

OPHTHALMIC YAG LASER SYSTEM

OPERATOR'S MANUAL



Original instructions

NIDEK CO., LTD.

NIDEK CO., LTD.
(Manufacturer): 34-14 Maehama, Hiroishi-cho, Gamagori, Aichi 443-0038, JAPAN
Telephone: +81-533-67-6611
URL: https://www.nidek.com/NIDEK INC.
(United States Agent): 2040 Corporate Court, San Jose, CA 95131, U.S.A.
Telephone: +1-800-223-9044 (USA Only)
URL: https://usa.nidek.com/NIDEK S.A.
(EU Authorized Representative): Europarc, 13 rue Auguste Perret, 94042 Créteil, FRANCE
Telephone: +33 1 49 80 97 97
URL: http://www.nidek.fr/

2019-06 13706-P912-A6 Printed in Japan

© 2014 NIDEK CO., LTD.

BEFORE USE OR MAINTENANCE, READ THIS MANUAL.

THIS MANUAL ONLY CONTAINS THE NECESSARY INFORMATION TO UNDERSTAND THE OPERATING PROCEDURES AND MAINTENANCE.

This Operator's Manual contains information necessary for the operation of the NIDEK OPHTHALMIC YAG LASER SYSTEM, YC-1800.

This manual includes the operating procedures, cautions for safety, specifications and maintenance instructions.

This manual is required to correctly use the device.

Especially, the cautions for safety and operating procedures must be thoroughly understood before using the device. Keep this manual handy to verify use whenever necessary.

Use of this device is limited to the treatment of eye diseases by qualified physicians only. The physicians are responsible for the application of this device and the treatment of various eye diseases.

If you encounter any problems or have questions about the device, contact NIDEK or your authorized distributor.

ACAUTION

• United States Federal law restricts this device to sale by or on the order of a physician.

Before using this product, be sure to read "SOFTWARE LICENSE AGREEMENT" at the end of this manual.

The "SOFTWARE LICENSE AGREEMENT" contains the terms for use of the software and related materials included for this product.



81		Page
31	INTRODUCTION	I-I
	1.1 Outline	1-1 1 1
	1.2 Principle	I-I
		1-1
		1-2
	1.5 Symbol Information	1-3
	1.6 Precautions in Patient Selection	1-5
0	1.7 Iroubles and Adverse Events	1-5
§ 2	SAFETY PRECAUTIONS	
	2.1 Storage, Transport, and Installation	2-1
	2.2 Wiring and Connection	
	2.3 Use	
	2.4 After Use, Maintenance, and Checks	
	2.5 Disposal	
	2.6 Safety Devices	2-7
	2.7 Nominal Ocular Hazard Distance (NOHD)	
	2.8 Labels	2-9
	2.9 Other Considerations	
§ 3	SYSTEM DESCRIPTION	
81	ODED ATING BDOGEDLIDES	4.1
37	OPERATING PROCEDURES	
	4.1 Connection	
	4.2 Operation Flow	
	4.3 Starting the System	
	4.4 Preparing for Treatment	
	4.5 Operation for Treatment	
	4.0 Indications of Misoperation	
	4.7 Efficiency Stop	
	4.8 Other Functions	
	4.8.1 Changing ingget switch	
0-	4.8.2 Attaching apprairation tonometer	
\$ 5	MAINTENANCE	5-1
	5.1 List of Consumable and Maintenance Parts	5-1
	5.2 Attaching Stack of Paper to Chinrest	5-1
	5.3 Replacing Fuses of Motorized Table (Optional)	
	5.4 Replacing Illumination Lamp	

.5-4
5_1
. 5-4
. 5-5
. 5-5
. 5-6
. 5-7
. 5-8
. 5-9
5-10
5-12
61
6 1
.0-1 6 1
.0-1
. 7-1
0 1
• ð-1
.8-1
.8-1
.8-3
.8-4
.8-4
. 8-4
. 9-1
.9-1
.9-2
10 1
10-1
10-1
10-3

§1 *INTRODUCTION*

1.1 Outline

The ophthalmic YAG laser system YC-1800 emits Nd: YAG laser (hereafter called "YAG laser") pulse beam by Q-switching. The YC-1800 allows the safe and bloodless treatment of intraocular diseases for outpatients by mechanical disruption caused by energy of the YAG laser pulses. The main purposes of the YC-1800 are posterior capsulotomy for secondary cataract, iridotomy for acute angle-closure glaucoma, and for pupillary membranectomy for traction retinal detachment.

The YC-1800 has a slit lamp for observation that includes the YAG laser and its controlling mechanism. The YC-1800 is also equipped with an operation panel and knobs that facilitate operation. The compact and lightweight power supply box is installed separately for lightness and compactness of the system. In addition, a motorized table for the YC-1800 is available optionally.

1.2 Principle

The OPHTHALMIC YAG LASER SYSTEM YC-1800 employs Q-switching for pulse oscillation. With Q-switching, the system accumulates energy within the laser cavity and, when sufficient, emits pulsed laser of high peak power in extremely short duration by automatically making the Q switch cell either transparent or opaque according to the accumulation of energy.

In the burst mode, the pulse emission is repeated by continuous pulse oscillation within the laser cavity after the initial laser emission.

The emitted YAG laser beam becomes coaxial with the aiming beam in the optical path within the system and converges at the intraocular target. When the YAG laser pulse beam converge at a spot, and the power density exceeds a certain degree, plasma is formed. Sudden expansion and heating of the plasma generates shock waves. This phenomenon is called "optical breakdown". The shock waves generated by the optical breakdown rupture fine tissue at the focal point. In addition, the formed plasma absorbs and scatters the incident light. This feature protects the posterior fundus structure beyond the focal point.

Since the Nd: YAG laser used in the YC-1800 is an invisible infrared ray (wavelength: 1,064 nm), a red diode laser (wavelength: 635 nm (typ.)) is used for the aiming beam. The laser system was so designed that the aiming beam becomes coaxial with the YAG laser pulse beam in the optical path in the system, and that the spot where the two alignment spots coincide becomes the target of the YAG laser pulse beam (Dual beam focusing system).

1.3 Intended Use

The ophthalmic YAG laser system YC-1800 is indicated for the performance of posterior capsulotomy, pupillary membranectomy, and iridotomy (hole in the iris) in phakic, aphakic and pseudophakic subjects.

1.4 Classifications

[Class of the laser product]

The YC-1800 is classified as a Class 3B laser system.

A Class 3B laser system is potentially hazardous if direct or scattered radiation is viewed by the unprotected eye (intrabeam viewing), but there is no possible hazard of ocular injuries if diffused reflections are viewed.

[Protection method against electric shock]

The YC-1800 is classified as the Class I system.

The Class I system is a system in which the protection against electric shock does not rely on basic insulation only, but which includes an additional safety precaution in such a way that means are provided for the connection of accessible conductive parts to the protective (earth) conductor in the fixed wiring of the installation in such a way that accessible conductive parts cannot become live in the event of a failure of the basic insulation.

[Degree of protection against electric shock]

The YC-1800 is classified as a system with Type B applied parts. A system with Type B applied parts provides an adequate degree of protection against electric shock particularly regarding leakage current and protective grounding (if any).

[Degree of protection by the enclosure]

The main body of the YC-1800 is classified as IPX0 and the foot switch is classified as IPX8.

[Method (s) of sterilization or disinfection recommended by the manufacturer]

The YC-1800 does not have any part to be sterilized or disinfected.

[Degree of safety in the presence of a flammable anesthetic mixture with air, or a flammable anesthetic mixture with oxygen or nitrous oxide]

The YC-1800 should not be used in the presence of a flammable anesthetic mixture with air, or a flammable anesthetic mixture with oxygen or nitrous oxide caused by leakage or a discharge.

[Degree of suitability for use in an oxygen rich environment]

The YC-1800 is not intended for use in an oxygen rich environment.

[Mode of operation]

The YC-1800 is classified as a continuous operation system.

[Classification by transference]

The YC-1800 is classified as a transportable system.

[Conformance to EMC]

The YC-1800 complies with the EMC standard IEC 60601-1-2:2007.

1.5 Symbol Information

This symbol means that the system is classified as a system with type B applied parts. 卞 The applied parts are the forehead rest and chinrest. See 3. SYSTEM DESCRIPTION (p.3-1). This symbol on the power switch of the motorized table indicates that power is supplied to the motorized table. This symbol on the power switch of the motorized table indicates that power is not suppled to the motorized table. This symbol indicates the key switch setting. When the key is set in this position, the system is not operational. This symbol indicates the key switch setting. When the key is set in this position, the system is (•` operational. This symbol indicates the fuse rating. This symbol indicates that the system should be operated only with alternating current. M This symbol indicates the date of manufacture. **^** This symbol indicates the manufacturer. X This symbol indicates where the foot pedal is to be connected. This symbol indicates that the port to connect the plug for the remote interlocks. This symbol indicates the switch to be pressed in case of emergency during operation of the STOP system. This symbol indicates that the operator is advised to refer to the related instructions in the **i** operator's manual. This symbol signifies that the indicator, which indicates the presence or absence of normal operating conditions in the system, is located on the left side.



This symbol indicates that the focal point of the YAG laser has shifted from the aiming beam toward the anterior.



This symbol indicates that the focal point of the YAG laser has shifted from the aiming beam toward the posterior.

123

This symbol indicates that the COUNTER display is located on the left.

(**)**+

This symbol indicates that the counter on the COUNTER display will be reset with a press of the switch.



This symbol indicates the Burst switch and Pulse number display are functions.



This symbol indicates the functions related to the setting of the aiming beam and the aiming level indicator.



 $(\mathbf{+})$

This symbol indicates that the aiming beam is turned off.

This symbol indicates that the intensity of the aiming beam increases in steps every time the Aiming switch is pressed. It also indicates that the number of pulses increases every time the Burst switch is pressed.

This symbol indicates that the intensity of the aiming beam decreases in steps every time this switch is pressed.



(-)

This symbol indicates the Energy control and ENERGY display for the YAG laser beam.



This symbol indicates the YAG laser emission is active or disabled every time the switch is pressed.



This symbol indicates that YAG laser emission is active.



This symbol indicates that YAG laser emission is disabled.



This symbol indicates the function to switch the arrangement of the aiming spots between the horizontal and vertical axes.



This symbol indicates to sort and dispose of packing materials following local governing ordinances and recycling plans (See "2.5 Disposal).

1.6 Precautions in Patient Selection

Caution should be exercised when selecting patients with the following conditions to be treated with the YC-1800:

When performing posterior capsulotomy after inserting the IOL Patients with progressive eye disease Patients who have difficulty in eye fixation due to nystagmus or condition that may induce nystagmus Patients with cloudy areas in the aqueous humor or cornea Patients with insufficient postoperative IOL retention due to complications such as posterior capsule rupture and laceration of zounule of Zinn Acute primary angle closure disease with corneal edema Late glaucomatous eyes with advanced visual disturbances

1.7 Troubles and Adverse Events

Possible troubles and adverse events (complications) are as described below.

[Troubles caused by failure of the system]

If any abnormality is found in the system in the pre-operation function check, stop using the system. If use of the system becomes impossible due to any abnormality in them, interruption and reattempt of laser emission may be required.

With the failed system, intended treatment result may not be obtained and the health hazard or unexpected adverse events described in [Adverse events] below may occur.

[Adverse events]

- Increased intraocular pressure
 · Corectopia
 · Hypherma
 · Corneal opacity
- Bullous keratitis Inflammation such as iritis, hyalitis, and uveitis Polar cataract
- Posterior synechia Late closure of iridectomy Peripheral anterior synechia Pupil block
- Corneal edema Iris damage IOL damage Dislocation of IOL into vitreous cavity
- Effects due to erroneous irradiation Cystoid macular edema Corneal burn
- Scleral perforation Corneal endothelial damage Macular hole Retinal detachment
- Endophthalmitis

In this manual, Signal Words are used to designate a degree or level of safety alerting. The definitions are as follows.

A DANGER:	Indicates an imminently hazardous situation which, if not avoided, will
	result in death or serious injury.
WARNING :	Indicates a potentially hazardous situation which, if not avoided,
	could result in death or serious injury.
A CAUTION:	Indicates a potentially hazardous situation which, if not avoided,
	may result in minor or moderate injury or, a property damage accident.

To avoid damage to personnel and the system, follow all the instructions mentioned below when using the system.

2.1 Storage, Transport, and Installation

SAFETY PRECAUTIONS

ACAUTION

\$2

- In storage, transport, and installation, make sure that the following conditions are met:
 - Not exposed to direct sunlight or ultraviolet rays
 - Not exposed to rain or water
 - No chemicals or organic solvents are present
 - No poisonous gas, sulfur, salt, or large amount of dust is contained in the air
 - Level (10° or less) and stable without vibration and shock
 - The following are the specified environmental conditions for storage and transport (packed condition), and installation (unpacked condition):

For storage and transport

Temperature: 32 to 122°F (0 to 50°C) / Humidity: 10 to 95% (non-condensing) For installation

Temperature: 59 to 86°F (15 to 30°C) / Humidity: 30 to 85% / Atmospheric pressure: 700 to 1,060 hPa (non-condensing)

- When moving or transport of the system, observe the instructions below.
 - To avoid malfunction caused by bumping the system, fasten the movable parts of the slit lamp and open the slit in advance.
 - To maintain performance of the laser emission, be careful not to bump the system even when it is packed in the shipping carton or in the carrying case (optional).
 - If the system is installed on the optical table (optional), release the lock of the casters before transporting the optical table and never tilt it more than 10° to avoid falling of the system that may injure personnel or damage the system.
 - To avoid condensation, keep the change in temperature as little as possible.

ACAUTION

- In installation of the system, observe the instructions below.
 - To avoid troubles from condensation, let the system sit until the condensation dissipates before installation.
 - To avoid malfunction from change in temperature and condensation, do not install the system where it is exposed to direct flow of air conditioning.
 - To avoid adverse effect on the lens or mirror, do not install the system in a high temperature, high humidity, or dusty environment.
 - If the system is installed on the motorized table (optional), fasten the system on the table with accessory screws.
 - Install the system so that the outlet that the mains plug is inserted into is easily accessible during use. In addition, ensure that the power cord can be disconnected without the use of any tool.

Failure to do so may interfere with disconnecting the power cord from the input power source in case of an abnormality.

• Use devices that comply with IEC 60601-1 in the patient environment. If any device that does not comply with IEC 60601-1 is to be used, use an isolation transformer or common protective grounding.

The volume of space (patient environment) where contact can occur between the patient and any part of the device (including connected ones) or between the patient and any other person(s) touching the device (including connected ones) is as shown to the right.



2.2 Wiring and Connection

AWARNING

- Be sure to connect the power plug to a gounded outlet.
 - Electric shock or fire may occur in the event of malfunction or power leakage.

ACAUTION

- In handling the power cord and cables, observe the following instructions:
 - To avoid break of cable that may cause short circuit or fire, always pull the plug, not the cord, when unplugging the power cord or do not coil the cord tightly or put it under heavy objects.
 - If the inside wires of the cord or cable are exposed, replace it with a new one immediately to avoid short circuit, electric shock, or fire.
 - To avoid injury or malfunction caused by break of wire or fall, never move the system by dragging the system while holding the power cord or cable.
 - To avoid malfunction or failure of the system, connect the cable plug to the specified connector securely.
- In handling the power cord, observe the instructions below.
 - To avoid malfunction or electric shock, use a grounded power outlet which meets the power requirements specified in the label on the system.
 - Do not use a power strip or extension cable for power supply of this system.
- In handling the connecting cable, observe the instructions below.
 - To avoid malfunction or failure of the system, connect the cable plug to the specified connector securely.

2.3 Use

⚠WARNING

• Use of controls or adjustments, or performance of procedures other than those specified herein may result in hazardous radiation exposure.

AWARNING

- In handling of the system, observe the instructions below.
 - Only service technicians properly trained by NIDEK may install and configure the system. Only qualified physicians may perform emission of the YAG laser beam for treatment.
 - To avoid hazardous radiation exposure, do not perform operation which is not described or different from the procedure specified in the operator's manual.
 - To avoid electric shock, do not modify or touch the internal structure.
 - To maintain the performance of laser emission, never soil or scratch the lens or mirror.
 - Be sure to use accessories specified by NIDEK.
 - If this system is used with other photocoagulators, be sure to use those specified by NIDEK. In that case, read their operator's manuals and thoroughly understand the safety precautions and operating procedures before use.

[Use of the system outside the scope of those manuals may cause unexpected troubles and adverse events.]

NIDEK Ophthalmic Laser Photocoagulator

Multicolor Laser Photocoagulator MC-500

NIDEK Ophthalmic Laser Photocoagulator

Green Laser Photocoagulator GYC-1000

- NIDEK Ophthalmic Laser Photocoagulator
 - Green Laser Photocoagulator GYC-500
- Prepare backup measures for the surgeries to be performed in case of failure of the system.
- Take care when using the system with other devices that are used in contact with patients: Interference of electromagnetic waves or other radiation may induce hazadous conditions.

Contact coagulation by an electrosurgical knife may cause electric shock or burning.

- Before operation of the system, observe the instructions below.
 - To avoid ignition or explosion from the laser emission, make sure that there is no flammable anesthetic gas in the operating room.
 - All personnel in the operating room except the operator and patient must wear recommended (or equivalent to the recommended) safety goggles during operation of the system to protect their eyes. In addition, instruct them never to gaze directly at the aiming beam even when wearing the safety goggles because eyes may still become damaged. Recommended goggles Model YL-717 for Nd: YAG

Model YL-717 for Nd: YAG DIR 925-1065 L5 (EN207)

Yamamoto Kogaku Co., Ltd. Japan

- Prior to starting the system, perform operation checks and record the results to prevent accidents. (See p.6-1 to 6-2 and p.9-3 to 9-4.)
- To avoid unintended exposure to the YAG laser beam, do not gaze at the aiming beam that is emitted from the laser aperture or direct it toward personnel. Always pay attention to the direction of the aiming beam.
- To avoid accident caused by unauthorized personnel, do not leave the system unattended while it is operational. If the operator has to be away from the system, turn the key switch to the off position, remove the key, and store it in a secure place.

ACAUTION

- In use of the YC slit lamp, observe the instructions below.
 - To avoid damage to the retina of the patient, only trained physician may perform observation using the YC slit lamp. Do not emit unnecessarily intense YAG laser beam.
 - To avoid the blue hazard, set the illumination for observation to the minimum level initially, and then increase it until the desired intensity can be obtained. After the observation, lower the illumination intensity to the minimum level again.
 - To keep the forehead rest, the chinrest, and the grips of the YC slit lamp clean, wipe them before observation of every patient.
- For laser emission, observe the instructions below.
 - When the YAG laser beam (wavelength: 1,064 nm) is emitted to tissue, the following symptoms may occur. Pay attention to the direction of the aiming beam to avoid emitting the YAG laser beam into eyes or onto skin inadvertently.
 - Eye symptoms Damage to the cornea or other parts of eye
 - Skin symptoms Pain
 - To avoid exposure to the reflected YAG laser beam, confirm that there is no reflective object in the optical path before laser emission.
 - To avoid partial obscuring of the YAG laser beam, move the illumination tower to the lowest position or 20° to the right or left before the laser emission.
 - To avoid excessive reaction, set the energy output of the YAG laser beam to the minimum initially, and then increase it until the desired effect can be obtained. Always set the energy output to the minimum after the laser emission.
 - To avoid exposure to the accidentally emitted YAG laser beam, always place the system in the condition in which the YAG laser beam cannot be emitted (STANDBY mode) (such as during observation of eye) except when emitting the YAG laser beam.
 - Confirm that the system is in a proper condition for emitting the YAG laser beam by the procedure below. (If any abnormality is found in Step 2, ask NIDEK for check and adjustment.)
 - 1. Project the aiming spot on a test target.
 - 2. Emit the YAG laser beam to the test target. Confirm that the optical axes of the aiming beam and the YAG laser beam coincide.
- If the standard illumination tower has been replaced with an optional illumination tower or the one that comes with the combination delivery unit, move the illumination arm to the left or right from the center so that it does not block the YAG laser beam (see p.4-6 for details).

2.4 After Use, Maintenance, and Checks

ACAUTION

- After use of the system, observe the instructions below.
 - To avoid fire caused by moistened dust around the power plug, disconnect the power cord from the grounded power outlet if the system will not be used for a long period of time.
 - To maintain the performance of laser emission, turn off the power and put dust cover over it after use of the system.
- For maintenance of the system, observe the instructions below.
 - To avoid accidents caused by improper repair of the system, only service technicians properly trained by NIDEK may repair the system.
 - When performing maintenance, ensure that there is sufficient work space, the device is turned off, and there are no unnecessary people nearby. Working in a narrow place may cause injury.
 - To maintain the performance of laser emission, take care not to scratch or accumulate dust on the optical parts such as lens and mirror.
 - To avoid malfunction or a fire, use only fuses of the specified rating.
 - To avoid burn, replace the burned out illumination lamp when it has cooled enough.
 - To protect the exterior or maintain the operability of the system, do not use organic or abrasive solvents for cleaning.
- For check of the system, observe the instructions below.
 - To ensure the continued safe use of the device, the manager* of this device must make sure that maintenance, preventive inspection, and laser output calibration are performed at least once a year (See p.9-1).
 - For details of maintenance and preventive inspection, ask NIDEK or your authorized distributor. If the manager of this device cannot perform the maintenance, preventive inspection, or laser output calibration, contact NIDEK or your authorized distributor.
 - * The manager is a person or an organization responsible for the use and maintenance of the device.
 - To avoid infection, wipe the surface of the system with a clean cloth dampened with alcohol before returning it to NIDEK for repair or maintenance.

2.5 Disposal

ACAUTION

- Follow local governing ordinances and recycling plans regarding disposal or recycling of system components when disposing the system. Ask NIDEK or your authorized distributor for details.
- When disposing packing, sort them by the materials and follow local governing ordinances and recycling plans.

2.6 Safety Devices

[Key switch]

Only the designated key can be used for the system in order that use of the system is restricted to qualified physicians only. If the key switch is set to the \bigcirc (ON) position, the key cannot be removed. Whenever the system is not in use, remove and store the key in a secure place.

[STATUS switch (or S-switch)]

The switch determines whether or not to enable emitting the YAG laser beam (READY (\bigcirc) or STANDBY (\bigcirc) mode). As long as the system is in the STANDBY mode, the YAG laser beam cannot be emitted even if the trigger switch is pressed inadvertently. Keep the system in the STANDBY (\bigcirc) mode by pressing the STATUS switch (or S-switch) except when emitting the YAG laser beam.

[EMISSION indicator]

While the key switch is set to the \bigcirc (ON) position, the EMISSION indicator on the control panel lights to warn the operator not to emit the YAG laser beam inadvertently. The indicator blinks in the event of failure of the system.

[Emergency stop switch]

This switch should be pressed for safety if the physician notices any abnormal conditions with either the patient or the system and determines that the surgical procedure cannot be continued. As soon as the emergency stop switch is pressed, the safety shutter is inserted into the optical path to block the laser beam, power to the system is cut off instantly, and all the indications on the control panel go out. (Only the LINE indicator on the switch box is illuminated.)

* In normal operation, the system must be stopped with the key switch.

* For restarting the system, see "4.7 Emergency Stop" (p.4-11).

[Aiming OFF function]

This function prevents emission of the YAG laser beam without emitting the aiming beam. When the aiming beam is turned off, the indication " \circlearrowright " lights up on the left of the AIMING level indicator on the control panel, and the system automatically enters the STANDBY mode (\circlearrowright) to disable emission of the YAG laser beam. In this condition, the system cannot enter the READY mode (\bigcirc) even if the STATUS switch (or S-switch) is pressed.

[Protective filters]

Protective filters are set in the slit lamp to protect the physician's eye from the reflection of the YAG laser beam.

[Self-diagnostic function]

This function is for monitoring the operating condition of the system. Should any abnormal condition occur in the system, the safety shutter immediately blocks the path of the laser beam. At the same time, the system sounds beeps and indicates an interlock or error number and the abbreviation of the error information.

* See "7. TROUBLESHOOTING GUIDE" (p.7-1) for the error numbers and the contents.

[REMOTE connector (for detection of the remote interlock)]

If the REMOTE connector is connected to a signal line of an external switch, turning off the external switch stops operation of the system. The REMOTE connector can be connected to a door switch of the operating room to stop the system if unauthorized person enters the room, or connected to an external switch so that any physician other than the surgeon can stop operation of the system if they determine that continuing the surgery is dangerous.

[Manual reset function]

After the system is stopped by unexpected reasons such as the stop signal from the REMOTE connector or power failure of the power supply line, the manual reset function disables automatic restart of the system even if all the causes of the trouble have been corrected and the system is ready to restart. With this function, the surgeon decides whether or not to restart the system.

* To restart the system, return the key switch to the OFF (\bigcirc) position once (manual reset), and turn it to the ON (\bigcirc) position again.

2.7 Nominal Ocular Hazard Distance (NOHD)

The Nominal Ocular Hazard Distance (NOHD) is the distance along the axis of the unobstructed beam from the laser aperture where the exposure or irradiance falls below the applicable exposure limit. The nominal ocular hazard distance (NOHD) of the YC-1800 is as follows:

In the single mode: $\text{NOHD}_{\text{S}} = 3.5 \text{ m}$ In the burst mode: $\text{NOHD}_{\text{B}} = 3.7 \text{ m}$

2.8 Labels

In order to draw the physician's attention, the appropriate warning labels are affixed to the specified positions on the main unit.



[For the USA and its commonwealth and other territories]



2 -	11
-----	----

2.9 Other Considerations

There has been a report that neovascular glaucoma may occur in patients with diabetic retinopathy after YAG laser posterior capsulotomy.

§3 SYSTEM DESCRIPTION

[Front view of the system]



[Top view of the system]



1) Grips

Ask the patient to hold these grips during the operation in order to keep him/her in a steady position.

2 Chinrest elevation control

Used to adjust the height of the patient's chin by turning.

3 Eyepieces

The magnification of the eyepieces is $12.5\times$, and the adjustable range of dioptric power is within $\pm 8D$.

④ Fixation lamp

Used to fixate a patient's visual axis by adjusting the position of the lamp while bending the arm at the joint connections.

5Forehead rest

Have the patient touch his/her forehead to this forehead rest.

6 Eye level marker

Adjust the height of the patient's eyes to this eye level marker.

⑦ Control panel

Conditions of the YAG laser beam emission are displayed and partly set on the control panel.

8 Base fixing knob

This knob is turned to fasten the slit lamp to the base so that it does not move horizontally.

9Laser head connector

The cable plug of the laser head is connected here.

10 Tonometer holder

When an applanation tonometer is used, the tonometer mount is attached to this holder.

* For attaching the applanation tonometer, see "4.8.2 Attaching applanation tonometer" (p.4-13).

[Right side view of the system]



(1) Aiming rotation (\clubsuit) control*¹

Used to switch the arrangement (vertical or horizontal) of the aiming spots. Select by turning the control.

¹² Focus shift control (余/类)*1

Used to adjust the focal point of the YAG laser beam relative to the aiming beam. The focal point is continuously changeable in the range from 0 to 500 μ m (in the air) both to the anterior (ANT.) and posterior (POST.) chamber sides, and displayed in the YAG FOCUS SHIFT display in 25 μ m increments.

(The control is provided with five click-stopped settings: 0, 125, 250, 375 and 500 $\mu m.)$

13 Energy control (A)*1

Used to set energy of the YAG laser in the range from 0.3 to 10.0 mJ in 0.1 mJ increments. Rotate the control until the expected energy is shown in the ENERGY display. Then the test-fire is automatically performed and the actual energy that can be output is displayed.

Magnification change control*1

Used to change the magnification of the microscope. The selectable magnifications and their relationship with the actual visual field are as shown below.

[Magnification]	[Actual visual field]
$5 \times$	<i>ϕ</i> 41.3 mm
$8 \times$	<i>ϕ</i> 25.8 mm
12.5×	φ16.5 mm
$20 \times$	<i>ø</i> 10.3 mm
$32 \times$	<i>ø</i> 6.5 mm

15 Slit rotation control*1

Used to rotate the slit 90° to left and right from the vertical position. A scale is provided above the slit rotation control to indicate the slit rotation angle.

16 Chinrest

The patient's chin is placed on the chinrest.

* When using the chinrest paper, remove a sheet for every patient.

17 Hole for focusing rod

Used to insert the focusing rod for adjusting diopter or pupil distance.

18 Slit width control*1

Used to change the slit width continuously. (Range: 0 to 15 mm)

19 Illumination arm fixing knob

Used to lock or unlock the illumination arm.

20 Microscope arm fixing knob

Used to lock or unlock the microscope arm fixing knob.

[Right side view of main unit]



[Right side view of joystick]



21 Hand switch

When this switch is pressed in the READY (③) mode, the YAG laser beam will be emitted.

* As the trigger switch, either the hand switch or the foot switch (optional) can be used. For changing the trigger switch, see "4.8.1 Changing trigger switch" (p.4-12).

2 S-switch

As the ④ STATUS switch ▲, pressing this switch toggles between the READY and STANDBY modes. (When the YAG laser beam is not emitted, place the system in STANDBY mode.)

Moving this switch to right or left changes the energy of the YAG laser beam finely as the ⁽³⁾ energy control.

23 Grip

Used to adjust the position of observation. Manipulating the grip horizontally moves the position of observation in the direction the grip is moved. Tilting the grip moves the position of observation finely in the direction the grip is tilted. Rotating the grip raises or lowers the position of observation.

24 Brake lever

Pulling the lever toward you locks the observation position.

25 Emergency stop switch

When this switch is pressed in an emergency, power supplied to the system will be shut off, and the system will be stopped.

* For restarting procedures, see "4.7 Emergency stop" (p.4-11).

26 Key switch

The switch is used to start and stop the system. When the key is inserted and turned to the ON (\bigcirc) position, the system is powered and enters the STANDBY (\bigcirc) mode in ten seconds. To stop the system, turn the key to the OFF (\bigcirc) position.

27 LINE indicator

The indicator illuminates when power is supplied to the system from the AC adapter.

28 Illumination control

Used to adjust intensity of the illumination for the slit lamp.

29 DC input connector

The plug of the connecting cable from the AC adapter is connected.

30 Foot switch connector

The plug of the cable from the foot switch (optional) is connected.

③ Remote connector

The signal cable for remote interlock is connected.

If the remote interlock function will not be used, connect the short plug.

32 Diaphragm selection disk

Used to select the diaphragm and adjust the slit length of the illumination. (Diaphragm: $\phi 15 / 10 / 6.3 / 0.4$ mm) (Slit length: 2 to 13.8 mm continuously)

33 Filter disk

Used to insert the filter into the optical path for observation.

[Index]	[Filter name]	[Purpose]
Red	Free	
White	Heat absorb	Heat absorb
Green	Red free	Red free
Blue	Blue	Fluorescent staining

[Control panel]



34 STATUS indicator

Illuminates to show whether or not the YAG laser beam can be emitted.

"O": READY mode

(Laser beam can be emitted.)

"": STANDBY mode (Laser beam cannot be emitted.)

35 ENERGY/PULSE display

The expected energy per pulse prior to the test fire, actual energy per pulse after the test fire, or actual energy per pulse after triggering is displayed in the range of 0.3 to 10.0 mJ in 0.1 mJ increments.

In the event of a system failure, "Err" appears on the display.

36 Aiming level indicator

Shows the intensity of the aiming beam by the amount of colored area along the scale. When the aiming beam is off, the indicator "O" (off) lights up.

③ PULSE NUMBER display

Shows the number of YAG laser pulses emitted with every triggering.

* The mode of "1" pulse is called the **single mode**, and the mode of "2" or "3" pulses is called the **burst mode**.

38 COUNTER display

Shows the total number of emitted YAG laser pulses in the range of "0" to "999". Countdown is indicated during startup of the system. An Error No. is indicated in the event of failure of the system.

39 YAG FOCUS SHIFT display

Shows the amount of the YAG laser beam focus shift relative to the aiming beam. The amount of shift is indicated in the range of 0 to 500 μ m in 25 μ m increments.

40 EMISSION indicator

Illuminates while the key switch is turned to the ON position (O) and the system is operational. The indicator goes off in the event of a system failure.

(1) Focus shift indicator

Illuminates to show whether the focal point of the YAG laser beam is shifted toward the anterior or posterior chamber side:

"** Anterior (ANT.)

"类": Posterior (POST.)

42 Reset switch

Pressing this switch 🕞 resets the total number of emitted YAG laser pulses on the Control display to "0".

43 Burst switch

The switch is used to set the number of YAG laser pulses emitted with a single triggering. Pressing the (\bullet) switch changes the number in the following order: "1" \rightarrow "2" \rightarrow "3" \rightarrow "1".

* As the number of the pulses changes, the laser energy automatically changes.

Aiming switches

When the $\textcircled{\bullet}$ switch is pressed, intensity of the aiming beam increases. When the \bigcirc switch is pressed, the intensity decreases. The level of the beam intensity is shown with a bar graph above the switches.

45 STATUS switch

Used to enable or disable emission of the YAG laser beam. Pressing the switch changes the mode between the READY and STANDBY modes. When the YAG laser beam will not be emitted, set the system in the STANDBY mode.

[AC adapter]



46 Connecting cable

This cable is connected to the DC input connector on the switch box. The cable transmits electrical power to the main unit.

Power cable

The main plug at the end of the cable is connected to a grounded power outlet.

3 - 9

[Motorized table (optional)]



4 Fuse holder

1 Master switch

Used to turn on and off power to the motorized table. Pressing the | side (ON) powers the motorized table. Pressing the O side (OFF) shuts off power to the table.

2 Table control lever

Moving the lever up and down respectively raises and lowers the motorized table.

3 Caster locks

Used to lock the motorized table by depressing the levers when installing the system and the motorized table. When moving the system and the motorized table, raise the lever to unlock the casters.

4 Fuse holder

Contains the fuses for the motorized optical table. If the table cannot be raised or lowered, the fuses in the holder may be blown.

* For replacing the fuses, see "5.3 Replacing Fuses of Motorized Table (Optional)" (p.5-2).

§4 OPERATING PROCEDURES

4.1 Connection







4.2 Operation Flow



4.3 Starting System

1. Connect the power cord of the AC adapter to a grounded outlet.

The LINE indicator on the top of the switch box lights up.



NOTE

- When the system is installed on the motorized table, connect the power cord of the table to a grounded outlet, and turn on (|) the master switch of the table.
- 2. Have all personnel except the patient and physician in the operating room wear the special safety goggles.

AWARNING

• Use the recommended safety goggles as below or equivalent ones. Never gaze at the laser beam even when wearing goggles. Eyes may be damaged.

Recommended goggles Model YL-717 for Nd: YAG DIR 925-1065 L5 (EN207) Yamamoto Kogaku Co., Ltd. Japan

3. Insert the key into the key switch and turn the key to the ON (①) position.

During the countdown, the EMISSION indicator on the control panel blinks and the remainingseconds are shown in the counter display during the countdown.*²

In approximately ten seconds, all the conditions of laser emission light up, and the system enters the STANDBY (**(**)) mode.



*2 During the countdown, the available trigger switch is indicated on the focus shift display with "H.S." (Hand Switch) or "F.S." (Foot Switch). For switching of the trigger switch, see "4.8.1 Changing trigger switch" (p.4-12).

4.4 Preparing for Treatment

- 1. Set the focusing rod and adjust the diopter scale and pupillary distance (hereafter called PD) for the operator.
 - 1) Remove the plug from the hole for mounting the focusing rod. Mount the focusing rod so that its flat surface faces the microscope.
 - 2) Project the slit image of any length, width and intensity onto the focusing rod.
 - 3) Turn the diopter adjustments of both eyepieces fully to the + side, and look into the eyepieces.
 * For eyeglass wearers, fold back the sleeves of the eyepieces.
 - 4) While observing the slit image on the focusing rod with one eye, turn the diopter adjustment of the eyepiece slowly until the slit image is sharply focused.

WARNING

• Adjust the diopter of one eye at a time. Never turn the diopter adjustment from the - side to the + side.

The diopter cannot be adjusted properly and the result of the YAG laser beam treatment may be seriously affected.

- 5) Adjust the diopter of the other eye by the same procedure as Step 4).
- 6) Move the binocular tubes to adjust the PD so that the slit images observed with both eyes become one image.
- 7) Remove the focusing rod, and insert the plug into the hole.





4 - 4

- 4 5
- 2. Press and hold the aiming switch to turn off the aiming beam.

The "''o'" indicator lights up.



Forehead rest

Chinrest

Grips

Eye level marker

Fixation lamp

3. Clean all parts that the patient's skin touches.

Wipe the forehead rest, chinrest and grips with clean gauze or absorbent cotton dampened with alcohol.

- * When using the chinrest paper, remove a piece of paper.
- 4. Ask the patient to place his/her chin on the chinrest and touch his/her forehead on the forehead rest.
- 5. Adjust the height of the table surface or seat of the chair so that the operator and patient can be seated in comfortable positions.



ШF

- 6. Turn the chinrest elevation control to align the height of the patient's eyes to the eye level marker.
- 7. Have the patient hold the grips. Fix the patient's head with the head belt.
- 8. Instruct the patient to fix their gaze on the fixation lamp to fix their visual axis.
- 9. Manipulate the joystick to bring the illumination onto the patient's eye.
- **10.** Turn the illumination control to adjust intensity of the illumination.
- 11. Manipulate the joystick so that the illumination is focused on the patient's cornea.
- 12. Set the contact lens on the patient's eye, manipulate the joystick while looking into the microscope, and observe the target of the laser emission.



- Use a contact lens that has been sterilized or disinfected according to the instructions in the user's manual that comes with the contact lens.
- If the standard illumination tower has been replaced with an optional illumination tower or with the one that comes with the combination delivery unit, move the illumination arm to the left or right from the center so that it does not interfere with the YAG laser beam.



Prism head A



Optional

Prism head C

Optional Prism head B (for YC-1300, 1400, or 1600 (fixed at top position) combination delivery unit)



Illumination tower (Combination delivery unit standard accessory (old))

Illumination tower B (Combination delivery unit standard accessory (new))



Illumination tower types	Illumination arm movement angle	Projection magnification	Diaph	nragm d	iameter	(mm)
Prism head A	Unnecessary					
Prism head B	12º moro moro	1.28	0.4	6.3	10	15
Prism head C	12 more more					
Delivery unit illumination tower	20° or more	1.48	0.5	7.3	11.6	17.3
Delivery unit illumination tower B		1.10	0.3	5.4	8.6	12.9

4 - 6

13. As necessary, perform the following operations.

- a) Select the magnification of the microscope with the magnification change control.
- b) Adjust the slit width with the slit width control.
- c) Adjust the diaphragm and slit length with the diaphragm selection disk.
- d) Adjust the slit angle with the slit rotating control.
- e) Select the desired filter with the filter disk.

Magnification	32X, 20X, 12.5X, 8X, 5X
Slit width	0 to 15 mm (continuous)
Diaphragm /	φ 15/10/6.3/0.4 mm
Slit length	2 to 13.8 mm (continuous)
Slit anglo	90° to right and left from the
	vertical position
	Free, heat absorb, red free,
Filler	blue



4.5 Operation for Treatment

ACAUTION

• Confirm that the irradiation conditions are correctly set and then emit the laser beam.

1. Set the following conditions for radiation.

All the conditions for radiation are displayed on the control panel.



[a. Focus shift]

Turn the focus shift control to set which side, the anterior or posterior chambers, the focal point of the YAG laser beam relative to the aiming beam is shifted to and how much.

The focus shift can be set continuously in the range of 0 to 500 μ m and is displayed in the YAG FOCUS SHIFT display in 25 μ m increments both toward the anterior (ANT.) and posterior (POST.) chamers. The control is provided with clicks at 0, 125, 250, 375 and 500 μ m (in air).

* The focus shift in the intraocular structure is about 80% of that in air. This means that the focus shifts of 0, 125, 250, 375 and 500 μ m in air respectively correspond to approximately 0, 100, 200, 300 and 400 μ m in the intraocular structure.

[b. Mode for laser emission]

Pressing the Burst switch \bigoplus changes the number of the YAG laser pulses per trigger in the following order: "1" \rightarrow "2" \rightarrow "3" \rightarrow "1".... The mode with "1" pulse is called "single mode", and the mode with "2" or "3" pulses "burst mode".

* Every time the mode is changed with the Burst switch, the test fire is executed automatically and the energy of the YAG laser beam on the ENERGRY display changes.

4 - 8

[c. Aiming level]

Pressing the aiming switches $(\textcircled{\bullet}/\textcircled{\bullet})$ changes intensity of the aiming beam. Pressing $\textcircled{\bullet}$ decreases the intensity, and pressing $\textcircled{\bullet}$ increases it. The aiming switch is turned off " $\textcircled{\bullet}$ " by pressing and holding $\textcircled{\bullet}$.

[d. Energy of the YAG laser beam]

Adjust the energy of the YAG laser beam by turning the energy control or moving the S-switch right and left. After the automatic test fire, the actual energy that can be emitted is displayed on the ENERGY display in the range of 0.3 to 10.0 mJ in 0.1 mJ increments.

[e. Counter reset]

As necessary, press the reset switch (1) to reset the counter on the COUNTER display to "0".

2. Press the STATUS switch a or the S-switch of the joystick to set the system in the READY mode.

As soon as the system is in READY mode, " \bigcirc " on the left of \blacksquare lights up.



ACAUTION

 When the YAG laser beam will not be emitted, be sure to set the system in the STANDBY
 (O) mode by pressing the STATUS switch a or the S-switch of the joystick. Even if the trigger switch is pressed inadvertently in STANDBY mode, the YAG laser beam will not be emitted.

3. Adjust the positions of the joystick and the contact lens to determine the target of the YAG laser beam emission.

Perform focusing of the two aiming spots until the two aiming spots converge into one spot at the target.

* If the aiming spots cannot be seen clearly, adjust the intensity or change the arrangement of the two aiming spots to horizontal or vertical with the aiming rotation control.



4. When the target is determined, press the trigger switch to emit the YAG laser beam.

Every time the YAG laser beam is emitted, an electrical beep sounds and the number of YAG laser pulses is shown on the Counter display.



NOTE

• If the YAG laser beam cannot be emitted by pressing the trigger switch and a warning beep sounds, check whether or not the system is in READY mode and the aiming beam is being emitted. (In this case, "A.P." or "S.S" appears on the YAG FOCUS SHIFT display. Correct the cause of the electronic beeps referring to "4.6 Indications of Misoperation" (p.4-11), and continue operation.

4 - 10

- If the trigger switch is held in a half-pressed state*, Err 53 may occur.
 * State that a certain amount of load is applied by putting a finger on the trigger switch
- If the YAG laser beam is emitted continuously, see the following maximum numbers of times the trigger switch can be pressed in Single and Burst modes: Single mode - 18 times/minute Burst mode - 6 times/minute
 If continuous irradiation that exceeds the above guides is performed, Err 10 or Err 31 may occur.
- 5. After emission of the YAG laser beam is completed, press the STATUS switch ▲ or the S-switch of the joystick to set the system in the STANDBY mode (()). Then press and hold the aiming switch to turn off () the aiming beam.
- 6. Release the patient from the head belt and chinrest.
- 7. To treat the next patient, leave the system in STANDBY mode (Ċ) and return to Step 3 of "4.4 Preparing for Treatment" (p.4-5).
- 8. Turn the key switch to the OFF () position to stop the system. Then remove the key and store it in the customary place.
 - * When the system is installed on the motorized table, turn off () the master switch of the motorized table as well.
- 9. Instruct all the personnel wearing safety goggles to take them off.
- 10. Disconnect the power cord of the AC adapter from the grounded power outlet.

All operations are now completed.

4.6 Indications of Misoperation

As soon as emission of the YAG laser beam is disabled because of improper operation, an electronic beep sounds, and an abbreviation for the cause is shown on the YAG FOCUS SHIFT display on the control panel. The following table shows the abbreviations and descriptions of them. Follow the instruction in "Remedy" in the table to to continue operation.



Abbreviation	Description	Remedy
"A.P."	The STATUS switch was pressed to set the system in the READY mode (\bigcirc) even though the aiming beam is turned off (\bigcirc).	Press the aiming switch 争 to turn on the aiming beam.
"S.S."	The trigger switch was pressed to emit the YAG laser beam even though the system is in STANDBY mode (()).	Press the status switch () or the S-switch to set the system in the READY mode ().

4.7 Emergency Stop

If the system needs to be stopped urgently for any failure of the system or abnormal condition of the patient during use of the system, press the **Emergency stop switch** (with "STOP" on the switch). The safety shutter blocks the laser beam, and, at the same time, power to the entire system is shut off.

(Turn the key to the OFF position to stop the system in the normal procedure.)

To restart the system, return the key to the OFF position (\bigcirc) once, then turn it to the ON position (\bigcirc) again. The system is activated in approximately ten seconds.



4 - 11

4.8 Other Functions

4.8.1 Changing trigger switch

Both the hand switch and foot switch (optional) are available as the trigger switch. Use of the hand switch and foot switch can be toggled with a simple operation as shown below.

- 1. Connect the cable from the foot switch to the foot switch connector only when the foot switch will be used as the trigger switch.
- 2. Insert the key into the key switch on the main unit, and turn it to the ON "^O" position.

The EMISSION indicator blinks during the countdown. At the same time, the remaining seconds is shown on the COUNTER display.

3. During the countdown, press the desired trigger switch while pressing and holding the STATUS switch ▲.

The pressed trigger switch, either the hand switch or foot switch, is selected and becomes enabled.

An abbreviation of the enabled trigger switch appears on the YAG FOCUS SHIFT display. "H.S." : Hand Switch "F.S." : Foot Switch



4.8.2 Attaching applanation tonometer

Rise of intraocular pressure is a commonly known postoperative complication of the YAG laser treatment. The system is designed so that an applanation tonometer can be attached to measure preoperative and postoperative intraocular pressure.

* Attachable applanation tonometer: R900 Type, HAAG-STREIT CO., LTD.

- 1. Mount the tonometer mount on the tonometer holder on top of the microscope, and fix the mount with the countersunk screw.
 - * The tonometer mount and the countersunk screw are accessories of the tonometer.
- 2. Attach the tonometer, passing the rod of the tonometer mount through the hole of the tonometer arm.



§5 MAINTENANCE

5.1 List of Consumable and Maintenance Parts

Article	Unit of order	Order No.
Chinrest paper	1 pack (400 sheets)	34131-M545
Fuses	2 fuses (125VAC, T10A) (for 100V regions)	804-02-02148
(for motorized table)	2 fuses (250VAC, T5A) (for 200V regions)	804-02-02043
Illumination bulb	1 bulb (6V, 20W: PG22)	34530-E003

5.2 Attaching Stack of Paper to Chinrest

1. Pull out the two pins for fixing a stack of paper to the chinrest of the system.

2. Take out about half of the paper from the pack.

Pay attention to keep the papers together.

NOTE

• The whole pack of paper (400 sheets) cannot be attached at a time.

3. Insert the pins into the holes on the papers.

- 1) Hold the stack of paper with one hand, and insert the pins into the holes in the papers with the other.
- 2) While holding the pins with thumbs, hold the stack of paper with the other fingers.

4. Attach the stack of paper onto the chinrest.

1) While holding the pins and the paper, insert the pins into the holes on the chinrest.



5 - 2 //

5.3 Replacing Fuses of Motorized Table (Optional)

If the master switch of the motorized table (optional) does not illuminate by turning it ON even though the power cord is connected, fuses of the motorized table may be blown. In such a case, replace the fuses with new ones following the procedure below.

- 1. Turn off the master switch of the motorized table.
- 2. Disconnect the power cord from the inlet of the motorized table and the outlet.
- 3. Take out the fuse carrier.

Take out the fuse carrier while pushing the fixing lip with a flatblade screwdriver.



4. Replace the blown fuse with a new one.

```
Fuse rating:

125V T10A (\phi 5.0 mm × 20 mm) × 2 pieces (for 100V regions)

250V T5A (\phi 5.0 mm × 20 mm) × 2 pieces (for 200V regions)
```

ACAUTION

- Be sure to replace the two old fuses at a time with new ones of the specified rating. The system may malfunction or a fire may result.
- If fuses are blown soon after replacement, disconnect the power cord from the power outlet, and contact NIDEK or your authorized distributer.

5. Attach the fuse holder to the motorized table in the reverse order of Step 3.

6. Check the fuses by the following procedure.

- 1) Insert the female plug of the power cord into the inlet of the motorized table. Then insert the male plug into the power outlet.
- 2) Turn on (|) the master switch.
- 3) Operate the table control lever and confirm that the top board of the table moves up and down.

5.4 Replacing Illumination Lamp

The illumination lamp may be blown if the illumination cannot be projected even if the key switch of the system is turned to the $ON(\bigcirc)$ position, the illumination control is not turned fully counterclockwise, and slit shutters are not closed. In such a case, replace the lamp with a new one.

ACAUTION

- The illumination lamp is still hot soon after the illumination is turned off. Take care not to burn fingers.
- Do not touch the glass part with bare hands. If the glass part is accidentally touched with a bare hand, wipe fingerprints using a clean cloth dampened with alcohol.
- 1. Turn off () the key switch of the system.
- 2. Loosen the screw of the lamp housing cover, and remove the cover.
- 3. Replace the blown lamp with a new one.
 - 1) Rotate the spring that holds the lamp socket to the right or left to take out the lamp socket.
 - 2) Confirm that the lamp has cooled enough to touch. Then take out the lamp from the socket.
 - 3) Firmly insert a new lamp into the lamp socket while paying attention to the orientation of the cutting of the lamp base.
 - * Use a halogen lamp (6V, 20W, PG22).
 - Firmly insert the lamp socket into the housing with one hand. While holding the lamp socket, rotate the spring with the other hand to hold the lamp socket with it.



- 5 4
- 4. While holding the lamp house cover closed with one hand, tighten the knob with the other.
- 5. Insert the power cord into the grounded power outlet.
- 6. Check whether the illumination is projected.

Turn the key of the system to the $ON(\bigcirc)$ position, open the slit shutters and confirm that the lamp is illuminated.

5.5 Cleaning

5.5.1 Cleaning exterior

If necessary, clean the dirty parts or parts that come into contact with the patient's skin (forehead rest, chinrest and grips for patient).

Wipe severe dirt with a clean and soft cloth or a cloth dampened in neutral detergent and wrung well.

Clean the parts where the patient's skin contacts using clean gauze or absorbent cotton dampened with alcohol.



5.5.2 Cleaning optical parts

If an incision can be made only with high radiant energy, or intensity of the illumination is not high enough even though the illumination control is fully set at the maximum, the objective lens or prism head may be dirty or dust may have settled on those parts. In such cases, clean the optical parts with the following procedure.

• Be careful not to scratch the objective lens or prism head during cleaning. Especially, pay attention not to scratch the objective lens.

The actually emitted energy may differ from the indication on the energy display.

- 1. Blow off dust that has settled on the surface of the objective lens or prism head with the blower brush.
- 2. Dampen a clean cotton swab with alcoholic solution (mixed solution with 50% methyl alcohol and 50% ethyl alcohol), then shake off any excess alcohol from the cotton swab.
- 3. Illuminate the objective lens or illumination prism with a flashlight, and clean it as instructed below.
 - a) For cleaning the objective lens, lightly rotate the cotton swab from the center to its periphery. Pay attention not to leave any non-wiped parts.
 - b) For cleaning the prism head, lightly move the cotton swab in one direction either from top to bottom or from bottom to top. If the prism head cannot be cleaned thoroughly, wipe it moving the cotton swab in the same direction again.
- 4. Replace the cotton swab with a new one and repeat Steps 2 to 3 until the part is completely wiped clean.

ACAUTION

• If parts are not clean enough after they are lightly wiped, discontinue cleaning and ask an authorized service person to clean.

5.6 Aligning Optical Axes of Laser Beams and Illumination

In transportation of the system, axes of the illumination and aiming beam or axes of the aiming beam and YAG laser beam may shift if the system is bumped. Transport the system as gently as possible.

After transporting the system, check whether or not the illumination, aiming beam and YAG laser beam are at the center of the visual field before using the system.

It is recommended to call NIDEK or your authorized distributor before conducting this procedure.

WARNING

- During the calibration, all personnel in the room should wear safety goggles of OD 4 or above to filter out the wavelength of 1064nm.
- Pay attention not to expose skin or clothing to the laser beam. Severe burns or fire may result.

ACAUTION

• Serious damage to the instrument may occur if these procedures are not performed by qualified personnel.

5.6.1 Checking alignment

ACAUTION

- For checking the alignment, prepare the following items.
 - Test paper (copied in black and cut into the size of a business card)
 - -Adhesive cellophane tape
- 1. Set the system operational, and adjust the diopter and PD to the operator's eye.
- 2. Set the magnification of the microscope to $32\times$, the illumination spot to the minimum and the focus shift to 0μ m.
- **3.** Adjust the focus on the flat surface of the focusing rod, visually check the shift of the illumination and aiming spots from the center of the visual field.

If the illumination spot is in the center, but the aiming spot is shifted from the center of the visual field, see "5.6.2 Aligning optical axis of laser beam" (p.5-7). After the alignment, proceed to Step 4.

- 4. Dismount the focusing rod, and attach the plug on the hole. Then fix the test paper between the forehead rest and chinrest with adhesive cellophane tape.
- 5. Set the emission energy of the YAG laser beam to 0.3 mJ. Then set the system to the READY mode.
- 6. Emit the YAG laser beam. Then check the shift between the burn pattern and aiming spot.
 - 1) When the focus is adjusted on the test paper, press the trigger switch and emit the YAG laser beam.
 - 2) If a shift between the burn pattern and aiming spot is observed, see "5.6.3 Aligning YAG laser beam to aiming beam" (p.5-8).

5 - 6

5.6.2 Aligning optical axis of laser beam

NOTE

- For adjusting the optical axis of the laser beam, prepare the following items:
 - Phillips screwdriver
 - Hexagonal wrench (Nominal diameter: 1.5 mm)
- 1. Loosen the set screws on the lid on top of the microscope. Then remove the lid.
- 2. Adjust the optical axis of the laser beam using the hexagonal wrench (nominal diameter: 1.5 mm).
 - a) The aiming spot moves in "a" direction if Screw A is tightened, and moves in "a" " direction if Screw A is loosened.
 - b) The aiming spot moves in "b" direction if Screw B is tightened, and moves in "b" " direction if Screw B is loosened.
 - c) The aiming spot moves in "c" direction if Screw C is tightened, and moves in "c" " direction if Screw C is loosened.



<u>CAUTION</u>

• Be sure to complete alignment by tightening each screw clockwise.

If the adjustment is completed by loosening the screw, the laser beam becomes susceptible to a shift of the optical axis from bumping the system.

• Perform alignment so that the screws are not overtightened. The figure on the right shows adjustment examples.

→ : Spot moves in this direction by tightening the screw ⇒ : Spot moves in this direction by loosening the screw



[Adjustment example 1] [Adjustment example 2]

3. Attach the lid to the original position.

5 - 8 ////

5.6.3 Aligning YAG laser beam to aiming beam

NOTE

- For aligning the YAG laser beam to the aiming beam, prepare the following items. - Phillips screwdriver, - Hexagonal wrench (Nominal diameter: 1.5, 2.5 mm)
- 1. Loosen the screws on the right and left covers (three screws on each side) with the hexagonal wrench to expose the adjustment part.
- 2. Adjust the optical axis of the YAG laser beam with the hexagonal wrench and Phillips screwdriver.
 - a) **If the burn pattern is shifted upward** Loosen Screw B with the hexagonal wrench (1.5 mm) and tighten Screw A with the hexagonal wrench (2.5 mm).
 - b) **If the burn pattern is shifted downward** Loosen Screw A with the hexagonal wrench (2.5 mm) and tighten Screws B (1.5 mm).
 - c) If the burn pattern is shifted to the right Loosen Screws C (three) with the Phillips screwdriver. Turn the holder clockwise. Tighten them (Screws C) where the burn pattern overlaps the aiming spot.
 - d) If the burn pattern is shifted to the left Loosen Screws C (three) with the Phillips screwdriver. Turn the holder counterclockwise. Tighten them (Screws C) where the burn pattern overlaps the aiming spot.
- 3. Radiate the YAG laser beam on the test paper.

If the YAG laser beam is still shifted from the aiming spot, return to Step 2. If the YAG laser beam is not shifted from the aiming spot, proceed to Step 4.



4. Attach the right and left covers in the reverse order of Step 1.

5.7 Calibration of Laser Beams

AWARNING

- Only personnel trained by NIDEK or a NIDEK distributor are allowed to calibrate the laser power and energy output.
- During the calibration, all personnel in the room should wear safety goggles of OD 4 or above to filter out the wavelength of 1064nm.
- Pay attention not to expose skin or clothing to the laser beam. Severe burns or fire may result.

ACAUTION

- Serious damage to the instrument may occur if these procedures are not performed by qualified personnel.
- Adjust the energy output of the YAG laser beam with the two vertically arranged aiming spots. (If the aiming spots are arranged horizontally, change the arrangement to vertical using the aiming rotation control.)

If the aiming spots are arranged horizontally, the energy output of the YAG laser beam may not be adjusted properly.

NOTE

Prepare the following power and energy meters or equivalents before adjusting power and energy output of the laser beam.
 For the aiming beam: Power meter (Model 212, COHERENT CO. LTD)

For the YAG laser beam:

Power meter (Model 212, COHERENT CO. LTD) Energy meter (Vector S200, SCIENTECH CO. LTD)

5.7.1 Calibrating power output of aiming beam

- 1. Attach the power meter to the system for measuring the aiming beam.
 - 1) Fasten the stand of the detector to the chinrest of the slit lamp with a tape or the equivalent.
 - 2) Connect the power meter and detector.

2. Start the system.

Insert the key into the key switch and turn the key to the ON (\bigcirc) position. The system enters the STANDBY mode (\bigcirc) in approximately 10 seconds.



3. Align the aiming spot with the light-receptive surface of the detector.

- 1) Turn off the illumination with the illumination control.
- 2) Press the aiming switch (+) on the control panel to emit the aiming beam.
- 3) Manipulate the joystick or chinrest elevation control so that two aiming spots of the largest possible sizes are projected on the light-receptive surface of the detector.

4. Measure the maximum and minimum power outputs of the aiming beam.

[A. Measuring maximum power output]

- 1) If the measured value is within the tolerance $(25 \pm 5 \,\mu\text{W} = 20.0 \text{ to } 30.0 \,\mu\text{W})$, the maximum power output does not need adjustment. Proceed to Step 5) of **[B. Measuring minimum power output]**.
- 2) Press and hold the aiming switch and turn off the aiming beam.
- 3) Set the range of the power meter to the 30 μ W range and adjust the power meter to zero.
- 4) Press the aiming switch (+) to set the intensity of the aiming beam to the maximum level (= all the scales of the indicator illuminate). Then measure the power output of the aiming beam.

[B. Measuring minimum power output]

- 5) If the measured value is within the tolerance $(0.5 \pm 0.3 \,\mu\text{W} = 0.2 \text{ to } 0.8 \,\mu\text{W})$, the minimum power output does not need adjustment. Proceed to Step 10 (p.5-12).
- 6) Press and hold the aiming switch and turn off the aiming beam.
- 7) Set the range of the power meter to the 1μ W range and adjust the power meter to zero.
- 8) Press the aiming switch (+) and set the intensity of the aiming beam to the minimum level (= one scale of the indicator illuminates). Then measure the power output of the aiming beam.

5. Set the system to the adjustment mode.

- Reset the key to the OFF () position, and stop the system.
- Turn the key to the ON (⊙) position while pressing the following three switches: Aiming switches → and → and STATUS switch ▲.

The system enters the adjustment mode, and the abbreviation of the parameter and the parameter number blink.

The parameter setting is also shown on the ENERGY display.



6. Select the parameters to be adjusted (Maximum/minimum power output of the aiming beam).

- 1) If the abbreviation and number of the parameter are not blinking, press the status switch at to make them blink.
- 2) Press the aiming switch () or () to select the parameter related to the maximum or minimum power output to be adjusted.

Adjustable item	Abbrevi parar	ation of neter	Parameter number
Max power output of aiming beam	A	Н	17
Max energy output of YAG laser	Y	Н	18
Min power output of aiming beam	A	L	19
Min energy output of YAG laser	Y	L	20

7. Change the parameter setting.

1) Press the STATUS switch (a) to make the parameter setting blink.

- 5 12
 - 2) Press the Aiming switch 🕒 or to change the parameter setting. (Pressing 🕂 increases the setting.)
 - * The parameter setting on the ENERGY display is the percentage of the measured value. For example, to make the measurement value 25 μ W when the measured value is 22 μ W and the parameter setting is 100, set the parameter to 113 or 114 as obtained from the following formula: 25 \div 22 \times 100 = 113.6.
 - 3) Press the reset switch 🕞. An electronic beep sounds and the parameter setting is determined and the parameter display stops blinking.
 - 4) To set other parameters related to maximum/minimum power output, return to Step 6.

8. Stop the system once and turn it on again.

Turn the key to the OFF (\bigcirc) position to stop the system once and turn the key to the ON (\bigcirc) position again. The system enters the STANDBY mode (\bigcirc) in about 10 seconds.

- 9. Return to Step 4 (p. 5-10).
- 10. Remove the detector of the power meter from the system.

The power output adjustment of the aiming beam is now complete.

5.7.2 Calibrating energy output of YAG laser beam

1. Set the energy meter to the system for measuring the YAG laser beam.

- 1) Fasten the stand of the detector to the chinrest of the slit lamp with a tape or the equivalent.
- 2) Connect the energy meter and detector.

2. Start the laser system.

Insert the key into the key switch and turn it to the $ON(\bigcirc)$ position.

The system enters the STANDBY (\bigcirc) mode in about 10 seconds.



3. Align the aiming spot with the light-receptive surface of the detector.

- 1) Turnoff the illumination.
- 2) Press the aiming switch () on the control panel to emit the aiming beam.
- 3) Manipulate the joystick or chinrest elevation control so that two aiming spots of the largest possible sizes are projected on the light-receptive surface of the detector.

4. Measure the maximum and minimum energy output of the YAG laser beam.

[A. Measuring maximum energy output]

- 1) Set the range of the energy meter to the 30 mJ range and adjust the energy meter to zero.
- 2) Turn the energy control to set the energy on the ENERGY display to 10.0 mJ. Then measure the energy output of the YAG laser beam with the maximum energy output ten times in a row with the same setting.
- 3) If the measured values are within the tolerance, the maximum energy output does not need adjustment. Proceed to Step 10 (p. 5-15).
 Tolerance (for the maximum energy output): 10.0 mJ ±20% (= 8.0 to 12.0 mJ)

[B. Measuring minimum energy output]

- 1) Set the range of the energy meter to the 1mJ range and adjust the energy meter to zero.
- 2) Turn the energy control to set the energy on the ENERGY display to 0.3 mJ. Then measure the energy output of the YAG laser beam with the minimum energy output ten times in a row with the same setting.
- 3) If the measured values are within the tolerance, the minimum energy output does not need adjustment. Proceed to Step 10 (p. 5-15).

• Tolerance (for the minimum energy output): $0.3 \text{ mJ} \pm 0.1 \text{ mJ} (= 0.2 \text{ to } 0.4 \text{ mJ})$

5. Set the system to the adjustment mode.

- 1) Reset the key to the OFF (\bigcirc) position, and stop the system.
- 2) Turn the key to the ON (①) position while pressing the following three switches: Aiming switches $\textcircled{\bullet}$ and \bigcirc , and STATUS switch $\fbox{\bullet}$.

The system enters the adjustment mode, and the abbreviation of the parameter and the parameter number blink.

The parameter setting is also shown on the ENERGY display.



6. Select the parameters to be adjusted (Maximum/minimum energy output of the YAG laser beam).

- 1) If the abbreviation and number of the parameter are not blinking, press the STATUS switch at to make them blink.
- 2) Press the aiming switch \bigoplus or \bigoplus to select the parameter related to the maximum or minimum energy output to be adjusted.

Adjustable item	Abbrevi paran	ation of neter	Parameter number
Max power output of aiming beam	А	Н	17
Max energy output of YAG laser	Y	Н	18
Min power output of aiming beam	А	L	19
Min energy output of YAG laser	Y	L	20

7. Change the parameter setting.

- 1) Press the STATUS switch a to make the parameter setting blink.
- 2) Press the aiming switch $\textcircled{\bullet}$ or \bigcirc to change the parameter setting. (Pressing $\textcircled{\bullet}$ increases the setting, whereas pressing () decreases the setting.)
 - * The parameter setting on the ENERGY display is the percentage of the measured value. For example, to make the measurement value 10.0 mJ when the measured value is 9.5 mJ and the parameter setting is 100, set the parameter to 105 or 106 as obtained from the following formula: $10.0 \div 9.5 \times 100 = 105.3$
- 3) Press the reset switch (1). An electronic beep sounds and the parameter setting is determined and the parameter display stops blinking.
- 4) To set the other parameter related to maximum/minimum energy output, return to Step 6.

8. Stop the system once and turn it on again.

Turn the key to the OFF (\bigcirc) position to stop the system once, turn the key to the ON (\bigcirc) position again. The system enters the STANDBY mode (\bigcirc) in about 10 seconds.

9. Return to Step 4 (p. 5-13).

10. Remove the detector of the energy meter from the system.

The energy output adjustment of the YAG laser beam is now complete.

§6 CHECKS

6.1 Checks Before Use

Before using the system, check the items below.

(1) Appearance

Check the appearance of the system and the motorized table for deformation and stains which hinder a physician from operating them correctly. Stains produced by chemical agents may cause a systemmalfunction.

(2) Power cord

Confirm that the power cord is connected to a single-phase outlet which meets the power requirements.

(3) Start-up

Turn the key of the system from the OFF (\bigcirc) position to the ON (\bigcirc) position. Confirm that the system enters the STANDBY (\bigcirc) mode in about 10 seconds.

6.2 Function Checks

Set the system in the STANDBY mode (\bigcirc) to check the items below. Record each result in the list on p.9-3.

(1) Focus shift control

Can the focal point be set to 500µm toward the posterior and anterior chambers with the control? Do the clicks correspond to the indications 0, 125, 250, 375 and 500µm on the YAG FOCUS SHIFT display?

(2) Burst switch 🛨

Can the number of pulses be set in the following order with the Burst switch: $1 \rightarrow 2 \rightarrow 3 \rightarrow 1$? Is the test fire executed automatically after changing the number of pulses? Does the beep sound?

(3) Aiming switches +/-

Does intensity of the aiming beam change every time either switch is pressed? Does the \bigcirc (OFF) indication illuminate as soon as the aiming beam is turned off by pressing and holding \bigcirc ? Does the been sound?

Does the beep sound?

ACAUTION

• Never gaze at the aiming beam or direct it toward personnel present during emission of the laser beam.

Otherwise, eyes may be seriously damaged.

(4) Energy control / S-switch

Can the radiant energy be set in the range of 0.3 to 10.0 mJ with the control? Is the test fire executed automatically after the setting?

(5) STATUS switch 🛦 / S-switch

Does the mode change between STANDBY (**(**) and READY (**(**) modes with every pressing of the STATUS/S-switch?

* If the O (OFF) indicator for the aiming level indicator illuminates, the system do not enter the READY (O) mode even by pressing the STATUS (▲) switch. Check the function of the switch after turning on the aiming beam by pressing +.
Does the beep sound?

(6) Trigger switch

Do the hand switch or foot switch (optional) work properly?

Is the YAG laser beam emitted by pressing the trigger switch when the system is in READY (\bigcirc) mode by pressing the STATUS (\blacktriangle) switch?

• Never direct the objective lens of the microscope toward personnel. The YAG laser beam is output from it.

Eyes may be seriously damaged.

(7) Optical axis of the laser beam

When the YAG laser beam was emitted on the test paper in Step 6, did the burn pattern and the aiming beam coincide?

(8) Emergency stop switch

Does the system stop immediately after the switch is pressed?

§7 TROUBLESHOOTING GUIDE

The system is provided with a self-diagnostic function which constantly monitors the working state during operation.

If any failure occurs in the system, the laser beam will be blocked by the safety shutter, the system produces alarm sounds intermittently, and the "EMISSION" indicator blinks.

In addition, "Err" is indicated on the ENERGY display and an error number on the COUNTER display.

In the event of failure, report the error number as well as symptoms of the failure. The error number is essential for a proper repair.

The contents of the error numbers are as described in the table below.



Error No.	Symptom	Suggestion	
Err 1	Overheat of device	Turn off (\bigcirc) the key switch and wait approx. 30 minutes.	
Err 5	Malfunction of	Turn off (a) the key ewitch. Then turn it on (a) again	
	safety shutter		
Err 7	Malfunction of	Turn off $(\dot{\circ})$ the key switch. Then turn it on (\circ) again	
	aiming shutter		
	Shortage of laser pulses		
Err 10	Laser irradiation that exceeds continuous	Contact NIDEK or your authorized distributor.	
	irradiation conditions		
Err 12	Excess of laser pulses	Contact NIDEK or your authorized distributor.	
Err 13	Irregular laser emission	Contact NIDEK or your authorized distributor.	
Err 14	Misfire of laser beam	Contact NIDEK or your authorized distributor.	
Err 15	Unstable laser energy	Contact NIDEK or your authorized distributor.	
Err 30	Failure of laser power supply	Contact NIDEK or your authorized distributor.	
	Failure of PFN voltage of laser power supply		
Err 31	Laser irradiation that exceeds continuous	Contact NIDEK or your authorized distributor.	
	irradiation conditions		
Err 50	Failure of energy monitor	Contact NIDEK or your authorized distributor.	
Err 51	Impossible to set the laser energy	Contact NIDEK or your authorized distributor.	
Err 52	Impossible to set the focus shift	Contact NIDEK or your authorized distributor.	
Err 52	Failure of input signal of trigger switch	Contact NIDEK or your authorized distributor	
EII 55	Half-pressed state of trigger switch		
Err 54	Failure of pulse number setting signal	Contact NIDEK or your authorized distributor.	
Err 60	Failure of motor for energy output control	Contact NIDEK or your authorized distributor.	
Err 90	Failure of program	Contact NIDEK or your authorized distributor.	
Err 91	Failure of EEPROM data	Contact NIDEK or your authorized distributor.	
Err 93	Failure of RAM data	Contact NIDEK or your authorized distributor.	
Err 94	KEYLOCK error	Contact NIDEK or your authorized distributor	

\$8 SPECIFICATIONS AND CONFIGURATION

8.1 Specifications

8.1.1 Specifications of system

1. Treatment laser

1-1. Type of laser:	Nd: YAG laser
1-2. Wavelength:	1,064 nm
1-3. Pulsing method:	Q-switching
1-4. Mode structure:	Fundamental
1-5. Pulse duration:	4 nsec (typ.)
1-6. Energy output:	0.3 to 10.0 mJ
(per pulse)	< <tolerance: ±20%="">></tolerance:>
	(If the output is less than 0.5 mJ, error of \pm 0.1 mJ is tolerated.)
	Maximum output: <40 mJ (@ Burst mode: 3 pulses/trigger)
1-7. Spot size:	8μm
1-8. Cone angle:	$16^{\circ} \pm 2^{\circ}$
1-9. Focus shift:	0to500µm(continuously variable, both toward anterior and posterior)
1-10. Single mode:	1 pulse/trigger
1-11. Burst mode:	2 or 3 pulses/trigger
1-12. Pulse interval:	33 µs or more
1-13. Pulse repetition rate:	3 Hz (in the burst mode: 1.5 Hz)
1-14. Cooling method:	Ambientair

2. Aiming laser

2-1. Type of laser:	Laser diode
2-2. Wavelength:	635 nm (typ.)
2-3. Energy output:	OFF (0 μ W), 0.5 to 25 μ W (adjustable in 10 levels)
2-4. Aiming method:	Dual beam method
2-5. Rotation of beam:	360° (clicks are in the vertical and horizontal positions)

3. Slit lamp

3-1. Objective lens	:
---------------------	---

f = 130 mm

3-2. Eyepiece lens: $12.5 \times$

3-3. Total magnification / Diameter of actual field of view: as described on the table.

Magnification	Diameter of actual field of view
5X	ϕ 41.3 mm
8X	ϕ 25.8 mm
12.5X	ϕ 16.5 mm
20X	<i>ϕ</i> 10.3 mm
32X	ϕ 6.5 mm

3-5. Diopter:

3-6. Diaphragm/Slit length:

- 3-7. Slit width:
- 3-8. Slit rotation:

3-9. Filter:

55 to 75 mm (continuously changed)

 $\pm 8D$

*\phi*15 mm, *\phi*10 mm, *\phi*6.3 mm, *\phi*0.4 mm / 2 to 13.8 mm (continuously changed)

0 to 15 mm (continuously changed)

 $\pm 90^{\circ}$

The types of filters are as listed on the table below.

Index	Filter name	Purpose		
Blue	Blue	Fluorescent stainin		
Green	Red free	Red free		
White	Heat absorb	Heat absorb		
Red	Free			

3-10. Illumination lamp:	6 V, 20 W, PG22 (Halogen lamp)
3-11. Illumination control:	Minimum to maximum (continuously variable)
3-12. Horizontal travel:	Front and back; 80 mm, Right and left; 100 mm,
	Front, back, right and left fine adjustment; 10 mm
3-13. Vertical travel:	30 mm

4. Power requirements

4-1. Voltage:	Single-phase, AC 100 to 240 V $\pm 10\%$
4-2. Frequency:	50/60 Hz
4-3. Power consumption:	100 VA or less (with AC adapter)

5. Environmental conditions

Indoor
Temperature: 15 to 30°C (59 to 86°F)
Humidity: 30 to 85% (R.H.)
Atmospheric pressure: 700 to 1,060 hPa
* Non-condensing / no harmful dust or smoke
Temperature: 0 to 50°C (32 to 122°F)
Humidity: 10 to 95% (R.H.)
* Non-condensing

6. Dimensions and mass

6-1. Dimensions:	324 (W) × 407 (D) × 528.5 (H) mm
6-2. Mass:	16 kg

7. Expected service life (defined by manufacturer)

7 years from the date of initial operation * Proper maintenance is necessary.

8.1.2 Specifications of motorized table (optional)

1. Performance

1-1. Ascent/descent range:	653 to 851 mm
	703 to 901 mm (for the USA)
1-2. Ascent/descent speed:	16.5 mm/sec. (60 Hz), 13.2 mm/sec. (50 Hz)

2. Power requirements

2-1. Voltage:	Single-phase, AC 115, 220, 240 V ±10%
2-2. Frequency:	Within 50/60 Hz±1Hz
2-3. Power consumption:	1000 VA or less (including the outlet)

3. Environmental conditions

* Same as the environmental conditions for the YC-1800.

4. Dimensions and mass

4-1. Dimensions:	$600 (W) \times 450 (D) \times 653$ to $851 (H) mm$
	$600 (W) \times 450 (D) \times 703$ to 901 (H) mm (for the USA)
4-2. Mass:	Approximately 30 kg

8.2 Configuration

8.2.1 Standard configuration

• YC-1800
• AC adapter 1
• Standard accessories
Head belt1
Arm rest
Focusing rod1
Dust cover 1
Chinrest paper (1 pack [400 sheets])1
Operator's manual
Key (including a spare)
Spare bulb (6V 20 W \times 1 piece)

8.2.2 Optional accessories

- Foot switch
- Motorized table
- Prism head B (fixed at top position)
- Prism head C (for YC-1300, 1400, or 1600 combination delivery unit)
- Co-observation scope
- Beam splitter
- Video camera adapter
- Safety goggles

\$9 ADMINISTRATION

9.1 Cautions on Administration

Appoint personnel to be in charge of storage and administration for the area the ophthalmic YAG laser system is used. One qualified manager and one sub-manager are needed. Please observe the following:

- The manager should appoint the personnel who use the system.
- The manager should provide personnel with knowledge on safety and training.
- The manager should prepare a registered list of the personnel authorized to use the system, store and manage the keys.
- Personnel who are authorized to use the system should follow the instructions of the manager.
- The manager should specify a controlled area for the use of the system (hereafter simply called "controlled area") and put up a notice in the area.
- In the controlled area, the manager should put up the required notices, which show the name of the laser, warnings, etc. in prominent positions.
- Any personnel who enter the controlled area (except the personnel who are on the registered name list) should get permission from the manager and take necessary precautions before entrance.
- All personnel who enter the controlled area are advisable to take a visual acuity test before and after entrance to check for a worsening in eyesight.
- In the controlled area, the manager should put up notices which show cautions and warnings, in prominent positions.
- The manager should prepare the required facilities and equipment for installation, maintenance and for safe administration of the system.
- As necessary, the manager should perform or have authorized personnel perform the function checks described in the operator's manual, and record the results in the Functional check list (p.9-3).
- The manager must make sure that the power and energy output of the laser beam is calibrated once a year, and that the power and energy output is recorded in the Calibration output list (p.9-4: (4) Calibration output list).

9.2 Management List

(1) Qualified manager and sub-manager

	Post	Name
Qualified manager		
Sub-manager		

(2) Registration list of the personnel who use the system

Post	Name

(3) Functional check list

\setminus		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
\backslash	ltem	Focus	Burst	Aiming	Energy	STATUS	Trigger	Ontical	Emergency
\backslash		chift	switch	cwitchoc	control /	cwitch /	cwitch	avic of	stop switch
	\backslash	STIIL	Switch	Switches		Switch/	Switch		stop switch
	\backslash	control			S-switch	S-switch		the laser	
Date								beam	
•	•								
<u> </u>									
<u> </u>									
•	•								
•	•								
•	•								
•	•								
•	•								
	•								
	•								
•									
	•								
•	•								
	•								

(4) Calibration output list

	Item	Maximum power output of aiming beam (µ W)		Minimum power output of aiming beam (µ W)		Maximum energy output of YAG laser beam (mJ)		Minimum energy output of YAG laser beam (mJ)	
Date		Pre-	After	Pre-	After	Pre-	After	Pre-	After
		calibration	calibration	calibration	calibration	calibration	calibration	calibration	calibration
•	·								
•	•								
•	•								
•	•								
•	•								
•	•								
•	•								
•	•								
•	•								
•	•								
•	•								
•	•								

§10 TECHNICAL INFORMATION

10.1 Light Hazard

Provision of information on the avoidance of light hazard from the optical device is required in ISO 15004-2: 2007 "Ophthalmic instruments - Fundamental requirements and test methods -".

ACAUTION

• The light emitted from this device is potentially hazardous. The longer the exposure time is, the greater the risk of ocular damage becomes.

Exposure to light from this device when operated at maximum intensity will exceed the safety guideline after 198 seconds (excluding the treatment laser).

O Relative spectrum









O Maximum intensity and fractions of maximum intensity





Slit light volume angle (degree)
10.2 EMC (Electromagnetic Compatibility)

The device complies with the International Electrotechnical Commission standards (IEC 60601-1-2:2007).

AWARNING

- Use the specified accessories, optional accessories, and cables.
 Otherwise, increased emissions or decreased immunity of the device may result.
- Do not use the device near, on, or under other electronic equipment.

ACAUTION

- The device needs special precautions regarding EMC.
 - The device needs to be installed and used in accordance with the EMC information provided in this manual.
- Portable and mobile RF communications equipment can affect the device.

O Specified cable

Part name	Cable shielded	Length (m)
Power cord	No	2.5
Connecting cord	No	1.5
Foot switch cable	Yes	2.9

O Essential performance

• Laser irradiation function

	Guidance and man	ufacturer's decla	aration	- electromagnetic emissions	
The YC-1800 is in	tended for use in the ele	ctromagnetic envi	ironme	nt specified below. The customer or the user of the	
YC-1800 should a	assure that it is used in s	uch an environme	ent.		
Emissi	ons test	Compliance		Electromagnetic environment - guidance	
RF emissions		Group 1	The YC-1800 uses RF energy only for its internal fun-		
CISPR 11			There to cau	fore, its RF emissions are very low and are not likely se any interference in nearby electronic equipment.	
RF emissions		Class B	The Y	C-1800 is suitable for use in all establishments,	
CISPR 11			Includ	ing domestic establishments and those directly	
Harmonic emission	ons N	ot applicable	that s	upplies buildings used for domestic purpose	
IEC 61000-3-2			uiat S	upplies buildings used for domestic purpose.	
Voltage fluctuation	ns/Flicker N	Not applicable			
emissions IEC 61	000-3-3				
	Guidance and man	ufacturer's decla	aration	– electromagnetic immunity	
The YC-1800 is in	tended for use in the elec	ctromagnetic envi	ronme	nt specified below. The customer or the user of the	
YC-1800 should a	issure that it is used in si	uch an environme	ent.		
Immunity test	IEC 60601 test level	Compliance	level	Electromagnetic environment - guidance	
Electrostatic	±6 kV contact	±6 kV contact		Floor should be wood, concrete or ceramic tile. If	
Discharge (ESD)	±8 kV air	±8 kV air		floors are covered with synthetic material, the relative	
IEC 61000-4-2				humidity should be at least 30%.	
Electrical fast	±2 kV for power supply	±2 kV for power		Mains power quality should be that of a typical	
transient/burst	lines	supplylines		commercial or hospital environment.	
IEC 61000-4-4	±1 kV for input/output	±1 kV for input/c	output		
	lines	lines			
Surge	±1 kV	±1 kV		Mains power quality should be that of a typical	
EC 61000-4-5 Differential mode		Differential mode		commercial or hospital environment.	
	±2 kV	±2 kV			
	Common mode	Common mode	Э		

IEC 61000-4-5	Differential mode ±2 kV Common mode	Differential mode ±2 kV Common mode	commercial or hospital environment.
Voltage, dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5% UT (>95% dip in UT) for 0,5 cycle 40% UT (60% dip in UT) for 5 cycles 70% UT (30% dip in UT) for 25 cycles	<5% UT (>95% dip in UT) for 0,5 cycle 40% UT (60% dip in UT) for 5 cycles 70% UT (30% dip in UT) for 25 cycles	Mains power quality should be that of a typical commercial or hospital environment. If the user of the YC-1800 requires continued operation during power mains interruptions, it is recommended that the YC-1800 be powered from an uninterruptible power suppl
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE U_{T} is the a	i.c. mains voltage prior to	application of the test le	evel.

10 - 5

Guidance and manufacturer's declaration - electromagnetic immunity			
The YC-1800 is intended for use in the electromagnetic environment specified below. The customer or the user of the YC-1800 should assure that it is used in such an environment.			
Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
Conducted RF IEC 61000-4-6 Radiated RF IEC 61000-4-3	3 Vrms 150 kHz to 80 MHz 3 V/m 80 MHz to 2.5 GHz	3 Vrms (V1=3) 3 V/m (E1=3)	Portable and mobile RF communications equipment should be used no closer to any part of the YC-1800, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance $d=1.2\sqrt{P}$ $d=1.2\sqrt{P}$ 80 MHz to 800 MHz $d=2.3\sqrt{P}$ 800 MHz to 2,5 GHz where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in metres (m).Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, a should be less than the compliance level in each frequency range. Interference may occur in the vicinity of equipment marked with the following symbol:

NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies.

NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

a. Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the YC-1800 is used exceeds the applicable RF compliance level above, the YC-1800 should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the YC-1800.

b. Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

10 - 6

Recommended separation distances between portable and mobile RF communications equipment and the YC-1800

The YC-1800 is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the YC-1800 can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the YC-1800 as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter W	Separation distance according to frequency of transmitter m		
	150 kHz to 80 MHz d=1.2√P	80 MHz to 800 MHz d=1.2√P	800 MHz to 2.5 Hz d=2.3√P
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in metres (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

10 - 7

- Words in this manual

To understand the contents of this manual easily, the following words are used. Before reading this manual, grasp the meaning of the following words.

Focus shift	To shift the focal point of the YAG laser beam and aiming beam. Mainly in treatment of secondary cataract, this function is used to avoid cracking the IOL by shifting the focal point of the YAG laser beam from the aiming beam toward the posterior.
Laser beam	YAG laser and aiming laser beams
Single mode/	
Burst mode	In Single mode with the pulse number "1", the laser beam is emitted every time the trigger switch is pressed. In Burst mode, the number of pulses is "2" or "3". In this mode, incision or ablation can be performed with a lower energy output than in Single mode.

IMPORTANT—READ CAREFULLY

THIS AGREEMENT APPLIES TO THE NIDEK SOFT-WARE AND ACCOMPANYING DOCUMENTS. PLEASE READ THIS AGREEMENT CAREFULLY AND THOR-OUGHLY BEFORE USING SOFTWARE.

SOFTWARE LICENSE AGREEMENT

This SOFTWARE LICENSE AGREEMENT ("Agreement") is an agreement between you, whether person or legal entity, and NIDEK CO., LTD., a Japanese corporation, ("NIDEK") for software supplied by NIDEK or its designee pursuant to this Agreement, whether software alone or embedded software in a NIDEK hardware product, whether on disk or in read only memory, or on other media, or through an authorized website or network, and any accompanying documents or materials (including, but not limited to, operation manuals and electronic documents for the software) (collectively, "Software").

Our product may include a third party's software which is linked, whether dynamically or statically, with the Software (the "Third-Party-Software"). The Third-Party-Software shall not be included in the definition of the "Software" in this Agreement. The rights and title of the Third-Party-Software belong to the third party, and the terms of use of the Third-Party-Software are set forth separately from this Agreement. The terms in this Agreement will not apply to the use of the Third-Party-Software except as expressly stipulated herein.

By using or installing the Software, you agree to be bound to the terms and conditions of this Agreement. If you do not agree with this Agreement, please do not use or install the Software and return the Software to the company from which you obtained the Software.

1. GRANT OF LICENSE

- 1.1. Subject to the terms and conditions set forth in this Agreement, NIDEK grants to you, and you accept, a limited, non-transferable and non-exclusive license to use the Software.
- 1.2. Unless otherwise agreed in writing by NIDEK or its designee, the license is limited to using the Software on a single computer or a single NIDEK hardware product.
- 1.3. The Software is only to be used for its intended purpose provided in the specifications, operation manual or related documents in accordance with applicable laws and regulations. If the Software is embedded software in a NIDEK hardware product, you will use such Software only as embedded software for the use of such NIDEK hardware product.
- 1.4. For the license of the Software granted in this Agreement, unless the license is granted by NIDEK or its designee explicitly free of charge, you will pay to NIDEK or its designee the price for the Software, or if the Software is embedded software in a NIDEK hardware product, the price for the NIDEK hardware product in which the Software is embedded.

2. INTELLECTUAL PROPERTY RIGHTS

2.1. NIDEK, or an owner of the Third-Party-Software, retains any and all legal rights, title and interests in and to the Software or the Third-Party-Software. Any and all rights under copyright law, patent law, design law and other intellectual property laws not expressly granted herein are reserved by NIDEK or the owner of the Third-Party-Software. The license granted herein will not be intended as, or construed to be, any assignment of the rights of NIDEK or the owner of the Third-Party-Software. The Software and the Third-Party-Software are protected by copyright and other intellectual property laws and international treaties.

3. LIMITATIONS

- 3.1. You may not use the Software for any products without a license of the Software.
- 3.2. You may not analyze, reverse-engineer, decompile, disassemble or otherwise attempt to discover the source code of the Software.
- 3.3. You may not alter, reproduce, modify, translate, adapt, or divert the Software.
- 3.4. You may not remove, delete or change the copyright notice or other legends of the Software.
- 3.5. You may not sell, distribute, rent, license, sublicense, lease, assign or otherwise transfer the Software to third parties, or operate the Software for the benefit of third parties without prior written consent of NIDEK.
- 3.6. You may not create derivative works or cause or permit others to create derivative works based upon the Software without prior written consent of NIDEK.
- 3.7. You may not disclose operation manuals for the Software to any third party without prior written consent of NIDEK; provided, however, for the avoidance of doubt, the "third party" in this section will not include doctors, examiners, nurses, employees, patients and other persons who need to know the Software.
- 3.8. You may not use NIDEK's trademarks or trade names without prior written consent of NIDEK.

4. EXPORT RESTRICTIONS

4.1. If you export or re-export, directly or indirectly, the Software, you must comply with applicable export laws and regulations of Japan and other countries, and obtain any licenses or approvals required by governmental authorities.

5. UPDATES

- 5.1. The Software and/or the Third-Party-Software may be, at NIDEK's own discretion, changed, updated or modified from time to time without any prior notice to you. If such changes, updates, and modifications are applied to the Software licensed to you under this Agreement, such changes, updates, and modifications will be deemed a constituent part of the Software, and the terms and conditions of this Agreement will apply to such changes, updates, and modifications.
- 5.2. NIDEK may, at its own discretion, make amendments to any provisions of this Agreement ("Amendments"), if NIDEK deems (a) that such Amendments are appropriate in terms of interests for customers of this Software, or (b) that such Amendments are commercially reasonable and not contrary to the objective of this Agreement. Prior to the Amendments, NIDEK will notify you of the terms and the effective date of such Amendments on the website or by any other means.

6. TERMINATION

6.1. This Agreement is effective until terminated. If you breach any term or condition of this Agreement, NIDEK may, without giving any prior notice to you, terminate this

Agreement with immediate effect. Upon termination of this Agreement due to the breach of this Agreement, NIDEK reserves all the rights to claim damages resulting from such breach.

6.2. If this Agreement is terminated for any cause, you must immediately cease the use of the Software, and delete, destroy and erase all the Software. Any fees paid by you for the license of the Software will not be refund for any reasons.

7. NO WARRANTIES

- 7.1. NIDEK MAKES NO REPRESENTATIONS OR WAR-RANTIES OF ANY KIND, EXPRESS OR IMPLIED, CONCERNING THE SOFTWARE AND THE THIRD-PARTY-SOFTWARE, INCLUDING, WITHOUT LIMITA-TION, WARRANTIES OF MERCHANTABILITY, FIT-NESS FOR A PARTICULAR PURPOSE, NON-INFRINGEMENT OF THIRD PARTY RIGHTS, INCLUD-ING, WITHOUT LIMITATION, THIRD PARTY INTEL-LECTUAL PROPERTY RIGHTS, ACCURACY, RELIABILITY OR AVAILABILITY, ABSENCE OF OR RECOVERY FROM ANY INTERRUPTION, ERROR-FREE OPERATION OR CORRECTION OF DEFECTS.
- 8. LIMITATION OF LIABILITY
- 8.1. IN NO EVENT WILL NIDEK BE LIABLE FOR ANY INCI-DENTAL, INDIRECT, SPECIAL, PUNITIVE, OR CON-SEQUENTIAL DAMAGES, LOSS, CLAIMS OR COSTS WHATSOEVER, INCLUDING, WITHOUT LIMITATION, ANY LOST DATA, PROFITS, REVENUES, BUSINESS OPPORTUNITIES OR INFORMATION, LOSS OF USE OF ANY PRODUCT, PROPERTY OR EQUIPMENT, DOWNTIME COST, COST OF PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES, OR ANY CLAIMS BY A THIRD PARTY, ARISING OUT OF OR RELATED TO THE USE OR INABILITY TO USE THE SOFTWWARE AND/OR THE THIRD-PARTY-SOFT-WARE, CHANGES, UPDATES OR MODIFICATIONS OF THE SOFTWARE AND/OR THE THIRD-PARTY-SOFTWARE, OR MAINTENANCE OR REPAIR SER-VICE OF THE SOFTWARE IF ANY. THE ABOVE LIM-ITATIONS WILL APPLY REGARDLESS OF THE FORM OF ACTION, WHETHER IN CONTRACT, TORT, STRICT PRODUCT LIABILITY, OR OTHERWISE, EVEN IF NIDEK IS NOTIFIED OF THE POSSIBILITY OF SUCH DAMAGES, LOSS, CLAIMS OR COSTS.
- 9. GOVERNING LAW AND ARBITRATION
- 9.1. This Agreement will be governed by and construed in accordance with the laws of Japan.
- 9.2. All disputes arising between you and NIDEK relating to this Agreement or the interpretation or performance thereof will be finally settled by binding arbitration in Tokyo in accordance with the Commercial Arbitration Rules of The Japan Commercial Arbitration Association. Judgment upon the award rendered by arbitration will be final and may be entered in any court having jurisdiction thereof.
- 10. SEVERABILITY
- 10.1.If any provision or any portion of any provision of this Agreement will be held to be invalid or unenforceable, that provision will be severed from this Agreement and such invalidity or unenforceability will not affect the remaining provisions of this Agreement. The remaining

provisions of this Agreement will continue in full force and effect.

11. SURVIVAL

11.1.The provisions of 2, 3, 4, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17 and this provision will survive the termination of this Agreement and will be binding after the termination of the Agreement.

12. ASSIGNMENT

- 12.1.This Agreement or any part of this Agreement may not be assigned or transferred without prior written consent of NIDEK. The permitted assignee or transferee must agree to all the terms and conditions of this Agreement prior to the assignment or transfer.
- 12.2.This Agreement will be binding upon the permitted assignee or transferee and be enforceable by NIDEK.

13. ENTIRE AGREEMENT

13.1.This Agreement constitutes the entire agreement between you and NIDEK concerning the Software, and supersedes any prior written or oral agreement between you and NIDEK. No modification of this Agreement will be binding unless otherwise agreed in writing.

14. NO WAIVER

14.1.The failure of NIDEK to enforce at any time or for any period the provisions hereof in accordance with its terms will not be construed to be a waiver of such provisions or of the rights thereafter to enforce each and every provision.

15. NO THIRD PARTY RIGHTS

15.1.This Agreement is intended to be solely for the benefit of you and NIDEK and is not intended to confer any benefits upon or create any rights in favor of any person other than you and NIDEK.

16. HEADINGS

16.1.All headings are for convenience only and will not affect the meaning of any provision of this Agreement.

17. LANGUAGE

17.1.In any countries outside Japan, this Agreement has been executed and delivered in a text using the English language. If translations into languages other than Japanese are attached with the English language, the text using the English language shall be controlling.