WASHINGTON STATE
DEPARTMENT OF
ECOLOGY

Carbon Monoxide Procedure

Air Quality Program

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1 INTRODUCTION

This document describes the procedures for carbon monoxide (CO) monitoring. Topics covered include: Site selection, installation, operation, calibration, quality control, and maintenance.

These procedures are written specifically for the Thermo Environmental Instruments Inc. 48C analyzer. For a more thorough explanation of operation, please refer to the manufacturer's manual. The 48C is shown in Figure 1.

Figure 1: 48C Carbon Monoxide Analyzer

1.1 Method of Operation

The method of operation is based on the principle that carbon monoxide absorbs infrared radiation at a wavelength of 4.6 microns. Infrared absorption is a non-linear technique; therefore, the 48C must transform the analyzer signal into a linear output. The 48C uses an exact calibration curve to accurately linearize the output over the range from 0 to 50 ppm.

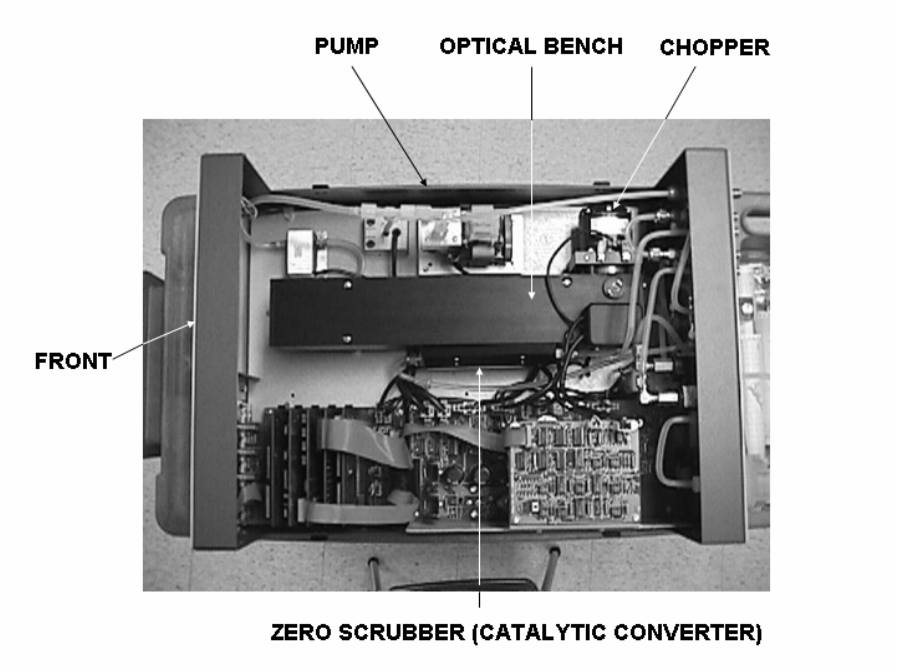
A sample is drawn into the 48C through the optical bench. Radiation from an infrared source is chopped and then passed through a gas filter alternating between CO and N_2. The radiation then travels through a narrow bandpass interference filter and enters the optical bench where it is absorbed by the sample gas. The infrared radiation then exits the optical bench and falls on an infrared detector.

The CO gas filter acts to produce a reference beam which cannot be further attenuated by CO in the sample cell. The N_2 side of the chopper is transparent to the infrared radiation and therefore produces a measure beam which can be absorbed by CO in the cell. The chopped detector signal

is modulated by the alternation between the two gas filters with an amplitude related to the concentration of CO in the sample cell. Other gases do not cause modulation of the detector signal since they absorb the reference and measure beams equally. Thus the gas filter correlation (GFC) system responds specifically to CO.

The 48C outputs the CO concentration to the front panel display and the analog outputs. Figure 1-1 displays the 48C without the top cover.

Figure 1.1: The 48C Without Top Cover



2 EQUIPMENT & SUPPLIES

- Thermo Environmental Instruments Inc. 48C CO analyzer and manufacturer's manual
- CO gas calibration standards and regulators
- Sample line filters
- ¼" teflon probe material, inlet probe funnel, conduit, and plumbing connectors
- Volt meter
- Room temperature sensor (thermometer)
- Chart recorder and paper
- Data logger
- Station log book
- Spare parts (probe material, funnels, connectors, etc.)
- Forms
    - Thermo Environmental Instruments Inc. 48C Preventative Maintenance Schedule
    - CO Monthly Maintenance Log

- Washington Department of Ecology Air Monitoring Precision Checks
- Carbon Monoxide Siting Criteria Checklist
- CO Monitor Site Visit Checklist

3 SITING REQUIREMENTS

Specific siting requirements can vary depending on several factors including, but not limited to, monitoring objective, spatial scale, and practical constraints. It is beyond the scope of this document to cover all siting specifics. For more detailed information on siting requirements please refer to 40 Code of Federal Regulations (CFR), Part 58, Appendix E or the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Section 2.0.1, entitled "Sampling Network Design and Site Selection". See also http://www.access.gpo.gov/nara/cfr/cfrhtml_00/Title_40/40cfr58_00.html

3.1 Basic Requirements

Although specific requirements may vary with the aforementioned factors, the following basic guidelines should be applied when siting a carbon monoxide station:

The most desirable height for a carbon monoxide monitoring inlet probe is 3 to 15 meters above ground level. If the inlet probe is located on the side of a building, then it should be on the windward side, relative to the prevailing winter wind direction. The inlet probe must be at least 1 meter vertically and horizontally away from any supporting structures. Dirty, dusty areas must be avoided in site selection.

The inlet probe must be located away from obstacles such that the distance between the probe and the obstacle must be at least twice the height that the obstacle protrudes above the inlet probe.

Air flow must be unrestricted in an arc of at least 270º around the inlet probe except in the event that the probe is located on the side of a building. In this case, the unrestricted air flow arc must be at least 180º. The arc must include the predominant winter wind direction.

Trees often obstruct normal wind flow patterns. To minimize this effect on microscale CO sites, locate the inlet probe such that there are no trees or shrubs between it and the road. For middle and neighborhood scale sites, the inlet probe must be located at least 10 meters from the drip line of trees between the probe and roadway. Furthermore, the inlet probe must be at least 10 meters from the drip line of any tree which extends 5 meters above the probe height.

Table 3.1.1 presents basic siting criteria and serves as a general guideline for determining optimum inlet probe location.

Table 3.1.1: Siting Criteria

Scale	Height Above Ground in Meters	Distance From Supporting Structures in Meters		Other Spatial Criteria
		Vertical	Horizontal	
Micro	3 ± 1/2	≥ 1	≥ 1	1. Must be at least 10 meters from nearest intersection and should be at a mid-block location. 2. Must be at least 2 meters and no more than 10 meters from edge of nearest traffic lane. 3. Must have an unrestricted air flow of 270º around the inlet probe, or 180º if located on side of building
Middle and Neighborhood	Between 3 and 15	≥ 1	≥ 1	1. Must have an unrestricted air flow of 270º around the inlet probe, or 180º if located on side of building. 2. Spacing from roads varies with traffic (see 40 CFR Part 58, Appendix E).

Additional factors must be taken into consideration when siting a carbon monoxide station:

- Operator safety
- Site accessibility during inclement weather
- Availability of power and telephone/data options
- Site security
- Site accessibility such that tools, supplies, and monitoring equipment may be safely transported to and from the site
- Potential site modification requirements and associated costs
- The building, room, or shelter in which the 48C and associated equipment are housed must be dry, clean, and temperature controlled (20ºC to 30ºC)

3.2 Installation of the 48C Carbon Monoxide Analyzer

Upon receipt of the 48C carbon monoxide analyzer, visually inspect it to ensure that all components are accounted for. Notify the Monitoring Unit immediately if any equipment is missing or damaged. Carefully transport the analyzer and associated equipment to the site.

Select a location within the shelter that will not be noticeably impacted by external factors (e.g. the flow of air from a heater or air conditioner). Install the carbon monoxide analyzer and monitoring equipment according to the manufacturers' manuals and Monitoring Unit specifications.

Dual probe lines are preferable to single probe lines as they more readily facilitate routine quality control tests of the entire sampling train. Therefore, install a dual probe line whenever possible.

3.3 Setup

The Monitoring Unit programs the 48C prior to distribution according to the specific data collection requirements. No additional programming should be necessary. Turn on the analyzer and other monitoring equipment. The analyzer will perform a brief self-test and then automatically enter the sample mode. If upon initial startup the analyzer or any associated equipment appear to be malfunctioning, contact the Monitoring Unit immediately.

4 CALIBRATION AND QUALITY CONTROL

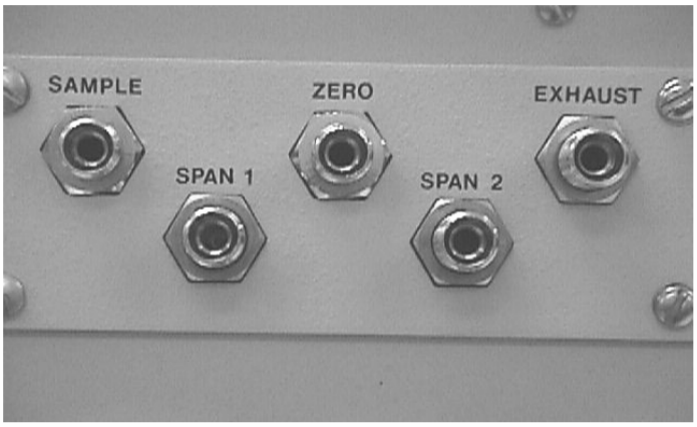
Prior to distribution, the Monitoring Unit performs a multi-point calibration on the 48C using the procedures detailed in the "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II - Ambient Air Specific Methods, Section 2.6.2." Therefore, only occasional minor adjustments to the analyzer should be necessary. However, an initial calibration check must be performed after installation to verify that the analyzer is operating properly (refer to section 4.2 of these procedures).

4.1 Calibration Standards

Two cylinders of carbon monoxide in air will be provided by the Monitoring Unit. The precision gas cylinder will contain a concentration of approximately 10 ppm. The span gas cylinder will contain a concentration of approximately 30 ppm. The assay of these cylinders must be traceable to a National Institute of Standards and Technology (NIST) CO in Air Standard Reference Material (SRM) or an NIST/EPA approved gas manufacturer's Certified Reference Material (CRM). Furthermore, the analysis date must be current. All tanks with an analysis date older than two years are expired and must be replaced.

It should be noted that all Ecology 48C analyzers have been modified. This modification involves the installation of an additional span port on the back of the analyzer and is not represented in the 48C user's manual. The configuration for all Ecology CO analyzers is represented in Figure 4.1 below. The span ports are clearly labeled SPAN 1 and SPAN 2. Connect the precision gas cylinder to the SPAN 1 port and the span gas cylinder to the SPAN 2 port.

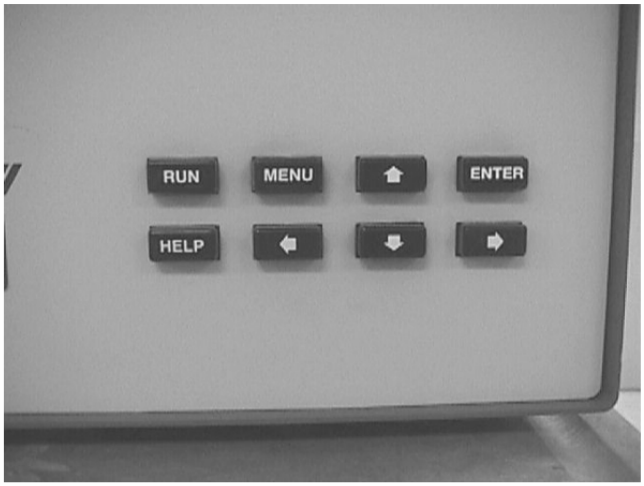
Figure 4.1: 48C Ports as Modified for Ecology



4.2 Calibration Checks

After the 48C and associated monitoring equipment are completely installed and appear to be functioning correctly, an initial calibration check must be performed by the station operator. This must be done prior to collecting data to ensure data quality. Allow at least one hour for the analyzer to warm up prior to performing the initial calibration check. Figure 4.2 displays the push buttons located on the lower-right corner of the front of the analyzer.

Figure 4.2: 48C Push Button Panel



Follow the procedures detailed below in order to perform a calibration check:

1. Verify that the analyzer, data logger, and chart recorder all read within .1 ppm of each other. If they do not, record the difference on the chart and in the log book and contact the Monitoring Unit.
2. Disable the data logger.
3. Mark the far right side of the chart to indicate when the data logger was disabled and record the following information on the chart: (do not overwrite the chart pen trace)
    a. Date.
    b. Time the data logger was disabled in Pacific Standard Time (PST).
    c. Operator initials.
    d. Analyzer state tag number.
    e. Precision and span gas cylinder numbers, concentrations, remaining pressures, and analysis dates. Cylinders with 200 PSI or less should be replaced. Cylinders with an analysis date older than two years are expired and must be replaced.
4. Press the Enter button on the front of the 48C to exit Remote mode (it will now be in Local mode).
5. Press the Run button once to engage the zero solenoid valve and begin sampling zero air.
6. Let the zero stabilize for at least 10 minutes. The analyzer is stable when the reading varies no more than ±2% of the scale of the instrument over a 5 minute period. Additionally, a stable trace or plateau must be obtained on the chart recorder. If stable readings cannot be obtained, there may be a problem and the Monitoring Unit should be consulted. Verify that the analyzer, data logger, and chart recorder all read within .1 ppm of each other.
7. After 10 minutes, if a stable trace has been obtained, record the reading from the data logger on the chart. All readings should be taken in engineering units (ppm).
8. Press the Run button once to engage the Span 1 solenoid valve and begin sampling the precision gas.
9. Wait at least 10 minutes for a stable reading. Verify that the analyzer, data logger, and chart recorder all read within .1 ppm of each other. Once a stable reading and chart trace are obtained, record the actual (precision gas cylinder concentration in ppm) and indicated (data logger reading in ppm) values on the chart.
10. The actual and indicated precision values must be recorded on the "Washington Department of Ecology Air Monitoring Precision Checks" form which can be found under the FORMS section of this document. The operator may elect to wait until the end of the month and transfer all of a given month's precision values to the form all at once.
11. Press the Run button once to engage the Span 2 solenoid valve and begin sampling the span gas.
12. Wait at least 10 minutes for a stable reading. Verify that the analyzer, data logger, and chart recorder all read within .1 ppm of each other. Once a stable reading and chart trace are obtained, record the actual (span gas cylinder concentration in ppm) and indicated (data logger reading in ppm) values on the chart.
13. The calibration check is now complete. Refer to Section 4.4 (Adjustments and Quality Control) of this document to determine if adjustments or other actions are necessary.
14. If further action is not needed, press the Run button to engage the Sample solenoid valve and begin sampling ambient air.

15. Press the Enter button to enter the Remote mode. This enables remote calibration checks.
16. Once the analyzer readings reflect ambient concentrations, re-enable the data logger.
17. Mark the far right side of the chart and record the time, in PST, that the data logger was enabled.
18. Verify that the sampler is running correctly and that the chart, analyzer, and data logger are reading within .1 ppm of each other.
19. Record all information in the station log book.

4.3 Precision

The analyzer must be periodically challenged with a precision gas. This is done as part of the calibration check. Precision checks can be either manual (operator initiated) or automated (initiated by the telemetry system).

4.3.1 **Manual Precision Checks**

Manual precision checks are those that the operator performs as part of a complete calibration check while on site. For telemetered sites, manual calibration checks must be no more than 14 days apart with an automated check in between. For non-telemetered sites, where automated calibration checks are not possible, manual checks must be no more than 10 days apart. To conduct a manual calibration check, follow the complete procedures in Section 4.2 of this document. Transfer the actual and indicated precision values to the "Washington Department of Ecology Air Monitoring Precision Checks" form.

4.3.2 **Automated Precision Checks**

Automated precision checks are those that are part of the automated calibration check that is initiated and completed via the telemetry system in concert with the data logger and analyzer. The automated calibration checks occur every Monday at 2:46 A.M. Any automated calibration checks that are used for the analyzer's precision check must be documented on the chart in the same manner as a manual calibration check and must occur near the mid-point between manual checks. Transfer the automated precision values to the "Washington Department of Ecology Air Monitoring Precision Checks" form.

4.4 Adjustments and Quality Control

Periodic adjustments of the analyzer may be necessary if it has drifted out of calibration. This is determined by examining the amount of drift (zero, precision, and span) and calculating the percent difference between the indicated and actual precision values and span values. Use the following calculation to determine the percent difference between the indicated and actual precision values. Repeat the calculation for the indicated and actual span values:

((Indicated Value – Actual Value)/Actual)*100 = percent difference

Consult table 4.4.1 in order to determine whether the analyzer is out of calibration and needs adjusting and whether the data meet quality control objectives:

Table 4.4.1: Adjustment and Quality Control Action Levels

Calibration Points	Calibration Check Result Control Limits	Corrective Action	Post-Adjustment Check
Zero	> ± 1% of full scale (.5 ppm)	Adjust the analyzer at the zero level only	Analyzer zero should read < .1ppm and should be positive (no negative readings)
	> ± 2% of full scale (1 ppm)	Invalidate data back to last valid calibration check and adjust analyzer at the zero level	
Precision and Span	> ± 7%	Adjust analyzer at the zero and/or span level – not precision level	Analyzer must read within ± 4%
	> ± 10%	Invalidate data back to last valid calibration check and adjust analyzer at the zero and/or span level	

If an adjustment is necessary, follow the procedures detailed below. **Do not adjust the analyzer during a precision check**. All adjustments are to be made only after a complete calibration check (zero, precision, and span) has been performed on the analyzer. In addition, adjustments are to be made at the zero and span levels only. **Never adjust the analyzer at the precision level**.

1. Make sure the data logger is disabled and document the chart to reflect that an adjustment is beginning.
2. The analyzer must be in Local mode to adjust the zero and span levels (Section 4.2 of this document details how to place the analyzer in Local mode).
3. Always adjust the zero level of the analyzer first.
4. To adjust the zero of the analyzer:
    a. Generate zero.
    b. Press the Menu button.
    c. Select Calibration from the menu using the ←↑↓→ buttons and press Enter.

   d. Select Calibrate Zero and press Enter.
   e. Wait at least 10 minutes until a stable reading is achieved.
   f. Press Enter to set the analyzer to read zero.
   g. Wait an additional 10 minutes for zero to stabilize and ensure adjustment success.
   h. Press Menu to return to the Calibration Menu or Run to return to the Run screen. Press the Run button until the Sample mode is displayed.
   i. Briefly check the precision and span values to see if any further adjustments are needed. Record these numbers on the chart. Post-adjustment indicated values must be within 4% of the actual (gas) values. If no further adjustments are needed proceed to step 5. If a span adjustment is necessary, proceed to the next step.
5. To adjust the span of the analyzer:
   a. Generate a span gas (Span 2) flow.
   b. Press the Menu button.
   c. Select Calibration from the menu using the ↑↓ buttons and press Enter.
   d. Select Calibrate Span and press Enter.
   e. Wait 10 minutes until a stable reading is achieved.
   f. Using the ↑↓ buttons, adjust the value in the Set To field to reflect the actual concentration of the span gas cylinder.
   g. Press Enter to accept the changes.
   h. Wait an additional 10 minutes for span to stabilize and ensure adjustment success.
   i. Press Menu to return to the Calibration Menu or Run to return to the Run screen. Press the Run button until the Sample mode is displayed.
   j. Briefly check the zero and precision values to see if further adjustments are needed.
6. Record the post-adjustment numbers on the chart. Post-adjustment indicated values must be within 4% of the actual values. If they are not, further adjustments are necessary.
7. If further adjustments are not needed, return the analyzer to the sample and remote modes.
8. Verify the analyzer is reflecting ambient air concentrations.
9. Enable the data logger.
10. Record all information in the station log book and on the chart.

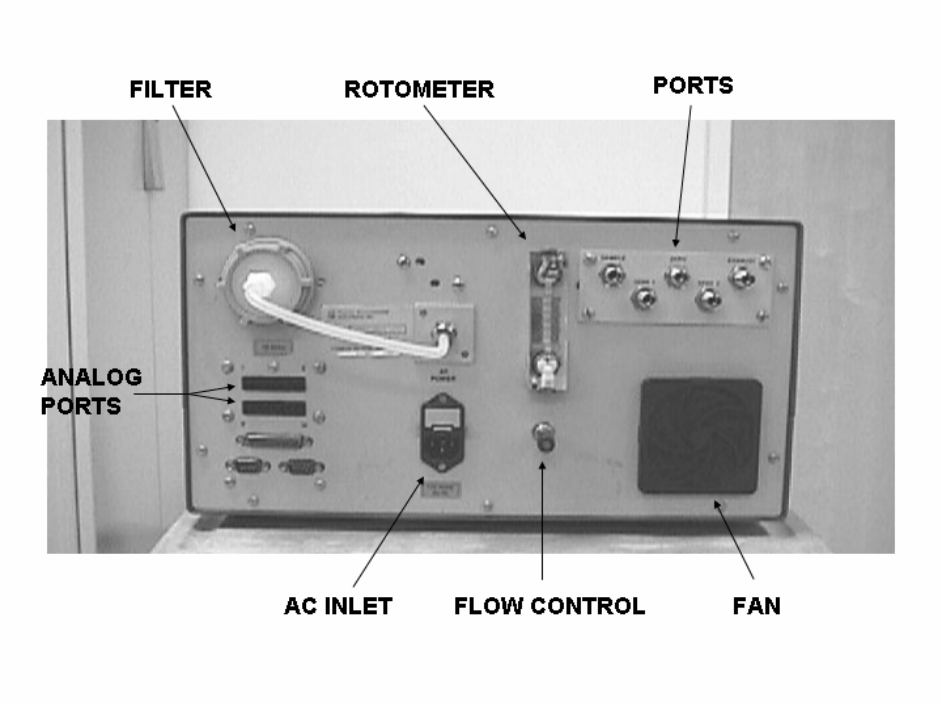
5 REQUIRED MAINTENANCE

The following section details routine maintenance that will help ensure proper function of the 48C analyzer and associated equipment. All maintenance should be recorded on the chart and in the station log book. The "Thermo Environmental Instruments Inc. 48C Preventive Maintenance Schedule" must be used to track all periodic maintenance activity. The operator should date and initial each activity on the schedule after it has been completed. The operator must also complete the "CO Monthly Maintenance Log" which can be found under the FORMS section of this document. The information collected will greatly enhance the ability of the operator and Monitoring Unit to diagnose potential problems in a timely manner.

Please refer to the Thermo Environmental Instruments Inc. 48C manual for more detailed instructions on how to perform specific maintenance items listed below. To assist as a visual

aide to maintenance activities, Figure 5 displays a photograph of the rear panel of the 48C analyzer.

Figure 5: Rear Panel of 48C



5.1 During Each Site Visit

- Visually inspect the site, including the inlet probe and funnel.
- Record exceptional events, extreme environmental conditions, and any factors that might significantly affect pollutant concentrations or monitoring activities in the station log.
- Check the time on the chart recorder. If the time difference between the chart recorder and data logger is greater than 10 minutes, adjust the chart by advancing the chart to the proper time. Do not reverse the chart.
- For non-telemetered sites, verify that the data logger and chart time are within 5 minutes of the telemetry system time.
- Verify that the analyzer, data logger, and chart recorder all read within .1 ppm of each other.
- Check chart paper supply and refill as needed.
- Change chart pens as needed.
- Clean monitoring station as needed.

5.2 Monthly

- From the Main Menu on the 48C select Diagnostics. Check and record all of the following items on the Monthly Maintenance Log:
    - Automatic Gain Control (AGC) (it should be ≈ 250,000)

  - Range (it should be 50 ppm)
  - AVG Time (it should be 30 sec)
  - CO Bkgd
  - CO Coef
  - Temp Cor. (it should be on)
  - Press Cor. (it should be on)
  - Voltages (Bias, +5, +15, -15, Battery)
  - Instrument pressure
  - Instrument internal and chamber temperatures (internal should be 25-35ºC, chamber should be 40-50ºC)
  - Flow (it should be ≈ 1 LPM)
  - S/R Ratio
- Change the in-line filter.
- Check all plumbing and electrical connections.

5.3 Quarterly

- Leak check:
  - From the Main Menu, select Diagnostics.
  - Select Flow.
  - Disconnect the probe line from the Sample port on the back of the analyzer.
  - Plug the Sample port.
  - If the analyzer is operating properly the reading should slowly decrease to zero and the pressure, as read in the Pressure screen (Diagnostics Menu), should drop to below 250 mmHg.
- Digital to analog converter test (zero and full scale):
  - From the Main Menu, select Diagnostics.
  - Select Test Analog Outputs.
  - Select zero.
  - Verify that the data logger and chart read zero.
  - Press the Menu button to return to previous screen.
  - Select Full Scale.
  - Verify that the data logger and chart are reading full scale (50ppm).
- Catalytic converter test:
  - Remove the Span 2 (high span gas) line and connect it to the Zero port on the back of the analyzer.
  - In order to avoid pressurizing the instrument, install a “T” and vent excess gas to atmosphere.
  - Place the analyzer into the Zero mode.
  - The analyzer reading will increase briefly and quickly drop to zero.
  - Test for 15 minutes.
  - Under proper operation the analyzer reading will vary slightly but should remain below .5 ppm during this time.
- Clean the analyzer fan and screen.
- Challenge the analyzer with a high span gas through the probe.

5.4 Annually

- Clean or replace the sample inlet and probe line(s). Replace the inlet funnel if it is cracked or broken.

In the event of maintenance problems including, but not limited to, leak check failures, through the probe high span gas failures, and catalytic converter test failures, call the Monitoring Unit immediately.

6 DATA DOCUMENTATION AND VALIDATION

Refer to the "Automated Method Data Documentation and Validation Procedures" under the Data Validation Section of this manual for a detailed description of handling, recording, and validating of air monitoring data. All data will be reviewed and certified by the Quality Assurance Unit prior to being reported to the EPA and prior to use in decisions concerning air quality management.

7 DATA QUALITY ASSESSMENT

For each calendar quarter and year, the Quality Assurance Unit will prepare data precision, accuracy, and completeness reports.

7.1 Precision

The precision will be evaluated and reported employing the frequencies, procedures, and calculations in 40 CFR 58, Appendix A, "Quality Assurance Requirements for State and Local Air Monitoring Stations (SLAMS)."

7.2 Accuracy

Using results from the performance audits and the calculations specified in 40 CFR 58, Appendix A, "Quality Assurance Requirements for State and Local Air Monitoring Stations (SLAMS)," data accuracy will be evaluated and reported.

7.3 Data Completeness

Data completeness will be determined for each analyzer and expressed as a percentage. Percent valid data will be a gauge of the amount of valid data obtained compared to the amount expected under ideal conditions (24 hours per day, 365 days per year). Exceptions will be made for analyzers operating on a seasonal basis.

8 REFERENCES

1) "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume I - Principles." EPA-600/9-76-005. December, 1984.

2) "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II - Ambient Air Specific Methods." EPA-600/4-77-027a. January, 1983.

3) Code of Federal Regulations, Title 40, Part 58 (40 CFR 58).

4) "State of Washington Department of Ecology, Air Quality Program, Automated Method Data Documentation and Validation Procedures."
December 1993.

5) "Instruction Manual, Model 48C, GFC Ambient CO Analyzer," Thermo Environmental Instruments Inc. April 11, 1997.

9 FORMS

- Thermo Environmental Instruments Inc. 48C Preventative Maintenance Schedule
- CO Monthly Maintenance Log
- Washington Department of Ecology Air Monitoring Precision Checks
- Carbon Monoxide Siting Criteria Checklist
- CO Monitor Site Visit Checklist

THERMO ENVIRONMENTAL INSTURMENTS INC. 48C PREVENTATIVE MAINTENANCE SCHEDULE

Maintenance Detail	Manual Refer.	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Complete the Monthly Maintenance Log	3-33 to 3-39	*	*	*	*	*	*	*	*	*	*	*	*
Remove screen & clean Fan Check pump/fan noise.		*	*	*	*	*	*	*	*	*	*	*	*
External Leak Check: Disconnect the probe line from the Sample port on the back of the analyzer. Plug the Sample port. If the analyzer is operating properly the reading should slowly decrease to zero and the pressure, as read in the Pressure screen (Diagnostics Menu), should drop to below 250 mmHg	5-3	*			*			*			*		
D-A converter test Check zero and full-scale	3-41 to 3-43	*			*			*			*		
Catalytic Converter Test Place analyzer in zero mode and obtain stable reading. Connect 30 ppm span gas to zero port (to avoid over-pressurizing instrument, install "t" to allow for venting). Run for 15 minutes. The output must be < .5ppm. In the event of a failure, contact the Monitoring Unit.		*			*			*			*		
Span performed through probe once/quarter		*			*			*			*		
Clean probe line or replace yearly.													

ANALYZER STATE TAG #_____ OPERATOR:_____

Note: Initial each task as completed

CO Monthly Maintenance Log

Thermo Environmental Model 48C Carbon Monoxide Analyzer

State Tag # _____ **Operator** _____

Date _____

Verify These Items:

Normal Operating Settings in ( )

AGC (≈250,000) _____

Range (50 ppm) _____

AVG Time (30 sec) _____

CO Bkgd _____

CO Coef _____

Temp. Cor. (on) _____

Pres. Cor. (on) _____

Analyzer Time _____

Analyzer Date _____

Voltages

Bias _____

+5V _____

+15V _____

-15V _____

Battery _____

ALARM RANGES			
Int. Temp.	**Min.**	Deg C	8
	Max.	Deg C	42
Chamber Temp.	**Min.**	Deg C	40
	Max.	Deg C	52
Pressure	**Min.**	mmHg	250
	Max.	mmHg	1000
Flow	**Min.**	LPM	0.35
	Max.	LPM	1.5
Bias Volts	**Min.**	Volts	-120
	Max.	Volts	-100
AGC	**Min.**	Hz	150000
	Max.	Hz	300000

Temperatures

Internal (25-35°C) _____

Chamber (40-50°C) _____

Analyzer Pressure _____ mmHg

Flow (≈ 1 LPM) _____ LPM

S/R Ratio _____

Washington Department of Ecology
Air Monitoring Precision Checks

AIRS SITE #: 5 3 _ _ _ - _ _ _ _

STATION# _ _ _ _ _ _ _ _ YEAR/MONTH:_____

ANALYZER STATE TAG #: _ _ _ _ _ _ _ _

OPERATOR:_____ POLLUTANT:_____

LOCATION:_____

DATE			ACTUAL CONC.				INDICATED CONC.				UNITS	PASSED	COMMENTS
Month	Day	Year										**Y** or **N**	

PRECISION CHECK EQUIPMENT:

Cylinder Gas S/N: _____

Calibrator Model: _____

Calibrator Serial #: _____

Permeation Tube #: _____

*Decimal Placement

CO	1	XX.X ppm
SO2	3	.XXX ppm
NO2	3	.XXX ppm
Ozone	3	.XXX ppm
Neph	3	.XXX Bscat

Shaded areas to be completed by QA Personnel

CARBON MONOXIDE (CO)

Siting Criteria Checklist

Site Name: _____ Site #: | | | | | | | | | |

Address: _____

City: _____ County: _____

_____

1. Vertical distance from ground to probe: ____ Meters
   - Microscale = 3±1/2 meters
   - Middle & Neighborhood scales = 3 to 15 meters

2. Distance from support structure (both horizontal and vertical should be ≥ 1 meter ____ Meters

3. Is there an unrestricted air flow in an arc of 270º (180º if on the side of a building) and is the predominant winter wind direction included in the arc? ____ Yes ____ No

4. Distance between probe and nearest tree dripline should be ≥ 10 meters if the tree extends 5 meters above probe and is located between the street and probe (middle and neighborhood scales). NO TREES BETWEEN ROAD AND INLET FOR MICROSCALE SITES. ____ Meters

5. a) Spacing from probe to the nearest traffic lane must be at least 2 and no more than 10 meters. ____ Meters
   b) Probe should be at least 10 meters from the nearest intersection, preferably mid-block. ____ Meters

6. Traffic count: Can be obtained from City or County Public Works Departments. ____ Vehicles/day

7. Comments: _____

_____

_____

Completed by: _____ Date: _____

Agency: _____

CO MONITOR SITE VISIT CHECKLIST

Site Name: _____ Site #: _____

Operator: _____ Analyzer State Tag #: _____

	CHECKED
GENERAL	
Pacific Standard Time (PST) noted on chart? (Y/N)	
Date and day of week noted on chart? (Y/N)	
Power on? (Y/N)	
Adequate supply of span and precision gases? (Y/N)	
CO disabled on data logger and time noted on chart? (Y/N)	
Performed calibration check? (Y/N)	
Do chart, data logger, and analyzer read within .1 ppm of each other? (Y/N)	
Adjustments made following calibration check? (Y/N)	
Is the analyzer back in Remote mode upon completion of calibration check? (Y/N)	
CO enabled on data logger? (Y/N)	
Has chart been completely documented to reflect calibration checks/maintenance/etc.? (Y/N)	
Does in line filter need to be changed? (Y/N)	
SHELTER	
Is the shelter temperature consistently staying between 20º and 30ºC? (Y/N)	
CHART RECORDER	
Is the chart time correct? (Y/N)	
Do the pens need to be changed? (Y/N)	
Is the chart paper supply adequate? (Y/N)	