Lake Shore CRYOTRONICS

Certificate Of Calibration

Report Number: X204446372370831

Sensor Model:	CX-1050-SD-HT-1.4L	Serial Number:	X204446
Sensor Type:	Cernox Resistor	Calibration Date:	8/31/2023
Sensor Excitation:	see *As-Measured Data* page	Calibration Due:	
Temperature Range:	1.4 K to 325 K		

Traceability and Calibration Method

This temperature sensor has been calibrated to the International Temperature Scale of 1990 (ITS-90) or the Provisional Low Temperature Scale (PLTS-2000) as appropriate. The calibrations are traceable to the National Institute of Standards and Technology (NIST, United States), the National Physical Laboratory (NPL, United Kingdom), the Physikalisch-Technische Bundesanstalt (PTB, Germany), or natural physical constants.

Lake Shore Cryotronics maintains ITS-90 and PLTS-2000 on standard platinum (SPRT), rhodium iron (RIRT), and germanium (GRT) resistance thermometers that have been calibrated directly by an internationally recognized national metrology institute (NIST, NPL, PTB) for T < 330 K or an ISO 17025 accredited metrology laboratory for 330 K < T < 800 K. A nuclear orientation thermometer is also used for temperatures less than 50 mK. These standards are routinely intercompared to verify consistency and accuracy of the temperature scale.

The sensor calibrations are performed by comparison to laboratory standard resistance thermometers and tested in accordance with Lake Shore Cryotronics, Inc. Quality Assurance Manual. The quality system of Lake Shore Cryotronics is registered to ISO 9001.

Procedures used: Q00277, Q00754, Q00765, Q00826

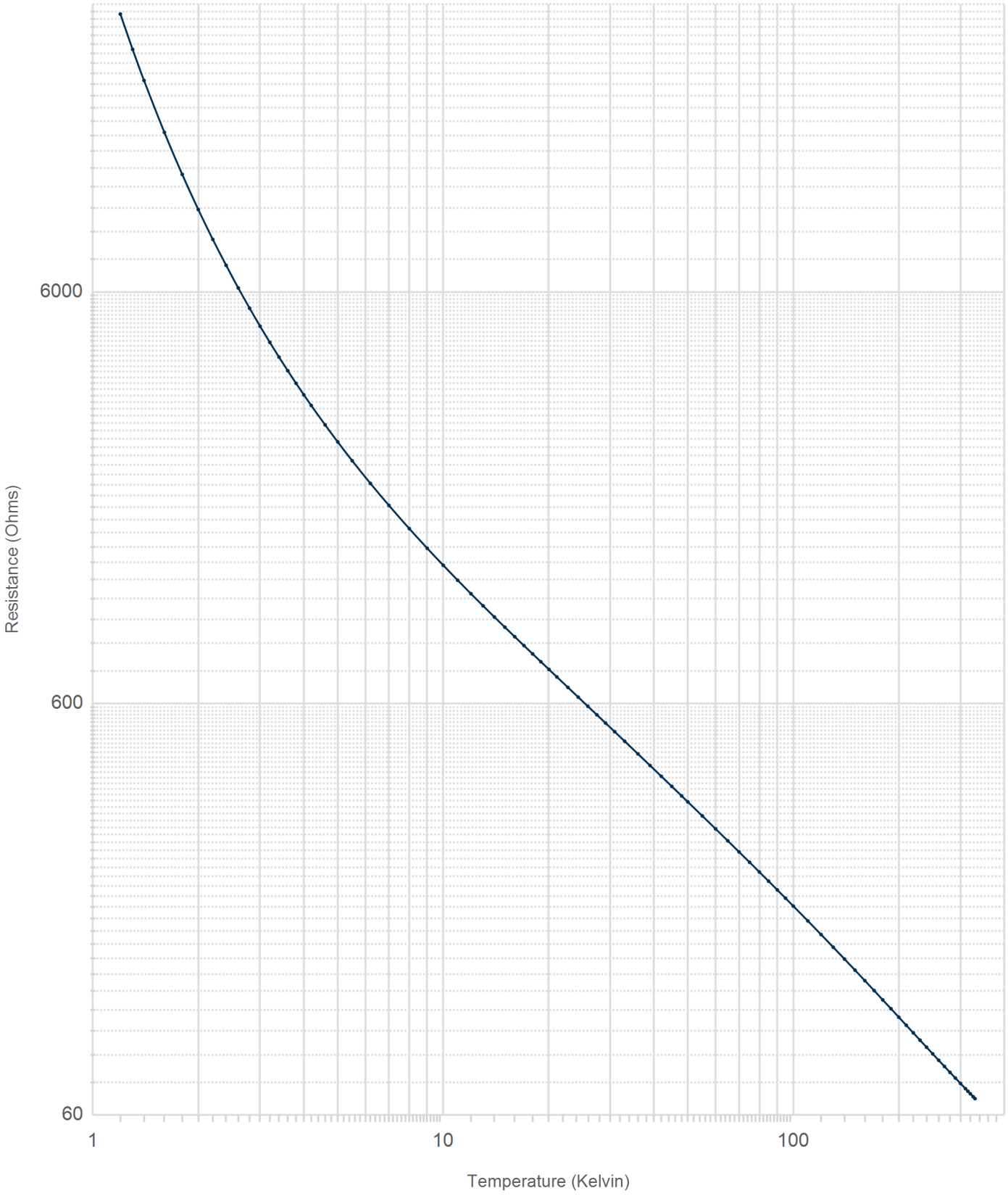
In Accordance with ISO 17025:

The calibration results in this report apply only to the specific sensor specified above. This report shall not be reproduced, except in full, without written approval from Lake Shore Cryotronics, Inc. Unless stated otherwise, the uncertainties in this report are based on an approximate 95% confidence level with a coverage factor k=2.

Approved By: Kristine Shiffman
Metrology

Please visit www.lakeshore.com/resources/sensor for a detailed description of this report, its contents, and calibration procedures.

As-Measured Data Plot



As-Measured Data

Temp. (K)	Resistance (Ω)	Excitation	Temp. (K)	Resistance (Ω)	Excitation
1.19811	28404.5	2mV ± 25%	29.0773	537.831	2mV ± 25%
1.29883	23305.7	2mV ± 25%	30.8794	512.309	2mV ± 25%
1.39976	19588.2	2mV ± 25%	32.9845	485.637	2mV ± 25%
1.60012	14653.0	2mV ± 25%	35.9789	452.537	2mV ± 25%
1.79982	11579.3	2mV ± 25%	38.9754	423.961	2mV ± 25%
1.99988	9515.69	2mV ± 25%	41.9605	399.165	2mV ± 25%
2.19988	8051.12	2mV ± 25%	44.9495	377.247	2mV ± 25%
2.40159	6963.47	2mV ± 25%	47.9516	357.745	2mV ± 25%
2.60103	6134.62	2mV ± 25%	49.9456	345.932	2mV ± 25%
2.80230	5478.63	2mV ± 25%	54.9445	319.736	2mV ± 25%
3.00203	4953.35	2mV ± 25%	59.9508	297.435	2mV ± 25%
3.20082	4525.05	2mV ± 25%	64.9513	278.238	2mV ± 25%
3.40090	4165.78	2mV ± 25%	69.9475	261.499	2mV ± 25%
3.60159	3860.43	2mV ± 25%	74.9482	246.782	2mV ± 25%
3.80244	3599.78	2mV ± 25%	79.9447	233.685	2mV ± 25%
4.00329	3373.80	2mV ± 25%	84.9434	221.970	2mV ± 25%
4.20285	3178.15	2mV ± 25%	89.9393	211.406	2mV ± 25%
4.60258	2852.07	2mV ± 25%	94.9382	201.832	2mV ± 25%
5.00166	2592.47	2mV ± 25%	99.9384	193.086	2mV ± 25%
5.50035	2333.13	2mV ± 25%	109.935	177.753	2mV ± 25%
6.20018	2055.27	2mV ± 25%	119.937	164.666	2mV ± 25%
7.00314	1817.14	2mV ± 25%	129.932	153.390	2mV ± 25%
8.00354	1596.43	2mV ± 25%	139.929	143.560	2mV ± 25%
9.00584	1429.81	2mV ± 25%	149.936	134.902	2mV ± 25%
10.0051	1300.20	2mV ± 25%	159.937	127.230	2mV ± 25%
11.0059	1195.35	2mV ± 25%	169.933	120.382	2mV ± 25%
12.0067	1108.75	2mV ± 25%	179.931	114.246	2mV ± 25%
13.0059	1035.89	2mV ± 25%	189.924	108.716	2mV ± 25%
14.0053	973.452	2mV ± 25%	199.929	103.698	2mV ± 25%
15.0068	919.185	2mV ± 25%	209.933	99.1352	2mV ± 25%
16.0105	871.480	2mV ± 25%	219.938	94.9776	2mV ± 25%
17.0106	829.394	2mV ± 25%	229.935	91.1658	2mV ± 25%
18.0106	791.753	2mV ± 25%	239.926	87.6689	2mV ± 25%
19.0130	757.677	2mV ± 25%	249.924	84.4490	2mV ± 25%
20.0522	725.760	2mV ± 25%	259.934	81.4659	2mV ± 25%
21.1223	695.918	2mV ± 25%	269.931	78.7174	2mV ± 25%
22.7130	656.365	2mV ± 25%	279.932	76.1593	2mV ± 25%
24.2993	621.577	2mV ± 25%	289.947	73.7790	2mV ± 25%
25.8844	590.738	2mV ± 25%	299.936	71.5663	2mV ± 25%
27.4781	562.959	2mV ± 25%	309.952	69.5014	2mV ± 25%

As-Measured Data

Temp. (K)	Resistance (Ω)	Excitation
314.952	68.5183	2mV ± 25%
319.950	67.5688	2mV ± 25%
325.945	66.4687	2mV ± 25%
329.946	65.7598	2mV ± 25%

Uncertainty Analysis

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 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 and NIST Technical Note 1297. 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.

CX-1050									
Temperature (K)	1.4	4.2	10	20	30	50	100	300	400
Uncertainty (± mK)	4	4	4	8	9	12	17	46	74

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 resistance (R) to a temperature (T). How well the polynomial represents the sensor calibration data is another source of uncertainty when using the sensor. The typical uncertainty contribution from the fit is significantly smaller than the system measurement uncertainty. See www.lakeshore.com/resources/sensors for further details on determining the additional uncertainty for a specific fitted/interpolated data set.

A note on uncertainty and resolution of data provided:

The full resolution of the calibration data provided in this report may be orders of magnitude higher than the uncertainty. This level of resolution is provided because practical usage of a cryogenic temperature sensor involves use of interpolation and a host of curve-fitting methods where the calculated output is likely to be highly sensitive to rounding errors. Additionally, usage can depend on temperature differentials as well as absolute temperature which has the same effect of potentially introducing rounding errors through even simple calculations.

The resolution of the data presented in this report is therefore provided in full to allow for the highest level of accuracy of calculations performed. It should not be considered as representative of the accuracy of the calibration system itself. Only the stated uncertainty values are to be used as such.

Polynomial Equation

Polynomial Type: Chebychev

Useful Range of Fit:

1.400 K to 14.005 K

973.452 Ω to 19564.291 Ω

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

ZL: 2.9402574215475 ZU: 4.45338774940429

Order	Coefficient	Std. Deviation of Coefficient	Ratio (Coeff. / Std Dev.)
0	5.487638	1.30354E-004	42098.05
1	-6.308681	2.09391E-004	-30128.67
2	2.792266	1.84116E-004	15165.81
3	-1.019812	1.88955E-004	-5397.12
4	0.312035	1.78813E-004	1745.04
5	-0.077432	1.64950E-004	-469.42
6	0.013465	1.63231E-004	82.49
7	-0.000482	1.64052E-004	-2.94
8	-0.001030	1.65860E-004	-6.21

Z = Log(Resistance)

k = ((Z-ZL)-(ZU-Z))/(ZU-ZL)

Temp. (K) = ΣA_i* COS(i * ARCCOS(k)), where 0 <= i <= 8 and the A_i's are the coefficients in the table above.

Polynomial Equation

Polynomial Type: Chebychev

Temp. (K) vs. Log(Resistance)

	R. Meas. (Ω)	T Meas. (K)	T Eq. (K)	T diff. (mK)
1	28404.539	1.19811	1.19797	0.14
2	23305.723	1.29883	1.29940	-0.57
3	19588.191	1.39976	1.39925	0.51
4	14652.956	1.60012	1.59972	0.40
5	11579.324	1.79982	1.80035	-0.53
6	9515.693	1.99988	2.00037	-0.49
7	8051.121	2.19988	2.20017	-0.29
8	6963.474	2.40159	2.40074	0.84
9	6134.623	2.60103	2.60060	0.43
10	5478.633	2.80230	2.80182	0.47
11	4953.345	3.00203	3.00217	-0.14
12	4525.046	3.20082	3.20116	-0.33
13	4165.775	3.40090	3.40114	-0.23
14	3860.425	3.60159	3.60212	-0.54
15	3599.784	3.80244	3.80259	-0.15
16	3373.805	4.00329	4.00353	-0.24
17	3178.152	4.20285	4.20273	0.11
18	2852.074	4.60258	4.60213	0.45
19	2592.468	5.00166	5.00104	0.62
20	2333.127	5.50035	5.50111	-0.76
21	2055.271	6.20018	6.20047	-0.29
22	1817.140	7.00314	7.00211	1.03
23	1596.426	8.00354	8.00278	0.75
24	1429.812	9.00584	9.00708	-1.24
25	1300.202	10.00507	10.00541	-0.34
26	1195.350	11.00592	11.00621	-0.29
27	1108.750	12.00674	12.00654	0.20
28	1035.888	13.00589	13.00537	0.52
29	973.452	14.00527	14.00507	0.20
30	919.185	15.00683	15.00678	0.05

31	871.480	16.01048	16.01078	-0.30

Order of Fit = 8 RMS error of Fit = 0.51 mK

Largest absolute error = 1.24 mK at data point no. 24

Polynomial Equation

Polynomial Type: Chebychev

Useful Range of Fit:

14.005 K to 79.945 K

233.685 Ω to 973.452 Ω

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

ZL: 2.32511684638812 ZU: 3.04483348076246

Order	Coefficient	Std. Deviation of Coefficient	Ratio (Coeff. / Std Dev.)
0	41.904171	3.57696E-004	117150.08
1	-37.670216	5.84688E-004	-64427.87
2	8.937130	5.31301E-004	16821.23
3	-1.293380	4.99100E-004	-2591.43
4	0.136909	4.79036E-004	285.80
5	-0.003868	4.51092E-004	-8.57
6	-0.005323	4.47939E-004	-11.88

Z = Log(Resistance)

k = ((Z-ZL)-(ZU-Z))/(ZU-ZL)

Temp. (K) = ΣA_i* COS(i * ARCCOS(k)), where 0 <= i <= 8 and the A_i's are the coefficients in the table above.

Polynomial Equation

Polynomial Type: Chebychev

Temp. (K) vs. Log(Resistance)

	R. Meas. (Ω)	T Meas. (K)	T Eq. (K)	T diff. (mK)
1	1108.750	12.00654	12.00542	1.11
2	1035.888	13.00537	13.00649	-1.12
3	973.452	14.00507	14.00632	-1.25
4	919.185	15.00683	15.00752	-0.69
5	871.480	16.01048	16.01062	-0.14
6	829.394	17.01058	17.00923	1.35
7	791.753	18.01059	18.00814	2.46
8	757.677	19.01302	19.01230	0.72
9	725.760	20.05219	20.05179	0.41
10	695.918	21.12229	21.12274	-0.46
11	656.365	22.71301	22.71339	-0.38
12	621.577	24.29932	24.30193	-2.61
13	590.738	25.88443	25.88596	-1.53
14	562.959	27.47809	27.47873	-0.64
15	537.831	29.07729	29.07705	0.23
16	512.309	30.87944	30.87821	1.23
17	485.637	32.98452	32.98392	0.60
18	452.537	35.97887	35.97761	1.26
19	423.961	38.97539	38.97553	-0.14
20	399.165	41.96045	41.95812	2.33
21	377.247	44.94948	44.95161	-2.13
22	357.745	47.95156	47.95130	0.26
23	345.932	49.94561	49.94705	-1.44
24	319.736	54.94446	54.94431	0.16
25	297.435	59.95080	59.94986	0.94
26	278.238	64.95126	64.95055	0.71
27	261.499	69.94752	69.95188	-4.36
28	246.782	74.94817	74.94470	3.47
29	233.685	79.94471	79.94543	-0.72
30	221.970	84.94342	84.94198	1.44

31	211.406	89.93926	89.94035	-1.09

Order of Fit = 6 RMS error of Fit = 1.55 mK

Largest absolute error = 4.36 mK at data point no. 27

Polynomial Equation

Polynomial Type: Chebychev

Useful Range of Fit:

79.945 K to 325.000 K

66.640 Ω to 233.685 Ω

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

ZL: 1.81796038383549 ZU: 2.41747048229696

Order	Coefficient	Std. Deviation of Coefficient	Ratio (Coeff. / Std Dev.)
0	176.718878	1.19060E-003	148428.90
1	-126.707056	1.84396E-003	-68714.77
2	22.608422	1.76996E-003	12773.37
3	-3.168343	1.68176E-003	-1883.94
4	0.603047	1.60125E-003	376.61
5	-0.117338	1.59682E-003	-73.48
6	0.017622	1.57247E-003	11.21

Z = Log(Resistance)

k = ((Z-ZL)-(ZU-Z))/(ZU-ZL)

Temp. (K) = ΣA_i* COS(i * ARCCOS(k)), where 0 <= i <= 8 and the A_i's are the coefficients in the table above.

Polynomial Equation

Polynomial Type: Chebychev

Temp. (K) vs. Log(Resistance)

	R. Meas. (Ω)	T Meas. (K)	T Eq. (K)	T diff. (mK)
1	261.499	69.95188	69.95523	-3.35
2	246.782	74.94470	74.94110	3.60
3	233.685	79.94543	79.94217	3.25
4	221.970	84.94342	84.94115	2.27
5	211.406	89.93926	89.94188	-2.62
6	201.832	94.93821	94.93905	-0.83
7	193.086	99.93838	99.94683	-8.45
8	177.753	109.93542	109.93210	3.31
9	164.666	119.93691	119.93794	-1.04
10	153.390	129.93184	129.93144	0.40
11	143.560	139.92932	139.92414	5.18
12	134.902	149.93590	149.92956	6.34
13	127.230	159.93652	159.93208	4.45
14	120.382	169.93327	169.94099	-7.73
15	114.246	179.93053	179.93654	-6.01
16	108.716	189.92419	189.92607	-1.88
17	103.698	199.92871	199.93256	-3.85
18	99.135	209.93331	209.93922	-5.91
19	94.978	219.93791	219.92970	8.21
20	91.166	229.93536	229.93306	2.30
21	87.669	239.92593	239.92563	0.29
22	84.449	249.92360	249.91596	7.64
23	81.466	259.93441	259.94056	-6.14
24	78.717	269.93073	269.92009	10.65
25	76.159	279.93219	279.93132	0.87
26	73.779	289.94730	289.95207	-4.77
27	71.566	299.93606	299.95090	-14.85
28	69.501	309.95175	309.94639	5.36
29	68.518	314.95173	314.95233	-0.60
30	67.569	319.95008	319.94867	1.42

31	66.469	325.94544	325.94836	-2.92
32	65.760	329.94611	329.94071	5.41

Order of Fit = 6 RMS error of Fit = 5.48 mK

Largest absolute error = 14.85 mK at data point no. 27

Interpolation Table

Temp. (K)	Res. (Ω)	dR/dT (Ω/K)	dlogR/dlogT	Temp. (K)	Res. (Ω)	dR/dT (Ω/K)	dlogR/dlogT
1.400	19564.3	-31940.6	-2.28563	8.500	1508.46	-165.375	-0.93187
1.500	16784.2	-24168.1	-2.15990	9.000	1430.84	-145.758	-0.91682
1.600	14647.7	-18899.6	-2.06444	9.500	1362.13	-129.573	-0.90369
1.700	12953.7	-15163.6	-1.99001	10.00	1300.83	-116.036	-0.89202
1.800	11583.7	-12371.6	-1.92243	10.50	1245.74	-104.612	-0.88174
1.900	10457.4	-10245.1	-1.86143	11.00	1195.94	-94.8588	-0.87249
2.000	9518.89	-8593.30	-1.80553	11.50	1150.65	-86.4836	-0.86434
2.100	8727.11	-7290.57	-1.75432	12.00	1109.27	-79.2387	-0.85720
2.200	8052.17	-6246.40	-1.70663	12.50	1071.26	-72.8996	-0.85063
2.300	7471.24	-5400.53	-1.66254	13.00	1036.25	-67.2725	-0.84395
2.400	6966.97	-4707.77	-1.62174	13.50	1003.88	-62.3220	-0.83810
2.500	6525.70	-4135.05	-1.58414	14.00	973.819	-58.0180	-0.83409
2.600	6136.82	-3656.80	-1.54928	14.50	945.780	-54.1970	-0.83091
2.700	5791.82	-3254.26	-1.51705	15.00	919.566	-50.7138	-0.82725
2.800	5483.94	-2912.55	-1.48709	15.50	895.012	-47.5580	-0.82362
2.900	5207.65	-2620.52	-1.45929	16.00	871.955	-44.7210	-0.82061
3.000	4958.49	-2369.03	-1.43332	16.50	850.246	-42.1558	-0.81808
3.100	4732.73	-2151.23	-1.40908	17.00	829.761	-39.8192	-0.81581
3.200	4527.31	-1961.36	-1.38633	17.50	810.392	-37.6868	-0.81383
3.300	4339.67	-1795.02	-1.36498	18.00	792.044	-35.7360	-0.81214
3.400	4167.65	-1648.49	-1.34485	18.50	774.629	-33.9462	-0.81072
3.500	4009.41	-1518.83	-1.32586	19.00	758.074	-32.2984	-0.80951
3.600	3863.40	-1403.56	-1.30787	19.50	742.310	-30.7779	-0.80851
3.700	3728.28	-1300.70	-1.29083	20.00	727.277	-29.3706	-0.80769
3.800	3602.91	-1208.52	-1.27463	21.00	699.196	-26.8531	-0.80652
3.900	3486.27	-1125.65	-1.25923	22.00	673.460	-24.6682	-0.80584
4.000	3377.51	-1050.84	-1.24451	23.00	649.768	-22.7582	-0.80558
4.200	3180.67	-921.781	-1.21719	24.00	627.869	-21.0747	-0.80557
4.400	3007.33	-814.731	-1.19203	25.00	607.554	-19.5836	-0.80584
4.600	2853.61	-725.125	-1.16890	26.00	588.648	-18.2540	-0.80626
4.800	2716.35	-649.486	-1.14769	27.00	571.000	-17.0624	-0.80680
5.000	2593.08	-585.003	-1.12801	28.00	554.483	-15.9902	-0.80746
5.200	2481.75	-529.641	-1.10976	29.00	538.986	-15.0204	-0.80817
5.400	2380.72	-481.725	-1.09266	30.00	524.412	-14.1405	-0.80893
5.600	2288.63	-440.206	-1.07713	31.00	510.679	-13.3391	-0.80973
5.800	2204.31	-403.707	-1.06224	32.00	497.711	-12.6066	-0.81053
6.000	2126.85	-371.551	-1.04817	33.00	485.445	-11.9356	-0.81137
6.500	1958.11	-306.570	-1.01767	34.00	473.822	-11.3188	-0.81220
7.000	1817.68	-257.403	-0.99127	35.00	462.792	-10.7496	-0.81297
7.500	1698.85	-219.399	-0.96859	36.00	452.308	-10.2247	-0.81380
8.000	1596.95	-189.404	-0.94883	37.00	442.329	-9.73875	-0.81463

Interpolation Table

Temp. (K)	Res. (Ω)	dR/dT (Ω/K)	dlogR/dlogT	Temp. (K)	Res. (Ω)	dR/dT (Ω/K)	dlogR/dlogT
38.00	432.819	-9.28732	-0.81539	200.0	103.666	-0.47740	-0.92103
39.00	423.744	-8.86806	-0.81619	205.0	101.334	-0.45548	-0.92144
40.00	415.073	-8.47757	-0.81697	210.0	99.1087	-0.43496	-0.92162
42.00	398.840	-7.77228	-0.81846	215.0	96.9826	-0.41571	-0.92159
44.00	383.926	-7.15431	-0.81992	220.0	94.9497	-0.39764	-0.92135
46.00	370.173	-6.60980	-0.82137	225.0	93.0043	-0.38066	-0.92090
48.00	357.446	-6.12687	-0.82275	230.0	91.1414	-0.36467	-0.92026
50.00	345.630	-5.69724	-0.82418	235.0	89.3561	-0.34960	-0.91943
52.00	334.627	-5.31248	-0.82554	240.0	87.6440	-0.33539	-0.91842
54.00	324.354	-4.96654	-0.82685	245.0	86.0009	-0.32197	-0.91724
56.00	314.738	-4.65527	-0.82829	250.0	84.4230	-0.30929	-0.91591
58.00	305.714	-4.37300	-0.82964	255.0	82.9068	-0.29730	-0.91442
60.00	297.228	-4.11682	-0.83104	260.0	81.4489	-0.28594	-0.91278
65.00	278.061	-3.57047	-0.83464	265.0	80.0464	-0.27518	-0.91102
70.00	261.349	-3.12960	-0.83824	270.0	78.6962	-0.26498	-0.90913
75.00	246.629	-2.77090	-0.84263	273.2	77.8712	-0.25882	-0.90788
77.35	240.291	-2.62445	-0.84482	275.0	77.3957	-0.25530	-0.90712
80.00	233.542	-2.47103	-0.84645	280.0	76.1424	-0.24610	-0.90500
85.00	221.839	-2.21854	-0.85006	285.0	74.9339	-0.23737	-0.90279
90.00	211.289	-2.00686	-0.85484	290.0	73.7680	-0.22906	-0.90048
95.00	201.721	-1.82510	-0.85953	295.0	72.6426	-0.22115	-0.89810
100.0	192.997	-1.66816	-0.86434	300.0	71.5558	-0.21363	-0.89563
105.0	185.006	-1.53117	-0.86901	305.0	70.5058	-0.20646	-0.89310
110.0	177.657	-1.41091	-0.87359	310.0	69.4907	-0.19962	-0.89051
115.0	170.873	-1.30468	-0.87806	315.0	68.5091	-0.19310	-0.88786
120.0	164.591	-1.21021	-0.88234	320.0	67.5592	-0.18688	-0.88517
125.0	158.755	-1.12582	-0.88644	325.0	66.6398	-0.18094	-0.88243
130.0	153.318	-1.05005	-0.89034				
135.0	148.242	-0.98174	-0.89405				
140.0	143.490	-0.91991	-0.89753				
145.0	139.033	-0.86373	-0.90080				
150.0	134.845	-0.81252	-0.90384				
155.0	130.901	-0.76568	-0.90664				
160.0	127.181	-0.72271	-0.90921				
165.0	123.668	-0.68320	-0.91154				
170.0	120.344	-0.64676	-0.91362				
175.0	117.196	-0.61307	-0.91546				
180.0	114.209	-0.58187	-0.91705				
185.0	111.373	-0.55290	-0.91841				
190.0	108.677	-0.52595	-0.91952				
195.0	106.111	-0.50084	-0.92039				

Breakpoints Description

Calibration Report:	X204446372370831		
Sensor Model:	CX-1050-SD-HT-1.4L	Serial Number:	X204446
Sensor Type:	Cernox Resistor	Temperature Range:	1.4 K to 325 K

The data presented in this calibration report may be used with Lake Shore Cryotronics instrumentation or with customer provided equipment (e.g. voltmeter, current source, computer).

If using Lake Shore instrumentation, then the provided Breakpoint tables provide a seamless solution for measuring temperature sensors and converting the measurement into temperature units. See Sensor Calibration Accuracies: Breakpoint Table for details on using this data with Lake Shore Cryotronics Instrumentation.

If the sensor is used with customer provided equipment (e.g., voltmeter, current source, and computer) then the Chebychev curve fit in the section labelled "Polynomial Equation" should be used. When using customer provided equipment to perform the sensor measurement, please refer to www.lakeshore.com/sensors for information regarding appropriate operating parameters.