



Perform Direct Zero Calibration

How to perform a zero air calibration direct from the bottle.

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INTRODUCTION

Zero calibration can be performed on all gas modules simultaneously because all gas modules are sampling the same zero air source.

It takes approximately 30 to 45 minutes for all of the modules to stabilize towards zero air, after which all offsets can be changed quickly, one after the other, and in any order, using either the **Manual Entry** or the **Calibration** areas of the **Calibration and Service** app.

Gas modules must be zero calibrated using zero air. N₂ can't be used.

We recommend you leave any failed modules running in the monitor throughout the zero and span calibration process. After you've calibrated the remaining modules, you can open the door to the monitor and remove the failed modules for inspection.



TOOLS:

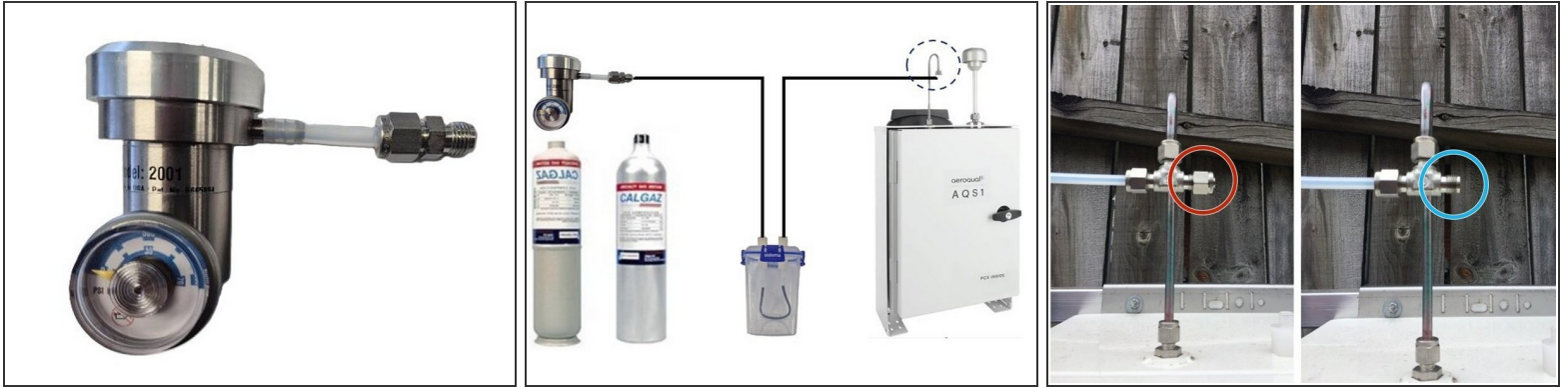
- [Adjustable spanner](#) (1)
- [9/16 Spanner](#) (1)



PARTS:

- [ACC R43 Calibration Kit](#) (1)
- [17 oz \(500ml\) of Water](#) (1)

Step 1 — Connect flow regulator



- If not already fitted, connect 5cm of tubing with Swaglok union to your flow regulator.
- Connect your flow regulator to your zero gas cylinder.
- Remove the Kynar fitting (inlet mesh filter) from the monitor's gas inlet.
- Connect the 3-way tee to the inlet.
- Add 17oz(500ml) of water to the humidifier.
- Connect the two lengths of ¼" Teflon tubing to the humidifier. One tube goes to the flow regulator, the other to the tee.
- If you're using a demand flow regulator, close (cap) the other side of the tee.
- If you're using a fixed or adjustable flow regulator, add a metre or more of tubing to the other side of the tee to exhaust the excess gas away from you.

Step 2 — Start zero air

Table 7: Zero calibration results

Module	Current offset	Reading after stabilization 10-minute average	Target zero acceptable range (ppm) 10-minute average	Acceptable standard deviation during zero calibration 10-minute average	New offset	Minimum and maximum recommended offset (ppm)	Offset uploaded	Reading after offset changed	Pass / fail
NO ₂ (O ₂)	0.000		0.000 ± 0.005	0.002	N/A	N/A	N/A	N/A	
NO ₂ (direct)			0.000 ± 0.005	0.002		Max +0.05 Min -0.05			
NO _x			0.000 ± 0.005	0.002		Max +0.05 Min -0.05			
O ₂			0.000 ± 0.005	0.002		Max +0.05 Min -0.05			
O ₃			0.000 ± 0.005	0.002		Max +0.05 Min -0.05			
CO			0.000 ± 0.050	0.020		Max +0.05 Min -0.05			
VOC low			0.000 ± 0.010	0.005		Max +0.05 Min -0.05			
VOC high			0.000 ± 0.100	0.020		Max +0.05 Min -0.05			
SO ₂			0.000 ± 0.005	0.002		Max +0.05 Min -0.05			
H ₂ S			0.000 ± 0.005	0.002		Max +0.05 Min -0.05			
CO ₂			0.000 ± 10.000	5.000		Max +0.05 Min -0.05			
Comments									

- Start supplying the zero air to the instrument. For fixed and variable regulators make sure excess flow is coming out of the exhaust tubing.
- Wait 30 to 40 minutes for the module readings to stabilize.
- While waiting for the readings to stabilise, record the **Current offset** for each of your gas modules in the Current offset column in table 7 of the calibration table.

Step 3 — Determine stability

Real time measurements							Last 10 readings		
Time	CO ppm	NO2 ppm	NOx ppm	O3 ppm	SO2 ppm	PID ppm			
10:45 p.m.	0.404	-0.003	-0.011	0.001	0.085	0.801			
10:44 p.m.	0.404	-0.003	-0.012	0.002	0.061	0.793			
10:43 p.m.	0.403	-0.002	-0.011	0.001	0.103	0.803			
10:42 p.m.	0.402	-0.002	-0.010	0.002	0.067	0.791			
10:41 p.m.	0.402	0.000	-0.012	0.001	0.089	0.808			
10:40 p.m.	0.401	0.001	-0.011	0.001	0.102	0.802			
10:39 p.m.	0.338	0.002	-0.010	0.002	0.071	0.796			
10:38 p.m.	0.336	0.003	-0.012	0.001	0.101	0.800			
10:37 p.m.	0.336	0.003	-0.011	0.001	0.065	0.795			
10:36 p.m.	0.335	0.004	-0.010	0.002	0.106	0.800			
10:35 p.m.	0.333	0.005	-0.011	0.001	0.068	0.792			
Average	0.372	0.001	-0.011	0.001	0.083	0.798			
Std Dev	0.035	0.003	0.001	0.001	0.018	0.005			

Table 7: Zero calibration results									
Module	Current offset	Reading after stabilization 10-minute average	Target zero acceptable range (ppm) 10-minute average	Acceptable standard deviation during zero calibration 10-minute average	New offset	Minimum and maximum recommended offset (ppm)	Offset uploaded	Reading after offset changed	Pass / fail
NO ₂ (O ₂)	0.000		0.000 ± 0.005	0.002	N/A	N/A	N/A	N/A	
NO ₂ (direct)			0.000 ± 0.005	0.002		Max +0.05 Min -0.05			
NO _x			0.000 ± 0.005	0.002		Max +0.05 Min -0.05			
O ₃			0.000 ± 0.005	0.002		Max +0.05 Min -0.05			
O ₃			0.000 ± 0.005	0.002		Max +0.05 Min -0.05			
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VOC low			0.000 ± 0.010	0.005		Max +0.05 Min -0.05			
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H ₂ S			0.000 ± 0.005	0.002		Max +0.05 Min -0.05			
CO ₂			0.000 ± 10.000	5.000		Max +0.05 Min -0.05			
Comments									

- To determine if the readings have stabilized:
 - Look at the standard deviation over a ten-minute period in the **Manual Entry** (shown) or **Calibration** areas of the **Calibration and Service** page.
 - Check if they fall within the acceptable range listed in the **Acceptable standard deviation during zero calibration** column of your calibration table.
- To be regarded as stable, the readings must not be increasing or decreasing, and must be within the acceptable range.
- If the values don't stabilize, write fail in the **Pass / Fail** column and move on to next module.

Step 4 — Determine need for adjustment

Table 7: Zero calibration results

Module	Current offset	Reading after stabilization 10-minute average	Target zero acceptable range (ppm) 10-minute average	Acceptable standard deviation during zero calibration 10-minute average	New offset	Minimum and maximum recommended offset (ppm)	Offset uploaded	Reading after offset changed	Pass / fail
NO ₂ (O ₂)	0.000		0.000 ± 0.005	0.002	N/A	N/A	N/A	N/A	
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H ₂ S			0.000 ± 0.005	0.002		Max +0.05 Min -0.05			
CO ₂			0.000 ± 10.000	5.000		Max +0.05 Min -0.05			
Comments									

- Record the stabilized reading from the 10-minute average in the **Reading after stabilization** column.
- If the stabilized value is within the accepted range (see **Target zero acceptable range** column), no offset adjustment is required. Write pass in the **Pass / fail** column and move on to next module.
- If the stabilized value is outside the accepted range, you need to make an offset adjustment.

Step 5 — Manually calculate offset

New offset = current offset + (gas reading / gain)

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Module	Current offset	Reading after stabilization 10-minute average	Target zero acceptable range (ppm) 10-minute average	Acceptable standard deviation during zero calibration 10-minute average	New offset	Minimum and maximum recommended offset (ppm)	Offset uploaded	Reading after offset changed	Pass / fail
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CO ₂			0.000 ± 10.000	5.000		Max +0.05 Min -0.05			
Comments									

- If you're using the **Manual Entry** area to upload offset adjustments, you need to calculate your new offset using the equation shown.
- To make the calculation, you need to know the module's:
 - Current offset
 - Current gain
 - 10-minute average reading.
- Record the calculated offset in the **New offset** column.

Step 6 — Automatically calculate offset

13:30

13:40

13:50

14:00

14:10

14:20

start calibration run

previous calibrations

Offset

Gain

Current offset

0.0

New offset

-4.7

New offset = (current reading / current gain) + current offset

Recommend

Apply

Time	Current	Average	Std Dev
2:21:00 PM	-4.7	-4.7	0.7
2:20:00 PM	-4.3	-4.7	0.7
2:19:00 PM	-5.6	-4.7	0.7
2:18:00 PM	-5.7	-4.7	0.7
2:17:00 PM	-3.8	-4.8	0.8
2:16:00 PM	-3.8	-4.9	0.8
2:15:00 PM	-4.0	-5.0	0.7
2:14:00 PM	-4.7	-5.0	0.7
2:13:00 PM	-5.1	-5.0	0.7
2:12:00 PM	-5.2	-4.8	0.9

Table 7: Zero calibration results

Module	Current offset	Reading after stabilization 10-minute average	Target zero acceptable range (ppm) 10-minute average	Acceptable standard deviation during zero calibration 10-minute average	New offset	Minimum and maximum recommended offset (ppm)	Offset uploaded	Reading after offset changed	Pass / fail
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VOC low			0.000 ± 0.010	0.005		Max +0.05 Min -0.05			
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H ₂ S			0.000 ± 0.005	0.002		Max +0.05 Min -0.05			
CO ₂			0.000 ± 10.000	5.000		Max +0.05 Min -0.05			
Comments									

- If you're using the automated process in the **Calibration** area to upload offset adjustments, select the correct gas channel and click the **Recommend** button to calculate the offset for your selected gas.
- Record the calculated offset in the **New offset** column.

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Step 7 — Apply offset adjustment

Table 7: Zero calibration results									
Module	Current offset	Reading after stabilization 10-minute average	Target zero acceptable range (ppm) 10-minute average	Acceptable standard deviation during zero calibration 10-minute average	New offset	Minimum and maximum recommended offset (ppm)	Offset uploaded	Reading after offset changed	Pass / fail
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CO ₂			0.000 ± 10.000	5.000		Max +0.05 Min -0.05			
Comments									

Calibration parameters									
	NO ₂ ppb	O ₂ ppb	O ₃ ppb	O ₃ raw ppb	PM _{2.5} raw µg/m ³	PM _{2.5} µg/m ³	TEMP °C	RH %	Gain
Gain	1.001	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Offset	-5.4	0.0	0.0	0.0	0.0	0.0	0.00	0.0	0.0
a	1.100				2.550				
b					1.870				
Save changes? Cancel Save									

Real time measurements									
	NO ₂ ppb	O ₂ ppb	O ₃ ppb	O ₃ raw ppb	PM _{2.5} raw µg/m ³	PM _{2.5} µg/m ³	TEMP °C	RH %	Gain
1:29 p.m.	3.5	27.4	30.0	28.4	0.7	0.7	17.60	46.6	6
1:28 p.m.	4.0	28.3	30.1	28.4	0.6	0.6	17.60	46.9	6
1:27 p.m.	3.6	27.5	30.1	28.4	0.6	0.5	17.44	47.0	6
1:26 p.m.	2.6	26.4	30.4	28.2	0.7	0.7	17.39	46.6	5
1:25 p.m.	2.5	26.2	30.2	28.3	0.8	0.7	17.33	46.9	5

Offset / Gain									
Current offset		New offset		New offset = (current reading / current gain) + current offset					
0.0		-4.7							
Recommend		Apply							

Time	Current	Average	Std
2:21:00 PM	-4.7	-4.7	
2:20:00 PM	-4.3	-4.7	
2:19:00 PM	-5.6	-4.7	
2:18:00 PM	-5.7	-4.7	
2:17:00 PM	-3.8	-4.8	
2:16:00 PM	-3.8	-4.9	
2:15:00 PM	-4.0	-5.0	
2:14:00 PM	-4.7	-5.0	
2:13:00 PM	-5.1	-5.0	
2:12:00 PM	-5.2	-4.8	

- If the new offset is within the accepted range (see the **Minimum and maximum recommended offset** column), you can upload your new offset.
- If you're using the **Manual Entry** area, click the appropriate cell, type in the new value and click **Save**.
- If you're using the **Calibration** area, simply click the **Apply** button.
- If the new offset is outside the accepted range, don't upload the offset. Write fail in the **Pass / fail** column and move on to next module.

Step 8 — Record applied offset

Table 7: Zero calibration results									
Module	Current offset	Reading after stabilization 10-minute average	Target zero acceptable range (ppm) 10-minute average	Acceptable standard deviation during zero calibration 10-minute average	New offset	Minimum and maximum recommended offset (ppm)	Offset uploaded	Reading after offset changed	Pass / fail
NO ₂ (O ₂)	0.000		0.000 ± 0.005	0.002	N/A	N/A	N/A	N/A	
NO ₂ (direct)			0.000 ± 0.005	0.002		Max +0.05 Min -0.05			
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SO ₂			0.000 ± 0.005	0.002		Max +0.05 Min -0.05			
H ₂ S			0.000 ± 0.005	0.002		Max +0.05 Min -0.05			
CO ₂			0.000 ± 10.000	5.000		Max +0.05 Min -0.05			
Comments									

- Record the offset you uploaded in the **Offset uploaded** column.
- Wait 2 or 3 minutes then record the current reading in the **Reading after offset changed** column.
- Confirm the reading is within acceptable limits. If yes, write pass in the **Pass / fail** column. If not, write fail.
- Move on to next module.

Step 9 — Journal Records



- There may be times when either the module doesn't stabilize, or a very large positive or negative offset is calculated. Make a note of this in the journal and then carry on with the rest of the zero calibration. Don't open the door to check the module because this causes temperature instability.
- ⓘ The journal automatically records any changes you apply to the offset so you don't need to make any manual entries.

For further support, contact Aeroqual Support.