
SOL COUNT

Automated Cell Counter

Semiconductor-Based Lens-Free Sensors User Manual

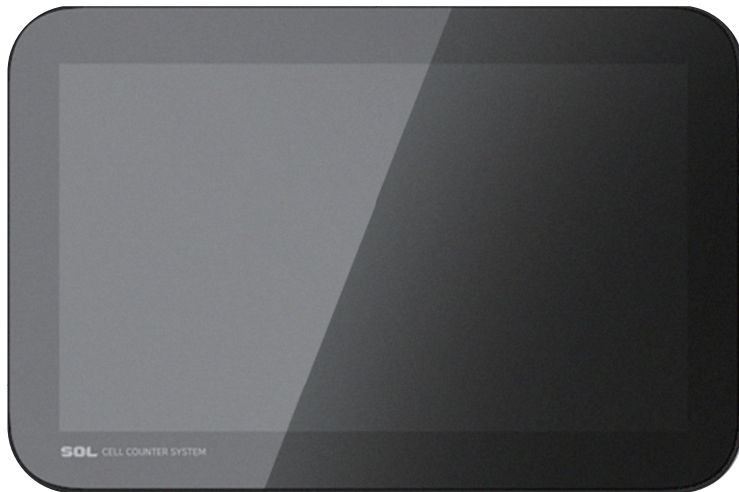


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1. Before Use

- 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.
- Press the power button for less than 1 second to power off when not in use.

1.1. Waterproofing and dustproofing

1. Waterproof and dustproof functions are not supported by this product. Do not submerge in liquids, such as brine, ionized water, or water with alcohol.
2. If the product is submerged in water, use a dry cloth to wipe it, then dry it thoroughly before use.
3. Avoid drops and impacts to the product to decrease the risk of damage.

1.2. Battery heating while in use or charging

1. **If there is heat while charging the battery**
 - The SOL COUNT Automated Cell Counter and charger might heat up during charging. This is normal, and the life and function of the product are unaffected.
 - 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.
 - 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.

2. In case of heating during product usage

- When the cell counting algorithm is running, battery consumption temporarily increases, and heat may be generated. Press and hold the power button for more than 3 seconds to power off.
- Do not place the product in direct sunlight or near items that generate heat, such as a hot stove.
- 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.
- If you use a damaged USB C-type cable, the product might generate heat.
- 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

2. Product Information

2.1. Product Overview

SOL COUNT Automated Cell Counter is a new 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. The disposable four-chamber cartridge makes it easy to use and more cost-effective than any competitor. In addition, SOL COUNT Automated Cell Counter is a compact and portable device.

2.3 Product Features

The SOL COUNT Automated Cell Counter is a fully automated cell counter and assay platform that uses semiconductors for lens-free image production and image analysis algorithms to analyze trypan blue-stained cells in suspension.

- The user interface is intuitive, and data can be easily saved and used to generate a report.
- 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 counted into the cartridge.
- Four enclosed sample chambers are included in each cartridge, enabling you to measure four different samples or perform replicate counting of the same sample.
- A typical cell count takes 10 seconds per sample and is compatible with a wide variety of eukaryotic (animal) cells.
- Information is provided on cell count, viability.

2.3.
Upon
receiving
the product
package

- Check the product package for any damage incurred while in transit.
- Make sure that all parts of the product package are included with the product (list above).
- 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
Product
Configuration



SOL COUNT
Automated Cell Counter
1 each



SOL COUNT Disposable
Cartridge (50ea/box)
1 box



SOL COUNT C-Type Cable
1 each



SOL COUNT USB drive
1 each

2.5.

Device Exterior



- ① **Touchscreen display:** The 7-inch capacitive touchscreen display displays cell count data, has function buttons, and is the main user interface of the SOL COUNT Automated Cell Counter.
- ② **Cartridge tray:** The SOL COUNT cartridge containing the sample is inserted into the device using this tray.
- ③ **Power button:** The power button is the main power switch.



- ④ **HDMI port:** The HDMI port is used for transmitting uncompressed video data and compressed or uncompressed digital audio data.
- ⑤ **USB port 1:** The USB ports allow you to transfer and save the cell count data and image to an external device for record keeping and printing. You can use the USB drive supplied with the device or any other standard, FAT 32-formatted USB drive for data transfer. If needed, you can plug in a USB mouse into the rear USB port for device control.
- ⑥ **USB port 2:** The USB ports allow you to transfer and save the cell count data and image to an external device for record keeping and printing. You can use the USB drive supplied with the device or any other standard, FAT 32-formatted USB drive for data transfer. If needed, you can plug in a USB mouse into the rear USB port for device control.
- ⑦ **Power port:** The power port is used to connect the device to a power source or charge the device using a C-type cable.
- ⑧ **LAN port:** The LAN port is used to connect the device to the internet.

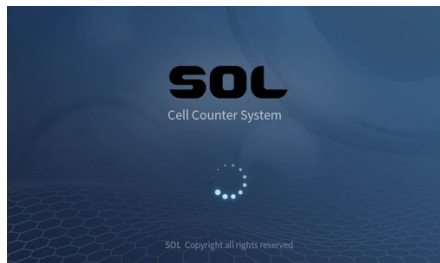
3. Getting Started

3.1. Operation Environment

1. Place the device on a level surface that is free from vibrations caused by other pieces of equipment.
2. Maintain at least 10 cm (4 inches) empty space on each side of the device to ensure adequate ventilation and prevent overheating of electronic components.
3. Set up the device away from direct light sources, such as window, and room light, which can enter the imaging path and affect the image quality.
4. Do not install the device in a high-humidity environment.

3.2. Turning on the Device

1. 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.
2. When you see the loading screen, you can immediately open the cartridge tray and insert a cartridge.

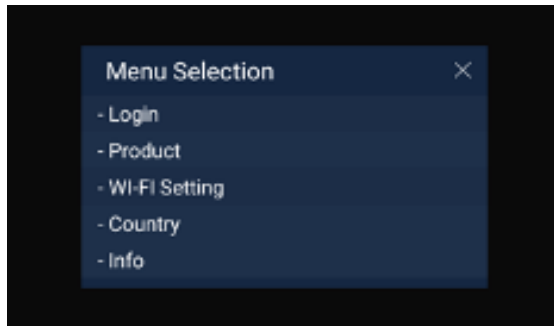


3. When the product is turned on normally, the "PREVIEW" screen is displayed, pictured below.



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.

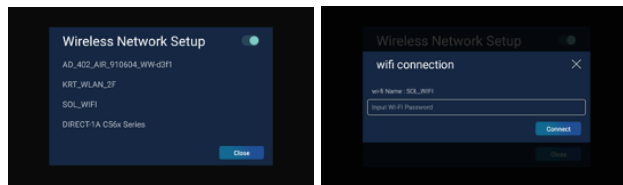
3.4. Connecting to the Internet

In order to continuously update the SOL COUNT Automated Cell Counter to ensure optimal performance, an ethernet or Wi-Fi connection is required.

1. 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.



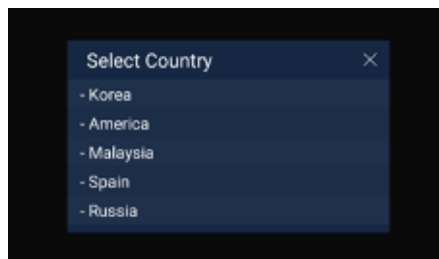
2. How to connect to the Ethernet

- 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.

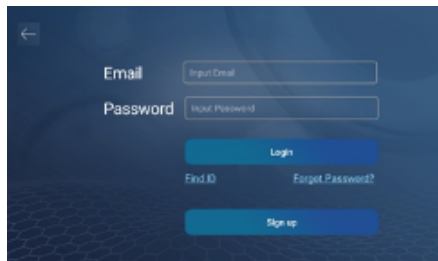
- The default setting is "Korean Time."



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 SOLOUD by linking with the SOLOUD 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.



4. 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.

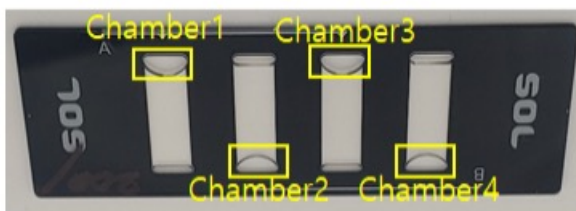
The cell sample is homogeneously mixed.

1. For accurate analysis of cell viability, ensure that cells are counted after trypan blue staining.
2. For accurate cell counting, after trypsin treatment, remove the adherent cells from culture wells and measure immediately.
3. Take care to avoid bubbles in the sample.
4. If your sample is beads, select "Beads" in the type menu.

4.2.

Loading the cartridge

1. The cell suspension is mixed 1:1 with 0.4% trypan blue stain. Mix the sample mixture well.
2. Pipet 10 μ l of the sample into the chamber (the sample loading area).



CAUTION

A: Chambers 1 and 3

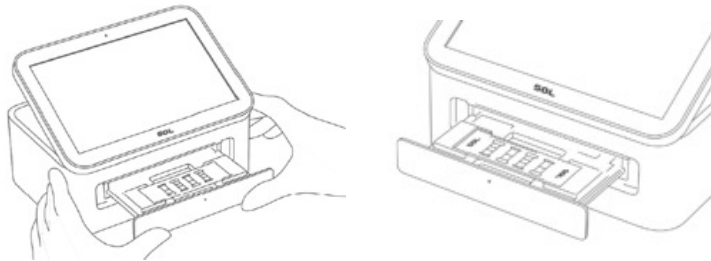
B: Chambers 2 and 4

When the 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

1. Let the sample settle in the chamber for 15 seconds.
CAUTION If the sample is in the cartridge for more than 1 minute, edge drying can occur, and the accuracy of the count decreases.
2. To open the cartridge tray, push the cartridge tray gently into the SOL COUNT device. Then, push the cartridge tray into device again to close. You should then see your loaded sample cell line on the screen.



3. SOL COUNT device is activated correctly.
CAUTION To remove a cartridge from the cartridge tray, push the cartridge tray gently into the SOL COUNT device until it opens.
CAUTION After using the cartridge, dispose of them as biohazardous waste. Do not reuse disposable cartridges.

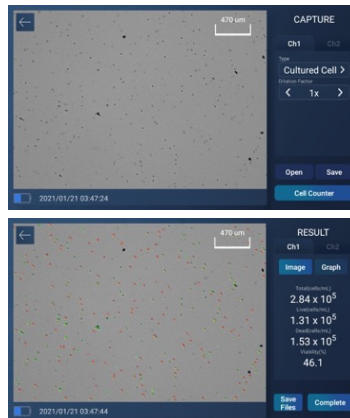
4.4.

The Count Procedure

1. LOAD the SOL COUNT cartridge with your trypan blue stained sample, open the cartridge tray of the device and insert the cartridge into the cartridge tray. Push the cartridge tray until it closes.
2. When the cartridge is inserted, the screen will display the trypan blue-stained cells from the sample.
3. Set the intensity of "LED CH 1" and/or "LED CH 2" (bright field illumination) from 1 to 5.
4. Set the channel. If you want to see results on only a single channel or on both channels press "CH1," "CH2", or "All."



5. Press the "Capture" button. If you want to view files that have been saved to the USB, press the "Open Files" button.
6. To get the cell count result, set the type (cultured cell or beads) and dilution factor. If the sample is without trypan blue staining, set it to 1x.
7. Press the "Cell counter" button after setting the parameters.



4.5.**Next Steps**

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

5. Results

5.1.

View results screen

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

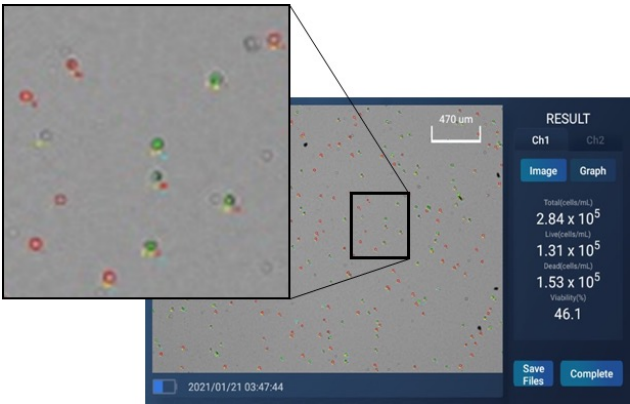


2. When performing a cell count and viability check with a trypan blue-stained sample, the total cell concentration is calculated by multiplying by the dilution factor of 2x.

5.2.

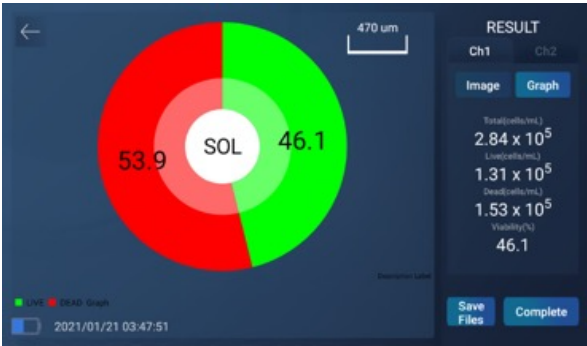
Comparison of live and dead cells

Perform a finger zoom to enlarge the view of the cell image with or without Trypan blue.



5.3.
Viewing the
graph

You can view the distribution of live and dead cells in a graphical format.



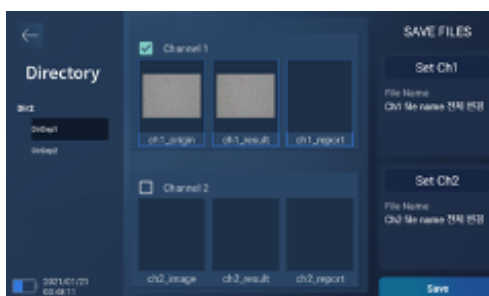
6. Saving results

6.1. Saving count results



1. SOL COUNT Automated Cell Counter allows you to save your data and images using a USB flash drive.
2. To save your data, insert the SOL COUNT Automated Cell Counter USB drive (or equivalent) 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.
3. Press the "Save Files" button on the cell counting RESULT screen as shown below to move to the save screen.

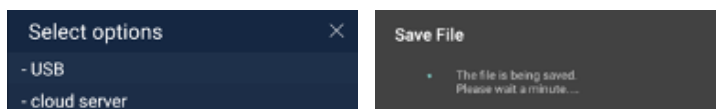


4. To save the cell count result data, you can choose from the following options, in any combination as displayed in the screen below.



5. Ch1_2-Origin: This is an image taken through an image sensor, and the image before cell counting is displayed.

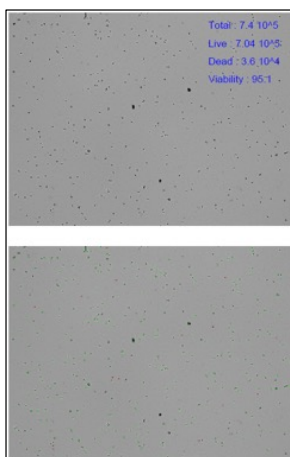
6. Ch1_2_Result: Image data screen after cell counting
7. Ch1_2_Report: Origin and result image data are saved in PDF file format.
8.  Channel 1 when checking "v" in the check box, you can designate the results for each channel at once.
9.  If you select "Set Ch1", "Set Ch2" button, you can change the file name for the result file.
10. Press the "Save" button to save the experiment data. In addition, the saved experiment data can be loaded 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

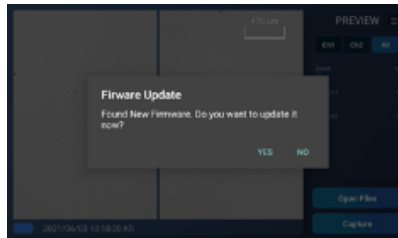
1. The report file is saved in PDF file format. An example is pictured below.



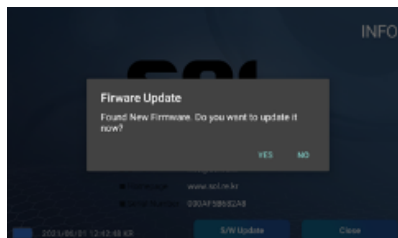
2. The top section of the report contains an origin image along with the viability percentage and the number of total, live, and dead cells.
3. At the bottom of the report, a result image contains the circle from the cell counter algorithm developed by SOL Inc.

7. Software Update

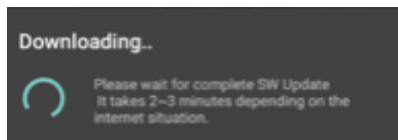
1. When a new software version is released, the SOL COUNT Automated Cell Counter displays the software update pop-up as shown below after booting is complete.



2. Select the Info menu in the pop-up menu and press the “S/W Update” button to update.



3. A software update is available when connected to the Internet (Wi-Fi or Ethernet) and the following message is displayed.



4. Software updates enable access to improved SOL COUNT Automated Cell Counter functions.
5. For more detailed usage and demonstration videos, please visit the SOL Inc website.
(www.sol.re.kr)

8. Product Specifications

Product	Dimensions (mm)	180 (W) x 120 (L) x 78 (H)
Weight	Weight	1.8 kg
LCD Standard	LCD Standard	7" 1024 x 600 HD IPS
Image Sensor	Image Sensor	1/4" 8M Pixel x 2
LED Wavelength	LED Wavelength	465-485 nm
Battery	Battery	4400mAh (2200mA x 2), 3.7V
Operation Temperature	Operation Temperature	10°C - 50°C
Relative Humidity	Relative Humidity	0%-95%
Wireless LAN	Radio Wave Range	2412-2472 MHz (802.11b/g/n)
Transmit Output	Transmit Output	2.5 mW/MHz
Ports and Buttons	Video Output Port	HDMI x 1
USB Port (OTG)	USB Port (OTG)	USB-A x 2
Charging Port	Charging Port	USB C-Type x 1
Key Button	Key Button	Power Button x 1
Output Port	Output Port	Ethernet x 1
Performance Specifications	Export Formats	PDF, JPG
Cell Size Range	Cell Size Range	5-50 μm
Measuring Volume	Measuring Volume	20 μl /test (2-chamber)
Cell Volume	Cell Volume	10 μl
Measuring Range	Measuring Range	1 X 10 ⁴ - 1 X 10 ⁷ cells/ml
Optimum Measuring Range	Optimum Measuring Range	0.5 X 10 ⁶ - 5 X 10 ⁶ cells/ml
Data Export	Data Export	USB Drive, Cloud server
Cell Counting Time	Cell Counting Time	≤10seconds/chamber
Light source	Light source	LED
Sensor	Sensor	8M B/W CMOS image sensor
Voltage	Voltage	5V, 2A USB C-Type Charging
Dimensions	Dimensions	180 (W) X 120 (L) X 78 (H) mm
Display	Display	7" LCD touch screen

9. 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 elapsed.
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 overseas.

For warranty-related inquiries or requests, 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. Scratching of the sensor reduces 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

First of all, ensure that you have downloaded the latest version of the software via Wi-Fi. You can download the latest version of the software from the SOL COUNT Automated Cell Counter app. Please establish a Wi-Fi connection before downloading.

Problem	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.• It is recommended to measure without delay, since the sample may dry from the edge of the cartridge 1 min after loading the sample.
	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 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.

Problem	Possible Cause	Possible solutions
Inaccurate Cell Count	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 μL 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 Counter" button.
Data transfer and saving	Too many files in the USB drive	Delete or transfer files.
	Improper slide insertion	<ul style="list-style-type: none"> Try another correctly formatted USB drive. After checking the battery, if it is low, connect the power.
Error while updating software	Unable to update the SOL COUNT Automated Cell Counter software	<ul style="list-style-type: none"> Check the Wi-Fi or Internet connection status.
	Incompatible USB drive	<ul style="list-style-type: none"> Some USBs are undetectable or incompatible. Use the USB supplied with the device or use a USB 2.0.

Problem	Possible Cause	Possible solutions
No cells are visible on the screen	LED intensity is not set	<ul style="list-style-type: none"> • Increase the "LED ch" intensity number to brighten the screen and check if the cells are visible.
	Camera operation error	<ul style="list-style-type: none"> • 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.
Image data cannot be saved after cell counting	Insufficient power charge	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Check whether the USB is plugged in, the folder to be saved is set, and the image to be saved is properly selected.
Insufficient reliability of cell viability and counting results	Incorrect setting of the dilution factor	<ul style="list-style-type: none"> • 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.

Warning

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.)

- This device is sensitive to static electricity. Such conditions may cause fire or electric shock, and product damage or breakdown may occur.

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 -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. 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.

13.2. 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.

14. Technical Support Information

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

SOL Inc

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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
SOL COU 3	SOL Cartridge 2 box	50 ea./1 box
SOL COU 4	SOL Cartridge 10 box	50 ea./1 box
SOL COU 5	SOL Cartridge 20 box	50 ea./1 box
SOL COU 6	SOL Cartridge 30 box	50 ea./1 box
SOL COU 7	SOL Cartridge 60 box	50 ea./1 box

SOL COUNT

Automated Cell Counter