UV-LED Square Curing System

USL-93030
USER'S MANUAL

CLEAN UP YOUR UNKNOWN CURIOSITY TioTek

- Read this manual carefully before operation.
- Observe all the procedures, safety warnings and cautions in this manual.
- Keep this manual readily accessible so that it can be consulted at any time.
- Specifications and appearances in this manual are subject to change for improvement without prior notice.

Table of Contents

1. Safety Precautions

Make sure to read these "Safety Precautions" carefully before starting to use the equipment and observe them during operation.

1-1. Classification of Symbols

Safety symbols in this manual and on labels are classified as described below.
As each word and symbol carry special meanings. Familiarize yourself with them and observe the instructions.

	**WARNING**	This means that possible death/ serious injury to the operator or breakdown of the system may result if these instructions are ignored and the equipment handled incorrectly.
		Do not look directly at LED-UV light, or at LED-UV light reflected in a mirror or other reflective surface.
	**WARNING**	Do not pull out the power source plug during thundering weather.
	**CAUTION**	High heat warning. After using, the equipment's lighting head is very hot. Do not touch it.

1-2. Safety Instructions

In order that this equipment is used properly and safely, be sure to observe these safety instructions. Use of this equipment in any way other than that described in this manual may hinder the protection function of this equipment. TIOTEK KOREA shall not be liable for any faulty conditions caused by such use against any of the said precautions.

 **WARNING**

A. In case of occurrence of abnormal conditions such as smoking, abnormal smell or noise, turn off the power immediately and then disconnect the AC power cord from the AC outlet.
B. Do not cause damage to the power cable.
C. Do not allow liquid including water or a foreign object to enter the equipment.
D. Do not touch the power plug with wet hand.
E. Disassembly and modification is prohibited.

CAUTION

Power Connection

A. To prevent electrical shock, always ground this unit using the grounding terminal of the power cord.

B. Make sure that the power voltage in use complies with specification.

UV-LED Head Unit with Condenser Lens

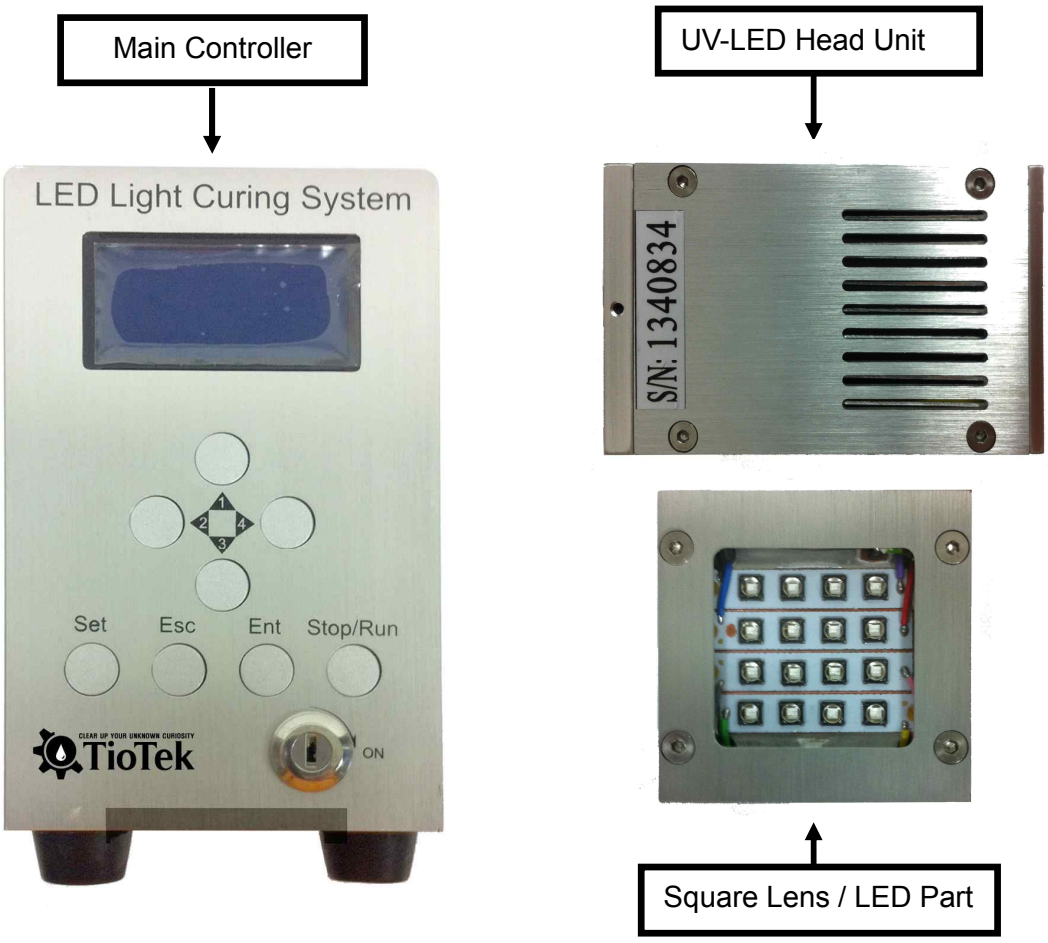
A. Use full care in handling the LED Head Unit Assembly.
As it has LED parts, a strong impact from dropping or the like may cause it to break or get maladjusted.

B. Do not directly touch by hand and contaminate the condenser lens surface.

C. Replace the LED Head Unit when the UV output intensity has deteriorated.
As the lighting time of UV-LED increases, UV output intensity is deteriorated. Measure the UV output intensity periodically and replace the LED Head Unit when the measured value is lower than the required level.

2. Product Overview

2-1 Appearance



This product is a light source for ultraviolet light output using UV-LED for the light output source. The UV-LED included in the LED Head Unit outputs the light which is then applied to any place as desired. This equipment consists of the optical system including UV-LED with exchangeable Square lens and controller. UV output can be executed by using the control switches or external control signals.

2-2 Characteristics

- **LED Light Source**
  Different from the traditional UV Curing System. This equipment uses the LED, instead of the bulb as the light source.

- **Expanded Service Life**
  The expected service life is 20,000 hours, much longer than that of the bulb, which is approximately 2,000 hours. Therefore it greatly reduces the bulb replacement and related cost.

- **High and Adjustable UV Output Power**
  The UV output power can be adjusted from 1~100%, satisfying various curing requirements.

- **Reduction of Heat Damage**
  Different from the bulb-type light source, UV LED hardly damages the illuminated objects thermally because it only irradiates ultraviolet light except infrared light which brings thermal trouble.

- **Multiple Condenser Lens Units Available**
  Four condenser lenses can be available according to the irradiation beam areas and UV-LED light intensity.

- **LCD Display**
  The operation conditions and system status are presented on an easy-to-read LCD display.

3. Getting Started

3-1 System Components

Unpack the system and accessories carefully and check whether the following items are included without missing.

Basic Items

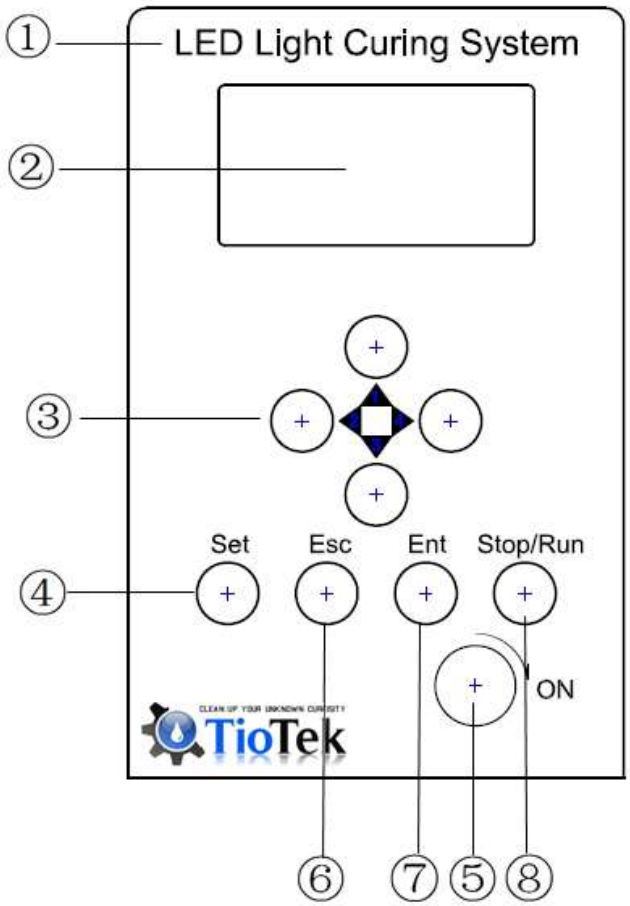
A. Controller	1 PC
B. UV-LED Head Unit	1 PC
C. Power Cable	1 PC
D. User Manual	1 PC
E. Control Switch (Foot or Hand)	1 PC
F. Certification	1 PC

Installation
Make sure the rubber legs are set horizontally parallel.
At the same time the ambient temperature should be between 5-40 degree centigrade.

Optional Accessories

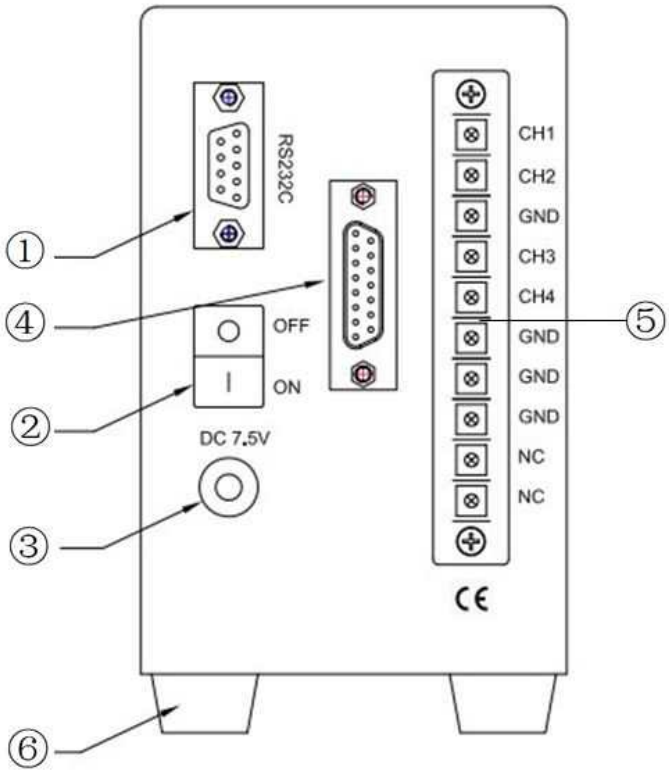
A. LED Head Cable
B. Power Cable (Extension, 2m)
C. Foot / Handle Switch

3-2 Front Panel



① Product name
② LCD Screen
③ Direction key to set function (also channel buttons)
④ Set key to enter setting mode
⑤ Lock key system will be locked by it.
⑥ ESC key. Exit or stop with it
⑦ ENTER key. save the settings to memory
⑧ RUN/STOP Key

3-3 Rear Panel



① RS232 port
② Power Switch
③ DC Socket
④ UV LED connector
⑤ Connectors of pedal signal
⑥ Foot Pad

ATTENTION

Avoid wet hand operating, in case electric shock

4. Installation Procedures

4-1 Installing the Controller

WARNING

Before connecting/disconnecting the related devices to the system, make sure that the controller is turned off. The controller may break down, if it is connected or disconnected while the power is on.

- Avoid a place with high temperature or humidity.
- Maintain proper space around the equipment for ventilation.
- Place the equipment horizontally.

4-2 Installing the UV-LED Head Unit and Condenser Lens Unit

WARNING

A. Never look at the UV output port directly.
B. Never allow light to come into contact with skin.
C. Always wear safety glasses, gloves and other appropriate protective gear when operating this equipment.
D. Before replacing the Condenser Lens Unit, confirm that UV is not output, turn off the power switch and wait until the LED head unit cools off.

CAUTION

Screws may be damaged if excessive torque is applied when screw-in the Condenser Lens Unit.

- Screw-in the Condenser Lens Unit to the UV-LED Head Unit.
- Plug-in connectors of DC Output Cable to UV-LED Head Unit and to LED Output connector on the rear panel of the controller.

4-3 Combining the UV-LED Head Unit

CAUTION

For a better cooling performance of the UV-LED Head Unit, combine UV-LED Head Unit.

- Irradiation plug aimed at the socket on the controller panel, push hard to lock it.
- Clench the mini-button on the plug will pull it out.

ATTENTION

- UV light is harmful to human body. Avoid body exposure especially eyes.
- Do wear UVATA goggle during operation.
- Do not touch the irradiation head immediately after using!

4-4 Connecting the External Devices

WARNING

Before connecting/disconnecting the related devices to the system, make sure that the controller is turned off. The controller may break down, if it is connected or disconnected while the power is on.

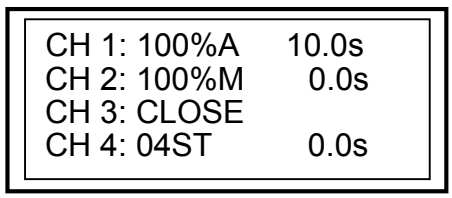
- Connect the foot switch to connector on the rear panel of the controller.
- Connect the I/O signals to Remote RS-232C Port (D-Sub 9 Pin connector) on the rear panel of the controller.

5. Operations

<Step 1> Connect the Electric Power by using the AC Power Cord

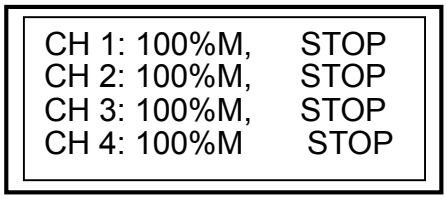
<Step 2> Power On

Insert the Key to the Key Holder and rotate it clockwise.
Then LCD will show basic display as follows and LED Indicating Lamp named "POWER" will be turned on.



This channel auto irradiation mode
This channel manual irradiation mode
This channel closed
This channel 4 steps irradiation mode

< Basic Display >



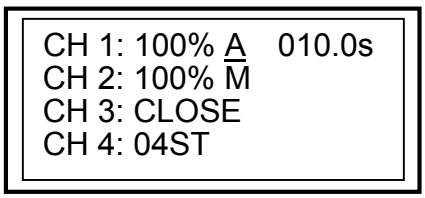
Press the "RUN/STOP" key to make the equipment run or stop,
When stopped, it will display

< Stop Mode >

<Step 3> Parameter Setting

Press "RUN/STOP" button to stop the machine, press the "SET" button for 3 seconds to enter setting page, the item with underline could be set.
press ESC to exit and the parameter will not change.

Entering the parameter setting mode, it will display as below:



Each channel could be set in 4 irradiation mode, indicated by letters
A: auto-irradiation mode, energy and countdown time could be set.
M: manual iiradiation mode, energy value can be set.
ST: step irradiation mode, the former step number could be set.
CLOSE：this channel closed, no irradiation.
PS: pulse mode, cycle STEP mode, cycle-index can be set.
Parameters with underline cursor can be set by pressting 『↑』 and 『↓』 buttons.
Press 『←』 and 『→』 buttons to move underline cursor to aimed position.

Irradiation energy setting
can be set between 0%--100%

Irradiation time setting
can be set between 000.0s--999.9s

STEP number setting
can be set to 1--16 steps

Press "ESC" key to exit setting mode, press "ENTER" key to save.

STEP mode parameters setting

If the channel is "STEP mode", press "SET" button to set parameters, it displays as:

```
SP01: 100%   000.0s
SP02: 100%   000.0s
SP03: 100%   000.0s
SP04: 100%   000.0s
```

Press 『←』 and 『→』 button to move the cursor, and then press 『↑』 and 『↓』 to change the value of this position. Each step's energy and time can be set. Energy range is 00--100%, time range is 000.0--999.9s.

If the step number is over 4, press "ENTER" button, it will display the next four steps setting page. Untill all the steps finish setting, press "ENTER" again to save.

PULSE parameter setting (PS:)
Cycle index can be set between 1--99.

System parameter setting
In STOP state, press "SET" button for over 3s, it will display as below:

```
CH 1: LINK ON
CH 2: LINK ON
CH 3: LINK ON
CH 4: LINK ON
```

Press 『←』 and 『→』 buttons to move the cursor, and then press 『↑』 and 『↓』 buttons to change the value of this position.

In the system parameter setting state, each channel have 4 states:
LINK linkage, ON can link; OFF, close link. Preinstall-value is close.
BUZZ Buzzing, ON, it will buzz when finished irradiation; OFF no buzz.
START, Pulse mode, press the pedal--irradiation on; next press--OFF; Low mode, press--on; loosen--OFF
COPY channel date copy. ON, copy this channel to other channels. Eg : CH1,CH2 COPY ON,CH3,CH4 COPY OFF, copy CH1 date to CH2, CH3,CH4 not change. Copy the date of first channel that is ON, COPY OFF channels copy disable.
000000H00M00S, total irradiation time display, can not change.
Press "SET" for over 3S to set. Press "ENTER" to save, run again.

Start Irradiation

All channels connected to LED, pedal switch connected, press the pedal or the relevant direction key to start irradiation.

Lock key

The key in ON position, system parameters can be set. After setting, the key taken out, machine can be operated, no set.

<Step 5> RS232 computer control port

For the customers' convenience, this system adds a RS232 connector which will connect the machine to computer and its usage are as follows

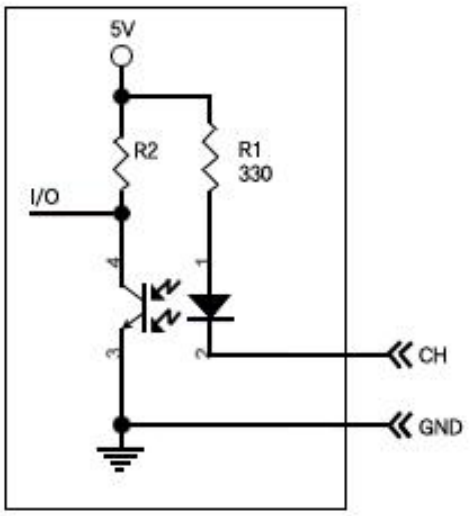
Upper PC choose right COM port, set baud rate 9600bps, 8 date bit 1 stop bit,no odd-even check bit. Upper computer or PLC send a communication protocol instruction (ASIC code lowercase letter "TioTek"). If UV controller receive successfully, it will send back a ASIC code ":", connect success

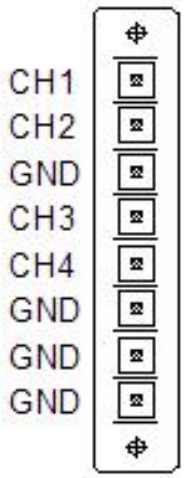
"The control method as follow:

1. Upper computer or PLC send an 8 byte of hex (0b0000, 0000), bit 4 controls the L ED light head, 1 indicates lighting, 0 close. Higher three bits invalid. Lower four bit s (high to low) stands for CH4, CH3, CH2 and CH1. 1, control available; 0, no cont rol. Eg, (0b0001, 0110) to turn on LED light of CH2 and CH3. (0b0000, 0110) to tur n off the LED light of CH2 and CH3.
2. After connection, each time computer sends a control instruction, UV machine send back it for checking. When one channel stops lighting, the UV machine send a hex byte to the computer through RS232 connector(e.g., 0b0010,0010, it means that CH2 stops working).
3. For over 4 channels controller, bit 5 controls the higher four channels. "1", it controls the LED light of CH5, CH6, CH7, and CH8; "0", no control. The control method of CH5, CH6, CH7, and CH8 is the same as CH1, CH2, CH3, Ch4. No need to do extra treatment.

Switch (Foot or Hand) connector instruction

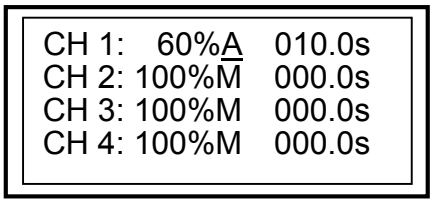
Control connector instruction as picture, after connect the pedal as indicated, the signal low level period should be longer than 50mS.





<Step 6> Examples of Irradiation mode setting

Example 1 A auto mode irradiation countdown 010.0s / 60% energy output



- ◆CH1/CH2/CH3/CH4 (left, irradiation channel)
- ◆Power setting and irradiation mode (middle)
- ◆Time setting (right)

1) Key switch to ON position

2) Press『Stop/Run』button to『STOP』state, then press『Set』button.

3) After enter, press『←→』to move『_』to irradiation mode position, as above picture. (Default is M) press『↑↓』to "A" mode.

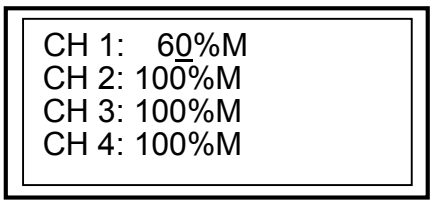
4) press『←→』to move『_』cursor to power setting position, press『↑↓』to 60% value

5) press『←→』to move『_』cursor to time setting position, press『↑↓』to 010.0s

6) press Ent button to save the setting. In 8 channel controler, it will enter CH5/CH6/CH7/CH8 setting. Same method. After setting, press Ent button to save.

Setting finish, press『CH1』's start button, LED light will work 10S at 60% power output.

Example 2 M manual mode 60% power output



- ◆CH1/CH2/CH3/CH4 (left, irradiation channel)
- ◆Power setting and irradiation mode (middle)

1) Key switch to ON position

2) Press『Stop/Run』to『STOP』state, then press 『Set』button enter setting page.

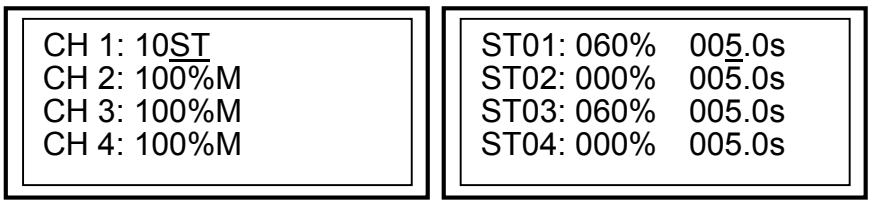
3) Press『←→』to move『_』cursor to power setting position, as above picture.

4) press『↑↓』button to 60% power output.

5) press Ent to save the setting. In 8 channel controller, it will enter CH5/CH6/CH7/CH8 setting. Same method. after setting, press Ent button to save.

Setting finish, press『CH1』's start button, LED light will work at 60% power output.
Press CH1's button again to stop.

Example 3 ST mode, 10ST mode irradiation, 60% 5S+stop 5S



< Pic 1 > < Pic 2 >

- ◆CH1/CH2/CH3/CH4 (left, irradiation channel)
- ◆Power setting and irradiation mode (middle)
- ◆Time setting (right)

1) Key switch to ON position

2) Press『Stop/Run』to『STOP』state, then press 『Set』button enter setting page.

3) Entered, press ←→buttons, moving 『_』cursor to mode setting position as picture 1. (Default M) Press ↑↓to ST mode.

4) press ←→ to move『_』cursor to STEP position (number before ST), press ↑↓to 10 steps.

5) press Set button to enter the ST mode setting, as above picture 2.

6) set ST01 press←→to move cursor to 100, press ↑↓to 060.Press ←→ to move the cursor to time setting position, press↑↓to 005.0s

7) set ST02 press←→, move the cursor to 100, press↑↓to 000% press ←→, move the cursor to time setting position, press↑↓to 005.0s

8) set ST03 the same method with ST01, so does ST05/07/09.

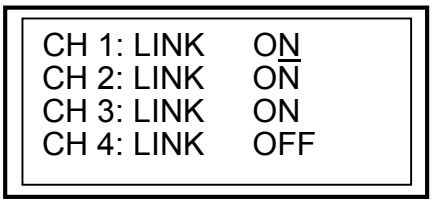
9) set ST04 the same method as ST02. So does ST06/08/10.

Note: after set ST01~ST04, press Ent button to save and enter next ST05~08 setting. So does the next ST09~ST12 and so on.

Setting finish, press CH1 switch button, work 5S at 60% power and stop 5s.
then another 60% power 5s, 5s stops, together 5 cycles. Max 16 steps.

<Step 6> Examples of system setting

LINK CH1/CH2/CH3 linkage working



1) Key switch to ON position

2) press『Stop/Run』button to『STOP』, press『Set』>3s, enter system setting page.

3) press『←→』move 『_』cursor to OFF, press『↑↓』change『OFF』to『0N』

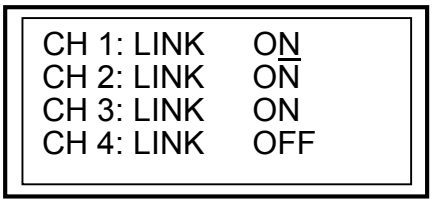
4) repeat 3) operation, respectively set CH2 CH3『LINK』mode in『0N』position

5) press『Set』>3s to save setting.

Setting finish, press CH1's start button, CH2 CH3 run and stop with CH1.『CH4』needs manual operation.
Default is OFF.

Note：Linkage work can also be 2 channels or 4 channels.

BUZZ CH1 ON / CH2 OFF



1) Key switch to ON position

2) press『Stop/Run』to『STOP』, press『Set』>3s, enter sysytem setting page.

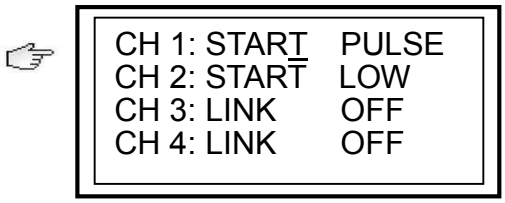
3) press ←→to move"_"cursor to CH1 and CH2『LINK』position, then press↑↓to BUZZ

4) press←→, move『_』cursor to CH1『OFF』position, press↑↓change『OFF』to『0N』

5) press『Set』>3s to save setting.

Setting finish, CH1 stops working, it will buzz. CH2 stops working, no buzz. Default OFF.
『OFF』close buzz

START Irradiation start mode CH1 pulse start



1) Key switch to ON position

2) press『Stop/Run』to『STOP』, press『Set』>3s, enter sysytem setting page.

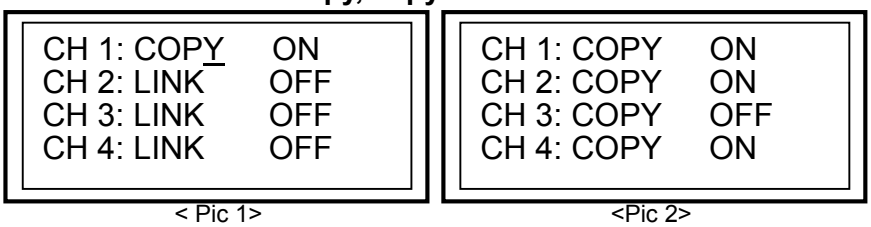
3) press←→, move『_』cursor to『LINK』, then press ↑↓to『START』

4) press←→,move『_』cursor to 『LOW』, press↑↓change『LOW』to『PULSE』

5) press『Set』 > 3s to save setting.

Setting finish, CH1 is pulse start mode. Pressing pedal switch to irradiate, pressing again to stop. Default『LOW』LOW state, press pedal switch start irradiation, loosen it stops.

COPY Channel date copy, copy CH1 date to CH2 and CH4



< Pic 1> <Pic 2>

1) Key switch to ON position

2) press『Stop/Run』to『STOP』, press『Set』>3s, enter system setting page.

3) press←→, move『_』cursor to『LINK』, press↑↓to『COPY』.

4) press『←→』, move『_』cursor to『OFF』, press『↑↓』change『OFF』to『ON』

5) respectively press『←→』, move『_』cursor to CH2 and CH4, repeat above "3)"and "4)", make it『COPY』at『ON』state.

6) press『Set』 > 3s to save setting.

Before setting, CH1 parameter is 60%A, 10s; CH2, CH3, CH4 is 80%A, 5s,
After setting, system will copy CH1's parameter date to CH2 and CH4, CH3 no change.
CH1, CH2, CH4 working parameter date becomes 60%A, 10s; CH3 no change, 80%A, 5s.
Default『OFF』

※ Non-Use Channel

If some of channels are not used, please set OFF at SET TIME STAGE of each channel. Otherwise this situation causes fake error conditions.

CAUTION

Optimized UV Light Intensity and Irradiation Time
In order to increase lifetime of the UV-LED, it is desirable to set the values for the light intensity and irradiation time properly and not too much.

<Step 7> Power Off
After the operation stops, rotate the key switch counter-clockwise and pull out the AC Power Cord. Properly keep the UV LED Head Units in order to prevent it from being damaged.

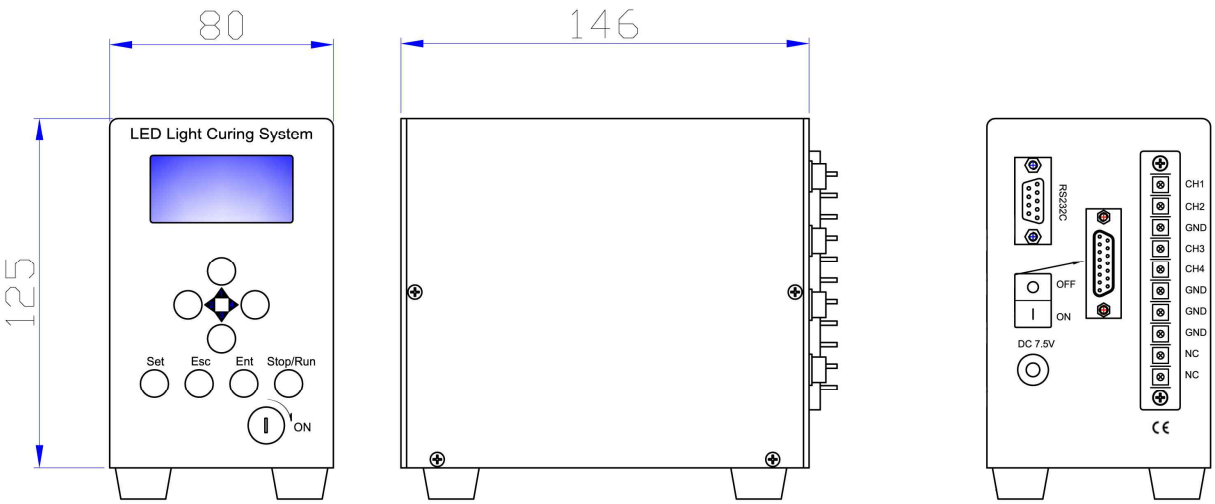
6. Technical Specification

6-1 Unit Specification

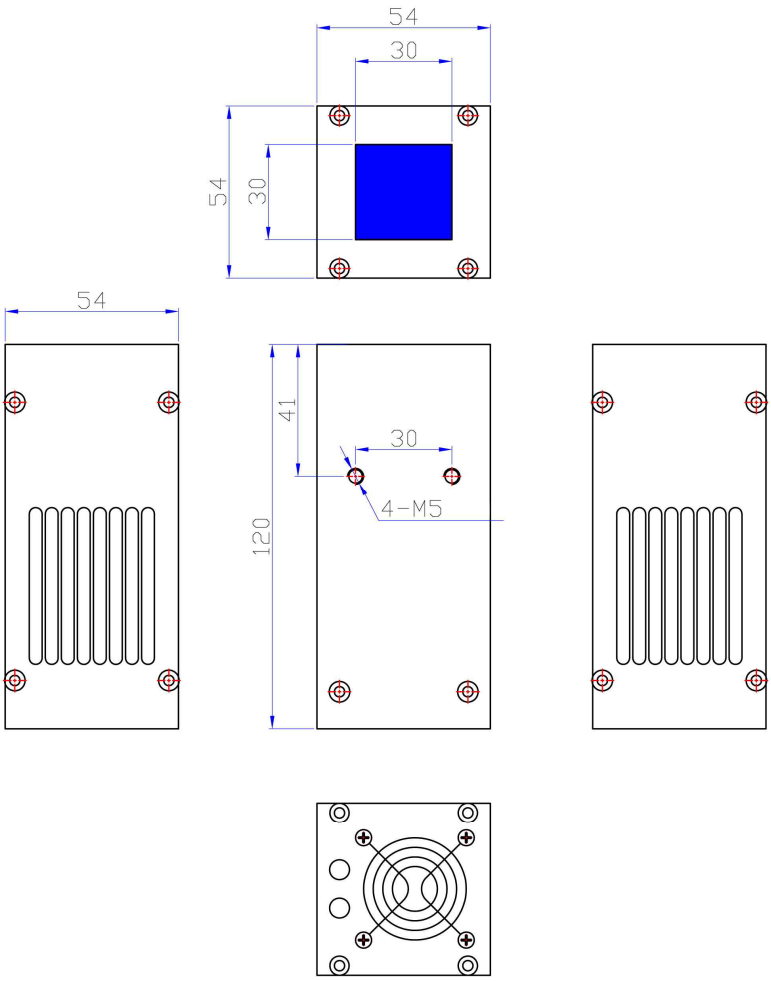
Parameter	Description / Value
Model	USL-93030
Wavelength	365nm
UV irradiation area	30*30mm
Irradiation distance	Approx. 10mm
Connectable Heads	1
Operation	Auto, Manual, Step, Pulse
Display	LCD & LED Indicating
Power Input	100 ~ 240 VAC, 50/60 Hz
Power Consumption	<180W
Power Range	0-100%
Intensity / Irradiation Control	Digital intensity and irradiation control Manual/timer control (0.1 to 999 sec.)
Cooling Method	Aluminum shell, Air Cooling / Fan Cooling
Ambient Temperature/Humidity Range	5 ~ 40℃
Storage Temperature/Humidity Range	-15 ~ 65℃
Controller Dimensions	80 X 125 X 146mm
Weight	Approx. 1.2Kg
Accessary	RE232 Port UV goggle Foot Switch

6-2 External Dimensions (mm)

Controller



UV-LED Head Unit



7. Troubleshooting

Please investigate the following points before requesting repair.

Malfunctions	Possible Causes & Corrections
Power cannot be on.	・ The emergency stop circuit is activated. → Check the related connector, wiring and components. → Contact your TIOTEK KOREA representative.
UV Output intensity is low.	・ The lens surface of Condenser Lens Unit is contaminated. → Clean it with a soft cloth. (dampened with alcohol)
	・ The set value of UV Output intensity is low. → Adjust the set value properly.
	・ The effective service life of UV LED has had it. → Check the accumulated LED turn-on time on. → Replace the LED Head Unit with a new one. → Contact your TIOTEK KOREA representative.
UV-LED doesn't light.	・ The connectors of the DC Output Cable are not docked perfectly or the cable is damaged. (short/open circuit) → Check the connector and DC Output Cable.
	・ The set value of UV Irradiation Time is OFF. → Adjust the set value properly.
	・ There is a short circuit in the DC output cable or LED. → Contact your TIOTEK KOREA representative.

8. Routine Maintenance

8-1. Packaging and transportation

In transportation, keep the original packing material to avoid any damage**.**

① Power off the equipment.
② Pull out all cable and power lines.
③ Put the controller into plastic packaging bag, then put it back to the original carton.
④ Store irradiation part with original material.
⑤ Store pedal with original packing material.
⑥ Store manual and power line in original carton.
⑦ Store all the above items into internal carton, seal it with packing tape.
⑧ Put foam in four corners of the external packing carton.
⑨ Put the internal carton to the external packing carton.
⑩ Close the external carton, seal it with packing tape.

8-2. Daily maintenance

Irradiator cleaning

Clean the LED head regular with soft buckskin, lens tissue, alcohol, to guarantee intensity and heat dissipation.

8-3. Controller cleaning

Clean controller regularly. Wipe it with little alcohol. Avoid volatilize fluid (like diluent or benzene) and ammonia water.

ATTENTION

A. **Do power off, pull out power line, let the machine cool down completely before cleaning.**
B. **Do not use it until the machine completely dry.**
C. **Avoiding electric shock!**

9. Warranty

TIOTEK KOREA Co., LTD. (hereafter referred to TIOTEK KOREA) warrants that this product that it manufactures and sells will be free from defects in materials and workmanship for a period of one (1) year from the date of shipment. If this product proves defective during its warranty period, TIOTEK KOREA, at its option, will either repair the defective product without charge for parts and labor, or provide a replacement in exchange for the defective product.
In order to obtain service under this warranty, Customer must provide the applicable office of TIOTEK KOREA or its authorized representative with notice of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. Customer shall be responsible for packaging and shipping the defective product to the service center designated by TIOTEK KOREA or its representative, with shipping charges prepaid. TIOTEK KOREA or its representative shall pay for the return of the product to Customer. Customer shall be responsible for paying any associated taxes or duties.

However if any of the following conditions applies, the cost of repair or replacement required to correct the trouble shall be charged to the customer even if it is within the warranty period.
- a trouble was caused by usage non-confirming to the instruction manual or negligent operation.
- a trouble was caused by disassembly or repair by the customer without any permission.
- a trouble was caused by an unauthorized electric or mechanical modification by the customer.
- a trouble was caused or induced by a natural calamity, earthquake, fire or otherwise irresistible force.
- a trouble was caused by a failure of the equipment or the like that is connected to or located near this equipment.

THE ABOVE WARRANTIES ARE GIVEN BY TIOTEK KOREA WITH RESPECT TO THIS PRODUCT IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED. TIOTEK KOREA AND ITS VENDORS DISCLAIM ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. TIOTEK KOREA 'S RESPONSIBILITY TO REPAIR OR REPLACE DEFECTIVE PRODUCTS IS THE SOLE AND EXCLUSIVE REMEDY PROVIDED TO THE CUSTOMER FOR BREACH OF THIS WARRANTY. TIOTEK KOREA AND ITS VENDORS WILL NOT BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES IRRESPECTIVE OF WHETHER TIOTEK KOREA OR THE VENDOR HASADVANCE NOTICE OF THE POSSIBILITY OF SUCH DAMAGES.

TioTek Korea Co.,

Bucheon DaeWoo Technopark C-605 187-7
Dodang-dong, Wonmi-gu, Bucheon-si, Gyeonggi-do,
South Korea
Post: 420-806

TEL) 82 32 670 7798
FAX) 82 32 670 7798

http://www.TioTek.kr
http://www.tiotek.co.kr
e-mail: tiotek@TioTek.kr