STANDARD OPERATING PROCEDURE
Instructions for Use of SKC AirChek Connect Sample Pump

KEY WORDS

air sampling, SKC AirChek Connect Sample Pump

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1.0 INTRODUCTION

1.1 Purpose

This Standard Operating Procedure (SOP) discusses the calibration and use of the SKC AirChek Connect Sample Pump (Cat. No. 220-4000) for collection of ambient air samples.

1.2 Scope

This document provides specific instructions for the calibration and use of a SKC AirChek Connect Sample Pump for the collection of air samples as part of the Department of Pesticide Regulation (DPR) Air Monitoring Network.

2.0 MATERIALS

2.1 SKC AirChek Connect Sample Pump

- 2.1.1 Charging cradle(s)
- 2.1.2 Single cradle power supply
- 2.1.3 Multi cradle power supply
- 2.1.4 All-in-One Adjustable Tube Holder
- 2.1.5 Small flat-head screwdriver

2.2 High ALICAT flow meter (MB-20SLPM)
2.3 Low ALICAT flow meter (MB-100SCCM)
2.4 Flexible vinyl tubing
2.5 Calibration tubing
2.6 Sorbent Tubes
2.7 Field Data Sheet (FDS) and Chain of Custody (COC) forms
2.8 Sealable polyethylene bag
2.9 Dry ice and ice chest
2.10 Red caps to seal sorbent tubes

3.0 PROCEDURES

3.1 General

The SKC AirChek Connect Sample Pump is a touch screen pump that operates at air flows from 5 to 5,000 ml/min. An overview of the pump is presented in Figure 1.

Figure 1. SKC AirChek Connect Sample Pump overview.

Flow rate is determined by the chemical being monitored, equipment, and duration of the sampling period. The determination of the appropriate flow rate is study dependent; therefore, it is recommended to refer to the study's protocol. With the constant flow mode, the SKC AirChek Connect Sample Pump can be adjusted to sample air flow for high volume flow (1 to 5 L/min), and low volume flow (5 to 500 ml/min) with All-in-One Adjustable Tube Holder (Figure 24).

3.1.1 Touch Screen

There are four touch screen activated buttons in the active zone (Figure 2).

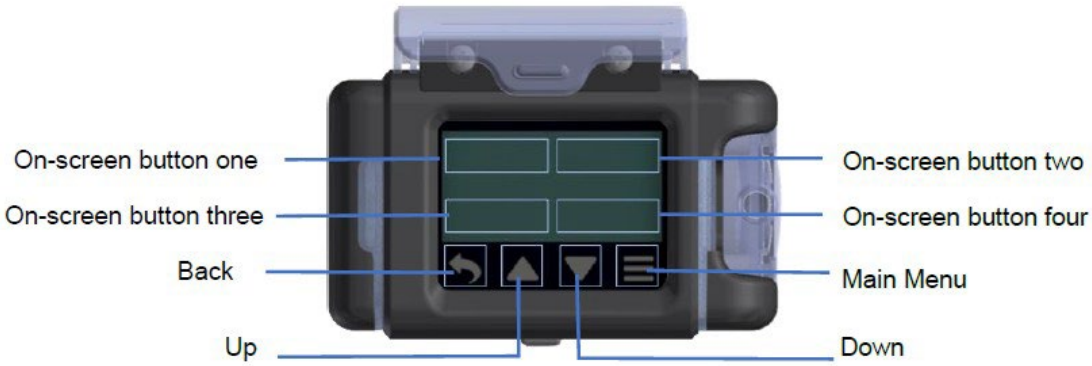


Figure 2. Touch Screen and navigation buttons from top view

3.1.2 Navigation buttons

Immediately below the display are four navigation buttons that access previous screens, Main Menu, and to increase/decrease values (Figure 3).

Back button	**Up Arrow button**	**Down Arrow button**	**Main Menu button**
Returns to previous screen 	Increases selected value or moves up a list/range/display  Touch and hold to speed increment of flow or pressure settings.	Decreases selected value or moves down a list/range/display  Touch and hold to speed decrement of flow or pressure settings.	Returns to Main Menu, from which you can access all options. 

Figure 3. Navigation buttons

4.0 Air Sampling

4.1 General

Air sampling studies are usually conducted for the purpose of determining the flux rate of a chemical following an application or estimating ambient air concentrations from off-site movement. The chemical being monitored will determine the sample media and tube type.

4.1.1 Turning Pump Power On/Off

- To power on the pump, press the recessed power on/off button on the side of the pump (Figure 1). The screen will light up and the flow screen will be displayed.
- To power off the pump, press the recessed power on/off button on the side of the pump.
- To conserve battery power, a non-running pump will power off automatically after 5 minutes of inactivity.
- The power on/off button also locks/dims and unlocks/undims the touch screen while the pump is running.

4.2 Setting up a sample with higher flow rate (MITC samples)

4.2.1 Setting Pump Flow Rate

Setting a flow rate, calibrating a flow rate, and sampling are done through the **Sample Menu**. For the higher flow rate (MITC samples), the flow rate on the pump is set to 1.5 L/min.

4.2.1.1 Break open the sorbent tube and attach the sorbent tube via vinyl tubing affixed to the SKC AirChek Connect Sample Pump inlet and turn on the pump.
Note: The pumps and the tubing may already be set up at some stations.

4.2.1.2 If the flow rate is not already set on the pump, follow these steps to set the flow rate at 1.5 L/min.
Note: If the flow rate is already set to 1.5 L/min go to section *4.2.1.3*

1. Press the main menu button (three Horizontal lines below the display) to get to the Main Menu and touch Sample (Figure 4).

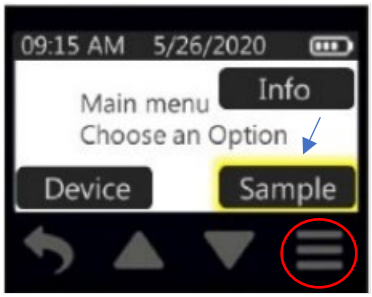


Figure 4. Sample Button

2. Touch Flow (Figure 5).

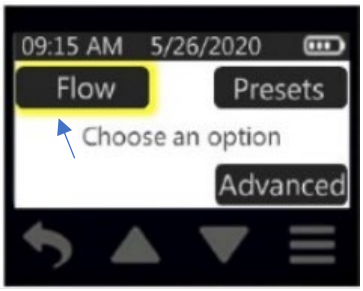


Figure 5. Flow Button

3. Touch flow display (Figure 6).

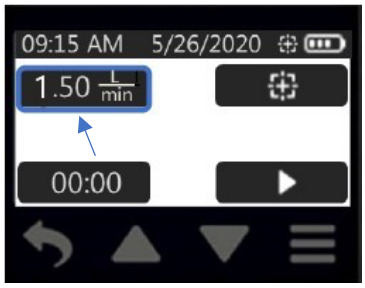


Figure 6. Flow Display

4. To toggle flow settings; Touch the left or right arrow buttons; flow changes by increments of 0.5 L/min. Touch up/down arrow buttons to fine-tune setting (Figure 7).

   Note: A sustained touch on the up/down arrow buttons will speed up increment/decrement of flow setting.

   Touch check mark to accept selection and return to Flow Menu with new flow setting displayed.

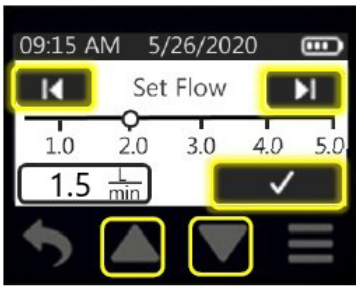


Figure 7. Left/Right and Up/Down Buttons

4.2.1.3 Power on the High ALICAT flowmeter and “Tare” flow.

4.2.1.4 Connect the other end of the sorbent tube to ALICAT flowmeter using calibration tubing (Figure 8).

Figure 8. Calibration Set up (1 to 5 L/min)

4.2.1.5 Touch the Run button to start the pump (Figure 9).

Figure 9. Run Button

4.2.1.6 Wait at least 1 minute for the flow to be stabilized.

- If the flow reading on the ALICAT flowmeter does not show the desired flow (1.5 L/min or within 10% of desired flow, 1.35 - 1.65 L/min), the pump needs to be calibrated as follows.
- If the pump does not need to be calibrated go to section 4.2.2.2

4.2.2 Calibration

4.2.2.1 While the ALICAT flowmeter is still connected and powered on, stop the pump and press the main menu button (three Horizontal lines below the display) to get to the Main Menu.

1. From the Main Menu, touch Sample (Figure 10).

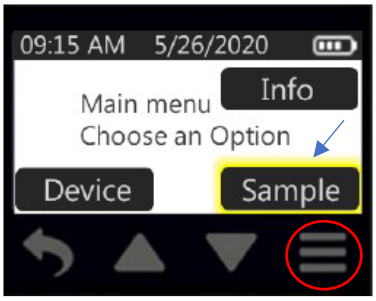


Figure 10. Sample Button

2. Touch Flow (Figure 11).

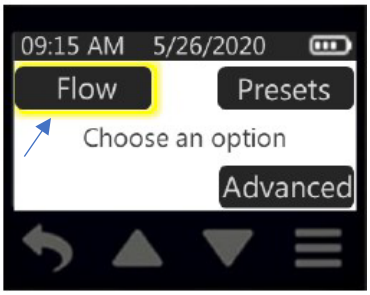


Figure 11. Flow Button

3. Touch calibration icon (Figure 12).

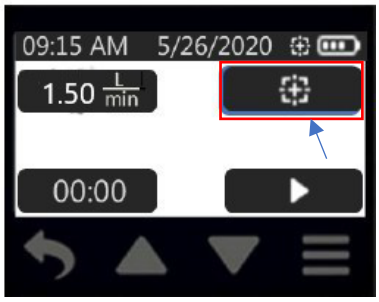


Figure 12. Calibration Button

4. Pump will start running when you touch the calibration icon. Touch up/down arrow buttons to increment/decrement the calibration adjustment (Figure 13).

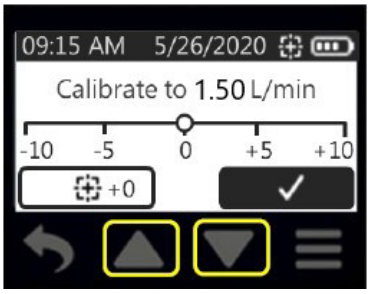


Figure 13. Up/Down Buttons

5. The calibration adjustment value will display beside the calibration icon. The flow rate on the ALICAT flowmeter will change because of this adjustment. When the method-specified flow rate (1.5 L/min) is reached, touch the check mark to accept the calibration adjustment value and return to the Flow Menu (Figure 14).

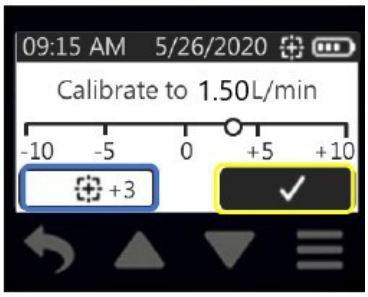


Figure 14. Accept Button

6. The flow rate displayed on the pump will remain unchanged (Figure 15).

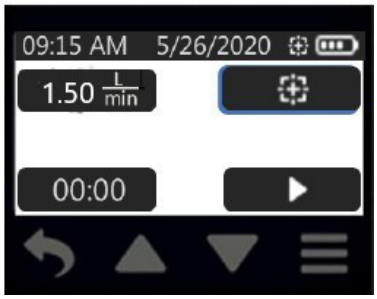


Figure 15. Main Display

4.2.2.2 Record the flow rate on the ALICAT flowmeter as the “Starting Flow” on the Field Data Sheet (FDS).

4.2.2.3 After setting/calibrating flow rate, ensure that ALICAT flowmeter and calibration tubing have been removed.

4.2.3 Duration

After setting up the samples, set the duration from the Main Menu as follows:

1. Press the main menu button (three Horizontal lines below the display) to get to the Main Menu and touch Sample (Figure 16).

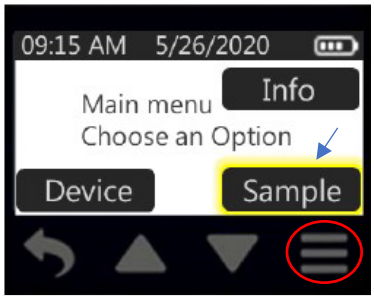


Figure 16. Sample Button

2. Touch Flow (Figure 17).

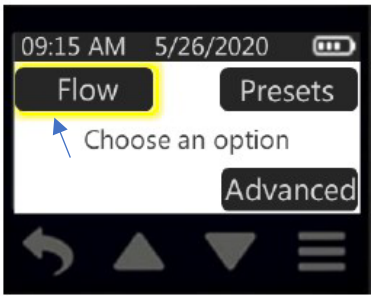


Figure 17. Flow Button

3. Touch Time button (00:00) in Flow Menu to set sample duration (Figure 18).

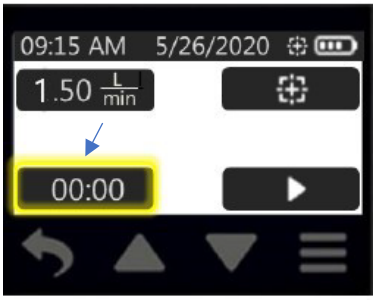


Figure 18. Time Button

4. Hour digit 1 will flash. Touch up/down arrow buttons to increment/decrement hour. Touch right arrow to advance to hour digit 2 (will flash) and up/down arrow buttons to adjust hour digit 2. Repeat through minutes (Figure 19). Note: The duration for Air Monitoring Network (AMN) samples should be 24 hours, but the time should be set for 25 hours in case anything happens in the field.

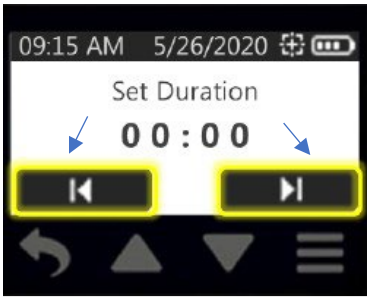


Figure 19. Left/Right and Up/Down Buttons

5. Touch check mark to accept new time and return to Main Display. New time setting will display (Figure 20).

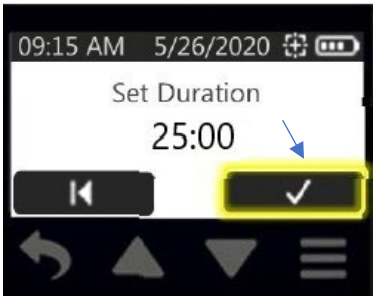


Figure 20. Accept Button

4.2.4 Sample Run

From the Main Menu Run the sample as follows:

1. Press the main menu button (three Horizontal lines below the display) to get to the Main Menu and touch Sample (Figure 21).

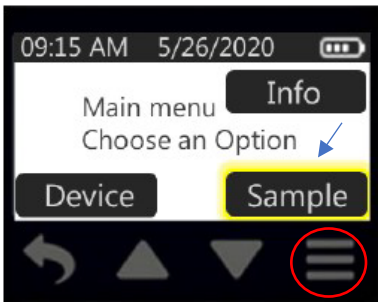


Figure 21. Sample Button

2. Touch Flow (Figure 22).

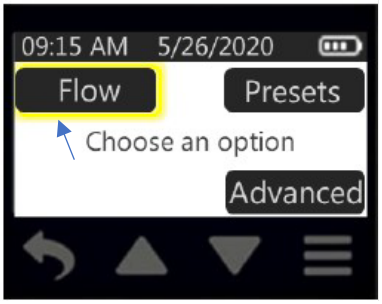


Figure 22. Flow Button

3. Touch Run button in Flow Menu to run pump in constant flow (Figure 23).

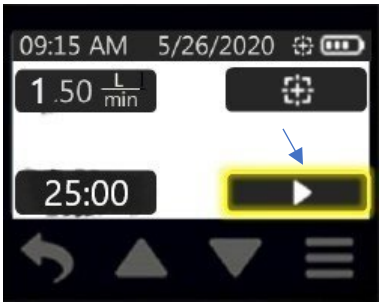


Figure 23. Run Button

4. While the pump is running the screen should be locked to prevent accidental tap errors or tampering. Use the power button to lock and unlock the touch screen during sampling.

4.2.5 Sample Collection

Before stopping the pump at the end of sampling period the "Ending Flow" needs to be measured.

4.2.5.1 Turn on the High ALICAT flowmeter and "Tare" flow.

4.2.5.2 Connect the other end of the sorbent tube to ALICAT flowmeter using calibration tubing (Figure 8).

4.2.5.3 Record the flow rate on the ALICAT flowmeter, as the "Ending Flow" on the FDS.

4.2.5.4 Remove the ALICAT flowmeter and the calibration tubing.

4.2.5.5 At 24 hours, stop the pump. Remove the sorbent tube and cap both ends. Place the sorbent tube into the designated sealable polyethylene bag. Place bag on dry ice.

4.2.5.6 Record "Sample end time", "Duration" and "Total Volume" on the FDS.

4.2.5.7 Turn off the pump.

4.3 Setting up a sample with a lower flow rate (Chloropicrin samples)

4.3.1 Setting Pump Flow Rate

Setting a flow rate, calibrating a flow rate, and sampling are done through the **Sample Menu**. For the lower flow rate (Chloropicrin samples), the flow rate on the pump is still set to 1.5 L/min and the All-in-One Adjustable Tube Holder (Figure 24) is used to adjust the flow to 50.0 mL/min.

Figure 24. All-in-One Adjustable Tube Holder

4.3.1.1 Break open the sorbent tube and attach the sorbent tube and the All-in-One Adjustable Tube Holder (Figure 24) via vinyl tubing to the SKC AirChek Connect Sample Pump inlet and turn on the pump.

Note: The pumps and the tubing may already be set up at some stations.

4.3.1.2 If the flow rate is not already set on the pump, follow these steps to set the flow rate to 1.5 L/min.

Note: If the flow rate is already set to 1.5 L/min go to section *4.3.1.3*

1. Press the main menu button (three Horizontal lines below the display) to get to the Main Menu and touch Sample (Figure 25).

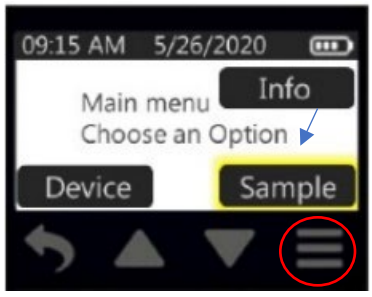


Figure 25. Sample Button

2. Touch Flow (Figure 26).

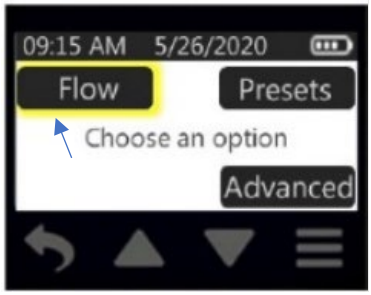


Figure 26. Flow Button

3. Touch flow display (Figure 27).

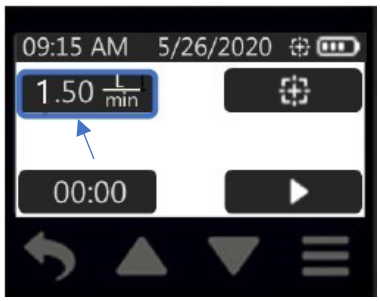


Figure 27. Flow Display

4. To toggle flow settings; touch the left or right arrow buttons. Flow changes by increments of 0.5 L/min. Touch up/down arrow buttons to fine-tune setting (Figure 28).

   Note: A sustained touch on the up/down arrow buttons will speed up increment/decrement of flow setting.

   Touch check mark to accept selection and return to Flow Menu with new flow setting displayed.

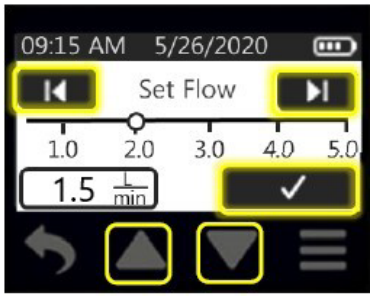


Figure 28. Left/Right and Up/Down Buttons

4.3.1.3 Power on the Low ALICAT flowmeter and "Tare" flow.

4.3.1.4 Connect the other end of the sorbent tube to ALICAT flowmeter using calibration tubing (Figure 29).

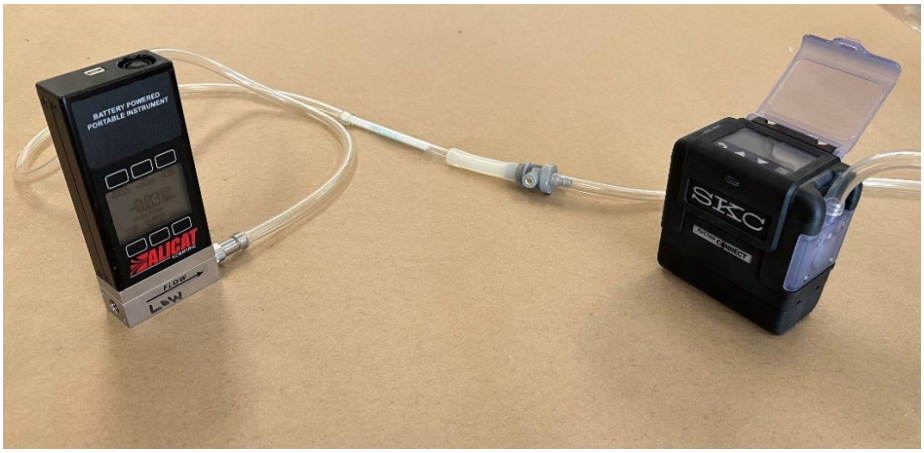


Figure 29. Calibration Set up (50.0 mL/min)

4.3.1.5 Touch the Run button to start the pump (Figure 30).

Figure 30. Run Button

4.3.1.6 Wait at least 1 minute for the flow to be stabilized.

- If the flow reading on the ALICAT flowmeter is not showing the desired flow (50.0 mL/min or within 10% of desired flow 45-55 mL/min), the pump needs to be calibrated as follows.
- Note: If the pump does not need to be calibrated go to section 4.3.2.2

4.3.2 Calibration

4.3.2.1 While the ALICAT flowmeter is connected, powered on, and the pump is still running, using a small flat-head screwdriver, turn the flow adjust screw on the All-in-One Adjustable Tube Holder clockwise to decrease flow or counterclockwise to increase flow until the method-specified flow rate is indicated on the ALICAT flowmeter (adjust to within 10% of desired flow, 45 – 55 mL/min).

4.3.2.2 Record the flow rate on the ALICAT flowmeter, as the “Starting Flow” on the FDS and stop the pump.

4.3.2.3 After setting/calibrating flow rate, ensure that ALICAT flowmeter and calibration tubing have been removed.

4.3.3 Duration

After setting up the samples, set the duration from the Main Menu as follows:

1. Press the main menu button (three Horizontal lines below the display) to get to the Main Menu and touch Sample (Figure 31).

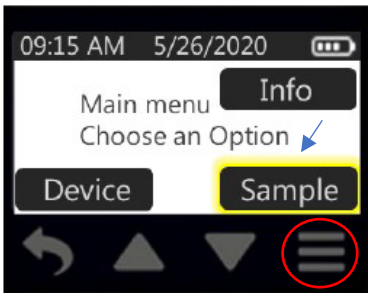


Figure 31. Sample Button

2. Touch Flow (Figure 32).

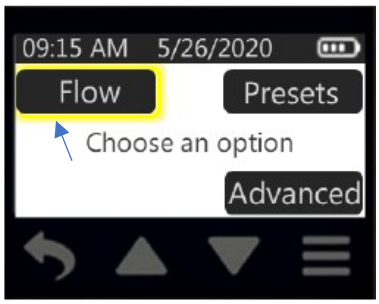


Figure 32. Flow Button

3. Touch Time button (00:00) in Flow Menu to set sample duration (Figure 33).

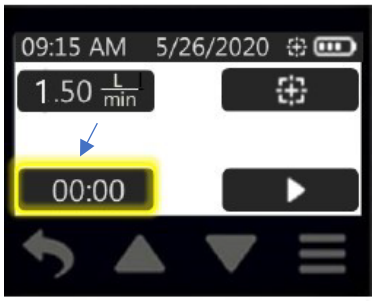


Figure 33. Time Button

4. Hour digit 1 will flash. Touch up/down arrow buttons to increment/decrement hour. Touch right arrow to advance to hour digit 2 (will flash) and up/down arrow buttons to adjust hour digit 2. Repeat through minutes (Figure 34). Note: The duration for Air Monitoring Network (AMN) samples should be 24 hours, but the time should be set for 25 hours in case anything happens in the field.

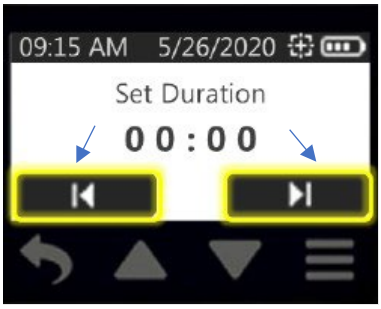


Figure 34. Left/Right and Up/Down Buttons

5. Touch check mark to accept new time and return to Main Display. New duration setting will display (Figure 35).

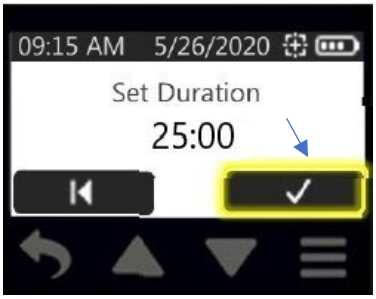


Figure 35. Accept Button

4.3.4 Sample Run

From the Main Menu Run the sample as follows:

1. Press the main menu button (three Horizontal lines below the display) to get to the Main Menu and touch Sample (Figure 36).

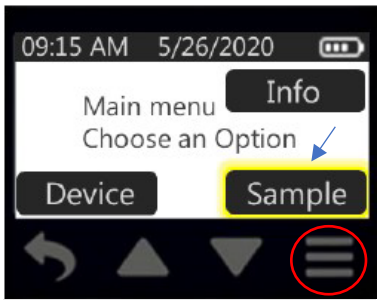


Figure 36. Sample Button

2. Touch Flow (Figure 37).

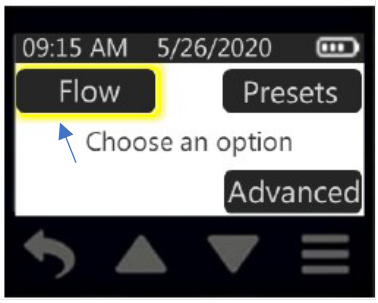


Figure 37. Flow Button

3. Touch Run button in Flow Menu to run pump in constant flow (Figure 38).

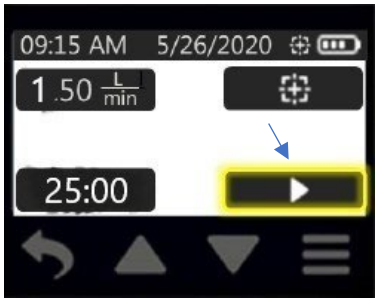


Figure 38. Run Button

4. While the pump is running the screen should be locked to prevent accidental tap errors or tampering. Use the power button to lock and unlock the touch screen during sampling.

4.3.5 Sample Collection

Before stopping the pump at the end of sampling period the "Ending Flow" needs to be measured.

4.3.5.1 Turn on the Low ALICAT flowmeter and "Tare" flow.

4.3.5.2 Connect the other end of the sorbent tube to ALICAT flowmeter using calibration tubing (Figure 29).

4.3.5.3 Record the flow rate on the ALICAT flowmeter, as the "Ending Flow" on the FDS.

4.3.5.4 Remove the ALICAT flowmeter and the calibration tubing.

4.3.5.5 At 24 hours, stop the pump. Remove the sorbent tube and cap both ends. Place the sorbent tube into the designated sealable polyethylene bag. Place bag on dry ice.

4.3.5.6 Record "Sample end time", "Duration" and "Total Volume" on the FDS.

4.3.5.7 Turn off the pump.

4.4 Reporting Requirement

4.4.1 Field Data Sheet

A Field Data Sheet (FDS) and Chain-Of-Custody (COC) form should be completed for each sample according to SOP ADMN006.02. The following information should be recorded on the FDS:

1. Site name
2. Location code
3. Station operator
4. Operator agency
5. Study number
6. Flow meter serial number
7. Sample start date

8. Sample end date
9. Sample start time
10. Sample end time
11. Duration
12. AMN sample type
13. Equipment type
14. Sampler ID
15. AMN sample number
16. Starting flow
17. Ending flow
18. Total Volume
19. Local conditions
20. Field notes / comments
21. Sample loaded by / date and time
22. Sample retrieved by / date and time
23. Sample transported or shipped to DPR warehouse by / date and time
24. Mode of transport

4.5 Study-Specific Decisions

The following study-specific decisions are the responsibility of the study project leader and should be made in consultation with the study field coordinator, senior scientists, and Quality Assurance Officer.

5.0 Troubleshooting

If you have any issues with operation and maintenance of the pump, you can contact relevant staff or you can refer to the SKC AirChek Connect Sample Pump Manual.

Appendix

This Appendix provides information on how to charge the battery pack(s), check the charging status, how to navigate through different Screens and the Manus, and how to set up the Time and Date on the SKC AirChek Connect Sample Pump.

The items described here have already been set up at most of the Sampling Stations and therefore presented here as an Appendix.

Charging the Battery Pack

In case you need to charge the battery pack(s), it can be done by using a single or multiple cradle and through the following steps.

Single cradle

Insert the connector on a single cradle power supply into the power port on the side of a standard charging cradle. Insert the wall cube into a 100-to-240-volt wall outlet (Figure 39).

Multiple cradle

Press together the connector on the side of the first cradle with the connector on the side of the next cradle. Repeat the connection to chain up to five standard charging cradles. Insert the connector of multiple cradle power supply into the power port on the side of the last cradle in the chain. Insert the wall cube into a 100-to-240-volt wall outlet (Figure 39).

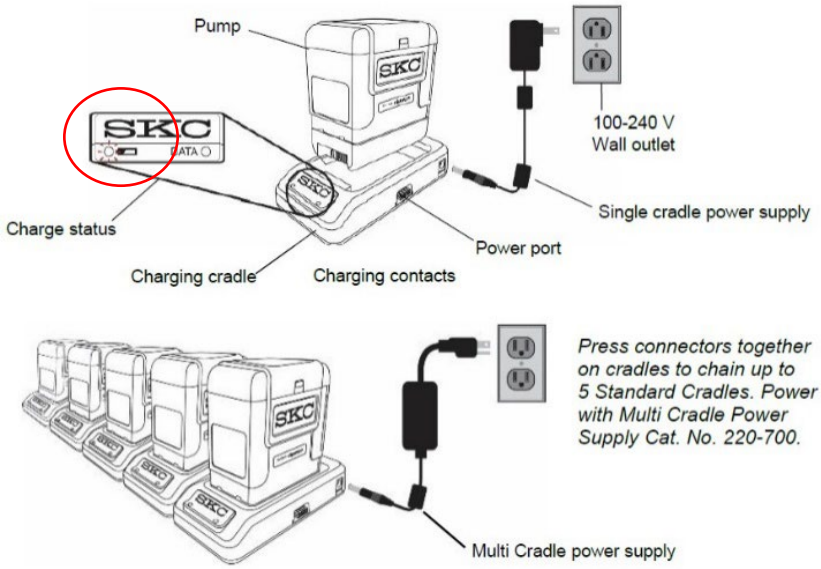


Figure 39. Charging Train, Single and Multiple Cradles

Charging status

After charging the battery completely (approximately 3 hours). The left LED on the cradle will indicate charging status (Figure 40).

LED Action			Charge Status
Red ● steady			Charge in progress
Red ● 3 sec	Green ● 1 sec	(Pattern repeats)	Approximately 75% charged
Green ● steady			Charge completed/trickle charge

Figure 40. Charging status

Display

There is a constant display at top of every screen which shows the time in 12 or 24-hour format, date in 3 format options, and battery status icon (Figure 41).

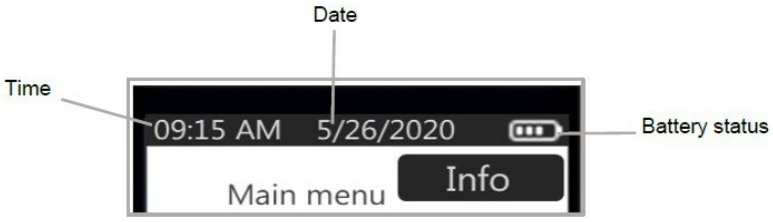


Figure 41. Constant Display

Figure 42 shows what the display will look like when the pump is running, and the screen lock is not activated.

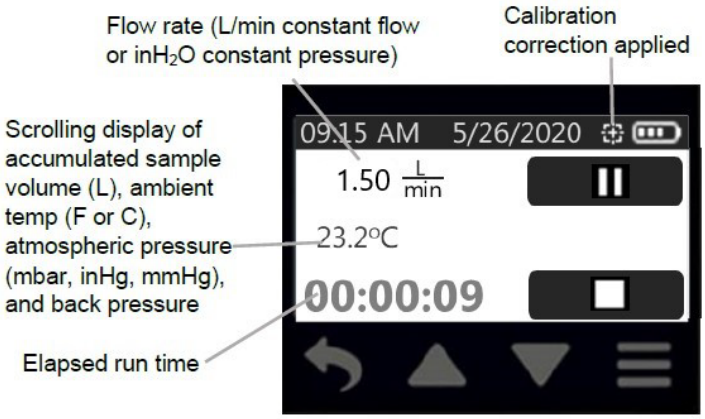


Figure 42. Display while pump is running

While the pump is running the screen should be locked to prevent accidental tap errors or tampering (Figure 43). Use the power button to lock and unlock the touch screen during sampling.

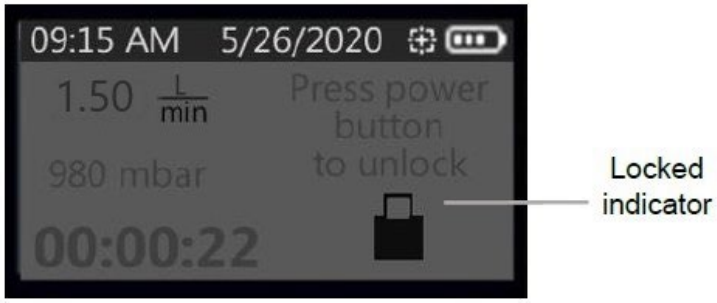


Figure 43. Locked Display

Menus and Screens

Menu overview

The main menu can be accessed by pressing the Main Menu button (three Horizontal lines below the display) to get to the Main Menu and touch Sample (Figure 44).

Figure 44. Main Menu

An overview of the Device, Info and Sample menu are presented in Figure 45.

Device	Info	Sample
History Menu • List of sample runs/summaries **Clock Menu** • Set Time • Set Date • Select Clock display • Select Date display **Units Menu** • Select Temp display • Select ATM display **Screen Menu** • Select Dim • Select Secure Lock • Select Auto Lock	• Firmware version number • Lifetime run time and volume • Pump serial number • Pump manufacture date	**Flow Menu** • Set Flow • Calibrate (constant flow mode) • Set Duration (timer) • Run button **Presets** • Select presets P1 – P4 (created in DataTrac® Pro, uploaded to pump) **Advanced Menu** • Set Pressure • Set Duration (timer) • Run button

Figure 45. Menu overview

Navigational touch buttons

Menus and screens contain other navigational touch activated buttons which are explained in Figure 46.

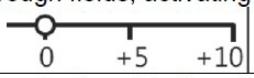
Button	General Function
Check mark 	Saves a selected item
Left and right movement 	Allows horizontal movement on a scale (see below) or moves left or right through fields, activating each for entry of value 
Calibration/flow adjustment 	Allows selection of an adjustment to flow during calibration
Run (start) 	Runs the pump for sampling
Pause 	Pauses a running pump. Elapsed time and volume accumulation pause. When Run is touched, time and volume will continue to accumulate.
Stop 	Stops a running pump and resets elapsed time and volume to zero. Run time information will be available in Sample Summary and History.

Figure 46. Navigational touch buttons

Clock Menu

To change time on the pump from the main menu:

1. Press the main menu button (three Horizontal lines below the display) to get to the Main Menu and touch Device (Figure 47).

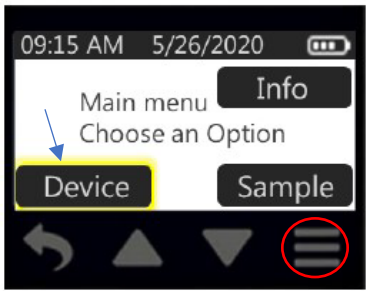


Figure 47. Device Button

2. Touch Clock (Figure 48).

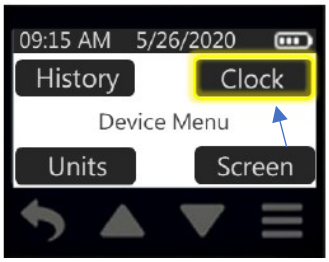


Figure 48. Clock Button

3. Touch the current displayed time (Figure 49).

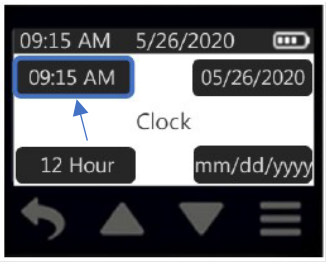


Figure 49. Time Display

4. Hour digits will flash. Toggle the up or down arrow buttons to increase/decrease hours. Touch the right arrow to advance to minutes (will flash) and up/down arrow buttons to toggle AM/PM (Figure 50).

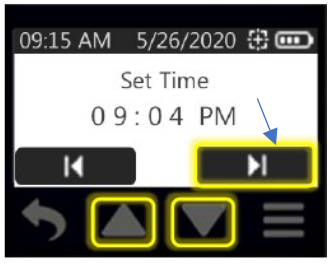


Figure 50. Left/Right and Up/Down Buttons

5. Touch the check mark to accept new time and return to Clock Menu. The updated time setting will display (Figure 51).

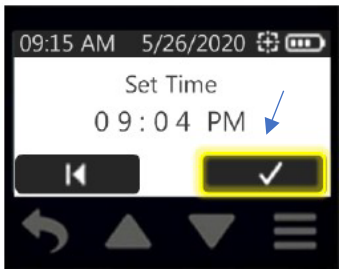


Figure 51. Accept Button

Date Menu

To change the date on the pump from the main menu:

1. Press the main menu button (three Horizontal lines below the display) to get to the Main Menu and touch Device (Figure 52).

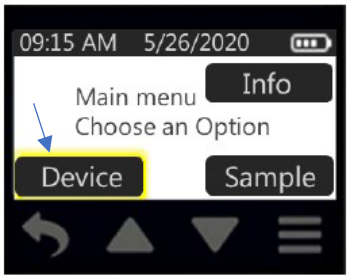


Figure 52. Device Button

2. Touch Clock (Figure 53).

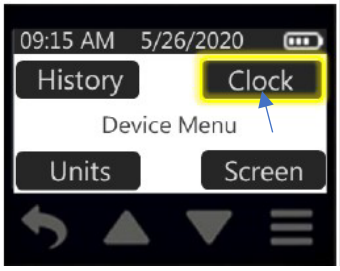


Figure 53. Clock Button

3. Touch date (Figure 54).

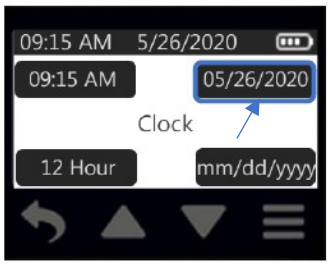


Figure 54. Date Button

4. Month digits will be flashing. To toggle, Touch the up/down arrow buttons to select the month.
   When month is set, touch the right arrow to advance to the day digit (will be flashing) and use up/down arrow buttons to increment/decrement day. Then touch right arrow to advance to year (will flash) and use up/down arrow buttons to increment/decrement year (Figure 55).

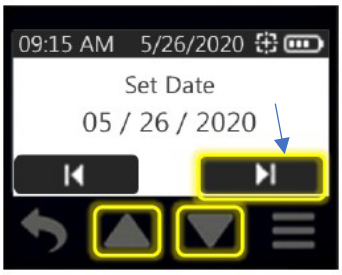


Figure 55. Left/Right and Up/Down Buttons

5. Touch check mark to accept new date and return to Clock Menu. The updated date will be displayed (Figure 56).

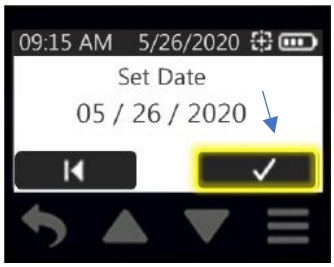


Figure 56. Accept Button

Options on pump screen during sample run are presented in figure 57.

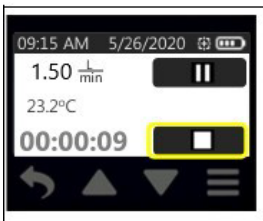
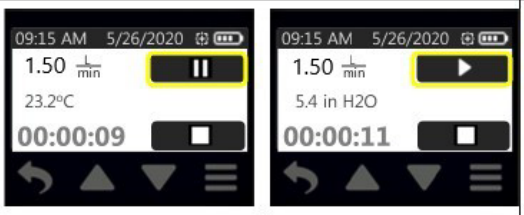
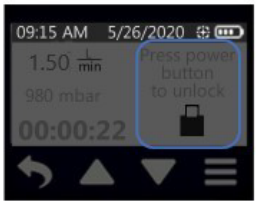
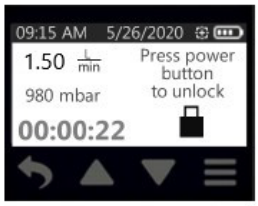
	**Touch the Stop button** to stop sampling, reset accumulated data display, and view Sample Summary.
	**Touch the Pause button** to pause sampling and retain accumulated data display. When touched, pause changes to Run button. **Touch Run button** to resume sampling and data accumulation.
	**Dim (set to On)** dims a screen that has been locked when you press the power on/off button on a running pump or through Auto Lock as soon as the pump starts running. **To resume normal backlighting,** press the power on/off button on the side of the pump (*Figure 1*). *See Modify Device Settings, Screen Menu.* This feature may be used concurrently with Auto Lock and Secure Lock
	**Auto Lock (set to On)** locks (inactivates) the pump touch screen when the pump starts running. A lock icon and "Press power button to unlock" message appears on the screen. **If Auto Lock is set to Off**, the screen remains inactive. The screen may be locked (made inactive) at any time during sampling by pressing the power on/off button on the side of the pump. **To unlock and reactivate the screen**, press the power on/off button on the side of the pump. This feature helps to reduce tap errors during sample runs.

Figure 57. Options during sample run