



TECHNICAL SERVICES DIVISION
QUALITY ASSURANCE PROJECT PLAN

MET SOP 507
BAROMETRIC PRESSURE

REVISION 507.1.00 8/29/2007

Dick Duker, Manager
MAQ Section

Mark Stoelting, QA Officer
Technical Services Division

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
939 ELLIS STREET
SAN FRANCISCO, CA 94109

STANDARD OPERATING PROCEDURE
BAAQMD TECHNICAL SERVICES DIVISION

BAROMETRIC PRESSURE AUDIT PROCEDURES

AUGUST 29, 2007

TABLE OF CONTENTS

INTRODUCTION2
GENERAL OPERATING PROCEDURES2
FIGURE 1: DRUCK RPT-410 SILICONE PRESSURE TRANSDUCER.....3
FIGURE 2: DRUCK DPI-705 DIGITAL PRESSURE INDICATOR3
AUDIT EQUIPMENT3
AUDIT PROCEDURES4
PREVENTATIVE MAINTENANCE5
CALIBRATION AND CERTIFICATION PROCEDURES.....5
AUTHORS, REVISIONS, AND APPROVALS5
REFERENCES5
APPENDIX A: BAAQMD AUDIT RECORD6

INTRODUCTION

The barometric pressure on a given surface is the force per unit area exerted by virtue of the weight of the atmosphere above. The pressure is thus equal to the weight of a vertical column of air above a horizontal projection of the surface, extending to the outer limit of the atmosphere. Barometric pressure measurements can be used in modeling and can be used to correct an ambient measurement to standard conditions (25°C and 760 millimeters of mercury). BAAQMD station barometers are located inside the logger enclosure and are audited quarterly with a handheld pressure sensor.

GENERAL OPERATING PROCEDURES

The station barometric pressure sensor BAAQMD uses is the Druck RPT-410 Silicone Pressure Transducer (Figure 1). Its measurement range is 600 – 1100 mb and it is accurate to within ± 0.5 mb. The audit barometer is a Druck DPI-705 Digital Pressure Indicator (Figure 2). The DPI-705 has a display resolution of 0.1 mb and is accurate to within 0.1% of *full scale* pressure. *Full scale* pressure is set at the factory to 30 psi (2069 mb), so the accuracy is within 2 mb. The Environmental Protection Agency *Quality Assurance Handbook for Air Pollution Measurements, Volume IV, Meteorological Measurements* recommend a measurement accuracy of within 3 mb. During an audit, a single-point measurement of the station and audit barometer is compared. As a

preventive measure, the program multiplier should be adjusted if the difference is greater than ± 2 mb.



Figure 1:
Druck RPT-410 Silicone Pressure Transducer

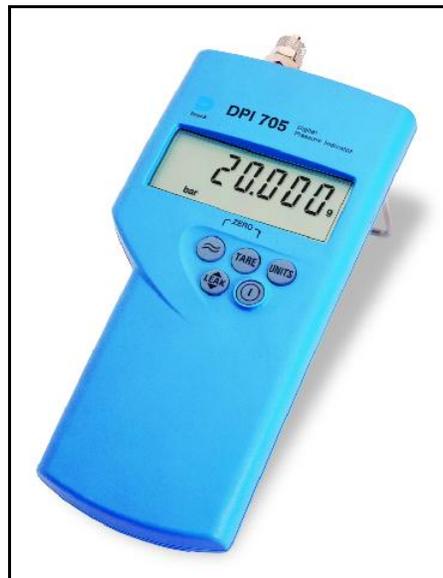


Figure 2:
Druck DPI-705 Digital Pressure Indicator

AUDIT EQUIPMENT

1. Druck DPI-705 Digital Pressure Indicator.
2. Barometric Pressure Audit Worksheet.

AUDIT PROCEDURES

1. Power on the Druck DPI-705 Digital Pressure Indicator. Press *Units* to select millibars (mb). The ambient pressure should be displayed.
2. Plug the CR10KD Keypad Display into the 9-pin socket on the CR10 wiring panel (a CR10X may also be used).
3. Display pressure on the CR10KD. Press *6 and A repeatedly to scroll to input location 14 where pressure should be displayed in millibars (mb).
4. Record the station and audit pressure on the audit worksheet.
5. If station and audit pressure differences exceed ± 2 mb, adjust the *pressure multiplier*:
 - a. Identify the instruction that measures pressure in the LoggerNet .CSI file. An example of this instruction is shown below. The *instruction header* on the first line consists of the *instruction number* (21) to the left, and *instruction code* (P27) to the right. The multiplier (1000) is *parameter 7*.
Note: The instruction numbers may vary by program, but the instruction code and location of the multiplier will not.

21: Period Average (SE) (P27)

1: 1 Reps

2: 14 150 kHz Max Freq @ 2 V Peak to Peak, Freq Output

3: 10 SE Channel

4: 10 No. of Cycles

5: 5 Timeout (0.01 sec units)

6: 16 Loc [Press]

7: **1000 Mult**

8: 0.0 Offset

- b. Once the instruction in the .CSI file is found, note the *instruction number*.
- c. At the CR10KD keypad, key in *C1955A to disable security, then *1 to enter program area. Now, key in the *instruction number* and press A repeatedly to advance to parameter 7 to display the multiplier. Record the multiplier on the audit sheet.
- d. If the station pressure is reading lower than the audit pressure, raise the multiplier. If the station pressure is reading higher, lower the multiplier. To change the multiplier, key in the new desired value (press *D* for decimal), press A to enter, then *0 to re-compile the program.

- e. Return to input location 14 on the CR10KD (step 3)
- f. Repeat steps (d) – (e) as necessary with different multiplier values until the pressure difference is within ± 3 mb.
- g. Record the final multiplier value on the audit worksheet.

PREVENTATIVE MAINTENANCE

1. Replace the batteries in the Druck DPI-705 with 3 AA alkaline cells when the *battery* symbol appears on the display.
2. Clean the DPI-705 instrument case with a moist cloth.

CALIBRATION AND CERTIFICATION

The Druck DPI-705 is calibrated annually against a Druck DPI-740 Precision Pressure Indicator from 600 – 800 mmHg (798 – 1064 mb) in increments of 25 mmHg (33.25 mb).

The Druck DPI-740 is calibrated annually at the factory. It is accurate to within 0.02% of *full scale* pressure. *Full scale* pressure is set at the factory to 40 inHg (1355 mb), so the accuracy is within ± 0.3 mb.

AUTHORS, REVISIONS, AND APPROVALS

August, 2007 (Original Version)

Author: Jiawei Toh, Air Quality Instrument Specialist I

Approved: Dick Duker, Meteorology and Quality Assurance Manager

REFERENCES

1. State of California Air Resources Board. August 2002. *Air Monitoring Quality Assurance Volume V: Audit Procedures for Air Quality Monitoring*. Appendix S, Performance Audit Procedures for Meteorological Sensors.

<http://www.arb.ca.gov/aaqm/qmosqual/qamanual/vol5/v5apxs.pdf>

2. US Environmental Protection Agency. October 2006. *Air Pollution Handbook For Air Pollution Measurement Systems Volume IV: Meteorological Measurements Version 1.0 (Draft)*. Section 7.7.

<http://www.epa.gov/ttn/amtic/files/ambient/met/draft-volume-4.pdf>

APPENDIX A

BAAQMD AUDIT RECORD

PRESSURE AUDIT WORKSHEET

BAAQMD AUDIT RECORD

Site Name _____

Auditor _____

Date __/__/__

Start Time _____(pst)

Finish Time _____(pst)

=====

PRESSURE SENSOR

Press Sensor Mfg	<u>Vaisala</u>
Model No.	<u>CS105</u>
Serial Number	_____

Last Calibration Date _____

The standard calibration sensor used is a Druck DPI-705 Digital Pressure Indicator.

Standard BP

Station BP

Diff.

Results: Pass/Fail

** Tolerance : ± 3 mb

COMMENTS
