

EDDYJET 2

USER'S GUIDE



EDDY JET 2

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V. 1.0

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1. CERTIFICATIONS

CE Declaration of Conformity for Eddy Jet 2 and the IUL's ISO 9001 manufacturer certification can be provided upon request.

Design, Installation, and Operation Qualifications

Design qualification (DQ): A filled form of this qualification is submitted with every manufactured device. The DQ certifies that, after manufacturing, a device complies with required specifications.

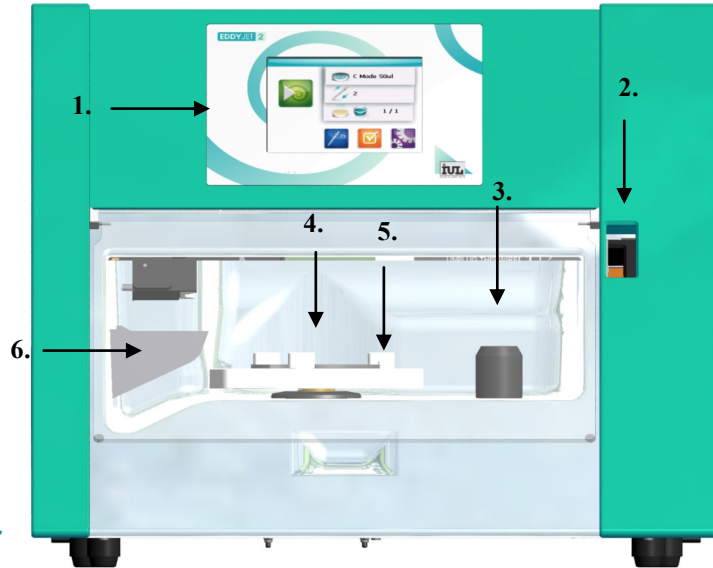
Installation Qualification (IQ): An IQ form is available for Eddy Jet 2, this document shall be issued by the company in charge of the instrument's installation. It will qualify the installation of the device as correctly completed.

Operational Qualification (OQ): An OQ form is available for Eddy Jet 2, this one shall be issued either by the company in charge of the instrument's installation or by a member of the recipient lab. This document will qualify the device as correctly functioning.

2. DEVICE OVERVIEW

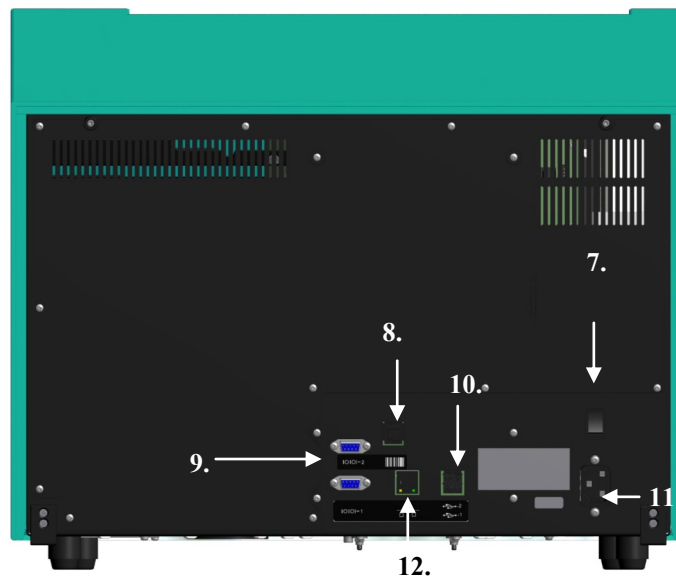
Front End View

- 1. Touchscreen
- 2. Microsyringe cartridge slot
- 3. Sample beaker trough
- 4. Turntable platform
- 5. Petri plate gripper
- 6. Microsyringe waste container



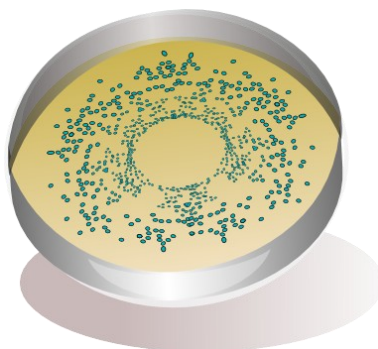
Rear View

- 7. Main Switch
- 8. Barcode reader connection
- 9. 2x RS-232 ports
- 10. 2xUSB ports
- 11. Mains cable connection
- 12. Ethernet connection



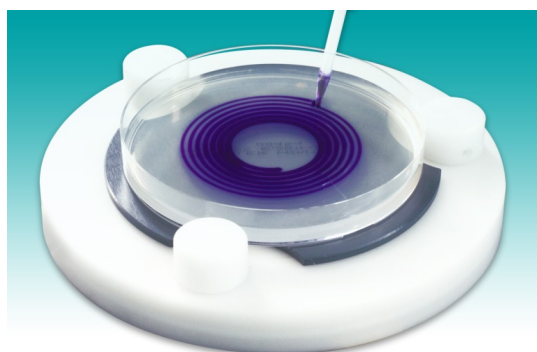
3. SPIRAL PLATING WITH EDDY JET 2

Introduction to Spiral Plating



Spiral plating is a widely accepted microbiological surface plating technique that was created in the 1970s to reduce the amount of agar plates used in surface spreads. Initially, this technique was implemented to test dairy samples¹, however, over the years it has gained a very broad application range and has become one of the most extended techniques when performing viable bacterial/fungal counts. Spiral plating has been awarded full approval by organizations like the AOAC², the ISO³ and the FDA⁴.

Spiral platers rotate an agar plate while pour decreasing amounts of liquid sample onto its surface describing an Archimedean spiral. After incubating the plates, colonies appear distributed along the spiral's track with a radial decrease in concentration. In this fashion, a single 90 mm Petri plate contains across its surface the equivalent to a threefold decimal dilution concentration range.



The core feature of Eddy Jet 2 is the use of high precision disposable micro-syringes. Microsyringes have a capacity of 110 μl and deliver extremely precise volumes of sample to agar surfaces. The angle at which a micro-syringe's tip contacts the agar's surface ensures constant liquid deposition. Despite this process' complexity, Eddy Jet 2 is a very user-friendly device. Self-explanatory icons guide the user through the device's software.



A specific counting grid is implemented to enumerate colonies. Counting always starts in the outermost sectors of the plate and moves inward (see the "Colony Counting" section for a detailed explanation). This method enables to elucidate a sample's bacterial and fungal concentration.

Main Applications of Spiral Plating

Spiral plating's main application, as previously described, is that of performing surface spreads for viable microorganism enumeration where a single spread can have a detection range between 2×10^2 and 4×10^5 CFU/ml. This application is mainly used to assess bacterial concentrations during and after manufacturing or processing of food, drinks, pharmaceuticals and cosmetics. It is also widely implemented during challenge testing (also known as preservative efficacy testing). This method has also been applied to test environmental water samples⁵. Agricultural and environmental industries implement spiral platers in bio-pesticide challenges, frost prevention and leaf studies.

Rare Applications of Spiral Plating

Spiral plating can be used for purposes different to CFU enumeration such as spiral MIC tests (Spiral Gradient Test) and mutagenicity assays (Spiral *Salmonella* Mutagenicity Assay).

Kill curves and susceptibility testing can be performed with the Spiral Gradient Test (SGT). This test evaluates an antibiotic's susceptibility by plating an antibiotic in a decreasing concentration (as spiral plates usually do with sample bacteria). Bacteria strains to be tested are then radially inoculated in the plate. Thus, the point at which the antibiotic inhibits growth can be detected. A specific antibiotic concentration can be associated to it and this enables to elucidate a clear-cut MIC with a software designed for this purpose⁶.

The Spiral *Salmonella* Mutagenicity Assay evaluates the potential mutagenicity of a substance. This test adapts the Ames test to spiral plating. As in the Spiral Gradient Test, the spiral plater is used to dispense decreasing amounts of sample across the agar plate's surface generating a concentration gradient. Mutation induction rates are evaluated by quantifying the amount of prototrophic revertants (His^+) from an inoculated strain of Histidine auxotrophic (His^-) bacteria. Revertant His^+ levels that lie above basal reversion levels account for mutated bacteria^{7,8}. A specific software must be also used for this test⁷.

Bibliography

1. C.B. Donnelly, G.E. Gilchrist, J.T. Peeler and J.E. Campbell, Spiral plate method for examination of raw and Pasteurized Milk, *Ap. And Env. Micr.* 1 (1976) 21-27.
2. AOAC Method 977.27
3. ISO 7218: 2007, Microbiology of food and animal feeding stuffs. General Requirements and Guidance for Microbiological Examinations.
4. L. Maturin and J.T. Peeler, Bacteriological Analytical Manual Chapter 3. Aerobic Plate Count. FDA (2001)
5. Wada M., Statistical study of the optimal conditions of the spiral plating method for counting bacterial numbers in river water. *Nihon Eiseigaku Zasshi.* 47:4 (1992) 798-810.
6. J.H. Paton, H.A. Holt and M.J. Bywater, Measurement of MIC's of Antibacterial Agents by Spiral Gradient Endpoint Compared With Conventional Dilution Method. *Int. J. Clin. Chemother.* 3 (1990) 31-38.

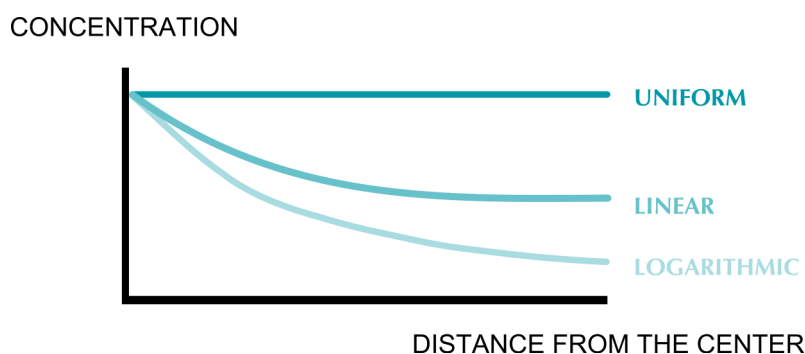
7. N.L. Couse and J.W. King, Use of the Spiral Plater With the Salmonella for Chemical Mutagens, Environ. Mutagen. 2 (1980) 307-308.

8. S L.D. Claxton and V.S. Houk, Methods for the spiral *Salmonella* assay including specialized applications, Mutat. Res. 488 (2001) 241-257.

4. TYPES OF SPIRAL DISTRIBUTIONS

Eddy Jet 2 can perform 22 spiral distributions (34 distributions, if counting those for 150 mm plates). Each type corresponds to a different pattern in liquid sample spreading across the spiral. Several types of distributions exist: logarithmic, linear, and uniform. As previously explained, the purpose of spiral plating is to create areas with different sample concentrations in a single plate. This is achieved by pouring different volumes of sample across the spiral. Note that the latter isn't true for uniform distributions where sample concentrations stay constant across the spiral. Variations in total volume, partial volumes and rotation speed as well as in plate size all account for each of the 34 spiral distributions that are available.

Note: distributions are also referred to as (deposition) modes and (types of) spiral distributions.



Logarithmic Distributions

In logarithmic modes, volumes poured across each section in the spiral decrease logarithmically providing a dramatic decrease in sample concentration along the different sections of the spiral. Logarithmic modes are by far the most widely used in spiral plating in order to perform viable bacterial/fungal counts.

Linear and Proportional Distributions

Linear/Proportional distributions create hyperbolic concentration gradients that are more moderate than those in exponential modes. During a linear distribution, the flow of dispensed samples into agar plates doesn't vary, meanwhile, as the stylus heads towards the outer parts of the spiral, the area over which the sample is being dispensed increases generating a hyperbolic concentration gradient.



Uniform Distributions

In uniform modes, the volume of liquid poured in different segments of the spiral doesn't vary at all, sample concentrations remain constant regardless of their position in the spiral. This distribution is designed to perform the deposition of tested microorganisms in the salmonella mutagenicity spiral assay. This assay is a variant of the AMES test, see the "Introduction to Spiral Plating" section for a description of this assay.

5. TECHNICAL SPECIFICATIONS

Reproducibility:	> 99%
Time for a full cycle:	35 s
Spiral modes :	22 spiral modes (34 including 150 mm modes)
Minimum step volume:	< 10 nl
Maximum pipetted volume:	100 µl
Syringe material:	Polypropylene
Plunger material:	Polyethylene H.D.
Volume Validation:	Programmed in 6 regions
Touch screen:	5.71 in
Operating system:	Windows Embedded CE 6.0 R3
External balance connection:	Serial RS232 DB9
Printer connection:	Serial RS232 DB9
Barcode reader connection:	IUL Barcode Reader Connection
Connection for updates:	Ethernet / USB Memory
Additional connections for peripherals:	2 USB Host ports
Dimensions: (WxHxD):	51.5 x 42 x 50 cm / 20.3 x 16.5 x 19.7 in
Weight:	20 Kg / 44 lb.
Motion control:	3 Microcontroller-regulated stepper motors
Operation Temperature	18-35°C

6. INSTALLING AND STARTING UP

Make sure that the original package contains the following undamaged items:

- Eddy Jet 2 main unit
- Power cord (CAT. 90004017).
- Transparent and black counting grids (CAT.9000625).
- Laminated volume table for 10 cm Petri dishes (CAT. 90001724).
- Crystal Violet Dye (CAT. 90001725).
- A turntable plate for 10 cm Petri plates (already installed).
- 4 microsyringe cartridge boxes (containing a total of 1000 microsyringes, CAT. 90001780).
- 10 sampling beaker boxes (containing a total of 1000 sampling beakers, CAT. 90001790).
- Waste container for used microsyringes (already installed).
- Holder for sample beaker box (CAT. 90001949).
- Holder for microsyringe box (CAT. 90001950).
- Sample beaker holder (CAT. 90001974).

Emplacement

The instrument must be placed on top of a solid, vibration free surface. It is important to recall Eddy Jet 2 is a fragile precision instrument that is made out of moving parts.

Turning the Device On

The power cord must be connected to the mains connection. Next, the main switch, located in the bottom left hand side of the device's rear end, must be turned on.



While the main menu loads, a house icon will appear onscreen. Once the main menu has loaded, any of the operating parameters may be changed (see the “Programming a Spread” section, for further information on parameters and how to modify them) or else a spread can be performed right away (see the “Executing a Spread” section).

7. PROGRAMMING SPREADS

Spread Settings Overview

Programming of a distribution involves defining several parameters:

- A. **Sample repetition:** Establishing the amount of spreads a single microsyringe is to perform (with the same sample).
- B. **Spiral distribution selection:** Eddy Jet 2 has 34 different spiral distribution modes (22 for 100mm dishes and 12 for 150 mm dishes). Each mode accounts for a different spiral. Volumes poured across each spiral vary for each mode (see Appendixes AI and A III). See the “Spiral Distributions” section for more detailed information on each type of distribution.
- C. **Air purge cycles:** In order remove air bubbles that might be taken in when sample liquid is driven into a microsyringe, purge cycles are implemented. IUL recommends setting 2 purge cycles for normal aqueous samples. However, if at any point considerable bubbles are detected inside microsyringes, this parameter is to be increased.
- D. **Feeding mode:** Samples can be fed automatically (placing sample beakers in the beaker trough) or manually (the operator will hold the sample container while a microsyringe intakes the sample).
- E. **Identification mode:** Two ID modes exist: default identification and controlled identification. Default identification will give increasing numbers to each of the plates that is processed. When controlled identification is activated plate ID numbers will be introduced manually by typing them in with a keyboard or with a barcode reader. The “External Connections” section must be reviewed for a detailed explanation on how to connect these peripherals.

Default Settings

Sample repetition:	None
Spiral distribution:	E 50 Mode
Air purge cycles:	2
Feeding mode:	Cups
Identification mode:	Automatic

The Device's Main Menu Allows to Overview Some Spread Settings

The main menu displays some of the settings of the spread to be performed: several icons account for different settings.



The spiral plate icon stands next to the spiral distribution.



The purging microsyringe icon stands next to the amount of purge cycles.



The Petri plate diameter (100 or 150 mm) will be displayed above a Petri plate icon.



The feeding mode icons will indicate whether automatic feeding (sample beaker icon) or manual feeding is activated (test tube icon).

1 / 2

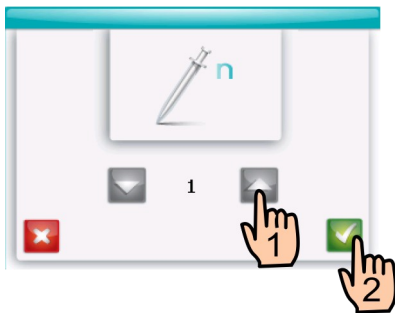
Since multiple spreads can be performed successively, a rational number indicates which serially programmed spread is about to be performed. "1/2" would indicate the first out of two successive spreads is going to be performed

Starting a Program



To get started programming, the blue microsyringe button in the device's main menu must be pressed.

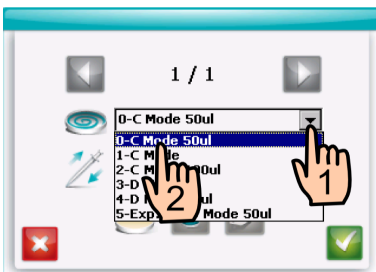
A. Sample Repetition



1. The amount of sample repetitions is to be chosen by pressing the up and down arrow buttons.
2. The green checkmark button must be pressed to save the sample repetition number. The general spread settings menu will be then accessed.

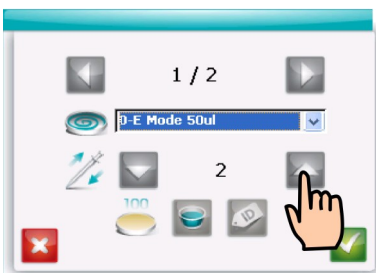
B. Choosing a Spiral Mode

Once in the general spread settings menu, the spiral distribution or mode to be used must be selected. There are 34 spread modes, the volumes poured in each of these are specified in Appendixes A I and AIII.



1. The drop down list is to be opened in order to display the available distributions.
2. The desired distribution must be pressed on in order to select it.

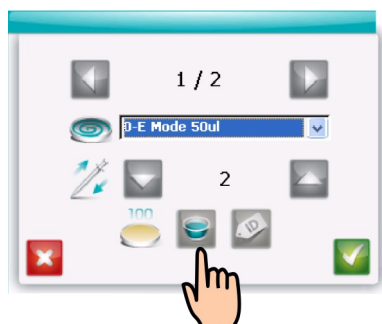
C. Purge Cycles




- The up and down arrows shall be pressed to set the amount of purge cycles.

D. Feeding Mode:

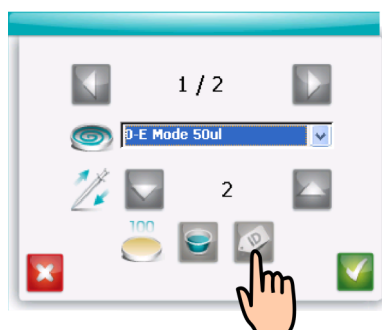
Default settings will always include automatic sample feeding.




-  If manual sample feeding is to be activated, the beaker button must be pressed, a test tube will take its place signaling manual feeding has been activated.

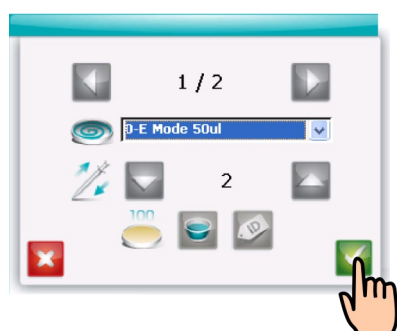
E. Identification Mode:


Inoculated plates and samples are numbered increasingly by default. Whenever operators need to control plate and sample ID numbers, controlled identification needs to be activated. When controlled plate ID is activated, identification numbers are inserted according to inputs from a barcode reader (CAT 90005701) or a keyboard (see the “External Connections” section for more information on how to connect these).



-  The ID label button must be pressed to activate controlled identification. Once it's pressed, It will color up indicating controlled plate identification has been activated.

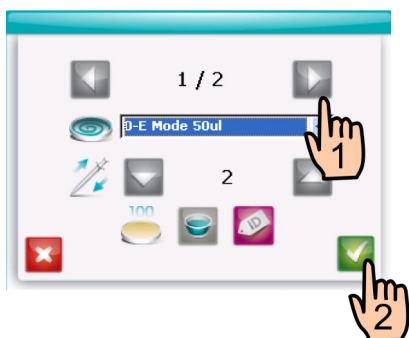
Saving a Single Spread



-  If only a single spread is to be performed for each sample, all settings must be saved right away by pressing the checkmark button. If the checkmark button isn't pressed selected settings won't be activated.

Successive Spread Programming

When programming several repetitions, the same settings will be activated for each successive spread unless programmed otherwise. Every general spread settings menu for each successive spread will be headed by its name (Repetition Number/Total Number of Repetitions).



1. Each successive spread's menu can be accessed by scrolling back and forward with the scrolling arrows.



2. Once spread settings have been programmed for each successive spread, the green checkmark button must be pressed to store them.

Changing From 100 to 150 mm Plates

Note: acquiring IUL's 150 mm Petri dish turntable (CAT. 90001715) is necessary to perform this operation.



To access the main settings menu, the purple gear wheel button must be pressed.

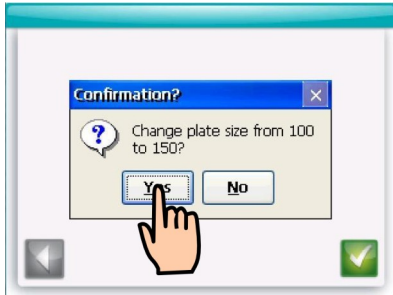
To change the plates being used to perform spiral spreads from 100mm plates to 150mm plates, access the main settings menu and click on the 100-150mm button.



The "changing plate size" button must be selected.



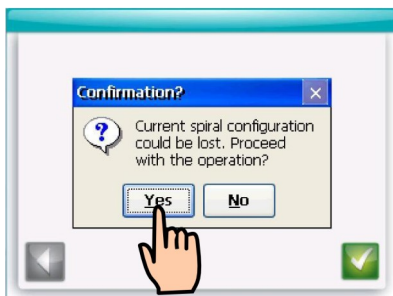
The “changing plate size” button must be pressed.



To confirm plate size change, the “Yes” button is to be pushed.



To save the change, the checkmark button must be pressed.



Finally, when asked if willing to continue despite possible spiral configuration change, the “Yes” button shall be pressed.

Recalling to check whether if the desired spiral distribution is activated is important. If not so, the first part of this “Programming a Spread” section in the manual shall be reviewed to select the desired distribution.



Next, the turntable platform should be switched using the small screwdriver that comes with the 150 mm turntable. The dark grey platform layer must be removed before unscrewing the platform that is to be changed. Installing the new platform is as simple as screwing it in place.

Changing From 150 to 100 mm Plates



The general settings menu must be accessed by pressing on the purple gear wheel button located in the main menu.



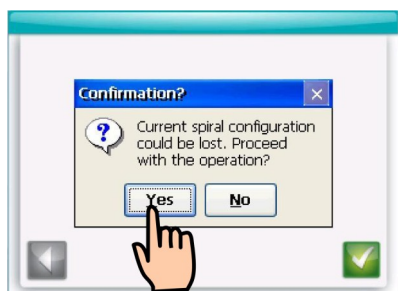
The “changing plate size” button must be selected.



1. The “changing plate size” button must be pressed. It will then change from 150-100 mm to 100-150 mm.



2. The green check mark button must be pressed.



Finally, when asked if willing to continue despite possible spiral configuration change, the “Yes” button shall be pressed. Recall checking whether if the spiral distribution that you desire is activated, if not, review the first part of this “Programming a Spread” section in the manual.



Next, the turntable platform should be switched by using the small screwdriver that comes with the 150mm turntable. Installing the new platform is as simple as screwing it and placing the top grey layer above it.

8. EXECUTING A SPREAD

Sample Preparation

Unless samples are liquid, an initial dilution and homogenization process shall be performed. Once the sample has been adequately homogenized (and diluted additionally if necessary), it can be plated by Eddy Jet 2. Nevertheless, it is important to bear in mind that large particles in suspension must be avoided as they could obstruct a microsyringe tip. If using a paddle homogenizer such as the Masticator, a simple solution to this problem is to use homogenizer bags with a filter (CAT. 900014501).

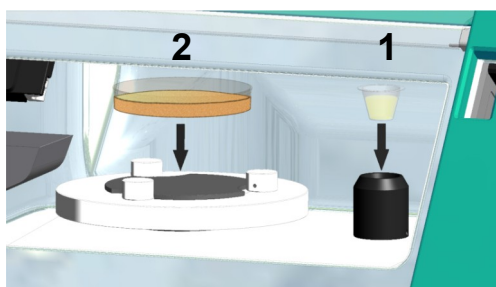
Choosing an Agar Petri Plate

It is very important to use agar plates that match the following requirements:

- Uniform depth of the agar layer throughout the Petri plate
- A smooth surface lacking any irregularities such as air bubbles or troughs
- Homogenous hydration of the agar's surface, meaning there shall be no dried out regions

Making a spiral inoculation with Eddy Jet 2:

Note: it's important to remember visiting the programming a spread section in this manual if settings are to be changed from default configuration.



1. If automatic feeding is activated, a sample beaker (containing the liquid sample to be processed) must be introduced into its slot. If manual feeding is activated this must be skipped.

2. A Petri dish is to be introduced in the device's platform. Petri plate grippers will ease this.



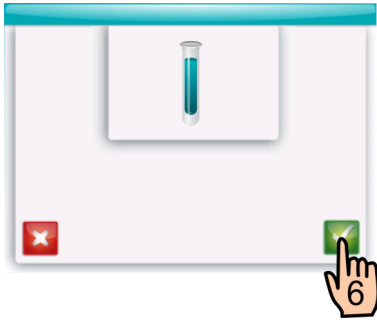
3. The green play button in the main menu must be pressed. A.) If controlled plate identification is activated the next section in the manual must be revised ("Controlled Identification"). B.) Point 4, 5, and 6 are to be read if manual feeding is activated. C.) If neither A nor B concern the operator only point 4 must be viewed.



(4.) If for any reason a spread must be cancelled, the red "X" button that will appear onscreen shall be pressed as the device operates. Continue to point 5 and 6 if manual feeding must be used, otherwise you are done.



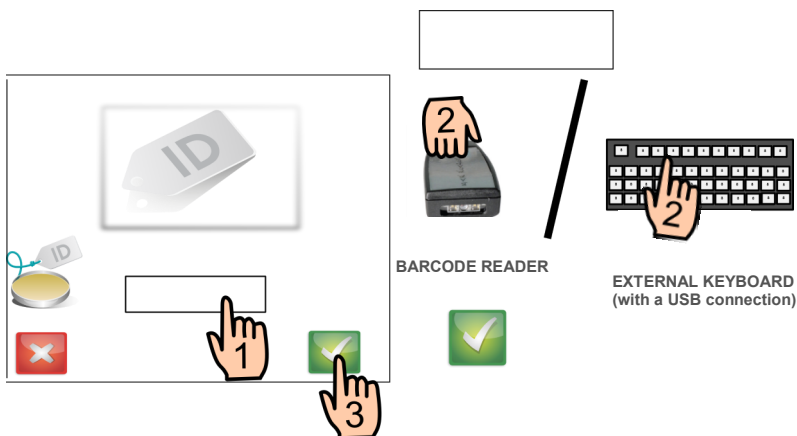
5.The sample container must be held near the microsyringe's tip.



6.The green checkmark button is to be pressed when sampling can start. The device will then proceed to sample and execute the spread. If manual identification has been activated the “Controlled Identification” section must be read next.

Controlled Identification:

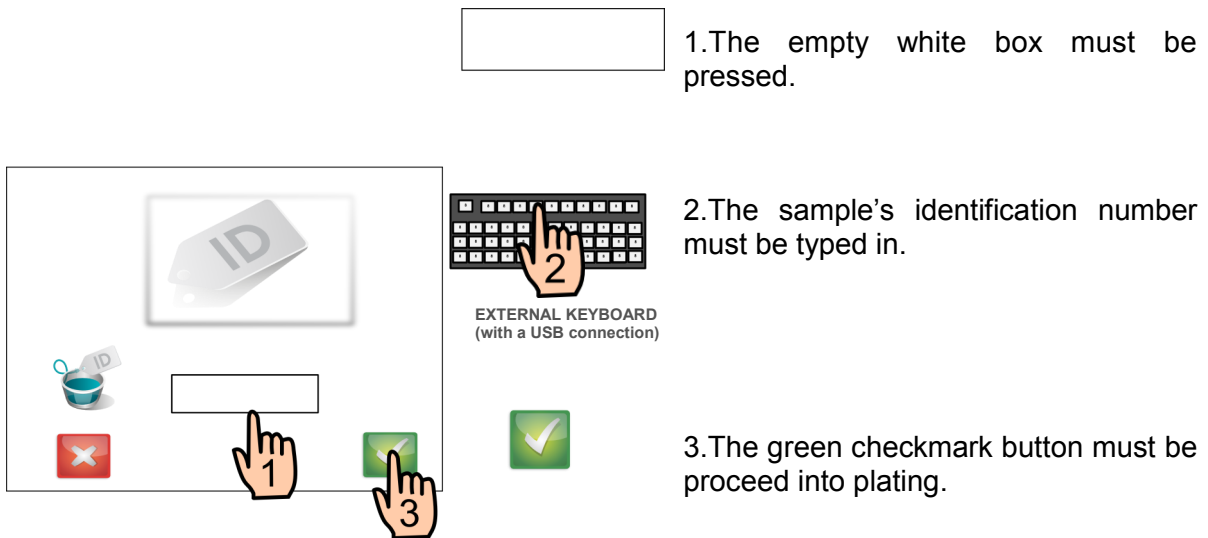
If controlled identification is activated, the device will automatically ask operators to introduce the controlled ID number before proceeding to perform a spread. Identification numbers can be introduced by simply reading a barcode with IUL’s barcode reader (CAT. 90005701) or by plugging a keyboard to the device (see the external connections section for more information on how to connect these peripherals).



When using a barcode reader, the plate barcode is to be read in the first place. It's important to recall holding the barcode reader about 25 cm away from the barcode. Next, step 3 must be followed. When using a keyboard, steps 1 through 3 shall be followed.

- 1.The empty white box must be pressed.
- 2.The plate's identification number must be typed.
- 3.The green checkmark button must be pressed to proceed to sample identification.

Next, controlled sample identification takes place:



The diagram illustrates the three-step process for sample identification on the Eddy Jet 2 interface. Step 1: A hand icon labeled '1' points to an empty white rectangular box on the screen. Step 2: A hand icon labeled '2' points to an external keyboard connected via USB. Step 3: A hand icon labeled '3' points to a green checkmark button on the screen. The interface also shows an 'ID' tag icon, a red 'X' button, and a blue beaker icon.

1.The empty white box must be pressed.

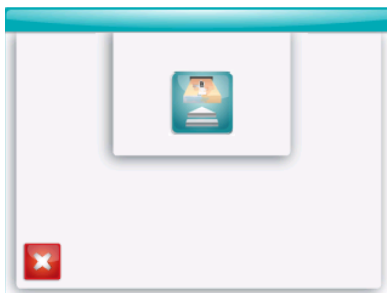
2.The sample's identification number must be typed in.

EXTERNAL KEYBOARD
(with a USB connection)

3.The green checkmark button must be pressed to proceed into plating.

Loading Microsyringes

Eddy Jet 2 will automatically ask operators to introduce a microsyringe pack whenever about to perform a spiral and in lack of microsyringes. The device must be involved in an inoculation in order to ask its operators to do this. An image of a cartridge with an arrow pointing inwards will appear onscreen. The cartridge has a set position, it must be introduced so that the words "EDDY JET" stand the right way up.



Unloading Microsyringes

Two circumstances might give way to microsyringe ejection:

- I. The user might wish to remove these, whichever the reason.
- II. The device may release a microsyringe cartridge whenever all microsyringes in a cartridge have been consumed.

I. Removing a microsyringe cartridge:



The general settings menu must be accessed by pressing on the purple gear wheel button located in the main menu.



Once in the main settings menu, the microsyringe cartridge removal button must be pressed.



While a house icon appears, the microsyringe cartridge is going to slowly move out of its slot. The operator must wait until the cartridge stops moving and a cartridge removal icon appears onscreen. A gentle pull needs to be made to remove the cartridge.



Warning: Ejected cartridges that for some reason contain leftover microsyringes can't be reintroduced into the machine.

II. Automatic release of microsyringes when all microsyringes have been consumed:

When the device detects no microsyringes are left in the cartridge it will automatically release the microsyringe package, while this happens a house icon will appear onscreen.



Next, a microsyringe cartridge icon that points outward will appear indicating the operator may softly pull to remove the old cartridge. The “Reloading Microsyringes After Automatic Cartridge Unload” section must be revised to see how to reload these.

Reloading Microsyringes After Automatic Cartridge Unload

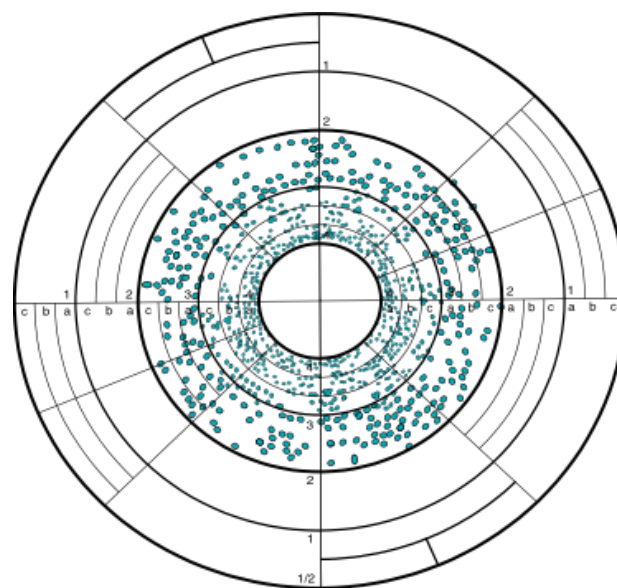
No particular protocol is to be followed in this case, see the “Loading Microsyringes” section.

Warning: Ejected cartridges that for some reason contain leftover microsyringes can't be reintroduced into the machine.

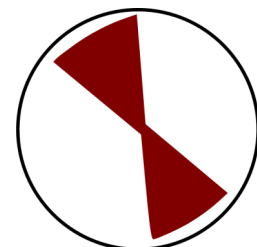
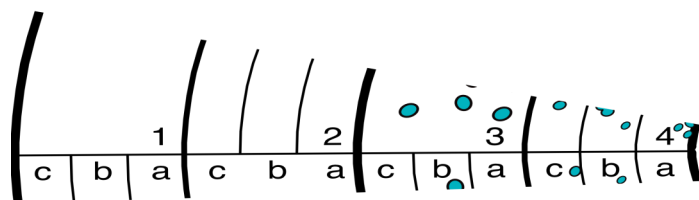
9. COLONY COUNTING

Counting colonies in a spiral inoculated plate requires a specific counting grid (which comes along with Eddy Jet 2). IUL strongly recommends the usage of manual (Colony Counter CAT.9000601) or automatic colony counters (Flash & Go CAT.90006010) to perform spiral colony counting. The use of the latter can genuinely streamline a lab's workflow by avoiding the time-consuming procedure described in this section of the manual.

Warning: Use exclusively spiral counting grids provided by IUL S.A. for Eddy Jet 2. Normal colony counting (which requires counting all colonies) must be used to count Uniform spreads.



When enumerating manually, a simple process must be followed: colonies are to be counted only in a 1/8 sector of the counting grid (the counting grid already contains marked 1/8 sectors). The counting grid is divided into 4 ring sections (1,2,3 and 4) that have been furtherly divided into three rings (1c,1b,1a...). Ring sections 1 and 2 only will be used whenever 150 mm plates are being read.



The following formula must be used to calculate CFU concentrations:

$$C = \frac{N' + N''}{V/4}$$

C = CFU concentration = CFU · ml⁻¹

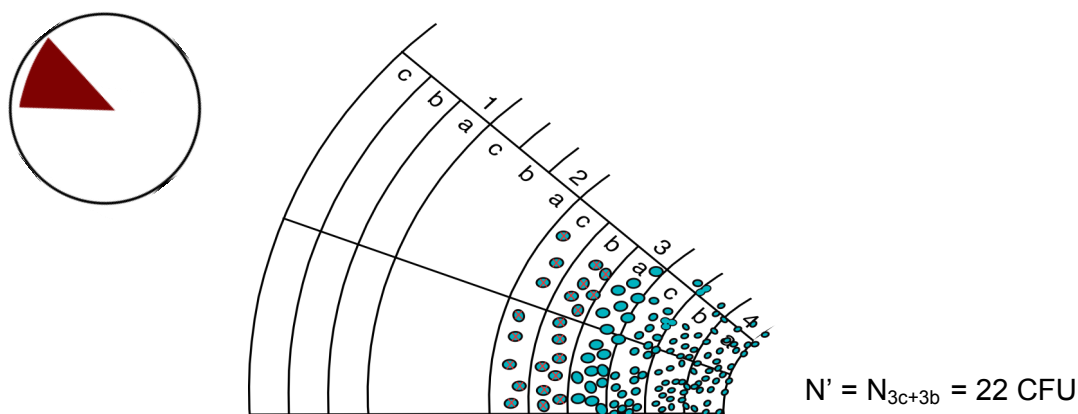
N' = CFU count in the first 1/8 ring sectors = CFU

N'' = CFU count in the opposite 1/8 ring sectors = CFU

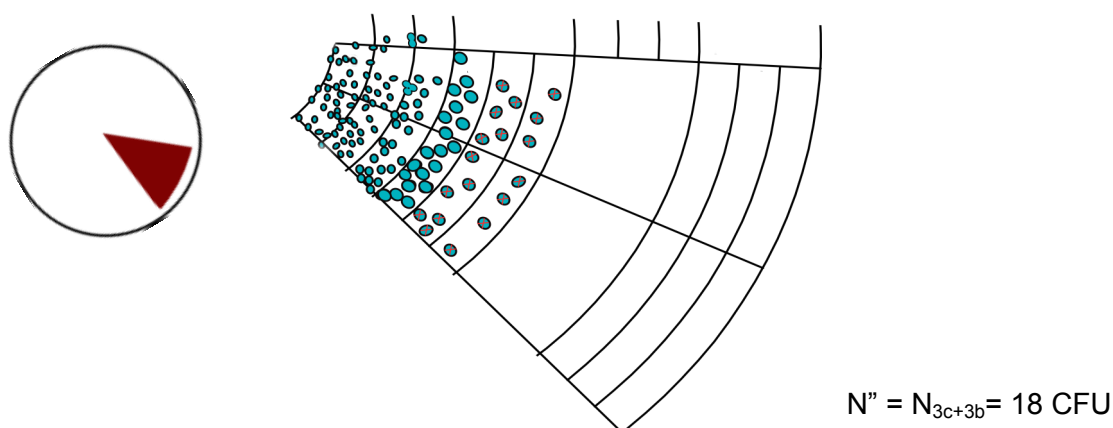
Counting is performed as follows:

Counting shall be restricted to the 3 and 4 ring sections of the counting grid for 100 mm Petri plates and to 1,2,3 and 4 ring sectors in 150 mm plates. Any colonies that appear outside of these boundaries are to be ignored. Counting shall be performed exclusively in a 1/8 sector of the counting grid, it must start at the outermost end of the grid and proceed inwards until a count of 20 colonies is met. From then on, only the colonies present in the last counted sector can be counted. Next, colonies that are present in the same rings of the opposed sector must be counted.

Note: an E-Mode 50µl distribution was supposedly used to inoculate the plate being counted in the following example.



The first count reaches 20 CFU in the 3b ring sector and it therefore stops here. Thus all colonies in the 3c and 3b ring sectors are counted. Then, the opposite end of the grid is counted in the same fashion:



The second count in the 3c and 3b sectors reaches 18.

Next, sample volume poured in the counted sectors (V) must be figured out. The total volume of the counted sectors appears in the laminated distribution table for spiral spreads. It's vital to choose the volume table that accounts for 100 mm Petri plates. In this case the E-Mode 50µl volumes for sections 3c and 3b (V_{3c+3b}) must be found.

$$V = V_{3c+3b} = 6'44 \mu\text{l} \cdot 10^{-3} \text{ml}/\mu\text{l} = 6'44 \cdot 10^{-3} \text{ml}$$

Last, the variables are ready to be introduced into the formula.

$$C = (N' + N'') / (V_{3c+3b} / 4)$$

$$C = (22 \text{ CFU} + 18 \text{ CFU}) / (6'44 \cdot 10^{-3} \text{ml} / 4)$$

$$\underline{C = 2,4845 \cdot 10^4 \text{ CFU / ml}}$$

Otherwise: figure out CFU / ml in one second...

Automatic Spiral Colony Counter



Flash & Go
CAT. 90006010

10. CONNECTING PERIPHERALS

The following peripherals can be connected to the Eddy Jet 2:

- Keyboard
- Printer
- Balance
- Barcode Reader
- USB Memory for Updates

Warning: no peripherals must be plugged to Eddy Jet 2 when it's turned on.

All of these are to be connected in the left rear end of the device. The “Device Overview” section should be reviewed to locate all of the connections in the device’s rear end.



Connecting a Keyboard

Only keyboards with a USB connection can be used. In order to use a keyboard it must simply be plugged to one of the 2 USB home ports located on the device’s left rear end (see the “Device Overview” section to locate these). This must be done after the device has been turned on.

Connecting a Printer or a Balance



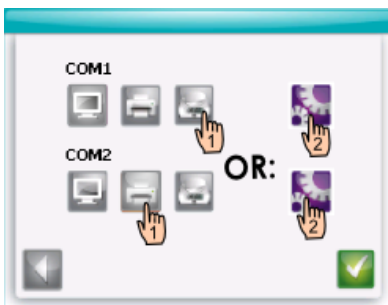
The main settings menu is to be accessed by pressing on the purple gear wheel button.



In order to access the RS-232 port connections menu the green RS-232 plug button must be pressed.

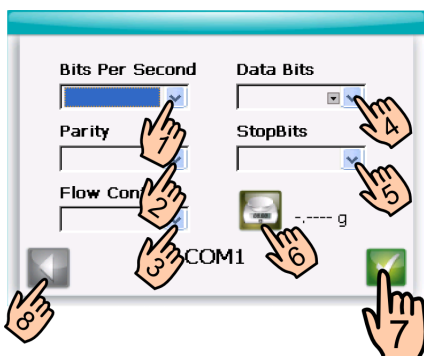
The RS-232 port must be plugged into one of the two RS-232 ports (see the “Device Overview” section in this guide to locate it), next the port connection must be configured through the RS-232 port connections menu.

Note: When using the lower RS-232 plug COM1 must be configured. Whenever using the upper connection COM2 is to be configured. Configuring one or the other is as simple as proceeding as follows on the buttons headed by each port’s name, COM1 and COM2.



1.The printer or balance buttons must be pushed depending on which device will be connected. The selected button will then color up.

2.The purple gear wheel button must be selected then to configure the settings.



5 x 1-5. Connection parameters are to be configured according to the printer’s/balance’s serial interface (to be provided by it’s manufacturer).



6.*The balance button is to be pressed to monitor communication with Eddy Jet 2 (balance readings are going to appear onscreen).

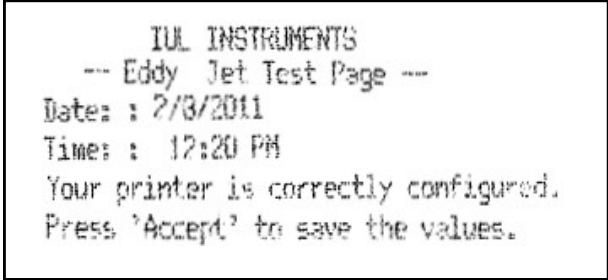


7.The green checkmark button is to be pressed to save the selected parameters.



8.The left-pointing arrow must be pressed to leave the RS-232 port connections menu.

* 6. When configuring the printer connection a printer button will appear. A ticket like the one in the top part of page 25 will be printed when the button is pressed.




Connecting a Barcode Reader

In order to use a barcode reader, it must be simply plugged to its specific plug in the device's left rear end (see the "Device Overview" section to locate it). It's important to keep in mind that the only barcode readers that will work with IUL's devices are IUL barcode readers (CAT. 90005701).


Connecting a USB Memory for Updates

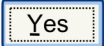
The USB memory must be connected to one of the two USB host ports located in the device's left rear end (see the "Device Overview" section in this guide to locate it).



 The main settings menu is to be accessed by pressing on the purple gear wheel button.



 The circular dashed arrow button must be pressed. Next, Eddy Jet 2 will automatically run the upgrade.



Several questions might appear onscreen at this point the "Yes" button must be selected to answer every one of them.

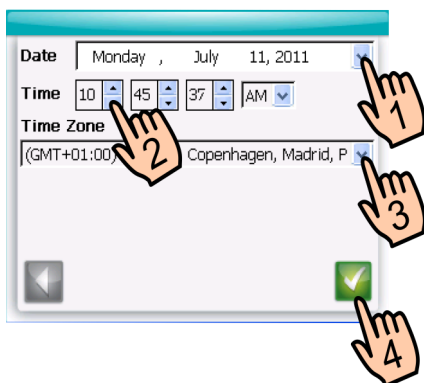
11. SETTING DATE AND TIME



The general settings menu must be accessed by pressing on the purple gear wheel button located in the main menu.



Once in the settings menu the purple clock and calendar button must be pressed.



1. The date must be set.



2. The time must be set.



3. The time zone must be set.



4. Time settings must be saved by pressing the green checkmark button.

12.

VERIFICATION

What to Do If Incorrect Results are Obtained

Verification checks are to be performed monthly. If the results obtained evidence the device isn't working correctly it must be sent to an IUL S.A. authorized workshop so it can be recalibrated. IUL can be contacted at:

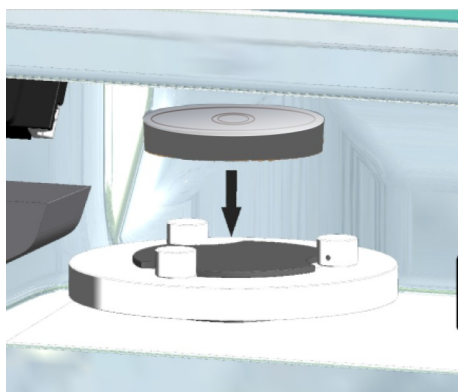
IUL, S.A.,
Torrent de l'Estadella, 22
08030 Barcelona, Spain
Telephone: +34 93 274 02 32
Fax: +34 93 274 01 44
iul@iul-inst.com

Verification Protocol For Position

This procedure verifies Eddy Jet 2 positions microsyringes accurately while performing a spiral. It is important to perform a position verification on a monthly basis.



To access the verification menu, the orange checkmark button in the main menu is to be pressed.



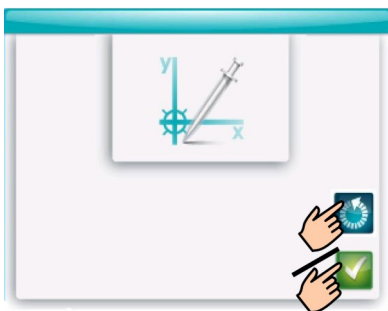
The adjustment pattern (CAT. 90001935) must be placed in the device's turntable.



Next, the green X/Y axis calibration button must be pressed.



The device will then proceed to load a microsyringe and perform the position verification test. Once the microsyringe comes to a halt, its tip must be positioned directly over the central outer circle as shown in the picture.



To repeat the position verification, the “restart dashed arrow” blue button must be pressed.




Otherwise, to approve the verification, the green checkmark button must be pressed.

Verification Protocol for Volume


The volume verification protocol checks the precision of volumes pipetted by the Eddy Jet 2 when a spread is made. It is important to perform a volume verification for each of the spread modes that are regularly used in a lab on a monthly basis. Volume verification shall be preferably performed with a precision balance, a printer, and a key board which must be plugged into Eddy Jet 2 before verification takes place. Otherwise testing can be done without connecting any of these. The “Connecting Peripherals” section in this manual must be reviewed to see how peripherals must be connected.

Note: Verification can be performed without a printer or a balance connected to Eddy Jet 2.



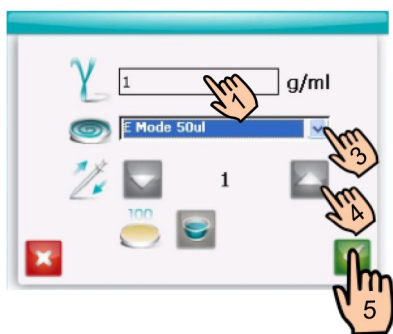
 To access the verification menu, the orange checkmark button must be pressed.



 Next, the blue pipette button should be pressed to configure the volumetric verification protocol.



1.The blank box must be pressed.



2.The verification menu will first require typing in the density of the liquid being used (0.997 g/ml in the case of distilled water at room temperature).



3.The verified spread mode to be tested must be selected.



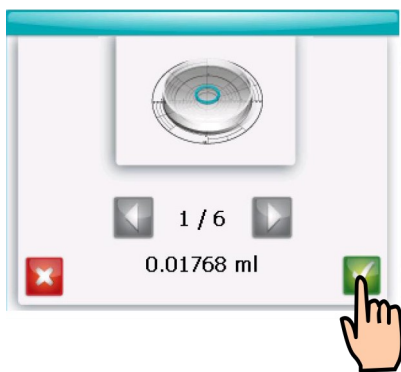
4.The amount of air purge cycles must be configured.



5.Settings are saved by pressing on the green checkmark button.



✓ A beaker introduction button will appear onscreen indicating that a beaker with distilled water must be placed in the beaker trough. After doing so, the green checkmark button must be pressed. When no balance is connected to Eddy Jet 2, the beaker to be filled must be tared once this step is performed.



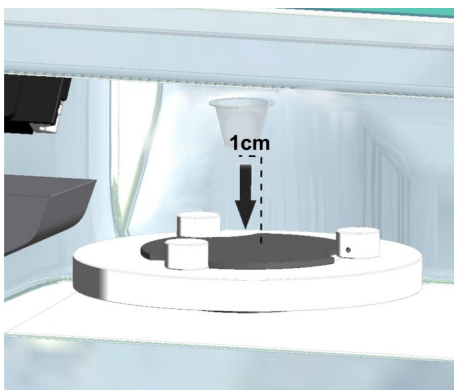
✓ The green checkmark button must be pressed to proceed to place a second beaker in the precision scale. This beaker is going to be used to contain and weigh the water dispensed during volume verifications. When no balance is connected to Eddy Jet 2, next step must be skipped.



The tare button in the balance is to be pressed. While a stable reading is reached, the balance icon will feature a red "0" reading.

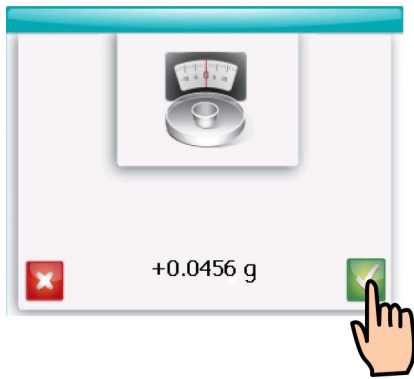


Once a stable reading has been reached a large green zero will appear in its place. After this, the beaker can be removed from the balance. This entire step will be skipped if there is no balance connected to Eddy Jet 2.

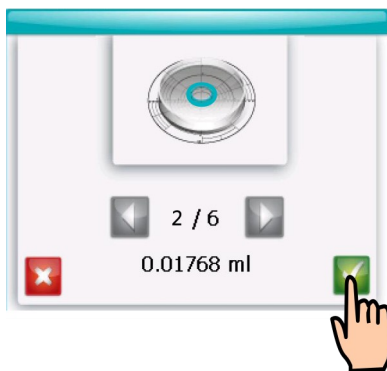


The beaker must be then placed about 1 cm to the left of the turntable's center.

Immediately after, the microsyringe will dispense a precise volume of liquid. Special care has to be taken to remove any small droplet that might remain at the microsyringe's tip by gently rubbing it against the beaker's walls. Once this is done the beaker is to be quickly introduced in the precision balance to avoid evaporation.



The green checkmark is to be pressed when the balance's reading remains stable (this should take only a few seconds). If verifying without a balance connected, the beaker will have to be obviously weighed in a balance and its weight shall be noted down. Once this is done, the green checkmark button must be pressed.



The device will then be ready to verify the next section of the spiral, to do this the green checkmark button must be pressed and the same tare, dispensing, and weighing process shall be executed.



After weighing the last section, a large orange checkmark button will appear onscreen, if the verification procedure is validated by the operator, the green checkmark button must be then pressed. If a printer and a balance were connected to the Eddy Jet 2, a record of the verification results will be printed.

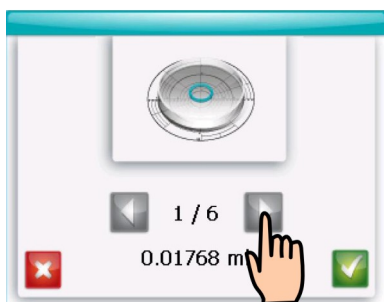
Printed recordings will look like the one below, note must be taken that pipetted volumes rarely match theoretical volumes exactly. Average error, however, must not exceed $\pm 2\%$. When verification is carried out without connecting a printer nor a balance to Eddy Jet 2, the operator will have to obviously calculate real volumes according to distilled water's specific weight (0.997g/ml).

```

-- Eddy Jet verification result
Date: : 18/8/2011 (DD/MM/YYYY)
Time: : 4:57 PM
Plate size : 100
Depos. type : 0-E Mode 50ul
Specific weight : 0.997 g/ml
Section 1 weight : 0.0176 g
Theoretic volume : 0.01768 ml
Real volume : 0.01765 ml
Section 2 weight : 0.0298 g
Theoretic volume : 0.02964 ml
Real volume : 0.02989 ml
Section 3 weight : 0.0382 g
Theoretic volume : 0.03792 ml
Real volume : 0.03831 ml
Section 4 weight : 0.043 g
Theoretic volume : 0.04356 ml
Real volume : 0.04313 ml
Section 5 weight : 0.0473 g
Theoretic volume : 0.04744 ml
Real volume : 0.04744 ml
Section 6 weight : 0.0495 g
Theoretic volume : 0.05000 ml
Real volume : 0.04965 ml
    
```

Verifying a Specific Section

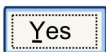
When searching to verify volume for a specific section, the same process described in the prior "Protocol for Volume Verification" section must be followed until the spread section selection screen is reached.



In order to choose which section to verify, the scrolling arrows must be used.



Verification will proceed from the current section until all the successive sections are verified unless the operator exits the verification screens at a certain point by pressing the "red X" button.



When asked whether willing to cancel verification the "Yes" button must be pressed.

13. MAINTENANCE, CALIBRATIONS, & TROUBLESHOOTING

Cleaning and Maintenance

In order to keep a high performance level, cleaning Eddy Jet 2 will be necessary. The device's outside can be cleaned using a water-soap moistened cloth. The device's transparent cover and white interior surface can be cleaned with an alcohol-soaked cloth for disinfection.

Touchscreen Calibration



The touch screen must be recalibrated whenever it appears to be functioning incorrectly.

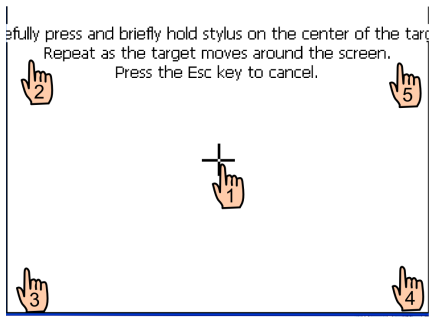
The general settings menu is accessed by pressing on the purple gear wheel button located in the main menu.



The yellow touch panel button must be selected next.



The "Recalibrate" button must be pressed.



carefully press and briefly hold stylus on the center of the target. Repeat as the target moves around the screen. Press the Esc key to cancel.

- + The “plus sign” must be pressed, it will then move.
 - + The “plus sign” must be pressed, it will then move.
 - + The “plus sign” must be pressed, it will then move.
 - + The “plus sign” must be pressed, it will then move.
 - + The “plus sign” must be pressed.
- Last, the screen is to be pressed anywhere.



OK Finally, the “ok” button must be pressed to finish the screen’s calibration.

Technical Service Menu

Warning: This menu is to be opened only when told so by an authorized technician.



The general settings menu must be accessed by pressing on the purple gear wheel button located in the main menu.



The turquoise gear wheel button with Eddy Jet 2’s logo shall be pressed.

The technical service menu will then appear on screen:



In order to return all of its parts to their rest positions, Eddy Jet 2 has a specific rest position button.



Position button number 1 enables to center sampling position.



Position button number 2 enables to center spreading position.



Position button number 3 enables to center the microsyringe ejection point.



The question mark button opens the firmware version information.



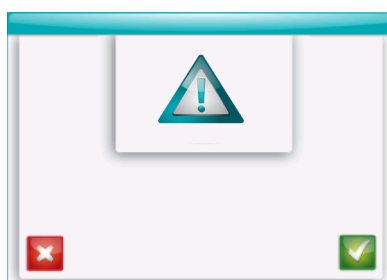
The “log to USB” button must be pressed when record is to be kept of the device’s operations and errors. This will provide very useful information to the technical service. This process requires to simply connect a USB memory to one of the two USB ports (see the “Device Overview” section to locate these) and to press the “log to USB” button.



The purple factory button allows to restore factory default settings. These will be 2 air purge cycles during sampling, executing a single E 50 μ l spread with each microsyringe in 100 mm plates, and COM1 and COM2 without functionality. Sample and Plate ID will be reset to 0. On the other hand, the date and time settings as well as the touch screen calibration won't be lost.

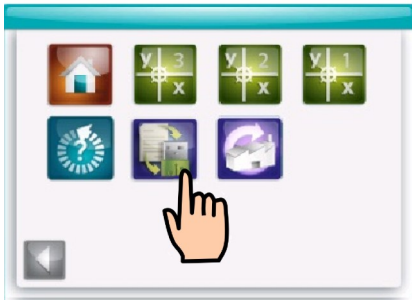
Troubleshooting

The following screen will appear whenever an error is detected:



If the device gives an error message, a USB memory can be connected to a USB port to record every operation that takes place (see the “log to USB” button in the “Technical Service Menu” section). This will provide very useful information to the technical service for troubleshooting.

This process requires to simply connect a USB memory to one of the two USB ports (see the “Device Overview” section to locate these). Next, access the Technical Service Menu as specified in the “Technical Service Menu” section.



Last, press on the “log to USB” button.

The files stored in the memory must be copied and sent to the technical service.

14. CONSUMABLES ACCESSORIES & RELATED INSTRUMENTS

Consumables



1000 Y-irradiated Microsyringes
CAT. 90001780



1000 Y-irradiated Sample Beakers
CAT.90001790

Accessories



Plate for 15 cm Petri Dishes
CAT. 90001715



Sampling Holder for Beakers
CAT. 90001829



Holder for Microsyringe Box
CAT. 90001950



Barcode Reader
CAT. 90005700



Holder for Sample Beaker Box
CAT. 90001949

Related Instruments

Automatic Spiral Colony Counter

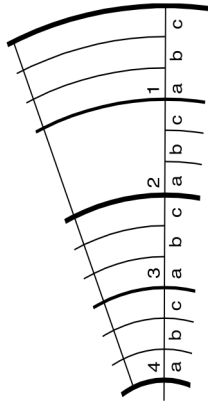


Flash & Go
CAT. 90006010

High Throughput Colony Counter

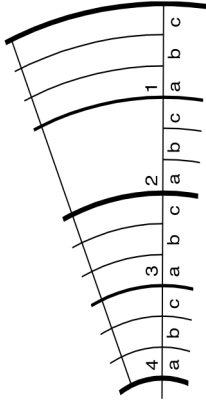


Plate Handler
CAT. 90004300



Counting Grid

	3c	3c+3b	3c+3b+3a	3+4c	3+4c+4b	3+4c+4b+4a
E-Mode 50 µl	2,56	6,44	12,08	20,36	32,32	50
C-Mode 40 µl	1,52	3,96	7,68	13,36	22	37,3
C-Mode 100 µl	4,56	11,52	21,52	35,92	56,8	92,2
D-Mode 49,2 µl	2,16	5,48	10,56	18,28	30	49,2
D-Mode 50 µl	3	7	13,2	22	34	50
Exp. 3000 Mode 50µl	1,16	4,72	10,08	18,28	30,12	50
Log Mode 50 µl	2,16	5,48	10,56	18,28	30	49,2
Log Mode 100 µl	4,32	10,8	21,12	36,4	60	98,4
Log Mode 200 µl	8,64	21,6	42,24	72,8	120	196,8
Linear Mode 18µl	3	6	9	12	15	18
Linear Mode 50µl	8,33	16,67	25	33,33	41,67	50
Linear Mode 100µl	16,67	33,34	50	66,67	83,34	100
Linear Mode 200µl	33,33	66,67	100	133,33	166,67	200
Slow 3000 Mode 50µl	1,16	4,72	10,08	18,28	30,12	50
Prop. 3000 Mode 20µl	3,33	6,66	10	13,33	16,67	20
Lawn 3000 Mode 20µl	4,73	8,91	12,52	15,59	18,09	20,04
Unif. 3000 Mode 20µl	5,22	9,69	13,41	16,37	18,58	20,04
C-Mode Fast 40 µl	1,52	3,96	7,68	13,36	22	37,3
Log Mode 300 µl	12,96	32,4	63,36	109,2	180	295,2
Log Mode 400 µl	17,28	43,2	84,48	145,6	240	393,6
Linear Mode 300µl	50	100	150	200	250	300
Linear Mode 400µl	66,67	133,33	200	266,67	333,33	400



Counting Grid



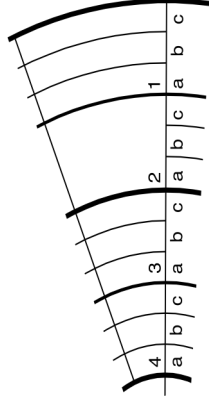
USE ONLY FOR VERIFICATION



	4a	4a+4b	4a+4b+4c	4+3a	4+3a+3b	4+3a+3b+3c
E-Mode 50 µl	17,68	29,64	37,92	43,56	47,44	50
C-Mode 40 µl	15,30	23,94	29,62	33,34	35,78	37,30
C-Mode 100 µl	35,40	56,28	70,68	80,68	87,64	92,20
D-Mode 49,2 µl	19,2	30,92	38,64	43,72	47,04	49,2
D-Mode 50 µl	16	28	36,8	43	47	50
Exp. 3000 Mode 50µl	19,88	31,72	39,92	45,28	48,84	50
Log Mode 50 µl	19,2	30,92	38,64	43,72	47,04	49,2
Log Mode 100 µl	38,4	62	77,28	87,6	94,08	98,4
Log Mode 200 µl	76,8	124	154,56	175,2	188,16	196,8
Linear Mode 18µl	3	6	9	12	15	18
Linear Mode 50µl	8,33	16,67	25	33,33	41,67	50
Linear Mode 100µl	16,67	33,34	50	66,67	83,34	100
Linear Mode 200µl	33,33	66,67	100	133,33	166,67	200
Slow 3000 Mode 50µl	19,88	31,72	39,92	45,28	48,84	50
Prop. 3000 Mode 20µl	3,33	6,67	10	13,34	16,67	20
Lawn 3000 Mode 20µl	1,95	4,45	7,52	11,13	15,31	20,04
Unif. 3000 Mode 20µl	1,95	4,45	7,52	11,13	15,31	20,04
C-Mode Fast 40 µl	15,30	23,94	29,62	33,34	35,78	37,30
Log Mode 300 µl	115,2	186	231,84	262,8	282,24	295,2
Log Mode 400 µl	153,6	248	309,12	350,4	376,32	393,6
Linear Mode 300µl	50	100	150	200	250	300
Linear Mode 400µl	66,67	133,33	200	266,67	333,33	400

A III: Volume (µl) Table: 150 mm Petri Dishes

150 mm

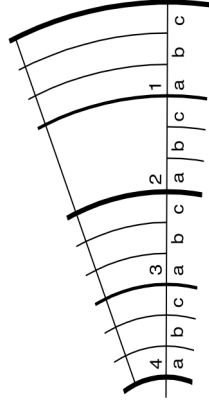


Counting Grid

	1c	1c+1b	1c+1b+1a	1+2c	1+2c+2b	1+2c+2b+2a	1+2+3c	1+2+3c+3b	1+2+3c+3b+3a	1+2+3+4c	1+2+3+4c+4b	1+2+3+4c+4b+4a
C-Mode 40 µl	0,05	0,15	0,38	0,75	1,33	2,28	3,8	6,24	10,14	16,44	26,04	39,6
C-Mode 100 µl	0,08	0,32	1,05	2,18	3,93	6,68	11,08	17,88	28,43	44,33	67,53	99,2
Exp. 3000 M. 54.30µl	0,15	0,4	0,8	1,46	2,54	4,23	6,66	10,18	15,25	22,57	33,23	54,3
Slow 3000 M. 54.30µl	0,15	0,4	0,8	1,46	2,54	4,23	6,66	10,18	15,25	22,57	33,23	54,3
Unif. 3000 M. 63.45µl	8,52	16,45	23,79	30,55	36,72	42,30	47,29	51,70	55,52	58,75	61,39	63,45
Prop. 3000 M. 43.09µl	3,59	7,18	10,77	14,36	17,95	21,54	25,13	28,72	32,31	35,9	39,49	43,09
Lawn 3000 M. 55,78µL	7,49	14,46	20,92	26,86	32,28	37,19	41,58	45,45	48,81	51,65	53,97	55,78
Linear Mode 50µl	4,17	8,33	12,5	16,67	20,83	25	29,17	33,33	37,5	41,67	45,83	50
Linear Mode 100µl	8,33	16,67	25	33,33	41,67	50	58,33	66,67	75	83,33	91,67	100
Linear Mode 200µl	16,66	33,34	50	66,66	83,34	100	116,66	133,34	150	166,66	183,34	200
Linear Mode 300µl	25	50	75	100	125	150	175	200	225	250	275	300
Linear Mode 400µl	33,33	66,67	100	133,33	166,67	200	233,33	266,67	300	333,33	366,67	400

A IV: Verification Volume (µl) Table: 150 mm Petri Dishes

150 mm



Counting Grid



USE ONLY ONLY FOR VERIFICATION

	4a	4a + 4b	4a+4b+4c	4+3a	4+3a+3b	4+3a+3b+3c	4+3+2a	4+3+2a+2b	4+3+2a+2b+2c	4+3+2+1a	4+3+2+1a+1b	4+3+2+1a+1b+1
48 C-Mode 40 µl	13,56	23,16	29,46	33,36	35,80	37,32	38,27	38,85	39,22	39,45	39,55	39,6
C-Mode 100 µl	31,67	54,87	70,77	81,32	88,12	92,52	95,27	97,02	98,15	98,88	99,12	99,2
Exp. 3000 M. 54.30µl	21,07	31,73	39,05	44,12	47,64	50,07	51,76	52,84	53,50	53,90	54,15	54,3
Slow 3000 M. 54.30µl	21,07	31,73	39,05	44,12	47,64	50,07	51,76	52,84	53,50	53,90	54,15	54,3
Unif. 3000 M. 63.45µl	2,06	4,7	7,93	11,75	16,16	21,15	26,73	32,90	39,66	47	54,93	63,45
Prop. 3000 M. 43.09µl	3,6	7,19	10,78	14,37	17,96	21,55	25,14	28,73	32,32	35,91	39,5	43,09
Lawn 3000 M. 55,78µl	1,81	4,13	6,97	10,33	14,2	18,59	23,5	28,92	34,86	41,32	48,29	55,78
Linear Mode 50µl	4,17	8,33	12,50	16,67	20,83	25	29,17	33,33	37,5	41,67	45,83	50
Linear Mode 100µl	8,33	16,67	25	33,33	41,67	50	58,33	66,667	75	83,33	91,67	100
Linear Mode 200µl	16,67	33,34	50	66,66	83,34	100	116,66	133,34	150	166,66	183,34	200
Linear Mode 300µl	25	50	75	100	125	150	175	200	225	250	275	300
Linear Mode 400µl	33,32	66,67	100	133,33	166,67	200	233,33	266,67	300	333,33	366,67	400

Never hesitate contacting us to solve any doubts or requests you may have. Remember to sign up in our online support to receive technical advice, reminders of updates, and more specific information regarding how to make the most out of your instrument.

<http://www.iul-inst.com/support-group.html>



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