

U.S. DEPARTMENT OF COMMERCE

PH/FDK NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY  
8364606 Gaithersburg, Maryland 20899  
H-4558  
TN 255979  
March 14, 1996

## REPORT OF CALIBRATION

on

Thermoelectric Dew-Point Generator

submitted by

Li-Cor Inc.  
Lincoln, NE 68504

on

September 8, 1995

### Description

NIST Identification Number: H-4558  
Manufacturer: Li-Cor Inc., Lincoln, NE 68504  
Model No.: Li-610, S/N DPG320B

The LI-610 Dew-Point Generator produces atmosphere of known dew point. A source of ambient air is bubbled through a condenser block containing a water bath, whose temperature is precisely controlled by a series of Peltier thermoelectric coolers.

### Calibration

The LI-610 Dew-Point Generator was intercompared with the NIST two-pressure humidity generator<sup>[1,2]</sup> by using a MBW Dew-Point Control Instrument Model K-1806/DP3-D-SH-III, Serial No. 93-9011. The MBW Dew-Point Control Instrument was earlier determined to have an expanded uncertainty of 0.1°C for dew points 0°C to 20°C from the NIST two-pressure humidity generator, which has an expanded uncertainty<sup>[3-6]</sup> of 0.04°C for the same range of dew-points tested. The moist air from the LI-610 Dew-Point Generator was introduced into the inlet of MBW hygrometer through 1/4-inch diameter teflon tube.

The hygrometer was assumed to be in equilibrium with the test air when the reading indicated a constant value for a time interval of twenty minutes or longer.

The results of the calibration are given in Table 1, attached as part of this report.

PH/FDK  
 8364606  
 836/H4558  
 TN 255919  
 March 14, 1996

Table 1

Li-610 Dew-Point Generator  
 S/N DPG320B  
 NIST Identification No. H-4558

----- H-4558 -----

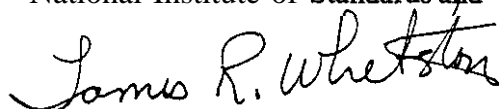
NIST Dew-Point* (°C)	MBW Dew-Point (°C)	Condenser Temperature (°C)	Flow (cc/mill)
0.81	0.7	1.00	1000
0.83	0.7	1.00	500
9.78	9.7	10.00	1000
<b>9.80</b>	<b>9.7</b>	10.00	500
19.80	19.8	<b>20.00</b>	<b>500</b>
19.78	19.8	20.00	1000
19.74	19.7	20.00	2500

\*Corresponding dew-point temperatures generated by NIST Two-pressure Humidity Generator. Mark 2.

PH/FDK  
836/H-4558  
8364606  
TN 255979  
March 14, 1996

The uncertainty reported by NIST represents only the estimated uncertainty in the NIST Standard. Additional uncertainties arising in the customer's use of the device (e.g., to transfer a calibration to another device) should be evaluated by the customer.

For the Director,  
National Institute of Standards and Technology



James R. Whetstone, Group Leader  
Process Sensing Group  
Process Measurements Division  
Chemical Science and Technology Laboratory

#### References

- (1) Hasegawa, S. and Little, J. W., The NBS Two-Pressure Humidity Generator, Mark 2, J. Res. Nat. Bur. Stand. (U.S.), 81A, No. 1, 81-88 (Jan.-Feb. 1977).
- (2) Taylor, B. N. and Kuyatt, C.E., Guidelines for Evaluating the Uncertainty of NIST Measurements Results, NIST Technical Note 1297 (January 1993).
- (3) Huang, P. H. and Whetstone, J. R., New Expressions of Uncertainties for Humidity Calibrations at the National Institute of Standards and Technology, NISTIR 5455 (June 1994).
- (4) Wexler, A., Vapor Pressure Formulation for Water in Range 0 to 100°C. A Revision, J. Res. Nat. Bur. Stand. (U.S.), 80A, Nos. 5 and 6, 775-785 (Sept.-Dec. 1976).
- (5) Wexler, A., Vapor Pressure Formulation for Ice, J. Res. Nat. Bur. Stand. (U.S.), 81A, No. 1, 5-20 (Jan.-Feb. 1977).
- (6) Greenspan, L., Functional Equations for the Enhancement Factors for CO<sub>2</sub>-Free Moist Air, J. Res. Nat. Bur. Stand. (U.S.), 80A, No. 1, 41-44 (Jan-Feb. 1976).
- (7) Huang, P. H., Thermodynamic Properties of Moist Air Containing 1000 to 5000 PPM<sub>v</sub> of Water Vapor, NISTIR 5241, 43-51 (April 1993).
- (8) Purchase Order Number LI 27240 dated August 16, 1995.