

SOL COUNT

Automated Cell Counter



Semiconductors for Lens-Free Sensors User Manual



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Table of Contents

3	01 Before use <ul style="list-style-type: none">1.1. Waterproofing and dustproofing1.2. Battery heating while in use or charging
4	02 Product information <ul style="list-style-type: none">2.1. Product overview2.2. Product Feature2.3. Upon receiving the product package2.4. Standard Product Components2.5. Device exterior components
5	03 Getting started <ul style="list-style-type: none">3.1. Operating environment3.2. Turning on the device3.3. Opening the Pop-up Menu3.4. Connecting to the Internet3.5. Setting Local Time3.6. Setting up Log in/Log out3.7. Checking Product Information
7	04 Cell viability test and cell counting <ul style="list-style-type: none">4.1. Preparation4.2. Loading the cartridge4.3. Counting cells4.4. The count procedure4.5. Next steps
9	05 Results <ul style="list-style-type: none">5.1. View results screen5.2. Comparison of live and dead cells
9	06 Saving results <ul style="list-style-type: none">6.1. Saving count results6.2. Report File
10	07 Software Update
11	08 Product Specifications
	09 Warranty
	10 Maintenance
12	11 Troubleshooting
13	12 Warning and Safety Cautions
14	13 Safety Standards <ul style="list-style-type: none">13.1. the United States Standards13.2. European Standards13.3. Korean Standards13.4. UK Standards
	14 Technical Support Information
	15 Ordering Information

01

Before Use

- Problems or issues related to the use of third-party cartridges are not covered by the warranty.
- To protect the screen during production and distribution, screen protective films are affixed, but might not be attached depending on the region or distributor. Damage to the protective film is not covered by the warranty.
- After a long period of unuse, press and hold the power button for at least 3 seconds, until the “Power off” pop-up window appears, then press the “OK” button to power off the device.

1.1. Waterproofing and dustproofing

- i. This product is not waterproof or dustproof. Vibrations or exposure to liquids, such as brine, ionized water, or alcohol, can cause malfunction.
- ii. If the product’s surface gets wet, use a dry cloth to wipe it, then dry it thoroughly before use.
- iii. Drops or impacts can cause permanent damage to the product.

1.2. Battery heating while in use or charging

- i. **If there is heat while charging the battery**
 - a. If the product heats up, disconnect the charger and press and hold the power button for at least 3 seconds to power off. Let the product cool before attempting to charge it again.
 - b. If the power port behind the product is very hot, it is possible that the connected USB C-type cable is damaged. In that case, replace it with a new USB C-type cable.
- ii. **In case of heating during product usage**
 - a. When the cell counting algorithm is running, battery consumption temporarily increases, and heat may be generated. If the product overheats, turn off the power and contact your distributor.
 - b. Do not place the product in direct sunlight or near items that generate heat, such as stoves or microwave ovens.
 - c. If you are in an area with no Wi-Fi service or the signal is weak, battery consumption might increase, and the product might generate heat.
 - d. If you use a damaged USB C-type cable, the product might generate heat.
 - e. If the power port behind the product is damaged or there is an extraneous substance (liquid, dust, metal powder, pencil lead, etc.), the product may generate heat. If there is a problem with the power terminal, please contact your local distributor.

02

Product Information

2.1. Product Overview

SOL COUNT Automated Cell Counter is a compact new user-friendly product featuring technology that can automatically count multiple cell types simultaneously. SOL COUNT Automated Cell Counter utilizes lens-free CMOS sensing technology to quickly and accurately measure the total number of cells, including live and dead cells, and easily store and transfer the data. Furthermore, two kinds of cells can be measured at the same time.

Additionally, the SOL COUNT 4-chamber cartridges are highly cost-effective.

2.2. Product Features





The SOL COUNT Automated Cell Counter is an automated cell counter and assay platform that uses free semiconductor biosensors to produce images and obtains results through analysis algorithms.

- Data is easily saved and presented to users through an intuitive user interface.
- Data can be transferred to a PC using the USB drive that is supplied with the device and also available separately.
- Easily load the cells to be analyzed into the cartridge.
- The four chambers of each cartridge can measure different samples simultaneously or perform repeated counting of the same sample.
- A typical cell count takes about 10 seconds..
- Information is provided on cell count and viability.

2.3. Upon receiving the product package

- If the product appears to have been damaged in transit, please contact your distributor.
- Make sure that all parts of the product are included in the package (2.4 Standard Product Components).
- Damage claims must be filed with the package carrier.
- In-transit damage is not covered by the warranty.
- Store the device and cartridge at a normal temperature. (15~25°C)

2.4. Standard Product Components

			
SOL COUNT Automated Cell Counter	SOL COUNT Disposable Cartridge	SOL COUNT C-Type Cable	SOL COUNT USB drive
1 each	1 box (50ea/box)	1 each	1 each

2.5. the Device exterior components



- ① **Touchscreen display:**
a 7-inch capacitive touch screen displays the “User Interface,” through which the cell counting function can be initiated.
- ② **Cartridge tray:**
cartridges can be inserted into the device using this tray.
- ③ **Power button:**
Press and hold the power button for 3 seconds or more to power on/off.
Press the power button for 1 second to turn the screen on/off (power saving mode).
- ④ **HDMI port:**
The HDMI port is used for transmitting uncompressed video data and compressed or uncompressed digital audio data.
- ⑤⑥ **USB port 1:**
Connecting to the USB ports allows you to save the cell count data and images (FAT32 format supported). If needed, you can also plug in a USB mouse .
- ⑦ **Power port:**
A C-type cable can be used to operate or charge the device.
- ⑧ **LAN port:**
A LAN cable can be used to connect the device to the internet.

03 Getting Started

3.1. Operation Environment

- i. This product is not waterproof or dustproof. Install the equipment on a stable and level place that is not exposed to vibration or moisture from third-party equipment.
- ii. Maintain at least 10 cm (4 inches) empty space on each side of the device to ensure adequate ventilation and prevent overheating of the product.
- iii. Set up the device as far away as possible from direct light sources, such as sunlight and indoor lights, which can expose the image sensor to light and affect the image quality. If the image sensor is exposed to direct sunlight or indoor lighting, data analysis may be affected. Install the equipment as far away as possible from such light sources.

3.2. Turning on the Device



- i. Turn on the power by pressing and holding the power button on the side of the product for more than 3 seconds. The logo screen is displayed as the device initializes.
- ii. When the loading screen appears, the device will automatically be initialized and ready to use.

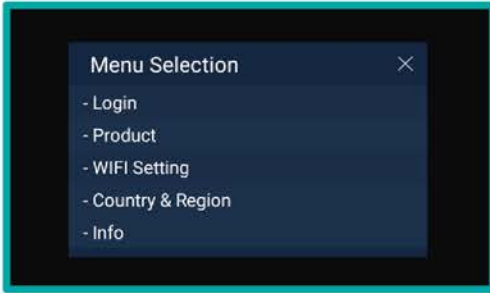
Note

Optimal instrument settings (interpolation) for cell counting are calibrated automatically when the power is turned on. Cartridges and foreign substances in the equipment can cause incorrect settings, so these must be checked for before turning on the power.



- iii. When the product is turned on normally, the “PREVIEW” screen is displayed as pictured below.

3.3. Opening the Pop-up Menu



Click the “☰” menu icon in the upper right of the PREVIEW screen to display the pop-up menu, pictured below.

-Login

Log in or out with the ID/PW made on the SOL website (<http://www.sol.re.kr>) or the SOL COUNT Automated Cell Counter.

-Product

You can view product information and a list of products related to the SOL COUNT Automated Cell Counter.

-Wi-Fi Setting

Go to the setting screen to configure Wi-Fi.

-Country

Set your local time by choosing your country.

-Info

You can update the serial number, S/W version, and S/W related to the product.

3.4. Connecting to the Internet

※ In order to keep the SOL COUNT Automated Cell Counter up to date and ensure optimal performance, an ethernet or Wi-Fi connection is required.

i. Connecting to the Internet via Wi-Fi

- After the product is booted, click the “☰” menu icon in the upper right corner of the PREVIEW screen to display the following screen, which allows you to move to the Wi-Fi setting screen.
- Wi-Fi can be turned on/off by clicking the slide button in the upper right corner. When setting an AP from the list of connectable APs and complete the Wi-Fi connection.



ii. How to connect to the Ethernet

- Connect a LAN cable that supports DHCP servers to the LAN port on the back of the product.

3.5. Setting Local Time



- You can set the local time for your country by selecting the Country menu in the pop-up menu.
- The default setting is “Korean Time.”

3.6. Setting up Log in/Log out



- When the Log in menu is selected in the pop-up menu, you can log in or out with the ID/PW registered on the SOL website (<http://www.sol.re.kr>) or the SOL COUNT Automated Cell Counter, and when the “Sign up” button is selected, you can create an ID/PW by registering as a new member.
- When you log in, you can save the result image of the SOL COUNT Automated Cell Counter in the SOL developer platform by linking with the SOL developer platform (dev.sol.re.kr).

3.7. Checking Product Information



- When you select the Product menu in the pop-up menu, you can see a list of products related to the SOL COUNT Automated Cell Counter.

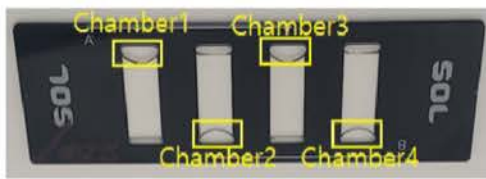
04 Cell Viability Test and Cell Counting

4.1. Preparation

- For measurement of total cell concentration and viability: The measurement range is $1 \times 10^4 - 1 \times 10^7$ cell/mL. The optimal range is $1 \times 10^5 - 5 \times 10^6$ cell/mL. The cell sample is homogeneously mixed.
- For adherent cells, it is recommended to measure them quickly after treatment with trypsin-EDTA for accurate counting results.
- For accurate cell counting, after trypsin treatment, remove the adherent cells from culture wells and measure immediately.
- Take care to avoid bubbles in the sample.
- If your sample is beads, select “Beads” in the type menu.

4.2. Loading the cartridge

- The cell suspension should be well mixed 1:1 with 0.4% trypan blue stain.
- Pipet 10 ul of the mixed sample into the chamber (the sample loading area).



※ **CAUTION** A: Chambers 1 and 3 B: Chambers 2 and 4

※ When the mixed sample is loaded into the SOL cartridge chamber, it is ready to be put into the SOL COUNT cartridge tray.

※ **CAUTION** Each chamber in the SOL COUNT Cartridge has a 10 ul sample capacity. If the sample exceeds this amount, the chamber may overflow.

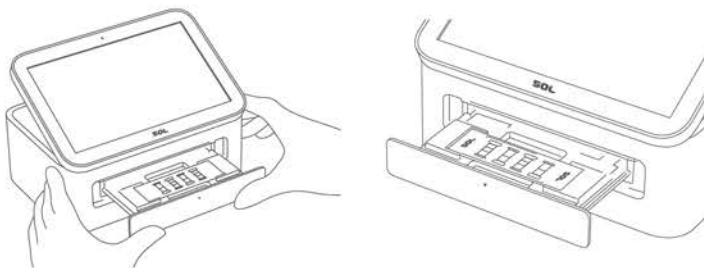
4.3. Counting Cells

- Let the mixed sample settle in the chamber for 15 seconds.

※ **CAUTION**

If the mixed sample is left unattended in the cartridge for more than 3 minutes, edge drying can occur, and the accuracy of the count decreases.

- Gently push the SOL COUNT tray to open the cartridge tray, place the cartridge into the unit, and push the tray back in. The cells of the mixed sample can then be checked on the screen.



- SOL COUNT device activation procedures are complete.

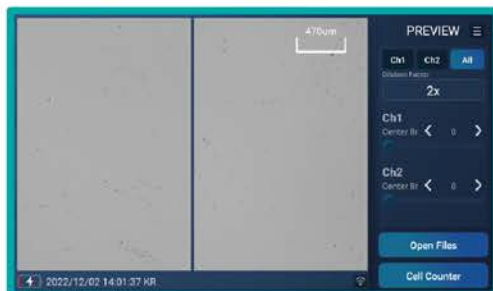
※ **CAUTION**

After checking and saving the results, gently press the cartridge tray to remove the cartridge and wait for the tray to open.

※ **CAUTION**

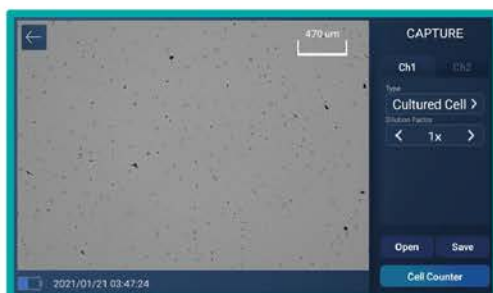
After using the cartridge, dispose of them as biohazardous waste. Do not reuse disposable cartridges.

4.4. The Count Procedure



- Set the channel. If you want to see results on only a single channel or on both channels press "CH1," "CH2", or "All."

- Press the "Capture" button. If you want to view files that have been saved to the USB, press the "Open Files" button.

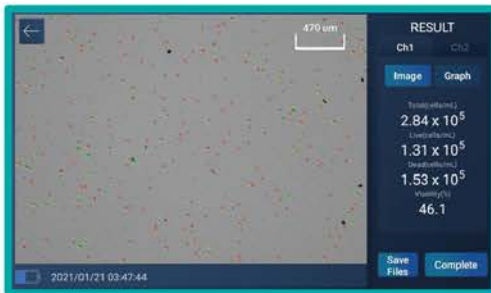


4.5. Next Steps

- To see the viability of live and dead cells in a graphical format, press the "Graph" button.
- To save the result, press the "Save" button.
- To measure a new sample count, press the "←" or "Complete" button.

05 Results

5.1. View results screen

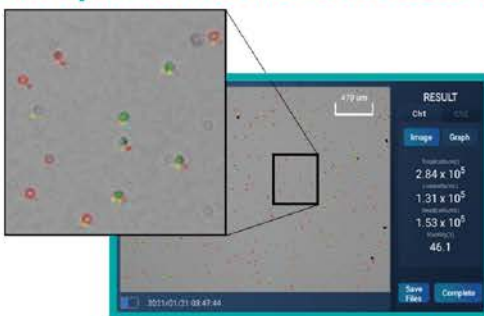


- i. The data analysis results (total cell concentration, live and dead cell concentration, viability %) are displayed on the SOL COUNT screen.

Note

The number displayed on the screen is the result of multiplying by the dilution factor of 2x.

5.2. Comparison of live and dead cells



- i. To enlarge a live or dead cell image, you can zoom in or out by dragging on the screen with two fingers.
 - Click the "Save Files" button to save the results.
 - Press the "←" or "Complete" button to measure a new sample.

5.3. Viewing the graph

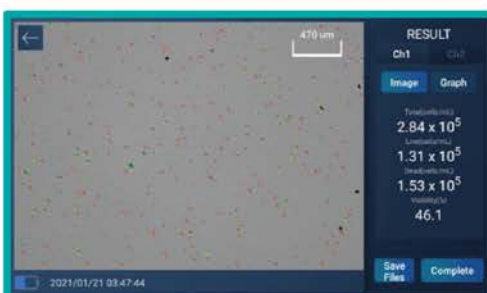


- You can view the distribution of live and dead cells in a graphical format.
- Click the "Save Files" button to save the results.
- Press the "←" or "Complete" button to measure a new sample.

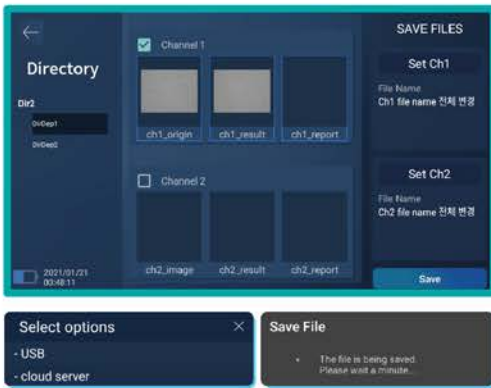
06 Saving results

6.1. Saving count results

- i. SOL COUNT Automated Cell Counter allows you to save your data and images to a USB.
- ii. To save your data, insert a USB drive into an available USB port on the device. There are two USB ports located on the back of the device. The first USB drive connected will be set as the preferred saving location.
- iii. Press the "Save Files" button on the cell counting RESULT screen as shown below to move to the save screen.



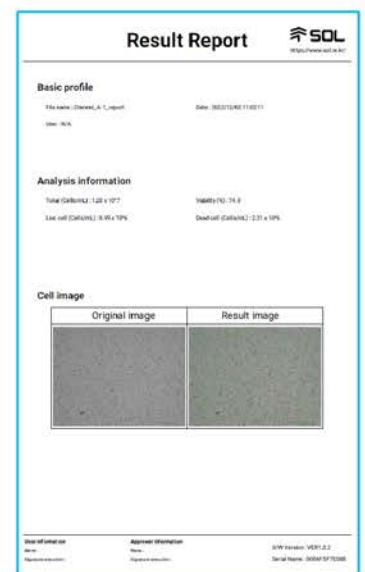
iv. To save the cell count result data, you can choose from the following options, in any combination.



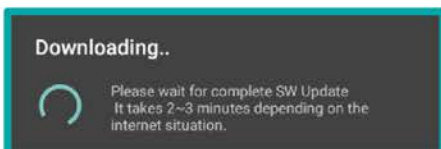
- v. Ch1_2_Origin: This is an image taken through an image sensor, and the image before cell counting is displayed.
- vi. Ch1_2_Result: Image data screen after cell counting
- vii. Ch1_2_Report: Ch1_2_Origin and Ch1_2_Result image data are saved in PDF file format.
- viii. Channel 1 when checking “ffl” in the check box, you can select all the results at once.
- ix. Set Ch1 If you select “Set Ch1”, “Set Ch2” button, you can change the file name.
- x. Press the “Save” button to save the experiment data. In addition, the saved experiment data can be loaded by pressing the “Open files” button. After clicking the “Save” button, you can select a storage method by selecting USB or cloud server.

6.2. Report file

- i. The report file can be saved in PDF or Excel file formats.
- ii. The image below is an example of a report file.
 - Basic profile: The file name, date, and username, which are the basic information of the sample, are included.
 - Analysis information: Analysis results, including total, live, and dead cell information and converted viability data, are included.
 - Cell image: ‘ch1,2_Origin’ and ‘ch1,2_Result’ images are provided.
 - The bottom part of the report contains the username and basic device information (software version, serial number, name).
- iv. The image below is an example of the Excel report file.
 - a. File name
 - b. Date: The date information of the saved file
 - c. Time: Time information of the saved file
 - d. Total (Cells/mL): The total cell concentration information
 - e. Viability (%): Cell Viability percentage information
 - f. Live (Cells/mL): Live cell concentration information
 - g. Dead (Cells/mL): The concentration of dead cells
 - h. Sheet name: File name, date and time



07 Software Update



- i. When a new software version is released, the SOL COUNT Automated Cell Counter displays the software update pop-up as shown below after booting is complete.

Note

This can be done when an Internet (Wi-Fi or Ethernet) connection is established. Please refer to '3.4 Connecting to the Internet' for Wi-Fi settings and instructions.

- ii. Select the 'Info' menu in the pop-up menu and press the “S/W Update” button to initiate the update.
- iii. A software update is available when connected to the Internet (Wi-Fi or Ethernet) and the following message is displayed.
- iv. Software updates enable access to improved SOL COUNT Automated Cell Counter functions.
- v. For more detailed usage and demonstration videos, please visit the SOL Inc website. (www.sol.re.kr)

08 Product Specifications

① Product



Dimensions (mm)	180 (W) x 120 (L) x 78 (H)
Weight	820g
LCD Standard	7" 1024 x 600 HD IPS
Image Sensor	1/4" 8M Pixel x 2
LED Wavelength	465-485 nm
Battery	4400mAh (2200mA x 2), 3.7V
Operation Temperature	10 °C - 50 °C
Relative Humidity	0% - 95%

② Wireless LAN



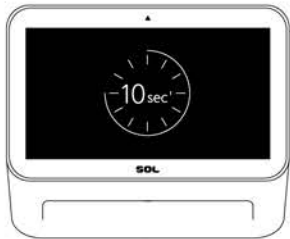
Radio Wave Range	2412-2472 MHz (802.11b/g/n)
Transmit Output	2.5 mW/MHz

③ Ports and Buttons



Video Output Port	HDMI x 1
USB Port (OTG)	USB-A x 2
Charging Port	USB C-Type x 1
Key Button	Power Button x 1
Output Port	Ethernet x 1

④ Performance Specifications



Export Formats	PDF, JPG, Excel
Cell Size Range	5-50 μm
Measuring Volume	20 μl /test (2-chamber)
Cell Volume	10 μl
Measuring Range	1 X 10 ⁴ - 2 X 10 ⁷ cells/ml
Optimum Measuring Range	0.5 X 10 ⁶ - 1 X 10 ⁶ cells/ml
Data Export	USB Drive
Cell Counting Time	≤10seconds/chamber
Light source	LED
Sensor	8M B/W CMOS image sensor
Voltage	5V, 23A USB C-Type Charging
Dimensions	180 (W) X 120 (L) X 78 (H) mm
Display	7" LCD touch screen

09 Warranty

During the one-year warranty period, if a defect occurs in the SOL COUNT Automated Cell Counter, SOL Inc repairs or replaces the defective part at its discretion. However, the following defects are specifically excluded.

- 1) When the warranty period has expired.
- 2) In case of failure due to careless handling or incorrect repair or modification.
- 3) In case of malfunction due to incorrect use of electric capacity.
- 4) In case of breakdown or damage due to external impact or dropping.
- 5) In the event of a breakdown due to repair by a service engineer not designated by SOL Inc.
- 6) In case of failure due to the use of consumables or repair materials not specified by SOL Inc.
- 7) When the exterior is damaged or deformed by organic solvents such as thinners or benzene.
- 8) In case of failure due to failure to observe the "Precaution" portion of the user manual.
- 9) In case of failure due to external causes other than defects of the product itself.
- 10) In case of failure due to natural disasters (lightning, fire, earthquake, wind and water, etc.).
- 11) When consumable parts have reached the end of their service life (battery, cartridge, etc.).
- 12) In the case of a simple inspection request without a product defect or failure.
- 13) When a product was purchased overseas, or a breakdown occurred while using it oversea

※ For inquiries or requests for service, please contact info@sol.re.kr or your local distributor.

10 Maintenance

- 1) Clean the product periodically to ensure high performance and prevent contamination.
- 2) When cleaning the product, always turn off the power and disconnect the power cable.
- 3) Be careful not to let the cleaning liquid get into the interface ports, such as the power button and charging port.
- 4) Wiping the touch screen with an abrasive cleaning solution or a material with a rough surface is not recommended, as it may scratch the touch screen.
- 5) Wipe the sensor in the cartridge tray with a lint-free cotton swab moistened with 70% alcohol. Other cleaning methods are not recommended, and the warranty will be void.
- 6) When cleaning the sensor part, do not apply too much force. Wipe it with a rubbing motion. Wiping with strong force can scratch the sensor. Gloss affects device performance.
- 7) When using the product for the first time after purchase or after a long storage period, charge the battery sufficiently before use.
- 8) If the product is connected to the Internet, the battery will drain quickly. Always charge the battery sufficiently before use to prevent the power from turning off during data transfer.

11 Troubleshooting

Problem 01	Possible Cause	Possible solutions
Inaccurate Cell Count	Variable counts of the same sample cells	<ul style="list-style-type: none"> ▪ If you are pipetting different samples from the same cell sample, variability in cell counts could be due to pipetting or mixing. ▪ Pipet the cell sample and trypan blue mixture up and down several times to make sure it is well mixed. ▪ If you are counting replicates of the same cartridge, Make sure that you do not shake or agitate the cartridge between counts. ▪ If the sample is left for more than 3 minutes after injection, cell counting may become inaccurate because it dries from the end of the chamber. Therefore, wait 30 seconds after sample injection and measure after the cells are stably positioned in the chamber.
	Sample preparation of high percentage of dead cells or live cells counted as dead	<ul style="list-style-type: none"> ▪ When preparing the sample, make sure that the 0.4% trypan blue staining reagent is diluted to exactly 1:1.
	Clumped cells	<ul style="list-style-type: none"> ▪ Clumped cells are more likely to be aggregated if cell counting is delayed after trypsin-EDTA treatment/trypsinization. Therefore, it is recommended to measure without delay after sufficient trypsinization time. ▪ Gently but thoroughly pipette your cell suspension to break up aggregates prior to counting.
	Cell concentration is too low or high	<ul style="list-style-type: none"> ▪ Cell concentrations of 1×10^4 - 1×10^7 cells/mL are optimal for counting. Dilute or concentrate cell suspensions accordingly.
	Improper slide insertion	<ul style="list-style-type: none"> ▪ Make sure that the cartridge has been inserted into the device.
	Improper sample loading	<ul style="list-style-type: none"> ▪ Do not over or under fill the cartridge chambers. Carefully load the chambers with 10 uL of cell suspension
	Damaged or contaminated cartridge	<ul style="list-style-type: none"> ▪ Use a new SOL COUNT cartridge. Wear gloves and handle by the edges to avoid smudging and contamination.
	Incorrect dilution factor	<ul style="list-style-type: none"> ▪ Adjust the dilution factor before pushing the "Cell count" button.
Problem 02	Possible Cause	Possible solutions
Data transfer and saving	Too many files in the USB drive	<ul style="list-style-type: none"> ▪ Delete or transfer files.
	USB drive not recognized by the device	<ul style="list-style-type: none"> ▪ Try another correctly formatted USB drive. ▪ After checking the battery, if it is low, connect the power.

Problem 03

Error while updating software

Unable to update the SOL COUNT Automated Cell Counter software

- Check the Wi-Fi or Internet connection status.

Incompatible USB drive

- Some USBs are undetectable or incompatible. Use the USB supplied with the device or use a USB 2.0.
-

Problem 04

No cells are visible on the screen

LED intensity is not set

- Increase the “LED ch” intensity number to brighten the screen and check if the cells are visible.

Camera operation error

- The screen becomes brighter by opening the cartridge tray and darker by closing it. If there is no change in screen brightness after performing this operation 3 times, turn the switch off and then on.
-

Problem 05

Image data cannot be saved after cell counting

Insufficient power charge

- Stable data storage is possible only when the power charge exceeds 70%.
- If there are many samples to be measured, it is recommended to connect the power cable before measuring.

Errors in the storage setup process

- Check whether the USB is plugged in, the folder to be saved is set, and the image to be saved is properly selected.
-

Problem 06

Insufficient reliability of cell viability and counting results

Incorrect setting of the dilution factor

- When the trypan blue staining is performed at 1:1, make sure to set the dilution factor to 2x before pressing the cell counting button.
-

12 Warnings and Safety Cautions

※ To protect the safety of users and to prevent property damage and inconvenience caused by accidents, please read the following section carefully before using the product and use the product correctly.

Note

Violation of warnings may lead to death or serious injury.

- 1) Do not install, disassemble, or modify the product at your discretion.
 - If installed, disassembled, or modified arbitrarily, problems such as product failure, explosion, fire and electric shock may occur, and the user would be responsible.
- 2) Do not drop the product into water or use or store it in a humid place.
 - Since this product is not waterproof, there is a risk of fire or electric shock when exposed to moisture or water.
- 3) Avoid storing or using the product in places with the following conditions: direct sunlight, dust, splashing water, high humidity, heating appliances (stove, microwave, etc.) and inflammable substances (gasoline, thinner, flammable spray, etc.)
 - Such conditions may cause fire or electric shock, and product damage or breakdown may occur.
 - This device is sensitive to static electricity so be careful when using it.
- 4) Do not put metal objects, such as hairpins or metal fixtures, or inflammable objects, such as paper or matches into the product.
 - Such objects may cause fire or electric shock, and product damage or breakdown may occur.
- 5) The proper operating temperature of this product is 10 °C ~ 50 °C.
 - If the temperature is higher or lower than the proper temperature, the performance of the product may degrade, or problems such as hardware damage may occur.
- 6) Do not touch the product or power plug with wet hands.
 - It may cause electric shock.
- 7) If the product emits smoke or a strange smell, stop using it, turn off the product by pressing the power button, and disconnect the power plug from the outlet.
 - Continued use may cause fire or electric shock.
- 8) If a foreign substance enters the product, turn off the power by pressing the power button on the main body, remove the power plug from the outlet, and contact the service center.
 - A fire or electric shock may occur due to foreign substances inside the product.

13 Safety Standards

13.1. United States Standards



FCC mark is a voluntary mark employed on electronic products manufactured or sold in the United States which indicates that the electromagnetic radiation from the device is below the limits specified by the Federal Communications Commission and the manufacturer has followed all requirements.



Products that pass the UL product performance test are permitted to use the UL certification mark. It evaluates a random sample among the products to be tested and gives permission to display a certification mark indicating the product passes safety standards. UL plays a role in informing the inspection history of materials or products by managing the list of issued certification marks and providing them to users.

13.2 European Standards



The CE mark indicates that this device conforms to all applicable European Community provisions for which this marking is required. Users must be aware of and follow the conditions described in this manual for operating the device. The protection provided by the device may be impaired if the device is used in a manner not specified by Sol Inc.

13.3. Korean Standards



The KC certification mark indicates that this device conforms with Korea's product safety requirements for electrical and electronic devices and components for which this marking is required.

13.4. UK Standards



The UK Conformity Assessment Labeling (UKCA) is a UK product label created after Brexit to replace the CE mark. Products to be sold in the United Kingdom (England, Wales and Scotland) will require this marking after 1 January 2021.

14 Technical Support Information

For product information and technical support, including manuals and FAQs, please contact us by telephone or email.

SOL Inc

Address BK Tower 2F, 28, Beobwon-ro 11-gil, Songpa-gu, Seoul 05836, Republic of Korea

Tel +82-2-6949-2960

Fax +82-2-6949-2965

Email info@sol.re.kr

URL www.sol.re.kr

15 Ordering Information

Product Code	Product Name	Composition/Unit
SOL COU 1	SOL COUNT	SOL COUNT Automated Cell Counter device 1 ea., SOL Cartridge 1 box, C-type cable, USB drive
SOL COU 2	SOL Cartridge 1 box	50 ea./1 box



BK Tower 2F, 28 Beobwon-ro, 11-gil, Songpa-gu, Seoul 05836, South Korea
Tel | +82-2-6949-2960 Fax | +82-2-6949-2965 URL | www.sol.re.kr