OBS 1-00
August 2000

Atmospheric Pressure Observing Practices and Procedures for using a Digital Barometer.

Purpose

This OBS Circular describes the procedures for observing pressure when using a digital barometer. Included are instructions for entering pressure into data entry screens, recording pressure onto form 0063-2322 Surface Weather Record and procedures for calculating pressure using tables. These instructions are for the reading and recording of any generic digital barometer. Documentation for the Vaisala PTB220SCA2A3 digital barometer is still in use and can be used in conjunction with these procedures. This circular is an addendum to *MANOBS 7th* Edition chapter 4.

General

The digital barometer displays the pressure at the level of the instrument. **The digital barometer shall not be moved by anyone other than a regional meteorological inspector**. Neither barometer nor its' power supply shall be opened. No attempt should ever be made to communicate with the barometer or power supply through the communications ports. Physical and logical damage could easily result. Ventilation of barometers is an extremely complex subject. Attachment of long lengths of plastic tubing to the barbed pressure fitting in order to provide "better" ventilation is not permitted without the written approval of the regional inspector following consultation with the national barometry authority. The observer shall report atmospheric pressure observed from a digital barometer in *hectopascal* (hPa). It is recommended that the Observer Notebook be used in conjunction with these procedures.

Section 1: Observer Duties

At stations using a digital barometer the observer shall:

1. Record, to the nearest 0.1 hPa the pressure being displayed on the digital barometer on the hour. Do not perform any adjustments, corrections or calibration**. Do not use any other reading being displayed on the digital barometer.**
2. Enter the recorded pressure reading obtained from the digital barometer into the appropriate field labeled "Digital Barometer" of the data entry screen (to the nearest 0.1 hPa). The data entry screens will automatically calculate all the necessary derived pressures from the direct reading of the digital barometer once entered by the observer. At some locations, the digital barometer will interact directly with the approved software, so no transfer of data is required of the observer.
3. Enter into the data entry screen all other observed values as per usual.
4. Enter all the necessary entries on Form 0063-2322 as outlined in section 2.
5. Complete the observation as per usual.

Section 2: Recording atmospheric pressures on form 0063-2322 at sites equipped with a digital barometer and data entry screens that compute pressure.

The observer shall transcribe the following information displayed on the data entry screen for the appropriate synoptic and intermediate synoptic hours onto form 0063-2322 Surface Weather Record as per MANOBS 10.4.13.1

1. Line 15 - Leave blank when using a digital barometer.
2. Line 16 - Leave blank when using a digital barometer.
3. Line 17 - Leave blank when using a digital barometer.
4. Line 18 - Digital barometer as read. Transcribe the digital barometer as read from the data entry screen.
5. Line 19 - Leave blank when using a digital barometer.
6. Line 20 - Leave blank when using a digital barometer.
7. Line 21 - Leave blank when using a digital barometer.
8. Line 22 - Leave blank when using a digital barometer.
9. Column 33 - Sea Level Pressure. Transcribe the MSL pressure obtained from the data entry screen in hectopascal and tenths with the initial 9 or 10 and the decimal point omitted, e.g., record 1013.2 hPa as 132; record 990.6 hPa as 906.
10. Column 39 - Altimeter Setting. Transcribe the Altimeter obtained from the data entry screen in inches, omitting the tens digit and the decimal point. Example: an altimeter entry 992 indicates an altimeter setting of 29.92 inches (refer to MANOBS para 4.4).
11. Column 41 - Remarks. Transcribe the Station Pressure as read from the data entry screen.
12. Column 42 - Appp. Transcribe the pressure tendency (ppp) and characteristic (A) as read from the data entry screen. The tendency characteristic code is not calculated and must be entered into the data entry screens by the observer.

Columns 33, 39 and 41 shall be completed on form 06-2322 at every METAR observation.

At stations not open 24 hours a day these instructions apply to the first observation of the day.

Section 3: Pressure Calculations Using the Tables

Normally all barometric computations will be performed by the input software. When the data entry screens malfunction the observers shall use the pressure tables to compute all of the atmospheric pressure and reductions required for the hourly observation as per MANOBS 10.4.13.1.1.

When tables are used to calculate atmospheric pressures the observer shall:

1. Complete lines 15,16,18,19,20,21 and 22 on form 0063-2322 as outlined per sections 10.4.14 to 10.4.21 of MANOBS.
2. Make appropriate entries in column 1 Notes and Instrument Defects and Changes on form 0063-2322 as outlined per section 10.4.1 of MANOBS.
3. Complete form 0063-2325 Monthly Summary of Instrument Malfunctions, Changes and New Installation indicating the hours that the tables were used for pressure computations.

The following explains the definitions of various lines on the form 0063-2322 and provides examples of how to do pressure calculations using the tables.

Line 15 - Sum. Enter the sum of the dry-bulb temperature of 12 hours previously and the current dry-bulb temperature.
Note: The temperature 12 hours ago is used in the calculation of the reduction to mean sea level pressure. When the temperature of 12 hours ago cannot be obtained from a dry-bulb reading, a collocated automatic station, or a thermograph, it shall be estimated (para. 4.3.3.2 of MANOBS)
Line 16 - Mean. Divide the sum by 2 and round to one decimal place to obtain a temperature mean and record this value. This mean shall be used for computing the Reduction to Sea Level (Line 21) using the tables supplied for this purpose.
Line 17 - Attached Thermometer. Leave blank if using a digital or AWOS barometer.
Line 18 - Barometer as Read. Enter the barometer as read (nearest tenth hPa) e.g. 968.9.
Line 19 - Total Correction. From the table for the reduction of the barometer reading to Station Pressure, determine the total correction and enter this value using the appropriate sign, e.g., +1.2, -0.7 etc.
Line 20 - Station Pressure. Compute the station pressure from the Barometer as Read and the Total Correction. Record the Station Pressure (nearest tenth hPa).
Line 21 - Reduction to Sea Level. Enter the reduction to sea level value as determined from the sea-Level reduction table. Refer to para. 4.3.2 of MANOBS.
Line 22 - Sea Level Pressure. Add the Reduction to Sea Level to the Station Pressure to obtain the sea-level pressure. Record the sea-level pressure (nearest tenth hPa), e.g. 1018.9.
Column 33 - Sea-Level Pressure. Enter the atmospheric pressure, reduced to sea-level, in hectopascal and tenths with the initial 9 or 10 and the decimal point omitted, e.g., record 1013.2 hPa as 132; record 990.6 hPa as 906.
Column 39 - Altimeter Setting. Enter the altimeter setting in inches, omitting the tens digit and the decimal point. Example: an altimeter entry 992 indicates an altimeter setting of 29.92 inches (refer to MANOBS para. 4.4)
Column 41 - Remarks. Enter in the reduction to Sea Level
Station Pressure. Enter the last 3 digits of the station pressure using hectopascal and tenths in the column labeled stn. pres.

Column 42 - Tendency: Enter a tendency code group at the main and intermediate synoptic hours (0000, 0300, 0600, 0900, 1200, 1500, 1800, 2100 UTC). The tendency shall take the same form as in the synoptic code "appp" where "a" is the code figure for the tendency characteristic (para 4.7.2.2 of MANOBS) and "ppp" is the amount of pressure change in hectopascal and tenths.

Example:

Amount of change (hPa)	Code ppp
0.0	000
0.3	003
1.1	011
10.2	102

How to Calculate Station Pressure using tables

Station pressure shall be determined by applying to the “Barometer as Read” a reduction figure obtained from the “Reduction of Barometer Readings to Station Pressure” table. This table incorporates corrections for barometer calibration and an additional correction to account for the difference in height between station elevation and the actual barometer elevation. See Figure 1 on the computation of station pressure.

Figure 1: How to Calculate Station Pressure using the Reduction of Barometer Readings to Station Pressure Table

CHARLOTTETOWN A

Reduction of Barometer Readings to Station Pressure
Reduction de la lecture a la cuvette a la pression a la station

Climate Id:	**8300300**	**Report Date:**	**2000-04-04 18:31**
Province:	**PRINCE EDWARD ISLAND**	**Comm Id:**	**YYG**

Elevations : Station	**48.8 M.**	**Cistern / Cuvette :**	**78.6 M.**
Att.		**Serial Number :**	**1405429409**

Appliquer a la Lecture du Barometre / Apply to Barometer Reading

Ext. Lectures du Barometre / Barometer Readings

Use Nearest Barometer Reading

Deg C	930	960	990	1020	1050
-30.0	3.9	4.0	4.2	4.3	4.4
-20.0	3.7	3.9	4.0	4.1	4.2
-10.0	3.6	3.7	3.8	4.0	4.1
0.0	3.5	3.6	3.7	3.8	3.9
10.0	3.3	3.5	3.6	3.7	3.8
20.0	3.2	3.3	3.5	3.6	3.7
30.0	3.1	3.2	3.3	3.5	3.6
40.0	3.0	3.1	3.2	3.3	3.4

Report: SIS_BARO_STN_REPORT (SIS_BARO_STN_REPORT_TEMP)

Use Nearest Current Outdoor Temperature

Current Outdoor Temperature	**10.8**	
Barometer as Read	**962.2**	**- transfer to line 18 on 06-2322**
Total Correction	**3.5**	**- transfer to line 19 on 06-2322**
Station Pressure	**965.7**	**- transfer to line 20 on 06-2322**

NOTE: If the barometer reading or temperature reading is exactly half way between listed values, select the "correction" for the higher value.

How to Calculate Altimeter Setting using tables

The altimeter setting is a computed value of mean sea level pressure which is used to set the sub-scale of an altimeter so that the height scale of the altimeter indicates the height of the instrument above mean sea level. The altimeter setting is normally calculated by the input software; however when necessary it shall be obtained by applying the **station** pressure to the table "Altimeter Settings from Station Pressures in hPa" which is supplied to each station where it is required. See Figure 2, How to Determine the Altimeter Setting.

Figure 2

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Altimeter Settings From Station Pressures in Hectopascals (hPa)

Calages de l'altimetre d'apres la pression la station en hPa

Climate Id: 8300300 Comm Id: YYG Report Date: 2000-04-04 18:30

Station Elevation / Elevation de la Station 48.8 meters 160.1 feet

	935	940	945	950	955	960	965	970	975	980	985	
0.0	2777	2792	2807	2822	2837	2851	2866	2881	2896	2911	2926	0.0
0.2	2778	2793	2808	2822	2837	2852	2867	2882	2897	2911	2926	0.2
0.4	2778	2793	2808	2823	2838	2853	2867	2882	2897	2912	2927	0.4
0.6	2779	2794	2809	2824	2838	2853	2868	2883	2898	2913	2927	0.6
0.8	2780	2794	2809	2824	2839	2854	2869	2884	2898	2913	2928	0.8
1.0	2780	2795	2810	2825	2840	2854	2869	2884	2899	2914	2929	1.0
1.2	2781	2796	2811	2825	2840	2855	2870	2885	2900	2914	2929	1.2
1.4	2781	2796	2811	2826	2841	2856	2870	2885	2900	2915	2930	1.4
1.6	2782	2797	2812	2827	2841	2856	2871	2886	2901	2916	2930	1.6
1.8	2783	2797	2812	2827	2842	2857	2872	2886	2901	2916	2931	1.8
2.0	2783	2798	2813	2828	2843	2857	2872	2887	2902	2917	2932	2.0
2.2	2784	2799	2813	2828	2843	2858	2873	2888	2902	2917	2932	2.2
2.4	2784	2799	2814	2829	2844	2859	2873	2888	2903	2918	2933	2.4
2.6	2785	2800	2815	2830	2844	2859	2874	2889	2904	2919	2933	2.6
2.8	2786	2800	2815	2830	2845	2860	2875	2889	2904	2919	2934	2.8
3.0	2786	2801	2816	2831	2846	2860	2875	2890	2905	2920	2935	3.0
3.2	2787	2802	2816	2831	2846	2861	2876	2891	2905	2920	2935	3.2
3.4	2787	2802	2817	2832	2847	2862	2876	2891	2906	2921	2936	3.4
3.6	2788	2803	2818	2832	2847	2862	2877	2892	2907	2921	2936	3.6
3.8	2789	2803	2818	2833	2848	2863	2878	2892	2907	2922	2937	3.8
4.0	2789	2804	2819	2834	2848	2863	2878	2893	2908	2923	2938	4.0
4.2	2790	2805	2819	2834	2849	2864	2879	2894	2908	2923	2938	4.2
4.4	2790	2805	2820	2835	2850	2865	2879	2894	2909	2924	2939	4.4
4.6	2791	2806	2821	2835	2850	2865	2880	2895	2910	2924	2939	4.6
4.8	2792	2806	2821	2836	2851	2866	2881	2895	2910	2925	2940	4.8

Report: SIS_BARO_ALTIMETER_REPORT (SIS_BARO_ALT_REPORT_TEMP)

Use the two values which added together to equal the Station Pressure from above. This example uses station pressure 965.7 See note 2 below.

Altimeter setting is 28.68 inches.
transfer to column 39 on the 06-2322 figure 1 (omitting the tens digit and the decimal point)

Notes:

1. Should the station pressure be outside of the range on your altimeter setting table, DO NOT EXTRAPOLATE. Report the altimeter setting as missing and notify your Regional Headquarters. An extension to the altimeter setting table shall then be provided to your station.

2. When values cannot be selected to exactly equal the station pressure, the station pressure selected shall be the next lower value: i.e., the altimeter setting above is for a station pressure of 965.6 hPa, because tabulated values cannot be selected to exactly equal the station pressure of 965.7 hPa

How to Calculate Reduction to Sea Level and Mean Sea Level Pressure using tables
The Mean Sea Level Pressure shall be obtained manually using tables by. See figure 3 on how to obtain MSL.

Figure 3: How to Calculate the Mean Sea Level Pressure

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Reduction of Station Pressure to Sea Level
La Pression au Niveau de la Mer

Climate Id: 8300300 **Report Date:** 2000-04-04 18:32

Province: PRINCE EDWARD ISLAND **Comm Id:** YYG

Station Elevation / Elevation de la Station : 48.8 M. 48.8 GPM.

Ajouter a la Pression a la Station(hPa) / Add to Station Pressure (hPa)

Pression a la Station / Station Pressure

Temperature	*930.0*	*950.0*	*970.0*	*990.0*	*1010.0*	*1030.0*	*1050.0*
Celsius	*949.9*	*969.9*	*989.9*	*1009.9*	*1029.9*	*1049.9*	*1069.9*
-34.0 to -24.1	6.1	6.2	6.4	6.5	6.6	6.8	6.9
-24.0 to -14.1	5.9	6.1	6.2	6.3	6.4	6.6	6.7
-14.0 to -4.1	5.8	5.9	6.0	6.2	6.3	6.4	6.5
-4.0 to 5.9	5.7	5.8	5.9	6.0	6.2	6.3	6.4
6.0 to 15.9	5.6	5.7	5.8	5.9	6.0	6.2	6.3
16.0 to 25.9	5.5	5.6	5.7	5.8	5.9	6.0	6.2

Select the appropriate range for station pressure **Station Pressure 965.7**
Select the appropriate range for mean temperature mean temperature +12.5
Select reduction to MSL **Reduction to Sea Level +5.7**
Mean Sea Level Pressure **971.4**

Transfer MSL to column 33 on the 06-2322 the last three digits only.

Report: SIS_BARO_MSL_REPORT (SIS_BARO_MSL_REPORT_TEMP)

The Sea Level Reduction shall be calculated for each measurement of sea level pressure taken at 0000, 0300, 0600, 0900, 1200, 1500, 1800 and 2100 UTC. For observations of pressure taken at times other than the above, the previously calculated Sea Level Reduction may be used, provided it was determined not more than 2 hours previously; otherwise a Sea Level Reduction shall be calculated at the time of the observation.