

BELL SYSTEM PRACTICES
Outside Plant Construction
and Maintenance

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PRESSURE TESTING

ALTITUDE CORRECTION FOR

PRECISE MEASUREMENTS

Contents	Page
1. General	1
2. Measurement of Elevation	1
3. Correction for Differences in Altitude	2

1. GENERAL

1.01 This is a new section that outlines the methods employed to convert precise pressure measurements made at different elevations to their equivalent values at a common elevation for comparison.

1.02 This section applies only in correcting pressure measurements taken with precision instruments that measure absolute cable pressures, such as the Wallace and Tiernan Aneroid Manometer which is read to the nearest .001 pound per square inch. The term "pounds per square inch" is abbreviated to "psi" in this section.

2. MEASUREMENT OF ELEVATION

2.01 When making precise measurements at different elevations, determine the elevation differences between the temporary valve points where measurements are made for gas leak location purposes. This is done whenever there is a difference in elevation of 1 foot or more between the lowest and highest valves at which pressure measurements are taken.

2.02 The difference in elevations between each of the temporary valve points and the base valve (generally the lowest valve point where a leak location measurement is taken) must be determined to an accuracy of about 1 foot. These elevations are determined for each valve at the point where the precision instrument will be placed when the pressure measure-

ment of that valve is taken. Elevations may be determined to the accuracy required by the use of a surveyor's level, builder's level or suitable equivalent.

3. CORRECTION FOR DIFFERENCES IN ALTITUDE

3.01 Absolute pressure measurements made at different elevations may be converted to their equivalent values at a common elevation by the use of the following table as described in the subsequent paragraphs.

3.02 The altitude correction for leak locating purposes should always be based on the difference in elevation between the valve point where the pressure is measured and a base elevation equal to that of the lowest valve point where a measurement is made. The altitude correction for each valve is then added to the pressure reading taken at the corresponding valve.

3.03 The corrections given in the table are for absolute pressure readings of 19.0 psi to 24.0 psi and cable temperatures of 30° F. to 101° F. By interpolation, correction values are determined for pressure readings to the closest .01 psi. This degree of accuracy will be sufficient for determining the elevation correction to be applied.

3.04 Since the correction values in the table are given in pounds per square inch per foot elevation difference, these values must be multiplied by the difference in elevation before applying to the pressure readings. For example: Assume that a pressure measurement of 23.128 psi taken at a cable temperature of 65° F. is to be corrected for an elevation difference of 4.7 feet above the base location (lowest valve point).

- (1) In entering the table round-off the 23.128 psi pressure reading to the closest .01 psi which is 23.13 psi.
- (2) Then, for a cable temperature of 65° F., the table shows correction values of .000799 psi for a pressure of 23.1 psi and .000802 psi for a pressure of 23.2 psi.
- (3) By interpolation the correction value for the 23.13 psi would be .000800 as this is 1/3 of the way between .000799 for 23.1 psi and .000802 for 23.2 psi.
- (4) The .0008 is then multiplied by the elevation difference of 4.7 feet to obtain the total correction.
 $.0008 \times 4.7 = .00376$ or .004 psi.
- (5) Add the .004 pound correction to the 23.128 psi measurement to obtain the equivalent pressure at the base elevation (that of the lowest valve).
 $23.128 + .004 = 23.132$ psi corrected absolute pressure measurement.

ELEVATION CORRECTIONS FOR PRECISE MEASUREMENTS

Absolute Pressure P.S.I.	PRESSURE CORRECTION PER FT. CHANGE IN ELEVATION								
	Cable Temperature of °F								
	30°	31°	32°	33°	34°	35°	36°	37°	38°
19.0	.000704	.000702	.000701	.000700	.000698	.000697	.000695	.000694	.000693
19.1	.707	706	705	703	702	700	699	698	696
19.2	711	710	708	707	705	704	703	701	700
19.3	715	714	712	711	709	708	706	705	703
19.4	719	717	716	714	713	711	710	708	707
19.5	722	721	719	718	716	715	714	712	711
19.6	726	725	723	722	720	719	717	716	714
19.7	730	728	727	725	724	722	721	719	718
19.8	733	732	730	729	727	726	724	723	722
19.9	737	736	734	733	731	730	728	727	725
20.0	741	739	738	736	735	733	732	730	729
20.1	745	743	741	740	738	737	735	734	733
20.2	748	747	745	744	742	741	739	738	736
20.3	752	750	749	747	746	744	743	741	740
20.4	756	754	753	751	749	748	746	745	744
20.5	759	758	756	755	753	752	750	749	747
20.6	763	762	760	758	757	755	754	752	751
20.7	767	765	764	762	761	759	757	756	755
20.8	770	769	767	766	764	763	761	760	758
20.9	774	773	771	770	768	766	765	763	762
21.0	778	776	775	773	772	770	768	767	765
21.1	782	780	778	777	775	774	772	771	769
21.2	785	784	782	781	779	777	776	774	773
21.3	789	787	786	784	783	781	779	778	776
21.4	793	791	789	788	786	785	783	782	780
21.5	796	795	793	792	790	788	787	785	784
21.6	800	799	797	795	794	792	790	789	787
21.7	804	802	801	799	797	796	794	792	791
21.8	807	806	804	803	801	799	798	796	795
21.9	811	810	808	806	805	803	801	800	798
22.0	815	813	812	810	808	807	805	803	802
22.1	819	817	815	814	812	810	809	807	806
22.2	822	821	819	817	816	814	812	811	809
22.3	826	824	823	821	819	818	816	814	813
22.4	830	828	826	825	823	821	820	818	816
22.5	833	832	830	828	827	825	823	822	820
22.6	837	836	834	832	830	829	827	825	824
22.7	841	839	837	836	834	832	831	829	827
22.8	845	843	841	839	838	836	834	833	831
22.9	848	847	845	843	841	840	838	836	835
23.0	852	850	848	847	845	843	842	840	838
23.1	856	854	852	851	849	847	845	844	842
23.2	859	858	856	854	852	851	849	847	846
23.3	863	861	860	858	856	854	853	851	849
23.4	867	865	863	862	860	858	856	855	853
23.5	870	869	867	865	863	862	860	858	857
23.6	874	872	871	869	867	865	864	862	860
23.7	878	876	874	873	871	869	867	866	864
23.8	882	880	878	876	874	873	871	869	868
23.9	885	884	882	880	878	876	875	873	871
24.0	.000889	.000887	.000885	.000884	.000882	.000880	.000878	.000876	.000875

Absolute Pressure P.S.I.	PRESSURE CORRECTION PER FT. CHANGE IN ELEVATION								
	Cable Temperature of °F								
	39°	40°	41°	42°	43°	44°	45°	46°	47°
19.0	.000691	.000690	.000688	.000687	.000686	.000684	.000683	.000682	.000680
19.1	695	693	692	691	689	688	686	685	684
19.2	698	697	696	694	693	691	690	689	687
19.3	702	701	699	698	696	695	694	692	691
19.4	706	704	703	702	700	699	697	696	695
19.5	709	708	706	705	704	702	701	699	698
19.6	713	711	710	709	707	706	704	703	702
19.7	716	715	714	712	711	709	708	707	705
19.8	720	719	717	716	714	713	712	710	709
19.9	724	722	721	720	718	717	715	714	712
20.0	727	726	725	723	722	720	719	717	716
20.1	731	730	728	727	725	724	722	721	720
20.2	735	733	732	730	729	727	726	725	723
20.3	738	737	735	734	732	731	730	728	727
20.4	742	741	739	738	736	735	733	732	730
20.5	746	744	743	741	740	738	737	735	734
20.6	749	748	746	745	743	742	740	739	737
20.7	753	751	750	749	747	745	744	743	741
20.8	756	755	754	752	750	749	748	746	745
20.9	760	759	757	756	754	753	751	750	748
21.0	764	762	761	759	758	756	755	753	752
21.1	767	766	764	763	761	760	758	757	755
21.2	771	770	768	767	765	763	762	760	759
21.3	775	773	772	770	769	767	766	764	763
21.4	778	777	775	774	772	771	769	768	766
21.5	782	780	779	777	776	774	773	771	770
21.6	786	784	783	781	779	778	776	775	773
21.7	789	788	786	785	783	781	780	778	777
21.8	793	791	790	788	787	785	783	782	780
21.9	797	795	793	792	790	789	787	786	784
22.0	800	799	797	796	794	792	791	789	788
22.1	804	802	801	799	797	796	794	793	791
22.2	807	806	804	803	801	799	798	796	795
22.3	811	809	808	806	805	803	801	800	798
22.4	815	813	812	810	808	807	805	803	802
22.5	818	817	815	814	812	810	809	807	806
22.6	822	820	819	817	815	814	812	811	809
22.7	826	824	822	821	819	817	816	814	813
22.8	829	828	826	824	823	821	819	818	816
22.9	833	831	830	828	826	825	823	821	820
23.0	837	835	833	832	830	828	827	825	823
23.1	840	839	837	835	833	832	830	829	827
23.2	844	842	841	839	837	835	834	832	831
23.3	847	846	844	843	841	839	837	836	834
23.4	851	849	848	846	844	843	841	839	838
23.5	855	853	851	850	848	846	845	843	841
23.6	858	857	855	853	851	850	848	847	845
23.7	862	860	859	857	855	853	852	850	848
23.8	866	864	862	861	859	857	855	854	852
23.9	869	868	866	864	862	861	859	857	856
24.0	.000873	.000871	.000870	.000868	.000866	.000864	.000863	.000861	.000859

Absolute Pressure P.S.I.	PRESSURE CORRECTION PER FT. CHANGE IN ELEVATION								
	Cable Temperature of °F								
	48°	49°	50°	51°	52°	53°	54°	55°	56°
19.0	.000679	.000678	.000676	.000675	.000674	.000672	.000671	.000670	.000668
19.1	682	681	680	678	677	676	674	673	672
19.2	686	685	683	682	681	679	678	677	675
19.3	690	688	687	686	684	683	681	680	679
19.4	693	692	690	689	688	686	685	684	682
19.5	697	695	694	693	691	690	689	687	686
19.6	700	699	698	696	695	693	692	691	689
19.7	704	703	701	700	698	697	696	694	693
19.8	707	706	705	703	702	701	699	698	696
19.9	711	710	708	707	705	704	703	701	700
20.0	715	713	712	710	709	708	706	705	703
20.1	718	717	715	714	713	711	710	708	707
20.2	722	720	719	718	716	715	713	712	710
20.3	725	724	722	721	720	718	717	715	714
20.4	729	727	726	725	723	722	720	719	717
20.5	732	731	730	728	727	725	724	722	721
20.6	736	735	733	732	730	729	727	726	725
20.7	740	738	737	735	734	732	731	729	728
20.8	743	742	740	739	737	736	734	733	732
20.9	747	745	744	742	741	739	738	737	735
21.0	750	749	747	746	744	743	742	740	739
21.1	754	752	751	749	748	747	745	744	742
21.2	757	756	755	753	752	750	749	747	746
21.3	761	760	758	757	755	754	752	751	749
21.4	765	763	762	760	759	757	756	754	753
21.5	768	767	765	764	762	761	759	758	756
21.6	772	770	769	767	766	764	763	761	760
21.7	775	774	772	771	769	768	766	765	763
21.8	779	777	776	774	773	771	770	768	767
21.9	782	781	779	778	776	775	773	772	770
22.0	786	785	783	781	780	778	777	775	774
22.1	790	788	787	785	783	782	780	779	777
22.2	793	792	790	789	787	785	784	782	781
22.3	797	795	794	792	791	789	787	786	784
22.4	800	799	797	796	794	793	791	789	788
22.5	804	802	801	799	798	796	794	793	791
22.6	807	806	804	803	801	800	798	796	795
22.7	811	809	808	806	805	803	802	800	798
22.8	815	813	811	810	808	807	805	803	802
22.9	818	817	815	813	812	810	809	807	805
23.0	822	820	819	817	815	814	812	811	809
23.1	825	824	822	821	819	817	816	814	812
23.2	829	827	826	824	822	821	819	818	816
23.3	833	831	829	828	826	824	823	821	819
23.4	836	834	833	831	830	828	826	825	823
23.5	840	838	836	835	833	831	830	828	826
23.6	843	842	840	838	837	835	833	832	830
23.7	847	845	843	842	840	839	837	835	834
23.8	850	849	847	845	844	842	840	839	837
23.9	854	852	851	849	847	846	844	842	841
24.0	.000858	.000856	.000854	.000852	.000851	.000849	.000847	.000846	.000844

Absolute Pressure P.S.I.	PRESSURE CORRECTION PER FT. CHANGE IN ELEVATION								
	Cable Temperature of °F								
	57°	58°	59°	60°	61°	62°	63°	64°	65°
19.0	.000667	.000666	.000664	.000663	.000662	.000661	.000659	.000658	.000657
19.1	671	669	668	667	665	664	663	662	660
19.2	674	673	671	670	669	668	666	665	664
19.3	678	676	675	674	672	671	670	669	667
19.4	681	680	678	677	676	675	673	672	671
19.5	685	683	682	681	679	678	677	675	674
19.6	688	687	685	684	683	681	680	679	678
19.7	692	690	689	688	686	685	684	682	681
19.8	695	694	692	691	690	688	687	686	684
19.9	699	697	696	695	693	692	691	689	688
20.0	702	701	699	698	697	695	694	693	691
20.1	706	704	703	701	700	699	697	696	695
20.2	709	708	706	705	704	702	701	700	698
20.3	713	711	710	708	707	706	704	703	702
20.4	716	715	713	712	711	709	708	707	705
20.5	720	718	717	715	714	713	711	710	709
20.6	723	722	720	719	718	716	715	714	712
20.7	727	725	724	722	721	720	718	717	716
20.8	730	729	727	726	725	723	722	721	719
20.9	734	732	731	729	728	727	725	724	723
21.0	737	736	734	733	732	730	729	727	726
21.1	741	739	738	736	735	734	732	731	729
21.2	744	743	741	740	739	737	736	734	733
21.3	748	746	745	743	742	741	739	738	736
21.4	751	750	748	747	746	744	743	741	740
21.5	755	753	752	750	749	748	746	745	743
21.6	758	757	755	754	753	751	750	748	747
21.7	762	760	759	757	756	755	753	752	750
21.8	765	764	762	761	760	758	756	755	754
21.9	769	767	766	764	763	761	760	759	757
22.0	772	771	769	768	766	765	763	762	761
22.1	776	774	773	771	770	768	767	766	764
22.2	779	778	776	775	773	772	770	769	767
22.3	783	781	780	778	777	775	774	772	771
22.4	786	785	783	782	780	779	777	776	774
22.5	790	788	787	785	784	782	781	779	778
22.6	793	792	790	789	787	786	784	783	781
22.7	797	795	794	792	791	789	788	786	785
22.8	801	799	797	796	794	793	791	790	788
22.9	804	802	801	799	798	796	795	793	792
23.0	808	806	804	803	801	800	798	797	795
23.1	811	809	808	806	805	803	802	800	799
23.2	815	813	811	810	808	807	805	804	802
23.3	818	816	815	813	812	810	809	807	805
23.4	822	820	818	817	815	814	812	811	809
23.5	825	823	822	820	819	817	815	814	812
23.6	829	827	825	824	822	821	819	818	816
23.7	832	830	829	827	826	824	822	821	819
23.8	836	834	832	831	829	828	826	824	823
23.9	839	837	836	834	833	831	829	828	826
24.0	.000843	.000841	.000839	.000838	.000836	.000834	.000833	.000831	.000830

Absolute Pressure P.S.I.	PRESSURE CORRECTION PER FT. CHANGE IN ELEVATION									
	Cable Temperature of °F									
	66°	67°	68°	69°	70°	71°	72°	73°	74°	
19.0	.000656	.000654	.000653	.000652	.000651	.000649	.000648	.000647	.000646	
19.1	659	658	657	655	654	653	652	650	649	
19.2	663	661	660	659	658	656	655	654	653	
19.3	666	665	664	662	661	660	659	657	656	
19.4	669	668	667	666	664	663	662	661	659	
19.5	673	672	670	669	668	667	665	664	663	
19.6	676	675	674	672	671	670	669	667	666	
19.7	680	678	677	676	675	673	672	671	670	
19.8	683	682	681	679	678	677	676	674	673	
19.9	687	685	684	683	682	680	679	678	676	
20.0	690	689	688	686	685	684	682	681	680	
20.1	694	692	691	690	688	687	686	684	683	
20.2	697	696	694	693	692	690	689	688	687	
20.3	701	699	698	696	695	694	693	691	690	
20.4	704	703	701	700	699	697	696	695	693	
20.5	707	706	705	703	702	701	699	698	697	
20.6	711	709	708	707	706	704	703	701	700	
20.7	714	713	712	710	709	708	706	705	704	
20.8	718	716	715	714	712	711	710	708	707	
20.9	721	720	719	717	716	714	713	712	710	
21.0	725	723	722	721	719	718	717	715	714	
21.1	728	727	725	724	723	721	720	718	717	
21.2	732	730	729	727	726	725	723	722	721	
21.3	735	734	732	731	730	728	727	725	724	
21.4	739	737	736	734	733	731	730	729	727	
21.5	742	740	739	738	736	735	734	732	731	
21.6	745	744	743	741	740	738	737	735	734	
21.7	749	747	746	745	743	742	740	739	738	
21.8	752	751	749	748	747	745	744	742	741	
21.9	756	754	753	751	750	749	747	746	744	
22.0	759	758	756	755	754	752	751	749	748	
22.1	763	761	760	758	757	755	754	753	751	
22.2	766	765	763	762	760	759	757	756	755	
22.3	770	768	767	765	764	762	761	759	758	
22.4	773	771	770	769	767	766	764	763	761	
22.5	776	775	774	772	771	769	768	766	765	
22.6	780	778	777	775	774	772	771	770	768	
22.7	783	782	780	779	777	776	775	773	772	
22.8	787	785	784	782	781	779	778	776	775	
22.9	790	789	787	786	784	783	781	780	778	
23.0	794	792	791	789	788	786	785	783	782	
23.1	797	796	794	793	791	790	788	787	785	
23.2	801	799	798	796	795	793	792	790	789	
23.3	804	802	801	799	798	796	795	793	792	
23.4	808	806	804	803	801	800	798	797	795	
23.5	811	809	808	806	805	803	802	800	799	
23.6	814	813	811	810	808	807	805	804	802	
23.7	818	816	815	813	812	810	809	807	806	
23.8	821	820	818	817	815	813	812	810	809	
23.9	825	823	822	820	819	817	815	814	812	
24.0	.000828	.000827	.000825	.000823	.000822	.000820	.000819	.000817	.000816	

Absolute Pressure P.S.I.	PRESSURE CORRECTION PER FT. CHANGE IN ELEVATION								
	Cable Temperature of °F								
	75°	76°	77°	78°	79°	80°	81°	82°	83°
19.0	.000645	.000643	.000642	.000641	.000640	.000639	.000637	.000636	.000635
19.1	648	647	646	644	643	642	641	640	639
19.2	651	650	649	648	646	645	644	643	642
19.3	655	653	652	651	650	649	648	646	645
19.4	658	657	656	655	653	652	651	650	649
19.5	662	660	659	658	657	655	654	653	652
19.6	665	664	662	661	660	659	658	656	655
19.7	668	667	666	665	663	662	661	660	659
19.8	672	670	669	668	667	665	664	663	662
19.9	675	674	673	671	670	669	668	666	665
20.0	679	677	676	675	673	672	671	670	669
20.1	682	681	679	678	677	676	674	673	672
20.2	685	684	683	682	680	679	678	676	675
20.3	689	687	686	685	684	682	681	680	679
20.4	692	691	690	688	687	686	684	683	682
20.5	696	694	693	692	690	689	688	687	685
20.6	699	698	696	695	694	692	691	690	689
20.7	702	701	700	698	697	696	694	693	692
20.8	706	704	703	702	700	699	698	697	695
20.9	709	708	706	705	704	702	701	700	699
21.0	713	711	710	709	707	706	705	703	702
21.1	716	714	713	712	710	709	708	707	705
21.2	719	718	717	715	714	713	711	710	709
21.3	723	721	720	719	717	716	715	713	712
21.4	726	725	723	722	721	719	718	717	715
21.5	729	728	727	725	724	723	721	720	719
21.6	733	731	730	729	727	726	725	723	722
21.7	736	735	733	732	731	729	728	727	725
21.8	740	738	737	736	734	733	731	730	729
21.9	743	742	740	739	737	736	735	733	732
22.0	746	745	744	742	741	739	738	737	735
22.1	750	748	747	746	744	743	741	740	739
22.2	753	752	750	749	747	746	745	743	742
22.3	757	755	754	752	751	750	748	747	745
22.4	760	758	757	756	754	753	752	750	749
22.5	763	762	761	759	758	756	755	754	752
22.6	767	765	764	763	761	760	758	757	756
22.7	770	769	767	766	764	763	762	760	759
22.8	774	772	771	769	768	766	765	764	762
22.9	777	775	774	773	771	770	768	767	766
23.0	780	779	777	776	774	773	772	770	769
23.1	784	782	781	779	778	776	775	774	772
23.2	787	786	784	783	781	780	778	777	776
23.3	791	789	788	786	785	783	782	780	779
23.4	794	792	791	790	788	786	785	784	782
23.5	797	796	794	793	791	790	788	787	786
23.6	801	799	798	796	795	793	792	790	789
23.7	804	802	801	800	798	797	795	794	792
23.8	808	806	804	803	801	800	798	797	796
23.9	811	809	808	806	805	803	802	800	799
24.0	.000814	.000813	.000811	.000810	.000808	.000807	.000805	.000804	.000802

Absolute Pressure P.S.I.	PRESSURE CORRECTION PER FT. CHANGE IN ELEVATION									
	Cable Temperature of °F									
	84°	85°	86°	87°	88°	89°	90°	91°	92°	
19.0	.000634	.000633	.000632	.000630	.000629	.000628	.000627	.000626	.000625	
19.1	637	636	635	634	633	631	630	629	628	
19.2	641	639	638	637	636	635	634	632	631	
19.3	644	643	642	640	639	638	637	636	635	
19.4	647	646	645	644	643	641	640	639	638	
19.5	651	649	648	647	646	645	644	642	641	
19.6	654	653	652	650	649	648	647	646	644	
19.7	657	656	655	654	652	651	650	649	648	
19.8	661	659	658	657	656	655	653	652	651	
19.9	664	663	661	660	659	658	657	656	654	
20.0	667	666	665	664	662	661	660	659	658	
20.1	671	669	668	667	666	665	663	662	661	
20.2	674	673	671	670	669	668	667	665	664	
20.3	677	676	675	674	672	671	670	669	667	
20.4	681	679	678	677	676	674	673	672	671	
20.5	684	683	681	680	679	678	677	675	674	
20.6	687	686	685	684	682	681	680	679	677	
20.7	691	689	688	687	686	684	683	682	681	
20.8	694	693	691	690	689	688	686	685	684	
20.9	697	696	695	693	692	691	690	688	687	
21.0	701	699	698	697	696	694	693	692	690	
21.1	704	703	701	700	699	698	696	695	694	
21.2	707	706	705	703	702	701	699	698	697	
21.3	711	709	708	707	705	704	703	702	700	
21.4	714	713	711	710	709	707	706	705	704	
21.5	717	716	715	713	712	711	710	708	707	
21.6	721	719	718	717	715	714	713	712	710	
21.7	724	723	721	720	719	717	716	715	713	
21.8	727	726	725	723	722	721	719	718	717	
21.9	731	729	728	727	725	724	723	721	720	
22.0	734	733	731	730	729	727	726	725	723	
22.1	737	736	735	733	732	731	729	728	727	
22.2	741	739	738	737	735	734	733	731	730	
22.3	744	743	741	740	739	737	736	735	733	
22.4	747	746	745	743	742	741	739	738	737	
22.5	751	749	748	747	745	744	743	741	740	
22.6	754	753	751	750	749	747	746	744	743	
22.7	757	756	755	753	752	750	749	748	746	
22.8	761	759	758	757	755	754	752	751	750	
22.9	764	763	761	760	758	757	756	754	753	
23.0	767	766	765	763	762	760	759	758	756	
23.1	771	769	768	766	765	764	762	761	760	
23.2	774	773	771	770	768	767	766	764	763	
23.3	777	776	774	773	772	770	769	768	766	
23.4	781	779	778	776	775	774	772	771	769	
23.5	784	783	781	780	778	777	776	774	773	
23.6	787	786	784	783	782	780	779	777	776	
23.7	791	789	788	786	785	784	782	781	779	
23.8	794	793	791	790	788	787	785	784	783	
23.9	797	796	794	793	792	790	789	787	786	
24.0	.000801	.000799	.000798	.000796	.000795	.000793	.000792	.000791	.000789	

Absolute Pressure P.S.I.	PRESSURE CORRECTION PER FT. CHANGE IN ELEVATION								
	Cable Temperature of °F								
	93°	94°	95°	96°	97°	98°	99°	100°	101°
19.0	.000624	.000622	.000621	.000620	.000619	.000618	.000617	.000616	.000615
19.1	627	626	625	623	622	621	620	619	618
19.2	630	629	628	627	626	625	623	622	621
19.3	633	632	631	630	629	628	627	626	624
19.4	637	636	634	633	632	631	630	629	628
19.5	640	639	638	636	636	634	633	632	631
19.6	643	642	641	640	639	638	636	635	634
19.7	647	645	644	643	642	641	640	638	637
19.8	650	649	647	646	645	644	643	642	641
19.9	653	652	651	650	649	647	646	645	644
20.0	656	655	654	653	652	651	649	648	647
20.1	660	658	657	656	655	654	653	651	650
20.2	663	662	661	659	658	657	656	655	653
20.3	666	665	664	663	662	660	659	658	657
20.4	670	668	667	666	665	664	662	661	660
20.5	673	672	670	669	668	667	666	664	663
20.6	676	675	674	672	671	670	669	668	666
20.7	679	678	677	676	675	673	672	671	670
20.8	683	681	680	679	678	677	675	674	673
20.9	686	685	683	682	681	680	679	677	676
21.0	689	688	687	685	684	683	682	681	679
21.1	693	691	690	689	688	686	685	684	683
21.2	696	695	693	692	691	690	688	687	686
21.3	699	698	697	695	694	693	692	690	689
21.4	702	701	700	698	697	696	695	694	692
21.5	706	704	703	702	701	699	698	697	696
21.6	709	708	706	705	704	703	701	700	699
21.7	712	711	710	708	707	706	705	703	702
21.8	715	714	713	712	710	709	708	707	705
21.9	719	717	716	715	714	712	711	710	708
22.0	722	721	719	718	717	716	714	713	712
22.1	725	724	723	721	720	719	718	716	715
22.2	729	727	726	725	723	722	721	720	718
22.3	732	731	729	728	727	725	724	723	721
22.4	735	734	732	731	730	729	727	726	725
22.5	738	737	736	734	733	732	731	729	728
22.6	742	740	739	738	737	735	734	732	731
22.7	745	744	742	741	740	738	737	736	734
22.8	748	747	746	744	743	742	740	739	738
22.9	752	750	749	747	746	745	744	742	741
23.0	755	753	752	751	750	748	747	745	744
23.1	758	757	755	754	753	751	750	749	747
23.2	761	760	759	757	756	755	753	752	751
23.3	765	763	762	761	759	758	757	755	754
23.4	768	767	765	764	763	761	760	758	757
23.5	771	770	768	767	766	764	763	762	760
23.6	775	773	772	770	769	768	766	765	763
23.7	778	776	775	774	772	771	770	768	767
23.8	781	780	778	777	776	774	773	771	770
23.9	784	783	782	780	779	777	776	775	773
24.0	.000788	.000786	.000785	.000783	.000782	.000781	.000779	.000778	.000776