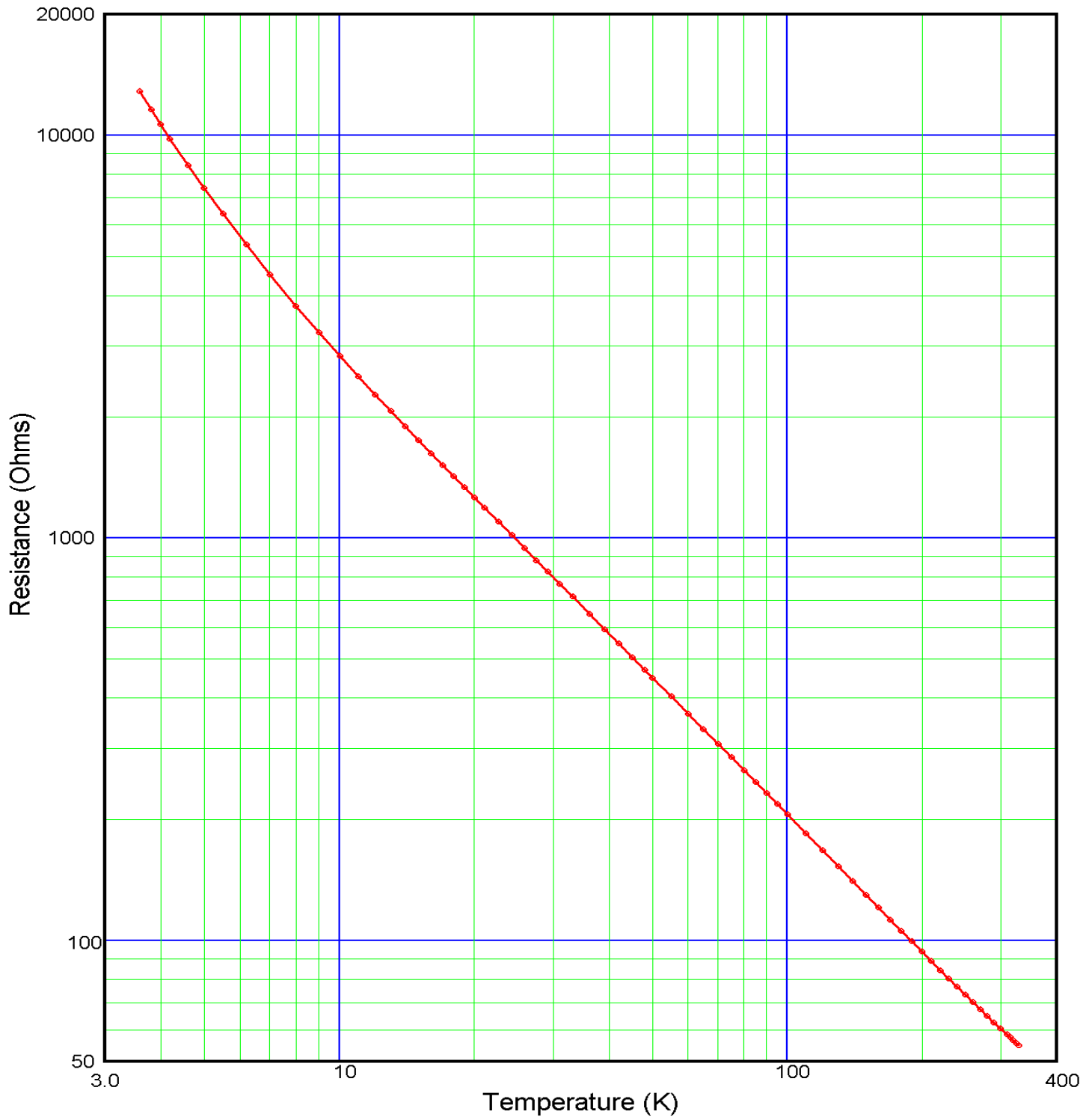


DATA PLOT

Calibration Report: 366318
Sensor Model: CX-1070-AA-4L
Sensor Type: Cernox Resistor
Temperature Range: 4.00K to 325K

Sales Order: 70589
Serial Number: X16458
Sensor Excitation: 2mV±50%



TEST DATA

Calibration Report: 366318
Sensor Model: CX-1070-AA-4L
Sensor Type: Cernox Resistor
Temperature Range: 4.00K to 325K

Sales Order: 70589
Serial Number: X16458
Sensor Excitation: 2mV±50%

| Index | Temperature (K) | Resistance (Ω) | Index | Temperature (K) | Resistance (Ω) |
|-------|-----------------|----------------|-------|-----------------|----------------|
| 1 | 3.59628 | 12869.8 | 41 | 75.2348 | 284.701 |
| 2 | 3.81129 | 11600.9 | 42 | 80.2358 | 264.798 |
| 3 | 4.00420 | 10646.3 | 43 | 85.2336 | 247.304 |
| 4 | 4.20001 | 9813.07 | 44 | 90.2292 | 231.906 |
| 5 | 4.60768 | 8431.31 | 45 | 95.2222 | 218.110 |
| 6 | 5.00724 | 7391.00 | 46 | 100.218 | 205.813 |
| 7 | 5.51078 | 6382.40 | 47 | 110.199 | 184.757 |
| 8 | 6.21829 | 5349.86 | 48 | 120.193 | 167.343 |
| 9 | 7.02558 | 4511.28 | 49 | 130.192 | 152.787 |
| 10 | 8.03186 | 3769.56 | 50 | 140.186 | 140.403 |
| 11 | 9.04239 | 3234.52 | 51 | 150.183 | 129.798 |
| 12 | 10.0487 | 2832.65 | 52 | 160.185 | 120.619 |
| 13 | 11.0564 | 2519.04 | 53 | 170.180 | 112.596 |
| 14 | 12.0641 | 2268.13 | 54 | 180.162 | 105.538 |
| 15 | 13.0673 | 2063.44 | 55 | 190.160 | 99.3122 |
| 16 | 14.0689 | 1891.95 | 56 | 200.163 | 93.7354 |
| 17 | 15.0638 | 1747.85 | 57 | 210.170 | 88.7582 |
| 18 | 16.0642 | 1622.88 | 58 | 220.167 | 84.2935 |
| 19 | 17.0569 | 1515.28 | 59 | 230.174 | 80.2497 |
| 20 | 18.0487 | 1420.68 | 60 | 240.176 | 76.5968 |
| 21 | 19.0441 | 1336.75 | 61 | 250.169 | 73.2821 |
| 22 | 20.0418 | 1261.91 | 62 | 260.179 | 70.2453 |
| 23 | 21.1356 | 1188.50 | 63 | 270.174 | 67.4706 |
| 24 | 22.7269 | 1095.21 | 64 | 280.167 | 64.9279 |
| 25 | 24.3131 | 1015.26 | 65 | 290.152 | 62.5769 |
| 26 | 25.9402 | 944.058 | 66 | 300.153 | 60.4207 |
| 27 | 27.6205 | 879.771 | 67 | 310.153 | 58.4333 |
| 28 | 29.2811 | 823.836 | 68 | 315.162 | 57.4806 |
| 29 | 31.1297 | 769.079 | 69 | 320.155 | 56.5811 |
| 30 | 33.2613 | 713.900 | 70 | 326.155 | 55.5317 |
| 31 | 36.2649 | 647.807 | 71 | 330.211 | 54.8512 |
| 32 | 39.2506 | 592.616 | | | |
| 33 | 42.2208 | 546.051 | | | |
| 34 | 45.2025 | 505.635 | | | |
| 35 | 48.1925 | 470.503 | | | |
| 36 | 50.1824 | 449.559 | | | |
| 37 | 55.1910 | 403.848 | | | |
| 38 | 60.2078 | 366.121 | | | |
| 39 | 65.2246 | 334.519 | | | |
| 40 | 70.2367 | 307.680 | | | |



POLYNOMIAL EQUATION

Calibration Report: 366318
Sensor Model: CX-1070-AA-4L
Sensor Type: Cernox Resistor
Temperature Range: 4.00K to 325K

Sales Order: 70589
Serial Number: X16458
Sensor Excitation: 2mV±50%

Polynomial Type: Chebychev
Useful Range of Fit:

4.00K to 24.3K
1.066e+4 Ohms to 1015. Ohms

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

ZL = 2.94436988074 ZU = 4.10957304528

| Order | Coefficient | Std. Deviation of Coefficient | Ratio (Coeff./Std Dev.) |
|-------|-------------|-------------------------------|-------------------------|
| 0 | 12.093616 | 2.3890E-04 | 50621.60 |
| 1 | -11.293900 | 3.6985E-04 | -30536.69 |
| 2 | 3.422143 | 3.5778E-04 | 9565.00 |
| 3 | -0.714679 | 3.3670E-04 | -2122.60 |
| 4 | 0.093692 | 3.2191E-04 | 291.05 |
| 5 | -0.003795 | 3.1292E-04 | -12.13 |

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

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

Temp. (K) = $\sum A_i \cdot \text{COS}(i \cdot \text{ARCCOS}(X))$, where $0 \leq i \leq 5$
and the A_i 's are the coefficients in the table above.



POLYNOMIAL EQUATION

Calibration Report: 366318
Sensor Model: CX-1070-AA-4L
Sensor Type: Cernox Resistor
Temperature Range: 4.00K to 325K

Sales Order: 70589
Serial Number: X16458
Sensor Excitation: 2mV±50%

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

| | R Meas. (Ω) | T Meas. (K) | T Eq. (K) | T diff. (mK) |
|----|----------------------|-------------|-----------|--------------|
| 1 | 12869.84 | 3.59628 | 3.59708 | -0.79 |
| 2 | 11600.86 | 3.81129 | 3.81084 | 0.45 |
| 3 | 10646.27 | 4.00420 | 4.00340 | 0.80 |
| 4 | 9813.071 | 4.20001 | 4.20023 | -0.22 |
| 5 | 8431.312 | 4.60768 | 4.60678 | 0.90 |
| 6 | 7391.004 | 5.00724 | 5.00691 | 0.32 |
| 7 | 6382.404 | 5.51078 | 5.51269 | -1.92 |
| 8 | 5349.862 | 6.21829 | 6.21965 | -1.36 |
| 9 | 4511.277 | 7.02558 | 7.02505 | 0.53 |
| 10 | 3769.560 | 8.03186 | 8.03102 | 0.84 |
| 11 | 3234.518 | 9.04239 | 9.04062 | 1.77 |
| 12 | 2832.655 | 10.04872 | 10.04850 | 0.23 |
| 13 | 2519.043 | 11.05636 | 11.05747 | -1.11 |
| 14 | 2268.127 | 12.06407 | 12.06451 | -0.43 |
| 15 | 2063.436 | 13.06726 | 13.06591 | 1.35 |
| 16 | 1891.953 | 14.06887 | 14.06974 | -0.87 |
| 17 | 1747.853 | 15.06378 | 15.06328 | 0.50 |
| 18 | 1622.881 | 16.06421 | 16.06513 | -0.93 |
| 19 | 1515.275 | 17.05691 | 17.05720 | -0.29 |
| 20 | 1420.680 | 18.04866 | 18.05017 | -1.51 |
| 21 | 1336.749 | 19.04406 | 19.04534 | -1.28 |
| 22 | 1261.910 | 20.04177 | 20.04060 | 1.17 |
| 23 | 1188.500 | 21.13557 | 21.13408 | 1.49 |
| 24 | 1095.206 | 22.72688 | 22.72633 | 0.54 |
| 25 | 1015.258 | 24.31313 | 24.31260 | 0.52 |
| 26 | 944.0581 | 25.94016 | 25.93959 | 0.57 |
| 27 | 879.7715 | 27.62054 | 27.62183 | -1.28 |

Order of Fit = 5 RMS error of fit = 1.01 mK
Largest absolute error = -1.92 mK at data point no. 7



POLYNOMIAL EQUATION

Calibration Report: 366318
Sensor Model: CX-1070-AA-4L
Sensor Type: Cernox Resistor
Temperature Range: 4.00K to 325K

Sales Order: 70589
Serial Number: X16458
Sensor Excitation: 2mV±50%

Polynomial Type: Chebychev
Useful Range of Fit:

24.3K to 110.K
1015. Ohms to 184.8 Ohms

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

ZL = 2.18408612803 ZU = 3.07499933691

| Order | Coefficient | Std. Deviation of Coefficient | Ratio (Coeff./Std Dev.) |
|-------|-------------|-------------------------------|-------------------------|
| 0 | 63.972056 | 1.7386E-03 | 36795.75 |
| 1 | -52.855500 | 2.8310E-03 | -18670.49 |
| 2 | 11.517939 | 2.5839E-03 | 4457.51 |
| 3 | -1.658717 | 2.3623E-03 | -702.16 |
| 4 | 0.166922 | 2.2050E-03 | 75.70 |
| 5 | -0.009817 | 2.2063E-03 | -4.45 |

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

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

Temp. (K) = $\sum A_i \cdot \text{COS}(i \cdot \text{ARCCOS}(X))$, where $0 \leq i \leq 5$
and the A_i 's are the coefficients in the table above.



POLYNOMIAL EQUATION

Calibration Report: 366318
Sensor Model: CX-1070-AA-4L
Sensor Type: Cernox Resistor
Temperature Range: 4.00K to 325K

Sales Order: 70589
Serial Number: X16458
Sensor Excitation: 2mV±50%

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

| | R Meas. (Ω) | T Meas. (K) | T Eq. (K) | T diff. (mK) |
|----|----------------------|-------------|-----------|--------------|
| 23 | 1188.500 | 21.13408 | 21.13288 | 1.20 |
| 24 | 1095.206 | 22.72633 | 22.72752 | -1.19 |
| 25 | 1015.258 | 24.31260 | 24.31362 | -1.02 |
| 26 | 944.0581 | 25.94016 | 25.93908 | 1.08 |
| 27 | 879.7715 | 27.62054 | 27.61944 | 1.10 |
| 28 | 823.8362 | 29.28115 | 29.28227 | -1.12 |
| 29 | 769.0790 | 31.12967 | 31.13045 | -0.78 |
| 30 | 713.8998 | 33.26126 | 33.26246 | -1.20 |
| 31 | 647.8073 | 36.26486 | 36.26488 | -0.02 |
| 32 | 592.6156 | 39.25060 | 39.25354 | -2.94 |
| 33 | 546.0510 | 42.22081 | 42.21593 | 4.88 |
| 34 | 505.6345 | 45.20250 | 45.20222 | 0.28 |
| 35 | 470.5030 | 48.19252 | 48.18909 | 3.42 |
| 36 | 449.5590 | 50.18243 | 50.17831 | 4.12 |
| 37 | 403.8482 | 55.19104 | 55.19105 | -0.01 |
| 38 | 366.1207 | 60.20778 | 60.21017 | -2.39 |
| 39 | 334.5191 | 65.22464 | 65.22887 | -4.23 |
| 40 | 307.6805 | 70.23672 | 70.24749 | -10.77 |
| 41 | 284.7008 | 75.23480 | 75.24642 | -11.62 |
| 42 | 264.7976 | 80.23579 | 80.23000 | 5.79 |
| 43 | 247.3038 | 85.23359 | 85.22740 | 6.18 |
| 44 | 231.9058 | 90.22919 | 90.20664 | 22.55 |
| 45 | 218.1096 | 95.22223 | 95.22290 | -0.67 |
| 46 | 205.8126 | 100.21814 | 100.22019 | -2.05 |
| 47 | 184.7575 | 110.19914 | 110.20408 | -4.94 |
| 48 | 167.3434 | 120.19280 | 120.20963 | -16.84 |
| 49 | 152.7869 | 130.19211 | 130.18095 | 11.16 |

Order of Fit = 5 RMS error of fit = 7.10 mK
Largest absolute error = 22.55 mK at data point no. 44



POLYNOMIAL EQUATION

Calibration Report: 366318
Sensor Model: CX-1070-AA-4L
Sensor Type: Cernox Resistor
Temperature Range: 4.00K to 325K

Sales Order: 70589
Serial Number: X16458
Sensor Excitation: 2mV±50%

Polynomial Type: Chebychev
Useful Range of Fit:

110.K to 325.K
184.8 Ohms to 55.73 Ohms

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

ZL = 1.73918639299 ZU = 2.33867470682

| Order | Coefficient | Std. Deviation of Coefficient | Ratio (Coeff./Std Dev.) |
|-------|-------------|-------------------------------|-------------------------|
| 0 | 193.116872 | 3.7501E-03 | 51496.06 |
| 1 | -114.485002 | 5.7925E-03 | -19764.20 |
| 2 | 19.049700 | 5.1943E-03 | 3667.43 |
| 3 | -2.901569 | 5.0664E-03 | -572.70 |
| 4 | 0.530263 | 5.0798E-03 | 104.39 |
| 5 | -0.104097 | 5.0419E-03 | -20.65 |
| 6 | 0.020868 | 4.8555E-03 | 4.30 |

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

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

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



POLYNOMIAL EQUATION

Calibration Report: 366318
Sensor Model: CX-1070-AA-4L
Sensor Type: Cernox Resistor
Temperature Range: 4.00K to 325K

Sales Order: 70589
Serial Number: X16458
Sensor Excitation: 2mV±50%

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

| | R Meas. (Ω) | T Meas. (K) | T Eq. (K) | T diff. (mK) |
|----|----------------------|-------------|-----------|--------------|
| 45 | 218.1096 | 95.22290 | 95.22704 | -4.14 |
| 46 | 205.8126 | 100.22019 | 100.21484 | 5.35 |
| 47 | 184.7575 | 110.20408 | 110.19730 | 6.77 |
| 48 | 167.3434 | 120.19280 | 120.20557 | -12.77 |
| 49 | 152.7869 | 130.19211 | 130.18770 | 4.41 |
| 50 | 140.4030 | 140.18611 | 140.19410 | -7.99 |
| 51 | 129.7981 | 150.18344 | 150.18464 | -1.21 |
| 52 | 120.6189 | 160.18485 | 160.17169 | 13.16 |
| 53 | 112.5958 | 170.18027 | 170.17084 | 9.43 |
| 54 | 105.5383 | 180.16184 | 180.17392 | -12.07 |
| 55 | 99.31218 | 190.16037 | 190.14306 | 17.30 |
| 56 | 93.73536 | 200.16340 | 200.17432 | -10.92 |
| 57 | 88.75819 | 210.17001 | 210.18206 | -12.05 |
| 58 | 84.29349 | 220.16665 | 220.16866 | -2.01 |
| 59 | 80.24968 | 230.17393 | 230.18957 | -15.64 |
| 60 | 76.59681 | 240.17555 | 240.18053 | -4.98 |
| 61 | 73.28206 | 250.16945 | 250.14994 | 19.51 |
| 62 | 70.24530 | 260.17878 | 260.16200 | 16.79 |
| 63 | 67.47055 | 270.17418 | 270.16190 | 12.28 |
| 64 | 64.92792 | 280.16666 | 280.14919 | 17.47 |
| 65 | 62.57687 | 290.15159 | 290.18917 | -37.59 |
| 66 | 60.42065 | 300.15252 | 300.17480 | -22.27 |
| 67 | 58.43330 | 310.15338 | 310.12816 | 25.23 |
| 68 | 57.48060 | 315.16219 | 315.18287 | -20.68 |
| 69 | 56.58108 | 320.15498 | 320.13829 | 16.69 |
| 70 | 55.53172 | 326.15525 | 326.15842 | -3.17 |
| 71 | 54.85123 | 330.21146 | 330.20837 | 3.09 |

Order of Fit = 6 RMS error of fit = 14.87 mK
Largest absolute error = -37.59 mK at data point no. 65



INTERPOLATION TABLE

Calibration Report: 366318
 Sensor Model: CX-1070-AA-4L
 Sensor Type: Cernox Resistor
 Temperature Range: 4.00K to 325K

Sales Order: 70589
 Serial Number: X16458
 Sensor Excitation: 2mV±50%

| Temp (K) | Res. (Ω) | dR/dT (Ω/K) | dlogR/dlogT | Temp (K) | Res. (Ω) | dR/dT (Ω/K) | dlogR/dlogT |
|----------|----------|-------------|-------------|----------|----------|-------------|-------------|
| 4.000 | 10661.8 | -4582.8 | -1.7193 | 37.00 | 633.354 | -19.247 | -1.1244 |
| 4.200 | 9813.97 | -3921.3 | -1.6782 | 38.00 | 614.644 | -18.188 | -1.1245 |
| 4.400 | 9084.65 | -3390.2 | -1.6420 | 39.00 | 596.950 | -17.213 | -1.1246 |
| 4.600 | 8451.33 | -2957.7 | -1.6099 | 40.00 | 580.192 | -16.314 | -1.1247 |
| 4.800 | 7896.49 | -2601.4 | -1.5813 | 42.00 | 549.210 | -14.710 | -1.1249 |
| 5.000 | 7406.90 | -2303.4 | -1.5549 | 44.00 | 521.206 | -13.328 | -1.1251 |
| 5.200 | 6972.00 | -2052.3 | -1.5307 | 46.00 | 495.777 | -12.129 | -1.1254 |
| 5.400 | 6583.50 | -1838.4 | -1.5079 | 48.00 | 472.590 | -11.082 | -1.1256 |
| 5.600 | 6234.54 | -1655.9 | -1.4873 | 50.00 | 451.364 | -10.163 | -1.1258 |
| 5.800 | 5919.54 | -1497.9 | -1.4676 | 52.00 | 431.865 | -9.3522 | -1.1261 |
| 6.000 | 5634.02 | -1360.5 | -1.4489 | 54.00 | 413.895 | -8.6323 | -1.1262 |
| 6.500 | 5025.38 | -1088.7 | -1.4082 | 56.00 | 397.282 | -7.9923 | -1.1266 |
| 7.000 | 4533.44 | -889.06 | -1.3728 | 58.00 | 381.881 | -7.4192 | -1.1268 |
| 7.500 | 4128.08 | -738.93 | -1.3425 | 60.00 | 367.567 | -6.9047 | -1.1271 |
| 8.000 | 3788.79 | -623.23 | -1.3159 | 65.00 | 335.848 | -5.8274 | -1.1278 |
| 8.500 | 3500.66 | -532.68 | -1.2934 | 70.00 | 308.909 | -4.9808 | -1.1287 |
| 9.000 | 3253.11 | -460.25 | -1.2733 | 75.00 | 285.758 | -4.3038 | -1.1296 |
| 9.500 | 3038.10 | -401.67 | -1.2560 | 77.35 | 275.968 | -4.0317 | -1.1300 |
| 10.00 | 2849.70 | -353.52 | -1.2406 | 80.00 | 265.658 | -3.7543 | -1.1306 |
| 10.50 | 2683.21 | -313.60 | -1.2272 | 85.00 | 248.053 | -3.3023 | -1.1316 |
| 11.00 | 2535.04 | -280.05 | -1.2152 | 90.00 | 232.509 | -2.9263 | -1.1327 |
| 11.50 | 2402.30 | -251.65 | -1.2047 | 95.00 | 218.690 | -2.6100 | -1.1338 |
| 12.00 | 2282.70 | -227.36 | -1.1952 | 100.0 | 206.327 | -2.3427 | -1.1354 |
| 12.50 | 2174.37 | -206.47 | -1.1869 | 105.0 | 195.198 | -2.1143 | -1.1373 |
| 13.00 | 2075.78 | -188.33 | -1.1794 | 110.0 | 185.135 | -1.9156 | -1.1382 |
| 13.50 | 1985.65 | -172.51 | -1.1728 | 115.0 | 175.999 | -1.7427 | -1.1387 |
| 14.00 | 1902.95 | -158.60 | -1.1668 | 120.0 | 167.670 | -1.5925 | -1.1397 |
| 14.50 | 1826.78 | -146.34 | -1.1616 | 125.0 | 160.044 | -1.4607 | -1.1409 |
| 15.00 | 1756.38 | -135.45 | -1.1568 | 130.0 | 153.039 | -1.3437 | -1.1414 |
| 15.50 | 1691.13 | -125.75 | -1.1525 | 135.0 | 146.586 | -1.2395 | -1.1415 |
| 16.00 | 1630.47 | -117.05 | -1.1487 | 140.0 | 140.625 | -1.1465 | -1.1414 |
| 16.50 | 1573.93 | -109.25 | -1.1453 | 145.0 | 135.105 | -1.0631 | -1.1410 |
| 17.00 | 1521.10 | -102.20 | -1.1422 | 150.0 | 129.980 | -0.98807 | -1.1402 |
| 17.50 | 1471.62 | -95.819 | -1.1394 | 155.0 | 125.212 | -0.92034 | -1.1393 |
| 18.00 | 1425.18 | -90.023 | -1.1370 | 160.0 | 120.766 | -0.85903 | -1.1381 |
| 18.50 | 1381.51 | -84.744 | -1.1348 | 165.0 | 116.612 | -0.80337 | -1.1367 |
| 19.00 | 1340.36 | -79.919 | -1.1329 | 170.0 | 112.724 | -0.75268 | -1.1351 |
| 19.50 | 1301.52 | -75.499 | -1.1312 | 175.0 | 109.078 | -0.70641 | -1.1333 |
| 20.00 | 1264.80 | -71.437 | -1.1296 | 180.0 | 105.654 | -0.66405 | -1.1313 |
| 21.00 | 1197.06 | -64.254 | -1.1272 | 185.0 | 102.432 | -0.62520 | -1.1292 |
| 22.00 | 1135.95 | -58.106 | -1.1253 | 190.0 | 99.3964 | -0.58946 | -1.1268 |
| 23.00 | 1080.58 | -52.766 | -1.1231 | 195.0 | 96.5326 | -0.55653 | -1.1242 |
| 24.00 | 1030.16 | -48.181 | -1.1225 | 200.0 | 93.8270 | -0.52611 | -1.1214 |
| 25.00 | 984.001 | -44.226 | -1.1236 | 205.0 | 91.2677 | -0.49796 | -1.1185 |
| 26.00 | 941.573 | -40.696 | -1.1237 | 210.0 | 88.8440 | -0.47185 | -1.1153 |
| 27.00 | 902.480 | -37.553 | -1.1235 | 215.0 | 86.5461 | -0.44761 | -1.1120 |
| 28.00 | 866.348 | -34.765 | -1.1236 | 220.0 | 84.3651 | -0.42505 | -1.1084 |
| 29.00 | 832.852 | -32.271 | -1.1237 | 225.0 | 82.2930 | -0.40403 | -1.1047 |
| 30.00 | 801.721 | -30.031 | -1.1237 | 230.0 | 80.3225 | -0.38441 | -1.1007 |
| 31.00 | 772.717 | -28.012 | -1.1238 | 235.0 | 78.4468 | -0.36608 | -1.0966 |
| 32.00 | 745.632 | -26.188 | -1.1239 | 240.0 | 76.6598 | -0.34892 | -1.0924 |
| 33.00 | 720.285 | -24.533 | -1.1240 | 245.0 | 74.9558 | -0.33284 | -1.0879 |
| 34.00 | 696.516 | -23.028 | -1.1241 | 250.0 | 73.3297 | -0.31776 | -1.0833 |
| 35.00 | 674.185 | -21.654 | -1.1242 | 255.0 | 71.7766 | -0.30360 | -1.0786 |
| 36.00 | 653.168 | -20.398 | -1.1242 | 260.0 | 70.2923 | -0.29028 | -1.0737 |



INTERPOLATION TABLE

Calibration Report: 366318
Sensor Model: CX-1070-AA-4L
Sensor Type: Cernox Resistor
Temperature Range: 4.00K to 325K

Sales Order: 70589
Serial Number: X16458
Sensor Excitation: 2mV±50%

| <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 | 68.8725 | -0.27775 | -1.0687 | 285.0 | 63.7678 | -0.23440 | -1.0476 |
| 270.0 | 67.5136 | -0.26595 | -1.0636 | 290.0 | 62.6194 | -0.22503 | -1.0422 |
| 273.15 | 66.6871 | -0.25886 | -1.0603 | 295.0 | 61.5166 | -0.21617 | -1.0366 |
| 275.0 | 66.2119 | -0.25482 | -1.0583 | 300.0 | 60.4569 | -0.20778 | -1.0310 |
| 280.0 | 64.9643 | -0.24432 | -1.0530 | 305.0 | 59.4381 | -0.19983 | -1.0254 |
| | | | | 310.0 | 58.4579 | -0.19230 | -1.0198 |
| | | | | 315.0 | 57.5144 | -0.18516 | -1.0141 |
| | | | | 320.0 | 56.6057 | -0.17838 | -1.0084 |
| | | | | 325.0 | 55.7301 | -0.17194 | -1.0027 |



THERMAL CYCLE TESTING

Sensor Model: CX-1070-AA-4L
Sensor Type: Cernox Resistor

Serial Number: X16458

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: | 59.3 Ω |
| Liquid Nitrogen: | 276 Ω |
| Liquid Helium: | 9780 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 at the values listed below. In order to minimize possible self-heating errors, we suggest that these same guidelines be followed in using the sensor:

| | |
|-------------|-----------|
| Above 1K: | 1 to 3 mV |
| 0.1 to 1K: | 0.1 mV |
| Below 0.1K: | 0.03 mV |

Lead Identification:

| | |
|--------|-----------|
| White: | I+ and V+ |
| Black: | I- and V- |

To avoid possible damage to the sensor, do not exceed 1 Volt and do not exceed 100 mA current.



BREAKPOINTS 340 FORMAT

Calibration Report: 366318
Sensor Model: CX-1070-AA-4L
Sensor Type: Cernox Resistor
Temperature Range: 4.00K to 325K

Sales Order: 70589
Serial Number: X16458

Name: CX-1070-AA-4L

Serial number: X16458

Format: 4 ;Log Ohms/Kelvin

Limit: 325.

Coefficient: 1 ;Negative

Point 1: 1.74607,325.000
Point 2: 1.75353,319.500
Point 3: 1.76047,314.500
Point 4: 1.76755,309.500
Point 5: 1.77478,304.500

Point 56: 2.38592, 86.500
Point 57: 2.40033, 84.000
Point 58: 2.41517, 81.500
Point 59: 2.42739, 79.500
Point 60: 2.43989, 77.500

Point 111: 3.38973, 11.300
Point 112: 3.41117, 10.850
Point 113: 3.43367, 10.400
Point 114: 3.45740, 9.950
Point 115: 3.48249, 9.500

Point 6: 1.78218,299.500
Point 7: 1.78974,294.500
Point 8: 1.79748,289.500
Point 9: 1.80539,284.500
Point 10: 1.81348,279.500

Point 61: 2.45272, 75.500
Point 62: 2.46589, 73.500
Point 63: 2.47941, 71.500
Point 64: 2.49332, 69.500
Point 65: 2.50763, 67.500

Point 116: 3.50611, 9.100
Point 117: 3.53102, 8.700
Point 118: 3.55745, 8.300
Point 119: 3.58557, 7.900
Point 120: 3.61178, 7.550

Point 11: 1.82176,274.500
Point 12: 1.83023,269.500
Point 13: 1.83891,264.500
Point 14: 1.84779,259.500
Point 15: 1.85689,254.500

Point 66: 2.52236, 65.500
Point 67: 2.53755, 63.500
Point 68: 2.55322, 61.500
Point 69: 2.57022, 59.400
Point 70: 2.58528, 57.600

Point 121: 3.63957, 7.200
Point 122: 3.66925, 6.850
Point 123: 3.70100, 6.500
Point 124: 3.73516, 6.150
Point 125: 3.76989, 5.820

Point 16: 1.86620,249.500
Point 17: 1.87575,244.500
Point 18: 1.88554,239.500
Point 19: 1.89557,234.500
Point 20: 1.90586,229.500

Point 71: 2.60081, 55.800
Point 72: 2.61685, 54.000
Point 73: 2.63343, 52.200
Point 74: 2.65059, 50.400
Point 75: 2.66836, 48.600

Point 126: 3.80625, 5.500
Point 127: 3.84314, 5.200
Point 128: 3.88306, 4.900
Point 129: 3.92364, 4.620
Point 130: 3.96457, 4.360

Point 21: 1.91641,224.500
Point 22: 1.92724,219.500
Point 23: 1.93835,214.500
Point 24: 1.94976,209.500
Point 25: 1.96030,205.000

Point 76: 2.68474, 47.000
Point 77: 2.70166, 45.400
Point 78: 2.71919, 43.800
Point 79: 2.73737, 42.200
Point 80: 2.75625, 40.600

Point 131: 4.00918, 4.100
Point 132: 4.02789, 4.000

Point 26: 1.97109,200.500
Point 27: 1.98216,196.000
Point 28: 1.99350,191.500
Point 29: 2.00514,187.000
Point 30: 2.01709,182.500

Point 81: 2.77463, 39.100
Point 82: 2.79373, 37.600
Point 83: 2.81361, 36.100
Point 84: 2.83432, 34.600
Point 85: 2.85449, 33.200

Point 31: 2.02935,178.000
Point 32: 2.04195,173.500
Point 33: 2.05490,169.000
Point 34: 2.06821,164.500
Point 35: 2.08192,160.000

Point 86: 2.87551, 31.800
Point 87: 2.89748, 30.400
Point 88: 2.91882, 29.100
Point 89: 2.94111, 27.800
Point 90: 2.96447, 26.500

Point 36: 2.09602,155.500
Point 37: 2.10893,151.500
Point 38: 2.12217,147.500
Point 39: 2.13580,143.500
Point 40: 2.14981,139.500

Point 91: 2.98710, 25.300
Point 92: 3.01079, 24.100
Point 93: 3.03568, 22.900
Point 94: 3.05973, 21.800
Point 95: 3.08505, 20.700

Point 41: 2.16423,135.500
Point 42: 2.17908,131.500
Point 43: 2.19439,127.500
Point 44: 2.21018,123.500
Point 45: 2.22648,119.500

Point 96: 3.10567, 19.850
Point 97: 3.12203, 19.200
Point 98: 3.13898, 18.550
Point 99: 3.15657, 17.900
Point 100: 3.17344, 17.300

Point 46: 2.24332,115.500
Point 47: 2.25855,112.000
Point 48: 2.27424,108.500
Point 49: 2.29044,105.000
Point 50: 2.30717,101.500

Point 101: 3.19094, 16.700
Point 102: 3.20915, 16.100
Point 103: 3.22811, 15.500
Point 104: 3.24625, 14.950
Point 105: 3.26511, 14.400

Point 51: 2.31950, 99.000
Point 52: 2.33209, 96.500
Point 53: 2.34502, 94.000
Point 54: 2.35828, 91.500
Point 55: 2.37191, 89.000

Point 106: 3.28482, 13.850
Point 107: 3.30544, 13.300
Point 108: 3.32507, 12.800
Point 109: 3.34558, 12.300
Point 110: 3.36711, 11.800



BREAKPOINTS 91C/93C/330 FORMAT

Calibration Report: 366318
 Sensor Model: CX-1070-AA-4L
 Sensor Type: Cernox Resistor
 Temperature Range: 4.00K to 325K

Sales Order: 70589
 Serial Number: X16458

Interpolation Method: Lagrangian
 Limit: 325. (Kelvin)
 Format: 4 (Log Ohms/Kelvin)
 Number of Breakpoints: 47

| No. | Units | Temperature (K) | No. | Units | Temperature (K) |
|-----|---------|-----------------|-----|---------|-----------------|
| 1 | 1.74609 | 325.0 | 26 | 2.91721 | 29.2 |
| 2 | 1.74743 | 324.0 | 27 | 2.97198 | 26.1 |
| 3 | 1.76828 | 309.0 | 28 | 3.02734 | 23.3 |
| 4 | 1.79052 | 294.0 | 29 | 3.08280 | 20.8 |
| 5 | 1.81431 | 279.0 | 30 | 3.13770 | 18.6 |
| 6 | 1.83980 | 264.0 | 31 | 3.19100 | 16.7 |
| 7 | 1.86717 | 249.0 | 32 | 3.24462 | 15.0 |
| 8 | 1.89661 | 234.0 | 33 | 3.29790 | 13.5 |
| 9 | 1.92836 | 219.0 | 34 | 3.35414 | 12.1 |
| 10 | 1.96269 | 204.0 | 35 | 3.40881 | 10.9 |
| 11 | 1.99995 | 189.0 | 36 | 3.46022 | 9.9 |
| 12 | 2.04056 | 174.0 | 37 | 3.51230 | 9.0 |
| 13 | 2.08504 | 159.0 | 38 | 3.56444 | 8.2 |
| 14 | 2.13410 | 144.0 | 39 | 3.61575 | 7.5 |
| 15 | 2.18863 | 129.0 | 40 | 3.66503 | 6.9 |
| 16 | 2.24983 | 114.0 | 41 | 3.72039 | 6.3 |
| 17 | 2.31951 | 99.0 | 42 | 3.77229 | 5.8 |
| 18 | 2.40036 | 84.0 | 43 | 3.81846 | 5.4 |
| 19 | 2.49688 | 69.0 | 44 | 3.86964 | 5.0 |
| 20 | 2.56943 | 59.5 | 45 | 3.92693 | 4.6 |
| 21 | 2.64484 | 51.0 | 46 | 4.00951 | 4.1 |
| 22 | 2.69529 | 46.0 | 47 | 4.02783 | 4.0 |
| 23 | 2.75151 | 41.0 | | | |
| 24 | 2.80562 | 36.7 | | | |
| 25 | 2.86196 | 32.7 | | | |

Temperature for Resistance Decades:

| Res. (Ohms) | Temp. (K) |
|-------------|-----------|
| 100 | 188.981 |
| 1000 | 24.642 |
| 10000 | 4.153 |



BREAKPOINTS 234 FORMAT

Calibration Report: 366318
 Sensor Model: CX-1070-AA-4L
 Sensor Type: Cernox Resistor
 Temperature Range: 4.00K to 325K

Sales Order: 70589
 Serial Number: X16458

Maximum Temperature Error:

1.4 - 10K: 0.011K
 10 - 20K: 0.011K
 20 - 40K: 0.016K
 40 - 100K: 0.013K
 > 100K: 0.070K

| BP # | Temp. (K) | Res. (Ω) | Log10 Res. | BP # | Temp. (K) | Res. (Ω) | Log10 Res. |
|------|-----------|----------|------------|------|-----------|----------|------------|
| 1 | 314.838 | 57.54399 | 1.760 | 46 | 49.444 | 457.0882 | 2.660 |
| 2 | 300.974 | 60.25596 | 1.780 | 47 | 47.461 | 478.6301 | 2.680 |
| 3 | 287.901 | 63.09573 | 1.800 | 48 | 45.558 | 501.1872 | 2.700 |
| 4 | 275.567 | 66.06934 | 1.820 | 49 | 43.732 | 524.8075 | 2.720 |
| 5 | 263.885 | 69.18310 | 1.840 | 50 | 41.978 | 549.5409 | 2.740 |
| 6 | 252.827 | 72.44360 | 1.860 | 51 | 40.294 | 575.4399 | 2.760 |
| 7 | 242.324 | 75.85776 | 1.880 | 52 | 38.676 | 602.5596 | 2.780 |
| 8 | 232.338 | 79.43282 | 1.900 | 53 | 37.124 | 630.9573 | 2.800 |
| 9 | 222.838 | 83.17638 | 1.920 | 54 | 35.636 | 660.6934 | 2.820 |
| 10 | 213.780 | 87.09636 | 1.940 | 55 | 34.205 | 691.8310 | 2.840 |
| 11 | 205.129 | 91.20108 | 1.960 | 56 | 32.832 | 724.4360 | 2.860 |
| 12 | 196.878 | 95.49926 | 1.980 | 57 | 31.514 | 758.5776 | 2.880 |
| 13 | 188.984 | 100.0000 | 2.000 | 58 | 30.248 | 794.3282 | 2.900 |
| 14 | 181.428 | 104.7129 | 2.020 | 59 | 29.034 | 831.7638 | 2.920 |
| 15 | 174.194 | 109.6478 | 2.040 | 60 | 27.868 | 870.9636 | 2.940 |
| 16 | 167.275 | 114.8154 | 2.060 | 61 | 26.749 | 912.0108 | 2.960 |
| 17 | 160.632 | 120.2264 | 2.080 | 62 | 25.675 | 954.9926 | 2.980 |
| 18 | 154.265 | 125.8925 | 2.100 | 63 | 24.643 | 1000.000 | 3.000 |
| 19 | 148.156 | 131.8257 | 2.120 | 64 | 22.703 | 1096.478 | 3.040 |
| 20 | 142.294 | 138.0384 | 2.140 | 65 | 20.919 | 1202.264 | 3.080 |
| 21 | 136.670 | 144.5440 | 2.160 | 66 | 19.281 | 1318.257 | 3.120 |
| 22 | 131.267 | 151.3561 | 2.180 | 67 | 17.778 | 1445.440 | 3.160 |
| 23 | 126.075 | 158.4893 | 2.200 | 68 | 16.400 | 1584.893 | 3.200 |
| 24 | 121.084 | 165.9587 | 2.220 | 69 | 15.139 | 1737.801 | 3.240 |
| 25 | 116.286 | 173.7801 | 2.240 | 70 | 13.984 | 1905.461 | 3.280 |
| 26 | 111.679 | 181.9701 | 2.260 | 71 | 12.929 | 2089.296 | 3.320 |
| 27 | 107.253 | 190.5461 | 2.280 | 72 | 11.964 | 2290.868 | 3.360 |
| 28 | 102.997 | 199.5262 | 2.300 | 73 | 11.083 | 2511.886 | 3.400 |
| 29 | 98.900 | 208.9296 | 2.320 | 74 | 10.279 | 2754.229 | 3.440 |
| 30 | 94.967 | 218.7762 | 2.340 | 75 | 9.546 | 3019.952 | 3.480 |
| 31 | 91.188 | 229.0868 | 2.360 | 76 | 8.876 | 3311.311 | 3.520 |
| 32 | 87.554 | 239.8833 | 2.380 | 77 | 8.265 | 3630.781 | 3.560 |
| 33 | 84.060 | 251.1886 | 2.400 | 78 | 7.706 | 3981.072 | 3.600 |
| 34 | 80.708 | 263.0268 | 2.420 | 79 | 7.197 | 4365.158 | 3.640 |
| 35 | 77.486 | 275.4229 | 2.440 | 80 | 6.731 | 4786.301 | 3.680 |
| 36 | 74.389 | 288.4032 | 2.460 | 81 | 6.304 | 5248.075 | 3.720 |
| 37 | 71.416 | 301.9952 | 2.480 | 82 | 5.913 | 5754.399 | 3.760 |
| 38 | 68.563 | 316.2278 | 2.500 | 83 | 5.555 | 6309.573 | 3.800 |
| 39 | 65.820 | 331.1311 | 2.520 | 84 | 5.226 | 6918.310 | 3.840 |
| 40 | 63.187 | 346.7369 | 2.540 | 85 | 4.924 | 7585.776 | 3.880 |
| 41 | 60.658 | 363.0781 | 2.560 | 86 | 4.646 | 8317.638 | 3.920 |
| 42 | 58.229 | 380.1894 | 2.580 | 87 | 4.389 | 9120.108 | 3.960 |
| 43 | 55.897 | 398.1072 | 2.600 | 88 | 4.153 | 10000.00 | 4.000 |
| 44 | 53.658 | 416.8694 | 2.620 | 89 | 3.641 | 12589.25 | 4.100 |
| 45 | 51.508 | 436.5158 | 2.640 | | | | |

