

6 SRP QUALITY ASSURANCE

This section contains recommended quality control (QC) checks that should be performed on a regular schedule to ensure that the SRP is operating within its design specifications and that its performance is suitably documented.

6.1 SRP Performance

On each occasion that the SRP is used to perform a verification run, the performance of the SRP should be monitored closely to ensure that the performance specifications are being met. Particular attention should be given to the precision of the SRP's photometric measurements. The SRP has the capability of making photometric O₃ measurements with a precision of 0.4 ppb over the range of 0 to 1000 ppb O₃ (assuming 20 replicate measurements), provided a reasonably stable source of O₃ is being assayed. Measured precision will not be as good if the O₃ source assayed is inherently unstable or if insufficient time is allowed for stabilization.

The photometer dark count and normal count (full count) for each channel of the SRP should be noted and recorded at the start of each run. When significant changes in these parameters or the SRP precision are noted from one run to another, it may be an indication that something about the SRP system has changed. If this occurs, use the photometer operational programs under the Diagnostics menu (see Section 4) to verify proper operation of the SRP system.

6.2 Routine Quality Control Checks

The stability, dark count, normal count (total), and temperature and pressure zero (electronic) and span checks, should be performed on a periodic schedule (see Section 4 for procedures). The minimum frequency of OCDS should be once per week because it has been noticed that the drift of the pressure transducer is sufficient enough to warrant frequent checks. Even after one week, minute adjustments may be needed to pull it back into specs. Since pressure is a critical element to the calculation of O₃, it should be checked frequently. If an operator has sufficient data demonstrating that the pressure can stay within spec for a longer period of time then that would be acceptable.

The dark count, full count, and the temperature and pressure zero (electronic) and span checks can be determined using the SRP operational program under the Diagnostics menu. Note and record the dark count (this should be between 5 and 20), the full count (this should be 90,000 minimum), the temperature electronic zero (this should be 0.1 to 1.0 mV), the pressure electronic zero (this should be 700 ± 0.1 mBar),

the temperature span (this should agree within $\pm 0.2^{\circ}\text{C}$), and the pressure span (this should agree within ± 0.10 mbar).. Use a local barometer to determine the pressure span check comparability. The SRP pump must be off during this comparison. The results of the photometer checks should be compared with the results of previous checks and recorded..

6.3 Standby Level 2 Transfer Standard

It is highly recommended that all regional SRP operators maintain, in ready reserve status, a fully verified Level 2 O₃ transfer standard (see reference 10 for guidance). These certified transfer standards can be used as backup for the SRPs in case of a malfunction, or as referee standards if disputes arise during verification of guest standards. They can also be used as active field Level 2 transfer standards.

6.4 Verification of the SRP to SRP

Verification of the network SRPs is required on a regular basis and is conducted by EPA using a protocol developed jointly by EPA and NIST. The verification process is a check to see if the original verification, conducted by NIST, is still applicable. It is not used to change or adjust the original empirical relationship of the two SRPs. Linear regression slopes of 1.00 ± 0.01 , with intercepts of zero ± 1 ppb, should be considered acceptable. The verification procedure should only be conducted by a person who is intimately familiar and experienced with the operation of the SRP and pertinent related documents. This section describes the verification process and gives all procedures, specifications, and other requirements for the verification of the network SRPs.

6.4.1 Verification Protocol

The SRP verification protocol is based on the requirement that the EPA and NIST Primary SRPs be directly intercompared once a year and consists of the following steps:

- 1) Set up traveling SRP as a guest.
- 2) Do not use the traveling SRP to generate Ozone.
- 3) Perform and Pass all QA checks first..
- 4) The verification is set up to be similar to the NIST verification as follows.
- 5) The software calls it a calibration, but for our purposes it is verification. Although we may use the two terms interchangeably, it needs to be noted that this is verification.
- 6) Set up the calibration for a minimum of 3 cycles.
- 7) The maximum concentration point should be $1000 \text{ ppb} \pm 20 \text{ ppb}$.
- 8) The minimum concentration point should be $< 25 \text{ ppb}$.
- 9) The average number of readings per concentration point should be a minimum of 7.
- 10) The MFC Flow should be sufficient to provide flow to all the instruments plus an over flow of about ≥ 1 liter per minute. The Lamp % will be whatever setting is needed to achieve steps 7 and 8 above.
- 11) The minimum number of concentration points is 10 (not including the Zero points). The SRP will evenly space the concentration points between the high to the low based on the % Lamp Power.
- 12) There should be a Zero at the end and at the start.
- 13) Passing criteria is Slope = 1.00 ± 0.01 and Intercept = $0.0 \pm 1.00 \text{ ppb}$.

Before each intercomparison is initiated, the operation of each SRP must be checked and appropriately documented on the SRP Operating Characteristics Data Sheet example included in *Appendix B*. Adjustment of critical SRP components (*i.e.*, temperature and pressure circuitry) and operating parameters (*i.e.*, dark counts and full-scale counts) must be performed as specified in the pre-verification checkout procedure in Section: 4.2.

If an intercomparison of the EPA Primary SRP and a Network SRP indicates a disagreement [*i.e.*, the network SRP's linear regression slope and intercept are outside the acceptable criteria (linear regression slope of 1.00 ± 0.01 with an intercept of $\text{zero} \pm 1$ ppb)], and the disagreement cannot be resolved, the EPA and NIST Primary SRPs must be directly intercompared to resolve the difference.

If there is no difference between the EPA and NIST Primary SRPs, the problem resides with the Network SRP. Normally, problems with the Network SRP that could result in such a disagreement would be identified during the pre-verification checkout and resolved at that point. The technical guidance provided in Section 8 identifies symptoms of typical SRP problems, causes of the symptoms, and presents solutions and corrective actions.

All Verification intercomparisons shall consist of nine (9) replicate analyses per O₃ concentration, with 12 concentrations over a range of 0 to 1000 parts per billion (ppb) (preferably evenly spaced), starting and ending with an O₃ concentration of zero. The precision of the replicates at each concentration should be such that the standard deviation is less than or equal to 1.0 ppb or 0.2 percent of the indicated photometer concentration (whichever is greater). The order of the comparison concentrations may be ascending, descending, or random (see the step-by-step procedure in Section 3.0).