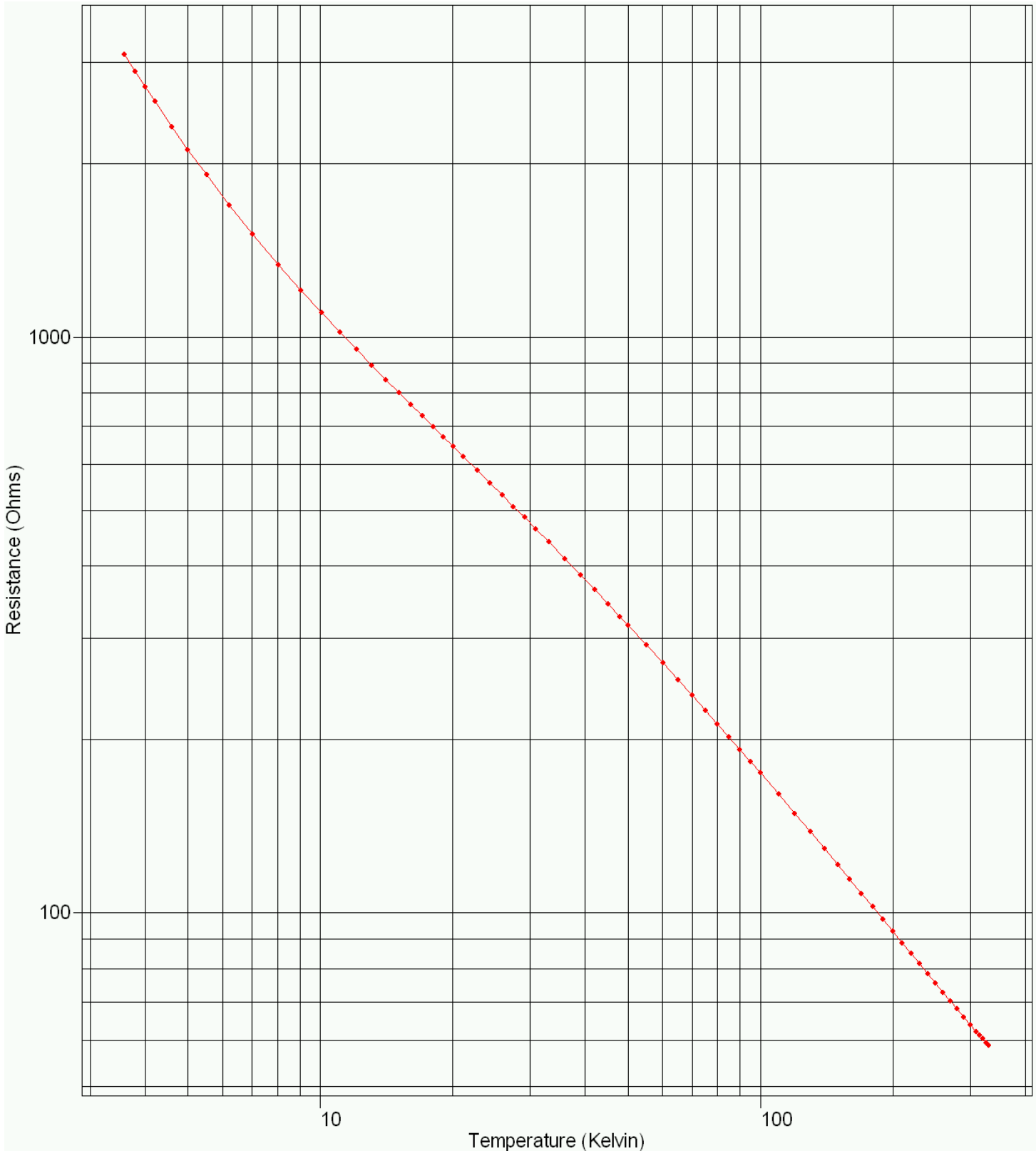


DATA PLOT

Calibration Report: 531605
Sensor Model: CX-1050-SD-4L
Sensor Type: Cernox Resistor

Sales Order: 42383
Serial Number: X49618
Temperature Range: 4.00K to 325K



TEST DATA

Calibration Report: 531605
Sensor Model: CX-1050-SD-4L
Sensor Type: Cernox Resistor

Sales Order: 42383
Serial Number: X49618
Temperature Range: 4.00K to 325K

Index	Temp. (K)	Resistance (Ω)	Excitation	Index	Temp. (K)	Resistance (Ω)	Excitation
1	3.59299	3098.66	2mV \pm 25%	41	75.0267	224.635	2mV \pm 25%
2	3.80105	2891.29	2mV \pm 25%	42	80.0263	212.542	2mV \pm 25%
3	3.99894	2720.27	2mV \pm 25%	43	85.0167	201.711	2mV \pm 25%
4	4.20682	2563.54	2mV \pm 25%	44	90.0205	191.901	2mV \pm 25%
5	4.59805	2319.27	2mV \pm 25%	45	95.0173	183.055	2mV \pm 25%
6	5.00359	2115.92	2mV \pm 25%	46	100.022	174.967	2mV \pm 25%
7	5.51117	1912.93	2mV \pm 25%	47	110.010	160.774	2mV \pm 25%
8	6.21779	1695.98	2mV \pm 25%	48	120.008	148.689	2mV \pm 25%
9	7.02772	1509.97	2mV \pm 25%	49	130.001	138.284	2mV \pm 25%
10	8.04311	1336.13	2mV \pm 25%	50	140.000	129.228	2mV \pm 25%
11	9.05282	1205.82	2mV \pm 25%	51	149.999	121.277	2mV \pm 25%
12	10.0654	1103.32	2mV \pm 25%	52	160.003	114.239	2mV \pm 25%
13	11.0823	1019.92	2mV \pm 25%	53	170.007	107.977	2mV \pm 25%
14	12.0926	951.237	2mV \pm 25%	54	180.009	102.370	2mV \pm 25%
15	13.0997	893.206	2mV \pm 25%	55	190.007	97.3363	2mV \pm 25%
16	14.1069	843.285	2mV \pm 25%	56	200.017	92.7679	2mV \pm 25%
17	15.0942	800.573	2mV \pm 25%	57	210.028	88.6407	2mV \pm 25%
18	16.0848	762.646	2mV \pm 25%	58	220.029	84.8700	2mV \pm 25%
19	17.0773	728.756	2mV \pm 25%	59	230.029	81.4363	2mV \pm 25%
20	18.0603	698.546	2mV \pm 25%	60	240.038	78.2804	2mV \pm 25%
21	19.0462	670.964	2mV \pm 25%	61	250.031	75.3884	2mV \pm 25%
22	20.0344	645.813	2mV \pm 25%	62	260.032	72.7219	2mV \pm 25%
23	21.1226	620.542	2mV \pm 25%	63	270.032	70.2496	2mV \pm 25%
24	22.7185	587.193	2mV \pm 25%	64	280.039	67.9701	2mV \pm 25%
25	24.3030	557.878	2mV \pm 25%	65	290.045	65.8503	2mV \pm 25%
26	25.8983	531.476	2mV \pm 25%	66	300.058	63.8790	2mV \pm 25%
27	27.5095	507.402	2mV \pm 25%	67	310.071	62.0444	2mV \pm 25%
28	29.1206	485.615	2mV \pm 25%	68	315.082	61.1745	2mV \pm 25%
29	30.9359	463.317	2mV \pm 25%	69	320.083	60.3287	2mV \pm 25%
30	33.0475	440.013	2mV \pm 25%	70	326.078	59.3563	2mV \pm 25%
31	36.0480	410.908	2mV \pm 25%	71	330.080	58.7270	2mV \pm 25%
32	39.0500	385.603	2mV \pm 25%				
33	42.0295	363.498	2mV \pm 25%				
34	45.0331	343.757	2mV \pm 25%				
35	48.0184	326.256	2mV \pm 25%				
36	50.0254	315.497	2mV \pm 25%				
37	55.0255	291.652	2mV \pm 25%				
38	60.0275	271.274	2mV \pm 25%				
39	65.0288	253.655	2mV \pm 25%				
40	70.0299	238.237	2mV \pm 25%				



UNCERTAINTY ANALYSIS

Calibration Report: 531605
 Sensor Model: CX-1050-SD-4L
 Sensor Type: Cernox Resistor

Sales Order: 42383
 Serial Number: X49618
 Temperature Range: 4.00K to 325K

Calibration Data Uncertainty

The uncertainties of the measured calibration data for Lake Shore's sensors are summarized in the table below. The values given are the combined uncertainty of the temperature measurement and the resistance or voltage measurement expressed as an equivalent temperature uncertainty in millikelvin (mK). Note that the values are the calibration uncertainty only and do not include the stability of the temperature sensor. The uncertainty analysis has followed the guidelines for determining measurement uncertainty as outlined in the ISO Guide to the Expression of Uncertainty in Measurement, NIST Technical Note 1297, and ANSI/NCSL Z540-2-1997. Since the uncertainty varies with temperature due to the variation of the sensor sensitivity and excitation, the table gives typical values at several different temperatures throughout the range of the calibration. The uncertainty is based on an approximate 95% confidence level with a coverage factor $k = 2$.

T (K)	Uncertainty (+/- mK)											
	Ge (GR-200-X)		Cernox (CX-Y)		CGR	RX		Pt		RhFe		Diode
	X ≤ 100	X ≥ 250	Y ≤ 1030	Y ≥ 1050		-102	-103	100 Ω	25 Ω	27 Ω	100 Ω	
1.4	4	4	4	4	4	4	4			4	4	7
4.2	4	4	4	4	4	4	6			4	4	5
10	4	4	5	4	4	10	15			4	5	6
20	8	7	9	8	8	34	34	8	10	8	9	9
30	9	8	11	9	9	72	60	8	8	9	9	28
50	12	11	16	12	13			10	10	10	10	34
100	32	18	24	16	27			11	11	11	11	30
300			72	40	100			22	22	22	22	33
400			120	67				43	43	42		47
500								48	48			52

Polynomial Fit Uncertainty

When a sensor is used to measure temperature, a polynomial fit to the measured calibration data is often used to convert the sensor resistance (R) or voltage (V) to a temperature (T). How well the polynomial represents the sensor calibration data is another source of uncertainty when using the sensor. In the polynomials provided with this set of calibration data, the standard deviation of the fit can be used as an estimate of this additional temperature uncertainty. The standard deviation of fit is determined from the following equation:

$$\sigma_{fit}^2 = \frac{\sum_{i=1}^N (T_i - T_{i,calc})^2}{N - n} = \frac{N}{N - n} (\Delta T_{RMS})^2$$

- where
- σ_{fit} = standard deviation of the fit
 - T_i = measured temperature for point i
 - $T_{i,calc}$ = the temperature calculated from the polynomial equation for point i
 - N = number of data points in fit range
 - n = number of fit coefficients
 - ΔT_{RMS} = root mean square deviation of fit

A value of ΔT_{RMS} is given for each range of fit.

F008-04-00 (08/06/04)



POLYNOMIAL EQUATION

Calibration Report: 531605
Sensor Model: CX-1050-SD-4L
Sensor Type: Cernox Resistor

Sales Order: 42383
Serial Number: X49618
Temperature Range: 4.00K to 325K

Polynomial Type: Chebychev
Useful Range of Fit:

4.00K to 24.3K
2719. Ohms to 557.9 Ohms

Lower and Upper limits of Log(resistance) used in computing Chebychev coefficients:
ZL = 2.70535202474 ZU = 3.49117352644

Order	Coefficient	Std. Deviation of Coefficient	Ratio (Coeff./Std Dev.)
0	12.027508	1.7356E-04	69299.34
1	-11.252987	2.6767E-04	-42040.63
2	3.454613	2.6067E-04	13252.80
3	-0.714617	2.4455E-04	-2922.13
4	0.072612	2.3685E-04	306.58
5	0.009589	2.3047E-04	41.60
6	-0.003780	2.2196E-04	-17.03
7	-0.000276	2.2069E-04	-1.25
8	0.000580	2.2113E-04	2.62

$Z = \text{Log}(\text{resistance})$

$X = ((Z-ZL)-(ZU-Z))/(ZU-ZL)$

Temp. (K) = $\sum A_i * \text{COS}(i * \text{ARCCOS}(X))$, where $0 \leq i \leq 8$
and the A_i 's are the coefficients in the table above.

POLYNOMIAL EQUATION

Calibration Report: 531605
Sensor Model: CX-1050-SD-4L
Sensor Type: Cernox Resistor

Sales Order: 42383
Serial Number: X49618
Temperature Range: 4.00K to 325K

Polynomial Type: Chebychev
Temp. (K) vs. Log(resistance)

	R Meas. (Ω)	T Meas. (K)	T Eq. (K)	T diff. (mK)
1	3098.657	3.59299	3.59324	-0.25
2	2891.286	3.80105	3.80034	0.71
3	2720.269	3.99894	3.99896	-0.02
4	2563.544	4.20682	4.20767	-0.86
5	2319.271	4.59805	4.59787	0.19
6	2115.921	5.00359	5.00327	0.33
7	1912.928	5.51117	5.51093	0.24
8	1695.984	6.21779	6.21826	-0.47
9	1509.974	7.02772	7.02738	0.34
10	1336.134	8.04311	8.04353	-0.41
11	1205.822	9.05282	9.05327	-0.44
12	1103.316	10.06543	10.06479	0.64
13	1019.920	11.08233	11.08191	0.42
14	951.2366	12.09265	12.09206	0.58
15	893.2062	13.09972	13.10017	-0.44
16	843.2848	14.10694	14.10776	-0.82
17	800.5732	15.09416	15.09453	-0.37
18	762.6460	16.08476	16.08521	-0.44
19	728.7562	17.07731	17.07688	0.43
20	698.5461	18.06026	18.05867	1.58
21	670.9645	19.04622	19.04699	-0.77
22	645.8131	20.03437	20.03485	-0.48
23	620.5422	21.12257	21.12126	1.32
24	587.1934	22.71849	22.71959	-1.09
25	557.8782	24.30298	24.30359	-0.61
26	531.4756	25.89831	25.89731	1.00
27	507.4018	27.50955	27.50982	-0.28

Order of Fit = 8 RMS error of fit = 0.67 mK
Largest absolute error = 1.58 mK at data point no. 20



POLYNOMIAL EQUATION

Calibration Report: 531605
Sensor Model: CX-1050-SD-4L
Sensor Type: Cernox Resistor

Sales Order: 42383
Serial Number: X49618
Temperature Range: 4.00K to 325K

Polynomial Type: Chebychev
Useful Range of Fit:

24.3K to 110.K
557.9 Ohms to 160.8 Ohms

Lower and Upper limits of Log(resistance) used in computing Chebychev coefficients:
ZL = 2.14077225405 ZU = 2.79277132355

Order	Coefficient	Std. Deviation of Coefficient	Ratio (Coeff./Std Dev.)
0	65.063848	5.9390E-04	109553.65
1	-53.239433	9.7491E-04	-54609.71
2	10.411417	8.7444E-04	11906.41
3	-1.203541	7.9950E-04	-1505.38
4	0.084548	7.6809E-04	110.08
5	0.004331	7.5703E-04	5.72
6	0.000981	7.4078E-04	1.32
7	-0.001077	7.1434E-04	-1.51

$Z = \text{Log}(\text{resistance})$

$X = ((Z-ZL)-(ZU-Z))/(ZU-ZL)$

Temp. (K) = $\sum A_i \cdot \text{COS}(i \cdot \text{ARCCOS}(X))$, where $0 \leq i \leq 7$
and the A_i 's are the coefficients in the table above.

POLYNOMIAL EQUATION

Calibration Report: 531605
Sensor Model: CX-1050-SD-4L
Sensor Type: Cernox Resistor

Sales Order: 42383
Serial Number: X49618
Temperature Range: 4.00K to 325K

Polynomial Type: Chebychev
Temp. (K) vs. Log(resistance)

	R Meas. (Ω)	T Meas. (K)	T Eq. (K)	T diff. (mK)
23	620.5422	21.12126	21.12107	0.18
24	587.1934	22.71959	22.72010	-0.51
25	557.8782	24.30359	24.30392	-0.32
26	531.4756	25.89831	25.89721	1.10
27	507.4018	27.50955	27.50952	0.02
28	485.6151	29.12056	29.11941	1.15
29	463.3169	30.93589	30.93728	-1.39
30	440.0128	33.04746	33.04945	-1.99
31	410.9076	36.04799	36.04805	-0.07
32	385.6027	39.05004	39.04706	2.98
33	363.4982	42.02947	42.02891	0.57
34	343.7572	45.03307	45.03416	-1.09
35	326.2561	48.01838	48.01850	-0.11
36	315.4973	50.02543	50.02554	-0.11
37	291.6525	55.02550	55.02669	-1.20
38	271.2745	60.02748	60.02860	-1.12
39	253.6547	65.02877	65.02718	1.59
40	238.2369	70.02987	70.02874	1.13
41	224.6354	75.02670	75.02792	-1.22
42	212.5418	80.02630	80.02322	3.08
43	201.7107	85.01674	85.01515	1.60
44	191.9005	90.02050	90.02951	-9.01
45	183.0546	95.01729	95.01584	1.45
46	174.9670	100.02175	100.01768	4.07
47	160.7743	110.00980	110.00970	0.10
48	148.6891	120.00847	120.00973	-1.26
49	138.2841	130.00091	130.00051	0.39

Order of Fit = 7 RMS error of fit = 2.28 mK
Largest absolute error = -9.01 mK at data point no. 44



POLYNOMIAL EQUATION

Calibration Report: 531605
Sensor Model: CX-1050-SD-4L
Sensor Type: Cernox Resistor

Sales Order: 42383
Serial Number: X49618
Temperature Range: 4.00K to 325K

Polynomial Type: Chebychev
Useful Range of Fit:

110.K to 325.K
160.8 Ohms to 59.53 Ohms

Lower and Upper limits of Log(resistance) used in computing Chebychev coefficients:
ZL = 1.76883763598 ZU = 2.26258063438

Order	Coefficient	Std. Deviation of Coefficient	Ratio (Coeff./Std Dev.)
0	194.642398	1.9002E-03	102433.02
1	-115.060965	2.9512E-03	-38987.44
2	17.480493	2.6555E-03	6582.63
3	-2.403108	2.5777E-03	-932.25
4	0.419878	2.5707E-03	163.33
5	-0.070501	2.5706E-03	-27.43
6	0.009416	2.5330E-03	3.72
7	0.000089	2.4619E-03	0.04
8	-0.003290	2.3501E-03	-1.40

Z = Log(resistance)

$X = ((Z-ZL)-(ZU-Z))/(ZU-ZL)$

Temp. (K) = $\sum A_i * \text{COS}(i * \text{ARCCOS}(X))$, where $0 \leq i \leq 8$
and the A_i 's are the coefficients in the table above.

POLYNOMIAL EQUATION

Calibration Report: 531605
Sensor Model: CX-1050-SD-4L
Sensor Type: Cernox Resistor

Sales Order: 42383
Serial Number: X49618
Temperature Range: 4.00K to 325K

Polynomial Type: Chebychev
Temp. (K) vs. Log(resistance)

	R Meas. (Ω)	T Meas. (K)	T Eq. (K)	T diff. (mK)
45	183.0546	95.01584	95.01441	1.43
46	174.9670	100.01768	100.02118	-3.50
47	160.7743	110.00970	110.00674	2.96
48	148.6891	120.00847	120.00646	2.01
49	138.2841	130.00091	130.00474	-3.84
50	129.2284	139.99988	140.00151	-1.63
51	121.2771	149.99909	149.99794	1.15
52	114.2393	160.00331	160.00214	1.17
53	107.9769	170.00694	170.00494	2.00
54	102.3704	180.00914	180.01100	-1.86
55	97.33635	190.00733	189.99884	8.49
56	92.76790	200.01653	200.03025	-13.72
57	88.64071	210.02802	210.01890	9.11
58	84.87004	220.02928	220.03953	-10.25
59	81.43627	230.02918	230.02623	2.95
60	78.28043	240.03841	240.04040	-2.00
61	75.38839	250.03059	250.02563	4.96
62	72.72186	260.03190	260.01647	15.43
63	70.24963	270.03187	270.04603	-14.16
64	67.97009	280.03854	280.03649	2.06
65	65.85026	290.04496	290.05004	-5.07
66	63.87905	300.05816	300.06536	-7.21
67	62.04438	310.07078	310.06952	1.25
68	61.17448	315.08174	315.06482	16.91
69	60.32872	320.08304	320.08821	-5.17
70	59.35634	326.07786	326.07808	-0.21
71	58.72698	330.08010	330.08338	-3.28

Order of Fit = 8 RMS error of fit = 7.17 mK
Largest absolute error = 16.91 mK at data point no. 68



INTERPOLATION TABLE

Calibration Report: 531605
Sensor Model: CX-1050-SD-4L
Sensor Type: Cernox Resistor

Sales Order: 42383
Serial Number: X49618
Temperature Range: 4.00K to 325K

Temp (K)	Res. (Ω)	dR/dT (Ω /K)	dlogR/dlogT	Temp (K)	Res. (Ω)	dR/dT (Ω /K)	dlogR/dlogT
4.000	2719.44	-802.59	-1.1805	37.00	402.502	-8.6389	-0.79413
4.200	2568.95	-705.51	-1.1534	38.00	394.055	-8.2594	-0.79648
4.400	2436.13	-625.00	-1.1288	39.00	385.974	-7.9056	-0.79880
4.600	2318.08	-557.49	-1.1063	40.00	378.236	-7.5749	-0.80107
4.800	2212.45	-500.34	-1.0855	42.00	363.700	-6.9743	-0.80539
5.000	2117.40	-451.45	-1.0661	44.00	350.291	-6.4446	-0.80950
5.200	2031.41	-409.37	-1.0479	46.00	337.881	-5.9748	-0.81342
5.400	1953.27	-372.88	-1.0309	48.00	326.359	-5.5556	-0.81710
5.600	1881.94	-341.22	-1.0153	50.00	315.630	-5.1805	-0.82066
5.800	1816.54	-313.35	-1.0005	52.00	305.612	-4.8429	-0.82402
6.000	1756.38	-288.75	-0.98639	54.00	296.236	-4.5378	-0.82719
6.500	1625.05	-238.96	-0.95579	56.00	287.441	-4.2620	-0.83033
7.000	1515.46	-201.15	-0.92913	58.00	279.172	-4.0109	-0.83329
7.500	1422.48	-171.88	-0.90623	60.00	271.383	-3.7821	-0.83618
8.000	1342.57	-148.69	-0.88598	65.00	253.744	-3.2909	-0.84302
8.500	1273.02	-130.10	-0.86870	70.00	238.320	-2.8920	-0.84945
9.000	1211.90	-114.89	-0.85321	75.00	224.707	-2.5634	-0.85559
9.500	1157.69	-102.34	-0.83980	77.35	218.843	-2.4286	-0.85839
10.00	1109.23	-91.824	-0.82782	80.00	212.595	-2.2894	-0.86149
10.50	1065.59	-82.961	-0.81748	85.00	201.742	-2.0582	-0.86720
11.00	1026.05	-75.389	-0.80822	90.00	191.955	-1.8614	-0.87276
11.50	990.018	-68.891	-0.80023	95.00	183.081	-1.6923	-0.87812
12.00	957.016	-63.251	-0.79311	100.0	174.994	-1.5461	-0.88351
12.50	926.644	-58.340	-0.78698	105.0	167.589	-1.4186	-0.88880
13.00	898.577	-54.021	-0.78154	110.0	160.783	-1.3063	-0.89369
13.50	872.537	-50.213	-0.77690	115.0	154.505	-1.2068	-0.89827
14.00	848.294	-46.826	-0.77280	120.0	148.696	-1.1184	-0.90255
14.50	825.649	-43.807	-0.76934	125.0	143.306	-1.0394	-0.90662
15.00	804.435	-41.098	-0.76633	130.0	138.289	-0.96864	-0.91058
15.50	784.506	-38.660	-0.76383	135.0	133.607	-0.90490	-0.91434
16.00	765.737	-36.454	-0.76170	140.0	129.230	-0.84716	-0.91776
16.50	748.018	-34.453	-0.75997	145.0	125.127	-0.79465	-0.92085
17.00	731.255	-32.629	-0.75855	150.0	121.276	-0.74673	-0.92360
17.50	715.362	-30.964	-0.75746	155.0	117.653	-0.70288	-0.92600
18.00	700.268	-29.436	-0.75663	160.0	114.241	-0.66263	-0.92805
18.50	685.906	-28.032	-0.75606	165.0	111.021	-0.62561	-0.92979
19.00	672.218	-26.737	-0.75571	170.0	107.980	-0.59148	-0.93122
19.50	659.153	-25.540	-0.75557	175.0	105.102	-0.55996	-0.93236
20.00	646.663	-24.431	-0.75560	180.0	102.376	-0.53078	-0.93323
21.00	623.250	-22.443	-0.75620	185.0	99.7908	-0.50373	-0.93385
22.00	601.691	-20.713	-0.75733	190.0	97.3358	-0.47860	-0.93423
23.00	581.755	-19.191	-0.75874	195.0	95.0019	-0.45521	-0.93437
24.00	563.247	-17.854	-0.76074	200.0	92.7810	-0.43342	-0.93428
25.00	545.996	-16.671	-0.76333	205.0	90.6654	-0.41307	-0.93397
26.00	529.866	-15.606	-0.76578	210.0	88.6482	-0.39403	-0.93343
27.00	514.748	-14.646	-0.76823	215.0	86.7230	-0.37621	-0.93268
28.00	500.542	-13.780	-0.77086	220.0	84.8842	-0.35949	-0.93170
29.00	487.161	-12.994	-0.77350	225.0	83.1265	-0.34378	-0.93051
30.00	474.531	-12.277	-0.77616	230.0	81.4449	-0.32901	-0.92911
31.00	462.587	-11.622	-0.77882	235.0	79.8350	-0.31509	-0.92750
32.00	451.270	-11.020	-0.78147	240.0	78.2926	-0.30198	-0.92569
33.00	440.530	-10.467	-0.78410	245.0	76.8140	-0.28960	-0.92368
34.00	430.321	-9.9568	-0.78669	250.0	75.3955	-0.27790	-0.92148
35.00	420.604	-9.4838	-0.78918	255.0	74.0339	-0.26684	-0.91911
36.00	411.342	-9.0458	-0.79168	260.0	72.7261	-0.25638	-0.91657



INTERPOLATION TABLE

Calibration Report: 531605
Sensor Model: CX-1050-SD-4L
Sensor Type: Cernox Resistor

Sales Order: 42383
Serial Number: X49618
Temperature Range: 4.00K to 325K

<u>Temp (K)</u>	<u>Res. (Ω)</u>	<u>dR/dT (Ω/K)</u>	<u>dlogR/dlogT</u>	<u>Temp (K)</u>	<u>Res. (Ω)</u>	<u>dR/dT (Ω/K)</u>	<u>dlogR/dlogT</u>
265.0	71.4692	-0.24647	-0.91387	285.0	66.8997	-0.21170	-0.90185
270.0	70.2605	-0.23707	-0.91104	290.0	65.8605	-0.20408	-0.89861
273.15	69.5227	-0.23141	-0.90919	295.0	64.8583	-0.19684	-0.89531
275.0	69.0976	-0.22817	-0.90808	300.0	63.8915	-0.18996	-0.89196
280.0	67.9781	-0.21972	-0.90501	305.0	62.9581	-0.18342	-0.88859
				310.0	62.0567	-0.17720	-0.88521
				315.0	61.1856	-0.17129	-0.88184
				320.0	60.3433	-0.16566	-0.87848
				325.0	59.5285	-0.16030	-0.87516



THERMAL CYCLE TESTING

Sensor Model: CX-1050-SD-4L

Sensor Type: Cernox Resistor

Serial Number: X49618

This sensor was tested for repeatability through rapid thermal cycles from room temperature into liquid helium. During this test, the following four lead resistance values were recorded:

Room Temperature:	62.9 Ω
Liquid Nitrogen:	219 Ω
Liquid Helium:	2569 Ω

The nitrogen and helium values were recorded in OPEN dewars, so precision comparisons with calibration values or other dip test values should not be made.

Recommended Operating Parameters:

For sensors calibrated by LSCI, the current to the sensor is adjusted to maintain the sensor output voltage or power at the values listed on the Test Data page.



BREAKPOINTS 340 FORMAT

Calibration Report: 531605

Sensor Model: CX-1050-SD-4L

Sensor Type: Cernox Resistor

Sales Order: 42383

Serial Number: X49618

Temperature Range: 4.00K to 325K

Name: CX-1050-SD-4L
Serial number: X49618
Format: 4 ;Log Ohms/Kelvin
Limit: 325.0
Coefficient: 1 ;Negative

Point 1: 1.77471,325.000	Point 56: 2.32988, 79.500	Point 111: 3.08135, 9.050
Point 2: 1.78181,319.000	Point 57: 2.34180, 77.000	Point 112: 3.09818, 8.650
Point 3: 1.78847,313.500	Point 58: 2.35408, 74.500	Point 113: 3.11607, 8.250
Point 4: 1.79527,308.000	Point 59: 2.36418, 72.500	Point 114: 3.13515, 7.850
Point 5: 1.80222,302.500	Point 60: 2.37452, 70.500	Point 115: 3.15297, 7.500
Point 6: 1.80933,297.000	Point 61: 2.38513, 68.500	Point 116: 3.17193, 7.150
Point 7: 1.81660,291.500	Point 62: 2.39601, 66.500	Point 117: 3.19220, 6.800
Point 8: 1.82404,286.000	Point 63: 2.40720, 64.500	Point 118: 3.21396, 6.450
Point 9: 1.83165,280.500	Point 64: 2.41871, 62.500	Point 119: 3.23743, 6.100
Point 10: 1.83945,275.000	Point 65: 2.43055, 60.500	Point 120: 3.26061, 5.780
Point 11: 1.84743,269.500	Point 66: 2.44212, 58.600	Point 121: 3.28406, 5.480
Point 12: 1.85560,264.000	Point 67: 2.45467, 56.600	Point 122: 3.30938, 5.180
Point 13: 1.86321,259.000	Point 68: 2.46764, 54.600	Point 123: 3.33692, 4.880
Point 14: 1.87099,254.000	Point 69: 2.47968, 52.800	Point 124: 3.36495, 4.600
Point 15: 1.87894,249.000	Point 70: 2.49208, 51.000	Point 125: 3.39327, 4.340
Point 16: 1.88707,244.000	Point 71: 2.50489, 49.200	Point 126: 3.42415, 4.080
Point 17: 1.89539,239.000	Point 72: 2.51812, 47.400	Point 127: 3.43453, 4.000
Point 18: 1.90390,234.000	Point 73: 2.53181, 45.600	
Point 19: 1.91261,229.000	Point 74: 2.54599, 43.800	
Point 20: 1.92152,224.000	Point 75: 2.56070, 42.000	
Point 21: 1.93065,219.000	Point 76: 2.57427, 40.400	
Point 22: 1.94001,214.000	Point 77: 2.58830, 38.800	
Point 23: 1.94959,209.000	Point 78: 2.60287, 37.200	
Point 24: 1.95941,204.000	Point 79: 2.61799, 35.600	
Point 25: 1.96947,199.000	Point 80: 2.63275, 34.100	
Point 26: 1.97980,194.000	Point 81: 2.64808, 32.600	
Point 27: 1.99039,189.000	Point 82: 2.66405, 31.100	
Point 28: 2.00127,184.000	Point 83: 2.67960, 29.700	
Point 29: 2.01131,179.500	Point 84: 2.69581, 28.300	
Point 30: 2.02159,175.000	Point 85: 2.71277, 26.900	
Point 31: 2.03214,170.500	Point 86: 2.72926, 25.600	
Point 32: 2.04295,166.000	Point 87: 2.74653, 24.300	
Point 33: 2.05404,161.500	Point 88: 2.76325, 23.100	
Point 34: 2.06542,157.000	Point 89: 2.78080, 21.900	
Point 35: 2.07712,152.500	Point 90: 2.79931, 20.700	
Point 36: 2.08913,148.000	Point 91: 2.81394, 19.800	
Point 37: 2.10148,143.500	Point 92: 2.82575, 19.100	
Point 38: 2.11419,139.000	Point 93: 2.83712, 18.450	
Point 39: 2.12727,134.500	Point 94: 2.84890, 17.800	
Point 40: 2.13925,130.500	Point 95: 2.86114, 17.150	
Point 41: 2.15154,126.500	Point 96: 2.87288, 16.550	
Point 42: 2.16418,122.500	Point 97: 2.88508, 15.950	
Point 43: 2.17720,118.500	Point 98: 2.89778, 15.350	
Point 44: 2.19061,114.500	Point 99: 2.90993, 14.800	
Point 45: 2.20445,110.500	Point 100: 2.92257, 14.250	
Point 46: 2.21873,106.500	Point 101: 2.93578, 13.700	
Point 47: 2.23350,102.500	Point 102: 2.94961, 13.150	
Point 48: 2.24493, 99.500	Point 103: 2.96280, 12.650	
Point 49: 2.25467, 97.000	Point 104: 2.97659, 12.150	
Point 50: 2.26464, 94.500	Point 105: 2.99109, 11.650	
Point 51: 2.27484, 92.000	Point 106: 3.00481, 11.200	
Point 52: 2.28529, 89.500	Point 107: 3.01920, 10.750	
Point 53: 2.29601, 87.000	Point 108: 3.03437, 10.300	
Point 54: 2.30700, 84.500	Point 109: 3.05040, 9.850	
Point 55: 2.31828, 82.000	Point 110: 3.06546, 9.450	



BREAKPOINTS 91C/93C/330 FORMAT

Calibration Report: 531605
 Sensor Model: CX-1050-SD-4L
 Sensor Type: Cernox Resistor

Sales Order: 42383
 Serial Number: X49618
 Temperature Range: 4.00K to 325K

Interpolation Method: Lagrangian
 Limit: 325.0 (Kelvin)
 Format: 4 (Log Ohms/Kelvin)
 Number of Breakpoints: 46

No.	Units	Temperature (K)	No.	Units	Temperature (K)
1	1.77473	325.0	26	2.68652	29.1
2	1.77590	324.0	27	2.72673	25.8
3	1.79403	309.0	28	2.76618	22.9
4	1.81329	294.0	29	2.80579	20.3
5	1.83378	279.0	30	2.84526	18.0
6	1.85562	264.0	31	2.88408	16.0
7	1.87895	249.0	32	2.92379	14.2
8	1.90391	234.0	33	2.96150	12.7
9	1.93067	219.0	34	3.00175	11.3
10	1.95942	204.0	35	3.04145	10.1
11	1.99041	189.0	36	3.07938	9.1
12	2.02393	174.0	37	3.11847	8.2
13	2.06035	159.0	38	3.15834	7.4
14	2.10012	144.0	39	3.19836	6.7
15	2.14384	129.0	40	3.23756	6.1
16	2.19235	114.0	41	3.27460	5.6
17	2.24688	99.0	42	3.30780	5.2
18	2.30925	84.0	43	3.34487	4.8
19	2.38246	69.0	44	3.37574	4.5
20	2.43662	59.5	45	3.42189	4.1
21	2.48863	51.5	46	3.43448	4.0
22	2.52494	46.5			
23	2.56493	41.5			
24	2.60570	36.9			
25	2.64604	32.8			

Temperature for Resistance Decades:

Res. (Ohms)	Temp. (K)
100	184.583
1000	11.357



BREAKPOINTS 234 FORMAT

Calibration Report: 531605
 Sensor Model: CX-1050-SD-4L
 Sensor Type: Cernox Resistor

Sales Order: 42383
 Serial Number: X49618
 Temperature Range: 4.00K to 325K

Maximum Temperature Error:

1.4 - 10K: 0.010K
 10 - 20K: 0.017K
 20 - 40K: 0.009K
 40 - 100K: 0.018K
 > 100K: 0.078K

BP #	Temp. (K)	Res. (Ω)	Log10 Res.	BP #	Temp. (K)	Res. (Ω)	Log10 Res.
1	320.527	60.25596	1.780	41	39.744	380.1894	2.580
2	304.247	63.09573	1.800	42	37.515	398.1072	2.600
3	288.981	66.06934	1.820	43	35.397	416.8694	2.620
4	274.624	69.18310	1.840	44	33.387	436.5158	2.640
5	261.107	72.44360	1.860	45	31.479	457.0882	2.660
6	248.346	75.85776	1.880	46	29.670	478.6301	2.680
7	236.285	79.43282	1.900	47	27.953	501.1872	2.700
8	224.853	83.17638	1.920	48	26.328	524.8075	2.720
9	214.014	87.09636	1.940	49	24.789	549.5409	2.740
10	203.710	91.20108	1.960	50	23.333	575.4399	2.760
11	193.912	95.49926	1.980	51	21.958	602.5596	2.780
12	184.589	100.0000	2.000	52	20.662	630.9573	2.800
13	175.696	104.7129	2.020	53	19.439	660.6934	2.820
14	167.224	109.6478	2.040	54	18.291	691.8310	2.840
15	159.137	114.8154	2.060	55	17.211	724.4360	2.860
16	151.417	120.2264	2.080	56	16.199	758.5776	2.880
17	144.043	125.8925	2.100	57	15.250	794.3282	2.900
18	136.995	131.8257	2.120	58	14.362	831.7638	2.920
19	130.259	138.0384	2.140	59	13.531	870.9636	2.940
20	123.819	144.5440	2.160	60	12.756	912.0108	2.960
21	117.664	151.3561	2.180	61	12.032	954.9926	2.980
22	111.781	158.4893	2.200	62	11.357	1000.000	3.000
23	106.161	165.9587	2.220	63	10.141	1096.478	3.040
24	100.791	173.7801	2.240	64	9.085	1202.264	3.080
25	95.661	181.9701	2.260	65	8.167	1318.257	3.120
26	90.762	190.5461	2.280	66	7.369	1445.440	3.160
27	86.088	199.5262	2.300	67	6.673	1584.893	3.200
28	81.631	208.9296	2.320	68	6.065	1737.801	3.240
29	77.377	218.7762	2.340	69	5.532	1905.461	3.280
30	73.324	229.0868	2.360	70	5.063	2089.296	3.320
31	69.463	239.8833	2.380	71	4.650	2290.868	3.360
32	65.785	251.1886	2.400	72	4.283	2511.886	3.400
33	62.282	263.0268	2.420	73	3.957	2754.229	3.440
34	58.948	275.4229	2.440	74	3.668	3019.952	3.480
35	55.775	288.4032	2.460				
36	52.756	301.9952	2.480				
37	49.885	316.2278	2.500				
38	47.154	331.1311	2.520				
39	44.557	346.7369	2.540				
40	42.089	363.0781	2.560				

