Mupid®-exU

Electrophoresis System

Instruction Manual

ADVANCE

Before Use

Please read this manual carefully before you start to operate the electrophoresis device Mupid.

Safety Precautions:

Explanation of symbols used in this manual and product

	This symbol denotes a general caution or warning. Be sure to follow the instruction.
	This symbol denotes the hazardous to health. Be sure to follow the instruction.

 WARNING

- DANGER-HIGH VOLTAGE - Although the Mupid®-exU is equipped with a safety system, the apparatus should always be operated with extreme caution.
- Do not disassemble and/or deform Mupid-exU and its any parts. Such a change may causes electric shock,fire or disorder of the device.
- Do not touch the power supply or the Electrophoresis Tank with wet hands during operation. Do not insert fingers or any other objects into the Tank during electrophoresis.
- When you find breakdown and/or crack of the outer surface of the Power Supply, then unplug it and contact the sales dealer.
- Immediately unplug the Power Supply, if the system is smoking, noising and/or abnormally smelling. If not followed, it could lead to fire or electric shock.
- Do not touch the electrodes and their plugs during electrophoresis.
- Do not attempt to use any other lids with this system.
  The lid supplied with the Electrophoresis Tank is the only authorized type of cover to be used.
- Always disconnect the power supply from the main power source before disconnecting it from the Electrophoresis Tank .

- All the Mupid-exU gel trays are highly UV transparent. UV rays are harmful to skin and eyes. Always wear face-shield and gloves when working with ultraviolet rays.

- Many of the reagents used in the electrophoretic process are hazardous (ie ethidium bromide, acrylamide, boric acid, etc.). Extreme care should be taken when handling these reagents.

- Unplug the power supply from the main power source when not in use.

- When unplugging the Power Supply, turn off the main switch of it at first.

- The Mupid-exU power supply is designed to work with a wide input voltage range, from 100 to 240V.
  Be sure to use the appropriate power cable for local voltage requirements.

- Using the ElectrophoresisTank with unauthorized power supply will disable the safety feature and present a risk of electric shock. ADVANCE Co.,Ltd. is not responsible for any injury or damage caused by inappropriate use of any components of this system.

- Be sure to leave sufficient space around the power supply to allow for free air circulation. The vents on the side of the power supply are designed for cooling of internal parts and should not be blocked. Prevent liquid from entering the power supply.

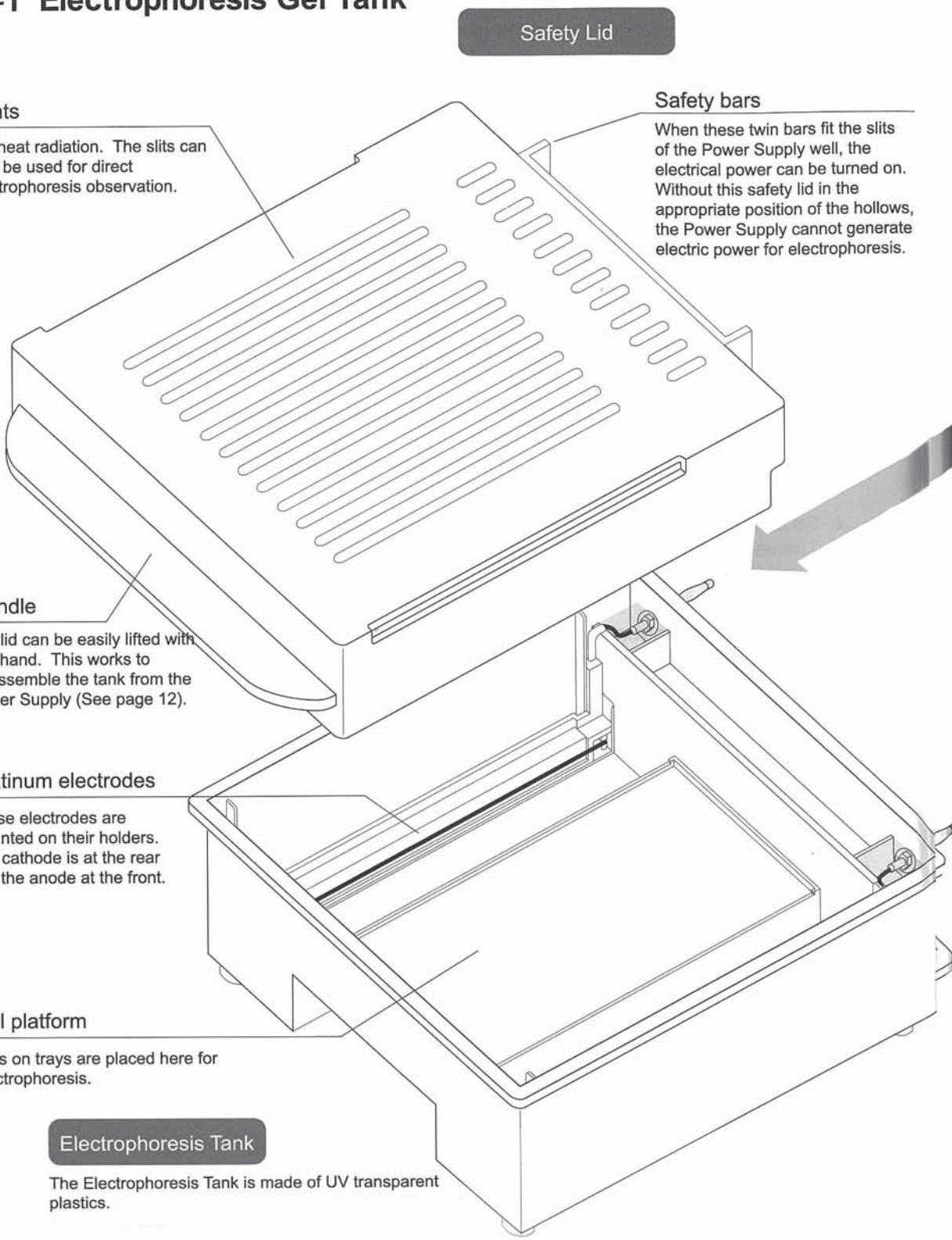
- Detach the power supply from the Electrophoresis Tank before lifting it. Unplug the power supply and empty the Electrophoresis Tank before moving it to another location.

- If liquid accidentally spills onto the power supply, disconnect the device from the main power source immediately and wipe with paper towels. If there is a chance that the liquid entered the power supply let it dry for several hours in a dry, well ventilated environment (such as chemical hood) before using it again.

- Change of temperature or relative humidity (such as change of the place from cold room to other room at higher temperature) may form dew inside the Power Supply. Wait for a while for drying the dew on such an occasion. Do not use the device with wet hands or wet gloves. If not followed, it could lead to electric shock.

1. Mupid®-eXu Construction and Functions

1-1 Electrophoresis Gel Tank



Timer Display

Displays the preset time or remaining operating time.
Roll display appears on the panel in continuous run mode.

Down and Up Buttons

Allow setting the required run time within a range of 1 to 99 minutes. Set zero for continuous run mode ("c" will display on the Timer Display).
These are also used for setting additional voltages (See page 11).

ADDITIONAL display LED

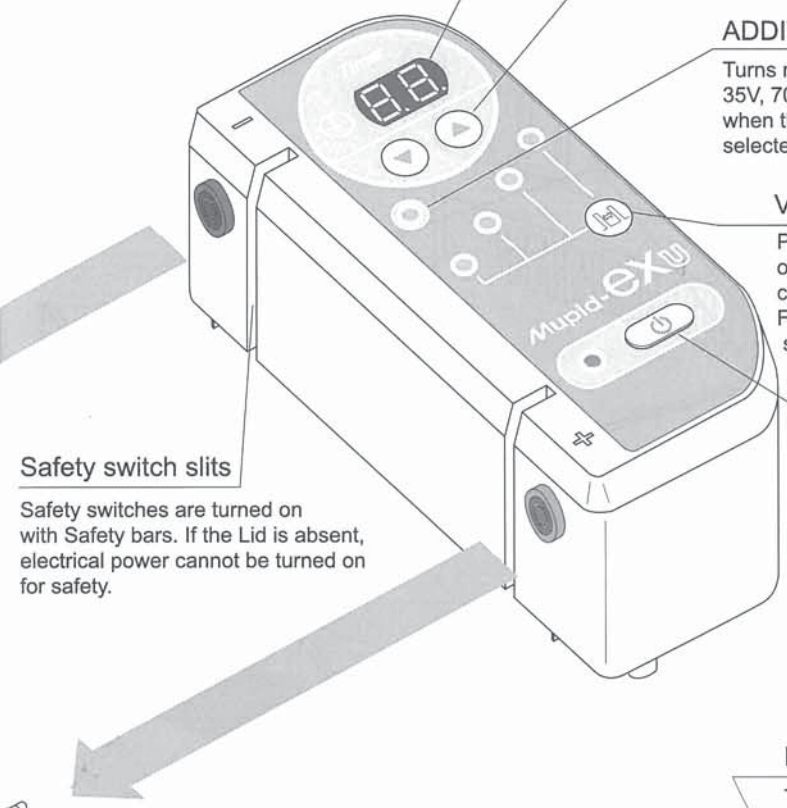
Turns red when one of the additional voltages (18V, 35V, 70V) is selected. Push the voltage selector when the red LED flashes and you will then see the selected voltage on the timer display.

Voltage selector

Pressed to select 25V, 50V, 100V, 135V or ADDITIONAL output. Peak voltage is a constant 140V for any output voltage.
For more output voltage information, please see page 11.

Run/Pause/Stop Button

Use this button to turn voltage on, off and to pause. The LED on the left side of the button remains lit when system power is on.



Safety switch slits

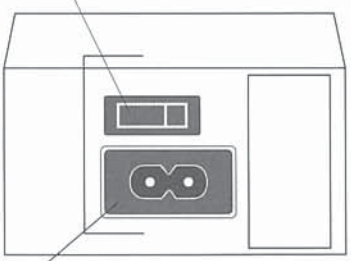
Safety switches are turned on with Safety bars. If the Lid is absent, electrical power cannot be turned on for safety.

Power Supply

Mupid®-eXU upgraded power supply features seven voltage settings, timer, last voltage memory, over current protection, and safety interlock system.

Main Switch

Turning this switch OFF results in completely turning off the Power Supply. Turn this switch OFF first, before unplugging.



Rear view of power supply

Electrical Power Input Plug

Accepts wide range power input from AC100V to AC240V. Ensure an approved power cable that satisfies your regional safety standards is used.

Electrode connector

Connects the electrodes to the Power Supply. This connector is gold-plated and can be cleaned in its entirety with for example, distilled water. After washing thoroughly dry.

Power Supply holder

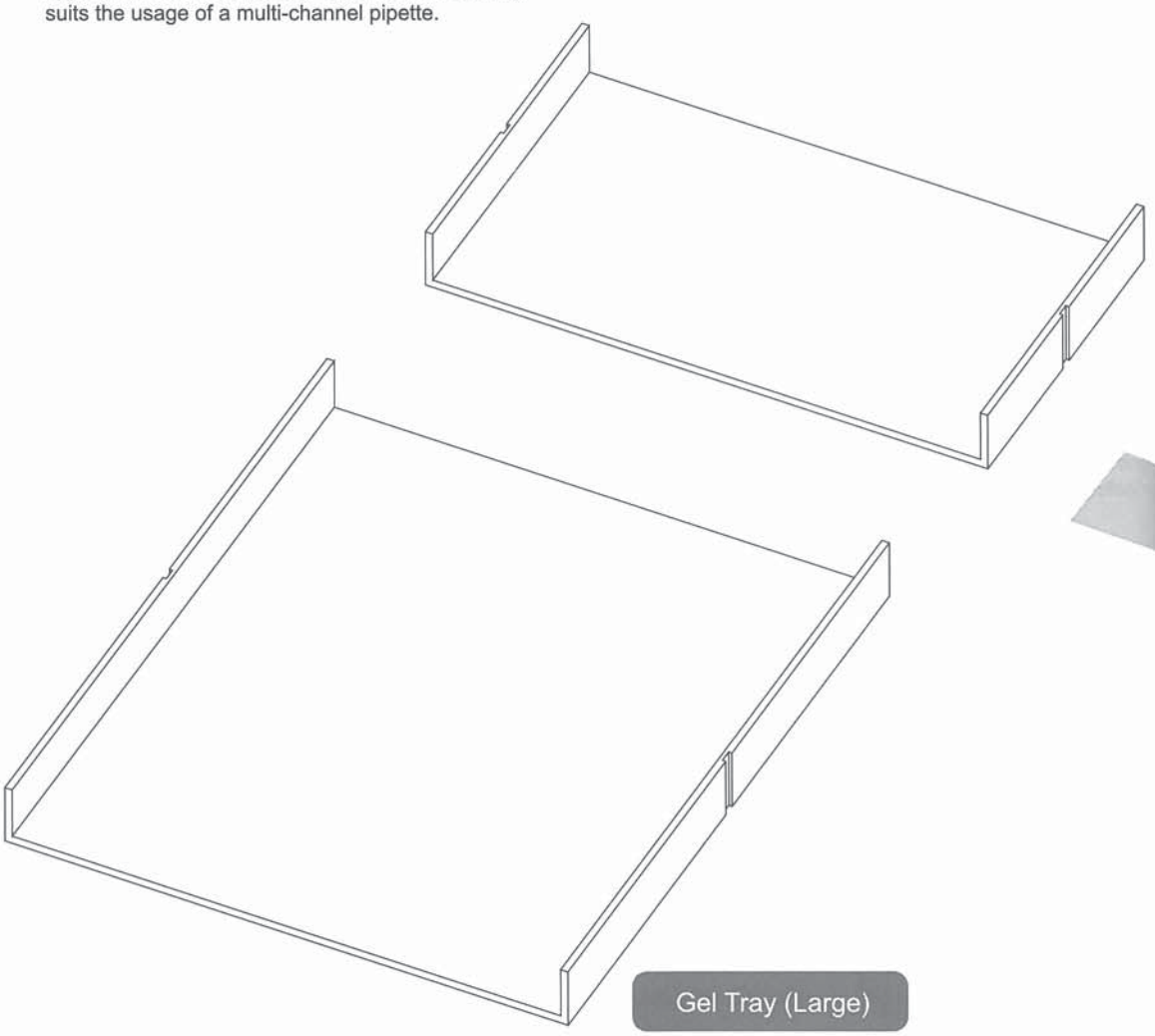
Supports part of the weight of the Power Supply.

1-2 Gel Casting Set

Made of UV transparent plastic, all Mupid-exU casting trays allow visualization of samples under UV light without removing the tray. This saves time and minimizes user exposure during handling of gels that may contain hazardous chemicals such as ethidium bromide.

Gel Tray (Small)

Small gels are made using this tray. Convenient transmittance of UV illumination for observation using a transilluminator. Maximum separation length is approx. 5.5 cm with this tray. The width of this tray suits the usage of a multi-channel pipette.



Gel Tray (Large)

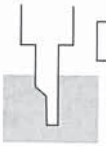
Large gels are made with this tray. Convenient transmittance of UV illumination for observation using a transilluminator. Maximum separation length is ca. 11cm with this tray. The width of this tray suits the usage of a multi-pipette.

Combs

Set these combs in the gel maker stand to form wells. Double-sided combs are provided: 13 teeth (6 mm wide wells), and 26 teeth (2 mm wide wells). The spacing of these wells is compatible with a multi-channel pipette.

shape

The 26-toothed comb is designed for excellent band resolution.



Direction of electrophoresis (in the case of DNA)

With the 26-toothed comb, electrophoresis is the direction as shown in this figure.

Center Partition

When using the large gel tray, remove this center partition.

Comb Setting Sills

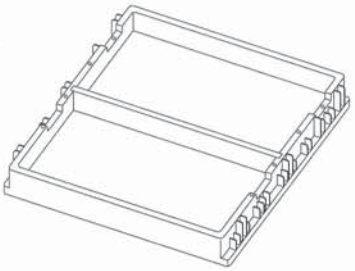
Up to four combs can be set in the stand for large gels, use the small round marks as the setting position (See page 6).

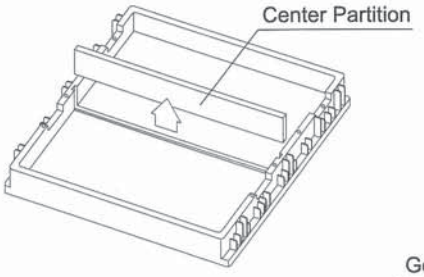
Gel Casting Stand

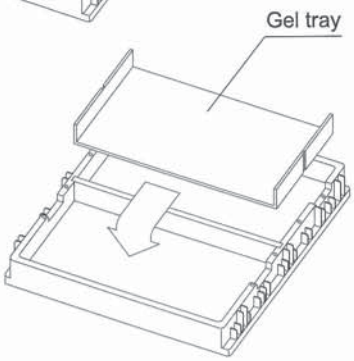
Set gel trays in this stand to cast gels.

2. Casting Gels

(1) Place the casting stand on a level surface.
Remove the center partition if the large gel tray is to be used.







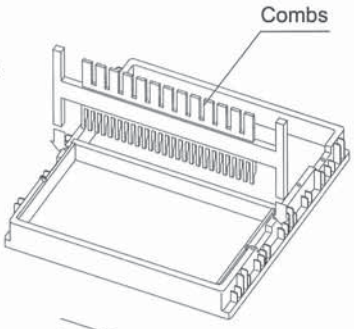
(2) Place the gel tray(s) into the casting stand.
Two small gels can be simultaneously cast.

(3) Weigh the required amount of agarose powder into an appropriate glass flask and add the exact amount of buffer. The choice of heat treatment (such as autoclaving, microwave-treatment and so on) depends on the type of agarose.
Heat the prepared solution until the agarose has completely dissolved.

(4) Allow the agarose solution to cool down to 70C or less before pouring.

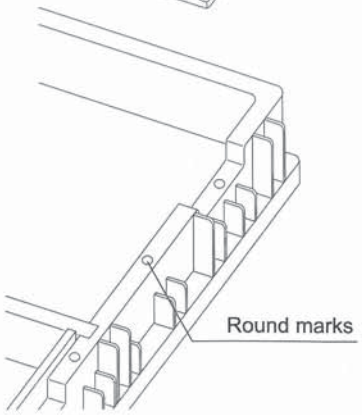
Pouring the solution in before it has cooled can deform the stand and/or gel trays.

(5) Select either the 13- or 26-toothed comb in accordance with the experimental requirements, and place the selected comb into the casting stand. The electrophoretic distance and number of samples will depend upon the number of combs you set in place.

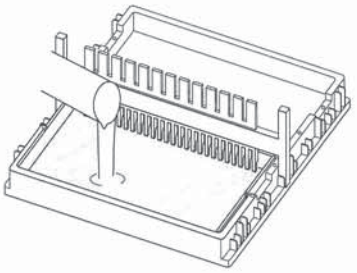


When using four combs, place in positions with the round marks so as to obtain equal intervals. The margin of the gel near both electrodes is necessary in achieving more linear movement of analytes (such as DNA).

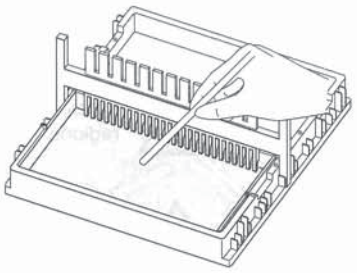
Setting the combs in position after having poured in the agarose solution can be applicable. Any air bubbles in the solution or gel of high concentration can be removed by this method in some cases.



(6) Pour the prepared agarose solution into the gel tray previously set in place in the gel casting stand in the above step 3. The amount of gel solution to pour depends upon the gel thickness you wish to obtain. About 50 ml of solution is required for a large gel with a thickness of 4mm.

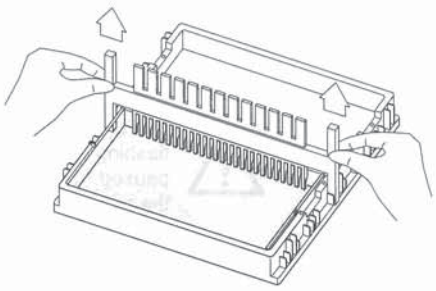


(7) Push the bottom of the gel tray with a glass rod to remove any air trapped underneath the tray; this must be performed before the gel solution begins to solidify. Check for any air bubbles on the surface and/or inside the gel solution.

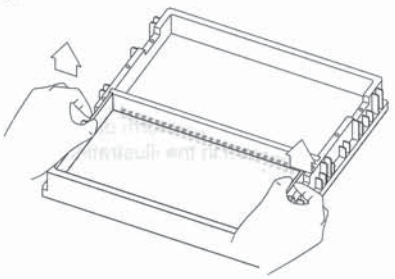


(8) Allow the gel solution to solidify for approx. 20 minutes at room temperature. It may take longer in some cases (for example with lower agarose concentrations).

(9) Remove the comb(s) with both hands by gently lifting upwards. Check that the gel has completely solidified in rectangular wells and that it is free of air bubbles.

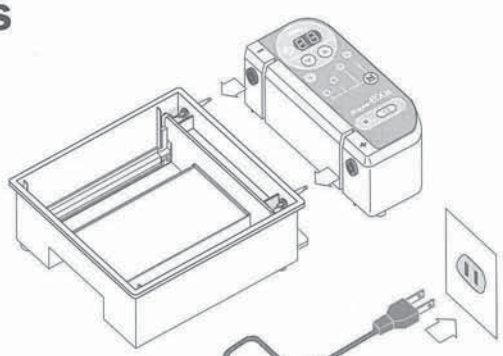


(10) Hold the gel tray at the notches on both sides of the casting stand. Pull the tray upwards. Gel preparation is now complete.



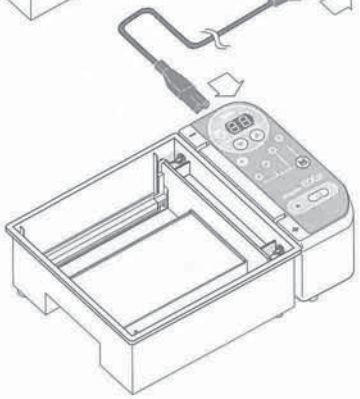
To store gels for later use, keep them in the tray and saturate with a small quantity of running buffer and cover the entire gel (approx. 3 mm above the gel surface) and tray with food protection film or other similar material to protect from desiccation and contamination.

3. Performing Electrophoresis



(1) Connect the Power Supply to the Electrophoresis Tank.

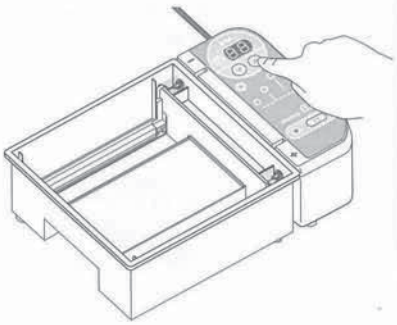
(2) Connect the power cable to the Power Supply. Plug the Power Supply into a wall outlet.



⚠ Ensure an approved power cord that satisfies your regional voltage standard is used.

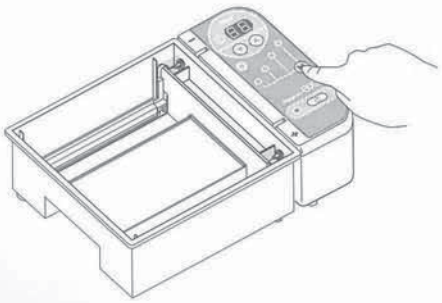
⚠ Input voltage is automatically detected by the system. A transformer is not necessary in any region where the standard voltage is 100 to 240VAC.

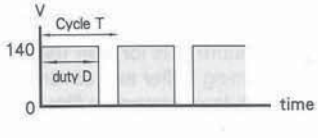
(3) Set the timer. Increase or decrease the value with the Up and Down buttons. 1 minute to 99 minutes can be set as the required run time. Set "0" for continuous run mode ("c" will appear on the display panel).



⚠ The LED at the left side of the Run/Pause/Stop button flashing indicates that the timer operation has been paused. To set the timer in this state,push and hold the button to reset the timer.

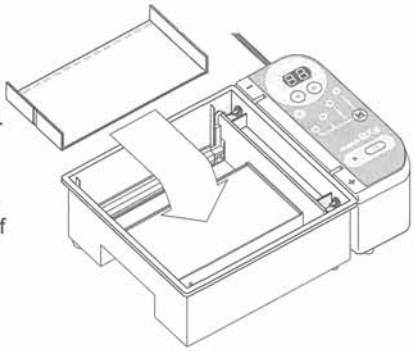
(4) Select the required output voltage from 25V, 50V, 100V 135V or ADDITIONAL. In ADDITIONAL mode, you can select 70V, 35V or 18V by using the Voltage Selector (See page 11). Peak voltage is a constant 140V for any output voltage, but the waveform differs according to the selected voltage output. The waveforms are shown in the illustration.





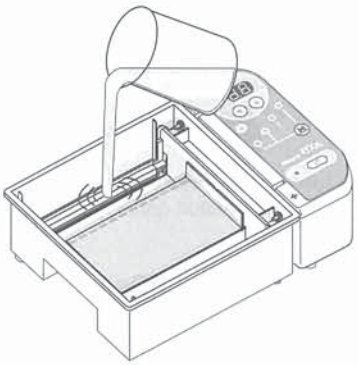
Selected(V)	135	100	70	50	35	25	18
D/T(%)	96	72	50	36	25	18	12

(5) Place the gel previously prepared onto the gel platform of the Electrophoresis Tank without removing it from the tray. For a large gel, place the tray in such a way that its center groove engages the rib of the Tank. Be careful that the gel does not slide out of the tray.



The electrode at the front is the anode. Set the gel so that its wells face the back panel for electrophoresis of nucleic acid.

(6) Pour running buffer into the Electrophoresis Tank to such a level that the gel is submerged approx. 3mm below the buffer.

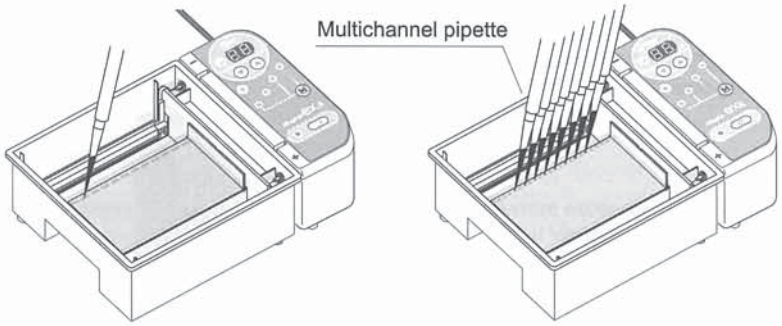


Please pay attention to the temperature increase with electrophoresis using 100V or 135V.

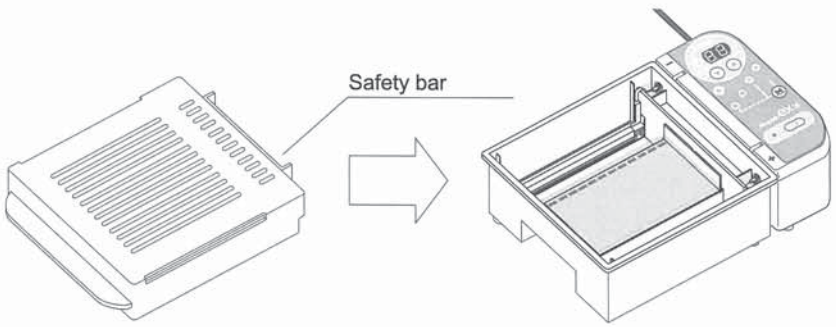
If too much buffer is poured into the Tank, the migration current may suddenly increase and the current supply may be cut off by the over-current protection function of this equipment during migration. Please pay attention to the amount of buffer solution used, particularly when using high concentration buffer.

Standard: 4mm thick gel in small trays: approx. 300 to 320ml (buffer solution only).
4 mm thick gel in a large tray: approx. 270 to 290 ml (buffer solution only).

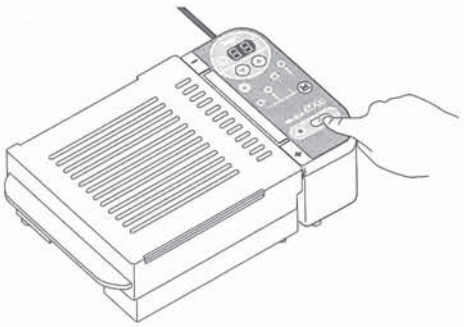
(7) Pipette the desired amount of sample into the wells. Approximately 12 μl of sample can be loaded into each 6 mm wide well, and up to approximately 4 μl into each 2 mm wide well. If a multi-pipette is used for 2.5 mm wells, arrange them alternately as shown in the illustration.



(8) Set the Safety Lid in place so that the safety bars fit correctly into the slits of the Power Supply.



(9) Press the Run/Pause/Stop button to turn on the Power Supply. The red LED will light up, indicating that system power is on. Check also that air bubbles can be observed from the electrodes as this indicates that power is actually being supplied to the buffer in the Electrophoresis Tank .



On the Timer Display

Remaining time is indicated in minutes on the timer display, and the LED flashes every second.

A rolling LED display appears on the panel (counterclockwise) in continuous run mode.

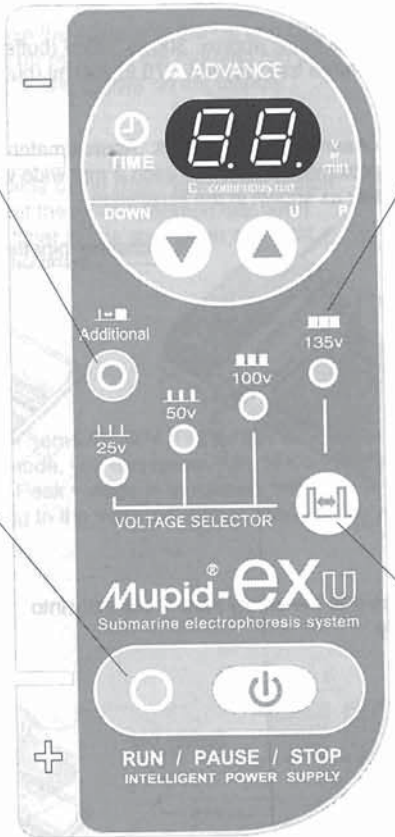
Display LEDs

Additional Voltages LED

Turns red when one of the additional voltages (18V, 35V,70V) is selected.
The voltage is showed on the Timer Display when selecting them or pushing the Voltage Selector during operation.

Output display LED

ON: system power is on.
OFF: system power is off.
Flashing: system power has been paused.



Output voltage display LED

The LED indicates when output voltage is selected from 25V, 50V, 100V, or 135V.

Flashing of one LED: current limiting mode, please see page 11
Flashing of four LEDs: over-current mode, please see page 11

Voltage Selector

Press and hold to show the voltage selected for electrophoresis on the display.

Setting of Additional voltages

The additional voltages (18V, 35V, 70V) are set as follows :

1. Light the Additional Voltages LED by pressing the Voltage selector.
2. Keep the Voltage selector pressed, then the value of voltage is shown on the Timer display.
3. Change the value with the Down and Up Buttons.
4. Release the Voltage selector to finish setting.

On pause mode, and re-start

Press the Run/Pause/Stop button when you need to temporarily stop an electrophoresis run. The Output display LED will continuously flash on and off to indicate a temporary shutdown. The remaining time of the timer setting will be retained in the memory. Press the Run/Pause/Stop button to resume the run.

If the Safety Lid is removed during electrophoresis the Power Supply will go into pause mode. Set the lid correctly into position so that the twin bars fit into the slits of the Power Supply. To re-start the run, press the Run/Pause/Stop button.

If the Run/Pause/Stop button is pressed for ca. 2 seconds in pause mode, the timer is reset using the last time memory. To re-start the run, press the Run/Pause/Stop button again.

Over-current detection and current limiting mode

If the output exceeds the rated voltage, one voltage LED only will continuously flash on and off to indicate current overload. The voltage is automatically adjusted to control the systems output power and the current will be reduced through controlling the power. This does NOT mean the system is "out of order".

If the output exceeds the rated voltage at the start of the run, the voltage control changes to current limiting mode. Therefore, please check whether such mode occurs or not by using buffer and gel without samples.

If you find that the current limiting mode often occurs, change the buffer condition and/or use much lower voltage for runs.

Electrophoresis using 2xTAE or NaOH solution (such as alkaline agarose electrophoresis) is not possible in this device.

On Shut Down caused by Over-current detection

The Power Supply is designed to protect against over-current. If current exceeding the equipment capacity is supplied, the Power Supply will automatically shut down and all Output Voltages LEDs will continuously flash on and off to indicate over-current. Then, immediately unplug the power cable from the wall outlet. Check to see what has caused the over-current or a short circuit between the electrodes. Verify that there is no problem with the operating conditions.

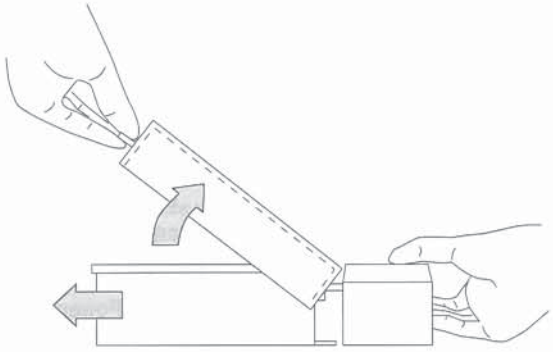
Finish of electrophoresis

When the time set on the timer is up, the power automatically turns OFF and an alarm sounds to indicate the operation is complete. If the system is in continuous run mode, ensure the output button is pressed so as to shut the Power Supply off.

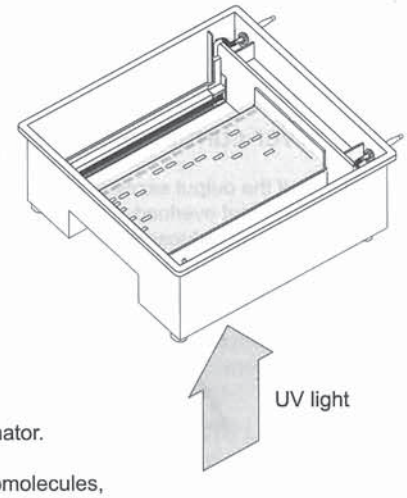
As soon as electrophoresis has completed proceed with staining and observation of gels before the bands start to diffuse.

4. Observation of sample bands (example)

(1) To disassemble the Tank from the Power Supply, remove the Lid as shown in the illustration by using the handle of the Lid as a fulcrum to turn off the Power Supply.



(2) The Tank and Gel trays are transparent under UV whose wavelength is longer than 290nm. If the samples have been pre-stained with fluorescent dye (to be excited by UV illumination), you can observe the fluorescence by using UV through the bottom of the tank.



Wear a face shield for the eyes and skin, and use gloves during UV illumination.

If the band fluorescence is faint, you may observe it in some cases through the gel above the UV illuminator.

(3) Before the pre-staining procedure, remove the gel with the gel tray.

(4) According to the appropriate procedure, stain the gel for observation.

(5) After staining, observe the fluorescence through the gel above the UV illuminator.

Some stain reagents are known to react with DNA and other biomolecules, and are health hazards. Extreme care is required when handling these reagents to avoid exposing your skin to them.

Do not forget to wear safety gloves before handling all materials including the reagents such as buffer or gels. Follow appropriate hazardous materials disposal regulations according to the applicable instruction manuals when disposing of gels, buffers and staining solutions after use. Thoroughly wash and clean the Electrophoresis Tank and Gel Trays if they are contaminated with staining agent solution.

5. Maintenance

Cleaning is the only routine maintenance required on the Mupid®-exU

Do not store electrophoresis buffer in the Electrophoresis Tank. Over the time the buffer starts crystallizing on electrodes and will effect the results of electrophoresis or may permanently damage the platinum electrodes.
It is recommended to discard buffer after electrophoresis and rinse the Tank with distilled water. Storing the Mupid®-exU components clean and dry will extend the life of the system and ensure trouble-free operation.

Be sure to disconnect the Mupid®-exU Power supply from the Tank and unplug the power cable from the wall outlet before lifting the Tank to discard buffer or clean the device.

When Gel trays or Tank are routinely exposed to UV light during visualization of samples, the plastic will gradually deteriorate. UV transmittance of the plastic will decrease by about 10% after 100 hours of exposure to UV rays. It may be necessary to replace the Gel trays or Tank to maintain highest sample visibility.

Be careful not to brush or disrupt the electrodes when cleaning the Tank. Electrophoresis buffer and agarose are best cleaned with running water. Rinse the Tank with distilled water and leave open to dry.

Do not autoclave any components of the Mupid®-exU system.

Do not use bleach, organic solvents or any other aggressive solutions to clean the system.

The Mupid®-exU Electrophoresis System should not be modified or altered in any way.

The Mupid®-exU Electrophoresis Tank is designed to be used only with the Mupid®-exU Power supply. Using the Tank with any other power supply or using the Mupid®-exU Power supply with an unauthorized electrophoresis tank will disable the safety features and may result in accidental electrical shock and possible user injury. ADVANCE Co.,Ltd. is not responsible for any injury or damage caused by the use of unauthorized components.

6. Trouble shooting

Problem	Possible cause and/or Corrective action
The Power Supply LED does not light up	· The power cable is not plugged into a wall outlet or not connected to the Power Supply. · The power cable does not satisfy your regional voltage standard in use. · The fuse has blown. Verify buffer concentration. · The equipment has overheated. If it has, unplug the power cable from the wall outlet. Ensure that nothing has covered the vent holes on the Power Supply. Place the Power Supply somewhere ventilated and cool for a while.
Impossible to set the Power Supply conditions	· During electrophoresis, setting is not possible. Press the Run/Pause/Stop button to shut it down. · If in pause-mode (the LED will be flashing on and off), press the Run/Pause/Stop button continuously for ca. 2 seconds so as to reset the timer.
No output voltage	· Press the Run/Pause/Stop button. · Position the safety lid properly. · Gel is not fully submerged in running buffer and/or has dried up. · The electrodes or copper wire around them may have broken.
Migration stops	· The volume of running buffer is too high, its concentration is too high or its temperature is too high. The buffer may have high conductivity. · The running buffer is being re-used and may have higher conductivity due to loss of water. · The main switch is OFF or the cable has detached from the Power Supply or wall outlet.
Low mobility (Slow sample migration)	· The voltage is not set to the correct level. · The type and/or concentration of buffer greatly affects mobility. · Higher conductivity in samples to be separated. Dilute or prepare new samples using the correct procedure and solution (for example, usage of phosphate-buffered saline as sample suspension buffer is not acceptable in electrophoresis). · The running buffer is being re-used so it may have higher conductivity due to loss of water. · It may be in current limiting mode. If the output exceeds the rated voltage, only one voltage LED will continuously flash on and off to indicate current overload. Voltage is automatically adjusted to control the systems output power. For more details, please see page 15.
Distorted bands	· Air bubbles are trapped inside the gel. · The agarose was not fully dissolved in the gel preparation step. · The electrophoresis cell is not level. Unevenness should be avoided with submerged electrophoresis. · The running buffer is being re-used so in most cases it will not have constant pH and conductivity and will greatly affect electrophoresis mobility.

Problem	Possible cause and/or Corrective action
No band can be observed	· The concentration of the staining solution is low and/or has been used too many times. Small volume of solution compared to the volume of gel. · Extended staining period may result in a higher signal, or a shortened period may result in a lower background. · Sample volume or amount is insufficient for detection. · For fluorescence observation, use the correct excitation wavelength for the fluorochrome. Too much illumination can degrade the fluorochrome, resulting in faint fluorescence. · Observe the fluorescence through the gel above the UV illuminator. · The sample has moved out of the gel for some reason. · The sample does not move or moves in an unexpected direction. Try using a shorter electrophoresis period. · Samples diffuse due to too much time elapsing after electrophoresis.

7. Specifications

Electrophoresis Tank	
Overall dimension	183mm(W) × 56mm(H) × 164mm(L)
Material characteristic	UV transparent (50% at 254nm, 80% at 312nm)
Solution volume	approx. 270 - 320ml
Quantity	1

Safety Lid	
Overall dimension	197mm(W) × 38mm(H) × 169mm(L)
Material characteristic	UV non-transparent
Quantity	1

Intelligent Power Supply	
Overall dimension	75mm(W) × 62mm(H) × 170mm(L)
Weight	410 g
Input Voltage	AC100 - 240V, 50/60Hz
Output Voltage	135V, 100V, 50V, 25V, 70V, 35V, 18V Constant peak voltage of 140V, and duty-control
Timer	Timer operation 0 - 99 min, and continuous mode Temporary shutdown supported
Safety Switch	Micro-switches in the Power Supply Without safety lid, no output of Power
Memory Function	Automatic memory (the last used V and T)
Quantity	1

Gel Tray	
Gel tray(small)	130mm(W) × 13mm(H) × 59.5mm(L)
Gel tray(large)	130mm(W) × 13mm(H) × 122mm(L)
Quantity	small: 2, large: 1

Comb	
Multiple number of wells	13 - 26 Wells 13 wells: 9mm spacing 26 wells: 4.5mm spacing
Quantity	4 (supports making 13 or 26 wells)

Gel Casting Stand	
Overall dimension	149mm(W) × 20mm(H) × 125mm(L)
Quantity	1

8. Where to Call

If you have a question about the Mupid-eXU Electrophoresis System or would like to order accessories, contact the sales dealer labeled on the back side of this manual. ADVANCE Co.,Ltd will support the dealer to answer for your question.

If you cannot find where to contact in this manual or on the products, please contact ADVANCE by E-mail written in English or Japanese. ADVANCE's E-mail address is info@mupid.com .

Mupid®-exU

Electrophoresis System

ADVANCE

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MADE IN JAPAN ND-2