





**CALIFORNIA**  
AIR RESOURCES BOARD

**Standard Operating Procedure for  
Xontech 924 Toxic Air Sampler Performance Audit**

**Volume V  
Audit Procedures Manual for Air Quality Monitoring**

**QMB SOP Appendix L  
Revision 1.0**

**Quality Assurance Section  
Quality Management Branch  
Monitoring and Laboratory Division**

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Disclaimer: Mention of any trade name or commercial product in this standard operating procedure does not constitute endorsement or recommendation of this product by the California Air Resources Board. Specific brand names and instrument descriptions listed in the standard operating procedure are for equipment used by the California Air Resources Board. Any functionally equivalent instrumentation is acceptable.

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**XONTECH 924 TOXIC AIR SAMPLER PERFORMANCE AUDIT**

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## L.1.0 INTRODUCTION

This document describes the audit procedure for the Xontech 924 sampler. The purpose of this Standard Operating Procedure (SOP) is to ensure that Quality Assurance Section (QAS) auditors conduct performance audits of the Xontech 924 Toxic Sampler in a complete and consistent manner.

### L.1.0.1 SUMMARY OF METHOD

Performance audits of the Xontech 924 Toxic sampler are conducted annually by QAS section staff. The sampler is comprised of four channels that collect ambient air samples as shown in Figure 1. Each channel is configured for specific toxic compounds. CARB usually operates three channels but some sites run two or more. Normally, channel #1 is for measuring Aldehydes, channel #2 for Toxic Metals, and channel #3 for Cr6+.



Figure 1 Xontech 924 sampler

The purpose of the audit is to assure the flow accuracy of each sampling channel in the sampler. The audit is conducted by comparing the indicated flow of each sampling channel against the true flow as measured by a certified flow transfer standard.

The flow audit criteria (percent difference from audit standard) for Xontech 924 samplers is referenced from California Air Resources Board's (CARB's) Performance Audit Validation Template with  $\pm 7\%$  warning and  $\pm 10\%$  failure control limits. The data from the worksheet is transferred into Xontech 924 audit template in AIS to calculate percent difference between audit standard and sampler flow rates.

#### L.1.0.2 INTERFERENCES

The interferences associated with this method include factors that can alter the flow rate. Such changes can be the result of loss of flow through leaks in the sampling train and audit equipment. Interferences can be minimized by properly tightening the fittings and tubings.

#### L.1.0.3 PERSONNEL QUALIFICATIONS

All new CARB auditors undertake a one year training program that is documented and monitored by the manager. The training includes in-office reading and coursework, hands-on field experience conducting audits, and shadowing an experienced auditor for one year along with several in-field evaluations by the QAS manager.

#### L.1.0.4 APPLICABILITY

This SOP covers the performance audit of the Xontech 924 samplers in operation at air monitoring stations in California.

#### L.1.0.5 HEALTH AND SAFETY

All personnel must follow general health and safety guidelines as described by the facility where the audit is conducted.

#### L.1.0.6 FIELD NOTIFICATION

Contact the air monitoring station operator to schedule the audit.

L.1.0.7 ACRONYMS AND DEFINITIONS

Table 1 Acronyms and Definitions

<b>Acronym</b>	<b>Definition</b>
AQDA	Air Quality Data Action
AIS	Audit Information System
AQS	Air Quality System
MFM	Mass Flow Meter
CAN	Corrective Action Notification
CARB	California Air Resources Board
CFR	Code of Federal Regulations
NIST	National Institute of Standards and Technology
LPM	Liters per Minute
QAS	Quality Assurance Section
QC	Quality Control
QC/QA	Quality Control/Quality Assurance
QMB	Quality Management Branch
O.D.	Outside Diameter
SOP	Standard Operating Procedure
TSA	Technical System Audit
U.S. EPA	United States Environmental Protection Agency
U.S. EPA QA	United States Environmental Protection Agency Quality Assurance

L.1.0.8 MATERIALS

- NIST traceable certified mass flow transfer standard (Tetralcal)
- Flow rate calibration adapters (venturi orifices- Tetralcal).
- Formaldehyde collection sorbent tube.
- 1/4" O.D. Teflon tubing.
- Swagelok cap.

These materials are shown in Figure 2.

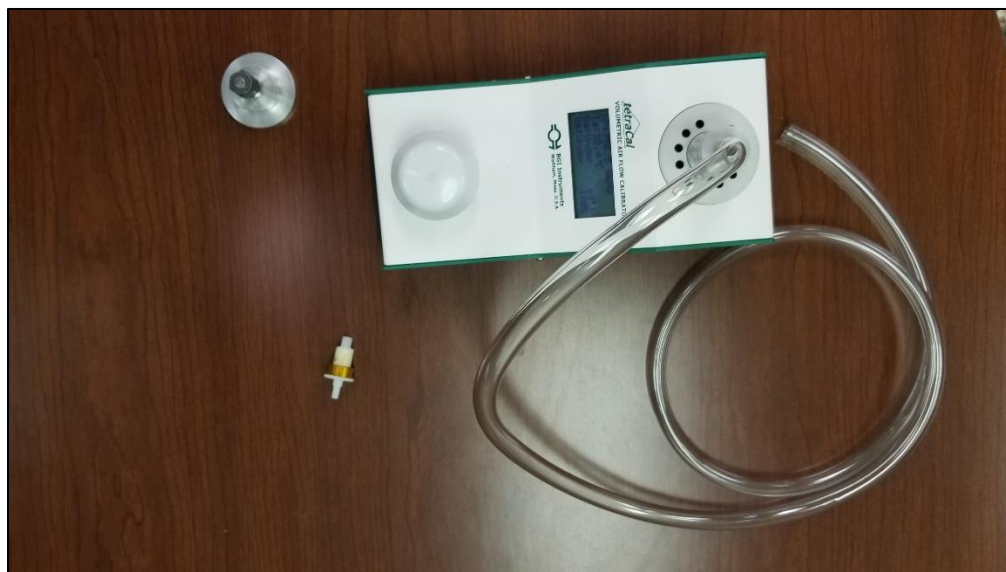


Figure 2 Materials for Xontech 924 performance audit.

#### L.1.0.9 AUDIT PROCEDURES

Record all pertinent station and sampler information on the QA audit worksheet Section (L.1.0.20). The weather cover on top of the Xontech 924 sampler should not be removed.

If better access to the sample holders is needed, the "T" pin on the support shaft can be removed by pressing the button on the top of the "T" and pulling the pin out. This will allow the lowering of the entire sampling module.

#### L.1.0.10 PRINT REPORT

Open the front door of the control module and select a sampling channel to be audited. The main menu for the Xontech 924 sampler has the date in the upper left-hand corner, the time in the upper right-hand corner, and "Idle" in the lower left-hand corner. Typically, the channels for the 924 are: aldehydes channel #1, total metals channel #2, and Cr+6 channel #3. But this order can change, please verify with station operator. From the Main Menu, press [**SELECT**] and [→] 4 times to get "PRINT FULL RPT?" Press [**SELECT**] to get the "N" to blink. Press [→] once to change "N" to "Y". Press [**EXIT**] to print a report and attach it to your worksheet.

Return to the Main Menu screen by pressing **[EXIT]** 3 times. Repeat this step to print report again at the end of the audit. Review the initial and final reports to ensure no changes have been made by the auditor during the audit.

L.1.0.11 SLOPE AND INTERCEPT

In order to get the slope and intercept, from the main menu, go to the "**CALIBRATE**" screen, by pressing **[→]** 3 times. It should indicate channel #1 (if not channel #1, just go with the one it's on) with the MFM's full scale range (F), slope (S), and intercept (I). Record these values on the worksheet. Press **[SELECT]** to underline the channel number. Press **[SELECT]** again to get the channel number to blink. Press **[→]** to change the channel to #2. Press **[EXIT]** to stop the channel number from blinking. The full scale range of MFM #2, the slope, and the intercept should be displayed. Record the values on the worksheet. Perform the same procedure for channel #3. Press **[EXIT]** 2 times to return to the Main Menu screen ("**IDLE**" displayed in the lower left-hand corner).

L.1.0.12 SAMPLING CHANNEL ACTIVATION

From the Main Menu, to check the flows, press **[→]** 6 times to get to the "**MANUAL RUN**" screen. Press **[SELECT]** to underline "**1:OFF**" for channel #1. Press **[SELECT]** again to get "**1:OFF**" to blink. Press **[→]** to change "**OFF**" to "**MAN**" (manual mode). (Note: **[←]** turns it back to **OFF**) "**MAN**" should be blinking. Press **[EXIT]** to start the pump. Press **[EXIT]** again to remove the underline from "**MAN**". Do this for all channels to ensure they run at the same time during the audit.

L.1.0.13 FLOW RATE AUDIT AND LEAK CHECK

Press **[SELECT]** to underline the channel number being audited. Press **[←]** to see the Flow screen. Press **[→]** multiple times to scroll to the channel you are auditing.

For the channel labelled 1, press the metal tab on the quick-disconnect at the bottom of the sample holding assembly, and pull down to disconnect (Figure 3 & Figure 4).



Figure 3



Figure 4

Unscrew the bottom of the sample holder. Remove the sorbent tube from the assembly. Insert a new sorbent tube in the sample holder (Figure 5 & Figure 6).



Figure 5



Figure 6



Reconnect the sample holder assembly and the quick-disconnect.  
Remove the protective cover from the bottom of the calibration adapter,  
and place the adapter in the sample holder (Figure 7).



Figure 7

Be sure that the adapter is seated flat against the O-ring and rubber gasket. Reconnect the sample holder assembly so that the inlet to the calibration adapter protrudes through the sampling platform (Figure 8 & Figure 9).



Figure 8



Figure 9

Be sure to reconnect the quick-disconnect (Figure 10).

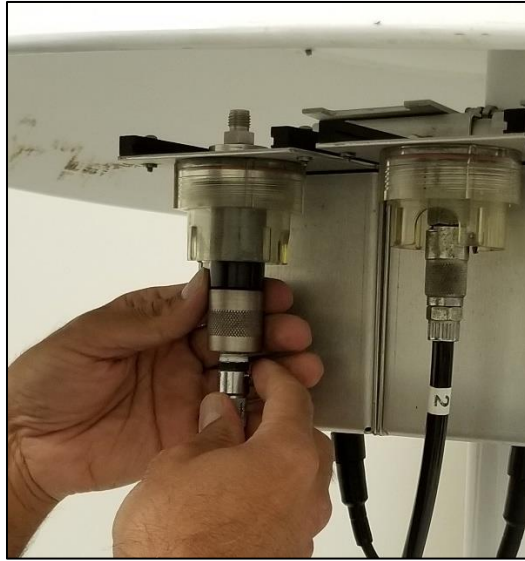


Figure 10

Turn the BGI Tetracal ON. Insert venturi with range of flow between 0.1-1.2 LPM. Attach the Tetracal and record the **Qs** flow reading from BGI Tetracal and Xontech 924 sampler channel 1 (Figures 11 & 12).



Figure 11



Figure 12

For the leak check, remove the Tetracal tubing from the Xontech 924 sampler and install the leak check cap. Sampler flow will drop and record the flow when stops dropping. To pass the leak check, the flow should be less than 2 percent of the full scale (0.04 LPM of 0-2 LPM for channel 1). Record the values on the worksheet. Re-assemble sample line.

Note: Figures 3-12 can be referenced for remaining channels.

For channel 2, press the metal tab on the quick-disconnect at the bottom of the sample holding assembly, and pull down to disconnect. Unscrew the bottom of the filter holder. Remove the filter (if present) and place it in the clean container. Remove the protective cover from the bottom of the calibration adapter, and place the adapter in the sample holder. Be sure that the adapter is seated flat against the O-ring and rubber gasket. Reconnect the sample holder assembly so that the inlet to the calibration adapter protrudes through the sampling platform. Be sure to reconnect the quick-disconnect. Turn the BGI Tetracal ON. Insert venturi with range of flow between 6-30 LPM. Attach the BGI Tetracal and record the **Qs** flow reading from BGI Tetracal and Xontech 924 sampler channel 2.

For the leak check, remove the Tetracal tubing from the Xontech and install the leak check cap. Sampler flow will drop and record the flow when stable. To pass the leak check, the flow should be less than 2 percent of the full scale (0.6 LPM of 0-30 LPM for channels 2 and 3). Record the values on the worksheet. Re-assemble sample line.

Repeat the process for channel 3 flow and leak checks.

In the event there is concern with the audit results, refer to Section L.1.0.16 for troubleshooting opportunities.

#### L.1.0.14 POST-AUDIT PROCEDURES

After completing the flow and leak checks for channels 2 and 3 the sample display screen should read "**Manual Run**". Press "**Select**" to underline "**1:Off**". Press the right-pointing arrow until the underline is below the active channel. Press "**Select**" to get "**Man**" to blink. Press the left-pointing arrow to change "**Man**" to "**Off**". Press "**Exit**" to stop the pump. Press "**Exit**" to remove the underline from "**Off**". Press the right-pointing

arrow twice to return to the main menu screen which should display "**Idle**". Raise the sampling module to the original position and insert the "T" pin, if necessary. Print final report from sampler and attach initial and final reports to the audit worksheet. Verify initial and final reports to ensure there are no changes to flow rate, date & time, slope, and intercept. Inform the station operator if there are any changes and have the operator change it back to match with the initial report.

L.1.0.15 COMPILING PRELIMINARY AUDIT RESULTS

1. Auditors responsible for data entry and review should sign the completed Audit Worksheet. The second auditor should review and verify that the worksheet and AIS entries match.
2. Notify the operator of preliminary audit results. A copy of the report will be provided electronically after review, via email.
3. Print final report

L.1.0.16 TROUBLESHOOTING

1. Check o-rings and gaskets to ensure they are seated and seal properly.
2. Check cracks in the plastic.
3. Check to ensure Qs is measured (not Qa).
4. Check initial and final print outs from the sampler to make sure there are no changes to flow rate, date & time, slope, and intercept.

L.1.0.17 CORRECTIVE ACTION NOTIFICATION (CAN)

CANs are issued to document issues that may impact or may potentially impact data quality, completeness, storage, or reporting. Refer to the SOP for Corrective Action Notifications (Volume V, Appendix AN) for guidance.

L.1.0.18 AIR QUALITY DATA ACTION (AQDA) REQUEST

AQDA Requests are issued when the audit reveals that the station's sampler(s) are not operating within federal critical criteria or CARB control limits. Refer to the SOP for Air Quality Data Action Requests (Volume V, Appendix AO) for guidance.

L.1.0.19     REFERENCES

Performance Audit Procedures for Xontech samplers August 2004 Vol V.

AQSB SOP ATP 801 RM Environmental Model 924, June 2007.

Corrective Action Notifications (Volume V, Appendix AN).

Air Quality Data Action Requests (Volume V, Appendix AO).

Performance Audit Validation Template:

(Shared(\mldbranch\Branch\QMB) (S:)\Cabinet\Forms & Worksheets,  
QA Revision: 4-26-2017\Control & warning limits-Performance Audit  
Validation Template-(rev 1-1-17).pdf)).

TetraCal Manual:

(Shared(\mldbranch\Branch\QMB) (S:)\General Shared\Instrument  
Manuals\TetraCal\_Manual-1.6.1.pdf)).

L.1.0.20 QA AUDIT WORKSHEET

### QA AUDIT WORKSHEET XONTECH SAMPLERS

Site Name: \_\_\_\_\_ Sampler ID #: \_\_\_\_\_ POC: \_\_\_\_\_

Operator: \_\_\_\_\_ Calibration Date: \_\_\_\_\_ Collocated

Auditors: \_\_\_\_\_ Cal Standard ID#: \_\_\_\_\_ Primary

Date: \_\_\_\_\_ Cal Equip Cert Date: \_\_\_\_\_ Secondary

Audit Flow Standard: TetraCal or MFM Temperature (°C): \_\_\_\_\_ Model

Audit Standard ID #: \_\_\_\_\_ Pressure (mmHg): \_\_\_\_\_ 924







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Pollutant: <i>Aldehydes</i>	Pollutant: <i>Metals</i>	Pollutant: <i>Cr<sup>6+</sup> (12115)</i>												
Channel #: _____	Channel #: _____	Channel #: _____												
Head Type: Filter <input type="checkbox"/> Tube <input checked="" type="checkbox"/>	Head Type: Filter <input checked="" type="checkbox"/> Tube <input type="checkbox"/>	Head Type: Filter <input checked="" type="checkbox"/> Tube <input type="checkbox"/>												
Slope: _____ <small>Same as start</small> <input type="checkbox"/>	Slope: _____ <small>Same as start</small> <input type="checkbox"/>	Slope: _____ <small>Same as start</small> <input type="checkbox"/>												
Intercept: _____ <input type="checkbox"/>	Intercept: _____ <input type="checkbox"/>	Intercept: _____ <input type="checkbox"/>												
Full Scale of the MFM: _____	Full Scale of the MFM: _____	Full Scale of the MFM: _____												
Leak Test (Flow): _____	Leak Test (Flow): _____	Leak Test (Flow): _____												
Set Flow: _____ <small>*ARB: 0.7 lpm; others: ask operator</small>	Set Flow: _____ <small>*ARB: 12.0 lpm; others: ask operator</small>	Set Flow: _____ <small>*ARB: 12.0 lpm; others: ask operator</small>												
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 50%;">Sampler Flow (SLPM)</th> <th style="width: 50%;">Audit Flow (SLPM)</th> </tr> <tr> <td style="height: 20px;"> </td> <td> </td> </tr> </table>	Sampler Flow (SLPM)	Audit Flow (SLPM)			<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 50%;">Sampler Flow (SLPM)</th> <th style="width: 50%;">Audit Flow (SLPM)</th> </tr> <tr> <td style="height: 20px;"> </td> <td> </td> </tr> </table>	Sampler Flow (SLPM)	Audit Flow (SLPM)			<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 50%;">Sampler Flow (SLPM)</th> <th style="width: 50%;">Audit Flow (SLPM)</th> </tr> <tr> <td style="height: 20px;"> </td> <td> </td> </tr> </table>	Sampler Flow (SLPM)	Audit Flow (SLPM)		
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Sampler Flow (SLPM)	Audit Flow (SLPM)													
Sampler Flow (SLPM)	Audit Flow (SLPM)													
Notes:														
Data recorded and verified by: _____														
California Air Resources Board	MLD/QAS-038 (Rev. 4-15-19)													

L.1.0.21 QA AUDIT WORKSHEET NOTES

Below is a concise summary of the audit procedures for Xontech 924.

**Xontech 924 Audit Procedures**  
 (For full details see SOP Appendix L)

Typical channels for the 924: Aldehydes are channel #1, Total Metals channel #2, and Cr6+ channel #3. Always check with the operator because this can change.  
**Note: "Exit" means both Enter and Exit depending on what is menu is displayed.**

1. **PRINT REPORT:** From the Main Menu, press [SELECT] and [→] 4 times to get "PRINT FULL RPT?" Press [SELECT] to get the "N" to blink. Press [→] once to change "N" to "Y". Press [EXIT] to print a report and attach it to your worksheet. Return to the Main Menu screen by pressing [EXIT] 3 times. Repeat this step at the end of your audit.
2. **SLOPE and INTERCEPT:** From the Main Menu, go to the "CALIBRATE" screen, by pressing [→] 3 times. It should indicate channel #1 (if not channel #1, just go with the one it's on) with the MFM's full scale range (F), its slope (S), and intercept (I). Record these values on the worksheet. Press [SELECT] to underline the channel number. Press [SELECT] again to get the channel number to blink. Press [→] to change the channel to #2. Press [EXIT] to stop the channel number from blinking. The full scale range of MFM #2, the slope, and the intercept should be displayed. Perform same procedures for channel #3. Press [EXIT] 2 times to return to the Main Menu screen ("IDLE" displayed in the lower left-hand corner).
3. **SAMPLING CHANNEL ACTIVATION:** From the Main Menu, to check the flows, press [→] 6 times to get to the "MANUAL RUN" screen.
4. Press [SELECT] to underline "1:OFF" for channel #1. Press [SELECT] again to get "1:OFF" to blink. Press [→] to change "OFF" to "MAN" (manual mode). (Note: [←] turns it back to OFF) "MAN" should be blinking. Press [EXIT] to start the pump. Press [EXIT] again to remove the underline from "MAN". Do this for all three channels by repeating step 4.
5. Press [SELECT] to underline the channel number being audited. Press [←] to see the Flow screen. Depress [→] multiple times to scroll to the channel you are auditing. Disconnect the quick disconnect from the filter and install the calibration adapter. Attach the TetraCal and record the **Qs** flow reading.
6. **LEAK TEST:** Install the leak check cap, record reading. Repeat steps 5 and 6 for all 3 channels. Note: The flow should be < 2% of the full scale of the MFM (0.6 lpm for a 0-30 lpm MFM, and 0.04 lpm for a 0-2 lpm MFM).
7. Exit to the Main Menu and print another report (see #1). Attach the reports to the audit worksheet.