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NORTH CAROLINA
Environmental Quality

Standard Operating Procedure for the Calibration of the Dwyer and SPER Manometers

Revision 2020

NORTH CAROLINA
Department of Environmental Quality

Standard Operating Procedure Approval

Department of Environmental Quality

I certify that I have read and approve of the contents of the Standard Operating Procedure for the Calibration of the Dwyer and SPER Manometers with an effective date of February 18, 2020.

1. Signature: Michael A. Morgan Date 2/20/20
   Air Quality Division Director

2. Signature: Patsi Butler Date 2-18-2020
   Quality Assurance Manager
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   Electronics and Calibrations Branch Supervisor

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1.0 SCOPE AND PURPOSE

This SOP will establish and provide the procedure and specified engineering unit values to certify the Dwyer and SPER manometers with pressure tests at 4, 8, 16, 24 and 36 in./H_2O.

2.0 INSTRUMENT DESCRIPTION

2.1 Dwyer

The Dwyer digital manometer is a hand-held, battery operated manometer. The Dwyer measures either positive, negative or differential pressures.

Table 1. Dwyer Specifications.

Pressure Range	0 to 20 in. WC
Max. Pressure	11 psi
Accuracy	+/- 0.5%
Display	3.5” Digit LCD
Resolution	0.01” WC
Operating Temperature Range	0º to 140º F
Battery Type	9V

Figure 1. Dwyer Manometer.

2.2 SPER

The SPER digital manometer is a hand-held, battery operated manometer. The SPER measures either positive, negative or differential pressures.

Table 2. SPER Specifications.

Pressure Range	± 138 in. WC
Max. Pressure	20 psi
Accuracy	± 0.3% of full scale at 25° C
Battery Type	9V

Figure 2. SPER Manometer.

3.0 VERIFICATION/CALIBRATION INSTRUMENT SET-UP

1. Turn on the manometer device under test (DUT). If the device does not turn on or "low battery" is indicated, replace the battery. The battery cover is located at the bottom of both manometers.

2. Open the battery cover and install a fresh 9V battery. Replace the cover.

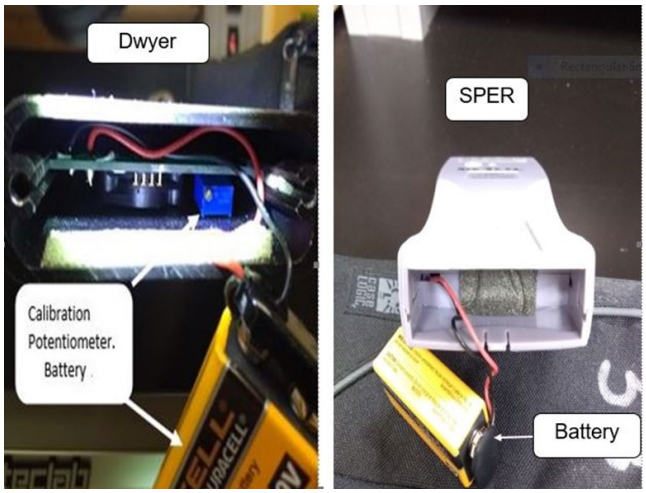


Figure 3. Battery Placement.

3. Connect the two Tygon tubes (a.k.a. quick disconnects) from the back of the lab standard and attach to the two ports of the lab standard negative pump with Vernier control (Figure 4).

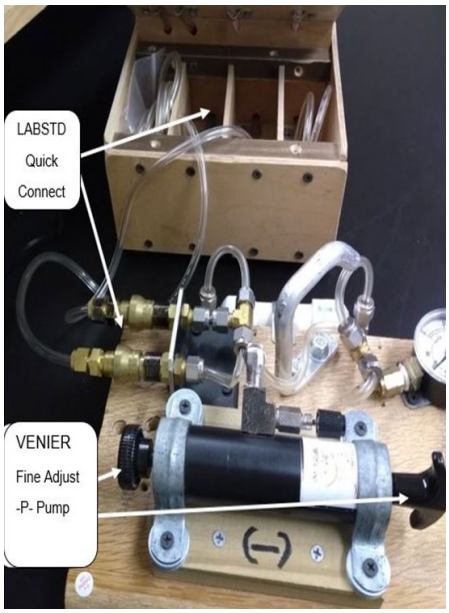


Figure 4. Lab manometer standard and Vernier control setup.

4. Attached the negative tube at the top of the Meriam lab standard (Figure 5) to the negative barb of the SPER or Dwyer DUT (not pictured).

Figure 5. Meriam Lab Standard and DUT Setup.

5. Ensure that the fitting coming from the lab standard "P" port is vented to the ambient air.

6. Setup the Meriam lab standard by entering 9999 and then pressing enter. (Figure 5).

7. Ensure all three Meriam lab standard displays are very near 0000.

8. Have a calibration worksheet ready to record readings during the calibration.

4.0 VERIFICATION AND CALIBRATION PROCEEDURE

1. Ensure that the DUT is reading in./H_2O.

2. Use the negative pump/Vernier to set the Meriam lab standard to exactly 1805 engineering units.

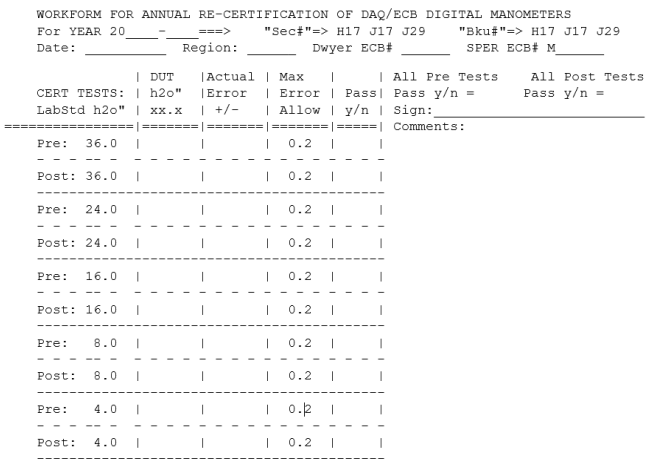
3. Once the Primary is set to the correct value; you may slowly tweak the Vernier on the lab standard pump to get as close as possible to the measurement list below (Table 3).

Table 3. Engineering Units and Resulting Calibration Pressure.

Lab Standard Setting	Resulting DUT Setpoint (in. of H_2O)
1805	36
1205	24
799.9	16
400.0	8
201.0	4

4. Log the DUT reading on the designated area on the calibration worksheet (Figure 6).

5. Repeat steps 1 thru 4 for the remaining test points and log the results on the calibration worksheet.



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WORKFORM FOR ANNUAL RE-CERTIFICATION OF DAQ/ECB DIGITAL MANOMETERS
For YEAR 20____-____===>    "Sec#"=> H17 J17 J29    "Bku#"=> H17 J17 J29
Date: __________  Region: ______  Dwyer ECB# ______  SPER ECB# M______

            | DUT   |Actual | Max   |     | All Pre Tests    All Post Tests
CERT TESTS: | h2o"  |Error  | Error | Pass| Pass y/n =       Pass y/n =
LabStd h2o" | xx.x  | +/-   | Allow | y/n | Sign:_____________________
================|=======|=======|=======|=====| Comments:
    Pre:  36.0  |       |       |  0.2  |     |
    - - - -- -  - - - - - - - - - - - - - - - -
    Post: 36.0  |       |       |  0.2  |     |
    ---------------------------------------------
    Pre:  24.0  |       |       |  0.2  |     |
    - - - -- -  - - - - - - - - - - - - - - - -
    Post: 24.0  |       |       |  0.2  |     |
    ---------------------------------------------
    Pre:  16.0  |       |       |  0.2  |     |
    - - - -- -  - - - - - - - - - - - - - - - -
    Post: 16.0  |       |       |  0.2  |     |
    ---------------------------------------------
    Pre:   8.0  |       |       |  0.2  |     |
    - - - -- -  - - - - - - - - - - - - - - - -
    Post:  8.0  |       |       |  0.2  |     |
    ---------------------------------------------
    Pre:   4.0  |       |       |  0.2  |     |
    - - - -- -  - - - - - - - - - - - - - - - -
    Post:  4.0  |       |       |  0.2  |     |
    ---------------------------------------------
```

Figure 6. Calibration Worksheet.

6. If the DUT is shown out of tolerance by the verification, a calibration will have to be performed.

7. Adjustments are performed by accessing a potentiometer located at the bottom of the Dwyer (Figure 3). Take out the battery but leave it connected. You will then see the blue potentiometer that can be adjusted with the use of a small screwdriver.

8. Begin the calibration pumping the Meriam lab standard back to 1805 engineering units.

9. Adjust the potentiometer to get the DUT to within ± .01 of 36" of H_2O. Counter clockwise will increase the value, and clockwise will decrease the value.

10. After this adjustment is completed, continue with the remaining points in Figure 6 and determine if they are within the ± 0.2 verification tolerance.

11. If they are within tolerance, fill out the remaining areas on the worksheet and complete the certification label and apply it to the DUT.

12. If the results exceed the tolerances, take the DUT out of service for further investigation.

5.0 DOCUMENTATION HANDLING

1. Scan the calibration worksheet. File the original in the paper files at the ECB.

2. Save the scanned copy on the P drive at P:\Ambient\ECB\NIST Certification Devices for the appropriate current year.