

Nikon

DS Camera Control Unit DS-U2

DS Camera Head DS-Fi1/DS-5M/DS-2Mv/DS-2MBW

DS Cooled Camera Head DS-Qi1Mc/DS-5Mc/DS-2MBWc/DS-Ri1

<Instructions>

(Ver.4.0)

Thank you for purchasing the Nikon products. This instruction manual has been prepared for users of the DS Camera Control Unit DS-U2, DS Camera Head DS-Fi1/DS-5M/DS-2Mv/DS-2MBW, DS Cooled Camera Head DS-Qi1Mc/DS-5Mc/DS-2MBWc/DS-Ri1. To ensure correct use, please read this manual carefully before use.

- No part of this manual may be reproduced or transmitted in any form without prior written permission from Nikon.
- The contents of this manual are subject to change without notice.
- 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 the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Trademarks

Microsoft, Windows, and Direct X are registered trademarks of Microsoft Corporation in the United States or other countries.

Pentium is registered trademarks of Intel Corporation in the United States or other countries.



Other company and product names indicated in this manual are the trademarks or registered trademarks of their respective companies.

The "TM" and ® marks are not used for registered trademarks and trademarks in this instruction manual.

Warning and Caution Symbols Used in This Manual

Although this product is designed and manufactured to be completely safe during use, incorrect usage or failure to follow the safety instructions provided may cause personal injury or property damage. To ensure correct usage, read this manual carefully before using the product. Do not discard this manual and keep it handy for easy reference.

Safety instructions in this manual are marked with the following symbols to highlight their importance. For your safety, always follow the instructions marked with these symbols.

Symbol	Detail
 Warning	Disregarding instructions marked with this symbol may lead to serious injury or death.
 Caution	Disregarding instructions marked with this symbol may lead to injury or property damage.



Warning

1. Intended application of this product

Use this product only for photomicrography. Do not use this product for other purpose.

2. Do not repair nor disassemble.

The AC adapter for the DS-U2 contains a high-voltage power supply. Never attempt to disassemble or repair the equipment by yourself; doing so may result in electric shock or equipment failure. Never attempt to disassemble any part of the equipment unless instructed to do so in this manual. If you notice any problems with the equipment, turn off the power and contact your nearest Nikon representative.

3. AC adapter

Use the specified AC adapter. Using a wrong adapter may result in fire or electric shock.

Refer to "3. DS AC adapter" in Chapter 9, Specifications for details.

4. Power cord

To prevent electric shock, be sure to turn off the power switch of the DS-U2 before attaching or detaching the power cord.

For the DS-U2, use only the specified AC adapter and power cord.

The specifications of the power cord are shown below. Using a wrong power cord may result in fire or other hazardous condition.

This product is classified as Class I protection against electric shock. Therefore, make sure that the power supply is connected to an appropriate ground terminal (protective earth terminal). If you lose or damage the power cord, contact your nearest Nikon representative.

- **For regions where the power supply is 100 to 120 VAC**

Attachable and detachable power cord set approved by the UL

3 conductor grounding Type SVT. No.18 AWG, 3m long maximum, rated at 125 VAC minimum

- **For regions where the power supply is 220 to 240 VAC**

Approved according to EU/EN standards,

3 conductor grounding Type H05VV-F, 3m long maximum, rated at 250 VAC minimum

5. Handling

- To prevent malfunctions or abnormal heating due to short circuits, do not wet this product and others used with this product nor allow foreign matters to be intruded. If these products get wet, or if foreign matter such as a piece of paper gets inside, immediately turn off the power switch of the DS-U2 and unplug the power cord from the wall outlet. Then, contact your nearest Nikon representative.
- To prevent fire or burn injury due to the breakage of a cable, do not excessively bend nor twist the cables.
- To prevent fire due to heating, do not place a cloth or paper on the DS-U2 nor block the vent of the DS-U2.



Caution

1. Installation location

- Do not use this equipment in locations subject to high temperatures, high humidity, vibration, or excessive amounts of dust. Doing so may result in fire or malfunction.
- Because the DS cooled camera is equipped with a cooling mechanism, it is slightly more susceptible to condensation than typical electronic devices if used for extended periods in locations subject to sudden temperature changes (from cold to hot or vice-versa) or high humidity.

Pay particular attention to the ambient humidity when using the DS cooled camera for extended periods. After extended use, be sure to leave the camera off for a few hours before turning it on again.

- When used for an extended period of time, the DS-U2 may become hot. Do not place the DS-U2 on a surface that cannot withstand heat (such as vinyl or plastic). Always install the equipment with a surrounding clear area of 100 mm or more.
- Arrange a layout that allows easy removal of the power cord from the inlet of the AC adapter in the event of an emergency.

2. Turn off the power before assembling the product or connecting /disconnecting cables.

To prevent failure or malfunction, be sure to turn off the power switch of the DS-U2 before assembling the product or connecting/disconnecting a cable.

3. Connect only the devices specified to the connectors.

To prevent malfunction or damage, connect only the devices specified to the connectors on the DS-U2, or the DS camera head.

4. Cautions on assembly, installation, and storage

- Always turn off the power switch before assembling the product, connecting or disconnecting cables.
- Be careful to avoid pinching your fingers or hands in the equipment during installation.
- To prevent malfunction, handle the product carefully and do not subject it to a strong physical shock or vibration.
- When installing the DS camera head to an optical device such as microscope, make sure that the product or its cable is not interfered with the movable part of the optical device.
- If you are not using the equipment for an extended period of time, unplug the power cord from the power outlet for safety.
- Store the product in a place with little vibration and dust.
- Do not store the product in a hot and humid place.

Contents

Chapter 1	Before Use	1
1	Models of the DS Camera Head.....	1
2	Components	2
Chapter 2	Peripheral Equipment.....	3
Chapter 3	Names of Parts and Their Functions	5
1	DS Camera Control Unit DS-U2	5
2	DS Camera Head	7
Chapter 4	Connecting and Installing the Equipment.....	8
1	Connection Diagrams	8
2	Installing the DS-U2	10
3	Connection Methods	11
Chapter 5	Microscope Setting	14
Chapter 6	Operation Method	17
1	Connecting a Camera Head	17
2	Installing Application Software.....	17
3	Installing the DS-U2 Device Driver	19
4	Operation	28
Chapter 7	Care and Maintenance.....	30
1	Cleaning the System	30
2	Storage.....	30
Chapter 8	Troubleshooting	31
1	Power Supply	31
2	Image Output to a PC Monitor.....	32
3	Camera Settings on the PC.....	35
4	Microscope Control with the PC	36
5	Before Contacting Us	37
Chapter 9	Specifications	38
1	DS Camera Control Unit DS-U2.....	38
2	DS Camera Head	39
3	DS AC Adapter	42
4	Overall Specifications	43

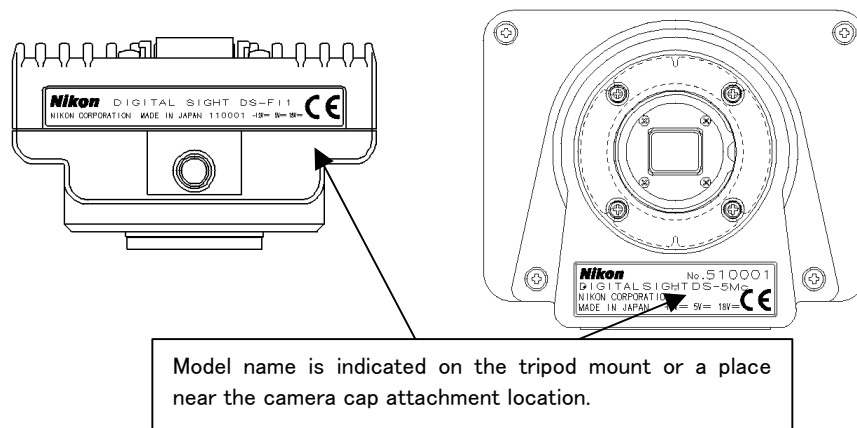
1

Before Use

1

Models of the DS Camera Head

Eight models of DS camera head are provided as follows. The features differ depending on the type you have purchased. Check the type name indicated on the DS camera head before use.



- Features of each model

Model name of the DS camera head	Image pixel	Cooling / Pixel-shifting function	Body color
DS-Fi1	2/3 inch, color 5.24 megapixel	----	White
DS-5M	2/3 inch, color 5.24 megapixel	----	White
DS-2Mv	1/1.8 inch, color 2.11 megapixel	----	White
DS-2MBW	1/1.8 inch, monochrome 2.11 megapixel	----	White
DS-Qi1Mc	2/3 inch, monochrome 1.50 megapixel	Applied / -	Black
DS-5Mc	2/3 inch, color 5.24 megapixel	Applied / -	Black
DS-2MBWc	1/1.8 inch, monochrome 2.11 megapixel	Applied / -	Black
DS-Ri1	2/3 inch, color 1.50 megapixel	Applied / Applied	Black


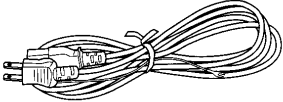
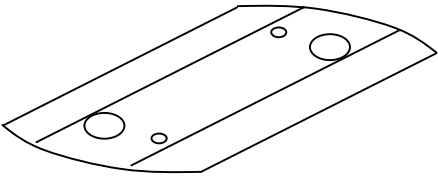
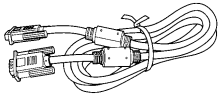

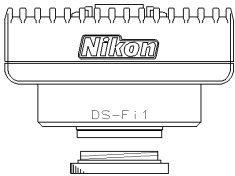


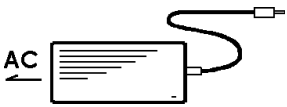
Refer to "Specifications" in Chapter 9 for details of the features above.

Pixel-shifting is a high-resolution photographing function available by using software on PC which is connected with USB cable.

2 Components

Check to see that all the items listed below are provided in the package.

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

1	DS Camera Control Unit DS-U2 	6	Power cord 
2	Vertical stand 	7	Camera cable 3 m E229586 
3	Instruction manual 	8	DS Camera Head with a C mount cap 
4	NIS-Elements freeware package (CD-ROM) 	9	C mount adapter (option) 
5	AC adapter 		

2

Peripheral Equipment

(1) Personal computer (PC)

The DS-U2 is connected to a PC via a USB2.0 interface. The DS-U2 can perform the following operations via the NIS-Elements freeware on the PC.

- 1) Display the captured images on the PC monitor
- 2) Confirm/change the setting of the DS-U2 (such as photographing conditions)

Additionally, using the Nikon NIS-Elements software (option) enables display of the conditions, control, and focus automatically of the Nikon ECLIPSE 80i/90i microscope via the DS-U2.

Contact your nearest Nikon representative for the NIS-Elements software. And, refer to the manual provided with each software for details on control function.

The PC and PC monitor to be connected to the DS-U2 must meet the following system requirements.

• PC unit

Item	Requirement
Type	Windows PC equipped with USB 2.0
CPU	Equivalent to Pentium 4 3.2 GHz or higher Core2 Duo E6700 (2.66GHz FSB1066MHz L2 4MB) or higher for DS-Ri1
Memory	1 GB or more 2 GB or more for DS-Ri1
Hard disc	100 MB of free hard disk space for installation; 300 MB of free disk space for program execution
Video	1280 x 1024 pixels, High Color mode or better (True Color mode recommended)
OS	Windows XP (Japanese/English) Note) Use the Windows XP Professional Service Pack 2.
Other	We recommend installing the Microsoft standard USB 2.0 device driver for the PC's USB controller.

• PC monitor

Item	Requirement
Resolution	1280 x 1024 pixels, True Color mode, displayable monitor recommended

Nikon does not guarantee that the software will work on all the PCs that comply with the operating environments described above. For more information, please contact your nearest Nikon representative.

(2) USB cable

A USB cable is used to connect the DS-U2 to the PC. We recommend a USB 2.0-compatible AB-type cable.

(3) C mount lens

A C mount lens is required to photograph subjects other than photomicrographs. Any lens that meets the following conditions may be used:

- Protrudes no more than 10 mm from the mount surface into the camera.
Less than 5mm for DS-Ri1.
- The image circle of the DS-2Mv, DS-2MBW, and DS-2MBWc is 1/1.8", and the image circle of the DS-Fi1, DS-Qi1Mc, DS-5M, DS-5Mc, and DS-Ri1 is 2/3". Use a lens for 1" or 2/3".
- When using diaphragm settings brighter than F2.8, you may observe slight light fall off around the periphery.

(4) Nikon 80i/90i microscope

When using the Nikon 80i microscope equipped with a digital imaging head or the Nikon 90i microscope, you can connect the DS-U2 to your microscope via the USB interface. The DS-U2 enables control of the microscope and display of microscope conditions using PC application software. To connect the Nikon 80i/90i microscope to the DS-U2, use the USB cable provided with the microscope.

The application software is sold separately.

* The Nikon 80i/90i microscope can be connected directly to a PC via the USB interface. All available microscope operations except autofocus can be controlled from the PC, and microscope settings can be checked from the PC monitor.

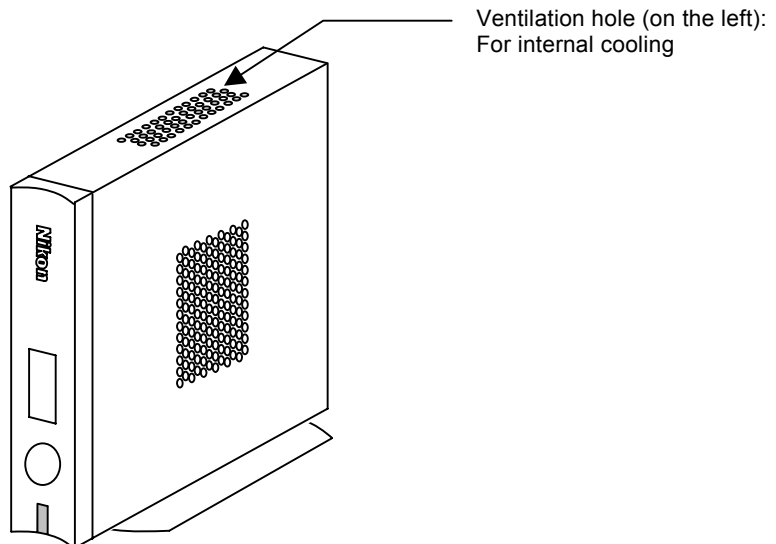
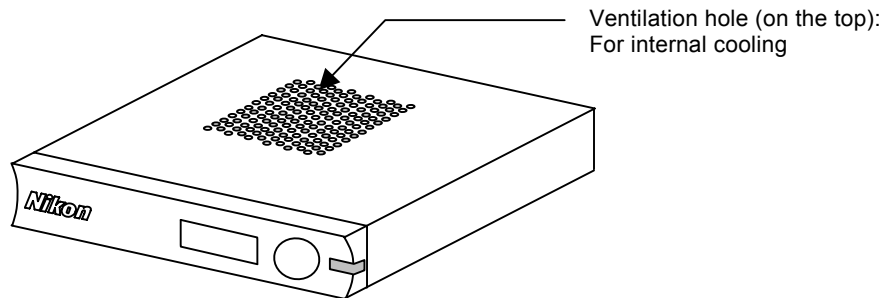
3

Names of Parts and Their Functions

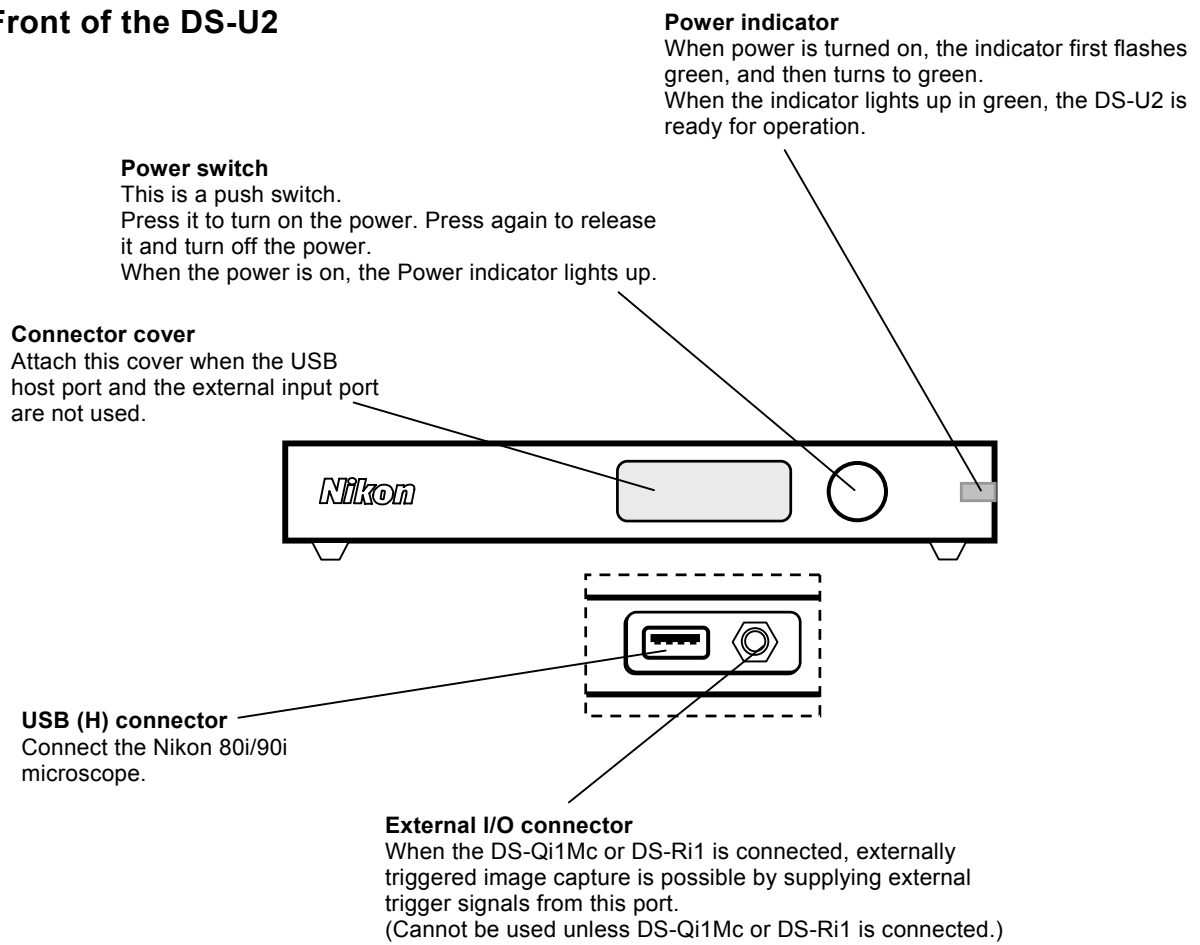
1

DS Camera Control Unit DS-U2

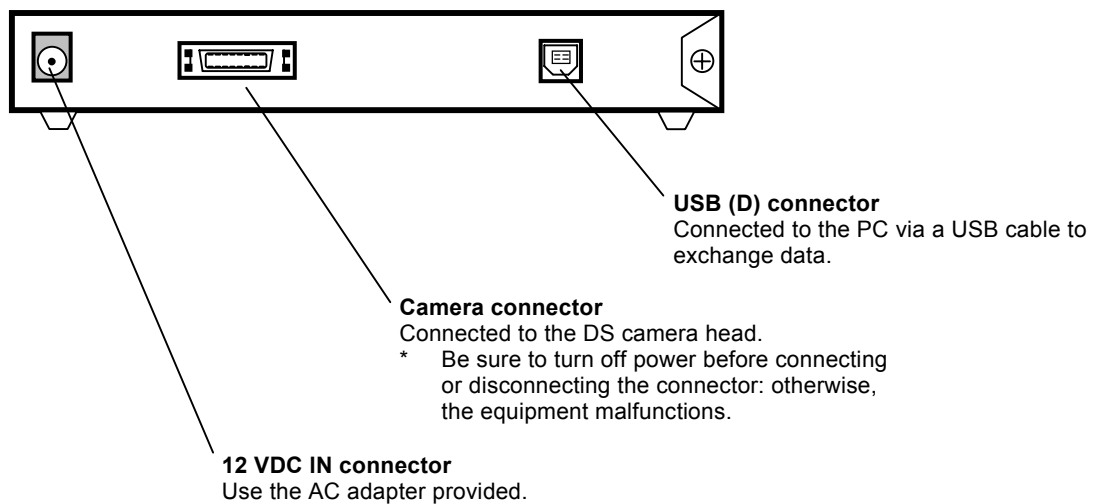
External appearance of the DS-U2



Front of the DS-U2

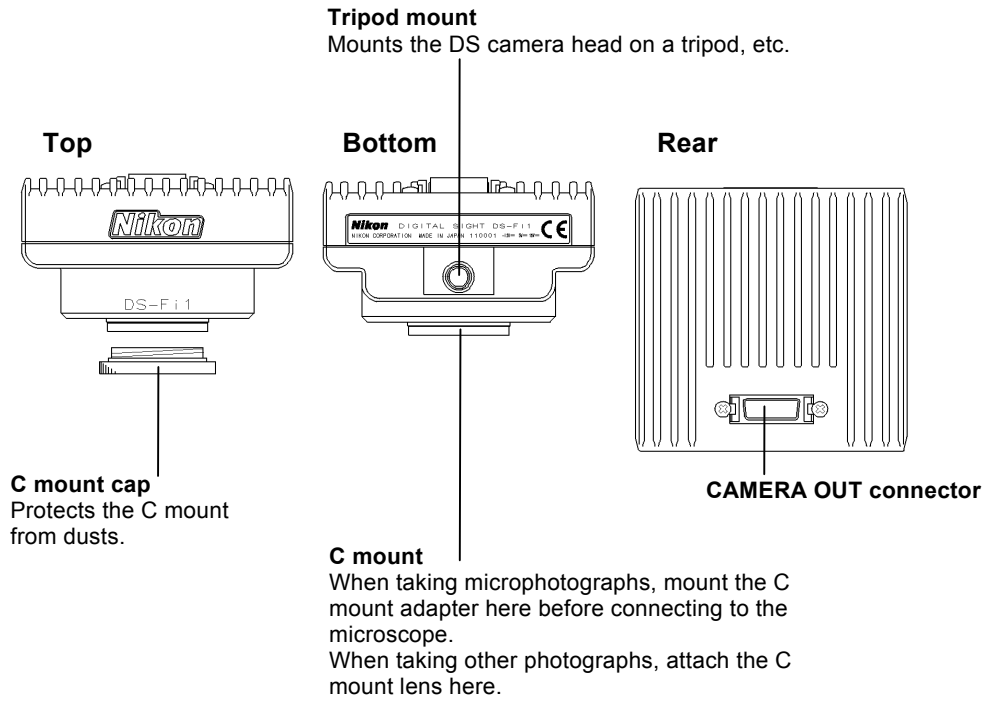


Rear of the DS-U2



2

DS Camera Head

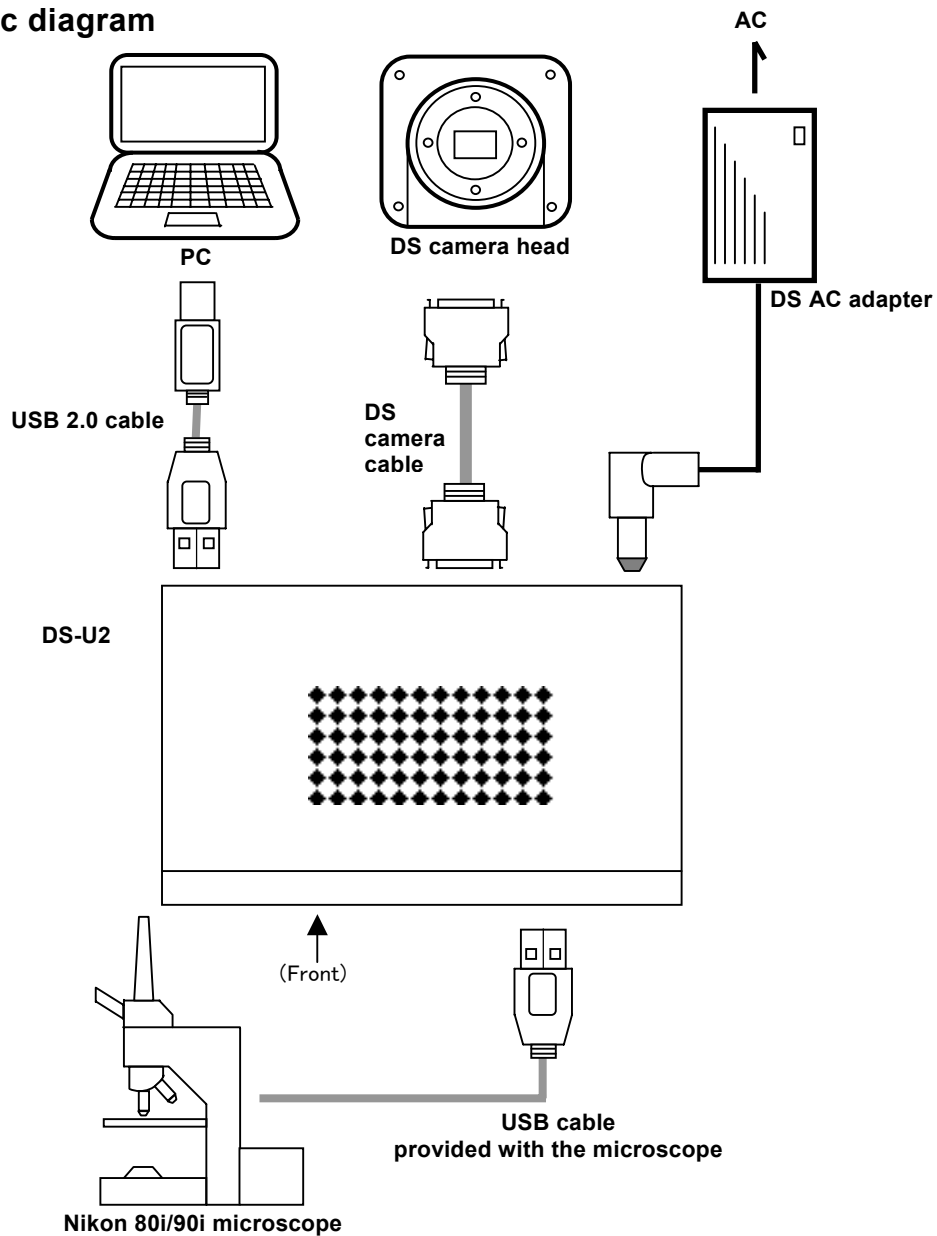


4

Connecting and Installing the Equipment

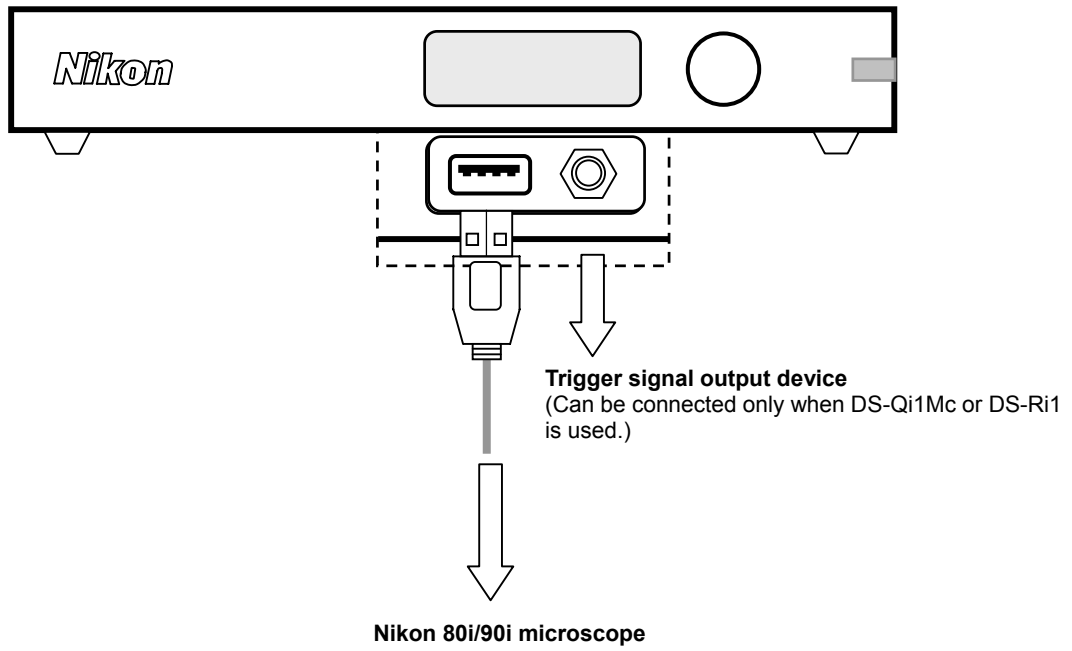
1 Connection Diagrams

Schematic diagram

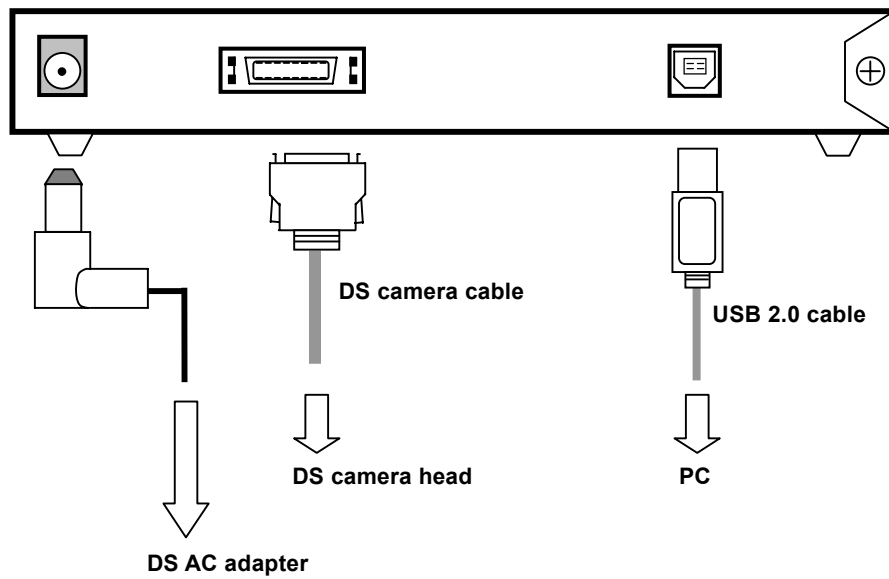


Connectors

Front of the DS-U2



Rear of the DS-U2



2

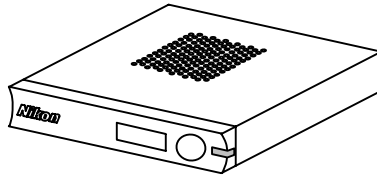
Installing the DS-U2

The DS-U2 can be positioned either horizontally or vertically.

- **Horizontal installation**

Set the DS-U2 horizontally on a flat surface.

Provide a clearance of approximately 100 mm around the product to dissipate heat.

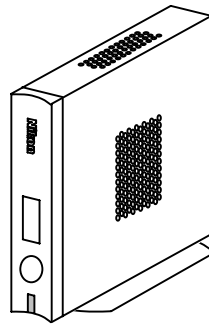


- **Vertical installation**

Attach the vertical stand to the DS-U2 for setting the product in the vertical position.

Set the DS-U2 vertically on a flat surface as shown below.

Provide a clearance of approximately 100 mm around the product to dissipate heat.



Attach the vertical stand as follows:

Remove the two screws at the upper front position and the lower rear position among four screws on the right side of the DS-U2. (See Figure A below.)

Then, fix the stand to the right surface of the DS-U2 using the removed screws. (See Figure B below.)

Use an M2.5-size Phillips driver to attach or detach screws.

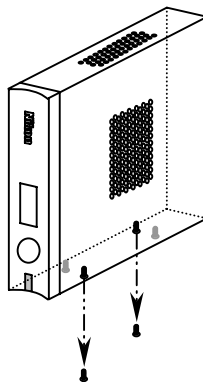


Figure A

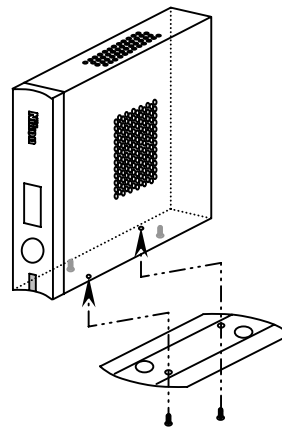


Figure B

3 Connection Methods

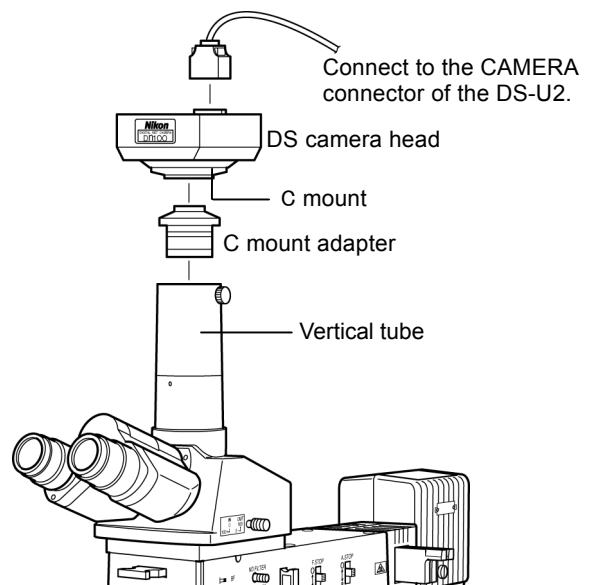
(1) Connecting the DS Camera Head

Be sure to turn off the DS-U2 before connecting the DS camera head.

Connect the CAMERA connector on the DS-U2 and the CAMERA OUT connector on the DS camera head using the provided camera cable. Insert the cable into the connectors with pinching the locking tabs. When the cable is inserted as far as it goes, the locking tabs return to their original positions, locking the connector in place.

Mounting the DS camera head on a microscope

- 1) Remove the C mount cap from the C mount on the DS camera head.
- 2) Make sure there is no dust on the C mount adapter.
If there is, use an air blower or other tool to remove it.
- 3) Screw the C mount adapter into the C mount on the DS camera head.
Screw it in as far as it goes.
- 4) Insert the C mount adapter into the vertical tube of the microscope.
Use the clamping screw on the vertical tube to secure the C mount adapter.



Likewise, a relay lens can be attached.

The x0.7 relay lens is recommended for the DS-Fi1, DS-Qi1Mc, DS-5M, DS-5Mc, and DS-Ri1.

The x0.55 relay lens is recommended for the DS-2Mv, DS-2MBW, and DS-2MBWc.

For setting the microscope with the DS camera head, read "Microscope Setting" in Chapter 5.

Installing an optional C mount lens on the DS camera head

Select an attachable lens (see "Peripheral Equipment" in Chapter 2.), and then screw it into the C mount.

Note that the image quality produced by this product is tuned for microphotography. The tripod mount on the DS camera head can also be used to mount the DS camera head on a tripod.

(2) Connecting to a PC with a USB Cable

Connect the USB connector on the PC and the USB (D) connector on the DS-U2 using the USB 2.0 cable (AB type).

(3) Connecting the Nikon 80i/90i Microscope

Connect the digital imaging head mounted on the 80i or the 90i microscope to the USB (H) connector of the DS-U2. Be sure to use the USB cable provided with the microscope.

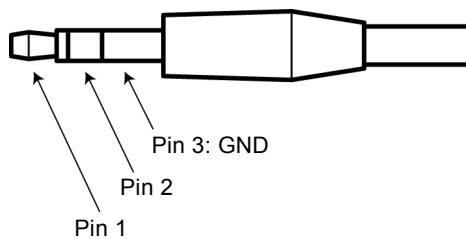
(4) When connecting external devices (trigger signal output devices)

Before connection, always turn off the DS-U2 and external devices.

When the DS-Qi1Mc or DS-Ri1 is connected, triggered capture from external devices is possible by supplying trigger signals to the EXT. I/O connector.

If you are preparing your own external device, use a device that meets the following specifications.

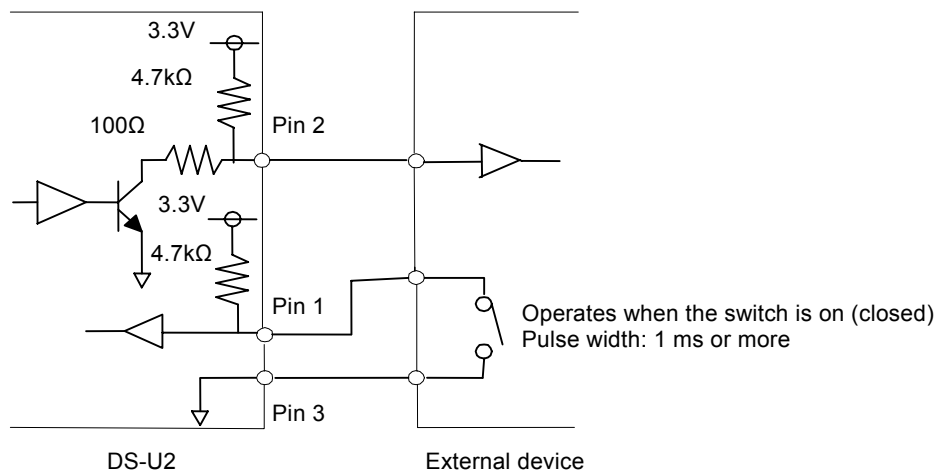
Connector: $\phi 3.5$ mm stereo pin jack



Functions

Pin 1: Trigger input

Pin 2: Read-out transfer timing signal (output)

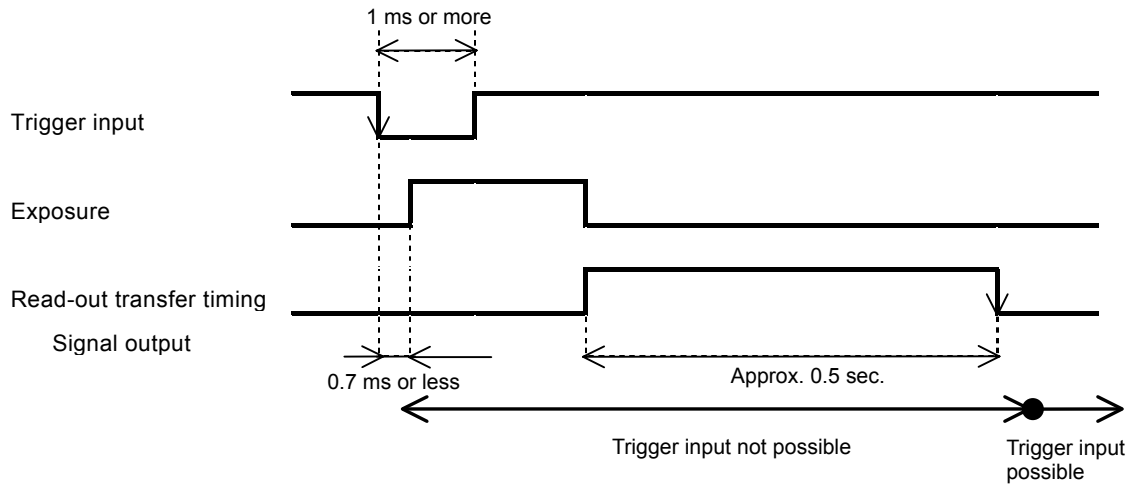


* The TTL or LVTTTL level signal can also be supplied through Pin 1.

In triggered capture, exposure is timed to the falling edge of the trigger signal. Settings configured beforehand in the computer program for exposure time and camera gain are used. Captured images are transferred via USB and displayed in the program.

The timing sequence of triggered capture is as follows.

3 Connection Methods



There is a time lag of up to 0.7 ms between reception of the trigger signal and exposure.

Once a trigger signal is received, the next signal is not accepted until the image has been transferred via USB. Even if a signal is received during this time, it has no effect. Triggers can be received again after the falling edge of the read-out transfer timing signal output.

For detailed instructions on triggered capture, refer to the software instruction manual.

(5) Connecting to a Power Supply

Be sure to turn off the DS-U2 before connecting the DS camera head to prevent electric shock.

Complete all other connections before connecting to a power supply.

Be sure to use the specified AC adapter (DS AC adapter). Refer to "3. DS AC adapter" in Chapter 9, Specifications for details. Connect the specified power cord to the specified AC adapter. Using a wrong AC adapter or power cord may result in a fire or other dangerous conditions. This product is classified as Class I protection against electric shock. Make sure that the power supply is connected to a wall outlet with a protective ground terminal. When the power cord is lost or damaged, contact your nearest Nikon representative.

5

Microscope Setting

When the camera head is mounted on a microscope, set up the microscope as described below.

(1) Use the appropriate filters

When capturing a color image:

Insert the NCB filter into the optical path.

When capturing a monochrome image:

Insert the appropriate filter into the optical path, depending on the photographic purpose.

Generally, inserting a green interference filter (GIF) will heighten contrast.

Additionally, contrast is enhanced by using a filter with a color complementary to the specimen.

Supplement

- * The method for inserting and removing a filter differs depending on the microscopes. Refer to the instruction manual of the microscope in use.
 - * A third-party color compensation filter (CC filter) can be inserted into the illumination optical path of the microscope to compensate for changes in color balance caused by the length of the exposure time.
 - * When using a phase contrast microscope or an interference microscope (two luminous fluxes or multiple luminous fluxes), you can enhance contrast using a green interference filter (GIF) or a monochrome interference filter (IF).
 - * We recommend simultaneous use of an NCB filter and a green interference filter (GIF) for the DS-Qi1Mc, DS-2MBW, and DS-2MBWc.
 - * Some microscopes may require a heat-wave absorption filter.
-

Terms

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) Adjusting the field diaphragm

Adjust the field diaphragm so that it circumscribes the viewfield. Especially for the fluorescent photo with dark background, be sure to adjust the field diaphragm due to its significant relationship with contrast. Refer to the instruction manual of the microscope for details on adjustment.

(3) Adjusting the aperture diaphragm

For diasopic illumination:

Generally, the numeric value of the condenser aperture diaphragm is adjusted to approximately 70% to 80% of the numerical aperture (N.A.) of the objective.

For episcopic illumination:

Generally, the aperture diaphragm is adjusted to approximately 70% to 80% of the size of the pupil of the objective that can be seen by removing the eyepiece and looking into the eyepiece tube.

Supplement

- * Refer to the instruction manual of the microscope for details on the aperture diaphragm adjustment.
 - * To capture the images that have greater depth of focus, decrease the opening size of the aperture diaphragm. Note that excessively decreasing the aperture may limit the performance of the objective.
-

Terms

What is depth of focus?

"Depth of focus" refers to the range along the axis of the field of view over which the image is in apparent focus. Although decreasing the opening size of the aperture diaphragm extends the depth of focus, the resolution will be reduced. Adjust the aperture diaphragm considering your purposes.

(4) Adjusting the focus

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

(5) Adjusting the lamp voltage

When photographing a color image, the color reproducibility of the image depends on the lamp voltage. When a halogen lamp is used as a light source, increasing the lamp voltage produces a bluish light, while decreasing the lamp voltage produces a reddish light. Except in cases where it is specifically necessary to adjust the color, the voltage must be set to the proper level for microphotography, which depends on the microscope in used. (Since this level varies for each type of microscope, refer to the instruction manual of the microscope.)

When the lamp voltage is changed, readjust the white balance.

(6) Adjusting the exposure time

Adjust the illumination for the microscope to a level that yields a suitable exposure time (generally 1/15 to 1/250 s) using a ND filter. Or, adjust the exposure condition of the camera.

Terms

What is a 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 actual levels.

(7) Effects of ambient light

When capturing a dark specimen with a fluorescent microscope, ambient light may enter the optical path. Accordingly, darken the interior lighting for photomicrography. Attach the caps over the binocular eyepiece to prevent light from entering through the eyepiece.

(8) Effects of vibration

Because photomicrography involves extremely high image resolution, a slight vibration can affect image quality. To insulate the microscope from vibration, set it on a solid, stable surface on a solid floor. Using an anti-vibration table compatible with the microscope will further reduce the effects of vibration. During microphotography, be careful to avoid touching the microscope or the desk or stand on which it is positioned.

6

Operation Method

1

Connecting a Camera Head

The DS-U2 is applicable for eight models of camera heads listed below.

The control unit (DS-U2) mode is automatically switched by changing the camera head.

DS-Fi1	5-megapixel CCD	/ color	/ non-cooled
DS-5M	5-megapixel CCD	/ color	/ non-cooled
DS-5Mc	5-megapixel CCD	/ color	/ cooled
DS-2Mv	2-megapixel CCD	/ color	/ non-cooled
DS-2MBW	2-megapixel CCD	/ monochrome	/ non-cooled
DS-2MBWc	2-megapixel CCD	/ monochrome	/ cooled
DS-Qi1Mc	1-megapixel CCD	/ monochrome	/ cooled
DS-Ri1	1-megapixel CCD	/ color	/ cooled / pixel-shift

Refer to "Specifications" in Chapter 9 for details on those cameras.

2

Installing Application Software

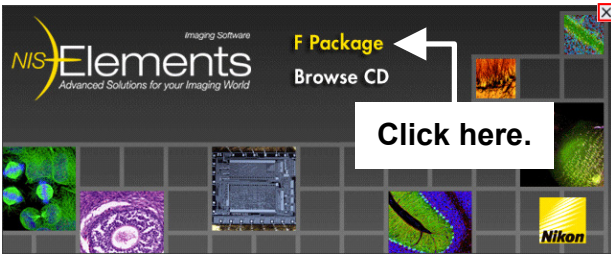
To operate the DS-U2, an application software must be installed in the PC connected to the DS-U2 via a USB interface.

To use the NIS-Elements freeware package, insert the enclosed CD-ROM in the PC and install it in the following procedures.

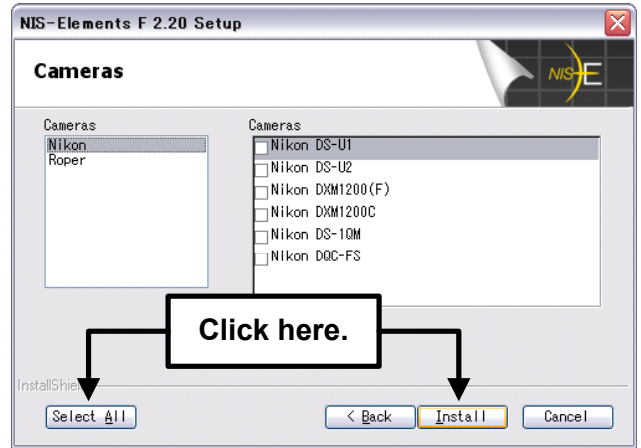
2 Installing Application Software

<Installation procedures>

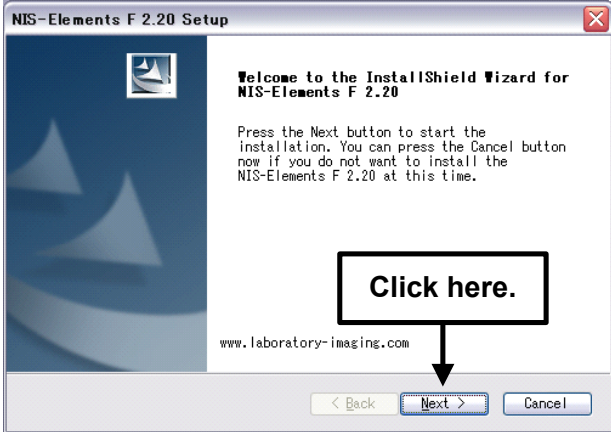
1 Click the F Package on the installation screen.



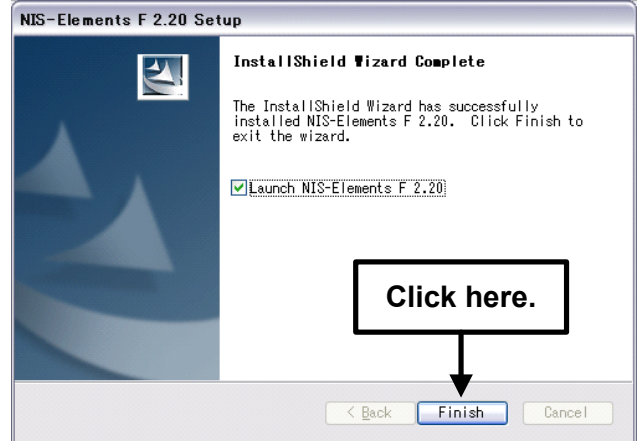
4 Click the Select All button to choose all the cameras. And click the Install button.



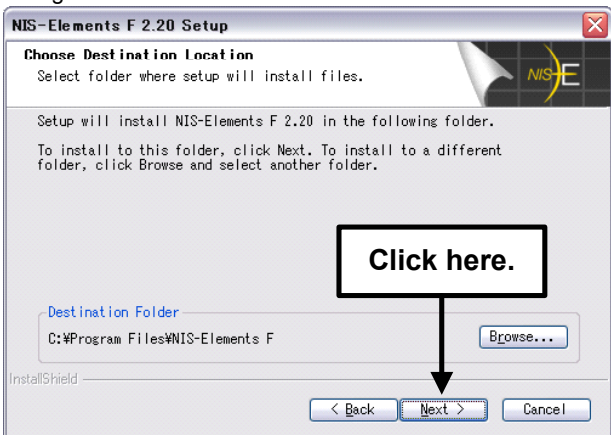
2 The Setup screen appears. Click the Next > button.



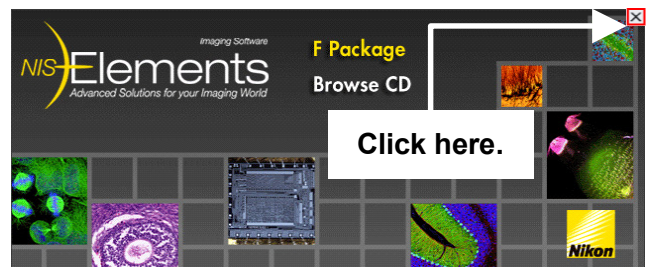
5 The Completion screen appears. Click the Finish button.



3 The Choose Destination screen appears. Click the Browse button when the folder for installation needs to be changed. Click the Next > button.



6 Click the X button to close the window.



To use the Nikon NIS-Elements software, which is sold separately, or another application dedicated to the DS-U2, install it in the PC according to the instruction manual provided with each software.

3

Installing the DS-U2 Device Driver

To connect the DS-U2 with a PC, the device driver must be installed in a PC.

For the DS-U2, install the Nikon USB DS Camera (hereafter called "camera driver") and the Eclipse-i Microscope (hereafter called "Eclipse i-series driver").

The installation procedure is as follows:



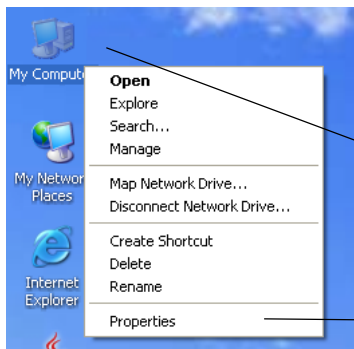
Note: Administrator login is required to install the DS-U2 device driver.

(1) Close all the other applications.

To avoid failure in the setup program, be sure to close all system-resident programs such as the screensaver and anti-virus utility. The procedure for closing the standard Windows screensaver is indicated in this manual. For other programs, refer to their instruction manuals.

Operation procedure

Shortcut menu



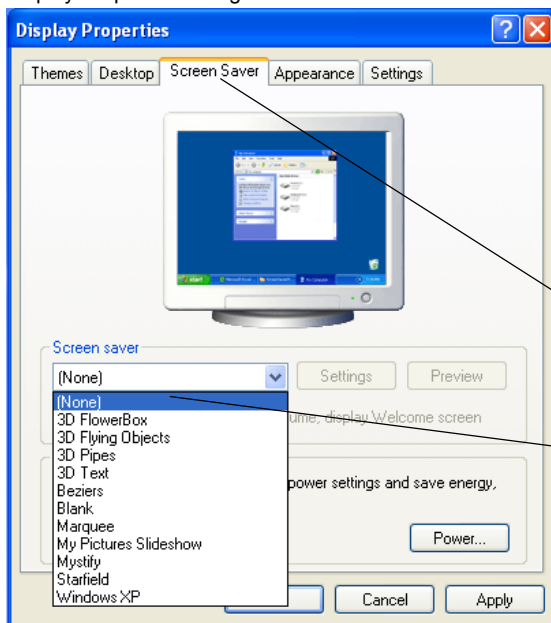
Right-click on the Windows desktop to display the shortcut menu.

Select Properties on the shortcut menu to open the Display Properties dialog box.

1. Right click on the desktop.

2. Select Properties.

Display Properties dialog box



Click the Screen Saver tab in the Display Properties dialog box.

Click the Screen Saver (S) text box and select None from the list, then click the OK button.

Screen Saver tab

Click None.

3 Installing the DS-U2 Device Driver

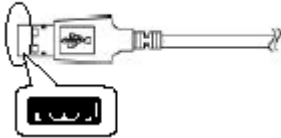
(2) Install the camera driver.

Connect the camera and then install the camera driver.

Operation procedure

Connecting the USB connector

USB A connector

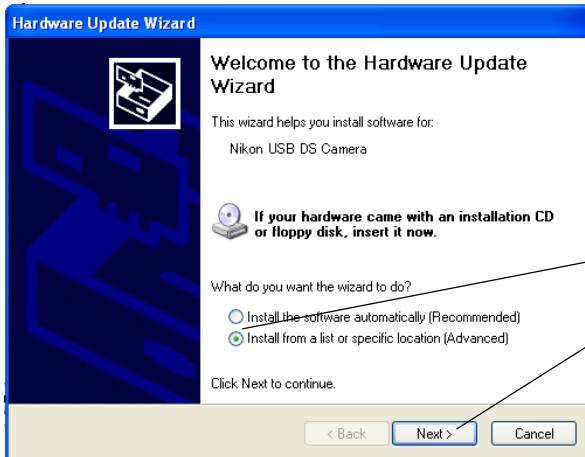


Connect the USB A connector of the USB cable to a PC.



The PC automatically searches for new hardware.

"Hardware Detection Wizard" dialog box

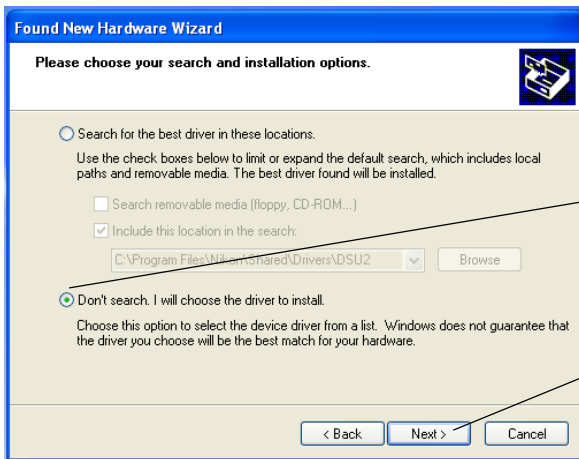


Click the "Install the hardware that I manually select from a list (Advanced)." And then, click Next.

1. Click here.

2. Click Next.

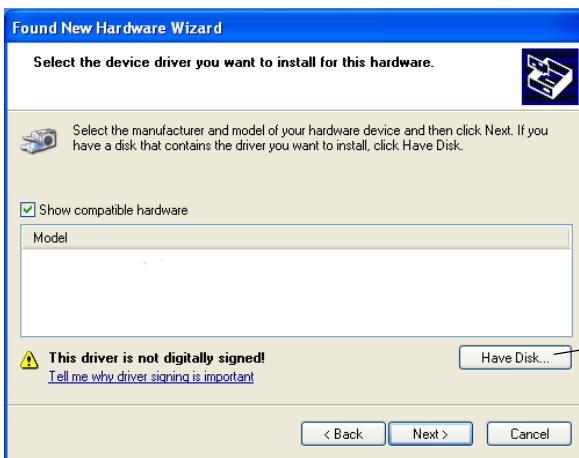
3 Installing the DS-U2 Device Driver



Click the "Don't detect; I will select it from a list." And then, click Next.

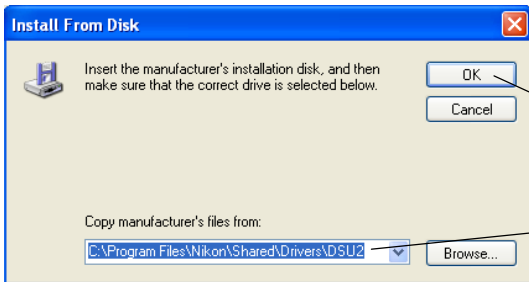
1. Click here.

2. Click here.



Click the Have Disk button.

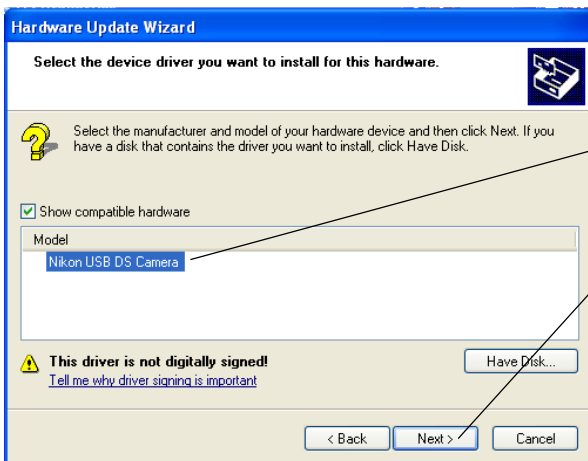
Click the Have Disk button.



Specify "C:\Program Files\Nikon\Shared\Drivers\DS-U2" for the "Copy manufacturer's files from" entry. Click the OK button.

2. Click the OK button.

1. Specify the folder.



Select the "Nikon USB DS Camera." And then, click the Next button. The driver will be installed.

1. Select the Nikon USB DS Camera.

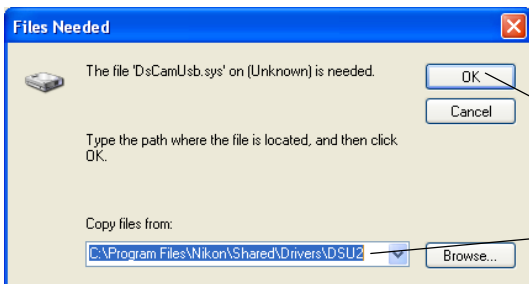
2. Click the Next button.

3 Installing the DS-U2 Device Driver



Click the Continue button.

Click the Continue button.

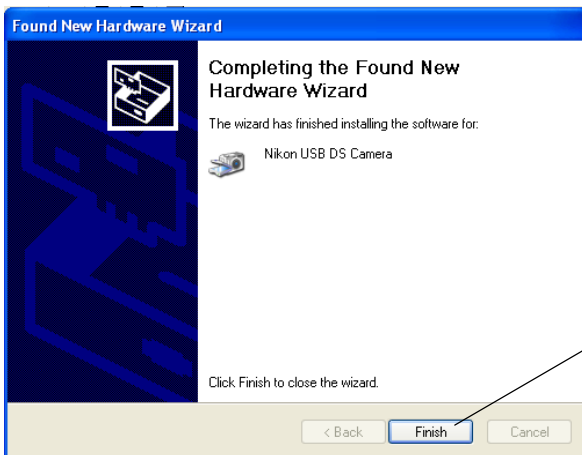


Specify "C:\Program Files\Nikon\Shared\Drivers\DS-U2" for the Copy From box.

And then, click the OK button.

2. Click the OK button.

1. Specify the folder.



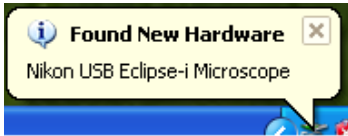
Click the Finish button.

Click here.

3 Installing the DS-U2 Device Driver

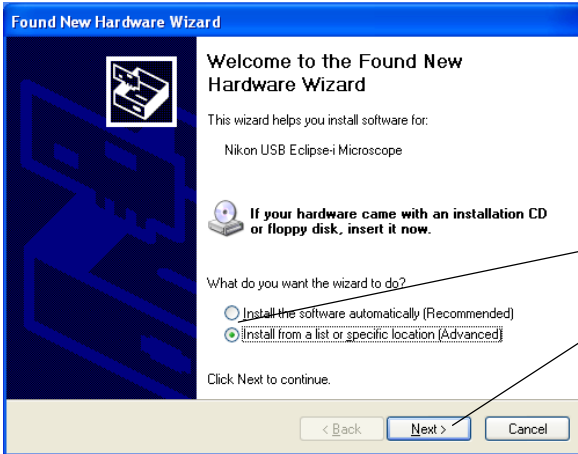
(3) Install the ECLIPSE-i series driver.

Next, drivers for ECLIPSE-i series is installed automatically.



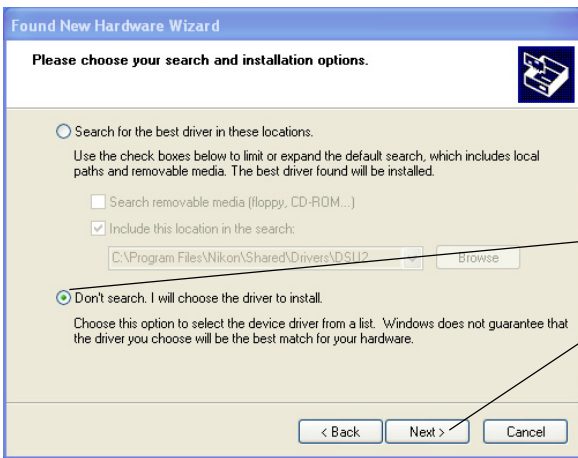
The PC automatically searches for new hardware.

"Hardware Detection Wizard" dialog box



Click the "Install the hardware that I manually select from a list (Advanced)." And then, click Next.

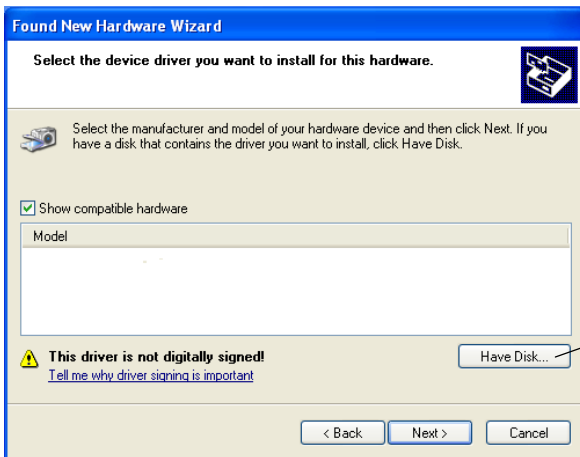
- 1. Click here.
- 2. Click Next.



Click the "Don't detect; I will select it from a list." And then, click Next.

- 1. Click here.
- 2. Click Next.

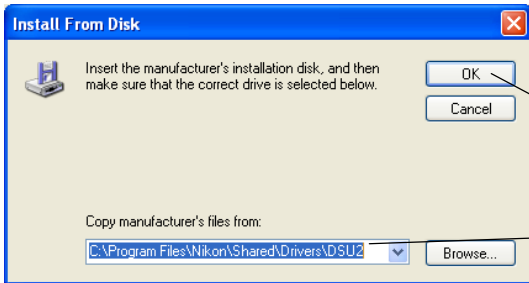
3 Installing the DS-U2 Device Driver



Click the Have Disk button.

Click the Have Disc button.

Screen for specifying file location



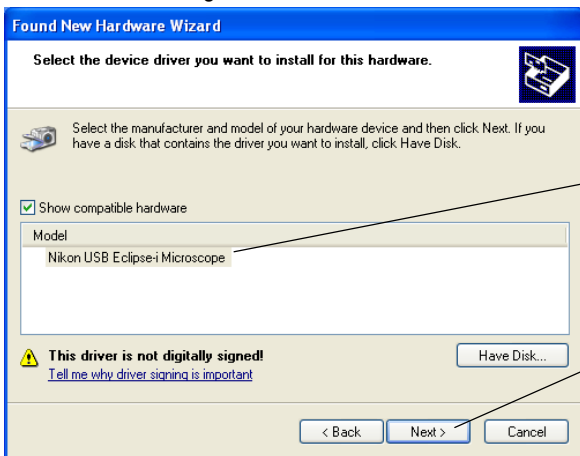
Specify "C:\Program Files\Nikon\Shared\Drivers\DS-U2" for the "Copy manufacturer's files from" entry.

Click the OK button.

2. Click the OK button.

1. Specify the folder.

Screen while installing



Select the "Nikon USB Eclipse-i Microscope." And then, click the Next button. The driver will be installed.

1. Select the Nikon USB Eclipse-i Microscope.

2. Click the Next button.

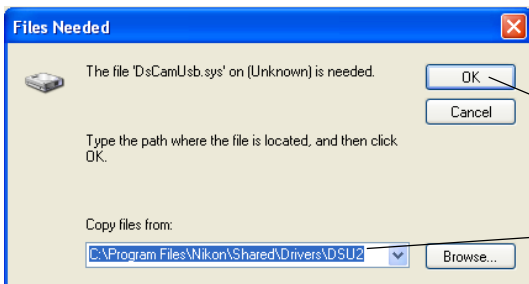
3 Installing the DS-U2 Device Driver

Screen when installation is completed



Click the Continue button.

Click the Continue button.

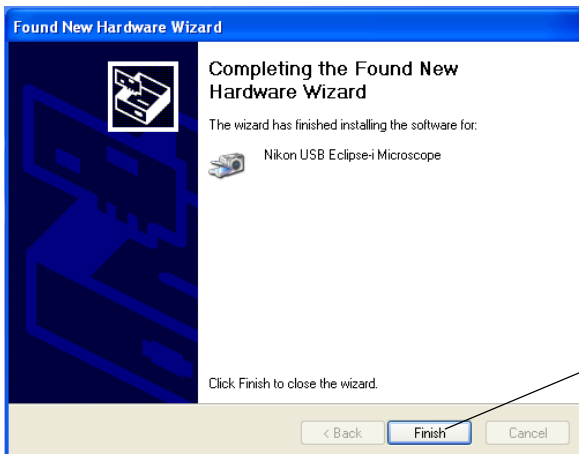


Specify "C:\Program Files\Nikon\Shared\Drivers\DS-U2" for the Copy From box.

And then, click the OK button.

2. Click the OK button.

1. Specify the folder.



Click the Finish button.

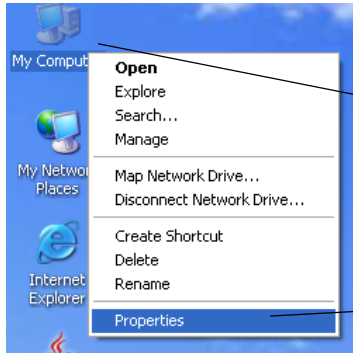
Click here.

(4) Check that the driver is installed.

Check that the driver is installed without any troubles.

Operation procedure

My Computer menu

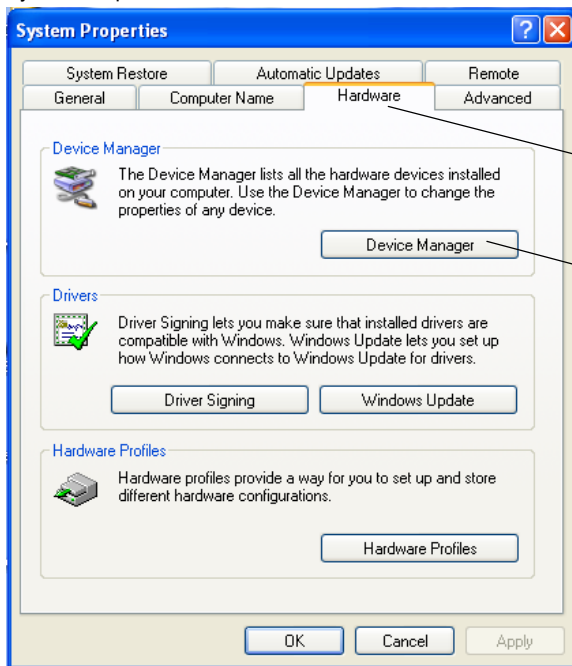


Right-click the My Computer icon and select Properties from the shortcut menu.

1. Click the My Computer icon.

2. Click Properties.

System Properties



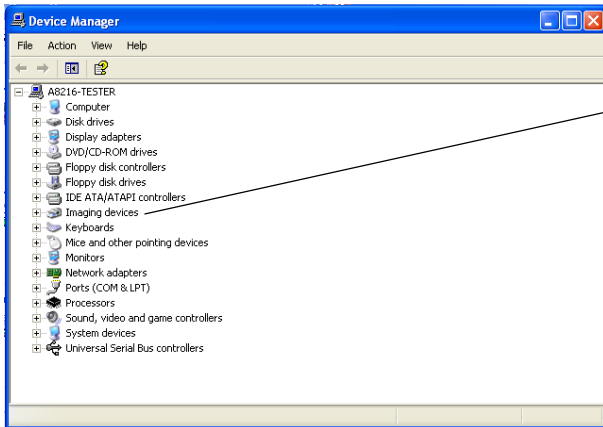
Click the Hardware tab, then click Device Manager (D) in the Hardware panel.

1. Click here.

2. Click here.

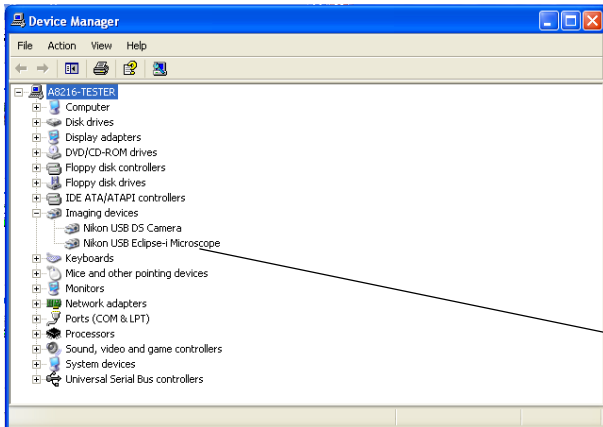
3 Installing the DS-U2 Device Driver

Device Manager window



Click the Imaging Device icon to open it.

Click here.



Two imaging devices must be listed: [Nikon USB DS Camera] [Nikon USB Eclipse-i Microscope]

Check here.

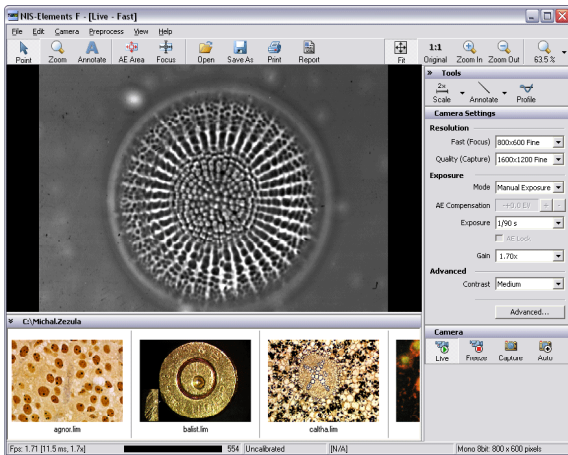
4 Operation

The operation method of the DS-U2 differs depending on the application used together.

(1) For the NIS-Elements freeware

Function of each icon on the Main Window is described below:

<NIS-Elements Freeware --- Main Window --->



1. Operation modes



This mode enables you to click on the image and move it within the image window. Zooming can be performed by a mouse wheel.



This mode changes the cursor to an interactive zoom tool that magnifies a circular part of the current image when clicked.



This mode enables you to insert annotation objects into pictures according to the **Tools** settings.

2. Areas of interest



This tool defines the area of the live image that is used to determine auto exposure parameters applied to the camera.



This tool defines the area of the live image that is used to determine the auto focus parameters. Place the rectangle to where you would like to focus.

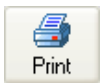
3. Documents treatment



Opens an image file stored on hard disk.



This command can save a captured or modified picture on hard disk.



Opens a printing dialog window that enables you to print the current image if a printer is present.



This button creates a basic image report. It makes a pdf file that contains the current image, its name, path, dimensions, and the file date.

4. Zooming



Adjusts the zoom factor to view exactly the whole image as big as possible.



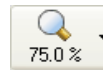
Adjusts the zoom factor to view the current image on the 1:1 scale.



Increases the zoom factor of the current image by one level.



Decreases the zoom factor of the current image by one level.



Enables to zoom the image within a range of 10% to 1200%. Click the arrow at the right of the button to select a zoom magnification.

4 Operation

5. Tools

Displays a scale in the bottom right corner of the image. Click the arrow at the right of the button to open the pop up menu, and then change the magnification of the scale. (2, 2.5, 4, 10, 20, 40, 50, 60, 100, 150 times)



A number of annotation objects can be inserted into the image. Click the arrow at the right of the button to open the pop up menu, and then, select the object to be inserted from the line, arrow, text, rectangle, or circle mode.



An intensity profile of a user defined cross section can be displayed in the image.

6. Working with camera

Displays the live image in the picture window.



Freezes and grabs the live camera image into the picture window as the "Frozen" document.



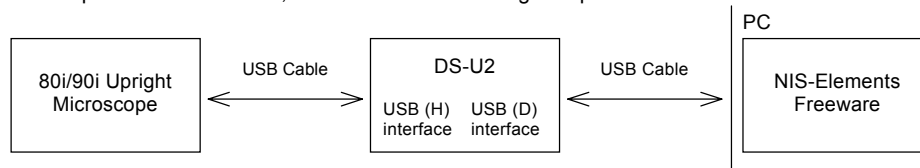
This command captures Live or Frozen image to the application window. It creates a new document called "Captured".



This command captures Live or Frozen image and saves it automatically and names it according to the current settings (File menu > Options).

For details on the operation method, refer to the online help on the application.

- * NIS-Elements Freeware does not include functions for controlling Nikon 80i or 90i series upright microscopes. For this reason, do not use the following setup.



- * NIS-Elements Freeware cannot be used while the i-Series Support Tools control and configuration software is running.

(2) For the NIS-Elements software sold separately or other applications dedicated to the DS-U2

Operate the DS-U2 with reference to the instruction manual provided with each software.

- * Keep the following requirements in mind when running the NIS-Elements software. This is because if the computer enters the Standby mode, live images will not be updated after the computer wakes up. Other problems may also arise.
- Do not close the computer (if it is a notebook).
 - Do not press the Sleep button on the computer.
 - Do not put the computer in Standby mode manually from an operating system menu.

7

Care and Maintenance

1

Cleaning the System

- Use a soft cloth to remove dirt from the DS-U2 and the cables.
- After attaching the C mount cap, use a soft cloth to remove dirt from the DS camera head.
- Use an air blower to blow away dirt inside the DS camera head mount. While blowing away, be sure not to touch the glass filter on the front of the CCD. If you do touch the glass filter, or if dirt cannot be removed from it, contact your nearest Nikon representative and have them clean it.
- To prevent discoloration and separation of the printing, do not use organic solvents (e.g., alcohol, ether, or paint thinner) to clean the coated, plastic or printed parts.

2

Storage

- Turn off the power when the product is not in use.
- Unplug the power cord when the product is not in use for an extended period of time.
- Do not store the product in a hot and humid place or a dirty and dusty place.
- Store the product with the C mount cap attached.

8

Troubleshooting

If you experience any troubles, check the troubleshooting list below.

If you are still not able to solve the trouble, consult with your nearest Nikon representative.

1

Power Supply

Trouble

Check point

The power cannot be turned on.

- Be sure that the power cable is connected. Check the power plug, the wall outlet, the AC adapter, and the 12 VDC IN connector of the DS-U2.
- Check that the power cord supplied with the product is used.
- Check that a specified AC adapter is used.
- Check that the power switch is turned on.

The DS-U2 is hot.

- If the product is used in a hot or narrow place, it may become hot. Check if there is foreign smell such as burnt odor. If there is, unplug the power plug and request a repair service.

2**Image Output to a PC Monitor****Trouble****Check point****No image appears.**

- Check that the cables are connected securely.
- Check that the cables are connected to the specified locations correctly.
- Check that the DS camera head is connected correctly.
- Check that the C mount cap is removed from the DS camera head.
- Check that the subject is placed within the viewfield of the microscope or the lens.
- Check that the optical path of the microscope is in the camera side.
- Check that the USB peripheral equipments such as the USB port, added USB interface board, USB hub are based on the USB 2.0.
- Check that the hub connecting the USB port and the DS-U2 is within a level in the tree structure. Using a hub within a level is recommended.
- Check that the cable connecting the USB port and the DS-U2 is based on the USB 2.0.
- Check that the version of the OS is appropriate for the product. The product is not compatible with the Macintosh.
- Applicable OS: Windows XP, Professional Service Pack 2 (SP2)
- Check that the application software in use is compatible with the DS-U2.
- Check that exposure is set correctly using the application software.
 - ⇒ Refer to the instruction manual for the application software.

Fixed images appear on the screen.

- Check that the camera cable is connected correctly.

2 Image Output to a PC Monitor

Trouble**Check point**

The image is out of focus.

- Check that the edge enhancement is set properly using the application software.
⇒ Refer to the instruction manual for the application software.
- Check that the electronic zoom is not turned on by the application software.
⇒ Refer to the instruction manual for the application software.
- Check that the microscope and the lens is in focus.
- Check that the product is used in a place with little vibration.
- Check that the aperture diaphragm is adjusted correctly. (The aperture diaphragm must be adjusted to 70% to 80% of the numerical aperture of the objective, or 70% to 80% of the pupil of the objective.)
⇒ Refer to "Microscope Setting" in Chapter 5.
- Check that the enlargement factor is adjusted correctly. (The enlargement factor must be adjusted to 500 to 1000 times of the numerical aperture of the objective.)

The image is too dark or too bright.

- Check that exposure or tone is adjusted correctly using the application software.
⇒ Refer to the instruction manual for the application software.
- Check that the intensity of illumination of the microscope is appropriate.

The color is poor.

- Check that the white balance is set with the application software.
⇒ Refer to the instruction manual for the application software.
- Check that the color compensation is not set too high with the application software.
⇒ Refer to the instruction manual for the application software.
- Check that the hue adjustment is not performed with the application software.
⇒ Refer to the instruction manual for the application software.
- Check that the color of the PC monitor is adjusted appropriately.
- Check that the color temperature of illumination is appropriate level.

Trouble	Check point
The contrast is low.	<ul style="list-style-type: none">• Check that the tone is adjusted correctly with the application software. ⇒ Refer to the instruction manual for the application software.• Check that the black level is set appropriately with the application software. ⇒ Refer to the instruction manual for the application software.• Check that the size of the field diaphragm is adjusted so that it circumscribes the view field.• Check that the size of the aperture diaphragm is adjusted to approximately 70% to 80% of the numerical aperture of the objective lens.• Check that an appropriate filter is used. When using a phase contrast microscope or an interference microscope (two luminous fluxes or multiple luminous fluxes), insert the specified filter. With a black and white image, contrast is improved by inserting a green interference filter (GIF). Contrast in color images is enhanced by inserting a filter having a complementary color to that of the specimen.• Check that the ambient light around the microscope does not affect. If the ambient light affects, darken the room or attach a cap to the binocular eyepiece.• Check that the contrast of the specimen is sufficient.

3**Camera Settings on the PC****Trouble****Check point**

Unable to control camera functions. (Or incorrect settings result.)

- Check that the specified device driver is installed in the PC. The specified device driver is enclosed with the CD-ROM.
- Check that the Microsoft standard USB 2.0 driver is installed as the USB controller device driver. Using a device driver supplied by a different company may result in improper operation.
- Check that the application software in use is compatible with the DS-U2.
- Check that the DS-U2 and the PC are connected with the USB cable.
- Check that the cables are connected to the specified locations correctly.
- Check that the USB peripheral equipments such as the USB port, added USB interface board, USB hub are based on the USB 2.0.
- Check that the hub connecting the USB port and the DS-U2 is within a level in the tree structure. Using a hub within a level is recommended.
- Check that the cable connecting the USB port and the DS-U2 is based on the USB 2.0.
- Check that the version of the OS is appropriate for the product. The product is not compatible with the Macintosh.
Applicable OS: Windows XP, Professional Service Pack 2 (SP2)

Sound is heard from the Camera Head (DS-Ri1)

- If you obtain a high-resolution image by pixel-shifting on DS-Ri1, sound could be heard from the movable part of the Camera Head. However, this is not a problem.

4

Microscope Control with the PC

Trouble

Check point

Unable to control microscope functions. (Or incorrect control results.)

- Check that the Nikon 80i/90i microscope is used. This function cannot be used with a microscope from a different company or other Nikon microscope models.
- Check that the microscope is turned on.
- Check that the microscope is ready for operation. It takes about 30 seconds for the microscope to be ready.
- Check that the USB cable is connected securely between the DS-U2 and the digital imaging head on the 80i microscope or the 90i microscope.
- Check that the hub between the microscope and the DS-U2 is within a level in the tree structure. Using a hub within a level is recommended.
- Check that the USB cable provided with the microscope is used to connect the microscope and the DS-U2.
- Check that the application software designed for control of the Nikon 80i/90i microscope is used.

Unable to display microscope status. (Or incorrect status information is displayed.)

- Check that the microscope initial setting is performed.
- Check that the registration is changed if the objective or filters are replaced.

5 Before Contacting Us

Before contacting Nikon or its sales partners, please have the following information ready, as this will speed up the response to your inquiry.

Date:	(Year)	(Month)	(Day)	
Date of purchase:	(Year)	(Month)	(Day)	Shop name:
Your name:				
Your contact address:				
Telephone				
DS camera control unit product name: DS-L2		Serial No.:		
DS camera head product name:		Serial No.:		
Peripheral devices connected (microscope, trigger signal generator, etc.)				
Manufacturer's name:		Model:		
Manufacturer's name:		Model:		
Your PC				
Manufacturer's name:		Model:		
Operating system (OS) version and Service Pack (SP) number:				
Type of CPU and its clock frequency:		Memory capacity:		
Types of applications and their versions (NIS-Elements, Freeware, etc.)				
Symptoms of the problem, displayed messages, and frequency with which the symptoms appear.				
Please supply us with as much information as possible.				
If there are problems in the images, please supply us with the images if available.				

Please copy this page and use it as required.

9

Specifications

1

DS Camera Control Unit DS-U2

Camera control system

Exposure control system	Program AE, shutter speed priority AE, focus AE, manual with AE lock function
Photometry	Average photometry, peak hold photometry, photometry area position/size selectable
Electronic shutter	1/1000 s to 60 s (with DS-F1i, DS-5M, DS-2Mv, or DS-2MBW) 1/1000 s to 600 s (with DS-Qi1Mc, DS-5Mc, DS-2MBWc, or DS-Ri1) 1/1000 s to 60 s (with DS-Ri1 in pixel-shifting mode)
Exposure compensation	13 steps
White balance	Set method, color balance adjustable
Color correction	Gamma (tone), black level, saturation, hue adjustment, special effects (monochrome, inversion)
Image correction	Shading correction, noise reduction, edge enhancement, horizontal/vertical inversion of image

Other functions

Scene mode	Selectable from five biological modes, four industrial modes, and two other modes
Autofocus	Possible only when connected to the Nikon 90i microscope
Image freeze	Available

I/F

USB2.0 host interface	Connect the interface to the Nikon 80i/90i microscope.
USB2.0 device interface	Compatible with Vendor Unique class. Connect this interface to the controller PC.
Transfer image format (USB2.0 device interface)	RGB 24 bit, monochrome 8 bit, or RAW 12 bit

General

External dimensions	193 (W) x 35 (H) x 195 (D) mm (when set in the horizontal orientation)
Weight	1.2 kg
Rated input voltage	12 VDC±5%
Power consumption	35 VA (when the DS camera head and DS AC adapter are attached)
Acoustic Noise	Less than 70 dB Maschinenlärminformations- Verordnung –3.GPSGV, 06.01.2004: Der höchste Schalldruckpegel beträgt 70 dB(A) oder weniger gemäß EN ISO 7779

2

DS Camera Head

	DS-Qi1Mc	DS-Fi1
Image pickup device	2/3-inch square pixel, 1.50 megapixel interline CCD	2/3-inch square pixel, 5.24 megapixel interline CCD
Color/monochrome	Monochrome	Color
Infrared blocking filter	None	Built in
Max. frame rate *1	19.0 fps (1.3M progressive scan) 31.5 fps (VGA progressive scan) 46.8 fps (QVGA progressive scan) 24.2 fps (center scan)	5.9 fps (5M interlaced) 10.0 fps (1.3M interlaced) 12.0 fps (1.3M progressive scan) 23.3 fps (center scan)
Number of recording pixels	1280 x 1024 640 x 480 320 x 240	2560 x 1920 1280 x 960 640 x 480
Quantization	12 bits	
Sensitivity	Equivalent to ISO 800	Equivalent to ISO 64
	(Settings: Tone 3; camera sensitivity x1)	
Lens mount	C mount Supported lenses: Protruding no more than 10 mm from the mount surface into the camera. Image circle: ϕ 11 mm	
Dimensions	77 (W) x 76 (D) x 44 (H) mm	
Weight	290 g	260 g
Fixing tripod mount	Tripod screw for cameras	
Body color	Black (with logo)	White (with logo)
CCD cooling	(Peltier cooling)	-----

*1 The CCD mode is indicated in parentheses.

The frame rate figure indicates the maximum frame rate of the camera.

The image display speed of the PC varies significantly depending on the PC's operating environment and the USB data transfer rate.

Given below are approximate maximum frame rates for image display:

640 x 480 pixels x 3 colors (RGB) 15 fps

640 x 480 pixels x one color (monochrome) 30 fps

2 DS Camera Head

	DS-Ri1
Image pickup device	2/3-inch square pixel, 1.50 megapixel interline CCD
Color/monochrome	Color
Infrared blocking filter	Built in
Max. frame rate *1	19.0 fps (1.3M progressive scan) 31.5 fps (VGA progressive scan) 46.8fps (QVGA progressive scan) 24.2fps (center scan)
Number of recordable pixels *2	1280 x 1024 640 x 512 640 x 480 320 x 256 320 x 240 4076 x 3116 (pixel-shifting mode) 3840 x 3072 (pixel-shifting mode) 2038 x 1558 (pixel-shitting mode) 1920 x 1536 (pixel-shifting mode) 1920 x 1440 (pixel-shifting mode) 1240 x 1024 (pixel-shifting mode) 960 x 720 (pixel-shifting mode) 640 x 480 (pixel-shifting mode)
Quantization	12bits
Sensitivity	Equivalent to ISO 200 (Settings: Tone 3; camera sensitivity x1)
Lens Mount	C mount Supported lenses: Protruding no more than 5 mm from the mount surface into the camera. Image circle: ϕ 11 mm
Dimensions	77 (W) x 76 (D) x 44 (H) mm
Weight	350 g
Fixing tripod mount	Tripod screw for cameras
Body color	Black (with logo)
CCD cooling	(Peltier cooling)

*1 The CCD mode is indicated in parentheses.
The frame rate figure indicates the maximum frame rate of the camera.
The image display speed of the PC varies significantly depending on the PC's operating environment and the USB data transfer rate.

Given below are approximate maximum frame rates for image display:

1280 x 1024 pixels (in fast mode)	19 fps
640 x 480 pixels	30 fps

*2 Pixel-shitting mode :
Pixel-shifting is a high-resolution photographing function available by using software on PC which is connected with USB cable.

2 DS Camera Head

	DS-2Mv	DS-2MBW	DS-2MBWc	DS-5M	DS-5M c
Image pickup device	1/1.8-inch square pixel, 2.11 megapixel interline CCD			2/3-inch square pixel, 5.24 megapixel interline CCD	
Color/monochrome	Color	Monochrome		Color	
Infrared blocking filter	Built in	None		Built in	
Max. frame rate *1	15.0 fps (2M progressive scan) 20.0 fps (800*6 progressive scan) 30.0 fps (800*5 progressive scan) 30.0 fps (center scan)			3.8 fps (5M interlaced) 6.8 fps (1.3M interlaced) 7.5 fps (1.3M progressive scan) 15 fps (center scan)	
Number of recording pixels	1600 x 1200 800 x 600 400 x 300			2560 x 1920 1280 x 960 640 x 480	
Quantization	12 bits				
Sensitivity	Equivalent to ISO 100	Equivalent to ISO 350 (Settings: Tone 3; camera sensitivity x1)		Equivalent to ISO 64	
Lens mount	C mount Supported lenses: Protruding no more than 10 mm from the mount surface into the camera. Image circle: ϕ 8.9 mm				
Dimensions	91 (W) x 76 (D) x 41 (H) mm				
Weight	260 g	290 g	260 g	290 g	
Fixing tripod mount	Tripod screw for cameras				
Body color	White (with logo)	White (with logo)	Black (with logo)	White	Black
CCD cooling	-----	-----	(Peltier cooling)	-----	(Peltier cooling)

*1 The CCD mode is indicated in parentheses.

The frame rate figure indicates the maximum frame rate of the camera.

The image display speed of the PC varies significantly depending on the PC's operating environment and the USB data transfer rate.

Given below are approximate maximum frame rates for image display:

640 x 480 pixels x 3 colors (RGB)	15 fps
800 x 600 pixels x 3 colors (RGB)	10 fps
800 x 600 pixels x one color (monochrome)	30 fps

3**DS AC Adapter**

Model name	F10453C / F1650K / AD-1260B / EA1050E-120
Manufacturer	Electricity Power Source (EPS) Inc. (F10453C, F1650K) Midi-Power Electronics Inc. (Manufacturer: Powertron Technology Co., Ltd) (AD-1260B) EDAC POWER Electronics Co., Ltd (EA1050E-120)
Rated input voltage	100 to 240 VAC 50/60 Hz 1.2 A maximum
Rated output voltage	12 VDC±5% 3.75 A maximum (F10453C)/3.5 A maximum (F1650K, EA1050-120)/5.0 A maximum (AD-1260B)
External dimensions	117 (L) x 53 (W) x 30 (H) mm (F10453C)/ 121 (L) x 60 (W) x 35 (H) mm (F1650K) 121 (L) x 62 (W) x 36 (H) mm (AD-1260B) 120 (L) x 60 (W) x 35 (H) mm (EA1050E-120)
Weight	250 g (F10453C)/350 g (F1650K)/270 g (AD-1260B)/ 253 g (EA1050E-120)
Conforming standards	GS, CE, and UL

4

Overall Specifications

Operating environment

Temperature	0 to 40 °C
Humidity	60% RH maximum (no condensation) (DS-Qi1Mc and DS-Ri1 only: Can also be used in 0 to 30°C and 80% RH)
Altitude	2000 m maximum
Pollution degree	Degree 2
Installation category	Category II
Electric shock protection class	Class I Indoor use only

Storage environment

Temperature	-20 to 60 °C
Humidity	90% RH maximum (no condensation)

* The contents of this manual are subject to change without notice.

VCCI**Note:**

This product has been tested and found to comply with the specifications for a Class A information technology equipment, pursuant to the standards of Voluntary Control Council for Interference by Information Technology (VCCI).

This product is intended to be used in a residential area, however, it may cause radio disturbances if used near a radio or a television set.

Follow the instruction manual to operate the product properly.

Conforming standards

This product conforms to the UL60950-1 standard.

This product conforms to the EN60950-1 standard.

This product satisfies the FCC 15B Class A standard.

This product satisfies the EU EMC Directive.

This product satisfies the EU Low Voltage Directive.

This product conforms to the Korea MIC mark approval.

