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| Zero Air Generator Verification Guide |
| *SOP Reference* |
| Revision Number 1  07/23/15 |

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# [Zero Air Verification Background](#TableofContents)

DAQ uses zero air generators to perform quality control and quality assurance on gaseous analyzers in the network. The zero air must be of high quality to meet USEPA requirements. The requirements for zero air for each pollutant are found in the “*Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Ambient Air Monitoring Program, EPA-454/B-13-003, May 2013*”.

DAQ technicians accomplish the zero air generator (ZAG) verification by first using a zero air standard to ensure that a gaseous analyzer that uses the station zero air indicates zero to within 1% of its range. Then the technician uses the analyzer to verify that the station zero air generator output is within 1% of the analyzer range. DAQ verifies station zero air generators annually using each gaseous analyzer that uses the generator at a station.

# [Zero Air Verification Procedure](#TableofContents)

1. Prepare the portable zero air standard by plugging it in and powering it up. Allow a minimum of 10 minutes warm-up time. Allow the front panel carbon monoxide catalytic oxidizer temperature to reach 100 °C.
2. Put the analyzer’s data acquisition system (DAS) measurement channel into the preventative maintenance mode.
3. Do not use the external switching valve for this test. Disconnect the analyzer’s sample line, including the in-line filter, from the switching valve.
4. Connect the output of the zero air standard to the input of the calibrator. Then connect the output of the calibrator to the gaseous analyzer.
5. Use the calibrator to apply zero air from the zero air standard to the analyzer sample inlet through the analyzer’s sample line and in-line filter.
6. If the analyzer’s front panel measured parameter concentration stabilizes within ± 1% of the analytical range (see Table 1), proceed to step 8.
7. If the analyzer’s front panel measured parameter concentration stabilizes outside the ± 1% of the analytical range, adjust the analyzer’s zero/background coefficients and repeat steps 5 and 6.
8. Connect the station ZAG to the calibrator inlet and apply zero air from the station ZAG to the analyzer sample inlet.
9. When the analyzer’s front panel measured parameter concentration stabilizes, record the analyzer’s front panel reading on the zero air verification spreadsheet.
10. If the analyzer’s front panel measured concentration is within ± 1% of the analytical range, the station ZAG verification passes.
11. If the analyzer’s front panel measured concentration is outside ± 1% of the analytical range, the station ZAG needs maintenance or repair.
12. Repeat steps 4 through 11 for all gaseous analyzers in use.
13. Return the analyzer to normal operating configuration. Return all analyzers to ambient sampling mode on the DAS as applicable.
14. If the analyzer’s zero/background coefficients were adjusted the analyzer must be re-calibrated.
15. Make required station and instrument log entries.
16. Save the verification spreadsheet in the proper location on the P drive.

### [Table 1. The 1% of the instrument range](#TableofContents).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **SO2** | | **O3** | **CO** | | **NO2** | **NOy** |
| Amb. range | Trace range | Amb. range | Amb. range | Trace range | Amb. range | Trace range |
| 1% of Range | 2.0 ppb | 1.0 ppb | 5.0 ppb | 0.4 ppm1 | 50 ppb | 5.0 ppb | 2.0 ppb |

1CO ambient range is different because of the lower detectable limit in 40 CFR 53.23(c).

### [Table 2. Lower Detectable Limits (for reference)](#TableofContents)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **SO2** | | **O3** | **CO** | | **NO2** |
| Amb. range | Trace range | Amb. range | Amb. range | Trace range | Amb. range |
| 40 CFR 53.23 (c)1 | 2 ppb | 1 ppb | 10 ppb | 400 ppb | 200 ppb | 10 ppb |
| Teledyne API2 | 0.4 ppb | 0.05 ppb | 0.4 ppb | 200 ppb | 40 ppb | 0.4 ppb |
| Certified ZAG3 | 0.5 ppb | 0.5 ppb | 0.5 ppb | 25 ppb | 25 ppb | 0.5 ppb |

140 CFR 53.23(c) summary from QA Handbook Volume II, Section 7.0, Table 7-5.

2Operation Manuals, Teledyne API.

3Sabio Instruments, Model 2020 Specifications.