td></tr> <tr><td>[ENHANCE]:</td><td>-1 to +1/2 EV</td></tr> </table> Peak mode: <table style="margin-left: 20px;"> <tr><td></td><td>-1 to ±0 EV</td></tr> </table>	[WIDE D]:	-1 to +1 EV	[WEAK]:	-1 to +1 EV	[STANDARD]:	-1 to +1 EV	[STRONG]:	-1 to +2/3 EV	[LINEAR]:	-1 to +1/2 EV	[METAL]:	-1 to +2/3 EV	[ENHANCE]:	-1 to +1/2 EV		-1 to ±0 EV
[WIDE D]:	-1 to +1 EV																
[WEAK]:	-1 to +1 EV																
[STANDARD]:	-1 to +1 EV																
[STRONG]:	-1 to +2/3 EV																
[LINEAR]:	-1 to +1/2 EV																
[METAL]:	-1 to +2/3 EV																
[ENHANCE]:	-1 to +1/2 EV																
	-1 to ±0 EV																
Exposure time	Program AE mode: If the DS-Fi3 is connected: 100 μs to 1s If the DS-Ri2 is connected: 100 μs to 1s Manual mode: If the DS-Fi3 is connected: 100 μs, 200 μs, 300 μs, 400 μs, 600 μs, 800 μs, 1 ms, 1.5 ms, 2 ms, 3 ms, 4 ms, 6 ms, 8 ms, 10 ms, 15 ms, 20 ms, 30 ms, 40 ms, 60 ms, 80 ms, 100 ms, 150 ms, 200 ms, 300 ms, 400 ms, 600 ms, 800 ms, 1 s, 1.5 s, 2 s, 3 s, 4 s, 6 s, 8 s, 10 s, 15 s, 20 s, 30 s (38 steps) If the DS-Ri2 is connected: 100 μs, 200 μs, 300 μs, 400 μs, 600 μs, 800 μs, 1 ms, 1.5 ms, 2 ms, 3 ms, 4 ms, 6 ms, 8 ms, 10 ms, 15 ms, 20 ms, 30 ms, 40 ms, 60 ms, 80 ms, 100 ms, 150 ms, 200 ms, 300 ms, 400 ms, 600 ms, 800 ms, 1 s, 1.5 s, 2 s, 3 s, 4 s, 6 s, 8 s, 10 s, 15 s, 20 s, 30 s, 40 s, 60 s, 80 s, 100 s, 120 s (43 steps) Focus-priority AE mode: 100 μs to 66 ms																
Camera gain (ISO speed)	Program AE mode: 100 to 1600 Focus-priority AE mode: 100 to 6400 Manual mode: 100, 120, 140, 170, 200, 240, 280, 340, 400, 480, 560, 680, 800, 960, 1130, 1360, 1600, 1920, 2250, 2700, 3200, 3840, 4600, 5520, 6400 (25 steps)																

Image processing

White balance	Set by the user. Red and blue gain values can be adjusted.	
Contrast (tone) compensation	7 settings: [WIDE D], [WEAK], [STANDARD], [STRONG], [LINEAR], [METAL], [ENHANCE])	
Contour processing (sharpness)	9 levels: -3 (soft) to +5 (sharp)	
Hue adjustment	-50 to +50 (minimum step: 1)	
Saturation adjustment	-50 to +50 (minimum step: 1)	
RB (red and blue) adjustment	50 to 150 (minimum step: 1)	
Black level	-50 to +50 (minimum step: 1)	
Special effect (color effect)	3 types: [COLOR], [B&W], [NEGA]	
Settings that can be initialized (and initial values)	[SCENE/CSM]	NEUTRAL
	[EXP CMP]	0
	[CAM GAIN]	Cleared (because exposure mode is set to program AE)
	[IMG MODE]	FAST
	[EXP MODE]	PROG
	[MTR MODE]	AVERAGE
	[MTR AREA]	LARGE
	[AE LOCK]	OFF
	[RB ADJUST]	100, 100
	[CHROMA]	0
	[HUE]	0
	[EFFECT]	COLOR
	[BK LEVEL]	0
	[CONTRAST]	STANDARD
	[SHARPNESS]	2
	SD	OFF

Tool functions

Length measurement	Length between two points, perpendicular line length, length between centers of two circles, angle, circle diameter, area of polygon, pitch
Calibration	OFF, M1 to M14 (14 settings can be registered) Optical device's native data can be used ([OPTICAL] mode). User-registered data can be used ([MANUAL] mode).
Annotations	Text, straight line, arrow, free-hand line, marker, scale bar, cross-hairs, grid, crossed scales, bars for XY measurement
Scales and measurement results	Can be embedded in images when saved in CSV format

Display processing part

LCD display	10.1-inch wide TFT LCD display (1920 x 1200 WUXGA)
Backlight	11 steps (0 to 10)
External output format	DisplayPort: 1920 x 1200, 1920 x 1080 microHDMI: 1920 x 1200, 1920 x 1080 Analog RGB (mini D-Sub 15-pin) connector: 1920 x 1200, 1920 x 1080 Note: The DisplayPort, analog RGB, and microHDMI connectors cannot be used concurrently.
Screen freeze (temporary stop)	Available
Zoom display	Electric zoom 1 to 16 times, zoom position movable
Playback display	Full-screen or thumbnail list display (20 thumbnails) Images saved on the internal drive, microSD cards, USB memory drives, and network drives can be replayed.
Operation menu display	[CAMERA], [SHOT/REC], [MEAS/DRAW], [SCALE], [IMAGE], [MIC EASY], [MIC CNTRL], [MIC SETUP], [DS SETUP], [INFO], [NOSEPIECE], [Ti2 CNTRL]
Language setting	Japanese / English
Date setting	Year, month, day, hour, minute, and second
Level meter	Exposure level is indicated in 9 steps with 12 elements in 3 zones (blue, green, red).
Focus indicator	Contrast-based 12-level display
Histogram display	Possible
Image flipping	Horizontal flipping, vertical flipping, and 180-degree °rotation
Capture sound volume	OFF, 1 to 10 (10 steps)

I/O interfaces

Refer to the specifications in the user guide of ARROWS Tab Q555/K64.

The use of each I/O interface is as follows:

USB 2.0 connectors (1 on main body, 3 on cradle)	USB memory drive, USB mouse, USB keyboard, and Nikon microscope
USB 3.0 connector (main body)	Camera
Wired LAN (cradle) and wireless LAN interfaces	Storing images to network drives and performing capture operations from viewer terminals (IPv4 supported)
Bluetooth	Bluetooth mouse and keyboard
Audio	Not used

Power

Refer to the specifications in the user guide of ARROWS Tab Q555/K64.

Other specifications

Refer to the specifications in the user guide of ARROWS Tab Q555/K64.