

Ozone Monitoring

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2.7.2. Procedures for Ozone Monitoring Site Calibration and Operation

A. Overview

The Division of Air Quality of the Department of Environment and Natural Resources determines the ground level concentration of ambient air ozone throughout North Carolina as required by the 1970 Clean Air Act and the subsequent Amendments (1977 & 1990) thereto. In response to increasing levels of air pollution the Clean Air Act was written with the primary purpose to “protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population”. In short, the Clean Air Act established ambient air quality as a national resource that must be protected. The EPA is designated the responsibility to administer and assist in the nationwide program to protect and improve air quality and each state is assigned the direct responsibility for assuring air quality within its borders. Ozone is one of the “Health and Welfare” based Criteria Pollutants required to be monitored by each state as a means of tracking progress in improving and maintaining ambient air quality.

Monitoring and reporting of ozone concentration across North Carolina is required by the EPA to occur from April 1st through October 31st each year. This is a major undertaking and requires a coordinated effort by both Regional and Headquarters staffs of the Division of Air Quality to satisfactorily meet this requirement. This section presents the operating procedures to be followed for the ozone monitoring systems installed statewide. These operating procedures are designed to produce the highest quality ozone data possible. It is critical that these procedures be followed. If questions arise technical assistance is available from both the Electronics and Calibration Branch (919-733-5235) and the Projects and Procedures Branch (919-733-1487) of the Ambient Monitoring Section in Raleigh.

B. Monitoring Instrumentation, Equipment, and Accessories

Ozone monitoring sites are equipped with ozone calibrators, ozone monitors, data loggers, zero air supplies, compressors, Windows compatible computers, modems, printers, and air conditioners and heaters. Essential procedures for the operation and checks to verify performance of the ozone monitoring system are contained in this section.

1. Thermo Environmental Model 49C-PS Primary Standard
2. Thermo Environmental Model 49C Ozone Analyzer.
3. Teflon Sampling Line
4. Zero Air Supply and Air Compressor System
5. Computer/ESC 8816 Data Loggers/Modem System
6. Temperature Controlled Monitoring Shelter

Note: minor components are not specified but included by reference

C. Continuous Monitoring Principles for Ozone Systems

Following the installation of the monitoring system by the staff of the Electronics Calibration Branch (usually in March), the Regional Monitoring staff has responsibility for the operation of the monitoring system at each site throughout the ozone season. The Regional Staff Operational Responsibilities include the following:

1. **Calibration.** The initial Calibration performed prior to April 1st establishes the starting point for ozone data collected each year at each site. If the site monitor fails a Calibration Check any time during site operation the system is considered “out of control” and a new Calibration is required to bring the system back within control limits. In addition, if the monitor is replaced, if the calibrator is replaced, or if major maintenance is performed a Calibration must be performed to re-establish the data link between each site.
2. **Calibration Check.** This determines the ongoing accuracy and stability of site-specific ozone monitoring system. Required every 14 days or less. This check includes the analysis of the Precision Point which is reported to the EPA on an on-going basis
3. **Changing and Conditioning of new Particulate Filters.** This protects the monitor and insures that a clean sample is being analyzed. Every 2 weeks is recommended and monthly is required.
4. **Leak Testing.** This is to insure the sample is not diluted with “room air” from the monitoring site.
5. **Changing the Silica Gel and Draining the Compressor.** This is to insure the zero air used during all calibrations is moisture free. This is required every two weeks.
6. **Inspecting the Sample Probe and Lines.** This is to insure the sample line is unobstructed and the ozone measured is not artificially reduced.
7. **Collection of Data from the Backup data logger.** This 1 minute average data is essential in investigating data anomalies, instrument performance, and overall data quality.
8. **Site Temperature Control.** The monitoring sites must be maintained between 20° and 30° C for the ozone data collected to meet federal acceptability standards.
9. **Site Inspection.** Activities around the site and the condition of the monitoring shelter can affect ambient ozone concentrations and must be documented.
10. **Submitting Precision Point Reports.** These reports serve as ongoing monitor performance evaluation required documentation.

11. **Review of Nightly Autocal and Daily Data.** The regional office staff is required to remotely collect and review the nightly auto-calibration data and monitoring data.
12. **Submitting Ozone Exceedance Reports.** These required reports document monitor performance for each ozone exceedance. An ozone exceedance is defined as a maximum average 8 hour ozone concentration ≥ 0.085 ppm ozone. The date of the exceedance is designated from the initial hour of the maximum 8-hr average. An ozone exceedance can also occur from 6 or 7 hour averages. This can occur when the monitor is not collecting valid ambient air ozone concentration data for 1 or 2 hours because of site maintenance, calibrations, checks, or power failures.
13. **Closing Calibration Check.** This yearly final Calibration Check is performed after November 1st each year. This instrument performance test must be performed within 14 days of the previous Calibration Check.

Notes:

1. No monitor checks that affect data are to be performed during periods of elevated ozone concentrations (11am to 6 pm EDST).
2. The biweekly Calibration Check must be performed prior to any adjustments or changes to the system.

2.7.2.1 Ozone Monitoring System Calibration

The initial calibration of the ozone monitoring system establishes the starting point for all data collected at each site. This is the critical link in the chain that connects all ozone concentration data collected from each site to all other sites statewide each year.

Throughout the ozone monitoring season performance checks are conducted on the ozone monitoring system. If the system fails these performance checks or maintenance and repair or replacement of instrumentation is required then additional adjusted calibrations must be performed to maintain the system within the required performance standards. If critical components (calibrator, monitor, Zero Air Supply) are changed at the monitoring site or major system maintenance (cell cleaning, solenoid replacement, lamp replacement, pump replacement, scrubber replacement) is performed then a Calibration is required to establish a new starting point for the system.

The Ozone Monitoring Logbook is an essential record that documents the performance of the ozone monitoring system and all site operator activities. It is a critical document in evaluating the quality of the data collected and adherence to approved procedures at each site. It is the site operator's responsibility to ensure that the logbook is accurately completed.

The monitoring system at each site is installed by ECB usually during March each year. It is the responsibility of the Regional Office Staff to perform the site Calibration prior to the April 1st start of the ozone-monitoring season.

A. Ozone Monitoring Site System Checks

a. Site Inspection

When driving up to the site, observe the outside of the sampling building, sampling probe, looking for vandalism, security breaches, and the presence of unauthorized personnel. If there is any evidence of vandalism contact the local law enforcement department and DAQ headquarters. Also note the activities adjacent to the sampling site such as construction, paving of highways, timbering, farming etc and document these observations in the logbook. This site inspection should be performed and documented during each site visit throughout the year.

b. Inspect the Inverted Funnel, Wire Screen, Sample Probe Line, and Calibration Line

Visually inspect and document the condition of the sample delivery and calibration tubing systems. This inspection should also be performed during each site visit

1. The probe should be turned down, an undamaged inverted funnel on the end, the wire screen must be in place to protect the sampling probe from insects and foreign material, and the Teflon line must be visible inside the funnel screen.

2. Ensure the sample tubing inside the monitoring building, especially at any bends, has not been kinked, crimped, cut, or a low spot or loop created which could collect moisture, particulates, or impede sample flow.
3. Each sampling and calibration line has multiple swage connections. Each of these connections is a potential source of leaks in the system. Each swage fitting should be “finger tight” to ensure adequate sealing. Each fitting must be checked for tightness. DO NOT over tighten the fittings because permanent damage to the fitting can occur potentially creating a leak.

c. Check the Zero Air Pack and Air Compressor

The TEI49C-PS ozone calibration system uses purified dry air to reproducibly generate a known concentration of ozone. The air stream from the compressor is purified and dried by the Zero Air Pack. The silica gel in the cartridges located on the back of the Zero Air Packs removes the moisture from the compressed air before the hydrocarbons are removed from the dried air by the internal activated charcoal filter. Silica gel, though, has a limited capacity to effectively remove moisture from the air stream. Because of this limited capacity the silica gel must be replaced every 14 days or less to insure effective moisture removal.

The pressure gauge on the Zero Air Pack should register 20 ± 2 psi. If outside of this range contact ECB. Record the reading.

Verify and record the outlet pressure on the compressor is reading between 30 to 40 psi. If outside of this range contact the ECB. Also drain any water from the compressor and the coalescer bowl. This inspection should be performed during each site visit.

d. Cooling Fan Filter Check

On the back of the instrument there is a cooling fan, which has a sponge filter inside it. Check to ensure the fan is running. Check to see if the filter is clean. Clean if necessary to ensure sufficient cooling airflow.

e. TEI 49C and TEI 49C-PS Alarm Checks

Check the TEI 49C and 49C-PS run screens. Is the word “ALARM” displayed? The number in the upper right hand corner indicates the number of alarms that have been activated. If an alarm is activated, record yes and the number in the Logbook.

NOTE: The pump on the 49C-PS has been configured to only run during the calibration mode and the alarm indicator will be displayed. These alarms are the Flow Alarms for cells A and B. All displayed alarms need to be investigated and documented.

Check the Alarm and Operational Status of the 49C Ozone Monitor and 49C-PS Ozone Calibrator

1. Press “Enter” to place in the “Local mode”.
2. Press the Menu button on the front of the instrument
3. Select the Alarm Submenu
4. Scroll through the parameters with operational limits listed below to determine which item is in the Alarm Mode.

<u>Parameter</u>	<u>Min</u>	<u>Max</u>
Bench Temp	5 C	50 C
Bench Lamp	50 C	60 C
Ozone Lamp	65 C	75 C
Pressure	650 mm Hg	850 mm Hg
Flow Cell A& B	0.4 Lpm	1.6 Lpm
Intensity Cell A & B	45 Khz	150 Khz

5. Check the appropriate block in the Ozone Monitoring Logbook Alarm Section
7. If an Alarm is noted Contact the ECB prior to performing calibrations or maintenance.
8. Press the Menu Button twice to return to the main menu
9. Press Run to return to the Run Screen.

f. Log In to Computer and the ESC 8816 Data Loggers

1. Turn on Computer Screen
2. **Check and set the Computer Time**
 - a. “Click” on the “Time Display” in the lower right hand corner of the Windows Desktop Display screen.
 - b. “Double Click” on the “Time Display” of the Windows Desktop.
 - c. On the “Date/Time Properties” display screen adjust the month, day, hour, and or minutes. The time must be “EASTERN STANDARD TIME”.
 - d. Click “OK” when finished.
3. Select and Double Click on {Shortcut to Spit-screen} Icon
4. **Check and Set Data Logger Date-Time and Down the Data Logger Channels**

Primary Data Logger (PDL).

1. **Click** on the Upper Display Screen to access the **PDL**
2. Press {ESC} key and then Press {ESC} key again
3. Type the 2 letter PDL Code (Listed on the front of the PDL) and the letters AQM
___ ___ **AQM**

Note: It might be necessary now to move the slide button at the right side of the PDL Display window up to see the action Menus

- 4 Select “**L**” for Login
- 5 Enter Password “**██████**” Press <ENTER>
- 6 Select “**C**” Configure Menu
- 7 Select “**S**” Configure Systems Parameter
- 8 Highlight “**Date-Time**” Press <ENTER>
- 9 Check Date-Time (Must be EST and same as computer time)
- 10 Enter “**Correct Date and Time**” Press <ENTER>
- 11 Press {ESC} key
- 12 Select “**D**” Configure Data Channel
- 13 Select “**M**” Disable Mark Channel Offline
- 14 Select “**O3**” Press <ENTER>

Backup Data Logger (BUDL)

1. Click on the lower display screen to access the BUDL
2. Press {ESC} key and then Press {ESC} key again
3. Type the 2 letter BUDL Code (Listed on the front of the BUDL) and the letters **AQM**, **AQM**

Note: It might be necessary now to move the slide button at the right side of the BUDL Display window up to see the action Menus

4. Select “**L**” for Login
3. Enter Password “**██████**” Press <ENTER>
4. Select “**C**” Configuration Menu
5. Select “**S**” Configure System Parameters
6. Highlight “**Date-Time**” Press <ENTER>
7. Check Date and Time (Must be EST and same as computer time)
8. Enter “**Correct Date and Time**” Press <Enter>
9. Press {ESC}Key
10. Select “**D**” Configure Data Channel
11. Select “**M**” Disable Mark Channel Offline
12. Select “**O3**” Press <ENTER>

g. New Sample Line Particulate Filter Installation and Conditioning

A new Teflon particulate filter **must be installed and conditioned prior to proceeding.**

Filter Change Procedure

1. Disassemble the filter holder with the filter disassembly wrenches provided.
2. Remove the existing filter and inspect the filter support screen.
3. If the filter support screen is dirty rinse with deionized water and then dry.
4. Reinstall the filter support screen.

5. Touching only the outer edge of the new filter place the filter in the holder.
6. Reassemble the filter holder. **DO NOT OVER TIGHTEN THE FILTER HOLDER FOR THIS CAN TEAR THE FILTER AND/OR DAMAGE THE FILTER HOLDER.**

Perform a Leak Test on the 49C (Record in the logbook).

1. Press the Menu Button on the front of the TEI 49C Ozone Monitor
2. Select Pressure Screen of the “Diagnostics Menu”
3. Disconnect the Ambient input line from the back of the particulate filter holder and plug the opening.
4. The pressure should decrease below 250 mm Hg within 40 seconds.
5. If pressure does not drop there is a leak. Remove Ambient Inlet plug fitting and check all fittings and check the input lines for cracks and correct as necessary
6. Repeat leak test. If fails. Contact ECB for assistance in correcting leaks.
7. If leak corrected and test is passed reattach the ambient input line to the filter holder.
8. Press Run and continue with filter conditioning.

Particulate Filter Ozone Conditioning Procedure (Record in the logbook).

1. **Click on PDL Display Screen**
2. Press the {ESC} key, Press the {ESC} key again.
3. Select “C” Configure Menu
4. Select “C” Configure Calibration Menu
5. Select “1” Start Single Phase Cal
6. Select “Level 4” Press <ENTER>
7. Scroll Down and Highlight “Duration”.
8. Enter “28 Minutes”.
9. Scroll Down to “Start Single Cal (NOW)” Press <ENTER>

The Level 4 Span Event (0.225 ppm Ozone) will start and run for 28 minutes to condition the particulate filter.

View and Record Data from Primary and Backup 8816 Data Loggers

To View Filter Conditioning Data from PDL

1. Press the {ESC} key, Press the {ESC} key again.
2. Select “D” Real-time Display Menu
3. Select “C” Continuous Report
4. Scroll Down to “Start Continuous Avg Report”, Press <ENTER>

To View Filter Conditioning Data from BUDL

1. Click in BUDL Display window
2. Press the {ESC} key, Press the {ESC} key again.

3. Select **"D"** Real time Display Menu
4. Select **"C"** Continuous Report
5. Scroll Down to **"Start Continuous Avg Report"**, Press **<ENTER>**

Note: The "1 minute" average concentration of ozone will be displayed on both the upper PDL display screen and the lower BUDL display screen. The values initially will be less than 0.225 ppm ozone because the particulate filter is reacting with the ozone being generated by the ozone calibrator. Over time the displayed ozone values will increase closer to 0.225 ppm ozone and stabilize.

After the Ozone Readings stabilize Record 5 x 1-minute average ozone concentrations from the PDL, BUDL, and TEI 49C-PS in the logbook in the Filter Conditioning Table.

(If the readings do not stabilize repeat Level 4 conditioning. If second filter conditioning does not stabilize contact ECB)

Particulate Filter Ozone Conditioning Zero Purge Procedure (Record in logbook).

1. Click on PDL Display Screen
2. Press the **{ESC}** key, Press the **{ESC}** key again
3. Select **"C"** Configure Menu
4. Select **"C"** Configure Calibration Menu
5. Select **"1"** Start Single Phase Cal
6. Select **"Zero"** Press **<ENTER>**
7. Scroll Down to **"Start Single Cal (NOW)"** Press **<ENTER>**

The Zero Span Event (0.000 ppm Ozone) will start and run for 14 minutes to condition the particulate filter.

View and Record Zero Purge Data from Primary and Backup Data Loggers and the Calibrator

To View Filter Conditioning Data from PDL

1. Press the **{ESC}** key, Press the **{ESC}** key again
2. Select **"D"** Realtime Display Menu
3. Select **"C"** Continuous Report
4. Scroll Down to **"Start Continuous Avg Report"**, Press **<ENTER>**

To View Filter Conditioning Data from BUDL

1. **Click** in BUDL Display window
2. Press the **{ESC}** key, Press the **{ESC}** key again
3. Select **"D"** Realtime Display Menu
4. Select **"C"** Continuous Report
5. Scroll Down to **"Start Continuous Avg Report"**, Press **<ENTER>**

After the Ozone Readings stabilize, Record 5 x 1-minute average ozone concentrations from the PDL, BUDL, and TEI 49C-PS in the logbook in the Filter Conditioning Table.

Compare the Average 49C-PS “True Ozone” to the corresponding PDL and BUDL values as follows:

<u>49C-PS</u>	<u>PDL</u>	<u>BUDL</u>
0.000 ppm	0.000 ppm \pm 0.003	0.000ppm \pm 0.003
0.225 ppm	0.225 ppm \pm 0.010	0.225ppm \pm 0.010

If these criteria are **not satisfied** repeat the filter conditioning.

If these criteria are met proceed with the Ozone Monitor Calibration Procedure.

B. OZONE MONITOR CALIBRATION PROCEDURE

NOTE: The computer display should still be in the split screen mode and both the PDL and BUDL channels are "down".

Verify the TEI 49C Monitor is in the Local mode. Is “REMOTE” displayed on the run ` screen. If “Remote” is displayed, press “Enter” to place in the “Local” mode.

a. Manual Adjusted Zero Procedure

1. **Click** on PDL Display Screen
2. Press the {ESC} key, Press the {ESC} key again
3. Select “**C**” Configure Menu
4. Select “**C**” Configure Calibration Menu
5. Select “**1**” Start Single Phase Cal
6. Select “**Zero**” Press <ENTER>
7. Scroll Down to “**Start Single Cal (NOW)**” Press <ENTER>

The Zero Span Event (0.000 ppm Ozone) will start and run for 14 minutes.

b. To View the Zero Data from PDL

1. Press the {ESC} key, Press the {ESC} key again
2. Select “**D**” Realtime Display Menu
3. Select “**C**” Continuous Report
4. Scroll Down to “**Start Continuous Avg Report**”, Press <ENTER>

After the 49C monitor response has stabilized (5 - 6 minutes) on the 49C monitor

5. Press the Menu Button.
6. Select Calibration from the main menu and push <Enter>.
7. Select Calibrate Zero and press <Enter>.
8. Press <Enter> to set the 49C zero point.
9. Press Menu to return to Calibration Menu
10. Press the Run button to return to the Run Screen

Verify the Stability and Accuracy of the zero adjustment. From the split screen record the five one-minute values from the O₃ and O₃CAL channels on the PDL and BUDL in the Ozone Logbook in the Adjusted Calibration Section. Calculate and record the average of the five one-minute values for each data logger in the logbook.

<u>49C-PS</u>	<u>PDL</u>	<u>BUDL</u>	<u>PDL to BUDL</u>
0.000 ppm	0.000 ppm \pm 0.003	0.000 ppm \pm 0.003	\pm 0.003

c. **Record** in the Adjusted Calibration Section of the logbook, the 49C Ozone Monitor determined **Ozone Background Correction Calibration Factor** as follows.

1. Press the Menu Button.
2. Select “Calibration Factors” from the main menu and push <Enter>.
3. Record the Ozone Background Calibration Factor in the Logbook.
4. Press Menu to return to Calibration Menu
5. Press the Run button to return to the Run Screen

If the Ozone Background Correction Factor is **equal to or less than \pm 0.003 ppm** proceed with Manual Level 4 Adjusted Calibration Procedure below.

If greater than \pm 0.003 ppm rerun Manual Adjusted Zero Procedure above.

If the zero calibration fails this criteria a second time contact the ECB.

If the PDL to BUDL is $>\pm$ 0.003 ppm contact the ECB

d. **Manual Level 4 Adjusted Calibration Procedure**

1. Click on PDL Display Screen
2. Press the {ESC} key Press the {ESC} key a second time
3. Select “C” Configure Menu
4. Select “C” Configure Calibration Menu
5. Select “1” Start Single Phase Cal
6. Select “Level 4” Press <ENTER>
7. Scroll Down to “Start Single Cal (NOW)” Press <ENTER>

The Level 4 Span Event (0.225 ppm Ozone) will start and run for 14 minutes.

To View the “Level 4” Data from PDL

1. Press the {ESC} key, Press the {ESC} key again
2. Select “D” Realtime Display Menu
3. Select “C” Continuous Report
4. Scroll Down to “Start Continuous Avg Report”, Press <ENTER>

After the 49C monitor response has stabilized (5 to 6 minutes), on the 49C monitor.

1. Press the Menu button on the 49C
2. Select the Calibration from the Main Menu and press <Enter>

3. Select Calibrate O₃ and press <Enter>
4. Use the Left and Right arrows to select the digit
5. Use the Up and Down arrows to increment each digit to the “True O₃ “ value as displayed by the 49C-PS
6. Press <Enter> to set the O₃ Span Point
7. Press Menu to return to the Calibration Menu
8. Press Run to return to the Run Screen

Verify the stability and accuracy of the span adjustment. From the split screen record the five one-minute values from the O₃ and CAL channels on the PDL and BUDL O₃ values. Calculate and record the average of the five one-minute values for each data logger in the logbook.

<u>49C-PS</u>	<u>PDL</u>	<u>BUDL</u>	<u>PDL to BUDL</u>
0.225 ppm	0.225 ppm $\leq \pm 0.003$	0.225 ppm $\leq \pm 0.003$	$\leq \pm 0.003$

If greater than ± 0.003 ppm rerun Manual High Span Adjusted Calibration Procedure above.

If the zero calibration fails this criteria a second time contact the ECB.

If the PDL to BUDL is $>\pm 0.003$ ppm contact the ECB

If the high span data is acceptable per the criteria above proceed below.

- e. **Record and Review** the 49C Monitor determined **Ozone Span Coefficient Calibration** Factor in the logbook in the Adjusted Calibration span section as follows.

1. Press the Menu button on the 49C
2. Select the Calibration Factors from the Main Menu and press <Enter>
3. Record the O₃ Coefficient Calibration Factor in the Logbook.
(If the Ozone Coefficient is greater than 1.05 a leak is suspected)
4. Menu to return to the Calibration Menu
5. Press Run to return to the Run Screen

If the Ozone Coefficient is Greater than 1.05 a leak is suspected. The following action list is required to be performed.

1. All fittings should be checked. This includes all fittings and connectors on the ozone monitor and the ozone calibrator.
2. A leak test should be performed.
3. The Manual Adjusted Zero Procedure should be performed.
4. Then the Manual High Span Adjusted Calibration should be performed.
5. If the Ozone Coefficient is greater than 1.05 contact ECB.

If the **Ozone span Coefficient** is less than or equal to **1.05**, proceed below

f. MANUAL INTERMEDIATE SPAN CALIBRATION PROCEDURE

This procedure must be performed three times for **Level 3** (0.160 ppm ozone), **Level 2** (0.090 ppm ozone), and **Level 1** (0.050 ppm ozone)

1. **Click** on PDL Display Screen
2. Press the **{ESC}** key, Press the **{ESC}** key a second time
3. Select **“C”** Configure Menu
4. Select **“C”** Configure Calibration Menu
5. Select **“1”** Start Single Phase Cal
6. Select **“Level 3”** Press **<ENTER>**
7. Scroll Down to **“Start Single Cal (NOW)”** Press **<ENTER>**

The Level 3 Span Event (0.0.160 ppm Ozone) will start and run for 14 minutes.

To View the “Level 3” Data from PDL

1. Press the **{ESC}** key, Press the **{ESC}** key again
2. Select **“D”** Realtime Display Menu
3. Select **“C”** Continuous Report
4. Scroll Down to **“Start Continuous Avg Report”**, Press **<ENTER>**

From the split screen record the five one-minute values from the O3 and CAL channels on the PDL and BUDL O3 values. Calculate and record the average of the five one-minute values for each data logger in the logbook.

<u>49C-PS</u>	<u>PDL</u>	<u>BUDL</u>	<u>PDL to BUDL</u>
0.160 ppm	$0.160 \text{ ppm} \leq \pm 0.003$	$0.160 \text{ ppm} \leq \pm 0.003$	$\leq \pm 0.003$

If calibration criteria are not met, the calibration is not acceptable. A complete Manual Adjusted Calibration must be rerun including all checks to identify and correct any problems. If a 2nd calibration fails, contact the ECB.

If acceptable proceed below.

- g.** Perform the **MANUAL INTERMEDIATE SPAN CALIBRATION PROCEDURE** again for **Level 2** (0.090 ppm) and then for **Level 1** (0.050 ppm) following the same procedures

For both the Level 2 and the Level 1 record five 1-minute values from the split screen display in the Ozone Logbook from the O3 and CAL channels on the PDL and BUDL O3 values after the readings stabilize.

Calculate and record the average of the five one-minute values for each data logger in the logbook.

<u>49C-PS</u>	<u>PDL</u>	<u>BUDL</u>	<u>PDL to BUDL</u>
0.090 ppm	0.090 ppm $\leq \pm 0.003$	0.090 ppm $\leq \pm 0.003$	$\leq \pm 0.003$
0.050 ppm	0.050 ppm $\leq \pm 0.003$	0.050 ppm $\leq \pm 0.003$	$\leq \pm 0.003$

If calibration criteria are not met, the calibration is not acceptable. A complete Manual Adjusted Calibration must be rerun including all checks to identify and correct any problems.

If a 2nd calibration fails, contact the ECB.

If the Manual Adjusted Calibration meets all the criteria specified above the calibration is acceptable. Within 14 days from today's date and within every 14 days thereafter throughout the ozone season the Calibration Check and Precision Analysis must be performed.

h. The Data Logger Channels must be "Upped" (brought back on line) to collect ambient air ozone concentration data. "Up" the Data Logger Channels

Primary Data Logger (PDL).

1. Click the Upper Display window to activate the PDL
2. Press {ESC} key and then Press {ESC} key again
Note: It might be necessary now to move the slide button at the right side of the PDL Display window up to see the action Menus
3. Select "C" Configure Menu
4. Select "D" Configure Data Channel
5. Select "E" Enable Mark Channel Online
6. Select "O3" Press <ENTER>
7. Close the Primary Data Logger by clicking the [X] in the upper right hand corner of the display window.
8. Answer "Yes" to the Action Prompt question

Backup Data Logger (BUDL).

1. Click the lower display window to switch to the BUDL
2. Press {ESC} key and then Press {ESC} key again

Note: It might be necessary now to move the slide button at the right side of the PDL Display window up to see the action Menus

3. Select "C" Configure Menu
4. Select "D" Configure Data Channel
5. Select "E" Enable Mark Channel Online
6. Select "O3" Press <ENTER>
7. Close the Primary Data Logger by clicking the [X] in the upper right hand corner of the display window.
8. Answer "Yes" to the Action Prompt question

2.7.2.2 CALIBRATION CHECK and PRECISION POINT ANALYSIS

The Calibration Check and Precision Point Analysis performed by the **Regional Site Operators** is the most powerful tool the Division of Air Quality possesses in maintaining a high quality ozone monitoring network for the citizens of NC. This valuable operational check is required to maintain data quality and validity.

A Calibration Check and Precision Point Analysis is required **EVERY 14 DAYS OR LESS** from the Initial Calibration performed prior to April 1st, throughout the entire ozone monitoring season, and as an ending calibration check after October 31st. The performance of this required check is essential to the overall success of the ozone monitoring program.

A. Site Inspection

When driving up to the site, observe the outside of the sampling building, sampling probe, looking for vandalism, security breaches, and the presence of unauthorized personnel. If there is any evidence of vandalism contact the local law enforcement department and DAQ headquarters. Also note the activities adjacent to the sampling site such as construction, paving of highways, timbering, farming etc and document these observations in the logbook. This site inspection should be performed and documented during each site visit throughout the year.

a. Inspect the Inverted Funnel, Wire Screen, Sample Probe Line, and Calibration Line

Visually inspect and document the condition of the sample delivery and calibration tubing systems. This inspection should also be performed during each site visit

1. The probe should be turned down, an undamaged inverted funnel on the end, the wire screen must be in place to protect the sampling probe from insects and foreign material, and the Teflon line must be visible inside the funnel screen.
2. Ensure the sample tubing inside the monitoring building, especially at any bends, has not been kinked, crimped, cut, or a low spot or loop created which could collect moisture, particulates, or impede sample flow. If line is crimped remove crimp. If moisture or particulates are noted replace line.
3. Each sampling and calibration line has multiple swage connections. Each of these connections is a potential source of leaks in the system. Each swage fitting should be "finger tight" to ensure adequate sealing. Each fitting must be checked for tightness. **DO NOT** over tighten the fittings because permanent damage to the fitting can occur potentially creating a leak.

b. Check the Zero Air Pack and Air Compressor

The TEI49C-PS ozone calibration system uses purified dry air to reproducibly generate a known concentration of ozone. The air stream from the compressor is purified and dried by the Zero Air

Pack. The silica gel in the cartridges located on the back of the Zero Air Packs removes the moisture from the compressed air before the hydrocarbons are removed from the dried air by the internal activated charcoal filter. Silica gel, though, has a limited capacity to effectively remove moisture from the air stream. **Because of this limited capacity, the silica gel must be replaced every 14 days or less to insure effective moisture removal.**

The pressure gauge on the Zero Air Pack should register 20 psi \pm 2 psi. If outside of this range contact ECB. Record the reading. This inspection should be performed during each site visit.

Verify and record the outlet pressure on the compressor is reading between 30 to 40 psi. If outside of this range contact the ECB. Also drain any water from the compressor and the coalescer bowl. This inspection should be performed during each site visit.

c. Cooling Fan Filter Check

On the back of the instrument there is a cooling fan, which has a sponge filter inside it. Check to ensure the fan is running. Check to see if the filter is clean. Clean if necessary to ensure sufficient cooling air flow.

B. TEI 49C and TEI 49C-PS Alarm and Operational Checks

Check the TEI 49C and 49C-PS run screens. Is the word "ALARM" displayed? The number in the upper right hand corner indicates the number of alarms that have been activated. If an alarm is activated, record yes and the number in the Logbook.

NOTE: The pump on the 49C-PS has been configured to only run during the calibration mode and the alarm indicator will be displayed. These alarms are the Flow Alarms for cells A and B. All displayed alarms need to be investigated and documented.

a. Check the Alarm and Operational Status of the 49C Ozone Monitor and 49C-PS Ozone Calibrator.

1. Press "Enter" to place in the "Local mode".
2. Press the Menu button on the front of the instrument
3. Select the Alarm Submenu
4. Scroll through the parameters listed below to determine which item is in the Alarm Mode.

<u>Parameter</u>	<u>Min</u>	<u>Max</u>
Bench Temp	5 C	50 C
Bench Lamp	50 C	60 C
Ozone Lamp	65 C	75 C
Pressure	650 mm Hg	850 mm Hg
Flow Cell A& B	0.4 Lpm	1.6 Lpm
Intensity Cell A & B	45 Khz	150 Khz

Check the appropriate block in the Ozone Monitoring Logbook Alarm Section

5. If an Alarm is noted Contact the ECB prior to performing calibrations or maintenance.
6. Press the Menu Button twice to return to the main menu
7. Press Run to return to the Run Screen.

b. Record, The Ozone Background and Span Coefficient Calibration Factor for the TEI 49C Ozone Monitor

1. Press the Menu button on the 49C Ozone Monitor
2. Select the Calibration Factors from the Main Menu and press <Enter>
3. Record the O₃ Background and O₃ Coefficient Factors in the Logbook.
4. Press Menu to return to the Calibration Menu
5. Press Run to return to the Run Screen

c. Log In to Computer and Data Loggers

1. Turn on Computer Screen
2. **Check and set the Computer Time**
 - a. “Click” on the “**Time Display**” in the lower right hand corner of the Windows Desktop Display screen.
 - b. “**Double Click**” on the “**Time Display**” of the Windows Desktop
 - c. On the “Date/Time Properties” display screen adjust the month, day, hour, and or minutes if needed. The time must be “**EASTERN STANDARD TIME**”. Click “**OK**” when finished.
3. Select and Double Click on {**Shortcut to Spit-screen**} Icon
4. **Check and Set Data Logger Date-Time and Down the Data Logger Channels**

Primary Data Logger (PDL).

- a. **Click** on the upper display window, PDL
 - b. Press {**ESC**} key and then Press {**ESC**} key again
 - c. the PDL) and the letters AQM ___ AQM
- Note: It might be necessary now to move the slide button at the right side of the PDL Display window up to see the action Menus
- d. Select “**L**” for Login
 - e. Enter Password “**██████**” Press <**ENTER**>
 - f. Select “**C**” Configure Menu
 - g. Select “**S**” Configure Systems Parameter
 - h. Highlight “**Date-Time**” Press <**ENTER**>
 - i. Check Date-Time (Must be EST and same as computer time)
 - j. If necessary Enter the “**Correct Date and Time**” Press < **ENTER** >
 - k. Press {**ESC**} key
 - l. Select “**D**” Configure Data Channel
 - m. Select “**M**” Disable Mark Channel Offline
 - n. Select “**O3**” Press <**ENTER**>

Backup Data Logger (BUDL)

- a. **Click** on the Lower Display Window (BUDL)
- b. Press {**ESC**} key and then Press {**ESC**} key again
- c. Type the 2 letter BUDL Code (Listed on the front of the BUDL) and the letters AQM, ___ ___ **AQM**

Note: It might be necessary now to move the slide button at the right side of the BUDL Display window up to see the action Menus

- d. Select "**L**" for Login
- e. Enter Password "" Press <**ENTER**>
- f. Select "**C**" Configuration Menu
- g. Select "**S**" Configure System Parameters
- h. Highlight "**Date-Time**" Press <**ENTER**>
- i. Check Date and Time (Must be EST and same as computer time)
- j. If necessary enter the "**Correct Date and Time**" Press < **ENTER** >
- k. Press {**ESC**}Key
- l. Select "**D**" Configure Data Channel
- m. Select "**M**" Disable Mark Channel Offline
- n. Select "**O3**" Press <**ENTER**>

C. Calibration Check and Precision Point Analysis Procedure

The Calibration Check and Precision Point Analysis is required every 14 days or less. This is the chief evaluation tool to measure the performance of the ozone monitoring system. This evaluation determines if the system is within acceptable operational limits. The analysis and the subsequent reporting of the precision point (0.090 ppm O₃) is an EPA requirement for all ozone monitoring sites nationwide.

a. Begin the ZERO EVENT

NOTE: The computer display should still be in the split screen mode and both the PDL and BUDL channels are "down".

Place the TEI 49C Monitor is in the Local mode. If "REMOTE" is displayed on the run screen. Press <Enter> to place in the "Local" mode.

Manual Zero Event (0.000 ppm Ozone) Procedure

1. Click on PDL Display Screen
2. Press the {**ESC**} key, Press the {**ESC**} key again
3. Select "**C**" Configure Menu
4. Select "**C**" Configure Calibration Menu
5. Select "**1**" Start Single Phase Cal
6. Select "**Zero**" Press <**ENTER**>
7. Scroll Down to "**Start Single Cal (NOW)**" Press <**ENTER**>

The Zero Span Event (0.000 ppm Ozone) will start and run for 14 minutes.

To View the Zero Data from PDL

1. Press the {ESC} key, Press the {ESC} key again.
2. Select “D” Realtime Display Menu
3. Select “C” Continuous Report
4. Scroll Down to “Start Continuous Avg Report”, Press <ENTER>

To View Zero Data from BUDL

1. Click in BUDL Display window
2. Press the {ESC} key, Press the {ESC} key again.
3. Select “D” Realtime Display Menu
4. Select “C” Continuous Report
5. Scroll Down to “Start Continuous Avg Report”, Press <ENTER>

After the Ozone Readings stabilize (Approximately 6 minutes)

Record 5 x 1-minute average ozone **ZERO Event** concentrations from the PDL, BUDL, and TEI 49C-PS in the logbook in the MANUAL CALIBRATION CHECK Table.

b. Begin an LEVEL 4 EVENT

Manual Level 4 (0.225 ppm Ozone) Procedure

1. Click on PDL Display Screen
2. Press the {ESC} key, Press the {ESC} key again
3. Select “C” Configure Menu
4. Select “C” Configure Calibration Menu
5. Select “1” Start Single Phase Cal
6. Select “Level 4” Press <ENTER>
7. Scroll Down to “Start Single Cal (NOW)” Press <ENTER>

The Level 4 Event (0.225 ppm Ozone) will start and run for 14 minutes.

To View the Level 4 Data from PDL

1. Press the {ESC} key, Press the {ESC} key again.
2. Select “D” Realtime Display Menu
3. Select “C” Continuous Report
4. Scroll Down to “Start Continuous Avg Report”, Press <ENTER>

After the Level 4 Ozone Readings stabilize (Approximately 6 minutes)

Record 5 x 1-minute average ozone **Level 4 Event** concentrations from the PDL, BUDL, and TEI 49C-PS in the logbook in the MANUAL CALIBRATION CHECK Table.

c. Begin an LEVEL 2 EVENT (PRECISION POINT)

Manual Level 2 (0.090 ppm Ozone) Precision Point Procedure

1. Click on PDL Display Screen
2. Press the {ESC} key, Press the {ESC} key again
3. Select “C” Configure Menu
4. Select “C” Configure Calibration Menu
5. Select “1” Start Single Phase Cal
6. Select “Level 2” Press <ENTER>
7. Scroll Down to “Start Single Cal (NOW)” Press <ENTER>

The Level 2 Event (0.090 ppm Ozone) will start and run for 14 minutes.

To View the Level 2 Data from PDL

1. Press the {ESC} key, Press the {ESC} key again
2. Select “D” Realtime Display Menu
3. Select “C” Continuous Report
4. Scroll Down to “Start Continuous Avg Report”, Press <ENTER>

After the Level 2 Ozone Readings stabilize (Approximately 6 minutes)

Record 5 x 1-minute average ozone **Level 2 Event** concentrations from the PDL, BUDL, and TEI 49C-PS in the logbook in the MANUAL CALIBRATION CHECK Table.

d. Calibration Check and Precision Point Analysis Data Evaluation

Average the five (5) 49C-PS Display, PDL, and BUDL values for each event. Compare the 49C-PS “True Ozone” to the corresponding PDL and BUDL values as follows:

<u>49C-PS</u>	<u>PDL</u>	<u>BUDL</u>	<u>PDL to BUDL</u>
0.000 ppm	0.000 ppm $\leq \pm 0.003$	0.000 ppm $\leq \pm 0.003$	$\leq \pm 0.003$
0.090 ppm	0.090 ppm $\leq \pm 0.003$	0.090 ppm $\leq \pm 0.003$	$\leq \pm 0.003$
0.225 ppm	0.225 ppm $\leq \pm 0.010$	0.225 ppm $\leq \pm 0.010$	$\leq \pm 0.003$

If the data points for either the **ZERO Event**, the **LEVEL 4 Event**, or the **LEVEL 2 Event** (Precision Point) is not within the specified limits above, then the ozone monitoring system has failed the Calibration Check and Precision Analysis and is out of control. The system is outside of the accepted performance control limits. The system must be recalibrated as if it is a brand new system

1. If the Calibration Check and Precision analysis is outside of the acceptable limits the **system must be recalibrated**. The following procedural steps must be followed.
 - a. **Section 2.7.2.1.g New Sample Line Particulate Filter Installation and Conditioning.** (pages 7 – 10)
 - b. **Section 2.7.2.1 B OZONE MONITOR CALIBRATION PROCEDURE** (pages 10 – 14)

2. If the Calibration Check and Precision Analysis **meets the acceptable control limits** the system is in compliance, proceed below.

- e. **New Sample Line Particulate Filter Installation and Conditioning.**

A monthly filter change and conditioning is required. It is recommended that the filter be changed and conditioned following each 14 days or less unadjusted calibration.

1. **Filter Change Procedure**

- a. Disassemble the filter holder with the filter disassembly wrenches provided.
- b. Remove the existing filter and inspect the filter support screen.
- c. If the filter support screen is dirty rinse with deionized water and then dry.
- d. Reinstall the filter support screen.
- e. Touching only the outer edge of the new filter place the filter in the holder.
- f. Reassemble the filter holder. **DO NOT OVER TIGHTEN THE FILTER HOLDER FOR THIS CAN TEAR THE FILTER AND/OR DAMAGE THE FILTER HOLDER.**

2. **Perform a Leak Test on the 49C (Record in the logbook).**

- a. Press the Menu Button on the front of the TEI 49C Ozone Monitor
- b. Select Pressure Screen of the "Diagnostics Menu"
- c. Disconnect the Ambient input line from the back of the filter holder and plug the Inlet fitting.
- d. The pressure should decrease below 250 mm Hg within 40 seconds. If pressure does not drop there is a leak. Remove Ambient Inlet plug fitting and Check all fittings and check the input lines for cracks and correct as necessary
- e. Repeat leak test. If fails. Contact ECB for assistance in correcting leaks.
- f. If leak corrected and test is passed reattach the ambient input line to the back of the filter holder.
- g. Press Run and continue with filter conditioning.

3. **Particulate Filter Ozone Conditioning Procedure**

- a. Click on PDL Display Screen
- a. Press {ESC} Press {ESC}
- b. Select "C" Configure Menu
- c. Select "C" Configure Calibration Menu
- d. Select "1" Start Single Phase Cal
- e. Select "Level 4" Press <ENTER>
- f. Scroll Down and Highlight "Duration".
- g. Enter "28 Minutes".
- h. Scroll Down to "Start Single Cal (NOW)" Press <ENTER>

The Level 4 Span Event (0.225 ppm Ozone) will start and run for 28 minutes to condition the particulate filter.

View Data from Primary and Backup Data Loggers and Record in Logbook

To View Filter Conditioning Data from PDL

- a. Press the {ESC} key, Press the {ESC} key again
- b. Select “D” Realtime Display Menu
- c. Select “C” Continuous Report
- d. Scroll Down to “Start Continuous Avg Report”, Press <ENTER>

To View Filter Conditioning Data from BUDL

- a. Click in BUDL Display window
- b. Press the {ESC} key, Press the {ESC} key again.
- c. Select “D” Realtime Display Menu
- d. Select “C” Continuous Report
- e. Scroll Down to “Start Continuous Avg Report”, Press <ENTER>

Note: The “1 minute” average concentration of ozone will be displayed on both the upper PDL display screen and the lower BUDL display screen. The values initially will be less than 0.225 ppm ozone because the particulate filter is reacting with the ozone being generated by the ozone calibrator. Over time the displayed ozone values will increase closer to 0.225 ppm ozone and stabilize.

After the Ozone Readings stabilize Record 5 x 1-minute average ozone concentrations from the PDL, BUDL, and TEI 49C-PS in the logbook in the Filter Conditioning Table.

(If the readings do not stabilize repeat Level 4 conditioning. If second filter conditioning does not stabilize contact ECB)

Particulate Filter Ozone Conditioning Zero Purge Procedure

- a. Click on PDL Display Screen
- a. Press {ESC} Press {ESC}
- b. Select “C” Configure Menu
- c. Select “C” Configure Calibration Menu
- d. Select “1” Start Single Phase Cal
- e. Select “Zero” Press <ENTER>
- f. Scroll Down to “Start Single Cal (NOW)” Press <ENTER>

The Zero Span Event (0.000 ppm Ozone) will start and run for 14 minutes to condition the particulate filter.

View Data from Primary and Backup Data Loggers and the Calibrator and Record in Logbook

To View Filter Conditioning Data from PDL

- a. Press the {ESC} key, Press the {ESC} key again.
- b. Select “D” Realtime Display Menu

- c. Select **“C”** Continuous Report
- d. Scroll Down to **“Start Continuous Avg Report”**, Press <ENTER>

To View Filter Conditioning Data from BUDL

- a. **Click** in BUDL Display window
- b. Press the {ESC} key, Press the {ESC} key again.
- c. Select **“D”** Realtime Display Menu
- d. Select **“C”** Continuous Report
- e. Scroll Down to **“Start Continuous Avg Report”**, Press <ENTER>

After the Ozone Readings stabilize, Record 5 x 1-minute average ozone concentrations from the PDL, BUDL, and TEI 49C-PS in the logbook in the Filter Conditioning Table.

Compare the Average 49C-PS “True Ozone” to the corresponding PDL and BUDL values as follows:

<u>49C-PS</u>	<u>PDL</u>	<u>BUDL</u>
0.000 ppm	0.000 ppm \pm 0.003	0.000ppm \pm 0.003
0.225 ppm	0.225 ppm \pm 0.010	0.225ppm \pm 0.010

If these criteria are not satisfied repeat the filter conditioning.
If criteria are met proceed below.

- f. The Data Logger Channels must be **“Upped”** (brought back on line) to collect ambient air ozone concentration data.

“Up” the Data Logger Channels

Primary Data Logger (PDL).

1. **Click** the Upper Display window to activate the PDL
2. Press {ESC} key and then Press {ESC} key again
Note: It might be necessary now to move the slide button at the right side of the PDL Display window up to see the action Menus
3. Select **“C”** Configure Menu
4. Select **“D”** Configure Data Channel
5. Select **“E”** Enable Mark Channel Online
6. Select **“O3”** Press <ENTER>
7. Close the Primary Data Logger by clicking the [X] in the upper right hand corner of the display window.
8. Answer **“Yes”** to the Action Prompt question

Backup Data Logger (BUDL).

1. **Click** the lower display window to switch to the BUDL
2. Press {ESC} key and then Press {ESC} key again

Note: It might be necessary now to move the slide button at the right side of the PDL Display window up to see the action Menus

3. Select “**C**” Configure Menu
4. Select “**D**” Configure Data Channel
5. Select “**E**” Enable Mark Channel Online
6. Select “**O3**” Press <**ENTER**>
7. Close the Primary Data Logger by clicking the [**X**] in the upper right hand corner of the display window.
8. Answer “**Yes**” to the Action Prompt question

2.7.2.3 COPY THE BACKUP DATA LOGGER FILES

The 1-minute average data from the Backup Up Data Logger is a powerful diagnostic tool for interpreting ozone data. This data enables the detailed evaluation of monitoring data and system performance anomalies. The site operators are required to obtain a copy the data files from the BUDL during each biweekly site visit. The Regional Office is responsible for archiving the BUDL data files for each site operated. These data records must be maintained until the data is certified to the EPA the following year.

To Copy The BUDL Data Files

- a. Double Click “**Short Cut to EDAS**”
- b. Enter Password “**██████**”
- c. Click “**OK**”
- d. Select “**Utilities**”
- e. Select “**Copy File**”
- f. Select “**Data Files**”
- g. Select “**Minute Data**”
- h. Select “**Range**”
- i. Select a “**Start Date**” = “**Last site visit date**”
- j. Select a “**To Date**” = “**Today’ Date**”
- k. Select Copy To “**E**” drive
- l. Insert **Zip Disk** into E Drive Press “**Copy**”
- m. When complete, remove the Zip Disc and label the disc appropriately with the dates of the Backup data file.

Periodically, the BUDL specific data files for each monitoring site will be requested by the Data Management and Statistical Service Branch for verification of performance and data evaluation.

2.7.2.4 Site Calls (see section III, Regional Office Data Retrieval, all parameters)

To minimize travel some site operational checks must be made by telephone. Site calls are recommended every working day. Calls to a site can be made at any time; however an effort to avoid calling during the first 5 minutes of an hour should be made in order to avoid conflict with the calls made by the automated polling process of the DMSSB headquarters computer. At a

minimum request, the yesterdays data, and today's data. If calling on a Monday, retrieve the data for Friday, Saturday, and Sunday data as well.

Note: Make sure the modem speed (BAUD rate) is set correctly for the corresponding site (i.e. if set to 300 BAUD it will not work usually on a 2400 BAUD). If you are uncertain as to what speed modem your site is operating, call the ECB or DMSSB for assistance. Often times a site operator can call a site if it is set to the incorrect BAUD rate, and the site will NOT respond. This is a common problem and can easily be avoided by making sure the rate(s) correspond.

Review the Reports For Flagged Data.

Flags are assigned to data to indicate its validity. If no flag follows a value, the data is assumed accurate and valid. These data are used in all appropriate averages. Compare any flagged data with what is expected to occur such as nightly auto-calibrations. If any of the flagged data appears unusual make a note to check the back up data collected during the next site visit. If several values are invalid, a site visit may be needed. If a channel is incorrectly marked D (down) the data may be valid and you will need to notify headquarters of any valid data to be reported.

Compare the monitor zero results to the zero for each day. Compare the monitor span results to the known calibrator output for each day. Review the power failure report. Review the log for temperature inside the building. See the section on "polling" for complete flag and review procedures.

2.7.2.5 Data Reporting and Validation for Regional Offices (see section IV)

Data Validation for Regional Offices: The regional office is responsible for data validity. The Regional Office monitoring staff must verify that all periods of missing or invalid data have been accounted for, and the reasons have been identified for missing or invalid data on the Monthly File Listing or on an AQ-42 in remarks.

The operator must review all AQ-42s for unusually high or low concentrations.

The operator signs, dates, and submits the completed AQ-42s to the DMSSB in Ambient Monitoring in Raleigh

Each month, the DMSSB initiates a data review by printing a raw data report for each field office. Each month, the Regional Offices will be requested to send selective sets of BUDL data that are needed beyond what is already needed by DMSSB for verifying the missing value imputations supplied by the field office. DMSSB requested Backup Data Logger files shall be FTPed to the DMSSB within 5 working days.

All monthly data should be submitted to headquarters within 10 working days from the end of the collection month.

All data, including logbooks and supporting printouts must be kept for five years.

2.7.2.6 Quality Assurance Procedures

The Quality Assurance Program requires strict adherence to approved procedures including the performance of specific tasks and activities. The determination of adherence to the approved procedures and the quality of ambient air data collected at each site includes the biweekly precision point analysis performed by the site operators, the monitor accuracy audits performed independently by the ECB, and a complete systems audit performed by the staff of the Ambient Monitoring Section of the Division of Air Quality of each monitoring site and the ECB. This approach provides the essential ongoing and independent evaluation of data quality and reliability for the entire ambient air quality data set collected at each site and statewide. **Strict adherence to the established approved procedures is required to enable the Division of Air Quality to certify that the data collected is true and representative of the ambient levels of ozone in the State of North Carolina.**

Site Operator Responsibilities

The critical part of the site operator's role in the Quality Assurance Program is the adherence to approved operating procedures, performing the required precision point analysis, and maintaining accurate records of all monitoring site activities. It is the site operator's responsibility to notify the Regional Air Quality Chemist of the performance of each ozone monitoring system during and/or immediately following each monitoring site visit. The site operators and the Regional Air Quality Chemist are jointly responsible for timely data validation and reporting.

Precision Point Analysis. Every two weeks (**14 days or less**), the precision point analysis must be performed on each O₃ analyzer as part of the Calibration Check procedures. The results of this precision point analysis are required to be reported to the DMSSB at the end of each quarter.

Data validation must be conducted by the operator on a routine basis according to section IV of this QA plan.

The Regional Air Quality Chemist should verify that all site visits and precision analysis are conducted as required.

Accuracy Auditing.

The ECB performs all O₃ monitoring sites accuracy audits. The operator shall assist if requested by ECB auditor in conducting accuracy audits.

Interagency Auditing.

Interagency audits may take place between the DAQ and Local Programs. Also, U.S.E.P.A. Region IV may schedule audits for various parameters, including O₃, throughout the year.

Audit Evaluation and Corrective Action.

For the accuracy audit, corrective action should be initiated by the Project and Procedures Branch supervisor, and documented at the bottom of the AQ121 Audit Form. An investigation must be undertaken to determine the cause of unusually poor audit results when any result exceeds a $\pm 15\%$ difference. Documentation of the correction will be with the QA report.

Data Verification.

The Regional Air Quality Chemist is responsible for all data verification activities.

Systems Auditing.

The Regional Ambient Air Monitoring Staff shall participate and assist in the Annual Systems Audit performed by the Ambient Monitoring Section. All records and documentation must be available for review. A schematic of the annual Systems Audit review areas is in Figure 1 on the following page.

North Carolina Ozone Monitoring System Data Chain

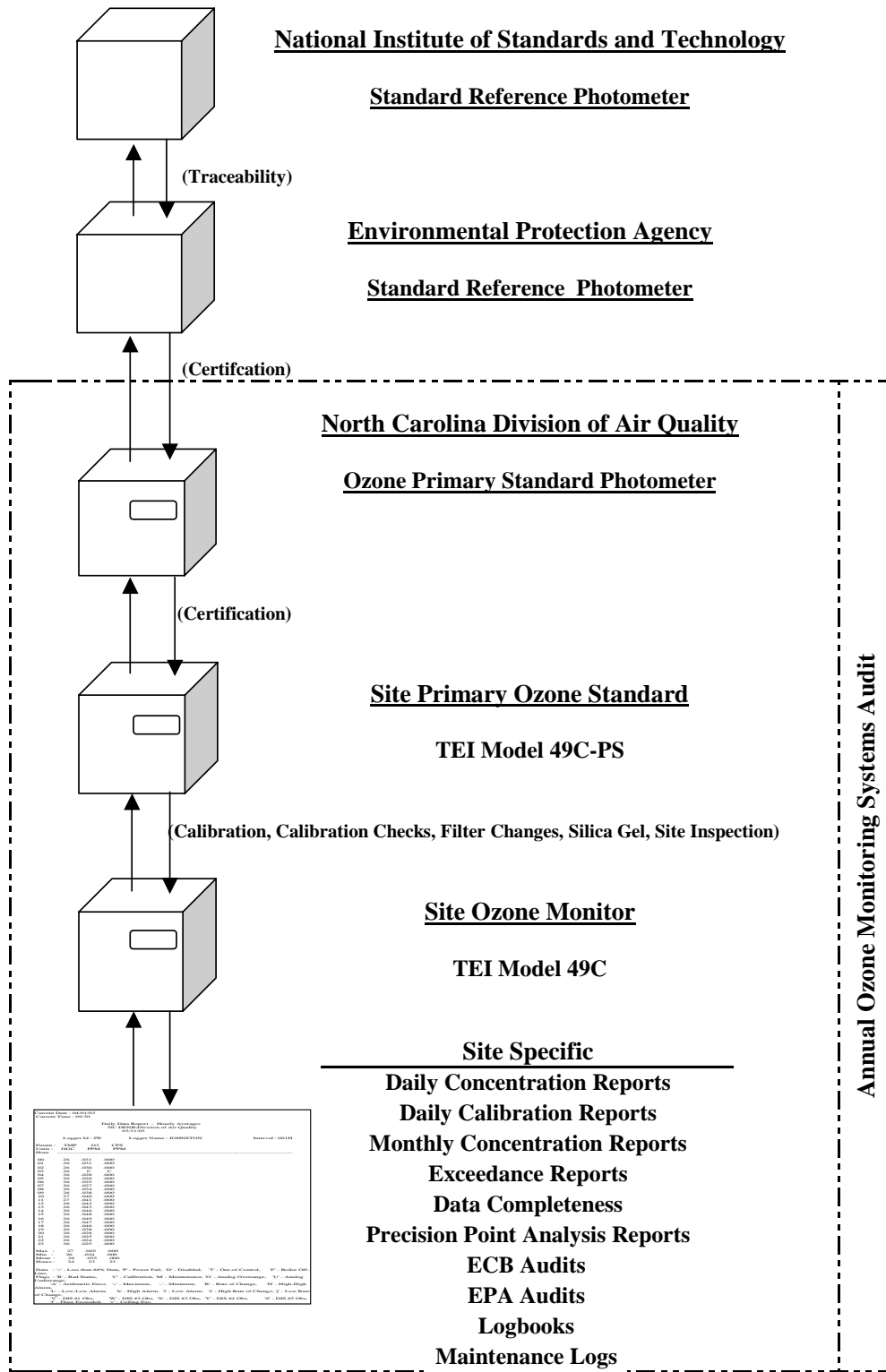


Figure 1. North Carolina Ozone Monitoring System