

Instructions

BXC-CBB

Modular Microscope Assemblies Hardware

Notes

This instruction manual is for Modular Microscope Assemblies.

To ensure safety, obtain optimum performance and to familiarize yourself fully with the use of this product, we recommend that you study this manual thoroughly before operating this product, and always keep this manual at hand when operating this product.

Retain this instruction manual in an easily accessible place near the work desk for future reference.

This product is applied with the requirements of standard IEC/EN61326-1 concerning electromagnetic compatibility.

- Emission Class A
- Immunity Industrial electromagnetic environment

Emissions exceeding the level required by aforementioned standards may occur if this product is electrically connected to other equipment.

Some interference may occur if this product is used in residential environments.

In accordance with European Directive on Waste Electrical and Electronic Equipment, this symbol indicates that the product must not be disposed of as unsorted municipal waste, but should be collected separately. Refer to your local distributor in EU for return and/or collection systems available in your country.

Research and Industrial Use Only

This product is categorized as FCC Part15 Class A exempt device. Using this product may affect other equipment in the environment. The operator of this exempted product shall be required to stop operating the product upon a finding by the Commission or its representative that the product is causing harmful interference. Operation shall not resume until the condition causing the harmful interference has been corrected.

For Korea only

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1. Introduction

Configuration of instruction manuals

Read all the instruction manuals supplied with the units you purchased.

The following instruction manuals are prepared for the units to be used with this product.

Manual names	Main contents
BXC-CBB Safety manual	Safety precautions
BXC-CBB Hardware manual	Safety precautions, specifications and assembly method
BXC-CBB Application manual	Advanced BXC-FSU Usage. For details, contact us.
BXC-CBB Command reference manual	How to use RS-232C communication commands. For details, contact us.

Intended use

This product is designed to observe magnified images of specimens in industrial applications.

Appropriate samples include semiconductors, electrical components, molded parts or mechanical parts.

Industrial applications include observation, inspection or measurements.

Do not use this product for any purpose other than its intended use.

2. Safety precautions

If the product is used in a manner not specified by this manual, the safety of the user may be imperiled. In addition, the product may also be damaged. Always use the product according to this instruction manual.

The following symbols are used in this instruction manual.

CAUTION:

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices or potential material damage.

NOTE:

Indicates a potential situation which, if not avoided, may result in failure of this instrument.

TIP:

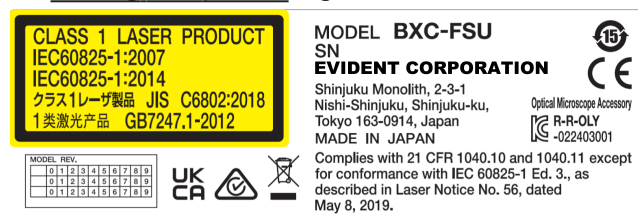
Indicates the useful knowledge or information for use.

2.1 Laser safety

CAUTION:

Never peel off the warning label.

Warning label position: Right side surface of BXC-FSU



This product is specified as CLASS 1 laser product.

CLASS 1 LASER PRODUCT (IEC60825-1:2007 / IEC60825-1:2014)

This product complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.

Do not remove the cover.

It is very dangerous to remove the cover using a tool as the built-in laser will be accessible. Never remove the cover as it could also cause failure of the product.

Built-in laser (semiconductor laser)

Wavelength: 780 nm

Maximum power output: 10 mW

Beam divergence: 35°

2.2 CAUTION: Safety precautions

Transportation

When carrying each unit, be careful not to drop it.

If the unit falls, your foot, etc. may get injured.

2.3 WARNING: Prevention of electric shock

Never disassemble any part of this product.

It could cause electric shock or failure of the product.

Do not touch the product with wet hands.

In particular, if you touch the main switch of the power unit or the power cord with wet hands, electric shock, ignition or failure of the product may be caused.

Do not bend, pull or tie the power cord/cables in a bundle.

Otherwise they could be damaged, causing a fire or an electric shock.

Keep the power cord and cables well away from the lamp housing.

If the power cord and cables contact a hot area of the lamp housing, they could melt and cause electric shock.

2.4 CAUTION: Electric safety

Always use the power cord specified by us.

If the proper AC adapter and the power cord are not used, the electric safety and the EMC (Electromagnetic Compatibility) performance of the product can not be assured.

Always connect the ground terminal.

Connect the ground terminal of the power cord and that of the power outlet.

If the product is not grounded, our intended electric safety and EMC performance of the product can not be assured.

Do not use the product in close proximity to the sources of strong electromagnetic radiation.

Proper operation may be interfered. The electromagnetic environment should be evaluated prior to operation of the product.

Disconnect the power cord in case of emergency.

In case of emergency, disconnect the power cord from the power cord connector on the product or from the power outlet.

Install the product at the location where you can reach the power cord connector or the power outlet at hand to disconnect the power cord quickly. If you cannot install the product at the location described above, check the rated current of this product and prepare the suitable disconnecting devices.

Do not connect or disconnect the power cord, cables and units while the power is on.

2.5 CAUTION: LED (light emitting diode)

Do not look directly at the light from the LED unit for a long time.

If you feel that the light from LED unit is too bright during observation, adjust the light intensity using the brightness control knob before continuing the observation. The LED built in this product is basically eye-safe. However, do not look directly at the light from the LED unit for a long time, since it may cause damage to your eyes.

Do not look directly at the light coming out from the objective or the specular reflection light from the sample.

Do not look directly at the light coming out from the objective for a long time, since it may cause damage to your eyes.




Do not expose your skin to the light coming out from the objective for a long time.

If your skin is exposed to the light coming out from the objective for a long time, you may get burned.

2.6 Safety symbols

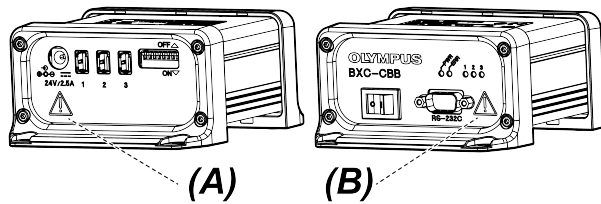
The following symbols are placed on this product.


Study the meaning of the symbol and always use the product in the safest possible manner.

Symbol	Meaning
	Indicates a non-specific general hazard. Follow the description given after this symbol or in the instruction manual
	Indicates that the seesaw type main switch is ON. (Seesaw type is the type of switch where ON or OFF is selected by pressing it to ON or OFF side.)
	Indicates that the seesaw type main switch is ON.

2.7 Caution engraving/label

Safety labels are placed on the portions which particularly require special cautions when using or operating this product. Be sure to follow these instructions.



Label position	Safety label	Instructions in the instruction manual	Relevant page
(A), (B)		[Caution for electric safety] [Caution for prevention of electric shock]	<u>3</u> <u>2</u>

If a caution engraving or label is dirty or peeled off, contact us for the replacement or other inquiry.

2.8 Specifications

Rating

AC adapter	Input: 100-240 V \sim 50/60 Hz 1.4 A(Max) Output: 24.0 V --- 2.71 A(Max)
Control box	Input: 24V --- 2.5A(Max)

Operating environment

Temperature	5 to 40°C (41 to 104 °F)
Humidity	0 to 85%
Variation of power supply voltage	\pm 10 %
Pollution degree	2 (in accordance with IEC60664)
Installation category (excess voltage category)	II (in accordance with IEC60664)
Conditions for safety standards	<ul style="list-style-type: none"> Indoor use Altitude: Max. 2000 meters Temperature: 5 to 40 °C (41 to 104 °F) Relative humidity: 20 to 80% for temperatures up to 31 °C (88 °F) (without condensation) In case of over 31 °C (88 °F), the relative humidity is decreased linearly through 70% at 34 °C (93 °F), 60% at 37 °C (99 °F), and to 50% at 40 °C (104 °F).

2.9 Restrictions

The maximum total length of the cables (BXC-LCBL1M, BXC-LCBL3M, BXC-LCBL6M) that can be used is 13 m.

3. Setup procedures

⚠CAUTION:

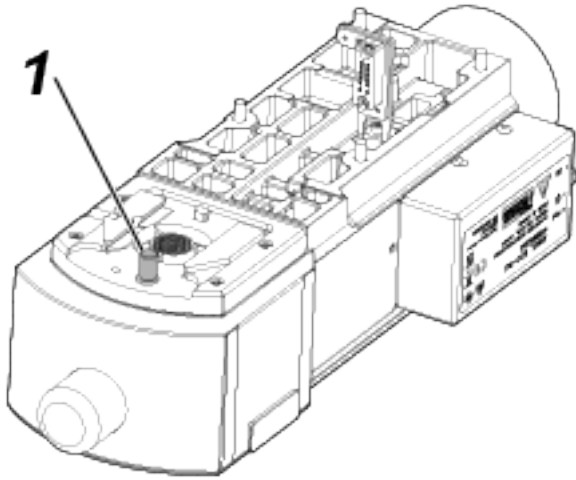
The use of this product in combination with systems that are not specified in this manual cannot be guaranteed. If you wish to use this product in combination with systems that are not specified in this manual, take measures under your responsibility so that the use of this product in combination with systems you will use complies with standards required in your local area.

3.1 Removing the transport lock from the motorized light guide reflected light illuminator

1. Place BXC-RLI/BXC-RLI-CA/BXC-RLI-LGCA facing down on a desk and remove the transport lock.

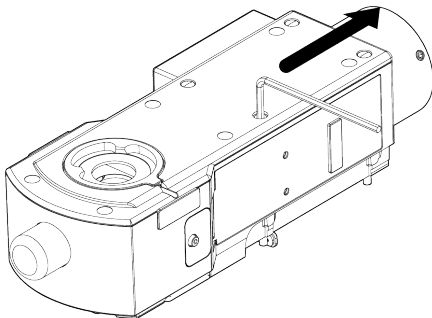
NOTE:

- A nosepiece cannot be attached unless the transport lock is removed.
- If you start the device with the transport lock attached, the product may be damaged.

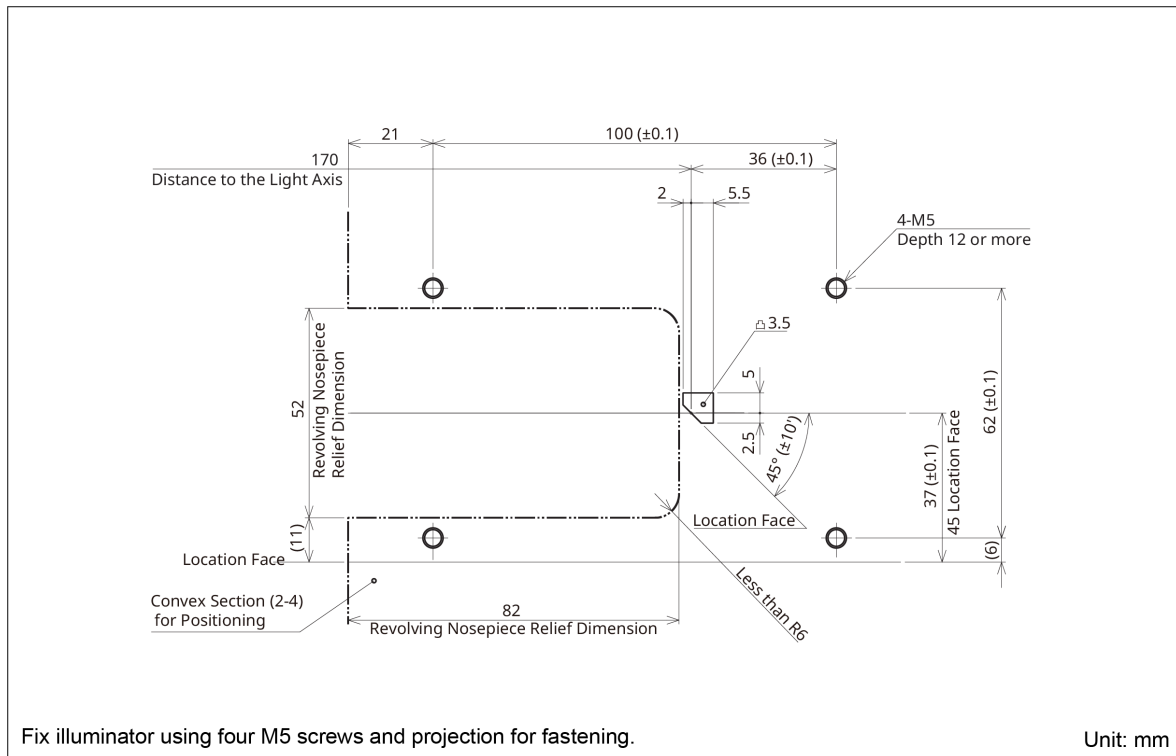


3.2 Attaching the motorized light guide reflected light illuminator

1. Remove the caps of BXC-RLI/BXC-RLI-CA/BXC-RLI-LGCA (four positions) with your tweezers, etc.
The following steps are described using only BXC-RLI.
2. While making BXC-RLI contact with your instrument from the front to the back (in arrow direction), tighten the clamping screws (four positions) provided with BXC-RLI.



Mounting Dimensions of Illuminator (BXC-RLI/BXC-RLI-CA/BXC-RLI-LGCA)



3.3 Attaching the Autofocus Sensing Unit to the motorized light guide reflected light illuminator

Attach BXC-FSU to BXC-RLI/BXC-RLI-CA/BXC-RLI-LGCA according to the following steps.

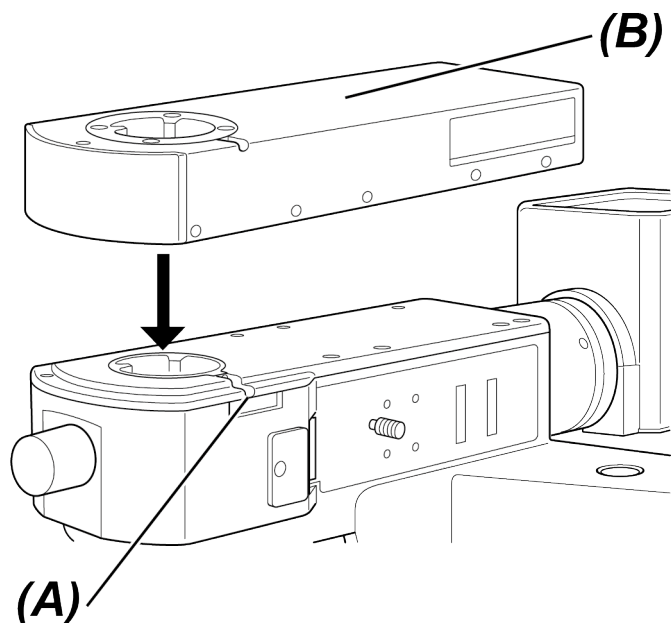
The following steps are described using only BXC-RLI.

Tool used: Allen wrench (3mm)

NOTE:

- Be sure to adjust centering of the Autofocus Sensing Unit BXC-FSU.
- To ensure safety, be sure to unplug the AF cable during installation and adjustment of the Autofocus Sensing Unit BXC-FSU.

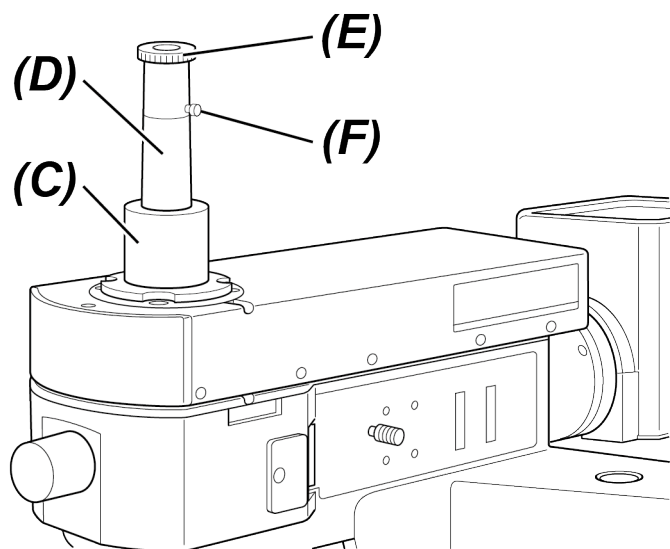
1. Sufficiently loosen the observation tube clamping screw (A) of the motorized light guide reflected light illuminator BXC-RLI with the Allen screwdriver provided with BXC-RLI, attach the circular dovetail on the bottom of the Autofocus Sensing Unit BXC-FSU (B), and tighten the clamping screw (A).



NOTE:

The centering of the Autofocus Sensing Unit BXC-FSU should be adjusted before mounting it on the observation tube.

2. Attach the standard cylindrical shaft (C) to the observation tube mounting seat of the Autofocus Sensing Unit BXC-FSU and insert the centering telescope CT (D) in the standard cylindrical shaft. Rotate the helicoid (E) on the top of the CT to focus on the cross scale. Rotate the helicoid (E) on the top of the CT to focus on the cross scale.

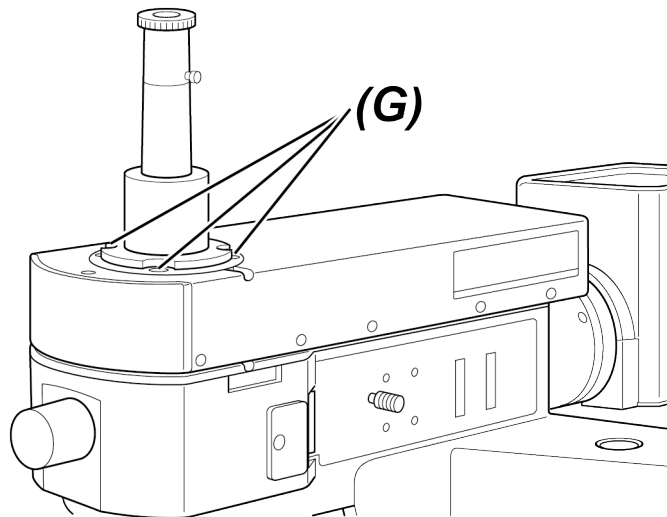


3. Engage the objective with the highest magnification of the ones being used in the light path.
4. Set the observation path of the vertical illuminator to reflected light brightfield (BF).
5. Loosen the clamping screw (F) of the CT. Slide the CT up and down while looking through it and tighten the clamping screw (F) when the objective pupil (white circle you see when looking through the CT) comes into focus.

- Loosen the clamping screws inside four holes (G) on top of the Autofocus Sensing Unit BXC-FSU, then move BXC-FSU in all directions to place both the center of the objective pupil and the center of the CT cross within one scale. When this is achieved, securely tighten the clamping screws.

NOTE:

Do not loosen the clamping screws too much.

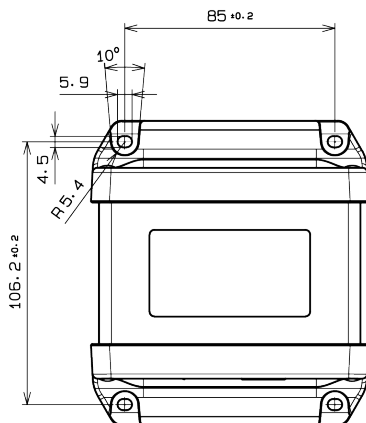


- Remove the standard cylindrical shaft and the CT, then cover four holes (E) on top of the Autofocus Sensing Unit BXC-FSU with the provided seals.

3.4 Installing the control box

When securing the control box to the floor, wall or ceiling, attach it with your screws.

Positions of screw holes:



Recommended screw: M4, L: 8 mm or longer

Washer: M4

- Remove four rubber feet from the control box using a tool such as tweezers.
- Insert your washers between the screw holes and the screws and tighten four screws.

NOTE:

Do not tighten the screws too much. Doing so may damage the product.

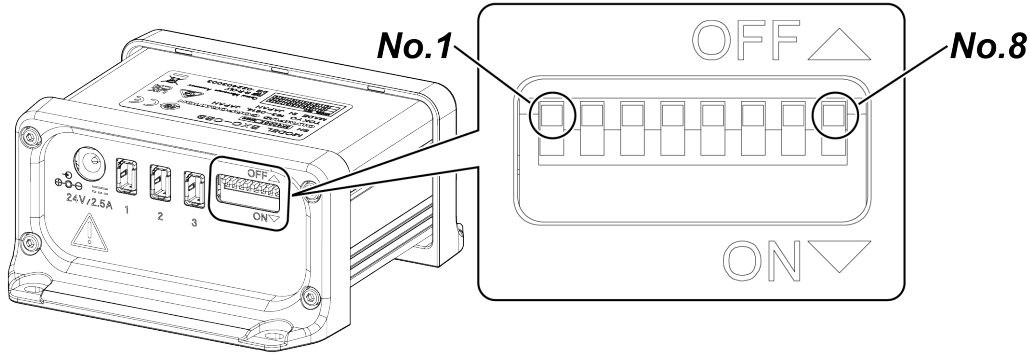
3.5 Setting up BXC-CBB

TIP:

Before setting the DIP switch, set the main switch to ○(OFF).

The switch settings are read and defined after Power-ON.

1. Confirm that the DIP switch on BXC-CBB is set properly.



The allocated functions of the DIP switches are shown in the table below.

■ : Factory default setting

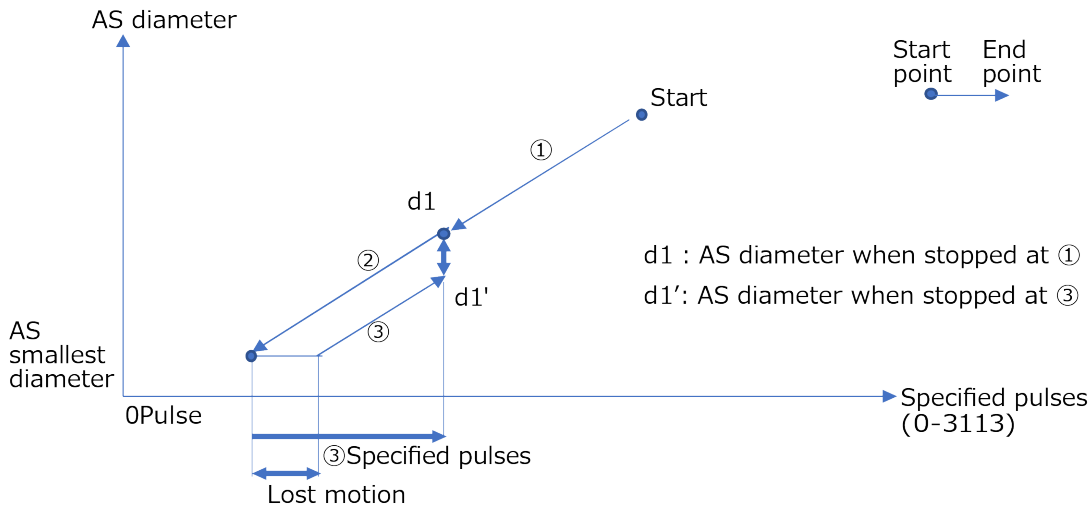
SW-No.								Function	Note
1	2	3	4	5	6	7	8		
Off								Buzzer sound	The buzzer sound is heard
On									The buzzer sound is not heard
	Off							Nosepiece (NP)	5Position-NP
	On								6Position-NP
		Off						AS control*1	Normal
		On							High-precision control (lost motion reduction)
			Off					NP Control*2	Rotate through the highest numbered hole
			On						Does not rotate through the highest numbered hole
				Off				Reserved by maker	Always OFF
				On					Always OFF
					Off			Reserved by maker	Always OFF
					On				Always OFF
						Off		Reserved by maker	Always OFF
						On			Always OFF

TIP:

***1 AS control**

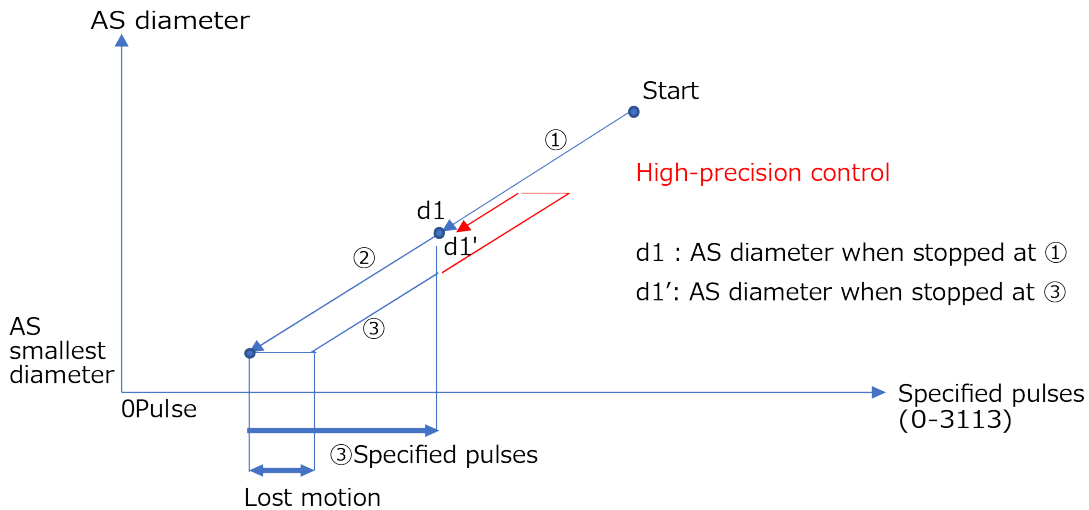
The AS mechanism uses backlash. For this reason, the AS diameter after moving varies depending whether the diaphragm was opened or closed. This is referred as lost motion. The lost motion for this system corresponds approximately to 200 pulses. This phenomenon is more apparent when the AS diameter is smaller. The following figure shows the relationship of the AS diameter to the specified pulse numbers using the 3-stage action, ① ⇒ ② ⇒ ③, as an example.

Normal



In the normal mode, the specified AS diameter is achieved with the shortest path. As action ③ includes a lost motion, the AS diameter defers from the AS diameter when stopped at action ①. Based on the recommended pulse number (see the table on page 28) for each objective, select high-precision control, if necessary.

High-precision control



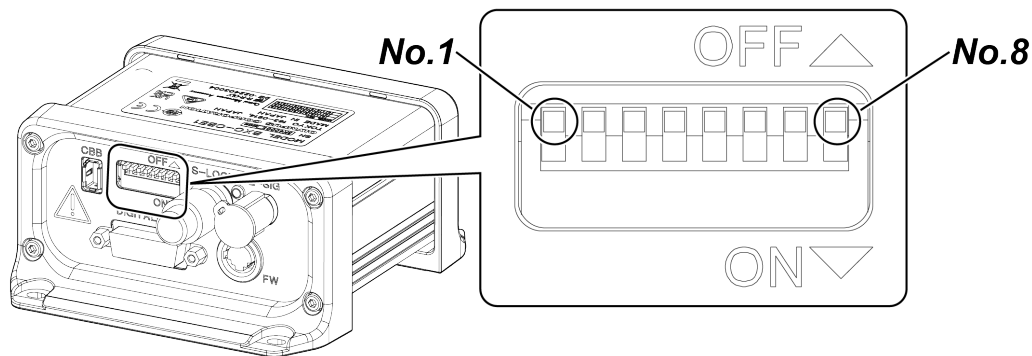
By selecting high-precision control, you can reduce the effect of the lost motion. In this mode, the positioning accuracy improves as the system always stops at the specified AS diameter from the opening direction. However, if the opening direction is specified, the control time will be longer for the amount of time it takes to move the distance shown with the red arrow.

***2 NP Control**

Selecting "Rotate through the highest numbered hole" rotates the nosepiece to the specified hole using the shortest path. Selecting "Does not rotate through the highest numbered hole" rotates the nosepiece in the opposite direction if the shortest path to the specified hole goes through the highest numbered hole. By attaching a low-magnification objective to hole 1 and a high-magnification objective to the highest numbered hole, you can avoid an objective colliding with the sample when the nosepiece is rotated.

3.6 Setting up BXC-CBE1

1. Confirm the DIP switch on BXC-CBE1 is set properly.



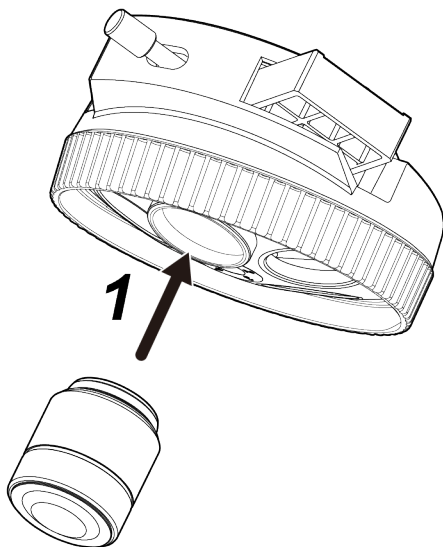
Set everything to OFF (factory default setting).

3.7 Attaching the objectives

1. Attach the objectives by screwing them into the nosepiece mounting holes.

NOTE:

- Start from the nosepiece mounting hole 1 in the order of the lowest to the highest magnification objective.
- Attach the objectives starting from the nosepiece mounting hole 1 without leaving any holes in between empty.
- Make sure to place caps on any holes to which objectives are not attached.



3.8 Attaching the nosepiece

If you are not using the motorized nosepiece connector such as when using a manual nosepiece, refer to "[Storing the motorized nosepiece connector of the motorized light guide reflected light illuminator \(page 13\)](#)".

1. Loosen the nosepiece clamping screw (A) of BXC-RLI/BXC-RLI-CA/BXC-RLI-LGCA using the Allen screwdriver provided with BXC-RLI/BXC-RLI-CA/BXC-RLI-LGCA.

The following steps are described using only BXC-RLI.

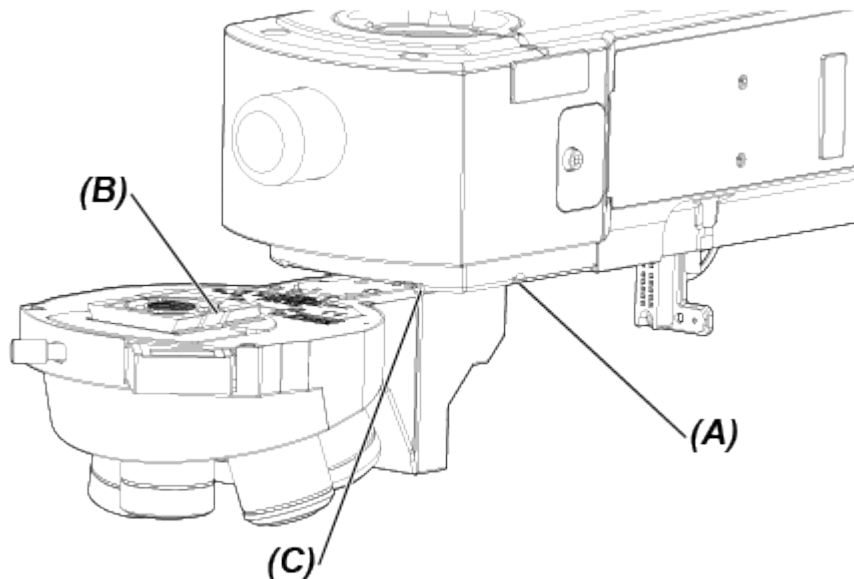
NOTE:

Be careful, if the clamping screw is loosened too much, it may come off.

2. Insert the nosepiece from the front side by aligning the slide dovetail (B) of the nosepiece with the nosepiece mount dovetail (C) of BXC-RLI, and push it until it touches the end.

NOTE:

Tightening the clamping screw before the nosepiece touches the end may damage the product or cause poor connection of the connector.



3. While pushing the nosepiece in the attaching direction with your left hand, hold the Allen screwdriver between the pointing finger and the thumb and tighten the nosepiece clamping screw (A) to secure the nosepiece.

3.9 Storing the motorized nosepiece connector of the motorized light guide reflected light illuminator

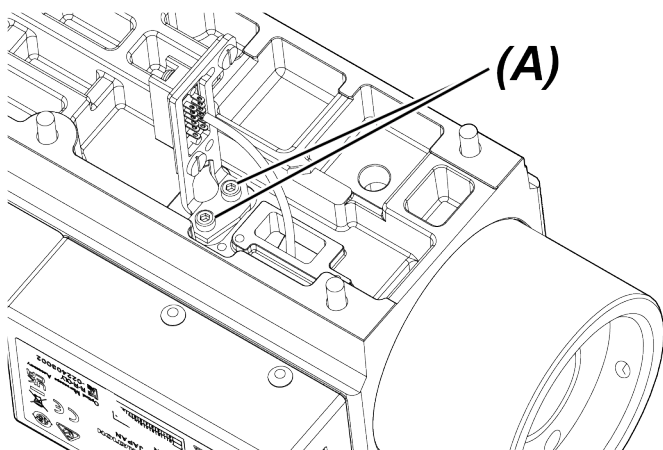
You can store the motorized nosepiece connector inside BXC-RLI/BXC-RLI-CA/BXC-RLI-LGCA if you are not using it, such as when using a manual nosepiece.

The following steps are described using only BXC-RLI.

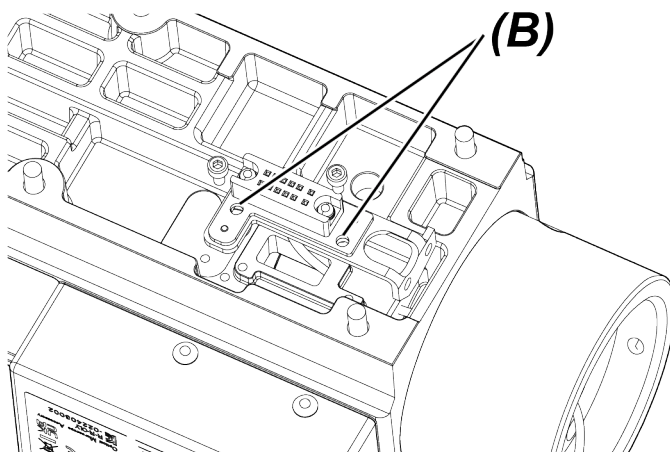
NOTE:

Once you remove the motorized nosepiece connector, its performance cannot be guaranteed even if you restore it.

1. Loosen and remove two clamping screws (A) on the back side of BXC-RLI with your allen wrench (M3).



2. Store the motorized nosepiece connector as shown in the figure and secure it by tightening two clamping screws (B) you previously removed.



3.10 Attaching the light source for reflected light illumination

3.10.1 Attaching the LED illumination

1. Loosen two mounting screws (A) of the reflected light illuminator using an Allen screwdriver.

NOTE:

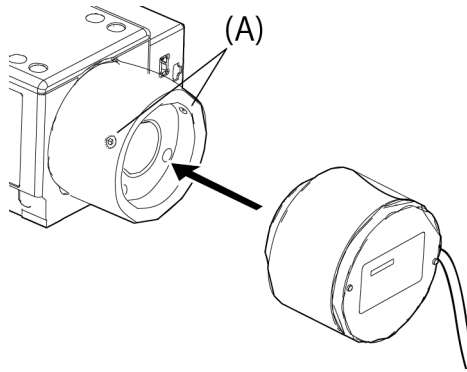
For safety, turn OFF the powers of the control box and PC while connecting cables.

2. Insert the reflected LED light source into the light source mounting hole of the reflected light illuminator until it touches the end.

NOTE:

When attaching the reflected LED light source, attach it so that the cable for the reflected LED light source comes to the right side when looking from the back of the microscope frame.

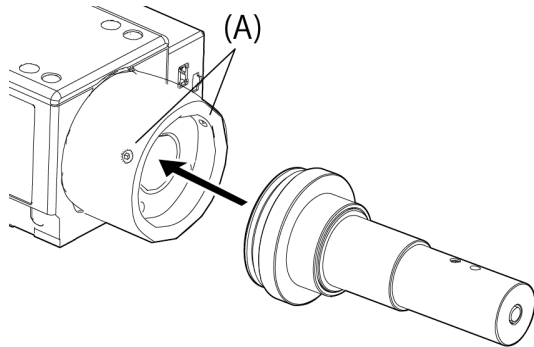
3. Tighten two mounting screws (A) of the reflected light illuminator using an Allen screwdriver.



- 4.** Connect the cable to the connector on the back of the reflected light illuminator.

3.10.2 Attaching the liquid light guide or mercury lamp housing

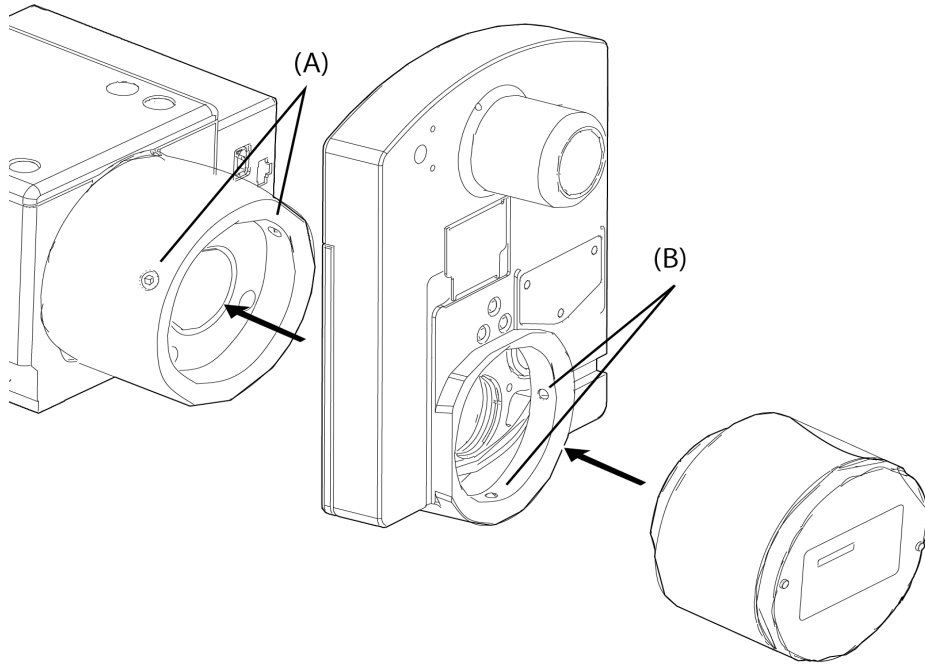
- 1.** Loosen two clamping screws (A) of the reflected light illuminator using an Allen screwdriver.
- 2.** Insert the liquid light guide adapter into the reflected light illuminator until it touches the end, and tighten two mounting screws (A).



3.10.3 Attaching the motorized reflected filter wheel U-FWR

- 1.** Loosen two mounting screws (A) of the reflected light illuminator using an Allen screwdriver.
- 2.** Insert the motorized reflected filter wheel into the reflected light illuminator until it touches the end, and tighten two mounting screws (A).
- 3.** Loosen two mounting screws (B) of the motorized reflected filter wheel using an Allen screwdriver.

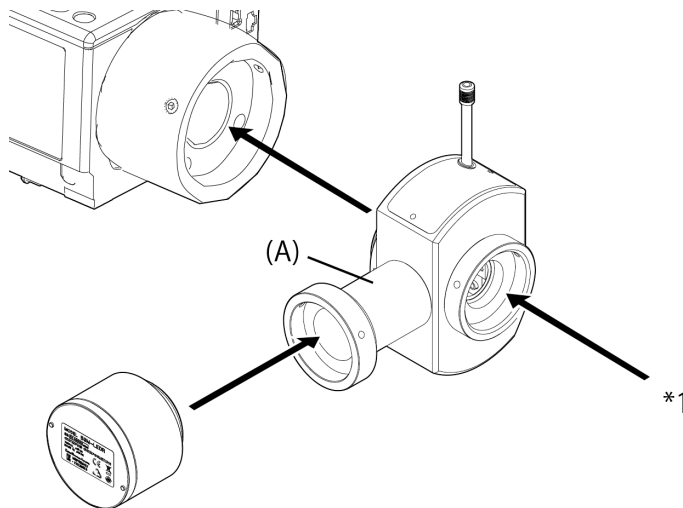
- 4.** Insert the reflected LED light source or the halogen lamp housing into the motorized reflected filter wheel until it touches the end, and tighten two mounting screws (B).



3.10.4 Attaching two lamp housings

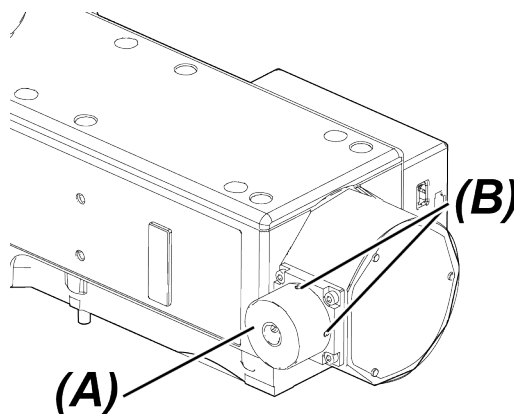
NOTE:

- The attachable lamp housings or adapters are restricted in combinations, orders and directions. (See the figure below.)
- Attach the double lamp housing adapter (U-DULHA) so that the part indicated as (A) in the figure below is on the left side and horizontal when facing the back side of the reflected light illuminator.
- When using the double lamp housing adapter (U-DULHA), connect BX3M-LEDR to BXC-RLI using the extension cable for LED light source MX-LLHECBL sold separately.

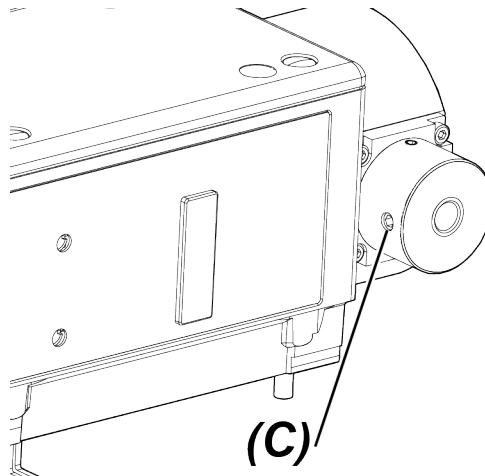


3.10.5 Attaching the light source for motorized light guide reflected light illuminator with clean lens for AS (BXC-RLI-LGCA)

1. When using a light guide with a diameter of $\varnothing 8$, you must replace the adapter. Remove the adapter for $\varnothing 10$ (A) that is attached when the product is shipped by loosening two mounting screws (B) with the L-wrench provided with BXC-RLI-LGCA.



2. Loosen the mounting screw (C) of the light guide with the Allen screwdriver provided with BXC-RLI-LGCA and attach the light source using light guide.



3.10.6 Attaching a third-party light source

You can attach a third party light source instead of the light source explained in 3.10.1 to 3.10.3 and at *1 shown in 3.10.4 or *2 shown in 3.10.5 .

NOTE:

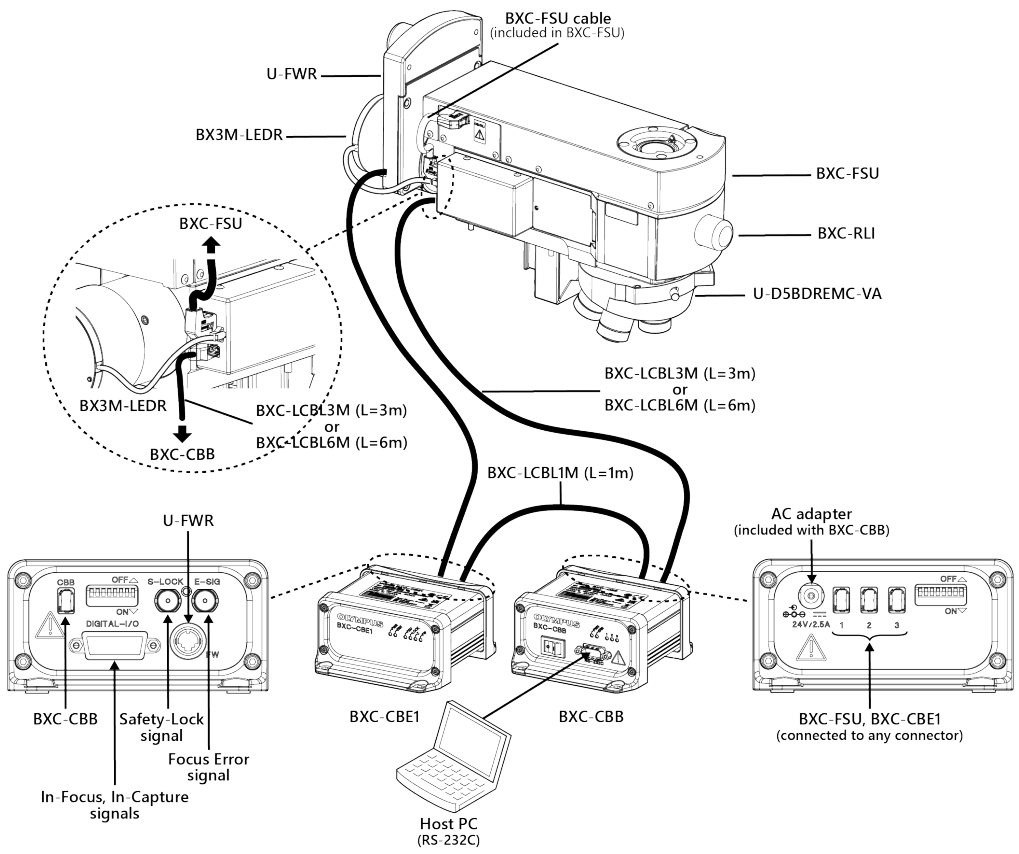
Product performance and safety cannot be guaranteed if a third-party light source is used with the product. If you wish to use this product in combination with a third-party light source, take measures under your responsibility so that the use of this product in combination with systems you will use complies with standards required in your local area.

3.11 Setting up BXC-FSU

3.11.1 Product outline of BXC-FSU

BXC-FSU is an intermediate mounting unit that is mounted on the top of the illuminator (BXC-RLI/BXC-RLI-CA/BXC-RLI-LGCA). It detects the focus state of the sample and connects to the control box (BXC-CBB, BXC-CBE1) to output Focus Error Signals and Focus Status Judgement Signals (In-Capture signal, In-Focus signal).

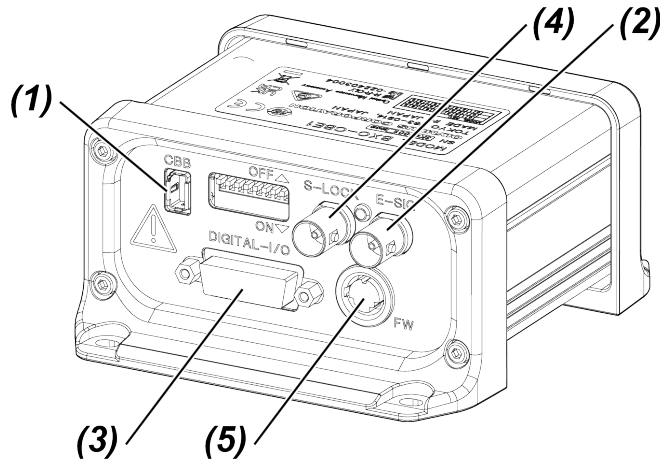
The following figure is an example of a typical system with BXC-FSU installed. The customer can control the Z-axis drive mechanism prepared by the customer using the Focus Error Signal and Focus State Judgement Signal (In-Capture signal, In-Focus signal). Also, when the safety lock signal is OPEN, the LD light emission in the BXC-FSU can be blocked.



For cable connection, see "[Connecting cables \(page 23\)](#)".

3.11.2 User-I/F

The back panel view of BXC-CBE1



(1) BXC-CBB I/F

Label: CBB
 Description: Internal I/ F (power supply and communication signals)

(2) Focus Error signal

Label: E-SIG
 Description: Focus Error Signal (Analog signal)
 Purpose: Used for Z-axis control of user system
 Connector type: BNC

Item	Specifications	Comments
Voltage Range	-10 to +10V	10V: $(A-B) / (A+B) = 1$ -10V: $(A-B) / (A+B) = -1$ #gain=1
Data rate	5 msec	U-AFA2M: 10 msec
Zero cross point	1	Around focal point
linearity	Monotonic	Our standard sample $+0.4 > (A-B) / (A+B) > -0.4$
Gain Adjustment	0.1 to 10X	Adjustable via RS232C
Clipping Voltage	-10 to +10V	Adjustable via RS232C
Signal Sign	Positive: Above the focal point (Near) Negative: Below the focal point (Far)	Reversible via RS232C

(3) Focus Status Judgement Signal

Label: S-LOCK

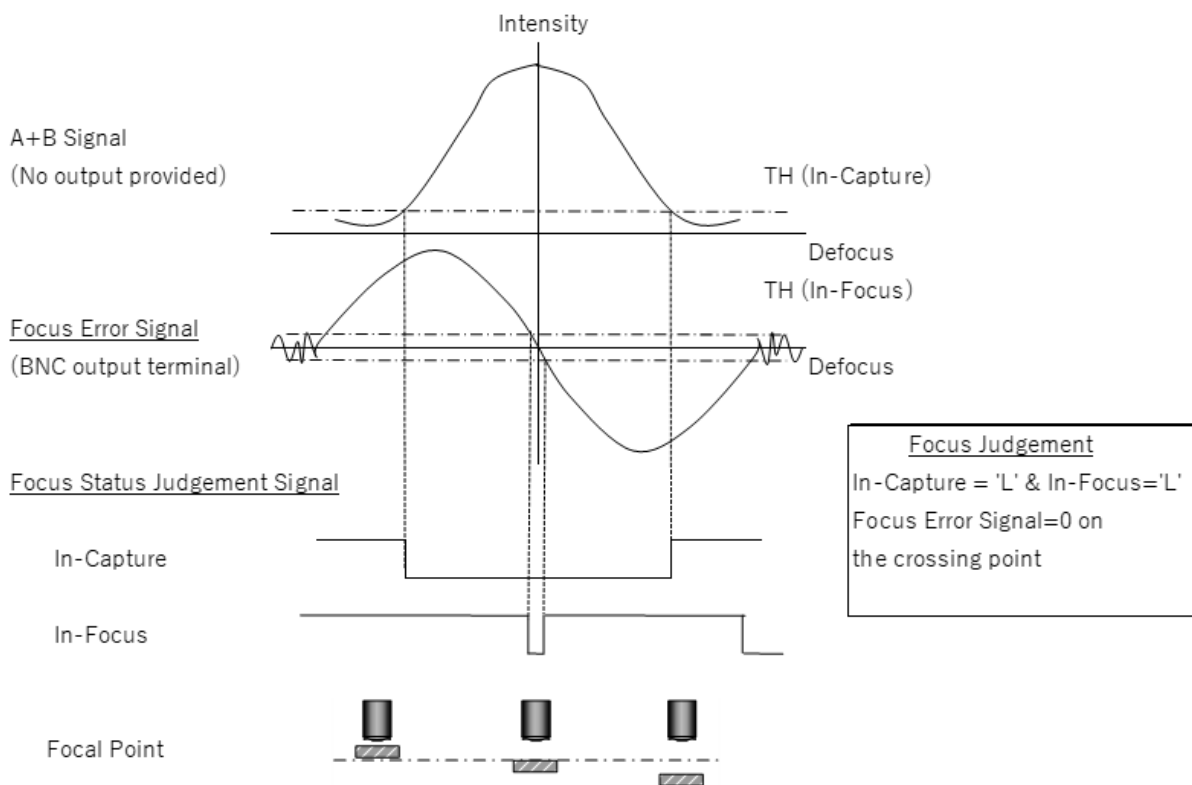
Description: In-Capture and In-Focus signals.

Function: Informing Focus status ("H" ≥ 4.0 V, "L" ≤ 0.5 V)

Connector type: D-SUB15 (female)

Pin No.	Pin Name	Pin No.	Pin Name
1	N.C.	9	N.C.
2	N.C.	10	GND
3	N.C.	11	N.C.
4	N.C.	12	N.C.
5	N.C.	13	N.C.
6	In-Capture signal	14	In-Focus signal
7	N.C.	15	N.C.

- BXC-CBE1 has sets of default values of TH(In-capture) and TH(In-focus), corresponding to each objective lens. The values can be changed.
- In-Capture / In-Focus / GND pin assignments are the same as U-AFA2M. However, other signals are assigned to different pins. Therefore, all pins except In-Capture/In-focus/GND signals must be N.C.(No Connect)



(4) Safety Lock

Label: S-LOCK

Function: Laser is not emitted if not terminated.

Relating the safety lock terminal status to outer panels of the customer's device, Laser radiation can be avoided when the panels are open.

Connector type: BNC

Terminal Condition	Laser Condition
OPEN	Lock (Laser disable)
Connect to GND (SHORT)	Un-Lock (Laser enable)

* Return from "Locked condition": Connect "Terminal" to GND again. No need to reboot BXC-CBB.

3.11.3 Adjusting camera diopter

Adjust camera diopter using the following steps.

TIP:

Be sure to adjust camera diopter, to prevent the following issues.

1. Parfocal among objective lenses getting worse.
2. Auto-focusing performance getting worse.

1. Put a specimen on the stage.
2. Set the highest magnification objective lens in the light path.
Command: **10B**
3. Move the Z-stage and adjust focus on the specimen.
4. Set the lowest magnification objective lens in the light path. Be sure not to move the stage height.
Command: **10B**
5. Move the circular dovetail of the camera adapter and adjust focus on the specimen.

TIP:

The diopter adjusting matter of the camera adapter is different in each camera adapter.

For details of camera adapters, refer to the camera adapter instruction manual provided by us.

3.11.4 Parfocalizing objective lenses

Parfocalizing of objective lenses provides smoother observation work flow even with frequent objective lens switch.

Parfocalizing is having objective lenses with the corresponding focal points all in the same plane.

For this purpose, a set of offset values of Z-stage position is recommended to be held in customer's system software.

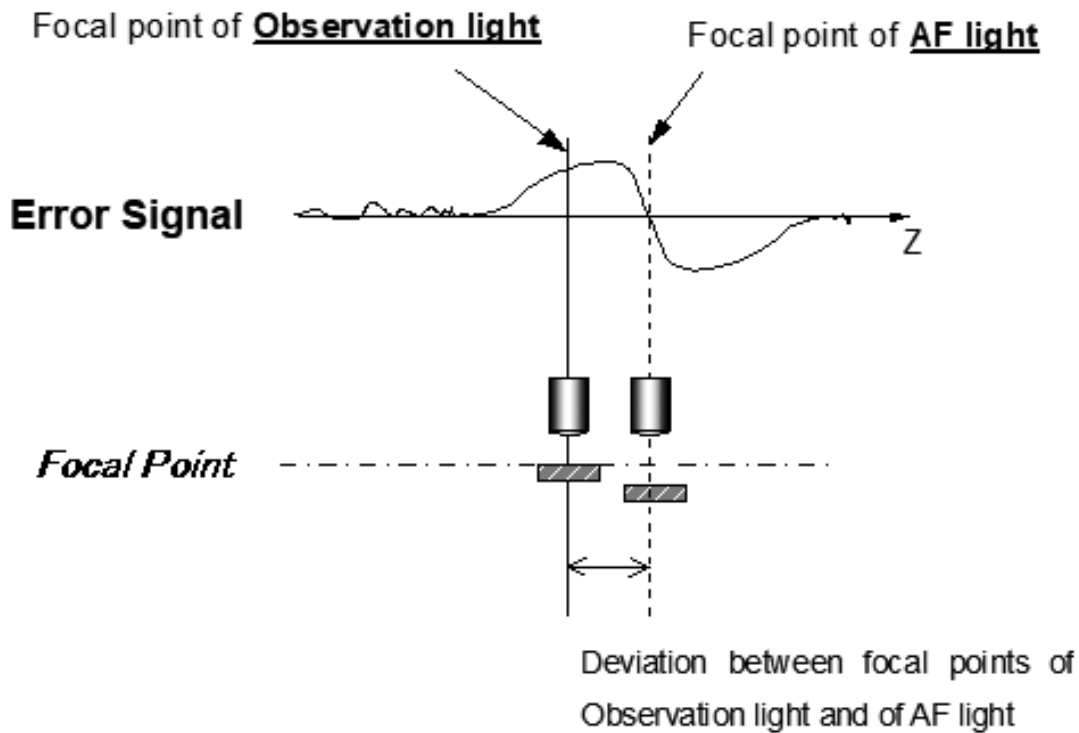
If needed, calibrate the set of offset values in advance with e.g. a mirror specimen.

3.11.5 Correcting chromatic aberration of the lenses

Chromatic aberration must be corrected for each objective lens every time BXC-CBB system is installed to improve the AF performance.

The following figure illustrates chromatic aberration. Chromatic aberration occurs between the observation light ($\lambda=550\text{nm}$) and the laser light ($\lambda=785\text{nm}$).

For detailed correction procedure, refer to the application manual.

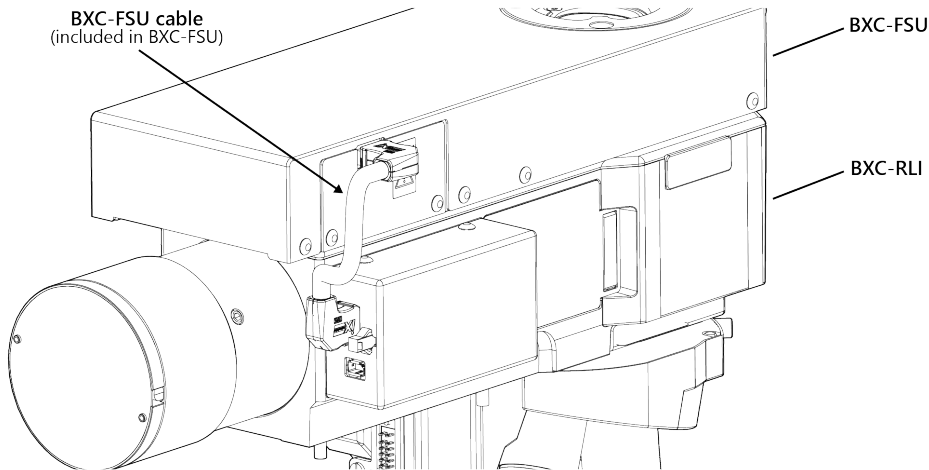


Chromatic aberration explanations

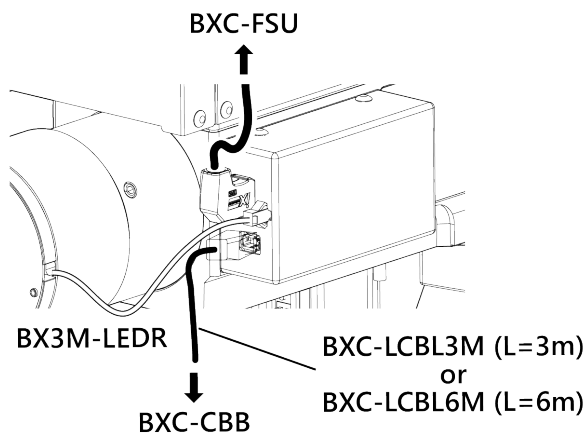
3.12 Connecting cables

3.12.1 Connecting a cable to the motorized light guide reflected light illuminator

1. Connect BXC-FSU and BXC-RLI/BXC-RLI-CA/BXC-RLI-LGCA with a dedicated cable (provided with BXC-FSU). The following steps are described using only BXC-RLI.



- The cable connector has a suitable orientation for the connection. The connector on the wrong side cannot be connected.
- Use the cable provided with BXC-FSU to connect BXC-FSU and BXC-RLI. Also, when connecting BX3M-LEDR to BXC-RLI, refer to the figure below.



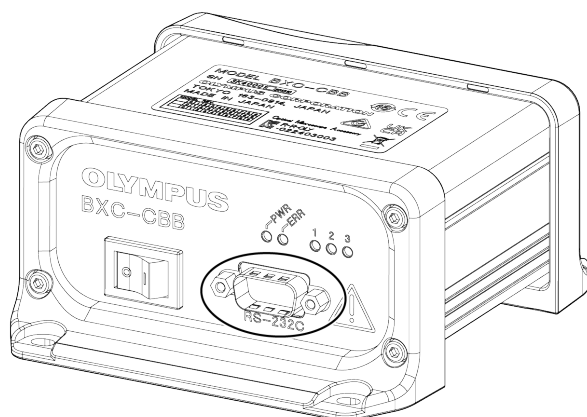
3.12.2 Connecting cables to BXC-CBB

(1) Host PC

NOTE:

For safety, turn OFF the powers of the control box and PC while connecting cables.

1. Connect RS-232C cable to the connector on the front panel of the control box BXC-CBB. (See the figure below.)



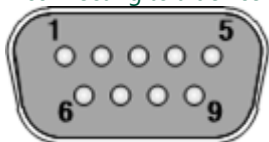
- To connect to a PC, use a D-Sub9 pin (female)-D-Sub9 pin (female) straight-through cable. (If you use an incorrect cable, the product may be damaged.)
- The connector on the front panel of the control box BXC-CBB: D-sub9pin DCE assignment
- Mating clamping screw: #4-40 UNC
- The following table shows the settings for communication (Fixed value)

Baudrate	19200 [bps]
Data bit	8 [bits]
Parity	even
Stop bit	1 or 2 [bits] (switching the setting not required) *
Terminator	CR+LF
Flow control	None

*The setting of the stop bits for communicating from the Host-PC to BXC-CBB. The setting of the stop bits for communicating from BXC-CBB to the Host-PC is fixed to "2".

TIP:

If connecting to a device other than a PC, do so at your own risk. Refer to the following table for the connections.

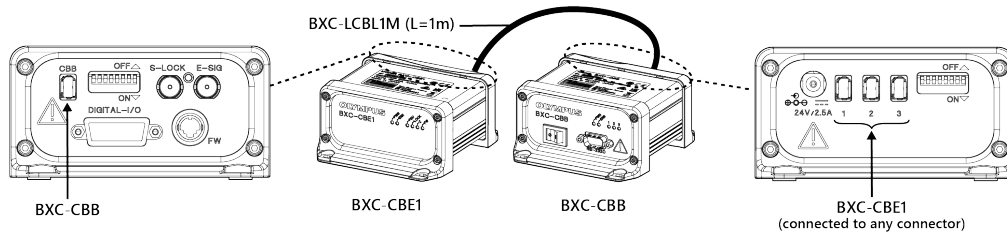


No.	Signal name	I/O	Function
2	RXD	OUT	Transmitted data
3	TXD	IN	Received data
5	GND	—	Signal ground
7	RTS	IN	Request to send
8	CTS	OUT	Clear to send

Pins not indicated are not internally connected and pins 7 and 8 are internally connected to each other.

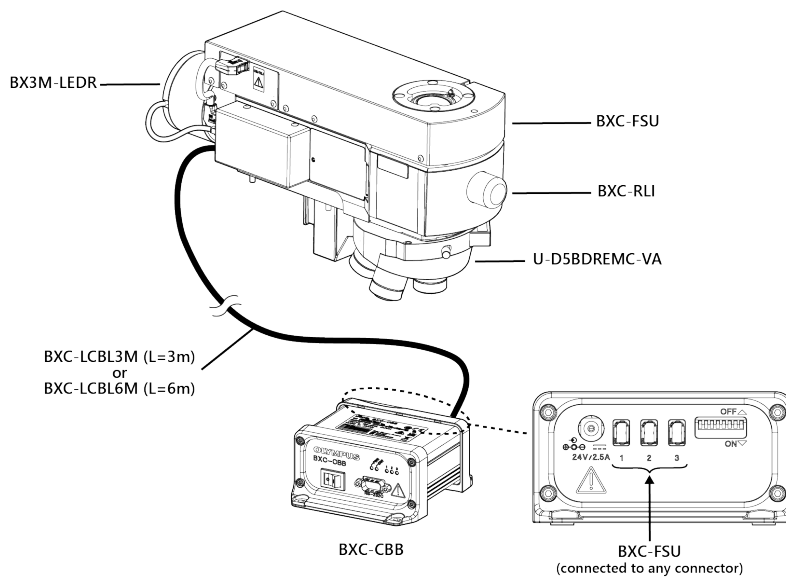
(2) BXC-CBE1

1. Connect BXC-CBB and BXC-CBE1 with **BXC-LCBL1M**.



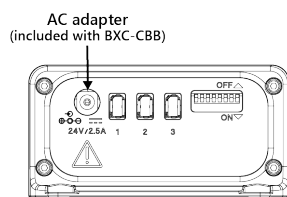
(3) BXC-RLI

1. Use BXC-LCBL3M or BXC-LCBL6M to connect BXC-RLI and BXC-CBB.

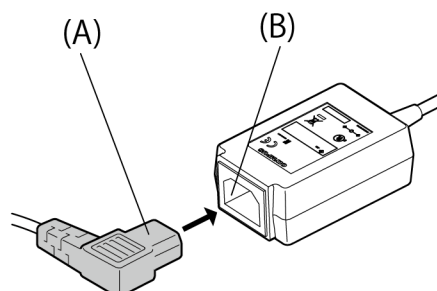


(4) AC adapter

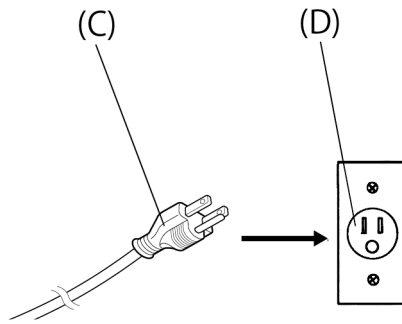
1. Connect the control box BXC-CBB and the AC adapter (provided with BXC-CBB).



2. Insert the power cord connector (A) into the connector (B) of the AC adapter.

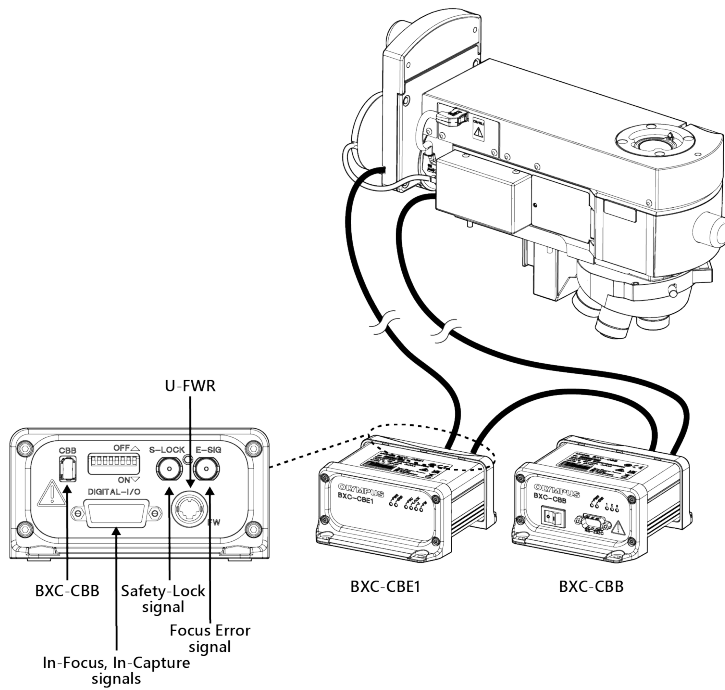


3. Connect the power cord's plug (C) to the power outlet (D) on the wall.



3.12.3 Connecting cables to BXC-CBE1

1. Connect each user cable to BXC-CBE1 as needed.

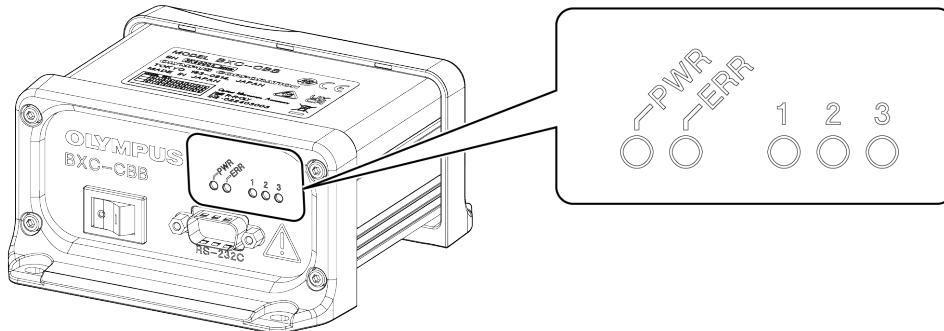


4. Operation procedures

1. Turn on the control box.
2. Control each unit using RS-232C communication commands from a PC.
For details on RS-232C communication commands, refer to the command reference manual.

4.1 Status display of the indicators on BXC-CBB

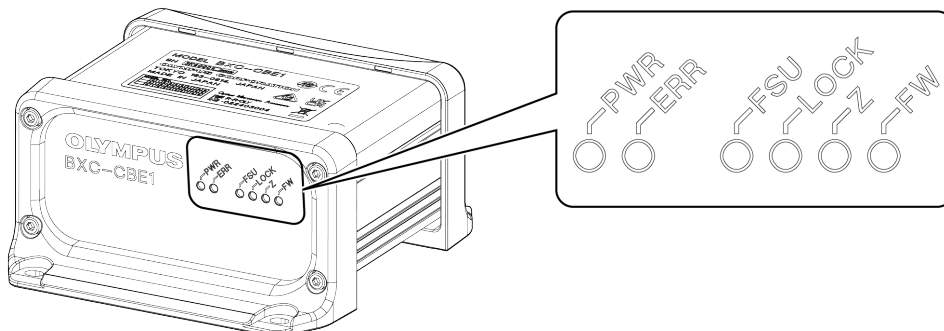
The following table shows the status display of each indicator.



Symbol	Color	Displays the status of	Status		
			●Off	○On	◎Flashing
PWR	Green	Power supply	Power off	Power on	—
ERR	Red	Fatal error	No error	Fatal error occurred	—
1	Green	Back connector 1	No unit connected	Unit connected	—
2	Green	Back connector 2	No unit connected	Unit connected	—
3	Green	Back connector 3	No unit connected	Unit connected	—

4.2 Status display of the indicators on BXC-CBE1

The following table shows the status display of each indicator.



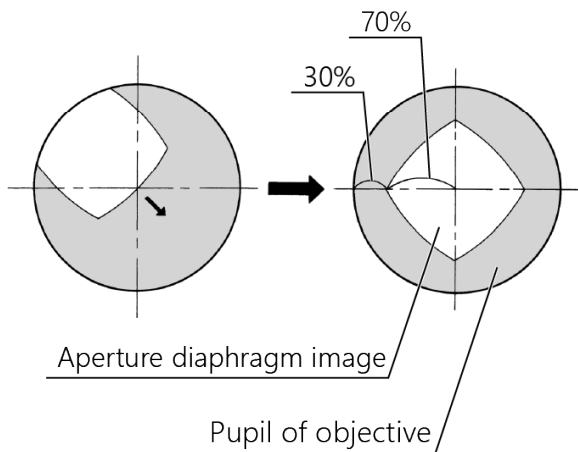
Symbol	Color	Displays the status of	Status		
			●Off	○On	◎Flashing
PWR	Green	Power supply	Power off	Power on	—
ERR	Red	Fatal error	No error	Fatal error occurred	—
FSU	Green	Sensing unit for AF	No unit connected	Unit connected	Control malfunction
LOCK	Green	Safety lock	Open state	Short-circuit state	Control malfunction
Z	Green	Reserved by maker	—	—	—
FW	Green	Filter wheel	No unit connected	Unit connected	Control malfunction

4.3 Adjusting the aperture diaphragm (AS)

NOTE:

If you do not combine the eyepieces, the standard straight tube and the centering telescope are necessary. Contact us for assistance.

1. Select BF.
2. Bring the sample into focus.
3. When you remove the eyepieces and look into the observation tube, you can see the image of aperture diaphragm. Send the command so that the image of aperture diaphragm becomes approx. 70% of the diameter of the pupil of objective (as shown in the picture below). For details on the commands, refer to the command reference manual.

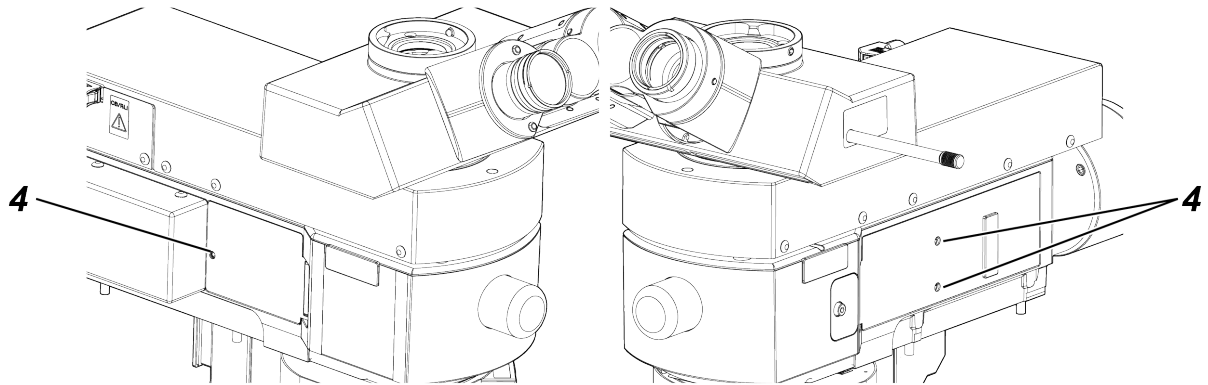


TIP:

The optimum pulse numbers for typical objectives are listed below.

Objective	AS recommended pulse number [pulses]	Objective	AS recommended pulse number [pulses]	Objective	AS recommended pulse number [pulses]
MPLFLN1.25X	1571	MPLFLN100X MPLFLN100XBD	361	LMPLFLN100X LMPLFLN100XBD	309
MPLFLN2.5X2 MPLFLN2.5X2BD	1571	MPLFLN150XBD	204	MPLAPON50X	887
MPLFLN5X2 MPLFLN5X2BD2	1465	LMPLFLN5X LMPLFLN5XBD	1255	MPLAPON100X	388
MPLFLN10X MPLFLN10XBD	1465	LMPLFLN10X LMPLFLN10XBD	1203	MXPLFLN20X	1465
MPLFLN20X MPLFLN20XBD	1071	LMPLFLN20X LMPLFLN20XBD	940	MXPLFLN20XBD	1334
MPLFLN50X MPLFLN50XBD	729	LMPLFLN50X LMPLFLN50XBD	414	MXPLFLN50X MXPLFLN50XBD	729

4. At this time, if the center of the aperture diaphragm is shifted, adjust it by rotating the aperture diaphragm centering screws (3 positions) with the Allen screwdriver.



4.4 Using the interlocked ND filter for BXC-RLI

TIP:

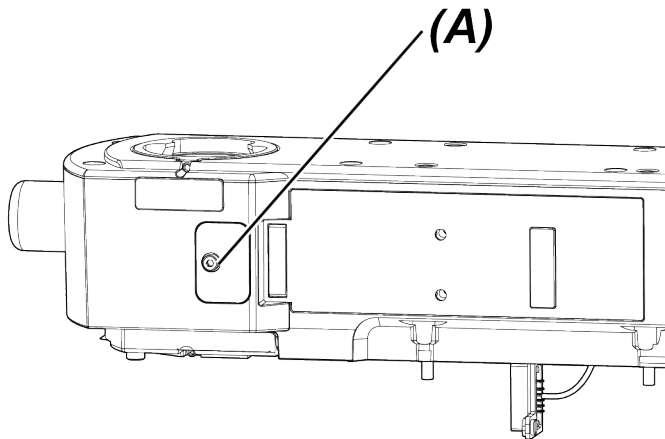
The ND filter is interlocked with the brightfield (BF) light path switching and makes it possible to reduce glare when the darkfield (DF) path is switched to the brightfield (BF) path.

Removing the Interlocked ND Filter

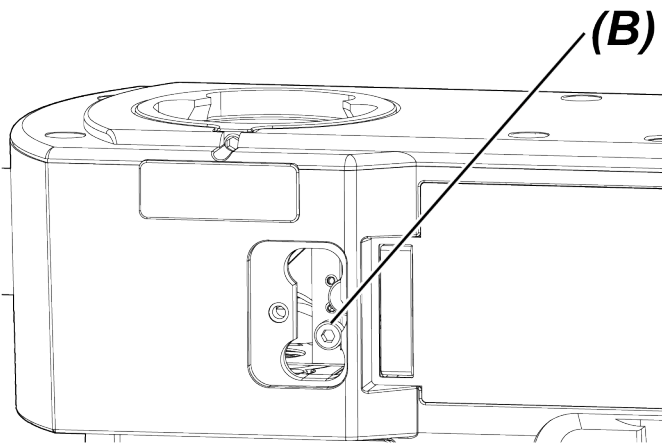
TIP:

The ND filter has been interlocked at the factory. If brightness is not enough during brightfield, DIC or other observation, remove the ND filter as described below.

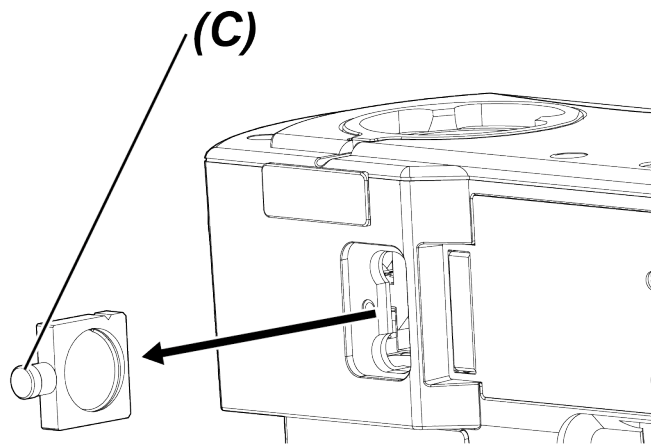
1. Switch the observation path to DF, then loosen the cover clamping screw (A) of the interlocked ND filter using the Allen screwdriver provided with BXC-RLI and remove the cover.



2. Loosen and remove the clamping screw (B) with the Allen screwdriver.



3. Remove the ND filter frame (C) which is visible after the cover removal.



4. Attach the cover to the original position.

NOTE:

To attach the removed ND filter again, push in the frame lightly.

Do not push with an excessive force. If the force is excessive, the ND filter will be disengaged from the DF path and the main switch of the control box should be set to "I" (ON) then "O" (OFF) again.

5. Maintenance and Storage

5.1 Cleaning of each part

Lens and filter

Do not leave stains or fingerprints on the lenses or filters. If they get dirty, blow away dust with a commercially available blower and gently wipe the lens or filter with a piece of cleaning paper (or washed-out clean gauze).

Only when cleaning fingerprints and oil stains, slightly moisten a piece of cleaning paper with commercially available absolute alcohol and wipe them off with it.

⚠WARNING:

Since the absolute alcohol is highly flammable, it must be handled carefully. Be sure to keep it away from open flames or potential sources of electrical sparks.

For example, the electrical equipment that is switched ON and OFF may cause the ignition of a fire.

Also, always use the absolute alcohol only in a well-ventilated room.

Portions other than lenses

Wipe the portions other than lenses with a dry soft cloth. If dirt/dust cannot be removed by dry-wiping, moisten a soft cloth with diluted neutral detergent and wipe off dirt/dust with it.

NOTE:

Do not use organic solvents because they may deteriorate the coated surface or plastic parts.

To extend the life of the nosepiece

Using only a specific hole (partial segment) of the nosepiece may result in the grease inside the nosepiece to spread unevenly and the motion of the nosepiece to deteriorate in rare cases.

To avoid this problem, you can use the OBREF command to rotate the nosepiece once to have the grease evenly applied.

The following measures are recommended:

- Rotate the nosepiece about once a week.
- Rotate once CW (clockwise) and once CCW (counterclockwise.)




For details, refer to the command reference manual.

6. Troubleshooting

Depending on how you use, the performance of this microscope may not be exhibited, though they are not failure. If problems occur, please review the following list and take remedial action as needed.

If you cannot improve the phenomena after checking the entire list, please contact us for assistance.

6.1 Optical systems

Phenomena	Cause	Remedy	Reference page
Even though the lamp lights, the field of view is dark.	The aperture diaphragm and the field diaphragm are not opened sufficiently.	Open the aperture diaphragm sufficiently, and open the field diaphragm until the field diaphragm circumscribes the field of view.	28
	The analyzer or the polarizer is in the light path.	Remove the analyzer or the polarizer from the light path.	—
	Light path selection lever of the trinocular tube is at the  position.	Set the light path selection lever of the trinocular tube to the  or the  position.	—
	The observation method selector knob or lever or the turret is at the halfway position.	Select the observation method selector knob or lever or the turret surely.	—
	The shutter is engaged in the light path.	Remove the shutter from the light path.	—
Though the brightness control knob or the light volume adjustment dial is rotated, the illumination does not become brighter.	The halogen bulb or the mercury burner is burned out.	Replace the halogen bulb or the mercury burner.	—
The peripheral area of the field of view becomes dark. Or, the brightness of the field of view is not even.	The light path selection lever of the trinocular tube is not stopped at the correct position.	Stop the light path selection lever of the trinocular tube at the position where the clicking sound is heard.	—
	The observation method selector knob or lever or the turret is at the halfway position.	Select the observation method selector knob or lever or the turret surely.	—
	The objective is not correctly engaged in the light path.	Turn the nosepiece until the clicking sound is heard and engage the objective in the light path.	—
	The nosepiece is not attached correctly.	Push in the nosepiece along the mounting dovetail until it touches the end, and secure it.	12
	The filter is not engaged in the light path correctly.	Stop the filter at the position where the clicking sound is heard.	—
	The analyzer and the polarizer are not inserted correctly.	Engage the analyzer and the polarizer in the light path correctly.	—
Dust or dirt is visible in the field of view.	The eyepiece, the tip of the objective or the sample is dirty.	Clean them sufficiently.	31
The observation image glares.	The aperture diaphragm is narrowed down too much.	Adjust the aperture diaphragm according to the numerical aperture of the objective to use.	28
The observation image is viewed in white haziness or not visible clearly.	The objective for UIS2(UIS) series is not used.	Replace with the objective for UIS2 (UIS) series.	—
	The dummy slider is not inserted in the nosepiece.	Insert the dummy slider in the nosepiece.	—

Phenomena	Cause	Remedy	Reference page
	The nosepiece is not attached correctly.	Push in the nosepiece along the mounting dovetail until it touches the end, and secure it.	12
	The objective is not correctly engaged in the light path.	Turn the nosepiece until the clicking sound is heard and engage the objective in the light path.	—
	The tip of the objective or the sample is dirty.	Clean them sufficiently.	31
The one-sided blur appears in the observation image.	The nosepiece is not attached correctly.	Push in the nosepiece along the mounting dovetail until it touches the end, and secure it.	12
	The objective is not correctly engaged in the light path.	Turn the nosepiece until the clicking sound is heard and engage the objective in the light path.	—
The observation image shifts when defocusing.	The nosepiece is not attached correctly.	Push in the nosepiece along the mounting dovetail until it touches the end, and secure it.	12
	The objective is not correctly engaged in the light path.	Turn the nosepiece until the clicking sound is heard and engage the objective in the light path.	—
	The aperture diaphragm is narrowed down but the centering is not performed yet.	Perform the centering of the aperture diaphragm.	28

6.2 Observation tube

Phenomena	Cause	Remedy	Reference page
The fields of view of two eyes do not coincide.	The interpupillary distance is not adjusted correctly.	Adjust the interpupillary distance correctly.	—
	The diopter of two eyes is not compensated.	Compensate the diopter correctly.	—
	The different eyepiece is used for right and left eyes.	Use the same eyepiece for right and left eyes.	—
	The user is not used to the parallel optical axis.	The following measures may help this problem: Do not look at the image immediately after looking into the eyepiece, but look at the whole field of view or release your eyes from eyepieces and look afar once, and then look into the eyepieces.	—

6.3 Drive system

Phenomena	Cause	Remedy	Reference page
Cannot communicate with the PC.	Communication settings are not correct.	Specify the communication settings correctly.	23

Phenomena	Cause	Remedy	Reference page
	Wrong cable is used.	Use a correct cable.	23
	Wrong command is used.	Refer to the command reference manual.	—
The nosepiece does not move.	The nosepiece setting to select either the 6Position-NP or 5Position-NP on the DIP switch is wrong.	Specify the correct nosepiece setting on the DIP switch.	10
	Only a specific hole (partial segment) is used.	Refer to "To extend the life of the nosepiece" and evenly apply the grease.	31
Auto-focusing does not work.	The safety lock is not attached.	Attach the short plug provided with the product or a lock mechanism.	—

Repair request

If you cannot improve the phenomena after taking the above remedies, please contact us for assistance. At that time, please tell them the following information as well.

- Product name and abbreviation (Example: BXC-CBB)
- Product number
- Phenomena

7. Proper selection of the power supply cord

If no power supply cord is provided, please select the proper power supply cord for the equipment by referring to "Specifications" and "Certified Cord" below:

Caution : In case you use a non-approved power supply cord for our products, we can no longer warrant the electrical safety of the equipment.

Specifications

Voltage rating	125 V AC (for 100-120 V AC area) or, 250 V AC (for 220-240 V AC area)
Current rating	6 A minimum 60 °C minimum
Temperature rating	3.05 m maximum
Length	Grounding type attachment plug cap. Opposite terminates in molded-on IEC configuration appliance coupling.
Fittings configuration	

Table 1 Certified cord

A power supply cord should be certified by one of the agencies listed in Table 1, or comprised of cordage marked with an agency marking per Table 1 or marked per Table 2. The fittings are to be marked with at least one of the agencies listed in Table 1. In case you are unable to buy locally the power supply cord which is approved by one of the agencies mentioned in Table 1, please use replacements approved by any other equivalent and authorized agencies in your country.




















Country	Agency	Certification mark	Country	Agency	Certification mark
Argentina	IRAM		Italy	IMQ	
Australia	SAA		Japan	JET	
Austria	ÖVE		Netherlands	KEMA	
Belgium	CEBEC		Norway	NEMKO	
Canada	CSA		Spain	AEE	
Denmark	DEMKO		Sweden	SEMKO	
Finland	FEI		Switzerland	SEV	
France	UTE		United Kingdom	ASTA BSI	
Germany	VDE		USA	UL	
Ireland	NSAI				

Table 2 HAR flexible cord

Approval organizations and cordage harmonization marking methods.

Approval organization	Printed or embossed harmonization marking (May be located on jacket or insulation of internal wiring)		Alternative marking utilizing black-red-yellow thread (Length of color section in mm)		
			Black	Red	Yellow
Comite Electrotechnique Belge (CEBEC)	CEBEC	<HAR>	10	30	10
Verband Deutscher Elektrotechniker (VDE) e.V. Prüfstelle	<VDE>	<HAR>	30	10	10
Union Technique de l'Electricite' (UTE)	USE	<HAR>	30	10	30
Instituto Italiano del Marchio di Qualita' (IMQ)	IEMMEQU	<HAR>	10	30	50
British Approvals Service for Electric Cables (BASEC)	BASEC	<HAR>	10	10	30
N.V. KEMA	KEMA-KEUR	<HAR>	10	30	30
SEMKO AB Svenska Elektriska Materielkontrollanstalter	SEMKO	<HAR>	10	10	50
Österreichischer Verband für Elektrotechnik (ÖVE)	<ÖVE>	<HAR>	30	10	50
Danmarks Elektriske Materialkontroll (DEMKO)	<DEMKO>	<HAR>	30	10	30
National Standards Authority of Ireland (NSAI)	<NSAI>	<HAR>	30	30	50
Norges Elektriske Materielkontroll (NEMKO)	NEMKO	<HAR>	10	10	70
Asociacion Electrotecnica Y Electronica Espanola (AEE)	<UNED>	<HAR>	30	10	70
Hellenic Organization for Standardization (ELOT)	ELOT	<HAR>	30	30	70
Instituto Portages da Qualidade (IPQ)	np	<HAR>	10	10	90
Schweizerischer Elektro Technischer Verein (SEV)	SEV	<HAR>	10	30	90
Elektriska Inspektoratet	SETI	<HAR>	10	30	90

Underwriters Laboratories Inc. (UL) SV, SVT, SJ or SJT, 3 X 18AWG
 Canadian Standards Association (CSA) SV, SVT, SJ or SJT, 3 X 18AWG

Manufactured by

Evident Corporation

6666 Inatomi, Tatsuno-machi, Kamiina-gun, Nagano 399-0495, Japan

Distributed by

Evident Europe GmbH

Caffamacherreihe 8-10, 20355 Hamburg, Germany

Evident Europe GmbH – UK Branch

Part 2nd Floor Part A, Endeavour House, Coopers End Road, Stansted CM24 1AL, UK

Evident Scientific, Inc.

48 Woerd Ave, Waltham, MA 02453, USA

Evident Scientific Singapore PTE. LTD.

#04-04/05, 25 Ubi Rd 4, UBIX Singapore 408621

Evident Australia PTY LTD

Level 4, 97 Waterloo Road Macquarie Park NSW 2113, Australia

Life science solutions

Service Center



<https://www.olympus-lifescience.com/support/service/>

Official website



<https://www.olympus-lifescience.com>

Industrial solutions

Service Center



<https://www.olympus-ims.com/service-and-support/service-centers/>

Official website



<https://www.olympus-ims.com>