

STANDARD OPERATING PROCEDURE

Instructions for Calibration and Use of a Xonteck Model 901 Canister Sampler

KEY WORDS

Air Sampling, Xonteck Model 901, Canister Sampler, Summa, VOC

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Environmental Monitoring Branch organization and personnel, such as management, senior scientist, quality assurance officer, project leader, etc., are defined and discussed in Standard Operating Procedure (SOP) [ADMN002](#).

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1.0 INTRODUCTION

1.1 Purpose

The Standard Operating Procedure (SOP) discusses the calibration and use of Xonteck Model 901 Canister Sampler (hereafter referred to as the "Xonteck 901" or "Xonteck") for collection of air samples.

1.2 Scope

The Xonteck 901 canister sampler is a computer-controlled, programmable air sampler that is designed for sampling of volatile organic compounds in ambient air. The method is based on collection of whole air samples into 6-liter SilcoCan amorphous silica-coated steel canisters as described by U.S. Environmental Protection Agency Compendium Methods T0-14 and T0-15.

2.0 MATERIALS

2.1 Materials used in Xonteck Sampling

- 2.1.1 Xonteck Model 901 Canister Sampler
- 2.1.2 1/4" PTFE tubing with Swagelok fittings
- 2.1.3 1/8" PTFE tubing with Swagelok fittings
- 2.1.4 Swagelok adapter
- 2.1.5 6-L SilcoCan[®]/Summa Canister equivalent
- 2.1.6 Two 9/16" wrenches
- 2.1.7 Two 7/16" wrenches
- 2.1.8 Sample labels
- 2.1.9 Field Data Sheets
- 2.1.10 Chain of Custody Forms
- 2.1.11 Calibration worksheet (kept in site enclosure)
- 2.1.12 Malfunction record sheet (kept in site enclosure)
- 2.1.13 Xonteck Model 901 Canister Sampler Manual
- 2.1.14 Alicat flow meter
- 2.1.15 Three-prong AC power cord

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3.0 PROCEDURES

3.1 General Set-Up and Flow Check Procedures

- 3.1.1 The Xonteck 901 is capable of flow between 2.00 and 20.00 ml/min. DPR studies typically use a flow rate of 7.5 ml/min for 24-hour samples, an initial canister pressure of -30 inHg, and a final canister pressure of 6-16 PSI. The project leader will ultimately determine the appropriate flow rate based on study-specific requirements.
- 3.1.2 If necessary, connect the power cord of the Xonteck 901 to an appropriate AC outlet.
- 3.1.3 Turn the unit on by pressing the power switch on the Xonteck, located on the lower right corner of the front panel ([Figure 1](#)). A startup screen will display indicating the instrument model and software version. After a few seconds, the Main screen will display.

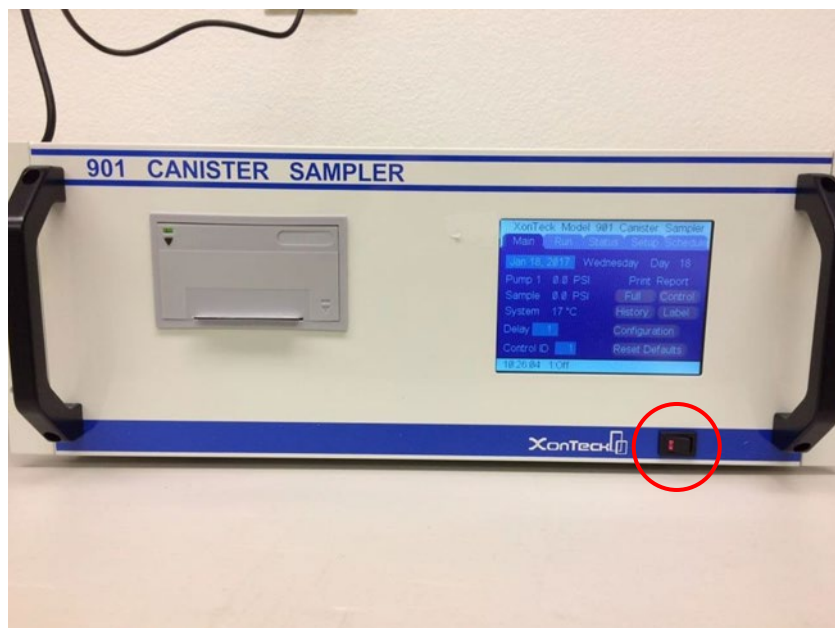


Figure 1. Xonteck 901 Front Panel. A printer is visible on the left side of the front panel and the touchscreen user interface is visible on the right side of the front panel. The power switch, circled in red, is in the bottom right corner.

- 3.1.4 Use the Alicat flow meter to measure flow and then compare it to the flow on the Xonteck display.

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- 3.1.4.1 Locate the tubing attached to the 'Output to Canister' line on the rear panel of the Xonteck unit (Figure 2).

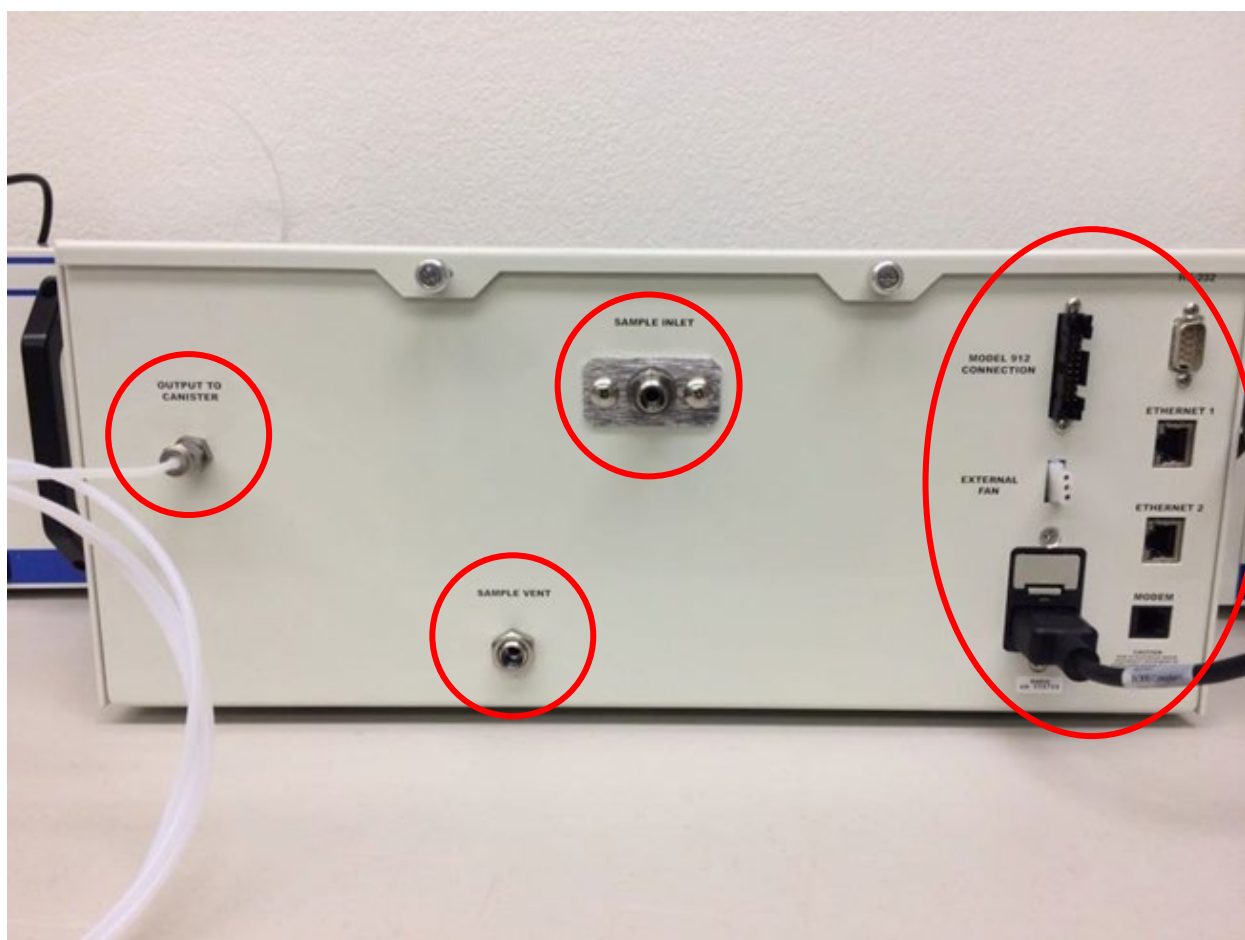


Figure 2. Xonteck 901 Canister Sampler Rear Panel. From left to right, the Output to Canister, Sample Vent, Sample Inlet, Power, Peripheral, and Network connections are visible.

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- 3.1.4.2 Connect the open end of the 'Output to Canister' line to the threaded end of the Alicat flow meter (Figure 3).

Note: The Xonteck is an active sampler that pushes air into a canister, so take note of the **FLOW** direction indicator on the Alicat flow meter.



Figure 3. Alicat flow meter before being powered on. Pressing the button on the top of the device will power it on. Pressing the Alicat logo will turn on the screen's backlight.

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- 3.1.4.3 Select the **RUN** tab near the top of the screen on Xonteck 901display to enter the Run screen. Set the sampling flow rate to 7.5 ml/min by selecting the value in the 'Set' column and entering your flow rate using the numeric keypad. Press **OK** to accept the flow rate. Press the **START** button to turn on the pump (Figure 4).
- 3.1.4.4 The screen will display the current flow (Flow) and target flow (Set) rate. The current flow rate will be used for calibration purposes and will be referred to as the 'actual flow'. The actual flow can take up to 20 minutes in cold weather to stabilize near the target flow rate.
- Note:** It is common for the actual flow to differ from the target flow by a value of up to 0.2 ml/min.

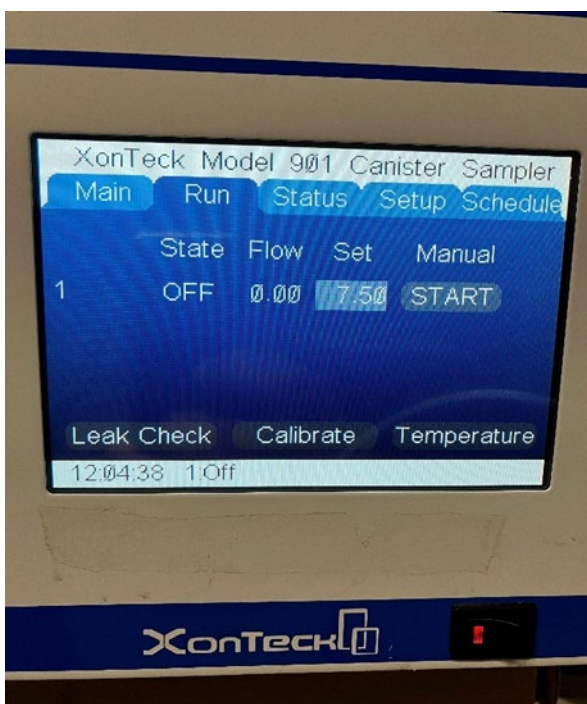


Figure 4. Display of the 'Run' screen upon activation of a manual sample run. The state column indicates 'MAN' to indicate a manual sampling run. Current flow ('Flow'), target flow ('Set'), and a start/stop button ('Manual') are visible.

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- 3.1.4.5 Once flow has stabilized, turn on the Alicat flow meter and obtain an average flow reading.

Figure 5. Close up of Xonteck output line threaded onto the the Alicat flow meter. This will allow for live flow reading during set-up and calibration.



- 3.1.4.6 Compare the actual flow on Xonteck 901 to the Alicat flow meter reading. The actual flow should fall within $\pm 10\%$ of the set rate of 7.5 ml/min (6.75 – 8.25 ml/min).
- 3.1.4.7 If the actual flow falls within the target range record the initial flow on the field data sheet (FDS) and proceed to [section 3.3](#).
- Note:** If flow rate is on the higher or lower end of the target range (8.25 mL/min and 6.75 mL/min), repeat the flow measurement process again to ensure accuracy.
- 3.1.4.8 If the actual flow falls out of acceptable range, the Xonteck must be calibrated. Follow the calibration procedure as described in [section 3.2](#).
- 3.1.4.9 On the Run screen, press STOP to turn off the pump.

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3.2 Flow Calibration

- 3.2.1 If the calibration flow from the external flow meter differs from the Xonteck's actual flow measurement by more than 10% (lower than 6.75 mL/min or higher than 8.25 mL/min), a flow calibration must be performed as follows:
- 3.2.2 Ensure that all fittings between the flow meter and the 'Output to Canister' port on the rear panel of the Xonteck 901 are securely fastened. Refer to [Figure 2](#).
- 3.2.3 On the Xonteck display, select the **RUN** tab and press the **CALIBRATE** button at the bottom of the screen ([Figure 6](#)). The Calibration screen will appear ([Figure 7](#)).

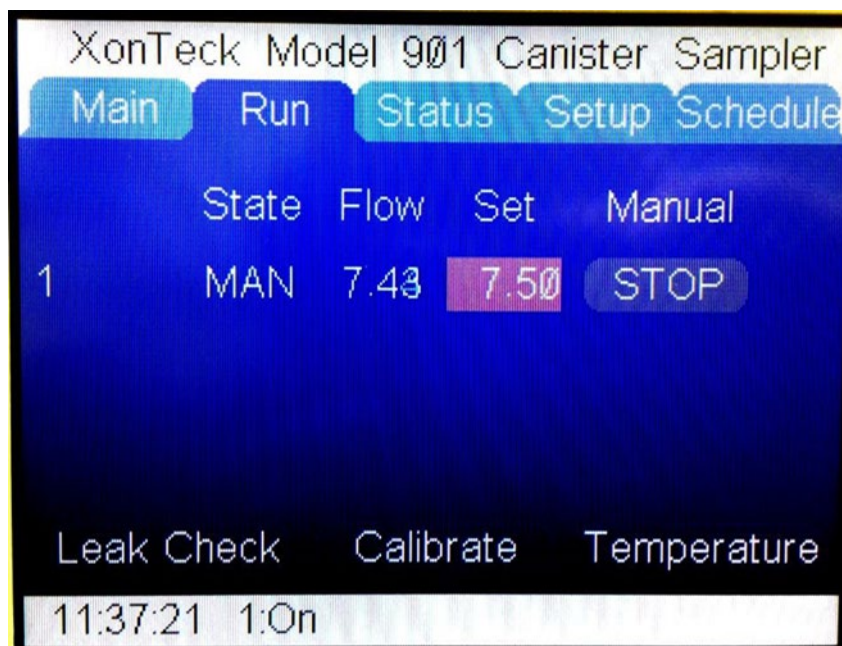


Figure 6. Calibrate option is located at the bottom-center of the screen.

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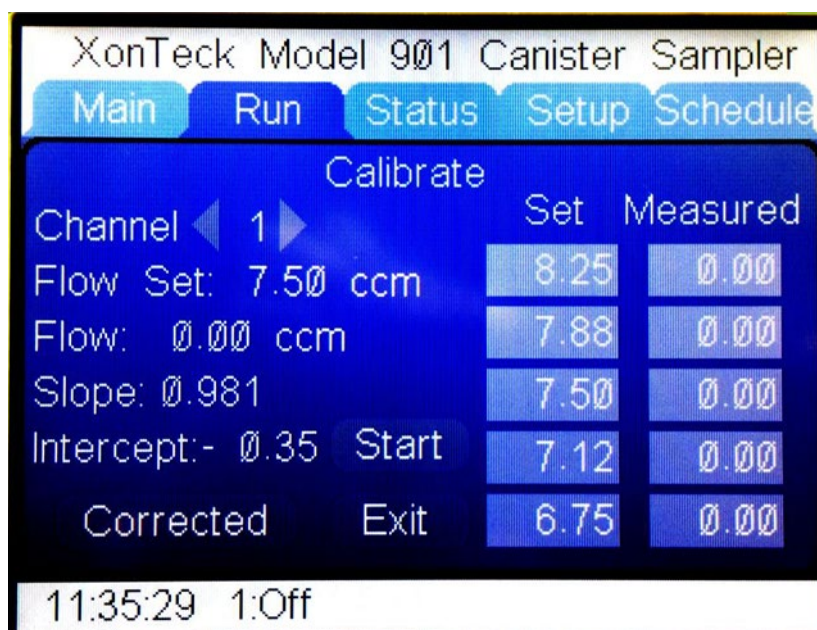


Figure 7. Xonteck 901 'Calibration' display, set to 'Calibrate' mode (note that 'Corrected' in the bottom left corner is not highlighted in green during the calibration process).

- 3.2.4 Turn off the **CORRECTED** button to enter flow calibration mode. Ensure that the **CORRECTED** button in the bottom left of the screen is highlighted in grey, and not green.
- 3.2.5 The flow calibration screen will display five flow reference set points. Ensure that the points are set to **8.25, 7.88, 7.5, 7.12, and 6.75** ml/min.
- 3.2.6 Select the **START** button to begin the flow calibration. The **START** button will change into a **NEXT** button for use during the calibration process. Once flow has stabilized, turn on the flow meter to obtain a flow reading.
- 3.2.7 Select **NEXT** on the calibration screen and enter the flow reading from the flow meter. Press **OK** to accept the entry. The Xonteck 901 will automatically adjust its flow to the next flow set point.
- 3.2.8 Tare the flow meter and obtain a flow reading for the next set point. Repeat flow measurement and input for the remaining four flow set points. If at any point you make an input error, press **ABORT** to restart the calibration procedure.

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- 3.2.9 After the five set points have been updated, the Xonteck unit will calculate and display the new Slope and Intercept values.
- 3.2.10 Press the SAVE button to save the new calibration. Press the **CORRECTED** button once more, so that it is now highlighted in green. The calibration will not be saved until these steps are performed.
- 3.2.11 Press **EXIT** to exit the flow calibration screen.
- 3.2.12 Select START on the Run screen and perform a new flow measurement to ensure that the calibration flow falls within 10% of the Xonteck's target flow. If the difference is greater than 10%, a new flow calibration should be performed.
- 3.2.13 Detach the ¼" OD calibration tubing from the flow meter and unthread the adapter of the ¼" OD calibration tubing from the end of the 1/8" OD sample tubing.

3.3 Air Sampling

- 3.3.1 Prior to sampling, ensure that flow calibration procedures have been completed as described in [section 3.2](#), if needed.
- 3.3.2 Label the canister with the next sample number in sequence. Verify the canister is set to an initial pressure between -28 inHg and -30 inHg. Record the pressure reading from the canister gauge and the canister sample number on the FDS and COC.
- 3.3.3 Remove the brass cap nut from canister valve using a 9/16" combination wrench. A second 9/16" wrench should be used to securely hold the second nut beneath the canister gauge to prevent damage to the assembly.

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- 3.3.4 Thread the adapter (used previously in the calibration step) onto the top of the canister valve until finger tight ([Figure 8](#)). Securely hold the second nut below the canister gauge with a 9/16" wrench while using a 9/16" wrench to tighten the adapter ¼ turn past finger tight. Do not over-tighten, as this may damage threading and cause leakage.

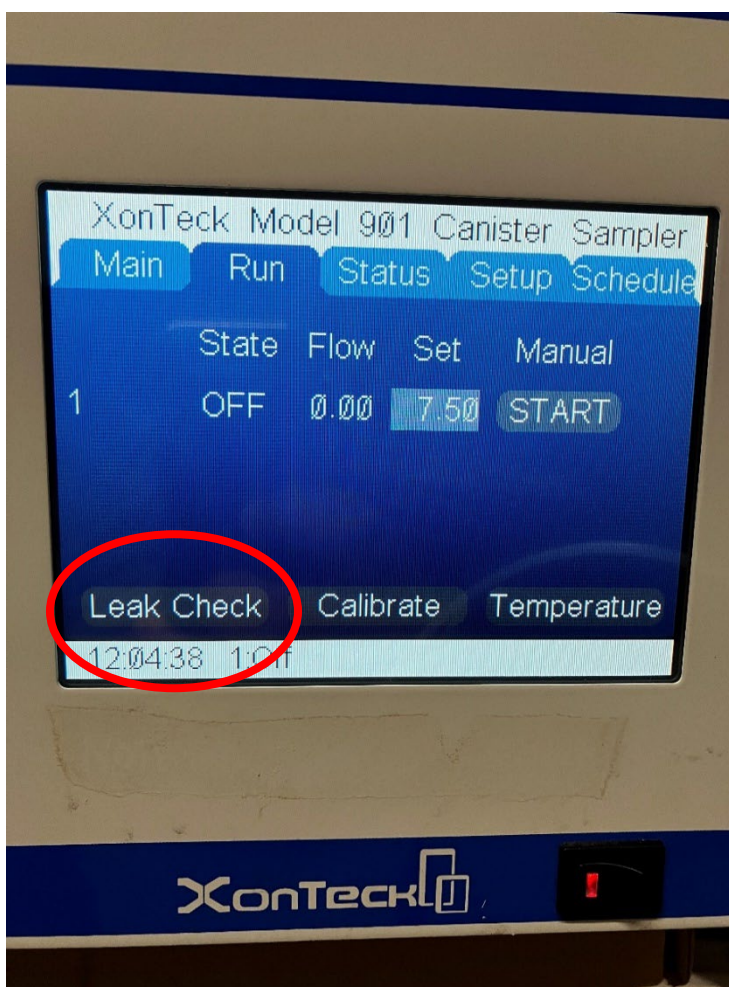


Figure 8. Xonteck 901 setup in sampling configuration. The Output to Canister port is fitted with the 'Output to Canister' line connected to a 6-L SilcoCan. Sample intake tubing leads out from the Sample Intake port and up to the sampling probe.

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- 3.3.5 Perform a leak check. After calibration procedures are completed (if needed) and with the Xonteck 901 powered on:
- 3.3.5.1 Ensure that the canister valve is closed.
 - 3.3.5.2 On the touchscreen display, select the **RUN** tab from the Main screen to display the Run screen. Select the **Leak Check** button near the bottom of the screen ([Figure 9](#)).



*Figure 9. The **Run** tab on the Xonteck screen. The **Leak Check** option is in the bottom left corner.*

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- 3.3.5.3 In the leak check dialogue ([Figure 10](#)), press the RUN button to begin the leak check. The pressure in Channel 1 will approach and hold near 10 PSI. The process may take up to a minute to complete.

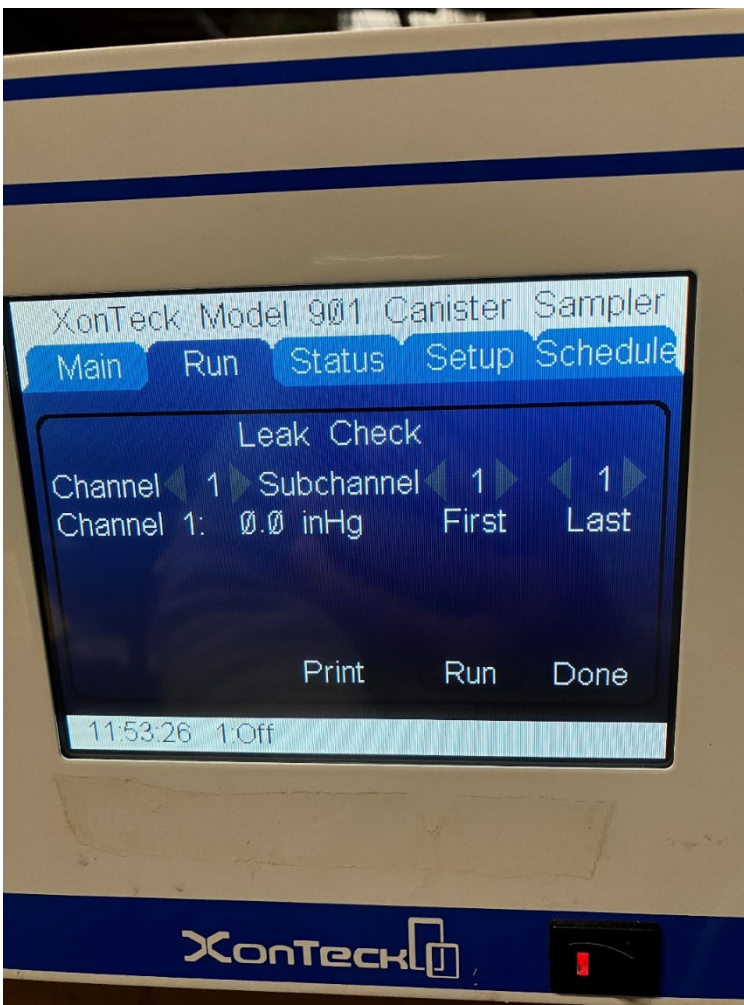


Figure 10. Leak Check dialogue screen. The initial pressure units are inHg, but once positive pressure is established, the units will change to PSI.

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- 3.3.5.4 Once the leak check is complete, the leak check dialogue will return a 'Pass' or 'Pressure Failure' message. A 'Pressure Failure' message indicates a loose connection between the Xonteck 901 and the canister. Check the tightness of all connections, and press **DONE** to return to the previous screen and to repeat the leak check.
- 3.3.5.5 If a 'Pass' message is returned, connections between the Xonteck 901 and the canister are secure. Press **DONE** on the screen and move onto the next step.
- 3.3.6 **Alternative Leak Check Procedure:** Several users have encountered malfunctions while performing the standard leak check procedure. For example, the Xonteck may sometimes fail to reach 10 PSI despite tight fittings, and sometimes the procedure may stall and return neither a pass nor a failure message.

Note: The following procedure is more sensitive than the built-in leak check test and may be used as an additional diagnostic tool and/or alternative to the built-in leak check test.

 - 3.3.6.1 Setup should be identical to that completed up to (and including) section 3.3.5; the Xonteck should be connected to the canister via the adapter, with fittings tightened and valve closed.
 - 3.3.6.2 On the touchscreen display, select the **RUN** tab to display the Run screen.
 - 3.3.6.3 Keep all settings at their default. Under the '**MANUAL**' column, press the **START** button to turn on the pump (Figure 9).
 - 3.3.6.4 With the pump activated, select the **MAIN** tab to go to the Main screen. On the Main screen, observe the PSI value for Pump 1. The PSI should gradually climb to approximately 20 - 21 PSI.
 - 3.3.6.5 Once the PSI stabilizes around 20 - 21 PSI, select the **RUN** tab to display the Run screen. Select **STOP** under the '**MANUAL**' column to turn off the pump.
 - 3.3.6.6 Select the **MAIN** tab and observe the PSI value for Pump 1. The PSI should be stable near its peak value of 20 - 21 PSI.
 - 3.3.6.7 If using this procedure as a substitute for the leak check, observe the PSI reading for approximately 5 - 10 minutes. A drop of 0.5 PSI or more over several minutes may indicate a large connection leak. A drop of less than 0.5 PSI in pressure over this period would indicate that connections are acceptably air-tight and sampling procedures may continue beginning with [Section 3.3.9](#).

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- 3.3.6.8 If using this procedure as a diagnostic tool for detection of small system leaks and as part of routine maintenance procedures, you should extend the observation time to one hour or longer. A drop of 0.5 PSI or greater per hour may indicate the presence of small system leaks.
- 3.3.6.9 If testing specifically for internal system leaks, the canister tubing may be disconnected from the rear panel of the Xonteck 901 and the 'Output to Canister' port may be directly capped to eliminate leakage due to faulty external fittings or tubing.
- 3.3.7 **Date/Time Settings:** If date and time values are in error (**date must be correct and time should deviate no more than +/- 5 minutes from actual time**), select **MAIN** to go to the main screen and select the date, highlighted in grey and located in the top left corner of the screen. In the pop-up dialogue, the user may enter values for **MONTH, DAY, YEAR, and TIME**. Press **OK** to save any changes.
- 3.3.8 Open the canister flow valve by turning the blue grip fully counterclockwise.
- 3.3.9 **Schedule a canister sample event:**
 - 3.3.9.1 Verify that the system date and time values displayed in the lower left-hand corner of the screen are accurate. If date and time are not accurate, see instructions in section 3.3.7 to update the date and time values.
 - 3.3.9.2 On the Run screen, verify that target flow is set to 7.5 ml/min.
 - 3.3.9.3 On the Main screen, select the DELAY button to set the purge delay time. The default purge delay time is 1 minute. The purge process will initiate prior to the scheduled sampling run to clear the system of residual air. **This setting is rarely, if ever, modified in the field.**
 - 3.3.9.4 On the Schedule screen ([Figure 11](#)), select the DATE button. Select the current MONTH. Set the DAY, YEAR, and TIME to the desired sampling date and start time. Select DURATION and enter the desired sampling duration in HH:MM format (i.e., 24:00 for a 24-hour sample).

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Note: When scheduling a sample to begin running as soon as possible, you must consider the purge delay time to the current system time rounded up to the nearest minute to determine the earliest time that an event may be scheduled. With a purge delay of 1 minute, this means most samples should be scheduled 2 to 3 minutes ahead of the current system time. For example, if you want to schedule a sample to run at 12:00, the system purge will occur at 11:59. Therefore, you will need to finish setting up the schedule before the system time reaches 11:59.

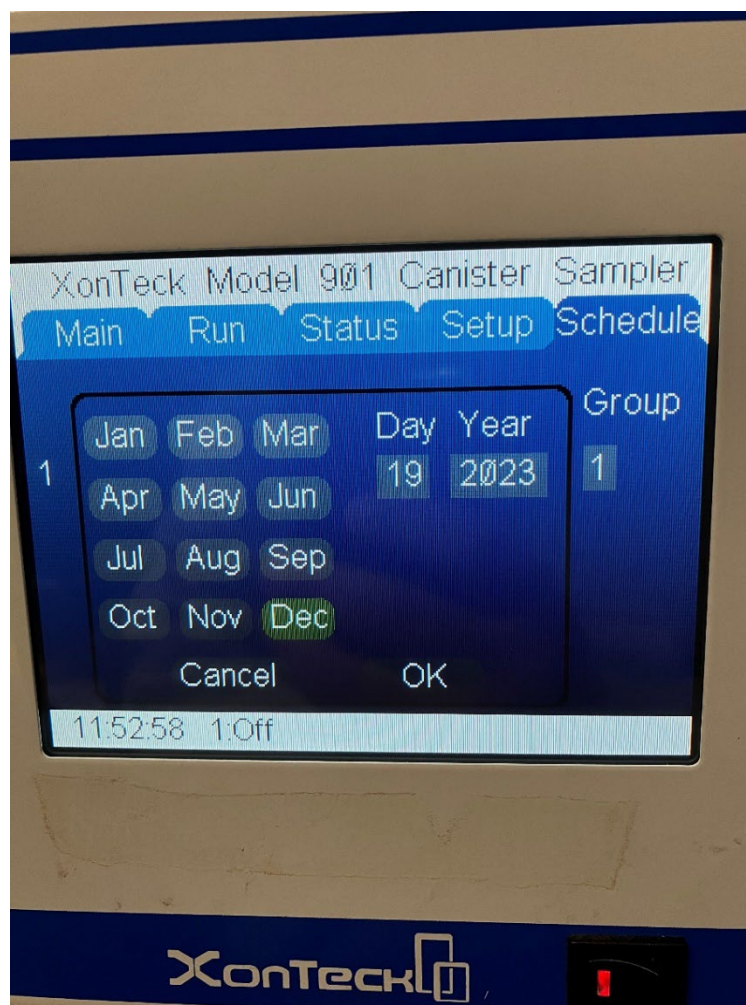


Figure 11. Month, day, and year selection screen from the Schedule tab. The month highlighted in green indicates the selected month.

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- 3.3.9.5 Press the SET button ([Figure 12](#)) to activate the schedule and select YES in the next dialogue to clear data from the previous sampling event. The sampling event is now scheduled.

Note: To cancel a scheduled event, select DURATION. In the pop-up dialogue, select DELETE followed by OK.

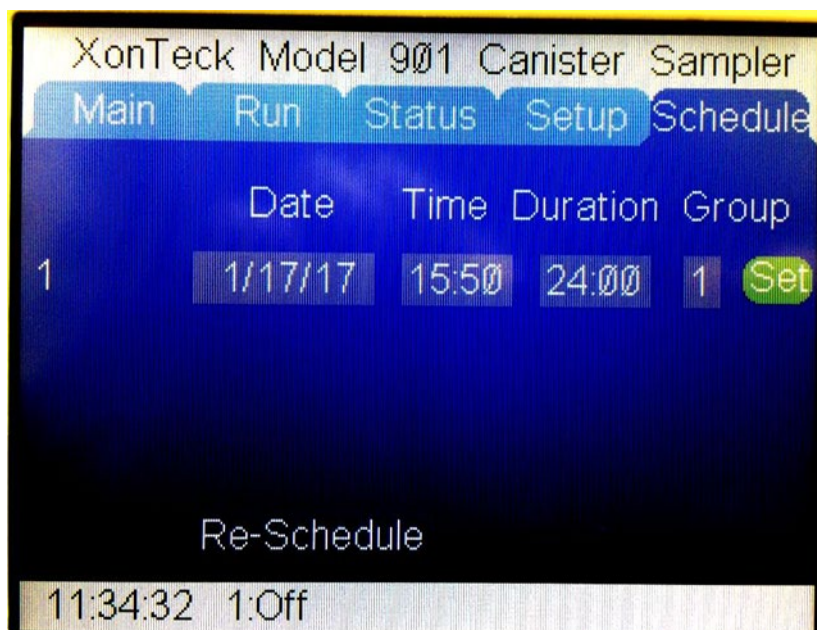


Figure 12. Xonteck Model 901 Canister Sampler 'Schedule' screen with a sample programmed to begin at 1/17/17 at 3:50 PM with a runtime of 24 hours. The green 'Set' button must be pressed to complete scheduling of the event.

- 3.3.9.6 Verify that the system purge begins one minute prior the scheduled sample start time. The opening of an internal solenoid valve will produce an audible click as the purge period ends and the scheduled sampling period begins.
- 3.3.9.7 Check the Status screen to verify that elapsed time, canister pressure, and average flow rate is being recorded by the Xonteck.
- 3.3.9.8 Record the start date and start time on the canister FDS.

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- 3.3.10 Upon sample completion, close the canister valve by turning the grip clockwise until firmly tightened. Review the sampler screen for any error messages. Verify that the canister pressure falls in a range of 6-16 PSI. If the canister pressure is outside of the valid range, a make-up sample will need to be set-up. Inform your supervisor as soon as possible so that arrangements to pick up the canister can be made.
- 3.3.11 Record the end date, end time, sampling duration, ending pressure from the canister gauge on the canister FDS.
- 3.3.12 Record the starting sample pressure, ending sample pressure, and average flow rate from the Status screen on the canister FDS.

Note: If the screen displays an error message, go to the Status screen, and select the **ERRORS** button to display error details. Document the error type and time of occurrence on the canister FDS. Contact the project leader or supervisor to determine whether the sample should be invalidated and the sample repeated.
- 3.3.13 Use one 7/16" wrench and one 9/16" wrench to unscrew the adapter (still connected to the sampling line) from the top of the canister and set aside for future use. The 7/16" wrench should be used to securely hold the second nut below the canister valve to prevent damage to the canister. The adapter should remain connected to the sampling line for the next user.
- 3.3.14 Replace the brass cap nut onto the canister valve and tighten using two 9/16" wrenches. The 9/16" wrench should be used to securely hold the second nut below the canister valve to prevent damage to the canister.

4.0 REPORTING REQUIREMENTS

4.1 Field Data Sheet

- 4.1.1 Study number
- 4.1.2 Site name
- 4.1.3 Sample number
- 4.1.4 Sampling personnel
- 4.1.5 Starting date and time of sampling event
- 4.1.6 Ending date and time of sampling
- 4.1.7 Sampling duration (in minutes)

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- 4.1.8 Sampler ID (State of California Property ID)
- 4.1.9 Average flow rate (ml/min)
- 4.1.10 Starting pressures from both the canister gauge and Xonteck display
- 4.1.11 Ending pressures from both the canister gauge and Xonteck display

4.2 Chain of Custody Form

In addition to filling out the field data sheets, chain of custody forms that will be sent to the lab along with the samples also need to be filled out. The information on the forms include:

- 4.2.1 Study number (pre-filled)
- 4.2.2 Matrix (pre-filled)
- 4.2.3 Crew
- 4.2.4 Sample number
- 4.2.5 Site ID
- 4.2.6 Sample end date
- 4.2.7 Ending canister pressure
- 4.2.8 Ending sampler pressure
- 4.2.9 Sample load date/time
- 4.2.10 Sample retrieval date/time
- 4.2.11 Sample transportation date/time