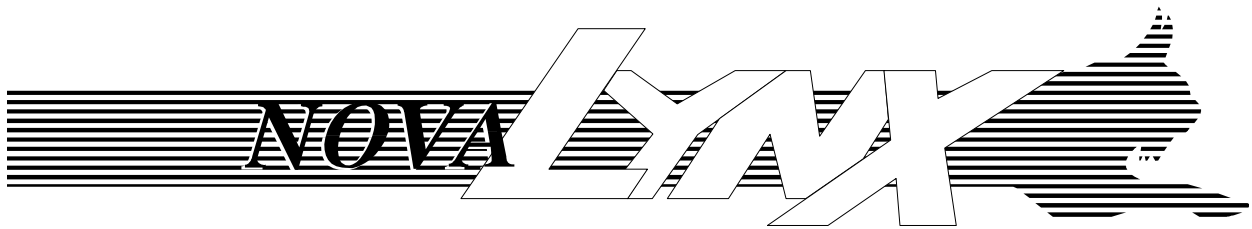


NOVALYNX CORPORATION

**MODEL 230-600
BAROMETRIC PRESSURE SENSOR PCB
MODEL 230-601
BAROMETRIC PRESSURE SENSOR IN NEMA ENCLOSURE**

INSTRUCTION MANUAL



REVISION DATE: 11/15/2006

Receiving and Unpacking

Carefully unpack all components and compare to the packing list. Notify NovaLynx Corporation immediately concerning any discrepancy. Inspect equipment to detect any damage that may have occurred during shipment. In the event of damage, any claim for loss must be filed immediately with the carrier by the consignee. Damages to equipment sent via Parcel Post or UPS require the consignee to contact NovaLynx Corporation for instructions.

Returns

If equipment is to be returned to the factory for any reason, call NovaLynx between 8:00 a.m. and 4:00 p.m. Pacific Time to request a Return Authorization Number (RA#). Include with the returned equipment a description of the problem and the name, address, and daytime phone number of the sender. Carefully pack the equipment to prevent damage or additional damage during the return shipment. Call NovaLynx for packing instructions in the case of delicate or sensitive items. If packing facilities are not available take the equipment to the nearest Post Office, UPS, or other freight service and obtain assistance with the packaging. Please write the RA# on the outside of the box.

Warranty

NovaLynx Corporation warrants that its products are free from defects in material and workmanship under normal use and service for a period of one year from the date of shipment from the factory. NovaLynx Corporation's obligations under this warranty are limited to, at NovaLynx's option: (i) replacing; or (ii) repairing; any product determined to be defective. In no case shall NovaLynx Corporation's liability exceed product's original purchase price. This warranty does not apply to any equipment that has been repaired or altered, except by NovaLynx Corporation, or that has been subjected to misuse, negligence, or accident. It is expressly agreed that this warranty will be in lieu of all warranties of fitness and in lieu of the warranty of merchantability.

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**MODEL 230-601
EQUIPMENT CONFIGURATION AND IDENTIFICATION**



NovaLynx Corporation

Model 260-600 & 230-601 Barometric Pressure Sensor Instruction Manual

1.0 INTRODUCTION

The NovaLynx Corporation Model 230-600 Barometric Pressure Sensor is an integrated sensor and signal conditioning package with all of the components located on a single board. As a "stand-alone" barometer, the circuit board may be installed into a NEMA enclosure for either indoor or outdoor installation. When the barometric pressure sensor board is furnished as part of a larger system, the board is often installed into a larger enclosure with other instruments. The model number for the NEMA version of the barometer is 230-601.

The 230-600 is a versatile electronic barometer featuring high accuracy, low power, wide operating temperature range, and calibrated outputs in several formats. Low power consumption and wide temperature range make the 230-600 ideal for remote applications using battery or solar power. Accuracy better than ± 0.5 mb is maintained over the entire pressure and temperature ranges. All models include full duplex RS232 and half duplex RS485 serial connections. Model 230-600C is configured for 4-20mA output. Model 230-600V is configured for 0-5 Vdc output. The standard pressure scale for analog outputs spans 600 to 1100 mb. A narrower range may be selected via software menu. Serial outputs run in continuous or polled modes. In polled mode, a network of up to 32 sensors may be individually addressed.

1.1 Specifications

Operating range	600-1100 mb (17.7-32.5 inHg) Standard Factory Default Other pressure ranges within the 600 to 1100 mb span may be selected via software commands but the full scale output signal range will always be the same, 0-5000mV. For example, 750 to 850 mb = 0-5 Vdc.
Output signal	4-20 mA (230-600C) 0-5 Vdc (230-600V) Serial RS232/RS485 9600 baud (all models)
Operating temperature	-50° to +60°C
Accuracy	± 0.3 mb (.01 inHg) @ 20°C ± 0.5 mb (.015 inHg) over temperature range
Power requirement	7 to 30 Vdc at 30 mA (230-600C) 7 to 30 Vdc at 10 mA (230-600V)
Dimensions	PCB 3.75" x 2.25" Enclosure 4.7" x 4.7" x 2.25"
Weight/Shipping	PCB only .25 lb/1 lb PCB in enclosure 1.25 lbs/2 lbs
Other	Sea-level offset

2.0 INSTALLATION

The following sections contain information concerning the installation of the barometer. Read these sections carefully before attempting to install the instrument in order to become familiar with the procedures. For some systems supplied by NovaLynx, the barometer will be factory installed and wired before shipment to the customer.

2.1 Remote Sensing

The barometer is designed for optimum performance whenever it is used within a stable operating environment. If the barometer is installed inside a tightly sealed room or enclosure, the remote sensing feature should be used. To sense pressures remotely, attach a 3/16" i.d. plastic hose to a hose barb on the sensor housing. The hose should then be routed as directly as possible to the outdoor atmosphere. Avoid making sharp bends in the hose that could collapse the inside of the tube. If the sensor is housed inside an enclosure that is vented to the outdoors, the use of tubing is not necessary.

2.2 Mounting

Mounting of the circuit board is accomplished using four mounting standoffs. Non-conductive nylon (1/2" x 8-32 thread size) standoffs are supplied for mounting the board onto panels or flat surfaces. The board is not sensitive to direction and can be mounted with any orientation. For most installations, the barometer housing is mounted with the sensor vent horizontal or with the remote sensing tube facing downward to prevent moisture from accumulating inside the pressure transducer. Securely fasten any cable to a rigid support with electrical tape or plastic cable ties to minimize cable damage. If the board has been supplied installed into the NEMA enclosure, bolt the enclosure onto the most convenient support. For outdoor installations try to avoid direct sunlight to minimize solar heating of the electronics. The enclosure may be mounted onto a flat wall using hardware appropriate to the type of wall, or may be mast mounted using the optional 395-A-003 Mast Mounting Hardware Kit.

2.3 Wiring

A screw-type terminal block for attaching the wires is supplied on the barometer circuit board assembly. Refer to wiring diagram for wire colors.

2.4 Jumper Settings

Jumper J1 selects the data output format (4-20mA, RS232, or RS485). Jumper J2 selects other parameters such as (B) POLLED/CONTINUOUS, (C) 50/60 Hz noise reduction. Refer to wiring diagram for specific jumper settings.

3.0 OPERATION

Operation begins 3 seconds after power is applied. Outputs are updated once every 2 seconds.

3.1 4-20 mA Analog Output (Model 230-600C)

Be sure jumper J1 is in the IOUT (factory default) position.

Standard current output range is 4.00 to 20.00 mA full scale for 600 to 1100 mb (multiplier 31.25 mb per mA).

Other pressure ranges within the 600 to 1100 mb span may be selected via software commands but the full scale output signal range will always be the same, 4-20 mA. See SOFTWARE COMMANDS for details.

3.2 0-5 Vdc Analog Output (Model 230-600V)

Be sure jumper J1 is in the VOUT (factory default) position.

Standard voltage output range is 0 to 5000 mV full scale for 600 to 1100 mb (multiplier 0.1 mb per 1 mV).

Other pressure ranges within the 600 to 1100 mb span may be selected via software commands but the full scale output signal range will always be the same, 0-5000mV. See SOFTWARE COMMANDS for details.

3.3 Serial Output (All Models)

The baud rate is 9600. Serial output may be set to CONTINUOUS (factory default) or POLLED mode using jumper J2. All serial output is numeric ASCII text representing pressure in mb. Each string is terminated with a CR (ASCII 13). Example:

0983.9
0983.9
0983.9
0983.9

In CONTINUOUS mode, serial data is automatically sent once every 2 seconds.

In POLLED mode, the unit sends data only after receiving a poll command. The poll command is Ma! where a is the address. The default address is 0 (ASCII 48). Upon receiving a properly addressed poll command, the unit sends data at the next available 2-second output interval.

3.4 Software Commands

All commands sent to the 230-600 must use a minimum delay between characters of 20 milliseconds. Characters arriving faster than this may be missed.

When IN OPERATE MODE sending three ESC (ASCII 27) characters activates the COMMAND mode. If using RS-485 connections, send the ESC characters only when the unit is not transmitting data. Otherwise, the characters will be missed.

COMMAND mode is indicated by a ">" prompt. All commands must be terminated with a CR (ASCII 13). Use "???" to list available commands and current setup parameters as shown below.

Model 230-600C 4-20 mA Output

```
>??  
YOUNG MODEL 61202 BAROMETER V.BAR0404  
-----  
Rn SET REFERENCE TO SEA LEVEL  
On SERIAL OUTPUT FORMAT  
Kn SET CALIB OFFSET  
Sn SET CALIB SLOPE  
Ln ANALOG OUT LO RANGE  
Hn ANALOG OUT HI RANGE  
T1 TRANSFER EEPROM OUT  
An SET POLL ADDRESS  
Ma! POLL ADDR a (DURING OPERATE)  
XX EXIT TO OPERATE  
O:1 K:0 S:10000 R:0 L:9750 H:10250 A:0  
VM:7940 VO:2 IM:2521 IO:-989 IV:976  
PS:2086 PO:13374 TS:18145 TO:9688 DCBA:1111 WD:N  
>
```

Model 230-600V 0-5 Vdc Output

```
>??  
YOUNG 61200 SERIES BAROMETER V3.0.00  
-----  
Rn SET REFERENCE TO SEA LEVEL  
On SET SERIAL OUTPUT FORMAT  
Dn SET DECIMAL  
Kn SET CALIB OFFSET  
Sn SET CALIB SLOPE  
Ln ANALOG OUT LO RANGE  
Hn ANALOG OUT HI RANGE  
Fn FILTER NUMBER  
T1 TRANSFER EEPROM OUT  
An SET POLL ADDRESS  
Ma! POLL ADDR a (DURING OPERATE)  
XX EXIT TO OPERATE  
O:1 D:2 K:0 S:10000 R:0 L:9750 H:10250 F:4 A:0  
PS:2086 PO:13374 TS:18145 TO:9688 DCBA:0110 WD:Y  
>
```

Rn sets sea level reference where n is the offset value in mb x 10. This value is added to the measured pressure to give the equivalent pressure at sea level.

On sets serial output format where n is the format type.

- n = 1 Normal setting (pressure only)
- n = 2 Diagnostic output for factory only

Dn sets decimal resolution in the serial output string.

- n = 1 0.1 mb
- n = 2 0.01 mb

Kn sets an offset where n is mb x 10. For example, to add an offset of +0.2 mb, enter K2. The Kn offset is applied after the Sn multiplier is applied. Kn is normally set to 0.

Sn sets a multiplier where n is the multiplier x 10000. For example, to multiply by 1.0123, enter S10123. The Sn multiplier is applied before the Kn offset is applied. Sn is normally set to 10000.

Ln sets the LOW end of the analog output range where n is mb x 10. Use with the Hn command to set the analog output span. The standard value is 6000 for 600.0 mb. Ln entries are limited to values between 6000 and 10000. For example, to set the LOW end of the range to 800 mb, enter L8000.

Hn sets the HIGH end of the analog output range where n is mb x 10. Use with the Ln command to set the analog output span. The standard value is 11000 for 1100.0 mb. Hn entries are limited to values between 7000 and 11000. As an example, to set the HIGH end of the range to 1050 mb, enter H10500.

Fn sets the filter number for an averaging function. The default value is 4. Use n=0 for no filtering, max=20. Larger values cause longer settling times for new results.

$$\text{output}_{\text{new}} = [(n-1) * \text{output}_{\text{last}} + \text{sample}_{\text{new}}] / n$$

T1 dumps the internal EEPROM contents. This is for factory use only.

An sets the address for POLLED mode. The address may be any ASCII character in the range '0-9', 'A-Z', or 'a-z'.

Ma! is the POLL command where 'a' is the address. A response appears only when the address in the POLL command matches that of the unit being polled. This command functions only while the 61202 is in OPERATE mode and is listed in the HELP screen only as a convenience.

XX returns barometer to operate mode.

Values shown at the end of the list are calibration parameters for factory use only. All settings are retained when power is removed.

4.0 CE COMPLIANCE

This product complies with European CE requirements for the EMC Directive. Please note that shielded cable must be used.

5.0 MAINTENANCE

Maintenance of the barometer is limited to regular checking of the calibration and inspection of the enclosure and interconnecting cable. The inspection of the equipment should be performed regularly to prevent accumulation of dust, dirt and corrosive pollutants on the outer surfaces. Fasteners should be tested for correct tightness and for corrosion. Inspect the cable for damage to the outer jacket, especially if the barometer is mounted on a tower or mast and exposed to high winds. Replace the cable if there are signs of scraping or wearing through of the outer jacket. Clean the enclosure's outer surfaces occasionally with clean water taking care to avoid getting any water inside the enclosure. Inspect the circuit board for signs of exposure to moisture. Place desiccant inside the enclosure if necessary to help dry out the interior of the enclosure.

The calibration can be checked using a secondary transfer standard such as an electronic altimeter or by using a mercurial barometer. Periodic calibration certification, if required, is available from the factory.

6.0 ATTACHMENTS

Elevation Correction Tables for Barometric Pressure Sensors

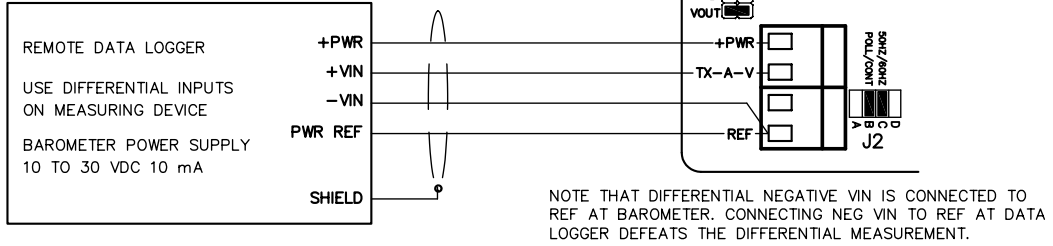
230-600C Wiring Diagrams

230-600V Wiring Diagrams

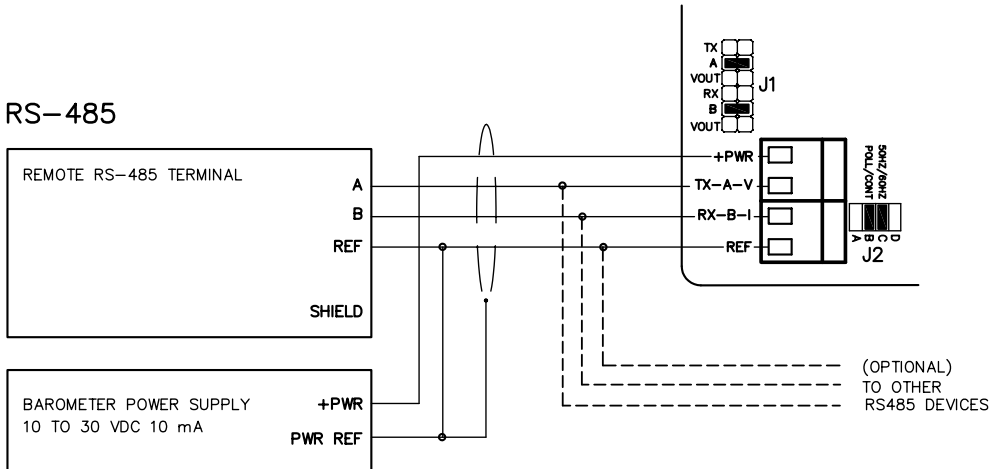
10000372 230-601 Outline Drawing & Cable Connections

MODEL 230-600V WIRING DIAGRAMS

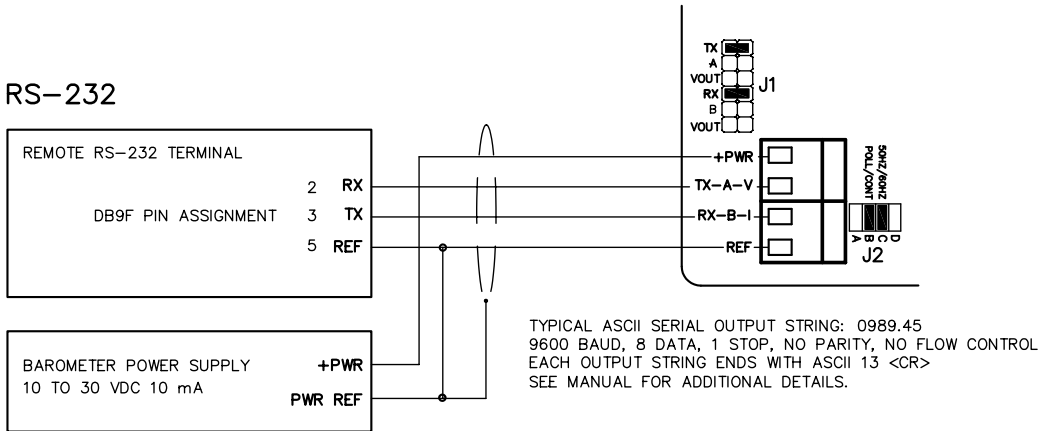
VOLTAGE OUTPUT



RS-485

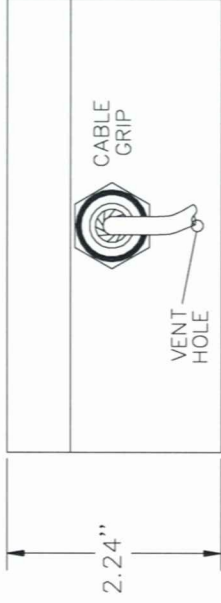
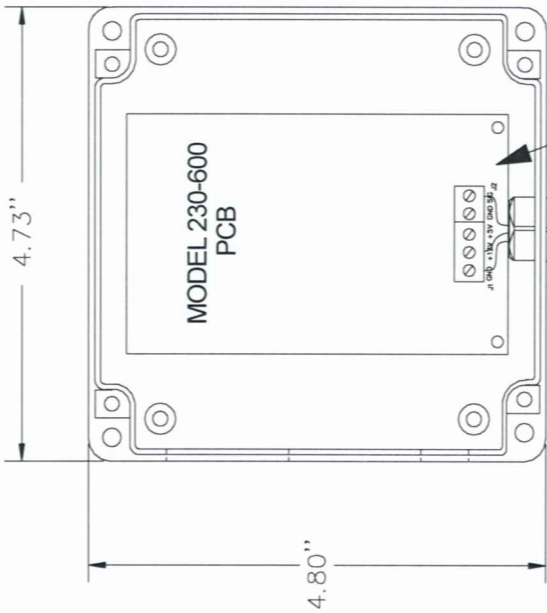


RS-232



J2 JUMPER SUMMARY

FEATURE	JUMPER J2
CONTINUOUS OUTPUT	JUMP B (DEFAULT)
POLLED OUTPUT	NONE
60 Hz NOISE FILTER	JUMP C (DEFAULT)
50 Hz NOISE FILTER	NONE



OUTPUT MODE	CABLE CONNECTIONS
0 - 5 VDC	+12 VDC = RED GROUND = BLACK + OUTPUT SIGNAL = WHITE - OUTPUT SIGNAL = GREEN
4 - 20 mA	+7 TO 30 VDC = RED POWER GND. = BLACK 4 - 20 mA OUT = WHITE

TITLE: OUTLINE, ANALOG BAROMETER & NEMA ENCLOSURE

MODEL USAGE: 230-601

BY: CA

DATE: 11-15-06

SCALE: DWG. NO. 1:1

SHEET 1 OF 1

B10000372

ELEVATION CORRECTION TABLES FOR BAROMETRIC PRESSURE SENSORS

INTRODUCTION

Weather stations located at elevations above sea level often need adjustment to the barometer so that sea level pressure is the indicated value. Sometimes the information necessary making for the adjustment is unavailable or is difficult to obtain. This document provides tables that give the barometer corrections for various elevations. A brief discussion of the concept of pressure variations with elevation is also included.

USING THE TABLES

Barometer corrections to sea level pressure are most often associated with airports, television reports, or National Weather Service offices. These organizations give sea level reduced pressure readings. Some large organizations may have networks of weather stations spread over a large region to measure lateral variations in pressure such as those produced by weather fronts. It is not necessary for a barometer to be corrected to sea level in order for it to operate. The correction adjustment is simply a preference for the way that pressure is reported.

Barometric pressure corrections can be obtained by contacting a local airport or National Weather Service weather station operator and requesting the current local reading. The barometer in question is then adjusted so that its reading matches that obtained from the airport or NWS. Some error will be introduced using this method of adjustment, increasing with distance since lateral pressure variations may increase with the horizontal distance from the reporting weather station.

The tables provided with this document are based upon the United States Standard Atmosphere and can be used in situations where no reporting stations exist within the immediate area. The tables give the correction factor that is added to the barometric pressure reading for a given station elevation. The correction is given both in inches of mercury (inHg) and in millibars (mb). Values are indicated for elevations expressed in feet above sea level.

For any station elevation, add the “**deviation from zero**” figure to the barometer’s current barometric pressure reading.

As an example, consider a barometer located at an elevation of 4550 feet with a current reading of 25.07 inHg. Using the tables, a value of 4.60 inHg should be added to the reading. The barometer should be adjusted until it produces a reading of 29.67 inHg to report the equivalent sea level pressure.

The “**standard pressure**” figures indicate the calculated barometric pressure at each elevation based upon the United States Standard Atmosphere. Actual pressures typically vary by up to 1 inHg (34 mb), depending upon weather conditions, time of year, and time of day. The variation is seldom more than 2 inHg (68 mb) from the values given, even in a severe storm. These figures provide a method for checking a barometer’s operation. A barometer that is located at an elevation of 1950 feet and is reporting a pressure of 860 mb has a calibration problem or is sitting in the eye of a super hurricane!

STANDARD PRESSURE VS. ELEVATION

Feet and mb

Station Elevation (feet)	Standard Pressure (mb)	Deviation from zero (mb)	Station Elevation (feet)	Standard Pressure (mb)	Deviation from zero (mb)
0	1013.2	0.0	1950	943.8	69.4
50	1011.4	1.8	2000	942.1	71.1
100	1009.6	3.7	2050	940.4	72.9
150	1007.8	5.5	2100	938.6	74.6
200	1005.9	7.3	2150	936.9	76.3
250	1004.1	9.1	2200	935.2	78.0
300	1002.3	10.9	2250	933.5	79.8
350	1000.5	12.8	2300	931.8	81.5
400	998.7	14.6	2350	930.1	83.2
450	996.9	16.4	2400	928.4	84.9
500	995.1	18.2	2450	926.7	86.6
550	993.3	20.0	2500	925.0	88.3
600	991.5	21.8	2550	923.3	90.0
650	989.7	23.6	2600	921.6	91.7
700	987.9	25.4	2650	919.9	93.4
750	986.1	27.2	2700	918.2	95.1
800	984.3	29.0	2750	916.5	96.8
850	982.5	30.8	2800	914.8	98.4
900	980.7	32.5	2850	913.1	100.1
950	978.9	34.3	2900	911.4	101.8
1000	977.1	36.1	2950	909.7	103.5
1050	975.4	37.9	3000	908.1	105.2
1100	973.6	39.7	3050	906.4	106.8
1150	971.8	41.4	3100	904.7	108.5
1200	970.0	43.2	3150	903.1	110.2
1250	968.3	45.0	3200	901.4	111.9
1300	966.5	46.7	3250	899.7	113.5
1350	964.8	48.5	3300	898.1	115.2
1400	963.0	50.2	3350	896.4	116.8
1450	961.2	52.0	3400	894.7	118.5
1500	959.5	53.8	3450	893.1	120.2
1550	957.7	55.5	3500	891.4	121.8
1600	956.0	57.3	3550	889.8	123.5
1650	954.2	59.0	3600	888.1	125.1
1700	952.5	60.7	3650	886.5	126.8
1750	950.8	62.5	3700	884.8	128.4
1800	949.0	64.2	3750	883.2	130.0
1850	947.3	66.0	3800	881.6	131.7
1900	945.6	67.7	3850	879.9	133.3

STANDARD PRESSURE VS. ELEVATION

Feet and mb

Station Elevation (feet)	Standard Pressure (mb)	Deviation from zero (mb)	Station Elevation (feet)	Standard Pressure (mb)	Deviation from zero (mb)
3900	878.3	134.9	5850	816.5	196.7
3950	876.7	136.6	5900	815.0	198.3
4000	875.0	138.2	5950	813.4	199.8
4050	873.4	139.8	6000	811.9	201.3
4100	871.8	141.4	6050	810.4	202.9
4150	870.2	143.1	6100	808.9	204.4
4200	868.6	144.7	6150	807.3	205.9
4250	866.9	146.3	6200	805.8	207.4
4300	865.3	147.9	6250	804.3	209.0
4350	863.7	149.5	6300	802.8	210.5
4400	862.1	151.1	6350	801.3	212.0
4450	860.5	152.7	6400	799.7	213.5
4500	858.9	154.3	6450	798.2	215.0
4550	857.3	155.9	6500	796.7	216.5
4600	855.7	157.5	6550	795.2	218.0
4650	854.1	159.1	6600	793.7	219.5
4700	852.5	160.7	6650	792.2	221.0
4750	850.9	162.3	6700	790.7	222.5
4800	849.3	163.9	6750	789.2	224.0
4850	847.7	165.5	6800	787.7	225.5
4900	846.2	167.1	6850	786.2	227.0
4950	844.6	168.7	6900	784.7	228.5
5000	843.0	170.2	6950	783.2	230.0
5050	841.4	171.8	7000	781.8	231.5
5100	839.8	173.4	7050	780.3	233.0
5150	838.3	175.0	7100	778.8	234.4
5200	836.7	176.5	7150	777.3	235.9
5250	835.1	178.1	7200	775.8	237.4
5300	833.6	179.7	7250	774.4	238.9
5350	832.0	181.2			
5400	830.5	182.8			
5450	828.9	184.3			
5500	827.3	185.9			
5550	825.8	187.5			
5600	824.2	189.0			
5650	822.7	190.6			
5700	821.1	192.1			
5750	819.6	193.6			
5800	818.1	195.2			

STANDARD PRESSURE VS. ELEVATION

Feet and inHg

Station Elevation (feet)	Standard Pressure (inHg)	Deviation from zero (inHg)	Station Elevation (feet)	Standard Pressure (inHg)	Deviation from zero (inHg)
0	29.92	0.00	1950	27.87	2.05
50	29.87	0.05	2000	27.82	2.10
100	29.81	0.11	2050	27.77	2.15
150	29.76	0.16	2100	27.72	2.20
200	29.71	0.22	2150	27.67	2.25
250	29.65	0.27	2200	27.62	2.30
300	29.60	0.32	2250	27.57	2.36
350	29.54	0.38	2300	27.52	2.41
400	29.49	0.43	2350	27.46	2.46
450	29.44	0.48	2400	27.41	2.51
500	29.38	0.54	2450	27.36	2.56
550	29.33	0.59	2500	27.31	2.61
600	29.28	0.64	2550	27.26	2.66
650	29.22	0.70	2600	27.21	2.71
700	29.17	0.75	2650	27.16	2.76
750	29.12	0.80	2700	27.11	2.81
800	29.07	0.86	2750	27.06	2.86
850	29.01	0.91	2800	27.01	2.91
900	28.96	0.96	2850	26.96	2.96
950	28.91	1.01	2900	26.91	3.01
1000	28.86	1.07	2950	26.86	3.06
1050	28.80	1.12	3000	26.82	3.11
1100	28.75	1.17	3050	26.77	3.16
1150	28.70	1.22	3100	26.72	3.20
1200	28.65	1.28	3150	26.67	3.25
1250	28.59	1.33	3200	26.62	3.30
1300	28.54	1.38	3250	26.57	3.35
1350	28.49	1.43	3300	26.52	3.40
1400	28.44	1.48	3350	26.47	3.45
1450	28.39	1.54	3400	26.42	3.50
1500	28.33	1.59	3450	26.37	3.55
1550	28.28	1.64	3500	26.32	3.60
1600	28.23	1.69	3550	26.68	3.65
1650	28.18	1.74	3600	26.23	3.69
1700	28.13	1.79	3650	26.18	3.74
1750	28.08	1.85	3700	26.13	3.79
1800	28.02	1.90	3750	26.08	3.84
1850	27.97	1.95	3800	26.03	3.89
1900	27.92	2.00	3850	25.98	3.94

STANDARD PRESSURE VS. ELEVATION

Feet and inHg

Station Elevation (feet)	Standard Pressure (inHg)	Deviation from zero (inHg)	Station Elevation (feet)	Standard Pressure (inHg)	Deviation from zero (inHg)
3900	25.94	3.98	5850	24.11	5.81
3950	25.89	4.03	5900	24.07	5.85
4000	25.84	4.08	5950	24.02	5.90
4050	25.79	4.13	6000	23.98	5.95
4100	25.74	4.18	6050	23.93	5.99
4150	25.70	4.22	6100	23.89	6.04
4200	25.65	4.27	6150	23.84	6.08
4250	25.60	4.32	6200	23.80	6.13
4300	25.55	4.37	6250	23.75	6.17
4350	25.51	4.42	6300	23.71	6.22
4400	25.46	4.46	6350	23.66	6.26
4450	25.41	4.51	6400	23.62	6.30
4500	25.36	4.56	6450	23.57	6.35
4550	25.32	4.60	6500	23.53	6.39
4600	25.27	4.65	6550	23.48	6.44
4650	25.22	4.70	6600	23.44	6.48
4700	25.17	4.75	6650	23.39	6.53
4750	25.13	4.79	6700	23.35	6.57
4800	25.08	4.84	6750	23.31	6.62
4850	25.03	4.89	6800	23.26	6.66
4900	24.99	4.93	6850	23.22	6.70
4950	24.94	4.98	6900	23.17	6.75
5000	24.89	5.03	6950	23.13	6.79
5050	24.85	5.07	7000	23.09	6.84
5100	24.80	5.12	7050	23.04	6.88
5150	24.75	5.17	7100	23.00	6.92
5200	24.71	5.21	7150	22.95	6.97
5250	24.66	5.26	7200	22.91	7.01
5300	24.62	5.31	7250	22.87	7.05
5350	24.57	5.35			
5400	24.52	5.40			
5450	24.48	5.44			
5500	24.43	5.49			
5550	24.39	5.54			
5600	24.34	5.58			
5650	24.29	5.63			
5700	24.25	5.67			
5750	24.20	5.72			
5800	24.16	5.76			