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INFORMATION RELEASE REQUEST

0031532

Reference: WHC-CM-3-4

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Information conforms to all applicable requirements. The above information is certified to be correct.

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- Project or program manager concurs with the issuance of this report.
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- If a journal article, the reference style agrees with guidance from the client or journal publisher.
- Contributions from authors of other organizations indicated in the comment section of this form.
- Document is responsive to the client's scope of work.
- Client approved this for release.
- Document reports or reflects quality technical work.
- Scientific methodology used is logical and reasonable.
- Inferences and conclusions are soundly based.

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Indicated at the bottom of the comment section of this form that General Counsel's office should review this document with particular attention to:

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- Justification for release of information.

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## 200 AREA CALIBRATION PROCEDURES

- PSCP-3-002 MAINTENANCE ENGINEERING SERVICES CALIBRATION PROCEDURE EBERLINE BETA AIR MONITOR, MODELS AMS-3, AMS-3A AND 700300
- PSCP-4-006 MAINTENANCE ENGINEERING SERVICES CALIBRATION PROCEDURE DWYER MAGNEHELIC DIFFERENTIAL PRESSURE GAUGE SERIES 200 AND CAPSEHELIC DIFFERENTIAL PRESSURE SERIES 4000
- PSCP-4-007 MAINTENANCE ENGINEERING SERVICES CALIBRATION PROCEDURE ROCKWELL TYPE GAS METER
- PSCP-4-091 MAINTENANCE ENGINEERING SERVICES CALIBRATION PROCEDURE PRESSURE AND VACUUM GAUGE
- PSCP-6-029 MAINTENANCE ENGINEERING SERVICES CALIBRATION PROCEDURE CHEM-TEC ADJUSTABLE FLOW SWITCH MODEL 500
- PSCP-7-001 MAINTENANCE ENGINEERING SERVICES CALIBRATION PROCEDURE AIR ROTAMETER

## 200 AREA GENERIC STACK RADIONUCLIDE SAMPLING SYSTEM

### RECORD SAMPLER

Filter: Gelman Sciences Versapor 3000 - Support Membrane

### ROTAMETER

Make/Model: DWYER/RMC-103PF  
Scale: 10" SCALE, 20 - 200 SCFM  
Accuracy:  $\pm 10\%$  AT 2.2 SCFM

### GASMETER OR TOTALIZER

Make/Model: ROCKWELL MR-9, temperature corrected  
Accuracy:  $\pm 10\%$  AT 2.2 SCFM

### PRESSURE OR VACUUM GAUGE

Make/Model: MARSH #J4805  
Scale: 30" Hg  
Accuracy:  $\pm 10\%$  of full scale

### FLOW SWITCH

Make/Model: CHEM-TEC EQUIP CO MODEL 500-316-BP OR 500-B-BP

### FLOW REGULATOR

Make/Model: EBERLINE 10552-CO2 RAP-1

### PUMP

Make/Model: GAST MODEL NO. 0822-V103-G271X

### TIMER

Make/Model: CRAMER 10083

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Other: W. J. Schildknecht, Manager 03/01/91  
Procedure Development & Control  
Maintenance Engineering

Signatures for approval and validation as listed above are recorded in this procedure's record file.

Concurrence and approval to make other than minor changes to this procedure must be obtained from the original reviewers and approval authority (organizations) listed above.

| Revision Bars found in this procedure (when applicable) indicate field changes and will be incorporated into the next revision.

This procedure is due for periodic review 5 years from release date of last revision or prior to use.



CHANGE RECORD

Change Number	Date	Change Document	Page(s)	Description
Rev. 5	03/01/91	N/A	A11	<p>Added M&amp;TE standard statement beginning Section 5.0.            Changed Step 5.2.            Step Order Section 5.0.            Placing M&amp;TE equipment first.            Renumbered Section 5.0.            Changed Steps 6.1, Step 6.2.            Deleted Step 6.5.            Added Note after Step 7.1.3.            Changed Step 7.2.3, 7.2.4.            Deleted Step 7.2.5, 7.3.1.            Changed Steps 7.3.2, 7.3.3, 7,5,13, 7.5.17            Renumbered Section 7.3.            Changed Steps 7.4.1, Step 7.4.2.            Added Note C before Step 7.5.1.            Added Steps 7.5.1, 7.5.2            7.8.6.            Deleted Step 7.9.1.            Added Step 7.9.1. (new)            Renumbered Step 7.9.2.            Changed Step 7.9.3.            Moved Note from before Step 7.9.4 to before Step 7.9.2.            Added Step 7.9.8, 8.1.            Renumbered Section 8.0.            Renumbered Section 9.0.            Changed New Figure 1, Step 7.10.1, 7.10.3, 7.10.7.            Changed Figure 1</p>
[A]	07/17/92	2U-92-1014	4	<p>Revised Step 5.8 by moving Co 60 10 to 100 mr/hr gamma source to make a new 5.9.            Renumbered old Steps 5.9, 5.10 &amp; 5.11.</p>

## 1.0 PURPOSE

This procedure provides a safe and uniform method for calibrating and optimizing the Beta Continuous Air Monitor (CAM) units.

## 2.0 REFERENCES

- 2.1 Eberline Model AMS-3, Beta Air Monitor Technical Manual, CVI #204100-001.
- 2.2 Maintenance Procedure 7-GN-034, "Procedure to Modify Eberline AMS-3 Continuous Air Monitors".
- 2.3 WHC-CM-4-15, Radiation Work Requirements and Permits Manual.

## 3.0 PERSONNEL REQUIREMENTS

- 3.1 Instrument Craftsman (IC).
- 3.2 Health Physics Technician (HPT), as required.
- 3.3 Operations Personnel (OP), as required.

## 4.0 PRECAUTIONS AND LIMITATIONS

- 4.1 Possibility for surface contamination exists, have HPT survey equipment prior to beginning of work.
- 4.2 All calibrated test equipment shall have current calibration stickers.
- 4.3 For units equipped with a chart recorder, all readings are the algebraic average of the indications on the chart paper.
- 4.4 Comply with applicable Radiation Work Permits for work area and handling of radiation sources.
- 4.5 In the event this procedure cannot be performed as written, stop work. Return equipment to safe configuration and inform Maintenance Supervisor that the procedure cannot be performed as written, and a revision or Field Change Notice is required.

## 5.0 TOOLS, EQUIPMENT AND MATERIALS

### NOTE

All M&TE used to perform this procedure shall meet the following requirements:

- o Be within its current calibration cycle, as evidenced by an affixed calibration label.
- o Be capable of desired range, with a minimum accuracy four times greater than the instrument output tolerance specified on the data sheet.

- 5.1 Oscilloscope, 4 MHz minimum band width.
- 5.2 Two pulse generators, (1-50 microsec, 600mV to 1V pulse).
- 5.3 Two digital multimeters (DMM) as needed.
- 5.4 Flow meters or rotameters (0 to 3 scfm minimum or 85 liters per minute [LPM] minimum) as required.
- 5.5 Vacuum gauge or digital manometer 0 to 15" of Hg minimum.
- 5.6 Stop watch.
- 5.7 Resistor - 500 to 1000 ohms 1/2 W minimum as required.
- 5.8 National Institute of Standards and Technology (NIST) traceable 47 mm plated sources of the following types:
  - SrY 90    10,000 to 40,000 dpm (4.5E-3 uCi to 1.8E-2 uCi)
  - Tc 99    11,000 to 50,000 dpm (3.96E-3 uCi to 2.25E-2 uCi)
  - Cs 137    11,000 to 50,000 dpm (3.96E-3 uCi to 2.25E-2 uCi)
  - Cs 137    0.4 to 2.0 uCi Beta-Gamma source.
  - Co 60    1.0  $\pm$ 0.2 uCi Beta-Gamma source. (Use only until the .4 to 2 uCi <sup>137</sup>Cs is available).
- 5.9 Co 60    10 to 100 mR/hr (V-Block, stick, or block) gamma source as verified by a contact measurement with a calibrated ion chamber.
- 5.10 Vacuum source.

- | 5.11 Vacuum grease.
- | 5.12 Preventive Maintenance Procedure System or Plant Instrumentation Surveillance Calibration and Evaluation System (PISCES) Data Sheet.

## 6.0 PREREQUISITES

- | 6.1 7-GN-034, Section 7.1, "High Voltage Switch Disable Mod", should be completed before performing this procedure.
- | 6.2 Verify vacuum relief valve is located on exhaust side of CAM rotameter. If not, then perform 7-GN-034, Section 7.2, "Relief Valve Location Mod".
- | 6.3 Record as-found values before adjusting any settings. If as-found values are out of tolerance notify Operations Management as applicable.
- 6.4 A Health Physics Technician shall perform a survey of equipment before beginning maintenance and of any equipment or component prior to removal from its installed location where potential for radiological contamination exists.

## 7.0 INSTRUCTIONS

### 7.1 Preliminary Check and Inspection

- 7.1.1 Remove cover and replace screws in instrument case.
- 7.1.2 If needed write serial number on inside of instrument and cover.
- 7.1.3 Check for physical damage, loose screws and parts.

NOTE

- o Pig may be removed from CAM for those locations where CAM must be lifted awkwardly or carried on stairs or walkways where undue strain would be experienced by personnel.
- o If the pig is removed and left in field location, then a spare pig must be available in the shop to complete this calibration.

7.1.4 During disassembly of detectors and flow chamber, have HPT survey for contamination and have Operations decontaminate unit as needed before proceeding with calibration procedure.

7.1.5 Check, clean, and lube "O" rings on filter unit and on flow chamber. Clean "O" ring grooves and replace "O" rings if defective.

7.1.6 Clean vacuum relief valve.

7.1.7 Reassemble detectors and flow chamber in unit.

NOTE

Ensure that spacer pins are in position in flow chamber.

7.1.8 Reinstall filter unit with clean filter paper and filter support.

7.1.9 Clean and service chart recorder as needed using appropriate manufacturer's manual.

NOTE

If there is no built-in chart recorder, write N/A on the "Recorder clean and oil" row" item of the PISCES Data Sheet, if applicable.

7.2     Calibrate Rotameter

7.2.1    Disconnect tubing from sample chamber outlet.

7.2.2    Connect M&TE equipment to CAM rotameter and vacuum source per Figure 1 as required.

7.2.3    Set flow until CAM rotameter indicates 30 LPM. Verify M&TE flowmeter indicates between 27 to 33 lpm.

7.2.4    Set flow until CAM rotameter indicates 60 LPM. Verify M&TE flowmeter indicates between 54 to 66 lpm.

7.3     Calibrate Vacuum Relief Valve

7.3.1    Set flow to approximately 60 lpm on M&TE flowmeter.

**NOTE**

One cubic foot per minute equals 28.32 LPM.

7.3.2    Block inlet to M&TE flowmeter and adjust vacuum relief valve until 11 to 13" Hg is measured on vacuum gauge/manometer.

7.3.3    Remove M&TE equipment installed as shown on Figure 1.

7.3.4    Reconnect tubing disconnected in Step 7.2.1.

#### 7.4     Leak Check

NOTE

Verify that Steps 7.1.7 and 7.1.8 have been performed.

7.4.1     Set flow for approximately 60 LPM on CAM rotameter.

7.4.2     SLOWLY block inlet to the CAM and verify no flow is indicated through CAM rotameter. IF flow is indicated, check for and repair any leaks found in "O" rings or connections and repeat Section 7.4, Leak Check.

#### 7.5     Count-Rate Meter Calibration

NOTE

- a.     There may be a slight difference between meter scale and the printed trace on the chart paper. The following checkout procedure must be used to calibrate the chart as the primary readout. IF a difference does exist a notation should be made on the maintenance records and a white tag shall be affixed to the top of the unit with the difference noted.
- b.     For units equipped with a remote recorder or no recorder, the recorder will be calibrated separately. Use the local meter scale for indication and check the output from CAM to recorder for proper output levels.
- c.     If CAM has been modified per 7-GN-034, Section 7.1, "High Voltage Switch Mod", then skip Steps 7.5.1 and 7.5.2 and go to Step 7.5.3.

7.5.1     Connect a short jumper from the positive side of R301 to the positive side of C301. See Figures 3 and 4.

- | 7.5.2    Connect a jumper across the 900 V VR tube leads, V301. This disables  
+    the high voltage supply so that background counts from the GM tube  
|    will not affect Calibration. Go to Step 7.5.4.
- 7.5.3    Set switch on rear of CAM behind the recorder to ON (up) position.  
This disables the high voltage supply so that background counts from  
the GM tube will not affect calibration.
- 7.5.4    Turn power switch off.
- 7.5.5    Set mechanical ZERO of meter.
- 7.5.6    Turn power switch on.
- 7.5.7    Connect a pulse generator to the MAIN SIGNAL connector on the back  
and adjust output for a negative pulse width, greater than  
1 microsecond, but not more than 50 microsecond.
- 7.5.8    Set pulse amplitude to 600 mV not to exceed 1 Volt.
- 7.5.9    Set pulse generator frequency to  $100\text{ K} \pm 1,000$  cpm.
- 7.5.10   Connect an oscilloscope to the output of A5B-Pin 8 test point, same  
point as left side of R15. See Figure 2.
- 7.5.11   Adjust the pulse width, using the front panel pulse width control R13  
Figure 2, for  $10 \pm 0.5$  microsecond.

NOTE

CAMS equipped with a 4 mA to 20 mA recorder output may require a 500 to 1000 ohm resistor in series with an ammeter connected across the recorder output terminal.

7.5.12 Set the pulse generator for  $100 \pm 10$  cpm.

7.5.13 For units equipped with recorder output, verify output is approximately 25% of recorder scale. Adjust as needed for CAMs with adjustment option.

7.5.14 Adjust the ZERO control R26, Figure 2, so that the readout indicates  $100 \text{ cpm} \pm 20\%$  of decade (80 - 120 cpm).

NOTE

It may take up to 10 min for the readout to stabilize. Instability and unusual length of time to stabilize should be noted on the maintenance records.

7.5.15 Set pulse generator output frequency for  $100 \text{ K} \pm 1,000$  cpm.

7.5.16 Adjust SPAN control R28 (Figure 2) until readout indicates 100 K cpm, full-scale.

7.5.17 For units equipped with recorder output verify output is approximately full-scale. Adjust as needed.

7.5.18 Repeat ZERO and SPAN steps above until no further adjustments are needed.

## 7.6 Subtraction Calibration

7.6.1 Connect Pulse Generator No. 1 to MAIN SIGNAL connector on the rear panel.

7.6.2 Connect Pulse Generator No. 2 to the SUBTRACTION SIGNAL connector on rear panel.

7.6.3 Adjust Pulse Generator No. 2 for an output pulse greater than 1 microsecond, less than 50 microsecond pulse width and 600 mV not to exceed 1 Volt in amplitude.

7.6.4 Turn the background subtraction switch OFF.

7.6.5 Adjust Pulse Generator No. 1 for an output of 100 K  $\pm$ 1,000 cpm.

7.6.6 Readout should indicate 100 K cpm (full-scale).

7.6.7 Set Pulse Generator No. 2 for 80 K  $\pm$ 800 cpm.

### NOTE

Reading should not change.

7.6.8 Turn the background subtraction switch ON.

! 7.6.9 Adjust the subtraction adjustment control, R14, Figure 2, for a readout  
! indication of 20 K  $\pm$  20% of decade (16K - 24K).

## 7.7 Alarm Delay

7.7.1 Turn alarm set control fully clockwise.

7.7.2 Produce a meter reading of greater than 100 cpm.

7.7.3 Turn the **alarm set** control fully counterclockwise and time the delay until alarm occurs.

7.7.4 Adjust the delay using R-33, Figure 2, on the logic board to produce the desired delay, nominal is 10 to 15 seconds to prevent transient conditions from causing a false alarm. Maximum delay is 30 sec.

## 7.8 External Alarms

7.8.1 Put the instrument into alarm condition by rotating the **alarm set** control fully counterclockwise.

7.8.2 Verify that the high radiation alarm relay contacts C. and N.C. open.

7.8.3 Verify operation of the Acknowledge Switch to turn the bell off after the alarm has tripped.

7.8.4 Remove the pulse generators.

7.8.5 Verify that Fail Alarm relay contacts C. and N.C. open, the green COUNTING LED is OFF and the red FAIL LED is ON. This may take 30 to 60 seconds to occur.

7.8.6 Remove the jumpers if installed in Step 7.5.1 and 7.5.2 from the HV supply or set switch on rear of CAM behind recorder to OFF (down) position to enable HV supply.

7.8.7 The Red FAIL light must be OFF and the Green COUNTING must be ON.

7.8.8 If equipped with a flow switch, restore vacuum and flow to the unit and verify the flow switch contacts are closed.

7.8.9 Remove vacuum source. If unit is equipped with flow switch, verify flow switch contacts open.

7.9 GM Tube Quality Check

7.9.1 Turn the background subtraction switch off.

NOTE

The following step will require HPT assistance.

7.9.2 Place a gamma source (10 to 100 mR/hr Co 60) near the detector on the top of the CAM behind the air inlet pipe or on the side at the bottom adjacent to the inlet pipe.

7.9.3 Observe for 1 minute the reading indicated on CAM recorder/indicator or remote output (with DMM).

7.9.4 Turn the background subtraction switch on.

7.9.5 Observe for 30 sec to 1 min the reading indicated on CAM recorder/indicator or remote output (with DMM).

7.9.6 Verify the background subtraction circuit causes a reading of less than that observed in Step 7.9.3.

7.9.7 Turn the background subtraction switch OFF.

7.9.8 Remove Gamma source.

7.9.9 Remove the filter holder plug and place a beta-gamma source of approximately .4 to 2 microcuries near the detector.

NOTE

Use of 1 microcurie  $\text{Co}^{60}$  source is permissible until new .4 to 2 microcurie  $\text{Cs}^{137}$  is available

7.9.10 Observe the count rate meter. It should go off-scale on the high side and remain there until the source is removed. IF NOT, the detector is susceptible to saturating and must be replaced.

7.10 Radiological Calibration

7.10.1 Remove holder from pig.

7.10.2 Place plated metal  $^{90}\text{Sr}$  source in holder facing the detector.

7.10.3 Place holder in pig.

7.10.4 Turn background subtraction switch ON

7.10.5 Observe the count rate indicated for five minutes and calculate the counting efficiency using the following equation:

$$\text{Counting Efficiency (\%)} = \frac{\text{cpm observed} \times 100}{\text{Source disintegrations/min}}$$

7.10.6 The counting efficiency for  $^{90}\text{Sr}$  must be at least 15%. IF NOT the instrument needs repair.

7.10.7 Repeat Steps 7.10.1 through 7.10.5 using  $^{99}\text{Tc}$  calibrated source (Efficiencies must be at least 10%).

7.10.8 Record the counting efficiencies observed on the maintenance record and on a sticker attached to the front of the instrument. Also record the source serial numbers on the maintenance record.

| 7.10.9 Remove all radiological sources from CAM.

8.0 **RESTORATION**

| 8.1 Reinstall pig if previously removed while at field location.

| 8.2 Inspect air inlet to verify that the screen filter has been removed from  
| CAMs that are installed in process buildings (controlled environment).

**NOTE**

Screens are to remain in CAMs that are installed in an uncontrolled environment. Check to assure screen is present and functional.

| 8.3 Reinstall the instrument cover and screws.

9.0 TESTING AND ACCEPTANCE

- | 9.1 If pig was removed in field then perform Steps 7.10.1 through 7.10.5 to ensure detector integrity.
- | 9.2 Connect calibrated flow meter to inlet of CAM.
- | 9.3 Set CAM rotameter flow to 60 lpm. Verify that M&TE rotameter indicates between 51 to 69 lpm.
- | 9.4 If applicable, place unit into alarm condition and verify alarm bell and rotating beacon operate (Some applications may have modified units, these should be noted on the PISCES Data Sheet).
- | 9.5 Attach calibration sticker to unit.

10.0 DISPOSITION

- 10.1 Input completed Data Sheets into PISCES Control System.
- 10.2 Report deficiencies or cause of early failure to Maintenance Manager for corrective action.
- 10.3 Inform Operations management and Maintenance management that procedure is complete.
- 10.4 Return Data Sheet or other test data to Maintenance Manager.
- 10.5 Notify Health Physics when the CAM is placed back in service and/or of any deficiencies.

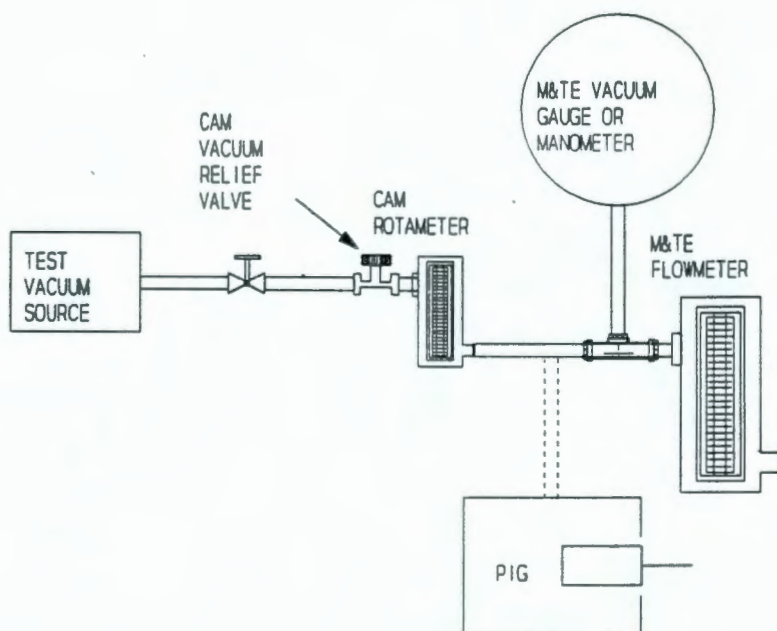
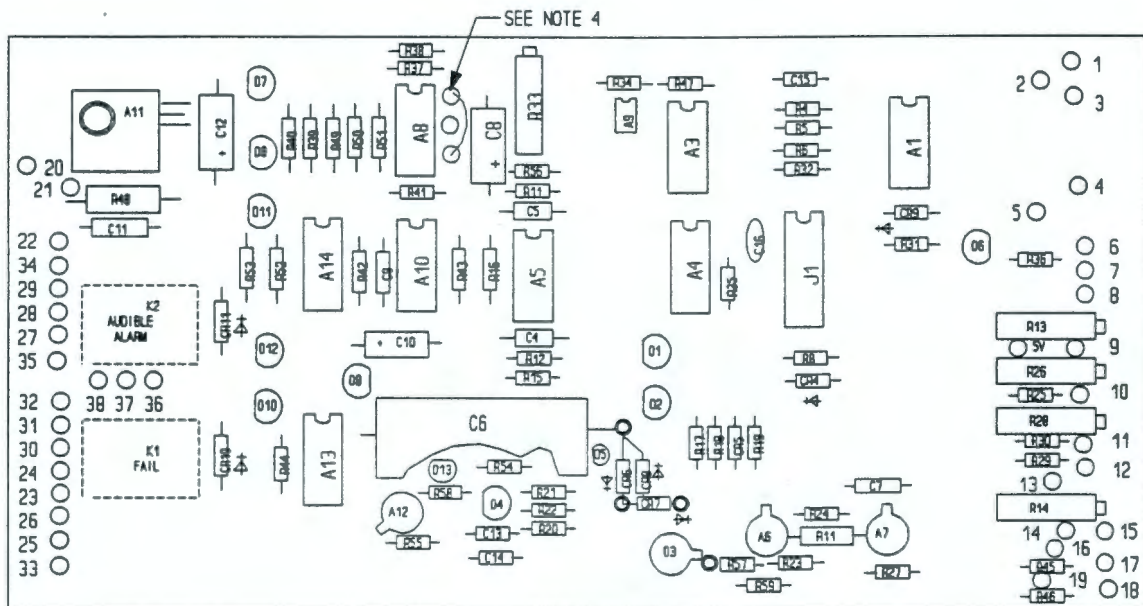


FIGURE 1. FLOWMETER/MANOMETER EQUIPMENT SETUP.

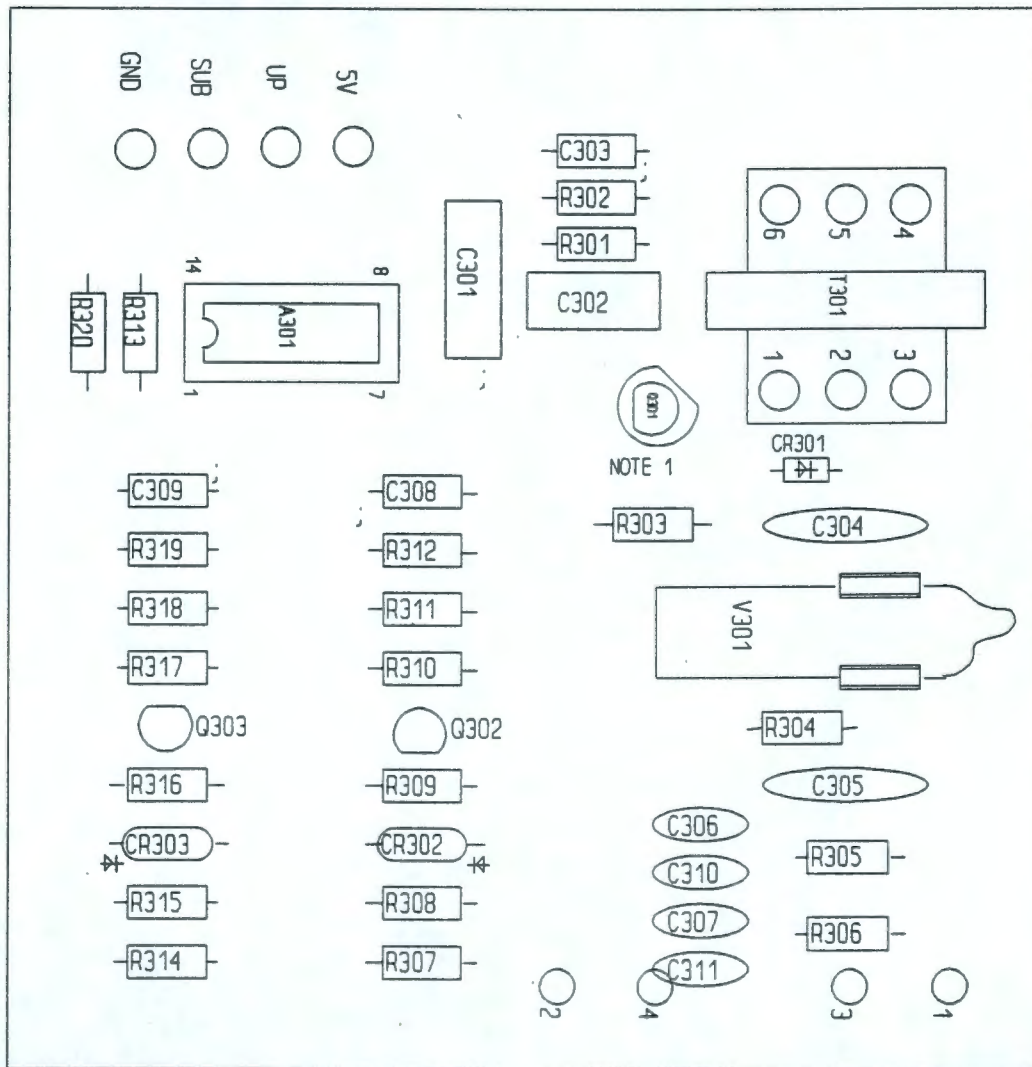


NOTES:

1. K1 AND K2 ARE IN SOCKETS ON THE REVERSE SIDE OF THE BOARD.
2. NUMBERED TERMINALS ARE SCHEMATIC REFERENCED WIRE CONNECTIONS.
3. A13 AND A14 ARE USED FOR THE OPTIONAL COMPUTER OUTPUT.
4. THE JUMPER SHOWN PROVIDES FOR THE ALARM RELAYS TO PULL IN ON ALARM. FOR DROP OUT ON ALARM (FAIL SAFE) JUMPER THE UPPER TWO TERMINALS SHOWN.

FIGURE 2. COMPONENT LAYOUT, LOGIC BOARD.

FIGURE 3. HV-TRIGGER BOARD COMPONENT LAYOUT.



NOTES:  
 1. Q301 IS AVAILABLE IN TWO CASE STYLES. BOTH ARE SHOWN.



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MAINTENANCE ENGINEERING SERVICES  
CALIBRATION PROCEDURE  
DWYER MAGNEHELIC DIFFERENTIAL PRESSURE GAUGE SERIES 2000  
AND CAPSEHELIC DIFFERENTIAL PRESSURE SERIES 4000  
Impact Level 3

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PSCP-4-006  
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Page 1 of 6

Prepared By: Signed by R. A. Chiavaras 6/5/91  
R. A. Chiavaras, Engineer, Procedure Development and DATE  
Control Maintenance Engineering

Signed by R. A. Lee for L. A. Powell 6/5/91  
L. A. Powell, CCA/COG, Field Maintenance Engineering North DATE

Signed by R. L. Meador 6/5/91  
R. L. Meador, Quality Assurance DATE

Signed by T. Nishioka 6/5/91  
Tadao Nishioka, Safety DATE

Signed by A. D. Lowe 6/5/91  
A. D. Lowe, Manager, T-Plant and Solid Waste Maintenance DATE

Signed by K. C. Douka for 6/5/91  
W. J. Schildknecht, Manager, Procedure Development and Control DATE  
Maintenance Engineering

Signed by G. A. Buel 6/5/91  
G. A. Buel, Engineer, Procedure Control, Procedure Development and DATE  
Control Maintenance Engineering

-----|

CHANGE RECORD

Change Level	Date	Change Document	Page(s)	Description
Revision or change	issue date	PAR #	affected page(s)	Step(s) and what was changed.
2			All	Title changed to reflect FCN 224-91. Also changed purpose on page 3
			4, 5	Changed appropriate sections of Step 7.0 to incorporate FCN 432-89 and FCN 444-89.

1.0 PURPOSE

This procedure provides a safe and uniform method of functionally testing Dwyer Magnehelic Differential Pressure Gauge Series 2000 and Capsehelic Differential Pressure Gauge Series 4000.

2.0 REFERENCES

- 2.1 WHC-CM-4-3, Industrial Safety Manual, Vol 1, Section TE, "Tools and Equipment", Standard G-1, "Lock and Tag" and Standard No. PP-7, "Personal Protective Equipment".
- 2.2 WHC-CM-4-15, Radiation Work Requirements and Permits, "8.0 Radiological Posting".
- 2.3 WHC-CM-8-2, 200 Area Support Services, Section 202, "Plant Instrumentation Surveillance, Calibration and Evaluation System" and Section 203, "Plant Instrumentation Calibration Labeling".
- 2.4 VI 0003128, Vendor Information.

3.0 PERSONNEL REQUIREMENTS

- 3.1 Instrument Craftsman (IC).
- 3.2 Health Physics Technician (HPT), as required.
- 3.3 Operations Personnel (OP), as required.

4.0 PRECAUTIONS AND LIMITATIONS

- 4.1 Inform Operations management and Maintenance management **IMMEDIATELY** if problems are encountered with this calibration.
- 4.2 If procedure cannot be performed as written, stop work. Return equipment to safe configuration and inform Maintenance Supervisor that procedure cannot be performed as written. Initiate a change as required.
- 4.3 Verify that all lock and tag or over-tagging requirements have been satisfied.

## 5.0 TOOLS, EQUIPMENT AND MATERIALS

### NOTE

All Measuring and Test Equipment (M&TE) used to perform this procedure shall meet the following requirements:

- o Be within current calibration cycle, as evidenced by an affixed calibration label.
- o Be capable of desired range, with an accuracy four times greater than the instrument output tolerance specified on the Data Sheet.

5.1 Digital manometer, or equivalent.

## 6.0 PREREQUISITES

- 6.1 Release from Operations management must be obtained prior to calibration of installed equipment/instrumentation.
- 6.2 Concurrence of Operations Management to disrupt signal for this check and possible adjustment(s). Obtain a signed release.
- 6.3 An HPT shall perform equipment survey prior to beginning maintenance or removal of any equipment or component from its installed location, where potential for radiological contamination exists.

## 7.0 INSTRUCTIONS

### 7.1 Record as-found Data

- 7.1.1 Remove gauge from service.
- 7.1.2 Connect manometer to high pressure input.

### NOTE

Refer to vendor information, if necessary, for location of high pressure connection.

7.1.3 Verify all connections are tight.

-----

- 7.1.4 Verify plastic cover is screwed down for as tight seal.
- 7.1.5 Apply the appropriate signal(s) as specified on the PISCES Data Sheet or on the face of the magnehelic, to check the gauge across its full range and record in as-found column.
- 7.1.6 If the instrument as-found outputs are within output tolerance range specified by PISCES Data Sheet and no adjustments are desired, then record as-found values in as-left column and proceed to Section 8.0, Restoration.
- 7.1.7 If the instrument as-found outputs are out of tolerance specified by PISCES Data Sheet and adjustments are required, then proceed to Section 7.2, Adjustment Section.
- 7.2 Zero Adjustment
- 7.2.1 With a 0% input signal, adjust ZERO adjustment located on gauge front.
- 7.2.2 Apply appropriate signal(s), as specified on PISCES Data Sheet, to check gauge across its full range.
- 7.2.3 If gauge responds appropriately, record as-left data on PISCES Data Sheet and proceed to Section 8.0.
- 7.2.4 IF an error is found, the gauge must be removed and a complete recalibration involving a partial disassembly should be performed. Consult vendor manual for disassembly instructions.
- 8.0 RESTORATION
- 8.1 Ensure all test equipment disconnected and removed.
- 8.2 Verify instrument/equipment returned to original configuration.
- 8.3 Apply calibration labels, if required, in accordance with provisions set forth in WHC-CM-8-2, Section 202 and Section 203.
- 9.0 TESTING AND ACCEPTANCE
- None.
-

10.0 DISPOSITION

- 10.1 Report any deficiencies and/or probable cause of early failure to the Maintenance Manager for corrective action.
- 10.2 Inform Operations management and Maintenance management that the calibration is complete.
- 10.3 Return Data Sheet to the Maintenance Manager.

Impact Level 4

Prepared By: Signed by S.A. Lammi-Brisbin 9/15/89  
S. A. Lammi-Brisbin, Engineer, Chemical Processing Maint.  
Engineering

Signed by D. D. Larson 9/27/89  
D. D. Larson, Manager, Chemical Processing Maint. Engineering

N/A  
Quality Assurance

N/A  
Safety

Signed by M. Young  
Process Engineer CCA/COG

Signed by A. R. Shearer 9/27/89  
Manager, Facility Maintenance

Signed by G. A. Stanton 9/28/89  
G. A. Stanton, Manager, Maintenance Engineering

Signed by G. A. Buel 9/29/89  
G. A. Buel, Procedure Coordinator, Maintenance Engineering Administration  
and Analysis



Impact Level 4

1.0 PURPOSE

This procedure provides a safe and uniform method of calibrating the ROCKWELL Type Gas Meter.

2.0 REFERENCES

- 2.1 Manufacturer's Information Manual, VI 0021754-002.
- 2.2 WHC-CM-4-15, Radiation Work Requirements and Permits, "8.0 Radiological Posting".
- 2.3 WHC-CM-4-3, Industrial Safety Manual, Vol. 1, "Safety Standards" and Vol. 2, "Safety Guides", Standard No. PP-7, "Personal Protective Equipment".

3.0 PERSONNEL REQUIREMENTS

- 3.1 Instrument Craftsman (IC).
- 3.2 Radiation Protection Technologist (RPT), as required.
- 3.3 Operations Personnel (OP), as required.

4.0 PRECAUTIONS AND LIMITATIONS

- 4.1 Inform Operations Management and Maintenance Management IMMEDIATELY if problems are encountered with this calibration.
- 4.2 In the event this procedure cannot be performed as written, stop work. Return equipment to a safe configuration and inform the Maintenance Supervisor that the procedure cannot be performed as written, and that a revision or Field Change Notice (FCN) is required.

! FCN 469-89

! 4.3 If the meter is found to be out of tolerance in Step 7.3 the meter should  
! be removed from service for benchtop repair/replacement. The calibration  
! adjustments listed in this procedure are associated with a benchtop  
! calibration and are not intended for field calibrations

5.0 TOOLS, EQUIPMENT AND MATERIALS

-----  
NOTE

All test equipment shall have a range and accuracy equal to or greater than the requirements listed on the PISCES Job Card.  
-----  
|-----|

Impact Level 4

FCN 234-91 (Pen and Ink)

~~5.1 Florator Test Kit, Series 700.~~

5.1 Certified Flow Measuring Instrument

5.2 Current calibration certification on item 5.1.

5.3 Calibration Record (i.e., PISCES Job Card).

6.0 PREREQUISITES

6.1 Release from Operations Management must be obtained prior to calibration of installed equipment/instrumentation.

6.2 Concurrence of Operations Management to disrupt signal for this check and possible subsequent adjustment(s). Obtain a signed release.

6.3 A Radiation Protection Technologist shall perform a survey of equipment before beginning maintenance and of any equipment or component prior to removal from its installed location, where potential for radiological contamination exists.

7.0 INSTRUCTIONS

NOTE

Tag the appropriate readout device with an OUT OF SERVICE tag prior to removing the instrument from service.

Record all required AS-FOUND values on the PISCES Job Card before making any changes or adjustments that could change these values.

FCN 234-91 (Pen and Ink)

~~IC 7.1 Connect the Florator Test Kit, or a suitable replacement, in series with the gas meter to be calibrated.~~

! IC 7.1 Certified Flow Measuring Instrument, or a suitable replacement, in series with the gas meter to be calibrated.

Impact Level 4

-----  
**NOTE**

IF a Florator Test Kit is not available, use a standard cfm rotameter. The conversion factor for a standard cfm rotameter is as follows:

cubic meters = (cubic feet/min.) X (0.02832) X (sample time in minutes)

-----

Impact Level 4

FCN 234-91 (Pen and Ink)

-----

NOTE

| Certified Flow Measuring Instrument, use a standard cfm rotameter. The  
conversion factor for a standard cfm rotameter is as follows:  
cubic meters = (cubic feet/min.) X (0.02832) X (sample time in minutes)

-----

FCN 402-89

~~7.2 Turn ON the supply rate to a known rate, and check for leaks; repair, as  
necessary.~~

| 7.2 Turn on the air flow at a known rate.

| 7.2.1 Calculate the time required to check the gas meter at the volumes  
specified by the PISCES Job Card, and at the calculated times, record  
the corresponding readings in the output as-found section of the job  
card.

FCN 402-89

-----

NOTE

| IF the instrument's as-found output values are within the tolerance range  
specified by the PISCES Job Card, THEN no calibration adjustments are required.  
Steps 7.3 through 7.9 may be skipped. Step 7.9.1 must be performed.

-----

7.3 Compare the gas meter reading to a standard reading for at least five  
minutes.

-----

NOTE

| IF the gas meter is not functioning, remove to the shop for repair.

-----

|-----|

Impact Level 4

IC 7.4 IF the gas meter and the standard are not within 5% of each other, proceed with Step 7.5. IF the meter and the standard are within 5%, skip to Step 7.10.

FCN 469-89

NOTE

IF the gas meter and the standard are not within 5% of each other on a field calibration the meter should be removed for benchtop calibration.

7.5 Remove the plate between the input and the output ports.

7.6 Loosen the two 3/8" nuts that are on the fixed shaft, and slide the collar.

7.7 Tighten the nuts on both sides of the collar.

7.8 Replace the cover and recheck the meter against the standard.

FCN 402-89

~~7.9 Repeat Steps 7.3 through 7.8 until readings are within tolerance; then, record the AS LEFT data.~~

7.9 Repeat Steps 7.3 through 7.8 until all readings are within tolerance.

7.9.1 Record the as-left calibration data on the PISCES Job Card.

7.10 Complete the Calibration Record, remove the standard from the system, return the gas meter to service, and remove the OUT OF SERVICE tag.

8.0 RESTORATION

8.1 Ensure that all test equipment has been disconnected and removed and that the instrument has been returned to its original configuration.

9.0 TESTING AND ACCEPTANCE

None.

10.0 DISPOSITION

10.1 Inform Operations Management and Maintenance Management that the calibration is complete.

10.2 Return PISCES Job Card to the Maintenance Manager.

10.3 Inform Operations Management and Maintenance Management **IMMEDIATELY** if there are any problems with calibration.

## FIELD CHANGE NOTICE

COGNIZANT MAINTENANCE ENGINEER <b>G. A. Culbertson</b> Signed by <b>G.A. Culbertson</b>	DATE <b>11/3/89</b>	TYPE OF CHANGE <input type="checkbox"/> MINOR FIELD CHANGE <input type="checkbox"/> ONE TIME CHANGE <input checked="" type="checkbox"/> FIELD CHANGE	CHANGE IMPACT LEVEL 1 ___ 2 ___ 3 ___ 4 ___	FIELD CHANGE NO. <b>402-89</b>
COGNIZANT MANAGER, MAINTENANCE ENGINEERING Signed by <b>G.A.Culbertson</b>	DATE <b>11/3/89</b>	IMPLEMENTING THIS CHANGE WILL REQUIRE OPERATOR ACTIONS TO MAKE EQUIPMENT AND PROCEDURES COMPATIBLE? YES ___ NO ___		
APPROVAL: MANAGER, MAINTENANCE ENGINEERING SERVICES Signed by <b>G.A.Culbertson for GAS</b>	DATE <b>11/3/89</b>	IS IMMEDIATE OPERATOR TRAINING REQUIRED UPON IMPLEMENTATION? YES ___ NO ___		PROCEDURE COORDINATOR, PDCME <b>G. A. Buel 11/6/89</b>
PROCEDURE NUMBER <b>PSCP-4-007</b>	PAGE NOS. <b>3,4</b>	REV. <b>1</b>	TITLE <b>Rockwell Type Gas Meter, Calibration Procedure</b>	
				CANCEL BY/DATE <b>Next Revision</b>

**BRIEF DESCRIPTION/JUSTIFICATION**

The following pen-and-ink field changes are to be incorporated per WHC-CM-8-2, Section 102.1, Rev. 1, Effective date 8/21/89.

**JUSTIFICATION:**

The procedure as written does not address collection of the AS-FOUND and AS-LEFT calibration data.

**DESCRIPTION:**

Page 3, Step 7.2, CHANGE to read: "Turn on the air flow at a know rate."

Page 3, ADD Step 7.2.1 as follows:

7.2.1 Calculate the time required to check the gas meter at the volumes specified by the PISCES job card, and at the calculated times, record the corresponding readins in the output AS-FOUND section of the job card.

-----  
**NOTE**

**IF** the instrument's AS-FOUND output values are within the tolerance range specified by the PISCES job card, **THEN** no calibration adjustments are required. Steps 7.3 through 7.9 may be skipped. Step 7.9.1 must be performed.

Page 4, CHANGE Step 7.9 tor ead, "Repeat Steps 7.3 through 7.8 until all readings are within tolerance."

Page 4, ADD Step 7.9.1, "Record the AS-LEFT calibration data on the PISCES Job Card."

APPROVAL, <u>QA (IMPACT LEVEL 1,2,3)</u> DATE	APPROVAL, <u>RADIOLOGICAL ENGINEERING</u> DATE	APPROVAL, _____ DATE
APPROVAL, <u>SAFETY (IMP LEV. 1,2,3)</u> DATE	APPROVAL, <u>ENVIRONMENTAL ENGINEER</u> DATE	APPROVAL, _____ DATE
APPROVAL, <u>PLANT/PROCESS ENGINEER</u> DATE	APPROVAL, _____ DATE	APPROVAL, _____ DATE
FIELD CHANGE INSERTED AT: DIST. BY/ DATE	FIELD CHANGE DATE INSERTED BY	DISTRIBUTION: BY: _____ DATE
DISTRIBUTION: _____ DATE	DISTRIBUTION: BY: _____ DATE	DISTRIBUTION: BY: _____ DATE
DISTRIBUTION: _____ DATE	DISTRIBUTION: BY: _____ DATE	DISTRIBUTION: BY: _____ DATE
DISTRIBUTION: _____ DATE	DISTRIBUTION: BY: _____ DATE	DISTRIBUTION: BY: _____ DATE
DISTRIBUTION: _____ DATE	DISTRIBUTION: BY: _____ DATE	DISTRIBUTION: BY: _____ DATE

IF YOU HAVE ANY QUESTIONS CONCERNING THIS FCN, PLEASE CONTACT THE PROCEDURE COORDINATOR AT 3-4605, MSIN S4-65

## FIELD CHANGE NOTICE

COGNIZANT MAINTENANCE ENGINEER F. P. Franklin F. P. Franklin	DATE 12/12/89 12/12/89	TYPE OF CHANGE <input type="checkbox"/> MINOR FIELD CHANGE <input type="checkbox"/> ONE TIME CHANGE <input checked="" type="checkbox"/> FIELD CHANGE	CHANGE IMPACT LEVEL 1__ 2__ 3__ 4__	FIELD CHANGE NO. 469-89
COGNIZANT MANAGER, MAINTENANCE ENGINEERING D. D. Larson	DATE 12/18/89	IMPLEMENTING THIS CHANGE WILL REQUIRE OPERATOR ACTIONS TO MAKE EQUIPMENT AND PROCEDURES COMPATIBLE? YES ___ NO ___		
APPROVAL: MANAGER, MAINTENANCE ENGINEERING SERVICES G. A. Stanton	DATE 12/18/89	IS IMMEDIATE OPERATOR TRAINING REQUIRED UPON IMPLEMENTATION? YES ___ NO ___	PROCEDURE COORDINATOR, PDCME G. A> Buel 12/19/89	
PROCEDURE NUMBER PSCP-4-007	PAGE NOS. 3,4	REV. 1	TITLE Rockwell Type Gas Meter, Calibration Procedure	CANCEL BY/DATE Next Revision

**BRIEF DESCRIPTION/JUSTIFICATION**

PAGE 2, Section 4.0, PRECAUTIONS AND LIMITATIONS

Add the following Step 4.3:

4.3 If the meter is found to be out of tolerance in Step 7.3 the meter should be removed from service for benchtop repair/replacement. The calibration adjustments listed in this procedure are associated with a benchtop calibration and are not intended for field calibrations.

PAGE 4, Section 7.0, INSTRUCTIONS

Add NOTE following Step 7.4

-----  
**NOTE**

**IF** the gas meter and the standard are not within 5% of each other on a field calibration the meter should be removed for benchtop calibration.  
-----

This change alleviates the problem of working on potentially internally contaminated equipment in the field and reflects the actual practice.

APPROVAL, QA (IMPACT LEVEL 1,2,3) DATE	APPROVAL, RADIOLOGICAL ENGINEERING DATE	APPROVAL, _____ DATE
APPROVAL, SAFETY (IMP. LEV. 1,2,3) DATE	APPROVAL, ENVIRONMENTAL ENGINEER DATE	APPROVAL, _____ DATE
APPROVAL, PLANT/PROCESS ENGINEER DATE	APPROVAL, _____ DATE	APPROVAL, _____ DATE
FIELD CHANGE DATE INSERTED AT: DIST. BY/ INSERTED DATE BY	DISTRIBUTION: BY: DATE	DISTRIBUTION: BY: DATE
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IF YOU HAVE ANY QUESTIONS CONCERNING THIS FCN, PLEASE CONTACT THE PROCEDURE COORDINATOR AT 3-4605, MSIN S4-65

## FIELD CHANGE NOTICE

COGNIZANT MAINTENANCE ENGINEER JOHN MYERS	DATE 4/25/91	TYPE OF CHANGE <input type="checkbox"/> MINOR FIELD CHANGE <input type="checkbox"/> ONE TIME CHANGE <input type="checkbox"/> FIELD CHANGE	CHANGE IMPACT LEVEL 1__ 2__ 3__ 4__	FIELD CHANGE NO. 234-91 (P&I)
COGNIZANT MANAGER, MAINTENANCE ENGINEERING	DATE	IMPLEMENTING THIS CHANGE WILL REQUIRE OPERATOR ACTIONS TO MAKE EQUIPMENT AND PROCEDURES COMPATIBLE? YES ___ NO <u>X</u>		
APPROVAL: MANAGER, MAINTENANCE ENGINEERING SERVICES	DATE	IS IMMEDIATE OPERATOR TRAINING REQUIRED UPON IMPLEMENTATION? YES ___ NO <u>X</u>		
PROCEDURE NUMBER	PAGE NOS.	REV.	TITLE	CANCEL BY/DATE
PSCP-4-007	2, 3	1	ROCKWELL TYPE GAS METER	Next Revision

**BRIEF DESCRIPTION/JUSTIFICATION**

Page 3, Delete Step 5.1 and replace with: 5.1 Certified Flow Measuring Instrument

Page 4, Change Step 7.1 to read: "Certified Flow Measuring Instrument", or a suitable replacement, in series with the gas meter to be calibrated.

Page 4, NOTE Replace "IF a Florator Test Kit is not available" with: Certified Flow Measuring Instrument"

APPROVAL, <u>QA (IMPACT LEVEL 1,2,3)</u> DATE	APPROVAL, <u>RADIOLOGICAL ENGINEERING</u> DATE	APPROVAL, _____ DATE
APPROVAL, <u>SAFETY (IMP. LEV. 1,2,3)</u> DATE	APPROVAL, <u>ENVIRONMENTAL ENGINEER</u> DATE	APPROVAL, _____ DATE
APPROVAL, <u>PLANT/PROCESS ENGINEER</u> DATE	APPROVAL, _____ DATE	APPROVAL, _____ DATE
FIELD CHANGE INSERTED AT: DIST. BY/ DATE	FIELD CHANGE DATE	DISTRIBUTION: BY: DATE
DISTRIBUTION: DATE	DISTRIBUTION: BY: DATE	DISTRIBUTION: BY: DATE
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DISTRIBUTION: DATE	DISTRIBUTION: BY: DATE	DISTRIBUTION: BY: DATE
DISTRIBUTION: DATE	DISTRIBUTION: BY: DATE	DISTRIBUTION: BY: DATE

IF YOU HAVE ANY QUESTIONS CONCERNING THIS FCN, PLEASE CONTACT THE PROCEDURE COORDINATOR AT 3-4605, MSIN S4-59



		<u>DATE</u>
<u>Author:</u>	J. R. Barber, Engineer, Procedure Development and Control Maintenance Engineering (PDCME)	
<u>Cognizant Engineer Approval:</u>	J. L. Day, Engineer Steam and Water Maintenance Engineering	5/28/92
<u>Cognizant Engineer Manager Approval:</u>	P. E. Stanley, Manager, Steam and Water Maintenance Engineering	5/28/92
<u>Validation Performed by:</u>	A. D. Daniel Facility Maintenance	5/26/92
<u>Released By Procedure Coordination:</u>	G. A. Buel, Engineer, PDCME	6/9/92

Signatures for approval and validation as listed above are recorded in this procedure's record file.

Concurrence and approval to make other than minor changes to this procedure must be obtained from the original reviewers and approval authority (organizations) listed above.

! Revision Bars found in this procedure (when applicable) indicate field changes and will be incorporated into the next revision.

This procedure is due for periodic review 5 years from release date of last revision or prior to use.



MAINTENANCE ENGINEERING SERVICES  
CALIBRATION PROCEDURE  
PRESSURE AND VACUUM GAUGES

IMPACT LEVEL 4

PROC. NO. PSCP-4-091  
REV. 3, CHG. 0  
PAGE 2 OF 9

Revision Status

<u>Change Level</u>	<u>Date</u>	<u>Change Document</u>	<u>Page(s)</u>	<u>Description</u>
Rev. 3	6/9/92	2U-91-1228	All	Total rewrite.



1.0 PURPOSE AND SCOPE

This procedure provides a safe, uniform method to calibrate Pressure and Vacuum Gauges.

2.0 REFERENCES

- 2.1 WHC-CM-4-3, Industrial Safety Manual, Section TE, "Tools and Equipment", Standard No. PP-7, "Personal Protective Equipment", and Standard G-1, "Lock and Tag".
- 2.2 WHC-CM-4-10, Radiation Protection, Section 8.0, "Radiation Work Permits".

3.0 PERSONNEL REQUIREMENTS

- 3.1 Instrument Craftsman.
- 3.2 Health Physics Technician (HPT), as required.
- 3.3 Operations Personnel, as required.

4.0 PRECAUTIONS AND LIMITATIONS

- 4.1 If during the performance of this procedure, any of the following conditions are found, immediately stop work, place equipment in a safe condition, and notify Supervision:
- Any equipment malfunction which could prevent fulfillment of its functional requirements.
  - Personnel error or procedural inadequacy which could prevent fulfillment of procedural requirements.
- 4.2 If this procedure or the work package in which it is being performed is Technical Safety Requirement (TSR) related (previously Operational Safety Requirement, OSR) and any of the above conditions are encountered, or any instrumentation is found out-of-tolerance, immediately notify Maintenance Supervision and Operations Supervision.
- 4.3 Contact Supervision for additional instructions if changing plant conditions affect work or delays in work extend past end of shift.

- 4.4 Comply with WHC and DOE environmental standards, as applicable, when disposing of any waste generated during performance of this procedure. Consult Facility/Plant/Area Hazardous Waste Coordinator for specific instructions.
- 4.5 Comply with WHC and plant/facility specific lock and tag or over-tagging requirements, as applicable.
- 4.6 If performance of any steps in this procedure is not required for procedure completion, steps not performed shall be indicated as such by entering "N/A" in the appropriate data sheet signoff space and explained in the COMMENTS\REMARKS section of the Data Sheet.
- 4.7 Verify pressure media (gas, water, chemicals, steam, etc) and take necessary precaution to prevent personal injury or damage to equipment when relieving pressure.

## 5.0 SPECIAL TOOLS, EQUIPMENT AND MATERIALS

### NOTE

All Measuring and Test Equipment (M&TE) used to collect qualitative data during performance of this procedure shall meet the following requirements:

- Be within its current calibration cycle as evidenced by an affixed calibration label.
- Be capable of desired range.
- Have an accuracy consistent with state-of-the-art limitations:
  - equal to or greater than the input tolerance specified on the PISCES Data Sheet,OR, if device being calibrated is not PISCES associated,
  - at least four times greater than the specified device tolerance.

5.1 Indicating Variable Pressure Source (manometer, dead weight tester, etc.)

5.2 Indicating Variable Vacuum Source, as required.

## 6.0 PREREQUISITES

6.1 Obtain release from Operations management prior to beginning performance of this procedure.

6.2 Verify Operations personnel have configured system/equipment as required to allow performance of this procedure.

6.3 If a potential for radiological contamination exists, request HPT perform equipment survey prior to beginning maintenance or prior to removal of equipment or component from its installed location.

6.4 Verify applicable lock and tag or over-tagging requirements have been satisfied.

## 7.0 INSTRUCTIONS

### NOTE

Because of the variety of Bourdon tube and linkage configuration between manufacturers and pressure ranges no attempt is made to adjust for span. Refer to vendor information for the specific gauge when span adjustments are desired.

7.1 Relieve sense line pressure, as applicable.

7.2 Remove gauge from installed location, if required.

### NOTE

For all data required use pointer tip indication for data collection.

7.3 Proceed to appropriate Section for gauge type to be tested:

- Pressure Gauge: Section 7.4
- Vacuum Gauge: Section 7.5
- Combination Vacuum/Pressure Gauge: Section 7.6.

## 7.4 Pressure Gauges

7.4.1 Connect input Pressure Source.

7.4.2 Apply test input pressure values specified by Data Sheet AND record output values in as-found column of Data Sheet.

7.4.3 IF as-found output values are within output tolerance range specified by Data Sheet AND no adjustments are desired, THEN record as-found values in as-left column and go to Section 8.0, Restoration.

7.4.4 Set input Pressure Source to a value equal to 0% specified on Data Sheet AND adjust ZERO adjustment until pointer tip indicate 0%.

7.4.5 IF gauge has no ZERO Adjustment, THEN remove pointer from spindle and without moving spindle, reattach pointer to spindle so tip indicates 0%.

7.4.6 Apply test inputs specified on Data Sheet AND record output values in as-left column of Data Sheet.

7.4.7 Go to Section 8.0, Restoration.

#### 7.5 Vacuum Gauges

7.5.1 Connect input Vacuum Source.

#### NOTE

It may not be possible to achieve the greatest value of vacuum specified on the Data Sheet. If this occurs consult with Cognizant Engineer for a different vacuum value to check.

7.5.2 Apply test input vacuum values specified by Data Sheet AND record output values in as-found column of Data Sheet.

7.5.3 IF as-found output values are within output tolerance range specified by Data Sheet AND no adjustments are desired, THEN record as-found values in as-left column and go to Section 8.0, Restoration.

7.5.4 Set test input Vacuum Source to a value equal to 0% specified on Data Sheet AND adjust ZERO adjustment until pointer tip indicate 0%.

7.5.5 IF gauge has no ZERO Adjustment, THEN remove pointer from spindle and without moving spindle, reattach pointer to spindle so tip indicates 0%.

7.5.6 Apply test inputs specified on Data Sheet AND record output values in as-left column of Data Sheet.

7.5.7 Go to Section 8.0, Restoration.

7.6 Combination Vacuum and Pressure Gauges

7.6.1 Connect input Vacuum Source.

**NOTE**

It may not be possible to achieve the greatest value of vacuum specified on the Data Sheet. If this occurs consult with cognizant Process Engineer for a different high vacuum value to check.

7.6.2 Apply test input vacuum values specified by Data Sheet AND record output values in as-found column of Data Sheet.

7.6.3 Disconnect input Vacuum Source AND connect input pressure source.

7.6.4 Apply test input pressure values specified by Data Sheet AND record output values in as-found column of Data Sheet.

7.6.5 IF as-found output values are within output tolerance range specified by Data Sheet AND no adjustments are desired, THEN record as-found values in as-left column and go to Section 8.0, Restoration.

7.6.6 Set input Vacuum Source to a value equal to 0% specified on Data Sheet AND adjust ZERO adjustment until pointer tip indicate 0%.

7.6.7 IF gauge has no ZERO Adjustment, THEN remove pointer from spindle and without moving spindle, reattach pointer to spindle so tip indicates 0%.

7.6.8 Apply test inputs specified on Data Sheet AND record output values in as-left column of Data Sheet.

8.0 RESTORATION

8.1 Remove Variable Pressure Source or Variable Vacuum Source from gauge.

8.2 Reinstall gauge in operating location, if required.

9.0 TESTING AND ACCEPTANCE

None.

10.0 DISPOSITION

10.1 Report deficiencies or cause of early failure to Supervision.

10.2 Return Data Sheet(s) to Supervision and inform Supervision calibration is complete.





Change Record

Change Level	Date	Change Document	Page(s)	Description
Rev. 1	12/13/90	N/A	All	Retype revision.
[A]	3/24/92	2U-92-0466		Change NOTE after 5.0 statement B.

1.0 PURPOSE

This procedure provides a safe and uniform method for calibrating the Chem-Tec Adjustable Flow Switch Model 500.

2.0 REFERENCES

- 2.1 WHC-CM-4-3, Industrial Safety Manual, Section TE, "Tools and Equipment and Standard No. PP-7, "Personal Protective Equipment".
- 2.2 WHC-CM-4-15, Radiation Work Requirements and Permits, "Radiological Posting".
- 2.3 WHC-CM-8-2, 200 Area Support Services, Section 202, "Plant Instrumentation Calibration Control System".

3.0 PERSONNEL REQUIREMENTS

- 3.1 Instrument Craftsman (IC).
- 3.2 Health Physics Technician (HPT), as required.
- 3.3 Operations Personnel (OP), as required.

4.0 PRECAUTIONS AND LIMITATIONS

- 4.1 Inform Operations management and Maintenance management IMMEDIATELY if problems are encountered with this calibration.
- 4.2 If procedure cannot be performed as written, stop work. Return equipment to safe configuration and inform Maintenance Supervisor that the procedure cannot be performed as written, and revision or Field Change Notice is required.

5.0 TOOLS, EQUIPMENT AND MATERIALS

NOTE

All M&TE used to perform this procedure shall meet the following requirements:

- a. Be within current calibration cycle, as evidenced by an affixed calibration label.
- b. Be capable of desired range and within input tolerance specified on the PISCES Data Sheet or Calibration Record.

- 5.1 Calibrated, adjustable rotameter or equivalent.
- 5.2 Voltmeter or light box, (continuity indicator).
- 5.3 Handtools.

#### 6.0 PREREQUISITES

- 6.1 Release from Operation management must be obtained prior to calibration of installed equipment/instrumentation.
- 6.2 A Health Physics Technician shall perform equipment survey prior to beginning maintenance or removal of any equipment or component from its installed location, where potential for radiological contamination exists.

#### 7.0 INSTRUCTIONS

##### 7.1 Calibration

- 7.1.1 Disconnect the input and output signals, as necessary, from the process and connect the test equipment.
- 7.1.2 Apply each test input signal specified by the PISCES Data Sheet, and record each corresponding output value in the as-found section of the PISCES Data Sheet.
- 7.1.3 **IF** the instrument's as-found output values are within the tolerance range specified by the PISCES Data Sheet; THEN no calibration adjustments are required. Proceed to Step 7.1.15.
- 7.1.4 Valve out flow, in series, with flow switch under test. Clean flow switch.
- 7.1.5 Unscrew clean-out plug, (see Figure 1).
- 7.1.6 Remove piston (magnet may be used to lift out piston).

7.1.7 Flush or clean flow passage.

7.1.8 Clean piston thoroughly before replacing.

**NOTE**

For Steps 7.1.9 through 7.1.14, make adjustments as near as reasonably achievable to the specified output value listed on the PISCES Data Sheet.

7.1.9 After replacing piston, replace clean-out plug.

7.1.10 Establish flow in system at the nominal rate desired. Adjust flow through flow switch until system rotameter indicates desired alarm flow value per PISCES Data Sheet. If it is desired to use a second rotameter instead of the system rotameter perform the following: Remove tubing from nearest fitting upstream of flow switch under test, install rotameter and adjust flow for required alarm value per PISCES.

7.1.11 Turn adjusting screw (flow control vane) (Figure 1) counterclockwise to open. Then turn clockwise slowly until switch actuates.

7.1.12 Switch will now actuate at desired flow rate.

**NOTE**

To adjust for decreasing flow rate, reverse procedure.

7.1.13 Restore system to normal condition.

7.1.14 IF instrument fails to meet required accuracy refer to manufacturer's manual for complete repair information.

**NOTE**

IF information is not in shop library it can be found in CVI 20951.

7.1.15 Record the as-left calibration data on the PISCES Data Sheet.

7.1.16 Remove test equipment and reconnect to process for normal operation.

8.0      **RESTORATION**

8.1      Ensure that all test equipment has been disconnected and removed and that the instrument has been returned to its original configuration.

9.0      **TESTING AND ACCEPTANCE**

None.

10.0     **DISPOSITION**

10.1     Inform Operations management and Maintenance management that the calibration is complete.

10.2     Return PISCES Data Sheet to the Maintenance Manager.

10.3     Inform Operations management and Maintenance management **IMMEDIATELY** if there are any problems with calibration.

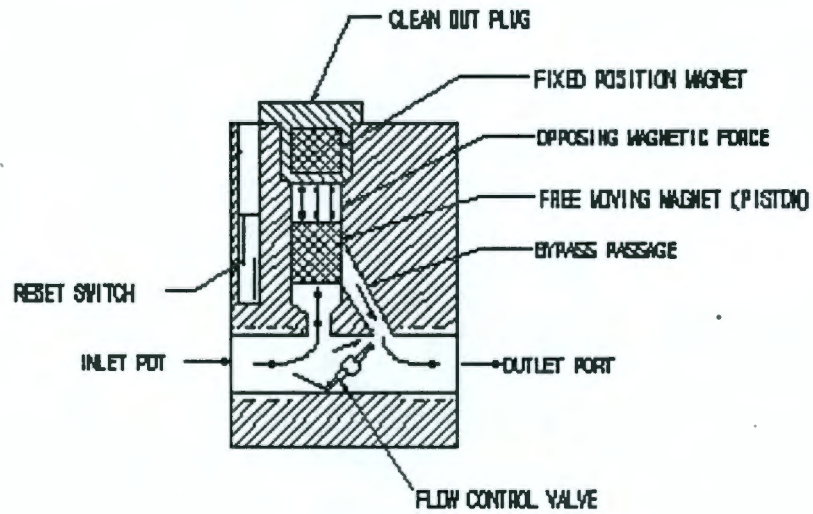


FIGURE 1. FLOW SWITCH.

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Chemical Processing Maintenance  
Engineering

Cognizant Engineer Approval: S. E. Bevans 8/17/89  
Chemical Processing Maintenance  
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Process Engineer CCA/COG: L. L. Weaver 8/14/89

Validation Performed by: R. D. Warren, Manager 8/14/89  
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Released By Procedure Coordination: G. A. Buel 8/18/89  
Engineer, Procedure Development &  
Control Maintenance Engineering

Other: G. A. Stanton, Manager 8/17/89  
Maintenance Engineering

Signatures for approval and validation as listed above are recorded in this procedure's record file.

Concurrence and approval to make other than minor changes to this procedure must be obtained from the original reviewers and approval authority (organizations) listed above.

! Revision Bars found in this procedure (when applicable) indicate field changes and will be incorporated into the next revision.

This procedure is due for periodic review 5 years from release date of last revision or prior to use.

CHANGE RECORD

<u>Change Level</u>	<u>Date</u>	<u>Change Document</u>	<u>Page(s)</u>	<u>Description</u>
Rev. 1	8/18/89	N/A	A11	Complete revision.
[A]	1/18/93	2U-92-1522	6	Delete Steps 7.1.5 and 7.1.6 and add new Step 7.1.5 and renumber.
		Minor Admin Change	3	Deleted Frequency and Craft block. Change 4.2 to updated standard statement.
			3,4	Change RPT to HPT
			A11	Chage Job Card to Data Sheet.

## 1.0 PURPOSE

This procedure provides a safe and uniform method of checking the calibration of an Air Rotameter and adjusting, if needed, those models that can be adjusted.

## 2.0 REFERENCES

- 2.1 Manufacturer's Information Manual.
- 2.2 WHC-CM-4-15, Radiation Work Requirements and Permits, "8.0 Radiological Posting".
- 2.3 WHC-CM-4-3, Industrial Safety Manual, Vol. 1, "Safety Standards" and Vol. 2, "Safety Guides", Standard No. PP-7, "Personal Protective Equipment".

## 3.0 PERSONNEL REQUIREMENTS

- 3.1 Instrument Craftsman (IC).
- 3.2 Health Physics Technician (HPT), as required.
- 3.3 Operations Personnel (OP), as required.

## 4.0 PRECAUTIONS AND LIMITATIONS

- 4.1 Inform Operations management and Maintenance management **IMMEDIATELY** if problems are encountered with this calibration.
- 4.2 If during the performance of this procedure, any of the following conditions are found, immediately stop work, place equipment in a safe condition, and notify Maintenance Supervision:
  - Any equipment malfunction which could prevent fulfillment of its functional requirements.
  - Personnel error or procedural inadequacy which could prevent fulfillment of procedural requirements.
- 4.3 The rotameter must be calibrated in the same orientation as it is, or will be, installed in the field. Also, IN FIELD parameters need to be duplicated as close as possible. It would be best to perform this calibration activity "IN PLACE" (where used).

## 5.0 TOOLS, EQUIPMENT AND MATERIALS

### NOTE

All test equipment shall have a range and accuracy equal to or greater than the requirements listed on the PISCES Data Sheet.

- 5.1 Standard rotameter, size applicable to rotameter to be calibrated, and Traceable to a Nationally recognized standard.
- 5.2 Vacuum supply sufficient to supply required air flow through the rotameter to be calibrated.
- 5.3 New filter media, as required for type 3 systems and Fixed Head Samplers.
- 5.4 Preventive Maintenance Procedure System or Plant Instrumentation Surveillance Calibration and Evaluation System (PISCES) Job Card.

## 6.0 PREREQUISITES

- 6.1 Release from Operations Management must be obtained prior to calibration of installed equipment/instrumentation.
- 6.2 Concurrence of Operations Management to disrupt signal for this check and possible subsequent adjustment(s). Obtain a signed release.
- 6.3 An HPT shall perform a survey of equipment before beginning maintenance and of any equipment or component prior to removal from its installed location, where potential for radiological contamination exists.
- 6.4 When calibration of a process, Fixed Head or effluent sampler rotameter is required, HPT shall survey to insure absence of contamination.
- 6.5 Notify Health Physics of effluent system shutdown when calibrating effluent sampler rotameter or fixed head sampler rotameter.
- 6.6 Record all required as-found values on the PISCES Data Sheet or Preventive Maintenance Procedure Data Sheet before making any changes or adjustments that would change these values.

- 6.7 See Table 1 for conversion data of standard cubic feet per minute (SCFM), Standard cubic feet per hour (SCFH) and liters per minute (LPM) Conversions (60 SCFH= 1 SCFM = 28.3168 LPM).
- 6.8 There are three basic types of rotameters covered by this instruction. See Figure 1 for description of system types and determine which method of calibration shall be used.
- 6.9 When calibrating an effluent sampler rotameter, attach standard rotameter to filter holder using adapter to eliminate the possibility of line connection errors.
- 6.10 When calibrating a Fixed Head Sampler rotameter, install new filter media and attach the standard rotameter to the filter holder using an adapter.
- 6.11 When calibration of a rotameter indicates a scale correction greater than 10%, notify Maintenance management and replace rotameter.

## 7.0 INSTRUCTIONS

### 7.1 Type 1 Rotameter

- 7.1.1 Valve rotameter to BY-PASS or remove from service to accomplish the calibration procedure.
- 7.1.2 Connect standard rotameter to supply port of rotameter to be calibrated.
- 7.1.3 Connect vacuum source to outlet (exhaust) port of rotameter.
- 7.1.4 Set vacuum control for desired calibration flow, (2 CFM, 175 CFH, etc.) on standard rotameter.
- ! 7.1.5 Check rotameter being calibrated for proper flow rate. (1CFM, 2CFM  
!

- | 7.1.6 Repeat Steps 7.1.4 through 7.1.5 as often as necessary to obtain a sufficiently graduated scale.
- | 7.1.7 Proceed to Step 7.4.
- 7.2 Type 2 Rotameter
  - 7.2.1 Valve rotameter to BY-PASS or remove from service to accomplish the calibration procedure.
  - 7.2.2 Connect standard rotameter to supply port of rotameter to be calibrated.
  - 7.2.3 Connect vacuum supply to outlet (exhaust) port of rotameter.
  - 7.2.4 Set vacuum control for desired calibration flow (1 CFM, 2 CFM, 175 CFH, etc.) on standard rotameter.
  - 7.2.5 If calibration rotameter reading does not correspond to standard rotameter reading, adjust graduated scale to proper position.
  - 7.2.6 Secure graduated scale and re-check reading.
  - 7.2.7 Readjust as required.
  - 7.2.8 Proceed to Step 7.4.
- 7.3 Type 3 Rotameter
  - 7.3.1 Valve rotameter to BY-PASS or remove from service to accomplish the calibration procedure.
  - 7.3.2 Place new filter paper in filter holder.

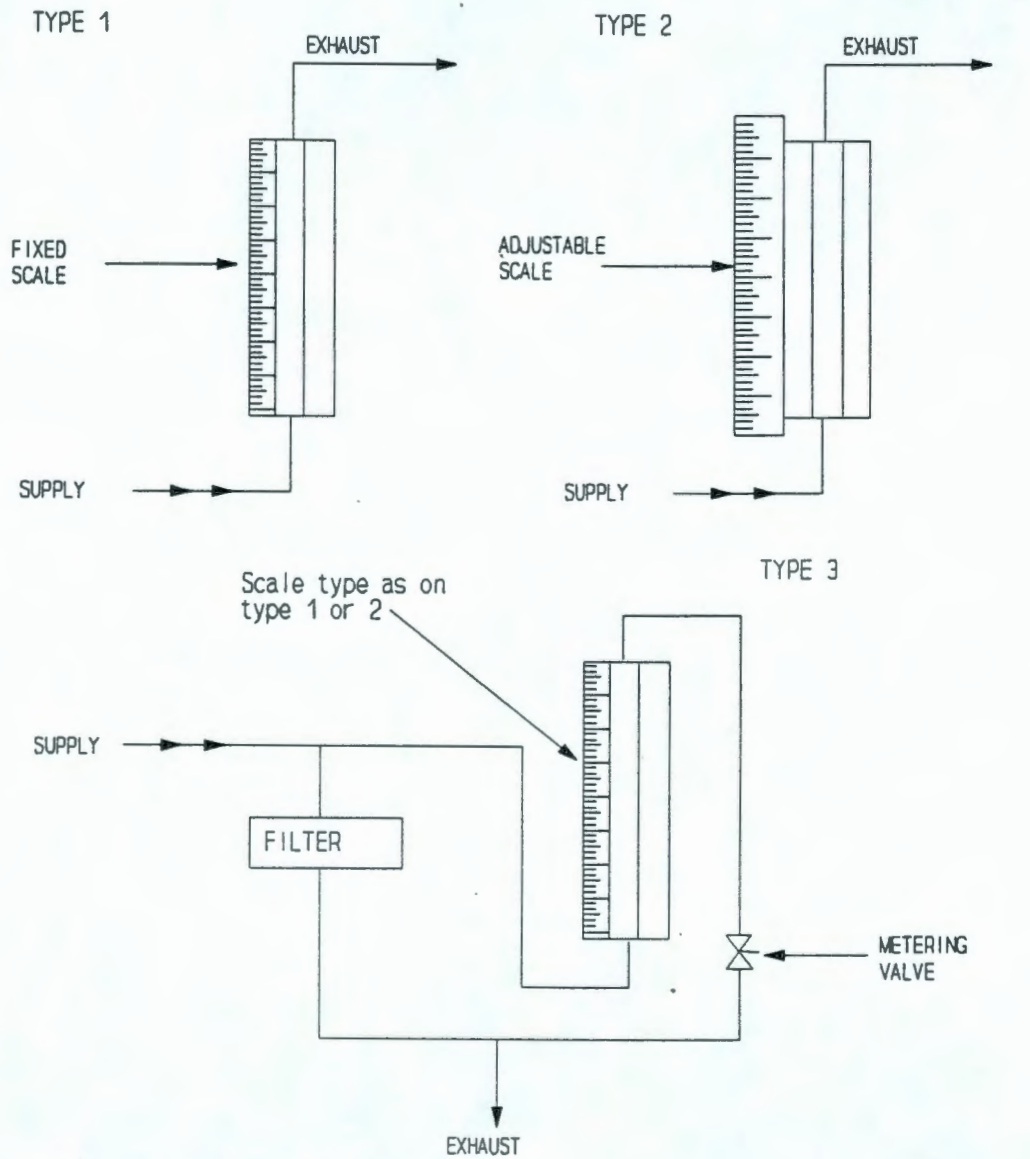
- 7.3.3 Connect standard rotameter to supply port of rotameter/filter assembly.
- 7.3.4 Set vacuum control for desired calibration flow (1 CFM, 2 CFM, 175 CFH, etc.) on standard rotameter.
- 7.3.5 If calibration rotameter reading does not correspond to standard rotameter reading, adjust metering valve for proper rotameter reading.
- 7.4 Final Check
  - 7.4.1 Remove vacuum source.
  - 7.4.2 Disconnect standard rotameter.
  - 7.4.3 Complete calibration record.
  - 7.4.4 Return rotameter to service or return all isolation valves to original condition.
- 7.5 Inform management that calibration is complete and of any deficiencies found.
- 8.0 RESTORATION  
None.
- 9.0 TESTING AND ACCEPTANCE  
None.

10.0 DISPOSITION

- 10.1 Inform Operations management and Maintenance management that the calibration is complete.
- 10.2 Return PISCES Job Card to the Maintenance Manager.
- 10.3 Inform Operations management and Maintenance management **IMMEDIATELY** if there are any problems with the calibration.

LPM	SCFH	SCFM	LPM	SCFH	SCFM
0.00	0	0.000	141.58	300	5.000
4.72	10	0.167	146.30	310	5.167
9.44	20	0.333	151.02	320	5.333
14.16	30	0.500	155.74	330	5.500
18.88	40	0.667	160.46	340	5.667
23.60	50	0.833	165.18	350	5.833
28.32	60	1.000	169.90	360	6.000
33.04	70	1.167	174.62	370	6.167
37.76	80	1.333	179.34	380	6.333
42.48	90	1.500	184.06	390	6.500
47.19	100	1.667	188.78	400	6.667
51.91	110	1.833	193.50	410	6.833
56.63	120	2.000	198.22	420	7.000
61.35	130	2.167	202.94	430	7.167
66.07	140	2.333	207.66	440	7.333
70.79	150	2.500	212.38	450	7.500
75.51	160	2.667	217.10	460	7.667
80.23	170	2.833	221.81	470	7.833
84.95	180	3.000	226.53	480	8.000
89.67	190	3.167	231.25	490	8.167
94.39	200	3.333	235.97	500	8.333
99.11	210	3.500	240.69	510	8.500
103.83	220	3.667	245.41	520	8.667
108.55	230	3.833	250.13	530	8.833
113.27	240	4.000	254.85	540	9.000
117.99	250	4.167	259.57	550	9.167
122.71	260	4.333	264.29	560	9.333
127.43	270	4.500	269.01	570	9.500
132.15	280	4.667	273.73	580	9.667
136.86	290	4.833	278.45	590	9.833
			283.17	600	10.000

TABLE 1. CONVERSION DATA.  
 (Based on 28.3168 Liters per SCFM)



Proper reading of rotameter bobs.



FIGURE 1. TYPE OF AIR ROTAMETERS.