

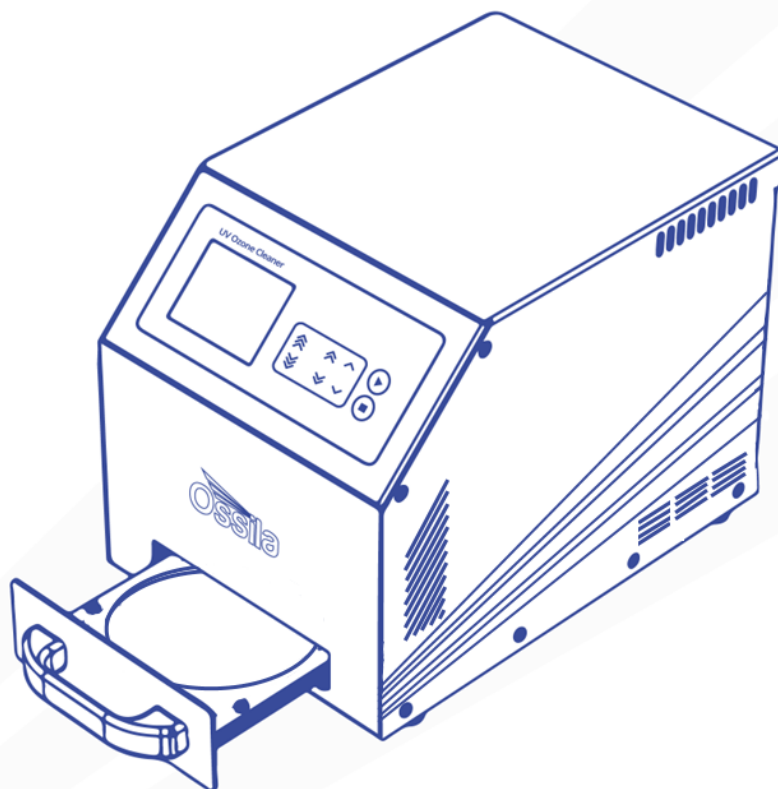
UV OZONE CLEANER USER MANUAL

Manual Version: 3.0.B

Product code: L2002A3

Product Version: 3.0

Software Version: 3.0



Contents

1. Overview.....	3
1.1 Applications.....	3
1.2 Contaminants	3
2. EU Declaration of Conformity (DoC)	4
3. Safety.....	7
3.1 Warning.....	7
3.2 Use of Equipment.....	7
3.3 Hazard Icons	7
3.4 General Hazards	8
3.5 Power Cord Safety	9
3.6 Servicing.....	9
3.7 Health and Safety – Installation.....	9
3.8 Health and Safety – Operation	10
3.9 Health and Safety – Servicing.....	10
4. Unpacking	11
4.1 Packing List.....	11
4.2 Damage Inspection.....	11
5. Specifications	11
6. System Components	12
7. Installation	13
8. Operation.....	14
8.1 Overview	14
8.2 User Interface.....	16
8.3 Practical Operation.....	17
8.4 Program Operation.....	17
8.5 Operational Safety.....	21
9. Maintenance	23
9.1 Cleaning	23
9.2 Repair and Service.....	23
9.3 Storage Conditions	23
10. Troubleshooting	23

1. Overview

The UV Ozone Cleaner is part of the Institute of Physics award-winning Solar Cell Prototyping Platform*. It provides a simple, inexpensive, and efficient method of obtaining ultra-clean surfaces free of organic contaminants. The UV Ozone Cleaner can clean a wide range of substrates, such as quartz, silicon, gold, nickel, aluminium, gallium arsenide, alumina, and glass slides.

The UV ozone cleaning process can produce an atomically clean surface in only a few minutes. However, the substrate surface must be nominally clean beforehand. The cleaning rate of UV ozone using atmospheric oxygen at ambient conditions depends on the nature of the contaminant molecules, but is typically of the order of 0.1 - 1.0 Å/s. The exact exposure times and methods required to remove various contaminants will vary and should be determined empirically.

The Ossila Solar Cell Prototyping Platform is a complementary collection of substrates, materials, and equipment as part of a high-performance standard photovoltaic reference architecture. This platform enables researchers to produce high-quality, fully functional solar cells which can be used as a reliable baseline.

For more information: ossila.com/pages/solar-cell-prototyping-platform

1.1 Applications

- Improving surface hydrophilicity
- Surface cleaning
- Preparation for thin-film deposition and surface treatment
- Ultraviolet curing
- Removal of surface monolayers
- Surface oxidation

1.2 Contaminants

- Photoresist
- Resins
- Human skin oils
- Cleaning solvent residues
- Plastic surface/silicon oil residues
- Solder flux

2. EU Declaration of Conformity (DoC)

We

Company Name: Ossila BV

Postal Address: Biopartner 3 building, Galileiweg 8

Postcode: 2333 BD Leiden

Country: The Netherlands

Telephone number: +31 (0)71 3322992

Email Address: info@ossila.com

declare that the DoC is issued under our sole responsibility and belongs to the following product:

Product: UV Ozone Cleaner (L2002A3)

Serial number: L2002A3-xxxx

Object of declaration:

UV Ozone Cleaner (L2002A3)

The object of declaration described above is in conformity with the relevant Union harmonisation legislation:

Low Voltage Directive 2014/35/EU

EMC Directive 2014/30/EU

RoHS Directive 2011/65/EU

The following harmonised standards and technical specifications have been applied:

BS EN 61010-1:2010/A1:2019 Safety requirements for electrical equipment for measurement, control, and laboratory use.

Signed:



Name: Dr James Kingsley

Place: Leiden

Date: 12/12/2022

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[Slovenščina]

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EU-vaatimustenmukaisuusvakuutus

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[Svenska]

Tillverkare:

EU-försäkran om överensstämmelse

Ossila BV, Biopartner 3 building, Galileiweg 8, 2333 BD Leiden, NL.

Vi intygar härmed att den utrustning som förtecknas överensstämmer med relevanta förordningar gällande EU-harmonisering som finns på föregående sidor i detta dokument.

3. Safety

3.1 Warning

- **Operate within fume cupboard in a room with suitable air ventilation at all times**
- **Only use the power cord supplied with the unit**
- **Mains inlet rated for 110-230V \pm 10%.**
- **Do not cover the ventilation slots**
- **If the lamp breaks, leave the room ventilating for at least 15 minutes and contact Ossila**
- **The unit must be connected to a earthed power outlet**

3.2 Use of Equipment

The UV Ozone Cleaner is designed to be used as instructed. It is intended to be operated in a laboratory environment under a fume cupboard/hood and is designed to be used in the following environmental conditions:







- Indoors in a laboratory environment (pollution degree 2)
- Altitudes up to 2000 m
- Temperatures of 5°C to 40°C; maximum relative humidity of 80% up to 31°C.

The cleaner is supplied with a power cord (and if necessary, an additional power transformer) for the country of purchase, in accordance with European Commission regulations and British Standards. Use of any other electrical power cables, adaptors, or transformers is not recommended.

3.3 Hazard Icons

The symbols shown in Table 3.1 can be found at points throughout the manual. Note each warning before attempting any associated operations.

Table 3.1 Hazard warning labels used in this manual.

Symbol	Associated Hazard
	General warning or caution, which accompanying text will explain
	Electrical shock
	Severe injury or death by electrical shock
	UV radiation
	Ozone inhalation
	Explosion

3.4 General Hazards

Before installing or operating the UV Ozone Cleaner, there are several health and safety precautions which must be followed and executed to ensure safe installation and operation.

WARNING: Improper handling when operating or servicing this equipment can result in serious injury. Read this manual before operating or servicing this equipment.



- I. **DANGER:** DO NOT use the UV Ozone Cleaner in the presence of an explosive atmosphere.



- II. **WARNING:** To avoid electrical shock or injury, do not remove tray or try to access any internal parts. Servicing should only be carried out by a trained professional. Before servicing, disconnect the power cord and wait 10 minutes (high voltage may persist in capacitors for some time after removal of power).



- III. **CAUTION:** The UV Ozone Cleaner uses a ground-type power plug, which must be connected to a earthed outlet to prevent electrical shock. The UV Ozone Cleaning unit will be supplied with an earthed plug appropriate for the country of purchase.



IV. The UV lamp is a mercury vapour lamp. The user may be exposed to mercury if the lamp glass breaks. If this happens, please abide by the following rules to minimise exposure:

- Ensure the power is disconnected to avoid the risk of electrocution.
- Store the container and UV Ozone Cleaner in a fume hood and leave the room under ventilation for at least 15 minutes.
- Using cut-resistant gloves, collect any stray pieces of glass in a sealed container. Dispose of the glass at a suitable collection point.



V. The UV Ozone Cleaner has a high voltage source. Do not attempt to open the unit.

3.5 Power Cord Safety



I. Emergency power disconnect options: Use the power cord as a disconnecting method and remove it from the power source. To facilitate disconnect, make sure the power outlet for this cord is readily accessible to the operator.



II. Only use the power cord supplied with the UV Ozone Cleaner. Using an unearthed plug may result in serious injury or death.

3.6 Servicing

If servicing is required, please return the unit to Ossila Ltd The warranty will be invalidated if:

- Modification or service has taken place by anyone other than an Ossila engineer.
- The Unit has been subjected to chemical damage through improper use.
- The Unit has been operated outside the usage parameters stated in the user documentation associated with the Unit.
- The Unit has been rendered inoperable through accident, misuse, contamination, improper maintenance, modification, or other external causes.

3.7 Health and Safety – Installation



I. High-intensity, mercury vapour lamps can generate extreme heat and temperatures. Furthermore, ozone is a powerful oxidising agent and can react explosively with combustible materials. Keep flammable materials a minimum of three feet away from operating equipment.



- II. The UV Ozone Cleaner is intended for operation inside a fully functioning fume hood or fume cupboard only. There is no ozone filtration system incorporated into the UV Ozone Cleaner.

3.8 Health and Safety – Operation



- I. UV radiation can cause severe burns to the eyes and skin. An integrated safety interlock prevents the lamp from being powered on whilst the tray is open. As a precaution, never look directly into the sample chamber when the UV ozone cleaner unit is powered on.



- II. Ozone is a highly reactive substance and can cause adverse health effects at the sites of initial contact: The respiratory tract, lungs — and at higher concentrations, the eyes. The principal health effects are caused by irritation or damage to the small airways of the lungs, and symptoms include coughing and a feeling of tightness in the chest. Uncontrolled exposure to high levels of ozone could lead to more severe health effects.



- III. When operating the UV Ozone Cleaner, air flow in and around the unit must remain unobstructed to prevent the unit from overheating. If the temperature inside the sample chamber reaches above 60 °C, the unit will flash a high temperature warning and automatically switch off the lamps to prevent overheating. Allow the system to cool down to room temperature before resuming use.



- IV. IMPORTANT NOTE: Excessive cooling will diminish the lamp's operating voltage and effectiveness, whereas Inadequate cooling may cause damage to system components.



- V. The UV Ozone Cleaner has a high voltage source. Do not attempt to open the unit.

3.9 Health and Safety – Servicing



- I. Service or installation work that includes integrating electrical components should only be performed by an Ossila engineer. Never alter the wiring of any purchased equipment. If changes are made, such alterations may damage the equipment, cause injury, or even death. At the very least, such alterations will void your warranty.



- II. If the fuses located in the fuse drawer at the back of the unit need changing, the unit must be placed in a safe mode by switching the unit off and disconnecting the power cord from the power socket.

4. Unpacking

4.1 Packing List

The standard items included with the UV Ozone Cleaner are:

- The UV Ozone Cleaner unit
- Power supply cord

4.2 Damage Inspection

Examine the components for evidence of shipping damage. If damage has occurred, please contact Ossila directly for further action. The UV lamp is a mercury vapour lamp and the user may be exposed to mercury only if the glass of the lamp is cracked or broken. If this happens, please contact Ossila after abiding by these rules to minimise exposure:

1. Ensure the power is disconnected to avoid the risk of electrocution.
2. Store the container and UV Ozone Cleaner in a fume hood and leave the room under ventilation for at least 15 minutes.
3. Using cut-resistant gloves, collect any stray pieces of glass in a sealed container. Dispose of the glass at a suitable collection point.

5. Specifications

The UV Ozone Cleaner specifications are shown in Table 5.1

Table 5.1. UV Ozone Cleaner specifications

UV Ozone Cleaner	Specifications
UV Lamp	4 x 150 mm x 15 mm Synthetic Quartz UV lamp
UV lamp key wavelengths	185 nm and 254 nm
Power supply	110V-230V \pm 10 %; 50/60Hz, 60 VA
Class of protection	Class I
Degree of protection	IP20
Maximum run time	59 minutes and 59 seconds
Safety features	Interlock; thermal cut-out; temperature regulation
Unit dimensions	Width: 210 mm Height: 228 mm Depth: 310 mm
Tray dimensions	150 mm Ø
Fuses	1 A slow blow
Weight	5.45 kg

6. System Components

The UV Ozone Cleaner comprises two items:

- UV Ozone Cleaner unit (Figure 6.1)
- Power supply cord (Figure 6.2).

Figure 6.1 UV Ozone Cleaner

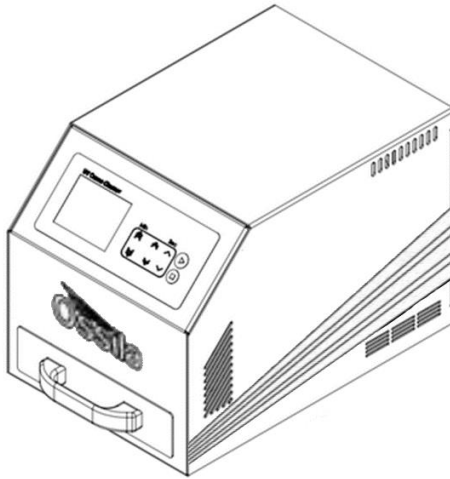
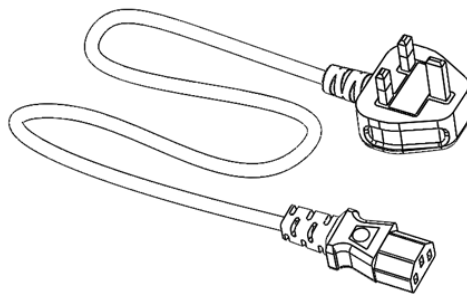


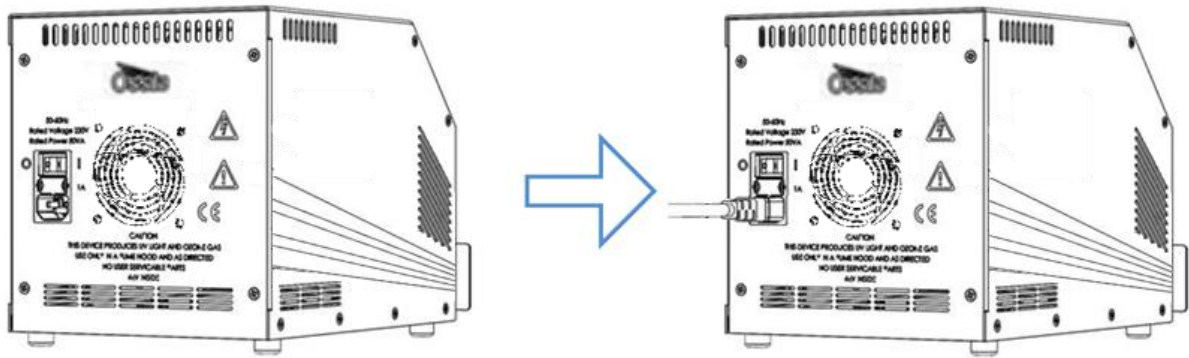
Figure 6.2 Main power cord adapter.



7. Installation

1. Place the unit on a solid, level surface inside a fume cupboard.
 - i. Ensure the area is free from vibrations, temperature extremes and highly flammable or explosive materials.
2. Before plugging in the UV Ozone Cleaner, ensure the power switch on the unit is switched to the '0' position (off).
3. Connect the power cord to the UV Ozone Cleaner unit.
 - i. See Figure 7.1 to see how to connect the UV Ozone Cleaner to the power supply cable.
4. Switch the UV Ozone Cleaner power switch to the 'I' position to turn on.

Figure 7.1 Plugging in the UV Ozone Cleaner power cord cable.



8. Operation

8.1 Overview

A top-down view of the UV Ozone Cleaner is shown in Figure 8.1, with all the relevant components highlighted. Figure 8.2 shows the power cord socket, fuse socket, and the power switch.

Figure 8.1. Components of the UV Ozone Cleaner.

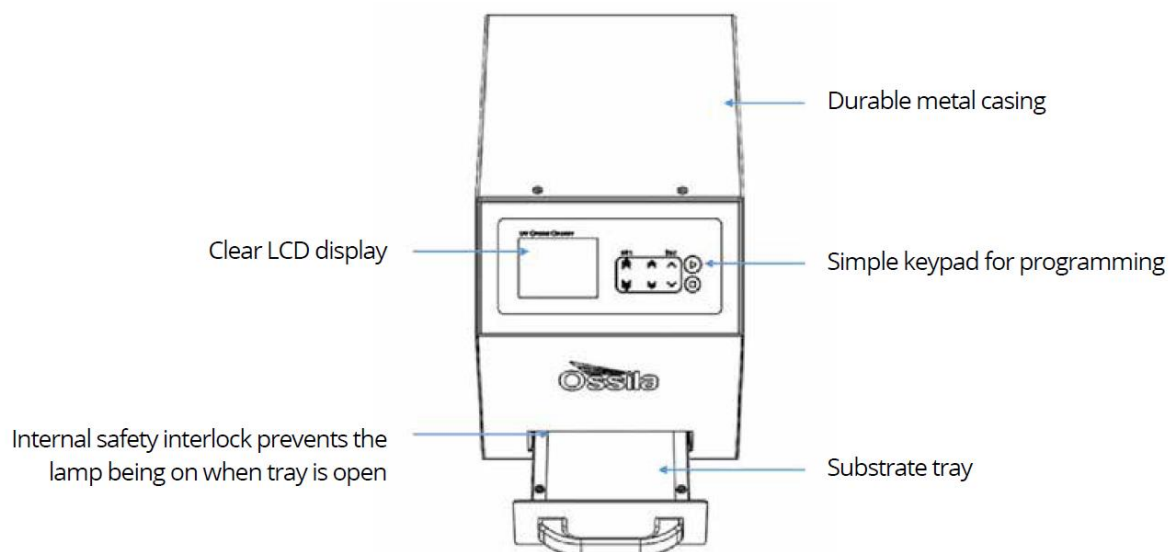
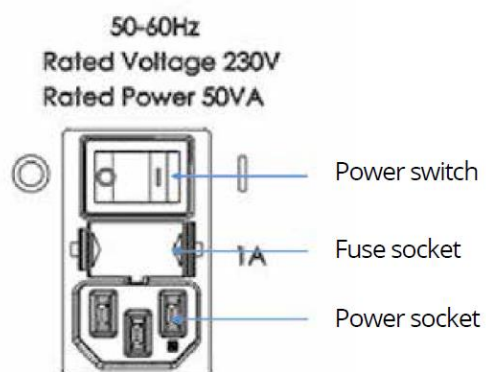


Figure 8.2. UV Ozone power switch, fuse socket, and power socket position on the back panel.



8.2 User Interface

Figure 8.3 shows the front panel of the UV Ozone Cleaner. The function of each of the keypad buttons is explained in Table 8.1.

Figure 8.3. UV Ozone Cleaner LCD screen and keypad.

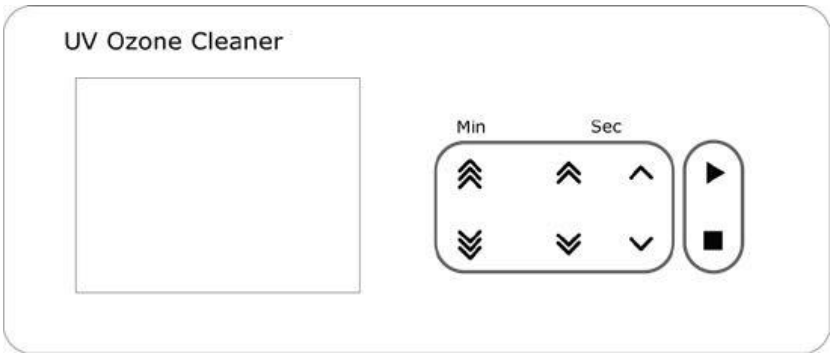










Table 8.1. Operational buttons and their associated functions.

Button	Function
	Starts operation for the Set Time programmed
	Terminates the running program and resets the Set Time to zero
	Increase the set time by 1 minute
	Decrease the set time by 1 minute
	Increase the set time by 10 seconds
	Decrease the set time by 10 seconds
	Increase the set time by 1 second
	Decrease the set time by 1 second

8.3 Practical Operation



Operate within fume cupboard in a room with suitable air ventilation at all times.



1. Open the tray door.
2. Carefully load your sample to be cleaned onto the tray.
 - I. The tray surface may become slippery with use of the UV Ozone Cleaner; take care to avoid your sample sliding off the surface.



- II. **WARNING:** Should your sample fall inside of the UV Ozone Cleaner unit, do not attempt to retrieve it. Doing so may result in damage to the unit or personal injury. The UV Ozone Cleaner can operate safely should small objects fall into the tray (providing the tray door can be fully closed).

3. Program the UV Ozone Cleaner with the desired Set Time and press the start button (see section below).
4. Once the program has finished, open the tray door and remove your sample.

8.4 Program Operation



WARNING! High voltage

The UV Ozone Cleaner is mains powered. Make sure the unit is connected to a grounded power outlet. Ensure the area around the back of the unit is kept clear. It is good practice to keep any cables around the unit in a tidy manner. Avoid keeping any solvents around this piece of equipment.



WARNING! Ultraviolet light

The low-pressure mercury vapour grid lamp inside this equipment emits harmful UV radiation. Avoid exposure at all times. Avoid keeping any solvents around this piece of equipment.



WARNING! Inhalation hazard

Ozone is produced by this equipment during operation. Use only inside a fume cupboard and in an area where appropriate ventilation is available.

1. Turn the UV Ozone Cleaner power switch on (position 'I'); the bootup screen is shown Figure 8.4.

Figure 8.4. Bootup screen.



2. During the bootup time, the user can enter the buzzer setting and temperature reading menu screens for the UV Ozone Cleaner.


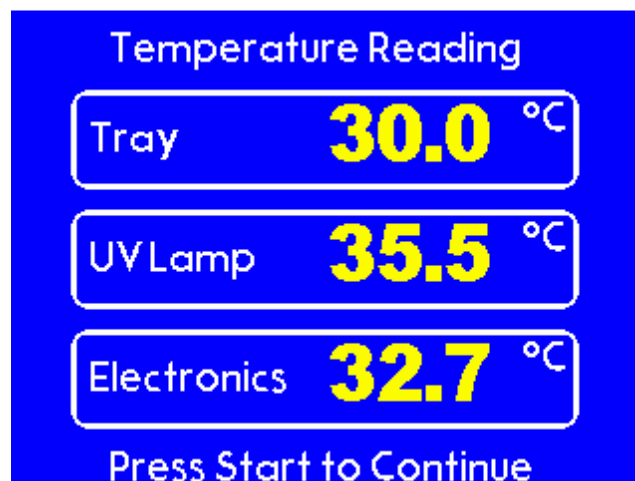

- I. Press and hold both single-increment second buttons  at the same time to see the temperature readings display as in Figure 8.5.

Figure 8.5. Temperature readings display.



- II. Press and hold both double-increment second buttons  at the same time to enter the buzzer settings as in Figure 8.6.



- III. To change the buzzer settings, press the single-increment up second button  to turn the buzzer sound on, or the single-increment down second button  to turn the buzzer sound off.

Figure 8.6. Buzzer settings menu.



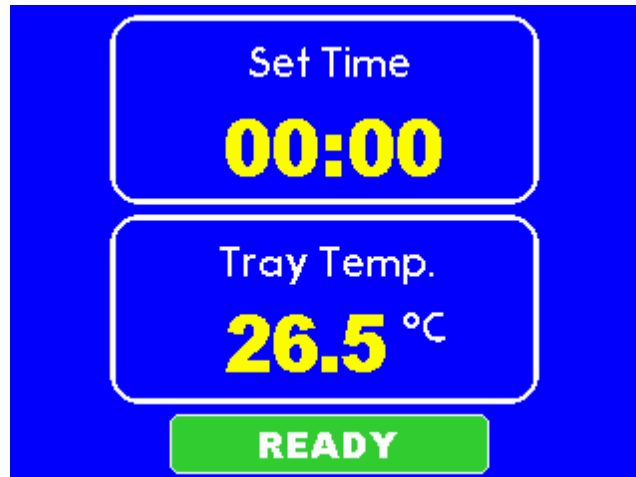
3. To exit the Settings page, press the START button to proceed to continue.
4. The user must read the caution message and press START to enter the main screen of the UV Ozone Cleaner as shown in Figure 8.7.

Figure 8.7. Caution screen



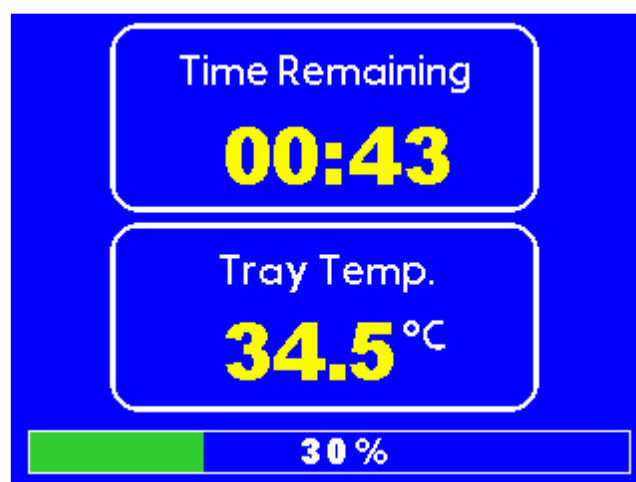
5. Modify the Set Time using the Minute (MIN) and Second (SEC) buttons on the keypad. The maximum value of the timer is 59 min 59 secs (as shown in Figure 8.8).

Figure 8.8. Set Time screen.



6. Once the timer has been set, press the START button to run the program. The LCD will display the following information (as shown in Figure 8.9).
 - I. The Elapsed timer will begin and the LED indicator light will switch on.
 - II. When the Elapsed time matches the Set Time, the one-note buzzer will sound — indicating the program has finished.
 - III. While the program is running, the user can stop the program by pressing the STOP button. This will also reset the Set Time to 00:00.

Figure 8.9. Set Time screen.



7. The fan in the unit will turn on when the cleaning program is started and will turn off once the STOP button is pressed if the Tray Temperature is below 27°C. If the Tray Temperature reads above 27°C, the fan will remain on for a further 20 minutes.

8.5 Operational Safety

(I) Safety Interlock

If the tray is opened while the system is running the program will automatically stop. Turn the lamp OFF and reset the Set Time to 00:00. The display will indicate 'TRAY OPEN' (as shown in Figure 8.10).

Figure 8.10. 'TRAY OPEN' warning.



(II) High Temperature Safety Warning

If one or more of the internal temperature sensors reads above certain temperature value, a high temperature warning will appear on the screen. Table 8.2 shows the different warnings for this unit for given temperatures. The error code that is displayed when the tray or electronics sensor exceeds 60 °C indicates which sensor is at a high temperature and is used for troubleshooting.

(III) Temperature Error

If one of the temperature sensors gives an error reading, a warning (as shown in Figure 8.11) will appear and the user is required to restart the unit. The error code that is displayed indicates which sensor is in error and is used for troubleshooting.

Table 8.2. High temperature warning.



Warning	Display
<p>HIGH TEMP (if tray or lamp is > 50°C or electronics > 45°C)</p>	 <p>The display shows a blue background with a white rounded rectangle at the top containing 'Set Time' and '00:00' in yellow. Below it is a red rounded rectangle containing 'Tray Temp.' and '55.0 °C' in yellow, flanked by two yellow warning triangles. At the bottom is a green rounded rectangle containing 'READY' in white.</p>
<p>VERY HIGH TEMP (if tray or electronics is > 60°C)</p>	 <p>The display shows a blue background with a large red rectangle in the center containing the text 'TEMP HIGH!', '0x2', and 'Please Turn OFF' in white.</p>

Figure 8.11. Temperature error warning.



9. Maintenance

9.1 Cleaning

Maintenance consists of periodic cleaning. The exterior of the instrument can be cleaned with a clean, dry cloth to remove any oil, grease, or grime. Never use liquid solvents or detergents. Repairs or servicing not covered in this manual should only be performed by qualified personnel.

9.2 Repair and Service

There are no user-serviceable parts in this unit except for the fuse which is accessible externally. If the unit is faulty, return it to Ossila Limited. Our service department will promptly quote to repair any faults that occur outside the warranty period.

9.3 Storage Conditions

The UV Ozone Cleaner should be kept in dry conditions; away from direct sources of heat or sunlight, and in such a manner as to preserve the working life of the instrument.

10. Troubleshooting

Problem	Possible cause	Action
No power / display	a.) The power switch on the unit is in the OFF position	a.) Check the connection and ensure the power is turned ON
	b.) The power supply may not be connected properly	b.) Ensure the unit is firmly plugged in to the power supply, and the plug is firmly connected to both the adapter and the working power socket
	c.) The fuse on the rear panel has blown	c.) Ensure the unit is unplugged. Check the fuse on the rear panel. If it has
	d.) Fault on circuit board	

Problem	Possible cause	Action
		<p>blown, replace with a suitably rated 1A slow blow fuse</p> <p>d.) If all the above causes have been considered, there may be a fault on the board. Please contact Ossila for information</p>
Power but timer does not operate	a.) The tray door has not been closed properly 'TRAY OPEN' will display	a.) Ensure the tray door is fully closed. The drawer should hold firmly in position when this is the case.
Continuous buzzer	a.) Error in temperature reading UV Ozone Cleaner temperature is extremely high	a.) Check the temperature reading by entering the settings mode (referred to Section 8.4). If the temperature is extremely high, turn the unit OFF and allow sufficient time for it to cool down