

# BLUE • VIOLET LASER

## INSTRUCTION MANUAL

Ver. 1.9

FOR

LASER HEAD	CONTROLLER
KAL - 55 / 50C - A	KLPS-08-A
KBL - 100 / 90C - A	
KBL - S130 / S120C - A	
KCL - 80 / 75C - A	
KDL - 55 / 50C - A	

Please read this instruction manual carefully and thoroughly before installing or operating your laser. Use of controls or adjustments followed by procedures other than specified herein may result in hazardous radiation exposure.

 **KIMMON KOHA CO., LTD.**

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## Introduction

Thank you very much for your purchase of KIMMON KOHA Blue·Violet laser system. This, compact, lightweight and high-performance, system is developed by use of our advanced laser technology freely. For your safety and long-lasting performance of your laser system, please follow instructions contained in this manual before installing or operating your laser system. Your proper operation after understanding the function of laser system is required.

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## 1. Cautions on Safe Use of Laser System

### 1-1 Laser Safety

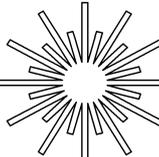
Your laser system is classified as "Class 3B(III B)" or "Class 4(IV)" laser by the Center for Devices and Radiological Health (CDRH) of US Food and Drug Administration (FDA-Spec. 1040) and International Electrotechnical Commission (IEC-Spec. IEC825-1), Class 3B(III B) levels of laser beam are considered to incur an acute hazard to the skin and eyes from direct radiation, Class 4(IV) are considered to incur an acute hazard to the skin and eyes from direct or scattered radiation.

1. Do not look directly into the laser beam by placing the laser system on a safe height.
2. Always use protective glasses (for 370-500nm) when operating your laser.
3. Controls and adjustments for the laser system must be conducted according to the provisions and procedures specified in this instruction manual.
4. Use of controls and adjustments followed by procedures other than specified in this manual may result in hazardous radiation exposure.

### 1-2 IEC/JIS/CDRH Labels

	
<b>Warning Label</b>	<b>Aperture Label</b>
	
<b>Class 3B (KAL Series)</b>	<b>Class 3B (KDL Series)</b>
	
<b>Class 4 (KBL, KCL Series)</b>	
<b>Explanation Label</b>	

**DANGER**



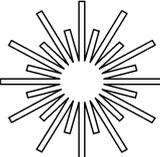
LASER RADIATION-AVOID DIRECT EXPOSURE TO BEAM

---

LASER DIODE, MAX. CW 200mW  
WAVELENGTH: 370-380nm  
CLASS III<sub>b</sub> LASER PRODUCT

**Class 3B (KAL Series)**

**DANGER**



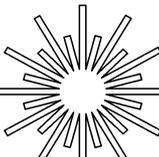
LASER RADIATION-AVOID DIRECT EXPOSURE TO BEAM

---

LASER DIODE, MAX. CW 200mW  
WAVELENGTH: 483-520nm  
CLASS III<sub>b</sub> LASER PRODUCT

**Class 3B (KDL Series)**

**DANGER**



LASER RADIATION-AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION

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LASER DIODE, MAX. CW 3W  
WAVELENGTH: 400-450nm  
CLASS IV LASER PRODUCT

**Class 4 (KBL, KCL Series)**

**Warning LOGOTYPE**

KIMMON KOHA CO., LTD.  
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MANUFACTURE: KIMMON KOHA CO., LTD.  
FUKUSHIMA FACTORY: 21 AZA SUGINOUCHI, KITAYOKOTA,  
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---

MANUFACTURED  
MONTH \_\_\_\_\_ YEAR \_\_\_\_\_

---

MODEL \_\_\_\_\_

---

S/N \_\_\_\_\_

---

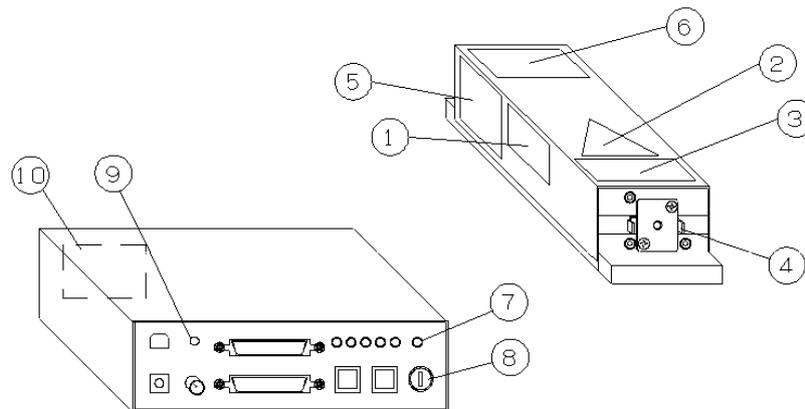
THIS LASER PRODUCT COMPLIES  
WITH 21 CFR 1040 AS APPLICABLE.

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MADE IN JAPAN

**Certification and Identification Label**

Location of Labels and Safety Parts are shown as below.



**Controller**

**Laser Head**

- |   |                               |
|---|-------------------------------|
| 1. Explanation Label                      | 6. Warning LOGOTYPE           |
| 2. Warning Label                          | 7. Indicator                  |
| 3. Aperture Label                         | 8. Key Lock Switch            |
| 4. Shutter                                | 9. Remote Interlock Connector |
| 5. Certification and Identification Label | 10. Explanation Label         |

**Figure 1 Location of Labels and Safety Parts**

**1-3 Abnormal conditions**

If abnormal conditions such as shown below are observed, stop using immediately and turn off power switch and pull out plug from the outlet. After that, please make contact with our company or our agency. If you continuous keep using, there will be fear of the fire.

- When smoke comes out from laser head / power supply, or which outside becomes extremely hot.
- When unusual sound or smells are found.
- When water enter into the body.

## 2. Outline of Laser System

### 2-1 Outline

This system is a blue violet oscillating laser, which consists of laser diode and its control circuit. The system oscillates visible radiation with wavelength of  $375\pm 5\text{nm}$  (KAL series),  $405\pm 5\text{nm}$  (KBL series),  $445\pm 5\text{nm}$  (KCL series) and  $488\pm 5\text{nm}$  (KDL series).

By precisely controlling LD temperature, the system controls change in wavelength and power. By the way, the system has two types of driving method: Auto Current Control (ACC) and Auto Power Control (APC), which controls by using optical feedback. Thus, you can select either one depending on usage.

As an optional system, you can control laser power from outside by using the PC (personal computer) control software of "Laser Control Program" or by the remote control box.

Note: You can select only ACC depending on the system type.

### 2-2 Basic Block Diagram

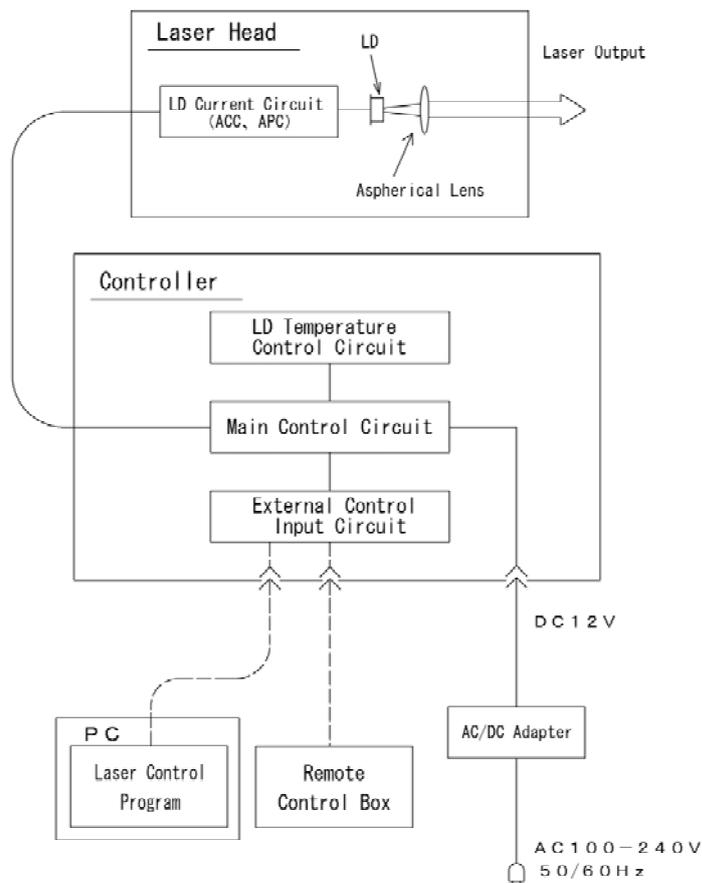


Figure 2 Basic Block Diagram of Laser System

### 2-3 Basic Principle

The word origin of “LASER” comes from Light Amplification by Stimulated Emission of Radiation. LASER is an acronym for these words. And, laser system is the system to amplify and oscillate light by means of using stimulated emission. This Laser System uses laser diode that oscillates blue violet. In general, laser diode has such structure as shown in Figure 3. p-n joint layer is sandwiched between p-type semiconductor and n-type semiconductor. Laser beam will emit when a condition for inverted population is meet satisfactory by passing an electrical current between p-type semiconductor and n-type semiconductor.

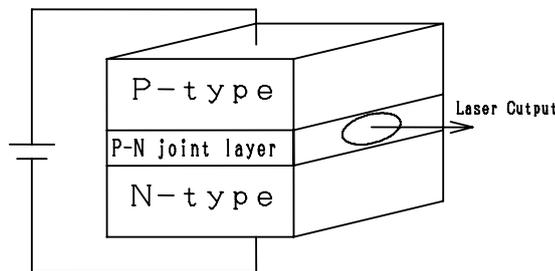


Figure 3 Basic structure of laser

Laser diode control, on the two-way circuit line, combines constant current control (ACC), which maintains electric current to be inserted into laser diode a fixed level, and laser feedback control which feedbacks intensity of laser beam and controls electric current to make beam power a fixed level (APC). You can select either one of these control types for your purpose of use.

Moreover, laser diode has a nature that wavelength of oscillation will be changed due to ambient temperature. To rein back this problem, temperature of laser diode case is controlled at a fixed level by using politer devices.

### 2-4 Specifications

#### 2-4-1 Combination of Laser Head and Controller

Table 1 Combination of Laser Head and Controller

Laser Head	Controller
KAL-55-A / KAL-50C-A	KLPS-08-A
KBL-100-A / KBL-90C-A	
KBL-S130-A / KBL-S120C-A	
KCL-40-A / KCL-35C-A	
KDL-55-A / KDL-50C-A	

## 2-4-2 Specifications of Laser Head

Table 2 : Specifications#1 of Laser Head

ITEM	KAL- 55-A	KAL- 50C-A	KBL- 100-A	KBL- 90C-A	KBL- S130-A	KBL- S120C-A	KCL- 80-A	KCL- 75C-A	KDL- 55-A	KDL- 50C-A	Remarks
1. WAVELENGTH (nm)	375 ± 5		405 ± 5				445 ± 5		488 ± 5		
2. LONGITUDINAL MODE STRUCTURE	Multiple										
3. RATED POWER (mW)	55	50	100	90	130	120	80	75	55	50	
4. BEAM DIAMETER(1/e <sup>2</sup> ) (mm)	<1.5* 3.5	< φ 2.5	<1.5* 3.5	< φ 1.5	<1.5* 3.5	< φ 1.5	<1.5* 3.5	< φ 1.5	<1.5* 3.5	< φ 1.5	1)
5. BEAM DIVERGENCE (mrad)	<1.2	<0.8	<1.2	<0.8	<1.2	<0.8	<1.2	<0.8	<1.2	<0.8	2)
6. POLARIZATION	Linear										
7. POLARIZATION RATIO	> 1 : 100										
8. NOIZE (RMS)	≤ ± 0.5%										
9. POWER STABILITY	≤ ± 2% / 8hr										3)
10. BEAM POINT STABILITY (μ rad)	< 20										3)
11. CLASSIFICATION	Class 3B		Class 4						Class 3B		

1) The beam diameter at the distance of 100 mm from aperture.

2) Based on our measurement method

3) At constant ambient temperature of 25 °C

Table 4 : Common Specifications of Laser Head

ITEM	K*L-**-A	KBL-S130-A	K*L-**C-A, KBL-S120C-A	Remarks
12. BEAM SHAPE	Elliptical		Circular	
13. DIMENSION (mm)	62*135*46		62*175*46	
14. MASS (g)	430		550	

### 2-4-3 Specifications of Controller

Table 5 : Specifications of Controller

ITEM	K L P S - 0 8 - A	Remarks
1.Input voltage	DC12 (V)	
2.Input current	3.0(A) and below	
3.Power consumption	36(W) and below	
4.Outside dimension	175*50*110mm	Not include projections
5.Mass	550g	

### 2-4-4 Specifications of AC/DC Converter

Table 6 : Specifications of AC/DC Adapter

1.Input voltage	AC100-240 (V)
2.Input frequency	50 / 60 (Hz)
3.Power voltage	DC12 (V)
4.Power current	3.8(A) and below
5.Outside dimension	95.9*50*28.5mm
5.Mass	200g

2-4-5 Specifications of PC software 『Laser Control Program』

Table 7 : Specifications of PC software 『Laser Control Program』

1. OS	Microsoft® Windows® 2000/XP/Vista/7/8	1)
2. Disk free space	10MB and below	
3. Display	800*600 pixel and more 256 colors and more	
4. Interface	USB (B type)	

1) Microsoft® Windows® is trademark and registration trademark of US Microsoft Corporation.

2-4-6 Specifications of Remote Control Box

Table 8 : Specifications of Remote Control Box

1. Outside dimension	70*110*50mm
2. Mass	400g
3. Cable length	900±50mm

2-4-7 Environmental Conditions

Table 10 : Environmental Conditions of Laser System

1. TEMPERATURE · HUMIDITY	In Operation: 10~35 (°C) 0~90 (%)	No condensation
	In non- Operation: -10~50 (°C) 0~90 (%)	
2. IMPACT RESISTANCE	During transport: 20(G) or below	Based on our packing
3. PLACE	Indoor use Altitude up to 2000m	

## 2-5 Dimensions

### 2-5-1 Laser Head

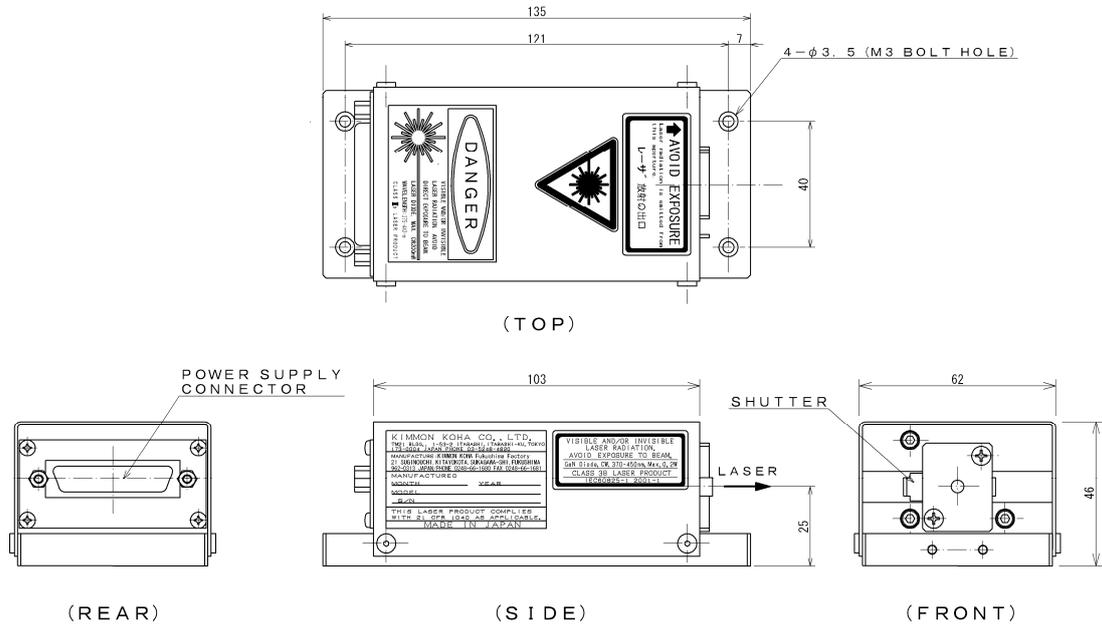


Figure 4 Laser Head(K\*L-\*\*-A Series except KBL-S130-A)

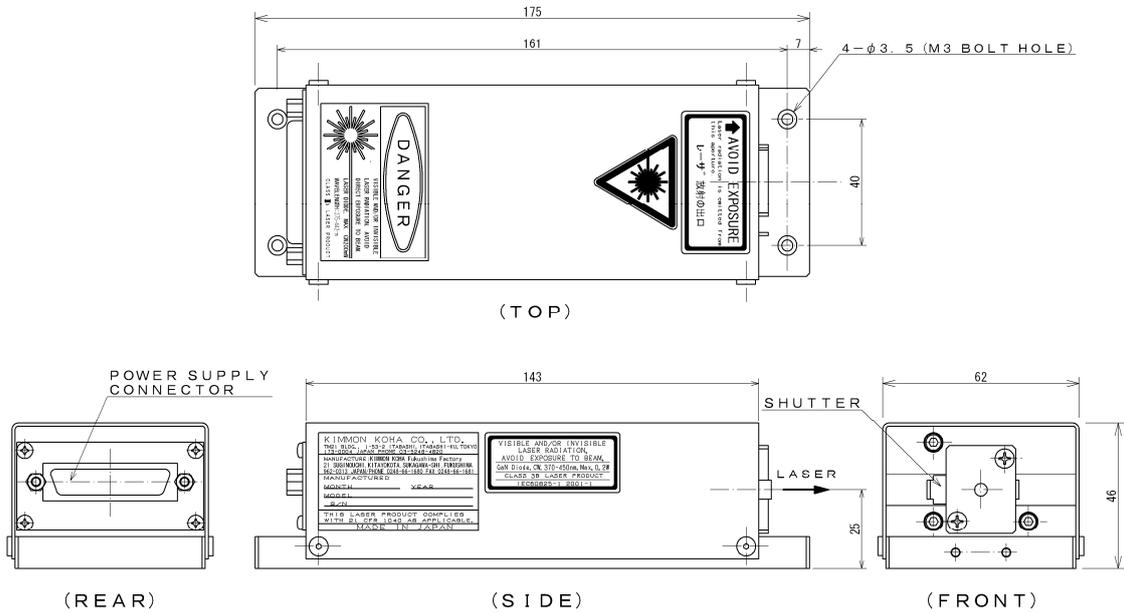
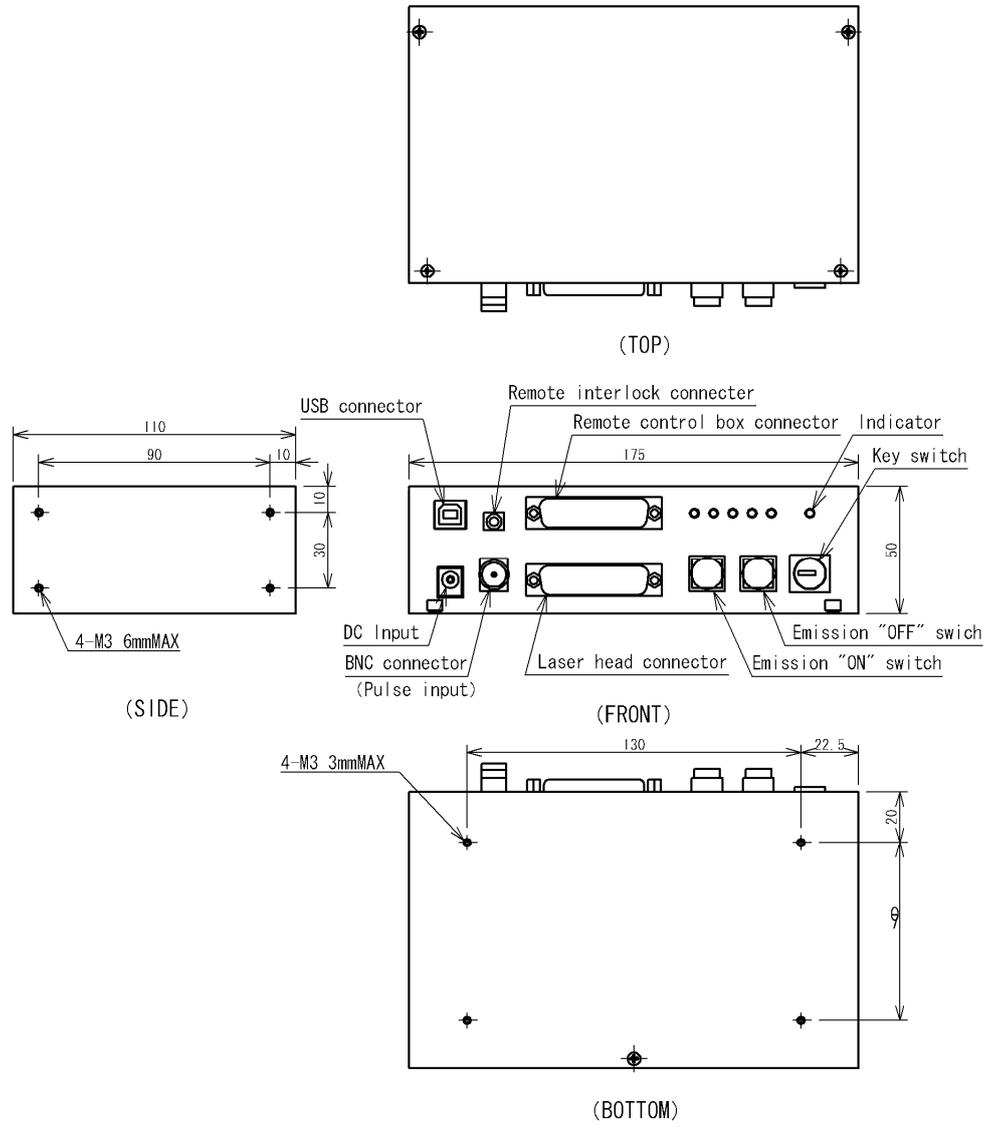


Figure 5 Laser Head(K\*L-\*\*-C-A Series / KBL-S130-A)

## 2-5-2 Controller



**Figure 6 Controller**

2-5-3 Remote control box

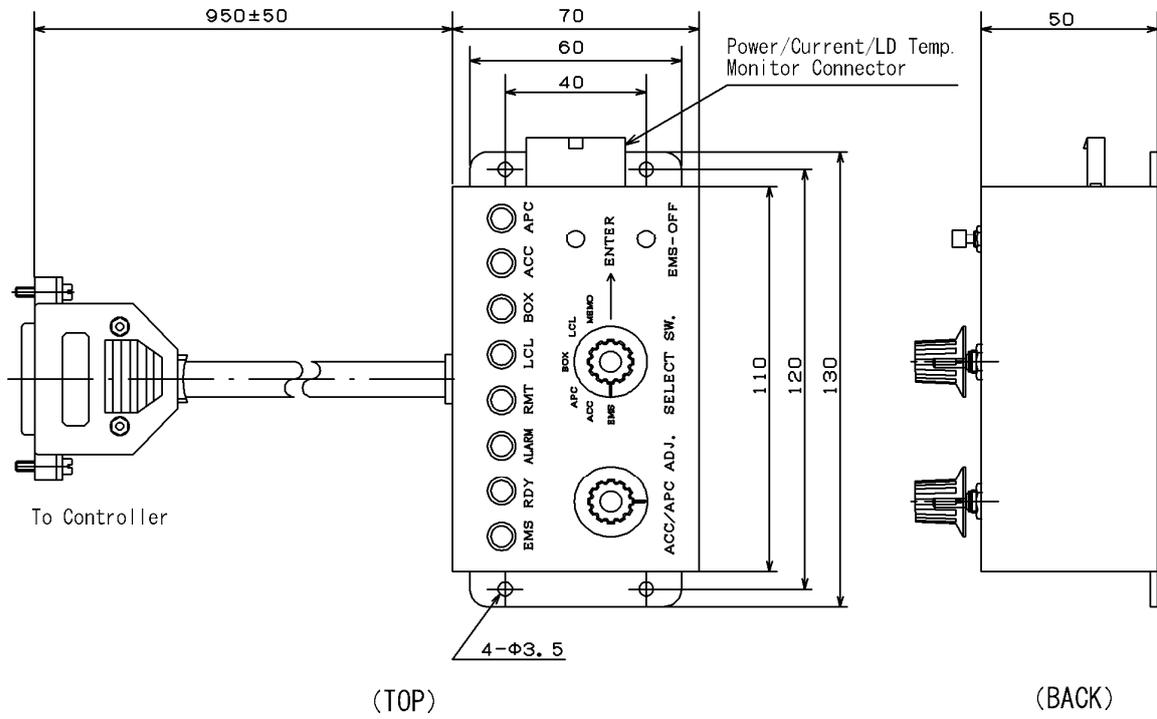


Figure 6 Remote control box

## 2-6 Inspection Requirements on Delivery

Laser head and power supply are packed carefully to stand shocks during transportation. Upon receipt of the delivery, check the quantity of units and parts on the packing list and inspect if there is any damage on them. Should you find any discrepancy or damage, please contact us. Where to contact us is provided at the end of this instruction manual.

### 2-6-1 Packing Contents

#### < Basic constitution >

- (1) Laser Head -----1 set
  
- (2) Controller (Power Supply) -----1 set
  - Attachment - Key ----- 1 pair
  - AC adapter (with AC cable) ----- 1 set
  - D-sub connector cable ----- 1 set
  - Remote interlock connector ----- 1 set
  - Instruction manual ----- 1 set
  - Test data ----- 1 set

#### < Optional constitution >

- (3) Laser Control Program -----1 set
  - Contents - Software(CD-ROM)----- 1 set
  - USB Cable (1m in length with earth terminal) ----- 1 set
  - Install manual ----- 1 set
  
- (4) Controller (Power Supply) -----1 set
  - Attachment - Power/Current/LD temp.  
monitor connector ----- 1 set

### 3. Cautions on Use of Laser System

The laser system is precision equipment. Please handle it carefully.

#### 3-1 During Traveling

Avoid shock or vibration from the laser system during transportation or moving.

#### 3-2 During Installation

Place the system at level platform. Do not install it where it is hot, humid or dusty. Avoid placing any thing near its inlet or outlet. Direct flow of cool or warm air may result in change of system's feature.

When the laser head is fixed by using a hole for fixing, any irregular on fixing surface may cause for deforming to laser base. Hence, it may result in insufficient laser power.

#### 3-3 During Operation

If you use the optical devices, mirror or prism etc..., make the laser reflection light not enter into the laser head aperture. If it enters, the noise level of laser may increase and the laser power stability may deteriorate.

#### 3-4 During Storage

When conserve the laser system, avoid hot or humid place, and cover it by dust sheet.

#### 3-5 Others

Removing of protective housing may result in electric shock, or hazardous radiation exposure.

## 4. Operating Instruction

### 4-1 Setting up

#### 4-1-1 Installation of Laser Head

After completing the inspection upon receipt of your laser system (2-6 herein), install the laser head on a stable place in such a way that the laser beam is not at your eyes level, while confirming the laser beam is at safe direction.

#### 4-1-2 Connection of Laser Head with Controller

Connect a connector on the rear side of the laser head with a connector on the front side of the controller (underside of the front panel) using a D-sub connector cable. Tighten completely both sides of screws after connection. Connect the Remote Interlock Connector with “Inter Lock” part located on the left and upper side of the front panel of the controller (refer to Figure 8).

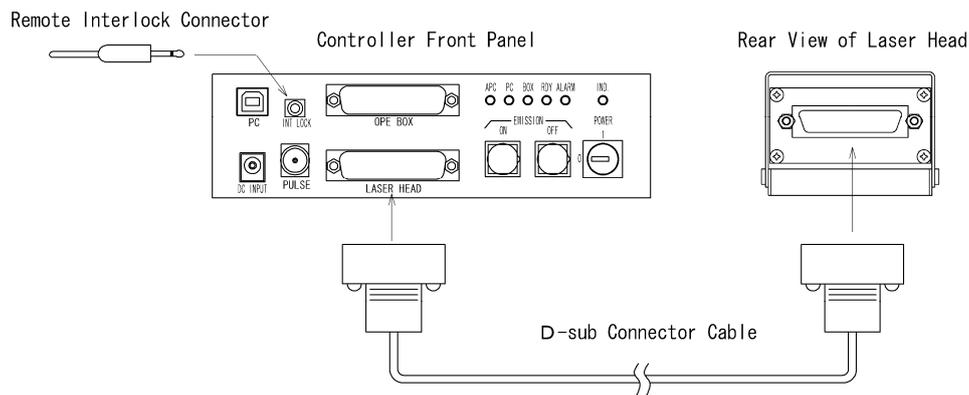


Figure 8 Connection of Laser Head and Controller

For safety reasons, Laser systems are obliged to install the remote interlock connector in case of Class 3B and 4 lasers. If the remote interlock connector is not connected with the laser, the alarm LED lights up and laser does not emit. Disconnecting the end cable of the remote interlock connector, then connecting it to a switch of other system or door switch, you can conduct a remote ON/OFF operations. (distance of extension is up to 10 meters, and use devices like relay or switch which connect outside must be suitable for low load level.)

#### 4-1-3 Connection of AC/DC adapter

After confirming that a key switch of controller is set at “OFF”, insert the power side plug of AC/DC adapter into the DC input jack that is located at the lower left part of front panel of the controller. Power cable must be connected with power source capacity of AC 100~240V, 50 Hz or 60 Hz and over 200W.

#### 4-1-4 Connection of Outside Control System (Option Setup)

##### (1) Laser Control Program

“Laser Control Program” is a software for controlling the laser. Connecting the software mounted PC with the Controller, you can monitor and control the laser power and the driving current of LD (LD current) on the PC display.

Insert a USB cable attached to this software into the USB connector of the Controller (insert one end of the USB cable into the “PC” insertion slot located at the upper left part of the front panel of the controller and insert another end of the USB cable into the USB connector of the PC(Refer to Figure 9)).

Note: In case of KBL5 series, you can monitor and control the LD current only.

##### (2) Remote Control Box

By connecting the Remote control box with the controller, you can monitor and control the laser power and the LD current by remote control. Note: Connect the D-sub connector cable of the remote control box with the connector of the controller (“OPE BOX” part located at the upper central place on the front panel). (Refer to Figure 9). Tighten completely both sides of screws of the connector after connection.

Note: In the case of KBL5 series, you can monitor and control the LD current only.

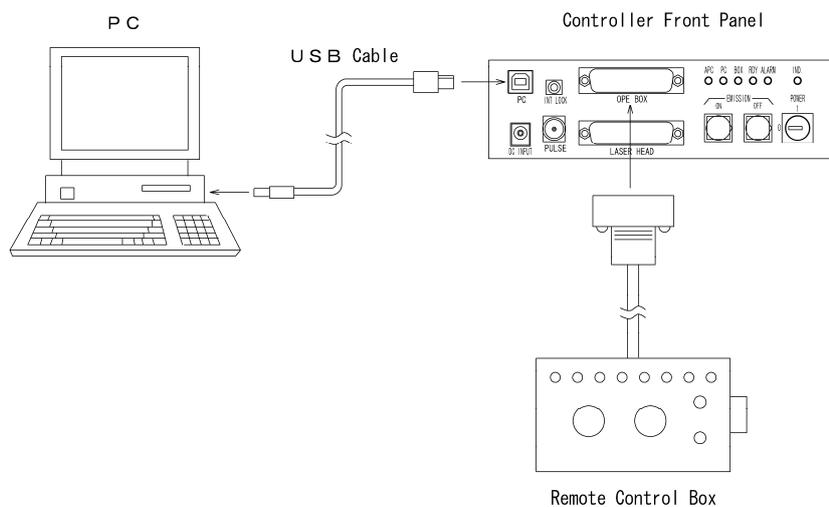


Figure 9 Connection of the Outside Control System

#### 4-2 Warnings and Cautions before Operation

#### 4-2-1 Cautions against laser beam exposure

Laser beam of this laser system oscillates is visible light with wavelength of 370-500nm. Do not look directly or indirectly into the laser beam. When operating the laser system, always wear protective glasses which stand up at 370-500nm wavelength of laser beam while confirming the direction of laser beam.

#### 4-2-2 Opening and closing of shutter

Before turn the key lock switch of the controller "ON," confirm that the shutter of the laser head is closed. Thereafter, conduct operation, and open the shutter while confirming the radiation of laser beam is at safe direction.

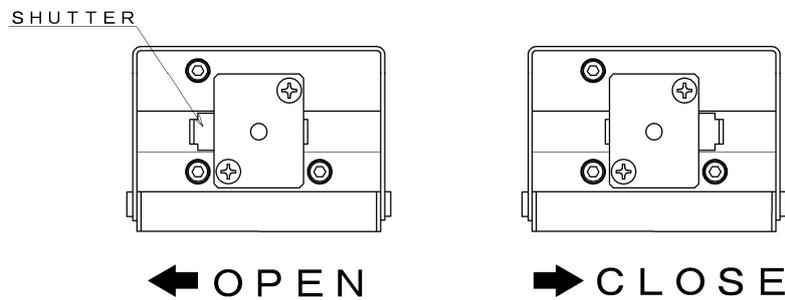


Figure 10 Opening and Closing of Shutter

#### 4-2-3 Protection Circuit

To protect the laser system from abnormal conditions, the system detects following situation as (1)~(4). When they are abnormal, electrical current input to laser diode and temperature control of laser diode will stop. Then, abnormal data will be displayed by PC program and alarm LED on the controller panel lights and output them outside as an alarm.

After abnormal conditions are detected, the protection circuit keeps its status even after abnormal conditions are resolved. To reset the protection circuit, turn OFF the key lock switch, then turn ON the switch once again.

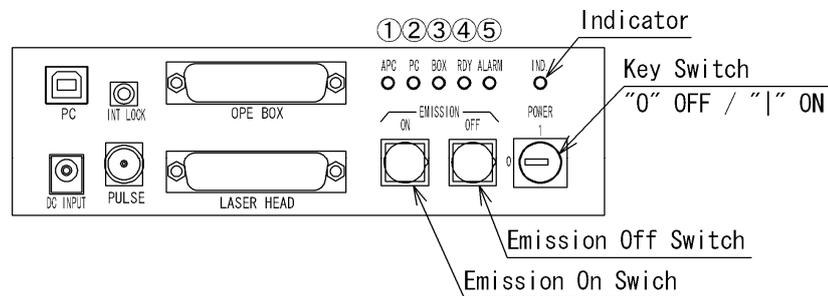
- (1)LD Abnormal Temperature: In the case that the difference between LD temperature and set temperature ( generally 25°C) is over 10 degree for more than 1 minute.
- (2)Condensation : In the event that the condensation is detected on the radiation case of the laser diode .
- (3)Indicator accident : In the event that controller's indicator breaks down.
- (4)Remote interlock :When remote interlock is opened.

### 4-3 Operation 1 (Single-handed Control of the Controller)

#### 4-3-1 Confirmation before operation

Single-handed control of the controller is the operation method that only laser head connect to the controller. If optional remote control box is connected to controller, the active control source become remote control box. So please confirm remote control box does not connect, if you have it.

And the laser power of single-handed control is different if you have optional remote control box or PC software. If you have optional tool, the laser power is same level and APC/ACC mode when you set by optional tool last time. And if you have no optional tool, the laser power is rated level.



- ① APC LED
- ② PC LED
- ③ BOX LED
- ④ Ready for Emission (RDY) LED
- ⑤ Alarm LED

Figure 11 Panel for the Controller Operation

In the Table below, the content of various indication LEDs as stated in the Figure 11 is summarized.

Table 10: Indication LEDs

Indication LEDs	Content of Indication	Remarks
① APC LED	Lighting-up: APC Control Not lighting-up: ACC Control	
② PC LED	Lighting-up: PC Control Active	1)
③ BOX LED	Lighting-up: Remote Control Box Active	
④ Ready for Emission (RDY) LED	Blink on and off: Standby status Lighting-up: RDY and Oscillating status	
⑤ Alarm LED	Lighting-up: Occurrence of Alarm Blink on and off: Over power or limit current	Refer 4-4-5

1) While PC LED is lighting-up, you can not use the emission ON switch and emission OFF switch on the operating panel of the controller.

#### 4-3-3 Operation Procedure

##### (1) Beginning of operation

Set the key switch of the controller at "ON". Warning LED will light up. The standby time is required for several tens of seconds after turning on the power supply switch and the Ready for Emission LED (RDY LED) blinks on and off, and controls LD temperature. Then, if the temperature of the LD is within the normal range, RDY LED will light up. If you press the emission switch while the RDY light is illuminating, electric current will be flowed into the LD and the laser will emit. Meanwhile, it is required a couple of minutes for obtaining a stable laser beam power after the operation is started (Note: necessary time varies depending on the environment).

##### (2) Shutdown

By pressing the emission Off switch (refer to Figure 11), the emission of the laser will stop on a temporarily basis (Note: in spite of stoppage of laser emission, temperature control of LD is being conducted continuously (RDY light is illuminating), thus by pressing the emission ON switch, the laser beam will oscillate again).

If you want to stop the operation completely, turn the key switch "OFF".

##### (3) After Operation

After operation, close the optical shutter of the laser head and disconnect the power cable of AC/DC adapter from the input power.

## 4-4 Operation 2 (PC Control)

### 4-4-1 Preparation before Remote Control

In order to control the laser with PC, you must install the control software on your PC. Install the control software of “Laser Control Program” in accordance with the attached installation manual. As explained at sub-section 4 - 1 - 3, confirm that PC is connected with the controller by means of USB cable (Connection of PC can be implemented after oscillation of the laser).

### 4-4-2 Explanation of Program Screen

This program consists of one control screen (refer to Figure 12).  
In Table 8, we describe the explanation of the display of ①~⑮.

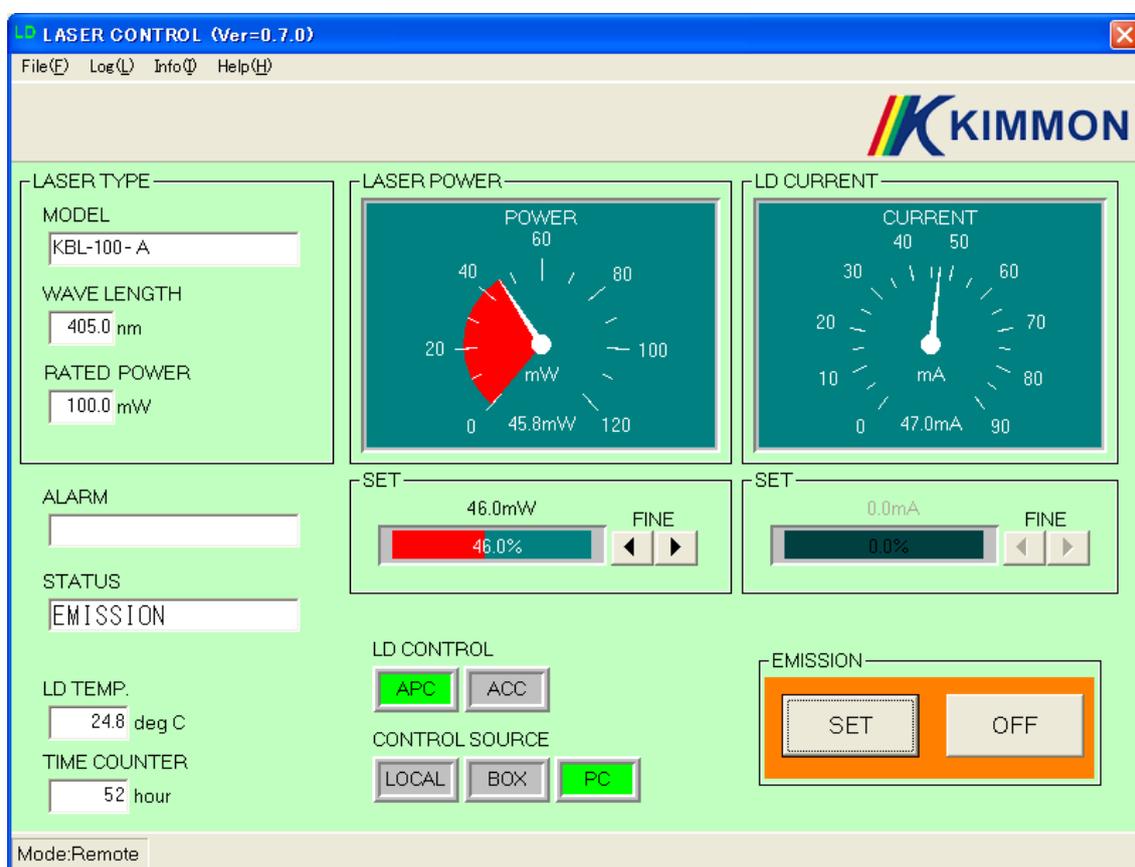


Figure 12 Program Screen

Table 11: Explanation of Program Screen

No.	Item	Detailed Particulars	Remarks
①	Laser Head Type		
②	Wavelength		
③	Rated Output		
④	Alarm Message	Display messages when detecting alarm. (refer to sub-section of 4-4-5).	
⑤	Status	Display status of the system	
		Content of display	Status
		OFF	Controller's key switch is "OFF".
		WARM UP	LD temperature is under control.
		READY	Ready for Emission status.
		EMISSION	Laser emission status
	ALARM	When detecting alarming messages.	
⑥	LD Temperature	Display current LD temperature	
⑦	Time Counter	Display cumulative time of emission.	
⑧	Laser Output (measured value)	Display laser output at present. Red part of the meter is a setup value, white needle and the figure displayed below is measured value.	1)
⑨	Laser Output (setup value)	Setup laser output (% display and mW display).	1)
⑩	LD current (measured value)	Display current LD electric current. Red part of the meter is a setup value, white needle and the figure displayed below is measured value.	
⑪	LD current (setup value)	Setup LD current (% display and mA display).	
⑫	Selection Switch of LD Control Method	Display current effective control method by green color. You can change LD control method (APC/ACC) during the emission OFF status. Note: You can not change LD control method during the emission ON status.	2)
⑬	Selection Switch of Control Source	Display current effective control source by green color. You can change the control source during the emission OFF status (refer to sub-section 4-4-4). Note: You can not change the control source during the emission ON status.	2)
⑭	Emission ON switch	If you press this switch when the status is "READY", laser oscillate at the current setup. In case of changing the laser output at item ⑨ or ⑩, such change becomes active by pressing this switch.	
⑮	Emission OFF switch	If you press this switch when status is emission ON, the emission will stop. Note: Even if emission OFF status, the LD temperature control is being conducted continuously.	

1) You can not use these items in the case of KBL-S\*\*-A.

2) These switches can not change while laser radiation is emitted.

#### 4-4-3 Operation Procedure

##### (1) Activation of the program and power source ON

Start up the “Laser Control Program” by means of “Start – Program – KIMMON – LD\_PROG” on the Windows® screen. By activating the program, a control screen of Figure 12 will boot up. After activation of the program, if you turn “ON” a key switch of the laser controller or the key switch is already “ON” status, the program, confirming the laser, display the laser head information such as type, wavelength, rated output, on “LASER TYPE” column at upper left part of the screen (if the information is not displayed on the screen, confirm the connection once again since there is a possibility that USB cable is not connected correctly).

After turning the power source ON, the program displays “ WARM UP” for several tens of seconds at status display part of (⑤), which indicates the standby time for controlling the LD temperature.

Note: Windows® is a trademark or registered trademark of Microsoft Corporation in the United States.

##### (2) Activation of PC control

Click the “PC” switch of laser control source(⑬) to enable PC control. In the case that “PC” switch is not lighted, PC control is not active but only power and LD current monitoring is active.

Note: If you select active control source “PC”, the Emission ON and OFF switch of controller panel will not work. So please switch laser emission ON/OFF by PC program.

##### (3) Setup of LD control method (APC/ACC)

By means of LD control selection switch (⑫), select either APC or ACC.

Note: In the case of KBL5 series, you can control ACC only.

##### (4) Setup of Laser Output, and LD current

If you select the “APC” in the (3) above, you can set up appropriate laser power by setup part at the item ⑨. Click a slide bar with a % showing by the mouse and move it, you can adjust the output in the range of 0 ~100 %. The fine-tune can be conducted by “ FINE button” on the right hand side.

If you select the “ACC” in the (3) above, you can set up appropriate LD current by setup part at the item ⑩. How to set up is as same as it in APC.

#### (5) Emission

Press the emission ON switch (⑭) after confirming that the status display (⑤) has moved from “WARM UP” to “READY”. Laser will oscillate at the set up level and the status display will change from “READY” to “EMISSION”.

#### (6) Emission OFF

Pressing the emission OFF switch (⑮), the emission of laser will stop and the status display (⑤) will change from “EMISSION” to “READY” (even if emission OFF status, LD temperature is still being controlled, so laser beam will oscillate once again by pressing the emission ON switch).

In order to stop the operation completely, turn the key switch “OFF”.

#### 4-4-4 Changeover of the control source

In the case of using the system under PC control, you can select the laser output control method out of 1) Laser Head - Controller Single-Handed, 2) Remote Control Box, and PC. Since you can not change it during laser emission, so you must change it after stopping emission by pressing the emission OFF switch (⑮).

Table 12: Laser Control-source

Switch Display	Active Control-source	Remarks
LOCAL	Controller (Rated Output)	In the case of LOCAL selection, “PC” switch part illuminates in green and you can change the control method (APC/ACC).
BOX	Remote Control Box	Limited in the case of connecting Remote Control Box.
PC	PC	

#### 4-4-5 Alarm Action

When abnormality occurs in the system, it displays the content of abnormality in the alarm message column (④) in English. Table below describes the content of alarm, character of display, status of alarm LED, and action of protection circuit. To come back from the laser emission OFF status, turn the key switch “OFF”, then turn the key switch “ON” again.

Table 13: List of Alarm

Content of Alarm	Character of Screen display	Alarm LED of Controller	Action of Protection Circuit	Remarks
1. LD temperature is abnormal	LD TEMP. ERROR	Illuminating	Emission stops	
2. LD dew condensation	DEW CONDENSATION	Illuminating	Emission stops	
3. Indicator is not lighting up	INDICATOR FAULT	Illuminating	Emission stops	
4. Remote Interlock is open	INTERLOCK OPEN	Illuminating	Emission stops	
5. Limit current	LIMIT CURRENT (Blinks on and off for 10 seconds)	Blinks on and off (for 10 seconds)	Output is Self-adjusting	1)
6. Higher power, Laser reflection	HIGHER POWER (Blinks on and off)	Blinks on and off		2)
7. LD accident, Out of control	LASER ERROR	Illuminating	Emission stops	

1) Refer to sub-section of 4-4-7.

2) Refer to sub-section of 4-4-8.

#### 4-4-6 De-installation and reconnection of USB cable

If you de-install a USB cable while the system emits laser light, the laser is continuously emitted and keep the laser power as before de-install the USB cable. On the PC screen, such a display as type of laser head, current value and others disappear. However, if you reconnect USB cable again, the display of screen will turn back and you may control the system as before. By utilizing this function more positively, if you want to use the laser at certain power level continuously, you can use a laser head and controller single-handedly. If you have plural laser systems, you may control these lasers with one PC by connecting a USB cable one after the other (refer to Figure 13).

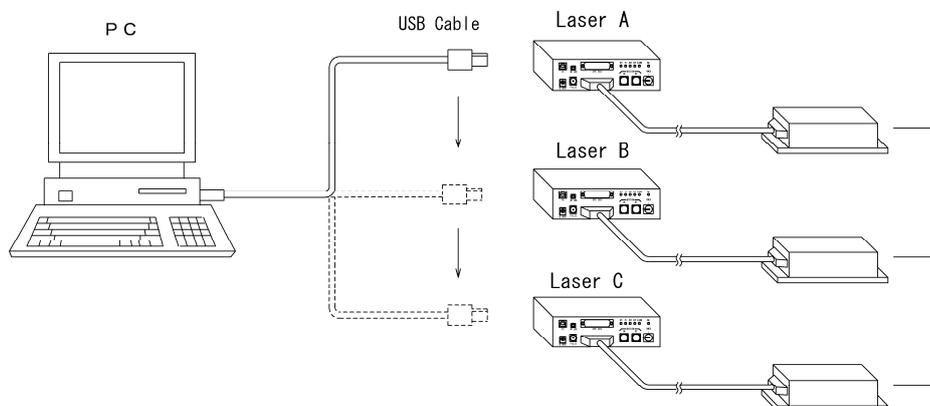


Figure 13 Control of Plural Lasers

#### 4-4-7 Limit current alarm

In general, LD has characteristics of deteriorating depending on length of usage. If LD deteriorates, optical output becomes lower compared with one before deterioration.

If LD deteriorates, the system will increase the current to keep the laser power when LD is under APC control. If the current achieve the some level, about 108% of start current level, the system alert by LED blinking for ten seconds and display "LIMIT CURRENT" on the alarm column of the PC screen.

In addition, in order to indicate the deterioration of LD, the color of the measured value of the current changes in red. If output of laser light becomes insufficient depending on usage of specification, replace the LD by contacting us.

#### 4-4-8 Higher power, Laser reflection alarm

When a higher power, more than about 108% of rated power, is detected by power monitor in LD, the system alert by LED blinking for ten seconds and display "HIGHER POWER" on the alarm column of the PC screen.

Usually the laser power dose not become over the rated power, but if the reflection of laser light by optical tool as mirror enter into the laser head aperture, power monitor detected it as laser power and system alert as higher power alarm. Then, please shut down the laser emission, and restart laser after laser reflection does not enter into the aperture.

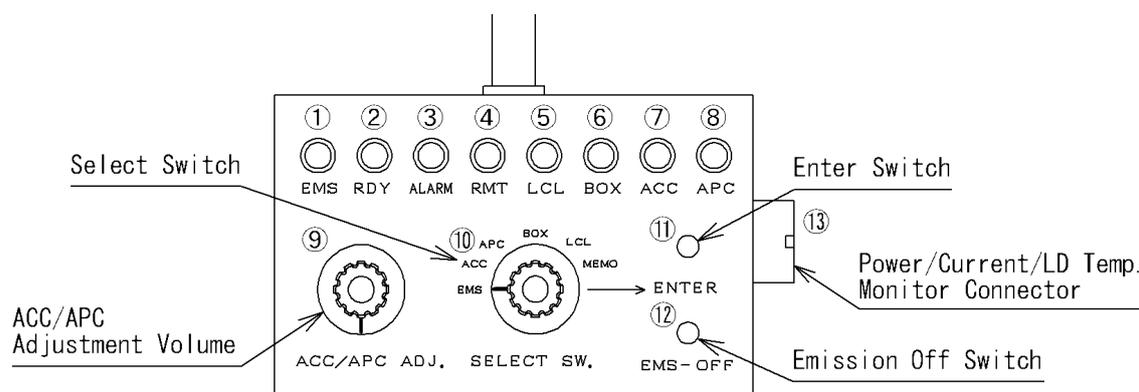
## 4-5 Operation 3 (Remote Control Box)

### 4-5-1 Preparation before Operation

As explained at sub-section 4-1-3, confirm that the remote control box and the controller are connected with a USB cable.

Note: Connecting and removal of the Remote Control Box during laser operation have the possibility to cause faulty operation of the device.

### 4-5-2 Explanation of Remote Control Box (Panel)



- |                |             |
|----------------|-------------|
| ① Emission LED | ⑤ Local LED |
| ② Ready LED    | ⑥ BOX LED   |
| ③ Alarm LED    | ⑦ ACC LED   |
| ④ Remote LED   | ⑧ APC LED   |

Figure 14 Remote Control Box (panel)

Content of each indication LED is summarized as below.

Indication LED	Content of Indication (light up time)	Remarks
① Emission LED	Laser emission	
② Ready LED	Ready for emission and emission status	
③ Alarm LED	Occurrence of Alarm	
④ Remote LED	Remote control (PC, Remote Control Box) is feasible.	
⑤ Local LED	Single-handed control of the Controller	
⑥ BOX LED	Remote Control Box is active.	
⑦ ACC LED	ACC control is active.	
⑧ APC LED	APC control is active.	

#### 4-5-3 Operation Procedure

##### (1) Activation of Remote Control Box

After connecting the remote control box, power-on the laser by turning a key switch "ON" of the controller. Setting the Select switch of the remote control box at "BOX" and press the decision switch (ENTER) . Control of the remote control box will become active, then the box LED of ⑥ will light up.

##### (2) Selection of LD Control Method (APC/ACC)

After setting the Select switch at "APC" or "ACC" and press the decision switch.

APC LED or ACC LED will light up.

##### (3) Emission

Some tens of seconds after turning the power source on is set for the standby time. During the time, the Ready LED blinks on and off, and the system controls LD temperature. If the LD temperature stays in the normal range, the Ready LED will change to lighting up. Set the Select switch at "EMS" while the Ready LED is lighting-up and then press the Enter switch. Laser will oscillate and the Emission LED on the panel will light up.

##### (4) Adjustment of Laser Power and LD Current

You can adjust (increase and decrease) the Laser Power in the case of selecting APC and you can adjust the LD current in the case of selecting ACC at (2) in the above respectively. Set the Select switch at "MEMO" and conduct the following procedure.

Increase : Turn the laser ACC/APC adjustment volume clockwise and then press the Enter switch.

Decrease : Turn the laser ACC/APC adjustment volume counterclockwise and then press the Enter switch.

##### (5) Emission OFF

If you press the Emission off switch (EMS-OFF), laser oscillation will stop (Note : Even in this time, the LD temperature control is being conducted (RDY LED is lighting up) and and the system is in the status of oscillating laser once again) . If you want to stop the operation completely and turn the key switch "OFF".

#### 4-5-4 Changeover of Control-source

You can change the system to a single-handed control of the controller from the remote control box. In the status of the remote control box control, setting the Select switch at “LCL”, then pressing the Enter switch. The Local LED ⑤ will light up and the system will change to the rated control of the single-handed controller. If you want to change it into the remote control box control once again, set the Select switch at “BOX”, then press the Enter switch.

#### 4-5-5 Monitoring of Power, Current and LD temperature

Connect the attached monitoring connector (male) with the connector (female) located at the side surface of the remote control box. Strip the coating of electric cable so that you can measure the current any time.

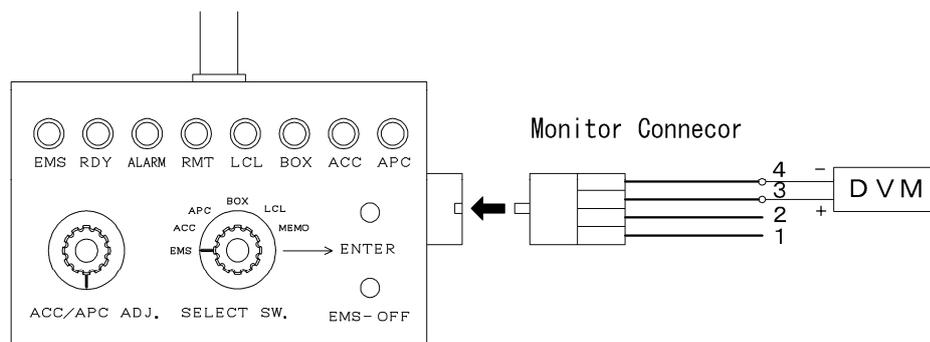


Figure 15 Monitoring of Power, Current and LD temperature

Content of the connector signal are as summarized below. Setting the No.4 pin as the reference voltage, measure the voltage of No. 1~3 pin with your digital volt meter (DVM) and others. Since DVM changes actual data of each voltage internally into the signal of 0 ~ 5.5 V (or 5.0 V), you must seek each value of signal by referencing the following table and figures as provided in the list of result.

Pin No.	Signal	Content	Remarks
1	Laser Power	0 – 5.5 V (Corresponding power is provided in the list of result)	1), 2)
2	LD Current	0 – 5.5 V (Corresponding power is provided in the list of result)	
3	LD Temperature	0 – 5.0 V (Correspond to 0 ~ 50°C)	
4	COM (GND)	Reference Voltage	

- 1) You can not measure it in the KBL-S\*\*-A.
- 2) Relation between monitoring voltage and laser power is not directly proportional due to characteristics of the photo-detector. The value of power indicated in the case of the PC control shows the corrected value of the monitoring voltage.

## 4-6 Pulsed Emission

### 4-6-1 Outline

This system enables the pulsed emission of laser by inputting the pulsed signal from the outside system such as a pulse oscillator.

### 4-6-2 Specification

Frequency : < 1KHz (Duty ratio < 50%)

Input Signal: TTL digital signal (0 – 5 V)

Input Signal (V)	Laser Emission
0 ~ 0.8	OFF
2 ~ 5	ON

### 4-6-3 Connection of Pulse Oscillator

By means of a BNC cable, connect the power of your pulse oscillator with BNC connector on the manipulation panel part (“PULSE” at left below of the front panel) of the controller.

### 4-6-4 Operation

Since Pulse emission becomes active only in the case of ACC control, change over the LD control method to ACC control (Note: Even if you input signals in APC control, pulsed Emission is not available). Then, oscillate the laser at your desired power (current value). Inputting pulsed signals in this situation, the laser powers the pulsed emission.

## 5. Trouble shooting

### 5-1 Laser Beam does not Emit

(1) Turn on key switch, but indicator does not be illuminating.

Status	Check Points	Actions
1. Key switch is ON. 2. No indicator is illuminating.		
3. Turn key lock switch OFF.		
4. Is input voltage for outlet appropriately supplied?	1) Check if power voltage is within specifications. Check by tester. 2) Check if power supply cable is appropriately connected to the outlet.	1) Use the outlet with specified power voltage. 2) Connect the power cable appropriately.
5. Contact us if status corresponds to none of the above		

(2) Indicator is illuminating, and alarm LED is illuminating, too.

Status	Check Points	Actions
1. Key switch is ON. 2. Indicator is illuminating. 3. alarm LED is illuminating.		
4. Turn key switch OFF.		
5. Check if the connection cable on the laser head is connected appropriately.	Check if it is connected to the connector of both of controller and laser head sides.	If it is disconnected, connect them appropriately.
6. Is remote connector connected?	Check if the remote connector is connected to the connector located on a upper side of the front panel of controller.	No connection is found, connect them.
7. Check if ambient temperature and humidity is within specifications.	Are they within specifications? Check using by temperature gauge and humidity gauge. Temperature: 10-35 °C Humidity: 0-90%	Use the laser system within specifications.
8. Contact us if status corresponds to none of the above.		

(3) Indicator is illuminating, but Ready LED is keep on blinking.

Status	Check Points	Actions
1. Key switch is ON. 2. Indicator is illuminating. 3. Ready LED is blinking.		
4. Turn key switch OFF.		
7. Check if ambient temperature and humidity is within specifications.	Are they within specifications? Check using by temperature gauge and humidity gauge. Temperature: 10-35 °C Humidity: 0-90%	Use the laser system within specifications.
8. Contact us if status corresponds to none of the above.		

(4) Ready LED changes to be illuminating, but no laser beam is emitted even if Emission ON switch is put on.

Status	Check Points	Actions
1. Key switch is ON. 2. Indicator is illuminating. 3. Ready LED is illuminating. 4. Laser does not emit.		
5. Check if PC control is available.	Check PC LED is illuminating (available).	If PC control is available, please control by PC software.
4. Turn key switch OFF.		
5. Check if shutter position is Open status.	Check shutter position.	If shutter position is Close, change it to Open.
6. Contact us if status corresponds to none of the above.		

#### 5-2 Decreased Laser Power Power

Status	Check Points	Actions
1. Decreased laser power power		
2. Do you use PC control or Remote Control Box?	Check if LD current is set up; at low level.	Increase LD current level.
3. Shutter is opened appropriately.	Check if shutter is at Open position properly.	Place the shutter at Open position.
4. Temperature or humidity is within specifications.	Check if ambient temperature and humidity where the laser system is operating is within specifications.	Operate the laser system within specifications.
5. Possibility of condensation	LD is controlled at about 25 °C. Is there any possibility of condensations at 25 °C in connection with ambient temperature and humid?	If there is any possibility, use the laser system in ambient of lower humidity and higher temperature.
6. Contact us if status corresponds to none of the above		

#### 5-3 Alarm LED is blinking on and off.

Status	Check Points	Actions
1. Alarm LED is blinking more than 10 sec.		
2. Do you use optical tool ?	Check if laser reflection by optical tool enter into the laser head aperture.	Do not enter the laser reflection into the aperture.
3. Contact us if status corresponds to none of the above		

#### 5-4 Laser System can not be Controlled by External Control (PC or Remote control box)

##### (1) Laser system can not be controlled by PC control program.

Status	Check Points	Actions
1. Key switch is ON. 2. Indicator is illuminating. 3. Ready LED is illuminating. 4.. Laser can not be controlled by PC control program.		
5. PC control program is running.	Check if PC control program is running on your PC.	If PC control program is not running, please start it.
6. PC control program acknowledges the laser system.	Check if the laser data is displayed at upper left part of program window.	If no laser data is displayed, please reinstall USB cable appropriately.
7. PC control is active.	Check if PC LED on controller panel is illuminating.	If PC LED is not illuminating, click "PC" of control source switches.
8. Contact us if status corresponds to none of the above.		

##### (2) Laser system can not be controlled by Remote control box.

Status	Check Points	Actions
1. Key switch is ON. 2. Indicator is illuminating. 3. Ready LED is illuminating. 4.. Laser can not be controlled by Remote control box.		
5. Remote control box is connected to the controller.	Check if Remote control box is connected to the controller.	If it is disconnected, connect it appropriately.
6. Contact us if status corresponds to none of the above.		

## 6. Limited Warranty

### 6-1 Warranty Coverage

Warranty period of our laser products are as follows. In case of failures that fall within our responsibility, we will provide free repair or parts replacement for that period.

- Laser head: within one year from the date of purchase, and the laser power is less than 50%(KBL-S130-A, KBL-S120C-A) / 70%(the other models) of the rated power (Measured by our standard powermeter)
- Controller: within one year from the date of purchase

This Limited Warranty will not apply for the following failures:

- (1) Failures in the conditions, circumstances, or by the handlings or operations not written in the instruction manual or product catalog.
- (2) Failures by the operation other than written in manual or by the users' handling such as excessive tilt, drop or shock etc.
- (3) If you do not follow the storage conditions that are described in the instruction manual.
- (4) If a failure occurred due to equipment other than our products.
- (5) If modified or repaired by any other than us.
- (6) If the cause is due to natural disasters such as fire, earthquake, flood, lightning, etc. or due to accidents not within our responsibility.
- (7) KIMMON KOHA CO., LTD. will not be responsible for any damage or loss caused by the failure of our laser products.
- (8) In case of repair or replacement, please bring in or return the product to our factory. Transportation costs will be borne by the customer.

### 6-2 Repair of Products

(1) If within seven years from the date of purchase we will conduct normal repair and maintenance. Even in the case of over seven years, we will also conduct repair and maintenance, but if it is determined that we cannot guarantee repairs due to deterioration over time of electronic parts or the resonator, etc. within the product, these parts will be replaced as a preventive measure. We will quote separately for these replacements.

Additionally in the case of over seven years, a charge will be made on repair for reasons other than replacement of parts.

(2) Product maintenance period is three years after discontinuance of Product. However, if the production of spare or repair parts have been discontinued, we reserve the right to refuse the repair or maintenance even within these three years.

7. Where to Contact Us

**KIMMON KOHA CO., LTD. Laser sales section**

**TM21 Building, 1-53-2 Itabashi, Itabashi-ku, Tokyo, 173-0004 Japan**

**Phone 81-3-5248-4820 FAX 81-3-5248-0021**