

Chapter 10



Dispenser

GMDN Code	41663, 35734
ECRI Code	16-274
Denomination	Dispenser, liquid, laboratory

The dispenser is a piece of equipment in the pipette and dilutor family. The word dispenser comes from the prefix *dis* which implies *privation*, and from the Latin word *pensum* which means *task*. There are different types of dispensers such as, models meeting chemical work requirements and others used in microbiology, bacteriology, immunology and pharmacology. There are automated dispensing units controlled by computer programs, which are used in institutions where there is a high testing demand and thus a need for automated procedures. This chapter features manual dispensers, also called repeater pipettes, as these are the most commonly used.

PURPOSE OF THE DISPENSER

The dispenser is a multi-purpose piece of equipment which can be used in the laboratory for carrying out the following activities:

1. To aspirate and dispense volumes of liquid or solutions when it does not require great exactitude.
2. To distribute a volume of liquid or solution stored in a recipient container in predefined partial volumes (repetitive dispensing with a constant final volume).
3. To mix a solution by successive aspiration and delivery, using an aspiration and supply device.
4. To titrate a solution or a virus stock by dispensing the material to be titrated by serial dilution into a diluent until reaching the end point.

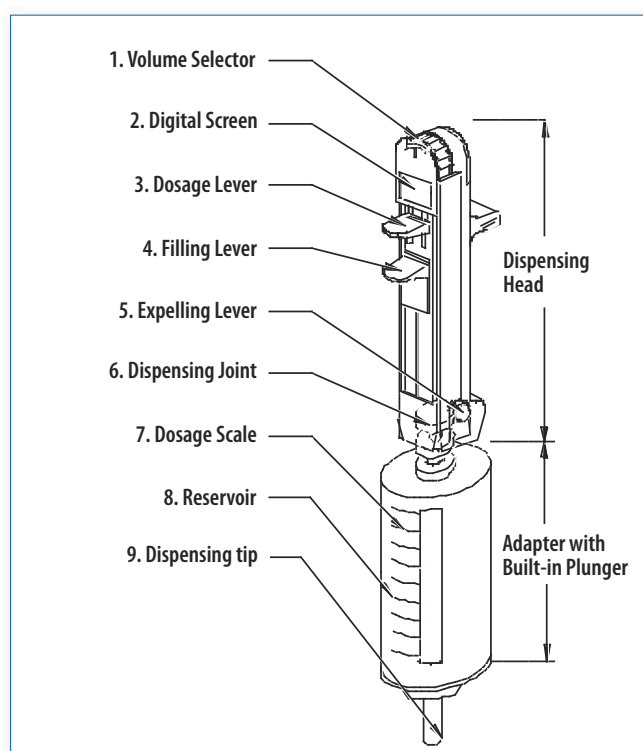
PHOTOGRAPH AND DIAGRAM OF THE DISPENSER

Dispenser



Photo courtesy of Gilson S.A.S.

Figure 25. Dispenser



5. To dilute the concentration of a solution by mixing defined volumes of this solution with a diluent.
6. To use similarly to a pipette (by aspirating a volume and then dispensing it).
7. To distribute the culture mediums in Petri dishes. Automated dispensers equipped with accessories for moving the Petri dishes and storing them once the culture medium is dispensed are often used. Precise application (small scale) of culture medium is done using disposable plastic syringes with N° 16¹ needles.

The dispenser can normally be programmed for such activities according to the manufacturer's instructions provided.

Operation principles

In general, modern dispensers are controlled by microprocessors and have the following components (Note that the numbering below corresponds to that in Figure 25).

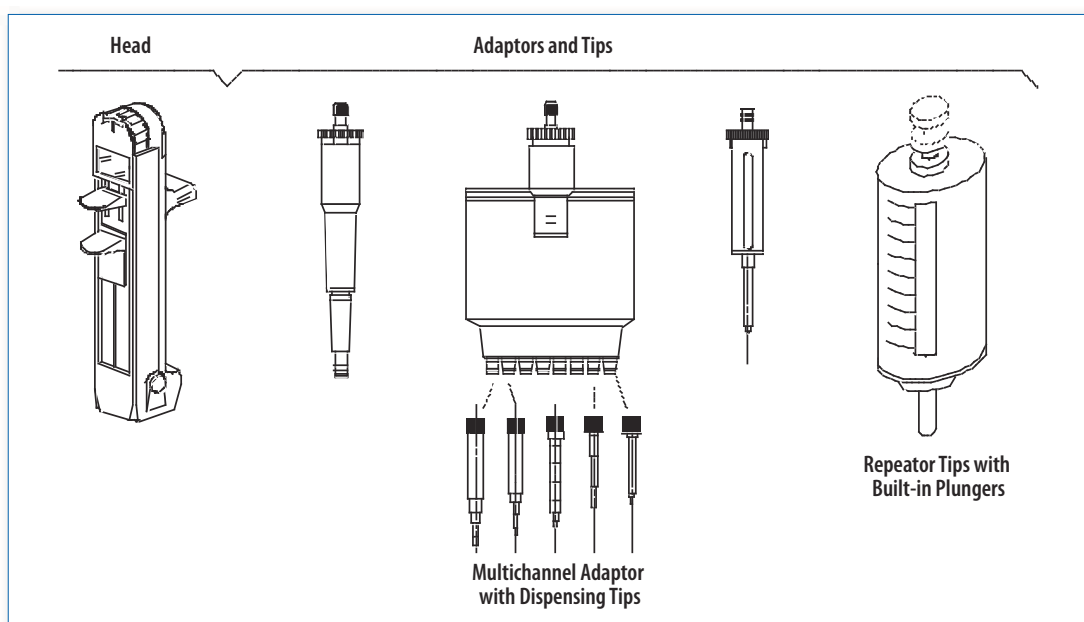
1. Volume selector. This thumbwheel is used to regulate the volume to be dispensed. The selection made is shown on the dispenser's screen.
2. Digital screen. This shows the data related to the selected function, such as selected volume, type of tip present on the dispensing head and information related to alarm and error messages that may be generated during operation e.g.: low battery or incorrectly selected tip for the volume selected.
3. Dosage lever. This lever activates the plunger attached to a syringe-like positive displacement adaptor, in which a piston is activated along a cylinder to dispense the selected volume of liquid.
4. Filling lever. A mechanical lever manually activated to aspirate the liquid into the adaptor's reservoir.
5. Eject button. A mechanism that releases the dispensing element (adaptor) from the dosing device head.
6. Dispenser connector. This is the offshoot connecting the setting element to the dispenser head. It contains a system of gaskets and guides for ensuring its adequate adjustment.
7. Dosage scale. This shows the maximum volume that can be dispensed with the selected adaptor. In some cases, it also indicates the remaining volume.
8. Dispensing adaptor. A container which holds the solution aspirated or supplied in dispensation cycles. There is a great variety, depending on the model of dispenser. There are simple or combined ones with adapted tips.
9. Dispensing tip. This facilitates supplying or drawing solutions. The tip is located at the end of the dispenser's adaptor. Without it, it is impossible to use the dispenser.
10. An on and off switch. (Not shown in the figure).
11. A battery compartment. (Not shown in the figure).

Dispenser's accessories

For the dispenser to perform specific tasks, the appropriate accessories are needed. Examples of adaptors are shown in the figure below.

¹ Product Information Sheet. 3cc Syringes. For dispensing and plating Methocult®. http://www.stemcell.com/technical/28230_28240-PIS.pdf

Figure 26. Dispenser and accessories



Dispensed volume

Dispensers have been developed for working with predefined volume ranges. Before use, the type of solution to be used and volumes to be dispensed will have to be considered. Manufacturers offer diverse models of adaptors. A table with typical work ranges is shown next.

Adaptor capacity	Volume ranges dispensed
0.1 ml	1–20 µl
0.2 ml	2–40 µl
1 ml	10–100 µl
5 ml	50–500 µl
10 ml	100 µl to 2 ml
25 ml	250 µl to 5 ml

REQUIREMENTS FOR OPERATION

Depending on the type of dispenser, minimum conditions are required for operation, some of which are as follows:

1. Verify that the dispenser has been designed for the solutions to be used. Verify the compatibility of materials in the user manual provided by the manufacturer.
2. A clean environment, equipped with suitably sized work stations, well ventilated and lit.
3. Verify that the room temperature is stable, with a variation range of ± 0.5 °C, between 4 and 40 °C and an optimum temperature of 20 °C.
4. Use the appropriate personal safety protection if working with toxic materials or materials posing a biological risk.
5. Use tips specifically designed by the manufacturer for each particular application.

ROUTINE MAINTENANCE

The maintenance of the dispenser is simple. The routines detailed below feature the most important activities:

Frequency: Daily

1. Clean the dispenser with a damp cloth and mild detergent.
2. Disinfect the dispenser using 60% isopropanol.
3. Prevent humidity from entering the interior of the electronic control and/or the mechanisms.

Battery change (as needed)

1. Open the battery compartment. This is generally done by simply sliding the lid from the “closed” position to the “open” position.
2. Remove the worn out battery. Dispose of it according to recommendations.
3. Install a battery with the same characteristics as the original. Verify the electrical polarity so that it is properly installed. Before inserting it, clean the contact surface with a piece of clean cloth.
4. Close and adjust the lid.

TROUBLESHOOTING TABLE		
PROBLEM	PROBABLE CAUSE	SOLUTION
It is not possible to install the adaptor in the dispenser's head.	The component is defective.	Seek assistance from a specialized service technician.
	The dispensing component is contaminated.	Observe if there is some type of obstruction. Clean if necessary. Seek help from the specialized service technician.
The adaptor cannot be removed from the dispenser's head.	There is a failure in the electronic system.	Reinitiate the equipment. (Switch off and on). Select manual extraction option.
	There is a failure in the adjustment mechanism.	Verify if the piston moves forward and backwards. Remove the cylinder over a waste container.
The tip of the dispensing device (adaptor) drips.	The tip is defective.	Substitute the dispensing device.
The pipette type dispensing device drips.	The dispensing tip is not well adjusted.	Free the dispensing tip from the adjustment cone. Adjust firmly.
	The dispensing tip was incorrectly selected.	Verify the type of tip recommended by the manufacturer.
	The piston or piston seal is damaged.	Replace the piston and seals. Use replacement parts supplied by the manufacturer.
The screen shows the low battery signal.	The battery is worn out.	Replace the battery.
The screen does not show any signals.	The battery is worn out.	Replace the battery.
	The electronic system is defective.	Seek the assistance of a specialized service technician.
The screen shows error signals.	Various	Seek the assistance of a specialized service technician.
The screen shows a filling error.	Insufficient liquid for the dispenser.	Verify that the volume available for dispensing is adequate. If not, load or aspirate a volume adequate for the quantity to dispense.
The screen shows complete volume error.	More liquid was aspirated than the adaptor or tip is able to receive.	Eject all liquid. Check operation attempted again.
The screen shows tip selection error.	The tip installed is not designed for carrying out the operation attempted.	Verify what type of tip is designed for performing the operation. Substitute the tip.
	The tip is defective.	Place a new tip with the same specifications as the original.

BASIC DEFINITIONS

Culture medium. Liquid or solid material developed for medical purposes for cultivating and identifying microorganisms capable of producing diseases (pathogens) and for various other purposes.

Dispensing element (adaptor). Devices also called Combitips, attached to the dispensing head to dispense a solution. Different sizes and shapes are available according to the volumes to be dispensed and the characteristics of the solution used.

Petri dish. A shallow plate made out of glass or plastic used for microorganism cultures in the laboratory.

Mix. Addition of substances which does not produce a chemical reaction. In a homogenous mixture, the composition and appearance must be uniform.