

AIRPREP[™]

CUB



AirPrep[™] Cub Sampler User Guide
Models ACD210 and ACD200

Contents

1	Product Overview.....	3
1.1	Product Description.....	3
1.2	Collection Capability.....	3
1.3	Materials Provided:.....	3
1.4	Materials Required But Not Provided.....	4
2	Method of Operation.....	5
2.1	Sample Collection on an Electret Filter.....	5
2.2	Instant Wet Foam Elution™.....	5
3	Sampler Components.....	7
3.1	AirPrep Cub Sampler Components.....	7
4	Procedures.....	8
4.1	Setting Up the AirPrep Cub Sampler for Collection.....	8
4.2	Installing the Filter.....	8
4.3	Control Panel Introduction.....	8
4.3.1	LED Indicator Light.....	8
4.3.2	Power on.....	9
4.3.3	Powering off Manually before time Expires.....	10
4.3.4	Power Off Due to Low Battery*.....	10
4.3.5	Selecting the flow rate.....	10
4.3.6	How to select a timed run mode.....	11
4.4	Recovery of the Sample.....	11
4.5	Eluting the Sample from the Filter.....	12
4.6	Cleaning the Sampler.....	12
5	AirPrep Cub Sampler- Model ACD210 Battery safety information	13
6	Specifications	14

1 PRODUCT OVERVIEW

AirPrep™ Cub Sampler ACD210 model has an internal battery
AirPrep™ Cub Sampler ACD220 model is plug-in only

1.1 PRODUCT DESCRIPTION

The AirPrep Cub Sampler is a dry filter air sampler that operates using our unique, patented rapid filter elution products to provide samples for a wide range of indoor and outdoor biomonitoring applications.

1.2 COLLECTION CAPABILITY

The AirPrep Cub Sampler is suited for the collection of bioaerosols (bacteria, molds, and viruses) and other particulate matter, including sub-micron sized particles, and airborne molecular contamination. The AirPrep Cub Sampler efficiently captures micron- and submicron-sized particles, including viruses, bacteria, pollen, molds and fungal spores, as well as non-biological particles from 0.01 micron to 10+ microns.

- Users can select from three flowrate modes: 50 LPM, 100 LPM, or 200 LPM from the front panel as described in Section 4.
- Users can select from four timed modes: 30 minutes, 1 hour, 2 hours, or continuous from the front panel as described in Section 4.
- Since liquids are not used in the collector, the system can be operated at temperatures ranging from -2° C to +60° C in non-condensing environments.

1.3 MATERIALS PROVIDED:

The AirPrep Cub Sampler includes the power supply cord (*Item #AC04076*) and a universal fitting installed in the base of the unit for common off-the-shelf camera tripods.

*Upon receipt, always inspect components when unpacking. If damage is observed, do not use and contact InnovaPrep or local distributor immediately. Please use the original box and foam packaging in the event a return shipment is necessary.

1.4 MATERIALS REQUIRED BUT NOT PROVIDED

The single-use AirPrep Filter & Elution Kit comes with everything you need to recover a fluid sample (as shown in Figure 1).

Users have a choice between two kits with different fluid types:

- AirPrep Filter & Elution Kit with TRIS - *Item AC8100T* - Recommended for use with rapid molecular methods of analysis.
- AirPrep Filter & Elution Kit with PBS - *Item AC8100P* - Recommended for classical culture analysis.

The AirPrep Filter & Elution Kit includes:

1. Elution Fluid Canister
2. Elutor Cap
3. Filter
4. Sample Cup
5. Sample Cup Lid (not shown)

The kits are available for purchase on the InnovaPrep website <https://www.innovaprep.com/store> .



**FIGURE 1 AIRPREP
FILTER & ELUTION KIT**

2 METHOD OF OPERATION

The AirPrep Cub Sampler uses an electret filter to capture particles. To recover the trapped particles, a novel Wet Foam Elution™ process is employed to break the electrostatic charge and flush the particles off the filter into a small liquid volume in seconds.

2.1 SAMPLE COLLECTION ON AN ELECTRET FILTER

The dry 52 mm electret filters are made with a combination of positively charged and negatively charged fibers. This substantially increases the collection efficiency of the filter and allows for the use of lower pressure drop filters, which, in turn, allows for higher sampling rates for extended periods using battery power.

2.2 INSTANT WET FOAM ELUTION™

The patented wet foam elution process uses a very specific high-quality foam to elute the filter. The elution fluid is composed of water, a low concentration surfactant (0.15% Tween 20), and a pH buffer (Tris or PBS). This solution is carbonated, which dissolves significant amount of CO₂ into the fluid. During the elution process, the valve opens as the elution canister is pushed into the elutor cap that is fitted onto the filter, forcing the elution fluid through the pressure orifice, through the filter and into the sample cup. As the fluid passes from the high-pressure environment on one side of the orifice, to the low-pressure environment on the other side, the dissolved CO₂ expands, comes out of the solution to form micro-bubbles. These micro-bubbles increase the volume of the fluid six-fold or more as it passes through the filter. The foam immediately collapses back into a liquid and is ready for sample processing and analysis. InnovaPrep's patented Wet Foam Elution process (<https://www.innovaprep.com/patents>) is much more efficient than liquid rinsing for the following reasons:

- **Volume Expansion** - When rinsing a filter with liquid, most of the liquid volume is used to fill the dead space inside the filter housing; only a small portion of the fluid covers the filter surface. This can be avoided to an extent by reducing the cross-sectional area of the fluid path across the filter, but a large portion of the liquid is still underutilized. Because our elution foam is 80-90% gas, this fills the empty space without contributing to the final sample volume.
- **Increased Viscosity** - Liquid has a tendency toward “channeling” when flowing through a filter, creating an area of high flow in the center of the fluid path, while the portion of flow in contact with the filter surface is much slower. The higher viscosity of our elution foam prevents channeling and allows for a more uniform flow through the interstitial spaces of the filter.

- **Bubble Dynamics** - The micro-bubbles in the foam behave as deformable solids. As they travel through the filter they move as a rigid body.
- **Exfoliating Action** - As the micro-bubbles in the foam impact against each other and burst, the turbulence and energy produced helps to lift particles that are adhering to the filter fibers.
- **Buffered Elution** - The buffered elution fluid is conductive and breaks down the electrostatic charges holding the particles to the electret filter, effectively releasing them in the liquid sample.

3 SAMPLER COMPONENTS

3.1 AIRPREP CUB SAMPLER COMPONENTS

1. Omni-Directional Inlet Cap – protects from water ingress
2. Inlet - screws off left to open for loading or recovering the filter cartridge. Screws on right to close
3. Front Panel - *Power on* and *Mode* selections (see section 4 for instructions)
4. Power Supply and Plug
5. Universal Tripod Connection - for attaching to a common, off-the-shelf camera tripod is located on the bottom of the instrument (not shown)



FIGURE 2 SAMPLER COMPONENTS

4 PROCEDURES

This section includes some of the basic instructions for operation.

4.1 SETTING UP THE AIRPREP CUB SAMPLER FOR COLLECTION

Push the barrel plug of the power supply (Figure 2) into the power jack on the bottom of the instrument. Plug the AC Power Cord into the power supply and plug the other end into an appropriate wall outlet.

4.2 INSTALLING THE FILTER

Open the inlet cap by twisting it to the left to lift off. Insert the filter into the top of the AirPrep Cub Sampler, as shown in figure 2. The filter housing is designed to only fit in one way. Screw the inlet lid on (twisting right) to close.

4.3 CONTROL PANEL INTRODUCTION

The control panel consists of four timer setting LED indicator lights, three flowrate LED indicator lights, and one momentary pushbutton switch (*Hold/Mode*).

Two variables constitute a “run mode”: flowrate and runtime.

To turn on and off:

- Press *Hold/Mode* for 2 seconds to Power on/power off

To change run modes

- press the *Hold/Mode* for 4 seconds

Reset Button

- A reset button is located on the bottom of each instrument, pressing this will result in an immediate system interrupt and reset of the system.

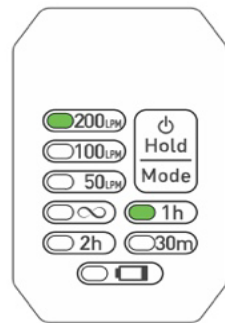


FIGURE 3 CONTROL PANEL

4.3.1 LED INDICATOR LIGHT

Flowrate LED Indicator Light

The flowrate LED indicator for the selected run mode will stay on while the fan is running.

Timer LED Indicator Light

- The timer LED Indicator light will flash slowly as they countdown, as they approach the expiration they will increase in frequency until the unit times out and shuts down. The light will remain solid for the last 10% of the timer.
- If the timer is set to continuous, the LED indicator light will stay steadily on.

The Battery LED Indicator Light (Model 210 only) will flash in the following situations:

- When a run mode is selected that exceeds the expected battery capacity
- After the battery is drained low enough to shut down the fan before the timer expired
- The battery LED indicator light will start to flash slowly as the charge approaches a critical level- increasing in frequency until it is steady on when the battery is at its preset critical charge.

4.3.2 POWER ON

When powering-on the sampler, the previous run mode will be recalled and started by default.

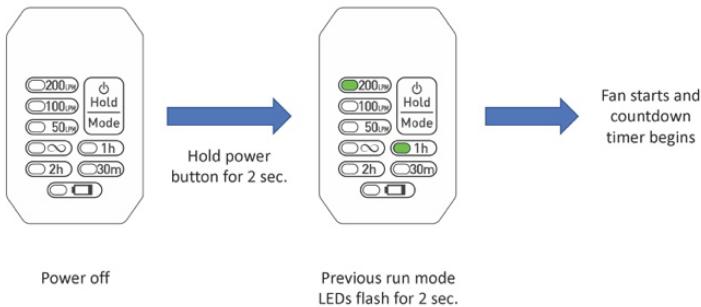
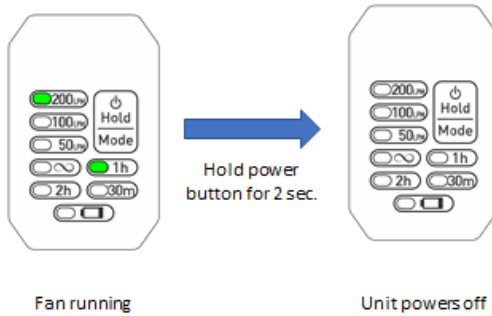


FIGURE 4. POWER-ON

4.3.3 POWERING OFF MANUALLY BEFORE TIME EXPIRES

To power-off the Air Sampler before the time expires, hold the *Hold/Mode* button for 2 seconds, the unit will power-off.



4.3.4 POWER OFF DUE TO LOW BATTERY*

*Model 210 only

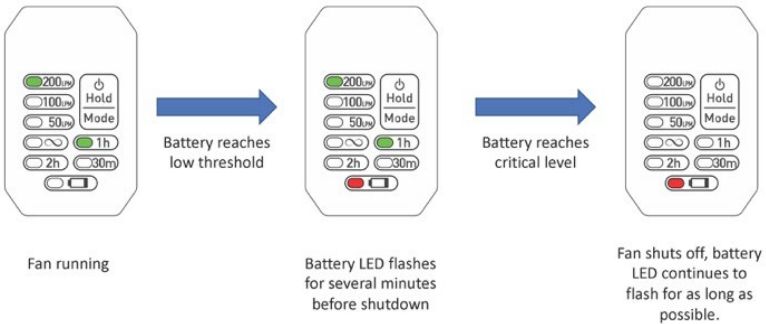


FIGURE 5. POWER-OFF DUE TO LOW BATTERY (MODEL 210)

4.3.5 SELECTING THE FLOW RATE

1. Press *Hold/Mode* button for 4 seconds, if fan was already running it will shut off after the first two seconds.
 - a. All 3 Flowrate LED Indicator lights will flash
2. Let up and momentarily press the *Hold/Mode* button
 - a. The 50LPM LED indicator light will flash. If desired, stop to select or

3. momentarily press the *Hold/Mode* button again
 - a. The 100LPM LED indicator light will flash. If desired, stop to select. Additional momentary presses will continue to cycle through the 50, 100 and 200 LPM LEDs
4. Press the *Hold/Mode* button for 2 seconds to save. Selected flowrate mode is saved, and LED indicator light illuminates steadily; all timer LED indicator lights start flashing

4.3.6 *HOW TO SELECT A TIMED RUN MODE*

1. Once the flow rate has been set. Press the *Hold/Mode* button momentarily.
 - a. All four timed mode LED indicator lights will flash
2. Let up and momentarily press the *Hold/Mode* button
 - a. The 30 Min LED indicator light will flash. If desired, stop to select or
3. momentarily press the *Hold/Mode* button again
 - a. The 1 hour LED indicator light will flash. If desired, stop to select. Additional momentary presses will continue to cycle through the remaining timer modes.
4. Press *Hold/Mode* button for 2 seconds to save selection. Selected flowrate mode is saved and LED indicator light illuminates.
 - a. Fan will start.

If a time & flowrate combination requires more battery than is available, the battery LED will flash to alert you

4.4 *RECOVERY OF THE SAMPLE*

1. When the run is completed, recover the filter from the sampler with gloved hands by twisting the inlet to the left to open.
2. Remove the filter cassette, invert it top-side-down, and press onto the sample cup firmly until it clicks all the way around the cup. Perform this on a stable surface.
3. Cap the filter with the elutor cap as shown in Figure 6 (make sure the filter and elutor cap are fully sealed).
4. Place the filter assembly in a zip-type bag for transporting dry, or alternatively, elute the filter as described in the following section.

4.5 ELUTING THE SAMPLE FROM THE FILTER

To extract the captured particles from the filter:

1. Place the sample cup, filter, and elutor cap, as shown in Figure 6, on a stable surface.
2. Firmly press the elution fluid canister into the elutor cap. The elution foam will be released from the elution fluid canister through the filter when the canister valve is pressed down. Hold the canister down until all the foam is released. The foam quickly collapses into a liquid in the sample cup and available for sample processing and analysis.



**FIGURE 6 AIRPREP
FILTER & ELUTION KIT**

4.6 CLEANING THE SAMPLER

Common off-the-shelf alcohol or bleach wipes can be used for cleaning and disinfection of the entire sampler. If applicable, disconnect the AC power plug prior to cleaning.

5 AIRPREP CUB SAMPLER- MODEL ACD210 BATTERY SAFETY INFORMATION

14.4V 3350mAh

Operating temperature:

- Charge: 10 - 45°C
- Discharge: -20 - 60°C

Storage temperature:

Recommended 25+/-5°C at 50% state of charge

- Do not immerse the AirPrep Cub Sampler in liquid. Exposure to liquid may damage the battery or the circuits. As a result, the battery may generate heat, smoke, catch fire, or explode.
- Do not use or place the AirPrep Cub Sampler near an open flame, heater, or high temperature (above 80°C).
- Do not use unauthorized chargers. Use of an unauthorized charger could cause the battery to generate heat, smoke, catch fire, or explode.

6 SPECIFICATIONS

Dimensions & Weight	8" X 5" X 5" and 2.5 lbs.
Filter Material	52mm dry electret depth filter
Particle Size Collection	0.01µm to 10µm+
Flow Rate/s	50, 100, and 200 LPM
Run Modes	Continuous, 2-hour, 1 hour, 30 min.
Power	120W AC
Sample Recovery Method	Instant Wet Foam Elution
Elution Fluid	Either 0.15% Tween 20 25mM Tris or 0.15% Tween 20 PBS
Single-use Rapid Filter Elution Kit Components	Filter, Sample Cup, Sample Cup Lid, Elutor Cap, and Elution Foam Canister
Final Sample Volume	6-7 mL
Compatible Analysis Methods	PCR, NGS, Culture (bacteria, molds)
Operating Temp./Humidity Range	Operating temperature: -2° C to 60° C in non-condensing environments.
Storage Temp.	0°C to 30°C
AirPrep Cub Sampler-Model ACD210 only	
Battery Type	Lithium ion, 14.4V 3350mAh @ 0.2 C discharge, room temperature
Battery Life	4 hours continuous @ 200 LPM, 20 – 30 °C
Long Term Storage (Recommended)	20 – 30°C, 45-85% RH, @ 50% Charge (> 3 Months)

Please contact InnovaPrep or an official InnovaPrep distributor for technical assistance and troubleshooting.

InnovaPrep, LLC

132 East Main Street, Box 68, Drexel, MO 64742

Phone: 816-619-3375

info@innovaprep.com and www.innovaprep.com

Revision	Date	Author
2	10/19/21	AKP