

STANDARD OPERATING PROCEDURE

***Instructions for Calibration and Use of a Met One 3-Channel Pesticide Sampler***

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**KEYWORDS**

Air Sampling, 3-Channel Pesticide Sampler, Air Monitoring Network

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## 1.0 INTRODUCTION

### 1.1 General

The Met One 3-Channel Pesticide Sampler (Figures 1 – 3), which is based on a Speciation Air Sampling System (SASS) is a portable integrated ambient particulate sampling system designed to collect ambient air samples on three separate sampling media.

### 1.2 Scope

This document provides specific instructions for the calibration and use of a Met One 3-Channel Pesticide Sampler for the collection of air samples as part of the Air Monitoring Network.



Figure 1: Met-One instrument

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Figure 2: Top Solar Shield of Met-One with removable covers.

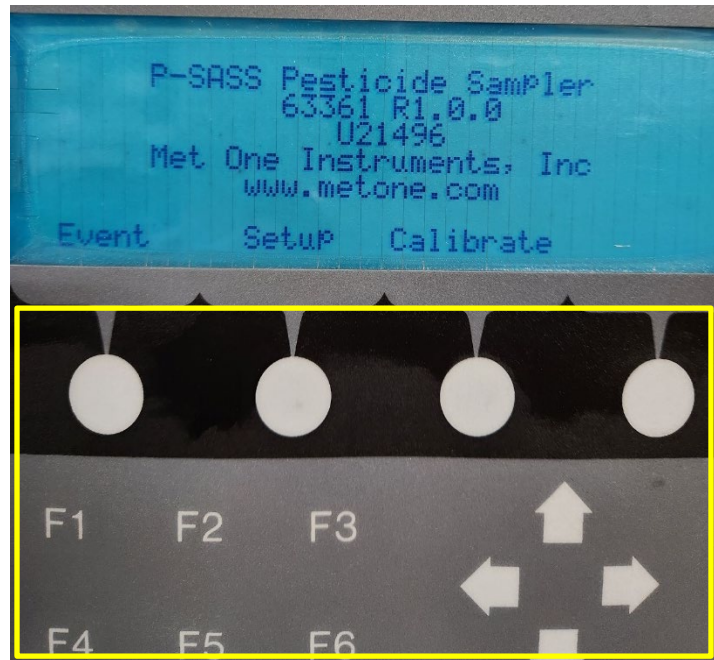


Figure 3: Control Panel for Met-One

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## 2.0 MATERIALS

- Met One 3-Channel Pesticide Sampler
- Energy Source: AC power
- Materials required for air sampling:
  - ALICAT flow meters (flow range to measure flows of 50 ccm for low flow meter, or 1.5 and 15 LPM for high flow meter.)
  - One hand-packed Teflon cartridge containing 30 mL of XAD-4 sorbent resin material.
  - One SKC Inc® pre-packed 200/1800 mg coconut charcoal sorbent tube
  - One SKC Inc® pre-packed 400/200 mg XAD-4 sorbent tube
  - Glass tube end breaker
  - Two (2) screw tops for Teflon cartridge
  - Four (4) protective sorbent tube red caps
  - Leak-tight calibration tubing with appropriate connectors/caps attached (Figure 4).
  - Sample number labels
  - Field Data Sheet (FDS) and Chain of Custody (COC) Form
  - Sealable polyethylene bag, labeled with location, date, operator's name, and Study Number 257
  - Roll of clear tape
  - Dry ice and ice chest



Figure 4: Connector for Multi-Residue (left picture), the connector for MITC and Chloropicrin Sorbent Tubes (middle picture), and, labels, sorbent tubes, and caps (right picture).

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## 3.0 AIR SAMPLING PROCEDURES

### 3.1 Day 1: Initial Sampler Set-up Day

- 3.1.1 If not done already the day before the sampling trip, attach proper sample number labels with clear tape to all sampling media to be used in the sampling event (1 MITC sorbent tube, 1 chloropicrin sorbent tube, and 1 multi-residue cartridge). Ensure that sample numbers are secured to the sampling media.
- 3.1.2 Remove the metal pin to lower the sampler's convective solar radiation shield. By lowering the shield, the sampler's channel inlets will become accessible (Figure 5).



Figure 5: Location of the pin on the solar radiation shield.

- 3.1.3 Remove the screw tops from the cartridge and break both ends of the SKC pre-packed sorbent tubes using the glass tube end breaker. (Figures 6 – 7)



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Figure 6: MITC sorbent tube (top), chloropicrin sorbent tube (middle), and multi-residue cartridge (bottom).

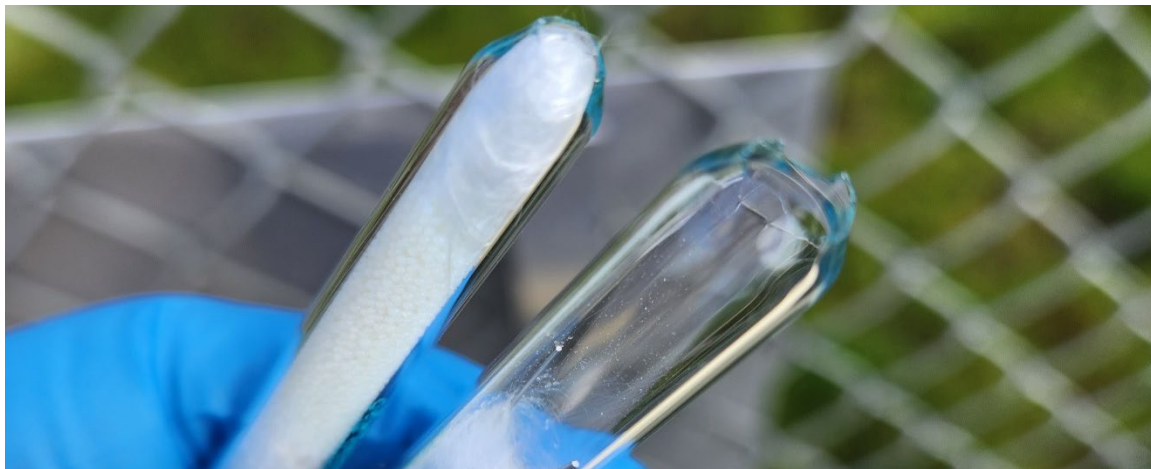


Figure 7: MITC and Chloropicrin Sorbent tubes, broken and ready for sampling.

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**3.1.4** Put the O-Ring on Multi-Residue Sorbent (Figure 8).



Figure 8: Black O-ring on Multi-Residue Cartridge

**3.1.5** Remove the plastic caps from the channels that were placed after the last sampling event (Figure 9).



Figure 9: Plastic caps on the opening of the tubes from the last sampling.

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**3.1.6** Attach all sampling media to the proper channel as stated below:

**Channel 1:** Multi-Residue Cartridge (Large Teflon cartridge)

**Channel 2:** MITC sorbent tube (Black glass tube)

**Channel 3:** Chloropicrin (White glass tube)

Note: The numbers for each channel can be found under the sun shield.  
(Number 1 is highlighted in Figure 9.)

**3.1.7** The empty part of the tube must be towards the ambient air (Figure 10).

**Optional:** After inserting the samples, use a piece of parafilm to secure the sample to the connecting tube so it does not fall out during the 24-hr sampling.



Figure 10: correct installation of sampling cartridges on Met-One

**3.1.8** Put the solar shield back in place after attaching the samples. Remove the sample covers, by twisting them, to make it easier to put the solar shield back into place (Figure 11). After measuring the flow and calibration, put the sample covers back on.



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Figure 11: Solar shield in place with sample covers removed.

### 3.2 Time and Date Verification

- 3.2.1 Unlock and open the box and turn on Met-One by touching any of the buttons on the bottom of the display panel. From the main system display, press "Setup" (Figure 12).

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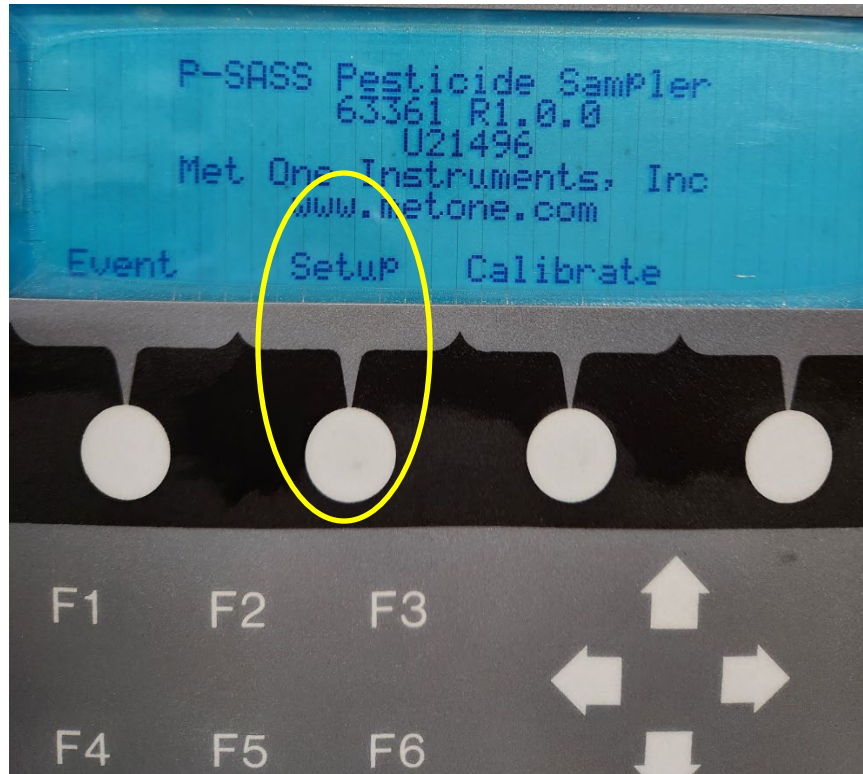


Figure 12: The main screen on Met-One.

3.2.2 Press "F3" on the control panel to enter the clock menu (Figure 13).

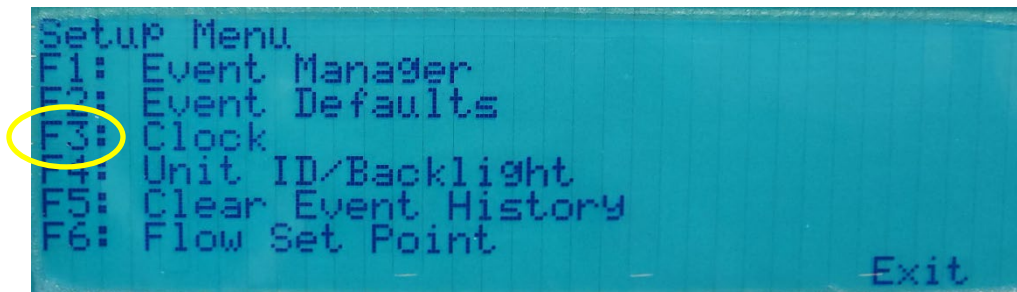


Figure 13: Setup Menu

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- 3.2.3 Compare the sampler display date and time with an accurately set watch or clock.
- 3.2.4 **Time needs adjusting:**
  - 3.2.4.1 If the sampler is not within five minutes of the accurately set watch or clock, use the arrow keys, located on the bottom right side under the display panel (Figure 3) to adjust the sampler clock to match the correct time.
  - 3.2.4.2 Press "**Set**" before exiting to ensure that all changes are stored.
- 3.2.5 **Time does not need adjusting:**
  - 3.2.5.1 Press "**Exit**" twice to go back to the main system display (Figure 14).



Figure 14: Clock Setup

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### 3.3 Flow Measurement and Calibration

- 3.3.1** Attach the calibration tubing to the end of each sorbent Tube (Figure 15).



Figure 15: Proper sampling media and calibration tubing attachments to the Met-One Channel Pesticide Sampler.

- 3.3.2** Met One 3-Channel Pesticide Sampler has three sampling channels, each at different flow rates. The first channel is designed to operate at 15 liters per minute (LPM), the second channel is designed to operate at 1.5 LPM, and the third channel is designed to operate at 50 mL/min or ccm. The sampler's flow must be calibrated if the initial flow reading falls outside of the acceptable flow range (Table 1).



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Table 1: Acceptable flow range for each sampling media

Channel	Sampling Media	Desired Flow	Acceptable Flow Range (+/- 10% of Desired Flow)
1	Multi-Residue Cartridge	15.0 LPM	13.5 LPM – 16.5 LPM
2	MITC Sorbent Tube	1.5 LPM	1.35 LPM – 1.65 LPM
3	Chloropicrin Sorbent Tube	50.0 ccm	45.0 ccm-55.0 ccm

3.3.3 From the main system display, press “**Calibrate**” (Figure 16).

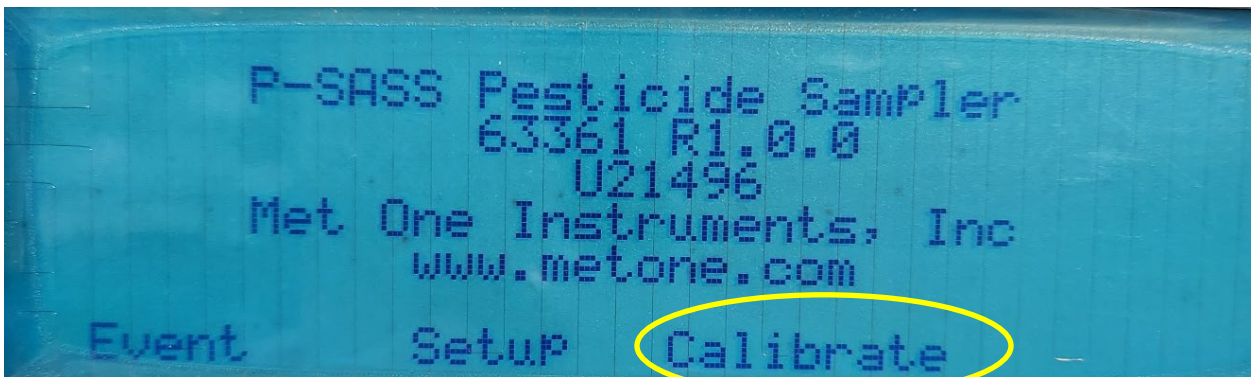


Figure 16: Main menu

3.3.4 Press “**F1**” to reach the System Test window (Figure 17)

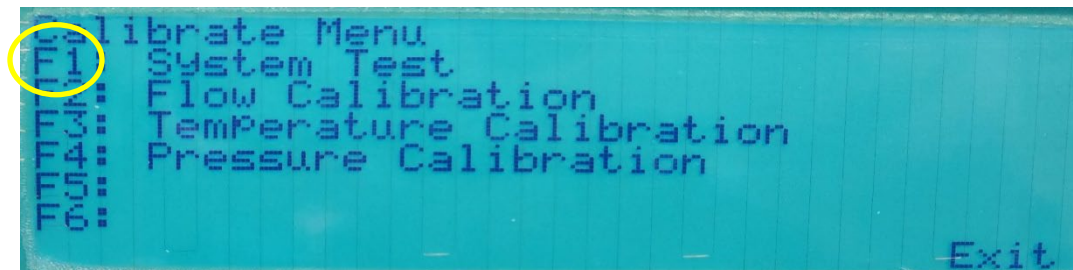


Figure 17: Calibration menu



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- 3.3.5 Press "**Pump**", using the white button located on the bottom command, then "**Continue**" to start the pump (Figure 18). Let the machine run for a couple of minutes before measuring the flow with a flowmeter (Figure 19).

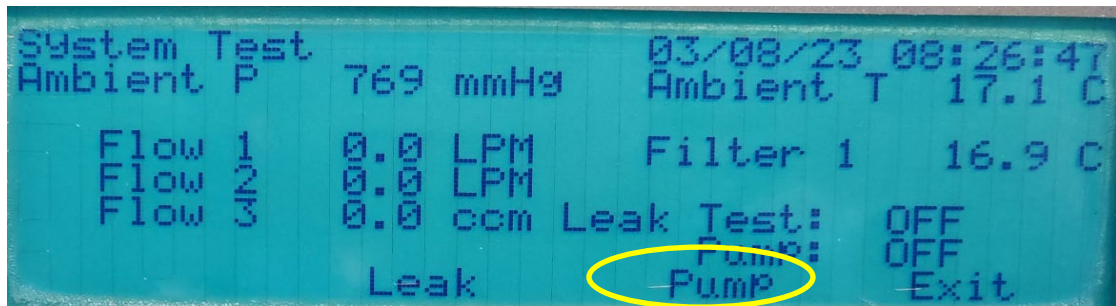


Figure 18: System test

- 3.3.6 Tare and attach the Alicat flow meter to each connector. For the chloropicrin sorbent tube, use the low-flow meter. For MITC and Multi-Residue sorbent tubes, use the high-flow meter. The flow meter can be placed on top of the control panel for a one-minute observation of the flow. Check to make sure the tubes are not twisted or pinched (Figure 19).

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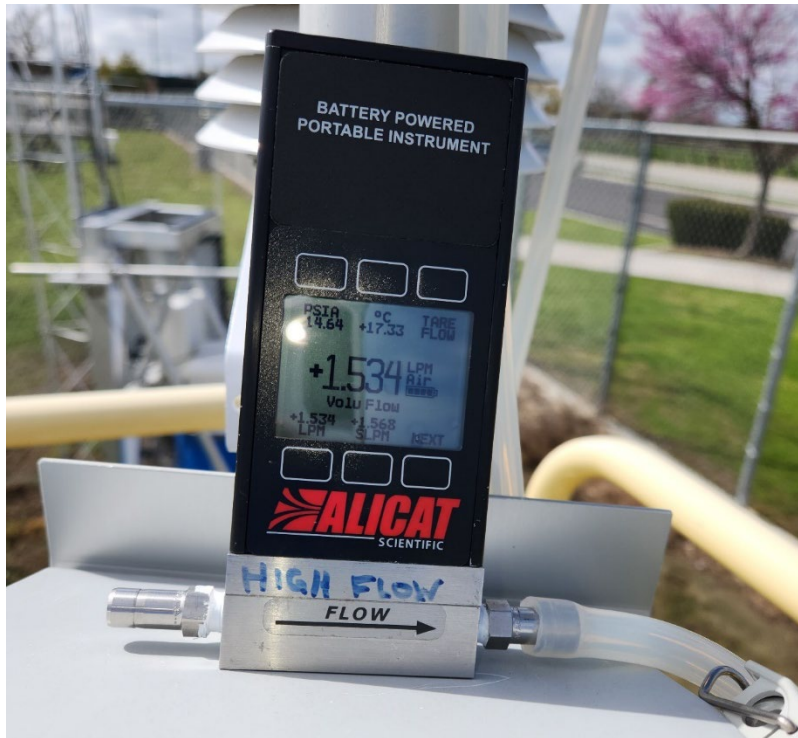


Figure 19: Alicat flowmeter on top of the Met-One

- 3.3.7 Perform flow measurements for all other channels in the sampler.
- 3.3.8 Compare measured flows to the acceptable starting flow criteria (Table 1).
- 3.3.9 Press “**Exit**” twice to leave the System Test display and get to the main system display.
- 3.3.10 If all measured flows are within the acceptable starting flow range listed, remove all Calibration Tubing, and proceed to Section 3.5 to schedule the Sampling Event.
- 3.3.11 If any of the measured flows are out of the acceptable starting flow ranges, conduct the following flow calibration procedure:

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**3.4 Calibration:**

**3.4.1** From the main startup display, press "Calibrate" (Figure 20).

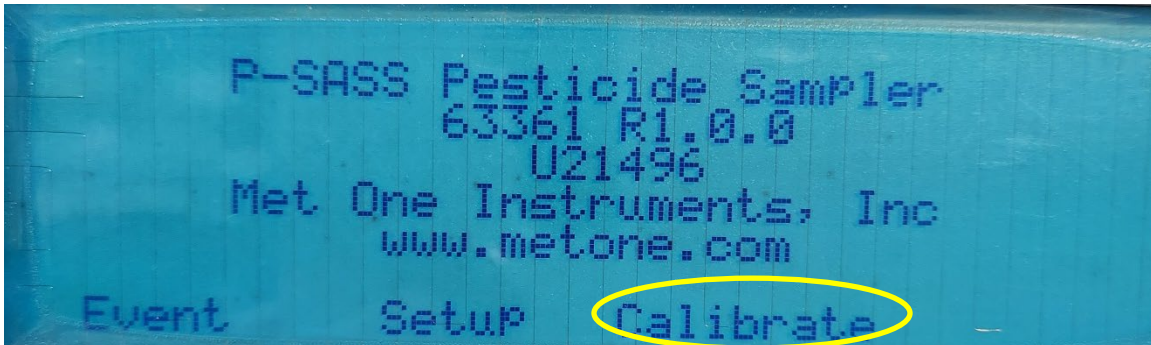


Figure 20: Main menu

**3.4.2** Press "F2" in the Calibration menu to reach the Volumetric Flow Calibration screen (Figure 21).

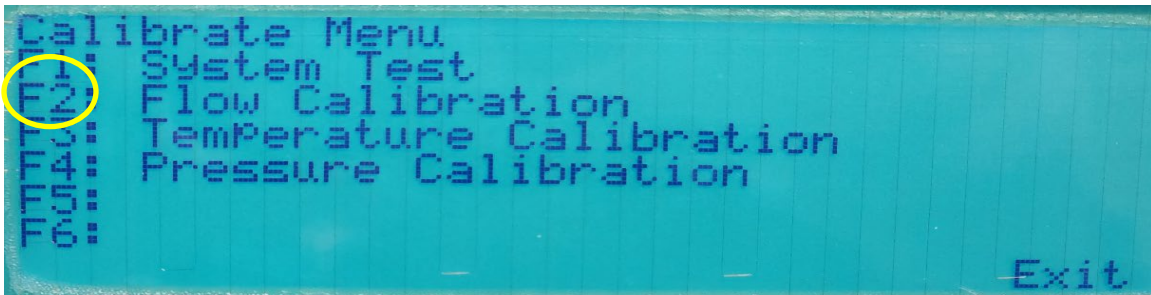


Figure 21: Calibration Menu

**3.4.3** Press "Pump" to turn the pump on. Allow the pump to run for 2-3 minutes to warm up.

**3.4.4** Using the left to right arrow keys, place the cursor (blinking square) on the **Channel** section and use the Up arrow to select the channel (1, 2, or 3) that needs flow calibration (Figure 22)

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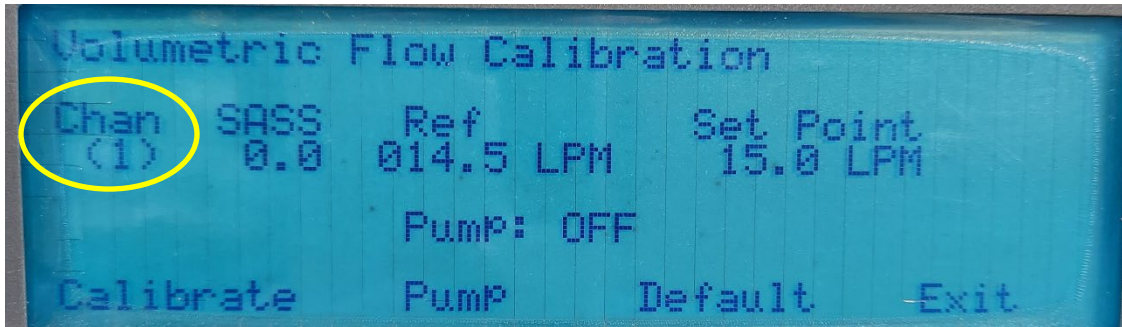


Figure 22: Flow Calibration

- 3.4.5 In the sampler's Volumetric Flow Calibration menu, use the left to right arrow keys to move the column and the up and down arrow keys to change the reference value, to enter the flow meter's flow reading in the **Ref** column then press the "**Calibrate**" key (Figure 23).

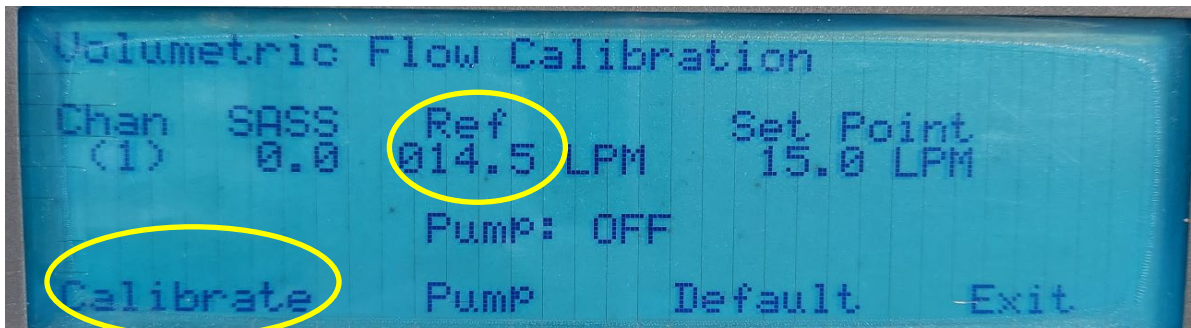


Figure 23: Setting up the reference point based on Alicat Flow meter reading.

- 3.4.6 Wait until the value displayed under the **SASS** column stabilizes to match the **Set Point** value. Note that this can take up to five minutes depending on the channel number (Figure 24).



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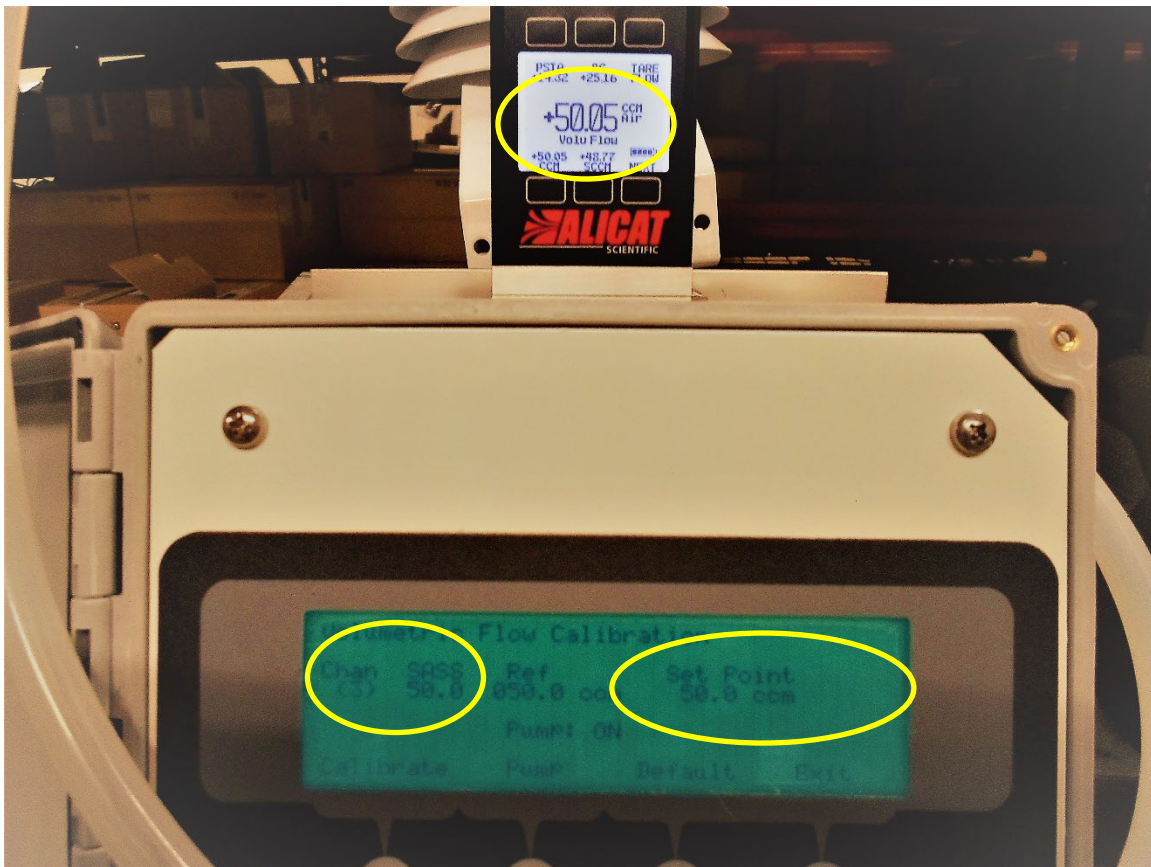


Figure 24: Matching the SASS point with Set Point and flowmeter.

- 3.4.7 The measured flow should be within  $\pm 10\%$  of the desired flow (Table 1). If the measured flow is outside the acceptable flow range, repeat the channel's flow calibration.
- 3.4.8 If SASS matches Set Point, but the flowmeter is not matching the reference point, input the flowmeter value into reference again while the pump is still running, and push "Calibrate" to repeat the calibration again.
- 3.4.9 Repeat the flow calibration procedure for all channels that require flow calibration.
- 3.4.10 Press "Exit" twice to save the changes and to go back to the main system display. The pump will automatically turn off upon exiting the Volumetric Flow Calibration window.
- 3.4.11 Remove the Calibration tubing from the samples.



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### 3.5 Start Scheduled Sampling Event

3.5.1 From the main system display, press “Event” (Figure 25).

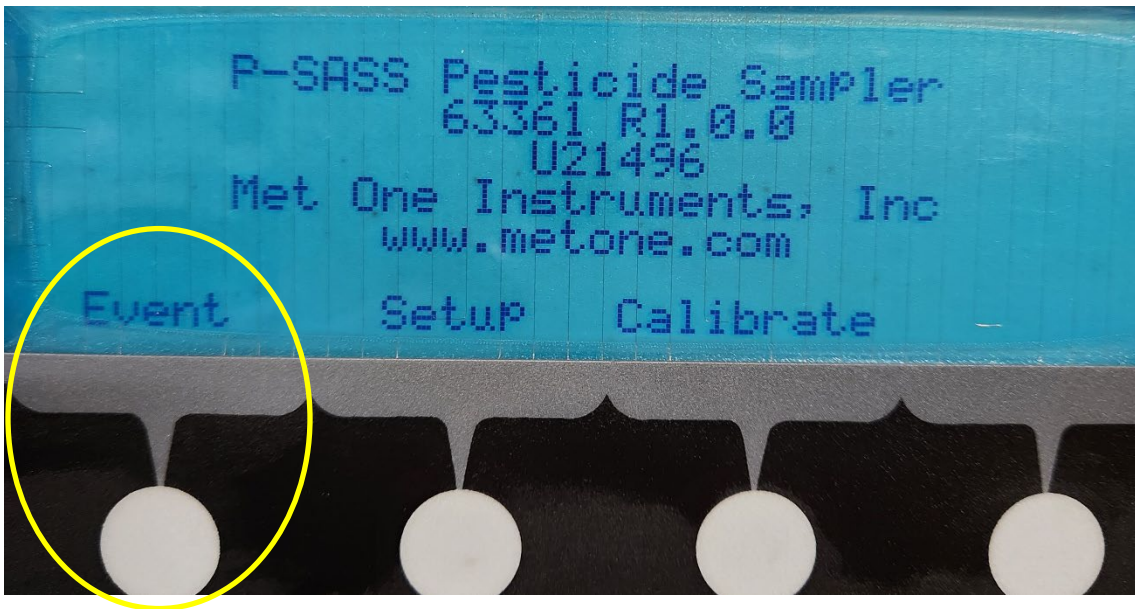


Figure 25: Main Menu

3.5.2 Press “F4” to enter the Event Manager display (Figure 26)

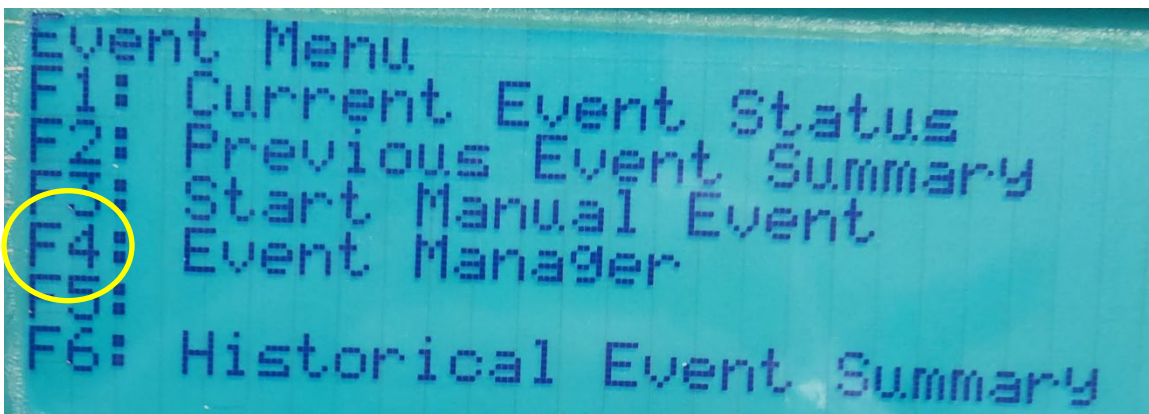


Figure 26: Event Menu

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3.5.3 Press "Add" to enter new sampling event details (Figure 27).

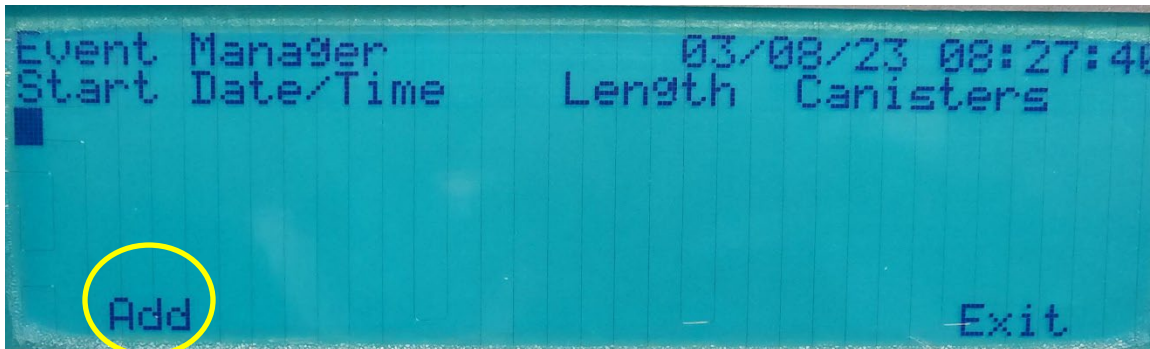


Figure 27: Event Manager, creating a new event.

3.5.4 Using the arrow keys, for Event Start select a starting Date and Time. The Event Start Time should be scheduled at least a couple of minutes ahead of set-up time and must be observed for at least 7-10 minutes to make sure the equipment is running smoothly after the sampling event has commenced (Figure 28).

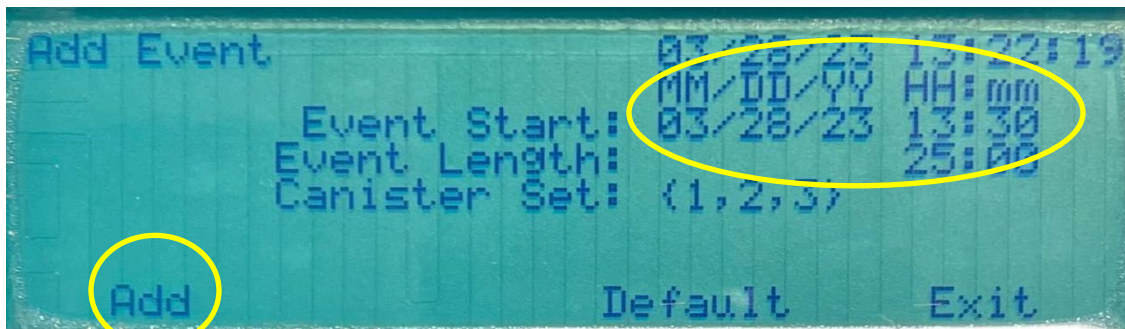


Figure 28: Adding a new event.

3.5.5 Event Length is set at 25 hours, but the sample must be picked up at **24 hours**.

**Note:** Ensure that on day two of sampling, you are present at the sampling event 20 minutes before the 24-hour conclusion as collected air samples should be removed, capped, and placed in dry ice immediately following a sampling event.

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- 3.5.6 Press "**Add**" to save the newly created scheduled event. Press "**Exit**" twice to reach the main Menu.
- 3.5.7 Wait until the scheduled sampling event commences, then from the main menu press Events to navigate the Even Menu.
- 3.5.8 In the Event Menu display, press "**F1**" to reach the Current Event Status window (Figure 26).
- 3.5.9 On the field data sheet (FDS), record the starting date and time, air sampler ID, station operator, starting flows, flow meter numbers, and agency. Using the "<<" and ">>" arrows in the system display, cycle through the various screens to observe and record the ambient temperature and pressure on the FDS (Figure 29).

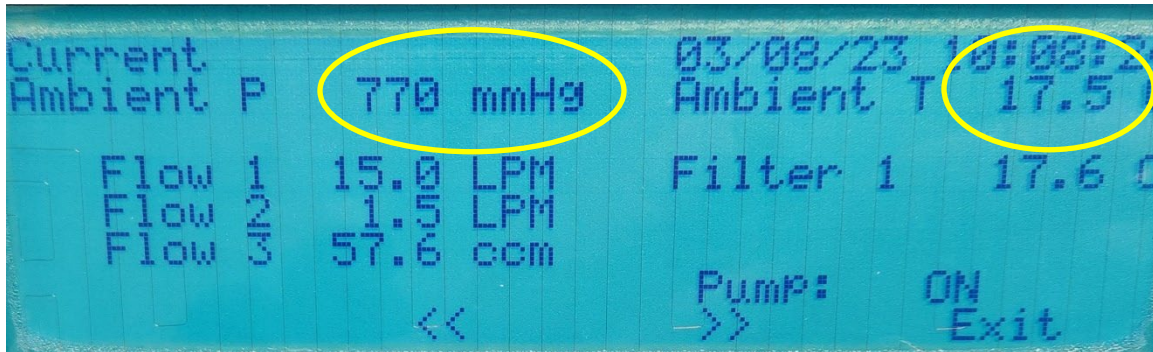


Figure 29: Current Event showing Current Ambient Pressure and temperature.

- 3.5.10 Press "**Exit**" twice to leave the Event Manager display and get to the main system display.
- 3.5.11 Slide the sampler's convective solar radiation shield up, if still down, and place the attached pin to lock the shield in place or put back the covers for the samples. Ensure that all sorbent tubes are not directly exposed to sunlight (Figure 2).

## 3.6 Day 2, 24-hrs Later: Stop Scheduled Sampling Event

- 3.6.1 Remove the metal pin to lower the sampler's convective solar radiation shield (Figure 5). By lowering the shield, the sampler's channel inlets will become accessible. Unlock and open the box to access the data.



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- 3.6.2 Five minutes prior to stopping the pump at **24 hours**, go to the **Events Menu** and open Current Event "**F1**". From the Current, record the current flow rates for all three samples.
- 3.6.3 If by mistake the pump was turned off, by using the ">>" key, find the screen for 5-minute values within the first couple of minutes and record the flows from the 5-minute values. Otherwise, the record will get to zero. Record the flow shown for each channel as the **End Flow** on the field data sheet (Figure 30).

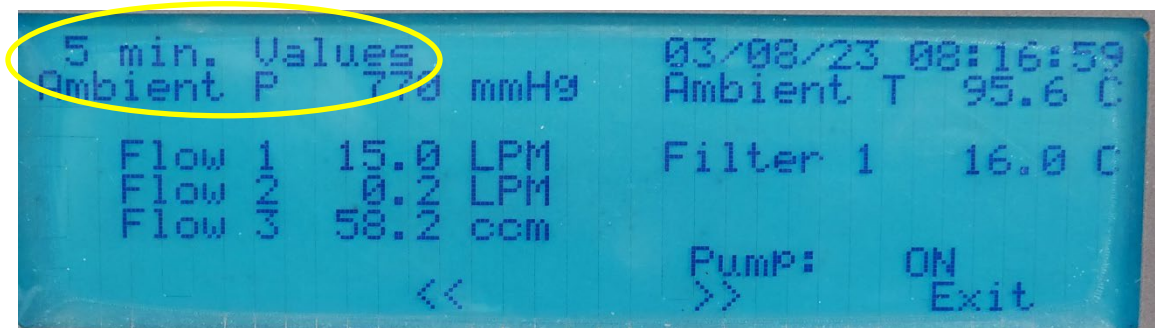


Figure 30: End flow.

- 3.6.4 If the measured flow is more than  $\pm 10\%$  from the starting flow, the samples are considered invalid, and new 24-hour samples need to be taken. Follow the steps in Section 3 to adjust the flow and start a new sampling event for the make-up sample. Contact the supervisor to inform them of the need to collect any make-up samples. Collect the invalid samples at the end of the 24 hours, record information on the FDS/COC, and keep them on dry ice, or freezer, until the makeup sample has been set up and has valid duration and flow results, then it is okay to discard the invalid samples.

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- 3.6.5 Wait until at least 24 hours have elapsed, then stop the sampling pump by pressing "**Stop**" from the Event Status display by pressing "<<" or ">>" to reach the Event Status display and then "**Continue**" (Figure 31).



Figure 31: Main Status page

- 3.6.6 Carefully remove all sorbent tubes, by removing the parafilm (if used) first, and cartridges from the sampler. Both ends of all sampling media should be capped (using protective caps or screw tops) immediately after being removed from the sampler.
- 3.6.7 Place all capped sampling media in a sealable polyethylene bag that was labeled with Study Number 257, sampling date, sampling location, and operator name.
- 3.6.8 Sandwich the bag inside of the ice chest between enough dry ice to allow samples to remain frozen during sample transport.
- 3.6.9 Using the "<<" and ">>" arrows in the system display, cycle through the various screens to collect the required FDS information specified in Section 4.0.
- 3.6.10 If the sampler display states any **Flow Warnings** or **Power Interruptions**, the samples collected may be invalid. Contact the project leader or supervisor to inform them of the issue and to obtain additional directions (Figure 32).



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Figure 32: Power interruptions and Flow warnings.

- 3.6.11** Cap all the Sample tubing with rubber caps to prevent pesticides, dust, or insects from entering the Met-One (Figure 33).



Figure 33: capping the sampling tubes.

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**3.6.12** Slide the sampler's convective solar radiation shield up and place the attached pin to lock the shield in place.

**3.6.13** Close and lock the main programming board with the lock provided.

## 4.0 REPORTING REQUIREMENTS

A field data sheet (FDS) and Chain of custody (COC) form should be completed for each sample according to SOP ADMN006.01. The following information should be recorded on the FDS and COC at the start and conclusion of the air sampling event:

- Site Name
- Site ID
- Station Operator
- Station Operator's Agency
- Flow meter numbers (high, medium, low)
- Sampler ID
- Start Date and Time
- Start and End Ambient Temperatures taken from the sampler
- Ambient Pressure
- End Date and Time
- Sampler numbers
- Starting flow
- Ending flow
- Mean flow
- Sample volumes
- Flow Warnings
- Power Interruptions
- Local conditions and field notes (if any)
- Sign and date under the "Sample Loaded By", "Sample Retrieved by" and "Sample Transported or Shipped to DPR Warehouse by" sections.

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## 5.0 TROUBLESHOOTING

Please refer to the Met One SASS Manual for a reference table with common sampler problems and possible solutions. Briefly:

- 5.1 If the sampler is plugged in and the display does not turn on after you press any button, the contrast might be too low. Press the contrast button a few times until the display gets sharper and darker.
- 5.2 If the pump does not turn on after you press "Pump", ensure that all connections to and from the pump are tightly inserted. Correct if needed. If the pump still does not turn on, unplug the sampler, and plug it back in after a few seconds. See if the pump will start by pressing "pump". If the sampler pump turns on, then perform the sampling steps detailed in Section 3.0.

**Note:** If the pump does not turn on after troubleshooting, contact the Study Lead, Study Field Coordinator, or your supervisor for additional steps.

## 6.0 REFERENCES

Field Operation Manual: Document No. SASS-9800 Rev G. Model SASS & Super SASS PM2.5 Ambient Chemical Speciation Samplers. Met One Instrument. 2001

Standard Operating Procedures for Met One SASS. SOP 5100CSN. United States Environmental Protection Agency. 2011

Standard Operating Procedures for Met One Instruments Speciation Air Sampling System (SASS). California Air Resources Board. 2003.