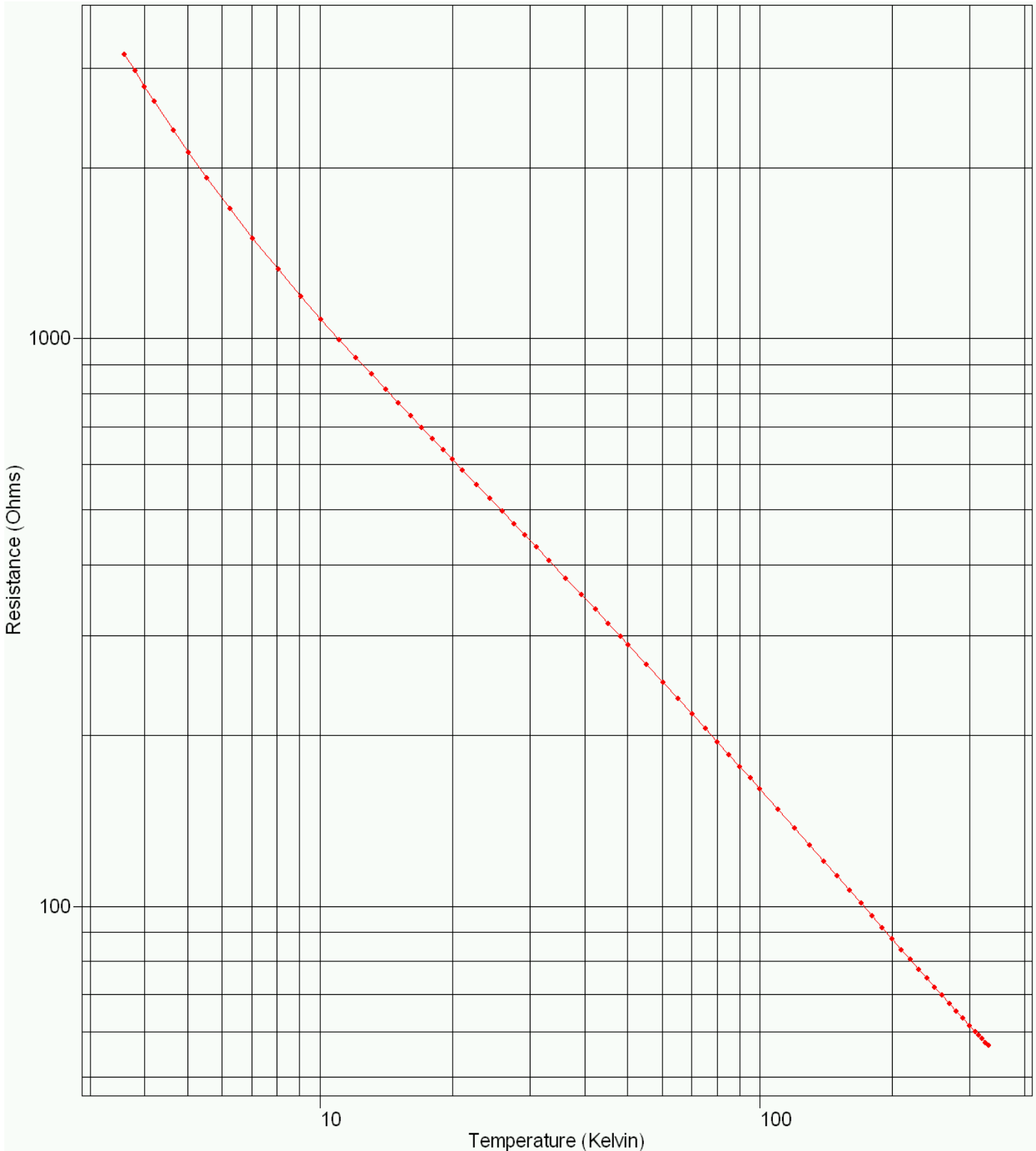


DATA PLOT

Calibration Report: 536506
Sensor Model: CX-1050-SD-4L
Sensor Type: Cernox Resistor

Sales Order: 43415
Serial Number: X50665
Temperature Range: 4.00K to 325K



TEST DATA

Calibration Report: 536506
Sensor Model: CX-1050-SD-4L
Sensor Type: Cernox Resistor

Sales Order: 43415
Serial Number: X50665
Temperature Range: 4.00K to 325K

Index	Temp. (K)	Resistance (Ω)	Excitation	Index	Temp. (K)	Resistance (Ω)	Excitation
1	3.60075	3170.18	2mV \pm 25%	41	75.2913	205.715	2mV \pm 25%
2	3.80000	2960.56	2mV \pm 25%	42	80.2796	194.809	2mV \pm 25%
3	3.99991	2778.50	2mV \pm 25%	43	85.2734	185.023	2mV \pm 25%
4	4.19915	2619.47	2mV \pm 25%	44	90.2644	176.201	2mV \pm 25%
5	4.64246	2330.64	2mV \pm 25%	45	95.2505	168.237	2mV \pm 25%
6	5.03722	2126.45	2mV \pm 25%	46	100.249	160.990	2mV \pm 25%
7	5.53583	1920.22	2mV \pm 25%	47	110.246	148.256	2mV \pm 25%
8	6.24157	1695.33	2mV \pm 25%	48	120.237	137.451	2mV \pm 25%
9	7.04853	1502.68	2mV \pm 25%	49	130.230	128.166	2mV \pm 25%
10	8.05513	1323.73	2mV \pm 25%	50	140.220	120.080	2mV \pm 25%
11	9.06851	1188.09	2mV \pm 25%	51	150.206	112.998	2mV \pm 25%
12	10.0801	1081.72	2mV \pm 25%	52	160.200	106.717	2mV \pm 25%
13	11.0923	995.902	2mV \pm 25%	53	170.200	101.135	2mV \pm 25%
14	12.1022	924.832	2mV \pm 25%	54	180.193	96.1318	2mV \pm 25%
15	13.1079	865.132	2mV \pm 25%	55	190.186	91.6291	2mV \pm 25%
16	14.1089	814.072	2mV \pm 25%	56	200.173	87.5701	2mV \pm 25%
17	15.1047	769.832	2mV \pm 25%	57	210.173	83.8607	2mV \pm 25%
18	16.0977	730.958	2mV \pm 25%	58	220.175	80.4974	2mV \pm 25%
19	17.0864	696.462	2mV \pm 25%	59	230.167	77.4195	2mV \pm 25%
20	18.0771	665.519	2mV \pm 25%	60	240.162	74.5984	2mV \pm 25%
21	19.0679	637.516	2mV \pm 25%	61	250.164	72.0015	2mV \pm 25%
22	20.0554	612.156	2mV \pm 25%	62	260.145	69.6076	2mV \pm 25%
23	21.1372	586.832	2mV \pm 25%	63	270.156	67.3820	2mV \pm 25%
24	22.7249	553.655	2mV \pm 25%	64	280.144	65.3380	2mV \pm 25%
25	24.3630	523.534	2mV \pm 25%	65	290.154	63.4273	2mV \pm 25%
26	26.0345	496.208	2mV \pm 25%	66	300.146	61.6559	2mV \pm 25%
27	27.6947	472.024	2mV \pm 25%	67	310.141	59.9952	2mV \pm 25%
28	29.3317	450.548	2mV \pm 25%	68	315.145	59.2091	2mV \pm 25%
29	31.1690	428.825	2mV \pm 25%	69	320.138	58.4491	2mV \pm 25%
30	33.2960	406.334	2mV \pm 25%	70	326.421	57.5280	2mV \pm 25%
31	36.3188	378.400	2mV \pm 25%	71	331.606	56.7983	2mV \pm 25%
32	39.3199	354.470	2mV \pm 25%				
33	42.3222	333.533	2mV \pm 25%				
34	45.3109	315.192	2mV \pm 25%				
35	48.3097	298.818	2mV \pm 25%				
36	50.3005	288.916	2mV \pm 25%				
37	55.2989	266.924	2mV \pm 25%				
38	60.3029	248.189	2mV \pm 25%				
39	65.3020	232.063	2mV \pm 25%				
40	70.3002	218.050	2mV \pm 25%				



UNCERTAINTY ANALYSIS

Calibration Report: 536506
 Sensor Model: CX-1050-SD-4L
 Sensor Type: Cernox Resistor

Sales Order: 43415
 Serial Number: X50665
 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:

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

- where
- σ_{fit} = standard deviation of the fit
 - T_i = measured temperature for point i
 - T_{icalc} = 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: 536506
Sensor Model: CX-1050-SD-4L
Sensor Type: Cernox Resistor

Sales Order: 43415
Serial Number: X50665
Temperature Range: 4.00K to 325K

Polynomial Type: Chebychev
Useful Range of Fit:

4.00K to 24.4K
2778. Ohms to 523.5 Ohms

Lower and Upper limits of Log(resistance) used in computing Chebychev coefficients:

ZL = 2.6739639571 ZU = 3.50108441156

Order	Coefficient	Std. Deviation of Coefficient	Ratio (Coeff./Std Dev.)
0	12.135296	1.4198E-04	85468.97
1	-11.347862	2.1994E-04	-51595.26
2	3.435857	2.1240E-04	16176.67
3	-0.701814	2.0023E-04	-3505.02
4	0.077904	1.9531E-04	398.87
5	0.003170	1.8782E-04	16.88
6	-0.001564	1.8187E-04	-8.60
7	-0.000230	1.7957E-04	-1.28

Z = Log(resistance)

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

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



POLYNOMIAL EQUATION

Calibration Report: 536506
Sensor Model: CX-1050-SD-4L
Sensor Type: Cernox Resistor

Sales Order: 43415
Serial Number: X50665
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	3170.184	3.60075	3.60076	0.00
2	2960.565	3.80000	3.79990	0.09
3	2778.495	3.99991	3.99979	0.12
4	2619.471	4.19915	4.19974	-0.59
5	2330.641	4.64246	4.64190	0.57
6	2126.447	5.03722	5.03736	-0.14
7	1920.221	5.53583	5.53559	0.24
8	1695.333	6.24157	6.24184	-0.27
9	1502.684	7.04853	7.04878	-0.25
10	1323.728	8.05513	8.05549	-0.36
11	1188.093	9.06851	9.06754	0.97
12	1081.724	10.08010	10.08038	-0.27
13	995.9025	11.09234	11.09161	0.73
14	924.8324	12.10217	12.10285	-0.68
15	865.1323	13.10790	13.10827	-0.37
16	814.0718	14.10893	14.10918	-0.24
17	769.8324	15.10474	15.10464	0.10
18	730.9575	16.09766	16.09723	0.43
19	696.4616	17.08638	17.08701	-0.63
20	665.5186	18.07712	18.07653	0.59
21	637.5158	19.06786	19.06770	0.16
22	612.1561	20.05539	20.05499	0.40
23	586.8321	21.13717	21.13773	-0.57
24	553.6552	22.72489	22.72542	-0.54
25	523.5343	24.36299	24.36164	1.35
26	496.2085	26.03454	26.03585	-1.31
27	472.0239	27.69470	27.69423	0.47

Order of Fit = 7 RMS error of fit = 0.57 mK
Largest absolute error = 1.35 mK at data point no. 25



POLYNOMIAL EQUATION

Calibration Report: 536506
Sensor Model: CX-1050-SD-4L
Sensor Type: Cernox Resistor

Sales Order: 43415
Serial Number: X50665
Temperature Range: 4.00K to 325K

Polynomial Type: Chebychev
Useful Range of Fit:

24.4K to 110.K
523.5 Ohms to 148.3 Ohms

Lower and Upper limits of Log(resistance) used in computing Chebychev coefficients:

ZL = 2.10777136911 ZU = 2.76851388038

Order	Coefficient	Std. Deviation of Coefficient	Ratio (Coeff./Std Dev.)
0	64.485593	8.7767E-04	73473.20
1	-53.074605	1.4289E-03	-37144.43
2	11.070458	1.2989E-03	8523.02
3	-1.468792	1.1868E-03	-1237.57
4	0.124746	1.1365E-03	109.76
5	-0.000357	1.1084E-03	-0.32
6	0.002748	1.0980E-03	2.50

Z = Log(resistance)

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

Temp. (K) = $\sum A_i \cdot \text{COS}(i \cdot \text{ARCCOS}(X))$, where $0 \leq i \leq 6$
and the A_i 's are the coefficients in the table above.

POLYNOMIAL EQUATION

Calibration Report: 536506
Sensor Model: CX-1050-SD-4L
Sensor Type: Cernox Resistor

Sales Order: 43415
Serial Number: X50665
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	586.8321	21.13773	21.13979	-2.06
24	553.6552	22.72542	22.72338	2.04
25	523.5343	24.36164	24.35907	2.57
26	496.2085	26.03454	26.03451	0.03
27	472.0239	27.69470	27.69532	-0.61
28	450.5477	29.33165	29.33311	-1.46
29	428.8246	31.16900	31.17080	-1.80
30	406.3342	33.29604	33.29742	-1.38
31	378.3997	36.31876	36.31945	-0.69
32	354.4696	39.31992	39.31771	2.21
33	333.5326	42.32217	42.32225	-0.08
34	315.1924	45.31093	45.30837	2.57
35	298.8182	48.30974	48.30871	1.03
36	288.9160	50.30053	50.30101	-0.47
37	266.9241	55.29891	55.29593	2.99
38	248.1887	60.30294	60.30356	-0.62
39	232.0633	65.30200	65.30884	-6.84
40	218.0497	70.30024	70.30186	-1.62
41	205.7148	75.29126	75.29671	-5.44
42	194.8087	80.27962	80.27239	7.23
43	185.0234	85.27336	85.26484	8.52
44	176.2008	90.26437	90.26722	-2.85
45	168.2368	95.25047	95.25607	-5.60
46	160.9898	100.24854	100.24494	3.60
47	148.2561	110.24578	110.24477	1.01
48	137.4514	120.23691	120.24142	-4.51
49	128.1656	130.22953	130.22730	2.23

Order of Fit = 6 RMS error of fit = 3.48 mK
Largest absolute error = 8.52 mK at data point no. 43



POLYNOMIAL EQUATION

Calibration Report: 536506
Sensor Model: CX-1050-SD-4L
Sensor Type: Cernox Resistor

Sales Order: 43415
Serial Number: X50665
Temperature Range: 4.00K to 325K

Polynomial Type: Chebychev
Useful Range of Fit:

110.K to 325.K
148.3 Ohms to 57.73 Ohms

Lower and Upper limits of Log(resistance) used in computing Chebychev coefficients:

ZL = 1.75433558987 ZU = 2.22592097598

Order	Coefficient	Std. Deviation of Coefficient	Ratio (Coeff./Std Dev.)
0	194.667244	2.5144E-03	77421.52
1	-115.477361	3.8851E-03	-29723.37
2	18.283447	3.5153E-03	5201.07
3	-2.611436	3.3969E-03	-768.77
4	0.462370	3.4038E-03	135.84
5	-0.077432	3.3996E-03	-22.78
6	0.012103	3.3301E-03	3.63
7	-0.003809	3.1659E-03	-1.20

Z = Log(resistance)

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

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



POLYNOMIAL EQUATION

Calibration Report: 536506
Sensor Model: CX-1050-SD-4L
Sensor Type: Cernox Resistor

Sales Order: 43415
Serial Number: X50665
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	168.2368	95.25607	95.25513	0.94
46	160.9898	100.24494	100.24687	-1.93
47	148.2561	110.24477	110.24365	1.12
48	137.4514	120.23691	120.23792	-1.01
49	128.1656	130.22953	130.22496	4.57
50	120.0799	140.21965	140.22459	-4.94
51	112.9978	150.20608	150.20302	3.07
52	106.7174	160.19981	160.20709	-7.28
53	101.1347	170.19954	170.19560	3.94
54	96.13182	180.19324	180.19163	1.61
55	91.62910	190.18601	190.18854	-2.52
56	87.57008	200.17275	200.15547	17.28
57	83.86066	210.17287	210.18977	-16.90
58	80.49745	220.17491	220.17579	-0.88
59	77.41948	230.16670	230.17087	-4.17
60	74.59838	240.16182	240.15843	3.39
61	72.00153	250.16431	250.15239	11.92
62	69.60763	260.14486	260.14033	4.53
63	67.38202	270.15592	270.18393	-28.02
64	65.33797	280.14364	280.13639	7.25
65	63.42731	290.15410	290.15050	3.60
66	61.65587	300.14646	300.12511	21.35
67	59.99518	310.14118	310.15202	-10.84
68	59.20907	315.14518	315.14875	-3.57
69	58.44908	320.13809	320.14398	-5.88
70	57.52804	326.42055	326.42752	-6.97
71	56.79833	331.60555	331.59520	10.35

Order of Fit = 7 RMS error of fit = 9.70 mK
Largest absolute error = -28.02 mK at data point no. 63



INTERPOLATION TABLE

Calibration Report: 536506
 Sensor Model: CX-1050-SD-4L
 Sensor Type: Cernox Resistor

Sales Order: 43415
 Serial Number: X50665
 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	2778.32	-849.05	-1.2224	37.00	372.667	-8.2862	-0.82269
4.200	2619.28	-744.78	-1.1943	38.00	364.574	-7.9039	-0.82384
4.400	2479.21	-658.53	-1.1687	39.00	356.851	-7.5481	-0.82493
4.600	2354.93	-586.44	-1.1455	40.00	349.470	-7.2166	-0.82600
4.800	2243.86	-525.86	-1.1249	42.00	335.650	-6.6166	-0.82793
5.000	2143.99	-474.15	-1.1058	44.00	322.955	-6.0901	-0.82973
5.200	2053.71	-429.79	-1.0882	46.00	311.249	-5.6255	-0.83140
5.400	1971.69	-391.32	-1.0717	48.00	300.418	-5.2129	-0.83291
5.600	1896.84	-357.96	-1.0568	50.00	290.367	-4.8456	-0.83439
5.800	1828.24	-328.63	-1.0426	52.00	281.010	-4.5166	-0.83578
6.000	1765.16	-302.71	-1.0290	54.00	272.278	-4.2205	-0.83704
6.500	1627.56	-250.22	-0.99932	56.00	264.108	-3.9540	-0.83838
7.000	1512.86	-210.36	-0.97334	58.00	256.446	-3.7124	-0.83962
7.500	1415.69	-179.53	-0.95110	60.00	249.244	-3.4929	-0.84084
8.000	1332.27	-155.11	-0.93142	65.00	232.993	-3.0247	-0.84383
8.500	1259.76	-135.57	-0.91475	70.00	218.846	-2.6473	-0.84677
9.000	1196.10	-119.59	-0.89985	75.00	206.406	-2.3384	-0.84968
9.500	1139.70	-106.42	-0.88709	77.35	201.061	-2.2122	-0.85105
10.00	1089.33	-95.392	-0.87570	80.00	195.374	-2.0821	-0.85256
10.50	1044.01	-86.100	-0.86594	85.00	185.516	-1.8670	-0.85542
11.00	1003.00	-78.161	-0.85719	90.00	176.650	-1.6846	-0.85825
11.50	965.665	-71.348	-0.84968	95.00	168.627	-1.5284	-0.86103
12.00	931.504	-65.434	-0.84294	100.0	161.330	-1.3936	-0.86383
12.50	900.103	-60.282	-0.83716	105.0	154.662	-1.2765	-0.86658
13.00	871.119	-55.750	-0.83198	110.0	148.542	-1.1739	-0.86930
13.50	844.263	-51.752	-0.82753	115.0	142.903	-1.0835	-0.87195
14.00	819.294	-48.195	-0.82355	120.0	137.690	-1.0032	-0.87433
14.50	796.004	-45.024	-0.82015	125.0	132.856	-0.93167	-0.87658
15.00	774.217	-42.176	-0.81713	130.0	128.360	-0.86765	-0.87874
15.50	753.780	-39.613	-0.81457	135.0	124.168	-0.81013	-0.88080
16.00	734.563	-37.293	-0.81231	140.0	120.250	-0.75813	-0.88264
16.50	716.450	-35.189	-0.81042	145.0	116.579	-0.71097	-0.88429
17.00	699.343	-33.271	-0.80877	150.0	113.133	-0.66801	-0.88570
17.50	683.151	-31.520	-0.80742	155.0	109.893	-0.62878	-0.88687
18.00	667.799	-29.913	-0.80628	160.0	106.840	-0.59281	-0.88778
18.50	653.216	-28.437	-0.80538	165.0	103.960	-0.55976	-0.88843
19.00	639.343	-27.076	-0.80464	170.0	101.238	-0.52931	-0.88882
19.50	626.123	-25.819	-0.80410	175.0	98.6628	-0.50118	-0.88896
20.00	613.508	-24.655	-0.80375	180.0	96.2228	-0.47515	-0.88884
21.00	589.922	-22.566	-0.80329	185.0	93.9081	-0.45101	-0.88850
22.00	568.285	-20.753	-0.80342	190.0	91.7098	-0.42858	-0.88791
23.00	548.328	-19.199	-0.80532	195.0	89.6197	-0.40771	-0.88712
24.00	529.839	-17.798	-0.80619	200.0	87.6304	-0.38825	-0.88611
25.00	512.692	-16.522	-0.80566	205.0	85.7351	-0.37008	-0.88490
26.00	496.740	-15.409	-0.80652	210.0	83.9276	-0.35309	-0.88350
27.00	481.831	-14.424	-0.80825	215.0	82.2023	-0.33719	-0.88192
28.00	467.862	-13.530	-0.80974	220.0	80.5541	-0.32228	-0.88017
29.00	454.743	-12.721	-0.81123	225.0	78.9780	-0.30828	-0.87825
30.00	442.395	-11.987	-0.81286	230.0	77.4699	-0.29512	-0.87618
31.00	430.748	-11.316	-0.81442	235.0	76.0255	-0.28274	-0.87396
32.00	419.743	-10.703	-0.81595	240.0	74.6413	-0.27107	-0.87160
33.00	409.326	-10.139	-0.81741	245.0	73.3137	-0.26007	-0.86911
34.00	399.450	-9.6203	-0.81885	250.0	72.0396	-0.24969	-0.86649
35.00	390.072	-9.1407	-0.82017	255.0	70.8159	-0.23987	-0.86375
36.00	381.156	-8.6971	-0.82143	260.0	69.6400	-0.23059	-0.86089



INTERPOLATION TABLE

Calibration Report: 536506
Sensor Model: CX-1050-SD-4L
Sensor Type: Cernox Resistor

Sales Order: 43415
Serial Number: X50665
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	68.5092	-0.22179	-0.85792	285.0	64.3926	-0.19094	-0.84508
270.0	67.4213	-0.21346	-0.85485	290.0	63.4550	-0.18416	-0.84165
273.15	66.7568	-0.20844	-0.85287	295.0	62.5504	-0.17772	-0.83815
275.0	66.3739	-0.20556	-0.85168	300.0	61.6773	-0.17158	-0.83458
280.0	65.3650	-0.19806	-0.84842	305.0	60.8341	-0.16574	-0.83094
				310.0	60.0195	-0.16016	-0.82724
				315.0	59.2321	-0.15485	-0.82349
				320.0	58.4706	-0.14977	-0.81969
				325.0	57.7340	-0.14493	-0.81584



THERMAL CYCLE TESTING

Sensor Model: CX-1050-SD-4L

Serial Number: X50665

Sensor Type: Cernox Resistor

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:

Approximately 305 K:	60.8 Ω
Liquid Nitrogen:	201 Ω
Liquid Helium:	2607 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: 536506

Sensor Model: CX-1050-SD-4L

Sensor Type: Cernox Resistor

Sales Order: 43415

Serial Number: X50665

Temperature Range: 4.00K to 325K

Name: CX-1050-SD-4L

Serial number: X50665

Format: 4 ;Log Ohms/Kelvin

Limit: 325.0

Coefficient: 1 ;Negative

Point 1: 1.76141,325.000	Point 56: 2.28396, 81.500	Point 111: 3.03520, 10.050
Point 2: 1.76804,319.000	Point 57: 2.29550, 79.000	Point 112: 3.05268, 9.600
Point 3: 1.77425,313.500	Point 58: 2.30499, 77.000	Point 113: 3.06915, 9.200
Point 4: 1.78061,308.000	Point 59: 2.31471, 75.000	Point 114: 3.08650, 8.800
Point 5: 1.78711,302.500	Point 60: 2.32467, 73.000	Point 115: 3.10492, 8.400
Point 6: 1.79376,297.000	Point 61: 2.33490, 71.000	Point 116: 3.12450, 8.000
Point 7: 1.80057,291.500	Point 62: 2.34541, 69.000	Point 117: 3.14540, 7.600
Point 8: 1.80754,286.000	Point 63: 2.35621, 67.000	Point 118: 3.16497, 7.250
Point 9: 1.81467,280.500	Point 64: 2.36732, 65.000	Point 119: 3.18579, 6.900
Point 10: 1.82198,275.000	Point 65: 2.37877, 63.000	Point 120: 3.20810, 6.550
Point 11: 1.82879,270.000	Point 66: 2.39056, 61.000	Point 121: 3.23209, 6.200
Point 12: 1.83574,265.000	Point 67: 2.40273, 59.000	Point 122: 3.25724, 5.860
Point 13: 1.84285,260.000	Point 68: 2.41404, 57.200	Point 123: 3.28282, 5.540
Point 14: 1.85012,255.000	Point 69: 2.42568, 55.400	Point 124: 3.30877, 5.240
Point 15: 1.85756,250.000	Point 70: 2.43769, 53.600	Point 125: 3.33684, 4.940
Point 16: 1.86517,245.000	Point 71: 2.45009, 51.800	Point 126: 3.36537, 4.660
Point 17: 1.87297,240.000	Point 72: 2.46291, 50.000	Point 127: 3.39413, 4.400
Point 18: 1.88095,235.000	Point 73: 2.47619, 48.200	Point 128: 3.42544, 4.140
Point 19: 1.88912,230.000	Point 74: 2.48994, 46.400	Point 129: 3.44378, 4.000
Point 20: 1.89749,225.000	Point 75: 2.50262, 44.800	
Point 21: 1.90607,220.000	Point 76: 2.51572, 43.200	
Point 22: 1.91487,215.000	Point 77: 2.52929, 41.600	
Point 23: 1.92389,210.000	Point 78: 2.54427, 39.900	
Point 24: 1.93314,205.000	Point 79: 2.55893, 38.300	
Point 25: 1.94264,200.000	Point 80: 2.57322, 36.800	
Point 26: 1.95238,195.000	Point 81: 2.58806, 35.300	
Point 27: 1.96139,190.500	Point 82: 2.60351, 33.800	
Point 28: 1.97061,186.000	Point 83: 2.61854, 32.400	
Point 29: 1.98006,181.500	Point 84: 2.63417, 31.000	
Point 30: 1.98975,177.000	Point 85: 2.65049, 29.600	
Point 31: 1.99969,172.500	Point 86: 2.66632, 28.300	
Point 32: 2.00989,168.000	Point 87: 2.68284, 27.000	
Point 33: 2.02037,163.500	Point 88: 2.70013, 25.700	
Point 34: 2.03113,159.000	Point 89: 2.71687, 24.500	
Point 35: 2.04219,154.500	Point 90: 2.73444, 23.300	
Point 36: 2.05357,150.000	Point 91: 2.75291, 22.100	
Point 37: 2.06527,145.500	Point 92: 2.77073, 21.000	
Point 38: 2.07733,141.000	Point 93: 2.78604, 20.100	
Point 39: 2.08836,137.000	Point 94: 2.79842, 19.400	
Point 40: 2.09969,133.000	Point 95: 2.81033, 18.750	
Point 41: 2.11135,129.000	Point 96: 2.82267, 18.100	
Point 42: 2.12335,125.000	Point 97: 2.83548, 17.450	
Point 43: 2.13572,121.000	Point 98: 2.84777, 16.850	
Point 44: 2.14848,117.000	Point 99: 2.86052, 16.250	
Point 45: 2.16165,113.000	Point 100: 2.87380, 15.650	
Point 46: 2.17526,109.000	Point 101: 2.88763, 15.050	
Point 47: 2.18757,105.500	Point 102: 2.90088, 14.500	
Point 48: 2.20025,102.000	Point 103: 2.91467, 13.950	
Point 49: 2.21147, 99.000	Point 104: 2.92910, 13.400	
Point 50: 2.22105, 96.500	Point 105: 2.94283, 12.900	
Point 51: 2.23087, 94.000	Point 106: 2.95716, 12.400	
Point 52: 2.24093, 91.500	Point 107: 2.97220, 11.900	
Point 53: 2.25126, 89.000	Point 108: 2.98799, 11.400	
Point 54: 2.26186, 86.500	Point 109: 3.00295, 10.950	
Point 55: 2.27276, 84.000	Point 110: 3.01864, 10.500	



BREAKPOINTS 91C/93C/330 FORMAT

Calibration Report: 536506
Sensor Model: CX-1050-SD-4L
Sensor Type: Cernox Resistor

Sales Order: 43415
Serial Number: X50665
Temperature Range: 4.00K to 325K

Interpolation Method: Lagrangian
Limit: 325.0 (Kelvin)
Format: 4 (Log Ohms/Kelvin)
Number of Breakpoints: 47

No.	Units	Temperature (K)	No.	Units	Temperature (K)
1	1.76143	325.0	26	2.65174	29.5
2	1.76252	324.0	27	2.69211	26.3
3	1.77945	309.0	28	2.73301	23.4
4	1.79747	294.0	29	2.77246	20.9
5	1.81666	279.0	30	2.81317	18.6
6	1.83716	264.0	31	2.85306	16.6
7	1.85908	249.0	32	2.89363	14.8
8	1.88258	234.0	33	2.93185	13.3
9	1.90783	219.0	34	2.97225	11.9
10	1.93504	204.0	35	3.01163	10.7
11	1.96445	189.0	36	3.04879	9.7
12	1.99637	174.0	37	3.08658	8.8
13	2.03115	159.0	38	3.12459	8.0
14	2.06928	144.0	39	3.16218	7.3
15	2.11138	129.0	40	3.19846	6.7
16	2.15835	114.0	41	3.23942	6.1
17	2.21149	99.0	42	3.27803	5.6
18	2.27278	84.0	43	3.31254	5.2
19	2.34543	69.0	44	3.35100	4.8
20	2.39968	59.5	45	3.38296	4.5
21	2.45223	51.5	46	3.43075	4.1
22	2.48920	46.5	47	3.44378	4.0
23	2.53019	41.5			
24	2.57036	37.1			
25	2.61100	33.1			

Temperature for Resistance Decades:

Res. (Ohms)	Temp. (K)
100	172.371
1000	11.038



BREAKPOINTS 234 FORMAT

Calibration Report: 536506
 Sensor Model: CX-1050-SD-4L
 Sensor Type: Cernox Resistor

Sales Order: 43415
 Serial Number: X50665
 Temperature Range: 4.00K to 325K

Maximum Temperature Error:

1.4 - 10K: 0.014K
 10 - 20K: 0.010K
 20 - 40K: 0.009K
 40 - 100K: 0.020K
 > 100K: 0.083K

BP #	Temp. (K)	Res. (Ω)	Log10 Res.	BP #	Temp. (K)	Res. (Ω)	Log10 Res.
1	308.528	60.25596	1.780	41	36.111	380.1894	2.580
2	291.965	63.09573	1.800	42	34.140	398.1072	2.600
3	276.490	66.06934	1.820	43	32.271	416.8694	2.620
4	261.996	69.18310	1.840	44	30.497	436.5158	2.640
5	248.393	72.44360	1.860	45	28.817	457.0882	2.660
6	235.593	75.85776	1.880	46	27.223	478.6301	2.680
7	223.536	79.43282	1.900	47	25.714	501.1872	2.700
8	212.145	83.17638	1.920	48	24.286	524.8075	2.720
9	201.386	87.09636	1.940	49	22.937	549.5409	2.740
10	191.194	91.20108	1.960	50	21.659	575.4399	2.760
11	181.534	95.49926	1.980	51	20.453	602.5596	2.780
12	172.372	100.0000	2.000	52	19.314	630.9573	2.800
13	163.663	104.7129	2.020	53	18.241	660.6934	2.820
14	155.390	109.6478	2.040	54	17.229	691.8310	2.840
15	147.522	114.8154	2.060	55	16.276	724.4360	2.860
16	140.031	120.2264	2.080	56	15.380	758.5776	2.880
17	132.902	125.8925	2.100	57	14.537	794.3282	2.900
18	126.116	131.8257	2.120	58	13.746	831.7638	2.920
19	119.653	138.0384	2.140	59	13.003	870.9636	2.940
20	113.502	144.5440	2.160	60	12.305	912.0108	2.960
21	107.650	151.3561	2.180	61	11.652	954.9926	2.980
22	102.079	158.4893	2.200	62	11.039	1000.000	3.000
23	96.775	165.9587	2.220	63	9.925	1096.478	3.040
24	91.731	173.7801	2.240	64	8.949	1202.264	3.080
25	86.939	181.9701	2.260	65	8.091	1318.257	3.120
26	82.383	190.5461	2.280	66	7.338	1445.440	3.160
27	78.049	199.5262	2.300	67	6.676	1584.893	3.200
28	73.934	208.9296	2.320	68	6.092	1737.801	3.240
29	70.027	218.7762	2.340	69	5.576	1905.461	3.280
30	66.315	229.0868	2.360	70	5.119	2089.296	3.320
31	62.791	239.8833	2.380	71	4.713	2290.868	3.360
32	59.449	251.1886	2.400	72	4.351	2511.886	3.400
33	56.276	263.0268	2.420	73	4.029	2754.229	3.440
34	53.264	275.4229	2.440	74	3.740	3019.952	3.480
35	50.408	288.4032	2.460				
36	47.700	301.9952	2.480				
37	45.130	316.2278	2.500				
38	42.693	331.1311	2.520				
39	40.382	346.7369	2.540				
40	38.191	363.0781	2.560				

