EPA-600/4-76-006
January 1976

Environmental Monitoring Series

CODING MANUAL FOR THE QUALITY ASSURANCE PERFORMANCE AUDIT FOR AEROMETRIC DATA

Environmental Monitoring and Support Laboratory
Office of Research and Development
U.S. Environmental Protection Agency
Research Triangle Park, North Carolina 27711

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EPA-600/4-76-006
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CODING MANUAL FOR THE QUALITY ASSURANCE PERFORMANCE AUDIT FOR AEROMETRIC DATA

by

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RESEARCH TRIANGLE PARK, N. C. 27711

January 1976

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ACKNOWLEDGMENT

Acknowledgment is made to Mr. Gardner Evans for his work in developing a system to process the data to be received from the regions on the attached forms.

CODING MANUAL FOR THE QUALITY ASSURANCE

PERFORMANCE AUDIT FOR AEROMETRIC DATA

I. INTRODUCTION

Appendix A of Guideline Document OAQPS No. 1.2-020, "Guidance for Decentralization and Continued Operation of the NASN," provides instructions for "Quality Assurance Performance Audits for NASN Network (Independent Duplicate Checks.)"

The purpose of this manual is to ensure uniformity in reporting information obtained through the performance audits for the National Air Surveillance Network (NASN). If the performance audit is to be considered as a source of information (1) to quantitatively assess data quality resulting from the measurement system and (2) to indicate when the system is in need of corrective action, then the audit data must be reported in a meaningful, uniform manner. As shown in the figures, a coding form has been designed which is pollutant/method specific to ensure that the incoming audit data relate solely to the measurement system by which it was collected and analyzed. At present, there are three pollutant/method forms, one each for total suspended particulate matter (high volume, glass fiber filter), sulfur dioxide (manual 24-hour, pararosaniline), and nitrogen dioxide (manual 24-hour, sodium arsenite). Forms and instructions for other pollutant/methods may be added later. Thus, this manual is being published "prepunched," to be inserted into a three-ring binder so that when other pollutant/methods in addition to those for NASN are totally defined they may be inserted easily into the document. Further, instructions on the

use of performance audit data by the originating laboratory and other users will be issued at a later date.

The Environmental Protection Agency has adopted the SAROAD (Storage and Retrieval of Aerometric Data) system as its official system for processing and storing air quality data and for storing the data in a Data Bank. (See Reference 7.) As indicated by the list of references, several documents have been published relating to and explaining the overall system. It is intended that the established coding structure of SAROAD be used wherever possible and to marry the audit information to the system by which the data were collected.

Any attempt to record the resulting data on forms that are in a format other than the SAROAD format is likely to result in some confusion and difficulty. Admittedly, however, the forms included in this manual are considered as tentative until their worthiness has been evaluated. In addition, new forms will be added for additional pollutants and for different methods of collection and analyses as the need arises.

The Environmental Monitoring and Support Laboratory (EMSL) will monitor the progress of incoming audit data and will, if necessary, simplify the forms. Any problems with either the auditing process or with the coding of the data should be made known to the EMSL.

The completed forms for performance audits should be submitted each quarter, along with the results of the NASN data, to the EPA Regional Office. Initially, the performance audit data should then be submitted to the EMSL, Research Triangle Park, North Carolina 27711, for review and analysis. Appropriate analysis of the data will result in:

1. Establishment of realistic acceptability criteria for the performance audit data.

2. Appropriate design of data forms.

3. Appropriate routine analysis of performance audit data.

Subsequently, the performance audit data will be routinely submitted from the regions, directly to OAQPS for routine analyses and reporting.

II. GENERALIZED INFORMATION

The upper third of each form (Figures 1, 2, and 3) is the portion which designates the pollutant being audited, the method of collection and analysis, the state and area within the state that the samples were collected, and the quarter when the audits were made. Notice that blocks 1-23 have been reserved for this information.

Space at the bottom of the form is provided to give the total number of analyses performed during the quarter for the specific pollutant/method. This will be used to calculate audit rate and to generate the probability levels associated with the summary statistics.

The auditor and supervisor should sign and date the form. The completed form (or duplicate) is then sent to the EPA Regional Office.

The information required or already precoded is as follows:

BLOCK NO.	
1	Precoded T, S, or N for Total Suspended Particulate Matter, Sulfur Dioxide, or Nitrogen Dioxide, respectively. Use the appropriate form for the pollutant being audited.

BLOCK NO.	
2 - 3	SAROAD State Code; for example, 01 in this block refers to Alabama. (See Appendix A.)
4 - 7	SAROAD area code; for example, if 1860 were coded in these blocks following state "01," then it would refer to samples collected at any site located in Huntsville. (For complete area codes see Reference 5.) If audits were made at a sampling of all sites measuring the specific pollutant method within the designated state during the same quarter and if this audit information is intended to extend to all the sampling sites in the state, then 9999 should be coded in these blocks.
8	The agency responsible for collection and analysis of the original samples. (See Code Table 1.)
9 - 10	The SAROAD project code classification designating the objective of the monitoring is shown by Code Table 2. These forms are preprinted with (QA) in these columns to designate that all data reported thereon are for quality assurance purposes.
11	The time interval of collection is always "7" for the three attached forms, implying 24-hour sampling, so the "7" is preprinted. The time interval may be different for other methods.
12 - 13	The year that samples are collected.

BLOCK NO.

14	The calendar quarter that measurements were taken. Quarters defined in groups of 3 months, beginning with January of each year. (1-Jan-March, etc.)
15 - 23	Precoded SAROAD parameter, method, and units for each pollutant method.
24 - 27	These columns are used to designate decimal point alignment in measurement of operation under consideration. The preprinted numbers in the "DP" column correspond with the darkened arrows in each of the data fields. On the "T" form for suspended particulate (11101) column 26 is used to distinguish between ways of measuring flow rate. "1" is to be used if measurement is reported in cubic feet/minute and "2" is used for cubic meters/minute. The values for flow rate in cubic feet/minute should be recorded to the nearest whole number, and a "0" entered in the DP block 25. Values for cubic meters/minute should be recorded to the nearest 0.01 with a "2" entered in the DP block 25.

The remainder of the form is specific to each of the pollutant monitoring systems being audited. It should be noted, however, that if only the alternate check is used, i.e., an independent sample is collected, analyzed, and processed, only columns 50-59 need be coded. Refer back to the OAQPS Guideline Document Number 1.2-020 for details. Analagously, if columns 30-49 are coded with audit checks, then columns 50-59 would be left blank. (There is a possibility that a monitoring laboratory would decide to

use both types of audits simultaneously, but this is not required.)

III. SPECIFIC INFORMATION

a) Total Suspended Particulate Matter

For total suspended particulate matter, there are two audit checks on the system. The first audits the weighing process; the second audits the air flow. It is reasonable to assume that the sample collected for the weight check is not related to the sample being collected during the flow-rate check. Hence, in general, the line referring to the first audit of the weight does not imply that it matches up with the sample collected during the flow-rate check.

COLUMN NO.	INFORMATION
28 - 29	Precoded audit number. If more than 15 audits are taken during the quarter, simply use another coding form, but renumber starting with 16.
30	Precoded number 1 to signal that the original weight in mg is to follow.
31 - 34	Original weight of the exposed filter in mg. Record to nearest whole mg.
35	Precoded number 2 to signal that the check weight in mg is to follow.
36 - 39	Weight of the exposed filter, recorded to the nearest whole mg.

While it is not necessary to subtract the check weight from the original weight, each auditor is encouraged to do so. A history of these differences will soon enable the auditor to develop a signalling system, indicating

when something is out of intuitive limits, so that corrective action can be taken.

COLUMN NO.	INFORMATION
40	Precoded number 3 to signal that the original flow rate in cubic feet per minute (ft^3/min) is to follow.
41 - 44	Original flow rate made on-site. Record the flow rate in ft^3/min to the nearest whole unit or in m^3/min to the nearest 0.01.
45	Precoded number 4 to signal that the calibration check data will follow.
46 - 49	The independent flow rate check using a reference flow rate device is made on-site. This result should be recorded in column 46-49 to the nearest whole unit if ft^3/min or to the nearest 0.01 m^3/min.

While it is not required, the difference should be recorded for internal audit assurance purposes.

b and c) Sulfur Dioxide and Nitrogen Dioxide

For SO_2 and NO_2 there are two audit checks on the measurement system. The first checks the analysis portion with respect to reference samples, and the second checks the air flow at a sampling site. For these pollutants, the audit number serves only to order the results and does not mean that reference sample audit number 1 is related to flow calibration check number 1.

COLUMN NO.	INFORMATION
28 - 29	Precoded audit number. If more than 15 audits are taken during the quarter, simply use another coding

COLUMN NO.	INFORMATION
	form but remember starting with 16.
30	Precoded number 1 to signal that the original (target) result of the reference sample in μg/ml will follow.
31 - 34	Target result of the reference sample in μg/ml recorded to three decimal places.
35	Precoded number 2 to signal that the regular analyst's result will follow.
36 - 39	The regular analyst's result of the reference sample in μg/ml to three decimal places.

The difference between the target result (columns 31-34) and the regular analyst's result (columns 36-39) should be recorded and examined for internal quality assurance purposes. This difference can form the basis for deciding how precise and accurate are the routine laboratory analyses. While it is recommended that each laboratory actually subtract this difference, it will be automatically calculated from the data and, as a consequence, need not be coded on the form.

COLUMN NO.	INFORMATION
40	Precoded number 3 to signal that the flow rate result from the calibrated rotameter will follow.
41 - 44	Record the calibrated rotameter results in cubic centimeters per minute (cm^3/min) to the nearest whole cm^3.
45	Precoded number 4 to signal that the operator's sampled rate will follow.

COLUMN NO.	INFORMATION
46 - 49	The operator's recording of the sampled flow rate in cm^3/min.

The difference should be considered by each laboratory for internal quality assurance purposes.

If there are problems or questions contact:

Environmental Monitoring and
Support Laboratory (MD-75)
Environmental Protection Agency
Research Triangle Park, N.C. 27711

O.M.B. No. 158 - R0126 Thru September 1976

U.S. ENVIRONMENTAL PROTECTION AGENCY
QUALITY ASSURANCE PERFORMANCE AUDIT DATA FORM
TOTAL SUSPENDED PARTICULATES FOR 24-hour OR GREATER SAMPLING INTERVAL

T (1) _____ (Agency name)

_____ (State name) _____ (EPA Region No.)

State (2 3) Area (4 5 6 7)

Agency (8) Project (9 10) Q A Time (11) 7 Year (12 13) Quarter (14)

Parameter code (15 16 17 18 19) 1 1 1 0 1 Method (20 21) 9 1 Units (22 23) 0 1

DP (24) 0 — Exposed filter weight, milligrams

DP (25) — Units (26) (1 if ft^3/min.; 2 if m^3/min.) — Flow rate check

DP (27) 1 — Alternate check, $\mu g/m^3$

Audit No. (28 29)	Original (30–34)	Check (35–39)	Difference	Original (40–44)	Check (45–49)	Difference	Original (50–54)	Check (55–59)	Difference
01	1 ▲	2 ▲		3	4		5 ▲	6 ▲	
02	1 ▲	2 ▲		3	4		5 ▲	6 ▲	
03	1 ▲	2 ▲		3	4		5 ▲	6 ▲	
04	1 ▲	2 ▲		3	4		5 ▲	6 ▲	
05	1 ▲	2 ▲		3	4		5 ▲	6 ▲	
06	1 ▲	2 ▲		3	4		5 ▲	6 ▲	
07	1 ▲	2 ▲		3	4		5 ▲	6 ▲	
08	1 ▲	2 ▲		3	4		5 ▲	6 ▲	
09	1 ▲	2 ▲		3	4		5 ▲	6 ▲	
10	1 ▲	2 ▲		3	4		5 ▲	6 ▲	
11	1 ▲	2 ▲		3	4		5 ▲	6 ▲	
12	1 ▲	2 ▲		3	4		5 ▲	6 ▲	
13	1 ▲	2 ▲		3	4		5 ▲	6 ▲	
14	1 ▲	2 ▲		3	4		5 ▲	6 ▲	
15	1 ▲	2 ▲		3	4		5 ▲	6 ▲	

[9 | 9 |] = Total Number of Analyses Processed During Audit Period

▲ Denotes Decimal Point Alignment

_____ (Signature of Auditor) (Date)

_____ (Signature of Supervisor) (Date)

SEND COMPLETED FORM TO:
Quality Assurance Branch (MD-77)
Environmental Monitoring and Support Laboratory
U.S. Environmental Protection Agency
Research Triangle Park, N.C. 27711

Figure 1. TSP form, performance audit data.

O.M.B. No. 158 - R0126 Thru September 1976

U.S. ENVIRONMENTAL PROTECTION AGENCY
QUALITY ASSURANCE PERFORMANCE AUDIT DATA FORM
FOR SULFUR DIOXIDE FOR 24-hour OR GREATER SAMPLING INTERVAL

S (1) (Agency name)

(State name) (EPA Region No.)

State (2 3) Area (4 5 6 7)

Agency (8) Project (9 10) Time (11) Year (12 13) Quarter (14)

Parameter Code (15 16 17 18 19) Method (20 21) Units (22 23)

Audit No. (28 29)	Measurement of reference samples, μg/ml (DP 3, 24) Original (30 31 32 33 34)	Check (35 36 37 38 39)	Difference	Flow rate check, m³/min. (DP 0, 25) Original (40 41 42 43 44)	Check (45 46 47 48 49)	Difference	Alternate check, μg/m³ (DP 1, 27) Original (50 51 52 53 54)	Check (55 56 57 58 59)	Difference
0 1	1 ▲	▲		3 ▲	4 ▲		5 ▲	6 ▲	
0 2	1 ▲	▲		3 ▲	4 ▲		5 ▲	6 ▲	
0 3	1 ▲	▲		3 ▲	4 ▲		5 ▲	6 ▲	
0 4	1 ▲	▲		3 ▲	4 ▲		5 ▲	6 ▲	
0 5	1 ▲	▲		3 ▲	4 ▲		5 ▲	6 ▲	
0 6	1 ▲	▲		3 ▲	4 ▲		5 ▲	6 ▲	
0 7	1 ▲	▲		3 ▲	4 ▲		5 ▲	6 ▲	
0 8	1 ▲	▲		3 ▲	4 ▲		5 ▲	6 ▲	
0 9	1 ▲	▲		3 ▲	4 ▲		5 ▲	6 ▲	
	1 ▲	▲		3 ▲	4 ▲		5 ▲	6 ▲	
	▲	▲		3 ▲	4 ▲		5 ▲	6 ▲	
	▲	▲		3 ▲	4 ▲		5 ▲	6 ▲	
	▲	▲		3 ▲	4 ▲		5 ▲	6 ▲	
	1 ▲	▲		3 ▲	4 ▲		5 ▲	6 ▲	
	▲	▲		3 ▲	4 ▲		5 ▲	6 ▲	

9 9 [ ] = Total Number of Analyses Processed During Audit Period

▲ Denotes Decimal Point Alignment

(Signature of Auditor) (Date)

(Signature of Supervisor) (Date)

SEND COMPLETED FORM TO:
Quality Assurance Branch (MD-77)
Environmental Monitoring and Support Laboratory
U.S. Environmental Protection Agency
Research Triangle Park, N.C. 27711

Figure 2. SO_2 form, performance audit data.

U.S. ENVIRONMENTAL PROTECTION AGENCY
QUALITY ASSURANCE PERFORMANCE AUDIT DATA FORM
FOR NITROGEN DIOXIDE FOR 24-hour OR GREATER SAMPLING INTERVAL

O.M.B. No. 158 - R0126 Thru September 1976

N (1) _____ (Agency name)

_____ (State name) _____ (EPA Region No.)

State (2 3) Area (4 5 6 7)

Agency (8) Project (9 10) 0 A Time (11) 7 Year (12 13) Quarter (14)

Parameter Code (15 16 17 18 19) 4 2 6 0 2 Method (20 21) 9 4 Units (22 23) 0 1

DP (24) 3 — Measurement of reference samples, $\mu g/ml$

DP (25) 0 — Flow rate check, $m^3/min.$

DP (27) 1 — Alternate check, $\mu g/m^3$

Audit No. (28 29)	Original (30 31 32)	Check (35 36 37)	Difference	Original (40 41 42 43 44)	Check (45 46 47 48 49)	Difference	Original (50 51 52 53 54)	Check (55 56 57 58 59)	Difference
01	1 ▲	2 ▲		3 ▲	4 ▲		5 ▲	6 ▲	
02	1 ▲	2 ▲		3 ▲	4 ▲		5 ▲	6 ▲	
03	1 ▲	2 ▲		3 ▲	4 ▲		5 ▲	6 ▲	
04	1 ▲	2 ▲		3 ▲	4 ▲		5 ▲	6 ▲	
05	1	2 ▲		3 ▲	4 ▲		5 ▲	6 ▲	
06	1 ▲	2 ▲		3 ▲	4 ▲		5 ▲	6 ▲	
07	1 ▲	2 ▲		3 ▲	4 ▲		5 ▲	6 ▲	
08	1 ▲	2 ▲		3 ▲	4 ▲		5 ▲	6 ▲	
09	1 ▲	2 ▲		3 ▲	4 ▲		5 ▲	6 ▲	
10	1 ▲	2 ▲		3 ▲	4 ▲		5 ▲	6 ▲	
11	1 ▲	2 ▲		3 ▲	4 ▲		5 ▲	6 ▲	
12	1 ▲	2 ▲		3 ▲	4 ▲		5 ▲	6 ▲	
13	1 ▲	2 ▲		3 ▲	4 ▲		5 ▲	6 ▲	
14	1 ▲	2 ▲		3 ▲	4 ▲		5 ▲	6 ▲	
15	1 ▲	2 ▲		3 ▲	4 ▲		5 ▲	6 ▲	

(99) _____ : Total Number of Analyses Processed During Audit Period:

▲ Denotes Decimal Point Alignment

_____ (Signature of Auditor) (Date)

_____ (Signature of Supervisor) (Date)

SEND COMPLETED FORM TO:
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Environmental Monitoring and Support Laboratory
U.S. Environmental Protection Agency
Research Triangle Park, N.C. 27711

Figure 3. NO_2 form, performance audit data.

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7. Air Quality Standards, Quarterly Reporting of Data. Federal Register. 38:21, February 1, 1973.

Code Table 1. AGENCY TYPE

A	EPA group responsible for atmospheric surveillance
B	EPA group responsible for meteorological activity
C	EPA group responsible for effects research
D	EPA group responsible for atmospheric research
E	EPA group responsible for abatement activity
F	State agency
G	County agency
H	City agency
I	District agency
J	Private
K	Institution (university, college, etc.)
L	Military
M	International agency
N	Other Federal nonmilitary agencies
O-Y	Open for future expansion
Z	Other

Code Table 2. PROJECT CLASSIFICATIONS

Long-term surveillance codes	
01	Population-oriented surveillance
02	Source-oriented ambient surveillance
03	Background surveillance
Short-term surveillance codes	
04	Complaint investigation
05	Special studies
06	Episode monitoring
07-99	For Federal networks and future expansion
08	Precipitation study
10	CAMP
QA	Quality Assurance

APPENDIX A

SAROAD STATE CODES

Alabama	01
Alaska	02
Arizona	03
Arkansas	04
California	05
Colorado	06
Connecticut	07
Delaware	08
District of Columbia	09
Florida	10
Georgia	11
Hawaii	12
Idaho	13
Illinois	14
Indiana	15
Iowa	16
Kansas	17
Kentucky	18
Louisiana	19
Maine	20
Maryland	21
Massachusetts	22
Michigan	23
Minnesota	24
Mississippi	25
Missouri	26
Montana	27
Nebraska	28
Nevada	29
New Hampshire	30
New Jersey	31
New Mexico	32
New York	33
North Carolina	34
North Dakota	35
Ohio	36
Oklahoma	37
Oregon	38
Pennsylvania	39
Puerto Rico	40
Rhode Island	41
South Carolina	42
South Dakota	43
Tennessee	44
Texas	45
Utah	46
Vermont	47
Virginia	48
Washington	49
West Virginia	50
Wisconsin	51
Wyoming	52

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA-600/4-76-006	2.	3. RECIPIENT'S ACCESSION NO.
4. TITLE AND SUBTITLE CODING MANUAL FOR THE QUALITY ASSURANCE PERFORMANCE AUDIT FOR AEROMETRIC DATA		5. REPORT DATE January 1976
		6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) Raymond C. Rhodes, Donald H. Fair		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS Environmental Monitoring and Support Laboratory, Environmental Research Center, Environmental Protection Agency, Research Triangle Park, N.C. 27711		10. PROGRAM ELEMENT NO. 1HD621
		11. CONTRACT/GRANT NO.
12. SPONSORING AGENCY NAME AND ADDRESS Environmental Monitoring and Support Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711		13. TYPE OF REPORT AND PERIOD COVERED Inhouse final
		14. SPONSORING AGENCY CODE EPA-ORD

15. SUPPLEMENTARY NOTES

16. ABSTRACT

Appendix A of Guideline Document OAQPS 1.2-020, "Guidance for Decentralization and Continued Operation of the NASN," provided instructions for performing quality assurance performance audits for the National Air Surveillance Network. This coding manual furnishes detailed coding instructions to those who perform the audits and record the data for transmittal to EPA.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
quality assurance performance evaluation monitors air pollution	performance audits NASN	13B 14B

18. DISTRIBUTION STATEMENT Release unlimited	19. SECURITY CLASS *(This Report)* Release unlimited	21. NO. OF PAGES 21
	20. SECURITY CLASS *(This page)* Release unlimited	22. PRICE

EPA Form 2220-1 (9-73)